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BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS

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GARY PIERCE
PAUL NEWMAN
SANDRA D. KENNEDY
BOB STUMP

IN THE MATTER OF THE APPLICATION OF SULPHUR SPRINGS VALLEY ELECTRIC COOPERATIVE, INC. FOR A HEARING TO DETERMINE THE FAIR VALUE OF ITS PROPERTY FOR RATEMAKING PURPOSES, TO FIX A JUST AND REASONABLE RETURN THEREON, TO APPROVE RATES DESIGNED TO DEVELOP SUCH RETURN AND FOR RELATED APPROVALS.	DOCKET NO. E-01575A-08-0328

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SULPHUR SPRINGS VALLEY ELECTRIC COOPERATIVE, INC.'S APPLICATION FOR REHEARING AND RECONSIDERATION

September 28, 2009

Arizona Corporation Commission
DOCKETED
SEP 28 2009
DOCKETED BY

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I. INTRODUCTION

Pursuant to A.R.S. § 40-253 and A.A.C. R14-3-111, Sulphur Springs Valley Electric Cooperative, Inc. ("SSVEC" or "Cooperative") hereby submits its Application for Rehearing and Reconsideration ("Application") of Decision No. 71274 dated September 8, 2009 ("Decision") issued by the Arizona Corporation Commission ("Commission") in Docket No. E-01575A-08-0328. In addition to, and in support of, this Application, SSVEC incorporates by reference the matters set forth in its (1) Closing Brief filed in this docket on May 22, 2009, (2) Reply Brief filed in this docket on June 9, 2009, and (3) Exceptions to the July 14, 2009, Recommended Opinion and Order filed in this docket on July 23, 2009 ("Exceptions").

For the reasons set forth below, SSVEC submits that the Decision is contrary to law, exceeds the Commission's jurisdiction, and is arbitrary, capricious, discriminatory, and/or unsupported by the evidence in the record. SSVEC requests that the Commission reconsider the matter and issue a modified Decision that: (1) adopts the revenue requirement set forth in the Recommended Opinion and Order ("ROO"); (2) neither prohibits the Cooperative from constructing a 69 kV power line to the Sonoita/Patagonia area, nor requires the Cooperative to conduct an independent feasibility study; and (3) adopts the Cooperative's requests regarding the administration of its Wholesale Power and Fuel Cost Adjustor ("WPFCA") with respect to the Commission's approval of adjustor increases as described herein and in SSVEC's Exceptions.

II. RATE CASE BACKGROUND

SSVEC is an Arizona member-owned non-profit rural electric distribution cooperative headquartered in Willcox, Arizona. SSVEC is a Class A electric public service corporation that serves most of Cochise County and portions of Santa Cruz, Pima, and Graham Counties, pursuant to a Certificate of Convenience and Necessity issued by the Commission. SSVEC's 13-member elected Board of Directors ("Board") oversees all

aspects of the Cooperative's operations and approves the annual operating budget for the Cooperative. At a special meeting of the Board held on June 18, 2008, the Board approved the filing of an application with the Commission for a hearing to determine the fair value of its property for ratemaking purposes, to fix a just and reasonable return thereon, to approve rates designed to develop such return, and for related approvals.

On June 30, 2008, the Cooperative filed the rate application with the Commission pursuant to A.R.S. § 40-250. This was SSVEC's first request to increase its rates and charges in more than 16 years since the Cooperative sought, and obtained, a rate increase pursuant to Decision No. 58358 (July 23, 1993) in Docket No. U-1575-92-220 (the "1993 Rate Decision"). The application, as originally filed, sought to increase its annual revenue by $10,881,590, which would have resulted in an increase in retail rates of approximately 11.75 percent. This requested increase was designed to enable the Cooperative to:

- Increase its equity by 1.5 percent – 2.0 percent per year to reach the Commission's recommended equity level of 30 percent by 2014/2015;
- Increase its annual cash flow; and
- Meet its financial objectives regarding the addition of new generation sources resulting from continuing growth within its service territory.

What is important to note from the outset is that unlike the investor-owned utilities that the Commission regulates, SSVEC is a non-profit member-owned cooperative that has a <u>member-elected Board that oversees the operations of the utility on behalf of the members</u>.[1] As a non-profit cooperative, SSVEC has no shareholders. This makes it fundamentally different than a typical investor-owned utility that has, as one of its objectives, to earn as high a return as possible for the benefit of its shareholders. In the case of a cooperative such as SSVEC, the profit motive is removed and its clear mandated

[1] This is one of the reasons why the Legislature deemed it unnecessary for the Residential Utility Consumer Office ("RUCO") to continue to intervene in cooperative rate case proceedings before the Commission on behalf of residential ratepayers and changed the law in 1994. RUCO was an intervenor in SSVEC's last rate case.

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objective is to provide its members safe and reliable service at the least possible cost. The Cooperative must collect from its member/ratepayers sufficient rates and charges to operate the utility and have sufficient operating income (or operating margin) in order to borrow money to fund capital improvement and other projects necessary to not only maintain the utility, but to address growth within its service territory. Unlike an investor-owned utility, if the Cooperative was to collect rates and charges from its members in excess of what it needs in order to achieve these objectives, it is required to return the excess to the member-ratepayers through capital credits. Unfortunately, the Decision ignores this fundamental distinction in the matters that are the subject of this Application.

At the conclusion of a rate case proceeding that involved 17 sets of data requests from the Commission's Utilities Division ("Staff") totaling 269 questions and over 15,000 pages of documents in response to those questions, 11 witnesses, three (3) full days of hearing, closing and reply briefs, and the expenditure of considerable rate case expenses, the Administrative Law Judge ("ALJ") issued a ROO that recommended a revenue requirement of $102,370,096 which would have resulted in an overall revenue increase of 10.28 percent after more than 16 years without an increase. This would have increased the average residential customer monthly bill by $9.04 to $97.82, or 10.18 percent. The ALJ's recommendation was based upon overwhelming evidence that supported the Cooperative's positions[2] and rejected Staff's recommended revenue requirement on the basis that it was not supported by credible evidence. Additionally, because of the uncontroverted evidentiary record, the ALJ recommended that the Cooperative not delay construction of a planned 69 kV sub-transmission line.

Following the issuance of the ROO, the Commissioners adopted two amendments offered by Commissioner Newman. The first amendment adopted Staff's proposed

[2] With the exception of the Cooperative's request to recover $298,622 in charitable contribution expenses and almost all of its rate case expenses.

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revenue requirement of $100,430,597 (ultimately adjusted for an additional $10,000 of rate case expenses) which lowered the overall rate increase from 10.28 percent to 8.19 percent resulting in an increase in the average residential monthly bill of $8.04 to $96.82 or 9.06 percent. This amendment arbitrarily reduced the proposed rate increase to the average residential customer by $1.00 or 1.12 percent per month.[3] This was done despite the lack of evidentiary support and in violation of Arizona law.

The adoption of the second amendment exceeded the Commission's jurisdiction by (i) prohibiting SSVEC from constructing a much needed 69 kV power line until further Order of the Commission; and (ii) requiring the Cooperative to conduct an independent feasibility study to determine alternatives to the 69 kV line, including the use of renewable generation.

SSVEC, through this Application, is requesting that the Commission modify the Decision to (1) establish a revenue requirement consistent with the revenue requirement supported by the evidentiary record as set forth in the ROO; (2) neither prohibit the Cooperative from constructing a 69 kV power line to the Sonoita/Patagonia area nor require the Cooperative to conduct an independent feasibility study which is consistent with the evidentiary record; and (3) adopt the Cooperative's requests regarding the administration of its WPFCA with respect to the Commission's approval of adjustor increases for the reasons set forth herein and in SSVEC's Exceptions.

III. THE DECISION DOES NOT ESTABLISH JUST AND REASONABLE RATES IN VIOLATION OF ARIZONA LAW

A. Overview of the Legal Standards

1. *Rates and Charges Must be Just and Reasonable*.

The Commission is established by Article 15, Section 1, of the Arizona Constitution. The Commission's authority is derived from Article 15, Section 3, which

[3] *See* Attachment A that demonstrates the financial differential between the Decision and the ROO.

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provides, in pertinent part, that the Commission "shall have full power to, and shall, prescribe just and reasonable classifications to be used and just and reasonable rates and charges to be made and collected by public service corporations within the State for service rendered therein." Ariz. Const. art. XV, § 3.

When setting rates for public utilities, the Commission should focus on the principle that "total revenue, including income from rates and charges, should be sufficient to meet a utility's operating costs and to give the utility and its stockholders a reasonable rate of return on the utility's investment." *Scates v. Arizona Corp. Comm'n,* 118 Ariz. 531, 533-34, 578 P.2d 612, 614-15 (App. 1978). In the case of a cooperative, the reasonable rate of return relates to the operating income or operating margin the utility needs to achieve its financial and operational objectives consistent with its non-profit status.

Although the Commission's authority to prescribe rates is plenary, (*see Tucson Elec. Power Co. v. Arizona Corp. Comm'n.,* 132 Ariz. 240, 242, 645 P.2d 231, 233 (1982)), the Commission's rate-making authority is subject to the "just and reasonable" clauses of Article 15, Section 3, of the Arizona Constitution. *Residential Utility Consumer Office v. Arizona Corp. Comm'n,* 199 Ariz. 588, 591, 20 P.3d 1169, 1172 (App. 2001).

Under the Arizona Constitution, "the Commission is required to find the fair value of the company's property and use such finding as a rate base for the purpose of determining what are just and reasonable rates." *Arizona Corp. Comm'n v. Arizona Public Service Co*, 113 Ariz. 368, 370, 555 P.2d 326, 328 (1976) (citing *Simms v. Round Valley Light & Power Co.,* 80 Ariz. 145, 294 P.2d 378 (1956)). "Thus, the rates established by the Commission <u>should meet the overall operating costs of the utility</u> and produce a reasonable rate of return [or operating margin]. It is equally clear that the <u>rates cannot be considered just and reasonable if they fail to produce a reasonable rate of return</u>

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[or margin in the case of a cooperative] or if they produce revenue which exceeds a reasonable rate of return." *Scates,* 118 Ariz. at 534, 578 P.2d at 615 (emphasis added).

2. *The Commission's Determination of Just and Reasonable Rates Must be Supported by the Evidence.*

"The acceptance of evidence presented by one person over that presented by another is not necessarily decisive because the weight given any of the evidence is within the Commission's discretion, so long as that discretion is not abused." *City of Tucson v. Citizens Utilities Water Co.*, 17 Ariz. App. 477, 480-481, 498 P.2d 551, 554-555 (emphasis added) (citing *Arizona Corp. Comm'n. v. Arizona Water Co.*, 85 Ariz. 198, 335 P.2d 412 (1959)). "It is, however, also well established 'that a reasonable judgment concerning all relevant factors is required in determining the fair value of the properties at the time of inquiry.'" *City of Tucson,* 17 Ariz. App. at 481, 498 P.2d at 555 (App. 1972) (citing *Arizona Water Co.*, 85 Ariz. At 200, 335 P.2d at 414). "If the Commission 'refuses to consider all the relevant factors, the fair value of the properties cannot have been determined under our Constitution.' Mere speculation and arbitrary conclusions are not substantial evidence and cannot be determinative." *City of Tucson*, 17 Ariz. App. at 481, 498, P.2d at 555 (emphasis added) (quoting *Arizona Water Co.,* 85 Ariz. at 200, 335 P.2d at 414). When considering the Commission's decisions in a rate making context, the Courts will look at the evidence only to determine if the decision is unreasonable in that it lacks substantial support in the record, is arbitrary, or is otherwise unlawful. *Chaparral City Water Co. v. Arizona Corp. Comm'n*, Case No. 1 CA-CC 05-0002, Mem. (App., Feb. 13, 2007) (citing *Simms*, 80 Ariz. at 154-155, 294 P.2d at 384). Moreover, in establishing just and reasonable rates, the Commission may not simply "back into a result." *See generally id.*

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3. *The Procedural Requirements Applicable to Setting Rates*.

The process and procedures the Commission follows to gather and consider evidence in setting rates are quasi-judicial in character. Perhaps the clearest statement of the Commission's duties is found in *State ex rel. Corbin v. Arizona Corp. Comm'n*, 143 Ariz. 219, 693 P.2d 362 (App. 1984):

> [A proceeding to set rates] carries with it fundamental procedural requirements. There must be a full hearing. There must be evidence adequate to support pertinent and necessary findings of fact. Nothing can be treated as evidence which is not introduced as such. . . . Facts and circumstances which ought to be considered must not be excluded. Facts and circumstances must not be considered which should not legally influence the conclusion. Findings based on the evidence must embrace the basic facts which are needed to sustain the order....
>
> . . .
>
> A proceeding before the Commission that involves the required taking and weighing of evidence, determinations of fact based upon the consideration of the evidence, and the making of an order supported by such findings, has a quality resembling that of a judicial proceeding. Hence, it is frequently described as a proceeding of a *quasi-judicial* character. The requirement of a 'full hearing' has obvious reference to the tradition of judicial proceedings in which evidence is received and weighed by the trier of the facts. The "hearing" is designed to afford the safeguard that the one who decides shall be bound in good conscience to consider the evidence, to be guided by that alone, and to reach his conclusion uninfluenced by extraneous considerations, which in other fields might have play in determining purely executive action. The 'hearing' is the hearing of evidence and argument.

In ex rel. Corbin, 143 Ariz. at 224, 693 P.2d at 367 (quoting *Morgan v. United States,* 298 U.S. 468, 56 S.Ct. 906, 80 L.Ed. 2d 1288 (1936) (citations omitted)).

Thus, the Commission's decision must be based on factual findings that are supported by the evidence presented by the parties in this proceeding, with due regard to the expertise and credibility of the witnesses, as well as the authorities and precedent supporting the parties' positions. The Commission cannot disregard the evidence supporting the ROO in this case in order to achieve lower utility rates.

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In *In Ex rel. Corbin*, the Court rejected the Commission's argument that because of the agency's constitutional genesis, the Commission is not subject to legislative control and judicial scrutiny in setting rates, noting that Article 15, Section 6, of the Arizona Constitution expressly authorizes the Legislature to regulate the procedural aspects of Commission rate proceedings. *Id.* at 224-25, 693 P.2d at 367-368. The Legislature has exercised this power by enacting various statutes, codified in Title 40 of the Arizona Revised Statutes, which impose procedural requirements on the Commission and subject the agency to the requirements of the Arizona Administrative Procedure Act ("APA").[4]

Under the APA, a contested case is defined as "any proceeding, *including rate making* ... in which the legal rights, duties or privileges of a party are required or permitted by law, other than this chapter, to be determined...."[5] In a contested case, the agency's "final decision shall contain findings of fact and conclusions of law, separately stated. Findings of fact, if set forth in statutory language, shall be accompanied by a concise and explicit statement of the underlying facts supporting the findings."[6]

"It is the general rule that the findings of administrative agencies must be explicit to enable the reviewing court to review the decision intelligently and to ascertain whether the facts as found afford a reasonable basis for the decision . . .." *Wammack v. Industrial Comm'n of Arizona*, 83 Ariz. 321, 325, 320 P.2d 950, 953 (1958) (citation omitted) (emphasis added). Moreover, "[r]equiring findings of basic facts by an administrative agency assures more careful administrative consideration, protects against carelessness, and arbitrary action, assists parties in planning their cases for rehearing and judicial review and keeps such agencies within their jurisdiction." *Civil Serv. Comm'n of City of Tucson v. Livingston*, 22 Ariz. App. 183, 188, 525 P.2d 949, 954 (App. 1974) (citation omitted) (emphasis added). "Findings based on the evidence must embrace the basic facts

[4] A.R.S. § 41-1001, *et seq.*
[5] A.R.S. § 41-1001(4) (emphasis added).
[6] A.R.S. § 41-1063.

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which are needed to sustain the order." *Livingston*, 22 Ariz. App. At 189, 525 P.2d at 955 (citing *Morgan*, 298 U.S. 468, 56 S. Ct. 906, 80 L.Ed. 2d 1288).

B. <u>The Commission's Adoption of Staff's Proposed Revenue Requirement is Unreasonable, Lacks Substantial Evidentiary Support in the Record, is Arbitrary, and is Otherwise Unlawful</u>.

At the August 25, 2009, Open Meeting, the Commission adopted Commissioner Newman's Proposed Amendment No. 5 which rejected the revenue requirement of $102,370,096 set forth in the ROO in favor of Staff's proposed revenue requirement (adjusted for rate case expenses) of $100,430,597.[7] The adoption of this revenue requirement is contrary to the recommendation of the ALJ who based her recommendation on (i) the weight of evidence presented at the hearing (which included extensive pre-filed testimony); (ii) extensive cross-examination of Cooperative and Staff witnesses; (iii) ALJ questioning of witnesses; and (iv) the Closing and Reply Briefs filed by the Cooperative and Staff.

The $1,939,499 difference in the revenue requirement stems from various adjustments and assumptions that Staff made regarding its proposed revenue requirement. SSVEC maintained throughout the proceeding that the attainment of its recommended revenue requirement (as adjusted in the ROO) is critical for the Cooperative to achieve its financial and operational objectives, including the achievement of a 30 percent level of equity by 2016, which was the stated goal agreed upon by Staff and the Cooperative, and as also found in the Decision.[8] Those Staff adjustments are as follows:

1. *<u>Reduced operating margin ($1,380,872)</u>*.

There was no credible basis for Staff's proposed reduction of the Cooperative's operating margin other than to simply lower rates. Moreover, this reduced operating margin makes the agreed-upon stated goal of SSVEC achieving a 30 percent equity level

[7] A copy of Commissioner Newman's Proposed Amendment No. 5 is attached hereto as Attachment B.
[8] Decision at page 43, Finding of Fact No. 30.

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by 2016 impossible, and meeting such equity goals will require an additional nine years to accomplish.[9] The evidence presented at the hearing clearly demonstrated that Staff's proposed revenue requirement adopted in the Decision will result in SSVEC not achieving the 30 percent equity level by 2016.[10]

Surrebuttal Schedule CSB-23 to the Surrebuttal Testimony of Crystal Brown (Hearing Exhibit S-7) sets forth Staff's equity and long-term debt projections.[11] It should be noted that the top portion of that Schedule is derived from the Cooperative's Rebuttal Exhibit DH-9 attached to Mr. David Hedrick's testimony. Therefore, both the Cooperative and Staff are in agreement with this starting point for this calculation. However, the bottom portion of Surrebuttal Schedule CSB-23 clearly shows where Staff deviated in order to justify its margin adjustment. In 2009, Staff begins increasing equity by reducing long-term debt by $3 million. The $3 million derives from two adjustments: $918,806 and $2,081,194. Based upon a review of the Surrebuttal Testimony and Surrebuttal Schedule CSB-23, one cannot determine from where these adjustments were derived. Therefore, Staff was asked to explain these two adjustments at the hearing. Ms. Brown testified at the hearing that the $918,806 that Staff had previously agreed SSVEC was entitled to was derived from the increase in margin in the Fort Huachuca contract.[12] Staff then arbitrarily assigned that portion of the increase in margin towards reduction of long-term debt.[13] In essence, Staff agreed with the Cooperative that it was entitled to an additional $918,806 in margin expense associated with the Fort Huachuca contract, then took it away from the Cooperative by assigning it to long-term debt reduction in order to arbitrarily inflate the equity ratio.

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[9] *See* schedule attached as Attachment C comparing the increase in equity under the Decision as compared to the ROO.
[10] Hearing Transcript (hereinafter "Hr. Tr.") at page 388, line 23 through page 401, line 6.
[11] Hearing Exhibit (hereinafter "Hr. Ex.") S-7 at page 12, lines 18-19.
[12] Hr. Tr. at page 390, line 5 through page 391, line 11.
[13] *Id.* at page 389, line 21 through page 390, line 4.

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If there is any doubt that this was an arbitrary adjustment, one just needs to look to the next part of the calculation. When asked from where the $2,081,194 was derived, Ms. Brown testified that it came from existing margin *or* depreciation expense.[14] Staff admitted that it came up with $2,081,194 because it determined it wanted to decrease long-term debt by $3 million, so after applying the $918,806 adjustment, it simply subtracted that amount to come up with the additional $2,081,194 in order to "back in" to the $3 million reduction. When asked why Staff decided to reduce long-term debt by $3 million, Ms. Brown testified that Staff wanted the Cooperative to contribute $3 million of its own equity to reduce debt, which in turn would increase equity.[15] As evidenced in the record, the major flaw in Staff's analysis is that Staff reduces long-term debt by an arbitrary amount of $3 million. Mr. Hedrick's Rebuttal Exhibit DH-9 already included a reduction in long-term debt by the entire amount of the net margin produced under the proposed revenue requirement.

Staff's analysis is further flawed because one of the objectives of this rate case was for the Commission to authorize a revenue requirement that includes a margin component to achieve 30 percent equity by 2016. The result of the adoption of this Staff recommendation (which only works on paper but does not work in reality) is that the Cooperative will require an additional $3 million of margin to reduce long-term debt. Therefore, based on Staff's analysis, the Cooperative would be $3 million short per year of meeting its margin needs to build equity. When asked if the Cooperative could achieve a 30 percent equity level by 2016 without this adjustment, Ms. Brown agreed that all things being equal, the Cooperative could not achieve this objective by 2016, and it would take considerably longer to attain.[16]

. . .

[14] *Id.* at page 391, line 12 through page 394, line 9.
[15] *Id* at page 394, lines 14-19.
[16] *Id.* at page 394, line 20 through page 395, line 5.

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Additionally, Staff testified that it reduced long-term debt by an arbitrary amount of an additional 10 percent, or $1,916,057, *starting in 2012* based upon the "bad economy".[17] Ms. Brown testified that Staff does not believe the Cooperative will grow at the same pace and, therefore, will not have to borrow as much.[18] When asked from where the 10 percent came, Ms. Brown testified that it was based upon "Staff's professional judgment" as to what would happen in the future.[19] However, Staff does not know what will happen in the future. This was an arbitrary determination to further reduce long-term debt in order to justify a lowering of the Cooperative's operating margin to mitigate the rate increase.

This adjustment is inconsistent with two important and undisputed facts. First, Mr. Huber testified that SSVEC's level of capital projects are needed to provide service and would continue into the future as planned, which would require SSVEC to continue its current level of borrowing.[20] Second, Staff offered no evidence regarding the Cooperative's level of growth or need for plant additions to support its recommendation. With this additional $1.9 million adjustment Staff has assigned from the very operating margin (that Staff already agreed the Cooperative is entitled), it used approximately $4.9 million towards long-term debt reductions to artificially inflate the equity level in order to be able to show that SSVEC could reach a 30 percent equity level by 2016. Without these adjustments, Staff acknowledged that SSVEC's attainment of a 30 percent equity level will be significantly delayed. Moreover, based upon Surrebuttal Schedule CSB-23, Staff agreed that the Cooperative's analysis set forth in Mr. Hedrick's Rebuttal Exhibit DH-9 is the appropriate starting point for the analysis.

. . .

[17] *Id.* at page 395, lines 21-24.
[18] *Id.* at page 396, line 7 through page 397, line 5.
[19] *Id.* at page 397, lines 6-12.
[20] *Id.* at page 85, line 15 through page 87, line 19.

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The net result of Staff's margin adjustments reduced the annual revenue requirement by $1,380,872. The evidence presented overwhelmingly demonstrated that Staff's proposed operating margin adjustment was arbitrarily determined for the sole purpose of lowering the rates and was not supported by the evidence. The ALJ agreed, and the ROO stated, the following:

> Staff's assumptions about the amount of long-term debt that the Cooperative will require in the future is not sufficiently supported to warrant dismissing the Cooperative's analysis and projections of its capital needs.[21]

Notwithstanding the above evidence and analysis to the contrary, the above quoted language was deleted from the Decision, and the Cooperative's revenue requirement was reduced by $1,380,872. The Decision ignored the evidence and arbitrarily found in (1) Finding of Fact No. 31 that "[t]he evidence supports the Staff's projection for equity growth" and (2) Finding of Fact No. 32 that Staff's proposed revenue requirement will allow the Cooperative to "achieve a 30 percent equity ratio in a reasonable period of time". This is despite the evidence to the contrary and the finding in Finding of Fact No. 30 that "[t]he goal of increasing SSVEC's equity to 30 percent of total capitalization by approximately 2016 is reasonable".

2. *Payroll Expense Adjustment ($523,570).*

Staff's reduction of known and measurable payroll expenses post-test year is not appropriate. Staff reduced payroll expenses by $523,570 as a result of the Cooperative's inclusion of 10 employees that were hired after the Test Year in 2008. Staff stated it was not appropriate to include the additional 10 employees because there was a corresponding reduction in staff by employees leaving the Cooperative.[22] Unfortunately, this is not supported by the facts in this case. As Mr. Hedrick testified in his Rebuttal Testimony:

[21] ROO at page 16, lines 20-22 (emphasis added).
[22] Hr. Ex. S-6 at page 18, lines 14-17.

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(i) the reduction was due to seasonal or part-time employees leaving, and the staffing level included in the rate application shows a net gain of 10 employees; (ii) the payroll level proposed by SSVEC is representative of the known, measureable, and continuing level of payroll expenses needed to provide quality service to members; and (iii) the Cooperative experienced significant growth over the past five years. Accordingly, the number of employees is reasonable and necessary in order to serve the members.[23]

In response to this argument, Staff noted that the payroll costs outside of the Test Year were not known and measurable and would violate the matching of revenues and expenses.[24] However, in his Rejoinder Testimony, Mr. Hedrick reiterated that (i) these employees were hired shortly after the end of the Test Year so that the Cooperative could continue to maintain a high level of reliable service; (ii) it was not unreasonable to include these costs in light of SSVEC's margins, equity, and other indicators; and (iii) they *are* known and measurable payroll costs.[25]

As noted by Staff, A.A.C. R14-2-103.A.3.i states that pro forma adjustments are "adjustments of actual Test Year results to obtain a more realistic relationship between revenues, expenses, and rate base". There is nothing that precludes the Commission from recognizing post-Test Year pro forma adjustments. At the hearing, Staff acknowledged that post-year adjustments are appropriate so long as they provide a more realistic relationship between revenue and expenses. The 10 employees at issue were hired in April 2008, less than four months after the end of the Test Year and are on the payroll today. But because they were hired outside of the Test Year, Staff maintains that it is inappropriate to include the expenses associated with those employees in SSVEC's revenue requirement. However, Staff itself made a pro forma adjustment to increase interest expense that occurred in November 2008, 11 months after the end of the Test Year

[23] Hr. Ex A-8 at page 8, line 9 through page 9, line 23.
[24] Hr. Ex. S-7 at page 3, line 24 through page 5, line 17.
[25] Hr. Ex. A-9 at page 3, lines 3-23.

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to provide a more realistic relationship between expenses and rate base and because Staff believed that the expense was reflective of reasonable interest expense for SSVEC going forward.[26]

If Staff considers an interest expense that occurred 11 months after the Test Year to be known and measurable, it is inconsistent to say that 10 employees that were hired a mere four months after the Test Year that are still on the payroll today are not a known and measurable expense. Moreover, Staff admits that because these 10 employees are on the payroll today, SSVEC would have to continue paying these employees from its margins.[27]

After weighing this considerable evidence, the ALJ recommended in the ROO, *and* the Decision contains, the following:

> The Commission considers post-Test Year adjustments on a case-by-case basis, in an attempt to normalize Test Year results to reflect known and measurable changes to the Test Year. In this case, although it does not appear that the 2007 staffing levels were abnormally low or not normal,' the Cooperative has demonstrated that its requested Payroll Expense represents a known and measurable expense, as well as a continuous level of staffing. Staff believed that the employees were hired to service growth in 2008 and future years. However, the Cooperative has shown that in the five years commencing in 2003, it has experienced significant growth and that growth in staffing, including the employees at issue, over the same period has grown proportionately. <u>The evidence shows that the new employees were hired in early 2008 to achieve sufficient staffing levels to maintain service quality arising from the high growth that occurred from 2003 through 2008, and were not hired to serve growth that occurred after the Test Year.</u> The Arizona Administrative Code allows for adjustments to actual test year results to obtain a normal or more realistic relationship between revenues and expenses and rate base. <u>In this case, the pro forma adjustment reflects a realistic staff level and a known and measurable expense.</u>[28]

. . .

. . .

[26] Hr. Tr. at page 372, line 13 through page 373, line 14; Hr. Ex. S-6 at page 21, lines 23-25.
[27] Hr. Tr. at page 387, line 9-16.
[28] Decision at page 6, line 14 through page 7, line 3 (emphasis added).

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However, the ROO contained the following additional sentence based on the evidence that was *deleted* from the Decision:

> We find the adjustment to be reasonable, and adopt the Cooperative's Payroll Expense.[29]

Despite the above-quoted language that remains in the Decision that provides the evidence and justification for the inclusion of the payroll expense, as well as the ALJ's recommendation, in order to "back in" to Staff's proposed revenue requirement to lower the rate increase, the Commission arbitrarily excised the language that found Staff's proposed adjustment to be reasonable, thereby reducing the revenue requirement by an additional $523,570.

3. *Year-End Bonus and Safety Pay Adjustment ($45,058).*

Staff characterized these payments as "incentive based" and not necessary to provide safe and reliable service and should be paid from SSVEC's margins.[30] However, Staff did not object to the Cooperative recovering expenses for fair and reasonable compensation.[31] Practically speaking, and looking past what these payments are called to what they actually are, the evidence demonstrated that these payments have not been treated by the Cooperative as incentive-based and should, therefore, be considered as part of the employees' compensation package. Although the Cooperative is not required to pay these amounts, they have been consistently paid each year, including during the Test Year, and were paid to all 195 employees.[32]

With respect to safety pay, maintaining the highest level of safety is an important objective of the Cooperative. The $24,557 was the amount paid during 2007 to all 195 employees with the average payment being only $126.[33] In SSVEC's last rate case, the

[29] ROO at page 7, lines 3-4.
[30] Hr. Ex. S-6 at page 21, lines 1-8; Hr. Ex. S-7 at page 8, line 22 through page 9, line 5.
[31] Hr. Tr. at page 367, lines 13-19.
[32] Hr. Ex. A-8 at page 11, lines 10-23; Hr. Ex. A-9 at page 4, lines 11-18.
[33] Hr. Ex. A-8 at page 11, lines 16-19.

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Commission found "that the Cooperative has shown this expense to be appropriate and of benefit to the Cooperative's ratepayers and will not disallow it."[34] Regarding the year-end bonus, the $20,500 of expense results in a $100 payment to employees during the Test Year and is a routine and expected part of the employees' compensation.[35]

Staff recommended that these expenses be paid from SSVEC's internally generated cash flows. This would have the effect of further reducing SSVEC's margin, which is inconsistent with the goal of achieving a 30 percent equity level by 2016.[36]

The Decision and ROO contain the following language:

> Whether the Cooperative is required to pay year end bonuses or not, employees have come to expect a relatively small extra payment at the end of the year, which contributes to employee morale and satisfaction and is one factor that allows the Cooperative to retain its employees. The year end bonus is not tied to performance and is distinguishable from other situation where the Commission has not allowed the recovery of incentive pay/bonuses. Encouraging employees to attend safety meetings and maintain a safe record ultimately leads to lower costs.[37]

However, the ROO contained the following additional sentence based on the evidence that was *deleted* from the Decision:

> The Cooperative has demonstrated that these payments reasonably benefit the members/ratepayers by helping to promote a stable and well-trained workforce, and we will not disallow the inclusion of these expenses.[38]

Despite the above-quoted language that remains in the Decision that provides the evidence and justification for the inclusion of the Year End Bonus and Safety Pay

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[34] 1993 Rate Decision at page 14, lines 4-6.
[35] Hr. Ex. A-8 at page 11, lines 21-23.
[36] Hr. Ex. S-7 at page 9, lines 2-5; *See also* Hr. Tr. at page 369, line 17 through page 370, line 25. Although Ms. Brown suggests that this could also be paid from the Cooperative's depreciation expense, she provided no support for SSVEC being required to do this as both SSVEC and Staff had previously agreed on the amount of depreciation expense that SSVEC was entitled to recover.
[37] ROO at page 7, lines 18-23.
[38] ROO at page 7, line 23, through page 8, line 1 (emphasis added).

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expense, as well as the ALJ's recommendation quoted above, in order to "back in" to Staff's proposed revenue requirement to lower the rate increase, the Commission arbitrarily excised the language that found Staff's proposed adjustment to be reasonable, thereby reducing the revenue requirement by an additional $45,058.

4. *Rate Case Expenses Adjustment ($30,000)*.

At the hearing, the Cooperative put on extensive evidence demonstrating that the rate case expenses that it had incurred in connection with this rate case were reasonable, appropriate, and consistent with the experience of other similarly-situated utilities where the Commission granted recovery of such expenses.[39] The Cooperative also demonstrated by overwhelming evidence, that Staff's recommendation that the Cooperative would only be entitled to recover a total of $100,000 ($20,000 per year over five years) was unfounded. Based on the evidence, the ALJ recommended in the ROO that the Cooperative's request for recovery of $397,608 over five years be reduced to $300,000 ($60,000 per year) over five years. The Cooperative agreed to this recommendation in accepting the ROO's recommended revenue requirement.

At the Open Meeting, Commissioner Pierce's Proposed Amendment No. 1 was adopted and incorporated into the Decision. This Amendment amortized the recovery of the $300,000 of rate case expenses over ten years instead of five. A copy of Commissioner Pierce's Proposed Amendment No. 1 is attached as Attachment D. The result is that the revenue requirement recommended in the ROO is further reduced by $30,000 per year.[40]

The Decision itself sets forth a comparison of rate case expenses that the Commission has approved for 10 other utilities[41] and acknowledged that the

[39] *See* SSVEC's Closing Brief, page 21, line 13 through page 28, line 21.

[40] Because of the adoption of Commissioner Newman's Proposed Amendment No. 5, which adopted Staff's lower revenue requirement, the effect of the adoption of Commissioner Pierce's Proposed Amendment No. 1 increased Staff's revenue requirement by $10,000 per year.

[41] Decision at page 13, lines 9-21.

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Cooperative's recovery of $300,000 of rate case expenses is:

> . . . fair and reasonable, and represents a more realistic level of total Rate Case Expense.[42]

What was deleted from the ROO and not incorporated into the Decision was the following language:

> The five year recovery period we adopt is slightly longer than usually seen for an investor-owned utility, but not unreasonable for this cooperative.[43]

Instead, the Decision *doubles* the recovery period, thereby *reducing* the annual recovery by *half*, on the erroneous basis:

> . . . that it has been 16 years since SSVEC's last rate case, and given the surplus recovery of SSVEC's prior rate case expenses, we believe it is appropriate to amortize rate case expenses over ten years.[44]

At the August 25, 2009, Open Meeting, counsel for the Cooperative pointed out the fallacy with respect to the above-cited basis for the extension of the recovery period as follows:

> I really would like to be heard on this one. This is sort of a sticking point here for us. You know, although Commissioner Pierce's amendment 1 allows for the full $300,000, because of the 10-year amortization period, the amendment really all but guarantees that we will never recover it.
>
> You know, if the ROO is adopted as is, if it is adopted, Sulphur would file its next rate case in three to five years. I think it is going to be sooner now because of the amendment, you know. So therefore the 300,000 of rate case expenses that would be recovered would be, you know, probably between 50- and $80,000 by the time we get to the next rate case.
>
> Those additional rate case expenses that would have normally come in over seven years I don't believe we would be getting,

[42] Decision at page 14, lines 5-6.
[43] ROO at page 14, lines 14-16.
[44] Decision at page 14, lines 9-11.

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> because they would be looking at the revenue as it existed at the time of the test year. So I don't think that we would ever fully recover that 300,000 with the 10-year amortization.
>
> Also, the amendment referred to the surplus recovery. And, Commissioner, you mentioned it before over 16 years, Sulphur's last rate case authorized $15,000 in rate case expenses, and so Sulphur had an additional 15,000 in revenue for several years after those rate case expenses had been recovered.
>
> However, to characterize it as surplus is not really accurate in the cooperative setting, because unlike an investor-owned utility where that 15,000 might have gone to the shareholders, this money, this excess amount, was just simply reinvested in the co-op, and basically in a very tiny way helped it be able to stay out even longer than it normally would, obviously the 16-year period.
>
> And so again, when the rate case is based on a 2007 year test year, so the total amount of revenue that was coming in at that point that included $15,000 a year amount was looked at, and so the revenue requirement increase is based on the deficiency over the total amount of revenue which includes that 15,000.
>
> So again, I think that the record, the record demonstrates that we incurred these expenses, they were prudent. This was a long and difficult case. The amount that the ALJ has recommended is less than what we have spent on this rate case yet in line with other similarly situated utilities. You generally allow a three- to four-year amortization. We voluntarily said five years would be fine.
>
> And our request, you know, would be that you would increase, in light of the passage of the other amendment, that you would increase the amount of expense associated with rate case expense from the 100,000 to the 300 as the judge recommends, and amortize it over five years.[45]

The Cooperative is unaware of the Commission ever adopting a 10-year amortization period for the recovery of prudently incurred rate case expenses for any other utility. The Decision itself demonstrates that a three-to-four-year amortization is typical, and the ROO even noted that the five years proposed by the Cooperative itself was *longer* than usual. There is no evidentiary or historical basis for the Commission's adoption of a

[45] Transcript of Open Meeting (hereinafter "OM Tr.") at page 264, line 23 through page 266, line 25.

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10-year amortization period. Such actions are: (i) arbitrary and capricious; (ii) inconsistent with the way the Commission has treated other regulated utilities in similar cases and is therefore discriminatory; and (iii) solely for the purpose of artificially lowering the rate increase. Moreover, this is a non-profit cooperative that cannot simply pass unrecovered costs to its shareholders. Regardless, the members/ratepayers will pay these expenses out of the Cooperative's operating margin, which is inconsistent with the Commission's stated objective for the Cooperative to build its equity to 30 percent by 2016.

C. Conclusion

Based on the foregoing, the Commission ignored the overwhelming evidence presented in the record that demonstrated that Staff's proposed revenue requirement would not result in just and reasonable rates because of the artificial lowering of the Cooperative's operating margin for the sole purpose of lowering the rate increase from the 10.28 percent set forth in the ROO to 8.19 percent established in the Decision. Although the difference in the two revenue requirements to the average residential customer is only $1.00 a month, the revenue impact to the Cooperative is almost $2 million per year. Consequently, and inconsistent with the stated objective of this rate case to move SSVEC to a 30 percent equity level by 2016 as set forth in Finding of Fact No. 30 of the Decision, the Commission's arbitrary action will result in the Cooperative having insufficient operating income for its anticipated capital requirements and to build its equity.

The ALJ that presided over the proceeding had an opportunity to evaluate and weigh all of the evidence presented, assess the expertise and credibility of the witnesses, and ask questions to arrive at a recommendation consistent with the evidence. At the August 25, 2009, Open Meeting, inquiry was made of the ALJ as to why she did not recommend adoption of Staff's proposed revenue requirement:

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> ALJ RODDA: I thought that the company's evidence in terms of their capital needs and their projections counterbalanced or outweighed Staff's assumptions. And I don't know, Staff made 10 percent, I don't know what the basis of the 10 percent reduction is. I didn't know why $3 million reduction in debt versus $2 million. I mean I didn't think there was sufficient analysis behind Staff's assumptions.
>
> COM. KENNEDY: Madam Chairman. And I don't mean to belabor the point, but I guess I am a little bit confused that we have expert Staff who work and spend time, lots of time doing their analysis, but you thought that the company and their recommendation was a better recommendation in revenue than Staff? I just want to make sure I am hearing you correctly.
>
> ALJ RODDA: That part of the analysis, yes. I guess that's – it was the battle of the experts. So you have to analyze the evidence before you.
>
> COM. KENNEDY: So, Madam Chairman, Judge Rodda, would you say that we don't need Staff's their [sic] expertise?
>
> ALJ RODDA: No. It is just in this particular circumstance, this one case, this one assumption, that's the way, you know, I always – every case I have to analyze evidence.[46]

By ignoring the evidence and adopting Staff's proposed revenue requirement, the Commission abused its discretion by reaching arbitrary conclusions that go against the substantial credible evidence introduced at the hearing. This was done for the sole purpose of lowering the rate increase, which resulted in the adoption of rates that are not just and reasonable.[47] The Cooperative has expended considerable time, resources, and member/ratepayer money to bring this rate case. It has cooperated with Staff and the Commission at every stage and at every level in order to have approved the revenue requirement it needs to operate the utility and fulfill its future capital requirements. The revenue requirement approved in the Decision all but guarantees it will be necessary for SSVEC to file for another rate increase much sooner than it otherwise would need to and

[46] OM Tr. at page 228, line 12 through page 229, line 12.
[47] *See Scates, supra; see also City of Tucson, supra.*

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be forced to once again spend time, resources, and money. The one additional dollar differential between the ROO's recommended revenue requirement and the Decision will not create rate shock for SSVEC's members after paying 1993 rates for more than 16 years. The shortfall will, however, have a detrimental cumulative effect on the Cooperative's ability to timely meet its capital needs and build its equity to the level this Commission has consistently mandated for cooperatives.

Accordingly, the Commission should reconsider the Decision to adopt the revenue requirement set forth in the ROO.

IV. THE SONOITA RELIABILITY PROJECT (69 KV LINE ISSUE)

A. Background

SSVEC has been assiduously working toward a solution to bring quality, reliable power to the Whetstone, Rain Valley, Elgin, Canelo, Sonoita, and Patagonia, Arizona areas (collectively the "Affected Areas") through its Sonoita Reliability Project ("Project"). The Project has taken years of planning, analysis, design consideration, cost estimation, community participation, and review, and provided SSVEC the information necessary for its management to make sound decisions based upon a balance of community concerns and requirements of the Cooperative with respect to its obligation to provide safe and reliable service within its service territory. As initially identified, the solution to this Affected Area's reliability issues involves a new substation in Sonoita. Based upon the Community's concerns, SSVEC obtained a new substation property in a commercial land use area of Sonoita, rather than using its existing parcel in a residential subdivision.

The 69 kV line necessary to energize the substation has been the most contentious and emotional issue for the Project. The routing of this line has been the primary focus of the community, and SSVEC has conducted numerous community meetings, met with representative groups and individual property owners, welcomed presentations to its

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Board, and received e-mails and letters with opinions regarding the line location. There was also considerable public comment made in this rate case docket.

As a non-partisan entity, SSVEC compiled the route arguments and balanced them with basic aspects of business practices and cost analysis. With these facts in mind, SSVEC determined that the most cost-effective option that impacted the least amount of its members was for the route for the 69 kV line to follow its existing known easements within the San Ignacio del Babocomari Land Grant ("SIDB") and the Sonoita Hills subdivision, the location of SSVEC's original substation property, Buchanan. The SIDB easement and affiliated easements to SSVEC's original substation property, Buchanan, have been on record for more than a quarter of a century. SSVEC's 1982 purchase of nearly 20 miles of SIDB easement, along with utilizing designated utility corridors, has allowed SSVEC to significantly reduce overall project costs due to acquisition of rights-of-way.

Additionally, the Cooperative provided Staff with information and extensive analysis regarding the existing electric distribution facilities in the Affected Areas, as well as information regarding voltage instability as shown by SSVEC's Milsoft WindMil Distribution Analysis Software.[48] The distribution analysis shows that the system currently has a 15% voltage drop on a 120-volt base, which exceeds acceptable limits set by manufacturers of electrical apparatus design to withstand +/-10% voltage fluctuations. This analysis clearly demonstrated that voltages do not meet Commission-mandated (A.A.C. R14-2-208 Provision of Service) voltage levels set forth in the 1989 edition of ANSI C84.1.[49] ANSI C84.1 requires voltages to be maintained between 126-117 volts and analysis for this circuit indicates voltages as low as 113V. The analysis provided to

[48] Attached as Attachment E is a copy of a 3-ring binder ("Sonoita Reliability Project") containing extensive information and analysis that was provided to Staff prior to the August 17, 2009, Open Meeting and was referenced at such Open Meeting.

[49] There are no updated editions.

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Staff further demonstrated that (i) the existing substation transformer has exceeded its maximum capacity rating of 7MVA multiple times in the past five years, leading to loss of functional life of the equipment, and (ii) the Arizona Department of Economic Security Population Statistics for June 6, 2007, indicate a population growth forecast for the Affected Areas within Santa Cruz County of 70-80 persons per year, using an average household size of 2.3 persons; this would indicate a growth of at least 30 homes (or services) per year to the Affected Areas thereby increasing the amount of load on the substation transformer. SSVEC's new service/expansion of service records indicates an actual average of 83 new/expanded services per year over the past five years.

Due to some public opposition to the proposed siting of the 69 kV line, the issues relating to the Project were improperly interjected into this rate case (as more fully discussed below). SSVEC subsequently provided the Commission and Staff with information and qualified analysis demonstrating: (i) the need and necessity to construct a new substation and affiliated 69 kV line, as the electric distribution facilities currently servicing the Affected Areas have significant deterioration of power quality resulting from an inordinately long feeder line; (ii) insufficient line and transformer capacity; (iii) non-conforming equipment serialization; and (iv) an average reliability occurrence of 270 outage hours per year over the last 10 years.[50] The existing line does not adequately and reliably serve the existing customers and will continue to decline with the increased load of new customers.

SSVEC's 1982 purchase of nearly 20 miles of SIDB easement, along with utilizing designated utility corridors, has allowed SSVEC to significantly reduce overall project costs due to acquisition of rights-of-way. Mr. Creden Huber, SSVEC's Chief Executive Officer, testified at the hearing regarding issues generally associated with the Project and

[50] Decision at page 36, lines 7-24; *see* also V-7 Outage Chart attached hereto Attachment F and referenced in footnote 122 of the Decision.

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the 69 kV line in particular. He presented uncontroverted evidence demonstrating that the Sonoita area has a 10-year average of 270 hours of outages per year adding to the total unreliability of the existing service line. Mr. Huber testified as to his concerns that the community would continue to be plagued by outages if SSVEC did not soon move forward with the Project and for his concern for the elderly and for the businesses that are impacted. Mr. Huber further testified that renewable energy will not solve this problem as this is a capacity and reliability issue and that the 69 kV line is not the reason the Cooperative filed for a rate increase.[51]

Mr. Jack Blair, SSVEC's Director of Member Services, also testified at the hearing that the option SSVEC chose for the siting of the 69 kV line is the only viable solution of all those considered, and the Cooperative has, and will do, everything it can to mitigate the impacts of this line on the surrounding property owners and described some of those plans. Mr. Blair further testified that any delay in this Project would increase the cost of the Project and prolong the power quality, capacity, and reliability issues that exist in the Affected Areas and that it would be necessary for the Cooperative to institute a new hook-up moratorium as the existing line is already at capacity.[52] Finally, Mr. Blair testified that the option SSVEC chose will impact the least amount of members at the lowest possible cost, and if the costs were to increase, they would have to be spread out among all of SSVEC's members.[53]

Based upon the information and qualified analysis provided to Staff, as well as Staff's site visit, Staff filed uncontroverted testimony concluding that: (i) SSVEC has evaluated numerous options regarding the Project and its associated 69 kV line to Sonoita, and the Project will improve reliability in the Affected Areas; (ii) SSVEC continues to

[51] *See* Hr.Tr. at page 70, line 24 through page 71, line 16; page 90, line 7 through page 108, line 22; Hr. Ex. A-4.
[52] SSVEC has since filed with the Commission an application for a hook-up moratorium.
[53] *See* Hr. Tr. at page 301 line 3 through page 309, line 17; *see* also late-filed Hr. Ex. A-26.

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communicate with its members in such Affected Areas through public meetings and mailings to provide a clear indication to such members that the primary issues related to this Project are reliability and quality of service; and (iii) SSVEC should continue to upgrade its 69 kV sub-transmission and distribution system to improve system performance and reliability for its members.[54]

Subsequent to the hearing and close of the evidentiary record, various members of the public filed in the docket information reiterating their opposition to the 69 kV line, as well as proposals to alleviate the capacity problem in the area through renewable/distributed generation applications. SSVEC carefully analyzed such proposals and determined that although it was willing to consider its use of renewable/distributed generation applications within the Affected Areas in the future, such applications would not solve the power quality, capacity, and outage reliability problems and that any delay in the construction of the 69 kV line would only further exacerbate the existing problem resulting in continuing and increasing outages and voltage instability until such time that the 69 kV line is brought into service. Following its analysis of the proposals, SSVEC met with Staff to go over its analysis, findings, and conclusions regarding such proposals.[55]

Based upon the uncontroverted evidence presented at the hearing, the ALJ found, and recommended in the ROO, that the 69 kV line (which would include the substation) be constructed stating:

> It is not in the public interest, however, to order SSVEC to delay the planned upgrade.[56]

On August 13, 2009, Commission Newman's Proposed Amendment No. 1 was docketed, which prohibited the Cooperative from constructing the 69 kV line until further

[54] Hr. Ex. S-5, at page 7, lines 11-13; page 19, lines 18-20, and page 20, lines 7-8.
[55] *See* Attachment E.
[56] ROO at page 39, lines 3-4.

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Order of the Commission. It further ordered the Cooperative to conduct an independent feasibility study to consider alternatives, including use of distributed renewable energy, that could mitigate the need for the 69 kV line, and to hold public forums in the Affected Areas for community discussion on the feasibility study. A copy of Commissioner Newman's Proposed Amendment No. 1 is attached hereto as Attachment G.[57]

At the August 17, 2009, Open Meeting, there was some public comment opposing the 69 kV line and asking the Commission to order the independent feasibility study to consider renewable generation applications as an alternative to the construction of the line. The Cooperative responded by reiterating that: (i) it had examined all viable and cost-effective alternatives, including the proposals referenced by those opposed to the line; (ii) such proposals would not alleviate the power quality, capacity, and reliability problems; (iii) the outage problem would only continue; and (iv) the independent feasibility study could cost as much as $250,000, the cost of which was not included as part of the rate case and that such expense would have to be borne by *all* SSVEC members and not just those living in the Affected Areas.

Notwithstanding the uncontroverted evidence presented by the Cooperative and Staff, as well as the recommendation of the ALJ set forth in the ROO that was based upon such evidence, the Commission arbitrarily based its decision on the public comment filed in the docket and made at the Open Meeting. This was despite the engineering analysis conducted by the Cooperative's expert engineering personnel, the decision made by the Cooperative's Board and management, and the recommendations of the Commission's engineering Staff. The Commission adopted Commissioner Newman's Proposed

[57] Chairman Mayes also docketed Mayes' Proposed Amendment No. 1 regarding conducting public forums on renewable generation in the Affected Areas and reporting back to the Commission on such public forums. Because Chairman Mayes' Proposed Amendment No. 1 neither prohibited the construction of the 69 kV line nor ordered the independent feasibility study, the Cooperative did not oppose this Amendment as it has always been willing to consider its members' desires to bring renewable generation to the Affected Areas.

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Amendment No. 1 prohibiting the Cooperative from constructing the line until further Order of the Commission and to conduct and pay for an independent feasibility study.[58]

B. The Commission Exceeded its Jurisdiction and Does Not Have the Legal Authority to Prohibit the Cooperative from Constructing the Proposed 69 kV line and Order an Independent Feasibility Study.

1. *The Commission's Authority to Regulate the Siting of Power Lines is Limited to Transmission Lines of 115 kV and above pursuant to A.R.S. § 40-360 et seq.*

Despite the Commission's acknowledgement in the Decision that it "does not have jurisdiction over the siting of the 69 kV line,"[59] by prohibiting the construction of the line "until further Order of the Commission,"[60] the Commission has, in fact, asserted jurisdiction over the siting of this line. Based upon the Commission's actions, it has made this a line-siting case. Those members of the community opposing the construction of the 69 kV line do so primarily because of the proposed routing (siting) of the line in SSVEC's existing easement along the SIDB with respect to their concerns regarding aesthetic and alleged environmental considerations.[61] The Decision also states that:

> . . . we are concerned that once constructed, the project will permanently change the landscape for the impacted communities and the manner in which electric service is provided to the Cooperative's customers.[62]

The Arizona Legislature has expressly granted the Commission authority relating to the regulatory determination of siting issues that includes environmental and aesthetic considerations for transmission lines of 115 kV and higher. These are issues the Commission's Line Siting Committee may take into consideration in connection with an application by a utility (defined as "a person engaged in the generation or transmission of

[58] Chairman Mayes' Proposed Amendment No. 1 was also adopted.
[59] Decision at page 38, lines 19-20.
[60] Decision at page 48, line 26.
[61] Decision at footnote 127.
[62] Decision at page 39, lines 8-10.

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electricity")[63] for siting of a power line of 115 kV and higher.[64] The Arizona Legislature has not granted the Commission authority to make such determinations for power lines below 115 kV, which are considered either sub-transmission or distribution lines. Therefore, such determinations are left to the utility and its management. Yet, in the instant case, the Commission asserted jurisdiction to prohibit the siting and construction of the proposed 69 kV line for reasons, in part, that the Legislature has determined the Commission may only be taken into consideration for power lines of 115 kV and above.

2. *Because the Commission Recognized that it Does not have Authority to Prohibit the Siting of the Proposed 69 kV line Pursuant to A.R.S. § 40-360 et seq., it Inappropriately Asserted Jurisdiction by Other Means.*

Notwithstanding the Commission's acknowledgement to the contrary, this is first, and foremost, a line siting case in which the Commission went out of its way to assert jurisdiction in order to ultimately prohibit the construction of the line. It just so happened that SSVEC had a pending rate case which Commission used as the vehicle to initially assert authority to hear issues associated with the siting of the line.[65]

The Commission received in late 2008 and early 2009, various communications letters from some SSVEC members living in the Affected Areas objecting to the siting of the 69 kV line alleging aesthetic and environmental concerns regarding the proposed siting of the 69 kV line. At its January 14, 2009, Staff Meeting, it was clear that the Commission recognized it had no jurisdiction over the siting of the line and there was little, if anything, it could do to prevent it. However, the Commission still struggled to find a means in which to consider this issue. The Commission ultimately determined that since SSVEC had a pending rate case and there could potentially be rate or quality of service issues, it would take public comment on the rate case within the Cooperative's

[63] A.R.S. § 40-360.11.
[64] A.R.S. § 40-360.10, §40-360.03.
[65] *See* Transcript of Jan. 14, 2009, Staff Meeting (hereinafter "Staff Meeting") docketed Sept. 11, 2009.

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service territory which would provide local members the opportunity to discuss their concerns regarding the line issue.[66]

At the August 17, 2009, Open Meeting, Commissioner Newman's Proposed Amendment No. 1 was offered which prohibited the Cooperative from constructing the 69 kV line until further Order of the Commission. Commissioner Pierce asked the Commission's Chief Legal Counsel about the language in Commission Newman's Proposed Amendment No. 1 as to whether the Commission had the authority to prohibit the Cooperative from constructing the 69 kV line until further Order of the Commission. The Commission's Chief Counsel answered as follows:[67]

> I think under the circumstances of this record, that finding or that proposed amendment language is appropriate. I have reviewed the statutes that relate to this. And just in a very brief way, under 40-321, the Commission has the power to determine the adequacy of services and including the methods of distribution.
>
> Among other things in that statute, under 40-322, you can establish standards of service. I think in light of the concerns of some in the community that renewables might be the appropriate method and the Commissioners' determination that more study is necessary, I think under those two statutes you would also have the opportunity to adopt this amendment.
>
> I also point out A.R.S. § 40-331, which provides that the Commission can order improvements and additions for a reasonable provision of service. It also provides in a very last part of the first section, and also it gives you some authority and I don't think we have ever tested it, to fix the siting of that additional improvement.
>
> So I think when we take these all together under the circumstances presented, I think under these statutes you have authority. If you want to go farther, we can look at the constitution. And in light of the fact that when these services and infrastructure are build there is necessarily an impact on rates. In light of the constitutional provision on ratemaking, I think we could also assert that the determination by the Commission in this instance would also have an impact or could have a substantial impact on rates.[68]

. . .

[66] *Id.* at page 10, lines 4-24; page 20, lines 17-24.
[67] OM Tr. at page 142, line 6 through page 143, line 2.
[68] *Id.* at page 143 line 3 through page 144, line 10.

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In response, Counsel for SSVEC stated, in part, the following:

> First, I do respectfully disagree with my colleague with respect to the jurisdiction of the Commission associated with the line. I think that, I think that 360 basically does not give jurisdiction over 115kV. I understand the statutes that they are citing, but I think that -- I just don't agree with that particular analysis.[69]

The only claim of jurisdiction set forth in the Decision to possibly support Commissioner Newman's Proposed Amendment No. 1 prohibiting the Cooperative from construction of the line is as follows:

> The Commission's Line Siting Committee does not have jurisdiction over the siting of the proposed 69 kV line, and the Commission does not design utility infrastructure. *However, the Commission does have authority to ensure that the Cooperative is providing safe and reliable service.* The Cooperative is responsible for designing and operating a safe and reliable system for all of its members. The Cooperative submitted evidence that the line is at capacity.[70]

This jurisdictional justification loosely referenced in the Decision appears to derive from the three statutes and the Commission's ratemaking authority cited by the Commission's Chief Counsel above. Unfortunately, the Commission's attempt to garner jurisdiction in order to justify the prohibition of the construction of the 69 kV line in light of the jurisdictional line drawn by the Legislature in A.R.S. § 40-360 *et seq.*, must fail. These statutes are "enforcement" statutes that give the Commission authority to assert jurisdiction and step in by way of an order to show cause when a utility is <u>not</u> performing its obligations as a public service corporation. Generally, one or more of these statutes are cited by the Commission when it issues an order to show cause when a utility fails to fulfill its obligations. (*See* Commission Decision Nos. 69913, 69882, and 69166, that all cite to A.R.S. §§ 40-321, 322 and 331; Commission Decision No. 65858 that cites to A.R.S. §§40-321 and 322.)

. . .

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[69] *Id.* at page 175, line 21 through page 176, line 2.
[70] Decision at page 38, lines 19-23 (emphasis added).

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Set forth below is an analysis of the three statutes and the ratemaking justification that was relied upon by the Commission to assert authority to prohibit the Cooperative from constructing the 69 kV line until further order of the Commission and ordering an independent feasibility study.

A.R.S. § 40-321

The Commission's Chief Counsel stated (as quoted above) that under A.R.S. § 40-321, the Commission has the power to determine the adequacy of services, including the methods of distribution. A.R.S. § 40-321(A) provides as follows:

> When the commission finds that the equipment, appliances, facilities or service of any public service corporation, or the methods of manufacture, distribution, transmission, storage or supply employed by it are unjust, unreasonable, unsafe, improper, inadequate or insufficient, the commission shall determine what is just, reasonable, safe, proper, adequate or sufficient, and shall enforce its determination by order or regulation.

The basis for the Commission's exercise of jurisdiction must derive from a finding that the public service corporation is acting in a manner that is unjust, unreasonable, unsafe, improper, inadequate or insufficient. In this case, the Commission has made no such finding whatsoever. In fact, the Commission agreed in the Decision that "to allow substandard service is not in the public interest"[71] which the Cooperative has been proactively seeking to rectify through the Project. The Decision further finds that:

> Ultimately, the Cooperative is responsible for the quality of service for all of its members, and must make informed decisions on how to meet its obligation. The information presented in the course of this proceeding supports the Cooperative's position. The Cooperative has explored alternative configurations for the project and has selected the project presented as the best balance between cost and impact on the community. Staff testified that the Project would improve reliability in the area.[72]

. . .

[71] Decision at page 38, line 24.
[72] Decision at page 39, lines 2-7.

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The Commission's justification stems from how the Project "*will change the landscape of impacted communities*" and whether renewable or distributed generation applications might mitigate the need for construction of the line.[73] Such aesthetic and environmental concerns, however, are not among the listed grounds for the exercise of jurisdiction under this statute, nor do they rise to the level of "unreasonable, unsafe, improper, inadequate or insufficient" facilities or services.

Case law interpreting A.R.S. § 40-321 also shows that A.R.S. § 40-321 does not provide a statutory basis for the Commission's jurisdiction over the proposed 69 kV line. *Arizona Corp. Comm'n v. Palm Springs Utility Co.*, 24 Ariz. App. 124, 129, 536 P.2d 245, 250 (App. 1975). In *Palm Springs*, the Arizona Court of Appeals held that the "Commission has the power to enter specialized orders affecting the quality of service provided by a public utility without the necessity of adopting a general industry-wide regulation covering the subject." *Id.* at 130, 536 P.2d at 251 (Jacobson, J., dissenting on other grounds). Due to several complaints from customers of Palm Springs concerning the taste and hardness of water being served to them, Palms Springs was ordered by the Commission *to show cause* "why it should not either find a new source of water meeting the federal recommended limits for total dissolved solids and chlorides, or, alternatively, why it should not put in machinery and equipment to bring its existing water supply within these recommended limits." *Id.* at 125, 536 P.2d 246. The Commission, therefore, has the power through an order to show cause proceeding to deal with specialized situations on a case-by-case basis, following a determination that the utility has conducted itself in a manner resulting in unreasonable, unsafe, improper, inadequate or insufficient facilities or services.

The Commission's jurisdiction in this regard through an order to show cause has only been confirmed in situations arising out of a public service corporation's *failure* to

[73] Decision at page 39, lines 8-9.

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take measures to provide safe and reliable service. Such jurisdiction has not been asserted in situations where a public service corporation is acting affirmatively to improve the quality of service.

Finally, the Decision does not provide a statutory basis for the Commission's jurisdiction over a 69 kV line. In *Palm Springs*, the Arizona Court of Appeals further held that the Commission's authority under A.R.S. § 40-321, although broad, is not "all-encompassing." *Id.* at 129, 536 P.2d at 250 Rather, while the Commission may deal with specialized situations on a case-by-case approach, there must exist "a rational statutory or constitutional basis for the action, and the action is not so discriminatory as to constitute a denial of the equal protection clause." *Id.* Here, the Commission is exercising jurisdiction in a manner that has never before been affirmed. There is no existing case law that suggests the Commission has ever attempted to bypass the clear limits of A.R.S. § 40-360 *et seq.* by invoking a very broad interpretation of A.R.S. §§ 40-321, 40-322, and 40-331, and to allow it to do so in this situation would be "so discriminatory as to constitute a denial of the equal protection clause." *Id.* at 24 Ariz. App. at 129, 536 P.2d at 250. SSVEC is unaware of any decision or order where the Commission has attempted to exercise such jurisdiction over the construction of a sub-transmission line for any other electric utility in the state.

Accordingly, the Commission's claim of jurisdiction pursuant to A.R.S. § 40-321 must be rejected.

A.R.S. § 40-322

The Commission's Chief Counsel stated (as quoted above) that under A.R.S. § 40-322, the Commission may establish standards of service. A.R.S. § 40-322 provides, in pertinent part, that the Commission may "ascertain and fix adequate and serviceable standards for the measurement of quantity, quality, pressure, initial voltage or other condition pertaining to the supply of the product, commodity or service furnished by such

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public service corporation." The standards of service referenced in this statute relate primarily to measurement (as suggested in its title). This statute permits the Commission to establish utility service standards found in A.A.C. R14-2-208 and 209 (and similar regulations for other utility services), meter reading, meter testing and fees, voltage requirements, access, and the ability to enforce these standards.

This statute simply is inapplicable and does not provide the Commission with authority to prohibit the Cooperative from constructing its 69 kV line as part of its backbone infrastructure to serve the Affected Areas.

A.R.S. § 40-331

The Commission's Chief Counsel stated (as quoted above) that under A.R.S. § 40-331, the Commission can order improvements and additions for the reasonable provision of service. Although based in part on Article 15, Section 3 of the Arizona Constitution[74], A.R.S. § 40-331 provides:

> A. When the commission finds that additions or improvements to or changes in the existing plant or physical properties of a public service corporation ought reasonably to be made, or that a new structure or structures should be erected, to promote the security or convenience of its employees or the public, the commission shall make and serve an order directing that such changes be made or such structure be erected in the manner and within the time specified in the order. If the commission orders erection of a new structure, it may also fix the site thereof.

This statute is also inapplicable to the instant situation. It is an enforcement-related statute that provides the Commission the ability to step in and order a utility (or utilities jointly) to make changes to existing plant, including the location of such plant, once it *finds* a problem. It can then "make and serve an order" (such as an order to show cause) on the utility. For example, if SSVEC allowed the service quality in the Affected Areas to deteriorate and/or allowed an unsafe condition to exist, and was taking no action to rectify this, the Commission could issue an order to show cause to order the utility to build

[74] This, however, does not make it any more applicable to the instant situation.

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additional plant to correct the problem. Another example is if a water utility failed to provide enough drinking water, the Commission could issue an order to show cause for the utility to drill a well and/or acquire more water.

This is not occurring in the instant situation, and the Decision constitutes an attempt by the Commission to unduly assert jurisdiction over the siting of the 69 kV line where none exists. Moreover, for the Commission to conveniently apply this statute to a planned power line that is under 115 kV as a means of justifying its jurisdiction, eviscerates the demarcation of authority drawn by the Legislature in A.R.S. § 40-360 *et seq.*

Certainly, the Commission has jurisdiction to require a public service corporation "to make such extensions, improvements, and betterments as may be required to render adequate service to the communities it serves." *Arizona Corp. Comm'n v. Tucson Gas, Elec. Light & Power Co.*, 67 Ariz. 12, 19, 189 P.2d 907, 911 (1948). In *Tucson Gas*, the Commission appealed a superior court ruling to set aside and annul certain orders to make capital additions, improvements, and extensions necessary to serve its customers. The Court of Appeals vacated the superior court's ruling, holding that the public utilities are subject to the orders of the Commission on quality of service issues. *Id.* Other cases have similarly upheld the power of the Commission to order a public service corporation to install additional facilities. *See Arizona Water Co. v. Arizona Corp. Comm'n*, 161 Ariz. 389, 392, 778 P.2d 1285, 1288 (1989); *James P. Paul Water Co. v. Arizona Corporation Comm'n*, 137 Ariz. 426, 429-30, 671 P.2d 404, 407-08 (1983). However, there are no cases in which courts have upheld the power of the Commission to prohibit construction of additional needed facilities for aesthetic or similar concerns.

Unlike in *Tucson Gas*, SSVEC is not trying to avoid responsibility for providing quality service to its customers. The opposite is true – it is seeking to construct additional facilities and improvements that have been clearly established as necessary to resolve

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serious power quality, capacity, and reliability problems in the Affected Areas. It is the Commission itself, through its action in prohibiting the construction of the 69 kV line, which will cause an indefinite extension of the poor service quality that currently exists in the Affected Areas while it studies whether renewable resources can solve the problem, despite the Cooperative's determination to the contrary. This action was taken irrespective of the evidence, as well as the Cooperative's extensive analysis relating to the resolution of the reliability and capacity issue for the Affected Areas.

The Commission's Constitutional Ratemaking Authority

The Commission's Chief Counsel stated the following regarding the Commission's ratemaking authority:

> If you want to go farther, we can look at the constitution. And in light of the fact that when these services and infrastructure are built there is necessarily an impact on rates. In light of the constitutional provision on ratemaking, I think we could also assert that the determination by the Commission in this instance would also have an impact or could have a substantial impact on rates.[75]

This justification clearly is to assert jurisdiction over the 69 kV line because the Commission has constitutional authority over rates. The fallacy with this argument is that everything a utility does, and every expenditure made by a utility, is derived from the rates that the utility charges its customers. The Commission's assertion of jurisdiction (outside and prior to the utility filing a rate case wherein the utility is asking for recovery of an expenditure in rates) to prohibit an expenditure and to order the utility to consider (and potentially implement) alternative expenditures, would give the Commission authority over each and every expenditure (no matter how small or insignificant) a utility makes and would be an improper infringement on management's authority. *See Phelps Dodge Corp. v. Arizona Elec. Power Co-op., Inc.*, 207 Ariz. 95, 113, 83 P.3d 573, 591 (App. 2004) and related cases discussed *infra*. The appropriate time for the Commission

[75] OM Tr. at page 144, lined 1- 10.

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to assess the impact on rates relating to a utility's expenditure is the time the utility applies for an increase in rates to recover the costs of such expenditure. At such time, if the Commission deems the expenditure imprudent, it could deny the recovery. However, prior to a request by the utility to recover the cost of the expenditure in rates, the Commission cannot assert its constitutional ratemaking jurisdiction to prohibit the expenditure and override the decision of the management of the utility.

The Commission's assertion of jurisdiction based on the above-referenced statutes and constitutional authority implies that the Commission has unfettered authority over a utility. The Commission's authority to regulate public service corporations does have limits. Those limits are defined by its constitutional authority over ratemaking and express statutory authority pursuant to legislative grant. *See e.g., Palm Springs*, 24 Ariz. App. at 129, 536 P.2d at 250. The Commission cited to three statutes and its ratemaking authority to prohibit the siting of a line and ordering an independent feasibility study to consider renewable generation to mitigate the need for the line. This flawed rationale could be applied to almost any and every aspect of a public service corporation's utility operations. For example, if a utility was planning on buying a fleet of new natural gas fueled trucks to replace its aging fleet, under the Commission's interpretation of A.R.S. §§ 40-322 and 331 and its ratemaking authority, the Commission could potentially order the utility to not buy the trucks. In fact, the Commission could, as it has in the instant case, order the utility to conduct an independent feasibility study to determine if the utility should buy a fleet of alternative fuel trucks, even if that results in a costly delay to the detriment of the utility's ratepayers. The Commission does not and should not have authority over the utility's management decisions per these statutes. If, in the utility's next rate case, the Commission determines that the purchase of those vehicles was somehow imprudent, it can deny recovery. Similarly, if SSVEC constructed its 69 kV line, and the Commission ultimately determined that it was somehow imprudent in the

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next rate case, it could deny recovery. That is the extent of the Commission's jurisdiction in this regard since the Commission admittedly does not have line siting jurisdiction under A.R.S. § 40-360 *et. seq.*

C. **The Commission's Decision Prohibiting the Cooperative from Constructing the Proposed 69 kV line and Ordering an Independent Feasibility Study is an Improper Infringement on the Cooperative's Management Authority**.

It is well established under Arizona law that the Commission does not have the power to interfere with a utility's management decisions. *Phelps Dodge Corp.*, 207 Ariz. at 113, 83 P.3d at 591. The Commission's actions will not be upheld if they "so interfere with management functions that they constitute an attempt to control the corporation rather than an attempt to control the rates." *Arizona Corp. Comm'n ex rel. Woods*, 171 Ariz. at 297, 830 P.2d at 818. In *ex rel. Woods*, the Arizona Supreme Court upheld the Commission's adoption of the Affiliated Interest Rules based primarily on the fact that the Commission did not unreasonably interfere with management functions. *See id.* However, in so doing, the Court held that the Commission may not use its power to unreasonably interfere with management functions. *Id.* In *Phelps Dodge*, the Court held that it will "not infer the grant of authority to interfere with the Affected Utilities' management decisions beyond the 'clear letter of the statute'." *Id.* at 113, 83 P.3d at 591 (quoting *Southern Pac. Co. v. Ariz. Corp. Comm'n*, 98 Ariz. 339, 343, 404 P.2d 692, 695 (1965)).

This long-standing tenent stems from *Southern Pacific*, 98 Ariz. 339, 404 P.2d 692. In *Southern Pacific,* the Arizona Supreme Court rejected a Commission decision because the Commission unreasonably interfered with management decisions, noting that regulatory bodies are not granted the authority to manage the affairs of a public utility service. *Id.* at 343, 404 P.2d at 694. In reviewing an order and decision of the Commission, the Court held that the Commission's decision requiring a railroad to restore

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discontinued train service without showing that it was necessary because service had become inadequate, deprived the railroad of its property without due process of law, and was a nullity. *Id.* at 347, 404 P.2d at 698. The Court stated that, "while the state may regulate with a view to enforcing reasonable rates and charges, it is not the owner of the property of public utility companies, and is not clothed with the general power of management incident to ownership." *Id.* at 343, 404 P.2d at 694. (citing *State of Missouri ex rel. Southwestern Bell Telephone Co. v. Public Service Commission of Missouri*, 262 U.S. 276, 289, 43 S.Ct. 544, 547, 67 L.Ed. 981 (1923)).

SSVEC is a member-owned non-profit cooperative, with a member-elected Board that provides an additional layer of oversight and provides for self-governance that an investor-owned utility does not enjoy. SSVEC's Board and senior management have determined, after years of extensive study and the expenditure of significant dollars, that of all the available options, the construction of the 69 kV line is the best possible solution to resolve the power quality, capacity, and reliability problems at the least cost and that impacts the least number of customers. SSVEC's Board and management have further determined that this course of action is in the best interest of the Cooperative and all of its members. The Commission itself recognized in the Decision that SSVEC has studied the available options and that there is a serious reliability and quality of service issue that exists in the Affected Areas.[76] However, the Commission is ordering the Cooperative to not build the line until further Order of the Commission and is ordering a costly independent feasibility study to be ultimately paid for by all of SSVEC's members (not just those members in the Affected Areas) and is willing to overlook the outages and poor service quality that will continue in the Affected Areas indefinitely.

SSVEC believes that this action by the Commission constitutes an unlawful interference in the management of the Cooperative in violation of Arizona.

[76] *See* Decision at page 36, lines 18-19; page 38, line 24 through page 39, line 4.

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D. The Commission's Decision to Prohibit the Cooperative from Constructing the 69 kV line and Ordering an Independent Feasibility Study is not Based Upon Substantial Evidence in Violation of Arizona Law.

As discussed in Section III.A.2 above, the Commission's decision must be based upon substantial evidence. At the evidentiary hearing, SSVEC provided the direct testimony of two witnesses regarding the Project. As stated previously, Mr. Creden Huber testified at the hearing regarding issues generally associated with the Project and the 69 kV line in particular. He presented uncontroverted evidence demonstrating that the Sonoita area has had a 10-year average of 270 hours of outages per year adding to the total unreliability of the existing service line. Mr. Huber testified to his concern that the community would continue to be plagued by outages if SSVEC did not soon move forward with the Project and his concern for the elderly and for the businesses that are impacted. Mr. Huber further testified that renewable energy will not solve this problem as this is a capacity and reliability issue and that the 69 kV line is not the reason the Cooperative filed for a rate increase.[77] SSVEC also provided the Commission with comprehensive background information about the Project, including extensive qualified engineering analysis of power quality, capacity, and reliability issues, background information about the Project and member communications and outage information.

As discussed hereinabove, Mr. Jack Blair testified at the hearing that the option SSVEC chose for the siting of the 69 kV line is the only viable option, and the Cooperative has and will continue to do everything it can to mitigate the impacts of this line on the surrounding property owners and described some of those plans. Mr. Blair further testified that any further delay in this Project will increase the cost of the Project and prolong the outages that will occur in the area and that it would be necessary for the

[77] *See* Hr.Tr. at page 70, line 24 through page 71, line 16; page 90, line 7 through page 108, line 22; Hr. Ex. A-4.

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Cooperative to institute a new hook-up moratorium since the existing line is already at capacity. Finally, Mr. Blair testified that he believes the option SSVEC chose will impact the least amount of members at the lowest possible cost, and if the costs were to increase, they would have to be spread out among all of SSVEC's members.[78]

Based upon the information provided to Staff, as well as a site visit, Staff filed uncontroverted testimony concluding that: (i) SSVEC has evaluated numerous options regarding the Project and its associated 69 kV line to Sonoita, and the Project will improve reliability in the Affected Areas; (ii) SSVEC continues to communicate with its members in such Affected Areas through public meetings and mailings to provide a clear indication to such members that the primary issue related to this Project is reliability and quality of service; and (iii) SSVEC should continue to upgrade its 69 kV sub-transmission and distribution system to improve system performance and reliability for its members.[79]

SSVEC's witnesses were available for cross-examination and answered questions posed by the ALJ. After weighing all of the evidence, the ALJ subsequently recommended in the ROO that:

> It is not in the public interest, however, to order SSVEC to delay the planned upgrade.[80]

This recommendation was arbitrarily deleted from the ROO in favor of the adoption of Commissioner Newman's Proposed Amendment No. 1 that prohibited SSVEC from building the line, except upon Order of the Commission and to conduct an independent feasibility study to mitigate the need for the line.

The Commission's Decision in this regard is contrary to the substantial evidence that was presented in this case. It was based entirely upon public comment and correspondence filed in the docket, which are not part of the evidentiary record. The

[78] *See* Hr.Tr. at page 301 line 3 through page 309, line 17; *see* also late-filed Hr.Ex. A-26.
[79] Hr.Ex. S-5 at page 7, lines 11-13; page 19, lines 18-20, and page 20, lines 7-8.
[80] ROO at page 39, lines 3-4.

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Commission's Decision was an arbitrary and capricious act in violation of Arizona law.

E. **The Commission's Decision to Prohibit the Construction of the 69 kV Line and the Ordering of an Independent Feasibility Study is a Denial of Procedural Due Process**.

If SSVEC's rate case application had not been pending, the Commission would not have had the ability to prohibit the Cooperative from constructing the 69 kV line or conducting an independent feasibility study without issuing some form of order to show cause and providing notice and an opportunity to be heard on the direct evidence to support such an order to show cause. The issue of the 69 kV line was not part of SSVEC's rate application. It was not an issue raised by Commission Staff except to support the Cooperative's plans to continue with the Project and build the 69 kV line. It was the Commissioners that allowed the issues associated with the Project to be interjected in the rate case.[81] The Commission ultimately based its decision to adopt Commissioner Newman's Proposed Amendment No. 1 on the basis of public comment, hearsay, innuendo, and misinformation, much of which occurred after the evidentiary record had closed in this proceeding. The Cooperative was not provided an opportunity to cross-examine statements or challenge documents that were filed in the docket related to this issue. The Cooperative filed Exceptions to the ROO based upon the ROO and only received Commissioner Newman's Proposed Amendment No. 1 a few days before the Open Meeting and had limited opportunity to respond.

The Cooperative asserts that the Commission inappropriately considered this issue as part of the rate case and should have instituted a separate order to show cause proceeding that would have provided the Cooperative appropriate notice and opportunity to be heard on the issue of the 69 kV line. In light of the foregoing, SSVEC asserts that the adoption of Commissioner Newman's Proposed Amendment No. 1 ordering the prohibition on the line and the feasibility study constitutes a denial of procedural due

[81] *See* Transcript of Staff Meeting.

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process in violation of Arizona law.

The Commission may not act in an arbitrary manner that deprives a public service corporation of due process. *Sulger v. Arizona Corp. Comm'n*, 5 Ariz. App. 69, 73, 423 P.2d 145, 149 (App. 1967) (citing *Bennett v. Arizona State Board of Public Welfare*, 95 Ariz. 170, 388 P.2d 166 (1963)). "Procedural due process requires that a respondent be provided notice that is 'reasonably calculated under all the circumstances to apprise interested parties of the pendency of the action and afford them the opportunity to present their objection' and an opportunity to be heard 'at a meaningful time and in a meaningful manner.'" Decision No. 70664 at 49 (2008) (citing *Comeau v. Arizona State Bd. of Dental Examiners*, 196 Ariz. 102, 106-108, 993 P.2d 1066, 1070-72 (App. 1999)); *see also Sulger*, 5 Ariz. App. at 73, 423 P.2d at 149 ("The procedure must include notice of time and place of hearing, a reasonable definite statement of the charges, the right to produce witnesses and to have a full consideration and determination according to evidence before the body with whom the hearing is held.") (citation omitted.)

As discussed above, the Decision does not provide a statutory basis for the Commission's jurisdiction over the 69 kV line in the Decision. In *Palm Springs*, the Arizona Court of Appeals held that the Commission's authority under A.R.S. § 40-321, although broad, is not "all-encompassing." 24 Ariz. App. 129, 536 P.2d 250. Rather, while the Commission may deal with specialized situations on a case-by-case approach, there must exist "a rational statutory or constitutional basis for the action, and the action is not so discriminatory as to constitute a denial of the equal protection clause." *Id.* Here, the Commission is exercising jurisdiction in a manner that has never before been asserted. There is no existing case law that suggests that the Commission has ever attempted to bypass the clear limits of A.R.S. §§ 40-360 *et seq.* by invoking an overly broad interpretation of A.R.S. §§ 40-321, 40-322, and 40-331, and to allow it to do so in this situation would be "so discriminatory as to constitute a denial of the equal protection

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clause." *Palm Springs,* 24 Ariz. App. at 129, 536 P.2d at 250.

F. **The Commission's Decision to Assert Jurisdiction Over the 69 kV Line Sets a Dangerous Precedent for all Arizona Electric Utilities and the Commission.**

The Commission exercised jurisdiction to prohibit the siting of a sub-transmission line on the basis of opposition that arose from some of SSVEC's members. The reason for the opposition was the proposed location of the new 69 kV line along the existing Cooperative SIDB easement. The Commission's actions establish a dangerous precedent whereby any person or group of persons who oppose the location of a new sub-transmission or distribution line will be able to seek relief through the Commission by way of an intervention in the utility's rate case, or by the filing of a formal complaint with the Commission and citing A.R.S. §§ 40-321, 40-322, 40-331 and/or the Commission's ratemaking authority.

The concern regarding the establishment of a precedent was first raised by Chairman Mayes at the January 14, 2009, Staff Meeting. Chairman Mayes stated:

> The -- the issue, I think-- we do have one big glaring problem, which is we don't have jurisdiction over the issue. And I don't want to set up a situation where we set a precedent for this Commission intervening on every 69 kV power line. We've got much bigger transmission issues that we do have to face –500 kV, 345 kV power lines, that are in our jurisdiction, that are going to demand a lot of our time over the next two years.[82]

At the August 17, 2009, Open Meeting, Commissioner Pierce raised the same concern:

> … I can see us stepping into making decisions on 69 kV lines all over the state.[83]
>
> . . .
>
> And I think the precedent is an issue that concerns me.[84]

[82] Staff Meeting at page 8, line 22, through page 9, line 5.
[83] OM Tr. at page 144, lines 12-13.
[84] *Id.* at page 145, lines 15-16.

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Finally, as earlier discussed, in *Palm Springs*, the Commission's actions to deal with specialized situations on a case-by-case approach, must be based on "a rational statutory or constitutional basis for the action, and the action is not so discriminatory as to constitute a denial of the equal protection clause." 24 Ariz. App. 129, 536 P.2d at 250 Therefore, to the extent the Commission establishes a precedent in asserting jurisdiction in the instant case, it will have no choice but to consider other similar matters relating to issues that arise regarding the siting of lines under 115 kV.

The establishment of this precedent is a "Pandora's Box" that the Commission should not open, especially in light of the overwhelming evidence presented by SSVEC that it has explored all options, including renewable generation, and that construction of the 69 kV line is the option that is the most technically feasible that impacts the least amount of members at the lowest possible cost to alleviate the capacity problem within the Affected Areas.

G. <u>As a Consequence of the Commission's Decision to Prohibit the Cooperative from Constructing the 69 kV Line, the Cooperative has Filed for a Moratorium on New Connections for the Affected Areas</u>.

Consistent with the evidence presented at the hearing, as well as the statements SSVEC made at the Open Meeting, on September 18, 2009, SSVEC filed an application for a moratorium on new connections and expanded services within the Affected Areas served by the existing V-7 feeder line in Docket No. E-01575A-090453 ("Moratorium Application"). As a result of the Decision, this action was necessary so that the power quality, reliability, and capacity problems resulting in power fluctuations and outages (that will continue to exist within the Affected Areas) will not be further exacerbated, nor further degrade, the service to existing members. A copy of the Moratorium Application is attached as Attachment H.

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H. The Commission has Exercised Jurisdiction Solely on the Basis that the Cooperative is a Public Service Corporation.

As discussed above, the Arizona Legislature has granted the Commission's Line Siting Committee authority over power lines of 115 kV and higher and a utility (as defined as "a person engaged in the generation or transmission of electricity") must obtain a Certificate of Environmental Compatibility from the Commission in order to construct such lines. Under this definition, the utility can be an Arizona public service corporation regulated by the Commission or an out-of-state or other transmission provider that is not a public service corporation otherwise subject to the Commission's jurisdiction.

In the instant case, the Commission has asserted jurisdiction solely on the basis that SSVEC is a public service corporation, and the Commission can regulate it under A.R.S. §§ 40-321, 322, and 331 and its ratemaking authority. However, if an out-of-state transmission provider were to construct the line to own and/or ultimately sell to SSVEC because the line is less than 115 kV, the Commission would not have had the opportunity or ability to assert any jurisdiction to prohibit the construction of the proposed 69 kV line in the manner that it has prohibited SSVEC. *See Palms Springs,* 24 Ariz. App. At 129, 536 P.2d at 250 (The Commission is not prohibited "from dealing with specialized situations on a case by case approach, so long as there exists a rational statutory or constitutional basis for the action, and the action is not so discriminatory as to constitute a denial of the equal protection clause.") This is another illustration as to why this is first and foremost a line siting case and not a quality of service case and proof that the actions of the Commission were inappropriate and discriminatory.

I. The Commission's Decision Regarding the 69 kV Line Ignores Crucial Evidence and Other Information and is Not in the Overall Public Interest of the Cooperative and its Members.

As discussed above, the Commission ignored crucial testimony and information that was admitted into the evidentiary record which was weighed by the ALJ in

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recommending that the Commission not delay the Project. This information included the direct testimonies of SSVEC's Chief Executive Officer, Creden Huber, and SSVEC's Director of Member Services, Jack Blair. The Commission also ignored the testimony of its own Staff engineering witness, Prem Bahl, who recommended that the Cooperative continue with the Project. Additionally, SSVEC introduced into the evidentiary record significant information regarding the Project, the various options that it considered as alternative routes for the 69 kV line, the costs of such options, and member communications and meetings through the date of the hearing in April 2009. It is this substantial evidence upon which the ROO's recommendation was based.

Subsequent to the hearing in April 2009, members of the public opposed to the construction of the 69 kV line filed information in the docket reiterating their opposition to the line and proposing that the capacity problem in the Affected Areas could be alleviated through renewable/distributed generation resources allegedly at less than the approximate $13 million cost of the Project. Such information was also provided to SSVEC and carefully analyzed.

SSVEC professional staff has the technical expertise and requisite experience to conduct such an analysis. Mr. Orozco (who spoke at the Open Meeting) has extensive experience in renewable energy technologies, policies and assessments dating from 1979 and ranging from solar and wind system installations in Alaska, to renewable energy assessments throughout Latin America and Africa.[85] SSVEC's professional staff and resources also include, but are not limited to: (i) five registered professional engineers, two additional engineers-in-training, (iii) a right-of-way staff, including a Senior Member, International Right of Way Association (SR/WA) with certification in Right of Way Negotiation and Acquisition; (iv) an Engineering Planning Division with state-of-the-art

[85] *See* Mr. Orozco's resume demonstrating his considerable qualifications and expertise regarding renewable energy and rural electrification attached hereto as Attachment I.

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computer modeling software, MilSoft Windmil and PowerWorld Simulator, to perform complex load flow analysis; and (v) a substation and transmission line design engineer with a Masters Degree in Electrical Engineering with over 20 years of experience.

Despite the unfounded assertions made at the Open Meeting by some members to the contrary, SSVEC did conduct a careful and thorough evaluation of the renewable generation and other proposals submitted by the opposition group and prepared an extensive report that it provided to Staff prior to the Open Meeting and was referenced at the Open Meeting.[86] Additionally, the Commission was told that Mr. Orozco and other SSVEC personnel who have worked on the Project met with Staff the week before the Open Meeting for more than 10 hours to go over every aspect of the Project, including SSVEC's analysis of the renewable energy and alternative proposals that had been submitted subsequent to the hearing. At the Open Meeting, and consistent with SSVEC's analysis, Staff reiterated that the problem in the Affected Areas is one of voltage drop and capacity. Staff did not disagree with any of the Cooperative's conclusions or recommendations.

At the Open Meeting, the Cooperative told the Commission that it had in fact looked at all of the proposals submitted and that a renewable/distributed generation alternative would not resolve the capacity problem for the Affected Areas. The Cooperative also reiterated that if the Project did not go forward, the Affected Area would still be plagued by outages and voltage instabilities and that for years, it has been assuring its members in the Affected Areas that relief was on the way through the construction of the line. Finally, the Cooperative indicated it believed the independent feasibility study that was being proposed would only delay the Project, cost as much as $250,000, and that the cost of that study, as well as costs of the Project in excess of $13 million due to the delay, would have to be borne by <u>all</u> (approximately 50,000) SSVEC members and not

[86] *See* Attachment E.

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just those approximately 5,000 members living in the Affected Areas, which would result in future rate increases.[87]

Despite what appears to be the Commission's belief that those individuals which opposed the construction of the line and filed comments in the docket and/or provided public comment represented the wishes of the members within the Affected Areas, there still exists a large segment of members that supports construction of the line because they: (1) are tired of receiving unreliable electric service (which will continue indefinitely because of the delay): (ii) do not want to pay higher rates to pay for a likely higher cost renewable energy (assuming one was even available); and (iii) do not want a new hook-up moratorium while this matter remains indefinitely pending. Attached as Attachment J are six letters that have been filed in the docket from individuals that oppose the Commission's decision to delay the construction of the 69 kV line that should also be taken into consideration.

In light of the:

- Evidence presented by the Cooperative and Staff;
- Recommendation of the ALJ;
- Extensive analysis conducted by SSVEC to explore each and every option, including renewable/distributed generation to *solve* the power quality, capacity, and reliability problems;
- Wishes of SSVEC members who continue to experience unreliable service who were not as vocal as others;
- Resulting need for a new hook-up moratorium;
- SSVEC Board decision to move forward with the Project as being in the best interest of all of its members;

[87] The Cooperative has since received preliminary estimates indicating the cost of a study necessary to meet the requirements of the Decision may be between $300,000 and $400,000. Although at the Open Meeting, the Commission indicated that the Cooperative could file an application for an accounting order for the recovery of compliance costs associated with the Decision, as a cooperative, such costs can only be recovered through the rates paid by all SSVEC member/ratepayers. *See* OM Tr. at page 302, line 25 through page 304, line 10.

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- Additional costs that will continue to be incurred; and
- Resulting increases in rates for all SSVEC members;

the Commission has not acted in the overall public interest of the Cooperative's membership by ordering the Cooperative to not move forward with the Project until further Order of the Commission and to instead conduct an unnecessary and costly independent feasibility study. For all of these reasons, the Commission should reconsider the Decision.

J. <u>Conclusion</u>.

The Commission exceeded its authority by asserting jurisdiction over a line siting case under the guise of service quality for a public service corporation. Moreover, the Commission's actions in this regard ignored the overall public interest and constituted an improper interference in the Cooperative's management functions. The Decision does not provide a definitive timetable for the resolution of the issue. Consequently, there is a likelihood of delay of at least several years before rectification may occur to alleviate the Affected Areas' power quality capacity and reliability problems, thereby continuing the degradation of the existing electric system. Maintaining the status quo (and the allowance of additional load in the form of new service connections or expansion of existing services if the Moratorium Application is not granted) for the next few years under the Decision, will only further degrade the quality and reliability of electric service in the Affected Areas by continuing and/or increasing the risk for: (i) voltage brown-outs, causing damage and possible safety hazards; (ii) overload damage to the substation transformer, including total failure; and (iii) an increased number of significant outages due to line and/or equipment failures.

SSVEC has demonstrated that it explored all viable options, including distributed renewable energy, and the proposed 69 kV line represents the only technically feasible

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solution that can be implemented to impact the least amount of members at the lowest possible cost to the Cooperative and its member/ratepayers. Given the amount of time, money, and effort expended by SSVEC on this Project, along with the analysis of SSVEC's expert engineering Staff, the independent feasibility study will not produce a conclusion different than the one already determined by the Cooperative, will only delay the much needed relief to the Affected Areas, and result in increased costs.

For the Commission to delay construction of the 69 kV line based upon misinformation and unproven allegations to appease only a segment within the Affected Areas, the Commission is ignoring what the Cooperative believes to be in the best interest of the vast majority of those members that live within the Affected Areas who are entitled to reliable electric service and who have waited patiently for relief for years. It is not fair or appropriate for those members to now wait for at least several more years and continue to endure poor quality service (and pay higher rates) for the relief they expected to receive in the near future through the construction of the 69 kV line.

Finally, the Commission's unprecedented assertion of jurisdiction where the Legislature has expressly spoken, is a "slippery slope" that the Commission should not attempt to navigate, for it will open the door for complaints and interventions for every utility customer who does not agree with the utility's need to install critical infrastructure in order to maintain quality service conditions for all customers.

Accordingly, as the Commission's assertion of jurisdiction in this regard is not supported by Arizona law, SSVEC requests that the Decision be reconsidered and modified to permit the Cooperative to immediately proceed with construction of the 69 kV line.

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V. SSVEC'S WHOLESALE POWER AND FUEL COST ADJUSTOR ("WPFCA")

A. Background

SSVEC has had a fuel adjustor mechanism that the Commission established in the Cooperative's 1993 Rate Decision that permits the Cooperative to pass through fuel and purchased power costs to its members. Until January 2008, SSVEC was an All Requirements Member ("ARM") and obtained all of its power from Arizona Electric Power Cooperative, Inc. ("AEPCO") through a similar adjustment mechanism that allows AEPCO to pass through its costs to its member distribution cooperatives. In January 2008, pursuant to Commission approval, SSVEC became a Partial Requirements Member ("PRM") of AEPCO, which entitles SSVEC to now obtain a portion of its power from sources other than AEPCO which, at some time in the future, may include self-generation. However, notwithstanding becoming a PRM, SSVEC will still obtain approximately 80 percent of its power needs from AEPCO, and it is anticipated that through 2012, SSVEC will obtain between 75.3 and 88.3 percent of its power from AEPCO.[88] Additionally, Mr. David Brian, SSVEC's power procurement witness, testified at the hearing that when a large power contract comes back to AEPCO in 2011, SSVEC could obtain as much as 94 percent of its power from AEPCO:

> And Sulphur, I mean we have talked about Sulphur buying 80 percent of its power from AEPCO. That number actually goes up over time over the next few years because the entitlement from AEPCO grows as one of the contractual sales that AEPCO is obligated to expire.
>
> There is a 100 megawatt sale to Salt River Project, for example, that would bring about 30 more megawatts of base load power to Sulphur in the year 2011. So the 80 percent number actually goes up about 94 percent in 2011. So we are talking about a very small amount of power in the scheme of things for a very small rural cooperative.[89]

[88] Hr. Ex S-13 at page 3, lines 12-25.
[89] Hr. Tr. at page 183, line 18 through page 184, line 4.

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As with all of the AEPCO member distribution cooperatives, SSVEC has no control over the cost AEPCO passes through and has no choice but to pay such amounts. However, the AEPCO adjustor mechanism is monitored and approved by the Commission through semi-annual filings that AEPCO makes with the Commission.

Staff recommended that since SSVEC became a PRM in January 2008:[90]

> [t]he Cooperative's energy costs have become more volatile. The greater the volatility impacts the bank balance and, consequently, the WPCA rate. In order to manage the WPCA rate, Staff recommends that, in the future, SSVEC submit proposed increases to the WPCA rate to the Commission for approval. Submitting proposed increases for approval would ensure that impacts to the Cooperative's customers are regulated.
>
> Staff does not recommend that SSVEC be required to seek approval for decreases in the WPCA rate.

Moreover, Staff's recommendation applies to *all* increases, even if the increase will not result in any customer "rate shock" whatsoever, regardless of how miniscule the increase. For example, if SSVEC sought to increase its adjustor by 1 percent and there was a $1.00 (or less) increase to the customer, SSVEC would be required to expend the time and expense necessary to file for Commission approval and wait many months for such approval. This would (i) negatively impact the ability of the Cooperative to properly administer its bank balance; (ii) require the Cooperative to use its equity margin to "lay out" the money to purchase the power (that as a public utility it is obligated to acquire) for extended periods of time; (iii) spend time, money, and resources going through a Commission proceeding (just to implement a small increase); (iv) cause significant delay in the Cooperative's ability to recover costs; and (v) hinder the Cooperative's ability to be in compliance with the under-collection bank balance threshold. Requiring Commission approval defeats the purpose of the adjustor mechanism which is to allow timely recovery

[90] Hr. Ex. S-12 at page 7, line 24 through page 8, line 3.

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of wholesale costs incurred that are outside the Cooperative's control.[91] Finally, in light of the fact that the Cooperative will be obtaining between 75 and 88 percent (or more) of its power from AEPCO, and SSVEC does not control the cost of that power, Staff's recommendation will result in the Commission duplicating its efforts by reviewing power costs twice because the majority of such costs will have already been reviewed for AEPCO prior to the pass-through to SSVEC.

Staff was also concerned that the Cooperative could purchase less than 80 percent of its power from AEPCO.[92] This concern is unfounded because the only time the Cooperative would do this is when the cost of power from AEPCO is more expensive than what the Cooperative could obtain by going to the market. If this happens, the amount of purchased power expenses that will be included in the WPFCA will be less, resulting in a benefit to the members.

If Staff's primary concern is truly the avoidance of "rate shock" for customers, Staff proposed, the Cooperative agreed, and the Decision reflects, that a $2 million threshold for under-collections and a $1 million threshold for over-collections be established for the WPFCA bank balance.[93] This mechanism will help ensure that the bank balance does not grow to a level that will cause rate shock when the Cooperative increases its adjustor. The Cooperative clearly demonstrated to the Commission at the hearing that over the last 16 years it has operated the utility in a prudent manner to cut costs and keep rates as low as possible for its members for as long as possible.

The Decision adopts Staff's recommendation that SSVEC be required to submit for Commission approval all proposed increases to its WPFCA rate. Although SSVEC does not agree with this recommendation per se, SSVEC did not further challenge this overall recommendation. However, SSVEC is a cooperative (as opposed to an investor-owned

[91] Hr. Ex. A-8 at page 18, line 25 through page 19, line 2.
[92] Hr. Ex. S-13 at page 3, lines 12-18.
[93] Hr. Ex. S-12 at page 9, lines 14-16; Hr.Ex. A-9 at page 12, lines 13-15.

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utility) and has not been required to obtain Commission approval for increases in the past. SSVEC believes the Commission arbitrarily ignored these facts in establishing in the Decision the necessity of when and how SSVEC would be required to obtain Commission approval to increase its WPFCA given the time, resources, and expenses associated with obtaining the approval.

B. <u>After the Cooperative Files for an Increase in its WPFCA, the increase should go into Effect if the Commission does not Act Upon the Filing within 60 Days</u>.

If the Commission determines that SSVEC must file for increases in its WPFCA, because timely recovery of expenses is critical to the Cooperative, SSVEC has proposed a mechanism that the Commission has authorized in the past that will ensure the Commission's ability to review and approve the increase in a timely manner, as such review and approval process is out of the Cooperative's control.

SSVEC provided testimony from its outside rate consultant regarding the mechanism as follows:

> SSVEC also believes that there must be some provision that requires the Commission to act on such filings within a specified time frame. Given the magnitude of the wholesale power cost and the potential impact of a less than timely recovery, a 60-day turn-around is not an unreasonable expectation. Staff suggests that the Cooperative could file six (6) months in advance to avoid a lag in recovery. Staff also testifies that purchased power costs are volatile and hard to predict. SSVEC is dependent upon AEPCO for the majority of its purchases and market prices for the remainder. SSVEC is not always able to predict changes in power cost into the future. That is why the WPCA factor is so important in the recovery of these costs. Unlike an investor-owned utility that may be able to predict fuel costs well into the future, SSVEC does not have that same ability. It is essential that SSVEC have the ability to recover sudden increases in fuel costs without a significant delay at the Commission.[94]

Staff, however, objected to this proposal, stating that:

> Market conditions can change or new question can arise concerning an application. Under such circumstances, a 60-day limit could

[94] Hr. Ex. A-9 at page 13, line 22 through page 14, line 8.

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> potentially limit the Commission's ability to fully consider an increase before it went into effect.[95]

On cross-examination, however, Staff admitted that it can typically take as long as *four to five months* for the Commission to approve an adjustor reset.[96] Moreover, Staff further provided information in its response to data request SSVEC 1.6 that the Commission has previously approved adjustors for three other utilities that go into effect unless suspended by the Commission.[97] Those utilities are AEPCO (Decision No. 68071), Arizona Public Service Co. (Decision No. 6963), and UNS Electric (Decision No. 70360) and are referred to in the Decision. However, the Decision does not explain why the Commission has chosen to treat SSVEC differently than these other utilities. In fact, because SSVEC is a cooperative that obtains most of its power from AEPCO, the evidence suggests that with respect to the WPFCA, a more "light handed" regulatory approach is warranted, as opposed to the "heavy handed" regulatory treatment adopted in the Decision for SSVEC. As stated above, in *Palm Springs*, there must exist "a rational statutory or constitutional basis for the action, and the action is not so discriminatory as to constitute a denial of the equal protection clause." *Id.* at 24 Ariz. App. at 129, 536 P.2d at 250. Although SSVEC does not dispute the Commission's constitutional rate authority over the fuel adjustor, it does believe that there is no rational basis to treat SSVEC differently than other utilities thereby discriminating against SSVEC which constitutes a denial of equal protection.

Because of: (i) SSVEC's legal status as a cooperative (as opposed to an investor-owned utility) that must have timely recovery of its fuel and purchased power costs; (ii) the timing of the Commission approval process is out of SSVEC's direct control; (iii) in the near future, between 75 percent and 88 percent (or more) of SSVEC's power will

[95] Hr. Ex. S-13 at page 5, lines 17-19.
[96] Hr. Tr. at page 539, lines 7-16.
[97] *Id.* at page 641, lines 2 through 642 line 6.

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come from AEPCO, and the Commission will have already approved the pass-through of those costs to SSVEC; and (iv) the Commission precedent that has already allowed automatic adjustors for other utilities (including a cooperative), if the Commission does not act; SSVEC requests that the Decision be modified such that WPFCA increases be permitted to go into effect if the Commission does not act to suspend the Cooperative's filing within 60 days.

C. Power purchased from AEPCO that is passed through the Commission-approved AEPCO adjustor should not be considered for purposes of an increase to the WPFCA.

As discussed in detail above, SSVEC has and will continue to obtain most of its power from AEPCO for the foreseeable future. AEPCO passes through the costs associated with its power purchased for SSVEC by way of a Commission-approved pass-through adjustor mechanism. SSVEC has no control over the costs that AEPCO passes through, and these costs have already been reviewed and approved by the Commission. Accordingly, the Decision should be modified such that WPFCA filings should only be for those increases resulting from SSVEC's power purchases from non-AEPCO sources.[98]

D. The WPFCA rate established in the Decision should be considered an initial ceiling for adjustment purposes.

The Decision establishes that the base cost of power for the Cooperative be set at $0.072127 per kWh and that SSVEC be able to continue its WPFCA for recovery of expenses in excess of this amount.[99] Accordingly, in adopting these rates, the Commission determined this to be a just and reasonable rate. Staff has proposed that the Cooperative must obtain Commission approval for any and all increases in the WPFCA. At the hearing, Staff was asked to clarify its position (on what it meant by *any and all* increases) to determine whether the recommendation means an increase *above* the initial adjustor rate that will be established following the Decision, or increases in the adjustor

[98] Hr. Ex. A-9 at page 19, lines 2-10.
[99] Hr. Ex. S-12 at page 4, lines 13-14; Hr. Ex. A-8 at page 1, line 26 through page 2, line 3.

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rate following a decrease that does not exceed the initial adjustor rate: [100]

> Q. Okay. Let me give you a hypothetical, because this is where I am still struggling to understand how this is going to work. Let's say in a given year Sulphur has lowered -- the adjustor level is set and let's say it translates into 2 cents, just for -- okay, it is 2 cents. So the number that is approved in this Commission allows for a 2 cent adjustor. Now, Sulphur needs to lower that adjustor to 1 cent. All right? And it stays at 1 cent for a period. Okay? Then Sulphur incurred some fuel costs and then it needs to raise it back to 2 cents. All right? Would you agree with me that the 2 cents established in this rate decision would be considered the ceiling in that Sulphur would only have to come in for increases beyond the 2 cents?
>
> A. No.
>
> Q. Okay. So once -- and again I am only asking because we really weren't sure what you meant here. If the Commission is establishing the adjustor at 2 cents hypothetically, or whatever that decimal, long decimal number is, and lowers it, Staff is unwilling to allow the company to go back up to that amount, the amount established in this rate case decision, without coming to the Commission first?
>
> A. Staff's position is that any increase to the adjustor must be filed with the Commission for approval.
>
> Q. Okay. That clarifies it. And, again, in your testimony you stated that the reason that, one of reasons Staff is recommending that the Commission approve all increases is to mitigate potential rate shock?
>
> A. That is correct.

This position makes no practical sense. First, the Decision approves the WPFCA thereby finding the initial rate factor derived from the Decision to be just and reasonable. Staff proposed, the Cooperative agreed, and the Decision finds, that SSVEC will not need to obtain Commission approval to lower the adjustor rate. If the Cooperative lowers the adjustor rate below the initial adjustor rate, under Staff's proposal as adopted in the Decision, the lowered rate now becomes the new ceiling and SSVEC is precluded from raising the adjustor above that new rate without obtaining Commission approval, even though it is less than the initial rate established as a just and reasonable rate. Second, if SSVEC was to increase the now lowered adjustor rate back to the initial rate, there would

[100] Hr. Tr. at page 610, lines 4 through page 611, line 10.

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be no rate shock, as the adjustor rate would simply return to the level set by the Commission in the Decision which has been found to be just and reasonable. Accordingly, SSVEC should be permitted to raise the adjustor back to the initial rate factor that will be in effect following the Decision without Commission approval. Only increases above that rate should require Commission approval, as opposed to any and all rate increases of the WPFCA, as required by the Decision.

Additionally, if the Cooperative files for an increase in its adjustor rate, and the Commission approves a new increased adjustor rate above the rate derived from the Decision, that rate should supplant the initial adjustor rate derived from the Decision as the new ceiling for purposes of future increases and decreases of the WPFCA.

SSVEC requests that the Decision be modified to adopt the mechanism proposed by SSVEC.

E. The Decision should clarify that SSVEC is permitted to file for WPFCA increases based upon prospective costs.

In light of the Decision's requirement that SSVEC must file for approval of increases to its WPFCA, SSVEC requests the Decision be amended to contain specific language that clarifies that the Cooperative may file for such increases based upon prospective increases in its fuel and purchased power costs. If SSVEC can reasonably anticipate such increases in advance of incurring those costs, it should be able to file for an increase in its WPFCA on a prospective basis and not have to wait until such time that it actually incurs the higher costs. This is consistent with Staff's testimony at the hearing in recommending that SSVEC be required to file for Commission approval of all WPFCA rate increases.

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F. Conclusion

With respect to the WPFCA, the Decision unnecessarily takes SSVEC from one end of the regulatory spectrum to the other. Prior to the issuance of the Decision, SSVEC could adjust its WPFCA without Commission approval. SSVEC since accepted the Commission's determination to require the Cooperative to file for approval before increasing the WPFCA and the adoption of thresholds. However, given that (i) this is a cooperative (as opposed to an investor-owned utility); (ii) the vast majority of SSVEC's power will come from AEPCO for the foreseeable future; (iii) the Commission will have approved the AEPCO pass through of power costs to SSVEC and there is no need for the Commission to have to look at the same power costs twice; (iv) the Commission has already authorized other utilities (both cooperative and investor-owned) to increase their adjustors if the Commission has not acted on their respective applications within 60 days; and (v) the other evidence and reasons provided by the Cooperative; SSVEC requests the Decision be modified consistent with the Cooperative's requests regarding its WPFCA.

VI. CONCLUSION

On the basis of the foregoing, SSVEC has demonstrated that as a matter of law, the Cooperative is entitled to reconsideration and rehearing of the Decision relating to the following matters:

(1) The adoption of the revenue requirement set forth in the ROO;

(2) The elimination of the prohibition against SSVEC constructing the 69 kV line and the requirement that it conduct an independent feasibility study; and

(3) The adoption of the Cooperative's requests regarding the administration of its WPFCA with respect to the Commission's approval of WPFCA rate increases.

. . .

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. . .

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Accordingly, SSVEC requests that this Application be granted.

RESPECTFULLY SUBMITTED this 28th day of September, 2009.

SNELL & WILMER L.L.P.

By _____
Bradley S. Carroll
One Arizona Center
400 East Van Buren Street
Phoenix, Arizona 85004-2202
Attorneys for Sulphur Springs Valley
Electric Cooperative, Inc.

ORIGINAL and 13 copies filed this
28th day of September, 2009, with:

Docket Control
ARIZONA CORPORATION COMMISSION
1200 West Washington
Phoenix, Arizona 85007

COPIES of the foregoing hand-delivered
this 28th day of September, 2009, to:

Kristin K. Mayes, Chairman
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

Gary Pierce, Commissioner
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

Paul Newman, Commissioner
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Bob Stump, Commissioner
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
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Steve Olea, Director
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Janice Alward, Chief Counsel
Wesley C. Van Cleve, Attorney
Legal Division
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

COPY of the foregoing sent via U.S. Mail
this 28th day of September, 2009, to:

Jane Rodda, Administrative Law Judge
Hearing Division
ARIZONA CORPORATION COMMISSION
400 West Congress
Tucson, AZ 85701-1347

By

10512842.4

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Attachment A

SULPHUR SPRINGS VALLEY ELECTRIC COOPERATIVE, INC.

DIFFERENCE BETWEEN ROO AND DECISION

	Revenue Requirement		Operating
	Amount	% Change	Margin*
Recommended in ROO	$ 102,370,096	10.28%	$ 16,706,387
As Shown in Final Order	$ 100,430,597	8.19%	$ 15,325,515
Difference between ROO and Final Order	$ (1,939,499)	-2.09%	$ (1,380,872)

	Average Bill	Monthly Change	% Change
Existing Rates			
Average Residential Customer (728 kWh/month)	$ 88.78		
As Recommended in ROO			
Average Residential Customer (728 kWh/month)	$ 97.82	$ 9.04	10.18%
As Shown in Final Order			
Average Residential Customer (728 kWh/month)	$ 96.82	$ 8.04	9.06%
Difference between ROO and Final Order		$ (1.00)	-1.12%

*Referred to as Operating Income in the ROO and Final Order

Attachment B

THIS AMENDMENT:		
_____ Passed	_____ Passed as amended by	_____
_____ Failed	_____ Not Offered	_____ Withdrawn

RECEIVED

2009 AUG 14 P 2: 56

AZ CORP COMMISSION
DOCKET CONTROL

NEWMAN PROPOSED AMENDMENT # 5

TIME/DATE PREPARED: August 14, 2009

COMPANY: Sulphur Springs Valley Electric Cooperative, Inc.

DOCKET NOS. E-01575A-08-0328

OPEN MEETING DATE: August 17, 2009 AGENDA ITEM NO. U-1

DELETE Page 16, Line 17 through Page 17, Line 5 and REPLACE with:

"We find that Staff's revenue requirement of $100,420,597 will allow the Cooperative to meet its lender's required financial ratios and achieve a 30 percent equity ratio in a reasonable period of time. This revenue level is an increase of $7,595,316, or 8.18 percent, over Test Year revenues."

Page 42, Line 12, DELETE Finding of Fact No. 30 and REPLACE with:

"The evidence supports the Staff's projections for equity growth."

Page 42, Line 14, DELETE Finding of Fact No. 31 and REPLACE with:

"Total revenues of $100,420,597 will allow the Cooperative to meet its lender's required financial ratios and achieve a 30 percent equity ratio in a reasonable period of time. This revenue level is an increase of $7,595,316, or 8.18 percent, over Test Year revenues; resulting in an 11.56 percent return on FVRB, which is reasonable under the circumstances of this case."

Page 42, Line 25 –

DELETE "Cooperative's" and REPLACE with "Staff's"

Page 18, DELETE Lines 7 through 14 and REPLACE with:

"The following lists the current, Staff proposed and SSVEC proposed monthly customer charges:"

Page 18, Line 15, DELETE "Approved" and REPLACE with "SSVEC"

Page 18, Line 15 through 19, INSERT the following column:

Staff
$ 8.25
$13.25
$13.50
$13.35
$14.45
$44.25
$56.25
$44.45

Page 18, DELETE Lines 20 through 22 and REPLACE with:

"We will adopt Staff's proposed monthly customer charges."

Page 43, Line 1 –

DELETE "Cooperative's" and REPLACE with "Staff's"

Page 20, Line 8, DELETE lines 8 through 11 and REPLACE with:

"We believe Staff's recommended service charges are reasonable."

Page 43, Lines 4 and 5 –

DELETE "$9.04, or 10.18 percent, from $88.28 to $97.82"

REPLACE with "approximately $8.00, or approximately 9.0 percent, from $88.78 to approximately $96.82"

Make all conforming changes.

Attachment C

SULPHUR SPRINGS VALLEY ELECTRIC COOPERATIVE
DOCKET NO. E-01575A-08-0328
TEST YEAR ENDING DECEMBER 31, 2007

INCREASE IN EQUITY

	Final Order	ROO Proposed
Net Income (Amount added to Equity)	8,886,920	10,267,812
Annual Increase in Capitalization	27,764,799	27,764,799
Equity Added as % of Assets Added	32.01%	36.98%

FINAL ORDER

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Long-Term Debt	$ 125,311,087	$ 150,113,579	$ 168,991,458	$ 187,869,337	$ 206,747,216	$ 225,625,095	$ 244,502,974	$ 263,380,853	$ 282,258,732	$ 301,136,611	$ 320,014,490	$ 338,892,369	$ 357,770,248	$ 376,648,127	$ 395,526,006	$ 414,403,885	$ 433,281,764	$ 452,159,643
Equity	42,836,486	45,798,793	54,685,713	63,572,633	72,459,553	81,346,473	90,233,393	99,120,313	108,007,233	116,894,153	125,781,073	134,667,993	143,554,913	152,441,833	161,328,753	170,215,673	179,102,593	187,989,513
Total Capitalization	$ 168,147,573	$ 195,912,372	$ 223,677,171	$ 251,441,970	$ 279,206,769	$ 306,971,568	$ 334,736,367	$ 362,501,166	$ 390,265,965	$ 418,030,764	$ 445,795,563	$ 473,560,362	$ 501,325,161	$ 529,089,960	$ 556,854,759	$ 584,619,558	$ 612,384,357	$ 640,149,156
Percent Capitalization																		
Long-Term Debt	74.52%	76.62%	75.55%	74.72%	74.05%	73.50%	73.04%	72.66%	72.32%	72.04%	71.79%	71.56%	71.36%	71.19%	71.03%	70.88%	70.75%	70.63%
Equity	25.48%	23.38%	24.45%	25.28%	25.95%	26.50%	26.96%	27.34%	27.68%	27.96%	28.21%	28.44%	28.64%	28.81%	28.97%	29.12%	29.25%	29.37%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

ROO

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Long-Term Debt	$ 125,311,087	$ 149,653,282	$ 167,150,269	$ 184,647,256	$ 202,144,243	$ 219,641,230	$ 237,138,217	254,635,204	272,132,191
Equity	42,836,486	46,259,090	56,526,902	66,794,714	77,062,526	87,330,338	97,598,150	107,865,962	118,133,774
Total Capitalization	$ 168,147,573	$ 195,912,372	$ 223,677,171	$ 251,441,970	$ 279,206,769	$ 306,971,568	$ 334,736,367	362,501,166	390,265,965
Percent Capitalization									
Long-Term Debt	74.52%	76.39%	74.73%	73.44%	72.40%	71.55%	70.84%	70.24%	69.73%
Equity	25.48%	23.61%	25.27%	26.56%	27.60%	28.45%	29.16%	29.76%	30.27%
Total	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Note: The projections assume an annual increase in capitalization of $27,764,799 based on 2007 and a net income each year as provided in the specific order.

Attachment B

Attachment D

THIS AMENDMENT:		
_____ Passed	_____ Passed as amended by	_____
_____ Failed	_____ Not Offered	_____ Withdrawn

RECEIVED
2009 AUG 12 A 10: 09
AZ CORP COMMISSION
DOCKET CONTROL

PIERCE PROPOSED AMENDMENT #

DATE PREPARED: August 11, 2009

COMPANY: Sulfur Springs Valley Electric Cooperative, Inc.

DOCKET NOs: E-01575A-08-0328

OPEN MEETING DATES: August 17, 2009 AGENDA ITEM: U-1

Page 14, line 12

DELETE "five" after "this over" and INSERT "ten"

DELETE "$60,000" after "Rate Case Expense" and INSERT "$30,000"

Page 14 line 14

DELETE "The five year recovery period we adopt is slightly longer than usually seen for an investor-owned utility, but not unreasonable for this cooperative."

INSERT "Given that it has been 16 years since SSVEC's last rate case, and given the surplus recovery of SSVEC's prior rate case expenses, we believe it is appropriate to amortize SSVEC's rate case expenses over ten years. The ten year recovery period we adopt is longer than usually seen for an investor-owned utility, but not unreasonable in light of the circumstances of this case."

Conforming changes.

Attachment E

SONOITA RELIABILITY PROJECT

Sulphur Springs Valley Electric Cooperative, Inc.

A Touchstone Energy® Cooperative

SSVEC

INDEX

Sulphur Springs Valley Electric Cooperative, Inc.

A Touchstone Energy® Cooperative

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SSVEC

Request for Proposal

DRAFT

Request for Proposal
For Sulphur Springs Valley Electric Cooperative
Review, Critique, Accept

May 20, 2009

{a working document}

Project Summary

The Sonoita/ Elgin Communities have significant concerns regarding a proposed 69kV transmission line proposed by Sulphur Springs Valley Electric Cooperative, Inc. (SSVEC). The concerns can be summaries in four key areas:

1. Visual pollution (aesthetics) of the beautiful northeast portion of Santa Cruz county;
2. The ecological and research impacts of the installation and maintenance of the proposed line;
3. The lack of renewable energy utilization – furthering dependence on non-renewable energy generation; and
4. Rising Energy Costs; Would employing Renewable Energy now save Cooperator Dollars in the future?

The purpose of a feasibility study would be to examine renewable energy alternatives to the installation of the proposed line, and to preliminarily quantify the cost of such an alternative.

Completion of such a study would satisfy SSVEC Cooperator concerns about the proposed line and quantify possible renewable distributed energy alternatives, by a qualified company. Improving the relationship and understanding of the Cooperative and its members, as unresolved questions are answered. The outcome would promote a mutually beneficial working relationship between cooperators and company.

Feasibility Study Overview

The feasibility study will determine a recommended best course of action for the proposed project. Specifically, the study would address two needs for customers on the SSVEC V-7 feeder line:

1. Providing increased capacity; and
2. Improving continuity (reducing power outages, or the risk thereof).

While special attention will be given to finding reasonable renewable energy solutions, the proposed 69kV transmission line will be evaluated, and compared and contrasted to other considered options. Cooperation with SSVEC engineers and staff will be critical to the information sharing and evaluation of all alternatives.

The study will include (but not be limited to); site details, resource requirements and availability (water), area guidelines/regulations (fed/state/county), technical options appraisal, technical suitability, demonstration value, capital cost range, energy output, CO2 savings, water usage (if any) or savings, practical considerations, system sizing requirements and a project commissioning timeline.

Particular attention will be paid to identification of potential funding options/sources, financing options/sources, and federal/state incentives. Consideration will be given to utility, SCCF, Patagonia, and third party system ownership.

Due to the sensitive nature of this project there should be an emphasis and/or focus on environmental, social and planning issues that may be associated with each option. Methods and assumptions should be detailed throughout the document. Verifying the availability of a renewable energy source at a specific site (e.g., wind studies, seasonal flow rates of a watercourse, landfill gas production rates and expected life, etc.) will be included.

Deliverables

The following Reports with accompanying Presentations are to be delivered in contractor format, including, as a minimum, information from the below deliverables with conceptual studies, feasibility and sensitivity analyses, power flow analysis, public relations and contact information, cost information with a financial and business plan, and Action Items and Status.

The deliverables will be integrated, updated at least every Friday by noon, and available, under controlled conditions, to designated study participants on a mutual website. Development of a comprehensive presentation series, as a minimum in PowerPoint with notes, shall parallel each report. At end of each third week, each report will be completed; however, the "reports" in between are to be considered as "working papers" and may be outlines and include TBD's as placeholders. The Third Week Reports will provide completed work but may have appendices showing report plans for the next 3-week cycle.

No. 1 – The Project Plan (including trade and technical studies)
No. 2 – Media, Contact and Promotion Plan
No. 3 – Funding, Financial and Business Plan, Proposed Agreements and REPs
No. 4 – Feasibility Study Results Report and Program Schedules, Action Items and Status

I. FEASIBIBLITY IDENTIFICATION AND ANALYSIS PLAN

Scope: Upon execution of this Agreement and any extension thereof consultants engaged by the company (SSVEC), under the direction and supervision of Company's Chief Executive Officer ("CEO") or specified designee, shall devote sufficient time and effort in conducting the following:

In coordination with engineers, manufacturers, contractors and sub-contractors from design, installation, operation and warranty disciplines

1. Identify the most efficient and cost-effective types of renewable energy systems that can be successfully installed throughout the northeastern area of Santa Cruz County served by Feeder V-7.

2. Include as potential candidates for feasibility analysis photovoltaic (PV), solar thermal, concentrated solar, wind, and biomass generation systems with, as appropriate, additional "peaker" opportunities in Report No. 1.

3. Establish contact and work closely with Sulphur Springs Valley Electric Cooperative (SSVEC) staff to review level of interest in renewable energy project so participation and electricity purchase are facilitated to meet the connectivity and capacity needs in Report No. 1. Negotiate preliminary terms as indicated and appropriate in Report No. 3.

4. Establish contact and work with Tucson Electric Power Company (TEP) to ascertain level of interest in renewable energy project participation, electricity purchase, and potential interconnectivity in Report No. 1. Negotiate preliminary terms including cross-boundary agreements, as indicated and appropriate in Report No. 3.

5. Establish contact and work with UNS Electric (UNSE) to ascertain level of interest in renewable energy project participation, electricity purchase, and potential interconnectivity in Report No. 1. Negotiate preliminary terms including cross-boundary agreements, as indicated and appropriate in Report No. 3.

6. Establish contact and work including project promotion and solicit support from the Santa Cruz County Board of Supervisors, County Community Planning Department, the Sonoita Community Crossroads Forum, the Town of Patagonia and Planning Department to present a preliminary renewable plan(s) for best sites to locate small (1-3 MW) renewable energy generation sources in Report Nos. 1, 2, 3, and 4.

7. Establish contact and work including project promotion and solicit support from the Arizona Department of Commerce Energy Office, the Arizona Governor's Office, Arizona Corporation Commission Utility Division, and State Congressional Delegates. Attention must be given to identify, submit, and negotiate state or federal grants, other funding, and/or loan incentives that could impact renewable energy funding for the project in Report Nos. 2, 3, and 4.

8. Establish contact and work including project promotion and solicit support from the federal Congressional delegations, Department of Energy, Department of Agriculture and Forest Service for near-term federal stimulus package assistance in Report Nos. 2, 3, and 4.

9. Establish contact and work including project promotion and solicit support from Department of Interior including the Bureau of Land Management for inclusion in Federal stimulus package assistance and

assistance with a preliminary overview and determination of possible site locations environmental and natural resource impacts in Report Nos. 1, 2, 3 and 4,

10. Establish contact and work including project promotion and solicit support from Arizona State Land Department, Parks and Recreation Department, Fish and Game Department for assistance with possible site locations in Report Nos. 2, 3 and 4.

11. Develop a comprehensive media and promotion, preliminary and final, plans to provide extensive media coverage and positive media for SSVEC, the Project, and all entities that dedicated resources to the Project in Report Nos. 2,3, and 4.

12. Provide advocacy, promotion, and negotiation of renewable energy incentives from public utility companies, and negotiate wholesale power purchase agreements for sale of power generated from the Project in Report Nos. No. 3 and 4.

13. Make specific recommendations, based on analysis and research, as to Project sizing, location, engineering, schedule, design and cost with proposed return on investment (ROI) determination, appropriately, in Reports No. 1, 3 and 4. Recommendations will include equipment and inverter specifications, grid-tie engineering, "Sonoita reliability loops," and interconnection specifications between SSVEC and/or TEP/UNSE, and construction scheduling in Reports No. 1 and 4.

14. Incorporate recommended system and schedule in the format of an RFP ready for bidding, including objective source selection criteria in the RFP in Report No. 4.

15. Identify experienced and qualified Arizona contractors and sub-contractors as potential bidders for the recommended system for presentation of Statement of Qualifications (SOQs) in Report No. 3.

16. Prepare a comprehensive project (and phasing, if appropriate) timeline and schedule from inception through system commissioning with Feeder V-7 capacity changes over time, viewed as annual and daily demand curves.

17. Coordinate and conduct with the Town of Patagonia and SCCF community meeting(s) to secure feedback from the SSVEC cooperative's members in the service area, and other parties for comment prior to development of final project plan in Report No. 2.

18. Develop an ongoing Operations and Maintenance (O&M) plan for the recommended system in Report No. 1.

19. Assist Town of Patagonia and Sonoita Crossroads Community Forum to prepare and submit of applications for local, state, and national grants, low cost loan programs or other assistance determined feasible in Report No. 3.

20. Present funding options for construction and/or permanent financing – depending on recommenced system and subsequent financing recommendation in Report NO. 3.

21. Secure letter(s) of intent from funding providers in Report No. 3.

22. Negotiation of terms for presentation with Staff to the SSVEC Board from utility(ies) and/or power purchasers in Report No. 3.

23. Identification of necessary permits required for project in Report Nos. 1 and 4.

24. Projected Completion date: August 30, 2009.

II. POSSIBLE COMPENSATION AND PAYMENT SCHEDULE

Estimated $250,000		$75,000
At Award - startup	$25,000	
On 30 Aug 2009, after Final Reports delivered	$35,000	
Upon SSVEC Review Final Reports	$15,000	

The above are on a Not-To-Exceed-Basis. However, if Patagonia, SCCF and SSVEC request additional deliverables or changes to above deliverables and is agreed to by the company awarded the Project, they will provide a written estimate of costs – to be agreed to by all parties in writing.

All out-of-pocket expenses incurred by awarded company are in the price of this contract and will be fully the responsibility of successful bidder, including any expenses incurred for engineering, professional consultants, and travel.

SSVEC

Request for Proposal Rebuttal

Sulphur Springs Valley Electric Cooperative, Inc.

A Touchstone Energy® Cooperative

REBUTTAL OF 3SEG'S
Request for Proposal for a Feasibility Study

The Request for Proposal (RFP) for a Feasibility Study as submitted by 3SEG is to *"...determine a recommended best course of action...to address two needs... 1) Provide increased capacity; and 2) improving continuity (reducing power outages, or the risk thereof)."*

SSVEC feels strongly that this RFP for a Feasibility Study is not necessary for the following reasons:

1. **SSVEC's staff is fully capable of such a study. SSVEC staff includes:**
   a. **Five registered Professional Engineers,**
   b. **Two Engineers-in-Training,**
   c. **A Right of Way staff, including a Senior Member, International Right of Way Association (SR/WA) with certification in Right of Way Negotiation and Acquisition,**
   d. **An Engineering Planning division with state-of-the-art computer modeling software, MilSoft Windmil and PowerWorld Simulator, to perform complex load flow analysis,**
   e. **A Substation and Transmission Line Design Engineer with a Masters degree in Electrical Engineering and 20+ years experience,**
   f. **An Engineering Manager with extensive experience in renewable energy technologies, policies and assessments dating from 1979 to date and ranging from solar and wind system installations in Alaska to renewable energy assessments throughout Latin America and Africa,**
   g. **Among other qualified personnel.**

2. **Most of the topics proposed for evaluation in the Feasibility Study have already been addressed by SSVEC staff.**
   The following pages present a detailed comment on work already performed by SSVEC and outside consultants in each of the major study points proposed by 3SEG.

3. **The RFP is too broad, too vague, and is non-conventional in the utility industry.**
   Distributed generation (DG) projects such as those discussed by the 3SEG group are typically handled by utilities in the following manner:

Not less than $250,000

a. A System Impact Study is done for a specific project (size, technology, voltage) at a specific site. This study evaluates the impact of the proposed DG system on the interconnecting distribution or transmission line. Often these studies identify line re-conductoring for voltage requirement and other necessary upgrades.
b. A Feasibility Study follows to define the exact system improvements needed to interconnect the DG system. A detailed design for the system interconnection results from this Feasibility Study.

The Feasibility Study proposed by 3SEG attempts to combine these two independent studies into one study and also expands the scope to tasks typically reserved for post completion of the detailed studies, such as marketing and promotion, funding/grants, and in this case, negotiation of certificated boundary agreements.

4. Since 1982 SSVEC has had a plan to "*...1) Provide increased capacity; and 2) improve continuity (reducing power outages, or the risk thereof).*"
   a. SSVEC has already done everything possible to extend the capacity of the V-7 feeder including:
      1. SSVEC has an obligation to provide safe and reliable power for current and new customers – The peak load of 7 MW already exceeds the substation and line capacities. In addition, SSVEC has facilities to the lot line and has committed service for 219 residential lots representing an additional 1.5MW of load. Unless system capacity is increased immediately, SSVEC will be forced to consider a moratorium on new facilities in the area – thus violating our obligation to serve all requests for power in our certificated service territory.
      2. Utilizing five line regulators - the Rural Utility Service (RUS) recommends not more than one line regulator on a feeder. Multiple line regulators result in both high and low voltages on the feeder as experienced by numerous residents in the area.
      3. Allowing loads to exceed substation transformer capacity – The existing transformer is rated for 5 MVA in open air and 7 MVA with fans. Recent peak load of 7.123 MW at 98% Power Factor equals 7.50 MVA – a 7% overload on the transformer. Current loads have exceeded this higher rating and a remedy must be implemented immediately.
      4. Re-conductoring of the main line is not a viable option - SSVEC studies show this option is costly ($12M including

ROW, substation, retirement of old facilities, and additional labor for energized work), must be done energized to keep area residents in service during the construction, requires significant rights-of-way acquisition, provides only minimal increased capacity due mainly to voltage drop, and does nothing for the reliability issue resulting from a 37-mile mainline from Huachuca West substation to Patagonia.

b. **SSVEC studies have clearly shown <u>that improving continuity of service (reducing power outages) in the area is best addressed with a new, uninterrupted 69kV line</u> along a completely separate corridor, mostly on private property, and a new substation in Sonoita.**

5. **SSVEC has thoroughly briefed ACC staff, including recent review of an additional 3" of support documents from SSVEC files, on analyses already completed by SSVEC and/or outside consultants on this project.**

The following is a detailed commentary of each of the points made in the 3SEG Request for Proposals for a Feasibility Study. <u>Again, SSVEC feels this study is not needed!</u>

Save the Scenic Sonoita/Elgin Grasslands Group (3SEG)
REQUEST FOR PROPOSAL – Rebuttal by SSVEC

The format used below presents points made in the 3SEG RFP for Feasibility Study and, using this font, rebuts statements made. Text presented in "*italic quotes*" is taken directly from the 3SEG presentation.

FOUR KEY CONCERNS:

* *VISUAL POLLUTION: Visual pollution (aesthetics) of the beautiful northeast portion of Santa Cruz County*
    - **Pole color study done**
        - **Gray poles are less noticeable**
        - **This matter addressed in detail at community presentations in Sonoita and Patagonia**
    - **Fewer poles with 69 kV line (202 poles @ 55'-65' vs. 382 poles @ 45'-55')**
    - **Fewer vehicles pass the 69 kV line (3000 vehicles/day on HWY 82 vs. 510 vehicles/day along HWY 83)**
        - **Remote sighting (4.4 mi. along paved road with 69kV vs. 23.3 mi. with V7 route)**

* *ECOLOGICAL & RESEARCH IMPACTS: The ecological and research impacts of the installation and maintenance of the proposed line*
    - **Corridor has already been violated with buried telecommunications cable trench and maintenance road**
    - **Full Storm Water Pollution Prevention Plan (SWPPP) compliance**
    - **Re-seeding with native species using local range consultant will be done**

* *RENEWABLE ENERGY UTILIZATION: The lack of renewable energy utilization – furthering dependence on non-renewable energy generation*
    - **7/7/09 - Issued RFP to 14 companies for up to 750 kW of renewable energy near Sonoita**
    - **7/21/09 – Evaluated 10 bids for Renewable Energy Power Purchase Agreements (PPA) and Design/Build options**
    - **8/3/09 – Submitted a $6M proposal for Clean Renewable Energy Bond (CREB) funding to RUS**

* *RISING ENERGY COSTS: Would employing Renewable Energy now save Cooperator dollars in the future?*
    - **SSVEC recognizes the need for a reduced carbon footprint**
    - **SSVEC is investing in renewable energy generation today!**
        - **Nearly 1 MW installed to date under SunWatts and Solar Schools programs**
            - **40kW with SunWatts (SSVEC pays $4/watt)**
            - **900 kW at Solar Schools (SSVEC owns via CREBS loan)**

STUDY ADDRESSES TWO NEEDS:

* *IMPROVING CAPACITY*
* *IMPROVING CONTINUITY*
    - *Study to Include (but not limited to):*
        - *Special attention to finding reasonable renewable energy solutions*
            - **SSVEC contracted POWER ENGINEERS to evaluate a 2 MW DG option for the area. Determined that the best site is Sonoita.**
                - **Study looked at:**
                - **Fault current analysis**
                - **Distance relaying required**
                - **Volts per Hertz protection**
                - **Under-voltage protection**
                - **Reverse power protection**
                - **Loss of field protection**
                - **Status unbalanced current protection**
                - **Voltage time overcurrent relay**
                - **Overvoltage protection**
                - **Stator ground fault protection**
                - **Frequency relay**
                - **Differential protection**
                - **Grounding**
                - **Need for communications processor**
                - **Assuming the system will require a diesel generator for power generation when renewables are not available, a 2MW diesel genset:**
                - **Fuel consumption (135 gal/hr)**
                - **Operation & Maintenance (O&M) cost = $700/hr**
                - **Noise Pollution (80 db) – not recommended for residential area**
                - **Arizona Department of Environmental Quality (ADEQ) permitting required**
                - **Requires 20,000 diesel storage tank on-site**

- **SSVEC received bid for 2MW genset from PowerSecure. $1M plus inter-tie.**

- *Evaluation of 69kV transmission line; <u>to be compared/contrasted to other considered options</u>*
- *Study Scope*
  - **Typically a System Impact Study is done first to determine if the distribution system can handle the power injection**
  - **6/2008 - SSVEC developed a Scope of Work for POWER Engineers to study DG options in the Sonoita area**
  - ***"Sonoita Distributive Generation Study"* submitted to SSVEC 10/2008 (See above for results)**
  - **Engineers Estimate of Probable Cost equals $1M plus $700/hr O&M**
  - *Site details*
    - **Detailed siting completed in POWER Study using MilSoft system modeling software**
  - *Resource requirements and availability (water)*
    - **Radiator cooling recommended by POWER**
  - *Area guidelines/regulations (fed/state/county)*
    - **ADEQ air pollution permit required under Environmental Protection Agency (EPA) Tier 2 criteria. Subject to Santa Cruz County (SCC) zoning and permitting.**
  - *Technical options appraisal*
  - *Technical suitability*
  - *Demonstration value*
  - *Capital cost range*
    - **POWER estimates $1M plus $700/hr O&M cost.**
    - **ASSUMING THE ARIZONA CORPORATION COMISSION (ACC), SCC, AND THE COMMUNITY WILL ALLOW A 2 MW DIESEL GENSET**
  - *Energy output*
    - **Derated for 5,000 foot elevation**
  - *CO2 savings*
  - *Water usage or savings*
    - **Negligible**
  - *Practical considerations*
  - *System sizing requirement*
    - ***A* 2MW system is needed. When using renewable energy, a back-up system is needed for periods when the sun does not shine or wind is not present. A 2MW**

diesel genset "peaker" would be required to back-up the renewables.

- *Project commissioning timeline*
  - **PowerSecure proposal quotes 42 weeks to final commissioning**

- *Particular attention to:*
  - *Potential funding options/sources*
    - **8/3/09 – SSVEC submitted a $6.0M proposal to CREBS for at least 750 kW of solar with low-interest loan funds to be re-paid by Renewable Energy Standard and Tariff (REST) funding**
  - *Financing options/sources*
    - **7/09 - RFP for renewables in Sonoita solicited Power Purchase Agreements (PPA) and Design/Build options**
  - *Federal/state incentives*
  - *Ownership (utility, SCCF, Patagonia, third party)*
    - **Results of 7/09 RFP suggests SSVEC ownership has lower life-cycle cost**
- *Emphasis and/or Focus on:*
  - *Environmental, social and planning issues*
- *Verifying the availability of a renewable energy source at a specific site*
  - *Wind studies*
    - **Northern Arizona University (NAU) wind map for Sonoita area shows Class 1 wind resource (Poor) 0.0-12.3 mph. 12.3 mph = 5.4 m/sec. SAVOIA "Raduga-1" 1MW wind turbine requires minimum of 5 m/s to operate.**
  - Seasonal flow of a watercourse,
    - **No rivers in the area**
  - *Landfill gas production rates*
    - **Arid western United States has limited landfill gas potential**
      - **Low moisture content in landfills inhibits anaerobic digestion and production of methane gas**
      - **Gasification technologies are applicable but typically sited at much larger waste processing facilities**
      - **Plasma gasification was considered in Cochise County but did not get approval**

  - *And expected life, etc.*

- *Identification and Analysis Plan*
  - *Most efficient and cost-effective types of renewable energy systems that can be installed*
    - *Photovoltaic*
      - **7/09 RFP respondents to SSVEC all quoted a Photovoltaic (PV)-based solution**
    - *Solar thermal*
      - **Reserved for larger grid-connected facilities (10MW+) or co-generation at industrial waste site (Dairy, steam plant, etc.)**
    - *Concentrated solar*
      - **Reserved for larger facilities**
    - *Wind*
      - **NAU study shows Class 1 resource (Poor) in Sonoita area**
    - *Biomass generation*
      - **Limited biomass in the area.**
      - **Do not want cut the Scenic Grasslands for biomass generation**
      - **Agricultural waste from the Tubac/Rio Rico area seem to be the closest bio-resource**
    - *"Peaker" opportunities*
      - **Completed *"Sonoita Distributive Generation Study"* submitted to SSVEC 10/2008 for DG peaker in Sonoita (See above for results)**
  - *"Level of interest in renewable energy from SSVEC"*

    SSVEC has high level of interest in renewables:
    - **Aggressive REST plan approved by ACC. Collecting:**
      - **$1.30/residential/month**
      - **$42.00/Small Commercial**
      - **$150.00/Large Commercial (over 3MW)**
    - **SSVEC's SunWatts program offers $4/Watt rebate for individual renewable energy systems in the service territory. This compares with:**

UTILITY	REBATE (Watt)
SSVEC	$ 4.00
TRICO Electric	4.00
Arizona Public Service (APS)	3.00
Tucson Electric Power (TEP)	3.00
UniSource Energy	3.00
Salt River Project (SRP)	2.70

    - **SSVEC's SunWatts program has installed 40 kW to date (Source: SSVEC SunWatts Report as of 8/2009)**

- **SSVEC installed and owns 41 solar school shades for a total of 900 kW**
- **SSVEC has bids for at least 750 kW of grid-connected solar for the Sonoita Substation**
- **SSVEC will offer net metering in new rates**

- *Level of interest in renewable energy participation, purchase, and interconnectivity from TEP*

  In 2003, SSVEC submitted a formal Request for Possible Transmission Service in the Sonoita area. TEP response:
  - **46kV line dedicated to Fort Huachuca back-up**
  - **When 138 kV line is out, load must shift to Fort Huachuca. No firm power.**
  - **To serve Fort Huachuca <u>and</u> Sonoita would require a conductor upgrade to the South Loop Substation**
  - **Two-county rule must be adjusted by Bond Council**
  - **Line suffered three outages in 2002. Total outage time of 42 hours.**
- *Negotiate preliminary terms of cross-boundary agreements*

  Terms of this Agreement must address issues of:
  - **Energy metering**
  - **Energy cost**
  - **System protection and coordination**
  - **Safety**
  - **Operations agreements (who controls switches)**
  - **Remote control of switching facilities**
  - **Payment (who pays for the inter-tie facilities)**
  - **Requires ACC approval**
  - **Estimated cost for SSVEC portion of inter-tie is: $420,000. NOTE: this does not include UNS costs to convert 2-phase to 3-phase and other inter-tie facilities.**
- *Level of interest in renewable energy participation, purchase, and interconnectivity from UNSE*
  - *Negotiate preliminary terms of cross-boundary agreements*
    - **Intertie to UNS is not applicable for load serving as proposed by 3SEG**
- *Promotion and support from Santa Cruz County Board of Supervisors; Community Planning/Development, SCCF, Town of Patagonia for site location of RE Generation 1-3MW sources*
  - **Large grid-connected renewable projects (1 MW-10 MW) are either co-located with an existing substation or require a new substation. SSVEC has an additional 2-3 acres at our Sonoita substation that, with SSC BOA approval, will be used for up to 750kW of grid-connected solar. An additional 12 acres are for sale adjacent to the**

substation that could accommodate approximately 1 MW-2 MW expansion.

- *Promotion and support from AZ DOC Energy Office, AZ Governors Office, ACC Utility Division, State Congressional Delegates for federal/state grants, other funding or incentives*
  - **Not typically solicited until you have a technical proposal in hand**
- *Promotion and support from Federal Congressional Delegates, DOE, DOA and USFS for federal stimulus assistance*
  - **Not typically solicited until you have a technical proposal in hand**
- *Promotion and support from DOI/BLM for federal stimulus package and environmental/natural resource impact.*
  - **CREBS funding for renewables is a better value and more readily accessible to SSVEC**
- *Promotion and support from ASLD, Park and Recreation, Fish & Game Department for site location*
  - **Not typically solicited until you have a technical proposal in hand**
- *Comprehensive media plans to provide extensive positive coverage for SSVEC/the Project/all Entities*
  - **Not performed until all details of the project have been defined and more development progress has been accomplished. It would be pre-mature to develop media plans at this early stage of project development.**
- *Provide advocacy, promotion, negotiation of RE Incentives from PU Companies*
  - **SSVEC's RFP solicited both Design/Build and Power Purchase pricing for at least 750 kW of renewables at the Sonoita Substation. Design/Build appears to be a better value for SSVEC.**
- *Negotiate wholesale power purchase agreements for sale of power generated from project*
  - **Typically this is not done until well after the system impact and feasibility studies are completed and funding mechanisms are identified**
- *Make specific recommendations based upon analysis and research on:*
  - *Project sizing*
    - **2 MW has already been determined as optimal by SSVEC and confirmed by POWER Engineers**
  - *Location*
    - **Sonoita Substation is the ideal location as the renewable energy can be injected directly onto the 25kV bus for distribution/utilization by all feeders in the area and export to Sierra Vista and beyond via the 69kV line**
  - *Engineering*

- **Completed by POWER Engineers in 10/2008 (See above for details)**
- *Schedule*
- *Design*
- *Cost with proposed Return on Investment determination*
- *Equipment specifications*
  - **2MW generator specification is in-hand as presented by PowerSecure. 750kW solar specifications are in-hand provided by bidders to SSVEC's renewables RFP dated 7/09.**
- *Inverter specifications*
  - **Completed as part of SSVEC's renewable RFP issued 7/09**
- *Grid-tie engineering*
  - **Minimal study if injection point is Sonoita Substation as proposed**
- *Sonoita reliability 'loops'*
  - **There are no "distribution loops" existing or proposed by SSVEC. There will be a limited transfer "feeder tie" between the existing Huachuca West substation and the new Sonoita Substation once the new sub is built.**
- *Interconnection specifications between SSVEC and/or TEP/UNSE...*
  - **SSVEC/UNS:**
    - **UNS is 2-Phase System / SSVEC 3-Phase**
    - **UNS is 13.8 kV System / SSVEC is 25kV System**

New 3-Phase line to be constructed from SSVEC to UNS at Flux Canyon – 1 mile	**$ 100,000**
Step-down transformers (specialized phase shift corrections) required	**70,000**
Set of 3-Voltage regulators	**60,000**
3- Automatic Circuit Reclosures, SCADA controlled	**150,000**
1 mile ROW for 3-Phase line on private property – Transformer Site	**40,000**
SSVEC Cost (does NOT include costs for UNS facility upgrades)	**$ 420,000**
DOES NOT INCLUDE ANY LEGAL EXPENSES OR ANY COSTS ASSOCIATED WITH CCN BORDER AGREEMENTS, ACC APPROVAL PROCEDURES, ETC	

- **SSVEC/TEP:**
  - **TEP is 46 kV System / SSVEC is 25kV System**
  - **TEP 46kV Line is a Radial line to Ft Huachuca**
  - **3SEG is suggesting 2 OR 3 interconnection sites at $3.27M each (minimum)**

Interconnect location substation site	**$ 170,000**
46:25kV transformers	**230,000**
Set of 3-Voltage regulators	**120,000**
2- Distribution Automatic Circuit Reclosures, SCADA controlled	**100,000**
Substation structure	**350,000**
Control house	**300,000**
Construction	**500,000**
Switching Station 3 Breaker Ring Bus	**1,500,000**
SSVEC Cost (does NOT include costs for TEP line upgrades)	**$ 3,270,000**
DOES NOT INCLUDE ANY LEGAL EXPENSES OR ANY COSTS ASSOCIATED WITH CCN BORDER AGREEMENTS, ACC APPROVAL PROCEDURES, WHEELING COSTS, ETC	

- *Construction scheduling*
  - **Premature at this time**
- *Provide RFP, ready for bidding, of recommended system and schedule, include objective source selection...*
  - **Already completed by SSVEC.**
- *Identify experienced and qualified Arizona contractors/subcontractors for potential bidders*
  - **SSVEC's RFP for renewable energy in Sonoita was sent to 14 pre-qualified bidders**
- *Prepare comprehensive project (and phasing) timeline schedule from inception through commissioning with Feeder V7 capacity changes over time in format of annual/daily demand curves*
- *Coordinate/conduct meetings with Town of Patagonia/SCCF for feedback and comment prior to development of final project plan*
  - **Premature at this time**
- *Develop an Operations & Maintenance Plan for recommended system*
  - **Included in bid proposals from various respondents to the SSVEC RFP for solar in Sonoita.**
- *Assist Town of Patagonia/SCCF with application grants for funding*
  - **Already performed by SSVEC in submittal of $6M proposal for CREBS funding for 750 kW of solar energy at Sonoita**

- *Present funding options for construction/permanent financing of recommended system*
  - **CREBS funding is the best financing option considering interest rate and payment terms**
- *Secure letter of intent from funding providers*
  - **Awaiting response on SSVEC's CREBS proposal**
- *Negotiation of terms from utilities and/or power purchasers*
  - **Contained in SSVEC RFP responses from bidders**
- *Identify necessary permits for recommended project*
  - **ADEQ air quality if a generator is used. SSC for siting/building permit.**

* *Four Reports addressing multiple levels of concern: (20, or so, pages):*
  - SSVEC has volumes of studies, cost estimates, designs, analysis, presentations and support materials already developed, evaluated and synthesized on this project.
* *a) technical;*
  - Technical study of viable options has already been completed
* *b) cost and schedule;*
  - SSVEC has already completed and presented cost estimates for numerous route options, technology options, cost options, and substation location options.
  - SSVEC is on schedule for completion of the 69kV line and substation for service in Fall 2010.
* *c) public relations;*
  - Public relations is never included in a Feasibility Study
* *d) recommended action*
  - SSVEC already has a recommended action based on detailed analysis of all alternatives.

* *RFP COMPLETION DATE: August 30, 2009 (3-months)*
  - **SSVEC feels strongly that this Feasibility Study is not needed as analysis of alternatives has already been done utilizing both SSVEC staff and outside consultants familiar with SSVEC's system. To commission another complete study would be time consuming, costly and redundant.**
  - **As previously stated,**

* *RFP COMPENSATION: $75,000*
  - **SSVEC has already spent $1,367,543.60 on the Sonoita project.**
  - **In addition, Purchase Orders are issued for poles and a substation transformer totaling an additional $1.1M.**

SSVEC

V-7 Feeder Analysis and Recommendations

COMPARISON of JULY 13 PRESENTATION and JULY 22 ACC SUBMITTAL

V-7 FEEDER ANALYSIS AND RECOMMENDATIONS

Notes for
Information Exchange Discussions with the

Sulphur Springs Valley Electric Cooperative's Engineering Staff

And the Sonoita/Patagonia/Elgin Team
Represented by the

Sonoita Cross-Roads Forum's Renewable Energy Committee

Bob Barnhill (President)
Gail and Steve Getzwiller, Linda Kennedy, Jeanne Horsman
Renewable Energy Committee, Sonoita Cross-Roads Forum,
a Section 501(c)3 IRS tax exempt organization

with

Marshall Magruder, Santa Cruz County Energy Commission, 2001-2008, consultant

Ron Belvel, Tucson Electric Power (TEP) and UNS Electric, Inc.

Robbie Richards, Copernicus Energy

Carolyn Shafer and CD Butsch, former Power Line Contractors, current E Santa Cruz Local Sustainability facilitator

Held at the SSVEC Office, Sierra Vista, AZ
13 July 2009

These Notes provide an overview of the present status, analysis, and recommendations to the SSVEC Engineering Staff.

Team Members include

Marshall Magruder

- BS Naval Academy; MS in Physical Oceanography, Naval PG School; MSSM, USC
- Retired Naval Officer (25 years) and Hughes Aircraft/Raytheon (17 years),
- Consultant recently with ISIS, Sierra Vista (Virtual Proving Ground, USAF IW Aggressor Squadron SBIR&D), Border Patrol SBI (Virtual Fence), USN/RN Aircraft Carriers, etc.

Bob Barnhill

- President of the Sonoita Crossroads Community Forum

Sonoita Crossroads Community Forum Renewable Energy Committee:

- Gail and Steve Getzwiller
- Linda Kennedy PhD, Director, Audubon Research Ranch with Rachel Burand (intern)
- Jeanne and Rob Horsman (unable to attend)

Tucson Electric Power (TEP) and UNS Electric, Inc.:

- Ron Belvel, Transmission and Distribution Systems Manager
- Bill Damitzel, Transmission and Distribution Systems Supervisor

Copernicus Energy, LLC:

- Robby Richards, owner

E Santa Cruz Local Sustainability

- Carolyn Shafer, Facilitator

CD Butsch, former power line contractor, Journeyman Lineman, Master Electrician
Sue Downing, Concerned Citizen Elgin, Arizona

OUTLINE OF THE DISCUSSIONS

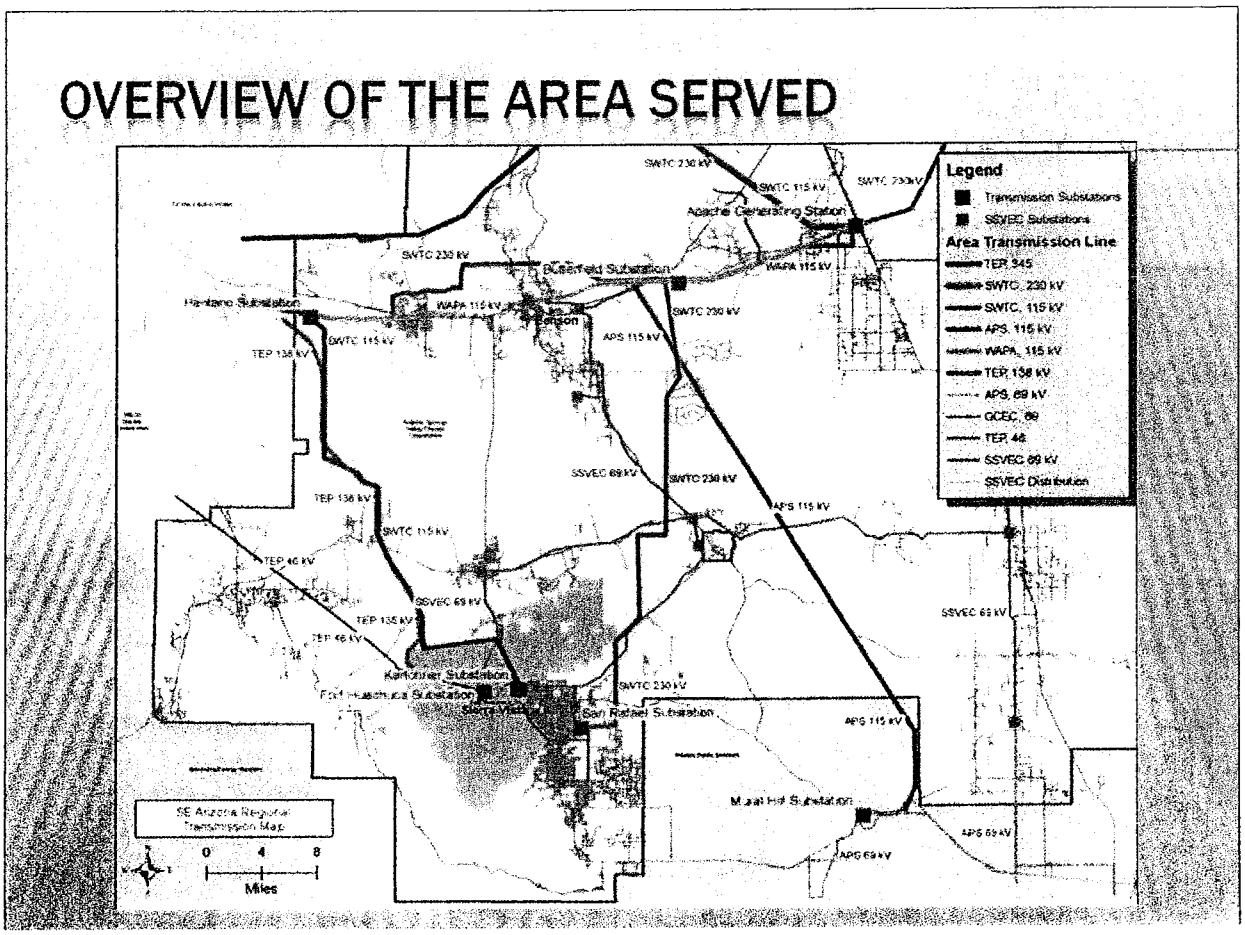
- Opening
- Overview of the V-7 Feeder Area
- Reliability Definition (NERC/WECC)
- CONNECTIVITY Status
- CAPACITY Status
- Benefits of a Substation
- How to meet N-1 Reliability Criteria
  - For CONNECTIVITY
  - For CAPACITY
- Cost of Option, what is BEST?
- Use a FEASIBILITY STUDY to Determine
- Recommendations

We will overview the V-7 Feeder and its existing status, define reliability criteria, determine existing status for connectivity and capacity, discuss the benefits of a substation, and look at options to ~~best MEET RELIABILITY CRITERIA~~ most reasonably MEET CONTINUITY OF SERIVICE and RESTORATION for CONNECTIVITY and CAPACITY.

Since several options exist and some details are not presently known, we are recommending that a FEASIBILITY STUDY conducted by a reputable, independent organization be used to determine details and provide a complete trade-study necessary for decision makers. The USDA has announced a stimulus package just for this purpose we would like to work with the company in obtaining and implementing.

We will provide recommendation to benefit all concerned to lead to the BEST solution for our communities.

We will agree with the results of such a FEASIBILITY STUDY.



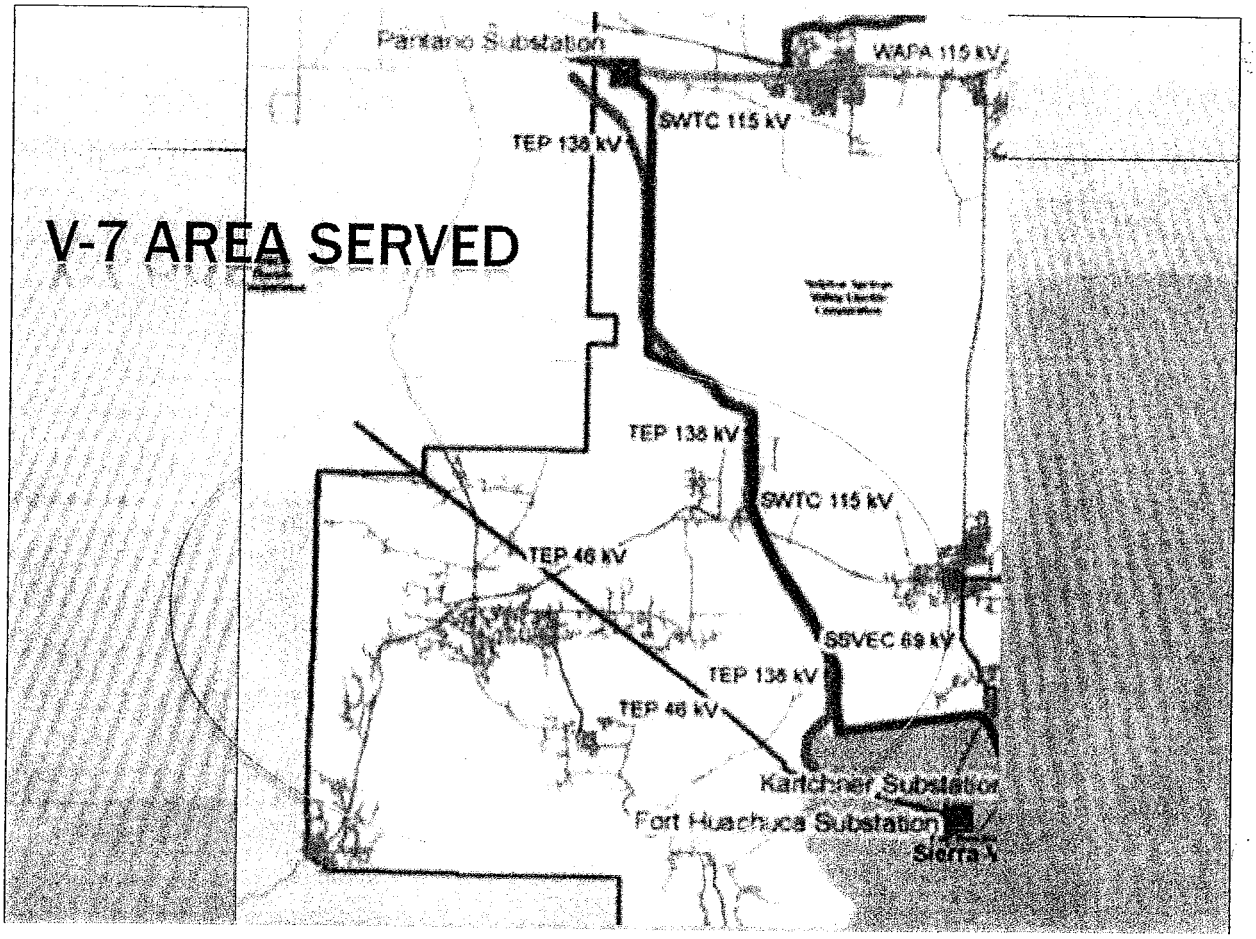
This picture is well known. Some features will be important as we continue.

First, there are several different electric utility company's services areas, with SSVEC in white. TEP has a service area in the NW corner in yellow, and UNS Electric in the SW corner in pink. Both TEP and UNS Electric, Inc. are subsidiaries of the same holding company, UniSource Energy, Inc., and, in general, use the same engineering staff personnel.

The area of interest involves the rural communities of Sonoita, Patagonia, and Elgin, that are at the "end of the line" compared to the rest of SSVEC's operational areas.

Also, the UNS Electric area in pink covers the San Rafael Valley and is just south of the Town of Patagonia. It also is at the "end of the line" with similar outages as with its neighbors in Patagonia. No ties exists between these two areas.

The next slide shows more localized details.



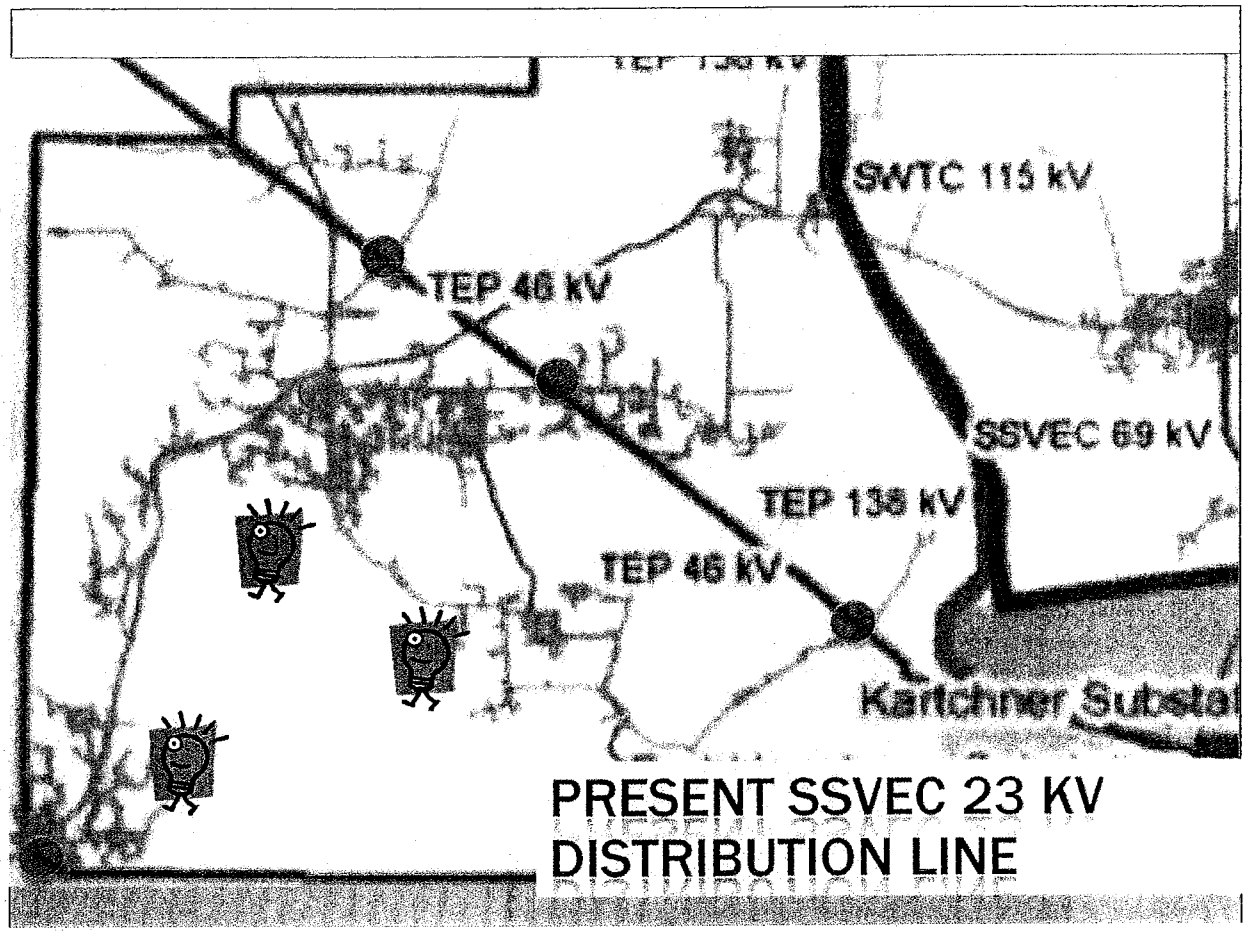
The V-7 Feeder is the single, radial 23 kV distribution line that extends west from the SSVEC substation at Mustang Corner, shown in light blue, within the oval and also includes Patagonia at the SW corner.

In general, this line goes west along SR-82 until Elgin Road, then south, then west along SR-83 through Sonoita continuing along SR-82 to Patagonia. Many additional distribution lines to Elgin and other communities form branches.

Please note that three higher voltage transmission and subtransmission lines cross the V-7 feeder, The Southwest Transmission Cooperative's 115 kV, TEP's 138 kV to Ft. Huachuca, and a TEP 46 backup line to Ft. Huachuca.

It is noted that TEP has IRS furnishing bond restrictions that permit it to only serve customers in two counties, namely Pima and Cochise Counties, thus TEP can not directly serve SSVEC customers in Santa Cruz County. UNS Electric can now can directly interconnect with SSVEC. TEP can provide service only in an emergency, such as an outage. This has implemented between the TEP Canoa substation in Pima County via a 46 kV line with 22 MW to the UNS Electric Amado Substation. This provides emergency backup service whenever primary service is interrupted.

The existing V-7 feeder has a capacity of 7 MW that will be discussed later.



This view is of the V-7 feeder service area. The Mustang Corner's 69kv to ~~23~~25 kV substation that serves this area is in the NE corner. The three crossing SWTC and TEP transmission lines are also shown.

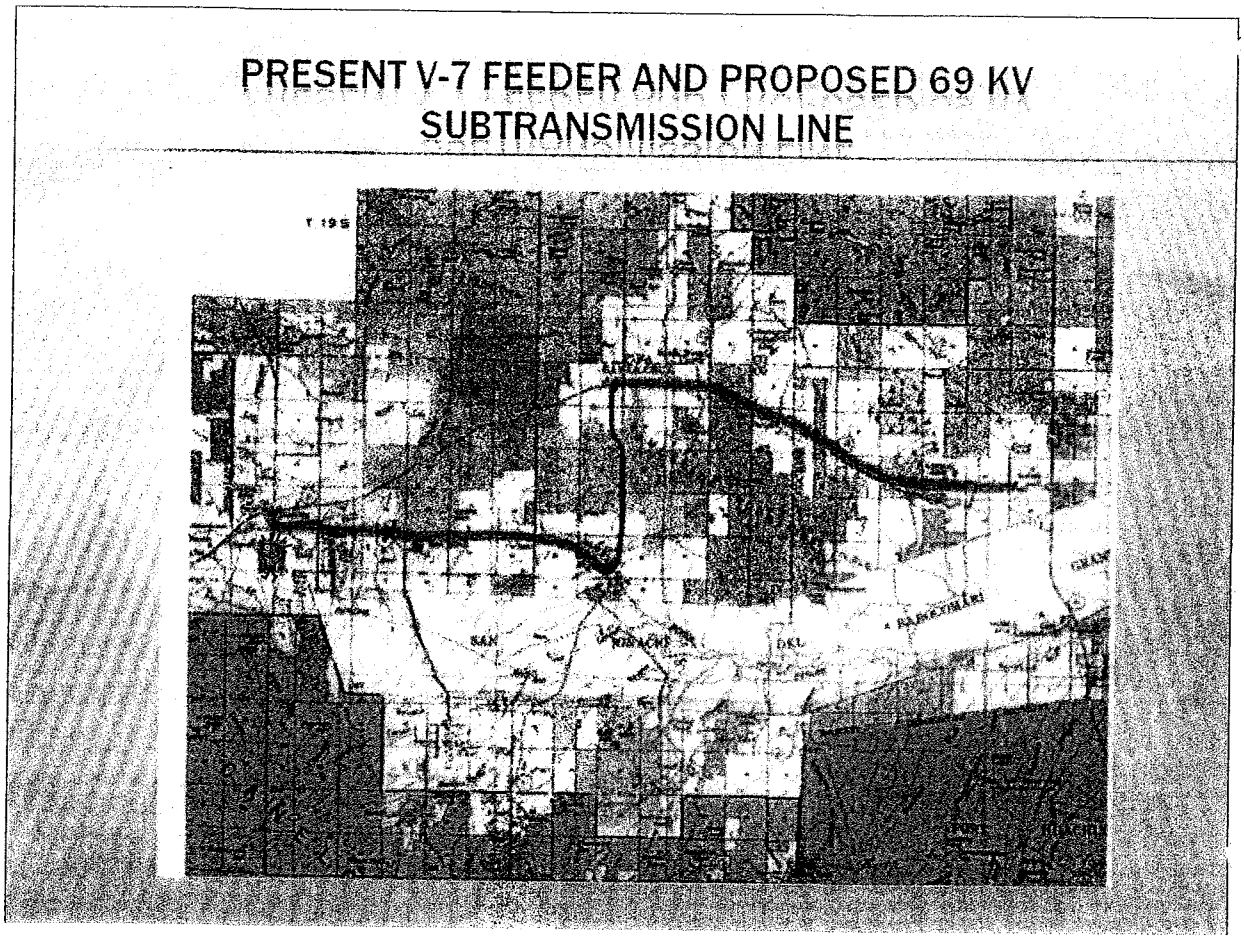
There are at least three points where the TEP 46 kV backup line to Fort Huachuca crosses the V-7 feeder. These are shown as small red circles. Only the middle red circle is a 3-phase connection, necessary for a tie with SSVEC's 25 kV. If a 46:23 kV transformer was installed, at two locations, then the V-7 feeder would always have backup power. TEP could build and maintain these transformers as SSVEC does not use 46 kV.

Further, SSVEC has proposed a substation in "downtown" Sonoita, shown in the yellow circle. This is planned to be the hub for four reliability loops (N, E, W, and S).

In the SW corner is shown a green circle shows where a possible tie to the UNS Electric might be considered. Less than 1 mile of line will be required plus a transformer plus remote disconnect switches to make islands then interconnect either Patagonia or San Rafael Valley with the other. Obviously both utilities will have to established an operational protocols and procedures, have a cross-boundary agreement and PPAs.

This is to show the physical relationships between these points.

Also, shown are prospective locations for 2 or so, small Renewable Energy "plants" with backup generation, plus another site at the Nogales International Airport (with county leased land). Robbie will discuss these and other renewable options later.



The existing 23 kV line from Mustang Corners to Sonoita is shown in Green, while the proposed 69 kV sub-transmission line is in yellow. Each will be discussed more later.

Again, the picture prospective for reference.

One distributed generation 1 to 3 MW RE plant near downtown would provide power boost to the local area. Adjacent to or in the SSVEC substation could be ideal.

RELIABILITY DEFINITION FOR TRANSMISSION LINES

(FROM WECC'S MINIMUM OPERATING RELIABILITY CRITERIA)

RELIABILITY. The combination of Security and Adequacy, as defined herein.

SECURITY. The ability of the ~~bulk~~ electric system to withstand sudden disturbances such as electric short circuits, anticipated loss of system components or switching operations.

ADEQUACY. The ability of a ~~bulk~~ electric system to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account schedule and reasonably expected unscheduled outages of system components.

In common terms, this means that **CONNECTIVITY** must be always maintained and that there must always be adequate **CAPACITY** to meet the demand.

Shown is the electricity industry's definition for RELIABILITY used by the National Electricity Reliability Corporation (NERC) and implemented for the Western Connection by the WECC, in its *Reliability Criteria* and the Arizona Corporation Commission's criteria used in its Biennial Transmission Assessments.

We are not discussing the national "bulk electric" system but a local distribution area: however, the Energy Policy Act of 2005 implemented a nationwide Electric Reliability Organization, which is also NERC. These reliability standards impact operations of all electric utilities, and will form the general basis for this presentation. The proposed 69 kV line is known as a sub-transmission line and is excluded from these helpful criteria.

It is possible for utilities to receive millions in fines when not meeting NERC criteria.

This is NOT an exhaustive nor detailed review of these standards but will use the terms CONNECTIVITY and CAPACITY as the two driving requirements for the V-7 Feeder Assessment process to determine needed and potential reliability improvements.

A FEASIBILITY STUDY should look at this in much greater detail, including flow diagrams under various contingencies. These can determine the constraints that determine the size of renewable energy systems.

ENTIRE PAGE ADDED

RELIABILITY DEFINITION FOR DISTRIBUTION LINES

(FROM THE ARIZONA ADMINISTRATIVE REGULATIONS R14-2-208C AND D)

C. CONTINUITY OF SERVICE.

Each utility shall make reasonable efforts to supply a satisfactory and continuous level of service. However, no utility shall be responsible for any damage or claim of damage attributable to any interruption or discontinuation of service resulting from:

1. Any cause against which the utility could not have reasonably foreseen or made provision for.
2. Intentional service interruptions to make repairs or perform routine maintenance.

D. SERVICE INTERRUPTIONS

1. Each utility shall make reasonable efforts to reestablish service within the shortest possible time when service interruptions occur.
2. Each utility shall make reasonable provisions to meet emergencies resulting from failure of service, and each utility shall issue instructions to its employees covering procedures to be followed in the event of emergency in order to prevent or mitigate interruption or impairment of service.
3. In the event of a national emergency or local disaster resulting in disruption of normal service, the utility may, in the public interest, interrupt service to other customers to provide necessary service to emergency service agencies on a temporary basis until normal service...can be restored.

Summary. A utility shall make reasonable efforts to supply satisfactory and continuous service and reestablish service in the shortest possible time when interruptions occur. **CONNECTIVITY** and **CAPACITY** are designed to meet demand.

Extract from the Arizona Administrative Code (A.A.R.) section R2-12-208.

C. Continuity of service.

Each utility shall make reasonable efforts to supply a satisfactory and continuous level of service. However, no utility shall be responsible for any damage or claim of damage attributable to any interruption or discontinuation of service resulting from:

1. Any cause against which the utility could not have reasonably foreseen or made provision for, that is, force majeure.
2. Intentional service interruptions to make repairs or perform routine maintenance.
3. Curtailment.

D. Service interruptions

1. Each utility shall make reasonable efforts to reestablish service within the shortest possible time when service interruptions occur.
2. Each utility shall make reasonable provisions to meet emergencies resulting from failure of service, and each utility shall issue instructions to its employees covering procedures to be followed in the event of emergency in order to prevent or mitigate interruption or impairment of service.
3. In the event of a national emergency or local disaster resulting in disruption of normal service, the utility may, in the public interest, interrupt service to other customers to provide necessary service to civil defense or other emergency service agencies on a temporary basis until normal service to these agencies can be restored.
4. When a utility plans to interrupt service for more than 4 hours to perform necessary repairs or maintenance, the utility shall attempt to inform affected customers at least 24 hours in advance of the scheduled date and estimated duration of the service interruption. Such repairs shall be completed in the shortest possible time to minimize the inconvenience to the customers of the utility.
5. The Commission, Consumer Services Section, shall be notified of interruption in service affecting the entire system or any significant portion thereof. The interruption of service and cause shall be reported by telephone to the Commission within 2 hours after the responsible representative of the utility becomes aware of said interruption and followed by a written report of the Commission.

V-7 FEEDER - PRESENT CONNECTIVITY STATUS

The ENTIRE V-7 feeder will fail ~~with the loss of ONE element~~ whenever:

- A remote generator fails to meet demand, there is no local generation or backup, or
- There is a transmission line fails prior to the eastern ~~Mustang Corners~~ Substation, or
- There is a transformer fails (69:25 kV) at the eastern ~~Mustang Corners~~ Substation

ENTIRE V-7 FEEDER FAILS

PROPOSED 69 kV LINE MAKES NO IMPROVEMENTS

Whenever there is a single pole failure on the V-7 between a customer there will always be an outage failure for that customer and ALL other customers further down the line, and up the line to a breaker that should have opened when a failure is observed.

REST OF V-7 FEEDER FAILS

PROPOSED 69 kV LINE MAKES A LITTLE IMPROVEMENT

~~PRESENT V-7 FEEDER CAN NOT MEET N-1~~

There are no specific rules for distribution line failures other than in prior slide. There are several IEEE distribution indices used for distribution lines however, SSVEC does not have them available.

Note: If a remote generator, transmission line, or transformer fails before Mustang Corners or the Huachuca City Substation, the entire existing V-7 Feeder fails for any radial line to the Sonoita substation.

NERC/WECC have four contingency categories:

A – No Contingencies – **All Facilities in service**, called N minus Zero or N-Ø
B – Event resulting is the loss of a **single element** (generator, line, circuit, transformer), called N minus One or N-1
C – Event(s) resulting in loss of 2 or more elements (N-2)
D – Extreme Event including cascading (N-3)

NERC Category A is also called N-Ø, Category B is N-1, Category C is N-2.

The ACC requires companies to meet N-1 conditions, and when performing work on an element, to also meet N-1, which is called N-1-1.

Meeting N-2 is a goal and that simulations be conducted for N-2 and N-3 to assess areas necessary to prevent these contingencies

2008 V-7 AND OTHER FEEDERS (CONNECTIVITY) OUTAGE DATA

Feeder Line	Hours Off	Number of Customers	Customer Hours OFF	Hours OFF/customer
V-7 Sonoita/Patagonia	179.98	3057	3839.91	0.06
R-3 Ramsey	64.16	1006	2988.66	0.06
K-2 Chri	239.75	1828	4299.75	0.13
O-5 Mescal	392.22	2639	4657.97	0.15
J-3 Kansas Settlement	197.05	1202	3409.05	0.16

1. Three feeder lines have higher outages than V-7, with twice the outage hours per customer.
2. Only 1 V-7 outage was due to "overload" impacting 1 customer.

Analysis prepared by Jeanne Horsmann and Gail Getzwiller, Sonoita.
Ref: SSVEC 2008 Feeder Outage Data (without November)

In 2008, there were 80 outages for total of 180 hours on the V-7 feeder. Note November data was not provided; however, 12 months of data are shown as January 2008 and 2009 were provided.

- 50 Outages (63%) impacted 1 meter (Causes: 18 unknown, 11 birds, 11 lightning, 3 animals, 3 wind, 3 other, 1 overload)
- 7 Outages (9%) impacted 2 meters (Causes: 3 lightning, 2 birds, 2 unknown, 1 Other)
- 5 Outages(6%) impacted 3 meters (Causes: 2 lighting, 1 birds, 1 tree, 1 unknown)

ONLY 3 Outages (4%) impacted a significant number of people on the main line with causes as indicated:

- 1 impacted 1,700 meters– cause "Other"
- 1 impacted 580 meters – cause wind
- 1 impacted 450 meters – cause wind

Others, 1 impacted 60 meters (cause "accident"), 1 impacted 45 meters (wind), 1 impacted 40 meters (lightning), 1 impacted 20 meters (birds), 1 impacted 12 meters (underground fault)

The causes for V-7 outages in 2008 were as follows:

Cause	No. of Outages	Hours
Overload	1	2.0
Tree	1	2.0
Underground Fault	2	10.0
Accidents	3	10.5
Animals	3	25.0
Other	5	6.5
Wind	7	21.0
Birds	15	22.3
Lightning	21	39.9
Unknown	25	42.8

WHAT IS THE V-7 GROWTH FORECASTS

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Patagonia CCD	**3,323**	**3,394**	**3,464**	**3,533**	**3,602**	**3,671**	**3,738**	**3,806**	**3,872**	**3,937**	**4,000**	**4,063**	**4,124**
Elgin CDP	441	458	475	492	509	525	542	558	574	590	605	621	636
Patagonia town	946	954	962	971	979	987	995	1,003	1,011	1,019	1,026	1,034	1,041
Sonoita CDP	1,084	1,117	1,151	1,184	1,217	1,249	1,281	1,314	1,345	1,376	1,406	1,436	1,465
Remainder of Patagonia CCD	853	864	876	887	898	909	920	931	942	952	963	973	983

Source: Arizona Department of Economic Security, Research Administration, Population Statistics Unit, 12/01/06.

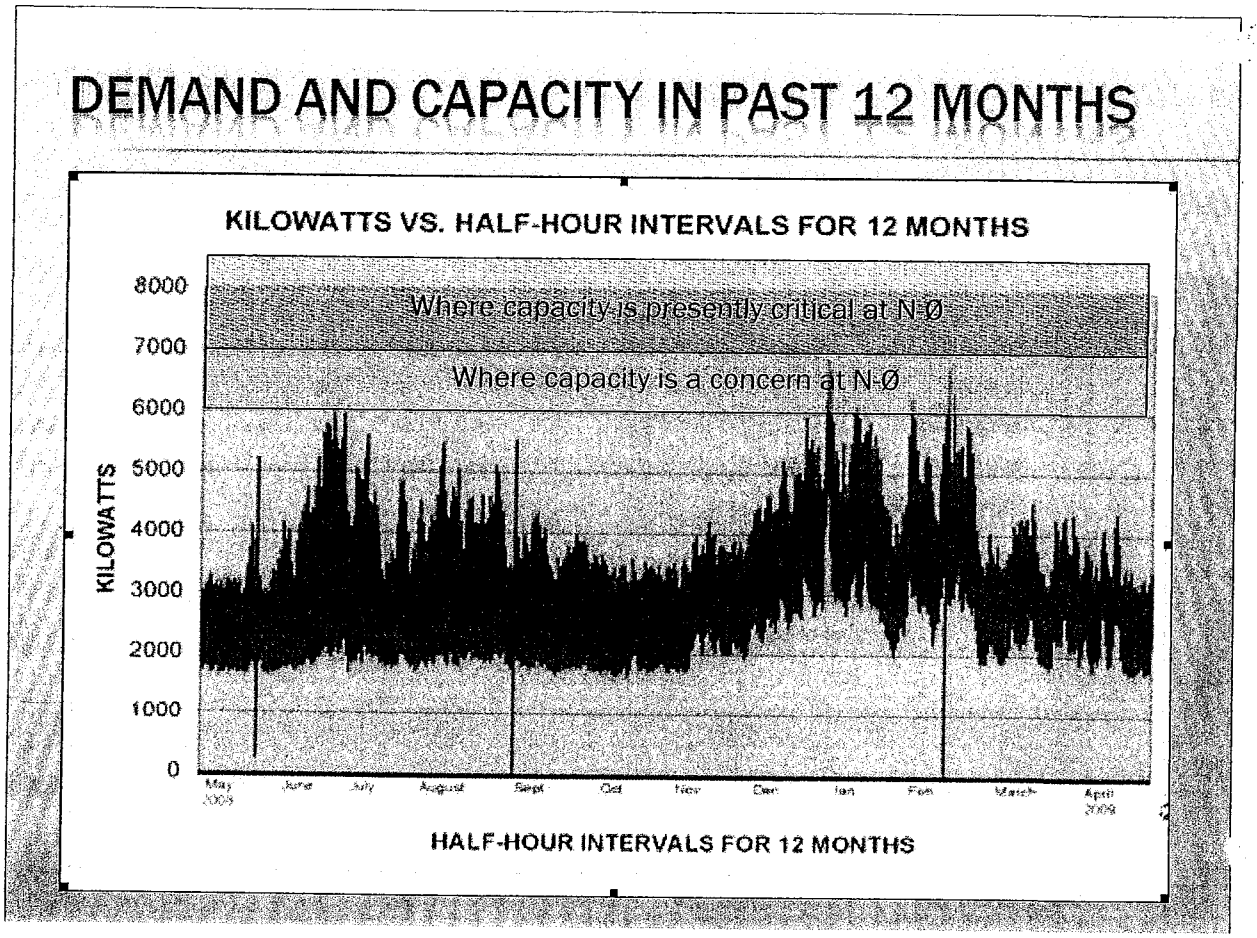
Seago / DES Population Statistics approved June 6, 2007

Even without considering the present economic decline, the future growth is slow for the entire V-7 feeder area.

When looking at the official Arizona population projections for each community in the V-7 feeder area, the existing 3325 total population last year is not expected to reach 4,000 persons until 2018. This is about 70-80 persons per year. These numbers include the "Remainder of the Patagonia CCD" which includes San Rafael Valley most of which is in the UNS Electric service area; thus these estimates are higher than the actual population.

Using the ratio used by SSVEC of 2.7 persons per household, then less than 30 homes per year are the anticipated growth for the whole area. No major industries now exist or plan to move into an area, that already has a serious shortage of water resources for its existing population.

Based on electric demand, installation of large numbers of single-home PV systems, larger 20-100 MW commercial PV systems, and two or three 1-3 MW renewable energy "plant" systems (with backup for sunless periods of time), there is NO URGENCY for the proposed 69 kV project. The numbers just are not there.

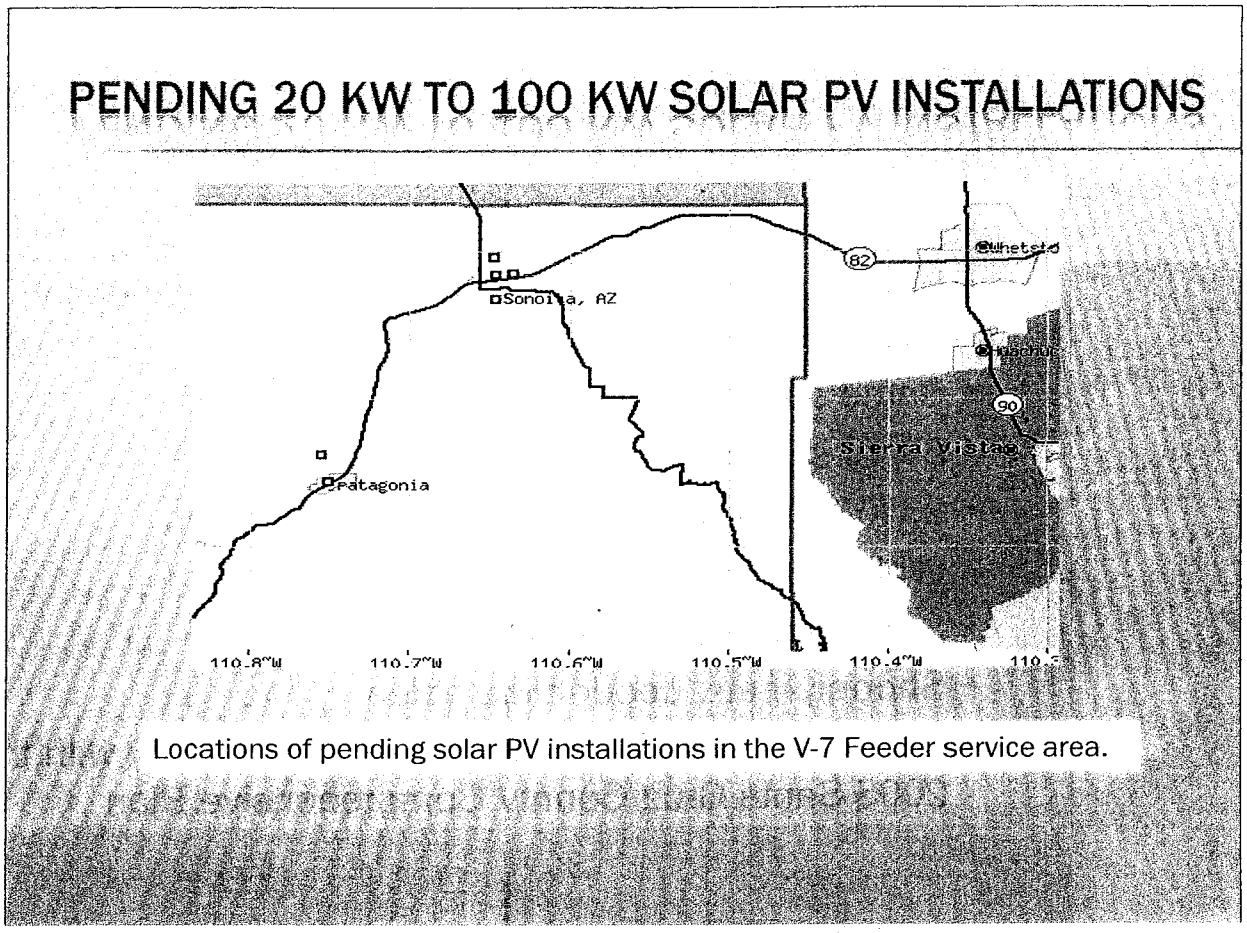


This shows the measured demand at the V-7 Feeder at Mustang Corner substation. It is obvious the existing situation needs a solution.

The V-7 Feeder 25~~23~~ kV distribution line is reported to have a 7 MW capacity which was not reached in the past 12-months.

Only on a few days in January and February, did the demand exceed 6 MW from the Mustang Corner. There are three probable service outages to this substation when generation or transmission to this point failed. During these time periods, a TEP 46 kV backup connection would have reduced the outage time for V-7 feeder customers. Without that ability or any other backup, all customers on the V-7 Feeder lost power in early September and in mid-February and a great number in early June of 2008. These three outages were NOT caused by anything in the V-7 Feeder's service area but were external "service" outages.

Since the present 25 ~~23~~kV line to Mustang Corner is not being retained, there will be NO reliability connectivity improvements by replacing the 23 kV with one of a higher capacity, as a single radial line will remain to service these customers.



Locations of pending solar PV installations in the V-7 Feeder service area.

A little over two months ago, the Cross-Roads Forum and other community organizations sponsored the Second Santa Cruz County Renewable Energy EXPO at the county fairgrounds in Sonoita. Over 350 attended, mostly from the V-7 Feeder service area. Result: High local interest in renewable energy

Eighteen solar and renewable energy vendors had booths and made presentations. As a result of the EXPO, community interest has greatly increased. Dozens appear to now be filling out applications for SSVEC solar rebates for home/business PV systems.

There are presently seven large, but local, PV arrays being planned between 20 kW and 100 kW, independent of the two or three 1-3 MW solar "plants" in the V-7 area. These are shown above.

As of this date, the Renewable Energy Committee feels that some ~~300-500 kW~~ 2MW of solar systems applications plus another 2+MW are in the works, all since the EXPO.

Robbie Richards can update us on solar progress in the V-7 feeder area.

BENEFITS OF "DOWNTOWN" SUBSTATION

- Hub for four (N, S, W, E) 25 kV distribution loops to improve reliability and for sectionizing
- Same as for either 23 kV or 69 kV sources
- 69 kV substation costs are $3 million
- 23 kV is less costly, about $1.5-$2.0 million
- Walls can be a lower, smaller transformer
- Smaller area
- Shorter, if any, feeder line poles
- New underground distribution lines to comply with the 2005 Santa Cruz County Comprehensive Plan

The communities understand the benefit of having a substation with distribution feeders that can improve reliability. These need to loop or tie so that two connectivity paths exist.

The SSVEC substation is being designed for a 14 MW capacity with five connections, four for feeder loops and one for a local renewable energy connection.

Four distribution loops have been discussed, going W (Sonoita), East (Elgin), North and South (Sonoita). At least two if not three of these could have a RE plant connected to their 25~~23~~ kV feeder line. A connection to a 1 to 3 MW RE generator will not overload these distribution lines and will add reliability due to adding reactive power and reducing costs when far from remote generations.

We understand that SSVEC is planning a 2MW Renewable Energy Plant at the Sonoita substation but have nothing to confirm this possibility.

The new voltage controllers and related substation equipment can use this locally generated power for the other three feeders. This, in fact, becomes a micro-grid, and at some future date, could be used as a SSVEC test bed for the newest "smart grid" implementations, which also should make this feeder more efficient.

A discussion concerning making V-7 a "smart grid" would provide many additional capabilities but feel these 21st century features can be added if including "smart grid" capabilities as a later upgrade in its design.

HOW TO REASONABLY MEET CAPACITY FOR CONTINUITY OF SERVICE

~~SSVEC MUST MEET CAPACTIY FOR N-1 (SINGLE ELEMENT OUTAGE)?~~

1. ~~MUST~~ CAPACITY TO MEET PEAK DEMANDS UP TO AND ABOVE 7 MW
2. ~~MUST~~ CAPACITY TO BE CONTINUOUSLY AVAILABLE (24/7)
3. ~~MUST~~ CAPACITY TO BE FOR ALL CUSTOMERS DURING AN OUTAGE

Does the proposed 69 kV meet capacity?

1. Yes, up to 14 MW, the Sonoita substation single transformer limit
2. No, if the radial 69 kV line is out ~~not the outage element.~~
3. No. If the 69 kV fails, all customers go dark, no backup lines to substation

69 kV APPROACH DOES NOT MEET ~~N-1~~ CONTINUITY OF SERVICE

Can the existing 25kV line plus ~~two~~ Renewable Energy Sources with 46kVs meet 7MW capacity demand?

1. Yes. During a ~~69~~ 25 kV outage, TEP can provide 18 MW+ several MW from RE
2. Yes. With "peaker" local generation for above 7 MW, 2 MW initially proposed
3. Yes, ~~three~~ backup interconnections are proposed ~~2~~ with TEP, ~~1~~ and with UNSE)

THIS MEETS ~~N-1~~ CONTINUITY OF SERVICE

There needs to be two ways to deliver power to the V-7 Feeder Customers. At present , the 25~~23~~ kV line is the only one.

Under the proposed 69 kV solution, the existing 23 kV line will be a "reliability loop" from the new Sonoita substation, without any connection to Mustang Corner.

This removes this tie to a SECOND power from Mustang Corner, thus leaving ONE radial 69 kV line connecting the V-7 customers. This still inhibits meeting ~~NERC N-1 Criteria~~continuity of service. If the 69 kV line goes down, the situation is the same as when the existing 25~~23~~ kV line goes down. There is NO change in reliability when this happens!!

The proposed two backup interconnections with the TEP 46 kV and one with the UNS Electric system provides for ~~three~~ two NEW sources for the V-7 Feeder customers. This will always have adequate power, especially, from the TEP 46 kV source. ~~NERC N-1reliability~~Continuity of Service criteria will be achievable wit this approach, definitely better than that with a single radial 69 kV line.

DOES SSVEC want to ~~meet N-1 Reliability Criteria~~reasonably provide Continuity of Service?

HOW TO REASONABLY MEET CONNECTIVITY FOR CONTINUITY OF SERVICE

~~HOW TO MEET CONDUCTIVITY FOR N-1 RELIABILITY CRITERIA~~

1. ~~MUST~~ SHOULD PROVIDE A ~~SECOND PATH TO A~~ DIFFERENT GENERATION SOURCE,
2. ~~MUST~~ SHOULD HAVE A SECOND INDEPENDENT TRANSMISSION PATH, and
3. ~~MUST~~ SHOULD HAVE A SECOND TRANSFORMER

Does ~~the proposed~~ 69 kV ~~provide these to meet N-1 conductivity~~ reasonably provide connectivity for continuity of service?

1. No. ONE LINE from Huachuca Substation to generation sources.
2. No. Only ONE transmission path for V-7 Feeder customers
3. No. One 69 kV transformer at Sonoita and Huachuca Substations.

Can ~~two~~ TEP 46 : 25 kV taps ~~provide these to meet N-1 conductivity~~ reasonably provide near continuous connectivity?

1. Yes.
2. Yes.
3. Yes.

NOTE: UNS ELECTRIC backup is a bonus, without a 2-county rule, with potential reliability improvements for Patagonia and San Rafael Valley.

There are several ways to reasonably meet connectivity~~solve maintaining a connection~~ when there is a single element contingency outage; however, having access to a second generation (via a transmission line) source is necessary for the V-7 Feeder area to meet Connectivity necessary for Continuity of Service~~N-1 Reliability Criteria~~.

The proposed 69 kV solution does not meet any of these for Continuity of Service~~the three N-1 Reliability Criteria~~.

An~~Two~~ interconnection with the TEP 46 kV can meet continuity of service~~all three N-1 Reliability Criteria~~. One~~Two~~ 46 kV connection provides connectivity~~s are necessary~~ in case the 23 kV outage is between the 46 kV connection and the Sonoita substation~~;~~, except when between the 46 kV connection and the substation ~~however, only one would be used~~.

HOW CAN WE KNOW WHAT'S BEST?

Options to be evaluated

1. 69 kV line with 69 kV Substation (as proposed) (connectivity ~~continuity,~~ capacity, cost)
2. One ~~Two of several~~ 46 kV taps (continuity, emergency capacity, cost)
3. One to three 1 to 3 MW RE system projects, with alternative backup (sunless hours) (continuity, capacity, cost)
4. Compare best mix of Options #2 plus #3 versus Option #1

A Feasibility analysis can provide Best Answers for all

1. To objectively evaluate all options including renewable energy and
2. To make quantitative, best value decision recommendations to this board
3. Limit to 60 days, to not delay 69 kV plan, if appropriate
4. To use an independent evaluator (organization) to consider all sides
5. To use team collaboration and open study to community participants
6. To use web-based development and collaboration processes
7. To deliver in four evolving reports covering (1) technical, (2) cost schedules information, (3) Public Relations, and (4) Short ~20-page Feasibility Study with an attached draft RFP for the recommended Option, if not the 69 kV line
8. Study Cost est. $70k or less, maybe <$50k

What are the options:

- **Construct a 69 kV that does not meet reliability criteria or**
- **Connect with 2 ~~or more~~ TEP/UNSE locations for backup (second line), use smaller Sonoita substation with feeders, with one or three renewable energy systems (with access to gas-powered electric generation), with many local private RE systems**

Resolve by conducting a FEASIBILITY STUDY

Conduct a Feasibility Analysis (Trade-Off Study) to provide the answer. Should be fast, so as not to delay 69 kV if that's the result (but really urgency isn't an issue)

See FEDERAL REGISTER announcement (29 May) for "Inviting Applications for Renewable Energy Systems and Energy Efficiency Improvements Grants and Guaranteed Loans and Renewable Energy **FEASIBILITY STUDIES GRANTS** Under the Rural Energy for American Program [Act of 2008, in Farm Bill] (handout)

AND

See Arizona Department of Commerce Energy Office, "American Recovery and Reinvestment Act of **2009 State Energy Program**" of 12 May 2009. (handout)
BOTH can provide funds to determine the best V-7 Feeder Option

WHICH OPTION IS LESS EXPENSIVE?

69 kV solution has an estimated cost is $ 13.5 M including $3 M substation
1. Does not provide reasonable continuity of service ~~meet NERC N-1 Reliability Criteria~~
2. Does not improve reliability

Proposed Renewable Energy approach
1. Saves SSVEC capital funds with private investment
2. Can qualify for various Stimulus funding to save SSVEC capital $$
3. Maybe less expensive to meet V-7 Feeder growth needs
4. May have significantly lower life-cycle ratepayer costs

Additional Benefits of Renewable Energy
1. Benefits of distributed generation (voltage stability, less line loss, etc)
2. Helps meet future ACC Renewable Energy Standard goals for SSVEC
3. Provides reasonable continuity of service with ~~Meets NERC N-1 Reliability Criteria with associated~~ improved reliability

Estimated costs for components for an alternative to the 69 kV line.

Substation	
One 25~~23~~ kV relay substation in Sonoita, present "downtown" location:	$2,250,000~~$1.5 M to $2 M~~
Reliability Loop Equipment and lines	$450,000
Peaker Plant:	
two 1.1 MW @ 375,000 = -2.2 MW Natural Generators:	$750,000
~~1 MW Natural Gas Genset (1,000 to 1900kW) Peaker Back up:~~	~~$158,000 to $335,000~~
46kV backup Interconnection:	
One~~Two~~ 46:25 kV ~~to 23 kV~~ transformers and substation (TEP ownership):	$200,000 to $300,000
One three ring breaker switch for 46 kV backup (@ TEP substation)	$800,000 to 1.2 M
UNSE Interconnnection:	
SSVEC: UNSE Transformer and associated equipment	$100,000
One mile of distribution lines (Patagonia-UNSE)	$100,000

Total cost **from** $4,650,000 to $5,150,000*
~~**$2.4 mil to $3.7M***~~

* Cost ranges is due to variable Substation costs for distribution loops, number and size of Generator sets, and three-ring breaker switch

POSSIBLE COSTS FOR RELIABILITY OPTIONS

Substation

One 25 kV relay substation in Sonoita, "downtown" location: $2,250,000

~~Sonoita Substation Cost = $ 2,550K (1.5M + 500 + 50 breakers = 2,550)~~

Reliability Loop Equipment and lines $450,000

~~Plus some line for Loops = $450K~~

Peaker Plant:

Two 1.1 MW @ 375,000 Natural Generators (2.2 MW): $750,000

~~Two 1.1 MW gensets @ $350k each = $ 700K (natural gas generators)~~

~~(2.2MW for sunless periods, when over 7MW capacity on 23 kV)~~

46 kV backup Interconnection:

46:25 kV transformer, substation (TEP owns): $300,000

~~Two: 46-23kV transformers, @ $300k = $ 600K (Sonoita TEP-SSVEC)~~

One three ring breaker switch for 46 kV backup TEP $800,000 to 1.2 M

UNSE Interconnnection:

SSVEC: UNSE Transformer and associated equipment $100,000

One mile of distribution lines (Patagonia—UNSE) $100,000

~~One: 23:13.2 kV transformer @100k = $ 100K (for San Rafael Valley-Patagonia)~~

~~1 mile of 23 kV line to connect above lines = $ 100K~~

Total $4,700,000 to $5,100,000

~~$4,500,000~~ Plus solar PV (minus stimulus = ??)

Here are some estimated costs for components being discussed, quotes from various sources

46 to 25~~23~~ kV transformer @ $300k x 2 = interconnections) includes remote switching	$300k~~600k~~ (at Sonoita TEP-SSVEC
46 kV 3-ring breaker switch	$800,000-1,200,000 (@ TEP substation)
25~~23~~ to 13.2 kV transformer @ $100k x 1 includes remote switching	$100k (at Patagonia-SRV interconnection)
25~~23~~ kV line to connect @$100k / mile	$100k (between Patagonia and SRV interconnection)
UNSE/TEP estimate	**$1,300,000 to $1,700,000 ~~800k~~**
Sonoita substation ($1.5M + $50 breakers + $500k other)	$2,250k
For reliability loops **from substation**	**$450k**
SSVEC estimate	**$2,700k**
Generation Sets (1.1 MW @350k x 2 peak)	$700k (for 2.2 MW of backup for over 7 MW at
TBD (PPA or SSVEC)	**$700k**
Total	$4,650,000 ~~$4,500,000~~

PLUS Solar MINUS Stimulus = $$

COSTS FOR SYSTEM RELIABILITY IS NOT SO BAD

Cost Summary to Reasonably Meet ~~Continuity~~ Connectivity & Capacity ~~N-~~1 ~~Requirements~~ Needs

- TWO ~~Natural Gas Gensets~~ Generation (gas, biogas, other)(2.2 MW on-call and dispatchable)
- ~~THREE~~ Emergency Backups (TEP) with 3-ring breaker
- ONE 25 ~~23~~kV Substation with Reliability Loops
- Plus On-call Tie to UNSE ~~Additional Line~~

$4,700,000 ~~$4,500,000~~

(May 27th = 3, 500, 000)

~~Two: 46 transformers, @ $300k = $ 600K~~

~~One: 23:13.2 kW transformer @100k = $ 100K for San Rafael Valley Sonoita~~

~~1 mile of 23 kV line to connect above = $ 100K for 1 mile line to connect~~

~~Two 1.1 MW gensets @$350k = $ 700K (2.2MW for sunless periods, when over (natural gas generators) 7 MW on 23 kV)~~

~~Sonoita Substation = $ 2,550K (1.5M + 500 + 50 breakers = 2,550~~

~~TOTAL = $ 4,050 plus solar PV (minus stimulus = $$)~~

~~Plus some line for PV = $450K~~

~~**Total $4,500,000 Plus solar PV (minus stimulus = $$)**~~

Summary Slide:

NOTE:

1. The generators are dispatchable and will be designed for deliver electricity as FIRM Delivery, peak and non-peak)
2. To be used when demand gets close to 7 MW, such as spinning reserves at 6.8 MW demand.

~~CONTINUITY~~ CONNECTIVITY AND CAPACITY (C&C) ~~WITH~~ PLUS RENEWABLE ENERGY

C&C $4,700,000 ~~$4,500,000~~ + 1MW Solar $5,500,000* = $10, 200,000 ~~$10,000,000~~ total cost

C&C $4,700,000 ~~4,500,000~~ + 2x1 MW Wind $2,000,000* = $6,700,000 ~~$6,500,000~~ total cost

C&C $4,700,000 ~~$4,500,000~~ + 2x1 MW BioMass $200,000** = $4,900,000 ~~$4,700,000~~ total cost

Total savings for SSVEC after adding a Renewable Energy Component

Savings could be from $3,300,000 TO $8,600,000 ~~$3,500,000 to $8,800,000~~

(*)(**) - estimates

This does NOT reflect stimulus funds or grants to reduce or eliminate the cost of the Renewable Energy Systems

~~New Slide since the SSVEC BOD Presentation May 27, 2009:~~

Conclusion: After obtaining information from another presenter, Environmental Technology Assistance Co. LLC, (ETAC) who is investigating putting in renewable generating station in the Willcox Area. And information from the SSVEC Board who reported on a 1MW BioMass Generator that was operating in their service area that only cost $98,000** to build.

Have now added the costs of installing Renewable generating stations to the CONNECTIVITY and CAPACITY (C&C) costs listed above.

Several Possibilities all saving the SSVEC millions of dollars *(from $4.5 mil to $9,804,000):*

C&C $4,700,000~~$4,500,000~~ + 1MW Solar $5,500,000* = $10,200,000~~$10,000,000~~ (1 MW RE)

C&C $4,700,000~~$4,500,000~~ + 2 x 1 MW Wind $2,000,000* = $6,700,000~~$6,500,000~~ (2 MW RE)

C&C $4,700,000~~$4,500,000~~ + 2 x 1 MW BioMass $200,000** = $4,900,000~~$4,700,000~~ (2 MW RE)

* ETAC data

** Data presented by Jack Blair at the SSVEC 27 May BOD meeting

NO Stimulus funds are included

UPGRADE 25 ~~23~~ KV FEEDER TO SONOITA (BARE BONES)

~~UPGRADE EXISTING V7 FEEDER LINE TO ELGIN/SONOITA~~

Option: Re-conductor existing line with 336 conductors
Purpose: To increase capacity of existing line from 7 MW to 20 MW

1) Upgrade can take place when SSVEC upgrades the existing poles:
   Cost : 5280 ft x 19miles = 100,320 ft x $25 / foot = $2,508,000
~~1) Re-conductor existing line with 336 conductors:~~
   ~~To increase capacity of existing line from 7 MW to 20 MW~~
   Saving compared to 69 kV (13.52.508)= $9,992,000

Add below to increase reliability
2) One ~~Two~~ 46:25kV transformers for TEP Emergency Backup = $600,000
3) One 3-way ring breaker switch for automated backup= $800,000-$1.2 M)
~~3) One 23kv Transformer in Patagonia = $100,000~~
4) Sonoita Substation plus 4 Reliability Loops = $2,700,000
~~4) One mile of 23kV line for Patagonia Connection = $100,000~~
5) SSVEC-UNSE tie including lines and equipment = $200,000

Totals (#1-#5) $6,800,000 to $7,200,000 ~~$3,308,000~~ (#1 includes labor, hot job) ~~(#2 includes labor)~~

Another plan the "Feasibility Study" could evaluate, would be bringing a 2nd line into Sonoita on the existing line to double the capacity on that line and establish a loop using the existing line.

This gives us
(1) a 7 MW line from the Sonoita substation to serve existing customers between Sonoita and Mustang Corners and
(2) A 14 MW (new line) from Mustang Corners to Sonoita as the main V-7 feeder to the new substation.
(3) Adding in the TEP 46 kV interconnections, UNSE interconnection and line, then
(4) This plan would reduce the need for a large transformer substation in Sonoita for the 69kV line to be a 23 kV hub for reliability loops as SSVEC may want a smaller substation to introduce loops into this plan.

~~Guess what.~~ This gives backups for lines, poles and transformers but not remote generation to meet the ACC Continuity of Service ~~NERC N-1~~ reliability criteria. ~~Almost, but not quite there.~~ Adding two 1.1 MW~~gensets~~ would meet the criteria for an additional $700,000+ (2.2 MW) with a 9.2 MW capacity.

Only pole conductor and replacements as a routine upgrade process should meet the NEPA Exclusion Category to replace and upgrade distribution lines on BLM lands, if required at all.

If there are problems with the NCA, we feel local support, including by former Congressman Kolbe should assist in keeping this in the Exclusion Category. We can try to arrange, if that helps.

OVERVIEW OF RFP FOR FEASIBILITY ANALYSIS

We prepared a draft RFP for SSVEC's consideration as a way to make an objective decision.

1)Collaborative: Project working papers are shared with SSVEC and Cooperators

2)Interactive: Online reports allow for SSVEC and Cooperator input

3)Four reports: Addressing multiple levels of concern; (a) technical, (b) cost and schedule, (c) Public Relations, and (d) Recommended Action (Summary Study)

4) Frequently base-lined: Data collection for all prospective alternatives

5) Action items: Clear action items for construction, funding, and implementation

TEAMWORK GETS BEST RESULTS!!

Please see our proposed RFP that is a TEAMWORK approach to putting together the BEST OPTION for the V-7 Feeder cooperators.

All of us want to work with the company to ensure we understand each other. That the BEST is best for all. The details in the proposed RFP cover, we believe, all key issues that should be summarized in a 20 or so page FEASIBILITY STUDY that will give the BOD with confidence that funds are being wisely spent in the best interest of SSVEC's customers.

Our initial funding approach, with discussions with TEP and others all recommend that we show 'feasibility' as a real option to significantly benefit both SSVEC and UNS Electric customers.

When two companies want to work together, completing "cross boundary agreements" become easy, teamwork breeds teamwork. Let's get started.

Our three Communities are motivated and eager to participate doing their part with home and business-oriented solar PV systems. Companies are eager to provide Renewable Energy on their properties, landowners are agreeable for "plant" systems (1-3 MW solar arrays), community citizens want this on their land, and with leadership and assistance from SSVEC, we see a "bright" future for our feeder area that may have been burdensome in a former years.

SSVEC could create the model for many other "end of the line" rural systems that face growing capacity issues. Our issues aren't unique but solving with modern technologies can benefit so many others in the same situation.

RECOMMENDATIONS

Today, we recommend that SSVEC Staff

1. Seriously consider all these Options
2. Work with our Committee and collaborate details necessary to better understand the renewable option(s) and how to foresee and overcome local issues.
3. Provide an RFP for a FEASIBILITY STUDY by a competent third party for the July SSVEC BOD meeting for review and approval decision. Include at least six independent, qualified Arizona organizations to receive the RFP with a 14-day turnaround, 5-day evaluation period for award NLT 20 August with completion NLT 20 October.
4. Vigorously pursue the USDA and AZ Energy Office Stimulus programs, including funding for a Feasibility Study. We can help!
5. Understand the urgency to complete and present the FEASIBILITY STUDY to the BOD prior to starting any construction of the proposed 69 kV line.
6. Provide periodic Feasibility Study Status Reports to BOD.

Our DRAFT FEASIBILITY RFP provides a consensus of our team's work to provide SSVEC with a rather comprehensive outline that should lead best practices inpreparation of a joint Report using our Committee, consultants, volunteers and a selected, third party, independent organization to work with our TEAM to review technical information, local and regional electrical information, environment, economic and energy demands necessary.

We want to work closely with and not apart or opposing SSVEC in this process. We feel the final results will benefit all of us in many ways it is hard to imagine at this time.

Please give this approach your most serious attention.

Our communities need Continuity of Service~~N-1~~ reliability, need backups and fully supports use of renewable energy to solve our continuity and capacity needs, instead of a 1982 solution.

We all Thank you!!!

SSVEC

Analysis Rebuttal

Sulphur Springs Valley Electric Cooperative, Inc.

A Touchstone Energy® Cooperative

SSVEC REBUTTAL OF 3SEG PROPOSAL

The following is a page-by-page and, in many cases, a line-by-line rebuttal of the latest submittal to the Arizona Corporation Commission by the Save the Scenic Sonoita Elgin Grasslands (3SEG) group. The format used takes each slide from the presentation and, using this font, rebuts statements made. Text presented in "*italic quotes*" is taken directly from the 3SEG presentation.

Explanation of Slide Modifications: The slides are from the July 13, 2009 3SEG/SSVEC Staff discussion. This document was submitted to the ACC on July 22, 2009 and contains modifications from the July 13 document as indicated by: UNDERLINED BLUE text added by 3SEG; ~~RED STRIKETHROUGH~~ deleted by 3SEG. EXAMPLE BELOW:

HOW TO REASONABLY MEET CAPACITY FOR CONTINUITY OF SERVICE

~~SSVEC MUST MEET CAPACTIY FOR N-1 (SINGLE ELEMENT OUTAGE)?~~

1. ~~MUST~~ CAPACITY TO MEET PEAK DEMANDS UP TO AND ABOVE 7 MW
2. ~~MUST~~ CAPACITY TO BE CONTINUOUSLY AVAILABLE (24/7)
3. ~~MUST~~ CAPACITY TO BE FOR ALL CUSTOMERS DURING AN OUTAGE

Does the proposed 69 kV meet capacity?

1. Yes, up to 14 MW, the Sonoita substation single transformer limit
2. No, if the radial 69 kV line is out ~~not the outage element~~.
3. No. If the 69 kV fails, all customers go dark, no backup lines to substation

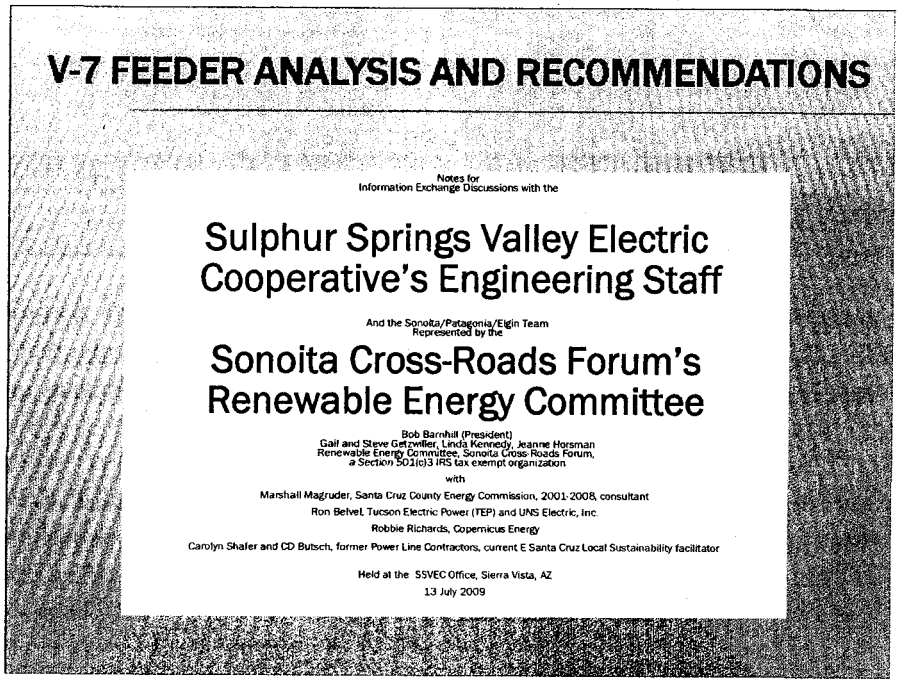
69 kV APPROACH DOES NOT MEET ~~N-1~~ CONTINUITY OF SERVICE

Can the existing 25kV line plus ~~two~~ Renewable Energy Sources with 46kVs meet 7MW capacity demand?

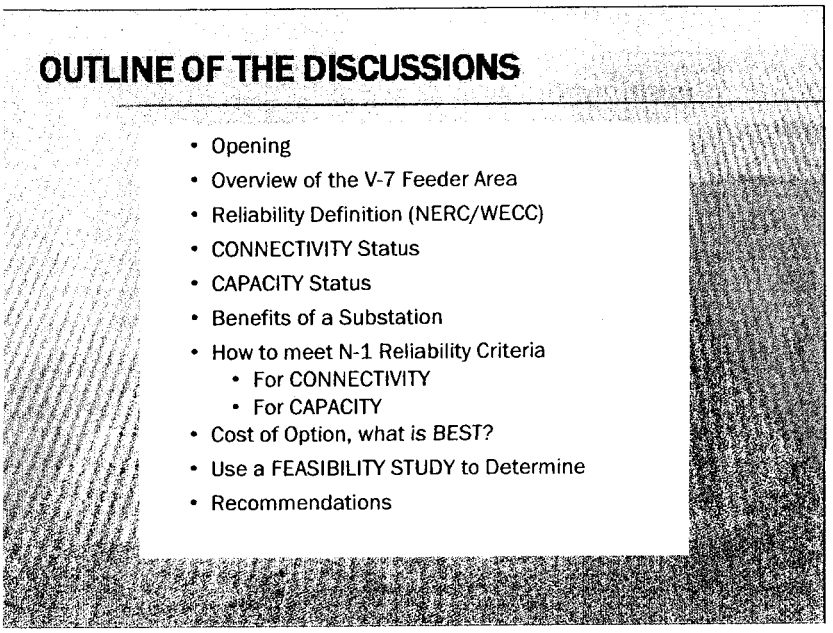
1. Yes. During a ~~69~~ 25 kV outage, TEP can provide 18 MW+ several MW from RE
2. Yes. With "peaker" local generation for above 7 MW, 2 MW initially proposed
3. Yes, ~~three~~ backup interconnections are proposed ~~2~~ with TEP, ~~1~~ and with UNSE)

THIS MEETS ~~N-1~~ CONTINUITY OF SERVICE

Page numbers coordinate with July 22, 2009 ACC Submittal by 3SEG. SSVEC response over-runs are added to page numbers by an alpha-character. Example: Page 10, to Page 10-A



- **With all due respect to those involved, no qualified Engineers are presented as collaborators on the 3SEG proposal, with the exception of Mr. Ron Belval**
- **Mr. Ron Belval of Tucson Electric Power (TEP) has stated his role is as a representative of TEP and not necessarily a supporter of the 3SEG proposal**
- **SSVEC has a staff fully capable of evaluation, design and construction of such projects – this is our business. SSVEC's staff includes:**
  - **Five registered Professional Engineers,**
  - **Two Engineers-in-Training,**
  - **A full Right of Way acquisition staff including a Senior Member of the International Right of Way Association (SR/WA) with Certifications in Right of Way Negotiation and Acquisition,**
  - **An Engineering Planning division with state-of-the-art computer modeling programs including MilSoft Windmil and PowerWorld Simulator for complex load flow analysis,**
  - **A Substation/Transmission Line Engineer with a Masters degree in Electrical Engineering,**
  - **An Engineering Manager with extensive experience in both conventional and renewable energy technologies, polices and assessments dating from 1979 to present and ranging from solar and wind system installations in Alaska to renewable energy assessments throughout Latin America and Africa,**
  - **Among other qualified personnel.**



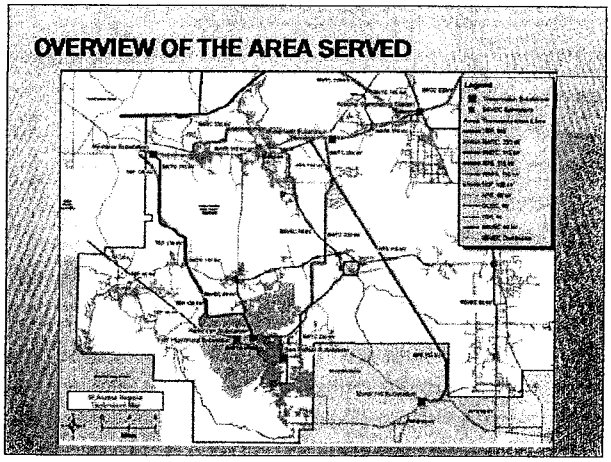
❑ *"The USDA has announced a stimulus package just for this purpose we would like to work with the company in obtaining and implementing."*

SSVEC has submitted two Stimulus-related proposals

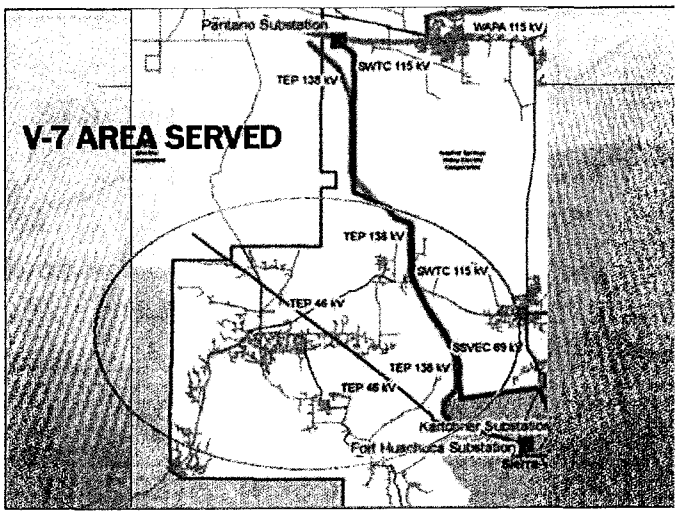
1. **To the Department Of Energy (DOE) for <u>Smart Grid</u> enhancements including:**
   - **Installation of fiber optic cable to the new Sonoita Substation**
   - **Sonoita Substation automation that will facilitate automatic operation of substation apparatuses**
   - **Automation of all feeder breakers including the dedicated renewable energy feeder**
   - **Metering to support local generation of renewable energy and possible Power Purchase Agreement (PPA) for private renewable energy development in the area**
   - **SCADA equipment to allow full remote monitoring and control of all equipment at the Sonoita Substation**
2. **United States Department of Agriculture (USDA) /Rural Utility Service (RUS) Clean Renewable Energy Bonds (CREBS) proposal**
   - **7/7/09 - Issued a Request for Proposal (RFP) to 14 companies for up to 750 kW of renewable energy at Sonoita**
   - **7/21/09 – Evaluated 10 bids for Purchase Power Agreement (PPA) and Design/Build options**
   - **8/3/09 – Submitted a $6M proposal for CREBS funding to RUS**

❑ *"We will agree with the results of such a FEASIBILITY STUDY."*

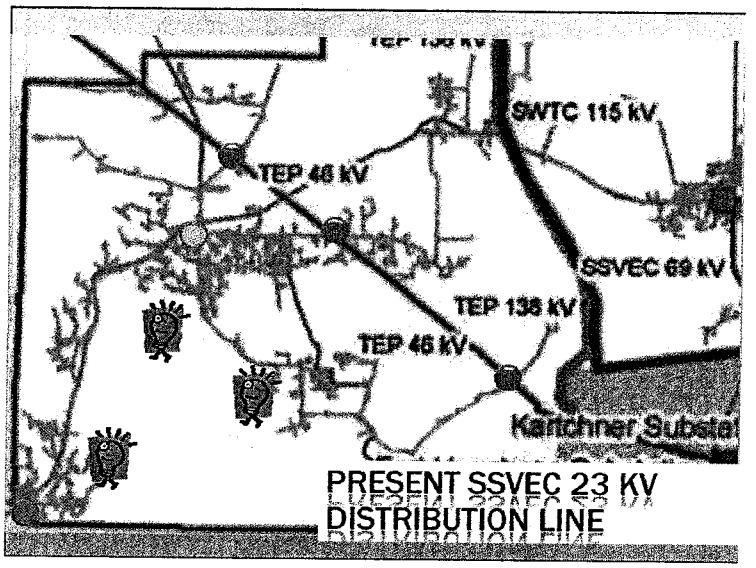
- **SSVEC addresses the issue of a Request for Proposal (RFP) for a Feasibility Study in a separate document.**



❑ **No comment from SSVEC**



- *"...TEP has IRS furnishing bond restrictions that permit it to only serve customers in two counties, namely Pima and Cochise Counties, thus TEP can not directly serve SSVEC customers in Santa Cruz County"*
  1. **This is a correct statement. TEP is currently restricted from load serving in Santa Cruz county for two reasons:**
     - **The Bond Council restriction**
     - **SSVEC has a Certificate of Convenience and Necessity to serve this area**



- *"There are at least three points where the TEP 46 kV backup line to Fort Huachuca crosses the V-7 feeder. These are shown as small red circles. Only the middle red circle is a 3-phase connection, necessary for a tie with SSVEC's 25 kV. If a 46:23 kV transformer was installed, at two locations, then the V-7 feeder would always have backup power."*
  - **Two of the suggested interconnect points are single-phase – not adequate for any significant back-up. This is recognized in the 3SEG statement above yet throughout the presentation they continue to refer to multiple interconnection points.**
  - **The statement goes on to say that if two points of interconnect are established, back-up power would be available. If one of the points is single-phase, this statement is not accurate. SSVEC is unclear in the proposed design at this point.**
  - **In 2003, SSVEC submitted a formal request to our power supplier, Arizona Electric Power Cooperative (AEPCO), for interconnection to TEP's 46kV line to serve the Sonoita area.**
    - **A formal reply from TEP stated that the 46 kV line is of limited capacity (20MW)**
    - **The line is fully committed to serving Fort Huachuca**
    - **Any service would be subject to disconnect at any time and**
    - **The 2-county rule was sited.**
    - **<u>POINT IS, SSVEC LOOKED AT THE TEP TIE OPTION BACK IN 2003!</u>**
  - **Again in 2007, SSVEC approached TEP regarding the 46 kV line. Similar response to 2003.**

- **To have any significant capacity, the 46kV line would have to be upgraded from TEP's South Loop substation - approximately 23 miles away.**
  - **At a cost of approximately $350,000 to $450,000 per mile, or about <u>$9M</u> - not including any ROW or legal expenses.**
- **Additionally, the TEP line crosses SSVEC's V7 feeder within the Las Cienegas National Conservation Area and likely would not be approved by Bureau of Land Management (BLM) or Arizona State Land (ASLD) office or the Santa Cruz County Board of Adjustment(SSC BOA).**

- ❑ *"TEP could build and maintain these transformers as SSVEC does not use 46 kV."*
  - **Hanging step-down transformers on poles with fuses for protection will not be allowed by TEP**
  - **TEP stated that a three-breaker ring bus would be required to tap the 46 kV line. Estimated cost approximately $1-1.5M**
    - **A 10 MVA 3-phase transformer costs $230K**
    - **3 voltage regulators each at $40K cost $120K**
    - **2 breakers (one for each feeder out of the new substation) at $100K**
    - **TEP would undoubtedly want breakers and controls similar to what SSVEC would need**
    - **Structural steel, insulators, switches, buswork, etc at a cost of $300K**
    - **A small control house to accommodate the relays, Supervisory Control And Data Acquisition (SCADA) and communications equipment is additional at $300,000**
    - **A reliable communications path would be required (fiber optic, radio, or microwave) (not cost estimated at this time)**
    - **Metering as required by the Arizona Corporation Commission (ACC) for utility interconnects would also be required (not cost estimated)**
    - **A minimum of 350' X 350' (approximately 3 acres) would be required at $60K/acre is approximately $170K (IF YOU CAN EVEN ACQUIRE LAND IN THIS AREA!)**

SSVEC / TEP 46kV Back-Up Interconnection	
Item	**SSVEC Estimated Cost**
Switching Station: 3 Breaker Ring Bus	**$1,500,000**
46:25kV Transformer	**230,000**
Set of 3-Voltage Regulators	**120,000**
2 – Distribution Automatic Circuit Reclosures (SCADA Controlled)	**100,000**
Substation Structure	**350,000**
Control House	**300,000**
Construction	**500,000**
Interconnect Location Substation Site	**170,000**
SSVEC Cost (does NOT include costs for TEP line upgrades)	**$3,270,000**

Details available upon request by the ACC

- *"In the SW corner is shown a green circle shows where a possible tie to the UNS Electric might be considered. Less than 1 mile of line will be required plus a transformer plus remote disconnect switches to make islands then interconnect either Patagonia or San Rafael Valley with the other. Obviously both utilities will have to established an operational protocols and procedures, have a cross-boundary agreement and PPAs".*

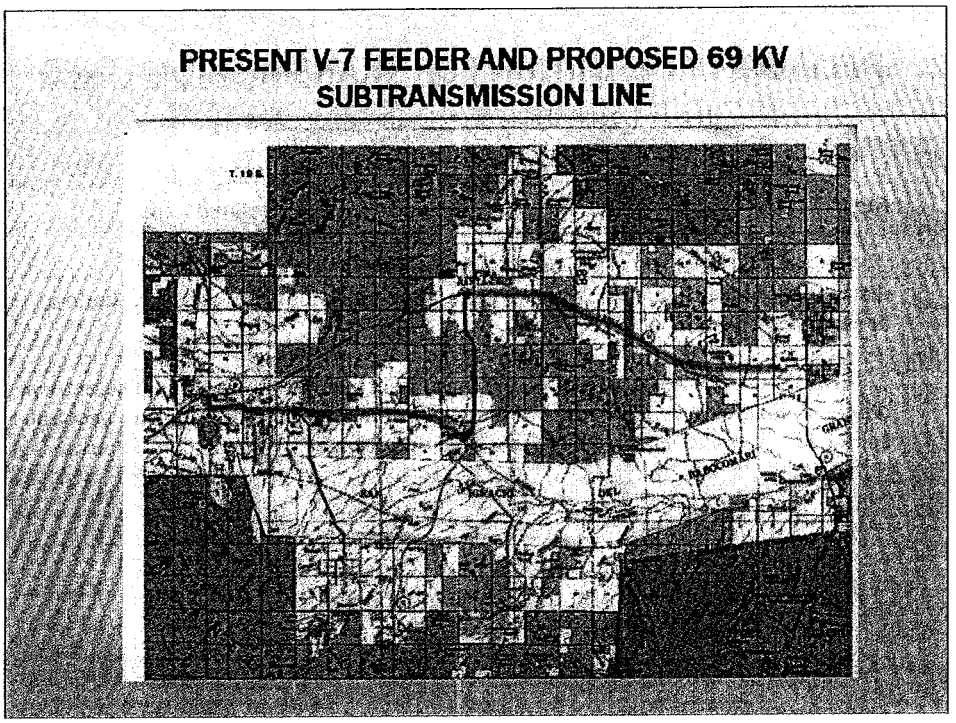
  - **The suggested interconnection offers several challenges:**
    - **UNS is 13.8kV, SSVEC is 25kV**
    - **UNS is 2-Phase, SSVEC is 3-Phase**
      - **Phase shifting equipment required**
    - **Communication for equipment cannot be maintained on SSVEC's existing radio system due to terrain issue / new system must be obtained**

  - **FOREMOST: This is SSVEC's service area as per approved ACC Certificate of Convenience and Necessity – if this tie is ANYTHING OTHER than Back-Up, then ACC must rule regarding service boundary modifications**

SSVEC / UNS Distribution Connection	
Item	**SSVEC Estimated Cost**
New 3-Phase line (1 mile at Flux Canyon)	**$ 100,000**
Step-Down Transformers	**70,000**
Set of 3-Voltage Regulators	**60,000**
3 –Automatic Circuit Reclosures (SCADA Controlled)	**150,000**
1 mile ROW for new 3-Phase line on Private Property – Transformer Site	**40,000**
SSVEC Cost (does NOT include costs for UNS facility upgrades)	**$ 420,000**

"This is to show the physical relationships between these points".

"Also, shown are prospective locations for 2 or so, small Renewable Energy "plants" with backup generation, plus another site at the Nogales International Airport (with county leased land). Robbie will discuss these and other renewable options later."



- *"One distributed generation 1MW to 3 MW RE plant near downtown would provide power boost to the local area. Adjacent to or in the SSVEC substation could be ideal."*
  - **SSVEC agrees and has pursued this suggestion**
  - **SSVEC added an additional feeder bay in the new Sonoita Substation specifically to accommodate renewable energy (RE) injection at this point**
  - **A proposal was submitted to USDA/RUS for CREBS funding for a solar facility at the new Sonoita Substation**
  - **Installation of any renewable energy at this site is, of course, subject to approval by the Santa Cruz County Board of Adjustors (SCC BOA)**

RELIABILITY DEFINITION FOR TRANSMISSION LINES

(FROM WECC'S MINIMUM OPERATING RELIABILITY CRITERIA)

RELIABILITY. The combination of Security and Adequacy, as defined herein.

SECURITY. The ability of the ~~bulk~~ electric system to withstand sudden disturbances such as electric short circuits, anticipated loss of system components or switching operations.

ADEQUACY. The ability of a ~~bulk~~ electric system to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account schedule and reasonably expected unscheduled outages of system components.

In common terms, this means that **CONNECTIVITY** must be always maintained and that there must always be adequate **CAPACITY** to meet the demand.

- *"Shown is the electricity industry's definition for RELIABILITY used by the National Electricity Reliability Corporation (NERC) and implemented for the Western Connection by the WECC, in its Reliability Criteria and the Arizona Corporation Commission's criteria used in its Biennial Transmission Assessments."*
  - **As Mr. Damitzel, Head of Planning and Technical Services of TEP clearly stated in our July 13th meeting:**
    - **North American Electric Reliability Cooperation (NERC) /Western Electricity Coordinating Council (WECC) criterion DO NOT APPLY to 69 kV lines**

- *"It is possible for utilities to receive millions in fines when not meeting NERC criteria."*
  - **SSVEC is in full compliance with all NERC requirements through either:**
    - **Direct SSVEC filings with NERC or**
    - **Through our power suppliers and transmission service providers**

**ENTIRE PAGE ADDED*

RELIABILITY DEFINITION FOR DISTRIBUTION LINES

(FROM THE ARIZONA ADMINISTRATIVE REGULATIONS R14-2-208C AND D)

C. CONTINUITY OF SERVICE.

Each utility **shall make reasonable efforts to supply a satisfactory and continuous level of service.** However, no utility shall be responsible for any damage or claim of damage attributable to any interruption or discontinuation of service resulting from:

1. Any cause against which the utility could not have reasonably foreseen or made provision for.
2. Intentional service interruptions to make repairs or perform routine maintenance.

D. SERVICE INTERRUPTIONS

1. Each utility **shall make *reasonable efforts* to reestablish service within the shortest possible time when service interruptions occur.**
2. Each utility shall make **reasonable provisions to meet emergencies** resulting from failure of service, and each utility shall issue instructions to its employees covering procedures to be followed in the event of emergency in order to prevent or mitigate interruption or impairment of service.
3. In the event of a national emergency or local disaster resulting in disruption of normal service, the utility may, in the public interest, interrupt service to other customers to provide necessary service to emergency service agencies on a temporary basis until normal service...can be restored.

Summary: A utility shall make **reasonable efforts** to supply satisfactory and continuous service and reestablish service in the shortest possible time when interruptions occur. **CONNECTIVITY** and **CAPACITY are designed to meet demand.**

- ❑ **SSVEC is fully aware of its commitment to providing safe, reliable power at the least cost consistent with good utility practice.**
- ❑ **SSVEC is aware of our obligations under Arizona Administrative Code section R2-12-208 regarding:**
  - **Continuity of service**
  - **Service Interruptions**
- ❑ **<u>THIS IS PRECISELY WHY SSVEC WOULD LIKE TO MOVE AHEAD AS QUICKLY AS POSSIBLE TO BUILD A 69 KV LINE AND ASSOCIATED SUBSTATION – TO IMPROVE THE CONTINUITY OF SERVICE IN THE AREA AND REDUCE POWER INTERRUPTIONS!</u>**

V-7 FEEDER - PRESENT CONNECTIVITY STATUS

The ENTIRE V-7 feeder will fail ~~with the loss of ONE element~~ whenever:

- A remote generator fails to meet demand, there is no local generation or backup, or
- There is a transmission line fails prior to the eastern ~~Mustang Corners~~ Substation, or
- There is a transformer fails (69:25 kV) at the eastern ~~Mustang Corners~~ Substation

ENTIRE V-7 FEEDER FAILS

PROPOSED 69 kV LINE MAKES NO IMPROVEMENTS

Whenever there is a single pole failure on the V-7 between a customer there will always be an outage failure for that customer and ALL other customers further down the line, and up the line to a breaker that should have opened when a failure is observed.

REST OF V-7 FEEDER FAILS

PROPOSED 69 kV LINE MAKES A LITTLE IMPROVEMENT

~~**PRESENT V-7 FEEDER CAN NOT MEET N-1**~~

- *"NERC/WECC have four contingency categories:"*
  - **Again, 3SEG seems to confuse NERC/WECC requirements for transmission lines (>100 kV) with sub-transmission systems (69 kV) and distribution systems (25 kV)**

2008 V-7 AND OTHER FEEDERS (CONNECTIVITY) OUTAGE DATA

Feeder Line	Hours Off	Number of Customers	Customer Hours OFF	Hours OFF/customer
V-7 Sonoita/Patagonia	179.98	3057	3839.91	0.06
R-3 Ramsey	64.16	1006	2988.66	0.06
K-2 Chrl	239.75	1828	4299.75	0.13
O-5 Mescal	392.22	2639	4657.97	0.15
J-3 Kansas Settlement	197.05	1202	3409.05	0.16

1. Three feeder lines have higher outages than V-7, with twice the outage hours per customer.
2. Only 1 V-7 outage was due to "overload" impacting 1 customer.

Analysis prepared by Jeanne Horsmann and Gail Getzwiller, Sonoita.
Ref: SSVEC 2008 Feeder Outage Data (without November)

In 2008, there were 80 outages for total of 180 hours on the V-7 feeder. Note November data was not provided; however, 12 months of data are shown as January 2008 and 2009 were provided.

- *50 Outages (63%) impacted 1 meter (Causes: 18 unknown, 11 birds, 11 lightning, 3 animals, 3 wind, 3 other, 1 overload)*
- *7 Outages (9%) impacted 2 meters (Causes: 3 lightning, 2 birds, 2 unknown, 1 Other)*
- *5 Outages(6%) impacted 3 meters (Causes: 2 lighting, 1 birds, 1 tree, 1 unknown)*

ONLY 3 Outages (4%) impacted a significant number of people on the main line with causes as indicated:

- *1 impacted 1,700 meters– cause "Other"*
- *1 impacted 580 meters – cause wind*
- *1 impacted 450 meters – cause wind*

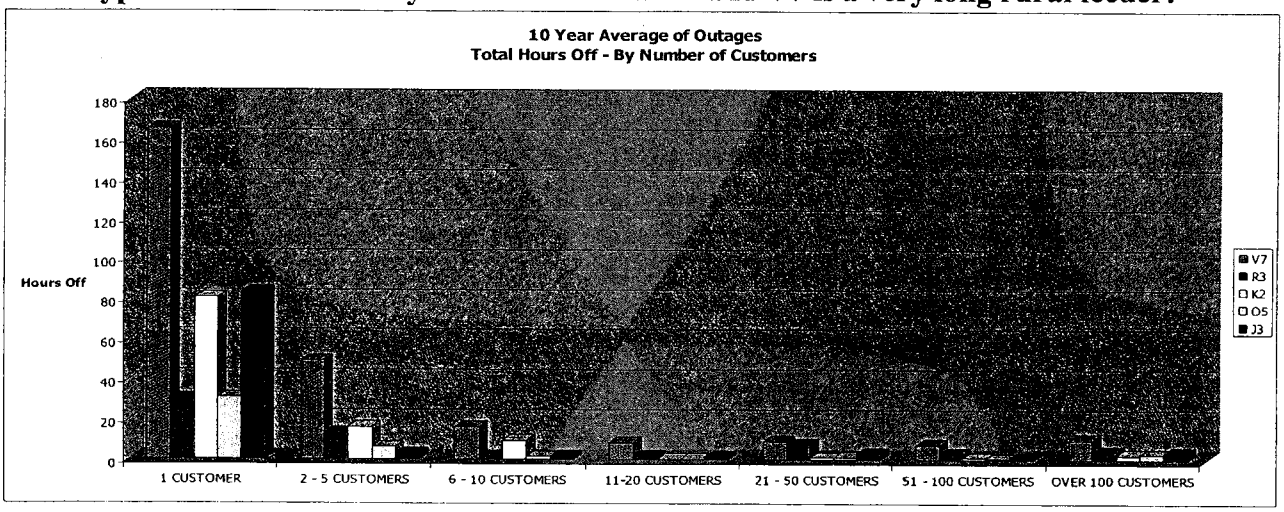
Others, 1 impacted 60 meters (cause "accident"), 1 impacted 45 meters (wind), 1 impacted 40 meters (lightning), 1 impacted 20 meters (birds), 1 impacted 12 meters (underground fault)
The causes for V-7 outages in 2008 were as follows:

Cause	*No. of Outages*	*Hours*
Overload	*1*	*2.0*
Tree	*1*	*2.0*
Underground Fault	*2*	*10.0*
Accidents	*3*	*10.5*
Animals	*3*	*25.0*
Other	*5*	*6.5*
Wind	*7*	*21.0*
Birds	*15*	*22.3*
Lightning	*21*	*39.9*
Unknown	*25*	*42.8*

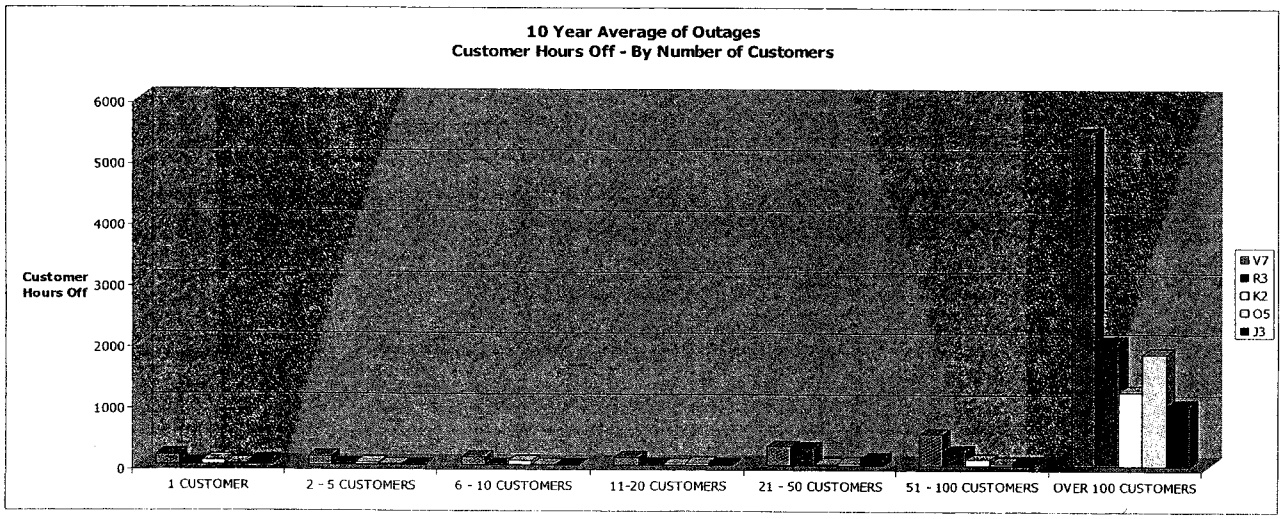
- The above data is correct for 11-months in 2008. HOWEVER, industry standards followed by SSVEC typically analyze outage data for 5 or 10-year periods in order to identify trends and statistics for problem feeders.
- The Outage Data for a 10-year period indicates the V7 Feeder is has the highest outage rate on the SSVEC System.

FEEDER	AVG Hours Out	AVG No. Customers Effected	AVG Consumer Hours Out
V7	270.7	2735.95	6883.131
R3	63.05	1134.81	2675.756
O5	43.86	2054.60	2004.006
K2	113.63	676.45	1568.918
J3	98.25	759.90	1332.726

- Outage types stated are consistent with system configuration. Majority of outages on typical rural feeder only affect one customer and V7 is a very long rural feeder:



- The area of concern is the actual number of CUSTOMER HOURS affected by the outages. Although there are over 160 HOURS OFF affecting one customer, that is diminutive compared to the number of CONSUMER HOURS affected by the HOURS OFF of >100 Customers:



WHAT IS THE V-7 GROWTH FORECASTS

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Patagonia CCD	**3,323**	**3,394**	**3,464**	**3,533**	**3,602**	**3,671**	**3,738**	**3,806**	**3,872**	**3,937**	**4,000**	**4,063**	**4,124**
Elgin CDP	441	458	475	492	509	525	542	558	574	590	605	621	636
Patagonia town	946	954	962	971	979	987	995	1,003	1,011	1,019	1,026	1,034	1,041
Sonoita CDP	1,084	1,117	1,151	1,184	1,217	1,249	1,281	1,314	1,345	1,376	1,406	1,436	1,465
Remainder of Patagonia CCD	853	864	876	887	898	909	920	931	942	952	963	973	983

Source: Arizona Department of Economic Security, Research Administration, Population Statistics Unit, 12/01/06.

Seago / DES Population Statistics approved June 6, 2007

Even without considering the present economic decline, the future growth is slow for the entire V-7 feeder area.

When looking at the official Arizona population projections for each community in the V-7 feeder area, the existing 3325 total population last year is not expected to reach 4,000 persons until 2018. This is about 70-80 persons per year. These numbers include the "Remainder of the Patagonia CCD" which includes San Rafael Valley most of which is in the UNS Electric service area; thus these estimates are higher than the actual population.

Using the ratio used by SSVEC of 2.7 persons per household, then less than 30 homes per year are the anticipated growth for the whole area. No major industries now exist or plan to move into an area, that already has a serious shortage of water resources for its existing population.

Based on electric demand, installation of large numbers of single-home PV systems, larger 20-100 MW commercial PV systems, and two or three 1-3 MW renewable energy "plant" systems (with backup for sunless periods of time), there is NO URGENCY for the proposed 69 kV project. The numbers just are not there.

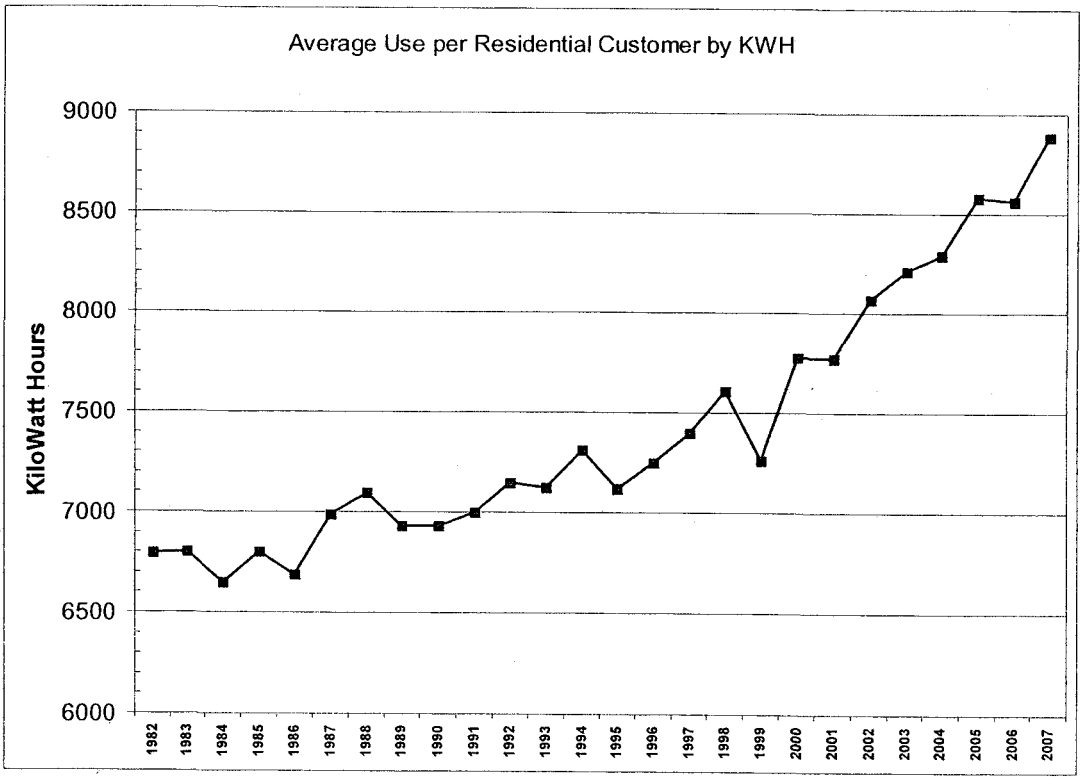
- **The growth forecast above shows an average annual percentage rate increase of approximately 1.82% for the entire Patagonia Census County Division, which does not seem significant; however this does equate to 801 people in the next twenty**

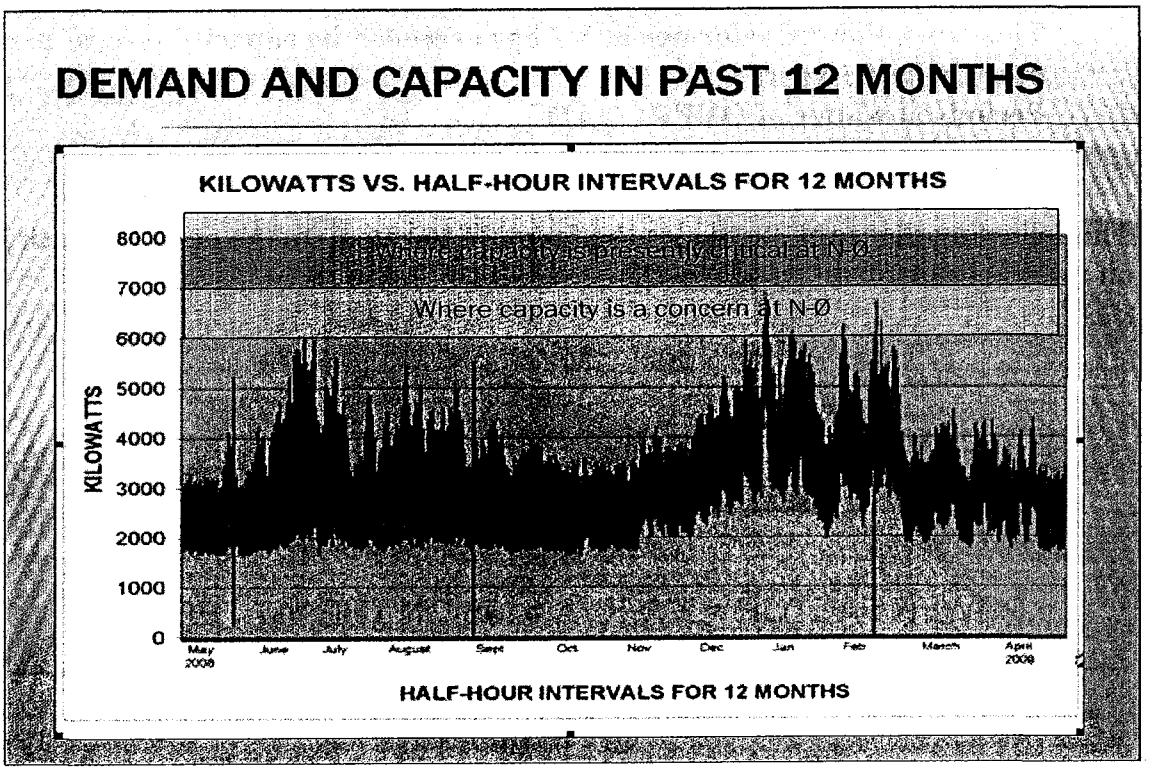
years. Using an average of 2.33 persons per household (City-Data) the following table indicates the number of homes the projected growth will likely incur:

TERM - YRS	PROJECTED POPULATION INCREASE	NUMBER OF HOMES
20	801	344
5	344	147
2	139	59

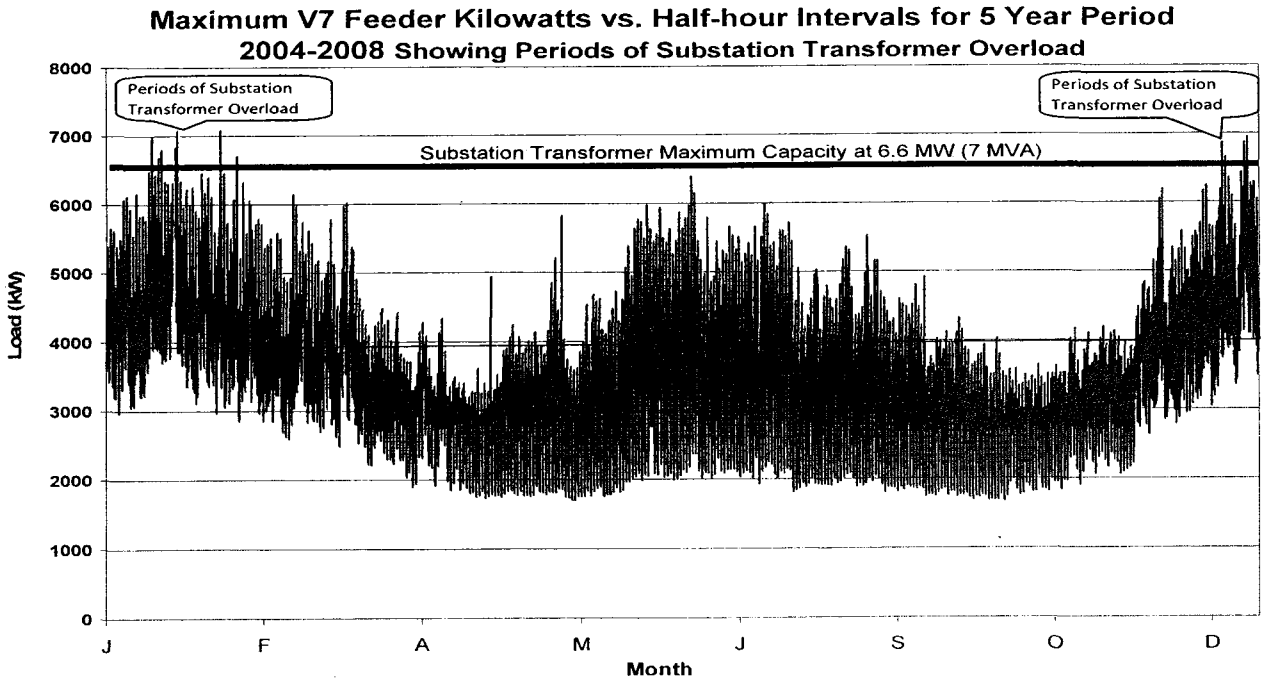
In SSVEC's analysis of the EXPRESS feeder option, the additional DEMAND LOAD upgrade would be 362kW, considering that each home uses 7KW per year, which will only allow for an additional 52 HOMES to be served. As the growth forecast above projects, this will be within the next TWO years!

Furthermore as the graph below indicates, the ACTUAL USE of electricity has also been on the rise. In 2007 the average USE per residential customer, considering a five-year period between 2003 and 2007, indicates an 8.26% increase, the same increase applied to the DEMAND LOAD would reduce the number of houses V7 is capable of serving to 47.



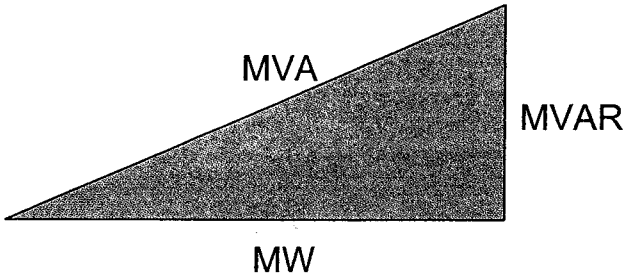


- *This shows the measured demand at the V-7 Feeder at Mustang Corner substation. It is obvious the existing situation needs a solution.*
- *The V-7 Feeder 25 kV distribution line is reported to have a 7 MW capacity which was not reached in the past 12-months.*



- **The substation transformer at V7 has exceeded its capacity several periods over the last 5-years**
- **Periods in winter of OVERLOAD**
- **Periods in summer near overload**

❑ **The following diagram illustrates the formula to calculate the actual capacity rating on the V7 Transformer:**



POWER FACTOR = KW/KVA = .98 ON THE V-7 FEEDER

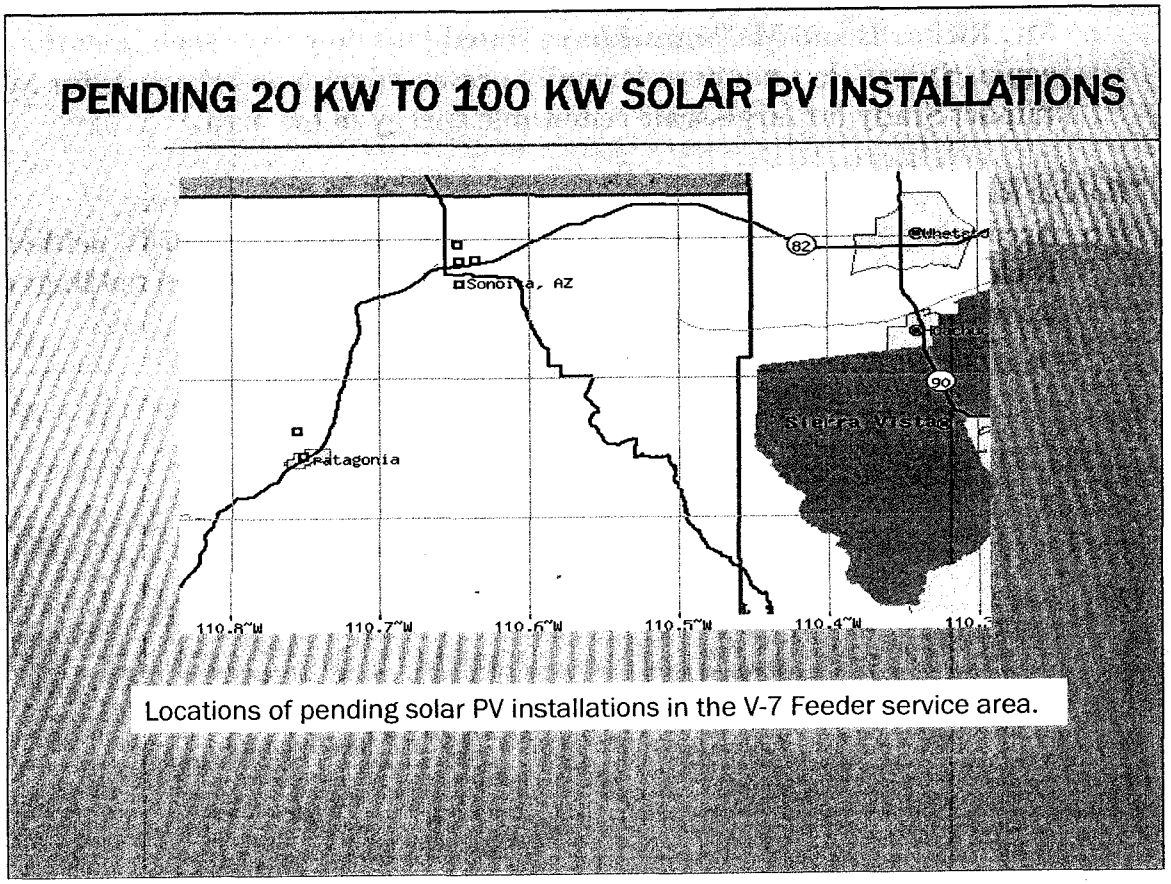
SUBSTATION TRANSFORMER CAPACITY = 7 MVA
@ .98 PF
= ONLY 6.6 MW

PEAK LOADS = 7.132 MW
@ .98 PF
= 7.5 MVA

SUBSTATION TRANSFORMER IS 7% OVERLOADED!!

❑ *Since the present 25 kV line to Mustang Corner is not being retained, there will be NO reliability connectivity improvements by replacing the 23 kV with one of a higher capacity, as a single radial line will remain to service these customers.*

- **SSVEC HAS NEVER REPRESENTED, NOR HAS ANY INTENTION, TO RETIRE THE EXISTING V-7 LINE FROM MUSTANG CORNER (HUACHUCA SUBSTATION) TO SONOITA!!**



- *"...community interest has greatly increased. Dozens appear to now be filling out applications for SSVEC solar rebates for home/business PV systems."*
  - **SSVEC applauds and supports those customers who have come forward and submitted applications to our SunWatts program.**
  - **Since the Renewable Energy Expo (which SSVEC helped sponsor) SSVEC has received only <u>four</u> applications which resulted in <u>4 kW</u> installed in the area since the Expo.**

- *"There are presently seven large, but local, PV arrays being planned between 20 kW and 100 kW, independent of the two or three 1-3 MW solar "plants" in the V-7 area. These are shown above."*
  - **SSVEC has no record of SunWatts applications for any such PV systems**
  - **SSVEC has not had a request to consider a single large PV project in the area**
  - **SSVEC welcomes developers to submit their intentions for consideration**

- *"As of this date, the Renewable Energy Committee feels that some 2MW of solar systems applications plus another 2+MW are in the works, all since the EXPO".*

- **Mr. Richards and Ms. Samsel have stated that they have such intentions but, again, SSVEC has not been formally presented with any requests for System Impact Study for large-scale renewable energy in the area.**

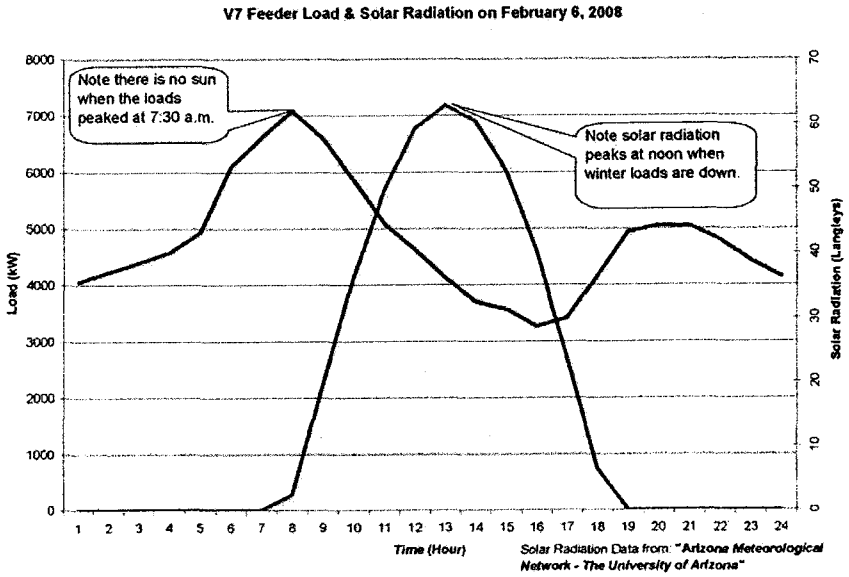
- ❑ *"Robbie Richards can update us on solar progress in the V-7 feeder area."*
  - **According to a search of Santa Cruz County Assessor's records, neither Mr. Richards nor Copernicus Energy, his company, have any and holdings or leases registered in the suggested areas.**

BENEFITS OF "DOWNTOWN" SUBSTATION

- Hub for four (N, S, W, E) 25 kV distribution loops to improve reliability and for sectionizing
- Same as for either 23 kV or 69 kV sources
- 69 kV substation costs are $3 million
- 23 kV is less costly, about $1.5-$2.0 million
- Walls can be a lower, smaller transformer
- Smaller area
- Shorter, if any, feeder line poles
- New underground distribution lines to comply with the 2005 Santa Cruz County Comprehensive Plan

- *"The communities understand the benefit of having a substation with distribution feeders that can improve reliability. These need to loop or tie so that two connectivity paths exist."*
  - **SSVEC abandoned plans to construct the substation at the Buchannan site in Sonoita Hills and purchased the new Sonoita Substation property ($335K) in a more commercial area.**
  - **The new Sonoita Substation has received a Conditional Use Permit from the Santa Cruz County Board of Adjustment.**
  - **Site plan and substation design are well underway.**
  - **The existing V7 feeder will be split in two with the Eastern portion fed from the existing Huachuca West substation and the Western portion, (roughly Elgin Rd turn-off to Sonoita) will be fed from the new Sonoita Substation.**
    - **This will provide a "feeder tie" between the new Sonoita Substation and the existing Huachuca West substation.**
    - **The capacity of this feeder tie will be limited.**

- ❑ *"The SSVEC substation is being designed for a 14 MW capacity with five connections, four for feeder loops and one for a local renewable energy connection."*
    - **No feeder 'loops' being considered. Otherwise correct**
- ❑ *"Four distribution loops have been discussed, going W (Sonoita), East (Elgin), North and South (Sonoita)."*
    - **No distribution 'loops' have been discussed. These are FEEDERS out of the substation, which may or may not have feeder 'ties'.**
- ❑ *"At least two if not three of these could have a RE plant connected to their 25 kV feeder line. A connection to a 1 to 3 MW RE generator will not overload these distribution lines and will add reliability due to adding reactive power and reducing costs when far from remote generations."*
    - **Placing large generators of any sort on a long radial line can cause technical problems such as:**
        - **Reverse current flow during periods of high generation and low power consumption. This reverse power flow can cause:**
            - **Line relays to trip**
            - **Voltage regulators to operate improperly**
            - **Line sectionalizers and automatic circuit reclosers to trip**
    - **The ideal injection point for these generators is at the new Sonoita Substation because:**
        - **Renewable power can be injected directly onto the bus, thus:**
            - **Reverse power flow issues mentioned above are eliminated**
            - **Allows renewable energy to go serve loads on any of the substation feeders – thus reducing load on the substation transformer**
            - **The renewable generation can be controlled via substation SCADA control and not require additional communication paths for automatic operation of the renewable energy (RE) system and its injection breaker**
        - **Line losses are minimized**
    - **Solar energy systems do not contribute energy during SSVEC's peak winter load period and would require energy storage.**



- *"We understand that SSVEC is planning a 2MW Renewable Energy Plant at the Sonoita substation but have nothing to confirm this possibility".*
  - **SSVEC submitted a proposal to the USDA/RUS for a large renewable energy facility at the Sonoita Substation site.**
- *"The new voltage controllers and related substation equipment can use this locally generated power for the other three feeders. This, in fact, becomes a micro-grid, and at some future date, could be used as a SSVEC test bed for the newest "smart grid" implementations, which also should make this feeder more efficient."*
  - **On August 6th, 2009 SSVEC submitted a proposal to the US Department of Energy (DOE) for <u>Smart Grid</u> enhancements including:**
    - **Installation of fiber optic cable to the new Sonoita Substation**
    - **Sonoita Substation automation that will facilitate automatic operation of substation apparatuses**
    - **Automation of all feeder breakers including the dedicated Renewable Energy feeder**
    - **Metering to support local generation of Renewable Energy**
    - **SCADA equipment to allow full remote monitoring and control**

- *"A discussion concerning making V-7 a "smart grid" would provide many additional capabilities but feel these 21st century features can be added if including "smart grid" capabilities as a later upgrade in its design."*
  - **Already completed by SSVEC staff**

HOW TO REASONABLY MEET CAPACITY FOR CONTINUITY OF SERVICE

~~SSVEC MUST MEET CAPACTIY FOR N-1 (SINGLE ELEMENT OUTAGE)?~~

1. ~~MUST~~ CAPACITY TO MEET PEAK DEMANDS UP TO AND ABOVE 7 MW
2. ~~MUST~~ CAPACITY TO BE CONTINUOUSLY AVAILABLE (24/7)
3. ~~MUST~~ CAPACITY TO BE FOR ALL CUSTOMERS DURING AN OUTAGE

Does the proposed 69 kV meet capacity?

1. Yes, up to 14 MW, the Sonoita substation single transformer limit
2. No, if the radial 69 kV line is out ~~not the outage element~~.
3. No. If the 69 kV fails, all customers go dark, no backup lines to substation

69 kV APPROACH DOES NOT MEET ~~N-1~~ CONTINUITY OF SERVICE

Can the existing 25kV line plus ~~two~~ Renewable Energy Sources with 46kVs meet 7MW capacity demand?

1. Yes. During a ~~69~~ 25 kV outage, TEP can provide 18 MW+ several MW from RE
2. Yes. With "peaker" local generation for above 7 MW, 2 MW initially proposed
3. Yes, ~~three~~ backup interconnections are proposed ~~2~~ with TEP, ~~1~~ and with UNSE)

THIS MEETS ~~N-1~~ CONTINUITY OF SERVICE

- *"There needs to be two ways to deliver power to the V-7 Feeder Customers. At present, the 25 kV line is the only one.*
- *Under the proposed 69 kV solution, the existing 23 kV line will be a "reliability loop" from the new Sonoita substation, without any connection to Mustang Corner.*
  - **How would the existing 25kV line be a "reliability loop" without a connection to MUSTANG CORNER?**
- *This removes this tie to a SECOND power from Mustang Corner, thus leaving ONE radial 69 kV line connecting the V-7 customers. This still inhibits meeting continuity of service. If the 69 kV line goes down, the situation is the same as when the existing 25 kV line goes down. There is NO change in reliability when this happens!!"*
  - **To clarify:**
    - **SSVEC HAS NEVER REPRESENTED, NOR HAS ANY INTENTION, TO RETIRE THE EXISTING V-7 LINE FROM MUSTANG CORNER (HUACHUCA SUBSTATION) TO SONOITA!!**
    - **This line will serve as a feeder line for customers in the Mustang Heights, Rain Valley, Elgin, and Sonoita East areas**
    - **There will be an open point near the Elgin turn-off on HWY 82 that will allow some load to be served off the existing Huachuca Substation and some load off the new Sonoita Substation**

- **This feeder tie will provide some back-up capability from the Huachuca West substation in the event of a failure at either the new Sonoita Substation or the 69 kV line**

- **THERE <u>WILL INDEED BE A SIGNIFICANT IMPROVEMENT</u> IN QUALITY AND RELIABILITY OF SERVICE ONCE THE 69 KV LINE AND NEW SONOITA SUBSTATION ARE BUILT**

- *"Yes. With "peaker" local generation for above 7 MW, 2 MW initially proposed"*
  - **<u>Since no viable energy storage options have been presented, this must be a FOSSIL FUELED GENERATOR AND, IF PLACED IN SONOITA, IT MUST BE DIESEL AS THERE IS NO NATURAL GAS AVAILABLE IN THE AREA.</u>**
  - **In June 2008, SSVEC commissioned a study to review the possibility of a 2MW fossil fuel generator in the Sonoita area:**
    - **Results showed:**
      - **Cost of $1M plus $700 per hour for Operations and Maintenance**
      - **80 db noise emission (exceeds SCC allowable limit)**
      - **Generator falls under EPA Tier 2 classification**
      - **A 20,000 Gallon fuel storage tank must be installed at generator site: 10'w x 33'l x 12'h**

- *"The proposed two backup interconnections with the TEP 46 kV ..."*
  - **See previous discussion that there is only one 3-phase interconnection possibility with TEP**
    - **The interconnection site is in the Las Cienegas National Conservation Area**
    - **Estimated cost of this inter-tie is $3.27M plus the upgrade extension cost**
    - **2-county IRS Bonding rule**
    - **Limited capacity on the 46 kV line**
    - **Upgrading the 46kV line from the proposed inter-tie point to the source at South Loop Substation is excessively expensive and not in SSVEC's best interest**
- *"..and one with the UNS Electric system provides for two NEW sources for the V-7 Feeder customers."*
  - **Both Unisource (UNS) and SSVEC lines in this area have very limited capacity as they are both long radial lines and the interconnection would be at the very end of each.**
  - **SSVEC completed a preliminary study on the UNS tie option and found that:**
    - **Operating voltage differs between UNS (13.8kV) and SSVEC (25kV)**
    - **The tie point will require a set of step down transformers**
    - **Voltage regulators will be required**

- **Three SCADA controlled Automatic Circuit Reclosers (ACR's) will also be required at the tie point, and at each end of the two load islands.**
  - ❑ **One located at the inter-connect point**
  - ❑ **One located at the open point on the UNS line**
  - ❑ **One located at the open point on the SSVEC line**

- **In addition, the UNS and SSVEC lines are approximately one mile apart, which will require a line upgrade for the UNS 2-phase, and a 3-phase line extension to a common inter-tie point at the boundary of the two service territories.**

SSVEC / UNS Distribution Connection	
Item	**SSVEC Estimated Cost**
New 3-Phase line (1 mile at Flux Canyon)	**$ 100,000**
Step-Down Transformers	**70,000**
Set of 3-Voltage Regulators	**60,000**
3 –Automatic Circuit Reclosures (SCADA Controlled)	**150,000**
1 mile ROW for new 3-Phase line on Private Property – Transformer Site	**40,000**
SSVEC Cost (does NOT include costs for UNS facility upgrades)	**$ 420,000**

❑ *"This will always have adequate power, especially, from the TEP 46 kV source."*
- **Not accurate**
- **TEP has stated they have limited capacity on the 46kV line, and can only be used for EMERGENCY BACK-UP**
- **UNS has limited capacity on their distribution line in Flux Canyon, and is not eligible for LOAD SERVING under SSVEC's CCN.**

❑ *" Continuity of Service criteria will be achievable wit this approach, definitely better than that with a single radial 69 kV line."*
- **False**
- **SSVEC's proposal for a new 69 kV line and associated substation, along with our plan to keep the 25kV distribution line between Huachuca West substation and Sonoita, will provide the best quality and service reliability that SSVEC can offer to this area that has suffered so long with less-than-standard power delivery.**

❑ *"DOES SSVEC want to reasonably provide Continuity of Service?"*
- **Of course SSVEC wants to provide the best electric service possible to the area.**
- **SSVEC studies clearly show that the best way to accomplish this is to build a new a new 69 kV line and associated new substation in Sonoita**

HOW TO REASONABLY MEET CONNECTIVITY FOR CONTINUITY OF SERVICE

~~HOW TO MEET CONDUCTIVITY FOR N-1 RELIABILITY CRITERIA~~

1. ~~MUST~~ SHOULD PROVIDE A ~~SECOND PATH TO A~~ DIFFERENT GENERATION SOURCE,
2. ~~MUST~~ SHOULD HAVE A SECOND INDEPENDENT TRANSMISSION PATH, and
3. ~~MUST~~ SHOULD HAVE A SECOND TRANSFORMER

Does ~~the proposed~~ 69 kV ~~provide these to meet N-1 conductivity~~ reasonably provide connectivity for continuity of service?

1. No. ONE LINE from Huachuca Substation to generation sources.
2. No. Only ONE transmission path for V-7 Feeder customers
3. No. One 69 kV transformer at Sonoita and Huachuca Substations.

Can ~~two~~ TEP 46 : 25 kV taps ~~provide these to meet N-1 conductivity~~ reasonably provide near continuous connectivity?

1. Yes.
2. Yes.
3. Yes.

NOTE: UNS ELECTRIC backup is a bonus, without a 2-county rule, with potential reliability improvements for Patagonia and San Rafael Valley.

- *"There are several ways to reasonably meet connectivity when there is a single element contingency outage; however, having access to a second generation (via a transmission line) source is necessary for the V-7 Feeder area to meet Connectivity necessary for Continuity of Service."*
  - **There WILL BE back-up capability to the Sonoita area via the existing V7 feeder tie from Huachuca West substation (though it may not be able to serve the entire load if the outage were to occur during a system peak).**
- *"The proposed 69 kV solution does not meet any of these for Continuity of Service."*
  - **In the event of an outage on the 69 kV line or the Sonoita Substation, the V7 feeder tie will be utilized to provide back-up capability until the outage is corrected**
- *"An interconnection with the TEP 46 kV can meet continuity of service. One 46 kV connection provides connectivity in case the 23 kV outage is between the 46 kV connection and the Sonoita substation, except when between the 46 kV connection and the substation."*
  - **TEP has clearly stated that any service off the 46 kV line is subject to interruption as Fort Huachuca has priority on the limited capacity of the line**

HOW CAN WE KNOW WHAT'S BEST?

Options to be evaluated

1. 69 kV line with 69 kV Substation (as proposed) (connectivity ~~continuity,~~ capacity, cost)
2. One ~~Two of several~~ 46 kV taps (continuity, emergency capacity, cost)
3. One to three 1 to 3 MW RE system projects, with alternative backup (sunless hours) (continuity, capacity, cost)
4. Compare best mix of Options #2 plus #3 versus Option #1

A Feasibility analysis can provide Best Answers for all

1. To objectively evaluate all options including renewable energy and
2. To make quantitative, best value decision recommendations to this board
3. Limit to 60 days, to not delay 69 kV plan, if appropriate
4. To use an independent evaluator (organization) to consider all sides
5. To use team collaboration and open study to community participants
6. To use web-based development and collaboration processes
7. To deliver in four evolving reports covering (1) technical, (2) cost schedules information, (3) Public Relations, and (4) Short ~20-page Feasibility Study with an attached draft RFP for the recommended Option, if not the 69 kV line
8. Study Cost est. $70k or less, maybe <$50k

- *FEASIBILITY STUDY*
  - **SSVEC has prepared a separate rebuttal to the proposed RFP for a Feasibility Study**

WHICH OPTION IS LESS EXPENSIVE?

69 kV solution has an estimated cost is $ 13.5 M including $3 M substation

1. Does not provide reasonable continuity of service ~~meet NERC N-1 Reliability Criteria~~
2. Does not improve reliability

Proposed Renewable Energy approach

1. Saves SSVEC capital funds with private investment
2. Can qualify for various Stimulus funding to save SSVEC capital $$
3. Maybe less expensive to meet V-7 Feeder growth needs
4. May have significantly lower life-cycle ratepayer costs

Additional Benefits of Renewable Energy

1. Benefits of distributed generation (voltage stability, less line loss, etc)
2. Helps meet future ACC Renewable Energy Standard goals for SSVEC
3. Provides reasonable continuity of service with ~~Meets NERC N-1 Reliability Criteria with associated~~ improved reliability

Estimated costs for components for an alternative to the 69 kV line.

Item	*3SEG Estimated Cost*	**SSVEC Estimated Cost**
Substation "downtown" location	*$2,250,000*	**$2,700,000**
Loop Equipment & Lines	*$450,000*	**N/A**
2.2 MW Natural Generators	*$750,000*	**1,000,000 + $750 hr O/M**
46kV Backup Interconnection		**$3,270,000**
▪ *46kV/25kV Transformer (TEP)*	*$200,000*	
▪ *Three ring Breaker Switch (TEP Substation)*	*$800,000 to $1,200,000*	
UNSE Interconnection:		**$420,000**
▪ *SSVEC/UNSE Transformer & Equipment*	*$100,000*	
▪ *1 Mile of Distribution Line*	*$100,000*	
Total	*$4,650,000 to $5,150,000*	**$7,390,000**
DIFFERENCE	**$2,740,000 - 2,240,000**	

SSVEC / TEP 46kV Back-Up Interconnection	
Item	**SSVEC Estimated Cost**
Interconnect Location Substation Site	**$ 170,000**
46:25kV Transformers	**230,000**
Set of 3-Voltage Regulators	**120,000**
2 – Distribution Automatic Circuit Reclosures (SCADA Controlled)	**100,000**
Substation Structure	**350,000**
Control House	**300,000**
Construction	**500,000**
Switching Station: 3 Breaker Ring Bus	**1,500,000**
SSVEC Cost (does NOT include costs for TEP line upgrades)	**$3,270,000**

SSVEC / UNS Distribution Connection	
Item	**SSVEC Estimated Cost**
New 3-Phase line (1 mile at Flux Canyon)	**$ 100,000**
Step-Down Transformers	**70,000**
Set of 3-Voltage Regulators	**60,000**
3 –Automatic Circuit Reclosures (SCADA Controlled)	**150,000**
1 mile ROW for new 3-Phase line on Private Property – Transformer Site	**40,000**
SSVEC Cost (does NOT include costs for UNS facility upgrades)	**$ 420,000**

POSSIBLE COSTS FOR RELIABILITY OPTIONS

Substation

One 25 kV relay substation in Sonoita, "downtown" location: $2,250,000

~~Sonoita Substation Cost = $ 2,550K (1.5M + 500 + 50 breakers = 2,550)~~

Reliability Loop Equipment and lines $450,000

~~Plus some line for Loops = $450K~~

Peaker Plant:

Two 1.1 MW @ 375,000 Natural Generators (2.2 MW): $750,000

~~Two 1.1 MW gensets @ $350k each = $ 700K (natural gas generators)~~

~~(2.2MW for sunless periods, when over 7MW capacity on 23 kV)~~

46 kV backup Interconnection:

46:25 kV transformer, substation (TEP owns): $300,000

~~Two: 46-23kV transformers, @ $300k = $ 600K (Sonoita TEP-SSVEC)~~

One three ring breaker switch for 46 kV backup TEP $800,000 to 1.2 M

UNSE Interconnnection:

SSVEC: UNSE Transformer and associated equipment $100,000

One mile of distribution lines (Patagonia—UNSE) $100,000

~~One: 23.13.2 kV transformer @100k = $ 100K (for San Rafael Valley-Patagonia)~~

~~1 mile of 23 kV line to connect above lines = $ 100K~~

Total $4,700,000 to $5,100,000

~~$4,500,000~~ Plus solar PV (minus stimulus = ??)

Item	*3SEG Estimated Cost*	**SSVEC Estimated Cost**
Substation "downtown" location	*$2,250,000*	**$2,700,000**
Loop Equipment & Lines	*$450,000*	**N/A**
2.2 MW Natural Generators	*$750,000*	**1,000,000 + $750 hr O/M**
46kV Backup Interconnection		**$3,270,000**
▪ *46kV/25kV Transformer (TEP)*	*$200,000*	
▪ *Three ring Breaker Switch (TEP Substation)*	*$800,000 to $1,200,000*	
UNSE Interconnection:		**$420,000**
▪ *SSVEC/UNSE Transformer & Equipment*	*$100,000*	
▪ *1 Mile of Distribution Line*	*$100,000*	
Total	*$4,650,000 to $5,150,000*	**$7,390,000**
DIFFERENCE	**$2,740,000 - 2,240,000**	

SSVEC / TEP 46kV Back-Up Interconnection	
Item	**SSVEC Estimated Cost**
Interconnect Location Substation Site	**$ 170,000**

46:25kV Transformers	230,000
Set of 3-Voltage Regulators	120,000
2 – Distribution Automatic Circuit Reclosures (SCADA Controlled)	100,000
Substation Structure	350,000
Control House	300,000
Construction	500,000
Switching Station: 3 Breaker Ring Bus	1,500,000
SSVEC Cost (does NOT include costs for TEP line upgrades)	$3,270,000

SSVEC / UNS Distribution Connection	
Item	SSVEC Estimated Cost
New 3-Phase line (1 mile at Flux Canyon)	$ 100,000
Step-Down Transformers	70,000
Set of 3-Voltage Regulators	60,000
3 –Automatic Circuit Reclosures (SCADA Controlled)	150,000
1 mile ROW for new 3-Phase line on Private Property – Transformer Site	40,000
SSVEC Cost (does NOT include costs for UNS facility upgrades)	$ 420,000

COSTS FOR SYSTEM RELIABILITY IS NOT SO BAD

Cost Summary to Reasonably Meet ~~Continuity~~ Connectivity & Capacity ~~N-1~~ ~~Requirements~~ Needs

- TWO ~~Natural Gas Gensets~~ Generation (gas, biogas, other)(2.2 MW on-call and dispatchable)
- ~~THREE~~ Emergency Backups (TEP) with 3-ring breaker
- ONE 25 23kV Substation with Reliability Loops
- Plus On-call Tie to UNSE ~~Additional Line~~

$4,700,000 ~~$4,500,000~~

(May 27th = 3, 500, 000)

- *Summary Slide:*
- *NOTE: The generators are dispatchable and will be designed for deliver electricity as FIRM Delivery, peak and non-peak)*
- *To be used when demand gets close to 7 MW, such as spinning reserves at 6.8 MW demand.*

Item	*3SEG Estimated Cost*	**SSVEC Estimated Cost**
Substation "downtown" location	*$2,250,000*	**$2,700,000**
Loop Equipment & Lines	*$450,000*	**N/A**
2.2 MW Natural Generators	*$750,000*	**1,000,000 + $750 hr O/M**
46kV Backup Interconnection		**$3,270,000**
▪ *46kV/25kV Transformer (TEP)*	*$200,000*	
▪ *Three ring Breaker Switch (TEP Substation)*	*$800,000 to $1,200,000*	
UNSE Interconnection:		**$420,000**
▪ *SSVEC/UNSE Transformer & Equipment*	*$100,000*	
▪ *1 Mile of Distribution Line*	*$100,000*	
Total	*$4,650,000 to $5,150,000*	**$7,390,000**

~~CONTINUITY~~ CONNECTIVITY AND CAPACITY (C&C) ~~WITH~~ PLUS RENEWABLE ENERGY

C&C $4,700,000 ~~$4,500,000~~ + 1MW Solar $5,500,000* = $10, 200,000 ~~$10,000,000~~ total cost

C&C $4,700,000 ~~4,500,000~~ + 2x1 MW Wind $2,000,000* = $6,700,000 ~~$6,500,000~~ total cost

C&C $4,700,000 ~~$4,500,000~~ + 2x1 MW BioMass $200,000** = $4,900,000 ~~$4,700,000~~ total cost

Total savings for SSVEC after adding a Renewable Energy Component

Savings could be from $3,300,000 TO $8,600,000 ~~$3,500,000 to $8,800,000~~

(*)(**) - estimates

This does NOT reflect stimulus funds or grants to reduce or eliminate the cost of the Renewable Energy Systems

- *Conclusion: After obtaining information from another presenter, Environmental Technology Assistance Co. LLC, (ETAC) who is investigating putting in renewable generating station in the Willcox Area. And information from the SSVEC Board who reported on a 1MW BioMass Generator that was operating in their service area that only cost $98,000** to build.*
- *Have now added the costs of installing Renewable generating stations to the CONNECTIVITY and CAPACITY (C&C) costs listed above.*
- *Several Possibilities all saving the SSVEC millions of dollars (from $4.5 mil to $9,804,000):*
- *C&C $4,700,000 + 1MW Solar $5,500,000* = $10,200,000 (1 MW RE)*
- *C&C $4,700,000 + 2 x 1 MW Wind $2,000,000* = $6,700,000 (2 MW RE)*
- *C&C $4,700,000 + 2 x 1 MW BioMass $200,000** = $4,900,000 (2 MW RE)*
  - *ETAC data*
- *** Data presented by Jack Blair at the SSVEC 27 May BOD meeting*
- *NO Stimulus funds are included*

UPGRADE 25 ~~23~~ KV FEEDER TO SONOITA (BARE BONES)

~~UPGRADE EXISTING V7 FEEDER LINE TO ELGIN/SONOITA~~

Option: Re-conductor existing line with 336 conductors
Purpose: To increase capacity of existing line from 7 MW to 20 MW

1) Upgrade can take place when SSVEC upgrades the existing poles:
   Cost : 5280 ft x 19miles = 100,320 ft x $25 / foot = $2,508,000
~~1) Re-conductor existing line with 336 conductors:~~
   ~~To increase capacity of existing line from 7 MW to 20 MW~~
   Saving compared to 69 kV (13.52.508)= $9,992,000

Add below to increase reliability
2) One ~~Two~~ 46:25kV transformers for TEP Emergency Backup = $600,000
3) One 3-way ring breaker switch for automated backup= $800,000-$1.2 M)
~~3) One 23kv Transformer in Patagonia = $100,000~~
4) Sonoita Substation plus 4 Reliability Loops = $2,700,000
~~4) One mile of 23kV line for Patagonia Connection = $100,000~~
5) SSVEC-UNSE tie including lines and equipment = $200,000

Totals (#1-#5) $6,800,000 to $7,200,000 ~~$3,308,000~~ (#1 includes labor, hot job) ~~(#2 includes labor)~~

- *Another plan the "Feasibility Study" could evaluate, would be bringing a 2nd line into Sonoita on the existing line to double the capacity on that line and establish a loop using the existing line.*
- *This gives us*
  1. *a 7 MW line from the Sonoita substation to serve existing customers between Sonoita and Mustang Corners and*
  2. *A 14 MW (new line) from Mustang Corners to Sonoita as the main V-7 feeder to the new substation.*
  3. *Adding in the TEP 46 kV interconnections, UNSE interconnection and line, then*
  4. *This plan would reduce the need for a large transformer substation in Sonoita for the 69kV line to be a 23 kV hub for reliability loops as SSVEC may want a smaller substation to introduce loops into this plan.*
- *This gives backups for lines, poles and transformers but not remote generation to meet the ACC Continuity of Service reliability criteria. Adding two 1.1 MW would meet the criteria for an additional $700,000+ (2.2 MW) with a 9.2 MW capacity.*
- *Only pole conductor and replacements as a routine upgrade process should meet the NEPA Exclusion Category to replace and upgrade distribution lines on BLM lands, if required at all.*

- *If there are problems with the NCA, we feel local support, including by former Congressman Kolbe should assist in keeping this in the Exclusion Category. We can try to arrange, if that helps.*

Item	*3SEG Estimated Cost*	**SSVEC Estimated Cost**
Reconductor V7 477 ACSR (336 not used by SSVEC)	*$2,508,000*	**$ 13,361,000**

SSVEC / V7 477ACSR Express Feeder (Double Circuit)	
Item	**SSVEC Estimated Cost**
Direct Material	**$ 1,552,300**
Substation: Huachuca Upgrade Transformer add 600A Feeder Bay	**1,000,000**
Substation: Sonoita at 25kV	**2,700,000**
ROW Acquisition	**2,562,000**
Construction	**5,178,700**
Retirement	**368,000**
SSVEC Cost	**$ 13,361,000**
Difference between 3SEG & SSVEC	**$ 10,852,000**

Upgrade of 25kV Feeder to Sonoita		
Item	*3SEG Estimated Cost*	**SSVEC Estimated Cost**
Reconductor V7 477 ACSR (336 not used by SSVEC)	*$ 2,508,000*	**$ 13,361,000**
Sonoita 25kV Substation	*2,250,000*	**2,700,000**
TEP Emergency Backup	*1,400,000*	**3,270,000**
UNSE Interconnection	*200,000*	**420,000**
2.2MW Generators	*700,000*	**1,000,000+**
Total Cost	*$6,358,000*	**$ 20,751,000**

OVERVIEW OF RFP FOR FEASIBILITY ANALYSIS

We prepared a draft RFP for SSVEC's consideration as a way to make an objective decision.

1)Collaborative: Project working papers are shared with SSVEC and Cooperators

2)Interactive: Online reports allow for SSVEC and Cooperator input

3)Four reports: Addressing multiple levels of concern; (a) technical, (b) cost and schedule, (c) Public Relations, and (d) Recommended Action (Summary Study)

4) Frequently base-lined: Data collection for all prospective alternatives

5) Action items: Clear action items for construction, funding, and implementation

TEAMWORK GETS BEST RESULTS!!

SSVEC's rebuttal to the RFP for Feasibility Study is found under separate cover

RECOMMENDATIONS

Today, we recommend that SSVEC Staff

1. Seriously consider **all** these Options
2. **Work with our Committee** and collaborate details necessary to better understand the renewable option(s) and how to foresee and overcome local issues.
3. Provide an RFP for a FEASIBILITY STUDY by a competent third party for the July SSVEC BOD meeting for review and approval decision. Include at least six independent, qualified Arizona organizations to receive the RFP with a 14-day turnaround, 5-day evaluation period for **award NLT 20 August with completion NLT 20 October.**
4. Vigorously pursue the USDA and AZ Energy Office Stimulus programs, including funding for a Feasibility Study. We can help!
5. Understand the urgency to complete and present the FEASIBILITY STUDY to the BOD prior to starting any construction of the proposed 69 kV line.
6. Provide periodic Feasibility Study Status Reports to BOD.

SSVEC's rebuttal to the RFP for Feasibility Study is found under separate cover

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Next Day by 12:00 PM Express Mail®	12:00 PM	POST OFFICE	FORT GRANT RD FORT GRANT, AZ 85644
Next Day by 12:00 PM Express Mail® Hold for Pickup	4:45 PM	POST OFFICE	200 S CURTIS AVE WILLCOX, AZ 85643
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SSVEC

Constructive Point Paper

CREDIT

From J. Ferrer [redacted]

This was handed out the Patagonia Town Council Meeting 12/10/08

~~Thanks~~ Joe

SONOITA-ELGIN-PATAGONIA RELIABILITY ALTERNATIVES

To resolve Important
Electrical Reliability Issues
While meeting the
Public Interest of
SSVEC and its Cooperative Ratepayers

A Constructive Point Paper

By
Local concerned citizens, ratepayers,
and customers

5 December 2008

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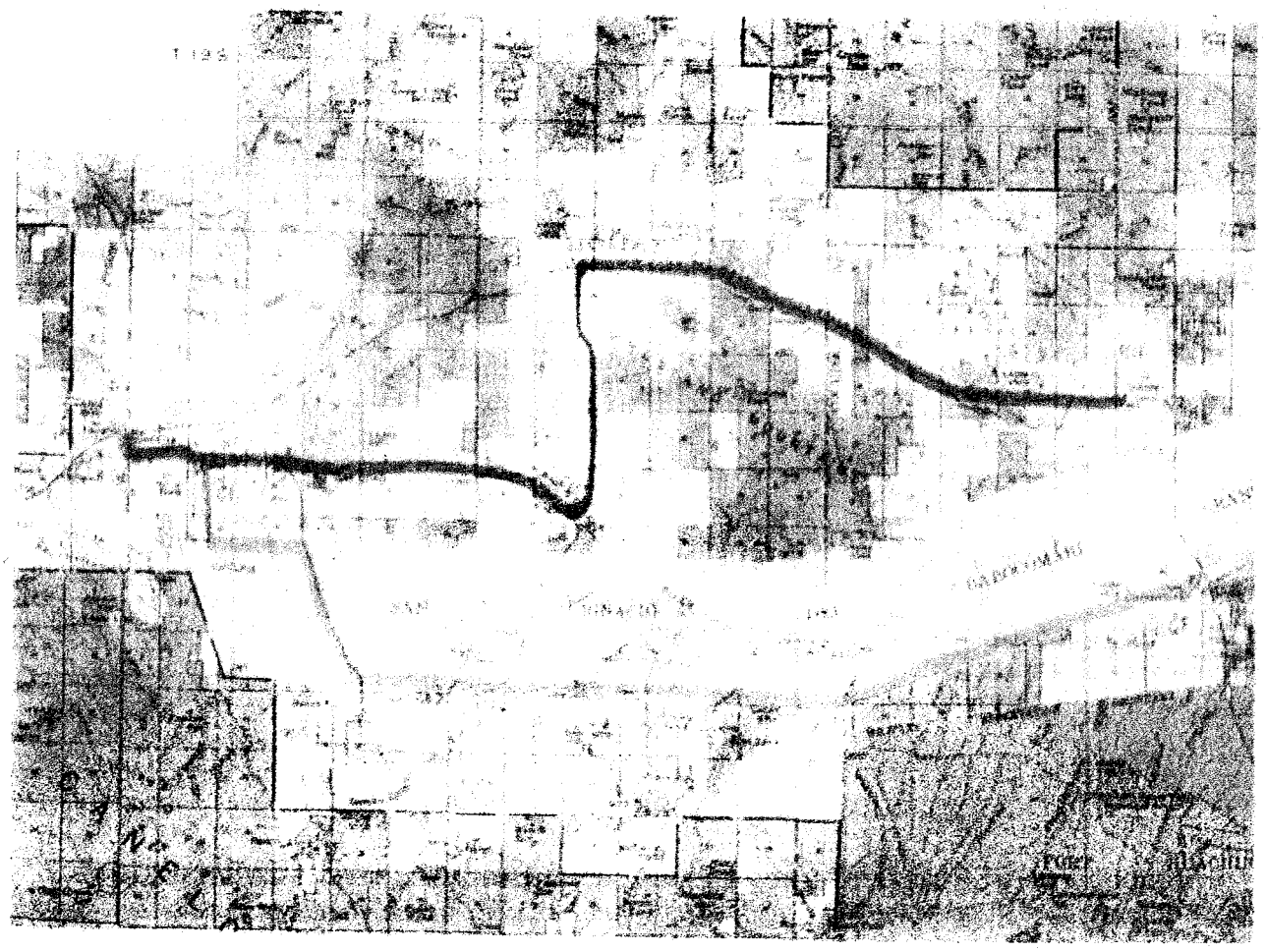
SONOITA-ELGIN-PATAGONIA
ALTERNATIVES

ISSUES

At present, there is one 23 kV distribution line serving SSVEC customers in Sonoita, Elgin, and Patagonia that is close to reaching its peak capacity. Another source of power is necessary to improve customer reliability on this 360-mile radial circuit. Without a substation in Sonoita, there are no distribution feeder lines to customer areas to provide local feeder loops and improve reliability. Backup emergency power is not available.

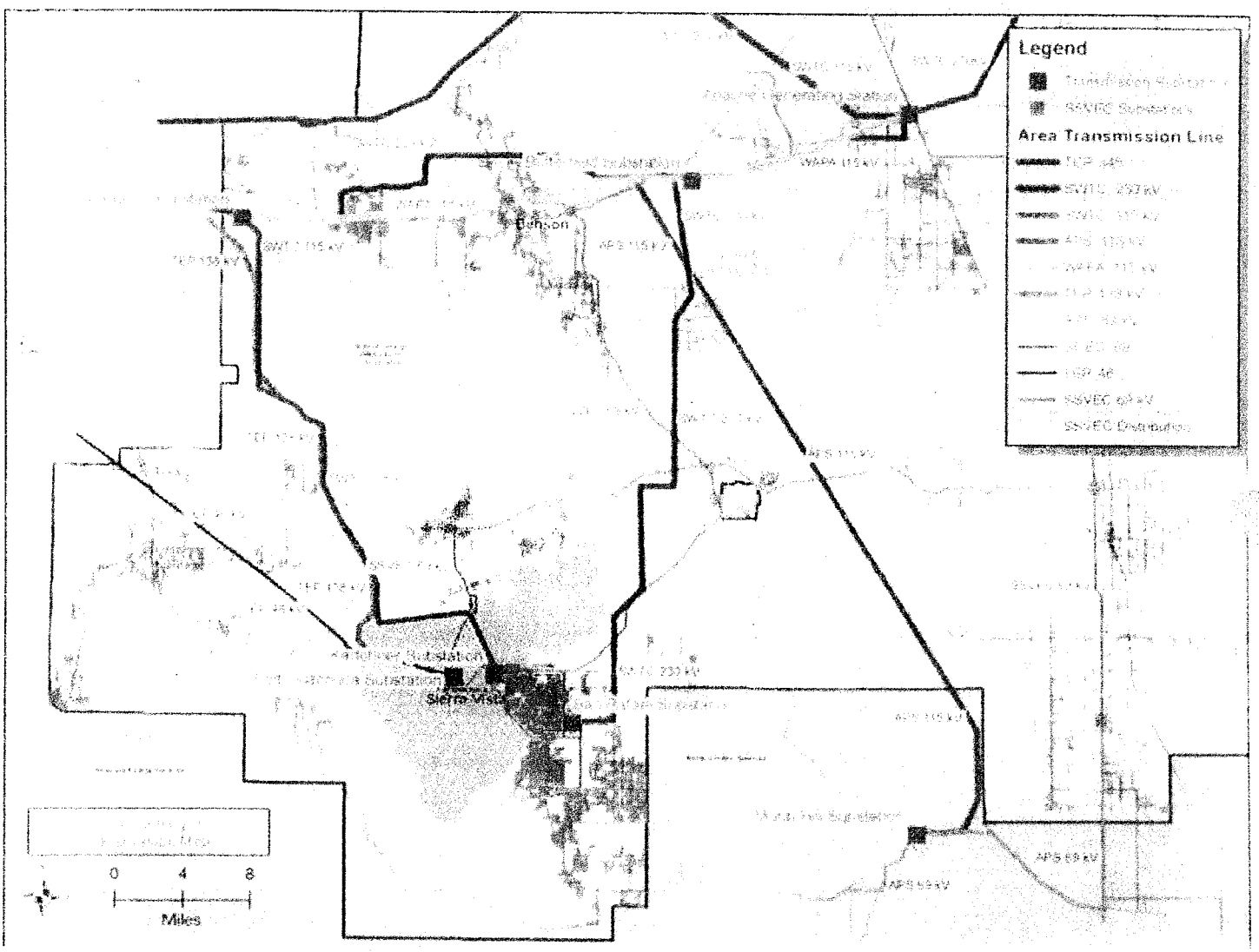
Discussion:
The present power demands for these customers is about 7 MW, this is met by a radial SSVEC 23 kV distribution line, shown in Map 1 in GREEN, from the SSVEC Mustang Corner Substation near the SR-82/90 intersection. There is no backup or second source for some 2,500 or so customers in Sonoita and another thousand in Patagonia areas.



Map 1. The Existing 23 kV line in Green Serves Sonoita, Elgin and Patagonia.
A SSVEC 23 kV distribution line presently serves Sonoita, shown in GREEN, goes from the Mustang Corner substation at SR 90 west via SR 82, then south on Elgin Road, continuing via SR 83 to Sonoita then to Patagonia via SR-82. A new substation in Sonoita for local feeder lines is proposed. The SSVEC plan (Alternative 2) installs a 69 kV line along a new route shown in YELLOW and the existing GREEN route used only for distribution. The ***Preferred Alternative 1*** *uses the existing GREEN route.*

Background.

SSVEC, an electrical distribution cooperative, provides electricity to service customers in Cochise, Santa Cruz and Pima Counties shown in Map 2. As a member of the Southwest Transmission Cooperative, SSVEC uses SWTC lines to its transmission substations. Also shown in this map are adjacent electrical utility companies service areas, including Tucson Electric Power Company (TEP) in yellow, UNS Electric (UNSE) in pink, TRICO in green, and Arizona Pubic Service (APS) in taupe. Since SSVEC is a distribution cooperative, it purchases power from other utilities for distribution to its customers, with SWTC for primary transmission of cooperative power generated at the Apache Power Plant.



Map 2. The SSVEC Distribution System and Other Utilities in its Service Area.

SSVEC operates all the light blue distribution lines shown and distribution substations (orange squares). The SWTC transmission lines from Pantano (115 kV in purple) and Butterfield (230 kV in green) substations bring in power so SSVEC can distribute to its customers. The SWTC Pantano-Huachuca transmission line crosses the existing 23 kV line from Mustang Corner substation (see Alternative 3). Fort Huachuca is served by TEP by a primary 115 kV line (in pink) and a 46 kV backup line (in blue). This 46 kV TEP line passes just north of Sonoita (see Alternative 4). Both TEP lines also cross the existing 23 kV line from Mustang Corner substation.

environmental impacts including negating decades of grassland research with severe visual impacts in virgin grasslands and adds miles of new power line service roads. There is widespread opposition to the YELLOW route that is preferred by SSVEC.

Alternative 3 – Use existing SWTC transmission lines as Source for Sonoita.
The SWTC 115 kV transmission line between Kartchner and Pantano SSVEC substations crosses the existing SSVEC 23 kV line to Sonoita.

Near this location, a small substation with a 115 to 69 kV transformer connects to the new 69 kV line that continues along the existing 23 kV west route to a new Sonoita Substation, and then continues along existing SSVEC 23 kV to Patagonia

Discussion. Map 2 shows where the existing SWTC Pantano 115 kV line crosses SR 82 a few miles east of where the TEP 46 kV crosses. If a substation with a 115 to 69 kV transformer was installed near this junction, then upgrading the SSVEC 23 kV line to 69 kV to the Sonoita substation also reduces additional 69 kV lines by many miles.

Alternative 4 – Use TEP 46 kV (upgraded to 69 kV) lines as Source for Sonoita.
Upgrade the present TEP 46 kV route to 69 kV from Greaterville to Ft Huachuca. Near to where this TEP line crosses SR-82 or SR-83, add a short 69 kV, using either Option, to the new Sonoita Substation and continue along existing SSVEC 23 kV to Patagonia

Option 4-82 - adds a new 69 kV line, from near where the TEP line crosses SR-82, to the new Sonoita Substation
Option 4-83 - adds a new 69 kV line, from near where the TEP line crosses SR-83, to the new Sonoita Substation

Discussion. The passing of the TEP 46 kV line near Sonoita appears to be a logical local source of power to meet the customer demands. Ongoing TEP plans to upgrade to 138 kV this line from TEP's South Substation in Sahuarita to Greaterville, could lead to upgrading this 46 kV to 69 kV or a higher voltage to meet the Ft. Huachuca backup peak demands, in Table 1. At 69 kV or higher, this line can adequately meet both Ft Huachuca and the SSVEC Sonoita-Elgin-Patagonia demands. Two options exist for tapping off an upgraded 69 kV line, where it crosses I-82 north of Sonoita or it crosses SR- 83 east of Sonoita in Map 2. A new 69 kV line from either location could continue to the new SSVEC 69 kV Sonoita substation. Either option would be the shortest "new" 69 kV route to Sonoita and the least expensive costs for the higher capacity necessary for this area if it is to be the primary source for SSVEC customers. It is assumed that TEP will need to solve the "two county" rule. A backup Alternative from this TEP 46 kV can avoid this issue.

BACKUP ALTERNATIVE POWER SOURCES

There is no second source of power for Sonoita or Patagonia. Without a "loop", continuity of service is not possible; however, Emergency Backup service, which means the switch is open unless there is an "emergency" (i.e. an outage), then a second source of power can easily be provided. This process is what TEP- and UNSE have accomplished with a TEP Conoa 46 kV substation in Pima County to serve UNSE customers via the Amado (Kantor) substation in Santa Cruz County. This satisfied IRS requirements for the "two county rule".

SECOND TRANSMISSION BACKUP ALTERNATIVES

These two Backup Alternatives provide second power sources for the SSVEC system supporting Sonoita, Elgin and Patagonia.

Backup Alternative A – Emergency Backup from TEP's 46 kV:
Add a transformer in a small substation on the present TEP 46 kV route (with or without an upgrade to 69 kV) between Greaterville and Ft Huachuca. This is near where the TEP line crosses SR-82 or SR-83, and a new 69 kV line continues to the new Sonoita Substation. This provides a second source for Sonoita and Patagonia.

Backup Option A-82 – Adds a new 69 kV line, from near where the TEP line crosses SR-82, to the new Sonoita Substation
Backup Option A-83 – Adds a new 69 kV line, from near where the TEP line crosses SR-83, to the new Sonoita Substation

Discussion. This Alternative provides a second power source and will improve reliability.

Backup Alternative B – Emergency Backup from the UNS Electric Grid:
UNS Electric has distribution lines within 1 mile of SSVEC lines in the southern part of the service area. Connections between these two systems can provide both higher reliable systems as continuity of service and be maintained since a loop will exist.

Discussion. This Alternative provides a second power source and will improve reliability for both SSVEC and UNSE customers.

CONCLUSION

The ongoing SSVEC "Yellow" approach needs higher level oversight or additional public reviews of all viable Alternatives.

RECOMMENDATIONS

A full and open discussion is necessary to review and evaluate options for the Sonoita-Elgin-Patagonia electrical situation. A higher capacity source, substation and preferably a second source is needed for this area. The "GREEN" solution is preferred. The proposed "YELLOW" solution, in many ways, is totally unacceptable but still needs to be included in this process.

SSVEC needs to reopen discussions, conduct an environmental assessment ASAP so that its present work on the Yellow route does not waste additional ratepayer's funds.

If SSVEC will not open up such a dialog with its cooperative ratepayers, then a formal request should be made to the Arizona Corporation Commission to appoint a Hearing Officer, preferably from the Siting Committee, to hear arguments leading to an environmental assessment and a recommendation for the best Alternative to resolve the issues herein.

Constraints Considered.
There are some facts that bound this issue.

First. The electrical load demands that need to be satisfied are summarized in Table 1 for the Sonoita-Elgin-Patagonia service area plus others that impact solutions.

Table 1. Peak Electrical Demands for SSVEC Customers and TEP at Ft. Huachuca.

Area	Number of customers	Present Peak Demand in Megawatts (MW)	Serving Electricity Company
Sonoita-Elgin	2,500	3-7 MW	SSVEC
Patagonia	1,000	1-2 MW	SSVEC
Fort Huachuca	1 Fort	10-20 MW	TEP

Second. The Alternatives herein meet these and other residential and small business demands. In general, the peak capacities for electrical conducting wires are about 7 MW for a 23 kV line, 20 MW for a 46 kV line, over 60 MW for a 69 kV line, over 110 MW for a 115 kV, and over 120 MW for a 138 kV line. The SSVEC 23 kV line serving Sonoita-Elgin-Patagonia is close to capacity. The TEP backup 46 kV line for Ft. Huachuca could be near capacity but is rarely used, only if there is an outage on the TEP 138 kV line to the Fort.

Third. Due to IRS "two county" rules, TEP is constrained to serve only customers in Pima and Cochise Counties. TEP, however, can provide power to customers in other counties during an emergency and could provide backup emergency services to SSVEC customers when SSVEC services are interrupted by an unexpected outage.

Fourth. Without a distribution substation in this area, local feeder lines are not used, thus total reliance on the existing SSVEC 23 kV severely constrains actions during any single outage. A substation permits SSVEC to isolate a distribution outage to one feeder and while continuing services to customers on other feeder lines. Several locations for a Sonoita distribution substation have been discussed and, in general, the community agrees a new substation off SR 83 in "downtown" Sonoita is the best location.

Fifth. The proposed upgrades between Sonoita and Patagonia re-build the existing 23 kV line without any routing changes along SR 82.

Assumptions for Alternatives.
The process of creating various Alternatives, involved looking at the above maps, and seeing potential connections with existing systems as preferred to avoid new expenses and to avoid additional environmental impacts. Some assumptions are always necessary.

Assumptions must consider ratepayer expenses as a key cost-driver but, "least expensive' solution may not meet customer expectations who feel a higher cost option is "worth" the expense.

In general, reusing existing easement is preferred when compared to creating a new one.

The Alternatives herein have high merit and should be considered to best serve the public's interest and concerns. Only the "YELLOW" Alternative 2 has been brought forth by SSVEC

for public review and consideration. It is assumed all Alternatives need consideration and public feedback before implementation. The preliminary "preferred" Alternative is number 1, the Green Line.

ALTERNATIVES

There are Alternatives and Options available not yet brought forth for public review and consideration. In our opinion, all are feasible, have merit, and should be considered to best serve the public's interest. The public prefers Alternative 1 as the best solution.

Alternatives for Primary Power for Sonoita-Elgin-Patagonia Options.
All these Alternatives propose radial lines. Alternative 1 is the easiest to implement and is preferred. Alternative 2 appears the most expensive, with ratepayer's costs decreasing for the other Alternatives. Alternative 3 gives greater future options for SSVEC, and Alternative 4 is simple and least expensive but requires an agreement between two companies to implement (more administrative issues than the others).

Alternative 1 – Use the GREEN Route. (preferred)
The existing GREEN route uses the location of the present 23 kV lines from the SSVEC 69 kV substation (near SR-82/SR-90 intersection), upgrades the 23 kV to 69 kV to the west, to the new Sonoita Substation, and continues along existing 23 kV route to Patagonia. Most of this route was installed prior to today's right of way requirements and is "grand-fathered" with upgrade rights that should facilitate the Alternative where permits do not exist. The Bureau of Land Management is expected to rule the upgrade as a NEPA Category Exception or require SSVEC to obtain a Land Use Permit.

Discussion. This is simply, a way to use the existing 23 kV line route as the basis for the upgrade to a new substation in Sonoita. It avoids the Alternative 2 (Yellow) issues including new power line service roads, new easements and rights of way through established subdivisions, and severe new environmental impacts. This is the preferred Alternative.

Alternative 2 – Use the YELLOW Route.
The YELLOW route goes from the SSVEC Huachuca City substation on 69 kV lines, via southern boundary of the Bacocomari Land Grant, up SR-83 to proposed SSVEC routes 1A or 3 to a new Sonoita Substation, and continues along existing SSVEC 23 kV route to Patagonia. There are two options:

Option 2A - Use SSVEC Route 1A (near Sonoita along SR-83)
Option 2B - Use SSVEC Route 3 (near Sonoita along North Boundary of Babocomari Land Grant and through Sonoita Hills Subdivision)

Discussion. This is the present SSVEC preferred Alternative that has resulted in local debates led by SSVEC for the community to chose between Route 1A and Route 3 in the Sonoita residential areas. Both these Options involve new lines and have caused unfortunate NIMBYisms throughout the community impacted by these lines.

The much larger issue, not discussed by SSVEC during these debates, is shown in YELLOW in Map 1. This involves cutting along the boundaries and through the Babocomari Land Grant that precedes both Options 2A and 2B. The YELLOW route has significant

Contents

1. Conservation Corridors between the San Pedro and Las Cienegas NCAs (Jeff Williams 11/08, Phoenix Zoo, Cienega Watershed Partnership)

   This is the corridor coming up from Mexico and correlates with the migration routes into ideal jaguar habitat. The Las Cienegas is the water source for Tucson.

2. Jaguar Habitat (Wildlands Project workshop 2007)

   Note the brick red (ideal habitat) and light blue (jaguar records) colors to the west of the pink arrow going into the Huachuca Mountains from reserves and habitat in Mexico.

3. SSVEC 69 kV Sub-Transmission Lines

   Green line indicates current 23 kV line from the substation at Mustang Corner to Sonoita. Yellow line indicates the new planned 69 kV line from Huachuca City through the Babacoari Ranch to Sonoita (~20 miles).

4. SSVEC 69 kV Sub-Transmission with Distribution Line Poles

   This is an example of what the poles will look like; 55' tall, 400-600' apart. It will take approximately 176-264 poles to cross 20 miles of the Babacomari.

5. SSVEC 69 kV Corner Pole

   This is an example of a corner pole. Note in comparison the size of the old wood pole.

6. South Boundary of the Babacomari Looking East

   The 55' power poles/lines will run down the left side of the fence (within a 75' easement), right over the home there.

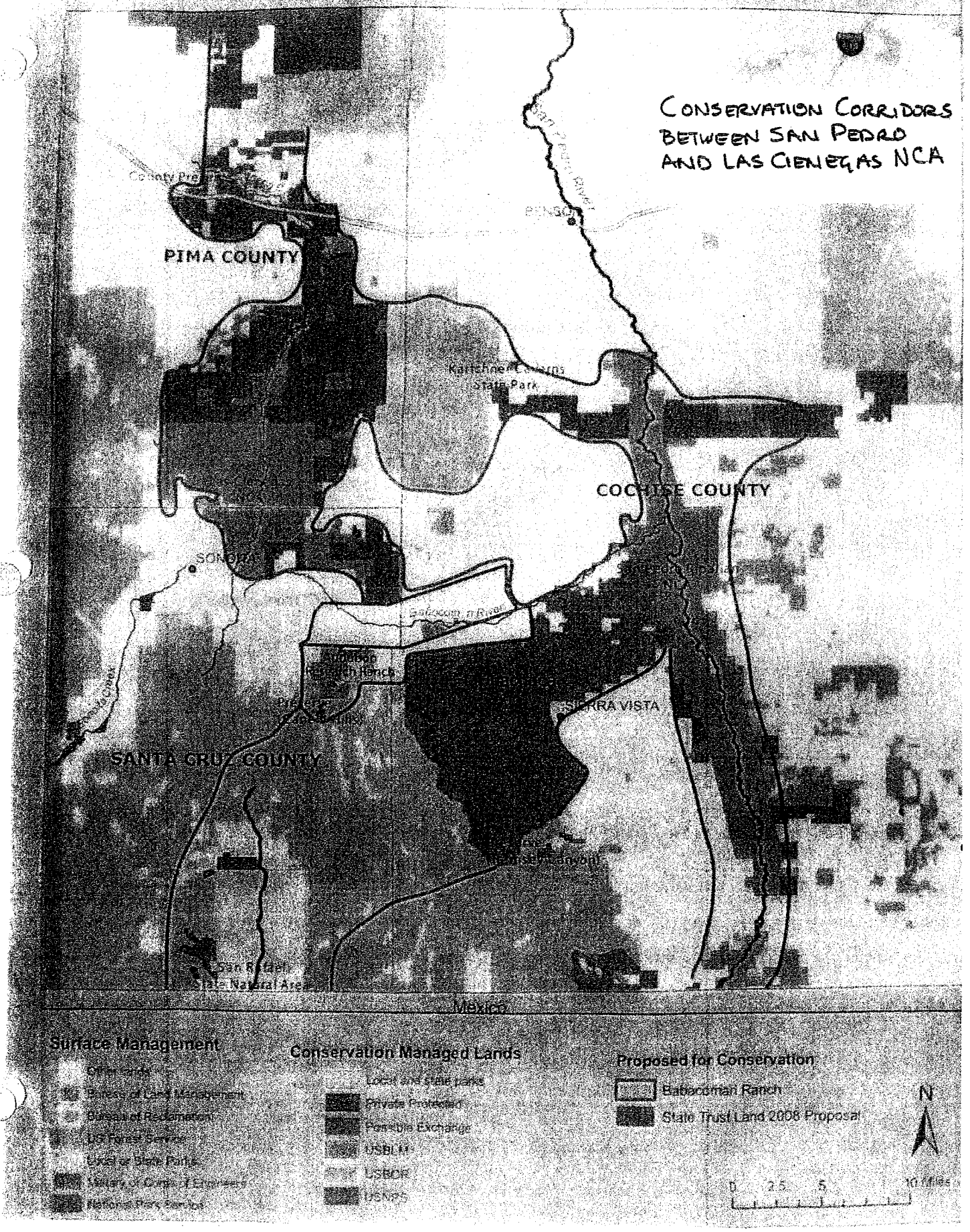
7. South Boundary of the Babacomari Looking West

   The 55' power poles/lines will run down the right side of the fence (within a 75' easement)

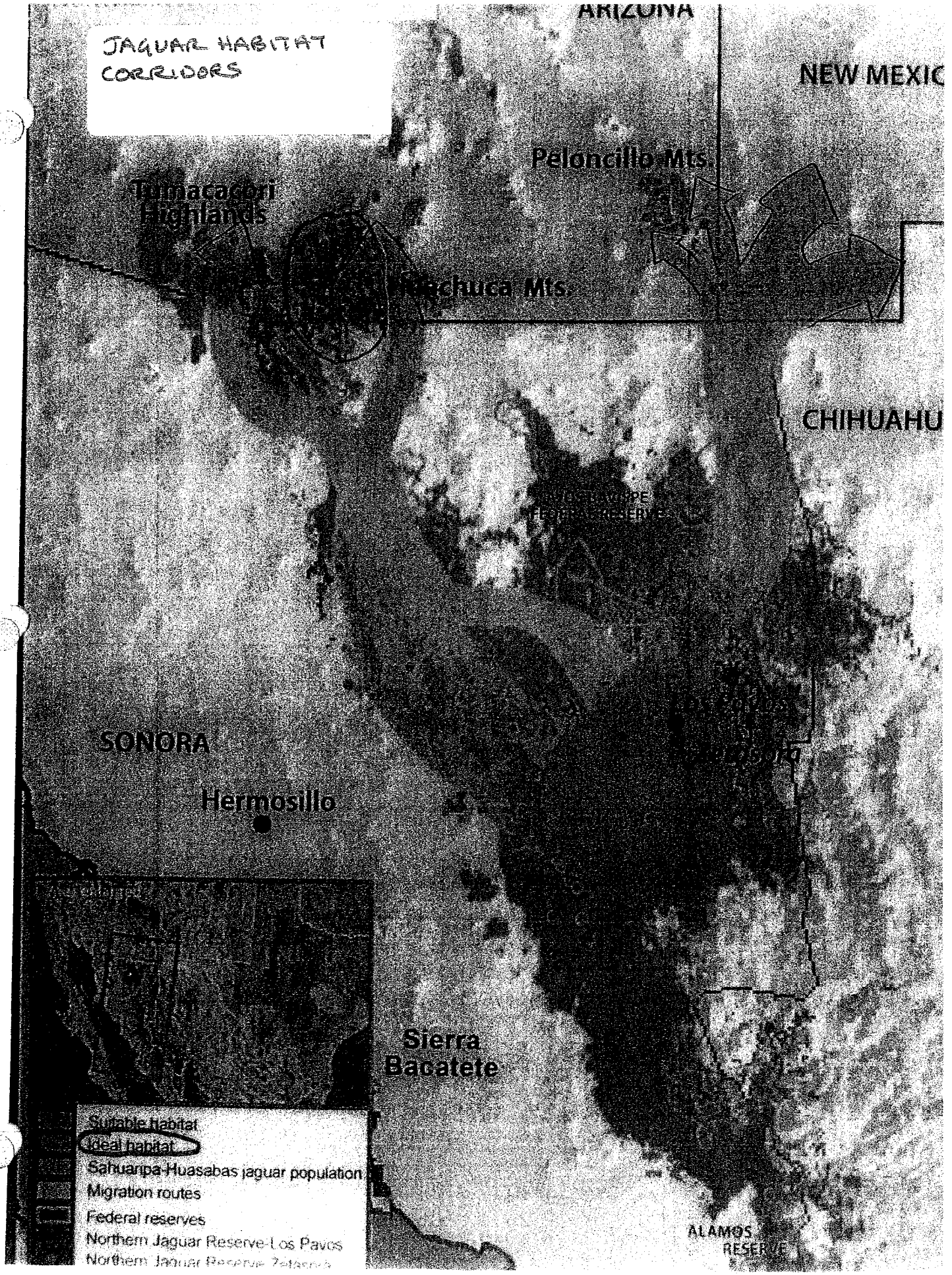
8. Boundary between the Audubon Research Ranch and the Babacomari Ranch

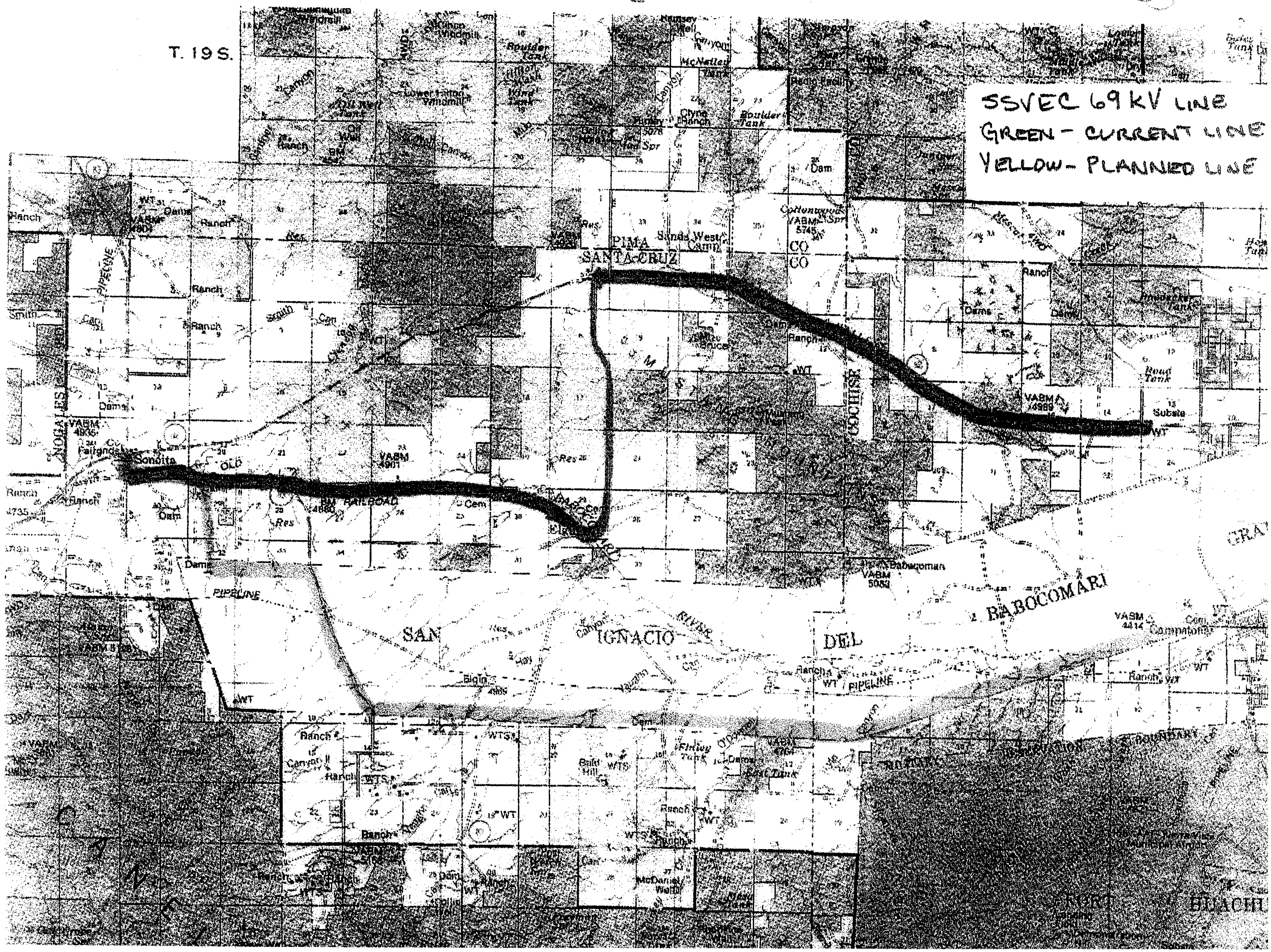
   This shows the destruction created just to site and prepare for the installation of the power pole. This does not show the additional damage that will result from 4-6 large cranes/trucks needed to install the 55' pole and string the power lines.

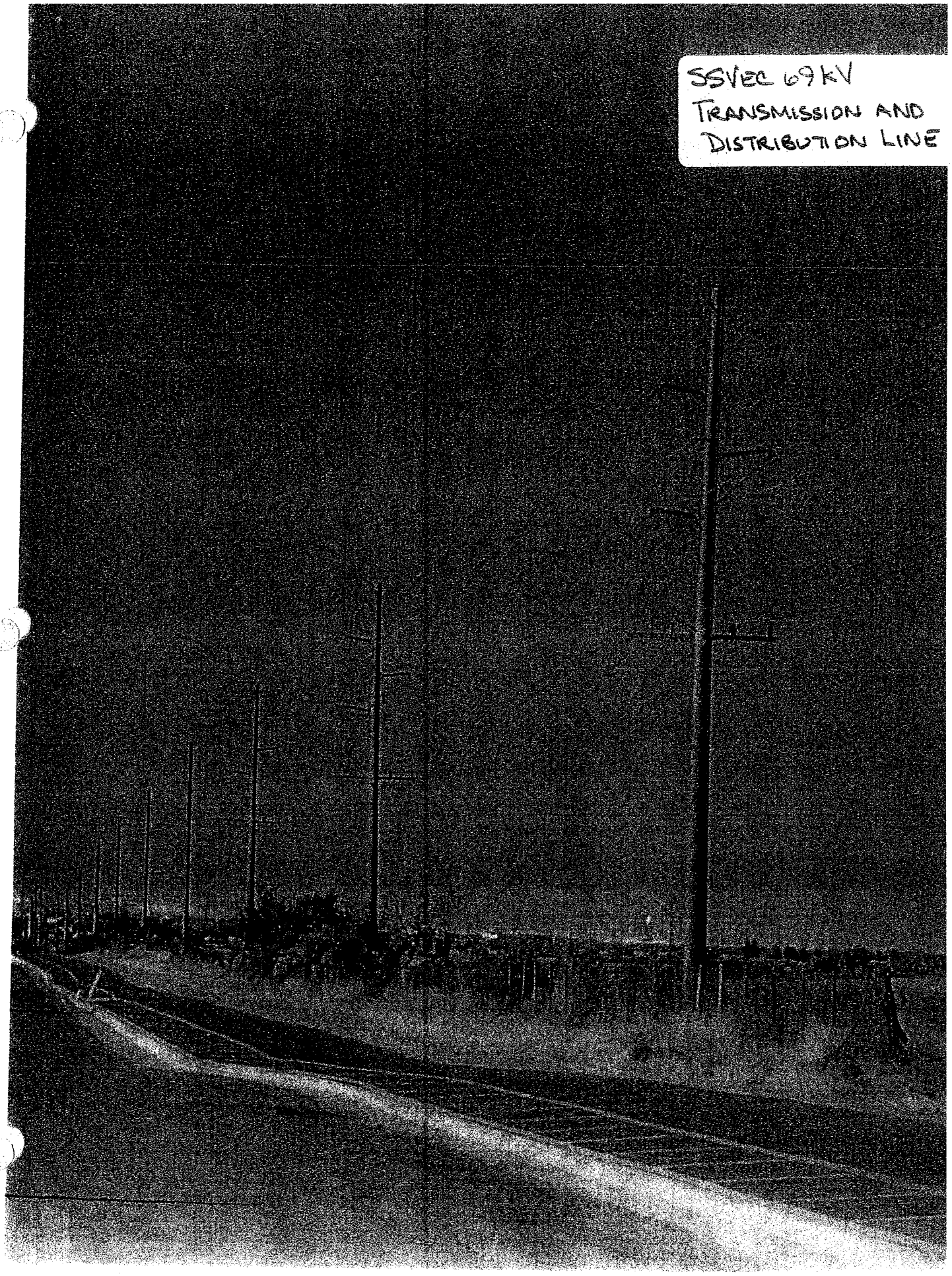
Conservation in Southeast Arizona



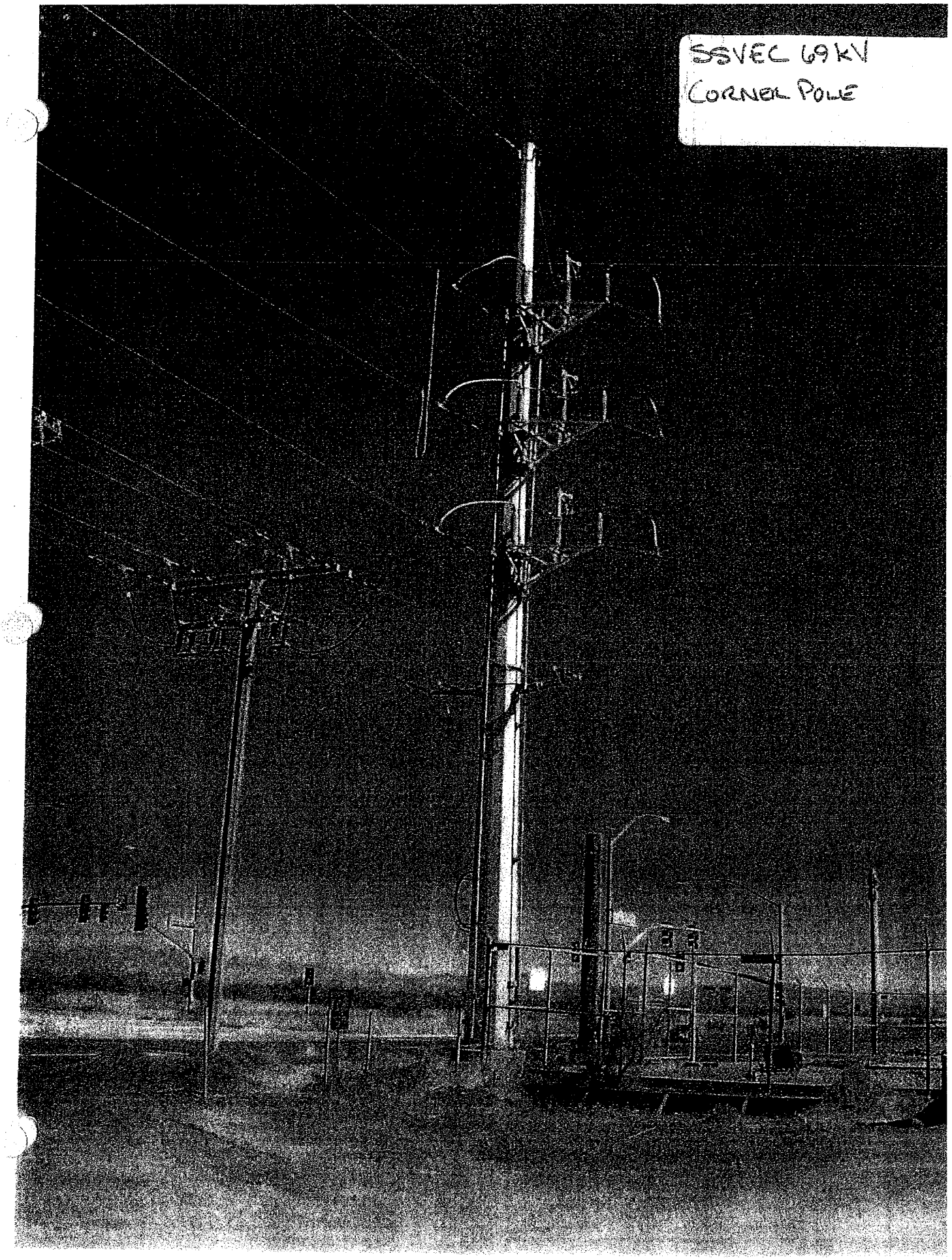
JAGUAR HABITAT
CORRIDORS

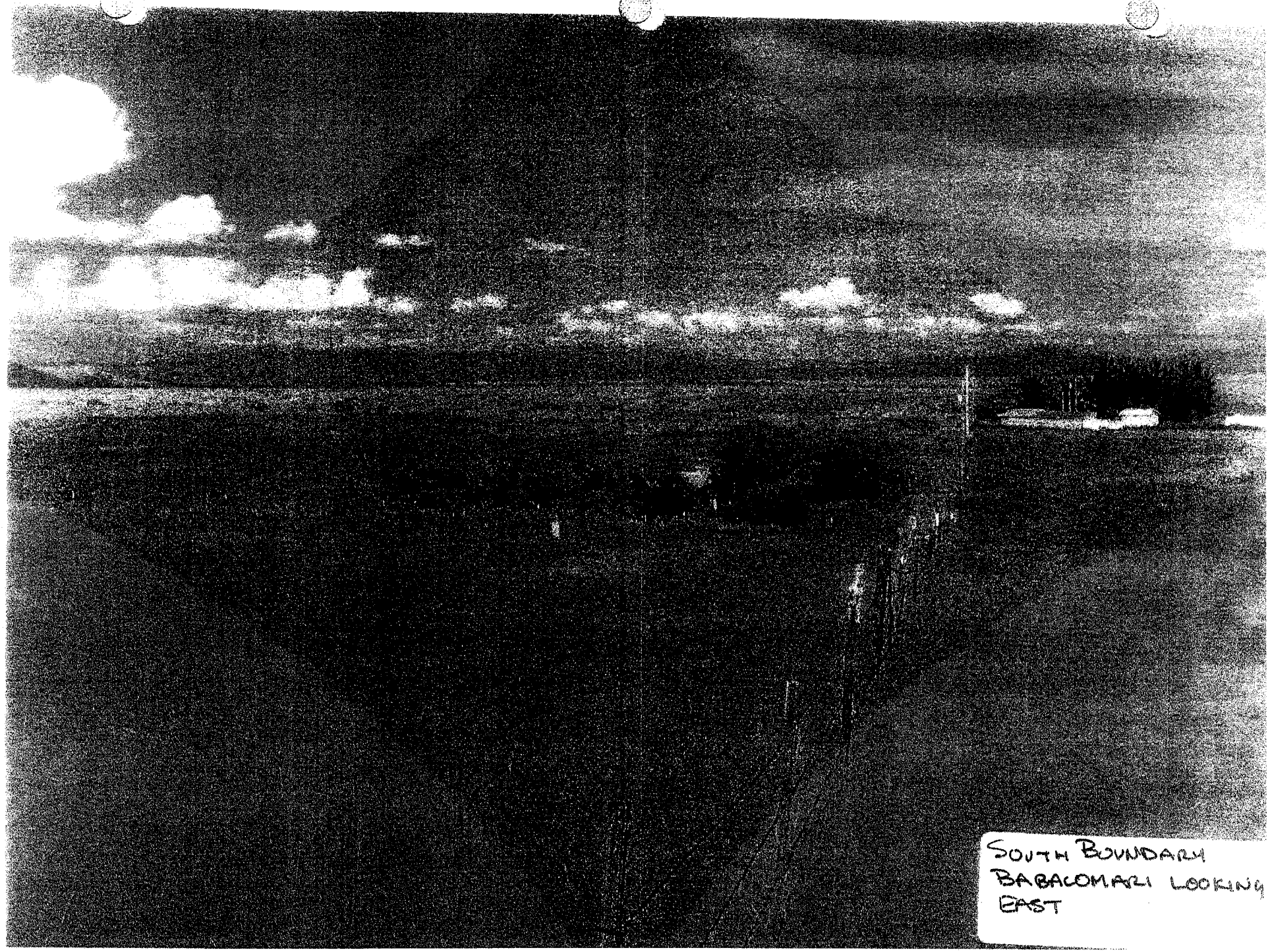



SSVEC 69 kV LINE
GREEN - CURRENT LINE
YELLOW - PLANNED LINE
T. 19 S.
PIMA
SANTA CRUZ
COCHISE
NOGALES
Sonoita
BABOCOMARI
SAN
IGNACIO
DEL
RIVER
PIPELINE
RAILROAD
Elgin
Substa



SSVEC 69 kV
TRANSMISSION AND
DISTRIBUTION LINE


SSVEC 69kV
CORNER POLE



SOUTH BOUNDARY
BABACOMARI LOOKING
EAST

SOUTH BOUNDARY
BABALOMARI LOOKIN
WEST

BOUNDARY BETWEEN
RESEARCH RANCH AND
BAGACOMARI, NOTE
DESTRUCTION

SSVEC

Rebuttal

Sulphur Springs Valley Electric Cooperative, Inc.

A Touchstone Energy® Cooperative

Save the Scenic Sonoita/Elgin Grasslands Group (3SEG)

CONSTRUCTIVE POINT PAPER – SSVEC RESPONSE

ALTERNATIVES PRESENTED

* **ALTERNATIVE 1:** (3SEG: "easiest to implement and is preferred")
  - Upgrade existing 3ph distribution line to 69kV sub-transmission with underbuild
    - Work must be performed energized – construction cost increases 150%
    - Existing lines under 'grandfathered' rights – no 'upgrade' rights; new easement acquisition costs for approximately 23 miles / nearly 100 parcels
    - Additional environmental impact/burden to the Las Cienegas National Conservation Area - a FEDERALLY protected area. New environmental and permitting costs.
    - Cost factors – construction cost difference alone for Alternative 1 route vs SSVEC Chosen route (Alternative 2) is over $2.6 MILLION – DOES NOT INCLUDE right of way acquisition costs for 23 miles.
    - Somewhat reduces reliability as both power sources are on same pole line – if it goes down, no way to back-up service area.
      - With 69kV on a separate route, retain ability to back-up from Huachuca Sub.

* **ALTERNATIVE 2:** (3SEG: "most expensive" and "significant environmental impacts with severe visual impacts in virgin grasslands")
  - 69kV sub-transmission only along SSVEC existing easement on Babocomari Land Grant
    - 20-mile easement purchased in 1982
    - Least construction cost
      - Work performed de-energized
      - 69kV only : no under-build
    - No protected environmental areas – ALL PRIVATE PROPERTY
      - SSVEC voluntarily contracted environmental survey - NO IMPACT to threatened/endangered species or habitat
      - Easement cleared in 1991 for fiber-optic cable installation – maintenance traffic continues
      - Shared boundary with Audubon Society Appleton-Whittell Research Ranch of only 1-mile (of 20-mile easement)
      - Babacomari Ranch is a working cattle ranch: grasslands are fully grazed and managed.

* **ALTERNATIVE 3:** (3SEG: "greater future options for SSVEC")
  - Use existing Southwest Transmission Cooperative (SWTCO) transmission lines as Source for Sonoita
    - Requires significant investment by SWTCO
      - New 115kV to 69kV substation
      - Property purchase for joint substation site
    - Reduces 69kV line by only 7.5miles (not enough to offset cost of 115/69 sub)
    - Same construction / easement cost and reliability constraints as Alternative 1.

* **ALTERNATIVE 4:** (3SEG: "simple and least expensive but requires an agreement between two companies")
  - Use Tucson Electric Power (TEP) 46kV (upgraded to 69kV) lines as source for Sonoita
    - Requires significant investment by TEP
      - Upgrade existing 46kV line to 69kV from Greaterville to Hwy 83 intersection (appx 12 miles)
      - New 69kV substation
      - Property purchase for joint substation site
    - Significant additional burden on the Las Cienegas National Conservation Area
    - Impact to designated Scenic Highway area

- TEP is legally restricted from providing service to Santa Cruz County

* **BACKUP ALTERNATIVES:** (3SEG: "there is <u>no</u> second source of power for Sonoita or Patagonia. Without a 'loop', continuity of service is not possible")
  - The Sonoita area has received service from a single source of power since SSVEC began service in the 1960's. In rural areas it is common to have a radial transmission line to service a small substation / community.
  - <u>Emergency backup from Tucson Electric Power (TEP) 46kV</u>
    - Requires significant investment by TEP
      - Upgrade existing 46kV line to 69kV
      - New 69kV substation
      - Property purchase for joint substation site
  - <u>Emergency backup from UniSource Energy Services **(115kV)**</u>
    - Requires significant investment by UNS
      - New 115kV to 69kV substation
      - Add 115kV or 69kV transmission line to substation site
        - If 115kV - siting requirements
      - Property purchase for joint substation site

* **CONTENTS:** (3SEG: Exhibits attached to Constructive Point Paper)
  - <u>Conservation Corridors between the San Pedro NCA and Las Cienegas NCA</u>
    - Babacomari only PROPOSED for Conservation
  - <u>Jaguar Habitat Map</u>
    - The Wildlands Project is related to cross-border pathways between Arizona and Mexico for multiple species of wildlife, including Jaguars. The United States / Mexico 'Border Wall' Project is a major concern in regards to impact of corridors. There is no evidence that an overhead power line will impact jaguar migration corridors or habitat.
  - <u>Map: Green Line (Alternative 1) vs Yellow Line (Alternative 2)</u>
    - This map does not provide the location of the Las Cienegas National Conservation Area, the Appleton-Whittell Research Ranch, or the ~20-mile 69kV Sub-transmission easement across private land which SSVEC purchased in 1982.
  - <u>Transmission Pole Photos</u>
    - The photos presented are NOT representative of the type of pole configuration used on 95% of the Sonoita Reliability Project
  - <u>Boundary Photos of the Babacomari</u>
    - The Constructive Point Paper incorrectly states the easement is 75' in width – actual width is 50'.
    - The photos *"South Boundary Babacomari Looking East"* and *"South Boundary Babacomari Looking West"* demonstrates development within, and adjacent to, the Land Grant grasslands area. Effects of grazing are visible in the Westward photo.
    - The photo *"Boundary between Research Ranch and Babacomari, Note Destruction"* illustrates a minimal amount of ground disturbance with significant grasses remaining intact. SSVEC has stated that all disturbances will be reseeded with native grasses at the conclusion of the project.
    - SSVEC acquired GPS aerial photography for the project corridor on the Babacomari Ranch in January 2008. The aerial photography distinctly shows existing roads adjacent to the Appleton-Whittell Research Ranch, as well as along a significant percentage of the southern boundary of the entire Land Grant. These roads/cleared areas were in existence long before any clearing was performed.

SSVEC

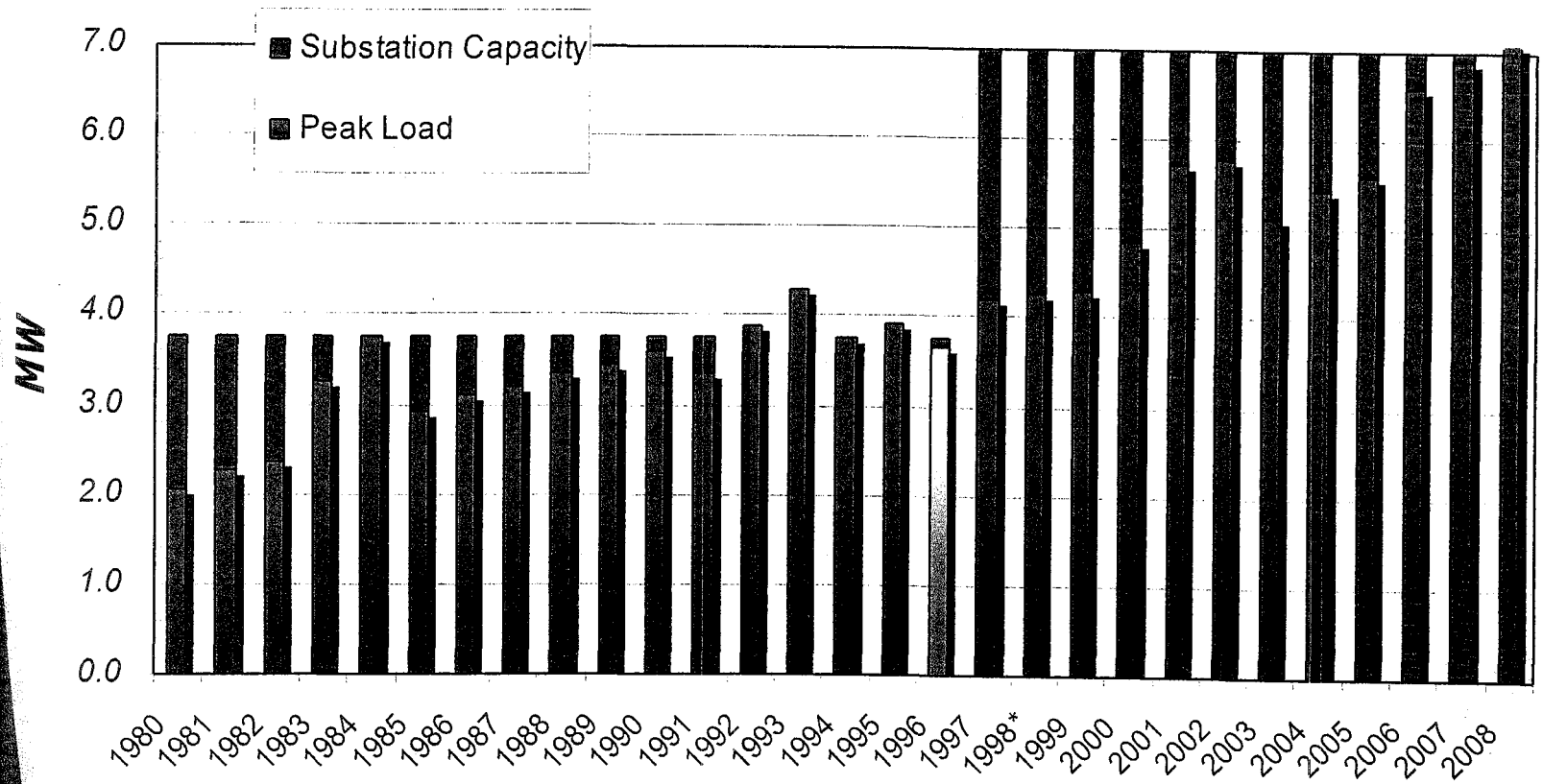
Transformer Capacity

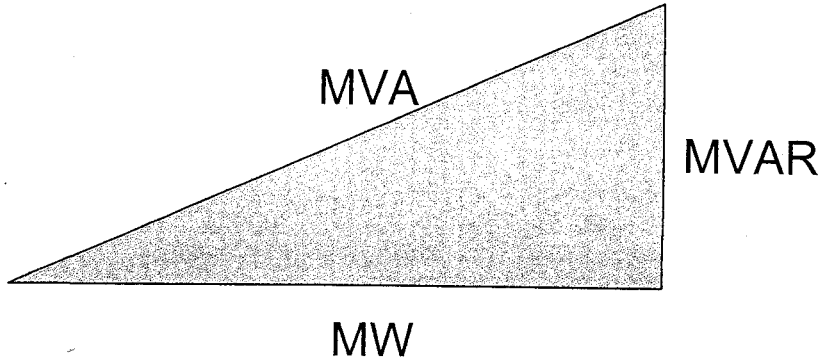
69 KV ANALYSES

- 477 has a thermal limit of 80MW but….
- 477 ACSR for 22 miles is good for 20MW @ 95% PF
- Upgrade Kartchner to Sonoita Tap increases capacity to 29MW @ 95% PF

Increasing Load vs. Capacity

Huachuca Substation at Capacity





POWER FACTOR = KW/KVA = .98 ON THE V-7 FEEDER

SUBSTATION TRANSFORMER CAPACITY = 7 MVA

@ .98 PF

= ONLY 6.6 MW

PEAK LOADS = 7.132 MW

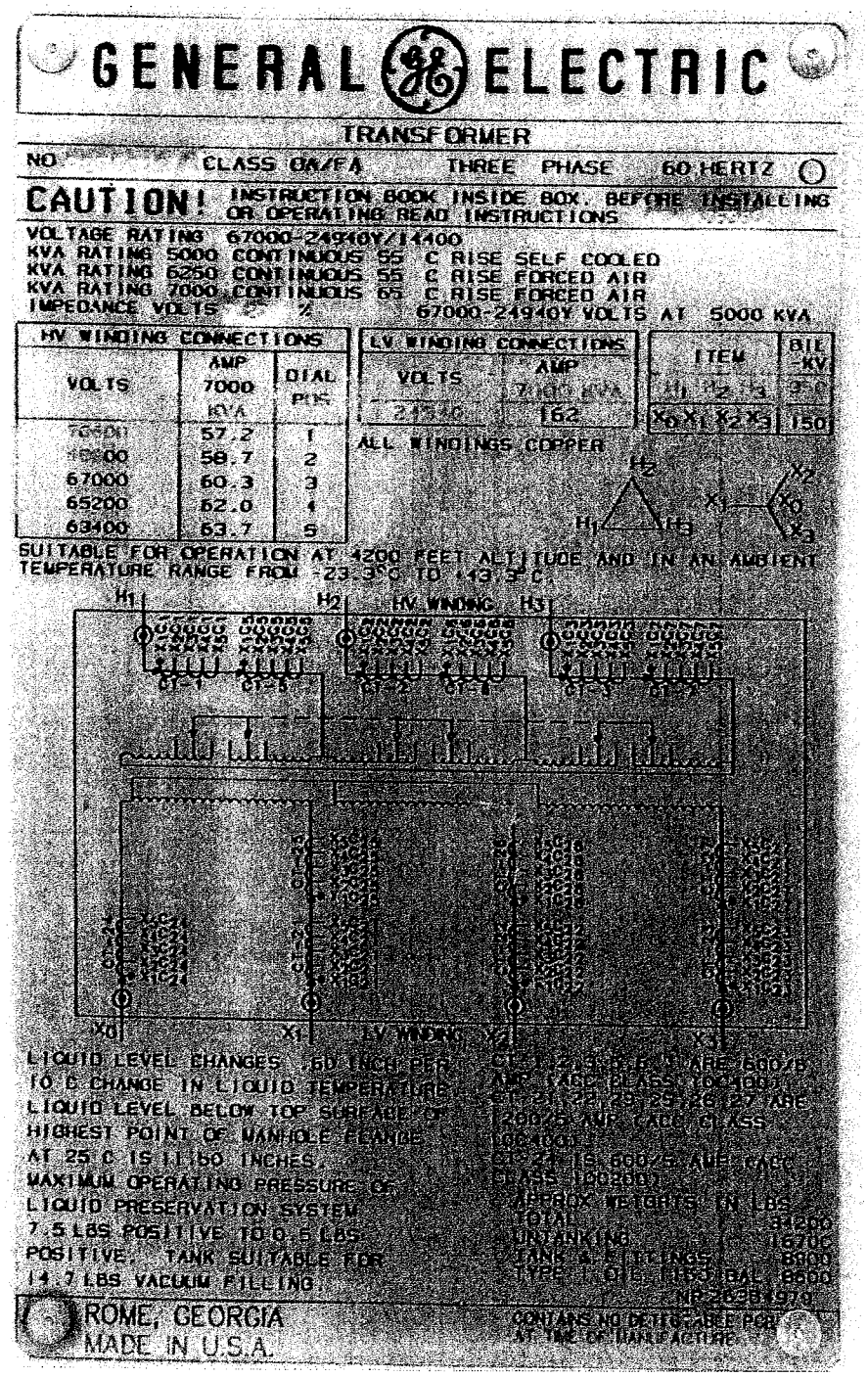
@ .98 PF

= 7.5 MVA

<u>SUBSTATION TRANSFORMER IS 7% OVERLOADED!!</u>

Huachuca West

Transformer Nameplate



GENERAL ELECTRIC

TRANSFORMER

NO CLASS OA/FA THREE PHASE 60 HERTZ

CAUTION! INSTRUCTION BOOK INSIDE BOX. BEFORE INSTALLING OR OPERATING READ INSTRUCTIONS

VOLTAGE RATING 67000-24940Y/14400
KVA RATING 5000 CONTINUOUS 55 C RISE SELF COOLED
KVA RATING 6250 CONTINUOUS 55 C RISE FORCED AIR
KVA RATING 7000 CONTINUOUS 65 C RISE FORCED AIR
IMPEDANCE VOLTS % 67000-24940Y VOLTS AT 5000 KVA

HV WINDING CONNECTIONS		
VOLTS	AMP 7000 KVA	DIAL POS
70500	57.2	1
68800	58.7	2
67000	60.3	3
65200	62.0	4
63400	63.7	5

LV WINDING CONNECTIONS	
VOLTS	AMP 7000 KVA
24940	162

ITEM	BIL KV
H1 H2 H3	95
X0 X1 X2 X3	150

ALL WINDINGS COPPER

SUITABLE FOR OPERATION AT 4200 FEET ALTITUDE AND IN AN AMBIENT TEMPERATURE RANGE FROM -23.3°C TO +43.3°C

LIQUID LEVEL CHANGES .60 INCH PER 10 C CHANGE IN LIQUID TEMPERATURE
LIQUID LEVEL BELOW TOP SURFACE OF HIGHEST POINT OF MANHOLE FLANGE AT 25 C IS 11.50 INCHES.
MAXIMUM OPERATING PRESSURE OF LIQUID PRESERVATION SYSTEM 7.5 LBS POSITIVE TO 0.5 LBS POSITIVE. TANK SUITABLE FOR 14.7 LBS VACUUM FILLING.

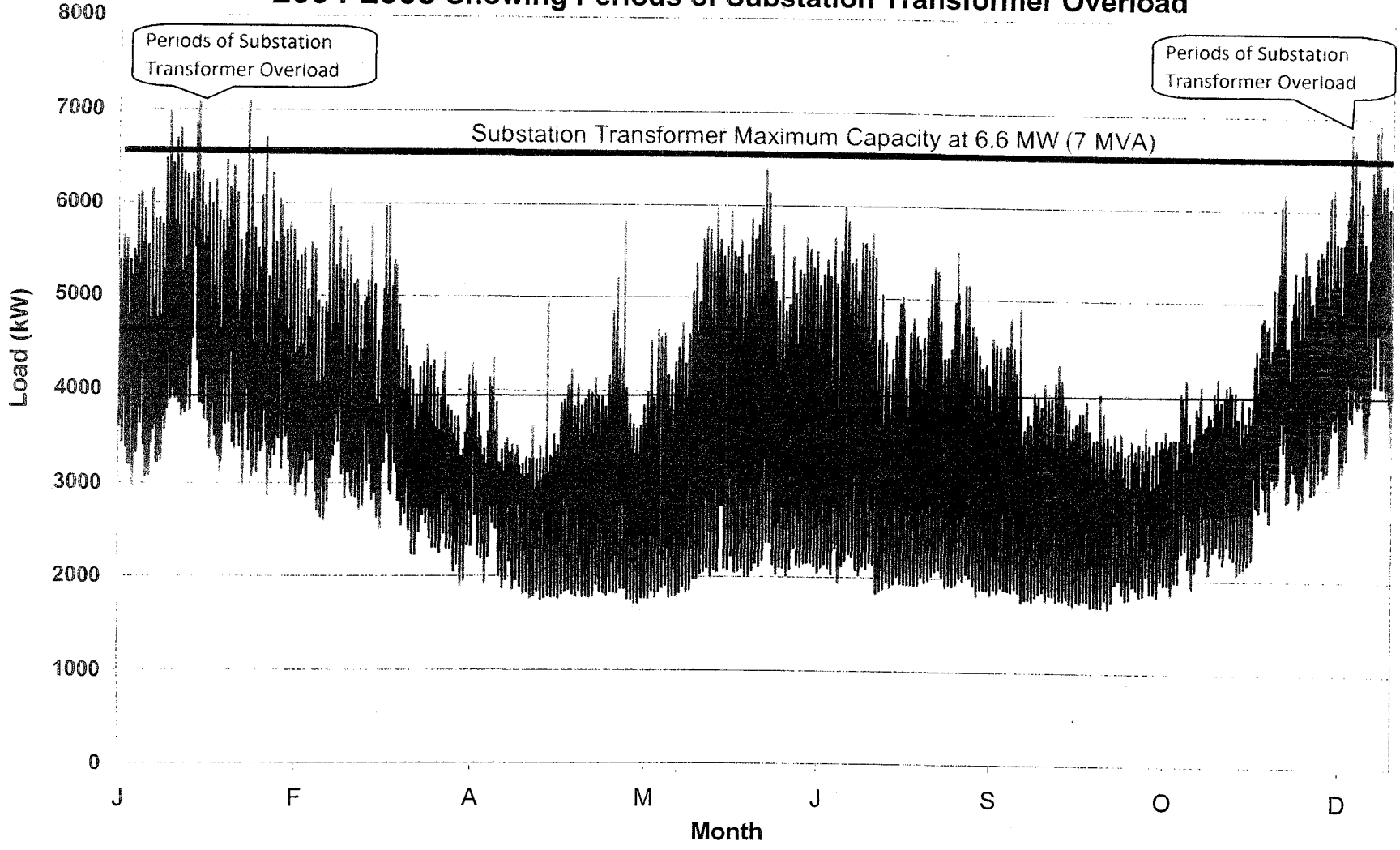
CT 1,2,3,4,5,6 ARE 600/5 AMP CACE CLASS 100-100
CT 21,22,23,24,25,26,27 ARE 1200/5 AMP CACE CLASS 100-100
CT 7,8 IS 600/5 AMP CACE CLASS 100-100

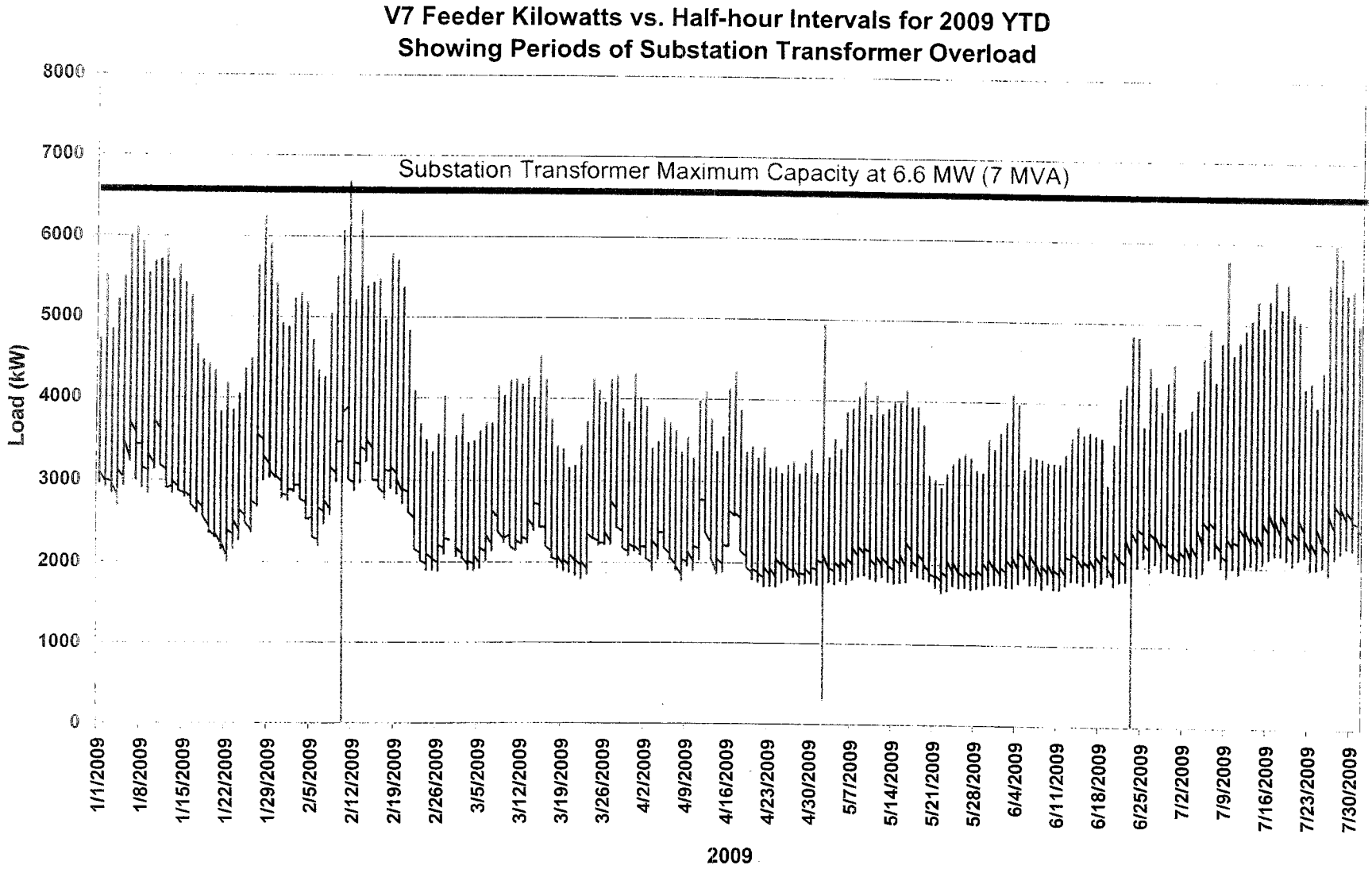
APPROX WEIGHTS IN LBS
TOTAL 81200
UNTANKING 16700
TANK & FITTINGS 8800
TYPE 1 OIL 11500 GAL 8000
NP 2631970

ROME, GEORGIA
MADE IN U.S.A.

CONTAINS NO DETECTABLE PCB AT TIME OF MANUFACTURE

Maximum V7 Feeder Kilowatts vs. Half-hour Intervals for 5 Year Period 2004-2008 Showing Periods of Substation Transformer Overload




V7 Feeder Kilowatts vs. Half-hour Intervals for 2009 YTD
Showing Periods of Substation Transformer Overload
Substation Transformer Maximum Capacity at 6.6 MW (7 MVA)
Load (kW)
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1/2009
1/8/2009
1/15/2009
1/22/2009
1/29/2009
2/5/2009
2/12/2009
2/19/2009
2/26/2009
3/5/2009
3/12/2009
3/19/2009
3/26/2009
4/2/2009
4/9/2009
4/16/2009
4/23/2009
4/30/2009
5/7/2009
5/14/2009
5/21/2009
5/28/2009
6/4/2009
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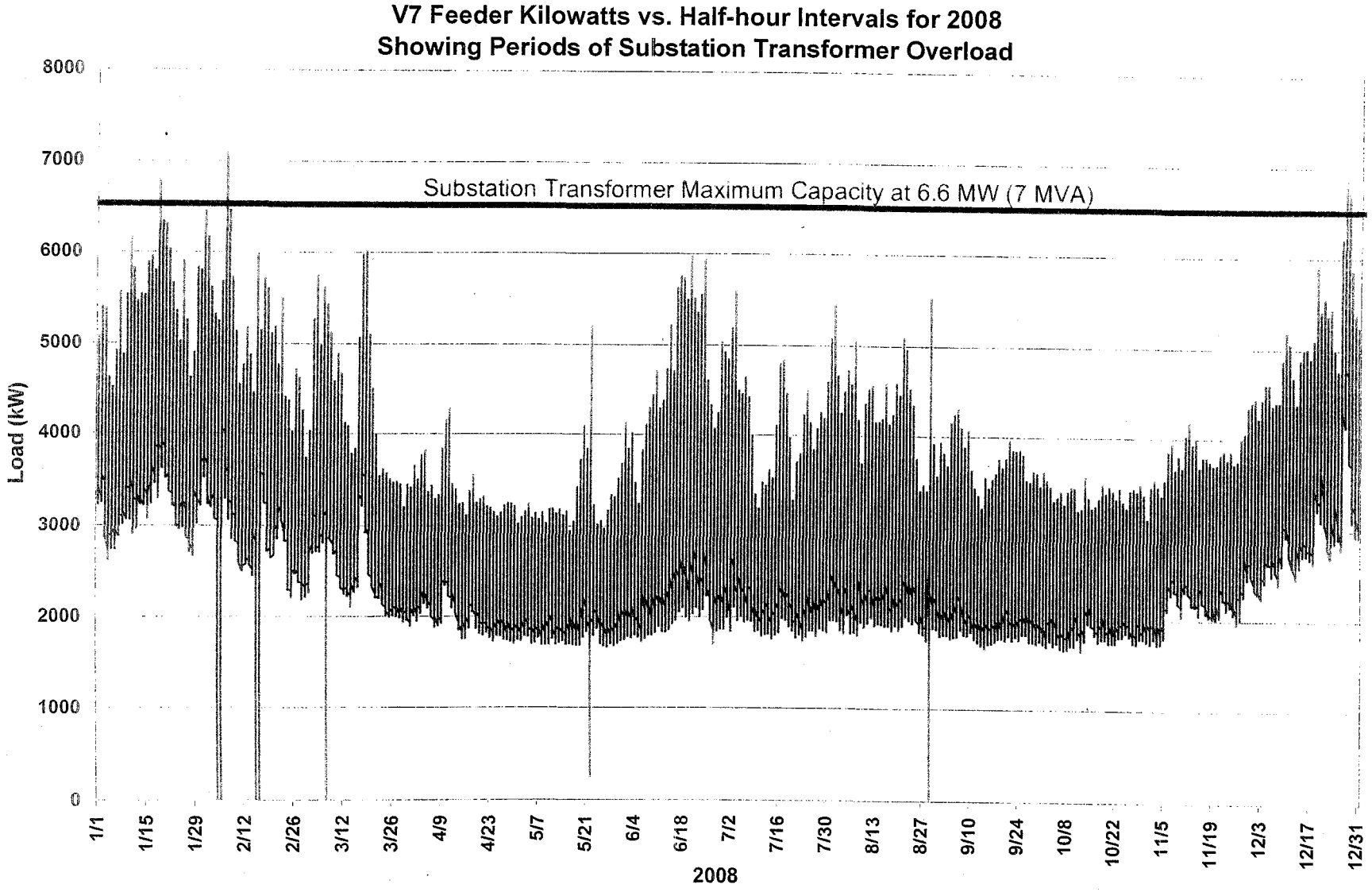
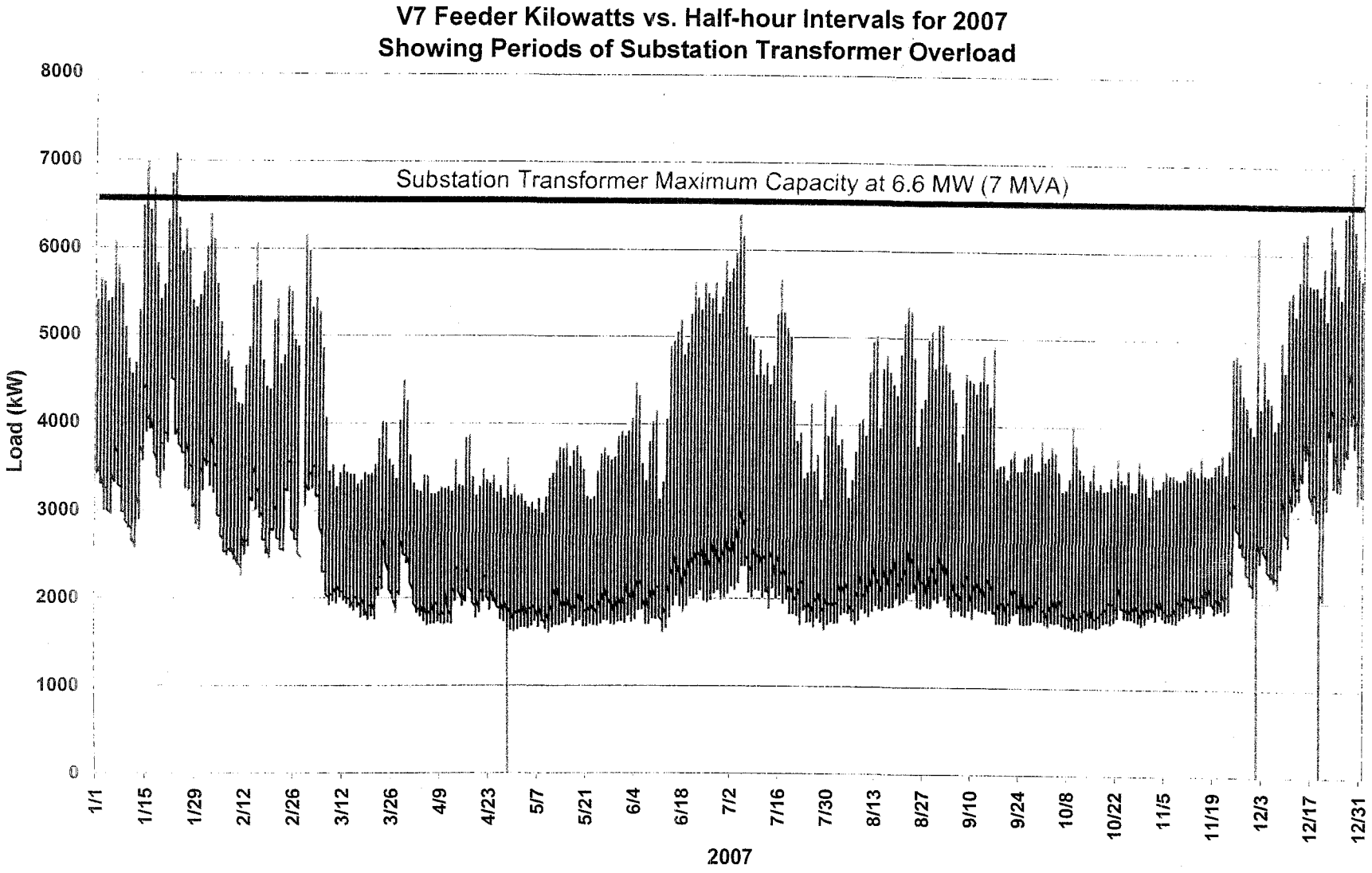
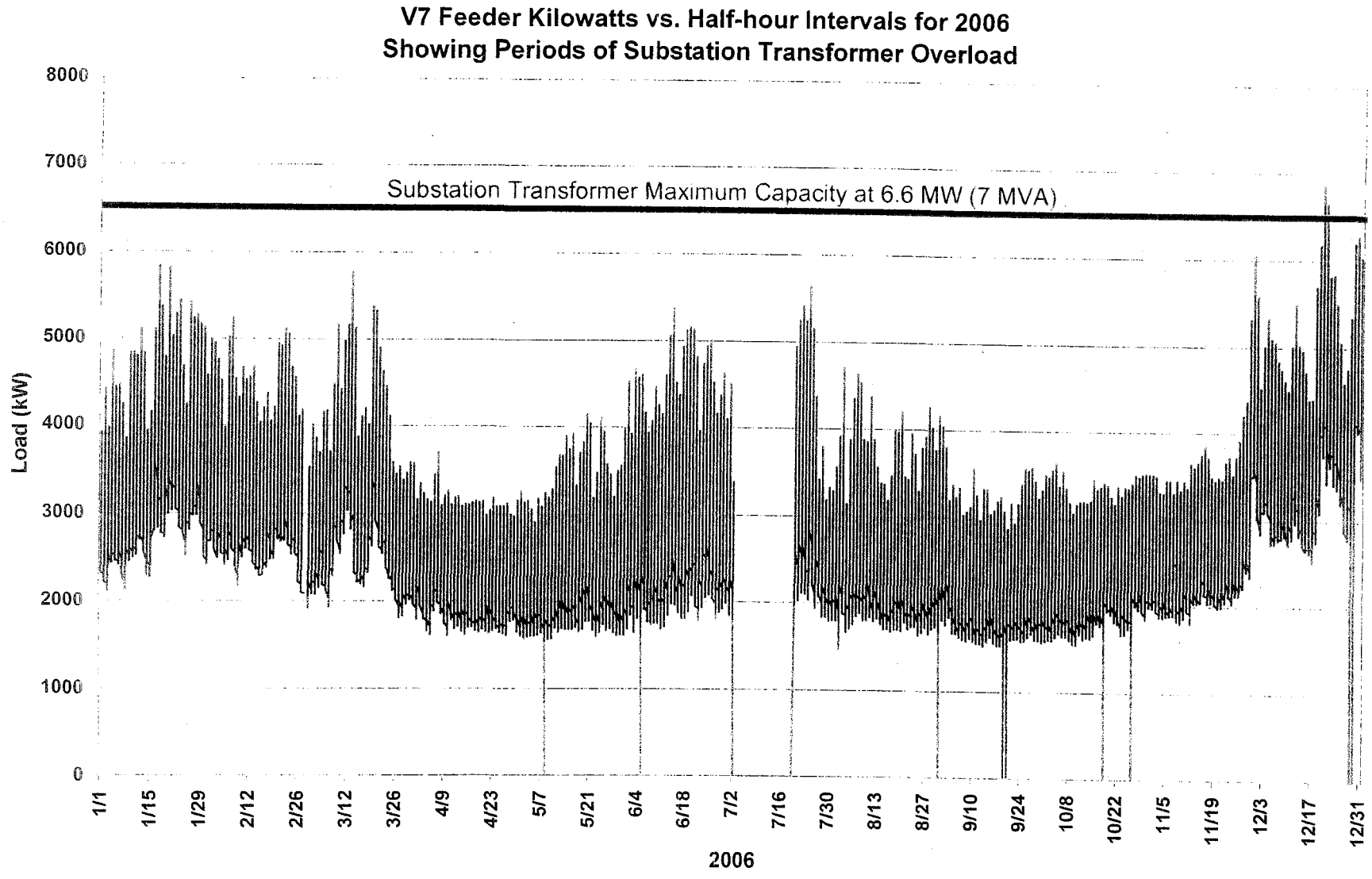
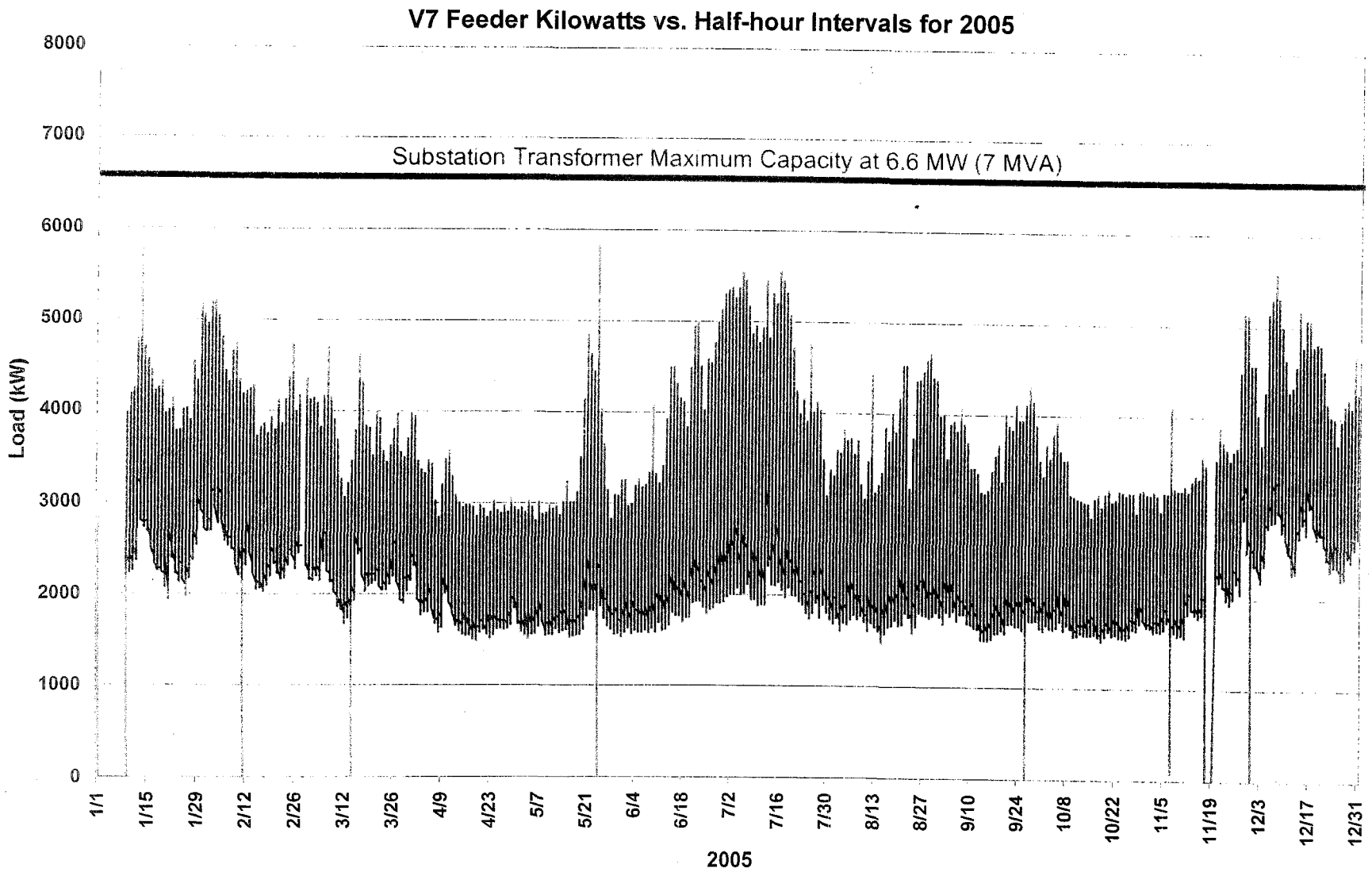
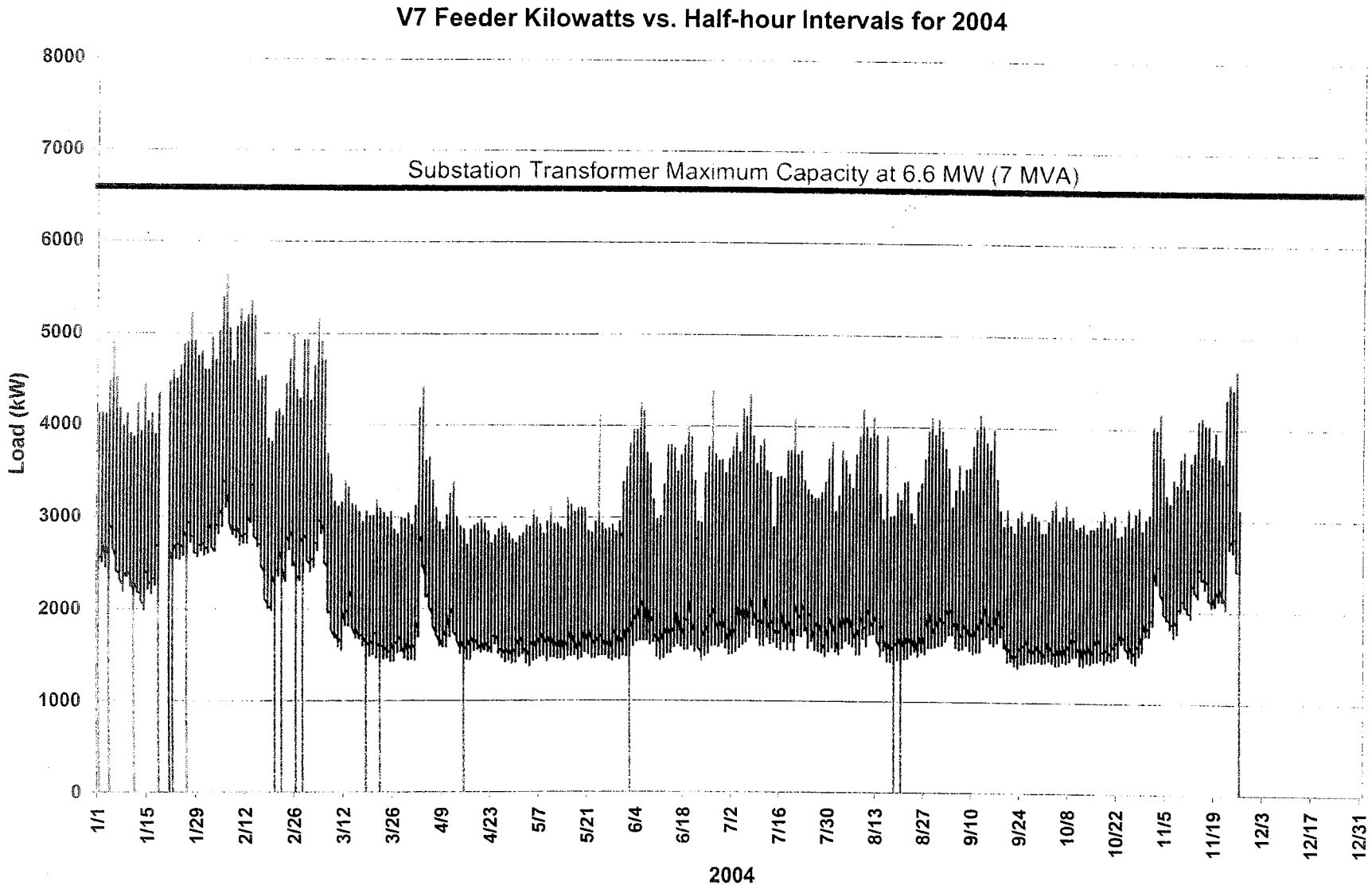
7/23/2009
7/30/2009
2009


V7 Feeder Kilowatts vs. Half-hour Intervals for 2008
Showing Periods of Substation Transformer Overload
Substation Transformer Maximum Capacity at 6.6 MW (7 MVA)
Load (kW)
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1
1/15
1/29
2/12
2/26
3/12
3/26
4/9
4/23
5/7
5/21
6/4
6/18
7/2
7/16
7/30
8/13
8/27
9/10
9/24
10/8
10/22
11/5
11/19
12/3
12/17
12/31
2008


V7 Feeder Kilowatts vs. Half-hour Intervals for 2007
Showing Periods of Substation Transformer Overload
Substation Transformer Maximum Capacity at 6.6 MW (7 MVA)
Load (kW)
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1
1/15
1/29
2/12
2/26
3/12
3/26
4/9
4/23
5/7
5/21
6/4
6/18
7/2
7/16
7/30
8/13
8/27
9/10
9/24
10/8
10/22
11/5
11/19
12/3
12/17
12/31
2007


V7 Feeder Kilowatts vs. Half-hour Intervals for 2006
Showing Periods of Substation Transformer Overload
Substation Transformer Maximum Capacity at 6.6 MW (7 MVA)
Load (kW)
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1
1/15
1/29
2/12
2/26
3/12
3/26
4/9
4/23
5/7
5/21
6/4
6/18
7/2
7/16
7/30
8/13
8/27
9/10
9/24
10/8
10/22
11/5
11/19
12/3
12/17
12/31
2006


V7 Feeder Kilowatts vs. Half-hour Intervals for 2005
Substation Transformer Maximum Capacity at 6.6 MW (7 MVA)
Load (kW)
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1
1/15
1/29
2/12
2/26
3/12
3/26
4/9
4/23
5/7
5/21
6/4
6/18
7/2
7/16
7/30
8/13
8/27
9/10
9/24
10/8
10/22
11/5
11/19
12/3
12/17
12/31
2005


V7 Feeder Kilowatts vs. Half-hour Intervals for 2004
Substation Transformer Maximum Capacity at 6.6 MW (7 MVA)
Load (kW)
8000
7000
6000
5000
4000
3000
2000
1000
0
1/1
1/15
1/29
2/12
2/26
3/12
3/26
4/9
4/23
5/7
5/21
6/4
6/18
7/2
7/16
7/30
8/13
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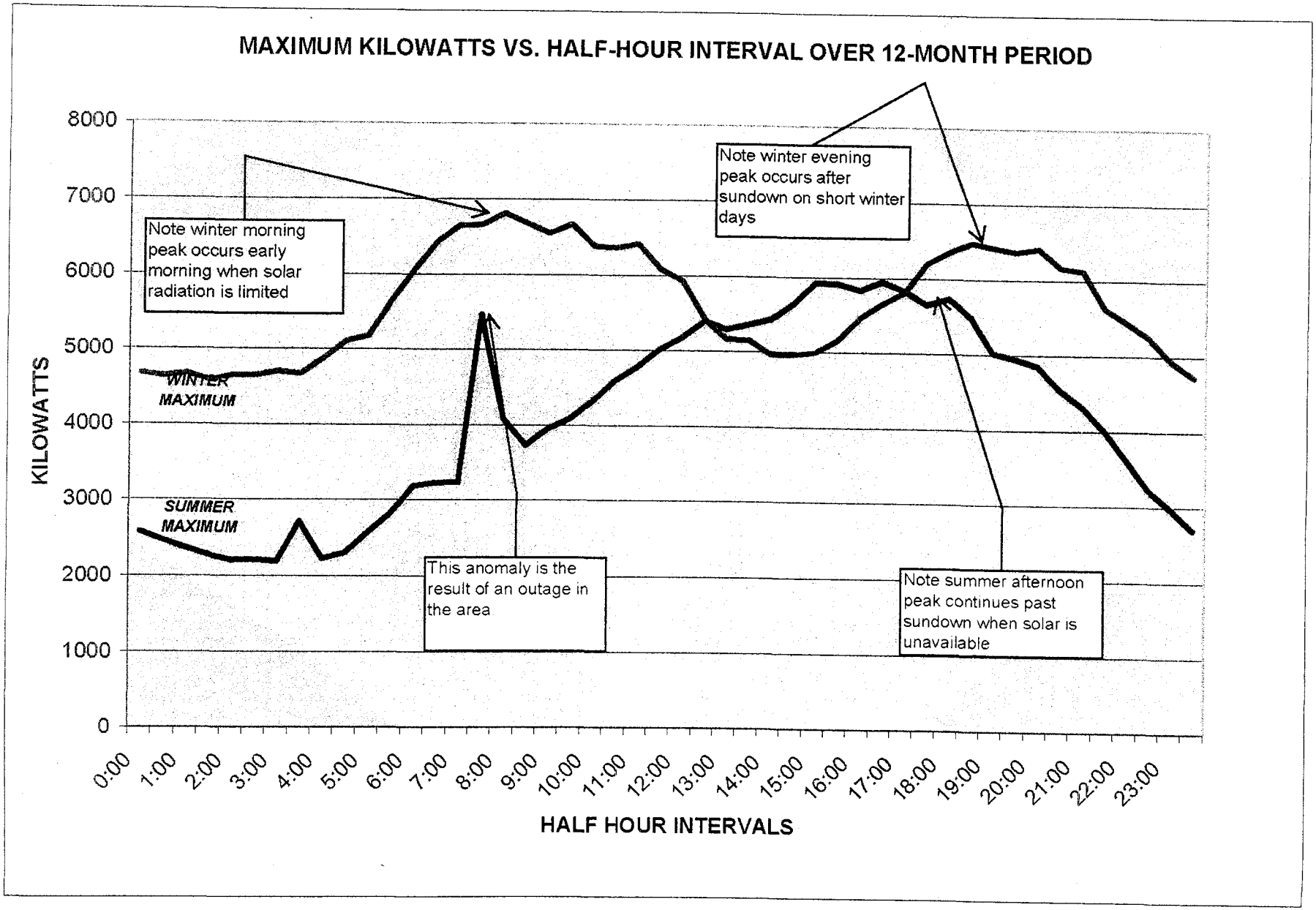
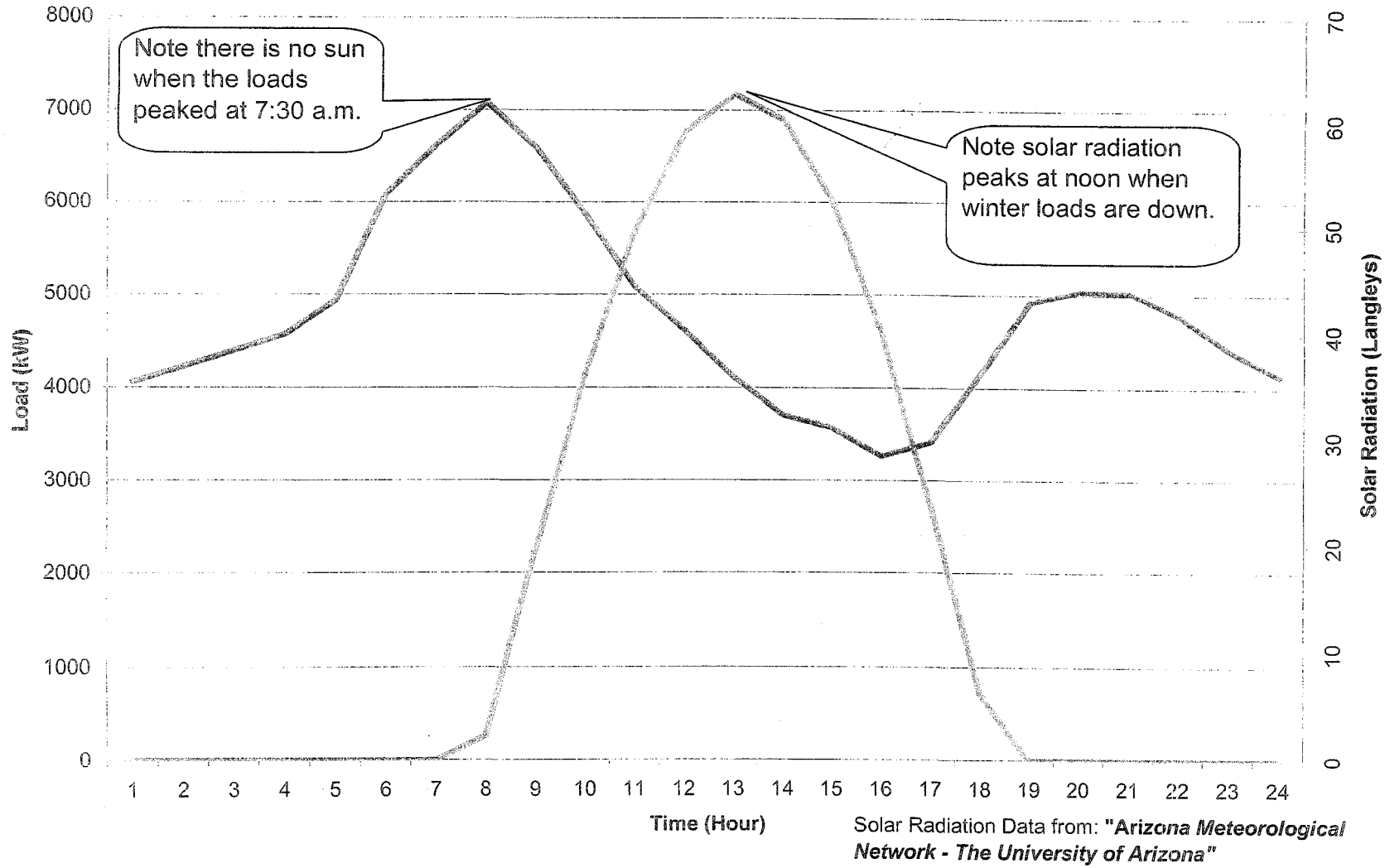
10/8
10/22
11/5
11/19
12/3
12/17
12/31
2004


MAXIMUM KILOWATTS VS. HALF-HOUR INTERVAL OVER 12-MONTH PERIOD
KILOWATTS
8000
7000
6000
5000
4000
3000
2000
1000
0
WINTER MAXIMUM
SUMMER MAXIMUM
Note winter morning peak occurs early morning when solar radiation is limited
Note winter evening peak occurs after sundown on short winter days
This anomaly is the result of an outage in the area
Note summer afternoon peak continues past sundown when solar is unavailable
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
HALF HOUR INTERVALS

V7 Feeder Load & Solar Radiation on February 6, 2008



Solar Radiation Data from: ***"Arizona Meteorological Network - The University of Arizona"***

THE UNIVERSITY OF ARIZONA®

Arizona Cooperative Extension

AZMET

The Arizona Meteorological Network

Turf Reports

Yesterday's Weather Summary

Crop Reports

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Other Sources of Weather Information

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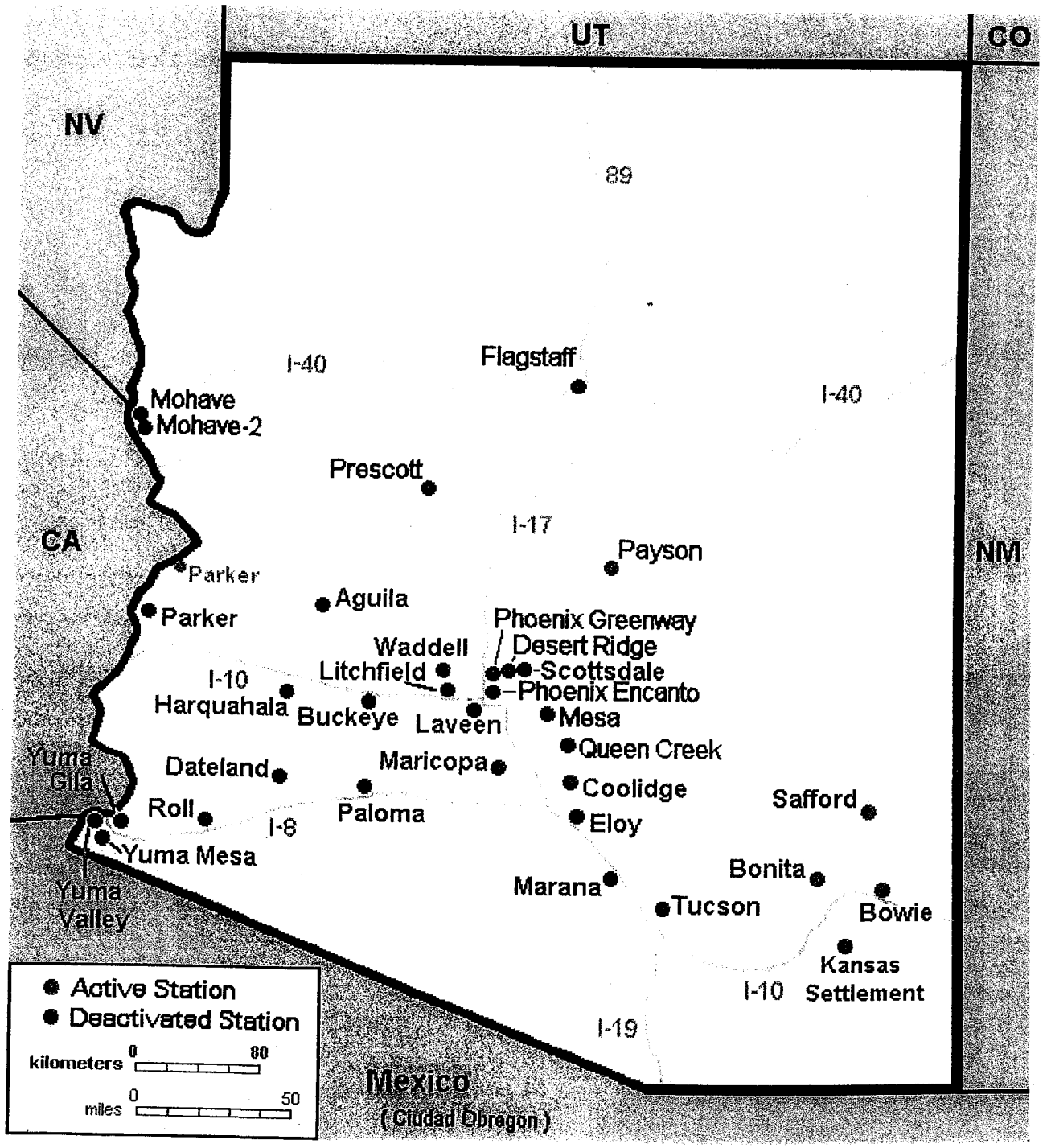
AZMET : The Arizona Meteorological Network



- Latitude, Longitude, Elevation - All Stations
- Map of Arizona Landmarks
- Map of Arizona Counties

AZMET Hourly Weather Data : TUCSON : Feb 6 2008

HR	AT	TD	RH	VPD	SR	PPT	ST4	ST20	WS	WSX	WVM	WVD
1	31.8	31.1	97.1	0.0	0.0	0.00	41.5	48.7	1.1	2.7	1.1	96
2	31.8	30.9	96.0	0.0	0.0	0.00	40.6	48.7	1.3	2.7	1.3	97
3	30.9	30.2	97.3	0.0	0.0	0.00	39.7	48.6	0.9	2.0	0.9	63
4	29.5	29.1	98.7	0.0	0.0	0.00	39.0	48.6	0.9	2.0	0.9	53
5	28.4	28.4	99.7	0.0	0.0	0.00	38.5	48.4	0.9	2.0	0.7	80
6	27.7	27.7	99.8	0.0	0.0	0.00	37.9	48.4	0.9	2.0	0.9	98
7	27.3	27.3	99.8	0.0	0.0	0.00	37.4	48.2	1.1	2.5	1.1	97
8	28.4	28.0	98.3	0.0	2.4	0.00	37.2	48.2	1.6	2.7	1.6	93
9	34.5	30.2	84.0	0.1	19.8	0.00	37.0	48.0	2.2	4.5	2.2	90
10	39.9	31.1	70.7	0.3	36.3	0.00	39.0	47.8	2.7	4.3	2.5	53
11	45.5	31.3	57.3	0.4	49.7	0.00	42.8	47.7	2.2	6.0	1.3	67
12	49.3	29.7	46.6	0.6	59.3	0.00	46.6	47.5	2.5	6.7	1.3	79
13	51.3	28.2	40.7	0.8	62.8	0.00	50.0	47.3	4.7	11.0	4.0	299
14	53.4	27.3	36.3	0.9	60.4	0.00	52.7	47.3	4.3	9.4	3.4	270
15	55.2	24.8	30.7	1.0	52.6	0.00	54.3	47.3	3.6	8.9	2.7	309
16	57.4	22.6	25.7	1.2	40.1	0.00	55.2	47.3	2.5	7.2	1.8	296
17	56.7	25.0	29.2	1.1	23.6	0.00	54.7	47.3	6.5	10.3	6.0	287
18	54.5	28.6	37.0	0.9	6.4	0.00	52.7	47.5	7.6	13.2	7.4	293
19	50.7	30.4	45.6	0.7	0.0	0.00	50.7	47.7	3.4	7.6	3.1	297
20	43.5	33.8	68.5	0.3	0.0	0.00	48.7	47.8	1.1	2.0	0.9	101
21	40.1	34.9	81.4	0.2	0.0	0.00	46.9	48.0	0.9	2.5	0.7	101
22	37.6	34.3	88.4	0.1	0.0	0.00	45.5	48.2	1.3	2.7	1.1	58
23	36.1	33.8	91.8	0.1	0.0	0.00	44.4	48.2	0.9	2.2	0.7	125
24	34.2	33.1	95.4	0.0	0.0	0.00	43.3	48.4	1.3	3.8	1.3	75

AZMET Daily Weather Data : TUCSON : Feb 6 2008

	MAX.	MIN.	MEAN	TOTAL	UNITS
TEMPERATURE	58.6	26.2	40.6		DegF
RELATIVE HUMIDITY	100.0	18.7	71.5		%
DEWPOINT			29.7		DegF
ACTUAL VAPOR PRESS.			0.6		KPas
VAPOR PRESS. DEF.			0.4		KPas
SOIL TEMP. 4 in	55.2	37.0	44.8		DegF
SOIL TEMP. 20 in	48.7	47.1	48.0		DegF
WIND SPEED	13.2		2.5		MPH
WIND VECTOR MAG.			0.7		MPH
WIND VECTOR DIR.			334		Degrees
SOLAR RADIATION				413.5	Langleys
PRECIPITATION				0.00	Inches
AZMET REF. EVAPOTRANSPIRATION				0.10	Inches
STD. REF. EVAPOTRANSPIRATION				0.07	Inches

HEAT UNITS	86/55F		86/50F		86/45F	
	DAY	CUM	DAY	CUM	DAY	CUM
SINE CURVE	0.5	87	2.0	169	4.0	277

DEFINITIONS AND UNITS

AT : Air Temp (DegF)
TD : Dewpoint (DegF)
RH : Rel Humidity (%)
VPD : Vapor Pressure Deficit(KPas)
SR : Solar Rad (Langleys)
PPT : Precipitation (Inches)
DAY : Heat Units for Day
CUM : Heat Units Accumulated Since Jan 1, 2008

ST4 : Soil Temp 4in (DegF)
ST20 : Soil Temp 20in (DegF)
WS : Mean Wind Speed (MPH)
WSX : Max Wind Speed (MPH)
WVM : Wind Vector Magnitude (MPH)
WVD : Wind Vector Direction (Degrees)
or 999 : Missing Data

AZMET Hourly Weather Data : KANSAS SETTLEMENT : Feb 6 2008

HR	AT	TD	RH	VPD	SR	PPT	ST4	ST20	WS	WSX	WVM	WVD
1	21.7	18.3	85.8	0.1	0.0	0.00	36.5	48.7	3.6	6.0	3.4	118
2	19.9	17.4	89.2	0.0	0.0	0.00	35.4	48.7	2.5	5.6	2.2	120
3	18.5	15.6	88.6	0.0	0.0	0.00	34.3	48.7	1.6	5.8	1.3	164
4	19.0	16.7	89.9	0.0	0.0	0.00	33.6	48.7	2.7	5.6	2.5	113
5	17.1	14.7	90.1	0.0	0.0	0.00	32.9	48.6	3.6	6.7	3.6	136
6	17.1	14.7	90.2	0.0	0.0	0.00	32.4	48.6	1.6	3.8	1.1	48
7	16.0	13.8	90.4	0.0	0.0	0.00	31.6	48.6	1.3	4.0	0.7	140
8	17.4	15.1	89.6	0.0	4.5	0.00	31.3	48.6	1.8	3.6	1.6	46
9	26.1	20.5	78.6	0.1	21.7	0.00	30.9	48.4	0.9	2.7	0.7	350
10	31.1	24.1	74.9	0.2	37.3	0.00	31.3	48.4	2.5	6.5	2.2	331
11	36.9	25.0	62.2	0.3	50.4	0.00	32.9	48.4	2.0	5.4	1.6	327
12	41.7	21.9	45.2	0.5	59.0	0.00	38.1	48.2	2.9	8.1	2.0	315
13	45.0	16.9	31.9	0.7	62.1	0.00	43.2	48.2	3.1	8.5	2.2	301
14	47.8	15.1	26.5	0.8	59.5	0.00	47.5	48.0	5.1	10.7	4.5	321
15	50.5	19.4	28.7	0.9	50.9	0.00	50.7	48.0	5.6	12.1	4.5	290
16	52.9	19.4	26.4	1.0	38.0	0.00	52.9	47.8	5.1	11.6	4.7	254
17	53.6	15.8	22.1	1.1	22.7	0.00	53.2	47.8	6.9	12.1	6.7	285
18	50.5	17.1	26.3	0.9	6.0	0.00	52.3	47.7	8.3	11.6	8.1	296
19	44.8	18.0	33.8	0.7	0.0	0.00	50.2	47.7	7.6	10.1	7.6	294
20	40.1	18.5	41.5	0.5	0.0	0.00	48.0	47.7	3.4	7.2	2.0	265
21	38.5	19.9	46.8	0.4	0.0	0.00	45.9	47.7	1.6	4.9	0.2	24
22	37.6	20.5	49.5	0.4	0.0	0.00	44.1	47.7	2.0	5.4	1.6	3
23	34.0	20.3	56.7	0.3	0.0	0.00	42.4	47.7	2.7	4.9	0.4	227
24	32.7	20.1	59.3	0.3	0.0	0.00	41.0	47.7	3.1	6.0	0.4	148

AZMET Daily Weather Data : KANSAS SETTLEMENT : Feb 6 2008

	MAX.	MIN.	MEAN	TOTAL	UNITS
TEMPERATURE	55.0	12.6	33.8		DegF
RELATIVE HUMIDITY	93.8	20.9	59.3		%
DEWPOINT			18.3		DegF
ACTUAL VAPOR PRESS.			0.3		KPas
VAPOR PRESS. DEF.			0.4		KPas
SOIL TEMP. 4 in	53.4	30.9	40.5		DegF
SOIL TEMP. 20 in	48.7	47.7	48.2		DegF
WIND SPEED	12.1		3.4		MPH
WIND VECTOR MAG.			1.3		MPH
WIND VECTOR DIR.			296		Degrees
SOLAR RADIATION				412.3	Langleys
PRECIPITATION				0.00	Inches
AZMET REF. EVAPOTRANSPIRATION				0.10	Inches
STD. REF. EVAPOTRANSPIRATION				0.08	Inches

HEAT UNITS	86/55F		86/50F		86/45F	
	DAY	CUM	DAY	CUM	DAY	CUM
SINE CURVE	0.0	28	0.7	76	2.2	147

DEFINITIONS AND UNITS

AT : Air Temp (DegF)
TD : Dewpoint (DegF)
RH : Rel Humidity (%)
VPD : Vapor Pressure Deficit(KPas)
SR : Solar Rad (Langleys)
PPT : Precipitation (Inches)
DAY : Heat Units for Day
CUM : Heat Units Accumulated Since Jan 1, 2008

ST4 : Soil Temp 4in (DegF)
ST20 : Soil Temp 20in (DegF)
WS : Mean Wind Speed (MPH)
WSX : Max Wind Speed (MPH)
WVM : Wind Vector Magnitude (MPH)
WVD : Wind Vector Direction (Degrees)
or 999 : Missing Data

AZMET Raw Data Formats

Hourly and Daily Data Formats

AZMET provides edited data in comma delimited ASCII format for use in application and database programs.
There are two types of comma delimited data files:
1) Hourly and 2) Daily.
In all raw data files, the units of measurement are Metric.

1) Hourly summaries contain hourly means and totals for all weather parameters monitored or calculated by AZMET.
The Raw Hourly Data file will contain hourly data only.
These files can be loaded into programs and data bases.

2) Daily data files contain only the daily data summaries.
The summary format differs slightly from that presented in the hourly data files. (See below).

All data summaries (both hourly and daily) terminate with a carriage return line feed character sequence. The rest of this document identifies the sequence and units for individual data points within a given data summary. Data points are identified and described in the order in which they appear in the file (left to right). NOTE! Data declared bad by AZMET Editing routines will appear as the integer 9999 or 999.

In 1999 we changed the depths of our soil temperature sensors : 1999 Soil Temperature Depths .

1) HOURLY DATA FILES

```
DATA POINT
NUMBERS -->  1  2  3  4    5    6  7 8  9   10   11  12  13  14 15  16  17
             |  |  |  |    |    |  | |  |    |    |   |   |   |  |   |   |
            92,254,1,20.9,42.2,1.4,0,0,25.5,27.6,1.6,1.3,147,33,2.6,.05,.34
DATA -->    92,254,2,19.5,49.8,1.1,0,0,24.8,27,1,.8,192,37,1.5,.03,.28
            92,254,3,19.1,51,1.1,0,0,24.2,26.5,1,.8,236,41,2.3,.03,.26
            92,254,4,18.1,55.1,.9,0,0,23.7,26,1.3,.8,289,48,2.5,.02,.22
```

Hourly Summaries

Data Point #	Explanation
1	Year of data. A two-digit number representing the last two digits of the year (e.g. 87 means 1987)
2	Day of year. This varies from 1 to 366 depending on the day of the year and whether the year is Leap Year.
3	Hour of day. Varies from 1 to 24 and represents the time of day the

subsequent data were obtained. For data representing means and totals, the time represents the end of the averaging or totalizing period (e.g. means and totals obtained at hour 12 represent means and totals over the 60-minute period ending at 12:00).

4 Mean air temperature in degrees Celsius.

5 Mean relative humidity in percent.

6 Mean vapor pressure deficit in kilo-pascals.

7 Total solar radiation in megajoules per square meter.

8 Total precipitation in millimeters.

9 Current soil temperature at 5cm depth in degrees Celsius. Soil surface is bare. Moved to 10cm in 1999.

10 Current soil temperature at 10cm depth in degrees Celsius. Soil surface is bare. Moved to 50cm in 1999.

11 Mean wind speed in meters per second.

12 Wind vector magnitude in meters per second.

13 Wind vector direction in degrees.

14 Standard deviation of the wind direction in degrees.

15 Maximum wind speed for hour in meters per second.

16 Reference crop evapotranspiration in millimeters.

17 Heat unit (degree day) total for hour. Heat unit limits are 30 and 12.8 C.

2) DAILY DATA FILES

```
DATA POINT
NUMBERS -->     1  2  3  4    5    6    7    8    9   10   11  12 13  14
                |  |  |  |    |    |    |    |    |    |    |   |  |   |
DATA -->       92,254,6,40.2,15.1,27.6,69.9,7.9,33.5,3.1,23.45,0,38,22.4,
                                29.3,34.1,24.7,29.1,1.3,.5,14,66,4.2,6.6,12
                                  |    |    |    |   |  |   |  |  |   |   |
DATA POINT NUMBERS -->           15   16   17   18  19 20  21 22 23  24  25
```

* NOTE: Daily data is actually all on one line per day, it has been put on two lines here to label each data point by number.

Data Point #	Explanation
1	Year of data. A two-digit number representing the last two digits of the year (e.g. 87 = 1987).
2	Day of year. This varies from 1 to 366 depending on day of year and whether year is a Leap Year.
3	Station number. Each station has an assigned number to aid data retrieval and database management. Listed below are the locations and their corresponding station numbers:

Station Number	Location	Station Number	Location
1	Tucson	14	Yuma North Gila
2	Yuma Valley	15	Phoenix Encanto
3	Yuma Mesa	16	Eloy
4	Safford	17	Dateland
5	Coolidge	18	Scottsdale
6	Maricopa	19	Paloma
7	Aguila	20	Mohave
8	Parker	21	Laveen
9	Bonita	22	Queen Creek
10	Waddell, Citrus Farm	23	Harquahala
11	Litchfield	24	Roll
12	Phoenix Greenwa	25	Ciudad Obregon
13	Marana	26	Buckeye

4	Maximum air temperature in degrees Celsius.
5	Minimum air temperature in degrees Celsius.
6	Mean air temperature in degrees Celsius.
7	Maximum relative humidity in percent.
8	Minimum relative humidity in percent.
9	Mean relative humidity in percent.
10	Mean vapor pressure deficit in kilopascals.
11	Total solar radiation in megajoules per square meter.
12	Total precipitation in millimeters.
13	Maximum soil temperature at 5cm depth in degrees Celsius. Bare soil surface.

Moved to 10cm in 1999.

14 Minimum soil temperature at 5cm depth in degrees Celsius. Bare soil surface. Moved to 10cm in 1999.

15 Mean soil temperature at 5 cm depth in degrees Celsius. Bare soil surface. Moved to 10cm in 1999.

16 Maximum soil temperature at 10cm depth in degrees Celsius. Bare soil surface. Moved to 50cm in 1999.

17 Minimum soil temperature at 10cm depth in degrees Celsius. Bare soil surface. Moved to 50cm in 1999.

18 Mean soil temperature at 10cm depth in degrees Celsius. Bare soil surface. Moved to 50cm in 1999.

19 Mean wind speed in meters per second.

20 Wind vector magnitude in meters per second.

21 Wind vector direction in degrees.

22 Wind direction standard deviation in degrees.

23 Maximum wind speed in meters per second.

24 Total reference evapotranspiration in millimeters.

25 Daily heat unit (degree day) total. Heat unit limits are 30 and 12.8 C.

Raw Data Formats : 2003 - Present

AZMET offers two types of comma delimited (ASCII format) data files: Hourly and Daily.
These raw data files can be loaded into spreadsheets
and databases such as Excel and Access, etc.
The raw files can also be read by advanced programming languages.
In all raw data files, the units of measurement are Metric.

In an effort to improve our service, we have made major changes
to the format of our raw data files from 2003 to present.
Both the Raw Hourly and Raw Daily files are altered.

All data for 2003 has been reprocessed and put into these new formats.
(Raw data files from 2002 and earlier, are still in the old original format.
Although, we are considering reworking past years into the new format.)

The Raw Hourly data has two new values added to the end of each line of data:
Actual Vapor Pressure (hourly average) at data point position 17
Dewpoint (hourly average) at data point position 18
The hourly integrated heat unit value which was at data point position 17
will be removed due to lack of use. The more widely accepted sine curve heat unit
value can still be found in the raw daily data.
Each hourly line will have a total of 18 values.

The Raw Daily data has three new values added to the end of each line of data:
Reference Evapotranspiration (ETo) by Penman-Monteith equation, at data point
position 26
Actual Vapor Pressure (daily mean at data point position 27
Dewpoint (daily mean) at data point position 28
Also note that the positions of the original AZMET ETo and heat unit values
have been transposed from the order of previous years.
Each daily line will have a total of 28 values.

In 1999 we changed the depths of our soil temperature sensors : 1999 Soil Temperature
Depths .

HOURLY FILES (2003 - Present) :

```
DATA POINT
NUMBERS --> 1  2  3  4    5    6  7 8  9   10   11  12  13  14 15  16  17  18
            |  |  |  |    |    |  | |  |    |    |   |   |   |  |   |   |   |
DATA --> 2003,254,1,20.9,42.2,1.4,0,0,25.5,27.6,1.6,1.3,147,33,2.6,.05,.34,-.3
```

Data Point		Description
1	A	Year
2	B	Day of Year (DOY)
3	C	Hour of Day
4	D	Air Temperature
5	E	Rel. Humidity
6	F	Vapor Pressure Deficit
7	G	Solar Radiation
8	H	Precipitation
9	I	4" Soil Temperature (= 2" prior to 1999)
10	J	20" Soil Temperature (= 4" prior to 1999)
11	K	Wind Speed (Ave)
12	L	Wind Vector Magnitude
13	M	Wind Vector Direction
14	N	Wind Direction Standard Deviation
15	O	Max Wind Speed
16	P	Reference Evapotranspiration (ETo) - Original AZMET
17	Q	Actual Vapor Pressure 'New' : 2003 to Present
18	R	Dewpoint, Hourly Average 'New' : 2003 to Present

DAILY FILES (2003 - Present) :

```
DATA POINT
NUMBERS -->    1  2  3  4    5    6    7    8   9   10   11  12 13  14
               |  |  |  |    |    |    |    |   |    |    |   |  |   |
DATA -->    2003,254,6,40.2,15.1,27.6,69.9,7.9,33.5,3.1,23.45,0,38,22.4,
                       29.3,34.1,24.7,29.1,1.3,.5,14,66,4.2,12,6.2,6,.4,.2
                        |    |    |    |   |  |   |  |  |   |   |  |  |   |
DATA POINT NUMBERS --> 15   16   17   18  19 20  21 22 23  24  25  26 27 28
```

* NOTE: Daily data is actually all on one line per day,
it has been put on two lines here to label each data point by number.

Data Point		Description
1	A	Year
2	B	Day of Year (DOY)
3	C	Station Number
4	D	Air Temp - Max
5	E	Air Temp - Min
6	F	Air Temp - Mean
7	G	RH - Max
8	H	RH - Min
9	I	RH - Mean

10	J	VPD - Mean	
11	K	Solar Rad. - Total	
12	L	Precipitation - Total	
13	M	4" Soil Temp - Max (= 2" prior to 1999)	
14	N	4" Soil Temp - Min (= 2" prior to 1999)	
15	O	4" Soil Temp - Mean (= 2" prior to 1999)	
16	P	20" Soil Temp - Max (= 4" prior to 1999)	
17	Q	20" Soil Temp - Min (= 4" prior to 1999)	
18	R	20" Soil Temp - Mean (= 4" prior to 1999)	
19	S	Wind Speed - Mean	
20	T	Wind Vector Magnitude for Day	
21	U	Wind Vector Direction for Day	
22	V	Wind Direction Standard Deviation for Day	
23	W	Max Wind Speed	
24	X	Heat Units (30/12.8 C) (86/55 F)	| positions
25	Y	Reference Evapotranspiration (ETo) = Original AZMET	| switched 2003
26	Z	Reference Evapotranspiration (ETo) = Penman-Monteith	'New' 2003-Present
27	AA	Actual Vapor Pressure - Daily Mean	'New' 2003-Present
28	AB	Dewpoint, Daily Mean	'New' 2003-Present

STATION NUMBERS

1 = Tucson	11 = Litchfield	21 = Laveen	31 = Prescott
2 = Yuma Valley	12 = Phx. Greenway	22 = Queen Creek	32 = Payson
3 = Yuma Mesa	13 = Marana	23 = Harquahala	33 = Bowie
4 = Safford	14 = Yuma N. Gila	24 = Roll	34 = Kansas Settleme
5 = Coolidge	15 = Phx. Encanto	25 = Ciudad Obregon	
6 = Maricopa	16 = Eloy	26 = Roll	
7 = Aguila	17 = Dateland	27 = Desert Ridge	
8 = Parker	18 = Scottsdale	28 = Mohave #2	
9 = Bonita	19 = Paloma	29 = Mesa	
10 = Citrus Farm	20 = Mohave	30 = Flagstaff	

AZMET Units of Measurement Conversion Factors

AZMET weather stations record and store data in metric units.
The data contained in our Raw Hourly and Daily files is in metric units.
The word 'English' here does not refer to the language.
'English' units are those units of measurements which were standardized

and used throughout Great Britain.

	METRIC UNITS	CONVERSION ----->	ENGLISH UNITS
Air Temperature	DegC	* 1.8 + 32	DegF
Relative Humidity	%	-none-	%
Vapor Pressure Deficit	KPas	-none-	KPas
Solar Radiation	MJ/Sq M	* 23.89	Langleys
Precipitation	MM	* .03937	Inches
Soil Temperature	DegC	* 1.8 + 32	DegF
Wind Speed	M/S	* 2.237	MPH
Wind Vector Magnitude	M/S	* 2.237	MPH
Wind Vector Direction	Deg	-none-	Deg
Wind Direction Standard Deviation	Deg	-none-	Deg
Reference Evapotranspiration	MM	* .03937	Inches
Heat Units	(C)	* 1.8	(F)

The '*' symbol means "multiply by"

METRIC	ABBR.	UNITS
Air Temperature	DegC	Degrees Centigrade
Relative Humidity	%	Percent
Vapor Pressure Deficit	KPas	Kilopascals
Solar Radiation	MJ/Sq M	MegaJoules per Square Meter
Precipitation	MM	Millimeters
Soil Temperature	DegC	Degrees Centigrade
Wind Speed	M/S	Meters per Second
Wind Vector Magnitude	M/S	Meters per Second
Wind Vector Direction	Deg	Degrees
Wind Direction Standard Deviation	Deg	Degrees
Reference Evapotranspiration	MM	Millimeters
Heat Units	HU	Heat Units in Centigrade

ENGLISH	ABBR.	UNITS
Air Temperature	DegF	Degrees Fahrenheit
Relative Humidity	%	Percent
Vapor Pressure Deficit	KPas	Kilopascals
Solar Radiation	--	Langleys
Precipitation	In	Inches
Soil Temperature	DegF	Degrees Fahrenheit
Wind Speed	MPH	Miles per Hour
Wind Vector Magnitude	MPH	Miles per Hour
Wind Vector Direction	Deg	Degrees
Wind Direction Standard Deviation	Deg	Degrees
Reference Evapotranspiration	In	Inches
Heat Units	HU	Heat Units in Fahrenheit

Regional Technical Seminar

West Regional Technical Seminar
Phoenix AZ
Tuesday January 31, 2006

Industry Practice on Transformer Loading

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WAUKESHA ELECTRIC SYSTEMS

Agenda

- Industry Guides
- Limiting Parameters for Overloading
- Theoretical Life
- Functional Life
- User's Practice – Worldwide Survey

Let's make this interactive!

Please stop me and ask questions during the presentation if you have them

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Industry Practice on Transformer Loading

- **Industry Guides**

old

C57.91-1981
Distribution Tr.

C57.92-1981
Power Tr.

C57.115-1991
Power Tr.>100MVA

⇒ (New) ANSI/IEEE C57.91-1995 Guide for Loading Transformers *

*** This guide is currently being revised by the IEEE Transformers Committee**

IEC Publication 354 (1991) Loading Guide for oil-immersed power transformers (This is being revised by IEC TC14 and will be re-numbered as IEC 60076-7)

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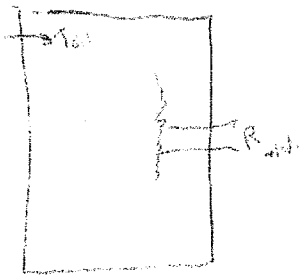
Industry Practice on Transformer Loading

- **Industry Guides**
  - Main differences between IEEE and IEC standards and guides are limits and calculation methods for Hot-spot temperature
  - IEC limits are lower (160 °C) than the IEEE limit of 180 °C
  - IEC calculation utilize the H factor of 1.1(for Distribution Tr.) to 1.3 (for Power Tr.)
  - New IEC revision will state this H factor ranges 1.0-2.1
    - With default value of 1.1 for Distribution Tr. And 1.5 for ON or OF cooling and 1.2 for OD cooling Power Tr.
  - IEEE requires more accurate calculation and verification (C57.12.00)

Waukesha Limits 140°C



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Industry Practice on Transformer Loading

- **Limiting Parameters for Overloading**
  - Under old guides;
    - **Top oil temperature ≤ 110 °C**
    - **Winding Hot-spot temperature ≤ 180 °C**
    - **Maximum short-time loading ≤ 2 times Maximum Nameplate rating**
  - Under 1995 guide; (*for distribution transformers*)
    - **Top oil temperature ≤ 120 °C**
    - **Winding Hot-spot temperature ≤ 200 °C**
    - **Short-time loading (1/2 hours or less) ≤ 3 times Maximum Nameplate rating**
  - Under 1995 guide; (*for power transformers*)
    - **Top oil temperature ≤ 110 °C**
    - **Winding Hot-spot temperature ≤ 180 °C**
    - **Maximum loading ≤ 2 times Maximum Nameplate rating**

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Industry Practice on Transformer Loading

Under IEC 354-1991;

Types of Loading	Distribution Transformers	Medium Power Transformers	Large Power Transformers
Normal cyclic loading			
Current (p.u.)	1.5	1.5	1.5
Hot-spot temperature and metallic parts in contact with insulating material (°C)	140	140	140
Top-oil temperature (°C)	105	105	105
Long-time emergency cyclic loading			
Current (p.u.)	1.8	1.5	1.3
Hot-spot temperature and metallic parts in contact with insulating material (°C)	150	140	130
Top-oil temperature (°C)	115	115	115
Short-time emergency cyclic loading			
Current (p.u.)	2.0	1.8	1.5
Hot-spot temperature and metallic parts in contact with insulating material (°C)	N/A	160	160
Top-oil temperature (°C)	N/A	115	115

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WAUKESHA ELECTRIC SYSTEMS

Top oil 110 [illegible] IEC
Hot spot [illegible] 140 recommended

Industry Practice on Transformer Loading

- **Theoretical Life**

$$Life = \exp\left(\frac{15000}{HST + 273} - 27.604\right)$$

Where, Life = Life in hours at temperature HST
HST = Hot Spot Temperature in °C

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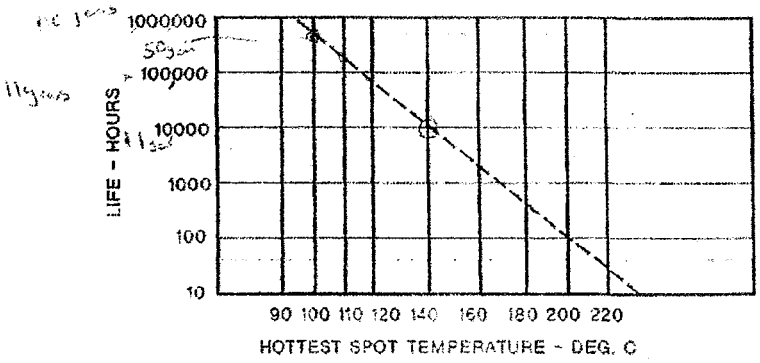
Industry Practice on Transformer Loading

- **Theoretical Life**



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WAUKESHA ELECTRIC SYSTEMS

Industry Practice on Transformer Loading

- **Theoretical Life**

Basis	Normal insulation life	
	Hours	Years
50% retained tensile strength of insulation (former IEEE Std C57.92-1981 criterion)	65,000	7.42
25% retained tensile strength of insulation	135,000	15.41
200 retained degree of polymerization in insulation	150,000	17.12
Interpretation of distribution transformer functional life test data (former IEEE Std C57.91-1981 criterion)	180,000	20.55

"Normal insulation life" of a well-dried, oxygen-free 65 °C average winding temperature rise insulation system at the reference temperature of 110 °C.

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Industry Practice on Transformer Loading

- **Theoretical Life**
  - Aging of insulation materials is caused by
    - o Moisture
    - o Oxygen
    - o Temperature
    - o Time
  - Proper application of oil preservation systems and maintenance can minimize the moisture and oxygen content
  - Proper loading can minimize the hot-spot temperature

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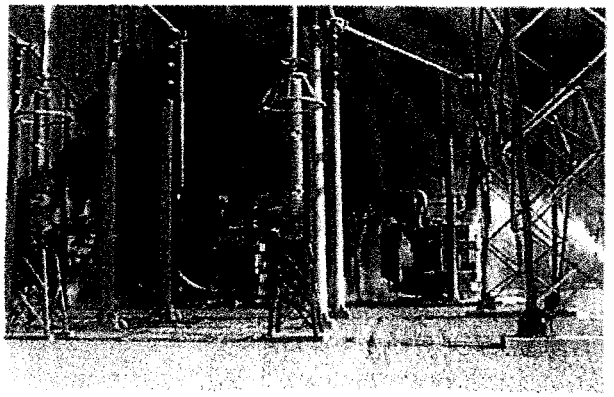
WAUKESHA ELECTRIC SYSTEMS

Industry Practice on Transformer Loading

Functional Life



MPEG Video

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WAUKESHA ELECTRIC SYSTEMS

Industry Practice on Transformer Loading

- **Functional Life**
  - Defined as conditions which the transformer does not function as intended
  - Overloading can cause "Bubbles" in the oil to cause dielectric failures (Hot-spot Temp.)
  - Overloading can cause tank pressure build-up to cause gasket leaks and PRD operation (Average Oil Temp.)
  - Other loading related issues: Current carrying components' ratings, CT saturation, Lead heating, leakage flux overheating, etc.

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WAUKESHA ELECTRIC SYSTEMS

Industry Practice on Transformer Loading

- **Functional Life (Bubble)**
  - Sources of Bubbles
    - o Gasses Dissolved in Oil
    - o Gasses Generated from Decomposition of insulation
    - o Water Vapor from Paper Insulation in Windings
  - Sudden release of gas/vapor as bubbles is possible under overloading

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WAUKESHA ELECTRIC SYSTEMS

Industry Practice on Transformer Loading

- **Functional Life (Bubbles)**
  - Next series of slides were presented to IEEE T&D Conference in Atlanta in 2001 by T.V. Oommen, Permission to use them granted by the author
  - Based on Two EPRI Reports
    - o EL-6761, March 1990
    - o EL-7291, March 1992

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WAUKESHA ELECTRIC SYSTEMS

SSVEC

V-7 Milsoft Analysis

V7 Analysis
July 2009
David J. Bryan, P.E.

Objective

A request was made to study a 336 ACSR, 25 KV distribution line from Huachuca West substation to the proposed Sonoita substation. The new line would be an express feeder, meaning there would be no local loads or taps connected to the line. The question is: how much additional load could this solution support?

The line would be constructed as a second circuit on the existing line. It should be noted that whether the proposed express feeder is part of a double circuit or built adjacent to the existing line does not effect a power flow analysis.

Details of Analysis

For the analysis, a new Milsoft model was created with detailed individual customers and line segments. Development of the model used the following specifications and parameters: the model used a July 2007 line facility export from SSVEC's GIS, and the typical construction unit was changed from a standard RUS C1 construction to SSVEC's standard overhead neutral unit, which is a common unit used in rural line design.

The model used consumer loads and feeder peak data from February 2008;the load mix was 37.5% constant power, 37.5% constant impedance, and 25% constant amps. This approximates standards from industry articles and manuals.

Load allocation was performed with a peak load of 7132 kW (February 6, 2008), an increase of 18.5% over previous analysis peak of 6021 kW in July 2007. The load factors were decreased significantly from 50-60% to 18 -- 25% to match typical consumer load factors at this time of year. As a point of reference, the load factor is a ratio of energy used versus peak demand. At 100% load factor, the peak demand is on 100% of the time; 50% load factor, peak is on 50% of the time.

The parameters identified for this model development produce much more accurate and detailed analysis compared to prior models. While this does not make a significant difference in the results previously reported, it does provide the best analysis that can be done at this time.

The base case with the existing configuration model with no improvements was analyzed for voltage and capacity issues, and the results shown in Figure 1. The model identified several line segment locations with unacceptable voltages (below 118V) and protective devices overloaded beyond their rated ampacity. This matched previous analysis done in November 2007..

A 477 ACSR express feeder, approximately 23 miles long, was modeled from the Huachuca West substation to the Sonoita substation site (Figure 2). SSVEC conductor size standards do not include 336ACSR; the next standard size was used for this model. The use of 477ACSR instead of 336ACSR provides an additional 26% ampacity [530amps to 670amps] with a 42% reduction in conductor resistance. For a 23 mile long distribution line, this is a significant reduction in

voltage drop, as shown in Figure 3 as compared to Figure 2. The rest of analysis and report is based on the use of 477ACSR wire.

At the Sonoita substation site, the existing incoming distribution line was opened to the east of the T-junction, immediately west of the existing Sonoita regulators. With this configuration, the Huachuca West substation serves the load from Mustang Corner to the Highway 83 and Papago Springs Road intersection.

With no improvements nor changing of any existing line regulators, the model indicated low voltages on the Elgin single phase tap and three phase line to Patagonia. Typical benefits of this significant amount of improvements are that all low-voltage and capacity issues are instantly corrected, which did not occur..

Loads in the Patagonia area were re-phased to balance the three phases' loading. The amperage went from 53-33-38 to 41-33-49 amps. All line regulators were removed and reinstalled individually using multiple load flow runs. Capacitors were also tried to correct low voltage issues, but did not work as a likely result of high line charging capacitance. The end result was that:

1) the three line regulators from Huachuca West substation to the new Sonoita substation were removed;
2) the existing Elgin regulator was moved upstream and a second regulator installed;
3) A new regulator bank at the end of the 477 ACSR express feeder was installed.

The net result was that two three phase regulator banks were removed and one additional single phase regulator was installed. The load flow results at the end of this step are shown in Figure 4.

It should be noted the load flow showed low voltage on the 477 ACSR express feeder prior to the line regulator. However since there are no customers on this express feeder, this low-voltage is acceptable.

Using successive load flow analyses, the residential and commercial loads were increased in the model to indicate growth. Irrigation and spot load (greater than 100 kW) were not increased. The majority of the load growth was on that portion of line between Sonoita and Patagonia; significant growth from Mustang corner to the new Sonoita substation site; and minor growth on the single phase tap to Elgin. A summary of the growth is shown below.

Location	kW Increase	% Increase
Mustang corner to new Sonoita substation site	38.9	2.4%
South and West of Sonoita	151	10.6%
Single phase to Elgin	66.2	8.2%
Total Substation including other areas besides 3 above	362	4.8%

The load flow results of the feeder with the improvements and the load growth are shown in Figure 5.

Losses

There are significant losses on the existing configuration of the V7 feeder – just over 24% (1734kW) during peak loading conditions. The proposed 477 ACSR express feeder model drops the losses to over 12% during peak loading conditions. These percentages are based on the Milsoft load flow analysis, which does not include losses due to line regulators.

Capacity

The analysis did not include correcting devices whose capacity was overloaded. The overloaded devices include line reclosers, substation transformer, and substation regulators. Line reclosers would be changed out as part of any large-scale facilities upgrade in an area. The current Huachuca substation transformer's maximum rating is 7000 kW, and the transformer is serving over 7000kW. The current substation's regulators are rated at 200 amps at the neutral setting, and the regulators are carrying over 190 amps.

Summary

Adding an express feeder line that is 23 miles long, 477ACSR, overhead 3phase, rebuilding the substation, and including some other minor improvements allows an additional 362kW to be served. For planning, SSVEC assumes the average household has 7kW of peak load. This equates to approximately 52 additional homes can be served.

Respectively submitted August 7, 2009

David J. Bryan, P.E.
Engineer
SSVEC

David Bryan

Digitally signed by David Bryan
DN: cn=David Bryan, c=US, o=SSVEC, ou=Engineering, email=dbryan@ssvec.com
Date: 2009.08.07 15:15:26 -07'00'

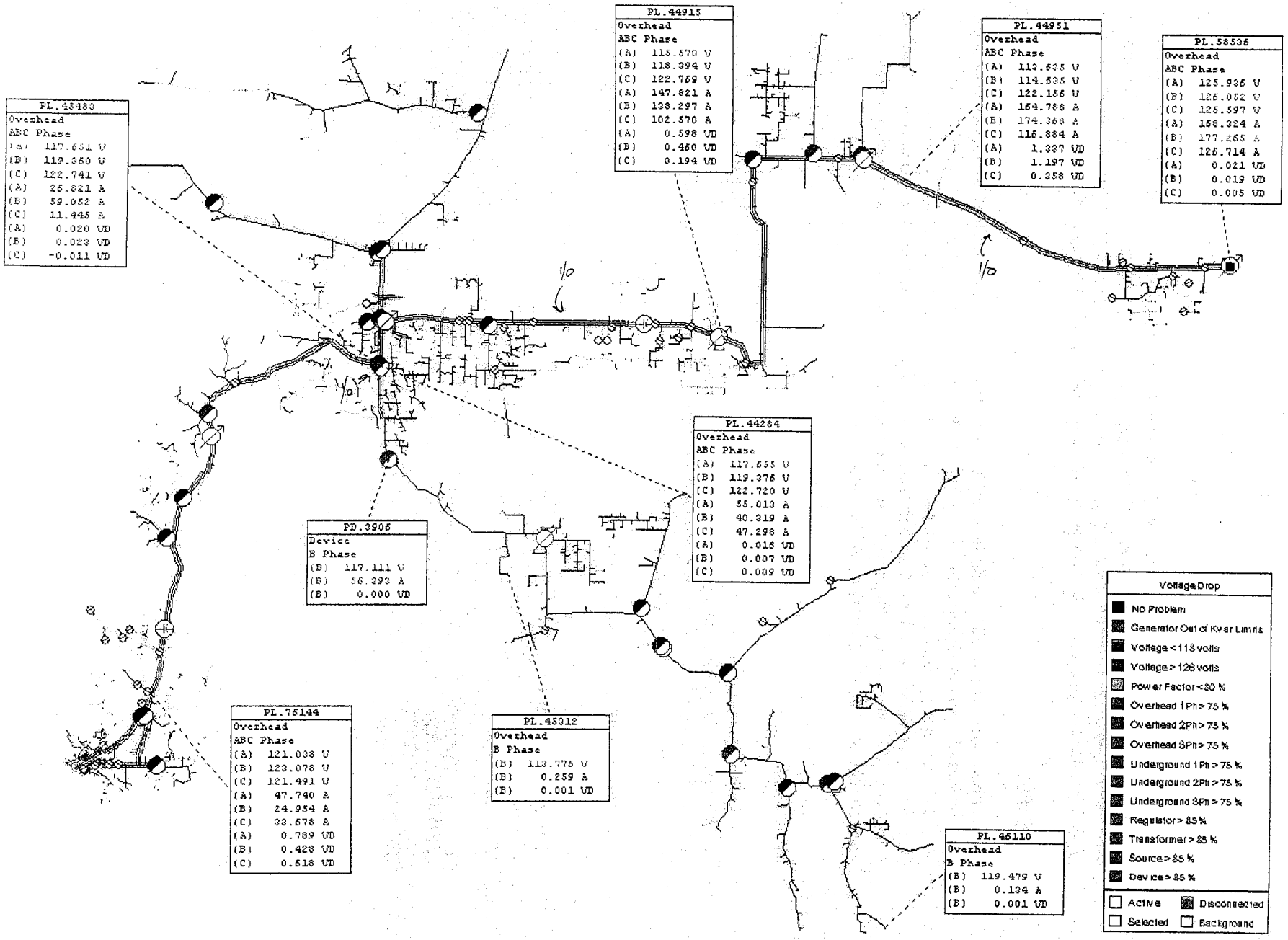


Figure 1: Base Case, Feb 2008 loads, no improvements

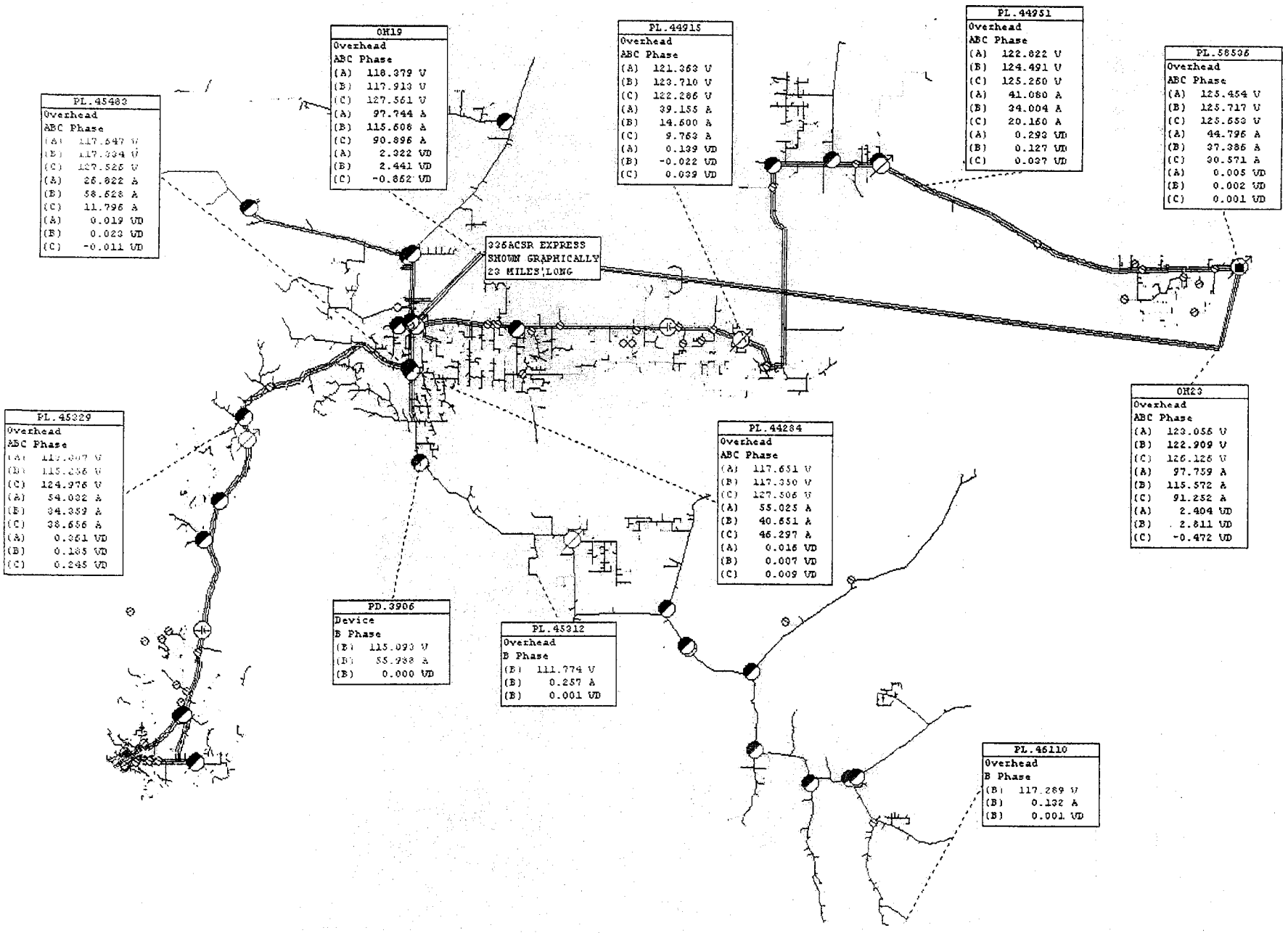


Figure 2: Added 336ACSR line [shown physically incorrect], no other changes, no growth

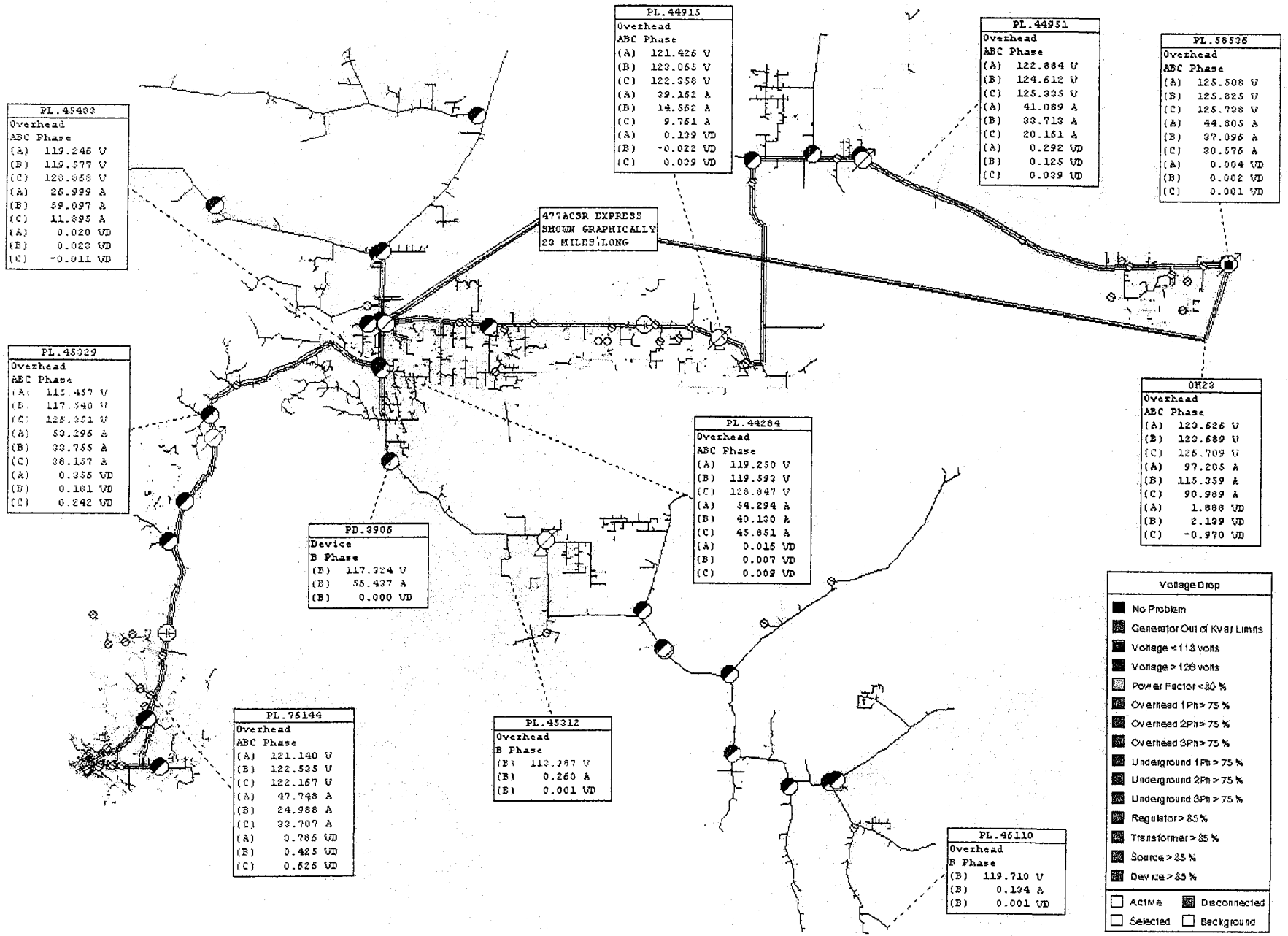


Figure 3: Added 477ACSR line [shown physically incorrect], no other changes, no growth

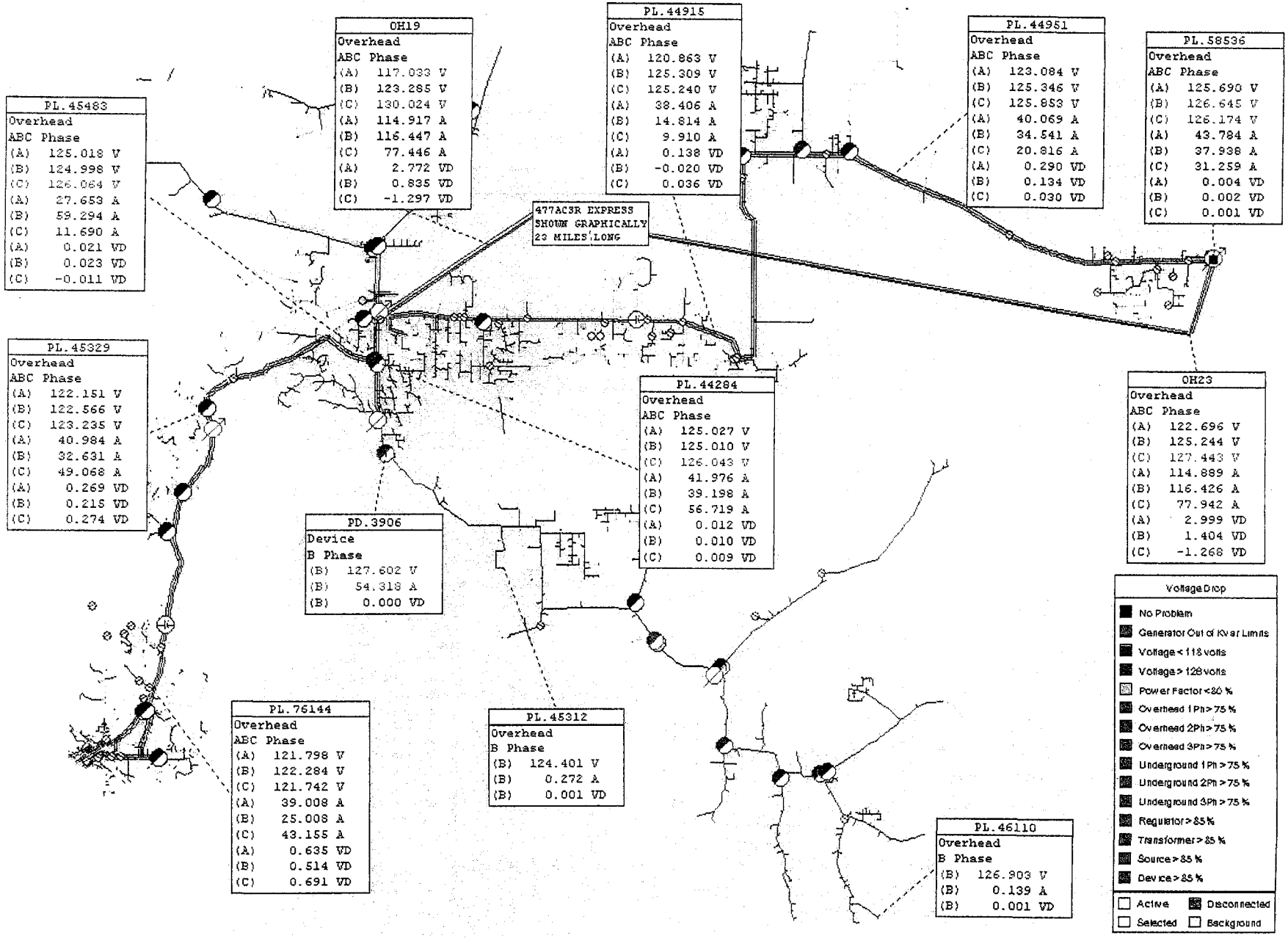


Figure 4: Added 477ACSR line [shown physically incorrect], added/removed regulators, no growth

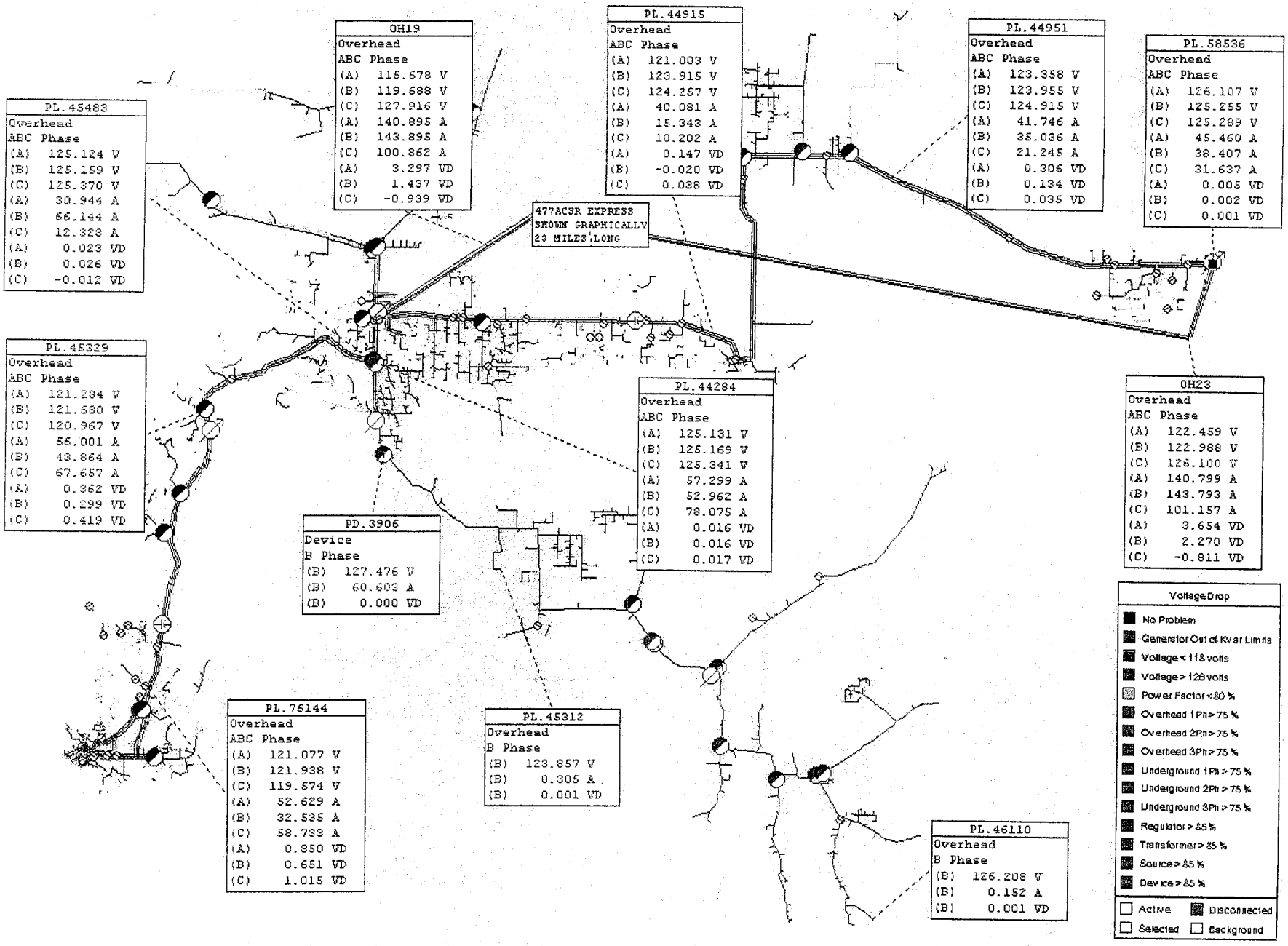


Figure 7 Added 477ACSR line [shown physically incorrect], added/removed regulators, maximum growth

SSVEC

Cost Estimates

Sulphur Springs Valley Electric Cooperative, Inc.

A Touchstone Energy® Cooperative

Sonoita Reliability Project
SSVEC Rate Case E-01575A-08-0328
May 11, 2009

OPTIONS CONSIDERED AND COST ESTIMATES

SSVEC considered many options before making the final decision on where to build and what kind of system to build to ensure quality and reliable service to all of our members in the Sonoita/Elgin/Patagonia area.

- **Option 1: As Currently Planned**

  The route that SSVEC has chosen is the most cost-efficient route, affects the fewest members, and uses existing easements. The cost to build this route and substation is approximately $13.5 million. This route has been on record for more than a quarter of a century and is an established utility corridor. Other alternatives would cost approximately 1.8 to 4.1 times more than the $13.5 projected cost of this option.

- **Option 2: Following V7 Feeder – Energized (Hot)**

  This option upgrades the existing feeder line along Highway 82 and Elgin Road. Rebuilding the line energized would be slow, expensive, and dangerous to our linemen. In addition, it would require the acquisition of rights-of-way from more than 80 landowners, as the existing right-of-way does not include sub-transmission land rights. Furthermore, the majority of this route has been designated a part of the 2000 Las Cienegas Conversation Area and would require special permitting from the Bureau of Land Management. The cost of this option would be approximately $24.6 million.

- **Option 2A: Following V7 Feeder – De-Energized (Cold)**

  This option upgrades the existing feeder line along Highway 82 and Elgin Road. This option reflects the de-energized cost by building an adjacent line. Rebuilding this line by building an adjacent line to the current line, while safer for our linemen, will still require the rights-of-way mentioned in Option 2 above. The cost of this option is approximately $19.6 million.

- **Option 3: 69kV URD (Buried)**

  This option would follow the Option 1 "As Currently Planned" route - but with an underground (URD) 69 kV sub-transmission line. Although this option seems to be a simple solution (especially since many residential members have opted to install underground distribution lines), installing an underground sub-transmission line is a very complex task and significant issues are involved and is quite expensive. Those issues are:

  1. The insulated cables used in underground sub-transmission lines require one or two large trenches which lead to greater environmental disturbances. Also, concrete vaults or large manhole covers are required every 900 to 2,000 feet depending on terrain.

2. Underground electric conductors produce heat, and, for efficient operation, this heat must me carried away from the conductors (air performs this function for overhead lines). This requires special concrete caps around the soils and special thermal backfill material to move the heat away from the line.
3. The right-of-way must be kept clear of any vegetation due to the possible interference by root systems.
4. Studies have indicated the lifespan of underground conductors is half that of overhead, thus increasing costs over time.
5. Any failures in underground transmission lines are extremely costly, disruptive, and time expensive to repair. Underground outages can last for weeks and even months.

The estimated cost of underground 69kV sub-transmission line is estimated to cost approximately $55 million, plus the shorter life span and increased cost over time to repair.

- **Option 4: To Buchanan on Babocomari**

This option would follow the Option 1 "As Currently Planned" route but would end the sub-transmission line at the Buchanan Substation site and build a new substation in the Sonoita Hills Subdivision. After input from the community, it was determined that moving this substation to an industrial/business location would impact less people. If SSVEC were to build on this site, it would require building not only a substation, but also one triple-circuit and one single-circuit large conductor feeder through the Sonoita Hills Subdivision. This option would cost approximately $13.3 million but was not chosen because for $200,000 more, we decided to move the substation and the lines to an industrial/business location.

- **Option 5: TEP Interconnect - Interconnect to the TEP 46kV Sub-Transmission Line.***

This TEP line was built in the 1940's. Several significant issues were identified with this alternative:

1. This power line serves Fort Huachuca and does not have enough capacity available for a substation to carry the additional load of the Sonoita/Elgin/Patagonia area.
2. TEP is bound through their Certificate of Convenience and Necessity by a special bonding arrangement which strictly limits their ability to serve outside two counties. TEP's management in 1993 and in 2007 indicated that a joint project may violate their bonding agreement.
3. Additional rights-of-way adjacent to the TEP line would be required, which would be expensive.
4. SSVEC's short-cost analysis also indicates that this option would be much more expensive than the chosen route .

** Option 5 is not a viable option, therefore, it was not fully estimated.*

Cost Summary for Sonoita Reliability Project Options					
Cost Category	Option #1 As Currently Planned	Option #2 Following V7 Feeder (Hot)	Option #2A Following V7 Feeder (Cold)	Option #3 69kV URD	Option #4 To Buchanan on Babocomari
Labor	$2,111,677	$4,678,210	$2,768,232	$14,651,321	$2,152,797
Materials	$4,315,260	$6,428,950	$6,123,620	$32,230,965	$5,048,297
Equipment & Rentals	$747,222	$1,951,193	$1,324,910	$1,852,193	$647,668
Transportation & Travel Costs	$504,914	$1,339,492	$937,946	$1,246,492	$467,038
Substation	$3,525,000	$3,875,000	$3,675,000	$3,875,000	$3,525,000
ROW & Fees	$686,435	$3,309,464	$3,138,653	$754,592	$86,539
Misc & Overhead	$1,622,657	$3,029,107	$1,709,135	$861,584	$1,389,225
Total	**$13,513,165**	**$24,611,416**	**$19,677,496**	**$55,472,147**	**$13,316,564**

10037537.1

Deborah White

From: Carroll, Bradley [bcarroll@swlaw.com]
Sent: Monday, May 11, 2009 10:53 AM
To: Creden W. Huber; Kirby Chapman; Jack Blair; Deborah White; Ron Orozco; Anselmo Torres
Cc: Christopher Hitchcock
Subject: 69 kV line Summary of Costs for Options - Late filed Hearing Exhibit
Attachments: 69kV Line 69 KV Option Late Filed Exhibit_10037537_1.DOC

Attached for your information and records is the final summary breakdown of costs for the various options considered for the Sonoita Reliability Project that ties into the the customer mailing that was already introduced as an exhibit at the hearing. This document will be filed as a late filed hearing exhibit later today, along with the two other late filed exhibits ordered by the ALJ. Thank you all for your assistance with this.

Bradley S. Carroll
Snell & Wilmer L.L.P.
602.382.6578 (direct)
bcarroll@swlaw.com

Job Cost Estimate for Sonoita Reliability Project

Estimates built on date: 3/31/2009 (inflation-sensitive date) 3 2009

WO #	WO Name	Start Date	Completion Date	# of Months from Estimate to Completion	740c	Engineering Hours	Construction Man Hours	Total Hours	Direct Material Charge	Materials from Inventory	Material and Construction Labor Guess with overhead factored in	Substation Cost	ROW Costs	Permits & Fees	Consultant - E&G	10% Contingency	# of Days for Travel/Per Diem per Employee	# of Employees on Travel/Per Diem
CONSTRUCTION COSTS																		
1	As Currently Planned	09/30/09	12/31/10	21	800.001	300	22,000	22,300	$ 2,485,807	$ 500,000		$ 3,000,000	$ 382,200	$ 202,000	$ 200,000	$ 300,000	175	15
2	Following V7 Feeder Cold	03/15/10	06/15/11	27	800.001	450	14,400	14,850	$ 3,829,946	$ 500,000		$ 3,000,000	$ 2,272,270	$ 289,896	$ 400,000	$ 300,000	275	15
3	Following V7 Feeder Hot	03/15/10	02/15/12	35	800.001	450	49,200	49,650	$ 3,829,946	$ 500,000		$ 3,000,000	$ 2,272,270	$ 289,896	$ 400,000	$ 300,000	410	15
4	To Buchannan on Babocomari	09/30/09	12/10/10	21	800.001	320	18,090	18,410	$ 2,161,473	$ 500,000		$ 3,000,000	$ 59,150	$ 14,500	$ 225,000	$ 300,000	151	15
5	69kV URD All	03/15/10	02/15/12	35	800.001	600		600			$ 35,079,571	$ 3,000,000	$ 382,200	$ 202,000	$ 600,000	$ 500,000	410	15
6	Buchannan Getaways	09/30/09	12/10/10	21	800.001	250	2,582	2,832	$ 200,000	$ 789,967					$ -	$ 100,000	22	15
7	Sonoita Sub Getaways	09/30/09	12/31/10	21	800.001	250	864	1,114	$ 200,000	$ 157,836					$ -	$ 100,000	7	15
8	New V7 Express Cold - 477	03/15/10	02/15/11	23	800.001	282	7,601	7,883		$ 1,163,662		$ 3,700,000	$ 2,272,270	$ 289,896		$ 330,000	951	1
9	Rebuild V7 Hot - 477	03/15/10	07/15/11	28	800.001	282	11,401	11,683		$ 1,163,662		$ 3,700,000	$ 2,272,270	$ 289,896		$ 400,000	1,426	1
10	Rebuild V7 Double Circuit	05/15/10	07/15/11	28	800.001	400	11,045	11,445		$ 1,552,313		$ 3,700,000	$ 2,272,270	$ 289,896		$ 480,000	1,381	1
11	NAME 11		01/09/13	46	800.001			-										
12	NAME 12		01/10/13	46	800.001			-										
13	NAME 13		01/11/13	46	800.001			-										
14	NAME 14		01/12/13	46	800.001			-										
15	NAME 15		01/13/13	46	800.001			-										
16	NAME 16		01/14/13	46				-										
17	NAME 17		01/15/13	46				-										
18	NAME 18		01/16/13	46				-										
	Construction Totals					3,584	137,183	140,767	$ 12,707,172	$ 6,827,441			$ 12,184,900	$ 1,867,980	$ 1,825,000	$ 3,110,000	5,208	108
RETIREMENT COSTS																		
1	As Currently Planned	09/30/09	12/31/10	21		40	600	640							$ 5,000		5	15
2	Following V7 Feeder Cold	03/15/10	06/15/11	27		100	7,200	7,300							$ 50,000		60	15
3	Following V7 Feeder Hot	03/15/10	02/15/12	35		100	4,800	4,900							$ 50,000		40	15
4	To Buchannan on Babocomari	09/30/09	12/10/10	21				-										
5	69kV URD All	03/15/10	02/15/12	35				-										
6	Buchannan Getaways	09/30/09	12/10/10	21		80	1,257	1,337									10	15
7	Sonoita Sub Getaways	09/30/09	12/31/10	21		40	182	222									2	15
8	New V7 Express Cold - 477	03/15/10	02/15/11	23														
9	Rebuild V7 Hot - 477	03/15/10	07/15/11	28		94	2,850	2,944									357	1
10	Rebuild V7 Double Circuit	05/15/10	07/15/11	28		94	2,850	2,944									357	1
11	NAME 11	01/00/00	01/09/13	46				-										
12	NAME 12	01/00/00	01/10/13	46				-										
13	NAME 13	01/00/00	01/11/13	46				-										
14	NAME 14	01/00/00	01/12/13	46				-										
15	NAME 15	01/00/00	01/13/13	46				-										
16	NAME 16	01/00/00	01/14/13	46				-										
17	NAME 17	01/00/00	01/15/13	46				-										
18	NAME 18	01/00/00	01/16/13	46				-										
	Retirement Totals					548	19,738	20,286	$ -	$ -			$ -	$ -	$ 105,000	$ -	831	77
	Totals					4,132.00	156,921.40	161,053	$ 12,707,172	$ 6,827,441			$ 12,184,900	$ 1,867,980	$ 1,930,000	$ 3,110,000	6,039	185

8 New V7 Express Cold - 477	Build new 477 ACSR Circuit in new 50' wide easement. Leave old line as is. Includes perfecting ROW and permits totalling $2.5M.
9 Rebuild V7 Hot - 477	Build new 477 ACSR Circuit in old alignment. Retire old line. Perfect easement to 50' wide.
10 Rebuild V7 Double Circuit	Build new 477 & 1/0 ACSR Double Circuit in new alignment. Retire old line. Need new 50' wide easement. Can abandon old easement.

All of the above include $2.7 million for new Sonoita sub (Original cost was $3 million reduced to $2.7 million to remove transformer cost) & 1million for transformer and substation upgrade at Huachuca Sub..

Job Cost Estimate for Sonoita Reliability Project

Estimates built on date: 3/31/2009 (inflation-sensiti

WO #	WO Name	Start Date	Completion Date	# of Days of SSVEC Equipment	# of SSVEC Equipment Used	# of Days of Outside Rental Equipment	# of Outside Rental Equipment Used	Contractor Foundations	Contractor SWPP	Contractor Dirt Work Already Completed	Permits & Fees	Fence Rental	Utility Rental	Office Space Rental	Other	Engineering Labor	Construction Labor	Total Direct Labor	All Engineering Consultants
CONSTRUCTION COSTS																			
1	As Currently Planned	09/30/09	12/31/10	175	12	180	4	$ 306,002		$ 85,000		$ 4,500	$ 4,500	$ 4,500		$ 14,561	$ 764,944	$ 779,505	$ 200,000
2	Following V7 Feeder Cold	03/15/10	06/15/11	275	12	275	4	$ 278,184		$ 85,000		$ 6,000	$ 6,000	$ 6,000		$ 21,842	$ 500,691	$ 522,532	$ 400,000
3	Following V7 Feeder Hot	03/15/10	02/15/12	410	12	410	4	$ 278,184		$ 85,000		$ 11,000	$ 11,000	$ 11,000		$ 21,842	$ 1,710,693	$ 1,732,535	$ 400,000
4	To Buchannan on Babocomari	09/30/09	12/10/10	151	12	151	4	$ 250,366		$ 85,000		$ 3,775	$ 3,775	$ 3,775		$ 15,532	$ 628,993	$ 644,525	$ 225,000
5	69kV URD All	03/15/10	02/15/12	410	12	410	4			$ 85,000		$ 11,000	$ 11,000	$ 11,000		$ 29,122	$ -	$ 29,122	$ 600,000
6	Buchannan Getaways	09/30/09	12/10/10	22	4			$ 153,001				$ 500	$ 500	$ 500		$ 12,134	$ 89,777	$ 101,911	$ -
7	Sonoita Sub Getaways	09/30/09	12/31/10	7	4			$ 27,818				$ 200	$ 200	$ 200		$ 12,134	$ 30,041	$ 42,176	$ -
8	New V7 Express Cold - 477	03/15/10	02/15/11	951	1							$ 8,000	$ 8,000	$ 8,000		$ 13,687	$ 264,288	$ 277,976	$ -
9	Rebuild V7 Hot - 477	03/15/10	07/15/11	1,426	1							$ 12,000	$ 12,000	$ 12,000		$ 13,687	$ 396,415	$ 410,102	$ -
10	Rebuild V7 Double Circuit	05/15/10	07/15/11	1,381	1							$ 11,500	$ 11,500	$ 11,500		$ 19,415	$ 384,037	$ 403,452	$ -
11	NAME 11		01/09/13													$ -	$ -	$ -	$ -
12	NAME 12		01/10/13													$ -	$ -	$ -	$ -
13	NAME 13		01/11/13													$ -	$ -	$ -	$ -
14	NAME 14		01/12/13													$ -	$ -	$ -	$ -
15	NAME 15		01/13/13													$ -	$ -	$ -	$ -
16	NAME 16		01/14/13													$ -	$ -	$ -	$ -
17	NAME 17		01/15/13													$ -	$ -	$ -	$ -
18	NAME 18		01/16/13													$ -	$ -	$ -	$ -
	Construction Totals			5,208	71	1,426	20	$ 1,293,555	$ -	$ 425,000	$ -	$ 68,475	$ 68,475	$ 68,475	$ -	$ 173,957	$ 4,769,879	$ 4,943,836	$ 1,825,000
RETIREMENT COSTS																			
1	As Currently Planned	09/30/09	12/31/10	5	12	5	4					$ 125	$ 125	$ 125		$ 1,941	$ 20,862	$ 22,804	$ 5,000
2	Following V7 Feeder Cold	03/15/10	06/15/11	60	12							$ 1,500	$ 1,500	$ 1,500		$ 4,854	$ 250,345	$ 255,199	$ 50,000
3	Following V7 Feeder Hot	03/15/10	02/15/12	40	12							$ 1,000	$ 1,000	$ 1,000		$ 4,854	$ 166,897	$ 171,751	$ 50,000
4	To Buchannan on Babocomari	09/30/09	12/10/10													$ -	$ -	$ -	$ -
5	69kV URD All	03/15/10	02/15/12													$ -	$ -	$ -	$ -
6	Buchannan Getaways	09/30/09	12/10/10	10	4							$ 250	$ 250	$ 250		$ 3,883	$ 43,694	$ 47,577	$ -
7	Sonoita Sub Getaways	09/30/09	12/31/10	2	4							$ 100	$ 100	$ 100		$ 1,941	$ 6,319	$ 8,261	$ -
8	New V7 Express Cold - 477	03/15/10	02/15/11													$ -	$ -	$ -	$ -
9	Rebuild V7 Hot - 477	03/15/10	07/15/11	357	1											$ 4,562	$ 99,095	$ 103,658	$ -
10	Rebuild V7 Double Circuit	05/15/10	07/15/11	357	1											$ 4,562	$ 99,095	$ 103,658	$ -
11	NAME 11	01/00/00	01/09/13													$ -	$ -	$ -	$ -
12	NAME 12	01/00/00	01/10/13													$ -	$ -	$ -	$ -
13	NAME 13	01/00/00	01/11/13													$ -	$ -	$ -	$ -
14	NAME 14	01/00/00	01/12/13													$ -	$ -	$ -	$ -
15	NAME 15	01/00/00	01/13/13													$ -	$ -	$ -	$ -
16	NAME 16	01/00/00	01/14/13													$ -	$ -	$ -	$ -
17	NAME 17	01/00/00	01/15/13													$ -	$ -	$ -	$ -
18	NAME 18	01/00/00	01/16/13													$ -	$ -	$ -	$ -
	Retirement Totals			831	46	5	4	$ -	$ -	$ -	$ -	$ 2,975	$ 2,975	$ 2,975	$ -	$ 26,598	$ 686,308	$ 712,906	$ 105,000
	Totals			6,039	117	1,431	24	$ 1,293,555	$ -	$ 425,000	$ -	$ 71,450	$ 71,450	$ 71,450	$ -	$ 200,555	$ 5,456,187	$ 5,656,742	$ 1,930,000

8 New V7 Express Cold - 477	Build new 477 ACSR Circuit in ne
9 Rebuild V7 Hot - 477	Build new 477 ACSR Circuit in ol
10 Rebuild V7 Double Circuit	Build new 477 & 1/0 ACSR Doubl

All of the above include $2.7 million for new Sonoita sub (Original

Job Cost Estimate for Sonoita Reliability Project

Estimates built on date: 3/31/2009 (inflation-sensiti

WO #	WO Name	Start Date	Completion Date	All Construction Contractors	Travel/Per Diem Cost/Day	Cost of SSVEC Equipment	Cost of Outside Rental Equipment	Indirect Labor	Payroll Taxes	Misc Overhead	Stores	Transporation	Total	Total Adjusted for Inflation	Project Budget
CONSTRUCTION COSTS															
1	As Currently Planned	09/30/09	12/31/10	$ 391,002	$ 196,875	$ 420,000	$ 180,000	$ 194,876	$ 62,360	$ 724,940	$ 250,000	$ 210,000	$ 10,493,066	12,329,353	
2	Following V7 Feeder Cold	03/15/10	06/15/11	$ 363,184	$ 309,375	$ 660,000	$ 275,000	$ 130,633	$ 41,803	$ 485,955	$ 250,000	$ 330,000	$ 13,978,594	17,123,778	
3	Following V7 Feeder Hot	03/15/10	02/15/12	$ 363,184	$ 461,250	$ 984,000	$ 410,000	$ 433,134	$ 138,603	$ 1,611,258	$ 250,000	$ 492,000	$ 17,501,075	22,605,556	
4	To Buchannan on Babocomari	09/30/09	12/10/10	$ 335,366	$ 169,875	$ 362,400	$ 151,000	$ 161,131	$ 51,562	$ 599,408	$ 250,000	$ 181,200	$ 9,177,914	10,784,049	
5	69kV URD All	03/15/10	02/15/12	$ 85,000	$ 461,250	$ 984,000	$ 410,000	$ 7,281	$ 2,330	$ 27,084	$ -	$ 492,000	$ 42,294,837	54,630,831	
6	Buchannan Getaways	09/30/09	12/10/10	$ 153,001	$ 24,206	$ 17,213	$ -	$ 25,478	$ 8,153	$ 94,777	$ 394,983	$ 8,607	$ 1,919,796	2,255,761	
7	Sonoita Sub Getaways	09/30/09	12/31/10	$ 27,818	$ 8,100	$ 5,760	$ -	$ 10,544	$ 3,374	$ 39,223	$ 78,918	$ 2,880	$ 677,230	795,745	
8	New V7 Express Cold - 477	03/15/10	02/15/11	$ -	$ 71,325	$ 190,200	$ -	$ 69,494	$ 22,238	$ 258,517	$ 581,831	$ 95,100	$ 9,346,509	11,137,923	
9	Rebuild V7 Hot - 477	03/15/10	07/15/11	$ -	$ 106,950	$ 285,200	$ -	$ 102,526	$ 32,808	$ 381,395	$ 581,831	$ 142,600	$ 9,905,241	12,216,463	
10	Rebuild V7 Double Circuit	05/15/10	07/15/11	$ -	$ 103,575	$ 276,200	$ -	$ 100,863	$ 32,276	$ 375,210	$ 776,157	$ 138,100	$ 10,534,811	12,992,934	
11	NAME 11		01/09/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-	
12	NAME 12		01/10/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-	
13	NAME 13		01/11/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
14	NAME 14		01/12/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
15	NAME 15		01/13/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
16	NAME 16		01/14/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
17	NAME 17		01/15/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
18	NAME 18		01/16/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		
	Construction Totals			$ 1,718,555	$ 1,912,781	$ 4,184,973	$ 1,426,000	$ 1,235,959	$ 395,507	$ 4,597,767	$ 3,413,720	$ 2,092,487	$ 125,829,075	$ 156,872,394	
RETIREMENT COSTS															
1	As Currently Planned	09/30/09	12/31/10	$ -	$ 5,625	$ 12,000	$ 5,000	$ 5,701	$ 1,824	$ 21,207	$ -	$ 6,000	$ 85,536	85,536	13,233,126
2	Following V7 Feeder Cold	03/15/10	06/15/11	$ -	$ 67,500	$ 144,000	$ -	$ 63,800	$ 20,416	$ 237,335	$ -	$ 72,000	$ 914,750	914,750	18,856,764
3	Following V7 Feeder Hot	03/15/10	02/15/12	$ -	$ 45,000	$ 96,000	$ -	$ 42,938	$ 13,740	$ 159,728	$ -	$ 48,000	$ 630,156	630,156	24,053,949
4	To Buchannan on Babocomari	09/30/09	12/10/10	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-	13,172,431
5	69kV URD All	03/15/10	02/15/12	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-	55,449,068
6	Buchannan Getaways	09/30/09	12/10/10	$ -	$ 11,781	$ 8,378	$ -	$ 11,894	$ 3,806	$ 44,247	$ -	$ 4,189	$ 132,621	132,621	2,388,382
7	Sonoita Sub Getaways	09/30/09	12/31/10	$ -	$ 1,704	$ 1,212	$ -	$ 2,065	$ 661	$ 7,683	$ -	$ 606	$ 22,491	22,491	818,236
8	New V7 Express Cold - 477	03/15/10	02/15/11	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-	11,137,923
9	Rebuild V7 Hot - 477	03/15/10	07/15/11	$ -	$ 26,775	$ 71,400	$ -	$ 25,914	$ 8,293	$ 96,402	$ -	$ 35,700	$ 368,141	368,141	12,584,604
10	Rebuild V7 Double Circuit	05/15/10	07/15/11	$ -	$ 26,775	$ 71,400	$ -	$ 25,914	$ 8,293	$ 96,402	$ -	$ 35,700	$ 368,141	368,141	13,361,075
11	NAME 11	01/00/00	01/09/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-	-
12	NAME 12	01/00/00	01/10/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-	-
13	NAME 13	01/00/00	01/11/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		-
14	NAME 14	01/00/00	01/12/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		-
15	NAME 15	01/00/00	01/13/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		-
16	NAME 16	01/00/00	01/14/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		-
17	NAME 17	01/00/00	01/15/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		-
18	NAME 18	01/00/00	01/16/13	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -		-
	Retirement Totals			$ -	$ 185,160	$ 404,389	$ 5,000	$ 178,227	$ 57,033	$ 663,003	$ -	$ 202,195	$ 2,521,837	$ 2,521,837	
	Totals			$ 1,718,555	$ 2,097,941	$ 4,589,363	$ 1,431,000	$ 1,414,186	$ 452,539	$ 5,260,770	$ 3,413,720	$ 2,294,681	$ 128,350,912	$ 159,394,231	

8 New V7 Express Cold - 477	Build new 477 ACSR Circuit in ne
9 Rebuild V7 Hot - 477	Build new 477 ACSR Circuit in ol
10 Rebuild V7 Double Circuit	Build new 477 & 1/0 ACSR Doubl

All of the above include $2.7 million for new Sonoita sub (Original

PRELIMINARY OPTIONS & COST ESTIMATES FEBRUARY 23, 1993

CONSTRUCTION OPTIONS	TOTAL 1ST YEAR	ANNUAL PRESENT VALUE	TOTAL PRESENT VALUE	TERM
Upgrade existing distribution feeder line only.	$2,854,000	$ 458,094	$ 6,107,173	U/A
Add a second distribution line along the Babocomari land grant boundary.	$3,045,000	$ 600,000	$ 7,993,000	S-T
Upgrade existing distribution line; wheel power from TEP's line; & add a distribution tie to Citizen's Electric's line near Patagonia.	$7,669,000	$1,323,000	$17,643,000	S-T
Add a 69 kV line along the existing distribution line in Rain Valley and extend directly west along highway 82 through Sonoita.	$5,830,000	$ 729,000	$ 9,718,000	L-T
Same as above, but divert the line through Elgin.	$7,537,000	$ 952,000	$12,697,000	L-T
Extend a 69 kV line along the Babocomari and follow the best available route to a point west of Sonoita, where a distribution substation would be installed.	$4,709,000	$ 575,000	$ 7,665,000	L-T
Same as above, but stop east of Sonoita; significant additional distribution lines would be required.	$5,782,000	$ 692,000	$ 9,229,000	I-T
Same as basic proposal, but build Joint Use line with TEP across the Land Grant.	$5,981,000	$ 736,000	$9,810,000	L-T
Extend 115 kV along the Land Grant to a new substation east of Sonoita. Several additional distribution lines would be necessary.	$7,453,000	$ 846,000	$11,275,000	I-T

U/A	=	UNACCEPTABLE
S-T	=	SHORT-TERM
I-T	=	INTERMEDIATE TERM
L-T	=	LONG-TERM
RADIAL	=	USUALLY UNDERGROUND IS LOOPED FOR RELIABILITY; THIS WAS N ESTIMATED HERE

PRELIMINARY OPTIONS & COST ESTIMATES FEBRUARY 23, 1993 Con'd

CONSTRUCTION OPTIONS	TOTAL 1ST YEAR	ANNUAL PRESENT VALUE	TOTAL PRESENT VALUE	TERM
Extend 69 kV underground along the Land Grant @ $1,000,000/mile to a new substation east of Sonoita.	$27,496,000	$3,454,000	$46,053,000	RADIAL
		(13 CENTS KWH - 25 YRS.)		
New substation, battery bank, and distribution ties; low capacity initial installation only. (EAST SITE)	$8,638,000	$1,440,000	$19,191,000	I-T

U/A	=	UNACCEPTABLE
S-T	=	SHORT-TERM
I-T	=	INTERMEDIATE TERM
L-T	=	LONG-TERM
RADIAL	=	USUALLY UNDERGROUND IS LOOPED FOR RELIABILITY; THIS WAS NOT ESTIMATED HERE

SSVEC

TEP

TEP SUBSTATION - BACKUP SERVICE ONLY

TEP has stated that the 46kV line's current capacity is intended as backup for Fort Huachuca. The 46 kV line's capacity is the same as the peak load at the Fort's substation. There is no excess capacity on the 46 kV line during peak conditions. This means that SSVEC would only be able to serve load from this line when Fort Huachuca is not is not needing service from this line or their load is not at peak. If it is decided to install a connection to the 46kV line then there could be times when the Fort needs the capacity of the line and SSVEC customers would be without power. The Fort may only need the capacity for short periods but there are times due to major catastrophes on the 138kV line that the 46kV would be utilized by the Fort for months at a time.
If TEP is doing maintance on their 138 kV line they may also be using the 46 kV line for long periods and this would limit SSVEC's access to the line. TEP would most likely deenergize the 138 kV line while they do maintenance and transfer the Fort's load to the 46 kV line. It would not be prudent to connect to the line if it is not upgraded to required capacity and allows uninterrupted service.

It has been stated that if two subs were connected to the 46kV line that there would be two sources or basically a looped system to serve SSVEC's customers. This is not so unless some changes are made to TEP's Fort Substation. The 46kV line is currently setup as a radial source into the Fort's substation and is unable to be looped into the 138kV line. Both are designed to be radial into the sub and neither is setup to back feed the other. Therefore unless a change is made that allows the 138kV to back feed onto the 46kV line then the 46kV line is a radial transmission source and the two subs would not make since if the line is out of service then both subs are also out of services. If the 46kV was able to be fed from either end then the two subs would electrically make since a problem on the transmission line could be isolated so that at most only one sub would be out of services. The cost associated with two subs would double the costs discussed below. It would be up to TEP to determine a cost to allow the 138kV line to back feed onto the 46kV line.

If the 46kV line were upgraded then perhaps SSVEC would have full service capability from this line. There are some complications to upgrading the line. Certificate of Convenience and Necessity Border Agreements and ACC approval procedures would need to be followed to allow this to happen. The cost to upgrade the line would also be a major factor since it would need to be upgraded from its origin to the proposed substation site that is to serve SSVEC. This will have a cost of approximately $350,000 to $450,000 per mile not including any ROW or legal expenses. Also unknown is the capacity at the source substation for the 46kV line. If there is no excess capacity at the source substation then an upgrade would be required and this could cost millions of dollars.

The V7-46kV Site substation would require a minimum site of 350' X 350' or approximately 3 acres not including any set back requirements the County may impose. SSVEC has recently analyzed the land requirement for a transmission switching station adjacent to a distribution substation and it was determined that this was the appropriate sized site.

When choosing the location of this Substation the ability to interconnect with the transmission system and the distribution system is a major concern. Typically substations are located at points where transmission lines cross distribution lines and are close to the load center for the load to be served. The 3SEG has proposed three locations for 46kV/25kV substation interconnections. I will address in the following paragraphs the location where the 46kV crosses SSVEC's V7 Feeder only (V7-46kV Site). The other two sites would require upgrading single phase lines to three phase at a per mile cost of $87,000 but the V7-47kV site would not require any upgrade of single phase to three phase. Another benefit of the V7-46kV Site is that this would allow two feeders to be established to split loads and improve reliability. If the V7 feeder is split into two feeders at this site then fewer customers would be affected by an interruption of service along the existing V7 Feeder. For the other two locations to have

two feeders to help split V7 would require in addition to the single phase to three phase conversion a new line to be constructed at a cost of $100,000 per mile from the substation to V7 Feeder.

TEP has stated that a three breaker ring bus would be required for SSVEC to tap their 46kV line. The cost for this would be approximately 1 to 1.5 million dollars. They also stated that without a line upgrade the capacity of this line is committed to serving Fort Huachuca. Due to this restriction there would need to be a communication link between the V7-46kV Site and Fort Huachuca's Substation and additional switching devices at Fort Huachuca's substation. The operation and ownership of the communication link and devices at Fort Huachuca Substation would remain with TEP and they would need to develop those costs.

This substation would require a transformer to step the voltage from 46kV to 25kV. The smallest transformer that could be justified using SSVEC standards would be a 10 MVA transformer to serve the existing 7 MVA of load and allowing for future load growth. SSVEC last week received bids on a 10 MVA transformer and the minimum bid was $230,000. Three voltage regulators would also be required for the substation to insure proper voltage is delivered to the customers and these would cost approximately $120,000 installed. Also required would be two 25kV Automatic circuit reclosures, one for each feeder, at a cost of $50,000 each installed or $100,000 total. The structural steel, insulators, switches, bus materials, and miscellaneous hardware needed to connect all the devices together will cost approximately $350,000. A control house will also need to be included to house all of the control, metering, and communication equipment. The cost for this is approximately $300,000. The cost for labor for construction of the substation not included above is $400,000 to $600,000. The cost for land at this site is approximately $60,000 per acre or a total cost of $170,000. Therefore as stated above the cost for the distribution sub will be 1.6 to 1.9 million dollars and the transmission sub will cost 1 to 1.5 million dollars.

The total cost for the V7-46kV Site will be 2.6 to 3.4 million dollars. This cost does not include any legal expenses, transmission upgrades discussed above, wheeling costs, any costs associated with Certificate of Convenience and Necessity Border Agreements, or ACC approval procedures

SSVEC / TEP BACK-UP SUBSTATION

Interconnect location substation site	$ 170,000
46:25kV transformers	230,000
Set of 3-Voltage regulators	120,000
2- Distribution Automatic Circuit Reclosures, SCADA controlled	100,000
Substation structure	350,000
Control house	300,000
Construction	500,000
Transmission Sub including 3 Breaker Ring Bus	1,500,000
SSVEC Cost (does NOT include costs for TEP facility upgrades)	$ **3,270,000**
DOES NOT INCLUDE ANY LEGAL EXPENSES OR ANY COSTS ASSOCIATED WITH CCN BORDER AGREEMENTS, ACC APPROVAL PROCEDURES, WHEELING COSTS, ETC	

Tucson Electric Power Company

Mailing Address: P.O. Box 711, Tucson, AZ 85702
Located at: 4350 E. Irvington Road, Tucson, AZ 85714

June 6, 2003

Bruce Evans
Southwest Transmission Cooperative, Inc.
Post Office Box 2195
Benson, Arizona 85602

RE: Proposed tap of TEP's 46kV line near Sonoita, Arizona

Dear Bruce:

This letter is in response to your request for possible transmission service in the Sonoita area. You propose that Sulphur Springs Valley Electric Cooperative tap our South to Fort Huachuca 46kV line 4-5 miles east of Sonoita.

Based on a preliminary review the proposed tap could only be constructed with the understanding that TEP have the ability to discontinue service to Sulphur Springs in the event of an outage on TEP's 138kV line to Fort Huachuca resulting in transferring the Fort service over to the 46kV line in question. Currently this 46kV line serves as back up to the load at Fort Huachuca and TEP's obligation to its customers at the Fort must not be jeopardized. The capacity of this 46kV line is just sufficient to meet the peak Fort load.

For your information there were three outages of the 138kV line to Ft. Huachuca in 2002: one in May (16 hours due to brush fire), one in June (22 hours due to brush fire) and one in December (4 hours due to raccoon). In April and May of this year, TEP cleared heavy vegetation away from the 138kV structures of this line to reduce the likelihood of outages due to brush fires.

The interconnection point is outside TEP's two-county retail service territory. In order to complete this interconnection outside that service territory, AEPCO will have to request an Order for Interconnection from FERC. Our bond counsel indicates that this is a routine procedure that is not uncommon and TEP is willing to provide to AEPCO a typical filing reflecting what such a request would look like.

The following is a recap of the information provided by TEP's distribution planning department.

- The 46kV line to Fort Huachuca is the back-up to the normal feed, which is a 138kV line.
- When the 138kV line is out, the load automatically transfers to the 46kV line.
- If the transfer occurs on peak in the summer the voltage is right at the lower limit of allowable.
- I modeled an additional 4.5 MW of load for a Sonoita tap near Greaterville. With this added load, the voltage dropped to the equivalent of 110 volts, which is not acceptable.
- The limit of the line capacity, as the system is currently configured, is somewhere between 17.5 MW and 22 MW.

Thank you for your inquiry. We look forward to working with you and Sulphur Springs Valley on this project.

Sincerely,
Mark Albertson

-----Original Message-----
From: Bruce Evans [mailto:bevans@aepnet.com]
Sent: Monday, June 09, 2003 10:14 AM
To: Torey Bell
Cc: Karen Cathers; Larry D. Huff; Raymond Som; Anselmo Torres
Subject: Sonoita Project

Torey,

I am forwarding to you a letter from TEP to Southwest Transmission regarding the potential for tapping TEP's 46 kV line to serve the proposed Sonoita substation.

The letter notes that there are limitations to the use of the line, under an outage of the 138 kV line that feeds Ft. Huachuca, from both a capacity and voltage standpoint. SSVEC will need to decide if they can live with this possibility. The letter also references a request for an order for interconnection from FERC, as a means of satisfying TEP's Bond Counsel on the two-county bond issue. I have asked Mark Albertson, the author of the letter, for information on a typical filing of this nature, as referenced in the letter.

Once I get this additional information from TEP, I will contact you again.

Thanks,

Bruce

SSVEC

UNS

UNS BACKUP/LOAD SERVING TIE

The first issue that will need to be addressed is how much capacity is available from UNS and how much would be reciprocated by SSVEC. All equipment will be sized according to this required capacity. Load islands will also need to be determined based on available capacity (how many miles can be served when load islands are created).

To serve the load islands in a looped configuration would be very costly and more than likely the costs would not offset the benefits. Load control devices would be required to control load flowing from one system to the other to limit overload of equipment installed. These devices would cost millions of dollars and would not be practical for the small capacities that either system will have available since this area is at the end of the line for both UNS and SSVEC.

As the line operating voltage differs between UNS (13.8kV) and SSVEC (25kV), the tie point will require a set of step down transformers and voltage regulators sized to the limits of capacity available from UNS's line in Flux Canyon or SSVEC's V-7 Feeder, which ever is largest. Three SCADA controlled Automatic Circuit Reclosers (ACR's) will also be required at the tie point, and at each end of the two load islands. This would allow for automated control for islanding and connection for the loads to be served.

Some work must be done to determine if the UNS's and SSVEC's system can be connected at the proposed tie point. Due to the phase angle difference it could be very expensive to tie these two systems if the phase shift can not be corrected by the connections of the step-down transformers. Step-down transformers can be connected Y-Y which provides no phase shift if none is needed or they can be connected Y-Delta if a 30^0 phase shift is needed. Most likely a Y-Y or Y-Delta connection is all that is needed, but analysis and testing will be required to determine if this is possible. If these two can not resolve the phase shift then it will require equipment that is too costly to justify for this connection. The cost would not offset the benefit.

Regulators cost approximately $20,000 to $30,000 each installed, depending on size. This tie point will require three (one for each phase). Due to small amount of power available at this location the cost for a small three phase regulator installation will be approximately $60,000. The cost of the three phase step-down transformer installation will be approximately $70,000. The cost of a three phase ACR installation will be $50,000 for each location and three installations will be required as discussed above. The total equipment cost for this tie point will be approximately $280,000.

UNS electric and SSVEC's system currently have a gap of approximately 1 mile were no lines exist. The cost to connect the two systems with a three phase line would be approximately $100,000. UNS system is currently two phase and this would require an additional phase to be added to their line to be able to properly connect into SSVEC's three phase system. Without knowing the condition and length of the two phase line it is impossible to estimate what the two phase to three phase upgrade would cost.

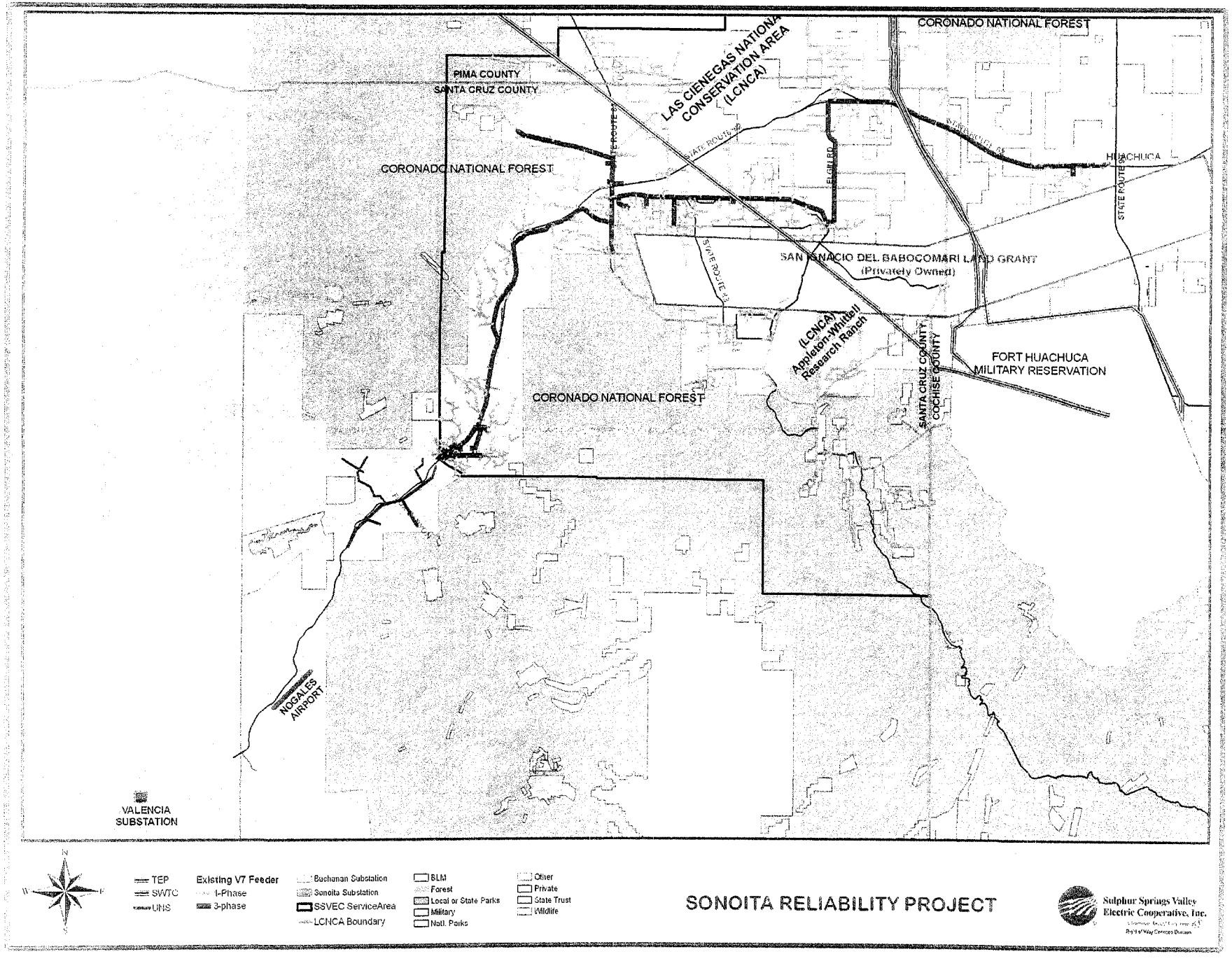
ROW costs for the 1-mile of private easement for the line extension, 6 acres total, would be approximately $40,000 plus any additional fees/requirements for permitting from ADOT along the Scenic Highway 82 Corridor.

Not included in the above costs are any required system upgrades that maybe required such as substation upgrades or line upgrades not discussed. To estimate these costs would require considerable analysis to determine what is required. Also not included is the cost of the engineering studies and testing that would be required. There would also be a requirement for communications between the three ACR installations discussed above. The cost for installation of the communication link has not been determined but it would be significant.

Futhermore, not included in the total cost of this project are legal fees associated with the Certificate of Convenience and Necessity Border Agreements and ACC approval procedures.

SSVEC / UNS DISTRIBUTION CONNECTION

New 3-Phase line to be constructed from SSVEC to UNS at Flux Canyon – 1 mile	$ 100,000
Step-down transformers (specialized phase shift corrections) required	70,000
Set of 3-Voltage regulators	60,000
3- Automatic Circuit Reclosures, SCADA controlled	150,000
1 mile ROW for 3-Phase line on private property – Transformer Site	40,000
SSVEC Cost (does NOT include costs for UNS facility upgrades)	$ **420,000**
DOES NOT INCLUDE ANY LEGAL EXPENSES OR ANY COSTS ASSOCIATED WITH CCN BORDER AGREEMENTS, ACC APPROVAL PROCEDURES, ETC	


CORONADO NATIONAL FOREST
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SANTA CRUZ COUNTY
CORONADO NATIONAL FOREST
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HUACHUCA
STATE ROUTE 92
STATE ROUTE 83
SAN IGNACIO DEL BABOCOMARI LAND GRANT
(Privately Owned)
(LCNCA) Appleton-Whittell Research Ranch
SANTA CRUZ COUNTY
COCHISE COUNTY
FORT HUACHUCA MILITARY RESERVATION
CORONADO NATIONAL FOREST
NOGALES AIRPORT
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UNS
Existing V7 Feeder
1-Phase
3-phase
Buchanan Substation
Sonoita Substation
SSVEC ServiceArea
LCNCA Boundary
BLM
Forest
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Natl. Parks
Other
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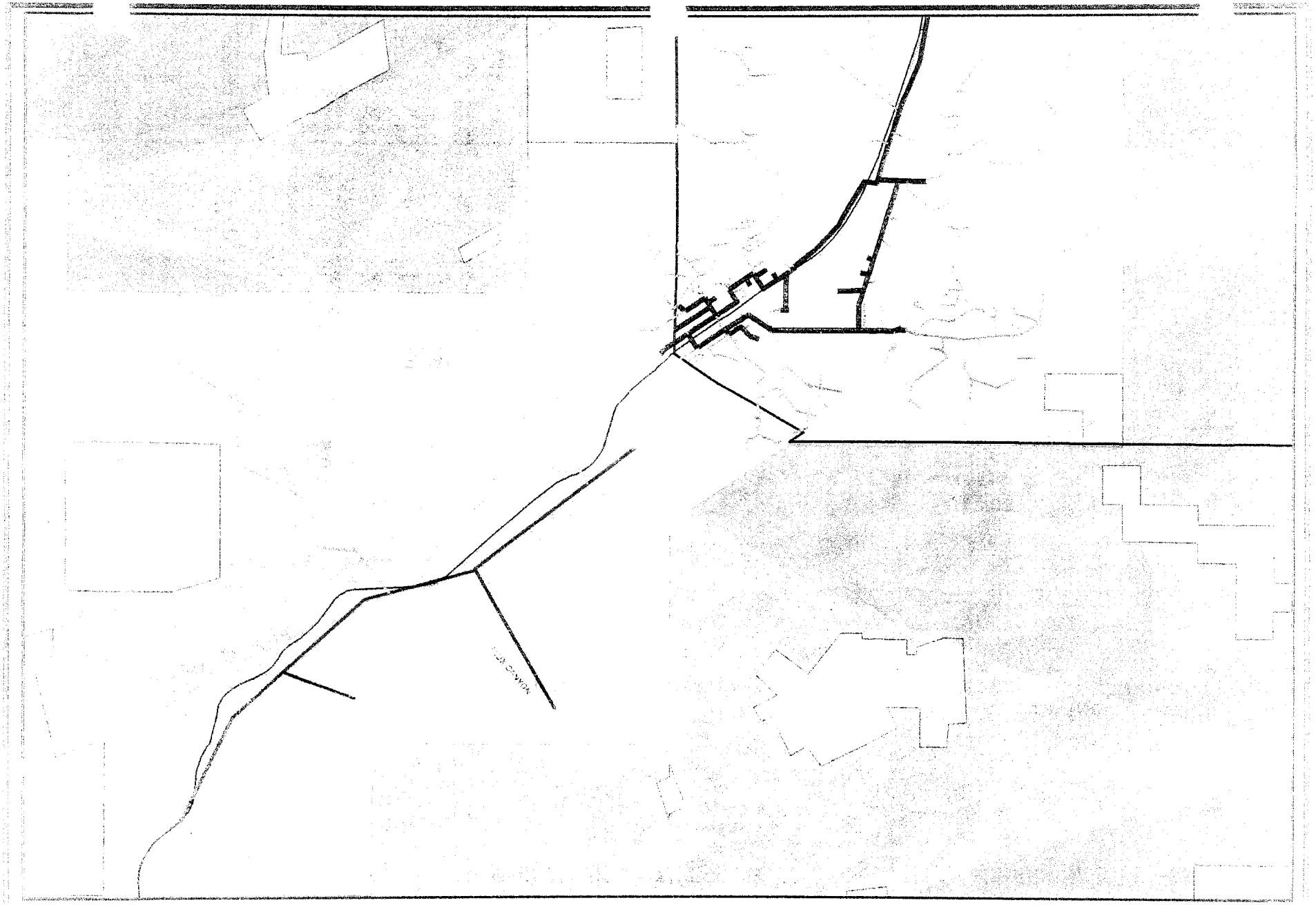
State Trust
Wildlife
SONOITA RELIABILITY PROJECT
Sulphur Springs Valley Electric Cooperative, Inc.



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UNS
Existing V7 Feeder
1-Phase
3-phase
Buchanan Substation
Sonoita Substation
SSVEC ServiceArea
LCNCA Boundary
BLM
Forest
Local or State Parks
Military
Natl. Parks
Other
Private
State Trust
Wildlife

SONOITA RELIABILITY PROJECT

Sulphur Springs Valley Electric Cooperative, Inc.

2008 V-7 AND OTHER FEEDERS (CONNECTIVITY) OUTAGE DATA

Feeder Line	Hours Off	Number of Customers	Customer Hours OFF	Hours OFF/customer
V-7 Sonoita/Patagonia	179.98	3057	3839.91	0.06
R-3 Ramsey	64.16	1006	2988.66	0.06
K-2 Chri	239.75	1828	4299.75	0.13
O-5 Mescal	392.22	2639	4657.97	0.15
J-3 Kansas Settlement	197.05	1202	3409.05	0.16

1. Three feeder lines have higher outages than V-7, with twice the outage hours per customer.
2. Only 1 V-7 outage was due to "overload" impacting 1 customer.

Analysis prepared by Jeanne Horsmann and Gail Getzwiller, Sonoita.
Ref: SSVEC 2008 Feeder Outage Data (without November)

In 2008, there were 80 outages for total of 180 hours on the V-7 feeder. Note November data was not provided; however, 12 months of data are shown as January 2008 and 2009 were provided.

- 50 Outages (63%) impacted 1 meter (Causes: 18 unknown, 11 birds, 11 lightning, 3 animals, 3 wind, 3 other, 1 overload)
- 7 Outages (9%) impacted 2 meters (Causes: 3 lightning, 2 birds, 2 unknown, 1 Other)
- 5 Outages(6%) impacted 3 meters (Causes: 2 lighting, 1 birds, 1 tree, 1 unknown)

ONLY 3 Outages (4%) impacted a significant number of people on the main line with causes as indicated:

- 1 impacted 1,700 meters– cause "Other"
- 1 impacted 580 meters – cause wind
- 1 impacted 450 meters – cause wind

Others, 1 impacted 60 meters (cause "accident"), 1 impacted 45 meters (wind), 1 impacted 40 meters (lightning), 1 impacted 20 meters (birds), 1 impacted 12 meters (underground fault)

The causes for V-7 outages in 2008 were as follows:

Cause	No. of Outages	Hours
Overload	1	2.0
Tree	1	2.0
Underground Fault	2	10.0
Accidents	3	10.5
Animals	3	25.0
Other	5	6.5
Wind	7	21.0
Birds	15	22.3
Lightning	21	39.9
Unknown	25	42.8

SSVEC

Reliability

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V7 AND GENERAL FEEDER RELIABILITY ANALYSIS

INTRODUCTION - HISTORY

ıe history of service to this area has previously been presented. Here is just a quick summary:

With the expansion of Ft. Huachuca, during World War II, plans were made for extension of primary electric lines from Fry, near Sierra Vista and from an area which became know as "Huachuca Junction" north of Ft Huachuca at State Highway 82. By the 1950's this extension actually happened from the more northern of the two routes. At Huachuca Junction, Huachuca Substation was constructed and single-phase primary service was extended through "Rain Valley" to Elgin and Sonoita. From Sonoita service was routed to the Canelo and "West Gate" areas. Patagonia at this time was served by Patagonia Water and Light Company.

It must be remembered that these were very sparsely populated areas that were not desired by any of the larger investor owned power companies; they couldn't make any money in these rural areas. With the Rural Electrification Act in the 1930's, cooperatives were encouraged and assisted to serve rural areas. SSVEC sprang from this effort in 1939.

By the early 1960's Patagonia Water and Light Company was having trouble meeting demands for power. SSVEC eventually was granted this addition to their Certificate of Convenience and Necessity by the Arizona Corporation Commission, and three-phase power was extended all the way from Huachuca substation, nearly 40 miles of line conversion and extension. The Patagonia addition added an acceptable load burden to the lightly loaded Santa Cruz County electric facilities owned by SSVEC. Reliability was not excellent, but it was acceptable by the standards of the day.

In the 1970's reliability analysis indicated that reliability was about average, but with growth it was identified as ʿuture problem area and monitoring was increased. At one time this area was growing in load as fast as 16% per year. As long-range planning was being conducted in the early 1980's future major extensions were identified and property rights began to be acquired for substations and easements. The Sonoita-bound easement was acquired through the Bobocomari Land Grant. Although growth continued, sometimes slower and sometimes faster, the first immediate problem was actually to maintain voltages within industry standard parameters. At the time the technology only allowed about 3 regulating units to be in series; 1 at the substation and 2 line-mounted units. The Rural Electrification Administration (REA - now Rural Utilities Service - RUS) only allowed planning to include 1 line-mounted unit. SSVEC had to resort to much more drastic measures to continue acceptable service performance.

PRESENT SITUATION

As problems arose over the years, SSVEC stayed substantially aware of both the reliability situation and the available technology and has been able to resolve immediate problems up to now. Industry standard voltage levels and reliability levels have been maintained. However, electric loads continue to increase and service standards have been raised, so problems have arisen in three categories: **1)** Power Quality involving voltage parameters: Steady state voltage must remain within industry-defined and regulated boundaries; voltages need to be stable without excessive highs (swells or spikes) or lows (sags or dips or flicker); the steady 60 HZ AC voltage sine wave must remain of proper shape; neither frequency nor waveform shape can be allowed to be out of defined boundaries. Unfortunately, our measurements now indicate the waveform is being distorted and system harmonics (accidental tuning) is resulting in high voltage in the center of the feeder. The series of voltage regulators works quite well in steady conditions, but sudden load changes are resulting in very severe voltage swings, both high and low temporary voltages. **2)** Reliability: Both industry and regulatory standards ʰave been developed for service interruption management and measurement, and the delay in V7 solutions is ɔw causing these limits to be approached and sometimes violated. **3)** Basic line capacity: Although this can be defined very precisely for certain facilities and conditions, those conditions are neither steady nor certain. A load imbalance of about 15 - 20 % on B-phase is very difficult and expensive to eliminate. Also, a 15 - 20 %

margin must be maintained for severe weather and to handle transient loads. As a result of these two factors alone, only 65 - 70 percent of the theoretical conductor capacity can be reliably carried (also sectionalizing devices recommend no more than 70 - 80% of maximum load be carried steady-state for these same reasons). ıce this is a winter peaking feeder (so far), 250 amps per phase is a reasonable maximum load (less in summer). This would normally indicate that real concerns are raise as load approaches 175 amps per phase. The SSVEC loads on this feeder have already exceeded 190 amps on the peak phase. Only one parameter is an inadequate measure; the full practical operations capacity of this line is rapidly being approached.

As SSVEC began to seriously consider longer-term solutions in the Santa Cruz County area, impediments also arose. **1)** SSVEC has sought to avoid unnecessary costs relative to revenue. Even now, this is not a profit center, especially if multiple millions of dollars are used to upgrade service quality and capacity. It is vital to identify the optimum long-term solutions to these problems, while maintaining a reasonable facility investment per dollar of revenue. **2)** Alarms were sounded about 1990 relating to "Electro-magnetic forces" (EMF). Folks became concerned, even though rural loads are low, and the proposed 69 kV extension would lower these substantially. SSVEC had to hold meetings to answer these questions. **3)** In the late 1990's the land owners near the power line easement began to raise concerns; the easement was challenged and much time has been spent trying to fairly deal with these concerns while trying to serve this area. The proposed solutions have been delayed by all these factors nearly 10 years.

DATA PREPARATION / PRESENTATION

Various presentations of the feeder data have previously been submitted. Because of our own extensive data and analysis of this feeder's problems over 3 decades and the many customer complaints both SSVEC and the Arizona Corporation Commission have received, ***disagreement along these issues was not anticipated.*** SSVEC neither prepared nor presented extensive support data for what, to SSVEC analysts, seem obvious; V7 feeder periences poor reliability and power quality. *A compounding factor* in this was the upgrading of SSVEC software and data systems throughout the late 1990's and early in this present decade. The changes being made in these systems resulted in general accounting customer data uncorrelated to engineering/facility data. Accurate accounting of meters served by each feeder was not prepared for several years. This was to avoid maintaining two or more sets of data throughout the accounting and mapping system upgrades. At all times accurate counts were maintained of total customers and meters and of all feeder loading data and interruption statistics. It was only the count of meters served by each feeder that was not maintained for several years. Key historical REA/RUS and more recent IEEE/NRECA interruption indices use these customer counts per feeder. SSVEC was temporarily not in a position to maintain this data by feeder. In response to these past SSVEC submittals, a customer group submitted **Table 1** data for 2008 along with their reasoning why this feeder is not having difficulties. When data began once again to be available, it was not always on the same counting basis as previous software systems. In responding to inquiries for more information for 2008, confusion was introduced by focusing on only one year of data. Weather and other hazards are too variable to focus on any one year. SSVEC has always reviewed 5 - 10 years of data in drawing conclusions and in making facility recommendations.

Charts 1 and 2 were presented originally . They clearly indicate that "total of outage durations" for feeder V7 has been very high relative to other feeders. Part of the reason is evident in **Chart 2**, the comparison of total miles of primary voltage line served by each of SSVEC's feeders. However, more data was needed to display the whole longer-term picture.

STANDARDS

ᴰEA/RUS traditionally evaluated interruption history and maintained standards based on ***"Consumer-Hours .r Consumer"*** [The sum (for all system or feeder outages) of the product of customers affected times the hours duration of interruptions and this sum divided by the number of customers served by the system (or feeder).] SSVEC record systems and all history were set up to maintain this REA/RUS mandated standard. For decades

the minimum system standard was set by REA at 5 Consumer-Hours per Customer annually. During long-term planning, it was required by REA that a lower goal be set. SSVEC initiated a "2 Consumer-Hours per Customer" annual outage goal in 1984, because the system average was then varying but near 3 hours. Larger ..lities, mostly urban achieve generally significantly higher standards. In recent year RUS has been encouraging the 2-Hour standard.

As there has been consolidation and competition in the industry, more indices and standards have appeared. The National Rural Electric Cooperative Association (NRECA) has now published quite a list of standards **(See Table 6)** developed by various groups and for various purposed around the country. Frankly, these various indices were typically developed when they placed a given utility in better light than some other standard. Because of SSVEC's major software upgrades, data for a period of about 5 years was maintained with inadequate customer counts by feeder; so it has been unfeasible to calculate many of the newer standards using "Customers per Feeder". With this recent work presented here, many of these indices have now been calculated. The REA/RUS standard was developed to allow the agency's regulators to fairly evaluate rural cooperative performance on maintenance and outage prevention. Densely populated utilities score better with one measure, while sparsely populated systems look better using different measures. Mostly agricultural systems favor one standard over measures used by mostly residential systems. SSVEC always used the RUS measure, because that was how SSVEC was primarily regulated.

RECENT ANALYSIS

In the past few weeks and months it has become clear that there is no consensus on the feeder reliability data. Since there are firm standards on these issues, an effort has been made by SSVEC analysts to pull the best customer data from older records, so standard data and feeder comparisons can better be made. The efforts and systems available were somewhat imperfect, but the accuracy achieved will not affect comparisons of data between various feeders, even if there is a modest error bound in the precise results of the indices. **Tables 2a-**, 1999 - 2008 SSVEC feeder outage data are presented here. This can be readily compared with older feeder and substation interruption data in **Tables 3-5**.

Table 2a includes all feeders; **Table 2b** includes only the feeders approaching 750 consumers or more (the SSVEC average). These are comparable with V7. A few additional problematic feeders serving less than 750 customers, but which have other poor indicators, have been included to reveal the entire situation. **Table 2c** includes those same feeders, but only where the "Consumer-Hours per Consumer" indicator is greater than or equal to 1 hour per year. This leaves a collection of 10 of SSVEC's feeders most comparable with feeder V7; SSVEC analysts feel this latter table (**Table 2c**) provides the best outage data comparison. Of 12 parameters and indices, feeder J3 is maximum in 4, K2 is maximum in 3, and V7 is maximum in 5, which include:

- ✓ Sum of the durations of all the feeder's interruptions; V7 totals about twice as many as any other feeder; **Chart 1** still is correct.
- ✓ The maximum number of customers with service actually interrupted during the year, **Chart 3**. For comparison, R3 feeder with similar average customers served as V7 experiences less than one half the number of customers interrupted annually.
- ✓ V7 experiences more than twice as many interruptions annually as any other feeder; see **Chart 4**. Although many of these are individual services, feeder issues (voltage spikes and dips) are likely contributing to some of these individual interruptions. **Chart 5**, which displays "SAIFI" the "Number of Outages per Customer" also indicates that V7 is *second highest* of feeders in this group.
- ✓ V7 data **(see Chart 6)** totals more than twice as many total Consumer-Hours interruption time than any other SSVEC feeder. Most of these hours is from feeder interruption rather than individual outages **(see Charts 3 and 4).**
- ✓ V7 has the highest indicator (2.83) of Consumer-Hours per Consumer per year **(Chart 7),** more than 3 times the system average (0.93). This is the indicator which has traditionally been **most used by REA/RUS** in evaluating performance.

Charts 8 and 9 were originally presented. These respectively indicate the contributions toward total annual hours of outage time and toward Consumer-Hours outage measures. These are useful in seeking explanations for the performance record and various solutions which might reduce problems. Similarly **Chart 10** provides ight into what facilities are damaged or which type of device is opening to cause the outages. **Chart 11** helps to visualize the specific hazard behind the interruptions. **Chart 12** presents a performance guide from NRECA, using the Computer Business Equipment Manufacturers Association (CBEMA) curves which indicate voltage performance which is normal (center), low (bottom), or high (top). **Chart 13** Information Technology Industry Council (ITIC) data is presented is a similar, but unsmoothed, set of "curves".

In the end with all present and previous presentations SSVEC is not intending or needing to argue which feeder has the truly worst performance record; each has its own issues, but SSVEC's analysts are stressing primarily that feeder V7 is very near the limits of what can be accomplished without a major facility upgrade in this area. Some other feeders do perform worse in some years and by some of the measures. Each feeder has a different history, environment, and customer/load mix. Here is a little illustration of how the problems evident in the data have been dealt with in the past few years for other feeder areas:

- Feeder O5 (originally O1 and presented for ten years in the new tables as "O15") recently was recently upgraded for several miles and new Cottonwood Substation was constructed. The long-range plan indicates that a 69 kV extension and an additional "Empirita" substation will also eventually be required. [Note: Feeder O8 was originally designated as O2; in the data tables the entire series is labeled "O28".]
- Feeder J3 was recently upgraded for several miles and the long-range plan has indicated that a 69 kV extension and an additional "Playa" substation will also eventually be required.
- Feeder K2 is itself a solution. In 2001 Chiricahua Substation was added as feeders K1 and K2 were formed from a portion of feeder J7. This latter feeder was once the SSVEC feeder with the most extreme problems. In the mid-1990's feeder N1 was extended to the extremity of feeder J7 to provide a loop and backup to the Rucker Canyon area.
- Feeder R3 is experiencing growth pains and will soon be split as various feeders from a new Hereford Substation west of Palominas, AZ.
- Feeder H4 was recently divided; a voltage conversion was performed and a portion of the feeder was transferred to Feeder J5. A new Sunsites Substation will be required within a few years.

Other poorly performing feeders evident in this recently available 10-year history have already been improved. SSVEC is seeking to ensure that our customers in Santa Cruz County are also provided with the highest quality service we can feasibly provide.

In reviewing the interruption data, these outage indicators are not actually describing the most critical problem with this feeder: For example, feeders which have been more problematic have "end of line voltmeters" (EOLVM) installed. Looking at two similar feeders which have these meters similarly placed:

- J3's EOLVM, over the past 5 years has experienced 15 high voltage spikes and 305 voltage dips that the meter registered.
- V7's EOLVM, for the same period, has counted 271 voltage spikes and 638 voltage dips. Unfortunately, the voltmeters nearer the mid-point of the V7 feeder (east and north of Sonoita) are registering much higher indications of voltage swells and spikes. J3 has no mid-point meters for comparison. The series of 5 voltage regulators, combined with frequent sudden load changes, help produce these spikes. Also near the feeder mid-point, voltage harmonic distortions have been measured exceeding prescribed limits (the underground lines in the vicinity have significant capacitive reactance, somewhat matching the large inductive reactance of the line back to the substation; this likely is producing the resonance).

urther, the numerous individual customer line-faults and interruptions produce sags and spikes that affect the entire feeder. The fault drags down the voltage momentarily, and subsequently there is an inductive voltage

spike when the fault clears. These performance issues affect the customers with visible light "flicker" and with trouble in resetting clock displays repeatedly on various devices.

the past few years, measurements have also indicated that excessive voltage harmonic content in the Sonoita area exceeds standard for good performance of computers and electronic devices. This issue must be addressed, because modern devices, including alternative energy inverters, will not remain stable with these conditions.

It is felt that these various power quality issues alone justify solutions that will bring service quality back to normal ranges as soon as feasible. This is likely the highest priority issue of feeder V7 to be solved. Priorities must be set. Which are of immediate concern? Which are of concern now, but might be considered serious nuisances, rather than really serious problems by the customers? Which will become serious threats to receiving normal electric service in the near-term? These priorities should be viewed approximately as:

- ✓ Power Quality / Stability Issues: A better "stiffer" grid connection and dividing the 1 feeder into several feeders.
- ✓ Pending Capacity Issues: Sources of energy are much discussed today. SSVEC has been ready to support any reasonable solution. More difficult and much more expensive is meeting customer demand at times of peak loading. This is currently much higher about sunrise on winter mornings and after dark on winter evenings. Summer peaks are now less problematic, but will also eventually become an issue. For non-traditional sources unavailable at peak, power storage becomes a necessity for these technologies, unless additional grid connections can be made. Additionally, a key issue in defining capacity is practical sectionalizing device coordination/selectivity. Normally these devices are loaded no more than 80%, for several devices this is precisely where V7 loads level are. More problematical is that phase trip setting have already been set higher than conductor melting points (SSVEC is forced to rely on "ground trips" and manual load management to avoid a literal conductor meltdown in the next few seasons -- when ever the next great winter storm arrives.)
- ✓ Transient Service Interruptions: A better "stiffer" grid connection and dividing the 1 feeder into several feeders, in addition to continued attention to individual line components.
- ✓ The general high incidence of power interruptions. Once separate feeders are formed, good sectionalizing plans and good attention to line components can significantly improve the outage record for this area.

2010 - 2012 CONSTRUCTION WORK PLAN ANALYSIS

An independent analysis was completed in early 2009 in preparation for the 2010 - 2012 Construction Work Plan. Here, some highlights are presented:

- **Table 9** presented a listing of substation reliability for 1992 - 2008: Feeder V7 was worst of all for 2 of the 4 indicators.
- **Table 10** presented a sort of outage data for transmission lines, substations, and for distribution feeders. Feeder V7 was indicated to have the worst distribution record of all for both parameters.
- **Table 11** presented an example of how the customers per substation and feeder have traditionally been distributed. However, this data was omitted or faulty for about 5 years, so is not reliably available. (For the most recent analysis, presented above for the first time, all available customer data was normalized with every tool immediately available. Then this data was averaged for the entire 10-year period of analysis. This was an effort to minimize the effect of missing or approximated data. While specific indicator calculations may have a limit in accuracy, using the same basis for all feeders should allow a fair comparison of the feeder's outage performance.)

RELIABILITY COMPONENTS

UTAGES

Some factors determining how many service interruptions will be experienced include:

- The number of customers, transformers, and service drops that are exposed to the various hazards. Also 3-phase customers frequently have 3 transformers with exposure instead of 1 transformer per single-phase customer. This is one primary reason J3 and K2 have as many interruptions as they do. V7, however, has very few 3-phase customers.
- Customer mix: Can customers notice problems (irrigation pumps versus residences)? Are customers home to notice the interruptions? Can customers easily report problems? Irrigation customers have different needs than residential customers also.
- The number of miles of primary line exposed to vibration damage, wind, lightning, trees, accidents, deterioration, snow, ice, etc. V7 has more primary miles of line connected than any other SSVEC feeder. This represents a great deal of weather exposure; V7 has the most exposure to snow/ice of any feeder.
- How well does the feeder configuration (straight radial, most line on side branch lines, customers nearer the source or closer to the feeder end points) serve the area? Does the line location and configuration allow for easy troubleshooting or is the line remote from roadways in many locations?
- Has optimum line fault protection (automatic sectionalizing) been determined and installed. This is one primary method extensively used to reduce problems for V7 in the past. However, increasing customers eventually overcomes this advantage. As a whole SSVEC interruptions are gradually involving more customers per incident.
- Feeder voltage and structure design effectiveness. V7 consists of many structures with "overhead neutral" design, seeking to shunt lightning strokes to ground; however, this configuration can, in some environments, lead to more interruptions of other types. Higher voltage lines are much better at resisting lightning flashovers, with 350kV basic insulation level (BIL) as opposed to 95 kV or 110 kV for distribution lines. This is one major advantage of 69 kV lines over distribution lines.
- Feeder age and condition; maintenance programs, etc.

'OMENTARY INTERRUPTIONS

For V7 momentary interruptions are a much greater problem than for most other feeders. Even if exposures don't result in power outages, line faults do produce sags and spikes. Lightning produces powerful spikes; faults can drop the line voltage momentarily to very low values. Especially motor starting loads cause voltage dips; this is not as large a problem for V7 as in some other places, because there are fewer large motors, but longer lines magnify this problem. Any load or fault interruption is followed with a voltage spike as the line inductance (electrical inertia) acts to maintain current flow.

- V7 is a very long feeder with about 350 connected primary miles. This all leads to lots of exposure to voltage dips, which act a momentary service interruptions. Lightning, bird-related faults, conductor "slap" (conductor movement in the wind) is more frequent. Snow or ice can cause upper conductors to sag into lower ones or sudden "unloading" causes lower conductors to flip upward into higher conductors. A much larger incidence of line faults is the result of all these factors, for this feeder. There are many protective sectionalizing devices (breakers) along the feeder; these open and close automatically as problems are sensed and eliminated. Breaker interruptions result in momentary power interruptions every time.
- This feeder is very long; customers are very remote from the substation. This translates into many miles of line with electric resistance and reactance. A surge of current through these lines creates substantial momentary voltage drops. The same fault or starting load results in greater voltage dips on long feeders. What is a minor nuisance on some feeders, frequently acts like a full momentary service interruption on longer lines.

This line has many more temporary current surges than most feeders, as described, because of the excessive exposure. Then the line is longer (and the conductor is quite small). This means greater impedance to power flows and greater voltage transients.

TYPICAL SOLUTIONS

- The most typical solution is to "divide and conquer": In some areas additional feeders can be extended. This is not a good solution when the length of the extension is more than about 5-10 miles or many miles of line remain served by individual sources. Construct new sub-transmission lines if needed and new load centers (substations) are sometimes essential. Split more extensive feeders into shorter optimized feeders.
- Multiple sources will not prevent interruptions, but the most serious interruptions can frequently be shortened by transferring affected customers temporarily to an alternate source. Multiple circuits on the same physical structures can help with some problems if the shared length is not too long, but these are not independent sources. Each circuit can affect the others and structural damage affects all attached circuits. Also, these facilities are expensive to construct.
- Upgrade existing lines (structures, conductors, voltage, etc) where feasible. This works best where the line configuration is not a long radial configuration, but where most primary line exists in significant multiple lateral branches; the source may be shared, but each lateral functions almost as an independent mini-feeder otherwise. Even newly upgraded lines are subject to damage or interference from various hazards. Excessive feeder length always leads to poorer feeder performance. In any event, feeders exceeding 50 miles of total primary or with a long radial source will deteriorate in quality of service delivered.

POWER QUALITY CAUSES

Primary feeders with long, small, conductors have high electrical resistance and inductance (magnetic properties). As loads increase voltage is reduced at points progressing away from the substation. At a certain load and distance stead-state voltage regulation becomes necessary. This is very true of V7 feeder.

Multiple Voltage Regulators in Series: As loads further increase, additional voltage regulators become necessary. For feeder V7 a total of 5 voltage regulators are in series to reach customers in Patagonia and Canelo. Steady state voltages are well maintained as long as controls don't malfunction. With voltage regulators, timers are necessary to avoid continual tap changing which would soon wear out the internal mechanisms. The substation must be set fastest, while the most remote regulators are set slowest. So, 20 seconds, 40 seconds, 60 seconds, 80 seconds, and 100 seconds, for example. Source issues are handled fairly rapidly, while voltage fluctuation affecting only the far ends are handled much more slowly. Rapid voltage dips caused by momentary surges or faults are not dealt with at all. If a disturbance caused the loss of significant load, high voltage will occur all along the feeder until the regulators "time out" and deal with the steady-state voltage. There is a problem with transient voltage regulation on V7.

Extensive feeder miles and customer transformers: Longer, more extensive feeders are affected by widely distributed hazards, such as lightning strikes, wind, trees, deterioration, accidents, birds, animals, etc. Although systems, devices, and procedures attempt to deal with these hazards, lines are affected and faults occur. A feeder with hundreds of miles of line and thousands of transformers experiences more faults than shorter feeders. V7 is the most extensive SSVEC feeder now in operation, and it experiences a large number of faults. These act in conjunction with the high line resistance and inductance to produce voltage fluctuations. Higher voltage (more than 6% above nominal) is referred to as swells or spikes; lower voltage (beginning about a 9% below nominal) would be referred to a sags or dips. Fluctuating power might be referred to as "unstable", or small fluctuations that are repeatedly visible in lights are termed "flicker". All of these occur at a much above average frequency on feeder V7.

Conductor inductance and capacitance are near matches: As it happens the source inductance and the line capacitance on feeder V7 are more or less matched or "tuned" by chance (especially as many miles of underground lines have been added). This results in types of electrical "resonance", "harmonics", voltage distortions, and similar phenomena. The harmonic content has a standard industry set maximum. SSVEC

testing (not yet extensive) indicates that about a 7% harmonic content. This is at or above standards for modern electronics to perform optimally. Additionally, during lighter load periods, voltages in the Sonoita vicinity (near mid-feeder) are rising well above standard steady state limits, because of these feeder characteristics, even ›ugh the voltage regulators next "upstream are appropriately maintaining voltage"; a significant voltage "rise" is occurring at these times.

V7 is seriously experiencing all of the above power quality issues. This type of issue can prevent voltage inverters from functioning.

CONCLUSIONS

- Delays, for economy, expediency, out of customer considerations, and for legal pursuits, have amplified the problems on this feeder. SSVEC initiated actions well ahead of serious developments, but subsequent unanticipated delays are leading to serious feeder performance issues right now. The voltage performance issues (not necessarily steady state voltage levels) ***especially need serious attention now.***
- This feeder V7 has severe issues right now, and gradual load growth will very soon (if not during the next severe winter storm) begin to require power curtailments during peak periods of customer demand.
- Solutions are needed soon to the many momentary interruptions, sags, dips, etc. These are causing our customers real management issues and SSVEC wants to solve these problems.
- If all the other issues can be resolved, and the feeder can be separated into smaller feeders, good sectionalizing design, maintenance, component upgrades, etc, can result in excellent rural electric service to this area.
- Some seem to feel SSVEC does not want non-traditional solutions. Actually, SSVEC desires any cost effective, reliable, and predictable methods to allow us to optimally and satisfactorily serve our customers.

TABLE 1

2008 V-7 AND OTHER FEEDERS (CONNECTIVITY) OUTAGE DATA

Feeder Line	Hours Off	Number of Customers	Customer Hours OFF	Hours OFF/cust/yr
V-7 Sonoita/Patagonia	179.98	3057	3839.91	0.06
R-3 Ramsey	64.16	1006	2988.66	0.06
K-2 Chri	239.75	1828	4299.75	0.13
O-5 Mescal	392.22	2639	4657.97	0.15
J-3 Kansas Settlement	197.05	1202	3409.05	0.16

1. Three feeder lines have higher outages than V-7, with twice the outage hours per customer.
2. Only 1 V-7 outage was due to "overload" impacting 1 customer.

Analysis prepared by Jeanne Horsmann and Gail Getzwiller, Sonoita.
Ref: SSVEC 2008 Feeder Outage Data (without November)

In 2008, there were 80 outages for total of 180 hours on the V-7 feeder. Note November data was not provided; however, 12 months of data are shown as January 2008 and 2009 were provided.

- *50 Outages (63%) impacted 1 meter (Causes: 18 unknown, 11 birds, 11 lightning, 3 animals, 3 wind, 3 other, 1 overload)*
- *7 Outages (9%) impacted 2 meters (Causes: 3 lightning, 2 birds, 2 unknown, 1 Other)*
- *5 Outages(6%) impacted 3 meters (Causes: 2 lighting, 1 birds, 1 tree, 1 unknown)*

ONLY 3 Outages (4%) impacted a significant number of people on the main line with causes as indicated:

- *1 impacted 1,700 meters– cause "Other"*
- *1 impacted 580 meters – cause wind*
- *1 impacted 450 meters – cause wind*

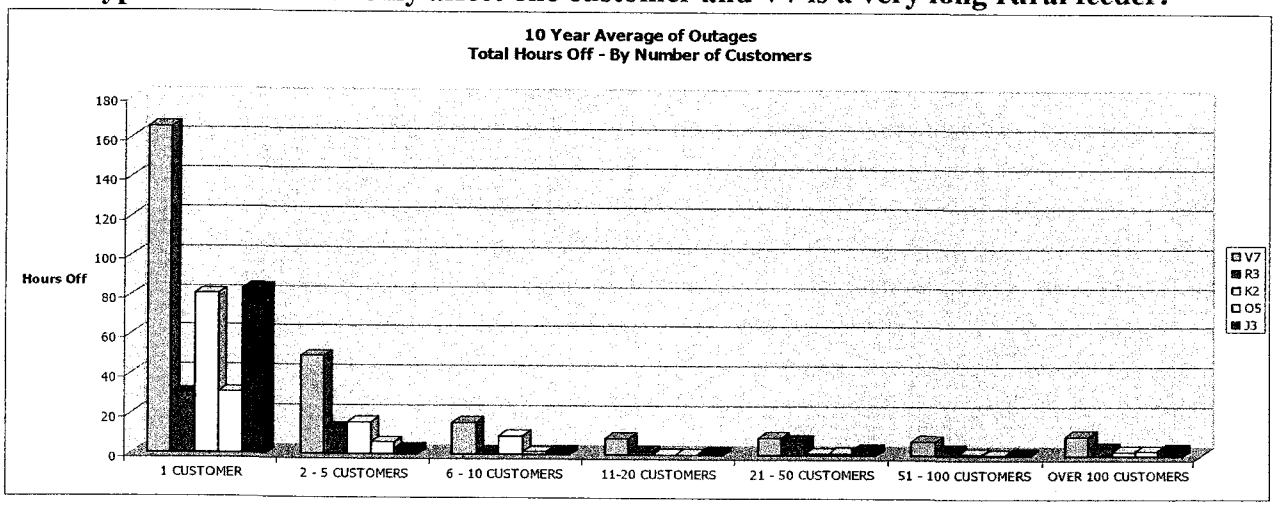
Others, 1 impacted 60 meters (cause "accident"), 1 impacted 45 meters (wind), 1 impacted 40 meters (lightning), 1 impacted 20 meters (birds), 1 impacted 12 meters (underground fault)
The causes for V-7 outages in 2008 were as follows:

Cause	*No. of Outages*	*Hours*
Overload	*1*	*2.0*
Tree	*1*	*2.0*
Underground Fault	*2*	*10.0*
Accidents	*3*	*10.5*
Animals	*3*	*25.0*
Other	*5*	*6.5*
Wind	*7*	*21.0*
Birds	*15*	*22.3*
Lightning	*21*	*39.9*
Unknown	*25*	*42.8*

- The above data is correct for 11-months in 2008. HOWEVER, industry standards followed by SSVEC typically analyze outage data for 5 or 10-year periods in order to identify trends and statistics for problem feeders.
- The Outage Data for a 10-year period indicates the V7 Feeder is has the highest outage rate on the SSVEC System.

FEEDER	AVG Hours Out	AVG No. Customers Effected	AVG Consumer Hours Out
V7	270.7	2735.95	6883.131
R3	63.05	1134.81	2675.756
O5	43.86	2054.60	2004.006
K2	113.63	676.45	1568.918
J3	98.25	759.90	1332.726

- Outage types stated are consistent with system configuration. Majority of outages on typical rural feeder only affect one customer and V7 is a very long rural feeder:



- The area of concern is the actual number of CUSTOMER HOURS affected by the outages. Although there are over 160 HOURS OFF affecting one customer, that is diminutive compared to the number of CONSUMER HOURS affected by the HOURS OFF of >100 Customers:

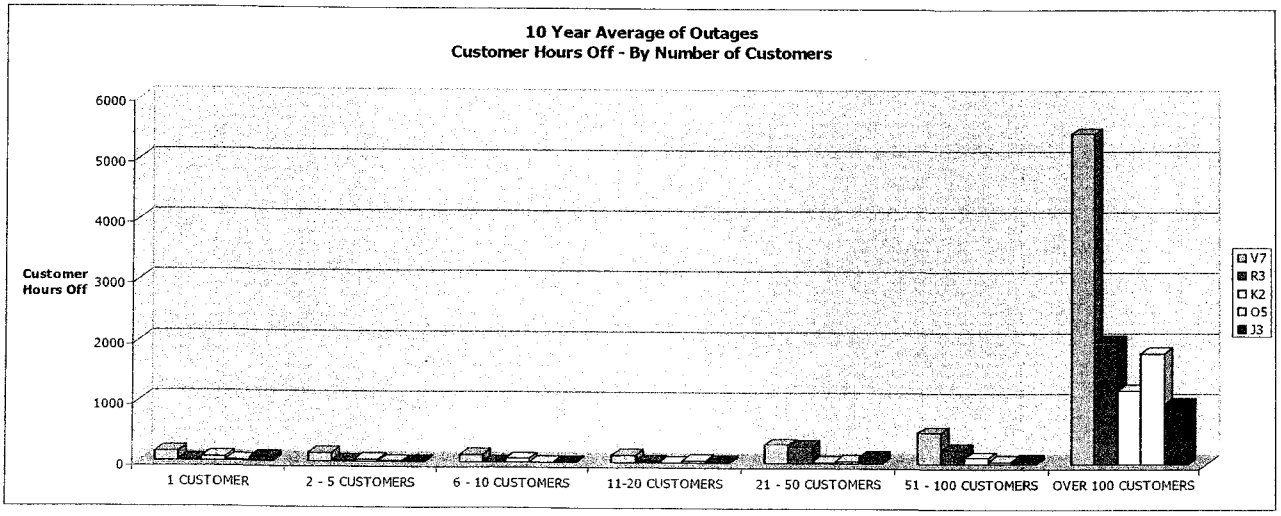


TABLE [redacted]

SUB/AREA	FEEDER	AVG CUST	Total Hours Off	HRS OFF/CUST	Total # Cons	AFFECT/CUST	# OUTAGES	# OUTGS/CUST	TOT CONS-HRS	CONS-HR/CUST	SAIDI DUR/CUST TTL HRS PER CUST	CAIDI AVG INCI DUR TTL HRS # OUTAGES	CTAIDI DUR/AF CUST TTL HRS INTR CUST	CAIFI FREQ/AF CUST OUTAGES INTR CUST
		ALL THESE COLUMNS ARE AVERAGES FOR 10 YEARS OF DATA:					AVG	INTR/CUST						
MESCAL	O8	575	62.3	0.108	882	1.533	23	0.040	2222.6	3.86	0.108	2.731	0.071	0.026
MORT	D7	84	9.0	0.108	20	0.238	2	0.027	317.0	3.78	0.108	3.922	0.451	0.115
W HUAC	V7	2149	269.6	0.125	2525	1.175	124	0.058	6077.5	**2.83**	0.125	2.181	0.107	0.049
MORT	D1	65	3.0	0.046	76	1.158	2	0.028	177.2	2.71	0.046	1.655	0.039	0.024
MESCAL	O28*	525	71.0	0.135	622	1.184	30	0.056	1333.5	2.54	0.135	2.408	0.114	0.047
MORT	D5	298	14.1	0.047	161	0.542	8	0.026	729.2	2.45	0.047	1.854	0.087	0.047
KANSAS	J3	548	96.6	0.176	579	1.057	42	0.077	1171.8	2.14	0.176	2.278	0.167	0.073
MESCAL	O1	1382	140.1	0.101	1734	1.255	66	0.048	2750.6	1.99	0.101	2.122	0.081	0.038
E HUAC	W3	1058	23.7	0.022	1294	1.223	16	0.015	2037.7	1.93	0.022	1.489	0.018	0.012
MESCAL	O15*	1624	111.3	0.069	2440	1.503	54	0.033	3081.6	1.90	0.069	2.072	0.046	0.022
MESCAL	O5	1866	82.5	0.044	3145	1.686	41	0.022	3412.7	1.83	0.044	1.992	0.026	0.013
SAN S	A2	183	28.2	0.155	167	0.912	9	0.049	325.4	1.78	0.155	3.172	0.169	0.053
WEBB	M1	228	43.7	0.192	111	0.489	12	0.054	387.0	1.70	0.192	3.578	0.392	0.110
CHIR	K2	840	138.2	0.164	661	0.786	43	0.051	1394.8	1.66	0.164	3.204	0.209	0.065
STEW	E3	698	16.5	0.024	339	0.486	8	0.012	1155.4	1.66	0.024	1.982	0.049	0.024
KANSAS	J7	529	55.0	0.104	421	0.795	25	0.048	808.8	1.53	0.104	2.175	0.131	0.060
STEW	E1	45	3.2	0.071	21	0.471	2	0.042	65.3	1.45	0.071	1.679	0.150	0.090
BOWIE	B5	39	9.1	0.232	14	0.351	3	0.079	55.3	1.41	0.232	2.935	0.659	0.225
COCH	H4	1480	56.2	0.038	1160	0.784	18	0.012	2060.8	1.39	0.038	3.073	0.048	0.016
SAN S	A3	291	16.8	0.058	200	0.685	6	0.020	386.5	1.33	0.058	2.945	0.084	0.029
TOMB	S23	320	22.4	0.070	291	0.907	10	0.032	408.7	1.28	0.070	2.174	0.077	0.035
RAMSEY	R3	2121	62.6	0.030	1121	0.529	40	0.019	2663.0	1.26	0.030	1.549	0.056	0.036
COCH	H3	365	15.9	0.044	138	0.378	7	0.019	386.5	1.06	0.044	2.338	0.115	0.049
MESCAL	O2	475	79.8	0.168	362	0.762	36	0.076	444.5	0.94	0.168	2.205	0.221	0.100
SYS	**AVG**	746	28.7	0.105	402	0.469	13	0.025	675.6	**0.93**	0.105	2.478	0.442	0.080
KEAT	T2	972	21.3	0.022	636	0.654	13	0.014	866.3	0.89	0.022	1.610	0.033	0.021
HAWES	X8	1798	14.1	0.008	844	0.470	6	0.004	1553.6	0.86	0.008	2.230	0.017	0.007
HAWES	X5	965	18.2	0.019	490	0.508	13	0.013	831.4	0.86	0.019	1.456	0.037	0.026
KEAT	T4	797	12.4	0.015	366	0.459	7	0.009	674.1	0.85	0.015	1.816	0.034	0.019
KANSAS	J5	202	16.9	0.084	65	0.323	9	0.043	162.5	0.80	0.084	1.941	0.259	0.133
HUAC	W5	1395	18.4	0.013	907	0.650	12	0.008	1080.6	0.77	0.013	1.573	0.020	0.013
BENSON	P5	843	20.8	0.025	423	0.501	10	0.011	620.1	0.74	0.025	2.162	0.049	0.023
BOWIE	B7	353	8.7	0.025	73	0.205	4	0.010	252.2	0.71	0.025	2.407	0.119	0.050
MCNL	N1	421	76.0	0.180	148	0.350	12	0.028	294.5	0.70	0.180	6.387	0.515	0.081
WEBB	M3	137	13.1	0.096	31	0.229	5	0.034	78.3	0.57	0.096	2.854	0.419	0.147
HAWES	X7	1629	19.6	0.012	662	0.407	11	0.007	904.9	0.56	0.012	1.818	0.030	0.016
STEW	E2	222	7.8	0.035	32	0.145	4	0.018	118.9	0.54	0.035	1.960	0.244	0.125
BOWIE	B3	101	6.0	0.060	15	0.146	2	0.019	51.3	0.51	0.060	3.158	0.408	0.129
WEBB	M5	81	10.8	0.132	30	0.370	2	0.027	41.2	0.51	0.132	4.886	0.357	0.073
ST DAV	Q3	453	7.5	0.017	175	0.386	5	0.010	228.6	0.51	0.017	1.667	0.043	0.026
MCNL	N2	556	44.9	0.081	138	0.248	13	0.024	267.7	0.48	0.081	3.374	0.325	0.096
RAMSEY	R1	906	16.2	0.018	256	0.282	10	0.011	424.6	0.47	0.018	1.588	0.063	0.040
BL VSTA	Y3	935	11.8	0.013	335	0.358	7	0.008	413.4	0.44	0.013	1.614	0.035	0.022
PUEBLO	Z2	261	3.4	0.013	17	0.067	2	0.006	114.1	0.44	0.013	2.292	0.198	0.086
PUEBLO	Z1	626	9.0	0.014	134	0.214	6	0.009	250.8	0.40	0.014	1.566	0.067	0.043
BL VSTA	Y2	666	3.6	0.005	144	0.217	2	0.004	258.5	0.39	0.005	1.518	0.025	0.017
SAN S	A1	29	2.2	0.075	5	0.173	1	0.045	11.0	0.38	0.075	1.673	0.435	0.260
RAMSEY	R4	392	9.0	0.023	160	0.408	7	0.019	143.8	0.37	0.023	1.209	0.056	0.046
ST DAV	Q7	2	6.0	3.600	0	0.180	0	0.180	0.6	0.36	3.600	20.000	20.000	1.000
PUEBLO	Z4	1660	16.0	0.010	413	0.249	10	0.006	554.1	0.33	0.010	1.659	0.039	0.023
S VSTA	U3	497	6.9	0.014	90	0.181	4	0.007	163.8	0.33	0.014	1.915	0.077	0.040
WEBB	M4	558	36.9	0.066	124	0.222	10	0.018	183.2	0.33	0.066	3.583	0.298	0.083
MESCAL	O4	1206	9.8	0.008	496	0.411	5	0.004	388.6	0.32	0.008	1.917	0.020	0.010
BL VSTA	Y1	490	3.3	0.007	127	0.260	2	0.004	156.0	0.32	0.007	1.737	0.026	0.015
CHIR	K1	27	6.1	0.227	4	0.149	3	0.098	8.4	0.31	0.227	2.321	1.523	0.656
BENSON	P7	418	8.4	0.020	78	0.187	5	0.011	129.1	0.31	0.020	1.740	0.107	0.061
HAWES	X1	1313	2.7	0.002	166	0.126	1	0.001	387.1	0.29	0.002	2.418	0.016	0.007
BENSON	P8	662	12.8	0.019	113	0.170	5	0.008	168.1	0.25	0.019	2.410	0.114	0.047
S VSTA	U5	981	5.8	0.006	252	0.256	5	0.005	247.2	0.25	0.006	1.229	0.023	0.019
KEAT	T1	1196	6.2	0.005	216	0.180	4	0.003	293.0	0.24	0.005	1.561	0.029	0.019
WLCX	F8	884	9.8	0.011	300	0.339	6	0.007	212.5	0.24	0.011	1.576	0.033	0.021
WLCX	F7	868	19.0	0.022	233	0.269	10	0.011	196.9	0.23	0.022	1.924	0.082	0.042
RAMSEY	R2	1195	12.0	0.010	249	0.208	10	0.008	265.7	0.22	0.010	1.220	0.048	0.039

ST DAV	[illegible]	306	9.2	0.030	42	0.137	4		J12	66.6	0.22	0.030	2.554	0.219	0.08[illegible]
KEAT	T3	1275	7.0	0.005	190	0.149	5	0.004	258.0	0.20	0.005	1.363	0.037	0.027	
WLCX	F4	98	3.5	0.036	17	0.172	2	0.021	18.5	0.19	0.036	1.655	0.207	0.125	
S VSTA	U6	1352	9.1	0.007	157	0.116	6	0.004	248.1	0.18	0.007	1.591	0.058	0.036	
S VSTA	U7	937	6.9	0.007	169	0.180	4	0.004	167.1	0.18	0.007	1.957	0.041	0.021	
MESCAL	O3	478	5.5	0.011	44	0.091	2	0.004	61.6	0.13	0.011	2.868	0.125	0.044	
PUEBLO	Z3	2192	11.2	0.005	241	0.110	9	0.004	254.6	0.12	0.005	1.215	0.047	0.038	
WLCX	F3	901	15.2	0.017	19	0.021	6	0.007	34.6	0.04	0.017	2.568	0.815	0.317	
BL VSTA	Y4	934	8.2	0.009	251	0.269	3	0.004	7.3	0.01	0.009	2.492	0.033	0.013	

TABLE 2b: SELECTED FEEDERS # CUSTOMERS

								SAIFI			SAIDI	CAIDI	CTAIDI	CAIFI	
								INTR/CUST			DUR/CUST	AVG INCI DUR	DUR/AF CUST	FREQ/AF CUST	
		ALL THESE COLUMNS ARE AVERAGES FOR 10 YEARS OF DATA:					AVG				TTL HRS	TTL HRS	TTL HRS	OUTAGES	
SUB/AREA	FEEDER	AVG CUST	Total Hours Off	HRS OFF/CUST	Total # Cons	AFFECT/CUST	# OUTAGES	# OUTGS/CUST	TOT CONS-HRS	CONS-HR/CUST	PER CUST	# OUTAGES	INTR CUST	INTR CUST	
W HUAC	V7	2149	269.6	0.125	2525	1.175	124	0.058	6077.5	**2.83**	0.125	2.181	0.107	0.049	
MESCAL	O28*	525	71.0	0.135	622	1.184	30	0.056	1333.5	2.54	0.135	2.408	0.114	0.047	
KANSAS	J3	548	96.6	0.176	579	1.057	42	0.077	1171.8	2.14	0.176	2.278	0.167	0.073	
E HUAC	W3	1058	23.7	0.022	1294	1.223	16	0.015	2037.7	1.93	0.022	1.489	0.018	0.012	
MESCAL	O15*	1624	111.3	0.069	2440	1.503	54	0.033	3081.6	1.90	0.069	2.072	0.046	0.022	
CHIR	K2	840	138.2	0.164	661	0.786	43	0.051	1394.8	1.66	0.164	3.204	0.209	0.065	
STEW	E3	698	16.5	0.024	339	0.486	8	0.012	1155.4	1.66	0.024	1.982	0.049	0.024	
KANSAS	J7	529	55.0	0.104	421	0.795	25	0.048	808.8	1.53	0.104	2.175	0.131	0.060	
COCH	H4	1480	56.2	0.038	1160	0.784	18	0.012	2060.8	1.39	0.038	3.073	0.048	0.016	
RAMSEY	R3	2121	62.6	0.030	1121	0.529	40	0.019	2663.0	1.26	0.030	1.549	0.056	0.036	
HAWES	X8	1798	14.1	0.008	844	0.470	6	0.004	1553.6	0.86	0.008	2.230	0.017	0.007	
HAWES	X5	965	18.2	0.019	490	0.508	13	0.013	831.4	0.86	0.019	1.456	0.037	0.026	
KEAT	T4	797	12.4	0.015	366	0.459	7	0.009	674.1	0.85	0.015	1.816	0.034	0.019	
E HUAC	W5	1395	18.4	0.013	907	0.650	12	0.008	1080.6	0.77	0.013	1.573	0.020	0.013	
BEN	P5	843	20.8	0.025	423	0.501	10	0.011	620.1	0.74	0.025	2.162	0.049	0.023	
HAWES	X7	1629	19.6	0.012	662	0.407	11	0.007	904.9	0.56	0.012	1.818	0.030	0.016	
RAMSEY	R1	906	16.2	0.018	256	0.282	10	0.011	424.6	0.47	0.018	1.588	0.063	0.040	
B VSTA	Y3	935	11.8	0.013	335	0.358	7	0.008	413.4	0.44	0.013	1.614	0.035	0.022	
PUEBLO	Z4	1660	16.0	0.010	413	0.249	10	0.006	554.1	0.33	0.010	1.659	0.039	0.023	
MESCAL	O4	1206	9.8	0.008	496	0.411	5	0.004	388.6	0.32	0.008	1.917	0.020	0.010	
HAWES	X1	1313	2.7	0.002	166	0.126	1	0.001	387.1	0.29	0.002	2.418	0.016	0.007	
S VSTA	U5	981	5.8	0.006	252	0.256	5	0.005	247.2	0.25	0.006	1.229	0.023	0.019	
KEAT	T1	1196	6.2	0.005	216	0.180	4	0.003	293.0	0.24	0.005	1.561	0.029	0.019	
WLCX	F8	884	9.8	0.011	300	0.339	6	0.007	212.5	0.24	0.011	1.576	0.033	0.021	
WLCX	F7	868	19.0	0.022	233	0.269	10	0.011	196.9	0.23	0.022	1.924	0.082	0.042	
RAMSEY	R2	1195	12.0	0.010	249	0.208	10	0.008	265.7	0.22	0.010	1.220	0.048	0.039	
KEAT	T3	1275	7.0	0.005	190	0.149	5	0.004	258.0	0.20	0.005	1.363	0.037	0.027	
S VSTA	U6	1352	9.1	0.007	157	0.116	6	0.004	248.1	0.18	0.007	1.591	0.058	0.036	
S VSTA	U7	937	6.9	0.007	169	0.180	4	0.004	167.1	0.18	0.007	1.957	0.041	0.021	
PUEBLO	Z3	2192	11.2	0.005	241	0.110	9	0.004	254.6	0.12	0.005	1.215	0.047	0.038	
WLCX	F3	901	15.2	0.017	19	0.021	6	0.007	34.6	0.04	0.017	2.568	0.815	0.317	
B VSTA	Y4	934	8.2	0.009	251	0.269	3	0.004	7.3	0.01	0.009	2.492	0.033	0.013	

[redacted]

								SAIFI			SAIDI	CAIDI	CTAIDI	CAIFI	
								INTR/CUST			DUR/CUST	AVG INCI DUR	DUR/AF CUST	FREQ/AF CUST	
		ALL THESE COLUMNS ARE AVERAGES FOR 10 YEARS OF DATA:					AVG				TTL HRS	TTL HRS	TTL HRS	OUTAGES	
SUB/AREA	FEEDER	AVG CUST	Total Hours Off	HRS OFF/CUST	Total # Cons	AFFECT/CUST	# OUTAGES	# OUTGS/CUST	TOT CONS-HRS	CONS-HR/CUST	PER CUST	# OUTAGES	INTR CUST	INTR CUST	
W HUAC	V7	**2149**	**269.6**	0.125	**2525**	1.175	**124**	0.058	**6077.5**	**2.83**	0.125	2.181	0.107	0.049	0
MESCAL	O28*	525	71.0	0.135	622	1.184	30	0.056	1333.5	2.54	0.135	2.408	0.114	0.047	4
KANSAS	J3	548	96.6	**0.176**	579	1.057	42	**0.077**	1171.8	2.14	**0.176**	2.278	0.167	**0.073**	0
E HUAC	W3	1058	23.7	0.022	1294	1.223	16	0.015	2037.7	1.93	0.022	1.489	0.018	0.012	2
MESCAL	O15*	1624	111.3	0.069	2440	**1.503**	54	0.033	3081.6	1.90	0.069	2.072	0.046	0.022	1
CHIR	K2	840	138.2	0.164	661	0.786	43	0.051	1394.8	1.66	0.164	**3.204**	**0.209**	0.065	0
STEW	E3	698	16.5	0.024	339	0.486	8	0.012	1155.4	1.66	0.024	1.982	0.049	0.024	5
KANSAS	J7	529	55.0	0.104	421	0.795	25	0.048	808.8	1.53	0.104	2.175	0.131	0.060	0
COCH	H4	1480	56.2	0.038	1160	0.784	18	0.012	2060.8	1.39	0.038	3.073	0.048	0.016	
RAMSEY	R3	2121	62.6	0.030	1121	0.529	40	0.019	2663.0	1.26	0.030	1.549	0.056	0.036	
	GRP AVG	**1157**	**90**	**0.089**	**1116**	**0.952**	**40**	**0.038**	**2178.5**	**1.88**	**0.089**	**2.241**	**0.094**	**0.041**	
	MAX	**2149**	**269.6**	**0.176**	**2525**	**1.503**	**124**	**0.077**	**6077.5**	**2.83**	**0.176**	**3.204**	**0.209**	**0.073**	**0**

TABLE 3

TOTAL NUMBER OF CONSUMER OUTAGE HOURS PER CONSUMER 1995 - 1999

SUBSTATION	1995	1996	1997	1998	1999	Sub/Fdr Average	% Comparison to System
SYSTEM TOTAL	1.110	1.690	1.613	1.659	2.706	1.756	
SAN SIMON TOTALS	0.642	1.559	1.291	0.090	0.969	0.910	52%
A1	0.000	0.000	2.353	0.143	0.057	0.511	
A3	1.350	2.212	1.901	0.069	0.162	1.139	
A5	0.351	0.868	0.247	0.068	0.022	0.311	
Outages of Entire Sub A	0.000	0.000	0.000	0.000	0.810	0.162	
BOWIE TOTALS	0.438	0.327	0.215	0.346	1.708	0.607	35%
B3	0.862	1.316	0.174	0.440	0.887	0.736	
B5	2.481	0.167	0.264	1.757	0.042	0.942	
B7	0.140	0.100	0.217	0.167	0.970	0.319	
Outages of Entire Sub B	0.000	0.000	0.000	0.000	0.827	0.165	
MORTENSON TOTALS	0.324	2.995	3.931	0.676	3.961	2.377	135%
D1	0.034	0.103	0.321	5.862	0.069	1.278	
D5	0.486	0.249	0.058	0.052	3.880	0.945	
D7	0.020	0.081	0.083	0.250	2.234	0.534	
Outages of Entire Sub D	0.000	2.802	3.830	0.000	0.808	1.488	
STEWART TOTALS	0.330	1.180	0.547	0.099	4.506	1.333	76%
E1	0.190	0.185	0.014	0.097	0.000	0.097	
E2	1.184	0.500	1.986	0.197	0.062	0.786	
E3	0.079	0.053	0.105	0.067	5.107	1.082	
Outages of Entire Sub E	0.000	1.016	0.000	0.000	0.822	0.368	
WILLCOX TOTALS	0.165	0.552	0.041	0.135	0.956	0.370	21%
F3	0.072	0.033	0.046	0.031	0.011	0.039	
F4	0.892	0.000	0.035	0.301	0.011	0.248	
F7	0.045	0.145	0.059	0.374	0.147	0.154	
F8	0.214	0.003	0.012	0.046	0.262	0.107	
Outages of Entire Sub F	0.000	0.503	0.000	0.000	0.816	0.264	
COCHISE TOTALS	0.463	0.516	0.413	0.625	0.595	0.522	30%
H3	0.167	0.067	0.273	2.186	1.403	0.819	
H4	0.536	0.630	0.450	0.221	0.067	0.381	
Outages of Entire Sub H	0.000	0.000	0.000	0.000	0.256	0.051	
KANSAS TOTALS	0.808	3.279	4.172	0.963	4.665	2.778	158%
J3	1.064	1.696	0.460	2.265	0.742	1.245	
J5	1.905	0.191	0.201	0.090	2.786	1.035	
J7	0.502	1.804	7.095	0.268	5.748	3.083	
Outages of Entire Sub J	0.000	1.642	0.000	0.000	0.925	0.513	
WEBB TOTALS	0.577	1.363	0.143	2.165	1.081	1.066	61%
M1	0.984	0.133	0.029	2.195	0.318	0.732	
M3	0.589	0.394	0.112	0.007	0.259	0.272	
M4	0.162	1.358	0.167	2.777	0.079	0.909	
M5	3.524	0.522	0.365	0.408	0.163	0.996	
Outages of Entire Sub M	0.000	0.422	0.000	0.000	0.925	0.269	
MCNEAL TOTALS	1.033	3.728	1.094	1.284	2.480	1.924	110%
N1	1.394	0.519	1.815	2.921	3.399	2.010	
N2	0.778	3.178	0.558	0.095	0.215	0.965	
Outages of Entire Sub N	0.000	1.646	0.000	0.000	0.927	0.515	
MESCAL TOTALS	2.073	4.127	1.240	0.724	1.268	1.886	107%
O1	2.074	6.311	1.723	0.433	1.803	2.469	
O2	6.536	5.730	1.253	3.291	2.021	3.766	
O3	0.000	1.150	0.000	0.000	0.000	0.230	
O4	0.902	1.297	0.799	0.164	0.010	0.634	
Outages of Entire Sub O	0.000	0.251	0.000	0.000	0.257	0.101	

SUBSTATION	1995	1996	1997	1998	1999	Sub/Fdr Average	Comparison to System
SYSTEM TOTAL	1.145	1.699	1.509	1.675	2.735	1.753	129%
BENSON TOTALS	1.186	1.180	0.582	0.560	1.863	1.074	61%
P5	2.512	0.450	1.091	1.154	1.709	1.383	
P7	0.253	0.111	0.005	0.022	1.064	0.291	
P8	0.030	1.340	0.240	0.111	1.718	0.688	
Outages of Entire Sub P	0.000	0.435	0.000	0.000	0.257	0.138	
ST DAVID TOTALS	1.849	0.945	0.130	1.142	1.889	1.191	68%
Q3	0.332	0.534	0.024	3.467	0.523	0.976	
Q5	0.002	0.015	0.187	0.046	0.035	0.057	
Q7	0.000	0.000	0.000	4.500	4.000	1.700	
Outages of Entire Sub Q	1.740	0.768	0.000	0.000	1.689	0.839	
RAMSEY TOTALS	0.259	0.403	0.542	3.667	4.141	1.802	103%
R1	0.563	0.705	3.105	1.251	1.949	1.514	
R2	0.252	0.094	0.132	3.592	0.104	0.835	
R3	0.164	0.566	0.138	5.046	5.633	2.309	
Outages of Entire Sub R	0.000	0.000	0.000	0.000	1.161	0.232	
TOMBSTONE TOTALS	1.903	3.908	1.584	0.519	1.781	1.939	111%
S3	0.079	4.392	1.205	0.586	0.948	1.442	
S7	0.050	0.056	3.643	0.031	4.594	1.675	
Outages of Entire Sub S	1.827	0.000	0.000	0.000	0.392	0.444	
KEATING TOTALS	2.063	0.533	1.056	0.931	2.865	1.489	85%
T1	1.510	0.154	0.944	1.663	0.222	0.899	
T2	0.476	0.333	0.436	0.875	1.736	0.771	
T3	0.388	0.801	1.550	0.212	0.814	0.753	
T4	0.524	1.174	1.437	0.555	0.451	0.828	
Outages of Entire Sub T	1.270	0.000	0.000	0.000	2.132	0.680	
SIERRA VISTA TOTALS	0.163	0.309	0.210	1.299	0.804	0.557	32%
U3	0.130	0.081	0.000	0.118	0.224	0.111	
U5	0.284	0.564	0.386	0.763	0.153	0.430	
U6	0.082	0.221	0.055	0.063	0.011	0.086	
U7	0.169	0.229	0.384	0.171	0.154	0.221	
Outages of Entire Sub U	0.000	0.000	0.000	0.999	0.697	0.339	
HUACHUCA WEST TOTALS	5.482	4.694	2.406	11.263	9.380	6.645	379%
V7	1.746	1.311	2.406	11.263	8.943	5.134	
Outages of Entire Sub V	3.736	3.383	0.000	0.000	0.437	1.511	
HUACHUCA EAST TOTALS	2.445	3.042	3.204	0.330	0.472	1.899	108%
W3	0.255	5.300	6.739	0.097	0.168	2.512	
W5	0.768	0.232	0.633	0.489	0.093	0.442	
Outages of Entire Sub W	1.883	0.742	0.000	0.000	0.349	0.595	
HAWES TOTALS	0.510	0.685	1.177	0.717	4.583	1.534	88%
X1	0.126	0.003	0.003	0.006	3.223	0.672	
X5	0.434	0.633	2.295	1.243	2.464	1.414	
X7	1.145	2.097	0.713	1.483	1.490	1.386	
X8	0.638	0.790	0.738	0.363	4.256	1.357	
Outages of Entire Sub X	0.000	0.000	0.000	0.000	1.417	0.283	
BELLA VISTA TOTALS	0.786	3.981	0.480	1.201	0.503	1.390	79%
Y1	1.079	0.533	5.533	0.000	1.765	1.782	
Y2	0.220	0.215	0.229	0.164	0.011	0.168	
Y3	1.461	2.889	0.461	2.374	0.145	1.466	
Y4	0.315	1.554	0.855	0.320	0.173	0.643	
Outages of Entire Sub Y	0.000	2.300	0.000	0.000	0.390	0.538	

TABLE 4
TOTAL NUMBER OF CONSUMER OUTAGE HOURS PER CONSUMER 1992 - 1996

SUBSTATION	1992	1993	1994	1995	1996	Sub/Fdr Average	Comparison to System
SYSTEM TOTAL	1.083	1.119	1.540	1.145	1.549	1.287	1.287
SAN SIMON TOTALS	2.738	2.029	1.349	0.644	1.261	1.604	0.016
A1	0.000	0.000	1.077	0.000	0.000	0.215	
A3	1.767	3.282	1.077	1.350	2.212	1.937	
A5	3.348	0.213	1.484	0.351	0.868	1.253	
Outages of Entire Sub A	0.000	0.911	0.000	0.000	0.000	0.182	
BOWIE TOTALS	0.769	0.787	0.434	0.437	0.134	0.512	0.006
B3	4.472	3.414	0.900	0.862	0.355	2.000	
B5	0.000	0.556	0.580	2.481	0.167	0.757	
B7	0.135	0.281	0.325	0.140	0.075	0.191	
Outages of Entire Sub B	0.000	0.000	0.000	0.000	0.000	0.000	
MORTENSON TOTALS	1.611	0.232	2.166	0.325	2.219	1.311	0.009
D1	0.056	0.803	3.892	0.034	0.103	0.978	
D5	2.098	0.083	0.029	0.486	0.249	0.589	
D7	2.324	0.132	0.201	0.020	0.065	0.548	
Outages of Entire Sub D	0.000	0.000	1.405	0.000	2.030	0.687	
STEWART TOTALS	0.073	2.218	0.236	0.330	1.171	0.806	0.015
E1	0.781	1.711	0.091	0.190	0.185	0.592	
E2	0.073	2.030	0.047	1.184	0.496	0.766	
E3	0.045	2.290	0.299	0.079	0.042	0.551	
Outages of Entire Sub E	0.000	0.000	0.000	0.000	1.016	0.203	
WILLCOX TOTALS	0.829	1.016	0.786	0.165	0.551	0.669	0.047
F3	1.962	0.773	1.341	0.072	0.030	0.836	
F4	0.997	3.432	1.329	0.892	0.000	1.330	
F7	0.654	2.046	1.331	0.045	0.145	0.844	
F8	0.010	0.003	0.030	0.214	0.003	0.052	
Outages of Entire Sub F	0.000	0.000	0.000	0.000	0.503	0.101	
COCHISE TOTALS	0.541	0.066	0.188	0.463	0.515	0.355	0.013
H3	0.504	0.208	0.094	0.167	0.067	0.208	
H4	0.550	0.031	0.211	0.536	0.630	0.392	
Outages of Entire Sub H	0.000	0.000	0.000	0.000	0.000	0.000	
KANSAS TOTALS	2.509	1.030	5.571	0.809	3.262	2.636	0.078
J3	0.636	0.680	2.455	1.064	1.685	1.304	
J5	0.435	1.433	0.176	1.905	0.165	0.823	
J7	3.593	1.113	3.538	0.502	1.789	2.107	
Outages of Entire Sub J	0.000	0.000	2.673	0.000	1.640	0.863	
WEBB TOTALS	0.958	1.467	4.646	0.577	0.871	1.704	0.034
M1	1.336	1.026	1.069	0.984	0.133	0.910	
M3	0.553	1.154	0.048	0.589	0.394	0.547	
M4	0.985	0.317	7.025	0.162	0.556	1.809	
M5	0.426	0.063	2.330	3.524	0.522	1.373	
Outages of Entire Sub M	0.000	0.931	0.000	0.000	0.422	0.271	
MCNEAL TOTALS	1.948	0.547	4.479	1.033	3.655	2.332	0.048
N1	4.845	0.165	0.768	1.394	0.506	1.536	
N2	0.043	0.795	2.563	0.778	3.062	1.448	
Outages of Entire Sub N	0.000	0.000	2.640	0.000	1.646	0.857	
MESCAL TOTALS	0.457	2.104	1.475	2.073	4.113	2.045	0.149
O1	0.249	3.121	3.773	2.074	6.287	3.101	
O2	1.181	7.956	0.824	6.536	5.686	4.437	
O3	0.000	0.875	0.000	0.000	1.150	0.405	
O4	0.426	0.123	0.090	0.902	1.297	0.568	
Outages of Entire Sub O	0.000	0.000	0.000	0.000	0.251	0.050	

SUBSTATION	1992	1993	1994	1995	1996	Sub/Fdr Average	Comparison to System
SYSTEM TOTAL	1.083	1.119	1.540	1.145	1.549	1.287	1.287
BENSON TOTALS	1.395	1.010	0.593	1.186	1.176	1.072	0.057
P5	2.547	1.755	0.151	2.512	0.450	1.483	
P7	1.403	0.099	0.712	0.253	0.111	0.516	
P8	0.053	0.477	1.064	0.030	1.330	0.591	
Outages of Entire Sub P	0.000	0.000	0.000	0.000	0.435	0.087	
ST DAVID TOTALS	0.056	0.763	0.191	1.849	0.945	0.761	0.007
Q3	0.000	0.042	0.045	0.332	0.534	0.191	
Q5	0.084	0.047	0.261	0.002	0.015	0.082	
Q7	0.000	0.000	0.000	0.000	0.000	0.000	
Outages of Entire Sub Q	0.000	0.718	0.000	1.740	0.768	0.645	
RAMSEY TOTALS	1.414	1.701	0.988	0.259	0.400	0.952	0.093
R1	1.100	1.842	2.982	0.563	0.705	1.438	
R2	2.603	1.796	0.451	0.252	0.091	1.038	
R3	0.163	1.542	0.754	0.164	0.562	0.637	
Outages of Entire Sub R	0.000	0.000	0.000	0.000	0.000	0.000	
TOMBSTONE TOTALS	0.154	0.073	3.182	1.903	3.900	1.843	0.012
S3	0.151	0.080	3.455	0.079	4.383	1.629	
S7	0.188	0.000	0.000	0.050	0.056	0.059	
Outages of Entire Sub S	0.000	0.000	0.000	1.827	0.000	0.365	
KEATING TOTALS	0.870	0.836	1.177	2.063	0.495	1.088	0.124
T1	1.939	0.271	0.420	1.510	0.152	0.858	
T2	0.064	1.396	1.318	0.476	0.331	0.717	
T3	0.150	1.279	0.398	0.388	0.756	0.594	
T4	0.771	0.636	2.331	0.524	1.041	1.061	
Outages of Entire Sub T	0.000	0.000	0.000	1.270	0.000	0.254	
SIERRA VISTA TOTALS	0.749	0.310	0.613	0.163	0.299	0.427	0.046
U3	0.018	0.019	0.629	0.130	0.014	0.162	
U5	0.102	0.002	0.319	0.284	0.564	0.254	
U6	1.318	0.768	0.843	0.082	0.221	0.647	
U7	1.036	0.012	0.550	0.169	0.221	0.398	
Outages of Entire Sub U	0.000	0.000	0.000	0.000	0.000	0.000	
HUACHUCA WEST TOTALS	3.827	4.042	3.058	5.482	4.642	4.210	0.199
V7	3.827	4.042	1.550	1.746	1.259	2.485	
Outages of Entire Sub V	0.000	0.000	1.508	3.736	3.383	1.725	
HUACHUCA EAST TOTALS	0.364	0.602	0.162	2.445	2.153	1.145	0.062
W3	0.226	0.819	0.245	0.255	3.127	0.934	
W5	0.446	0.470	0.112	0.760	0.227	0.403	
Outages of Entire Sub W	0.000	0.000	0.000	1.883	0.742	0.525	
HAWES TOTALS	0.991	0.740	1.600	0.510	0.675	0.903	0.123
X1	0.033	0.011	0.011	0.126	0.003	0.037	
X5	1.046	0.216	1.435	0.434	0.632	0.753	
X7	0.000	6.817	5.918	1.145	1.969	3.170	
X8	1.223	0.164	0.395	0.638	0.790	0.642	
Outages of Entire Sub X	0.000	0.000	0.457	0.000	0.000	0.000	
BELLA VISTA TOTALS	0.821	0.937	3.294	0.786	3.894	1.946	0.149
Y1	2.193	1.611	0.000	1.079	0.533	1.083	
Y2	0.609	1.128	0.115	0.220	0.001	0.414	
Y3	0.252	0.258	1.500	1.461	2.866	1.267	
Y4	0.501	1.406	0.849	0.315	1.554	0.925	
Outages of Entire Sub Y	0.000	0.000	2.458	0.000	2.300	0.952	

TABLE 5

TABLE 110a
ENTIRE SUBSTATION/FEEDER OUTAGE RECORDS (FIVE YEAR AVERAGES)
Consumer Hours per Consumer 1986--1990

ENTIRE SUB/FEEDE	1986	1987	1988	1989	1990	AVE PER FEEDER
SAN SIMON	0.000	0.000	0.000	0.000	0.000	0.000
A-1	0.105	3.033	0.000	0.000	0.000	0.579
A-3	1.245	0.801	0.600	0.472	1.472	0.915
A-5	0.664	0.320	0.280	1.637	0.078	0.579
BOWIE	0.000	0.000	0.487	0.000	0.000	0.106
B-3	0.000	4.778	0.578	3.676	4.729	2.670
B-5	1.706	3.459	0.021	2.788	0.968	1.625
B-7	0.167	0.201	0.041	0.056	0.213	0.134
MORTENSON	3.143	1.493	0.000	0.000	0.000	0.806
D-1	0.185	0.328	0.000	0.077	0.000	0.105
D-5	0.327	0.276	0.482	0.144	0.078	0.247
D-7	0.258	1.050	0.067	0.286	0.050	0.342
STEWART	0.000	0.000	0.000	0.000	0.000	0.000
E-1	0.000	0.125	0.022	0.250	0.175	0.081
E-2	0.258	0.594	0.725	5.554	0.048	1.319
E-3	0.304	0.125	0.025	0.132	0.900	0.292
WILLCOX	0.000	1.937	0.000	0.000	0.000	0.386
F-3	0.018	0.019	0.477	0.049	0.734	0.247
F-4	1.514	1.608	2.519	0.123	0.401	1.169
F-7	0.619	1.242	0.218	0.106	0.504	0.522
F-8	0.069	0.992	0.021	0.051	0.013	0.209
COCHISE	0.000	0.000	0.000	0.000	0.000	0.000
H-3	5.299	0.302	1.443	3.827	0.210	2.138
H-4	1.345	0.381	2.650	0.308	2.780	1.477
KANSAS	0.000	0.932	0.000	4.041	0.000	0.979
J-3	6.528	2.878	2.905	1.284	1.773	3.143
J-5	1.983	1.036	0.293	1.788	3.807	1.631
J-7	5.425	8.295	1.855	16.694	3.320	7.133
WEBB	0.000	0.965	0.750	0.000	0.000	0.354
M-1	3.615	8.894	5.378	8.407	6.962	6.551
M-3	0.868	0.168	0.068	0.128	0.064	0.256
M-4	0.322	7.752	0.615	0.278	1.207	2.001
M-5	0.092	0.250	1.905	0.133	17.073	3.567
MCNEAL	0.000	0.000	0.000	0.000	0.000	0.000
N-1	3.198	0.249	2.009	6.664	1.521	2.659
N-2	0.166	2.480	1.865	1.582	7.135	2.723
MESCAL	0.000	0.000	0.000	0.000	0.000	0.000
O-1	2.871	0.588	0.956	1.377	1.174	1.339
O-2	18.358	4.474	11.560	4.086	2.221	8.244
O-3	1.000	0.000	1.500	0.000	0.000	0.563
O-4	0.613	0.205	0.027	0.205	0.537	0.327

ENTIRE SUB/FEEDER	1986	1987	1988	1989	1990	AVE PER FEEDER
BENSON	0.000	0.000	0.000	0.000	0.000	0.000
P-5	2.530	1.268	0.159	0.826	2.099	1.265
P-7	1.553	0.330	2.357	0.222	0.065	0.882
P-8	0.751	0.444	1.321	0.083	0.464	0.494
ST. DAVID	0.000	0.000	0.000	3.397	0.000	0.220
Q-3	0.239	0.391	0.920		0.173	0.344
Q-5	4.102	0.042	0.266	3.776	0.049	1.382
AP PWDR Q-7	0.000	0.000	0.000	0.250	2.000	0.450
TOMBSTONE	0.000	1.206	0.000	0.000	0.000	0.237
S-3	3.863	6.171	3.209	5.798	13.525	6.549
S-7	0.053	4.550	2.763	0.000	2.211	1.923
HUACHUCA EA	0.000	0.000	0.000	0.000	0.000	0.000
W-3	0.097	0.232	0.527	0.188	0.575	0.327
W-5	0.018	0.061	0.136	2.128	0.739	0.616
HUACHUCA WEST						
V-7	7.269	9.748	2.603	3.870	9.771	6.618
SIERRA VIST	1.000	0.000	0.000	0.000	0.000	0.211
U-3	1.080	1.755	0.115	2.034	1.706	1.369
U-5	0.444	1.749	0.660	0.013	0.054	0.555
U-6	0.420	0.565	0.601	0.771	2.095	0.927
U-7	0.005	0.123	0.507	0.042	0.034	0.152
BELLA VISTA		0.088	0.000	0.000	0.021	0.021
Y-1					2.443	2.443
Y-2		0.124	0.467	1.264	0.896	0.752
Y-3		0.882	7.554	0.131	0.093	2.361
Y-4		1.858	3.450	2.831	1.010	2.271
KEATING	0.000	0.000	0.000	0.000	0.000	0.000
T-1	0.316	0.095	3.038	4.649	1.080	1.964
T-2	0.177	0.236	0.335	0.793	0.309	0.340
T-3		0.925	0.462	1.702	0.244	1.098
T-4	0.955	1.210	0.123	1.403	0.223	0.847
HAWES	0.000	0.000	0.000	0.000	0.000	0.000
X-1					0.027	0.027
X-5	1.502	2.926	0.432	0.354	0.156	1.064
X-7						
X-8	4.060	0.628	1.537	1.173	0.288	1.686
RAMSEY	0.000	0.000	0.000	0.000	1.170	0.239
R-1	0.761	5.072	0.248	2.162	1.925	1.792
R-2	1.794	4.160	3.022	1.339	1.183	2.223
R-3	1.180	1.428	1.320	0.822	0.712	1.080

TABLE 6

NRECA Reliability Survey

APPENDIX - Definitions

SUSTAINED OUTAGE INDICES

Average Service Availability Index – ASAI is a measure of the average availability of the sub transmission and distribution systems to serve customers. It is the ratio of the total customer minutes that service was available to the total customer minutes demanded in a time period. It is normally expressed as a percentage.

$$\text{ASAI} = \frac{\textit{Customer Hours Service Availability}}{\textit{Customer Hours Service Demand}}$$

System Average Interruption Frequency Index (Sustained Interruptions) – This is defined as the average number of times that a customer is interrupted during a specified time period. It is determined by dividing the total number of customers interrupted in a time period by the average number of customers served. The resulting unit is "interruptions per customer".

$$\text{SAIFI} = \frac{\textit{Total Number of Customer Interruptions}}{\textit{Total Number of Customers Served}}$$

System Average Interruption Duration Index – This is defined as the average interruption duration for customers served during a specified time period. It is determined by summing the customer-minutes off for each interruption during a specified time period and dividing the sum by the average number of customers served during that period. The unit is minutes. This index enables the cooperative to report how many minutes customers would have been out of service if all customers were out at one time.

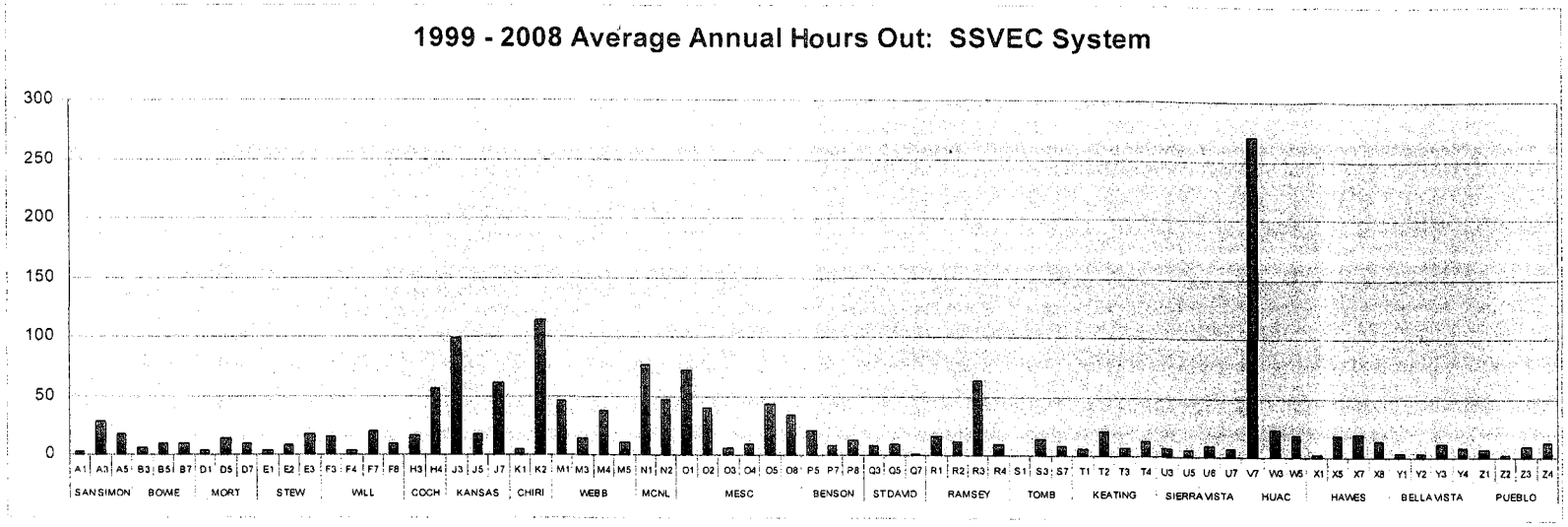
$$\text{SAIDI} = \frac{\sum \textit{Customer Interruption Durations}}{\textit{Total Number of Customers Served}}$$

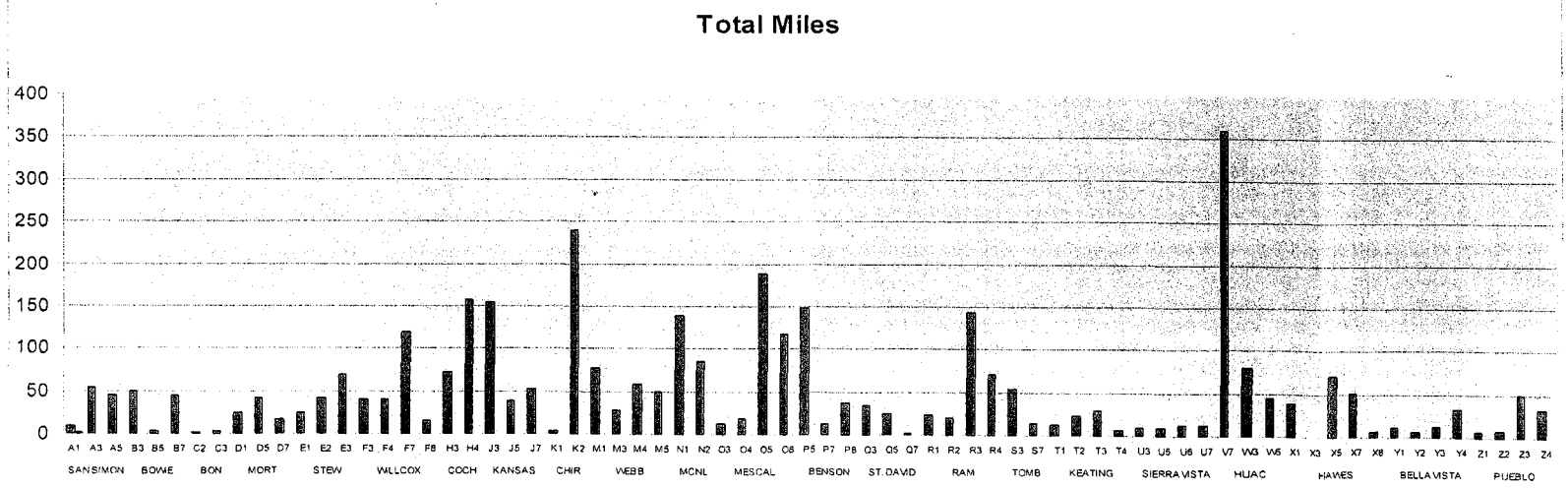
Customer Average Interruption Duration Index – This is defined as the average length of an interruption, weighted by the number of customers affected, for customers interrupted during a specific time period. It is calculated by summing the customer minutes off during each interruption in the time period and dividing this sum by the number of customers experiencing one or more sustained interruptions during the time period. The resulting unit is minutes. The index enables utilities to report the average duration of a customer outage for those customers affected.

$$\text{CAIDI} = \frac{\sum \textit{Customer Interruption Durations}}{\textit{Total Number of Customer Interruptions}}$$

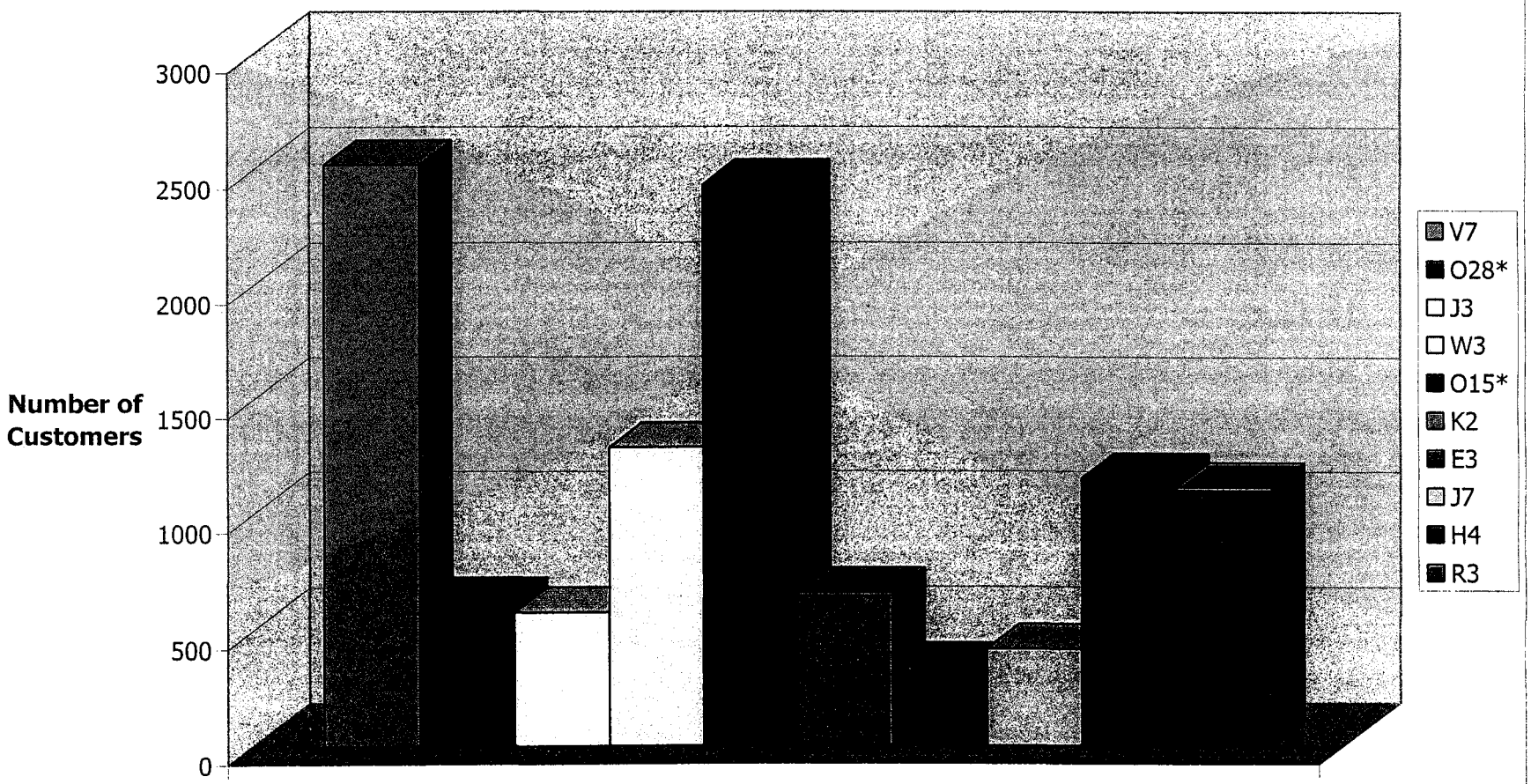
CHARTS 1 - 2

V-7 Feeder Outages and Length in Miles as Compared to all SSVEC feeders

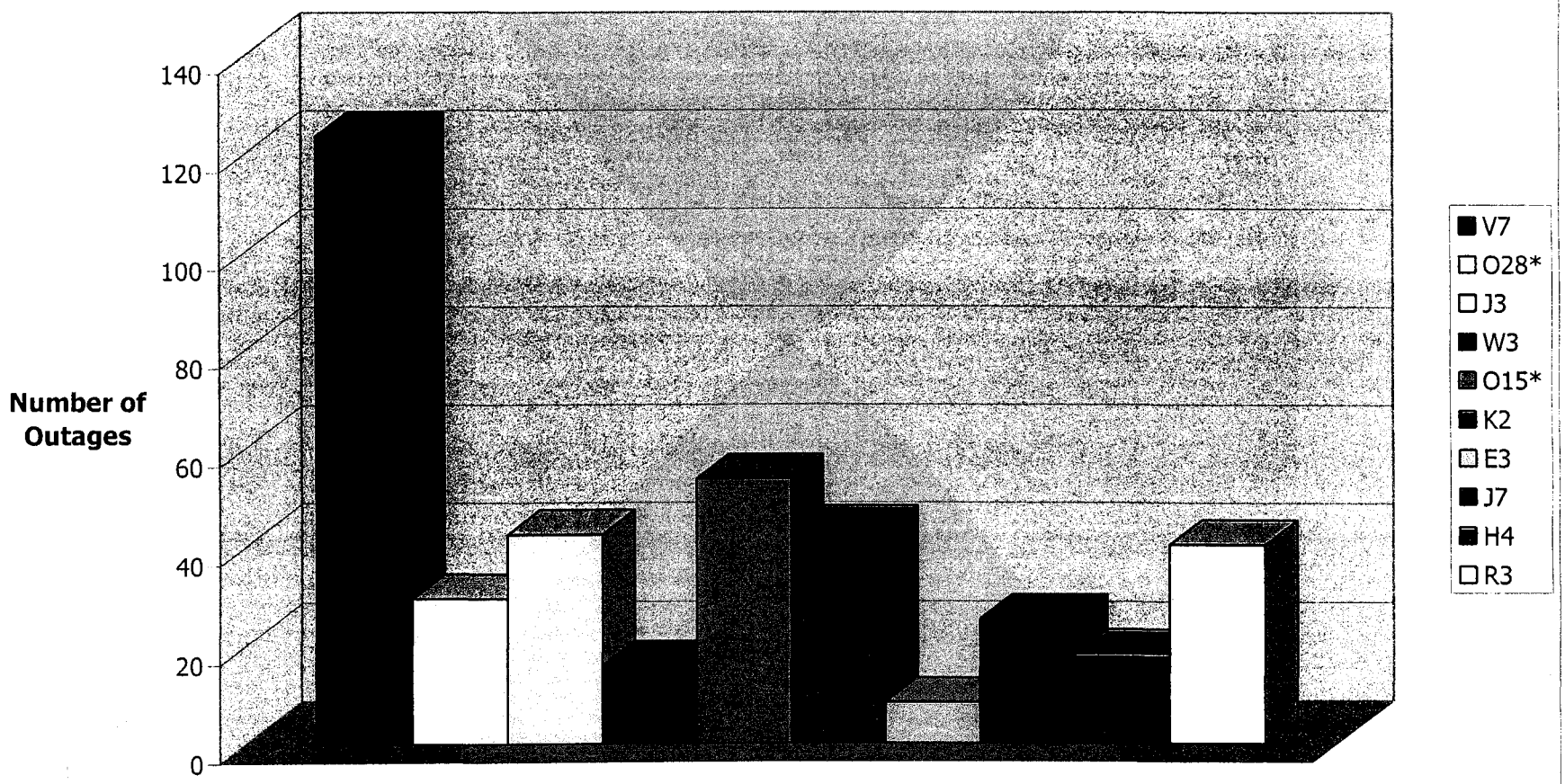




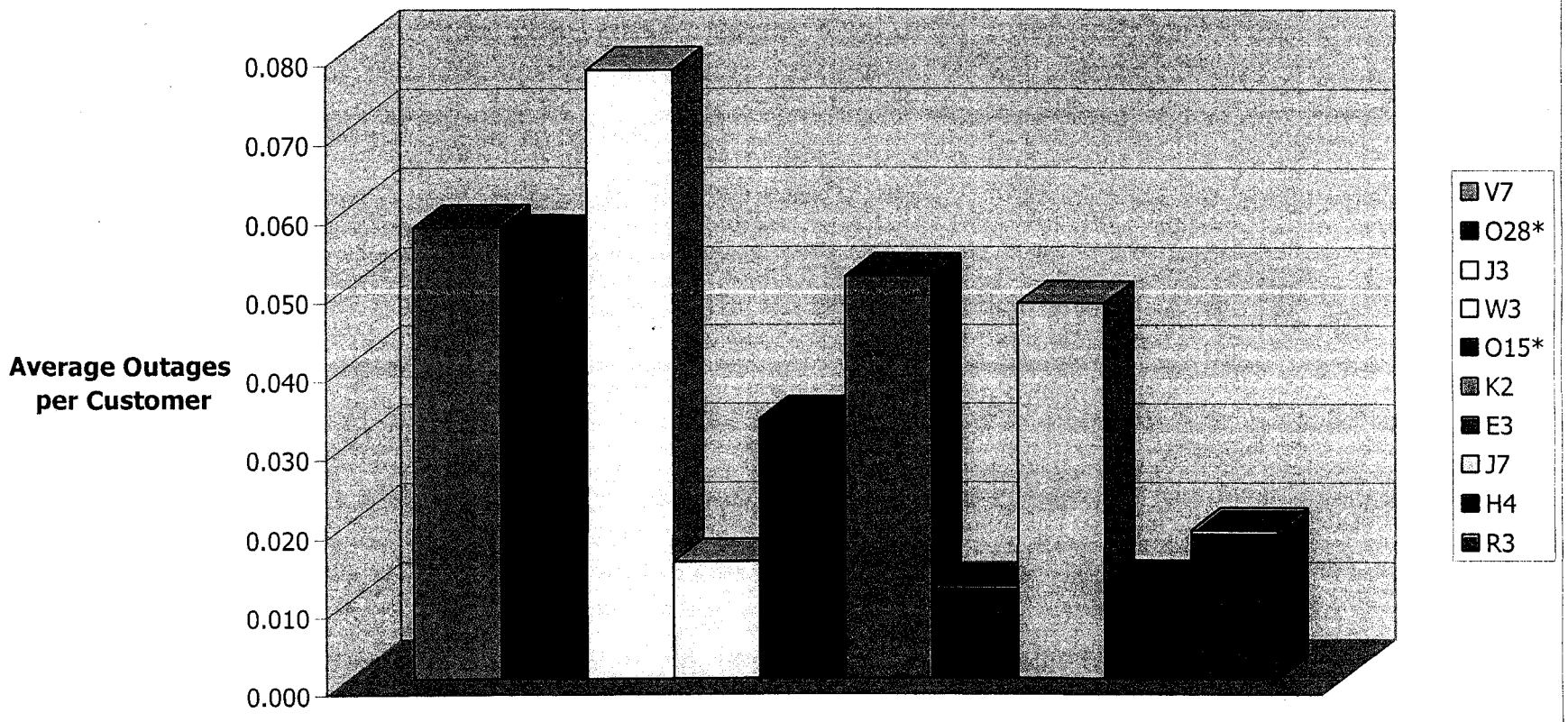
1999 - 2008 Total Customers Affected Annually by Outages
CHART 3



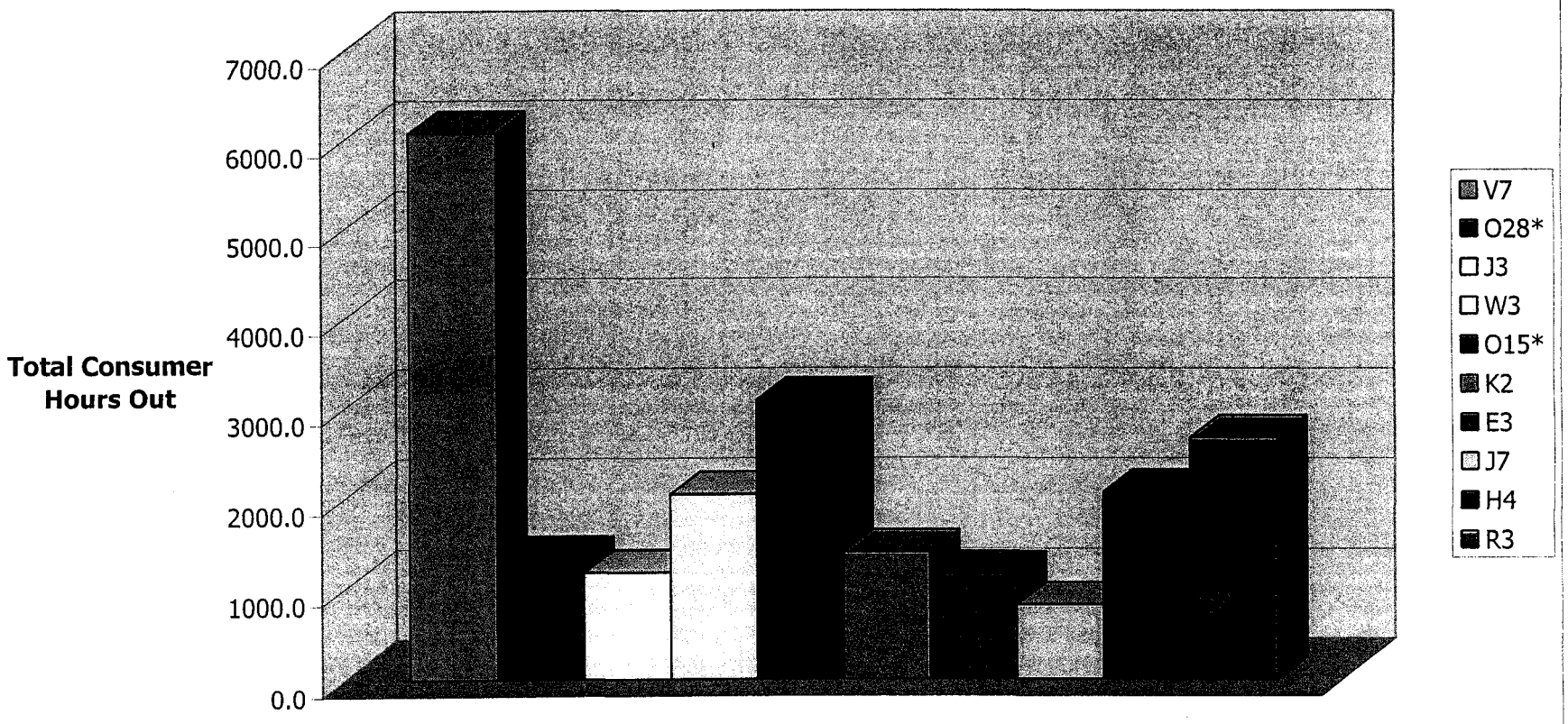
1999 - 2008 Total Number of Outages Annually
CHART 4



1999 - 2008 Average Number of Outages per Customer
CHART 5



1999 - 2008 Average Consumer-Hours Outage Time
CHART 6



1999 - 2008 Average Consumer-Hours Outage Time per Customer
CHART 7

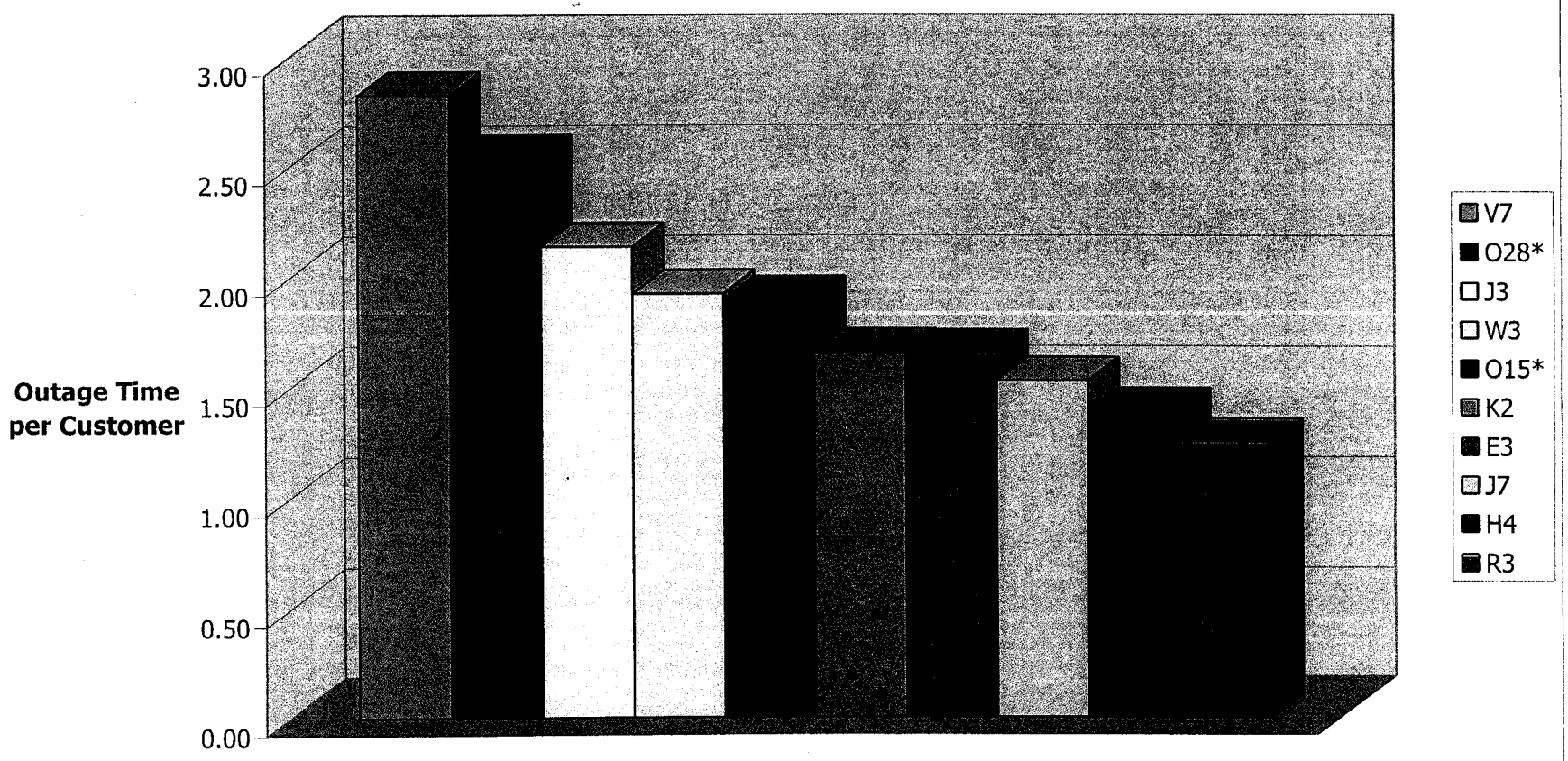
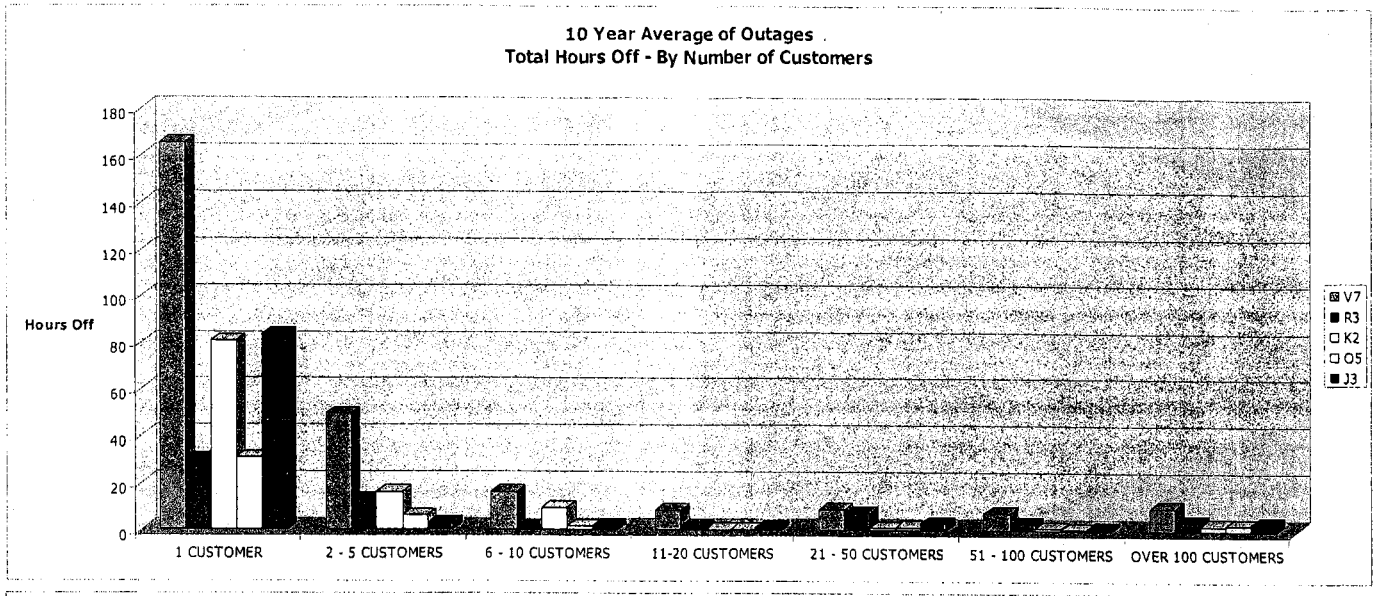
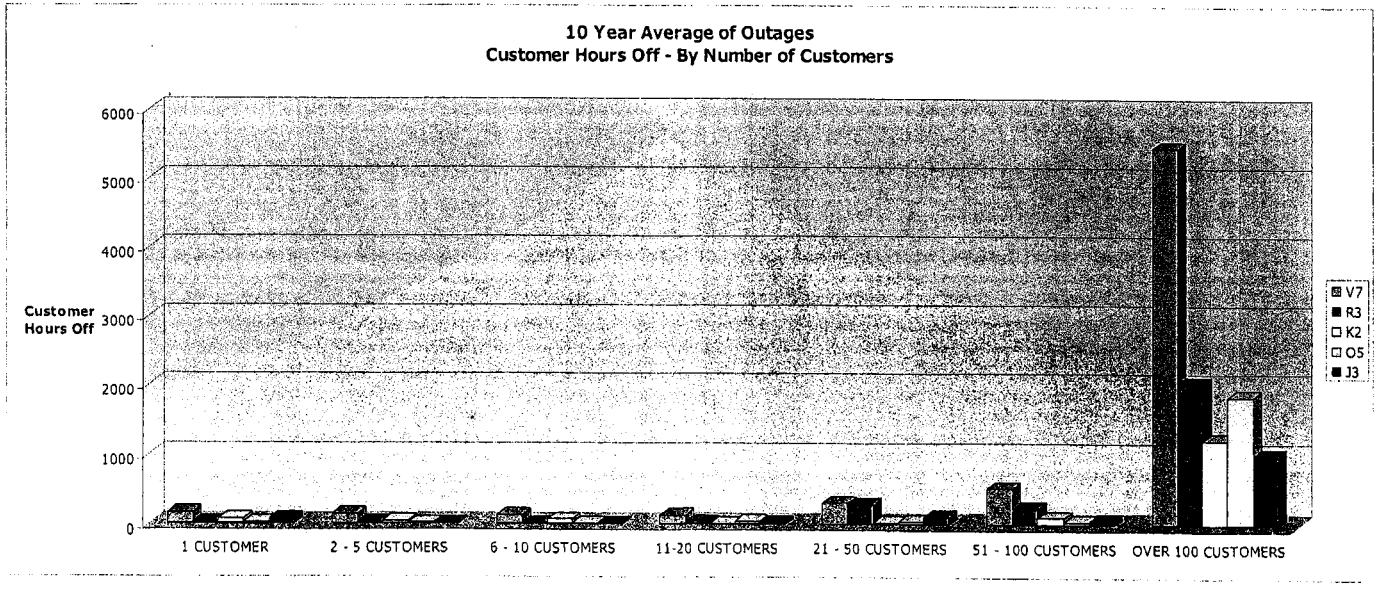
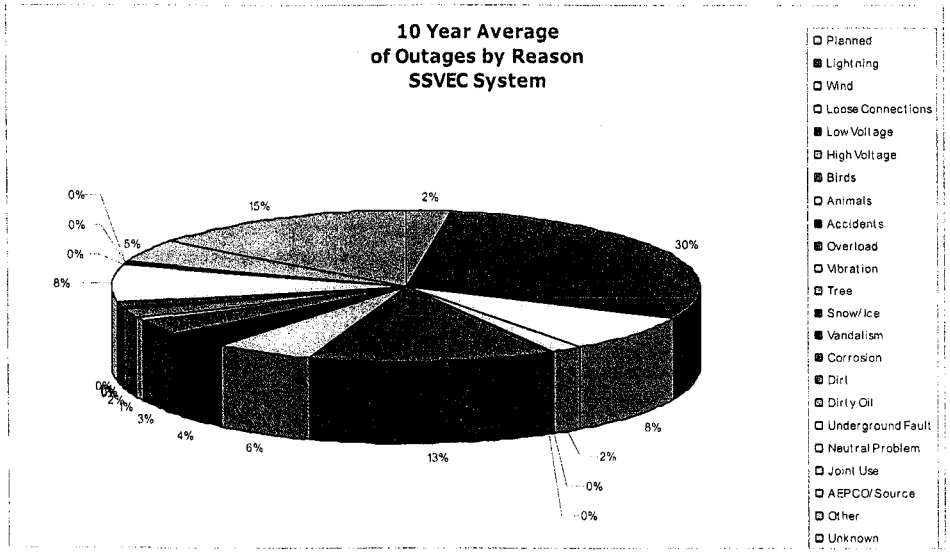


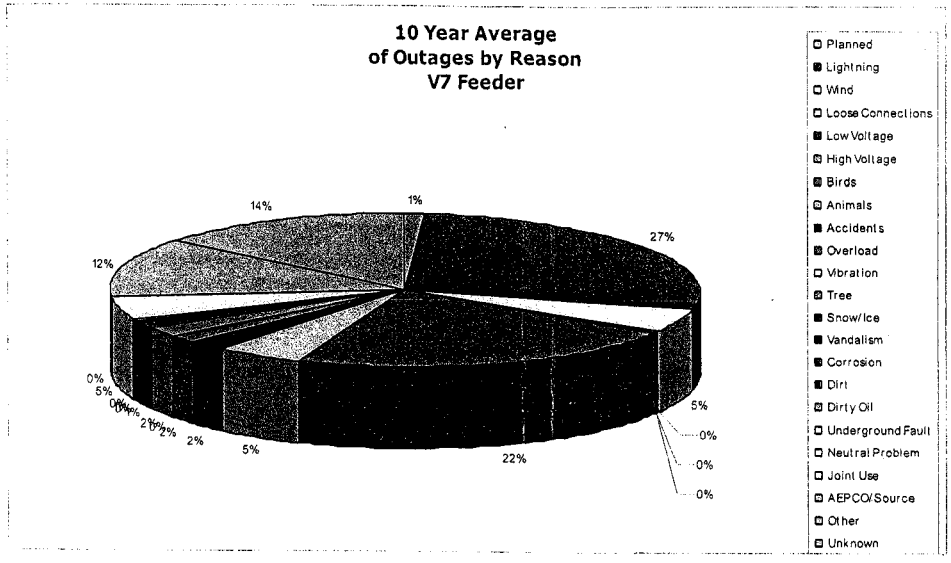
CHART 8 - 9

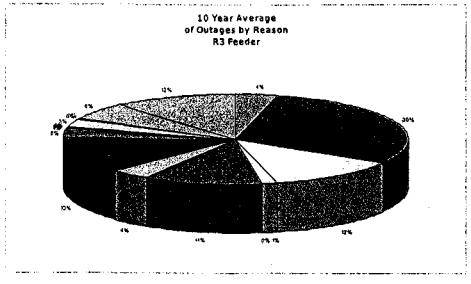

10 Year Average of Outages
Total Hours Off - By Number of Customers
Hours Off
180
160
140
120
100
80
60
40
20
0
1 CUSTOMER
2 - 5 CUSTOMERS
6 - 10 CUSTOMERS
11-20 CUSTOMERS
21 - 50 CUSTOMERS
51 - 100 CUSTOMERS
OVER 100 CUSTOMERS
V7
R3
K2
O5
J3

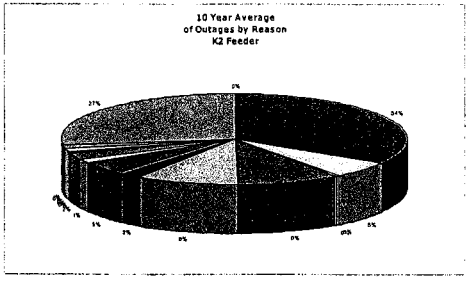

10 Year Average of Outages
Customer Hours Off - By Number of Customers
Customer Hours Off
6000
5000
4000
3000
2000
1000
0
1 CUSTOMER
2 - 5 CUSTOMERS
6 - 10 CUSTOMERS
11-20 CUSTOMERS
21 - 50 CUSTOMERS
51 - 100 CUSTOMERS
OVER 100 CUSTOMERS
V7
R3
K2
O5
J3

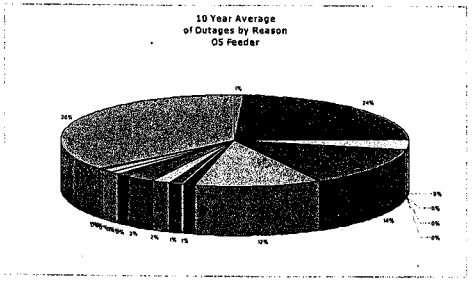
10-YEAR AVERAGE OUTAGE ANALYSIS BY REASON
SYSTEM – V7 – R3 – K2 – O5 – J3
CHART 10

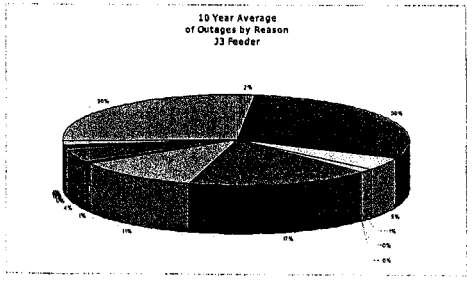




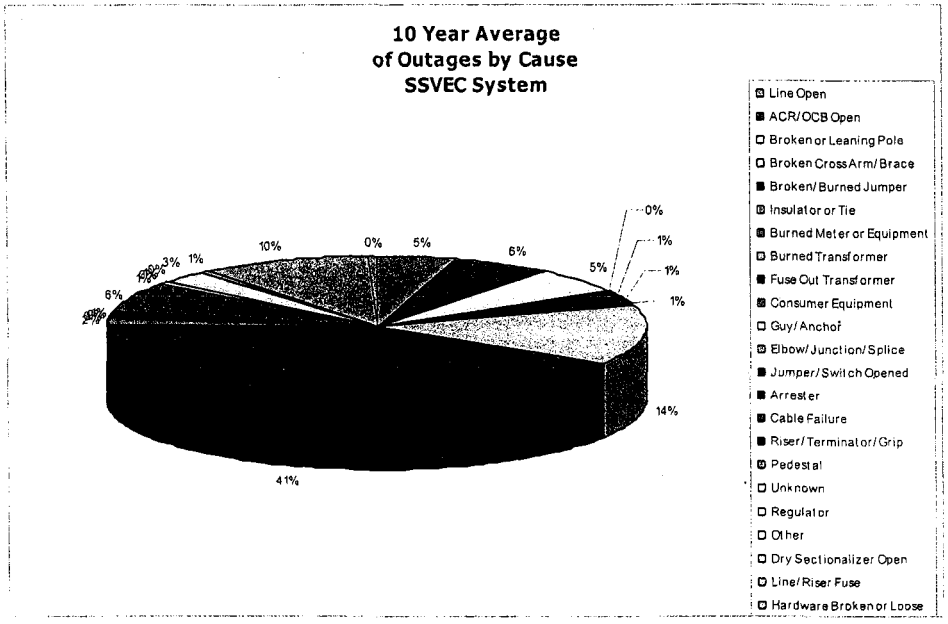


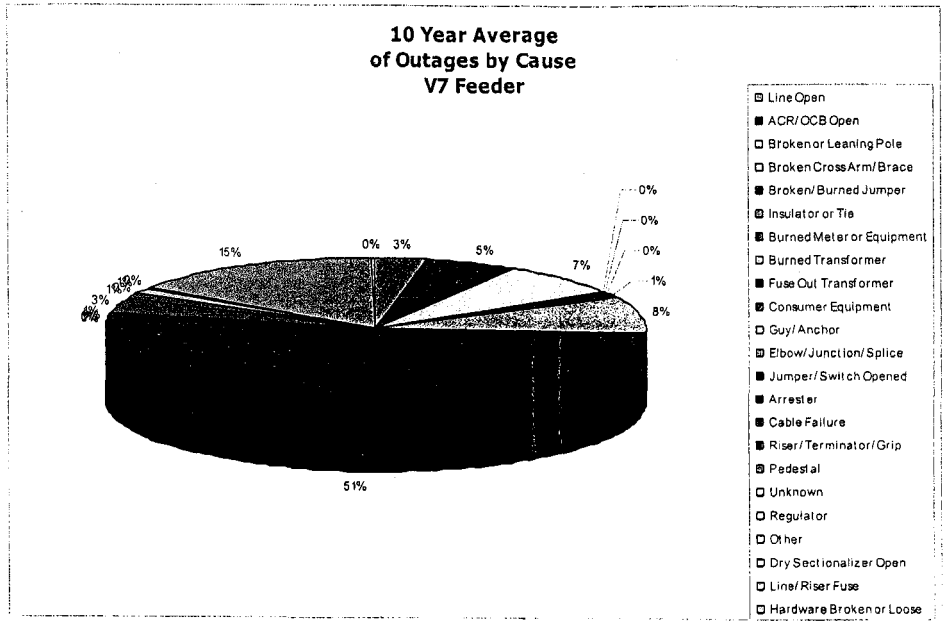


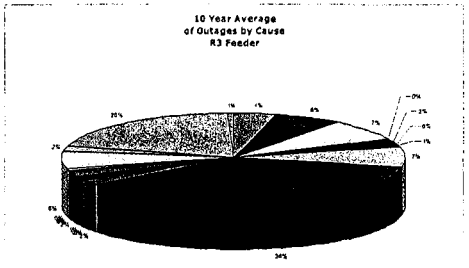


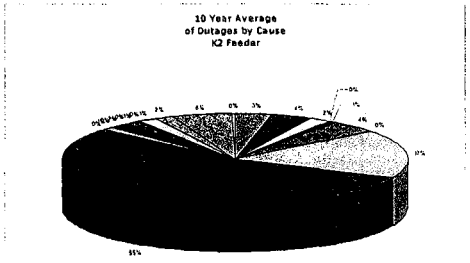


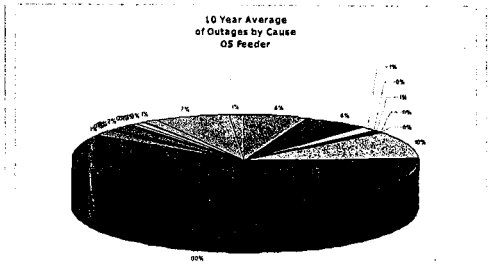
10-YEAR AVERAGE OUTAGE ANALYSIS BY CAUSE
SYSTEM – V7 – R3 – K2 – O5 – J3
CHART 11

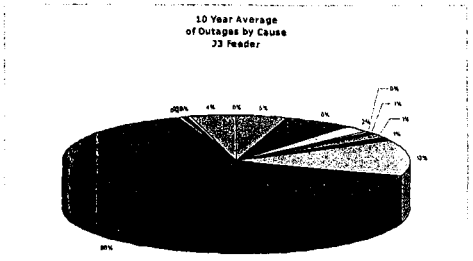










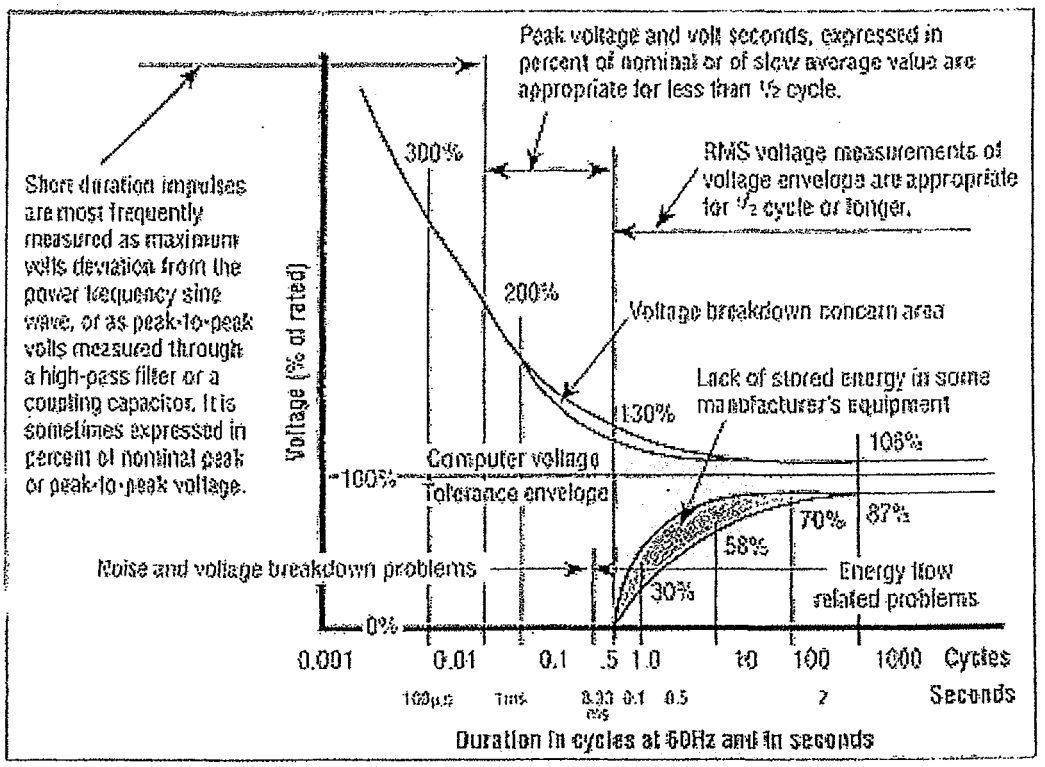


NRECA Reliability Survey

Definitions - continued

MOMENTARY OUTAGE INDICES

CBEMA *Curve.* A set of curves representing the withstand capabilities of computers in terms of the magnitude and duration of the voltage disturbance. Developed by the Computer Business Equipment Manufacturers Association (CBEMA), it has become a de facto standard for measuring the performance of all types of equipment and power systems, and is commonly referred to by this name.



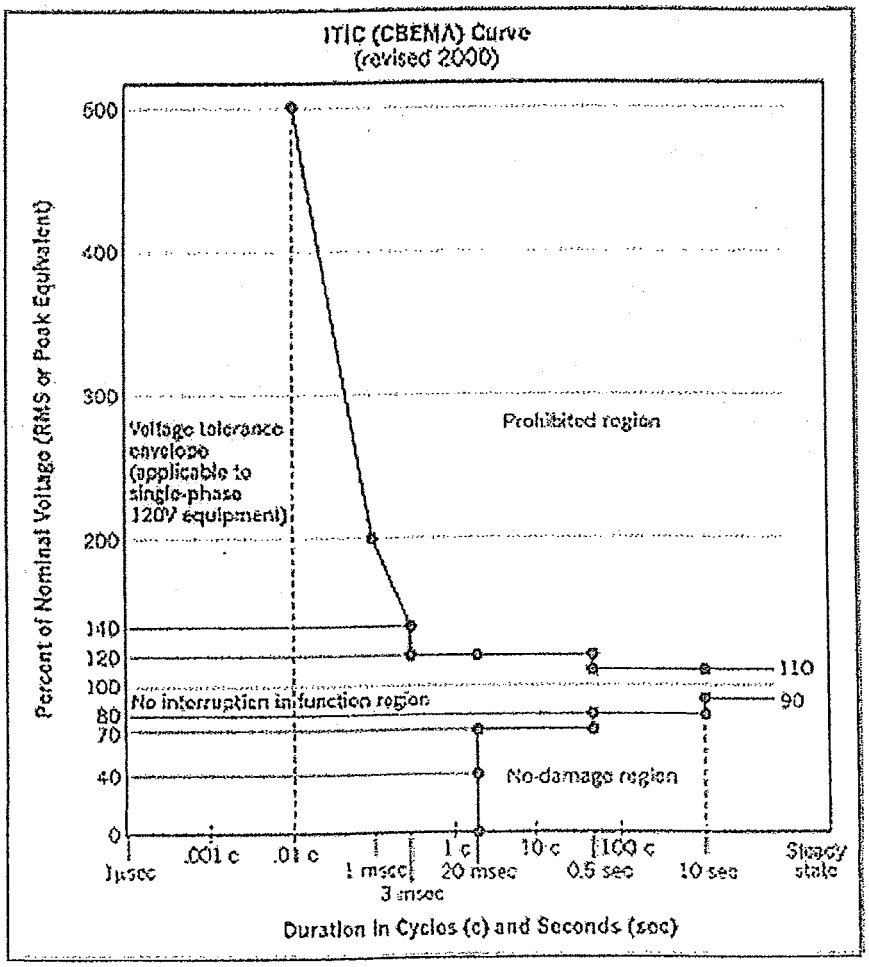
The CBEMA Curve from FIPS No. 94.

NRECA Reliability Survey

Definitions - continued

MOMENTARY OUTAGE INDICES

ITIC *Curve.* The ITIC curve was derived by a working group of CBEMA, which changed its name to the Information Technology Industry Council. This derivation was developed in collaboration with EPRI's Power Electronics Application Center (PEAC). The intent was to develop a curve that more accurately reflects the performance of typical single-phase, 60-Hz computers and their peripherals, and other information technology items like copiers, fax machines, and point-of-sales terminals. While specifically applicable to computer-type equipment (as with the CBEMA curve), the ITIC curve is generally applicable to other equipment containing solid-state devices.



DAVID'S STUDY

From: David Bryan
Sent: Wednesday, February 18, 2009 2:58 PM
To: Torey Bell; Phil Asbury; Ron Orozco; Vic Plumb; Ricardo Garcia; Bobby Bernal; Anselmo Torres
Subject: 2009 Outage Study
Importance: Low

Everyone:

If you have time and want to, please review the attached and provide any comments.

I did some analysis on which feeders/subs were the worst in terms of outages. Also, tried to look at causes of outages for overall design issues. Attached is a summary of the analysis.

Thanks

David

NOT PREPARED FOR THIS PRESENTATION, BUT RATHER FOR 2010-12 CWP ANALYSIS.

2009 Outage Study

DJB Summary:

For the 2010-12 CWP, I wanted to list the 10 worst feeders in terms of outages and have a project to concentrate on them for reliability issues. Each feeder would be reviewed for corrections for unprotected taps, lack of lightening arrestors, and coordination problems.

There was quite abit of data available. Hand-inputted outage data was available from 1992 on; the total count was approximately 12,300 individual outages with over 1,000,000 consumer-hour outages. The data appeared to be valid and consistent.

Other than V7 and O5 consistently coming out as the worst feeders, there wasn't any clear indications of which feeders were worst than the others.

There were clear indications of which substations with all feeders aggregated had the worst outage records. The subs, in priority, were:

Huachuca West
Mescal 25kV
Ramsey
Keating
Hawes
Kansas Settlement

Attached are several summary pages.

For design issues, many of the outages are wind or lightening caused. This speaks to the issues of the need for wood pole replacement and increased use of lightening arrestors on the system.

DJB Recommendation

Three of the substations above will have significant work done in the area with the new Sonoita, Cottonwood, and Hereford substations. I suggest working on their feeders as part of the projects already underway.

Data available

Also available are:

1) Spreadsheet with the data;
2) Printouts from spreadsheet showing work analysis.

TABLE 9

RANKING ONLY

Sub	Number of Outages	~~Total Consumer Hours~~	~~Avg Consumer Hours~~	Geometric Mean
O	1	1	1	3
R	2	4	5	6
T	3	3	4	5
X	4	2	2	4
J	5	5	6	8
M	6	11	18	9
F	7	16	11	7
U	8	8	8	10
Y	9	6	3	1
P	10	10	17	14
Z	11	15	7	2
N	12	14	16	16
W	13	7	10	20
E	14	13	14	12
A	15	22	13	11
H	16	9	9	15
D	17	12	12	13
B	18	20	22	19
K	19	18	15	18
S	20	19	19	17
Q	21	21	21	21
V	22	17	20	22

Ranking of Substations on various metrics – ~~low~~ HIGH numbers are the worst. Data is from 1992-2008.

TABLE 10

41 (d)

Using 2005-8 data only, list of worst feeders by number of consumer-hours and by number of outages.

Xmission FEEDER (KARTCHNER)

Sum of CONS HR	Years 2005-8
FEEDER	total
TK03	76,764
V7	30,601
WSUB	25,110
[illegible]	19,316
TA15	17,305
[illegible]	16,470
TR12	14,149
W3	12,627
[illegible]	12,148
[illegible]	11,092
K2	10,611
[illegible]	9,305
R3	8,461
W5	7,447
ASUB	6,692
T1	6,580
[illegible]	6,467
TA10	6,358
[illegible]	6,157
[illegible]	5,914
[illegible]	4,659
TA14	3,617
[illegible]	3,403
[illegible]	2,866
JSUB	2,793
TA12	2,652
T2	2,493
[illegible]	2,418
[illegible]	2,176
Y2	2,146
[illegible]	2,135
[illegible]	1,898
[illegible]	1,844
[illegible]	1,780
N1	1,765
D1	1,762
[illegible]	1,741
[illegible]	1,721
[illegible]	[illegible]
[illegible]	1,705
M1	1,693
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	1,490
R1	1,403
[illegible]	1,262
J5	1,260
[illegible]	1,227
P7	1,221
[illegible]	1,166
[illegible]	1,081
[illegible]	1,044
KSUB	975
F6	935
[illegible]	911
D3	854
L6	842
[illegible]	822
[illegible]	789
[illegible]	757
[illegible]	756
[illegible]	672
[illegible]	586
[illegible]	551
B5	535
[illegible]	511
[illegible]	406
[illegible]	[illegible]
[illegible]	401
E1	318
[illegible]	304
[illegible]	277
[illegible]	270
[illegible]	226
[illegible]	222
[illegible]	211
[illegible]	209
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	165
[illegible]	102
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	41
[illegible]	16
[illegible]	7
[illegible]	[illegible]
[illegible]	[illegible]

Count of CONS HR	Years 2005-8
FEEDER	total
V7	397
[illegible]	207
[illegible]	190
[illegible]	163
[illegible]	161
[illegible]	91
[illegible]	[illegible]
[illegible]	64
[illegible]	63
[illegible]	57
N2	55
[illegible]	54
M1	53
[illegible]	52
N1	51
[illegible]	48
W2	47
M4	43
[illegible]	42
[illegible]	41
J6	38
[illegible]	36
A5	33
[illegible]	33
[illegible]	[illegible]
[illegible]	32
[illegible]	32
T4	30
[illegible]	28
T2	26
[illegible]	24
E2	23
F8	23
[illegible]	22
B5	21
[illegible]	21
[illegible]	20
[illegible]	20
[illegible]	19
[illegible]	18
[illegible]	18
[illegible]	18
[illegible]	16
[illegible]	16
[illegible]	15
[illegible]	15
[illegible]	14
[illegible]	14
D5	13
F4	12
K1	12
M5	11
[illegible]	11
D1	10
D2	10
T3	10
A1	9
[illegible]	9
[illegible]	[illegible]
[illegible]	9
[illegible]	8
D7	8
Z2	8
F1	[illegible]
TA15	6
X9	6
NSUB	5
TK03	5
X1	5
ASUB	4
HSUB	4
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
TA14	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
G7	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
WSUB	[illegible]
[illegible]	[illegible]

Data Available

- SCADA 1994 - 2008, manually inputted
- Feeder lengths
- # Customers / feeder (missing)

Use of Criteria

	GOOD	BAD
TOTAL CONS HRS	total $ lost	emphasizes areas with most customers
Number of Outages		emphasizes long lines
Geometric, Harmonic Mean		skewed by high or low
Average		skewed by high or low outages
Median	the actual value that is ~~X~~ center of data	ignores skew
Mean with high or low removed	removes data, sometimes good form calculation	average that attempts to remove skew by removing high & low data
# of Outage ÷ feeder length	attempts to compensate for long feeder length	

Overall Feeder

V7, H4, R3 come up frequently currently plans in place that should help

	MEAN w/	# of out	# of Outage	TOTAL
V1		1		
Z4	1			
Y4	2			
W5	3			
R2	4			
M5		2		
F4		3		
J3				
J7			1 4	

W3 based on total consumer hours of # of outages
W5 also

J3, J7

J5 also

~~Y4~~ X

↓ sort ↓

	Total Consumer Hours	Number of Outages	Geometric Mean	Harmonic Mean	Mean with high & low removed	Avg Cons-Hrs Outage	Median (half-way)	Feeder Length	# of Outages/Feeder Length
Z4	1,733.60	78.00	[redacted]					33.29	0.11
USUB	8,797.65	1.00	2,289.41	1,254.68	4,261.34	4,261.34	1,764.62		
TA14	19,293.07	8.00	2.47	0.02	[redacted]	2,789.68	0.01		
TJ11	962.50	2.00	0.39	0.01	3,486.71	3,486.71	0.01		
TA10	7,462.06	2.00	0.14	0.01	2,832.97	2,832.97	0.01		
Y4	4,849.70	65.00	[redacted]		2,285.77	2,285.77	[redacted]	32.56	0.51
W5	13,462.05	210.00	0.15	0.01	2,224.55	2,224.55	0.01	15.18	0.20
TL4	1,122.00	4.00	0.09	0.01	1,090.62	1,090.62	0.01		
R2	3,412.16	176.00	598.53	206.83	1,445.42	1,445.42	682.95	79.04	0.11
VSUB	15,529.92	6.00	360.59	27.20	1,296.10	1,296.10	563.60		
NSUB	15,127.00	12.00	379.15	128.36	1,176.72	1,176.72	945.05		
H4	23,985.00	252.00	0.37	0.01	1,073.75	1,073.75	0.01	106.81	0.47
H3	5,168.03	130.00	364.36	132.13	999.38	999.38	299.25	72.26	0.56
J5	2,730.63	143.00	361.67	115.32	943.97	943.97	424.04	38.47	0.27
X7	14,369.97	165.00	367.03	143.29	934.61	934.61	326.25	50.19	0.30
X1	5,047.85	23.00	349.01	10.10	914.86	914.86	372.25	39.33	[redacted]
O4	5,053.50	101.00	58.32	0.12	835.00	835.00	85.68	18.08	0.18
J7	22,658.33	623.00	1.46	0.02	808.97	808.97	0.01	32.31	0.06
TA13	50,791.20	5.00	0.36	0.01	801.59	801.59	0.01		
F8	2,443.84	63.00	0.14	0.01	795.87	795.87	0.01	15.87	0.19
E2	1,924.00	82.00	55.63	10.51	699.36	699.36	60.13	41.45	0.51
HSUB	25,759.75	3.00	286.10	46.97	683.78	683.78	505.13		
T3	4,876.00	83.00	244.32	0.24	658.34	658.34	379.05	29.41	0.35
K1	547.25	22.00	224.45	75.27	653.72	653.72	144.50	3.18	0.14
N2	6,336.46	246.00	1.53	0.02	630.30	630.30	0.01	85.60	0.35
V7	[redacted]		0.21	0.01	626.24	626.24	0.01	[redacted]	0.16
X5	21,956.55	287.00	369.67	0.24	599.53	599.53	362.85	71.68	0.25
Y2	3,443.18	57.00	273.66	72.30	579.06	579.06	309.25	5.17	0.11
TS11	8,527.56	3.00	0.05	0.01	575.06	575.06	0.01		
T1	3,008.00	82.00	326.54	105.55	570.23	570.23	154.50	11.72	0.14
W3	31,166.50	276.00	83.84	10.23	560.93	560.93	112.75	50.44	0.29
O5	20,940.07	212.00	70.70	0.24	550.17	550.17	90.25	[redacted]	0.39
OSUB	1,512.50	5.00	121.97	0.24	514.21	514.21	274.25		
TA19	4,112.70	1.00	0.08	0.01	451.41	451.41	0.01		
X8	12,480.75	185.00	0.15	0.01	413.26	413.26	0.01	0.10	0.05
R1	5,750.50	208.00	59.44	0.24	392.42	392.42	92.75	23.76	0.11
SSUB	1,560.74	4.00	52.66	0.12	375.33	375.33	106.50		
D7	3,853.70	39.00	0.41	0.01	371.06	371.06	0.01	16.05	0.13
QSUB	3,865.71	3.00	293.89	240.49	364.98	364.98	314.75		
O1	28,241.25	368.00	142.80	18.73	362.71	362.71	209.98		
O3	802.00	32.00	26.29	0.12	335.56	335.56	51.38	5.72	0.56
T4	15,260.25	155.00	0.03	0.01	310.93	310.93	0.01	6.08	0.04
D1	2,167.75	36.00	15.29	0.12	309.81	309.81	29.88	25.31	0.72
M3	3,982.65	64.00	91.33	29.24	296.31	296.31	92.25	27.94	0.19
A5	6,806.63	99.00	0.10	0.01	293.73	293.73	0.01	15.19	0.16
A3	1,379.63	134.00	60.04	12.78	283.61	283.61	41.75	54.70	0.11
U7	3,467.88	70.00	0.03	0.01	280.33	280.33	0.01	12.73	0.17
MSUB	1,472.75	3.00	98.99	22.49	266.90	266.90	107.98		

Outage info DavidBryan

6:29 AM 2/11/2009

This and next 3 pages, using 1992-2008 data, listing top 40 or so feeders in terms of outage metrics, and then sorting by metrics.

102,272 CUST-HRS
2054 OUTAGES

↓ SORT

	Total Consumer Hours	Number of Outages	Geometric Mean	Harmonic Mean	Mean with high & low removed	Avg Cons-Hrs Outage	Median (half-way)	Feeder Length	# of Outages/Feeder Length
V7	[redacted]	[redacted]	0.21	0.01	626.24	626.24	0.01	[redacted]	[illegible]
J5	10,419.78	732.00	0.08	0.23	113.78	113.78	38.89	164.82	[illegible]
R3	[redacted]	[redacted]	5.84	0.56	62.41	62.41	6.75	142.99	[illegible]
J7	39,655.[illegible]	423.00	1.46	0.02	808.97	808.97	0.01	57.[illegible]	[illegible]
O1 *	29,241.75	368.00	142.89	18.73	262.71	962.71	262.58		
O2 *	9,765.00	37.00	6.49	0.02	26.91	26.91	1.69		
K2	15,860.15	265.00	7.05	0.04	354.26	354.26	0.01	238.80	[illegible]
H4	[illegible]	202.00	9.97	0.01	1,073.75	1,073.75	0.01	[illegible]	0.17
X5	11,956.55	187.00	[illegible]	0.24	599.58	599.58	362.85	21.[illegible]	0.25
W3	11,106.30	276.00	33.04	10.73	560.93	560.93	112.75	58.11	0.24
N2	6,376.46	216.00	1.83	0.02	680.30	680.30	0.01	65.00	[illegible]
H1	5,146.50	126.00	47.87	22.09	264.02	264.02	135.75	138.96	0.91
O5 *	20,040.17	217.00	70.79	0.24	550.17	550.17	90.25	[redacted]	0.94
T2	18,666.75	211.00	76.80	47.85	190.67	190.67	135.50	22.11	0.11
W5	10,362.55	110.00	0.15	0.01	2,224.55	2,224.55	0.01	15.16	0.22
R1	6,759.50	208.00	59.44	0.24	392.42	392.42	92.75	29.76	0.14
Y3	18,897.85	192.00	47.58	5.12	220.41	220.41	75.88	12.71	0.02
M1	4,561.75	178.00	2.77	0.04	37.61	37.61	8.50	77.12	0.43
R2	9,413.16	176.00	298.53	268.85	1,445.42	1,445.42	692.95	19.08	0.11
F7	1,081.94	170.00	12.26	0.28	101.83	101.83	13.56	118.83	0.70
P5	12,341.10	168.00	7.02	0.56	80.89	80.89	10.38	148.41	0.99
M4	7,111.58	166.00	2.06	0.03	30.52	30.52	10.50	55.04	0.32
X7	14,389.97	165.00	57.08	113.26	934.61	934.61	325.25	59.19	0.35
E3	19,721.67	161.00	0.01	0.01	139.02	139.02	0.01	69.85	0.43
J5	2,720.64	145.00	261.07	115.32	943.97	943.97	121.84	38.17	0.37
X6	22,439.79	135.00	0.05	0.01	113.26	113.26	0.01	0.16	0.00
F4	15,809.25	135.00	0.03	0.01	310.93	310.93	0.01	6.02	0.04
A3	1,879.63	134.00	60.01	12.76	283.61	283.61	11.75	54.[illegible]	[illegible]
H3	5,169.50	129.00	161.56	122.15	399.38	399.38	[illegible]	2.06	0.03
D5	7,[illegible]	125.00	0.81	0.02	139.71	139.71	2.50	[illegible]	0.34
O6 *	18,204.17	120.00	0.07	0.01	198.02	198.02	0.01	117.23	0.78
S3	4,884.75	119.00	1.[illegible]	0.05	54.30	54.30	8.75	53.[illegible]	0.35
U6	4,203.46	117.00	0.02	0.01	145.53	145.53	17.00	12.[illegible]	0.11
P6	4,910.25	106.00	0.07	0.01	223.64	223.64	0.01	[illegible]	[illegible]
F3	1,316.50	104.00	0.06	0.03	18.11	18.11	2.15	[illegible]	0.94
O4 *	8,053.56	101.00	58.30	0.12	835.00	835.00	33.69	33.[illegible]	0.33
A5	6,866.[illegible]	91.00	0.04	0.01	293.73	293.73	0.01	15.[illegible]	0.16
U5	5,067.25	90.00	[illegible]	[illegible]	176.58	176.58	21.[illegible]	3.49	0.11
T3	4,576.00	85.00	11.[illegible]	0.21	658.31	658.31	279.25	[illegible]	[illegible]
F8	7,413.84	83.00	0.11	0.01	795.87	795.87	0.01	15.97	0.19
Y1	2,058.00	82.00	206.81	165.55	570.28	570.28	331.50	11.72	0.14
E2	1,934.00	82.00	55.57	10.51	699.36	699.36	50.13	11.35	0.14
Z1	1,732.00	79.00	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	0.11
Z3	2,287.78	78.00	128.14	15.20	296.63	296.63	237.50	20.19	[illegible]
R4	1,497.75	75.00	0.02	0.01	196.02	196.02	0.01	70.[illegible]	[illegible]
P7	1,941.25	74.00	12.23	0.06	163.26	163.26	19.50	11.29	0.15
U7	3,487.81	70.00	0.03	0.01	260.83	260.83	0.01	12.47	0.17
Y4	4,849.00	15.00	552.79	109.26	2,245.77	2,245.77	1,284.00	37.25	[illegible]

↓ SORT

	Total Consumer Hours	Number of Outages	Geometric Mean	Harmonic Mean	Mean with high & low removed	Avg Cons-Hrs Outage	Median (half-way)	Feeder Length	# of Outages/Feeder Length
V7	[redacted]	[redacted]	0.21	0.01	926.24	926.24	0.01	[redacted]	0.0
TA15	89,508.12	23.00	0.02	0.01	171.37	171.37	0.01		
TK03	43,680.51	11.00	0.02	0.01	160.01	160.01	0.01		
TA13	30,791.20	5.00	0.06	0.01	801.59	801.59	0.01		
WSUB	53,589.00	5.00	0.97	0.02	910.53	910.53	1.77		
TR12	36,174.70	4.00	0.02	0.01	29.09	29.09	0.01		
R3	31,490.96	551.00	5.54	0.05	62.41	62.41	5.75	1,[illegible]	0.2[illegible]
W3	31,106.50	276.00	93.84	10.23	560.53	560.53	112.78	50,44	0.2[illegible]
O1	33,241.26	568.00	142.69	19.73	362.71	362.71	202.38		
RSUB	28,769.79	8.00	228.10	10.97	663.78	663.78	516.13		
H4	23,986.00	282.00	0.37	0.01	1,073.75	1,073.75	0.01	158.64	0.17
J7	22,655.35	223.00	1.46	0.02	808.97	808.97	0.03	52.31	0.05
X8	22,430.77	135.00	0.05	0.01	413.26	413.26	0.01	6.16	0.05
X5	21,456.55	287.00	269.67	0.24	509.58	509.58	362.65	71.68	0.4[illegible]
O5	20,040.07	212.00	70.70	0.24	560.17	560.17	90.25	[redacted]	0.50
JSUB	19,415.25	13.00	0.28	0.02	22.81	22.81	0.75		
TA14	19,232.07	8.00	2.47	0.02	[redacted]	[redacted]	0.01		
FSUB	19,109.50	5.00	32.47	5.59	215.13	215.13	26.28		
E3	16,754.57	164.00	0.04	0.01	139.02	139.02	0.01	69.65	0.43
J3	16,410.76	732.00	24.05	0.22	113.78	113.78	25.50	154.62	0.21
T4	15,960.15	135.00	0.03	0.01	310.93	310.93	0.01	5.00	0.04
K2	15,689.18	355.00	0.05	0.01	254.26	254.26	0.01	238.90	0.67
NSUB	15,127.00	12.00	379.15	128.53	1,176.72	1,176.72	343.06		
VSUB	15,029.52	6.00	600.59	57.20	1,296.10	1,296.10	563.50		
X7	14,339.67	165.00	327.68	113.28	934.61	934.61	325.25	66.19	0.50
Y3	12,397.35	192.00	47.58	5.12	220.41	220.41	75.18	12.71	0.07
TSUB	12,301.21	3.00	6.32	0.04	87.44	87.44	48.25		
T2	12,066.75	211.00	116.20	67.25	190.87	190.87	135.50	22.41	0.11
W5	13,362.35	210.00	0.15	0.01	2,224.55	2,224.55	0.01	15.18	0.22
YSUB	13,114.63	9.00	21.56	4.25	119.81	119.81	24.50		
O6	13,204.17	120.00	0.07	0.01	188.03	188.03	0.01	117.78	0.98
P5	12,341.10	168.00	7.02	0.08	80.89	80.89	10.38	148.81	0.80
TA11	10,893.04	4.00	0.02	0.01	64.65	64.65	0.01		
XSUB	9,918.04	3.00	2.83	0.08	72.46	72.46	11.00		
R2	9,418.16	176.00	548.59	206.93	1,445.42	1,445.42	632.95	15.06	0.11
T1	9,003.00	82.00	326.54	165.55	570.28	570.28	334.50	11.72	0.14
DSUB	8,907.25	11.00	0.46	0.02	29.25	29.25	1.00		
R1	8,779.50	208.00	58.44	0.24	362.42	362.42	92.75	20.76	0.11
O2	8,705.00	310.00	0.49	0.02	28.84	28.84	1.00		
O4	8,052.50	104.00	38.32	0.12	835.00	835.00	33.08	82.02	0.13
TA10	7,842.00	2.00	0.11	0.01	2,592.97	2,592.97	0.01		
D5	7,135.25	125.00	0.01	0.02	139.74	139.74	2.50	11.38	0.34
M4	7,111.55	126.00	2.06	0.03	30.52	30.52	10.50	54.21	0.25
ASUB	7,049.10	3.00	3.80	0.06	32.13	32.13	11.75		
A5	6,906.62	29.00	0.10	0.01	293.73	293.73	0.01	15.10	0.46
USUB	6,727.50	1.00	3,289.41	1,254.98	4,261.34	4,261.34	1,164.62		
N1	6,405.50	20.00	97.37	22.99	264.02	264.02	135.75	198.00	0.61
N2	6,326.40	21.00	1.53	0.02	630.30	630.30	0.01	35.00	0.55

Using 1992-2008 data, listing of the REASON for the outage versus the CAUSE of the outage. Useful for determing WHAT are causing the outages.

OVERALL OUTAGE CAUSE

CONSUMER HOURS

Sum of CONS HR	CAUSE																								
REASON	Line Open	ACR/OCB Open	Broken or Leaning Pole	Broken Cross Arm/Brace	Broken/Burned Jumper	Insulator or Tie	Burned Meter or Equipment	Burned Transformer	Fuse Out Transformer	Consumer Equipment	Guy/Anchor	Elbow/Junction/Splice	Jumper/Switch Opened	Arrester	Cable Failure	Riser/Terminator/Grip	Pedestal	Oil Sectionalizer	Regulator	Other	Dry Sectionalizer Open	Line/Riser Fuse	Hardware Broken or Loose	Grand Total
Planned	11,786.25	3,434.74	963.50	3.00	1.50	22.50	24.00	205.50	660.75	10.50		13.50	3,009.50	0.50	14.00		55.00	182.00	406.00	5,445.05	32.00	237.50	2,473.30	28,980.59
Lightning	15,980.80	52,514.38	5,744.00	20,276.75	236.00	2,584.00	1,708.00	5,796.20	12,641.66	100.00		377.00	75.00	1,189.25	884.00	207.50		855.50	2,520.00	6,702.25	2,658.75	14,423.00	203.00	157,675.24
Wind	18,511.00	49,623.02	250,278.88	1,415.25	684.90	3,075.00	83.50	4.00	742.75	382.05			186.00	4.00	23.00	77.25		1,573.50		2,561.75	311.00	244.00	32.25	320,813.60
Loose Connections	5,889.24	13,471.50			1,558.20		46.50	214.50	3,038.31	76.00	1,012.00	1,502.00	53.50	76.00		14.25		9,906.50		158.75		64.00	178.25	37,258.50
Low Voltage		20.00						75.50	15.50															111.00
High Voltage							5.00	49.00	12.00				3.00											142.45
Birds	10,272.50	32,536.43			3,107.00	1.50	13.50	90.00	12,179.22			49.00	0.50	312.00	23.00	68.25		13.00	53.45	6.00				84,205.15
Animals	122.15	1,945.00	110.00		784.00			46.75	4,149.70					1.50	26.00	19.25		1.00	3,400.00	450.00	56.00	1,565.50	57.75	14,297.35
Accidents	8,489.09	28,489.59	16,386.02	5,896.00	37.50	56.25	38.50	110.00	178.50	34.00	30.00	8.00	98.50		782.25	1.00	35.50	2.00		8,632.00	2.50	416.50		62,385.95
Overload	2,301.50	2,353.00			196.00		9.25	2,204.00	8,408.18	39.00		10.00	39.75			85.00		11.75		2,581.50	5.50	733.50	403.00	19,903.93
Vibration	6,699.75	2,268.50			598.50	619.00	1.00		41.50				662.00	210.00	0.75	3.00		105.50		179.50	450.50	3,522.75		15,576.25
Tree	3,669.75	8,659.50		386.50	33.50		1.00	8.50	119.80	6.00		2.00	1.00		44.00					333.50	72.00	9.50	4,057.25	13,435.10
Snowfice	628.00	2,224.00							9.00									27.75		91.00	177.50	8.50	19.00	3,014.00
Vandalism	596.00	1,408.00	80.00			120.00	4.00	12.00	3.50	2.50			5.00	6.00							9.00	146.00		7,643.00
Corrosion	151.50	8,476.15			109.00	97.00	2.00	32.00	113.25	139.75		171.00			749.50	6.00		2.00	2,100.00	1,093.00		75.00	2,156.00	16,457.85
Dirt										18.50								4.00		5,591.00	102.50	407.00	288.00	18.50
Dirty Oil								10.00																12.00
Underground Fault	971.50	10,594.00						480.50	41.75			2,249.60	3.00		42,659.65	1,999.75	114.75	2.00						84,994.00
Neutral Problem	51.50	819.75			1.50				1.00	8.00			4,847.50		392.00			1.50		8.50		25,639.52		8,139.00
Joint Use			24.00															0.75		11.00			8.00	24.00
AEPCO/Source	35,665.34	105,121.96	10,407.25	11,118.00	11,329.60																			191,077.95
Other	1,181.25	36,632.20	9,710.28	9,412.00	539.50	315.00	57.00	25,290.75	3,250.00	42.50		2,188.50	24.50	554.00	569.50	128.25	7.00	2,065.00		5,470.79				109,542.26
Unknown	847.18	13,967.33	6.00	9.00	30.50		10.00	23,087.00	4,187.72	26.00	6.75	300.00	15.75	30.00	33.75	13.50		4,000.00	3,950.00	8,788.58	282.50	2,160.95	437.00	48,155.59
(blank)								4.00		0.25								376.50		731.01	32.00	2,312.50	133.50	4.25
Grand Total	121,712.30	384,761.07	293,689.93	48,496.50	19,227.20	6,891.05	1,983.25	57,740.20	49,794.09	886.05	1,048.75	6,870.60	8,024.50	2,363.25	46,201.40	2,622.00	212.25	19,128.25	12,429.45	46,633.18	4,193.75	52,205.72	10,442.30	1,199,778.03

NUMBER OF OUTAGES

Count of CONS HR	CAUSE																							
REASON	Line Open	ACR/OCB Open	Broken or Leaning Pole	Broken Cross Arm/Brace	Broken/Burned Jumper	Insulator or Tie	Burned Meter or Equipment	Burned Transformer	Fuse Out Transformer	Consumer Equipment	Guy/Anchor	Elbow/Junction/Splice	Jumper/Switch Opened	Arrester	Cable Failure	Riser/Terminator/Grip	Pedestal	Oil Sectionalizer	Regulator	Other	Dry Sectionalizer Open	Line/Riser Fuse	Hardware Broken or Loose	Grand Total
Planned	269.00	14.00	11.00	1.00	1.00	6.00	1.00	24.00	192.00	3.00		5.00	12.00	1.00	2.00		8.00	2.00	1.00	154.00	1.00	25.00	10.00	743.00
Lightning	132.00	321.00	22.00	14.00	6.00	26.00	17.00	721.00	1,034.00	18.00		3.00	5.00	53.00	8.00	19.00		21.00	1.00	10.00	72.00	376.00	3.00	2,885.00
Wind	65.00	134.00	159.00	9.00	77.00	18.00	1.00	1.00	105.00	11.00			10.00	2.00	5.00	5.00		6.00		23.00	6.00	20.00	9.00	666.00
Loose Connections	36.00	16.00			72.00		20.00	10.00	43.00	32.00	1.00	7.00	7.00	2.00		5.00		6.00		20.00		6.00	29.00	314.00
Low Voltage		1.00						8.00	5.00															14.00
High Voltage							2.00	7.00	5.00				1.00											20.00
Birds	27.00	65.00			5.00	1.00	2.00	17.00	2,325.00			2.00	1.00	4.00	2.00	13.00		1.00	1.00	3.00				2,651.00
Animals	9.00	11.00	3.00		3.00			9.00	718.00					1.00	2.00	8.00		1.00	1.00	1.00	3.00	180.00	1.00	833.00
Accidents	45.00	78.00	78.00	1.00	5.00	1.00	9.00	18.00	40.00	4.00	2.00	1.00	7.00		30.00	1.00	5.00	1.00		9.00	1.00	58.00		407.00
Overload	16.00	14.00			6.00		4.00	38.00	266.00	19.00		1.00	11.00			2.00		5.00		42.00	2.00	24.00	11.00	436.00
Vibration	27.00	6.00			23.00	4.00	1.00		28.00				4.00	1.00	1.00	1.00		3.00		12.00	4.00	40.00		112.00
Tree	55.00	48.00		3.00	7.00		1.00	3.00	22.00	2.00		1.00	1.00		14.00					4.00	2.00	3.00	7.00	191.00
Snowfice	3.00	18.00							5.00									5.00		19.00	4.00	3.00	3.00	33.00
Vandalism	4.00	2.00	1.00			2.00	2.00	1.00	2.00	3.00			1.00	1.00							3.00	4.00		33.00
Corrosion	2.00	12.00			8.00	2.00	2.00	9.00	42.00	14.00		3.00			23.00	2.00		1.00	1.00	7.00		1.00	4.00	146.00
Dirt										1.00								3.00		9.00	2.00	9.00	4.00	1.00
Dirty Oil								4.00																5.00
Underground Fault	19.00	19.00						5.00	10.00			21.00	1.00		596.00	16.00	1.00	1.00						1,011.00
Neutral Problem	8.00	4.00			2.00				1.00	1.00			1.00		2.00			2.00		2.00		320.00		29.00
Joint Use			1.00																	4.00			4.00	1.00
AEPCO/Source	30.00	21.00	8.00	3.00	3.00													1.00						76.00
Other	24.00	33.00	14.00	5.00	5.00	2.00	5.00	37.00	202.00	26.00		17.00	5.00	2.00	12.00	9.00	2.00	5.00	3.00	72.00	5.00	55.00	5.00	613.00
Unknown	20.00	58.00	1.00	1.00	9.00		2.00	46.00	818.00	12.00	1.00	1.00	4.00	4.00	1.00	4.00		10.00		16.00	5.00	104.00	2.00	1,121.00
(blank)								1.00		1.00														2.00
Grand Total	791.00	935.00	298.00	37.00	233.00	62.00	70.00	959.00	5,863.00	149.00	4.00	62.00	71.00	71.00	698.00	85.00	16.00	78.00	8.00	417.00	110.00	1,233.00	93.00	12,343.00

Outage Info DavidBryan

10:03 AM, 2/11/2009

2005-B
CUST. HRS

Using 1992-2008 data, listing REASON for outage versus YEAR. Useful for determining problems that are increasing.

CAUSES
1) WIND - 329,000
2) AEPCO (XMISSION SUPPLIER) - 181,000
3) LIGHTNING - 257,000

History of Outages by Type

Consumer Hours

Sum of CONS HR	REASON																								
Year	Planned	Lightning	Wind	Loose Connections	Low Voltage	High Voltage	Birds	Animals	Accidents	Overload	Vibration	Tree	Snow/Ice	Vandalism	Corrosion	Dirt	Dirty Oil	Underground Fault	Neutral Problem	Joint Use	AEPCO/Source	Other	Unknown	(blank)	Grand Total
1994	1,739.75	11,337.25	14,029.25	121.50			1,765.75	202.50	4,598.75	226.25	61.00	937.75	14.50	1,438.00	168.75			8,853.25	4.00		322.50	10,615.00			54,605.75
1995	9,067.74	4,731.75	1,498.50	1,912.25	11.00	1.00	1,870.75	446.00	1,706.75	265.25	190.50	383.75	712.00	57.00	149.50			6,271.00	4,856.50		1.00	4,833.00			38,866.24
1996	2,070.50	10,936.00	2,352.50	234.75	8.00	2.50	2,217.75	334.50	1,952.75	336.50	874.50	1,802.25	23.00	20.50	338.25	18.50		7,375.75	210.75		16,996.25	13,215.75			61,421.25
1997	218.50	6,823.75	10,898.00	216.50	1.50	21.50	1,190.25	636.50	3,656.85	924.25	4,015.75	2,774.75	335.00	40.00	181.50			9,227.25	11.25		17,378.25	1,728.75			60,258.10
1998	142.00	12,754.25	21,044.70	237.50	1.00	10.00	3,555.00	7,056.50	725.75	517.00	2,006.50	2,587.00	6.00	2,233.00	124.50			4,492.75	6.00		2,477.00	4,590.50			84,838.05
1999	276.75	9,259.70	50,018.25	10,610.50	20.00	4.00	1,104.00	132.00	1,444.65	58.75	293.75	1,014.75			190.50			5,230.75			22,205.52	3,052.25		4.00	105,127.12
2000	810.75	2,138.30	4,866.55	405.00	30.50		931.55	415.70	2,281.70	5,558.50	369.25	214.00	1,900.50	387.50	7,039.75		3.00	7,733.50	1.50		10,360.55	1,257.25		0.25	46,825.60
2001	491.75	21,341.00	3,653.50	13,795.50		4.00	6,642.00	82.25	9,851.25	1,008.50	2,203.50	158.50	7.00	131.00	1,124.50		3.50	5,018.00	501.00		19,718.10	10,743.00	2,136.00		98,612.85
2002	691.50	4,481.70	12,120.25	130.00	8.00	2.00	684.25	888.00	6,491.75	771.75	288.50	155.50	2.00	2.00	483.00			2,916.75			4,112.70	8,780.00	4,078.80		47,098.45
2003	2,594.50	13,509.25	105,162.65	2,166.75		22.50	1,142.75	277.15	3,676.50	1,274.00	111.50	523.75			164.00			9,173.40	404.50			2,020.50	584.35		142,868.05
2004	3,034.25	8,748.75	9,768.26	2,484.57			16,641.18	172.20	5,876.00	304.00	23.00	409.50	14.00	1,043.50	5,818.00			3,134.35			2,824.65	4,601.58	24,384.33		89,100.22
2005	31.80	18,272.90	8,403.25	2,311.45	1.00	1.00	4,431.86	2,643.65	3,239.40	1,203.83	1,841.50	618.50			58.50			2,240.25	2.00			8,153.00	1,892.60		55,145.61
2006	1,993.50	8,705.98	32,204.98	1,840.75		18.00	3,981.00	191.90	11,504.04	381.60	738.75	1,470.00		2,100.00	1.50		2.00	6,165.52	138.00		11,577.30	312.00	5,007.75		88,424.58
2007	5,131.80	12,284.66	26,643.80	465.25	2.00	55.95	14,456.41	240.25	2,793.91	6,921.65	2,362.25	3.00			39.50		3.50	2,990.50	2.00	24.00	72,291.27	27,344.00	2,650.59		176,706.29
2008	655.50	12,350.00	26,918.45	124.23	28.00		3,570.63	518.25	2,585.90	131.00	90.00	32.10		190.50	805.90			6,043.00	1.50		813.88	8,327.58	5,521.57		89,837.98
Grand Total	28,880.59	157,675.24	329,813.90	37,253.50	111.00	142.45	64,205.15	14,237.35	62,365.95	19,903.93	15,576.25	13,435.10	3,014.00	7,643.00	16,457.65	18.50	12.00	84,964.02	8,139.00	24.00	181,077.96	109,542.28	46,155.99	4.25	1,159,778.03

NUMBER OF OUTAGES

Count of CONS HR	REASON																								
Year	Planned	Lightning	Wind	Loose Connections	Low Voltage	High Voltage	Birds	Animals	Accidents	Overload	Vibration	Tree	Snow/Ice	Vandalism	Corrosion	Dirt	Dirty Oil	Underground Fault	Neutral Problem	Joint Use	AEPCO/Source	Other	Unknown	(blank)	Grand Total
1994	111.00	220.00	56.00	27.00			212.00	59.00	29.00	26.00	5.00	18.00	3.00	5.00	18.00			78.00	2.00		1.00	52.00			930.00
1995	166.00	163.00	22.00	31.00	2.00	1.00	319.00	52.00	35.00	34.00	6.00	18.00	3.00	2.00	9.00			93.00	2.00		1.00	64.00			1,023.00
1996	127.00	243.00	49.00	25.00	3.00	1.00	266.00	57.00	30.00	23.00	8.00	17.00	4.00	5.00	13.00	1.00		96.00	3.00		18.00	35.00			1,024.00
1997	51.00	224.00	38.00	31.00	1.00	4.00	239.00	52.00	32.00	28.00	9.00	29.00	4.00	3.00	19.00			91.00	4.00		9.00	39.00			917.00
1998	19.00	171.00	66.00	28.00	1.00	3.00	303.00	47.00	43.00	20.00	11.00	14.00	2.00	6.00	11.00			75.00	1.00		1.00	24.00			846.00
1999	10.00	261.00	52.00	26.00	1.00	2.00	216.00	56.00	19.00	20.00	8.00	13.00			12.00			78.00			20.00	38.00		1.00	835.00
2000	31.00	203.00	24.00	19.00	2.00		216.00	61.00	33.00	47.00	8.00	9.00	13.00	3.00	16.00		1.00	79.00	2.00		11.00	89.00		1.00	868.00
2001	74.00	190.00	25.00	26.00		1.00	258.00	51.00	34.00	27.00	10.00	15.00	2.00	3.00	10.00		2.00	64.00	4.00		4.00	72.00	34.00		906.00
2002	84.00	127.00	30.00	13.00	1.00	1.00	136.00	69.00	25.00	36.00	10.00	11.00	1.00	1.00	9.00			63.00			1.00	42.00	126.00		785.00
2003	21.00	189.00	58.00	15.00		1.00	67.00	52.00	19.00	16.00	7.00	13.00			4.00			87.00	6.00			25.00	132.00		692.00
2004	17.00	182.00	34.00	9.00			88.00	47.00	30.00	18.00	3.00	10.00	1.00	1.00	5.00			44.00			1.00	29.00	149.00		669.00
2005	6.00	158.00	37.00	19.00	1.00	1.00	86.00	44.00	20.00	61.00	6.00	9.00			5.00			43.00	1.00			22.00	187.00		686.00
2006	11.00	178.00	57.00	18.00		3.00	67.00	58.00	20.00	36.00	11.00	8.00		1.00	1.00		1.00	53.00	2.00		4.00	18.00	140.00		690.00
2007	11.00	207.00	57.00	13.00	1.00	2.00	98.00	76.00	23.00	34.00	7.00	1.00			9.00		1.00	32.00	1.00	1.00	4.00	21.00	169.00		768.00
2008	4.00	169.00	61.00	14.00	1.00		78.00	40.00	15.00	10.00	3.00	9.00		3.00	5.00			50.00	1.00		1.00	35.00	205.00		704.00
Grand Total	743.00	2,865.00	666.00	314.00	14.00	20.00	2,651.00	833.00	407.00	436.00	112.00	191.00	33.00	33.00	146.00	1.00	5.00	1,011.00	29.00	1.00	76.00	613.00	1,121.00	2.00	12,343.00

TABLE 11

Sulphur Springs Electric Cooperative 6.4.2

2008 Year to Date Number of Service Locations (Normal Configuration) Data Compiled: November 2008

Area	Substation	Feeder	Service Locations	Substation
AREA 1	SS.San Simon	A-1	North	34
	B17338847	A-3	South	194
	(Redtail)(PCB RT12)	A-5	West	273
				501
	BW.Bowie	B-3	North & South	86
	B14034852	B-5	East	10
	(Redtail)(PCB RT12)	B-7	Town	375
				471
AREA 2	BO.BONITA	C-1	Spare	0
	X09248945	C-2	East	1
	(Stewart)(PCB ST11)	C-3	West	0
	(Redtail)(PCB RT10)			1
	MN.MORTENSON	D-1	North	108
	X09248989	D-5	South	342
	(Stewart)(PCB ST11)	D-7	West	65
	(Redtail)(PCB RT10)			515
	ST.STEWART	E-1	North	74
	A10341089	E-2	West	229
	(Redtail)(PCB RT10)	E-3	East	723
				1026
	WX.WILLCOX	F-3	Airport Rd.	1250
	C11051150	F-4	East	94
	(apache)(PCB 013)	F-7	Stewart	910
		F-8	Willcox	879
				3133
	CC.COCHISE	H-3	North	398
	E10104649	H-4	South	1510
	(Apache)(PCB 015)			1908
	KS.KANSAS	J-3	North	598
	E11268711	J-5	South & West	160
	(Apache)(PCB 014)	J-7	East	170
				928
	CA.CHIRICAHUA	K-1	North	33
	G12101345	K-2	East	798
	(Apache)(PCB 014).			831
AREA 3	WB.WEBB	M-1	North	222
	H12331388	M-3	East	146
	(Apache)(PCB 014)	M-4	South & Elfrida	504
		M-5	West	125
				997
	MC.McNEAL	N-1	North & San Bernardino	431
	K12098881	N-2	South	607
	(Apache)(PCB 014)			1038
AREA 4	MS.MESCAL 12.47 KV	O-3	East	788
	F06049071	O-4	Benson	961
	(Apache)(PCB 015)			1749
	MS.MESCAL 25 KV	O-5		2049
	F06049071	O-8		585
	(Apache)(PCB 015)			2634
	BE.BENSON	P-5	East & South	902
	F07076141	P-7	Pomerene	528
	(Apache)(PCB 015)	P-8	Airport Rd.	632
				2062
	SD.ST. DAVID	Q-3	North	576
	G07075177	Q-5	South	324
	(Apache)(PCB 015)	Q-7	Apache Nitrogen	11
				911

Feeder	Service Locations		
RA.RAMSEY	R-1	North	506
L06018620	R-2	South	754
(San Rafael)(PCB 005)	R-3	West	2208
	R-4		1010
			4478
TM.TOMBSTONE	S-3	South & East	
I08034370	S-7	North	
(San Rafael)(PCB 004)			
KG.KEATING	T-1	West	1416
K06021388	T-2	East	807
(San Rafael)(PCB 001)	T-3	South	1488
	T-4	North	380
			4091
SV.SIERRA VISTA	U-3	East	654
J06348613	U-5	South & East	870
(Kartchner)(PCB 005)	U-6	South & West	1489
	U-7	West	828
			3841
HW.HUACHUCA WEST	V-7	Sonoita	2424
I05136152			2424
(Kartchner)(PCB 003)			
HW.HUACHUCA EAST	W-3	North & East	1260
I05136152	W-5	South	1527
(Kartchner)(PCB 003)			2787
HW.HAWES WEST	X-1	West	2075
K07182386	X-7	South	1997
(San Rafael)(PCB 001)	X-8	North	465
			4537
HW.HAWES EAST	X-3	Spare	0
K07182386	X-5	East & North	944
(San Rafael)(PCB 001)	X-6	Spare	0
			944
BV.BELLA VISTA	Y-1	West	1042
J06361267	Y-2	South	514
(Kartchner)(PCB 005)	Y-3	East	679
	Y-4	North	1404
			3639
PB.PUEBLO	Z-1	South	204
K07068848	Z-2	South & East	360
(San Rafael)(PCB 004)	Z-3	North	2079
	Z-4	West	2514
			5157

Area			
AREA 5			
TOTALS	Redtail PCB RT12	(Bowie / San Simon)	972
	Stewart PCB ST11	(Bonita / Mortenson)	516
	Redtail PCB RT10	(Stewart / Bonita* / Motenson*)	1026
	*customers not included in the total		
	Apache PCB 013	(Willcox)	3133
	Apache PCB 014	(Kansas / Chiricahua / Webb / McNeal)	3794
	Apache PCB 015	(Cochise / Mescal 25 KV / Mescal 12.47 KV / Benson / St. David)	9264
	San Rafael PCB 001	(Hawes East / Hawes West / Keating	9572
	San Rafael PCB 004	Tombstone / Pueblo	5157
	San Rafael PCB 005	(Ramsey)	4478
	Kartcher PCB 003	(Huachuca West /Huachuca East)	5211
	Kartcher PCB 005	(Sierra Vista / Bella Vista)	7480
		Total Customers:	50603

RELIABILITY SOLUTIONS IMPLEMENTED FOR HIGH OUTAGE FEEDERS

O5 FEEDER:

The O5 feeder has historically shown a potential for high growth. Because of this and the limited flexibility of this long feeder it has recently been the focus of many recently completed, or proposed future upgrades. Within the last few years two large portions of the main line have been completely rebuilt and upgraded to larger conductors. In conjunction with these projects coordination/sectionalizing studies where conducted and protection equipment was installed to limit exposure and large outages. A new substation, Cottonwood, is currently in the commissioning stage. This substation will significantly shorten the older portion of the feeder by several miles. It also provides the availability to split this circuit into up to six smaller circuits to limit exposure. Along with all of this, there are several smaller upgrades proposed for the upcoming work plan that is in development. These include, but are not limited to; replacing and/or upgrading the remaining two sections of the main line that have not yet been done, upgrading an existing tie line to provide additional backup capacity to a portion of the circuit, and installing a new underground tie to a commercial area that has no backup capability.

K2 FEEDER:

The K2 feeder is an unusual feeder. It is really two feeders in one. One mile from the sub this feeder splits. One section feeds an agricultural area. Because of significant load growth in the last five years, a lot of work has been done in this area to increase capacity and reliability. The second portion of this feeder is very long serving a very large loosely populated area. It has a significant amount of overhead line which results in a large exposure to weather related outages. In the fall of 2008 eleven miles of this circuit where rebuilt with a primary goal of increasing reliability. The majority of this project replaced a single phase line with a three phase line splitting up the service area in hopes of significantly decreasing the severity of outages. During this project approximately 30 sectionalizing devices where either added, moved, or modified to make the circuit more reliable.

J3 FEEDER:

The J3 feeder is similar to the K2 feeder in that it not only serves a very large irrigation load, but also serves several areas of very sparsely populated residential load. This feeder has been the subject several small upgrades in the recent past, along with an upgrade of seven miles of the main circuit leaving the substation. Because of its age, and significant amount of exposure J3 is high on the list of priorities for future sectionalizing studies as well as maintenance and pole replacement programs.

R3 FEEDER:

The R3 feeder is in a rapid high growth area of large subdivisions and large upscale residences. Because of this and the limited flexibility of this long feeder it has recently been proposed for an upgrade which involves the installation of a new substation, Hereford, central to the load area, and nine miles of new 69kV sub-transmission line. This substation will significantly shorten the feeder by several miles. It also provides the availability to split this circuit into up to four smaller circuits to limit exposure. Along with all of this, there are several smaller upgrades proposed for the upcoming work plan that is in development. These include, but are not limited to; replacing and/or upgrading the existing distribution sections of the main line, upgrading an existing tie line to provide additional backup capacity to a portion of the circuit, and installing a new underground tie to a residential area that has no backup capability.

Daniel Wilson
Standards and Line Design Engineer
SSVEC
Willcox, AZ
520.384.5498

SECTION B: DISCUSSION OF WORK PLAN DEVELOPMENT

The Work Plan Development Process

The workplan was developed using the following steps:

1. System Analysis – The Milsoft© WindMil distribution system modeling and analysis software package was used to evaluate the distribution system for voltage and ampacity issues. All feeders outside of Sierra Vista, Ramsey R3, and the Sierra Vista substation were modeled using 2005 system configuration and 2006 summer loads. All other Sierra Vista substations are not modeled yet. In Milsoft©, loads on each of the feeders were grown significantly to see if any problems [voltage or ampacity] occurred. Other than 5 areas of concerns, which were already known, there weren't any other issues identified.

2. Coordination Meetings – This was the "heart" of the development of the workplan. Coordination meetings were held with Engineering, Operations, Construction, and ICS personnel to seek input on project identification, project need, and project priorities.

3. Meeting with Senior Staff Review and Approval – At the May 22, 2007 regular Senior Staff meeting, Engineering presented a detailed review and discussion of all projects proposed at that time. After some discussion, a list of projects to be postponed and not included in this workplan was developed. Criteria used in this process included cost, need, and workforce capacity to implement projects. All projects presented in this workplan were presented and approved by Senior Staff at this meeting.

4. Communications Projects – The Technology Manager presented narrative and cost estimates for proposed fiber optic and communications facilities as well as the automated meter reading plan. These projects were reviewed and approved as presented with the exception of one fiber optic project which was postponed.

5. Input from Accounting and Finance – Accounting and financial information was provided accounting and finance personnel. Recent trends in expenditure in various cost categories were provided to Engineering and used in deriving estimated amounts for the 2008-2009 timeframe. Recent closure of a number of older work orders skewed this trend analysis and every effort was made to account for this abnormality.

Areas of Concern

Six areas of special concern were identified prior to the development of this workplan. Each is discussed in detail below. They are:

(1) Feeder R3 - Hereford/Palominas area
(2) H4 [Cochise/Sunsites]
(3) V7 [Sonoita/Patagonia]
(4) W5 [Huachuca City/Whetstone]
(5) O5 [Cottonwood/ J6/Mescal Lakes]

In addition, the overall condition of SSVEC's aging 69 kV sub-transmission system is of concern and is addressed below.

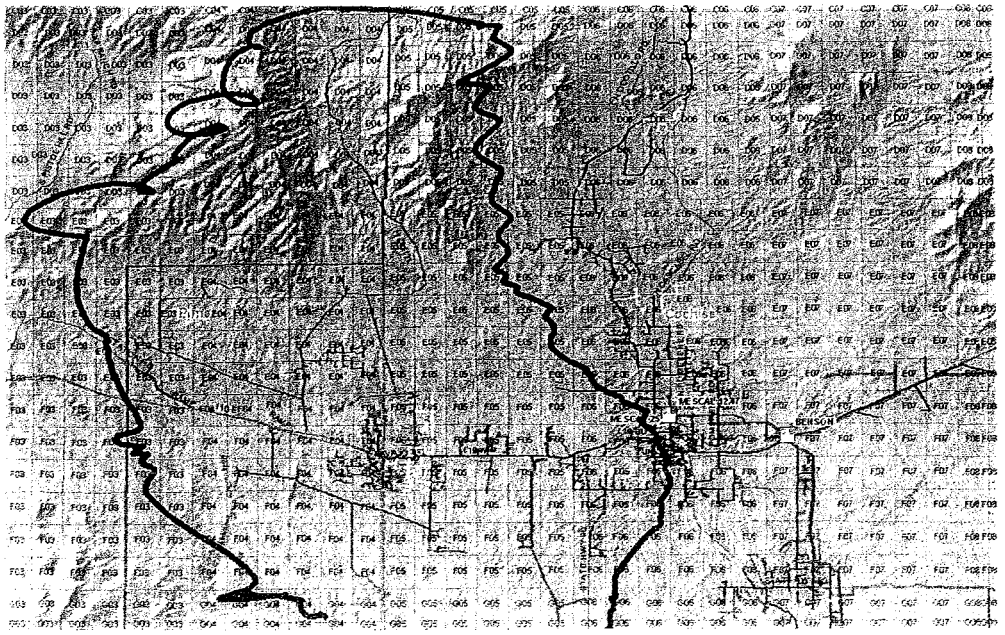
1. Feeder O5 - Cottonwood, J6, and Mescal Lakes Area

Electric service to the Mescal Lakes, J6, and to the West and North of these areas is presently provided by a single 25kV feeder designated O5, which extends from the Mescal substation located near I-10 and Ocotillo Road in Benson, to SSVEC's Western-most boundary in Pima County. The three-phase portion of this feeder extends approximately 20 miles from the substation where an additional 35 miles of single-phase line completes the circuit. The feeder consists of #4/0ACSR conductor from the substation to Ocotillo Road, then 336 ACSR to SSVEC's new Benson office, then 1/0ACSR to the steel pole on the North side of I-10/SR90 interchange, and then #4ACSR conductor the remainder of the way. See area map on the following page.

The concern in this area is the rapid growth primarily from large underground subdivisions such as Cottonwood, Kartchner Vistas, and the future developments further South. This load, compounded by approximately 5 MW of new load growth in the J6 and Mescal Lakes areas, has created a conductor overload on portions of the O5 feeder.

To address this concern, SSVEC recently started to upgrade conductor size on the portion of the feeder along I-10 from Holiday Inn Express to the J6/Mescal Lakes interchange. This upgrade will alleviate much of the overloading problems currently being experienced.

SSVEC recently acquired a substation site adjacent to the new Benson office facility and associated rights-of-way to complete the 69 kV sub-transmission line from St.



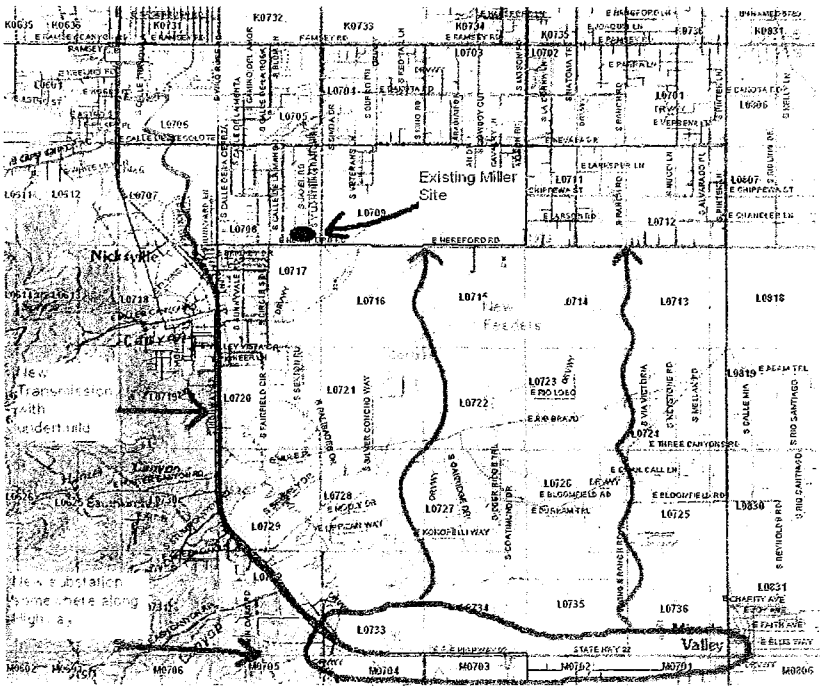
David substation to the new Cottonwood Substation. Design and construction of these facilities will meet current and near-term load growth in the area.

Should the recent downturn in the home market reverse and significant new growth occur, additional upgrades may be necessary in the area – but this is not expected within the term of this workplan.

SSVEC had planned to build a new 230/69 kV substation and power delivery point North of Benson. This new facility, the Sloan Substation, has been postponed in light of the recent downturn in the housing market and would likely be the next upgrade for the area. The Sloan Substation will eventually allow for a 69 kV loop to serve the Mescal, Cottonwood, Guindani (future substation), St. David and Benson substations. This loop will allow for additional load carrying and back-up capacity in the area.

Feeder R3 - Hereford/Palominas Area

The following graphic shows the area served by the R3 feeder out of Ramsey Substation. This 12.47 kV line serves a fast growing area in the Southern part of SSVEC's service territory. The feeder has one mile of 336 ACSR conductor , then 2.5 miles #4/0ACSR, then four miles #1/0ACSR and then #4ACSR conductor to the end.



Recent rapid growth is a result of large underground subdivisions such as Kinjockity Phase I, and larger homes on large lots. Continued growth is expected in this area.

SSVEC owns the Miller Substation site located near the intersection of Y-Lightening and Hereford Roads. The Long Range Plan analysis started in 2006 shows that this substation location is too close to the existing Ramsey Substation and too far North of the new load center.

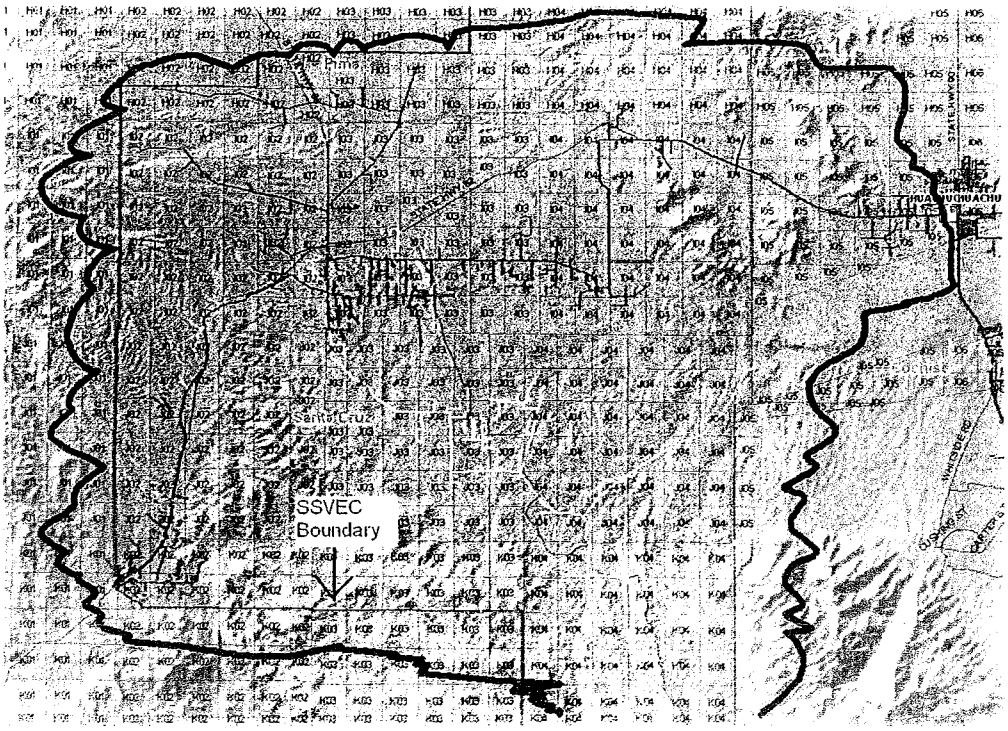
Options considered were:

a. Build a smaller Miller Substation at the existing site and build a second and similarly-sized substation further South in the future,
b. Build Miller Substation at the existing site, retire Ramsey Substation, and install a substation in the future between Miller and Hawes;
c. Don't use the Miller site but rather build a new substation to the South of the Miller site.

Option C is considered the best option considering cost, operability and expandability to cover future loads in the area. SSVEC is already looking into possible substation sites and sub-transmission corridors for this project.

2. <u>Feeder V7 - Sonoita/Patagonia Area</u>

This area has long been a source of concern and now has reached the limits of the existing feeder's capability to serve the over 2,300 members. At present the V7 feeder utilizes five stages of voltage regulation and is a source of frequent outages due to its extensive length and current condition. This radial feeder also has no secondary feed options. A separate detailed report on its limitations and possible solutions for this area was produced by SSVEC's Engineering Division. Findings from this report substantiate the recommendations contained herein.



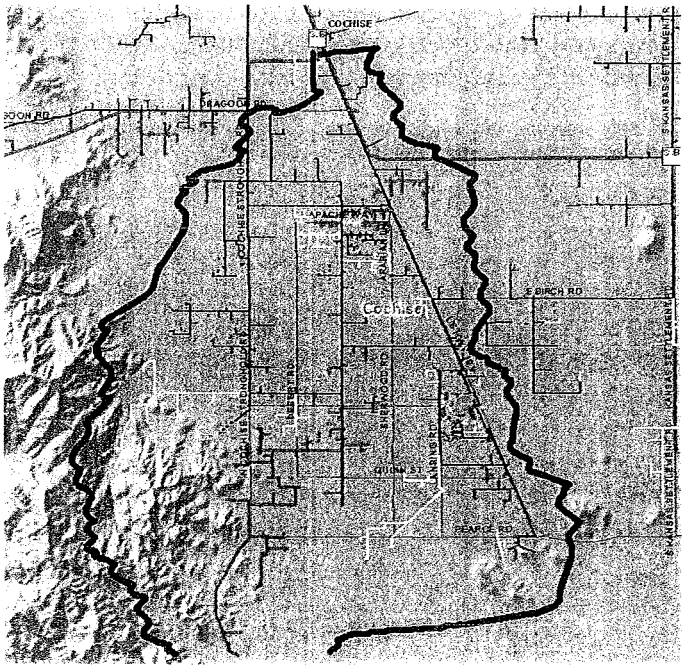
In 1978, SSVEC purchased an easement from the Babacomari Ranch Company for a 69 kV sub-transmission corridor to serve the area. In 1991, this purchase was contested by the ranch. Recent legal action and settlement negotiations indicate that a near-term resolution is likely.

Given the likelihood of a settlement, included in this workplan [carried over from the previously approved work plan] is funding for design and construction of approximately 23 miles 69 kV sub-transmission line from Hwy 90 near Huachuca City to the Sonoita area, a new 69/25 kV substation, and feeders to connect the new facilities to the existing system.

3. Feeder H4 - Sunsites/Pearce Area

The Sunsites and Pearce areas have experienced steady growth over many years. Recently a new large subdivision in Sunsites was approved and will add to the continued growth.

Both the Sunsites and the Pearce areas are currently served by a single 12.47 kV feeder from the Cochise Substation. The substation is located adjacent to the Apache Generating Station. The substation is four miles away from the nearest load center on the feeder, and more than 7 miles from Sunsites. Much of the mainline feeder is #4/0 ACSR conductor.



A substation has been planned in the Sunsites area for some time now though no land or sub-transmission rights-of-way have been acquired. This workplan includes costs for land acquisition and sub-transmission rights-of-way for this new Sunsites Substation though no construction is planned in 2008-2009.

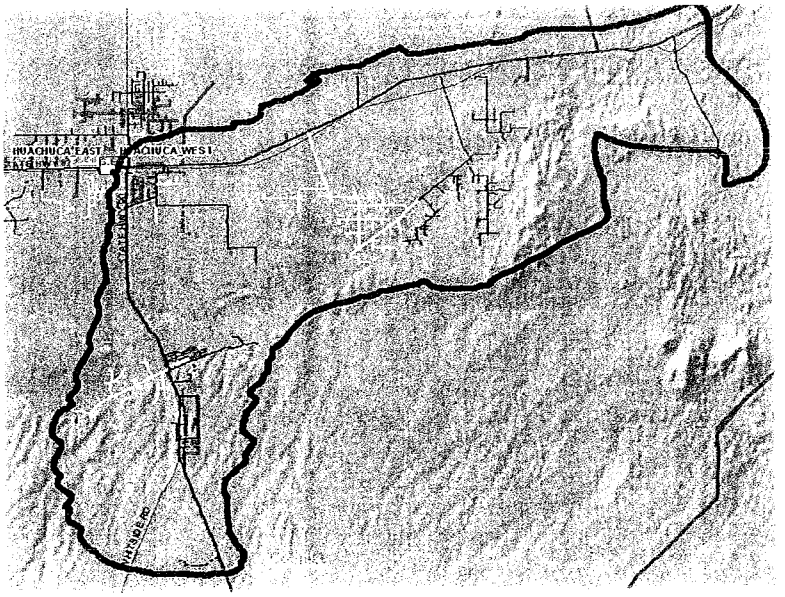
Long Range Plan analysis started in 2006 indicates that the best way to meet the near-term load growth in this area is to convert the H4 feeder from 12.47 kV to 25 kV. Further analysis revealed that beginning the voltage conversion beginning at the ends

of the feeder and working back toward the existing substation would be the best way to implement this conversion.

Once this conversion is completed in 2009, the next workplan will call for construction of the new Sunsites Substation and 69 kV sub-transmission line. Tie lines to the newly-converted feeder will be constructed. This will provide facilities to meet load growth for years to come in this area. The voltage conversion will also allow for back-up feed capability from/to the neighboring Kansas Substation to the East and Chiricahua Substation to the SouthEast.

4. <u>Feeder W5 - Huachuca City/Whetstone Area</u>
Huachuca City, Whetstone and what was formerly known as the Babocomari Land Grant is growing rapidly. This area is located North of Sierra Vista, and just North of the Fort Huachuca Military Reservation. The area is served by a single 12.47 kV feeder extending South from the Huachuca East Substation.

The Babocomari Land Grant has been owned by a single entity for many years and is now in the hands of a partnership. There are now over 800 platted home sites on the old land grant and approximately 100 homes are now built.



SSVEC's Long Range Plan analysis started for this area is to convert to 25 kV. This will increase load-serving capability and increase reliability by matching voltage with the neighboring existing Huachuca West Substation and future substations between Benson and Whetstone. In development of this workplan, discussion took place regarding the option to convert the Southern portion of this feeder beginning at the Mustang Corner area and extending South to complete the conversion during the next workplan. However, due to the amount of work already in the 2008-9 workplan, this project was postponed.

Project: Sonoita Substation New Feeders
CWP Item Number: 200.119 **Estimated Cost:** $900,000
Year: 2009

DESCRIPTION OF PROPOSED CONSTRUCTION

Build new, upgrading existing, and/or rerouting distribution lines as a result of the new Sonoita Substation or upgrading existing lines as needed since Sonoita substation has not been built.

Exact description can't be done since the substation site hasn't been bought yet.

REASON FOR PROPOSED CONSTRUCTION

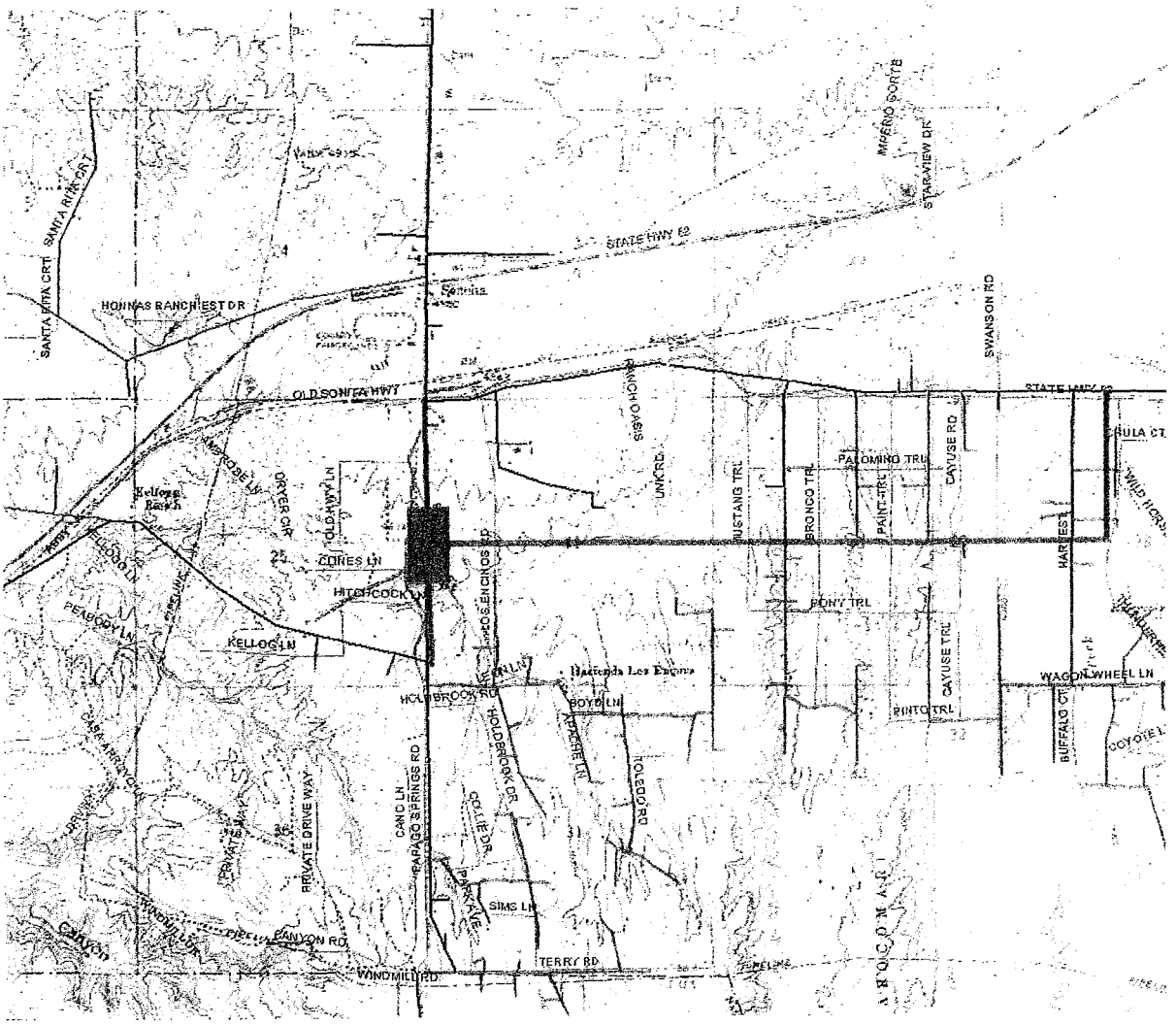
The work is due to a new substation, or to continue to serve loads from existing facilities due to the lack of the Sonoita substation. See page 9 for more details.

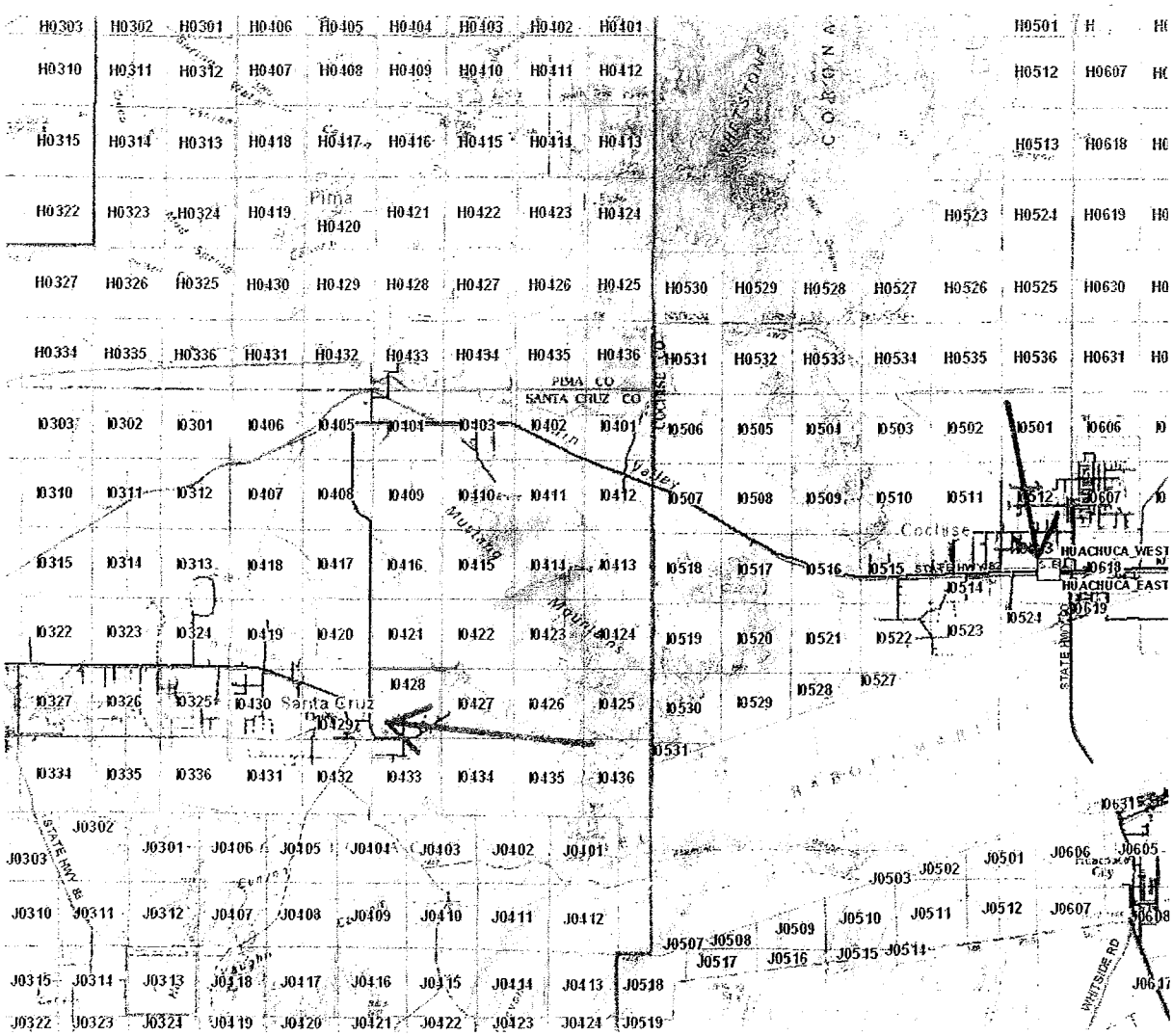
If the new substation cannot completed in time to meet the load requirements, the existing feeder will need to be rebuilt to a larger conductor from the substation to Elgin road.

RESULTS OF PROPOSED CONSTRUCTION

ALTERNATES TO PROPOSED CONSTRUCTION

There are no meaningful alternatives.


SANTA RITA CRT
HONNAS RANCH EST DR
STATE HWY 52
OLD SONITA HWY
STAR VIEW DR
SWANSON RD
RANCH OASIS
UNK RD
PALOMINO TRL
CAYUSE RD
BRONCO TRL
PAINT TRL
HARTEST
CONES LN
HITCHCOCK LN
KELLOG LN
PEABODY LN
PONY TRL
CAYUSE TRL
WAGON WHEEL LN
PINTO TRL
BUFFALO CT
HOLDBROOK RD
BOYD LN
HOLDBROOK DR
TOLEDO RD
CANO LN
PAPAGO SPRINGS RD
COLLIE DR
PARK AVE
SIMS LN
PRIVATE DRIVE WAY
CANYON RD
WINDMILL RD
TERRY RD


H0303 H0302 H0301 H0406 H0405 H0404 H0403 H0402 H0401 H0501
H0310 H0311 H0312 H0407 H0408 H0409 H0410 H0411 H0412 H0512 H0607
H0315 H0314 H0313 H0418 H0417 H0416 H0415 H0414 H0413 H0513 H0618
H0322 H0323 H0324 H0419 H0420 H0421 H0422 H0423 H0424 H0523 H0524 H0619
H0327 H0326 H0325 H0430 H0429 H0428 H0427 H0426 H0425 H0530 H0529 H0528 H0527 H0526 H0525 H0630
H0334 H0335 H0336 H0431 H0432 H0433 H0434 H0435 H0436 H0531 H0532 H0533 H0534 H0535 H0536 H0631
Pima
PIMA CO
SANTA CRUZ CO
I0303 I0302 I0301 I0406 I0405 I0404 I0403 I0402 I0401 I0506 I0505 I0504 I0503 I0502 I0501 I0606
I0310 I0311 I0312 I0407 I0408 I0409 I0410 I0411 I0412 I0507 I0508 I0509 I0510 I0511 I0512 I0607
I0315 I0314 I0313 I0418 I0417 I0416 I0415 I0414 I0413 I0518 I0517 I0516 I0515 I0514 I0618
I0322 I0323 I0324 I0419 I0420 I0421 I0422 I0423 I0424 I0519 I0520 I0521 I0522 I0523 I0524 I0619
I0327 I0326 I0325 I0430 I0428 I0427 I0426 I0425 I0530 I0529 I0528 I0527
I0429
I0531
I0334 I0335 I0336 I0431 I0432 I0433 I0434 I0435 I0436
Santa Cruz
Cochise
HUACHUCA WEST
HUACHUCA EAST
STATE HWY 82
STATE HWY 83
STATE HWY 86
WHITSIDE RD
J0302
J0303 J0301 J0406 J0405 J0404 J0403 J0402 J0401 J0503 J0502 J0501 J0606 J0605
J0310 J0311 J0312 J0407 J0408 J0409 J0410 J0411 J0412 J0507 J0508 J0509 J0510 J0511 J0512 J0607 J0608
J0517 J0516 J0515 J0514
J0315 J0314 J0313 J0418 J0417 J0416 J0415 J0414 J0413 J0518 J0617
J0322 J0323 J0324 J0419 J0420 J0421 J0422 J0423 J0424 J0519

Project: R3 Three Canyons Road
CWP Item Number: 200.120 **Estimated Cost:** $225,000
Year: 2008

DESCRIPTION OF PROPOSED CONSTRUCTION

Build 4 miles, 3-phase, underground 4/0 ACSR conductor. Construction will begin at or near location L0729-1110, and end at or near location L0723-88890. All of the construction will be done in existing rights-of-way. Some of the conduit has been installed already as this project has been known for awhile.

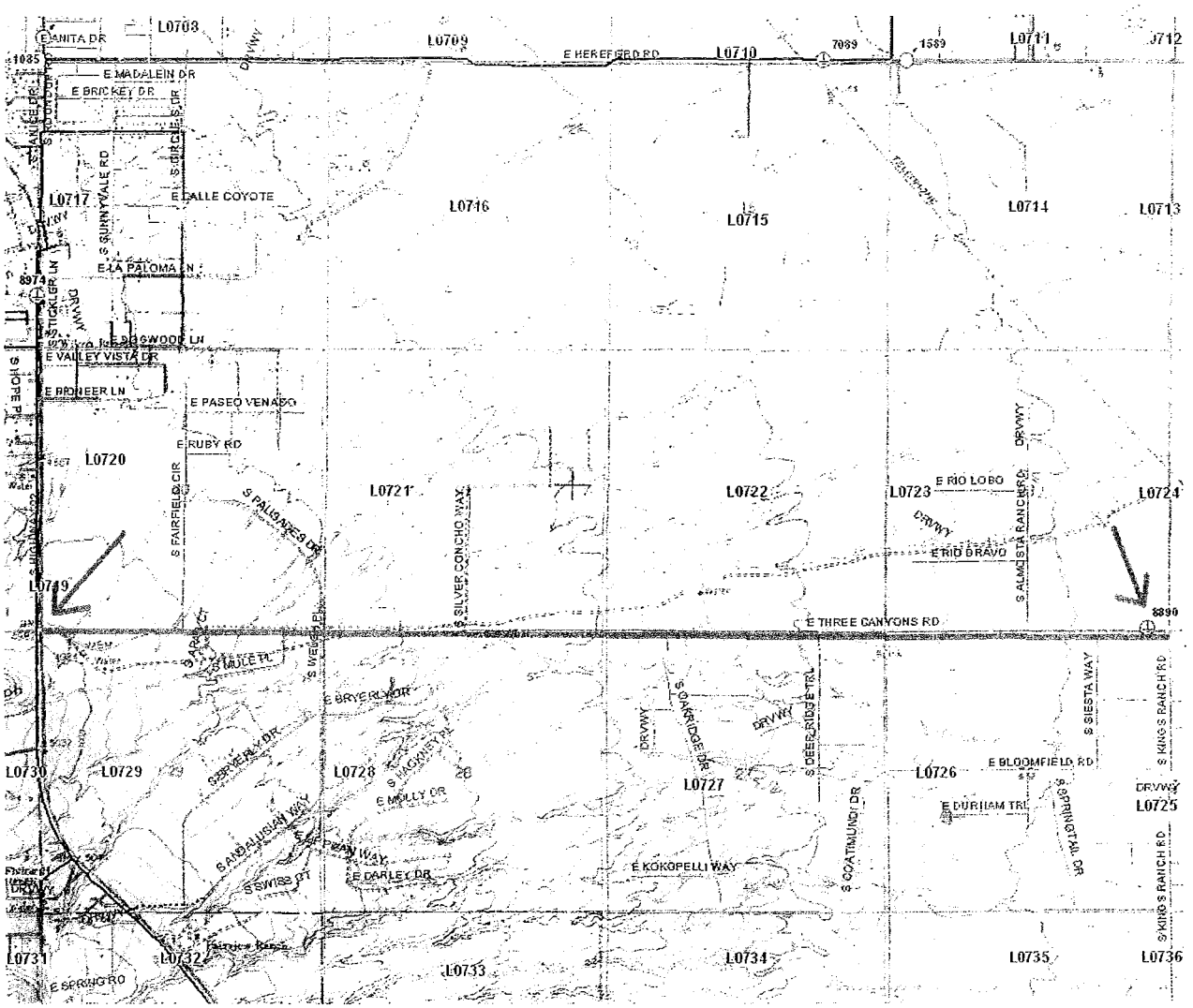
REASON FOR PROPOSED CONSTRUCTION

This area is growing rapidly. Furthermore, the new Hereford substation will be built shortly. This project provides voltage support and line capacity to the area along with increased back up capability between Ramsey and Hereford substations.

RESULTS OF PROPOSED CONSTRUCTION

1) The existing feed winds for 8 miles to serve the existing load. The new feed will serve the load by a direct route of 3 miles.
2) Building this feeder section will also provide loop feed possibilities for scheduled and emergency outages.

ALTERNATES TO PROPOSED CONSTRUCTION
There are no meaningful alternatives.


L0708
L0709
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E ANITA DR
E MADALEIN DR
E BRICKEY DR
E HEREFORD RD
E CALLE COYOTE
E LA PALOMA LN
E VALLEY VISTA DR
E PIONEER LN
E PASEO VENADO
E RUBY RD
E RIO LOBO
E RIO BRAVO
E THREE CANYONS RD
E BLOOMFIELD RD
E DURHAM TRL
E KOKOPELLI WAY
E DARLEY DR
E MOLLY DR
E BRYERLY DR
E SPRING RD
S SUNNYVALE RD
S FAIRFIELD CIR
S PALISADES DR
S SILVER CONCHO WAY
S ALMOSTA RANCH RD
S OAKRIDGE DR
S DEER RIDGE TRL
S COATIMUNDI DR
S SIESTA WAY
S KINGS RANCH RD
S SPRINGTAIL DR
S ANDALUSIAN WAY
S SWISS CT
S HOPE PL
DRVWY
1085
7089
1589
8974
8890

Project: Cottonwood Feeders
CWP Item Number: 200.130 **Estimated Cost:** $200,000
Year: 2008

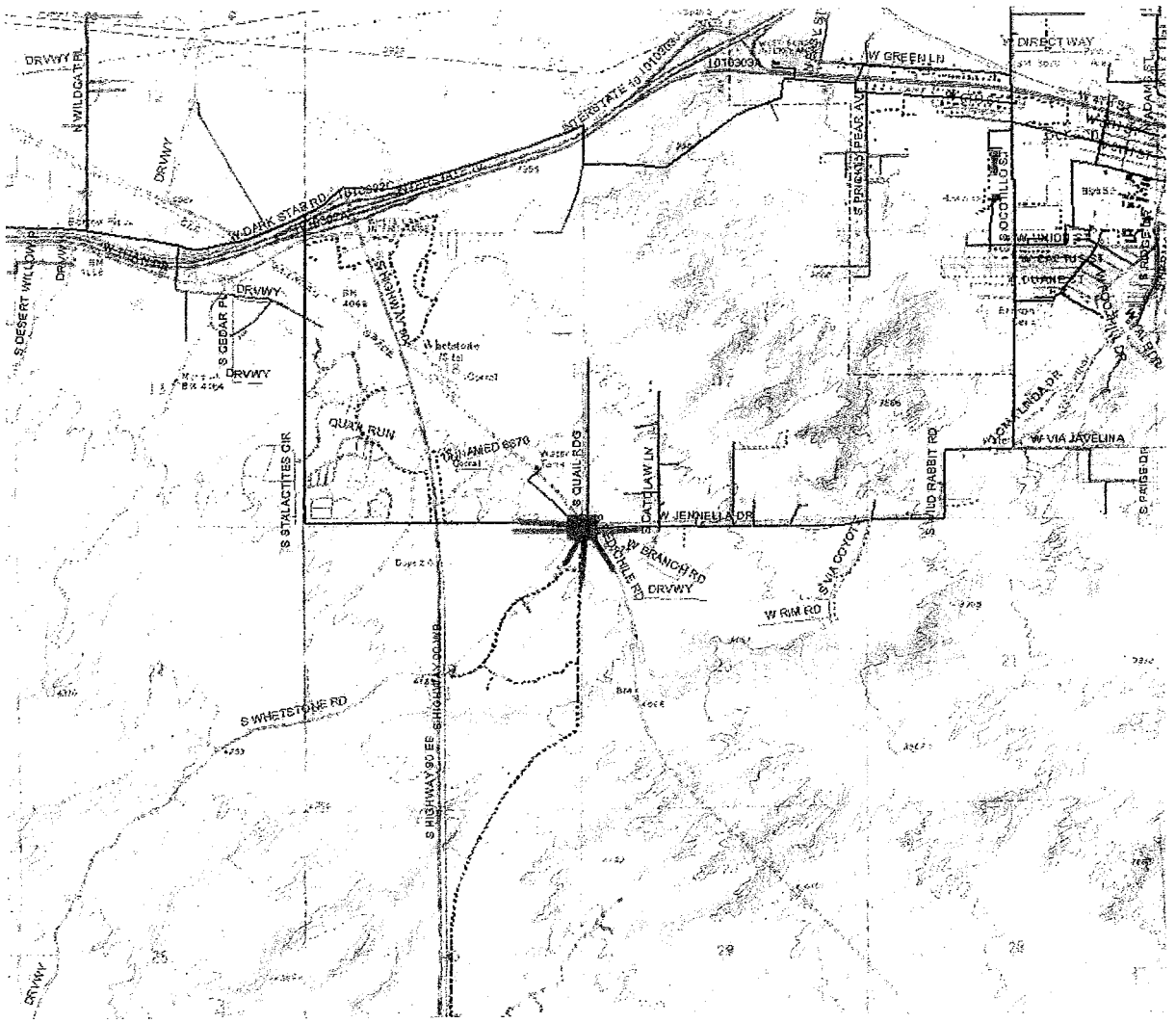
DESCRIPTION OF PROPOSED CONSTRUCTION

Build 3-phase, 500MCM underground or 477 ACSR overhead as needed to connect substation to system. There shouldn't be much construction as many of the existing lines have been built with the substation in mind.

REASON FOR PROPOSED CONSTRUCTION
This project allows to power to come from the Cottonwood substation. This substation and its feeders will provide adequate electric service to the fast growing areas along Highway 90, J6/Mescal Lakes, and areas West of the Benson area. See page 7 for more details.

RESULTS OF PROPOSED CONSTRUCTION

ALTERNATES TO PROPOSED CONSTRUCTION
There are no meaningful alternatives.


W DIRECT WAY
W GREEN LN
DRVWY
N WILDCAT PL
W DARK STAR RD
S DESERT WILLOW PL
S CEDAR PL
QUAIL RUN
S STALACTITES CIR
S QUAIL RDG
S CATCLAW LN
W JENNELLA DR
W BRANCH RD
W RIM RD
S WHETSTONE RD
S HIGHWAY 90 EB
S PRICKLY PEAR AVE
S OCOTILLO ST
W VIA JAVELINA
S WILD RABBIT RD
S PAISE DR

Project: Hereford Substation New Feeders
CWP Item Number: 200.132 **Estimated Cost:** $1,900,000
Year: 2009

DESCRIPTION OF PROPOSED CONSTRUCTION

Build new, upgrading existing, and/or rerouting distribution lines as a result of the new Hereford Substation. Possibly up to 4 miles of 500mcm underground and 5 miles of 4/0 underground.

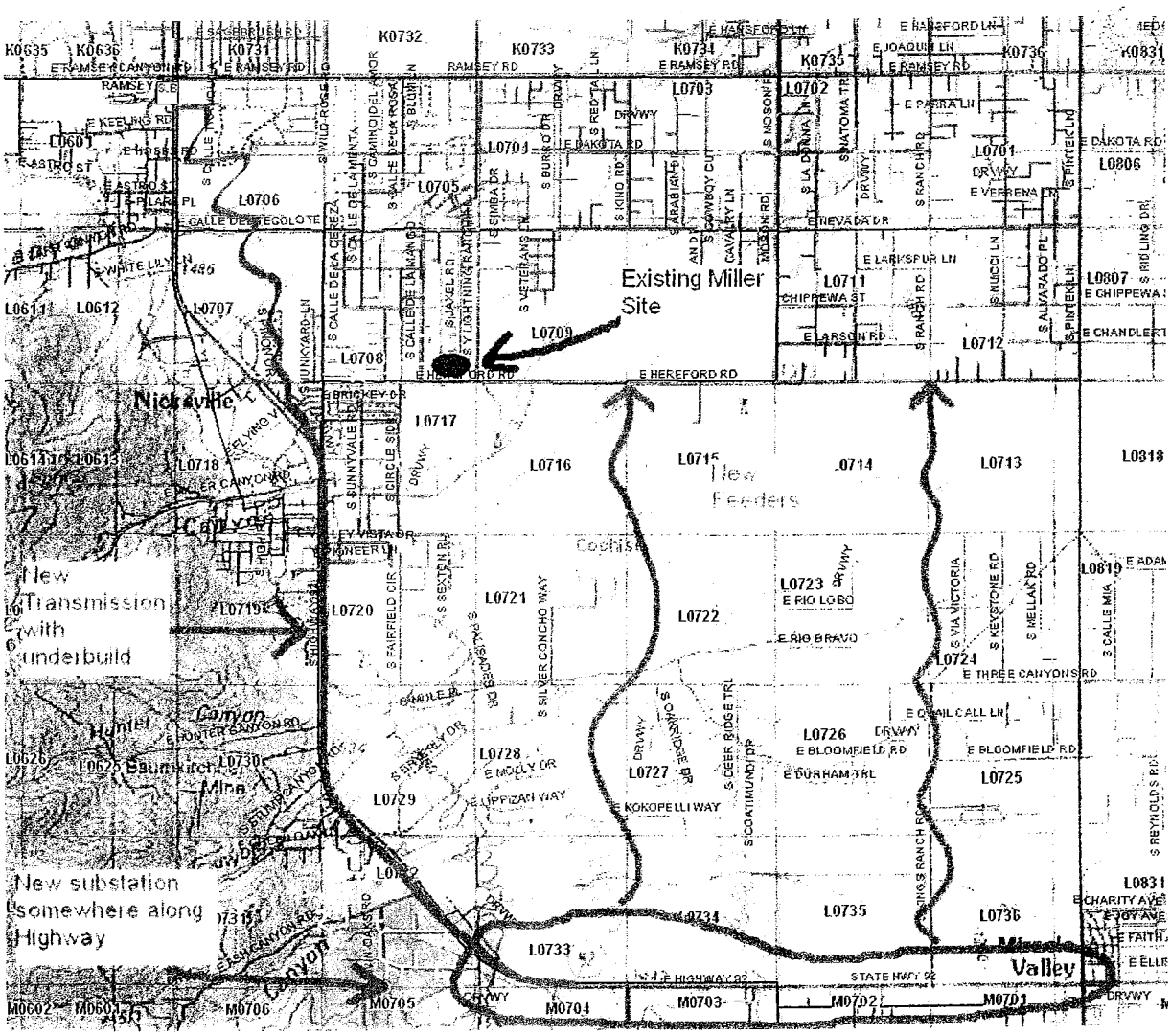
REASON FOR PROPOSED CONSTRUCTION

The work is due to a new substation. See page 8 for more details.

RESULTS OF PROPOSED CONSTRUCTION

ALTERNATES TO PROPOSED CONSTRUCTION

There are no meaningful alternatives.


Existing Miller Site
Nickelville
Canyon
New Transmission with underbuild
Hunter Canyon
Baumkirch Mine
New substation somewhere along Highway
New Feeders
Cochise
Valley
RAMSEY RD
E HEREFORD RD
E RIO BRAVO
E THREE CANYONS RD
E BLOOMFIELD RD
E DURHAM TRL
E KOKOPELLI WAY
STATE HWY 92
E HIGHWAY 92

Project: Sonoita Substation
CWP Item Number: 400.001 **Estimated Cost:** $2,500,000
Year: 2008, 2009

DESCRIPTION OF PROPOSED CONSTRUCTION

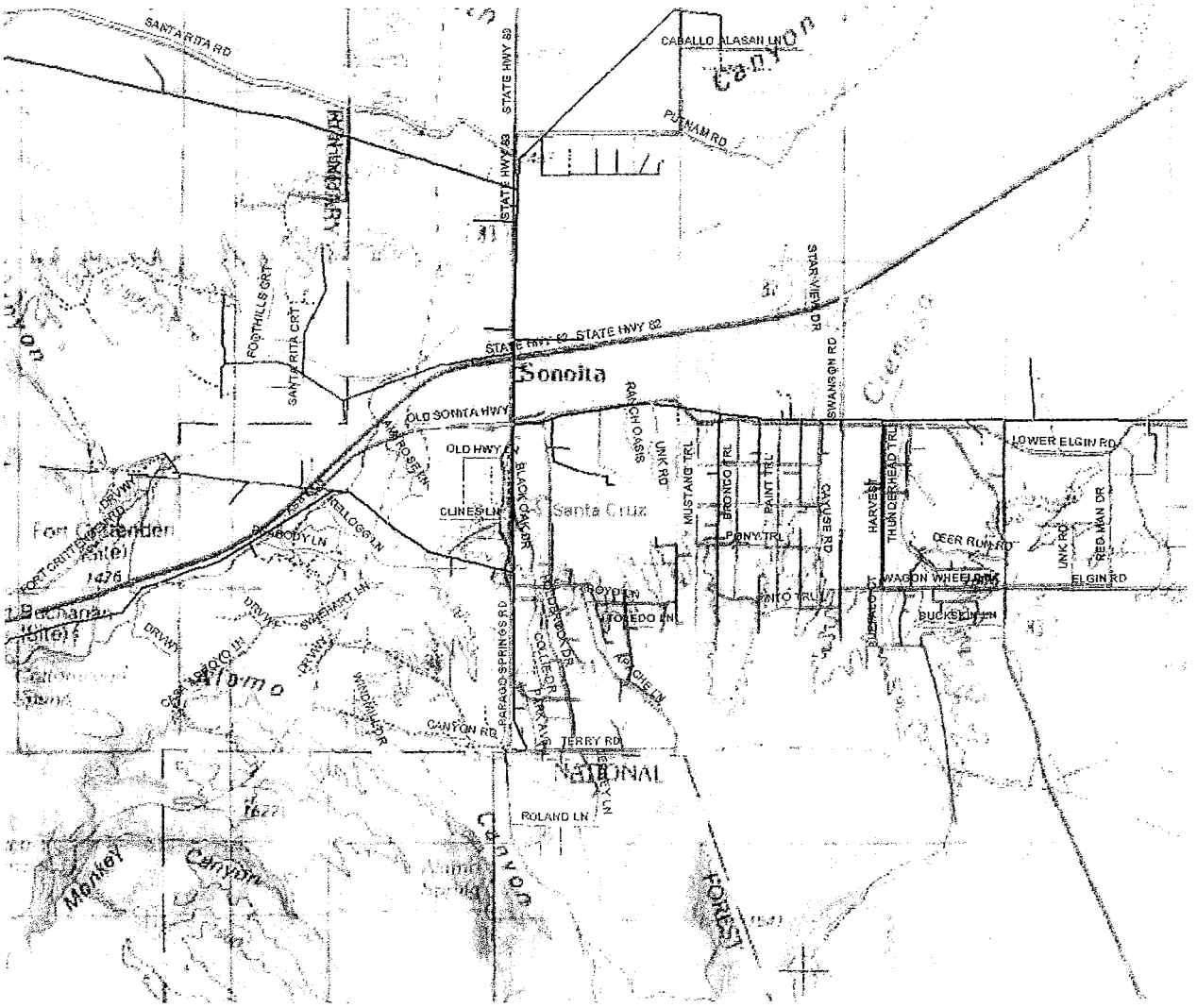
Obtain the necessary rights-of-way and build a new 69/24.9 kV Sonoita Substation to help serve the load of the Huachuca West Substation. The Sonoita Substation will have four feeder bays with a 10/12/14 MVA transformer.

REASON FOR PROPOSED CONSTRUCTION

The existing feeder serving the Sonoita, Patagonia, and nearby areas has reached it power serving capacity. The load continues to grow. A sub-transmission line, substation, and feeders are required. See page 9 for more details.

RESULTS OF PROPOSED CONSTRUCTION

ALTERNATES TO PROPOSED CONSTRUCTION


SANTA RITA RD
STATE HWY 83
CABALLO ALASAN LN
Canyon
PUTNAM RD
STATE HWY 82
Sonoita
OLD SONITA HWY
OLD HWY LN
CLINES LN
Santa Cruz
RANCH OASIS
UNK RD
MUSTANG TRL
BRONCO TRL
PAINT TRL
PONY TRL
CAYUSE RD
HARVEST
THUNDERHEAD TRL
SWANSON RD
STAR VIEW DR
LOWER ELGIN RD
DEER RUN RD
WAGON WHEEL
ELGIN RD
BUCKSKIN LN
RED MAN DR
UNK RD
TOLEDO LN
PARADO SPRINGS RD
CANYON RD
TERRY RD
ROLAND LN
NATIONAL
FOREST
Monkey
Canyon
Fort Crittenden
Buchanan
Alamo
FOOTHILLS CRT
SANTA RITA CRT
KELLOGG LN
DRVWY
SWEHART LN
WINDMILL DR
BLACK OAK DR
COLLIE DR
APACHE LN
PARK AVE

Project: Cottonwood Substation
CWP Item Number: 400.004 **Estimated Cost:** $2,000,000
Year: 2008

DESCRIPTION OF PROPOSED CONSTRUCTION

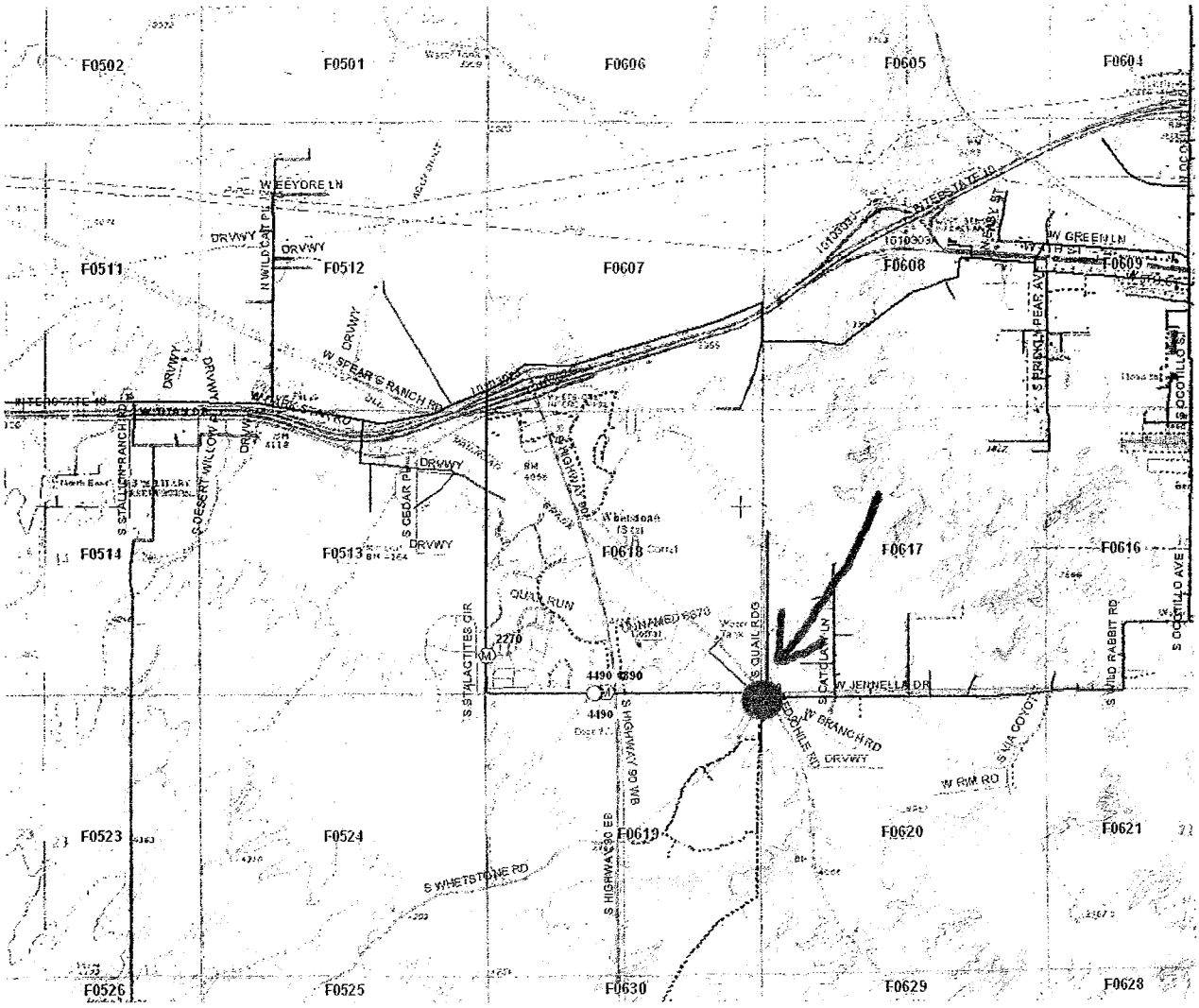
Build a new 69/25 kV substation in the Benson area to serve new load.

REASON FOR PROPOSED CONSTRUCTION

This substation and its feeders will provide adequate electric service to the fast growing areas along Highway 90, J6/Mescal Lakes, and areas West of the Benson area. See page 7 for more details.

RESULTS OF PROPOSED CONSTRUCTION

ALTERNATES TO PROPOSED CONSTRUCTION


F0502
F0501
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F0630
F0629
F0628
W EEYORE LN
DRVWY
W SPEAR'S RANCH RD
INTERSTATE 40
W GREEN LN
S PRICKLY PEAR AVE
S OCOTILLO AVE
S STALLION RANCH RD
S DESERT WILLOW
S CEDAR PL
S HIGHWAY 90
Whetstone
QUAIL RUN
S STALACTITES CIR
2270
4490
S QUAIL RDG
S CATCLAW LN
W JENNELLA DR
W BRANCH RD
S VIA COYOTE
W RIM RD
S WILD RABBIT RD
S HIGHWAY 90 WB
S HIGHWAY 90 EB
S WHETSTONE RD

Project: Hereford Substation
CWP Item Number: 400.005
Year: 2008, 2009

Estimated Cost: $2,500,000

DESCRIPTION OF PROPOSED CONSTRUCTION

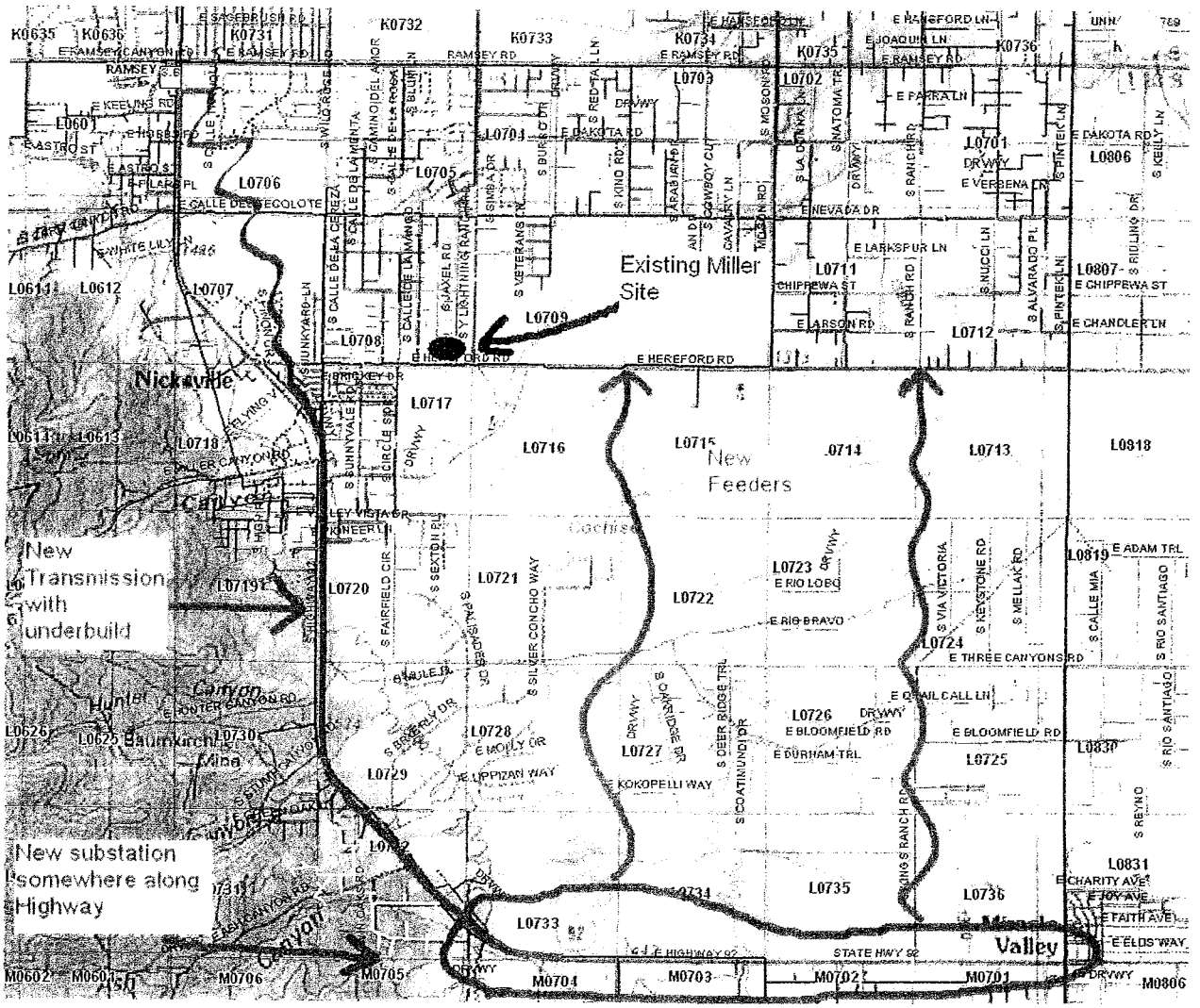
Buy the substation site and necessary rights-of-way, and do the engineering for the substation in 2008. Construct the substation in 2009. This is assuming the proposed rights-of-way for the source sub-transmission and substation site can be obtained.

REASON FOR PROPOSED CONSTRUCTION

The work is due to a new substation. See page 8 for more details.

RESULTS OF PROPOSED CONSTRUCTION

ALTERNATES TO PROPOSED CONSTRUCTION


Existing Miller Site
New Feeders
New Transmission with underbuild
New substation somewhere along Highway
Nickeville
Valley
E HEREFORD RD
E RAMSEY RD
E DAKOTA RD
E NEVADA DR
E LARKSPUR LN
E CHIPPEWA ST
E CHANDLER LN
E RIO LOBO
E RIO BRAVO
E THREE CANYONS RD
E BLOOMFIELD RD
E DURHAM TRL
E CHARITY AVE
E FAITH AVE
E ELDS WAY
STATE HWY 92
E HIGHWAY 92
L0709
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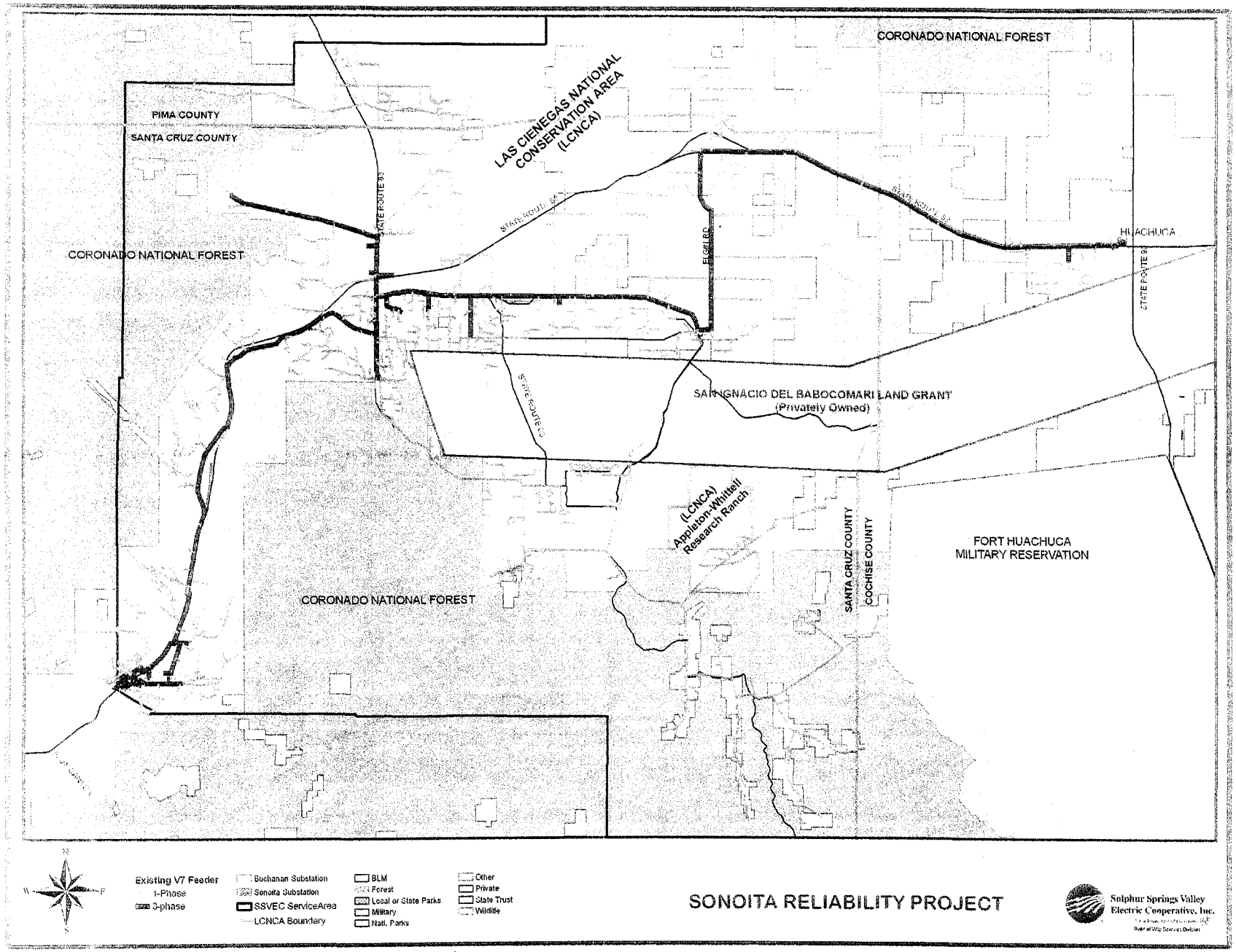
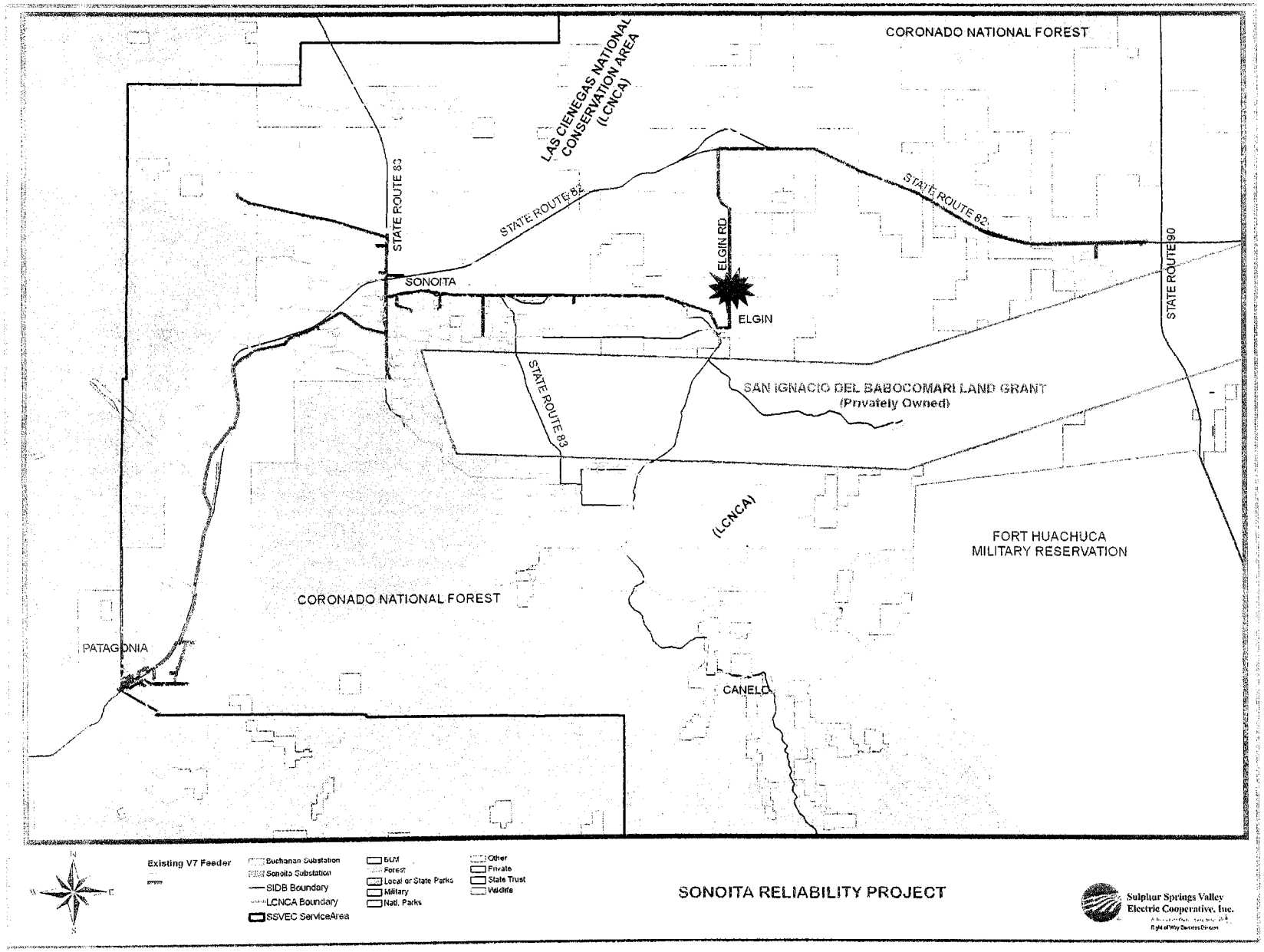
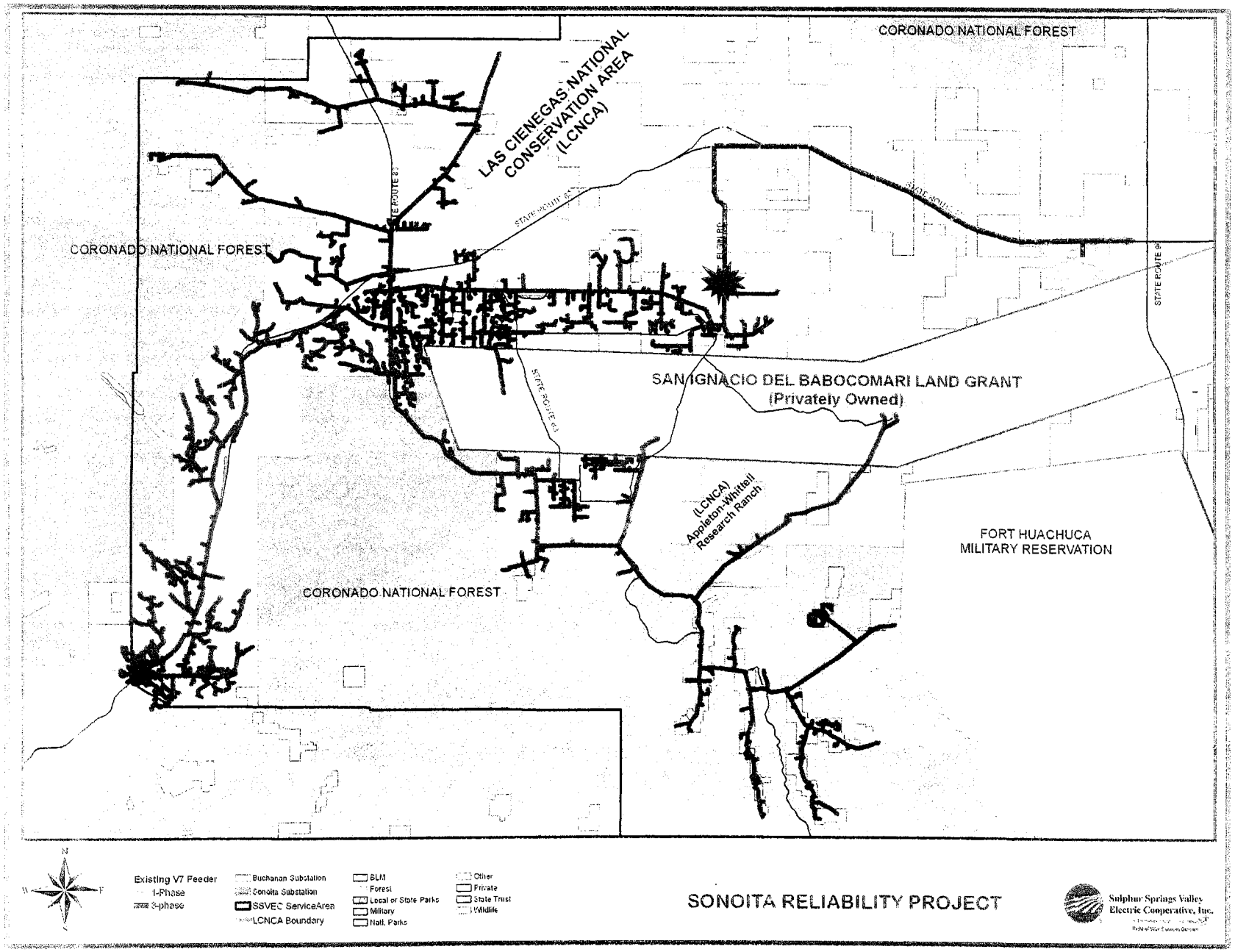

CORONADO NATIONAL FOREST
LAS CIENEGAS NATIONAL CONSERVATION AREA (LCNCA)
PIMA COUNTY
SANTA CRUZ COUNTY
STATE ROUTE 83
STATE ROUTE 82
STATE ROUTE 92
HUACHUCA
CORONADO NATIONAL FOREST
ELGIN RD
STATE ROUTE 93
SAN IGNACIO DEL BABOCOMARI LAND GRANT (Privately Owned)
(LCNCA) Appleton-Whittell Research Ranch
SANTA CRUZ COUNTY
COCHISE COUNTY
FORT HUACHUCA MILITARY RESERVATION
CORONADO NATIONAL FOREST
Existing V7 Feeder
1-Phase
3-phase
Buchanan Substation
Sonoita Substation
SSVEC ServiceArea
LCNCA Boundary
BLM
Forest
Local or State Parks
Military
Natl. Parks
Other
Private
State Trust
Wildlife
SONOITA RELIABILITY PROJECT
Sulphur Springs Valley Electric Cooperative, Inc.



SONOITA RELIABILITY PROJECT

Sulphur Springs Valley Electric Cooperative, Inc.


CORONADO NATIONAL FOREST
LAS CIENEGAS NATIONAL CONSERVATION AREA (LCNCA)
CORONADO NATIONAL FOREST
STATE ROUTE 83
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STATE ROUTE 83
STATE ROUTE 90
SAN IGNACIO DEL BABOCOMARI LAND GRANT (Privately Owned)
(LCNCA) Appleton-Whittell Research Ranch
FORT HUACHUCA MILITARY RESERVATION
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Existing V7 Feeder
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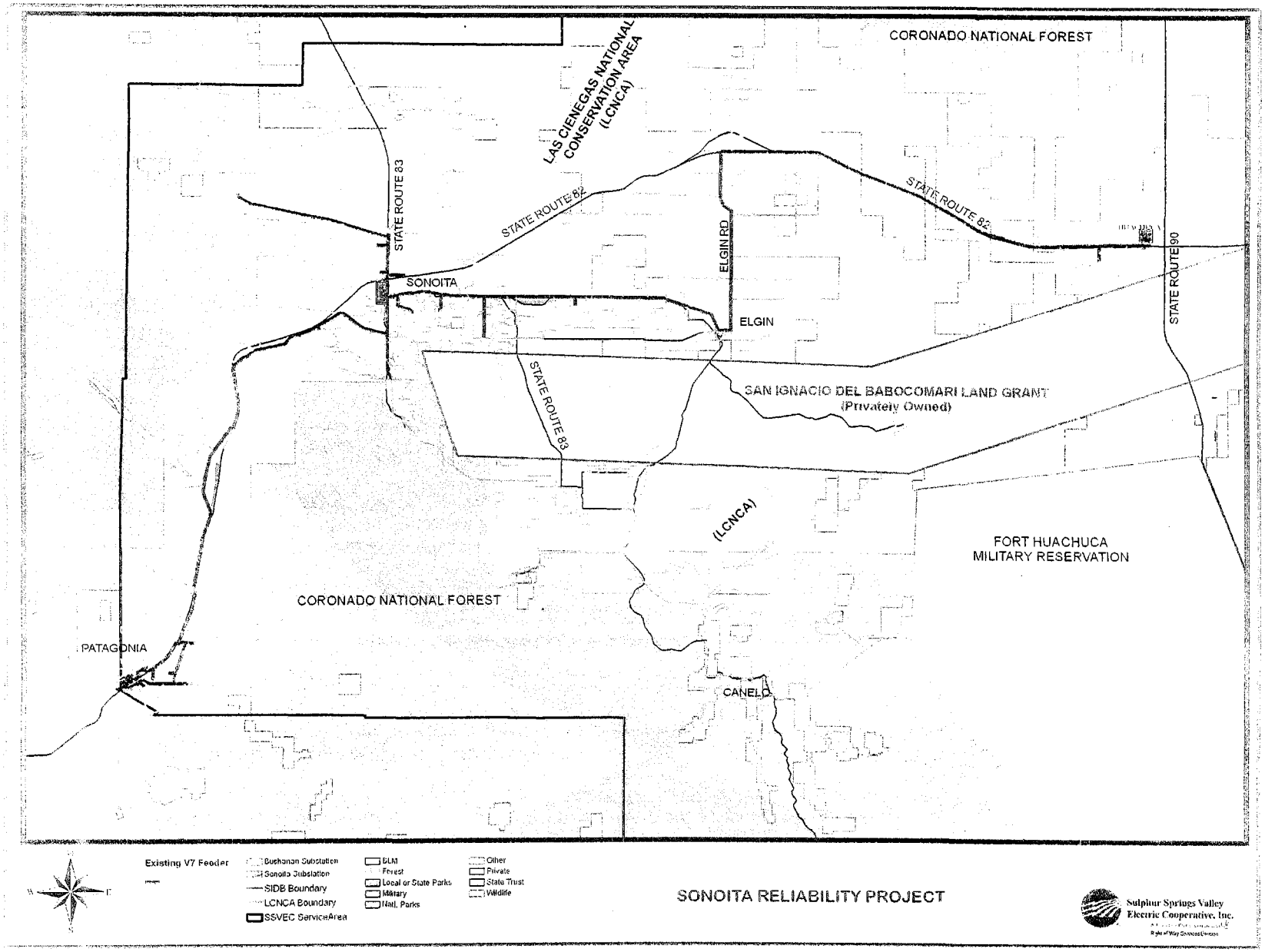
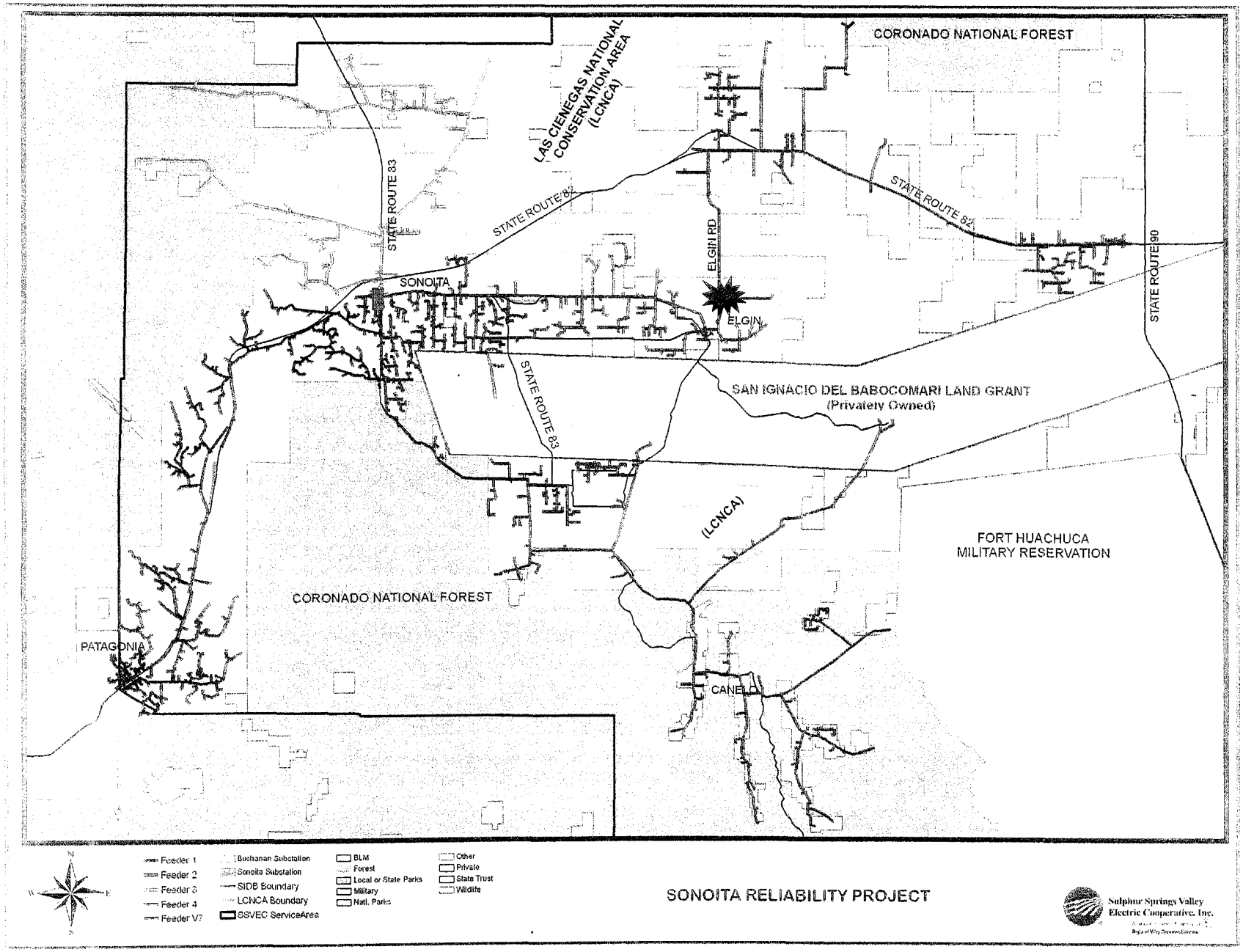
SONOITA RELIABILITY PROJECT
Sulphur Springs Valley Electric Cooperative, Inc.



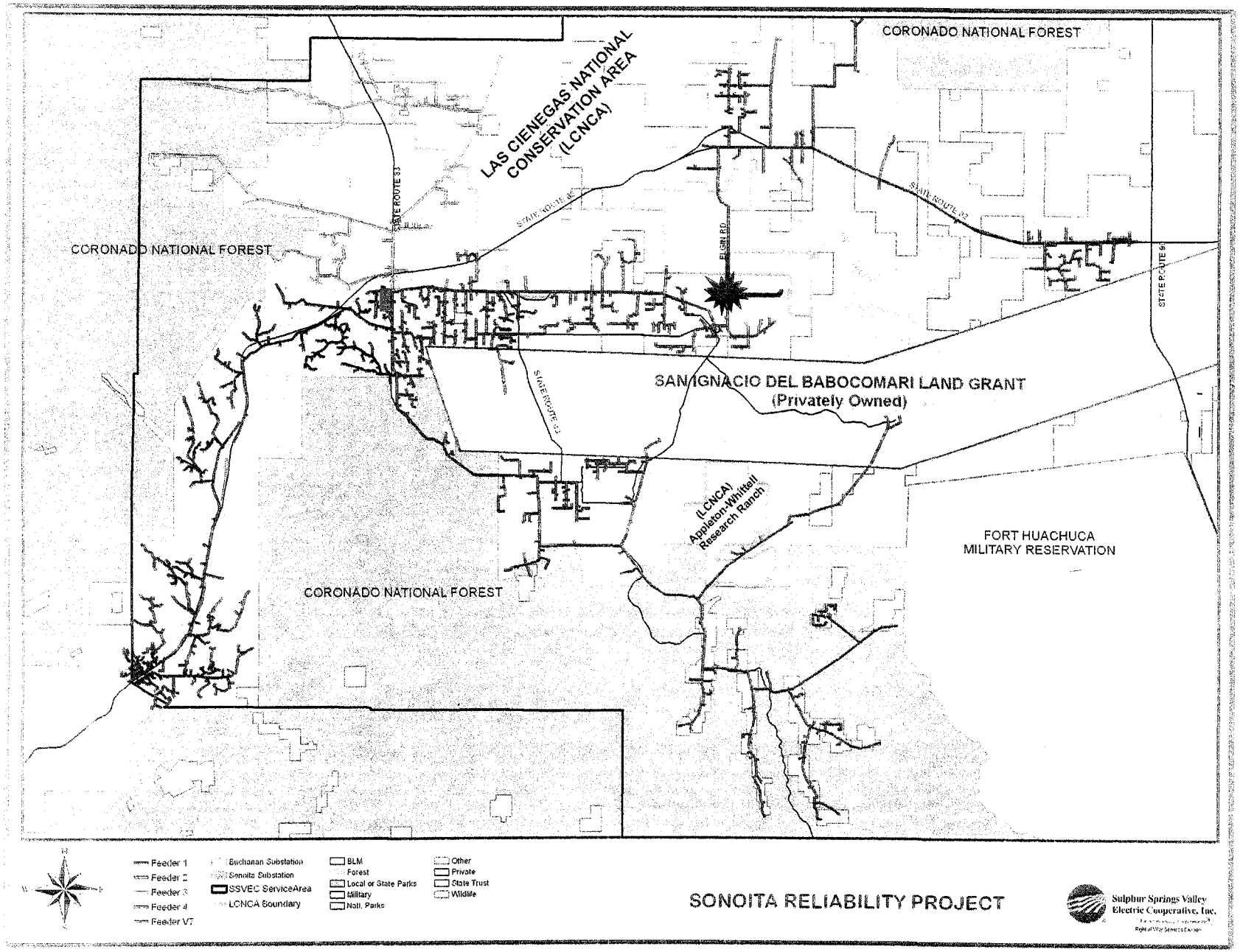
SONOITA RELIABILITY PROJECT

Sulphur Springs Valley Electric Cooperative, Inc.



SONOITA RELIABILITY PROJECT

Sulphur Springs Valley Electric Cooperative, Inc.



SONOITA RELIABILITY PROJECT

Sulphur Springs Valley Electric Cooperative, Inc.

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WORK
PLAN

TOTAL NUMBER OF INTERRUPTIONS 1992-1996

SUBSTATION	1992	1993	1994	1995	1996	Average
SYSTEM TOTAL	885	795	925	1023	934	912
SAN SIMON TOTALS	26	20	18	22	14	20
A1	0	0	2	0	0	0
A3	10	14	9	14	8	11
A5	16	5	7	8	6	8
Outages of Entire Sub A	0	1	0	0	0	0
BOWIE TOTALS	9	12	9	17	10	11
B3	3	5	4	6	3	4
B5	0	2	1	2	2	1
B7	6	5	4	9	5	6
Outages of Entire Sub B	0	0	0	0	0	0
MORTENSON TOTALS	15	11	15	15	19	15
D1	2	3	6	1	3	3
D5	9	4	4	13	12	8
D7	4	4	4	1	2	3
Outages of Entire Sub D	0	0	1	0	2	1
STEWART TOTALS	21	37	21	24	31	27
E1	8	3	1	2	2	3
E2	2	13	4	11	13	9
E3	11	21	16	11	15	15
Outages of Entire Sub E	0	0	0	0	1	0
WILLCOX TOTALS	33	25	34	21	23	28
F3	7	4	10	7	9	7
F4	8	9	4	2	0	5
F7	20	10	15	8	12	13
F8	3	2	5	4	1	3
Outages of Entire Sub F	0	0	0	0	1	0
COCHISE TOTALS	33	25	35	43	40	35
H3	17	14	9	9	9	12
H4	16	11	26	32	31	23
Outages of Entire Sub H	0	0	0	0	0	0
KANSAS TOTALS	123	125	145	149	114	131
J3	40	34	46	63	53	47
J5	10	9	8	11	9	9
J7	73	82	89	75	50	74
Outages of Entire Sub J	0	0	2	0	2	1
WEBB TOTALS	34	48	29	34	26	34
M1	7	17	9	14	11	12
M3	7	6	2	5	4	5
M4	15	21	13	12	8	14
M5	5	3	5	3	2	4
Outages of Entire Sub M	0	1	0	0	1	0
MCNEAL TOTALS	27	34	58	35	51	41
N1	17	13	25	18	23	19
N2	10	21	30	17	27	21
Outages of Entire Sub N	0	0	3	0	1	1
MESCAL TOTALS	64	59	62	109	103	79
O1	11	24	26	40	54	31
O2	41	25	29	54	42	38
O3	0	1	0	0	2	1
O4	12	9	7	15	4	9
Outages of Entire Sub O	0	0	0	0	1	0

SUBSTATION	1992	1993	1994	1995	1996	Average
SYSTEM TOTAL	885	795	925	1023	934	912
BENSON TOTALS	40	24	26	34	28	30
P5	17	13	9	16	11	13
P7	12	1	7	8	4	6
P8	11	10	10	10	12	11
Outages of Entire Sub P	0	0	0	0	1	0
ST DAVID TOTALS	3	4	7	5	8	5
Q3	0	2	3	2	5	2
Q5	3	1	4	1	2	2
Q7	0	0	0	0	0	0
Outages of Entire Sub Q	0	1	0	2	1	1
RAMSEY TOTALS	108	82	96	66	89	88
R1	15	11	50	8	15	20
R2	34	37	12	18	17	24
R3	59	34	34	40	57	45
Outages of Entire Sub R	0	0	0	0	0	0
TOMBSTONE TOTALS	18	2	7	9	12	10
S3	17	2	7	7	11	9
S7	1	0	0	1	1	1
Outages of Entire Sub S	0	0	0	1	0	0
KEATING TOTALS	27	23	42	52	34	36
T1	8	4	9	14	5	8
T2	6	4	14	21	16	12
T3	4	6	6	6	5	5
T4	9	9	13	10	8	10
Outages of Entire Sub T	0	0	0	1	0	0
SIERRA VISTA TOTALS	28	18	32	36	27	28
U3	4	1	1	5	1	2
U5	3	1	8	7	10	6
U6	19	13	18	13	13	15
U7	2	3	5	11	3	5
Outages of Entire Sub U	0	0	0	0	0	0
HUACHUCA WEST TOTALS	169	146	164	184	147	162
V7	169	146	163	182	145	161
Outages of Entire Sub V	0	0	1	2	2	1
HUACHUCA EAST TOTALS	41	20	27	46	49	37
W3	15	14	21	20	26	19
W5	26	6	6	25	22	17
Outages of Entire Sub W	0	0	0	1	1	0
HAWES TOTALS	31	50	58	76	66	56
X1	2	1	2	5	1	2
X5	22	32	33	40	32	32
X7	0	8	9	7	19	9
X8	7	9	13	24	14	13
Outages of Entire Sub X	0	0	1	0	0	0
BELLA VISTA TOTALS	30	30	40	48	43	38
Y1	7	6	0	2	1	3
Y2	3	7	9	8	1	6
Y3	13	9	20	32	29	21
Y4	7	8	8	6	8	7
Outages of Entire Sub Y	0	0	3	0	4	1

18% OF ALL OUTAGES WERE ON V7

TOTAL NUMBER OF CONSUMER OUTAGE HOURS 1992 - 1996

SUBSTATION	1992	1993	1994	1995	1996	AVERAGE
SYSTEM TOTAL	32,497	34,594	49,726	38,969	56,011	42,359
SAN SIMON TOTALS	835	641	437	217	494	525
A1	0	0	14	0	0	3
A3	156	309	98	139	277	196
A5	680	45	325	78	218	269
Outages of Entire Sub A	0	288	0	0	0	58
BOWIE TOTALS	274	280	154	162	56	185
B3	237	188	50	56	27	111
B5	0	15	16	67	6	21
B7	37	77	88	39	23	53
Outages of Entire Sub B	0	0	0	0	0	0
MORTENSON TOTALS	345	46	446	72	593	300
D1	3	31	144	1	3	36
D5	279	10	4	70	44	81
D7	63	5	9	1	4	16
Outages of Entire Sub D	0	0	290	0	542	166
STEWART TOTALS	37	1209	138	212	854	490
E1	13	33	2	4	5	11
E2	6	221	6	171	85	98
E3	19	955	130	38	23	233
Outages of Entire Sub E	0	0	0	0	741	148
WILLCOX TOTALS	1798	2261	1730	369	1296	1491
F3	1264	504	826	36	23	531
F4	181	635	142	74	0	206
F7	346	1119	733	26	80	462
F8	8	3	28	233	3	55
Outages of Entire Sub F	0	0	0	0	1183	237
COCHISE TOTALS	607	76	223	582	703	438
H3	113	47	22	42	19	48
H4	495	29	201	541	685	390
Outages of Entire Sub H	0	0	0	0	0	0
KANSAS TOTALS	1998	855	5287	830	3833	2560
J3	137	146	759	372	682	419
J5	32	112	14	160	16	67
J7	1829	597	1978	297	1208	1182
Outages of Entire Sub J	0	0	2537	0	1929	893
WEBB TOTALS	585	913	3006	388	663	1311
M1	159	117	132	122	21	110
M3	42	94	4	50	37	45
M4	364	120	2761	69	260	715
M5	20	3	110	148	24	61
Outages of Entire Sub M	0	579	0	0	322	180
MCNEAL TOTALS	1169	338	2880	710	2811	1581
N1	1153	40	201	396	161	390
N2	16	298	982	314	1384	598
Outages of Entire Sub N	0	0	1698	0	1266	593
MESCAL TOTALS	963	4588	3380	5156	11692	5036
O1	177	2341	3034	1942	6620	2622
O2	304	2101	239	2111	2155	1352
O3	0	4	0	0	6	2
O4	482	144	108	1103	1636	694
Outages of Entire Sub O	0	0	0	0	676	135

SUBSTATION	1992	1993	1994	1995	1996	AVERAGE
SYSTEM TOTAL	32,497	34,594	49,726	38,969	56,011	42,359
BENSON TOTALS	2233	1646	993	2115	2251	1848
P5	1867	1318	116	2025	386	1142
P7	333	24	177	70	34	127
P8	34	304	700	21	999	411
Outages of Entire Sub P	0	0	0	0	833	167
ST DAVID TOTALS	14	195	53	581	334	235
Q3	0	4	4	34	59	20
Q5	14	8	49	1	4	15
Q7	0	0	0	0	0	0
Outages of Entire Sub Q	0	183	0	547	271	200
RAMSEY TOTALS	4366	5145	2775	886	1516	2937
R1	430	833	1348	288	381	656
R2	3730	2424	521	342	133	1430
R3	205	1888	906	256	1001	851
Outages of Entire Sub R	0	0	0	0	0	0
TOMBSTONE TOTALS	30	15	646	419	944	411
S3	27	15	646	16	942	329
S7	3	0	0	1	2	1
Outages of Entire Sub S	0	0	0	402	0	80
KEATING TOTALS	2935	2981	4565	7872	1920	4054
T1	2519	336	536	1772	178	1068
T2	77	1495	1274	553	423	764
T3	60	697	218	219	438	330
T4	260	453	2539	480	882	923
Outages of Entire Sub T	0	0	0	4848	0	970
SIERRA VISTA TOTALS	2504	1045	2154	591	1120	1483
U3	11	10	300	62	7	78
U5	80	2	318	305	643	269
U6	1763	1026	1186	119	329	884
U7	651	8	351	107	141	251
Outages of Entire Sub U	0	0	0	0	0	0
HUACHUCA WEST TOTALS	5392	5841	4563	8904	8166	6553
V7	5392	5841	2313	2804	2214	3713
Outages of Entire Sub V	0	0	2250	6000	5952	2840
HUACHUCA EAST TOTALS	594	1017	282	4519	4230	2128
W3	138	522	160	185	2508	702
W5	457	495	122	855	264	438
Outages of Entire Sub W	0	0	0	3480	1458	988
HAWES TOTALS	3494	2907	7632	2543	3443	4004
X1	74	6	8	109	3	28
X5	1800	377	2669	827	1237	1382
X7	0	2277	2048	430	766	1104
X8	1680	247	728	1178	1430	1054
Outages of Entire Sub X	0	0	2179	0	0	436
BELLA VISTA TOTALS	2328	2601	8382	1944	9696	4990
Y1	1316	521	0	21	8	373
Y2	540	1005	104	198	1	370
Y3	207	252	1518	1575	3256	1362
Y4	266	824	505	151	704	490
Outages of Entire Sub Y	0	0	6255	0	5727	2396

15% OF CUST. OUTA HAS OCCURED BY V7

TOTAL NUMBER OF CONSUMER OUTAGE HOURS PER CONSUMER 1992 - 1996

SUBSTATION	1992	1993	1994	1995	1996	Sub/Fdr Average	Comparison to System
SYSTEM TOTAL	1.083	1.119	1.540	1.145	1.549	1.287	1.287
SAN SIMON TOTALS	2.738	2.029	1.349	0.644	1.261	1.604	0.016
A1	0.000	0.000	1.077	0.000	0.000	0.215	
A3	1.767	3.282	1.077	1.350	2.212	1.937	
A5	3.348	0.213	1.484	0.351	0.868	1.253	
Outages of Entire Sub A	0.000	0.911	0.000	0.000	0.000	0.182	
BOWIE TOTALS	0.769	0.787	0.434	0.437	0.134	0.512	0.006
B3	4.472	3.414	0.900	0.862	0.355	2.000	
B5	0.000	0.556	0.580	2.481	0.167	0.757	
B7	0.135	0.281	0.325	0.140	0.075	0.191	
Outages of Entire Sub B	0.000	0.000	0.000	0.000	0.000	0.000	
MORIENSON TOTALS	1.611	0.232	2.166	0.325	2.219	1.311	0.009
D1	0.056	0.803	3.892	0.034	0.103	0.978	
D5	2.098	0.083	0.029	0.486	0.249	0.589	
D7	2.324	0.132	0.201	0.020	0.065	0.548	
Outages of Entire Sub D	0.000	0.000	1.405	0.000	2.030	0.687	
STEWART TOTALS	0.070	2.210	0.236	0.330	1.171	0.806	0.015
E1	0.781	1.711	0.091	0.190	0.185	0.592	
E2	0.073	2.030	0.047	1.184	0.496	0.766	
E3	0.045	2.290	0.299	0.079	0.042	0.551	
Outages of Entire Sub E	0.000	0.000	0.000	0.000	1.016	0.203	
WILLCOX TOTALS	0.829	1.016	0.786	0.165	0.551	0.669	0.047
F3	1.962	0.773	1.341	0.072	0.030	0.836	
F4	0.997	3.432	1.329	0.892	0.000	1.330	
F7	0.654	2.046	1.331	0.045	0.145	0.844	
F9	0.010	0.003	0.030	0.214	0.003	0.052	
Outages of Entire Sub F	0.000	0.000	0.000	0.000	0.503	0.101	
COCHISE TOTALS	0.541	0.066	0.188	0.463	0.515	0.355	0.013
H3	0.504	0.208	0.094	0.167	0.067	0.208	
H4	0.550	0.031	0.211	0.536	0.630	0.392	
Outages of Entire Sub H	0.000	0.000	0.000	0.000	0.000	0.000	
KANSAS TOTALS	2.509	1.030	5.571	0.809	3.262	2.634	0.078
J3	0.636	0.680	2.455	1.964	1.685	1.304	
J5	0.435	1.433	0.176	1.905	0.165	0.823	
J7	2.592	1.313	3.538	0.502	1.789	2.107	
Outages of Entire Sub J	0.000	0.000	2.673	0.000	1.640	0.863	
WEBB TOTALS	0.958	1.467	4.646	0.577	0.871	1.704	0.034
M1	1.336	1.026	1.069	0.984	0.133	0.910	
M3	0.553	1.154	0.040	0.589	0.394	0.547	
M4	0.985	0.317	7.025	0.162	0.556	1.809	
M5	0.426	0.063	2.330	3.524	0.522	1.273	
Outages of Entire Sub M	0.000	0.931	0.000	0.000	0.422	0.271	
MCNEAL TOTALS	1.948	0.547	4.479	1.033	3.655	2.332	0.048
N1	4.845	0.165	0.768	1.394	0.506	1.536	
N2	0.043	0.795	2.563	0.778	3.052	1.448	
Outages of Entire Sub N	0.000	0.000	2.640	0.000	1.646	0.857	
MESCAL TOTALS	0.457	2.104	1.475	2.073	4.113	2.045	0.149
O1	0.249	3.121	3.773	2.074	6.287	3.101	
O2	1.101	7.956	0.824	6.536	5.686	4.437	
O3	0.000	0.875	0.000	0.000	1.150	0.405	
O4	0.426	0.123	0.090	0.902	1.297	0.568	
Outages of Entire Sub O	0.000	0.000	0.000	0.000	0.251	0.050	

SUBSTATION	1992	1993	1994	1995	1996	Sub/Fdr Average	Comparison to System
SYSTEM TOTAL	1.083	1.119	1.540	1.145	1.549	1.287	1.287
BENSON TOTALS	1.395	1.010	0.593	1.186	1.176	1.072	0.057
P5	2.547	1.755	0.151	2.512	0.450	1.483	
P7	1.403	0.099	0.712	0.253	0.111	0.516	
P8	0.053	0.477	1.064	0.030	1.330	0.591	
Outages of Entire Sub P	0.000	0.000	0.000	0.000	0.435	0.087	
ST DAVID TOTALS	0.056	0.763	0.191	1.849	0.945	0.761	0.007
Q3	0.000	0.042	0.045	0.332	0.534	0.191	
Q5	0.084	0.047	0.261	0.002	0.015	0.002	
Q7	0.000	0.000	0.000	0.000	0.000	0.000	
Outages of Entire Sub Q	0.000	0.718	0.000	1.740	0.768	0.645	
RAMSEY TOTALS	1.414	1.701	0.988	0.259	0.400	0.952	0.093
R1	1.100	1.842	2.982	0.563	0.705	1.438	
R2	2.603	1.794	0.451	0.252	0.091	1.038	
R3	0.163	1.542	0.754	0.164	0.562	0.637	
Outages of Entire Sub R	0.000	0.000	0.000	0.000	0.000	0.000	
TOMBSTONE TOTALS	0.154	0.073	3.182	1.903	3.900	1.843	0.012
S3	0.151	0.080	3.455	0.079	4.383	1.629	
S7	0.188	0.000	0.000	0.050	0.056	0.059	
Outages of Entire Sub S	0.000	0.000	0.000	1.827	0.000	0.365	
KEATING TOTALS	0.070	0.036	1.177	2.063	0.495	1.088	0.124
T1	1.939	0.271	0.420	1.510	0.152	0.858	
T2	0.064	1.396	1.318	0.476	0.331	0.717	
T3	0.150	1.279	0.398	0.398	0.756	0.594	
T4	0.771	0.634	2.331	0.524	1.041	1.061	
Outages of Entire Sub T	0.000	0.000	0.000	1.270	0.000	0.254	
SIERRA VISTA TOTALS	0.749	0.310	0.613	0.163	0.299	0.427	0.046
U3	0.018	0.019	0.629	0.130	0.014	0.162	
U5	0.102	0.002	0.319	0.284	0.564	0.254	
U6	1.318	0.768	0.843	0.082	0.221	0.647	
U7	1.036	0.012	0.550	0.169	0.221	0.398	
Outages of Entire Sub U	0.000	0.000	0.000	0.000	0.000	0.000	
HUACHUCA WEST TOTALS	3.827	4.042	3.058	5.482	4.642	4.210	0.199
V7	3.827	4.042	1.550	1.746	1.259	2.485	
Outages of Entire Sub V	0.000	0.000	1.508	3.736	3.383	1.725	
HUACHUCA EAST TOTALS	0.364	0.602	0.162	2.445	2.153	1.145	0.062
W3	0.226	0.819	0.245	0.255	3.127	0.934	
W5	0.446	0.470	0.112	0.760	0.227	0.403	
Outages of Entire Sub W	0.000	0.000	0.000	1.083	0.742	0.525	
HAWES TOTALS	0.991	0.740	1.600	0.510	0.675	0.903	0.123
X1	0.033	0.011	0.011	0.126	0.003	0.037	
X5	1.046	0.216	1.435	0.434	0.632	0.753	
X7	0.000	6.817	5.910	1.145	1.969	3.170	
X8	1.223	0.164	0.395	0.638	0.790	0.642	
Outages of Entire Sub X	0.000	0.000	0.457	0.000	0.000	0.000	
BELLA VISTA TOTALS	0.821	0.937	3.294	0.786	3.894	1.946	0.149
Y1	2.193	1.611	0.000	1.079	0.533	1.083	
Y2	0.609	1.128	0.115	0.220	0.001	0.414	
Y3	0.252	0.258	1.500	1.461	2.866	1.267	
Y4	0.501	1.406	0.849	0.315	1.554	0.925	
Outages of Entire Sub Y	0.000	0.000	2.458	0.000	2.300	0.952	

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OUTAGE REPORT

substation and feeder. This information is analyzed, and is then used to recommend further system and design standards and improvements.

Outages that result in service interruptions to more than 100 consumers, or more than 100 consumer hours are reported to SSVEC's Board of Directors and are included in the monthly board report. Additional outage information such as a year-to-date summary, and a historical interruption summary for that particular month are also included in the monthly board report. The end of the year board report contains outages that result in service interruptions to more than 1000 consumers, or more than 1000 consumer hours, interruption totals on a monthly basis for that year, and a historical annual interruption summary for the past 10 years. This information is presented so that management and the Board of Directors can track SSVEC's progress in reducing service interruptions, and their impacts on SSVEC's customers.

Outage Statistics and Analysis

The data collected in the field and processed by the Engineering Department has been tabulated, reviewed and analyzed through 1999.

Number of Interruptions

The following table labeled "Total Number of Interruptions 1995-1999" shows the total number of outages for the overall system, each substation, and each feeder for the last five years, as well as an average for the five year period which is represented by the associated chart labeled "Average of Total Interruptions per Substation". The highest number of interruptions by feeder occurred on the Huachuca West V-7.

TOTAL NUMBER OF INTERRUPTIONS 1995 -1999

SUBSTATION	1995	1996	1997	1998	1999	Average
SYSTEM TOTAL	1,023	1,024	917	845	835	929
SAN SIMON TOTALS	22	14	17	12	16	16
A1	0	0	1	1	1	1
A3	14	8	7	5	11	9
A5	8	4	9	4	3	4
Outages of Entire Sub A	0	0	0	0	1	0
BOWIE TOTALS	17	16	9	8	12	12
B3	6	7	5	2	3	5
B5	2	2	2	2	1	2
B7	9	7	2	4	7	4
Outages of Entire Sub B	0	0	0	0	1	0
MORTENSON TOTALS	15	21	18	14	20	18
D1	1	3	2	4	1	2
D5	13	12	10	7	12	11
D7	1	3	3	3	6	3
Outages of Entire Sub D	0	3	3	0	1	1
STEWART TOTALS	24	34	32	12	20	24
E1	2	2	1	2	0	1
E2	11	14	9	1	4	8
E3	11	17	22	9	15	15
Outages of Entire Sub E	0	1	0	0	1	0
WILCOX TOTALS	21	25	24	35	34	28
F3	7	11	3	11	8	8
F4	2	0	2	4	1	2
F7	8	12	15	15	12	12
F8	4	1	4	5	12	5
Outages of Entire Sub F	0	1	0	0	1	0
COCHISE TOTALS	41	40	46	43	24	39
H3	9	9	18	15	8	12
H4	32	31	28	28	15	27
Outages of Entire Sub H	0	0	0	0	1	0
KANSAS TOTALS	149	127	154	126	108	133
J3	63	57	42	45	32	56
J5	11	11	17	7	11	11
J7	75	57	75	54	64	45
Outages of Entire Sub J	0	2	0	0	1	1
WEBB TOTALS	34	29	19	30	25	27
M1	14	11	3	16	8	10
M3	5	4	3	1	4	4
M4	12	11	10	12	8	11
M5	3	2	3	1	2	2
Outages of Entire Sub M	0	1	0	0	1	0
MCNEAL TOTALS	35	59	29	34	29	37
N1	18	24	20	14	12	18
N2	17	34	9	18	16	19
Outages of Entire Sub N	0	1	0	0	1	0
MESCAL TOTALS	109	110	91	96	122	106
O1	40	57	55	50	78	56
O2	54	46	27	33	37	39
O3	0	2	0	0	0	0
O4	15	4	9	13	6	9
Outages of Entire Sub O	0	1	0	0	1	0
ex. Transmission outage	0	3	8	2	1	3

SUBSTATION	1995	1996	1997	1998	1999	Average
SYSTEM TOTAL	1,023	1,024	917	845	835	929
BENSON TOTALS	34	30	24	31	28	27
P5	16	11	14	18	12	14
P7	8	4	2	3	6	5
P8	10	14	8	10	9	10
Outages of Entire Sub P	0	1	0	0	1	0
ST DAVID TOTALS	5	8	4	7	10	7
Q3	2	5	3	2	4	4
Q5	1	2	1	4	1	2
Q7	0	0	0	1	1	0
Outages of Entire Sub Q	2	1	0	0	2	1
RAMSEY TOTALS	64	95	80	67	76	77
R1	8	15	19	13	7	12
R2	18	18	17	12	14	14
R3	40	62	44	40	54	48
Outages of Entire Sub R	0	0	0	2	1	1
TOMBSTONE TOTALS	9	13	14	7	11	11
S3	7	12	12	6	5	8
S7	1	1	2	1	5	2
Outages of Entire Sub S	1	0	0	0	1	0
KEARNY TOTALS	52	41	33	45	48	44
I1	14	6	9	4	4	7
I2	21	17	8	15	23	17
I3	6	7	7	6	9	7
I4	10	11	11	20	11	13
Outages of Entire Sub I	1	0	0	0	1	0
SIERRA VISTA TOTALS	34	31	19	30	14	26
U3	5	3	0	4	4	3
U5	7	10	4	6	4	7
U6	13	14	6	9	3	9
U7	11	4	7	6	4	6
Outages of Entire Sub U	0	0	0	3	1	1
HUACHUCA WEST TOTAL	184	160	157	150	130	156
V2	182	158	157	150	129	155
Outages of Entire Sub V	2	2	0	0	1	1
HUACHUCA EAST TOTALS	44	54	42	36	49	45
W3	20	29	24	22	20	23
W5	25	24	18	14	28	22
Outages of Entire Sub W	1	1	0	0	1	1
HAWES TOTALS	76	68	55	40	39	56
X1	5	1	2	1	3	2
X5	40	33	33	22	18	29
X7	7	20	8	11	9	11
X8	24	14	12	6	7	13
Outages of Entire Sub X	0	6	0	0	2	0
BELLA VISTA TOTALS	48	46	40	22	17	35
Y1	2	1	5	0	1	2
Y2	8	2	10	3	3	5
Y3	32	31	21	14	9	21
Y4	6	8	4	5	3	5
Outages of Entire Sub Y	0	4	0	0	1	1

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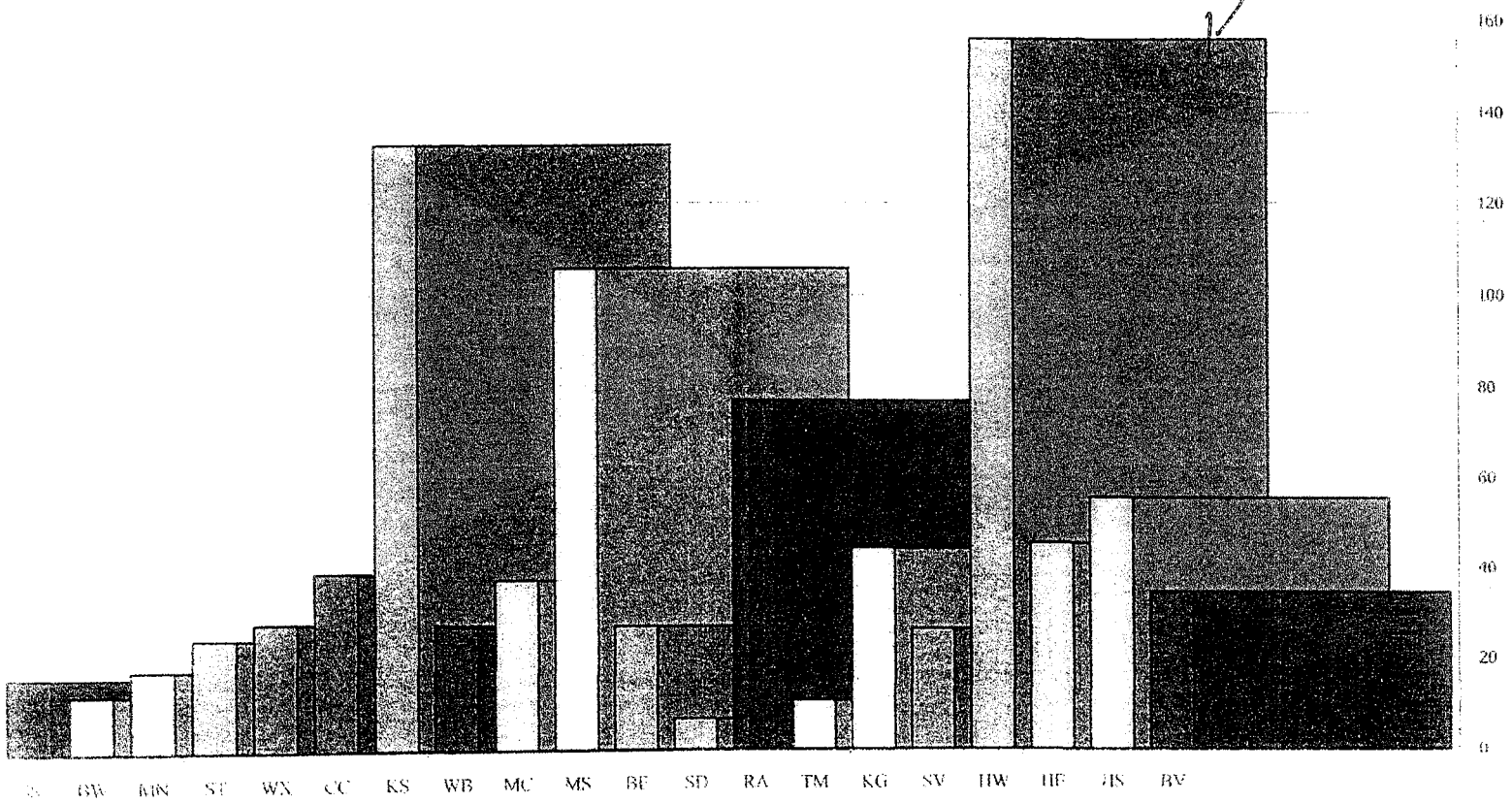
AVERAGE OF TOTAL INTERRUPTIONS PER SUBSTATION 1995 - 1999

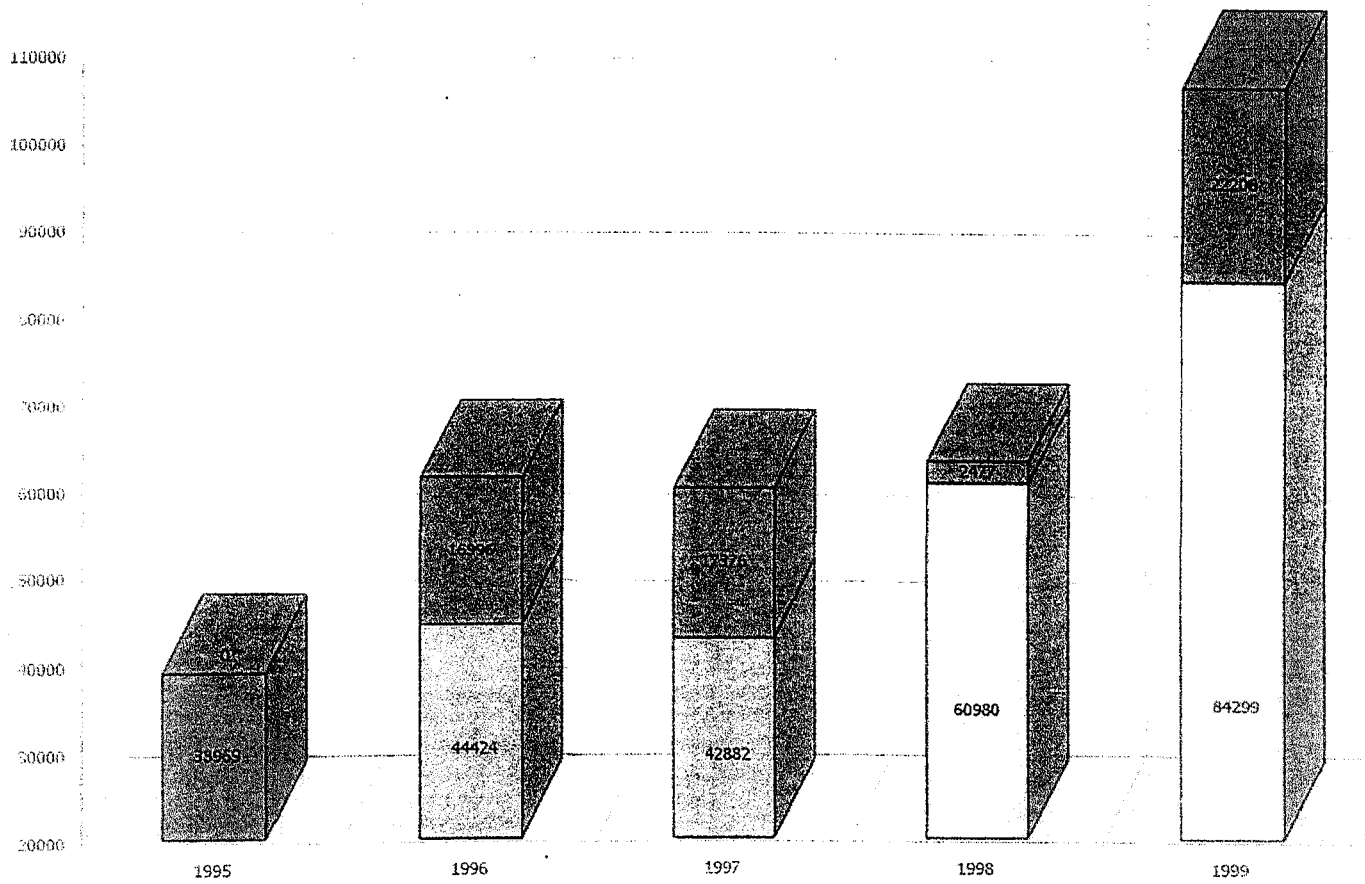


TOTAL NUMBER OF CONSUMER OUTAGE HOURS 1995 - 1999

SUBSTATION	1995	1996	1997	1998	1999	AVERAGE
SYSTEM TOTAL	38969	61,420	60,258	63,457	106,505	66,122
SAN SIMON TOTALS	217	494	417	31	380	308
A1	0	0	40	3	1	9
A3	139	277	297	10	23	149
A5	78	218	81	18	6	80
Outages of Entire Sub A	0	0	0	0	350	70
BOWIE TOTALS	162	137	111	158	779	269
B3	56	100	16	37	75	57
B5	67	6	14	65	2	31
B7	39	31	81	56	326	107
Outages of Entire Sub B	0	0	0	0	377	75
MORTENSON TOTALS	72	797	1561	197	1177	760
D1	1	3	18	170	2	39
D5	70	44	15	10	792	186
D7	1	5	8	17	143	16
Outages of Entire Sub D	0	745	1521	0	240	501
STEWART TOTALS	212	860	509	79	3587	1049
E1	4	5	1	3	0	3
E2	171	86	437	38	12	149
E3	38	28	71	38	2921	619
Outages of Entire Sub E	0	741	0	0	654	279
WILLCOX TOTALS	369	1298	110	338	2420	907
F3	36	25	41	26	40	28
F4	74	0	4	28	1	21
F7	26	88	56	242	100	102
F8	233	3	9	43	245	107
Outages of Entire Sub F	0	1183	0	0	2065	650
COCHISE TOTALS	582	703	658	913	877	747
H3	42	19	91	656	421	246
H4	541	685	567	257	79	426
Outages of Entire Sub H	0	0	0	0	377	75
KANSAS TOTALS	830	3850	5995	1240	6037	3590
J3	372	687	230	1035	340	533
J5	160	18	26	8	287	100
J7	297	1218	5740	196	4213	2333
Outages of Entire Sub J	0	1928	0	0	1197	625
WEBB TOTALS	388	1037	130	1832	921	862
M1	122	21	6	386	56	118
M3	50	37	13	1	28	26
M4	69	634	93	1425	41	452
M5	148	24	19	20	8	44
Outages of Entire Sub M	0	322	0	0	788	222
MCNEAL TOTALS	710	2867	1011	1069	2071	1545
N1	396	165	715	1023	1193	696
N2	314	1437	296	46	104	439
Outages of Entire Sub N	0	1266	0	0	774	408
MESCAL TOTALS	5156	11135	3819	2106	3707	5164
O1	1942	6646	2159	495	2086	2666
O2	2111	2172	569	1392	857	1420
O3	0	6	0	0	0	1
O4	1103	1636	1091	219	13	812
Outages of Entire Sub O	0	676	0	0	751	285
Misc. Transmission outage	0	2318	17545	3977	2400	5248

SUBSTATION	1995	1996	1997	1998	1999	TOTAL
SYSTEM TOTAL	38,969	61,420	60,258	63,457	106,505	330,609
BENSON TOTALS	2115	2259	1258	1146	3837	2123
P5	2025	386	1052	1050	1559	1214
P7	70	34	2	7	364	95
P8	21	1006	204	69	1365	541
Outages of Entire Sub P	0	833	0	0	529	272
ST DAVID TOTALS	581	334	54	440	729	427
Q3	34	59	4	423	64	117
Q5	1	4	50	12	9	15
Q7	0	0	0	5	4	2
Outages of Entire Sub Q	547	271	0	0	652	294
RAMSEY TOTALS	886	1527	2239	11773	16770	6639
R1	288	381	1757	720	1123	854
R2	342	137	204	5554	162	1280
R3	256	1008	278	5500	10781	3565
Outages of Entire Sub R	0	0	0	0	4704	941
TOMBSTONE TOTALS	419	946	357	137	472	466
S3	16	944	229	136	221	309
S7	1	2	128	1	147	56
Outages of Entire Sub S	402	0	0	0	104	101
KEATING TOTALS	7672	2064	4461	3891	12032	6064
T1	1772	181	1381	2210	298	1168
T2	553	426	417	860	1708	793
T3	219	464	950	133	511	455
T4	480	994	1713	690	562	888
Outages of Entire Sub T	4848	0	0	0	8953	2760
SIERRA VISTA TOTALS	591	1157	766	5137	3201	2170
U3	62	39	0	60	118	55
U5	305	643	443	914	166	498
U6	119	329	75	99	18	128
U7	107	146	248	115	104	144
Outages of Entire Sub U	0	0	0	3950	2776	1346
HUACHUCA WEST TOTALS	8804	8257	4747	21265	17757	12166
V7	2804	2306	4747	21265	16929	9610
Outages of Entire Sub V	6000	5952	0	0	828	2556
HUACHUCA EAST TOTALS	4519	5978	6834	697	1003	3806
W3	185	4250	6051	83	144	2143
W5	856	270	782	615	116	528
Outages of Entire Sub W	3480	1458	0	0	741	1136
HAWES TOTALS	2543	3494	6436	3893	25027	8278
X1	109	3	4	6	3276	680
X5	827	1238	4718	2582	5157	2904
X7	430	816	282	605	622	551
X8	1178	1438	1433	700	8232	2596
Outages of Entire Sub X	0	0	0	0	7739	1548
BELLA VISTA TOTALS	1944	9912	1245	3140	1323	3512
Y1	21	8	83	0	30	28
Y2	198	191	209	152	11	152
Y3	1575	3282	551	2835	173	1683
Y4	151	704	402	153	83	298
Outages of Entire Sub Y	0	5727	0	0	1026	1351

SSVEC System Consumer Outage Hours 1995 - 1999



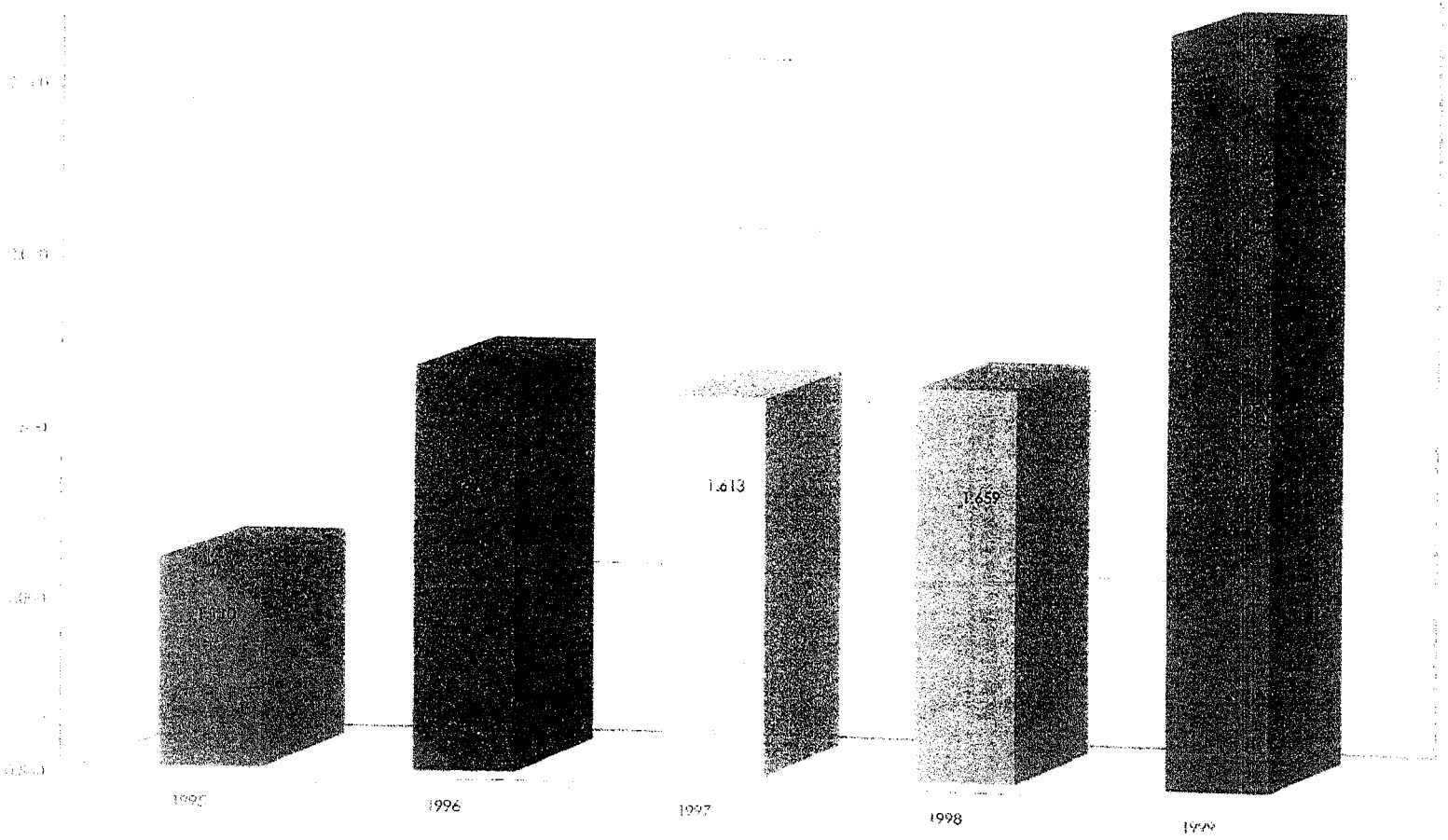
Note: Area in Green Indicates AEPCO Portion of Outages
Other Colors Indicate SSVEC Portion

TOTAL NUMBER OF CONSUMER OUTAGE HOURS PER CONSUMER 1995 - 1999

SUBSTATION	1995	1996	1997	1998	1999	Sub/Fdr Average	% Comparison to System
SYSTEM TOTAL	1.110	1.690	1.613	1.659	2.706	1.756	
SAN SIMON TOTALS	0.642	1.559	1.291	0.090	0.969	0.910	52%
A1	0.000	0.000	2.353	0.143	0.057	0.511	
A3	1.350	2.212	1.901	0.049	0.162	1.139	
A5	0.351	0.868	0.247	0.068	0.022	0.311	
Outages of Entire Sub A	0.000	0.000	0.000	0.000	0.810	0.162	
BOWIE TOTALS	0.438	0.327	0.215	0.344	1.708	0.607	35%
B3	0.862	1.316	0.174	0.440	0.887	0.736	
B5	2.481	0.167	0.264	1.757	0.042	0.942	
B7	0.140	0.100	0.217	0.167	0.970	0.319	
Outages of Entire Sub B	0.000	0.000	0.000	0.000	0.827	0.165	
MORTENSON TOTALS	0.324	2.995	3.931	0.676	3.961	2.377	135%
D1	0.034	0.103	0.321	5.862	0.069	1.278	
D5	0.486	0.249	0.058	0.052	3.880	0.945	
D7	0.020	0.081	0.083	0.250	2.234	0.534	
Outages of Entire Sub D	0.000	2.802	3.830	0.000	0.808	1.488	
STEWART TOTALS	0.330	1.180	0.547	0.099	4.586	1.333	76%
E1	0.190	0.185	0.014	0.097	0.000	0.097	
E2	1.184	0.500	1.986	0.197	0.062	0.786	
E3	0.079	0.053	0.105	0.067	5.107	1.062	
Outages of Entire Sub E	0.000	1.016	0.000	0.000	0.822	0.368	
WILLCOX TOTALS	0.165	0.552	0.041	0.135	0.956	0.370	21%
F3	0.072	0.033	0.046	0.031	0.011	0.039	
F4	0.892	0.000	0.035	0.301	0.011	0.248	
F7	0.045	0.145	0.059	0.374	0.147	0.154	
F8	0.214	0.003	0.012	0.046	0.262	0.107	
Outages of Entire Sub F	0.000	0.503	0.000	0.000	0.816	0.244	
COCHISE TOTALS	0.469	0.516	0.413	0.625	0.595	0.522	30%
H3	0.167	0.067	0.273	2.186	1.403	0.819	
H4	0.536	0.630	0.450	0.221	0.067	0.381	
Outages of Entire Sub H	0.000	0.000	0.000	0.000	0.256	0.051	
KANSAS TOTALS	0.808	3.279	4.172	0.963	4.665	2.778	158%
J3	1.044	1.696	0.460	2.265	0.742	1.245	
J5	1.905	0.191	0.201	0.090	2.786	1.035	
J7	0.502	1.804	7.095	0.268	5.748	3.003	
Outages of Entire Sub J	0.000	1.642	0.000	0.000	0.925	0.513	
WEED TOTALS	0.577	1.363	0.143	2.165	1.061	1.066	61%
M1	0.984	0.133	0.029	2.195	0.318	0.732	
M3	0.589	0.394	0.112	0.007	0.259	0.272	
M4	0.142	1.358	0.167	2.777	0.079	0.909	
M5	3.524	0.522	0.365	0.408	0.163	0.996	
Outages of Entire Sub M	0.000	0.422	0.000	0.000	0.925	0.269	
MCNEAL TOTALS	1.033	3.728	1.094	1.284	2.480	1.924	110%
N1	1.394	0.519	1.815	2.921	3.399	2.010	
N2	0.778	3.178	0.558	0.095	0.215	0.965	
Outages of Entire Sub N	0.000	1.646	0.000	0.000	0.927	0.515	
MESCAL TOTALS	2.073	4.127	1.240	0.724	1.268	1.886	107%
O1	2.074	6.311	1.723	0.433	1.803	2.469	
O2	6.536	5.730	1.253	3.291	2.021	3.746	
O3	0.000	1.150	0.000	0.000	0.000	0.230	
O4	0.902	1.297	0.799	0.164	0.010	0.634	
Outages of Entire Sub O	0.000	0.251	0.000	0.000	0.257	0.101	

SUBSTATION	1995	1996	1997	1998	1999	Sub/Fdr Average	Comparison to System
SYSTEM TOTAL	1.145	1.699	1.509	1.675	2.735	1.753	129%
BENSON TOTALS	1.186	1.180	0.582	0.560	1.863	1.074	61%
P5	2.512	0.450	1.091	1.154	1.709	1.383	
P7	0.253	0.111	0.005	0.022	1.064	0.291	
P8	0.030	1.340	0.240	0.111	1.718	0.688	
Outages of Entire Sub P	0.000	0.435	0.000	0.000	0.257	0.138	
ST DAVID TOTALS	1.849	0.945	0.130	1.142	1.889	1.191	68%
Q3	0.332	0.534	0.024	3.467	0.523	0.976	
Q5	0.002	0.015	0.187	0.046	0.035	0.057	
Q7	0.000	0.000	0.000	4.500	4.000	1.700	
Outages of Entire Sub Q	1.740	0.768	0.000	0.000	1.689	0.839	
RAMSEY TOTALS	0.259	0.403	0.542	3.667	4.141	1.802	103%
R1	0.563	0.705	3.105	1.251	1.949	1.514	
R2	0.252	0.094	0.132	3.592	0.104	0.835	
R3	0.144	0.566	0.138	5.046	5.633	2.309	
Outages of Entire Sub R	0.000	0.000	0.000	0.000	1.161	0.232	
TOMBSTONE TOTALS	1.903	3.908	1.584	0.519	1.781	1.939	111%
S3	0.079	4.392	1.205	0.586	0.948	1.442	
S7	0.050	0.056	3.643	0.031	4.594	1.675	
Outages of Entire Sub S	1.827	0.000	0.000	0.000	0.392	0.444	
KEATING TOTALS	2.063	0.533	1.056	0.931	2.865	1.489	85%
T1	1.510	0.154	0.944	1.663	0.222	0.899	
T2	0.476	0.333	0.436	0.875	1.734	0.771	
T3	0.388	0.801	1.550	0.212	0.814	0.753	
T4	0.524	1.174	1.437	0.555	0.451	0.828	
Outages of Entire Sub T	1.270	0.000	0.000	0.000	2.132	0.680	
SIERRA VISTA TOTALS	0.163	0.309	0.210	1.299	0.804	0.557	32%
U3	0.130	0.081	0.000	0.118	0.224	0.111	
U5	0.284	0.544	0.386	0.763	0.153	0.430	
U6	0.082	0.221	0.055	0.063	0.011	0.086	
U7	0.169	0.229	0.384	0.171	0.154	0.221	
Outages of Entire Sub U	0.000	0.000	0.000	0.999	0.697	0.339	
HUACHUCA WEST TOTALS	5.482	4.694	2.406	11.263	9.380	6.645	379%
V7	1.746	1.311	2.406	11.263	8.943	5.134	
Outages of Entire Sub V	3.736	3.383	0.000	0.000	0.437	1.511	
HUACHUCA EAST TOTALS	2.445	3.042	3.204	0.330	0.472	1.899	108%
W3	0.255	5.300	6.739	0.097	0.168	2.512	
W5	0.768	0.232	0.633	0.489	0.093	0.442	
Outages of Entire Sub W	1.883	0.742	0.000	0.000	0.349	0.595	
HAWES TOTALS	0.510	0.685	1.177	0.717	4.583	1.534	88%
X1	0.126	0.003	0.003	0.006	3.223	0.672	
X5	0.404	0.633	2.295	1.243	2.464	1.414	
X7	1.145	2.097	0.713	1.483	1.490	1.386	
X8	0.638	0.790	0.738	0.363	4.256	1.357	
Outages of Entire Sub X	0.000	0.000	0.000	0.000	1.417	0.283	
BELLA VISTA TOTALS	0.786	3.981	0.480	1.201	0.503	1.390	79%
Y1	1.079	0.533	5.533	0.000	1.765	1.782	
Y2	0.220	0.215	0.229	0.164	0.011	0.168	
Y3	1.461	2.889	0.461	2.374	0.145	1.466	
Y4	0.315	1.554	0.855	0.320	0.173	0.643	
Outages of Entire Sub Y	0.000	2.300	0.000	0.000	0.390	0.538	

SSVEC Consumer Hours Per Consumer
1995 - 1999



Huachuca West

This substation has the highest outage rate when measured in consumer hours per consumer, number of outages, or customer hours interrupted. The distribution of outage causes is shown in the previous mentioned chart labeled "Huachuca West Substation Outages by Reason".

Huachuca West is a single feeder substation. The feeder has more than 1800 customers, 247+ connected miles, and traverses remote areas. Outages are long because of the time required to access and patrol this line. Outages tend to affect large numbers of customers because of the large line lengths that can be affected by any one outage. Voltage is also challenging to maintain on this line.

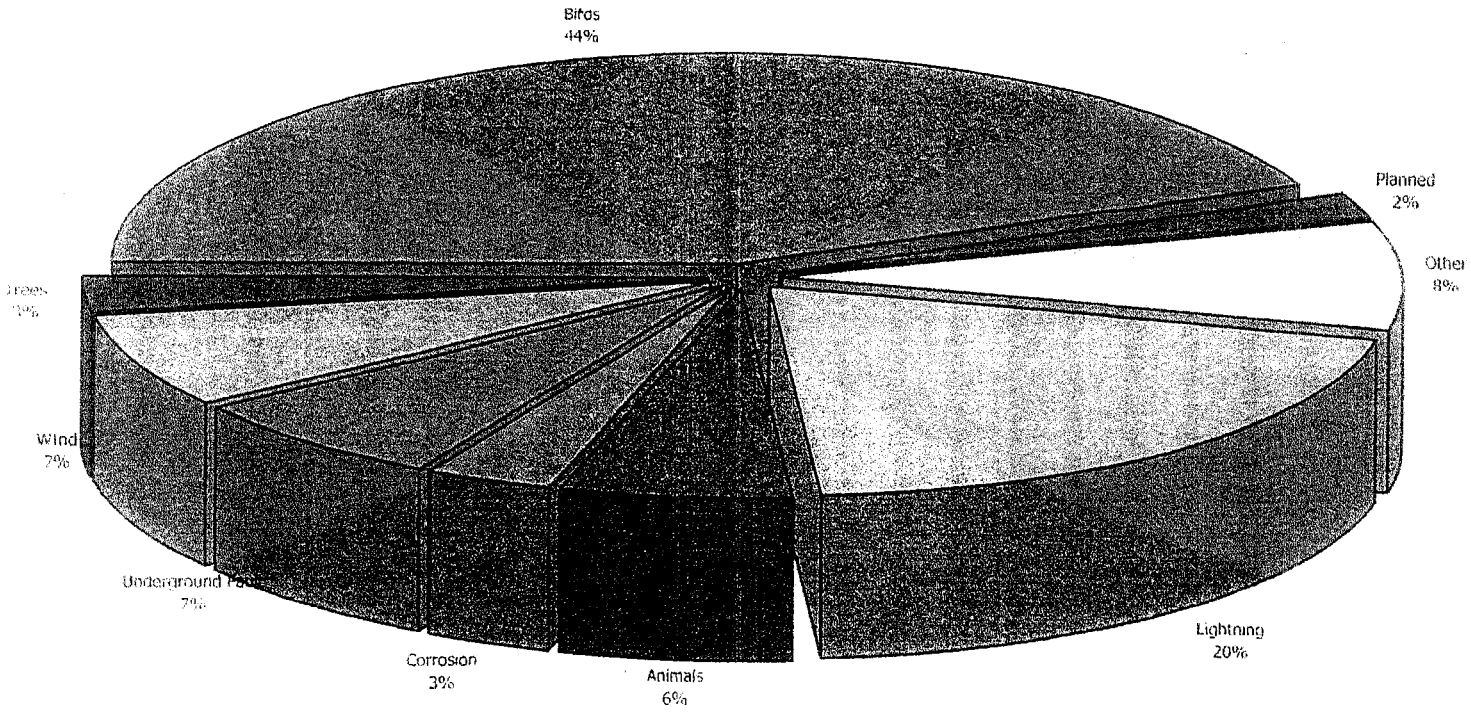
In accordance with the Long-Range Plan a new substation is planned for this area after the year 2000. The new substation will dramatically improve reliability, by splitting the existing V-7 feeder into three feeders which will improve sectionalizing. Until the new substation is justified and developed, the best opportunity for improving the reliability of this feeder is to reduce the number of bird outages, reduce lightning outages, and try to develop more information about the large number of "Unknown" causes at this location. Reclosers at the substation and on line downstream have data recorders that can be used to record fault currents, which may be useful in estimating the location of problems. In summary, the following is proposed for improvement prior to the new substation;

- Use data recorders on substation and line reclosers to identify problem areas
- Reduce bird outages with continued use of insulated bushing covers and raptor perches
- Review SSVEC standards for proper lightning protection installation.
- Investigate advancements in lightning protection technology and review for use on system in problem areas.
- Work with the Line Department to try and reduce the number of "Unknown" outage causes

Summary

The Cooperative has taken pride in the fact that our overall system outage rate is quite below the standards set by RUS, it reveals that our line maintenance schedules are satisfactory, our sectionalizing schemes are successful, and our constant commitment is to our customers.

Huachuca West Substation Outages by Reason 1995 - 1999



INTERRUPTION REPORT

Sulphur Springs Valley Electric Cooperative, Inc.

Date:	Reported By:		Hours off	# of Consumers	Consumer Hours
Time Off:	Time On:	Time Reported:			

Location of Area Affected - Name of Subdivision:

Pole No. SSVEC Location No:

Did Sectionalizing Work Property?
☐ Yes ☐ No (explain)

Corrective Action Taken

Secondary Voltage (if measured) Completed By:

☐ Secondary ☐ Primary ☐ Transmission

☐ Overhead ☐ Underground

Round Trip Mileage
(if consumer equip. or accident)

USE 24 HOUR TIME SYSTEM

☑ *Operating Component or Component Failure*	☑ *Reason*	☑ *Substation / Feeder*	
☐ *Normal Operation* ☐ *Component Failure*	☐ *Known Reason* ☐ *Probable Reason*		
☐ A - Line Open	☐ 1 - Planned	☐ SS - San Simon A	☐ FT - Fort Huachuca
☐ B - ACR/OCB Open	☐ 2 - Lightning	☐ BW - Bowie B	☐ TJ - Tombstone J
☐ C - Broken or Leaning Pole	☐ 3 - Wind	☐ MN - Mortenson D	☐ TL - San Rafeal
☐ D - Broken Cross Arm/Brace	☐ 4 - Loose Connections	☐ ST - Stewart E	☐ TK - Kartchner
☐ E - Broken/Burned Jumper	☐ 5 - Low Voltage	☐ WX - Willcox F	☐ TR - Redtail
☐ F - Insulator or Tie	☐ 6 - High Voltage	☐ CC - Cochise H	☐ TS - Stewart 69
☐ G - Burned Meter or Equipment	☐ 7 - Birds	☐ KS - Kansas J	☐ -
☐ H - Burned Transformer	☐ 8 - Animals	☐ CI - Chiricahua K	☐ TZ - System TTL
☐ I - Fuse Out Transformer	☐ 9 - Accidents	☐ WB - Webb M	☐ -
☐ J - Consumer Equipment	☐ 10 - Overload	☐ MC - McNeal N	☐ - Circuit as Labeled
☐ K - Guy/Anchor	☐ 11 - Vibration	☐ MS - Mescal O	☐ 1 -
☐ L - Elbow/Junction/Splice	☐ 12 - Tree	☐ BE - Benson P	☐ 2 -
☐ M - Jumper/Switch Opened	☐ 13 - Snow/Ice	☐ SD - St David Q	☐ 3 -
☐ N - Arrestor	☐ 14 - Vandalism	☐ RA - Ramsey R	☐ 4 -
☐ O - Cable Failure	☐ 15 - Corrosion	☐ TS - Tombstone S	☐ 5 -
☐ P - Riser/Terminator/Grip	☐ 16 - Dirt	☐ KG - Keating T	☐ 6 -
☐ Q - Pedestal	☐ 17 - Dirty Oil	☐ SV - Sierra Vista U	☐ 7 -
☐ R - Oil Sectionalizer	☐ 18 - Underground Fault	☐ HW - Huachuca V	☐ 8 -
☐ S - Regulator	☐ 19 - Neutral Problem	☐ HE - Huachuca W	☐ 9 - Sub High
☐ T - Other (explain)	☐ 20 - Joint Use	☐ HS - Hawes X	☐ - Fuse or Switcher
☐ U - Dry Sectionalizer Open	☐ 21 - AEPCO/Source	☐ BV - Bella Vista Y	☐
☐ V - Line/Riser Fuse	☐ 22 - Other (explain)	☐ PU - Pueblo Z	☐
☐ W - Hardware Broken or Loose	☐ 23 - Unknown	☐ TA - Apache	☐

Avian Protection Units	
Unit	*Quantity*
VP3-1	
VP3-2	
VP4-1	
VP5-1	
VP6-1	
VP6-2	
VP7-1	
VP7-2	
VP8-1	
☐ Single Phase	
☐ Three Phase	

Species	
Crow	
Raven	
Red Tail Hawk	
Dove	
Blackbird	
Woodpecker	
Vulture	
Other	

Comments/Explanation

ACC Notification - Mandatory for outages that exceed 100 consumers and 1 hour.

Date:	ACC Person Contacted:	ACC Notification Completed By:

DISCRIPTION OF UNITS
VP3-1 PERCH GUARD
VP3-2 BIRD DETERRENT
VP4-1 INSULATOR & LINE COVER
VP5-1 ARRESTER COVER
VP6-1 BUSHING COVERS (LARGE)
VP6-2 BUSHING COVERS (SMALL)
VP7-1 PROTECTIVE TUBING .464"X8'
VP7-2 PROTECTIVE TUBING 1.084"X8'
VP8-1 SQUIRREL GUARD

"If bird protection installed, complete blanket work order.

SSVEC

Growth Forecasts

WHAT IS THE V-7 GROWTH FORECASTS

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Patagonia CCD	**3,323**	**3,394**	**3,464**	**3,533**	**3,602**	**3,671**	**3,738**	**3,806**	**3,872**	**3,937**	**4,000**	**4,063**	**4,124**
Elgin CDP	441	458	475	492	509	525	542	558	574	590	605	621	636
Patagonia town	946	954	962	971	979	987	995	1,003	1,011	1,019	1,026	1,034	1,041
Sonoita CDP	1,084	1,117	1,151	1,184	1,217	1,249	1,281	1,314	1,345	1,376	1,406	1,436	1,465
Remainder of Patagonia CCD	853	864	876	887	898	909	920	931	942	952	963	973	983

Source: Arizona Department of Economic Security, Research Administration, Population Statistics Unit, 12/01/06.

Seago / DES Population Statistics approved June 6, 2007

Even without considering the present economic decline, the future growth is slow for the entire V-7 feeder area.

3SEG

When looking at the official Arizona population projections for each community in the V-7 feeder area, the existing 3325 total population last year is not expected to reach 4,000 persons until 2018. This is about 70-80 persons per year. These numbers include the "Remainder of the Patagonia CCD" which includes San Rafael Valley most of which is in the UNS Electric service area; thus these estimates are higher than the actual population.

Using the ratio used by SSVEC of 2.7 persons per household, then less than 30 homes per year are the anticipated growth for the whole area. No major industries now exist or plan to move into an area, that already has a serious shortage of water resources for its existing population.

Based on electric demand, installation of large numbers of single-home PV systems, larger 20-100 MW commercial PV systems, and two or three 1-3 MW renewable energy "plant" systems (with backup for sunless periods of time), there is NO URGENCY for the proposed 69 kV project. The numbers just are not there.

SSVEC Response

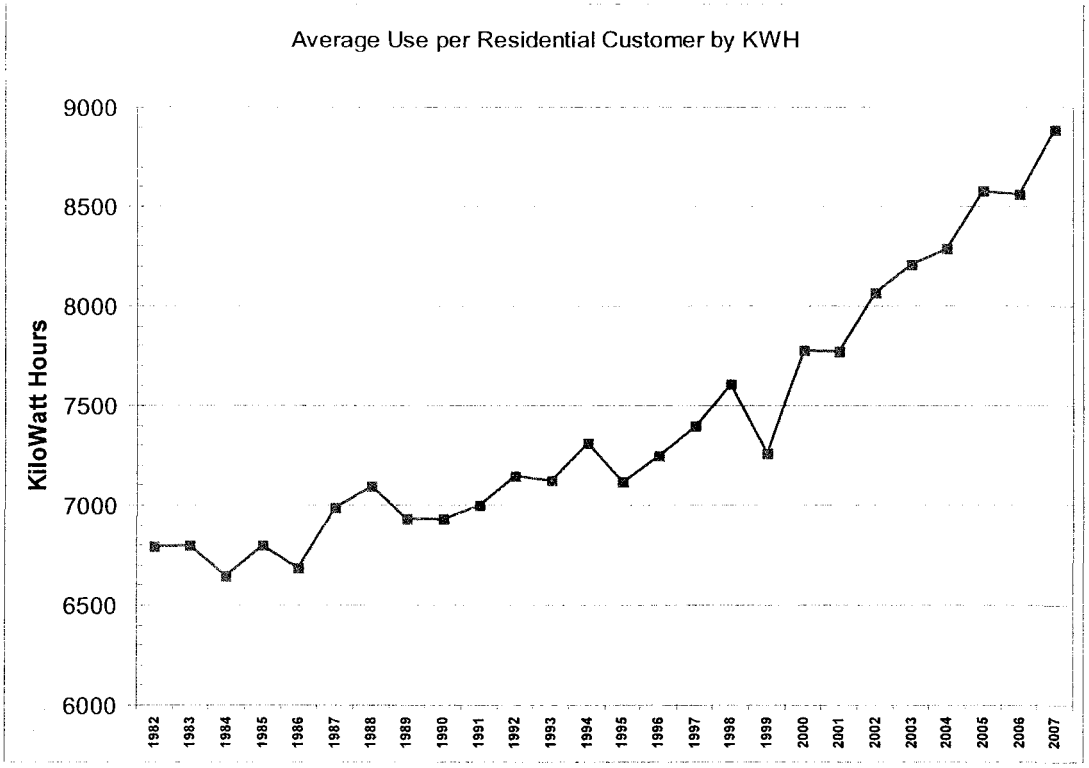
- **The growth forecast above shows an average annual percentage rate increase of approximately 1.82% for the entire Patagonia Census County Division, which does not seem significant; however this does equate to 801 people in the next twenty**

years. Using an average of 2.33 persons per household (City-Data) the following table indicates the number of homes the projected growth will likely incur:

TERM - YRS	PROJECTED POPULATION INCREASE	NUMBER OF HOMES
20	801	344
5	344	147
2	139	59

In SSVEC's analysis of the EXPRESS feeder option, the additional DEMAND LOAD upgrade would be 362kW, considering that each home uses 7KW per year, which will only allow for an additional 52 HOMES to be served. As the growth forecast above projects, this will be within the next TWO years!

Furthermore as the graph below indicates, the ACTUAL USE of electricity has also been on the rise. In 2007 the average USE per residential customer, considering a five-year period between 2003 and 2007, indicates an 8.26% increase, the same increase applied to the DEMAND LOAD would reduce the number of houses V7 is capable of serving to 47.



SSVEC

Visual Impact

VISUAL IMPACT

- ❑ Traffic Count
  - ADOT 2006-07 report shows

    6 times more vehicles will see the new distribution express feeder along Hwy 82 than will see the 69kV line along Hwy 83.

    SR 82 Mustang Heights Rd --> SR 90 3,000 cars per day
    SR 83 Vaughn Loop Rd --> S. Elgin Rd. 510 cars per day

- ❑ **pole color study done**

- ❑ **fewer poles with 69kV**
  (202 poles @65-75' vs. 382 poles @45-50')

- ❑ **remote siting**
  (4.4 mi. along paved road with 69kV vs. 23.3 mi. with V7 route)

Ron Orozco

From: Daniel Wilson
Sent: Wednesday, July 22, 2009 12:48 PM
To: Ron Orozco
Cc: Becky Witte
Subject: Traffic counts

Attachments: traffic counts.pdf

traffic counts.pdf
(112 KB)

Ron

Here is the latest counts published by ADOT. The information you are looking for i[illegible] the top of page 10. Brief summary below using 2007 AADT (Average Annual Daily Traff[illegible]

SR 82 Sonoita --> Mustang heights Road	2,200
SR 82 Mustang Heights Rd --> SR 90	3,000
SR 83 Vaughn Loop Rd --> S. Elgin Rd.	510
SR 83 S. Elgin Rd. --> Sonoita	1,400

I think it would be accurate to state that "the distribution route has a visual imp[illegible]on approximately twice the number of motorist as the proposed 69kV line"

Daniel

ATR = Automatic Traffic Recorder, BMP = Beginning Milepost, EMP = Ending Milepost, AADT = Average Annual Daily Traffic, POS_Dir = Positive Direction (North or East), NEG_Dir = Negative Direction (South or West), Last Year = Last year count was taken, S = Section reinstated, C = New Station, D = No longer part of State Hwy System, E = Closed for construction, N/A = Not available

See Data Dictionary on webpage for definitions of these factors.

Segment	ATR	Route	BMP	Place	EMP	Place	AADT	POS_Dir	NEG_Dir	Last Year	Factor	Factor	Factor
1241	NO	SR 82	5.69	South River Rd/Duquesne Rd.	12.15	Patagonia Lake Rd	2300	2300	N/A	N/A	2007	N/A	N/A	N/A
1242	NO	SR 82	12.15	Patagonia Lake Rd	19.47	3rd Ave	2300	2300	N/A	N/A	2007	11	55	11
1243	YES	SR 82	19.47	3rd Ave	32.36	SR 83 - Sonoita	2300	2300	1200	1200	2007	11	55	11
526	NO	SR 82	32.36	SR 83 - Sonoita	49.90	Mustang Heights Rd	2200	2200	1100	1100	2007	N/A	N/A	26
950	NO	SR 82	49.90	Mustang Heights Rd	51.60	SR 90	2800	3000	1500	1500	2007	N/A	N/A	26
527	NO	SR 82	51.60	SR 90	67.57	SR 80	930	860	460	430	2007	N/A	N/A	14
528	NO	SR 83	3.19	Parker Canyon Lake	20.20	Vaughn Loop Rd	90	100	N/A	N/A	2007	12	64	5
324	NO	SR 83	20.20	Vaughn Loop Rd	27.46	South Elgin Rd	530	510	N/A	N/A	2007	12	64	5
529	YES	SR 83	27.46	South Elgin Rd	31.63	SR 82 - Sonoita	1400	1400	700	700	2007	12	64	5
1244	NO	SR 83	31.63	SR 82	55.36	Sahuarita Rd	2100	2100	N/A	N/A	2007	12	64	5
1245	NO	SR 83	55.36	Sahuarita Rd	58.58	I-10 (Exit 281)	2000	3000	N/A	N/A	2007	12	64	5
930	NO	SR 84	155.16	I-8 (Exit 151)	160.87	SR 347 / Maricopa Rd	1300	1200	590	650	2007	N/A	N/A	15
531	NO	SR 84	160.87	SR 347 / Maricopa Rd	165.91	Stanfield Rd	3500	3500	N/A	N/A	2006	N/A	N/A	15
532	NO	SR 84	165.91	Stanfield Rd	175.94	Burris Rd - Casa Grande	4400	4300	N/A	N/A	2006	N/A	N/A	15
1246	NO	SR 84	175.94	Burris Rd - Casa Grande	176.95	Thornton Rd	9700	7600	3100	3100	2007	N/A	N/A	15
1247	NO	SR 84	176.95	Thornton Rd	177.96	SR 287 / SR 387	12200	10800	N/A	N/A	2007	N/A	N/A	15
540	NO	SR 84	195.36	SR 87 / County Control (MP 195.20)	196.06	I-10 (Exit 211)	2800	2800	N/A	N/A	2006	N/A	N/A	N/A
541	NO	SR 85 (1)	0.00	SB 8 (3) - Gila Bend	0.58	I-8 (Exit 116)	3100	2500	N/A	N/A	2007	14	69	9
542	NO	SR 85 (1)	0.58	I-8 (Exit 116)	3.17	Gila Bend Air Base Access Rd	2200	2300	N/A	N/A	2007	14	69	9
925	NO	SR 85 (1)	3.17	Gila Bend Air Base access Rd	38.11	Hayworth Rd	1900	1800	920	830	2007	14	69	9
1248	NO	SR 85 (1)	38.11	Hayworth Rd	40.59	Rasmussen Rd	6200	2600	N/A	N/A	2007	14	69	9
1249	NO	SR 85 (1)	40.59	Rasmussen Rd	42.30	La Mina Ave / Plaza St (SE)	5000	5500	3000	2500	2007	14	69	9
545	NO	SR 85 (1)	42.30	La Mina Ave / Plaza St (SE)	42.50	Ajo Well No. 1 Rd	2700	4700	2400	2300	2007	14	69	9
926	YES	SR 85 (1)	42.50	Ajo Well No. 1 Rd	53.06	SR 86 - Why	2600	2600	1300	1300	2007	14	69	9
546	NO	SR 85 (1)	53.06	SR 86 - Why	74.99	Puerto Blanco Dr / Organ Pipe Nat'l Monument	1500	1500	840	700	2007	N/A	N/A	11
927	NO	SR 85 (1)	74.99	Puerto Blanco Rd / Organ Pipe National Monument	80.69	International Border & POE - Lukeville	1500	1500	730	670	2007	N/A	N/A	11
1250	NO	SR 85 (2)	120.32	SB-8 (3) - Gila Bend	140.13	Landfill entrance Rd	11300	9700	5100	4500	2007	N/A	N/A	31
1251	NO	SR 85 (2)	140.13	Landfill entrance Rd	150.49	Buckeye Rd	10400	11600	5800	5700	2007	N/A	N/A	31
491	NO	SR 85 (2)	150.49	Buckeye Rd - Buckeye	154.48	I-10 (Exit 112)	16500	13000	N/A	N/A	2007	N/A	N/A	31
547	NO	SR 86	53.06	SR 85 - Why	92.31	BIA Rte 15 - Quijotoa	930	1000	N/A	N/A	2007	N/A	N/A	12
548	NO	SR 86	92.31	BIA Rte 15 - Quijotoa	114.06	Sells Rd South	2000	1800	930	920	2007	10	61	5
549	NO	SR 86	114.06	Sells Rd South	134.36	SR 386	2800	2700	N/A	N/A	2007	10	61	5
550	YES	SR 86	134.36	SR 386	150.43	SR 286 - Robles Jct	2900	2800	1400	1400	2007	10	61	5
931	NO	SR 86	150.43	SR 286 - Robles Junction	159.59	Valencia Rd	6300	8700	N/A	N/A	2007	N/A	N/A	10
933	NO	SR 86	159.59	Valencia Rd	163.41	San Joquin Rd	8400	7800	N/A	N/A	2007	N/A	N/A	10
551	NO	SR 86	163.41	San Joquin Rd	166.28	Kinney Rd	17700	17200	N/A	N/A	2007	N/A	N/A	10
552	NO	SR 86	166.28	Kinney Rd	169.06	La Cholla Blvd	33400	33300	16800	16500	2007	N/A	N/A	10
553	NO	SR 86	169.06	La Cholla Blvd	170.35	Mission Rd	30900	30900	16300	14600	2007	N/A	N/A	10
554	NO	SR 86	170.35	Mission Rd	171.41	I-19 (Exit 99)	39100	39200	18700	20500	2007	N/A	N/A	10
1252	NO	SR 87	115.77	SR 84 - Picacho	117.90	Battaglia Dr	2200	2900	N/A	N/A	2007	9	54	6
1253	NO	SR 87	117.90	Battaglia Dr	125.92	SR 287	3700	5000	N/A	N/A	2007	9	54	6
557	NO	SR 87	125.92	SR 287	131.50	Martin Rd - Coolidge	6300	7100	3600	3500	2007	9	54	6
558	NO	SR 87	131.50	Martin Rd - Coolidge	132.51	Coolidge Ave	12800	7900	N/A	N/A	2007	9	54	6
559	NO	SR 87	132.51	Coolidge Ave	133.05	Central Ave	15000	18000	N/A	N/A	2007	9	54	6
1254	NO	SR 87	133.05	Central Ave	133.76	Florence Ave / Vah Ki Inn Rd	16200	14400	7400	7000	2007	9	54	6
1255	NO	SR 87	133.76	Florence Ave / Vah Ki Inn Rd	134.75	SR 287	15000	15000	N/A	N/A	2006	9	54	6
1256	NO	SR 87	134.75	SR 287	136.62	Skousen Rd	9000	9000	N/A	N/A	2006	9	54	6
1257	YES	SR 87	136.62	Skousen Rd	141.48	SR 387	9200	7600	3900	3800	2007	9	54	6
935	NO	SR 87	141.48	SR 387	145.43	SR 187	5500	5400	2700	2600	2007	9	54	6
936	NO	SR 87	145.43	SR 187	151.29	Sacaton Rd / BIA Rte 7	4700	6700	3400	3300	2007	9	54	6
562	NO	SR 87	151.29	BIA Rte 7 / Sacaton Rd	159.70	SR 587	6600	7600	N/A	N/A	2007	9	54	6
1258	NO	SR 87	159.70	SR 587	160.67	Riggs Rd	12600	11000	5500	5500	2007	9	54	6
1259	NO	SR 87	160.67	Riggs Rd	161.68	Chandler Heights Rd	16000	16000	N/A	N/A	2005	15	66	10
1260	NO	SR 87	161.68	Chandler Heights Rd	162.69	Ocotillo Rd	28000	28000	N/A	N/A	2005	15	66	10
1261	NO	SR 87	170.20	Western Canal	171.72	Baseline Rd	46000	46000	N/A	N/A	2005	15	66	10
1262	NO	SR 87	176.74	McKellips Rd	177.04	SR 202	30000	30000	N/A	N/A	2005	15	66	10
1263	NO	SR 87	177.04	SR 202	177.79	McDowell Rd	25600	25400	12800	12600	2007	15	66	10
939	NO	SR 87	177.79	McDowell Rd	179.00	N. Center St.	16700	18300	8900	9500	2007	15	66	10
1629	NO	SR 87	179.00	N. Center St.	179.80	N. Mesa Drive	B	22900	N/A	N/A	N/A	15	66	10
1630	NO	SR 87	179.80	N. Mesa Drive	182.10	N. Gilbert Rd.	B	25100	N/A	N/A	N/A	15	66	10
575	NO	SR 87	182.10	N. Gilbert Rd.	188.83	Shea Blvd	27500	27400	N/A	N/A	2006	15	66	10
809	NO	SR 87	188.83	Shea Blvd	190.84	Fort McDowell Rd	18500	17300	8700	8600	2007	15	66	10
576	NO	SR 87	190.84	Fort McDowell Rd	199.14	Saguaro Lake Rd / Bush Hwy (USFS Rte 206)	7600	8200	4400	3800	2007	15	66	10
577	NO	SR 87	199.14	Saguaro Lake Rd / Bush Hwy (USFS Rte 206)	217.92	Sunflower Rd	9100	8500	4600	3900	2007	15	66	10
578	NO	SR 87	217.92	Sunflower Rd	235.69	SR 188	10700	8100	4400	3600	2007	15	66	10
580	NO	SR 87	235.69	SR 188	239.45	Gisela Rd	10600	8900	4500	4400	2007	15	66	10
579	YES	SR 87	239.45	Gisela Rd	250.97	Round Valley Rd	13100	13300	6600	6700	2007	15	66	10
580	NO	SR 87	250.97	Round Valley Rd	251.85	Main St - Payson	30700	15300	8100	7200	2007	15	66	10
581	NO	SR 87	251.85	Main St - Payson	252.58	SR 260	31300	26100	13000	13100	2007	15	66	10
582	NO	SR 87	252.58	SR 260	254.56	Houston Mesa Rd	28300	23000	11600	11400	2007	N/A	N/A	36

Sub transmission line design

X

- After the substation location has been identified,
- the next component to study is the sub-transmission line.
- Sub-transmission lines are a necessary part of SSVEC's INFRASTRUCTURE that enables us to provide electricity to homes and businesses - however

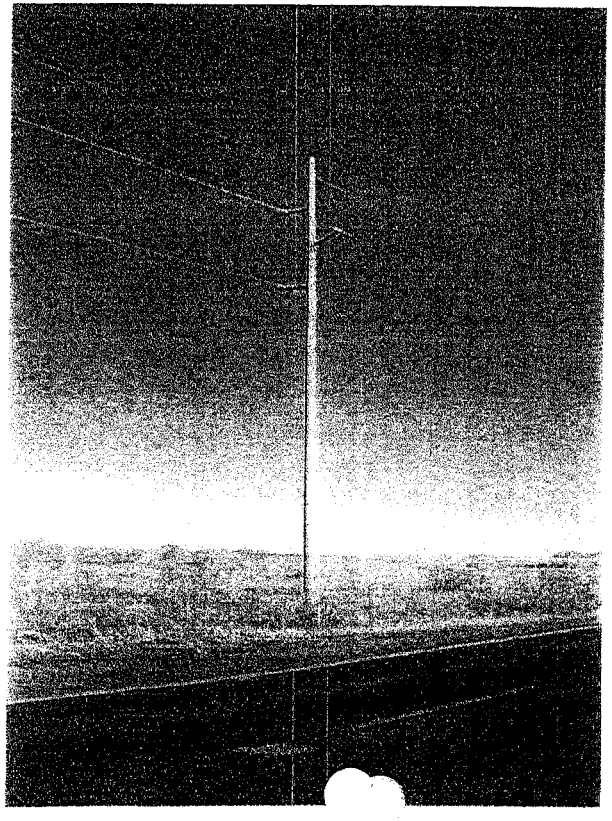
Visual Impact

Visual Impact of this Sub-Transmission line is of concern to the community –

SSVEC IS SENSITIVE TO THIS ISSUE WITH DESIGN PLANNING AND WILL USE COMPONENTS WITH IMPROVED AESTHETIC APPEARANCE.

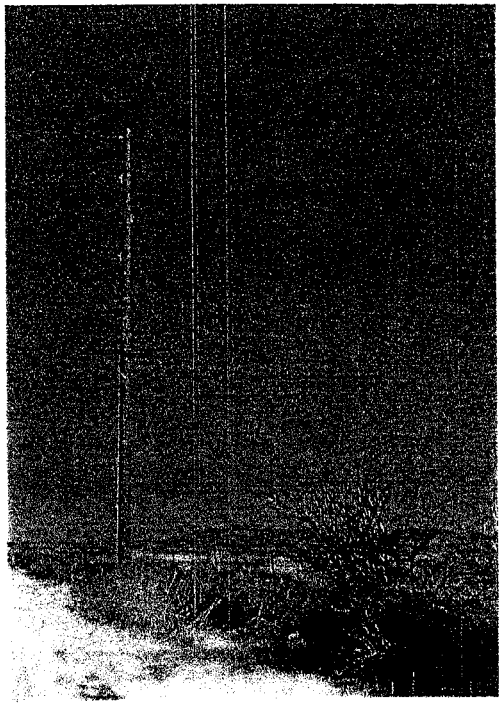
- The first question we hear: What is the pole going to LOOK LIKE?
- SSVEC will use a NARROW–PROFILE MONO-POLE design for the sub-transmission line.
- LATER on we will show you locations where this pole will be installed

Narrow – Profile Sub Transmission Pole



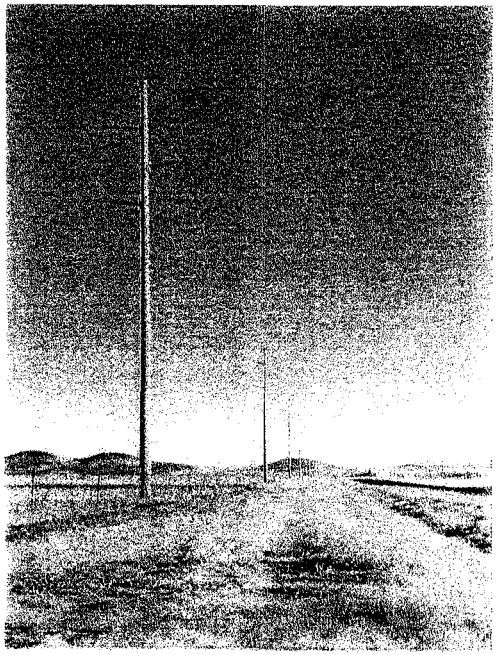
This pole will be used in areas where distribution service to HOMES/BUSINESSES is also necessary –HORIZONTAL ARM

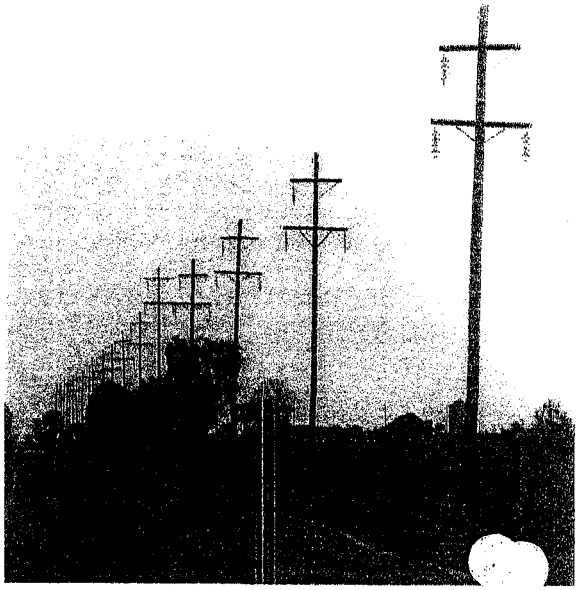
Narrow Profile Sub-Transmission Pole with High Flat Distribution Crossarm



Alternative Pole Materials

- Did you notice neither of those poles are WOOD?
- Material of the pole itself is also considered in design.
- New technology in material allows poles to be made out of CONCRETE, GALVANIZED STEEL, AND FIBERGLASS.
- Longer life spans than wood
- higher resistance to WARPING, BENDING and breakage which decreases impact along the right of way from maintenance traffic.
- Allow LONGER SPANS than wood "STRONGER"
- Environmentally 'GREENER
- Did you notice in the photos that the pole color is grey?
- SSVEC has experimented with pole color testing and found in the desert landscape of SOUTHEAST AZ that GREY poles provide MAXIMUM BLENDING into the background.

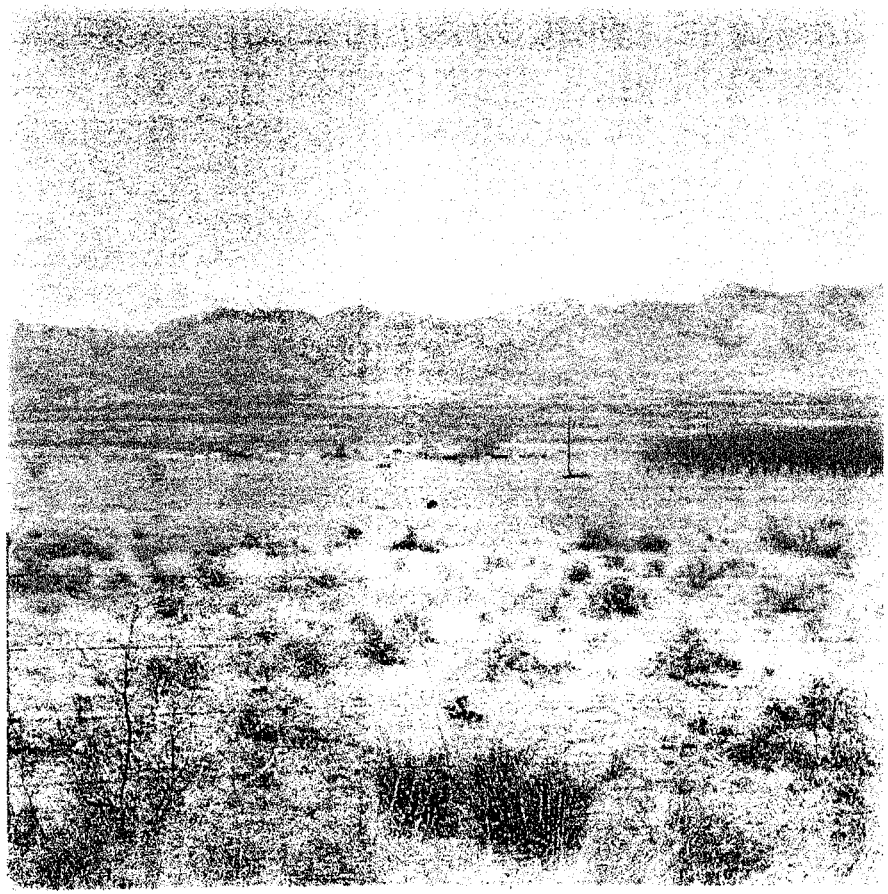




Pole Color Test: Tan vs. Gray

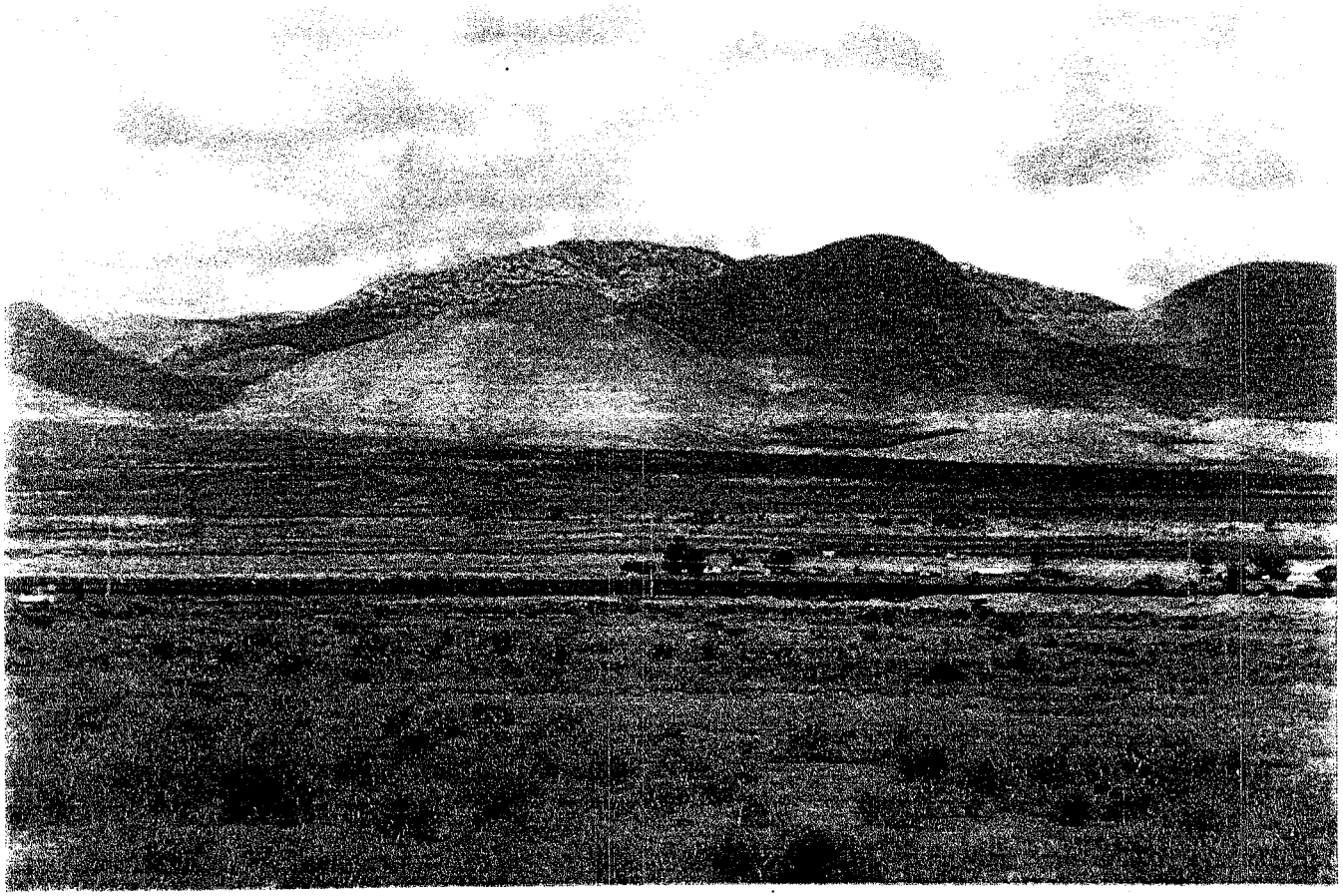
This photo shows a WOOD pole that is TAN in color, which is similar to our native grasses the largest percentage of the year, as you can see, it CONTRASTS very sharply against the background of the landscape. On EACH side of this pole are GREY sub-transmission poles with distribution under build (Camera is less than 1/2m from pole)

Pole Color Test: Rust vs. Gray



This photo shows a STEEL pole that is RUST in color – this is the standard metal used by utility companies. There is a GREY pole to the LEFT of this pole (Camera is 1 mile from POLES)

Grey Pole with Green Background



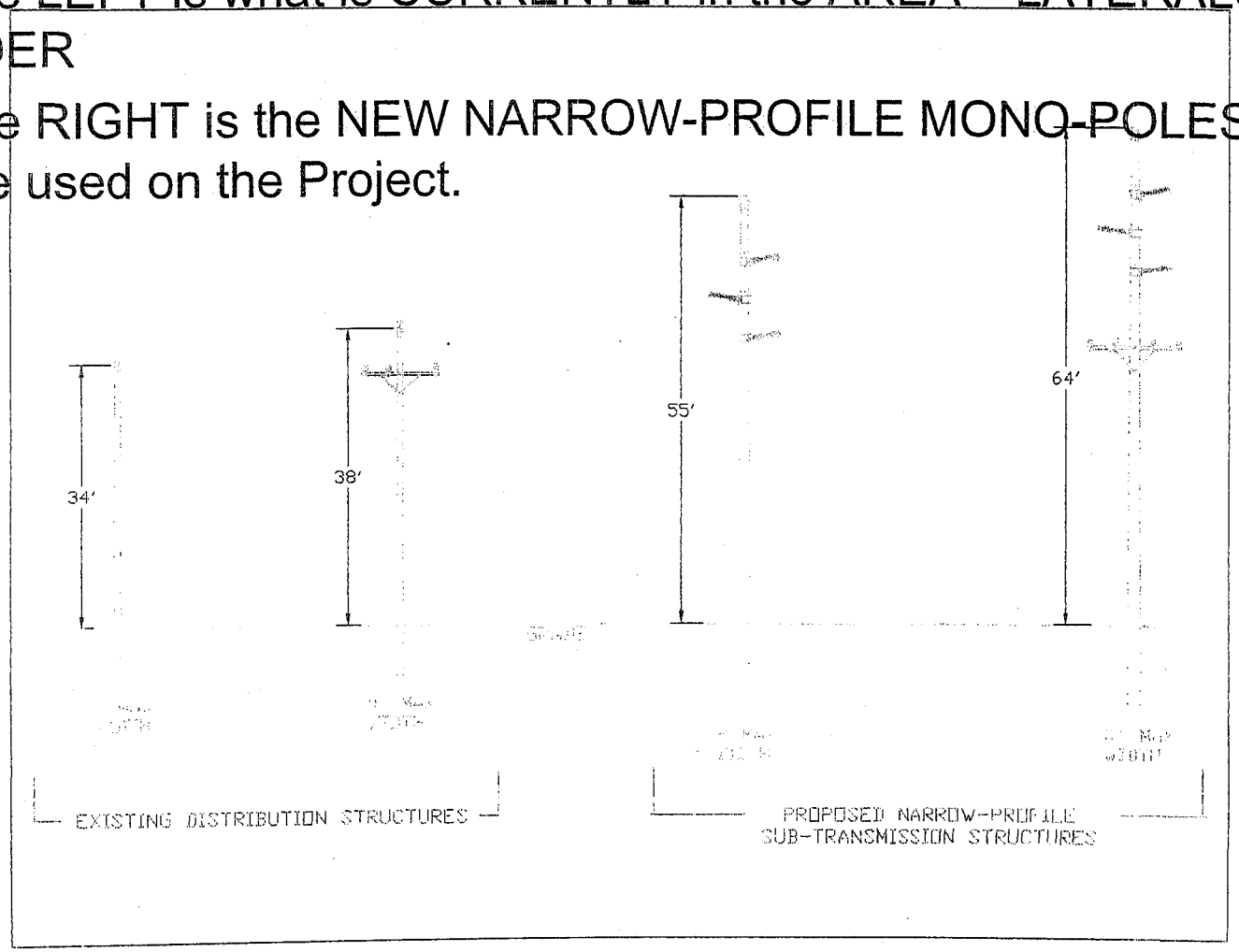
Finally, this PHOTO was taken last week in a "GREENER" setting than the test photos, this only shows the GREY POLES. Camera is 1 mile away with a ZOOM 2X the naked eye.

Pole Comparisons

Height of the pole is of great concern to the COMMUNITY, and the NARROW PROFILE design does require a slightly taller pole than other designs – although the visual impact is lower.

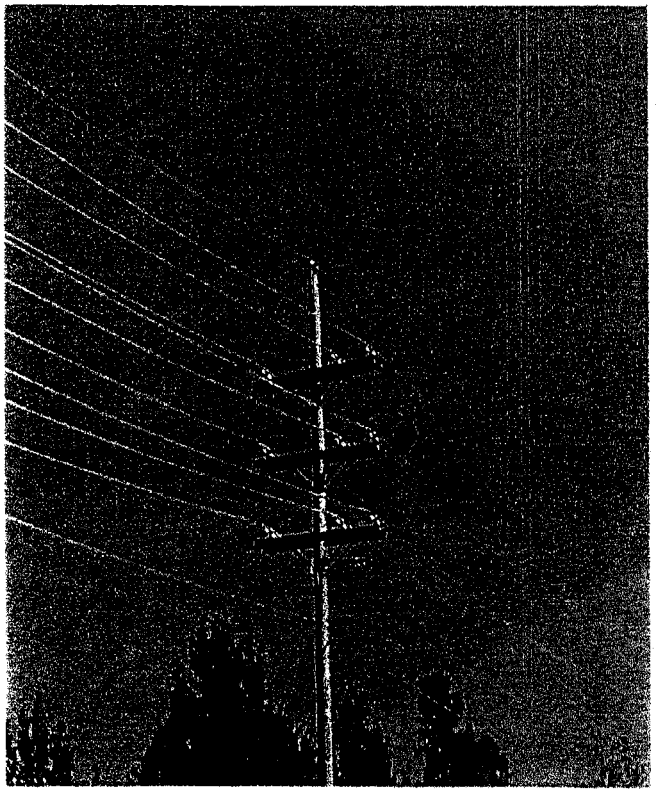
On the LEFT is what is CURRENTLY in the AREA – LATERALS / FEEDER

On the RIGHT is the NEW NARROW-PROFILE MONO-POLES that will be used on the Project.



OTHER POLE CONFIGURATION TYPES

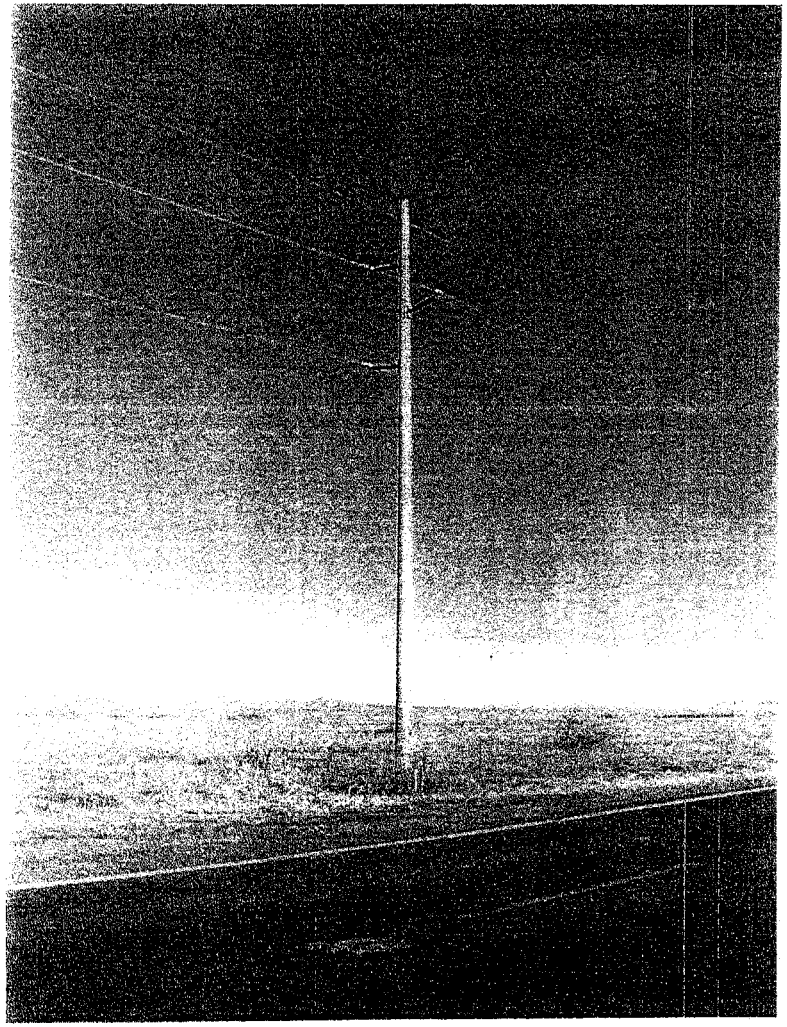
Double Circuit

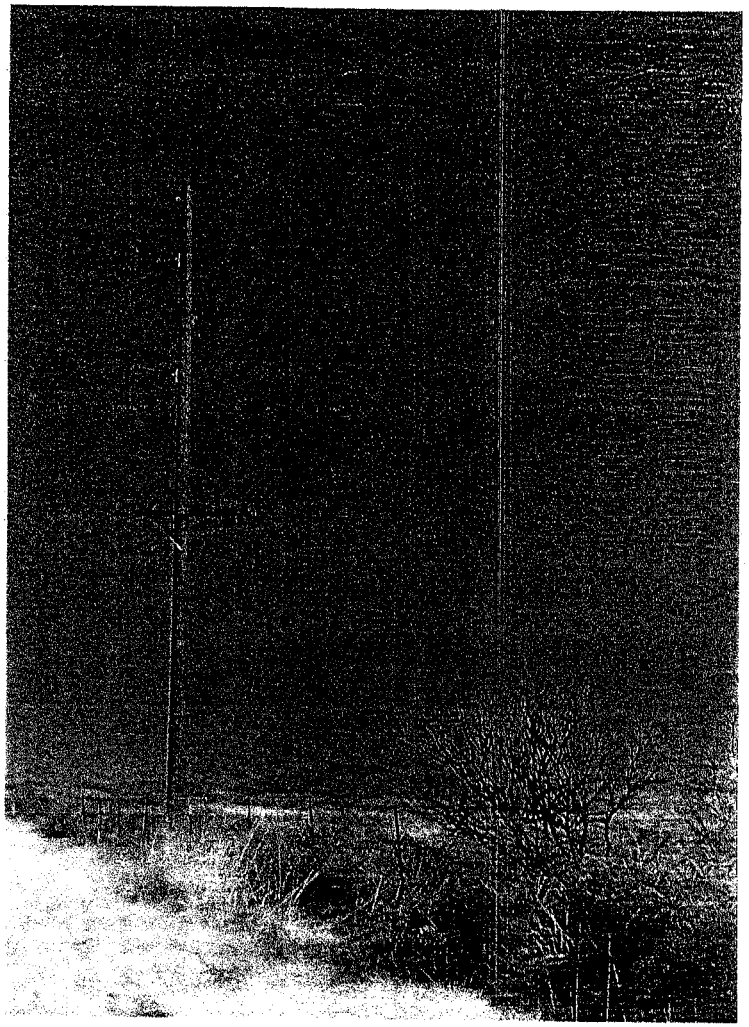


Triple Circuit

- Example POLE CONFIGURATIONS where the HEIGHT may be lower – but the VISUAL IMPACT is higher
- DOUBLE / TRIPLE circuits used where SUBSTATION is TOO FAR from LOAD CENTER
- SSVEC WILL NOT BE USING THESE STRUCTURES ON THIS PROJECT

Selected Pole Configuration





SSVEC

Sun Watts

Sun Watts Rebate Tracking as of AUGUST 6, 2009

City, State	Zip	Type	Manufacturer/Model #	#Watts	Payment Type	Rebate Total	To Acct
Elgin, AZ	85611	Solar	Xantrex GT 3.0	1600	$4.00	$6,400.00	12/13/2005
Sonoita, AZ	85637	Solar	Xantrex GT 3.0	2000	$4.00	$8,000.00	5/21/2007
Patagonia, AZ	85624	Solar	Magnetek Aurora GEPV173MCA/EC-115 Evergreen	1840	$4.00	$7,360.00	9/7/2007
Elgin, AZ	85611	Solar	Grundfos GF110	400	$4.00	$1,600.00	10/17/2007
Elgin, AZ	85611	Solar	BP 175B	350	$4.00	$1,360.00	3/18/2008
Sonoita, AZ	85637	Wind	Southwest Windpower Skystream 3.7	1800	50% of total	$6,987.50	4/17/2008
Sonoita, AZ	85637	Solar	Fronius IG3000	6300	50% of total	$19,500.00	10/1/2008
Elgin, AZ	85637	Wind	Southwest Windpower Skystream 3.7	2400	50% of total	$8,250.00	11/20/2008
Sonoita, AZ	85637	Wind	Southwest Windpower Skystream 3.7	2400	50% of total	$8,250.00	11/21/2008
Sonoita, AZ	85637	Wind	Southwest Windpower Skystream 3.7	2400	50% of total	$8,950.00	12/9/2008
Sonoita, AZ	85637	Solar	Sunny Boy SB 5000US	4680	50% of total	$17,572.00	12/23/2008
Elgin, AZ	85611	Wind	Southwest Windpower Skystream 3.7	2400	50% of total	$9,375.00	3/20/2009
Patagonia, AZ	85624	Solar	Kaco Blue Planet w/12 Kyocera Panels	1530	$4.00	$6,120.00	4/27/2009
Sonoita, AZ	85637	Wind	Southwest Windpower Skystream 3.7	2400	50% of total	$8,375.00	4/28/2009
Elgin, AZ	85611	Solar	Application Received/Design approved	9600			
Sonoita, AZ	85637	Solar	Application Received/Design not yet approved	4800			
			TOTAL CUSTOMER	46900	46.9kW		
			Average Customer	2931	2.9kW		
Elgin School				23000			
Patagonia School				46000			
			SSVEC Total	69000	69kW		

Small Solar Generating Plants

- SSVEC's SunWatts Renewable Energy Program supports this concept system wide
  - Incentive program: SSVEC will pay $4,000 per kilowatt up to half the installed cost of the system.
  - Typical system on SSVEC program is ~2kW
  - Typical home uses between 7-10 kW of energy
  - 16 Customers in Sonoita/Elgin/Patagonia
- SSVEC Program has installed 'Solar Shade' systems at schools in service territory. Currently one 46kW and one 23kW solar system at Elgin School and Patagonia High School in Santa Cruz County.
- These systems do not address capacity issue
- If conventional generator back-up is proposed, gas or diesel supply and storage becomes an issue. Non-Renewable Source
- Utility-grade power purchase agreement for firm power would require redundant back-up and/or spinning reserve

Install a 1-3MW Solar Facility

- A 1-3MW Solar facility at the Nogales Airport would be UniSource's Service decision.
  - The Nogales Airport is over 11-miles from SSVEC's Service Area
- SSVEC has submitted a proposal under the Clean Renewable Energy Bond program for a 750kW Solar Renewable Energy System with a possible location at the Sonoita Substation
- Currently proposed energy storage technologies only provide limited periods of sustainability
  - Battery
  - Flywheel
  - Compressed Air
  - Salt
- SSVEC supports the Cooperative Research Network program of study and exploration of energy storage technologies
- Non-dispatchable renewable energy systems reduce the need for fuel (typically coal or natural gas) but do little to address the capacity issue

Sulphur Springs Valley Electric Cooperative, Inc.
A Touchstone Energy® Cooperative

SUN Watts

Sulphur Springs Valley Electric Cooperative, Inc.
Small Residential/Small Business/Commercial
Single-Phase 120 V or 120/240 V
Photovoltaic System Interconnection Requirements
January 1, 2008

1.0 GENERAL REQUIREMENTS

1.1 The following photovoltaic (PV) system or other renewable system interconnection requirements by Sulphur Springs Valley Electric Cooperative, Inc. (SSVEC) are the minimum requirements by SSVEC to ensure proper interface of small residential, single-phase 120 V or 120/240 V, 15 kW or less, photovoltaic systems with the utility. These minimum requirements are based on the **IEEE Recommended Practice for Utility Interface of Residential and Intermediate Photovoltaic Systems (ANSI/IEEE Std 929)**. In addition to the following minimum requirements, the customer is responsible for complying with all other applicable technical standards, safety codes, **Article 690 of the National Electric Code**, and equipment manufacturers' specifications related to the design, installation, operation, and maintenance of the customer's entire electrical installation, including the PV system, not specifically mentioned in this document. **The PV System Components must be Listed and Tested by a Nationally Recognized Testing Laboratory (NRTL) to UL Standard 1741.**

2.0 AGREEMENT PROCESS REQUIREMENTS

2.1 The customer contacts SSVEC and requests interconnection requirements. SSVEC will forward interconnection requirements (page 1 through 3) and agreement form (page 4, 5 and 6).

2.2 The customer reviews the interconnection requirements and returns the signed and completed agreement form (page 4, 5 and 6) to SSVEC, which verifies that the customer is in agreement with the interconnection requirements. SSVEC will not sign the agreement form authorizing parallel operation with the utility until section 2.6 is complete.

2.3 SSVEC will approve the agreement form, if the customer has submitted the correct information, and the customer has signed the agreement form. SSVEC will then verbally contact the customer, and give the customer permission to proceed with the PV project. The customer should not proceed with the PV project until SSVEC approves the agreement form, and verbally contacts the customer.

2.4 The customer must obtain all permits and inspections required by city or county inspectors regarding the installation of the PV system. The PV system must be installed by a licensed electrical or PV contractor. The disconnect switch must be inspected by a licensed electrician.

2.5 After the PV system has been installed, inspected, and approved by the city or county inspector, the customer should contact SSVEC. SSVEC will inspect the PV system installation to confirm that it complies with the interconnection requirements. SSVEC recommends the licensed electrical or PV contractor be on site when SSVEC inspects the PV system installation to answer any questions that SSVEC may have.

2.6 After SSVEC has inspected the PV system installation, and confirmed that it meets the interconnection requirements, SSVEC will then sign the agreement form, which authorizes the customer to operate the PV system in parallel with the utility. SSVEC will send copies of the completed agreement form to the customer.

3.0 POWER QUALITY REQUIREMENTS

3.1 The power quality at the customer's meter must be within **published national voltage (ANSI/IEEE Std C84.1) and harmonic (ANSI/IEEE Std 519) standards**. The PV system must not exceed SSVEC flicker standards, and must operate in synchronism with the utility at 60 Hz. The PV system must not inject direct current (DC) into the alternating current (AC) system. In addition to these standards, the customer's PV system must not cause noticeable interference with telephone, radio, computer or other communication systems. If the customer's power quality does not meet these standards or if the PV system interferes with the power quality of other SSVEC customers, SSVEC reserves the right to disconnect the PV system from the utility.

4.0 PROTECTION REQUIREMENTS

4.1 The customer must ensure that the PV system automatically disconnects from the utility if SSVEC, or other personnel, open an upstream breaker, fuse, or switch to de-energize the utility power source to safely work on local area power lines or equipment. Without proper protection, the PV system could potentially backfeed the local area loads, and energize the local area power lines. This condition is called "islanding" and is extremely dangerous because SSVEC, or other personnel, will have assumed that they have isolated the utility power source, and could potentially be electrocuted by the customer's PV system backfeeding the utility. This situation is absolutely intolerable and it is the customer's responsibility to ensure that the PV system will automatically disconnect from the utility under these conditions.

4.2 Upstream SSVEC distribution breakers will trip open due to temporary faults (lightning strikes, etc.) and will automatically reclose 1-2 seconds later. Upstream SSVEC transmission breakers will also trip open due to temporary faults and will automatically reclose instantaneously. It is the customer's responsibility to ensure that the PV system has automatically disconnected from the utility before an upstream utility distribution or transmission breaker automatically recloses onto the PV system out of synchronism. SSVEC will not be responsible for any damage caused by an upstream utility breaker automatically reclosing onto the customer's PV system out of synchronism.

4.3 The following minimum protection is required by SSVEC to prevent the PV system from islanding the utility. The PV system must automatically disconnect from the utility 2 seconds (120 cycles) after the voltage deviates outside the voltage range 88-110% of nominal. The PV system must automatically disconnect from the utility 0.1 second (6 cycles) after the frequency deviates outside the frequency range of 59.3-60.5 Hz. After the PV system has disconnected from the utility, it should remain disconnected until voltage and frequency is within the above voltage and frequency ranges for 60 seconds.

4.4 In addition to the minimum protection required by SSVEC, it is the customer's responsibility to ensure that all additional personnel safety and equipment protection devices required by all other applicable technical standards, safety codes, and equipment manufacturers' specifications are properly installed. SSVEC is not responsible for the protection of the customer's PV system.

5.0 DISCONNECT SWITCH REQUIREMENTS

5.1 The customer shall install a SSVEC accessible, outdoor mounted, load break disconnect switch with a visible open that is capable of being padlocked in the open position by SSVEC personnel. The disconnect switch shall be mounted at the service entrance next to the meter, properly grounded, and clearly labeled "**PHOTOVOLTAIC SYSTEM AC DISCONNECT**". The disconnect switch shall be installed on the alternating current (AC) circuit between the utility and AC input to the PV inverter. The purpose of the disconnect switch is for SSVEC, or other personnel, to disconnect the PV system from the utility to eliminate all potential sources of backfeed when it is necessary to safely work on local area power lines or equipment. The customer understands that SSVEC has the right to padlock the disconnect switch in the open position at any time, without notice to the customer. The customer also understands not to tamper with, or remove the padlock if the disconnect switch is padlocked in the open position by SSVEC. The disconnect switch must be installed by a licensed electrician.

6.0 ANNUAL INSPECTION

6.1 SSVEC may conduct one inspection annually, at no cost to the costumer. The customer all provide SSVEC personnel with reasonable access to the PV system to conduct the annual inspection. This inspection will consist, at a minimum, of a visual inspection of required equipment and a test to verify that the equipment will still disconnect properly from the utility when the utility power is disconnected.

SSVEC

SSVEC Solar Proposals

Sulphur Springs Valley Electric Cooperative, Inc.

A Touchstone Energy Cooperative

REQUEST FOR QUOTATIONS TO DEVELOP A SOLAR ENERGY GENERATION FACILITY

July 7, 2009

SULPHUR SPRINGS VALLEY ELECTRIC COOPERATIVE, INC.
Request For Quotations To Develop a Solar Energy Generation Facility

1.0 SCOPE

Sulphur Springs Valley Electric Cooperative, Inc. ("SSVEC") is issuing this Request for Quotations ("RFQ") to solicit indicative proposals from potential solar energy developers and design/build contractors for 750 kW of solar-powered generation to be built adjacent to an existing SSVEC substation. SSVEC is receptive to proposals that either provide for a turnkey project with SSVEC as the project owner at completion, or in the alternative a long term purchased power agreement ("PPA") with a developer, under which SSVEC would purchase the output of the facility over its life.

2.0 SCHEDULE

The following schedule and deadlines apply to this solicitation:

Release of RFQ:	July 7, 2009
Indicative Proposals Due:	**July 17, 2009**
Begin Contract Negotiations:	August 2009
Execute Contracts by:	December 2009
Commercial Operation Date	Fall 2010

3.0 PROJECT DESCRIPTION

A. Background & Scope

SSVEC is a non-profit, member-owned distribution cooperative providing electricity to more than 50,000 services over some 4,000 miles of energized line in southeastern Arizona. The cooperative's service territory covers parts of Cochise, Graham, Pima and Santa Cruz Counties and includes the communities of Sierra Vista, Huachuca City, Patagonia, Elfrida, Benson, St. David, Bowie, San Simon, Willcox, Sonoita, and Pearce-Sunsites.

SSVEC is seeking opportunities to collaborate with either a design/build contractor or developer for the purpose of developing a solar electricity generation project in its service territory, at a site adjacent to an existing substation to be specified at a future date. The development of this project is part of SSVEC's efforts to comply with the Arizona Corporation Commission's ("ACC's") Renewable Energy Standard ("RES") outlined in Title 14, Chapter 2, Article 18 of the Arizona Administrative Code. SSVEC is seeking federal grants and financing to assist with the feasibility of this project.

The project that is envisioned is a free field, ground mounted solar energy generation facility capable of delivering up to 750 kW during peak periods. The specific technology is left up to the respondent to propose. The facility would be located adjacent to a new 69 kV/25 kV substation on the SSVEC distribution system. Interconnection to SSVEC's system will be via a 600A underground get-away from a dedicated 25kV grounded Wye distribution bus at a new substation (all of this will be provided by SSVEC). The respondent must provide transformation from inverter output voltage to 25kV, three phase, grounded Wye and provide all DC/AC inversion as well as AC disconnect(s), instrument-rated, substation class metering. SSVEC will install all of the CTs and PTs, but the respondent must provide the CT cans.

While SSVEC is unable to provide specific details about the site at this time, the respondent should assume for purposes of preparing a response that the site is an approximately ten acre tract owned by SSVEC with topology and terrain typical of SSVEC's service territory.

B. Design/Build Alternative

SSVEC is receptive to a design/build turnkey structure where the respondent designs and constructs the facility in collaboration with SSVEC, and then turns over ownership and operation to SSVEC when the project achieves commercial operation. A design/build contractor will be responsible for all equipment, materials, and services required for a complete operating facility. The following lists the major components of the work. This is not intended to be a complete, exhaustive listing, but is provided for convenience of the contractor in quickly developing an understanding of the overall scope of the project work.

- Design: Preparation of facility plans, engineering drawings, and technical specifications.
- Major Plant Equipment: Procuring, receiving, unloading, storing, installation, commissioning and testing of plant equipment.
- Civil-Structural: Site surveys; geotechnical investigation of the site; clearing, grubbing, and site preparation; perimeter security fences and gates; underground utilities and piping; grading and drainage; soil erosion, sediment control, and final stabilization; roads, parking, sidewalks, and paving; landscaping; restoration of site, including lay-down areas, to acceptable condition upon demobilizing from the site; and all foundations.
- Electrical: Controls, metering, relaying; electrical interface between the plant, collector bus with high side breakers, and the substation; plant lighting, plant lightning protection, and grounding.

Any contractor selected as the result of this solicitation will be expected to enter into an agreement with SSVEC that will govern the scope of the work as generally described above, payment obligations, contractor performance obligations, and insurance and security requirements.

C. PPA Alternative

SSVEC is also receptive to a PPA structure, where SSVEC would purchase the output of the project over its life. In the case of the PPA structure, SSVEC expects the developer to own, operate, and maintain the solar energy generation system for a period of at least twenty years. Prospective developers must be willing to enter into specific agreements with various parties which may be involved in the successful execution of this project, including a site use agreement with SSVEC for installation, operation and maintenance activities conducted at the site.

D. Interconnection Requirements

The facility will be required to be constructed to meet the minimum requirements for safe and effective operation in accordance with SSVEC's Interconnection Requirements for Distributed Generation, which can be provided at the respondent's request. These interconnection requirements apply to those installations that will be connected to the SSVEC distribution system (25 kV or less) and do not backfeed onto the transmission system. The proposed project is designed so that it would not backfeed onto the 69 kV transmission system.

These requirements may not cover all details in specific cases. The respondent would be expected to discuss project plans with SSVEC before designing the facility or purchasing and installing equipment.

The minimum required protective relaying and/or safety devices and requirements specified in SSVECs' requirements are for protecting SSVEC facilities and customer equipment from damage or disruptions caused by a fault, malfunction or improper operation of the distributed generating facility. They are also necessary to ensure the safety of utility workers and the public. Minimum protective relaying and interconnection requirements do not include additional relaying, protective or safety devices as may be required by industry and/or government codes and standards, equipment manufacturer requirements and prudent engineering design and practice to fully protect the generating facility or facilities; those are the sole responsibility of the respondent.

4.0 PROJECT SELECTION

Proposals will be judged based on their ability to meet SSVEC's need for economical and reliable renewable energy in the necessary timeframe. Respondents to this solicitation should provide all relevant information necessary to allow SSVEC to conduct a thorough analysis of the proposal. The principal criteria to be used by SSVEC in evaluating proposals include, but are not necessarily limited to, total delivered cost of the renewable energy over the contract term, the reliability of the project, and the financial and operational viability of the respondent.

SSVEC reserves the right to consider any other factors that it deems to be relevant to its needs. SSVEC reserves the right to request additional information from individual respondents or to request all respondents to submit supplemental materials in fulfillment of the content requirements of this RFQ or to meet additional information needs of SSVEC. SSVEC also

reserves the unilateral right to waive any technical or format requirements contained in the RFQ. Furthermore, SSVEC, in its sole discretion, will analyze any financial, operational, or other necessary criteria to determine their comfort and confidence that the respondent has the capability to fulfill their proposal.

Respondents are encouraged to include the following information:

Past Experience. SSVEC will consider past experience in designing, installing, owning, operating, and maintaining solar energy projects of similar size and complexity. If the respondent forms a joint venture or other teaming arrangement, these same considerations will be applied to the parties to the joint venture or teaming arrangement cumulatively. Additional response information may be included such as the extent to which the respondent has experience with solar projects in southern Arizona.

Pricing. Provide a preliminary project cost estimate in sufficient detail to allow SSVEC to validate and verify the various cost components contained in the proposal. Explain the approach for minimizing the price of electricity generated. Respondents are encouraged to guarantee their prices for at least 90 days. Preference will be shown to those proposals that guarantee their pricing for longer periods of time.

Proposed System Conceptual Design & Technical Specifications. Describe the preliminary design/ layout of the PV system, land required, type of technology, efficiency, mounting, tracking method if used, transmission interconnection plan (to an existing 12.5 kV substation), and recommended provisions to minimize system visibility (including light reflection) for the ground-mounted system. Proposals offering some level of "firming" are especially welcome.

Financial Capability. Provide verifiable information demonstrating that the respondent is in sound financial condition and has the ability to secure the necessary financing to meet the project's requirements now and in the future. The respondent's financial capability will be reviewed for stability and adequacy to meet its obligations under the proposal. If the respondent is selected as the winner of the RFQ and plans to secure financing from an outside source, an official letter from the financier confirming the financial arrangement may be required.

Solar Equipment Supply. If the respondent is selected as the winner of the RFQ, the respondent may be asked to provide a letter from its solar equipment supplier and/or manufacturer substantiating the availability of the equipment for use for the project.

5.0 RESPONSE SUBMISSION

SSVEC desires to receive paper or digital copies of proposals by 4:00 PM Eastern Standard Time, on July 17, 2009, at the address below.

GDS Associates, Inc.
1850 Parkway Place, Suite 800
Marietta, GA 30067

Attn: David Brian (david.brian@gdsassociates.com)
Phone: 770-425-8100
Facsimile: 770-426-0303

SSVEC

CREBS

PROPOSAL

EXHIBIT A

Detailed Description of the Qualified Renewable Energy Facility - A reasonably detailed description of the qualified renewable energy facility including reasonably expected costs of components, such as land, site prep, equipment, installation, other dedicated facilities such as transmission, project capacity and projected or expected use of the power produced at the Project.

Sulphur Springs Valley Electric Cooperative, Inc. ("SSVEC") issued a Request for Quotations ("RFQ") to solicit proposals from potential solar energy developers and design/build contractors for up to 750 kW of solar-powered generation to be built adjacent to a future SSVEC substation in Sonoita, Arizona. In its RFQ, SSVEC informed interested parties that it was receptive to proposals that either provided for a turnkey project with SSVEC as the project owner at completion, or in the alternative, a long term purchased power agreement ("PPA") with a developer, under which SSVEC would purchase the output of the facility over its life. SSVEC accepted proposals on July 17, 2009. Following a review of the proposals, SSVEC personnel have determined that a PPA agreement would not be cost-effective and has eliminated PPA proposals from further consideration. It is currently reviewing turnkey proposals from qualified providers. Contract negotiations with acceptable applicants' are expected to begin in August 2009, with the execution of contracts expected to occur in December 2009. SSVEC estimates that the cost of the project will be $6.0 million. The development of this project is part of SSVEC's efforts to comply with the Arizona Corporation Commission's ("ACC's") Renewable Energy Standard ("RES") outlined in Title 14, Chapter 2, Article 18 of the Arizona Administrative Code.

Background: SSVEC, a non-profit member-owned distribution Cooperative, provides electricity to 49,828 customers located in four counties in Southeastern Arizona. Its services are provided by more than 4,000 miles of energized lines. The Cooperative's service territory covers parts of Cochise, Graham, Pima and Santa Cruz Counties and includes the communities of Sierra Vista, Huachuca City, Patagonia, Elfrida, Benson, St. David, Bowie, San Simon, Willcox, Sonoita, and Pearce-Sunsites. SSVEC employs personnel that are highly qualified in their jobs, many who have years of experience working in the utility business. SSVEC was formed in 1938 as part of the Rural Electrification Administration (REA) which was created in 1935 by President Franklin Roosevelt. It is a 501 (c) (12) non-profit organization. Since its inception, SSVEC has worked closely with farms, ranches and small communities providing reliable power supplies. Over the years, these once dark and isolated areas have become thriving centers of commerce, industry, agriculture, culture and quality living.

Location and Site: The project will be located on a 5-acre greenfield site near the town of Sonoita, AZ, located in Santa Cruz County, Arizona. The Project site is readily accessible via Old Sonoita

Road near its intersection with HWY 83 and Papago Springs Road. The Project site would be located adjacent to a new 69 kV/25 kV electric substation on the SSVEC distribution system. The new substation will use approximately 1-acre of the site footprint. Additional acreage can be purchased for the Project's plant site if additional space is required.

Equipment and Installation: SSVEC proposes a free field, ground mounted solar energy generation facility capable of delivering up to 750 kW during peak periods and approximately 1,700,000 kilowatt-hours of energy annually. SSVEC has left the specific technology options (photovoltaic modules, inverters, and tracking system) up to the respondents to its RFQ to propose. SSVEC personnel are currently reviewing turnkey proposals from qualified applicants; an interview process will commence following selection of the most cost-effective proposals. The topology and terrain is flat, with no aerial obstructions. The proposed project will deliver 12,500 volts of alternating electricity once the facility is operational.

Design/build turnkey structure: In its effort to ensure that it undertakes the most cost-effective alternatives in order to meet both current and future needs of its customers, SSVEC has solicited proposals for multiple concepts. It has therefore determined that it will negotiate a turnkey operation, rather than a PPA project.

Using the design/build, turnkey structure, SSVEC proposes to work in collaboration with a selected company who would be responsible for the design and construction of the facility. Upon completion of construction activities, SSVEC would assume ownership and would operate the facility. The selected design/build contractor would be responsible for all equipment, materials, and services required for project completion and facility operation. SSVEC would enter into an agreement with that will govern the scope of the work, including payment obligations, contractor performance obligations, insurance, and security requirements. What follows is a list of the major components of the work:

- Design: Preparation of facility plans, engineering drawings, and technical specifications.
- Major Plant Equipment: Procuring, receiving, unloading, storing, installation, commissioning and testing of plant equipment.
- Civil-Structural: Site surveys; geotechnical investigation of the site; clearing, grubbing, and site preparation; perimeter security fences and gates; underground utilities and piping; grading and drainage; soil erosion, sediment control, and final stabilization; roads, parking, sidewalks, and paving; landscaping; restoration of site, including lay-down areas, to acceptable condition upon demobilizing from the site; and all foundations.
- Electrical: Controls, metering, relaying; electrical interface between the plant, collector bus with high side breakers, and the substation; plant lighting, plant lightning protection, and grounding.

Interconnection Requirements: Interconnection to SSVEC's system will be via a 600A underground get-away from a dedicated 25kV grounded Wye distribution bus at a new substation being built by SSVEC. The RFQ respondents must provide transformation from inverter output voltage to 25kV, three phase, grounded Wye and provide all DC/AC inversion as well as AC disconnect(s), instrument-rated, substation class metering. SSVEC will install all of the CTs and PTs, but the respondent must provide the CT cans.

The Sonoita facility will be constructed to meet the requirements for safe and effective operation in accordance with SSVEC's Interconnection Requirements for Distributed Generation, which requirements apply to installations that will be connected to the SSVEC distribution system (25 kV or less) and do not back-feed onto the transmission system. The proposed project is designed so that it would not back-feed onto the 69 kV transmission system.

The minimum required protective relaying and/or safety devices and requirements specified in SSVECs' requirements are for protecting SSVEC facilities and customer equipment from damage or disruptions caused by a fault, malfunction or improper operation of the distributed generating facility. They are also necessary to ensure the safety of utility workers and the public. Minimum protective relaying and interconnection requirements do not include additional relaying, protective or safety devices as may be required by industry and/or government codes and standards, equipment manufacturer requirements and prudent engineering design and practice to fully protect the generating facility or facilities; those are the sole responsibility of the respondent.

Total Estimated Capital Cost of the Project - The current total estimated cost of the Project is approximately $6 million, with a breakdown as follows:

Sonoita Solar Generation Project
Preliminary Cost Estimate

Category	Cost ($000s)
Solar Photovoltaic Modules	3,300
Inverters	300
Module Mount/Tracking System	400
Site preparation	50
Transformers	100
Monitoring System	50
Additional Land	900
Total Construction Costs	5,100
Owner's Contingency	350
CREBs Issuance Fees	550
Total Project Cost	**6,000**

EXHIBIT C

Plan of Financing

Schedule for Spending CREB Loan Proceeds

SSVEC anticipates a CREB issuance date of January 2010 for the current requested $6,000,000 CREB allocation. SSVEC expects to begin project construction by Q3 2010. The project is expected to have a construction period of 2 to 3 months, placing the commercial online date in the Fall 2010 timeframe. The following schedule provides the anticipated spending of CREB proceeds for the current requested allocation of $6,000,000.

SSVEC – Solar Generation Project **Periodic Drawdown Schedule of Amounts to be Advanced to Borrower For CREB Project**	
DATE ON WHICH PROCEEDS ARE EXPECTED TO BE EXPENDED	AMOUNT OF PROCEEDS TO BE EXPENDED
Aug-09 thru Dec-09	$0
Jan-10	$550,000
Feb-10	$0
Mar-10	$0
Apr-10	$0
May-10	$0
Jun-10	$0
Jul-10	$0
Aug-10	$1,800,000
Sep-10	$1,800,000
Oct-10	$1,800,000
Nov-10	$0
Dec-10	$0
TOTAL	**$6,000,000**

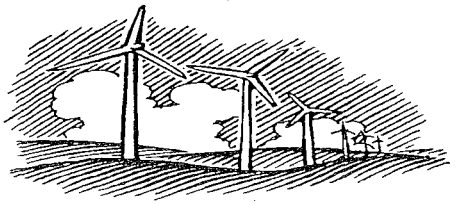
Clean Renewable Energy Bonds ("CREBs")

The Energy Policy Act of 2005 (P.L. 109-58) provides electric cooperatives and public power systems with the ability to issue "Clean Renewable Energy Bonds" ("CREBs"). The CREBs program is further described in Internal Revenue Service ("IRS") Notices 2005-98 and 2006-7 ("Notices"). The Notices will eventually be followed by "temporary and proposed" regulations that invite public comment. The "temporary and proposed" regulations may add detail to the program but will not alter the general terms of the Notice.

CREBs deliver an incentive comparable to the Production Tax Credit ("PTC") that is available to private developers and investor-owned utilities ("IOUs"). A CREB is a special type of bond, known as a "tax credit bond," that offers cooperatives the equivalent of an interest-free loan for financing qualified energy projects for a limited term. CREBs are, in part, modeled on a program called the "Qualified Zone Academy Bond" or "QZAB" program that provides tax credit bonds for school renovation and upgrades in certain qualified school districts.

Qualified Projects

Renewable energy generation projects that qualify for the PTC generally qualify for CREB financing. Specifically, these projects include wind, closed-loop biomass, open-loop biomass (including agricultural livestock waste), geothermal, solar, municipal solid waste (including landfill gas and trash combustion facilities), small irrigation power and hydropower.



Notice 2006-7 clarifies that facilities that are "functionally related and subordinate" to the generation facility itself are also eligible for CREB financing. These facilities may include a radial transmission line to the nearest substation, interconnection upgrades made necessary as a result of the renewable project, offices, storage, or other items. Facilities will not be functionally related and subordinate to a generation facility if they are not of a character and size commensurate with the character and size of the generation facility. Your bond counsel can assist you in identifying the scope of eligible facilities.

Qualified Issuers

Entities qualified to issue CREBs include governmental bodies, Indian tribal governments, mutual or cooperative electric companies and clean energy bond lenders – namely, the National Rural Utilities Cooperative Finance Corporation ("CFC") and Cobank. Notice 2006-7 clarifies that Qualified Issuers include entities that are able to issue tax-exempt bonds "on behalf of" a governmental unit (e.g., a joint action agency).

How CREBs Work

The electric cooperative or cooperative lender ("Issuer") would issue the CREBs and sell them to bondholders. With a conventional bond, the Issuer must pay interest to the bondholder. But with a tax credit bond, the Issuer does not make interest payments. The federal government provides a tax credit to the bondholder in lieu of the Issuer paying interest to the bondholder.

Treasury sets the rate of the credit on a daily basis, at a level that permits the issuance of the CREBs without discount and without interest cost to the Issuer. When the bondholder purchases the bond, the credit rate is locked in for the term of the bond. The credit accrues quarterly and is included in gross income of the bondholder (as if it were an interest payment on the bond). The bondholder takes the amount of the tax credit as a credit against its regular income tax liability and alternative

minimum tax liability. Repayment of principal to the bondholder occurs on a "level annual repayment" basis, meaning equal payments each year of the term of the bond, commencing in the first year of issuance.

The value of the CREB to a bondholder for any year is equal to the credit, less the amount of tax payable on the credit. For example, if the credit amount is $100 and the bondholder is in the 35 percent tax bracket, the credit provides a $65 benefit to the bondholder.

Availability of CREBs

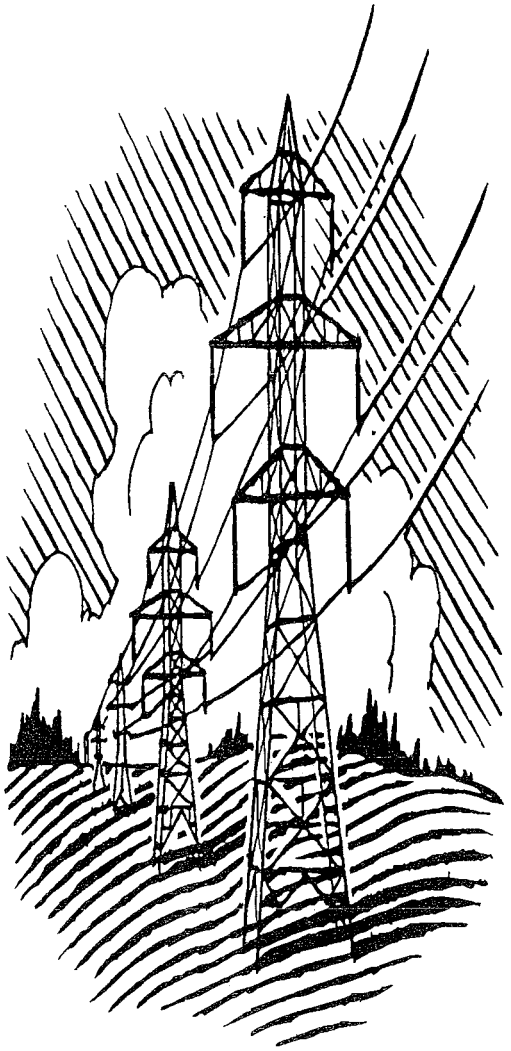
The Clean Renewable Energy Bond program will be available for two years, beginning January 1, 2006, and is subject to a cap of $800 million over two years to be shared between electric cooperative and government projects. The Secretary of Treasury ("the Secretary") will allocate the bonds on a project-by-project basis, prioritizing eligible projects from smallest to largest dollar amount of CREBs requested (with the smallest project first in the queue). The full amount of financing requested will be granted. All projects located at the same site and owned by the same Borrower are treated as a single project. No less than $300 million is reserved for electric cooperatives. The Secretary's timeline for granting the allocations is not provided in the Notices.

Application process

Notice 2005-98 solicits applications to Treasury for CREBs and sets a deadline of April 26, 2006 for applications to be submitted to the IRS. Applications must identify the Issuer and Borrower (the Borrower is the cooperative and the Issuer is either the cooperative or cooperative lender). The application must also describe the project in detail, including a certification by an independent, licensed engineer that the project is eligible and technically viable. Refer to the Notice for additional details of the application.

The Term of CREBs

The maximum term of the bonds is calculated through a formula that is dependent upon interest rates. Technically, the maximum maturity is the term which will result in the present value of the obligation to repay the final principal payment equaling 50 percent of the face amount of the CREB. So, as interest rates increase, the term of the bond decreases. At current interest rates, the maximum term of a CREB is about 15 years. The maximum term of the CREB will be published daily by the Bureau of Public Debt on its web site, http://www.publicdebt.treas.gov.



Credit Rate
The tax credit rate payable to the bondholder (in lieu of interest) will be published daily on the Bureau of Public Debt website mentioned above. Credit rates will be based upon yield on outstanding AA rates corporate bonds of a similar maturity, as estimated by Treasury the day before the CREB is sold. A feature that enhances the marketability of the CREB is "serialization" of the credit rate. In other words, each level annual repayment of principal will be structured as a separate bond paying a separate credit rate to a bondholder.

CREBs were intended by Congress to be issued without interest cost. Given how the credit rate will be set, however, they may sell at a discount depending on the market's perception of the underlying credit of the Borrower or Issuer or due to the small size of the program. Also, the need to begin repaying principal in the first year and transaction costs will result in some additional costs.

Spending the Proceeds of CREBs
CREB issuers must adhere to specific project timeframes for spending CREB proceeds. After issuing the CREBs for a qualified project, the Issuer must spend 95% of the proceeds within five years for that project. See IRS Notice 2005-98 for information on remedial actions that must be taken if the deadline is not met or if proceeds are not spent as intended for a qualified project. Such actions include and are not limited to repaying bondholders with unspent proceeds of the borrowing. Failure to take these actions could cause the bondholders not to receive any tax credits.

Proceeds of CREBs may not be invested above the yield of the CREBs and certain earnings from investment of CREB proceeds must be rebated to the Federal government. Refer to Notice 2005-98 for more information on such arbitrage requirements.

Board Action Needed for Reimbursement
An Issuer may use CREB proceeds to reimburse itself for project costs incurred up to 18 months *prior* to issuing the CREBs. To take advantage of this reimbursement, the actual Borrower (meaning, the cooperative itself, should CFC or Cobank issue the bonds on its behalf) must adopt an official intent to reimburse the expenditure *prior* to the payment of the expenditure. And, the Issuer must adopt an official intent to reimburse the expenditure within 60 days.

Parties Involved in Issuing CREBs
Electric cooperatives may issue the bonds, or have CFC or Cobank issue them on their behalf. Electric cooperatives that choose to issue CREBs independently should also be in contact with bond counsel. NRECA can recommend several bond counsel firms with experience regarding the CREBs.

Partnering with Private Entities
For tax-exempt electric cooperatives, sale to non-members of renewable power from a facility financed by a CREB would be treated in the same manner as any other income -- that is, the 85-15 rule would continue to apply. Examples of sales to non-members include sales of excess renewable capacity or the sale of renewable energy certificates. In any situation, the CREB-financed project must be owned by the cooperative, though it could be operated by another entity. A cooperative may partner with a private entity to finance a project but may only finance the portion it owns with the CREB. In this case, the proper election should be made so that the tax characteristics of the property are attributed to each individual co-owner, since a partnership is not an eligible Issuer under the statute.

A cooperative may lease a CREB-financed project to a private entity provided that the lease meets applicable legal requirements and the cooperative is still deemed to be the owner for tax purposes. A coop could sell a CREB-financed facility to another coop or government body, but if the facility is sold to an entity that can not issue CREBs, such as an

IOU or private developer, the coop would have to use the proceeds of the sale to repay all outstanding CREBs. Bond counsel should be consulted for further information on partnerships, leasing and other arrangements.

Marketing CREBs

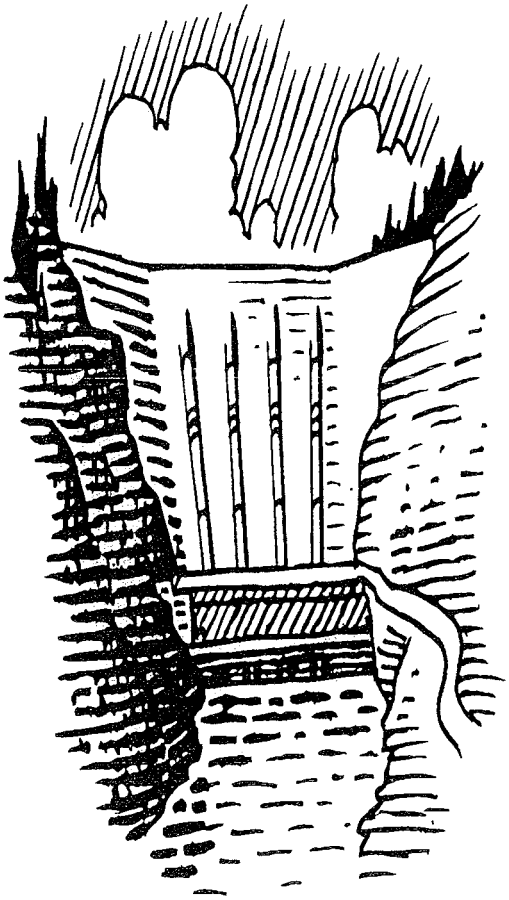
Issuers may pool several projects together to create a bond issue of sufficient size to enhance its marketability, attract interest from the largest number of potential investors and reduce transaction costs. Cooperative lenders could market the bonds to institutional investors, such as pension funds, insurance companies, or Wall Street houses that may offer the bonds to some clients. The bonds could also be sold through mutual funds and to individual investors.

CREBs versus the Production Tax Credit

The Clean Renewable Energy Bond is a different type of financing tool than the PTC that is available to IOUs and private developers. The bond works as a financing tool. In contrast, the benefits from a PTC are received only after the facility is financed and electricity is generated. The value of the CREB relative to the PTC varies according to the project. The PTC provides a 10-year stream of tax credits for all of the above listed renewable generation facilities that qualify for CREBs. The rate provided by the PTC is 1.9 cents per kWh for wind, closed-loop biomass, geothermal and solar. The rate provided by the PTC is reduced to .9 cents per kWh for open-loop biomass (including agricultural livestock waste), municipal solid waste (including landfill gas), hydropower and small irrigation hydropower. The value of the CREB is *not* reduced for such projects, thus the Clean Energy Bond would be relatively more beneficial. A conservative estimate is that a CREB will save the cooperative a minimum of 30 percent versus an RUS loan, depending upon the project.

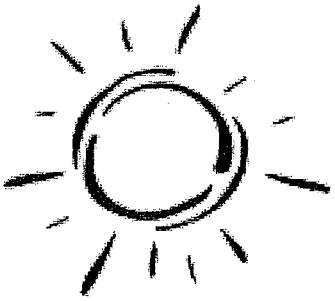
Steps to Take Immediately

It is important for a cooperative to adopt an official intent to use the proceeds of the CREBs to finance its renewable project. This declaration would be made through a board resolution. The cooperative may reimburse itself for capital expenditures related to the construction of a project once the bonds are issued, but *only* if such a resolution is in place in advance *(see "Reimbursement" above).* Bond counsel can advise you as to the proper wording for the resolution, and NRECA can provide you with a sample resolution that would subject to review by your bond counsel.



Other Resources

There are additional resources helpful to affording renewable generation that may be combined with CREBs. Renewable energy credits ("RECs") are renewable attributes of generation that are separated from the production of electricity and sold to other utilities that must meet renewable portfolio standard requirements, or to entities that want to demonstrate that they are contributing to clean energy production. For more information on RECs, visit the Public Renewables Partnership website at http://www.repartners.org/webcast/4%20RECs%20Lieberman.pdf In addition, the USDA offers grants called "Section 9006 grants" (go to the USDA website at www.rurdev.usda.gov/rbs/farmbill/what_is.html). Finally, state incentives for renewable generation may be available.



Information as of March 3rd, 2006

For More Information

The U.S. Congress Joint Committee on Taxation has published a description of CREBs at the following link: http://www.house.gov/jct/x-60-05.pdf (JCX-60-5, July 28, 2005). Legislative text for Energy Policy Act of 2005 (P.L. 109-58) is available at http://thomas.loc.gov IRS notice 2005-98 is available at http://www.irs.gov/pub/irs-drop/n-05-98.pdf. IRS notice 2006-7 is available at http://www.irs.gov/pub/irs-drop/n-06-07.pdf. Consult the notice for additional detail not provided in this brochure, including additional application requirements, information reporting to the IRS, remedial actions in case of failure to spend bond proceeds as required and arbitrage.

NRECA Contacts

For more information on CREBs, contact Russ Wasson at 703-907-5802, or Susan Pettit at 703-907-5822.

SSVEC

SSVEC DG Proposal

Exhibit B

Supplier's Scope of Work For

Sonoita Distributed Generation Project

SSVEC WO Number#80105

Between

Sulphur Springs Valley Electric Cooperative, Inc.

A Touchstone Energy Cooperative

1348 N. Guilio Cesare Ave
Sierra Vista, Arizona 85635

And

POWER ENGINEERS

Power Engineers, INC.
3940 Glenbrook Drive
P.O. Box 1066
Hailey, ID 83333

June, 2008

Purpose of This Document:

This Exhibit B - Supplier's Scope of Work shall be incorporated in and governed by the terms of that certain Master Professional Services Agreement by and between Sulphur Springs Valley Electric Cooperative, Inc. ("SSVEC") and Power Engineers, Inc. ("Supplier") dated _____, as amended (the "Agreement"). Unless expressly provided for in this Exhibit B, in the event of a conflict between the provisions contained in the Agreement and those contained in this Exhibit B, the provisions contained in the Agreement shall prevail.

Background:

Whereby SSVEC has an Agreement with Supplier, and SSVEC has need for services as defined herein, the Supplier and SSVEC mutually agree to the following.

Project Manager for SSVEC:

The Project Manager for SSVEC on this project is:

David Bryan

office 520-720-6421 cell 520-508-7986

The Project Manager for Supplier on this project is:

Mike Walbert

office 208-788-0357 cell 208-309-1171

Project Accounting Information:

Invoices along with brief monthly report emailed to dbryan@ssvec.com and accountspayable@ssvec.com

SSVEC WO #80105

SSVEC CWP Code 1400.01

SSVEC GL Code 107.24

SSVEC Dept. Number 51

SSVEC Activity Code 666

Project Description:
SSVEC is evaluating a potential distributed generation (DG) project in the Sonoita area – SSVEC feeder number V7. This project will provide system support to a very long radial 25 kV distribution feeder which currently has four line regulators to support voltage in the area. DG is an attractive option for this location.

List of services requested:
Task 1 – Review the SSVEC analysis on the V7 Feeder
Task 2 - Site Visit
Task 3 – Report of Findings and Recommendations
Task 4 – Detailed Analysis and Final Design and Estimate of Probable Cost
Task 5 – Prepare and Execute Procurement Documents
Task 6 – Construction Supervision
Task 7 – Commissioning and Testing
Task 8 – As-Built Drawings

Specific Tasks under this Scope:
Task 1 – Review the SSVEC analysis on the V7 Feeder

SSVEC will provide Supplier with detailed feeder data including MilSoft WinMil model and various load scenarios for evaluation. Details of current line equipment including regulators, capacitors and will also be provided by SSVEC or as requested by Supplier. Additionally SSVEC will provide Supplier with load duration information. The Supplier may be required to seek related information from 3rd parties (e.g. availability of natural gas supply in the area, zoning requirements, etc). SSVEC will provide Supplier with power cost values to be used in the economic evaluation of this DG project.

The Supplier will direct a dialogue with SSVEC staff, coordinated through the assigned SSVEC Project Manager, to define SSVEC's overall goal, options currently under consideration, technical and operational concerns, and other details of the project.

The Supplier will then synthesize these data prior to a site visit (Task 2).

The Supplier will develop written Preliminary Report including the following information:

- ❑ Summary of information gathered and used in the analysis.
- ❑ Summary of preliminary findings including options for:
  - o DG technologies,
  - o DG size,
  - o locations,
  - o rough estimate of costs and cost-savings,
  - o likely interconnection and operations issues
- ❑ Preliminary recommendations (if available at this time)

- ❑ Proposed agenda for site visit. Where possible, details of information needed likely sources (SSVEC staff, outside personnel, physical review of specific sites) shall be provided by the Supplier. SSVEC Project Manager will be responsible for arranging meetings and other local logistics for this visit.

Task 1 - Deliverable(s): Short written Preliminary Report as described above.

Task 1 – Schedule: To begin immediately upon signing of this Exhibit B – SOW. To be completed within 60 calendar days. Report to be submitted not less than one week prior to scheduled Site Visit (see Task 2 below).

Task 2 – Site Visit

Upon submittal of Task 1 Preliminary Report and positive review by SSVEC, Supplier shall arrange for a site visit to the area. An agenda for this visit will be submitted after SSVEC review of the Preliminary Report and will be subject to review and revision by SSVEC. Where possible, details of information needed likely sources (SSVEC staff, outside personnel, physical review of specific sites) shall be provided by the Supplier. SSVEC Project Manager will be responsible for arranging meetings and other local logistics for this visit.

Task 2 - Deliverable(s): Complete site visit.

Task 2 - Schedule: Planning for this Task to begin immediately upon signing of this Exhibit B – SOW. Site visit to be completed within 75 days calendar days but not less than two weeks after submittal of Task 1 Preliminary Report.

Task 3 – Report of Findings and Recommendations

Supplier will provide a written report of findings and recommendations based on further evaluation of information provided in Tasks 1 and 2 above. Additional information search and analysis are likely required of the Supplier during this Task 3 effort.

The Report of Findings and Recommendations is not a complete and definitive design but rather a discussion of recommended option(s). The Supplier should make every effort to identify major considerations for each option presented – thus facilitating SSVEC's ability to evaluate options and make a decision on which option to develop.

At a minimum this report should address:

- ❑ Summary of information reviewed and used in the analysis
- ❑ Summary of all assumptions made in the analysis
- ❑ Option(s) recommended for consideration
- ❑ Discussion of each option to include:
    - o Description of DG technology and fuel source

- Description of the interconnection point and required interconnection equipment
- Estimated total capital and operating cost of the DG unit
- Estimated project economics (Cost/Benefit, NPV, or IRR) with clear statement of assumptions of costs and benefits. This will include estimated run-time for various levels of voltage support and/or demand reduction scenarios
- Summary of technical and operational issues associated with the option
- Statement of likely risks (technology, financial, operational, etc)
- Major equipment lead times and likely commissioning date
- Summary of the Supplier's evaluation of the option

❑ Supplier's summary evaluation of all options considered

❑ Supplier's recommendation(s)

❑ Additional detail on one (or more) recommended option(s). This is the Supplier's recommendation based on the information available up to this point in the project development. The report should contain manufacturer specifications for major components (DG unit, interconnection and relaying/protection equipment, additional line equipment if necessary). This section of the report should also include a Gantt chart or other graphic representation of likely project implementation schedule with a summary of each task.

❑ The use of graphics and maps for illustration is encouraged.

❑ Where possible, data files should be provided to SSVEC for internal review and analysis

Task 3 - Deliverable(s): Written Report of Findings and Recommendations as described above.

Task 3 - Schedule: Within 90 days of signing of this Exhibit B – SOW.

Task 4 – Detailed Analysis and Final Design and Estimate of Probable Cost

Based on internal evaluation by SSVEC of the Report of Findings and Recommendations, the Supplier may be requested in writing via a formal Notice to Proceed to begin further analysis and design on one or more DG option.

The scope of work (SOW) for this task is dependent on the generation option selected by SSVEC. This SOW will be defined once a generation option is selected. For example there may be design required for the generation interconnection but no detailed design required for a generator package supplied by a manufacturer.

Tasks 5, 6, 7, and 8 are also dependent on the options selected and the SOW will need to be determined once an option is selected.

Task 4 - Deliverable(s): To be determined

Task 4 - Schedule: To be determined

Task 5 – Prepare and Execute Procurement Documents

Task 5 - Deliverable(s): To be determined

Task 5 - Schedule: To be determined

Task 6 – Construction Supervision

Task 6 - Deliverable(s): To be determined

Task 6 - Schedule: To be determined

Task 7 – Commissioning and Testing

Task 7 - Deliverable(s): To be determined

Task 7 - Schedule: To be determined

Task 8 – As-Built Drawings

Task 8 - Deliverable(s): To be determined

Task 8 - Schedule: To be determined

Supplier Resources Allocated to this Project:

The Supplier has reviewed the Project Description and Tasks herein and intends to use the following resources to complete this project:

- ❑ Supplier's Project Management personnel:
  - o Mike Walbert – Senior Project Manager I
  - o Laurie Robinson – Project Manager Assistant I
- ❑ Supplier's Generation personnel:
  - o David Gardner – Senior Project Manager III
  - o Jack Groves – Senior Project Manager II
  - o Mike Lidinsky – Senior Project Manager II
- ❑ Supplier's SCADA and Analytical Services (SAS) personnel
  - o John Kumm – Senior Project Manager I
  - o John Squire – Engineer III
  - o Rob Schaerer – Engineer II

Hourly Rate for Services:

Supplier agrees to provide the services described herein in accordance with the hourly rate schedule as provided to SSVEC in January 2008 or newer. In no case shall the total amount billed to SSVEC exceed ___$150,000.00___ without prior written agreement from SSVEC (see Master Professional Services Agreement for detail).

Payment for hourly rate for services shall be in accordance to the following schedule:

Task Number	Deliverable	Fee Amount for Task
Tasks 1 thru 3	**Brief Monthly Report of Activities under this task.**	Based on monthly report of hourly services and associated expenses.
Tasks 4 thru 8	**Brief Monthly Report of Activities under this task.**	Based on monthly report of hourly services and associated expenses.

Liquidated Damages:

In accordance with terms of the Master Professional Services Agreement, liquidated damages are hereby established at the rate of _____Not Applicable in the SOW____if Supplier does not meet schedule of services as presented herein.

Acceptance:

FOR SULPHUR SPRINGS VALLEY ELECTRIC COOPERATIVE, INC. (SSVEC)

Signature: _____

Name:

Title:

Date:

FOR POWER ENGINEERS, INC. (SUPPLIER)

Signature: _____

Name:

Title:

Date:

October 31, 2008

SULPHUR SPRINGS VALLEY ELECTRIC COOPERATIVE

Feeder V7

Sonoita Distributive Generation Study

Revision A

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114730

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Sonoita Distributive Generation Study

Prepared by POWER Engineers, Inc. for

Sulphur Springs Valley Electric Cooperative

Feeder V7

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1.0 Executive Summary

Sulphur Springs Valley Electric Cooperative, Inc. (SSVEC) contracted POWER Engineers, Inc. (POWER) to provide technical assistance in regards to adding distributive generation to its V7 Feeder fed from the Huachuca West Substation. The purpose of this study is to provide an engineering analysis for SSVEC in regards to adding distributive generation to its V7 Feeder. Part of this project is to determine a location on the V7 Feeder where the circuit could be opened to allow a 2 MW generator to serve peak load to reduce the loading at the substation and on the 1/0 ACSR mainline of the feeder. A peak substation load of 6,900 kVA was used as the basis for the analysis with an annual growth of 2% for the entire V7 Feeder. The 2 MW generator would be able to serve most of the line between the cities of Sonoita and Patagonia, Arizona for three years beyond the peak year.

2.0 Introduction

2.1 Project Description

The purpose of this study is to provide an engineering analysis for SSVEC in regards to adding distributive generation to its V7 Feeder. The V7 Feeder is fed from the Southwest Transmission Cooperative at 69 kV and is stepped down to 24.9 kV at the Huachuca West Substation to serve consumers in the Rain Valley, Elgin, Sonoita and Patagonia areas of Arizona. In recent years, the feeder has reached its load-serving limit of around 7,000 kVA. In order to better serve its existing consumers, and to accommodate growth in the area, SSVEC plans to construct a new substation and associated transmission line in the Sonoita area.

Until this new substation is constructed, SSVEC plans to install a 2 MW generator (diesel or natural gas) on the V7 Feeder to operate in peak loading conditions. This generator will be installed and run "islanded" from the rest of the feeder. Load flow analysis was used to determine the optimal location to place a switch to open the feeder in order to run the generator islanded. This study also explores other aspects of adding distributive generation to a feeder including protection on the distribution line and for the generator, and communications between the substation and the generator.

Note, voltage flicker and frequency deviation on the feeder due to the generator were not addressed in this study. When a more detailed analysis is performed this should be addressed.

2.2 Data Review

The Huachuca West Substation is a single-feeder facility. The V7 Feeder is a radial feeder consisting of 311 miles of primary line and approximately 50 miles of secondary. The feeder is fed from a 69-24.9kV 5,000/7,000 kVA transformer. In previous studies conducted by SSVEC, it was determined that the substation has reached its maximum capacity and in order to continue to serve its existing and future consumers, a series of improvements would be required. Figure 1 is a graph of peak load growth over the past ten years. January 2007 saw a peak substation load of 6,900 kVA.

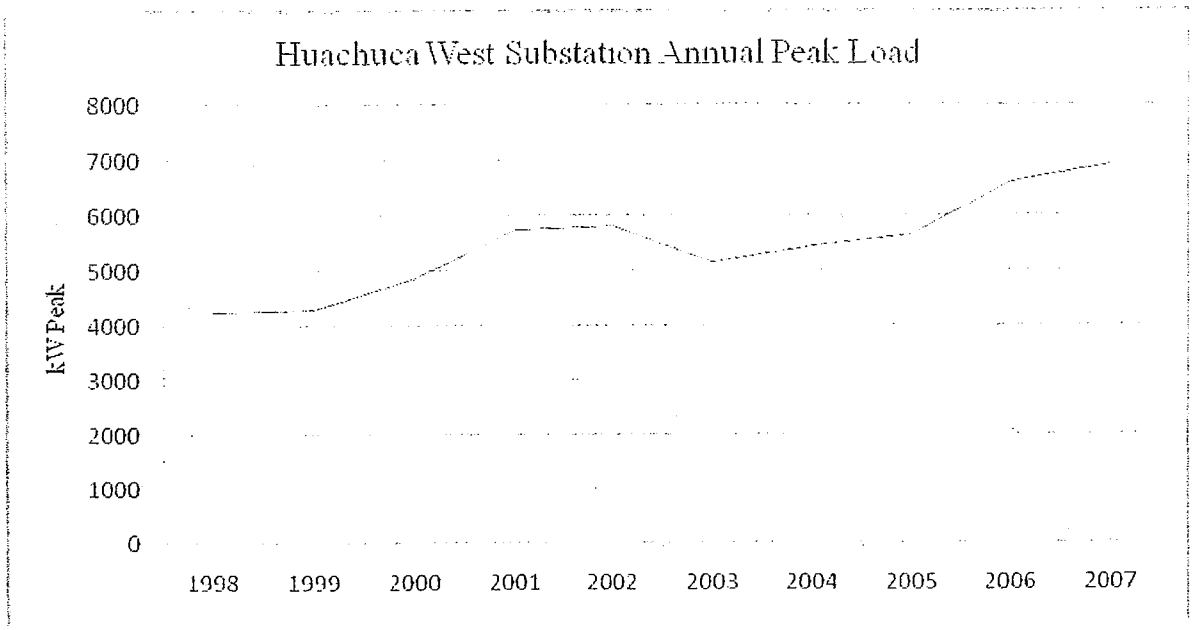

Figure 1: Feeder V7 Peak Loading

One of the solutions to alleviate some of the load from the Huachuca West Substation and the V7 Feeder during these peak times is using distributive generation. In studies conducted by SSVEC, it was determined that a 2 MW generator could be purchased and installed on the system to be run during these peak times. The generator being considered for this application is a portable unit that is skid/trailer mounted; giving SSVEC the flexibility of moving it to other locations within their system once its use on the V7 Feeder is no longer required. At this time, how the generator will be connected to the distribution system is still being taken into consideration. It will either be connected directly at 24.9 kV or will be connected through a generation voltage to 24.9 kV step-up transformer. According to these studies based on load data between November 2006 and November 2007, this generator would only need to be run during peak conditions, which is a very small period of time each year.

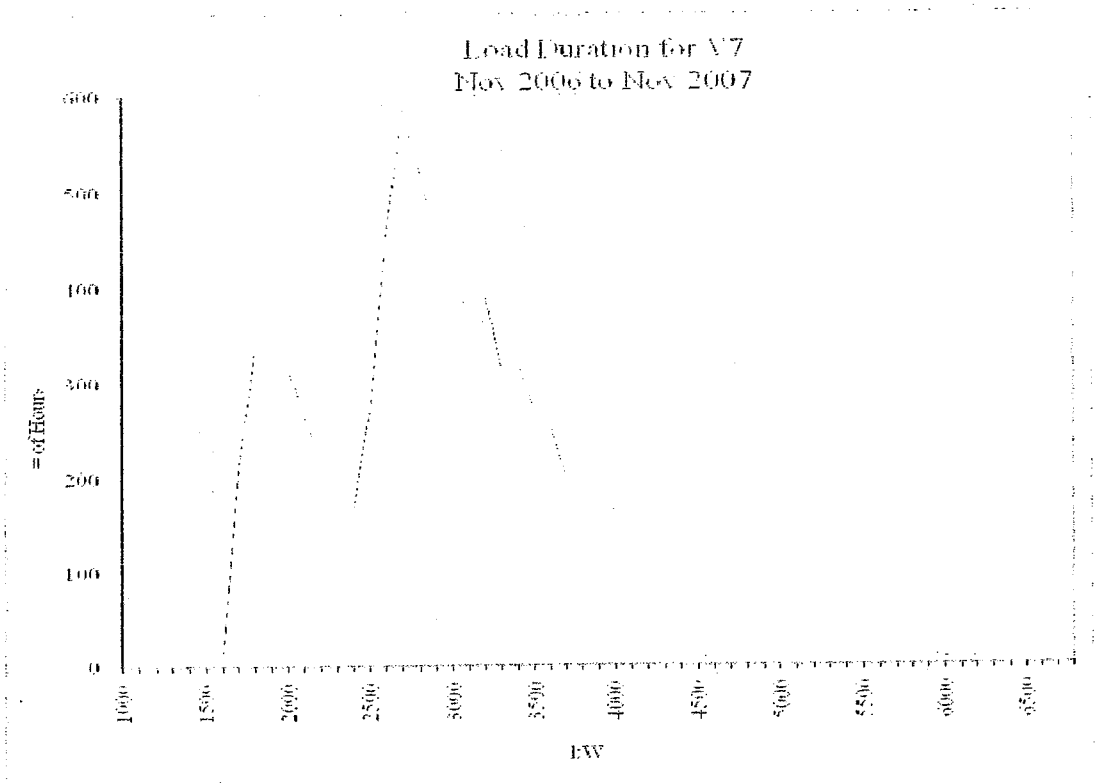

Figure 2: Feeder V7 Load Duration Curve

In order to facilitate this study to determine the optimal location for the generator, POWER received a copy of SSVEC's latest Milsoft WindMil model "HuachucaWest JUL08SYS Jul 07Bill July07Alloc Reduc". SSVEC indicated that the January 2007 peak loading of 6,900 kVA was to be used as the basis for the analysis. The WindMil model contained load data at the Load Control Point PD.3918 as shown in Table 1.

Table 1: Existing Load at PD.3918 in WindMil Model

	kW	kvar	% PF	Calculated kVA	kVA % of Total
A-Phase	2,097	438	97.9	2,141	34.0
B-Phase	1,969	332	98.6	1,997	31.7
C-Phase	2,157	102	99.9	2,159	34.3
Total	6,223	872		6,297	100.0

The by-phase breakdown of the peak load of 6,900 kVA was unknown. It was assumed that the by-phase percentage allocation of the 6,900 kVA would follow the same percentage allocation

that was already being used in the model. The kW and kVAr data in Table 2 was input into the WindMil model and used to distribute the load among the down-line circuit elements.

Table 2: Division of 6,900 kVA Peak Load at PD.3918

	kVA % of Total	kVA	kW	kvar	% PF
A-Phase	34.0	2,346	2,297	480	97.9
B-Phase	31.7	2,187	2,157	364	98.6
C-Phase	34.3	2,367	2,364	112	99.9
Total	100.0	6,900	6,818	955	

Other data and guidance received from SSVEC included:

- A 2% growth is to be used for 3 years to grow the peak load of 6,900 kVA.
- Previous reports by SSVEC that have led up to this study.
- The allocation of load is to be the same as what is already in the WindMil model.
- If necessary, 124 V can be used as the output voltage on regulators.
- The three Capacitor banks have been turned off due to voltage rise concerns on the feeder.

3.0 Analysis

3.1 Introduction

Before any load flow analysis was performed, the general layout of the V7 Feeder was analyzed to determine where the generator could potentially be located. Maps of the area were also taken into consideration to determine what population centers were in the vicinity.

Feeder V7 is a long radial feeder. The feeder originates from the Huachuca West Substation and runs primarily west toward Sonoita. When the feeder reaches Sonoita, it branches off to the north, to the southwest (toward Patagonia) and to the southeast (in the direction of Ft. Huachuca). Due to this configuration at Sonoita, the possible locations of where to locate the generator and where to open the feeder to island the generator are limited. The lines that branch to the north and to the southeast are either short or primarily single-phase. The line southwest to Patagonia feeds the majority of the load past Sonoita. SSVEC has a branch office in Patagonia. Opening the feeder between Sonoita and Patagonia therefore is the focus of this study.

3.2 Load Flow Analysis Results

3.2.1 Results Before Islanding

In previous studies conducted by SSVEC the purchasing of a 2 MW generator was looked into. This 2 MW rating is based on a 0.8 power factor. At unity power factor, this generator could serve 2.5 MW (2.5 MVA), but in order to provide var support for the portion of the feeder it will be serving, the actual real power output would be 2 MW. The 2 MW output at 0.8 power factor was used as the maximum loading to determine where on the feeder to place an open point to run the generator islanded.

Load flow analysis was performed on the V7 Feeder utilizing the base allocation of the 6,900 kVA of peak load and then growing the entire feeder load by 2% for three successive years. To determine where the feeder can be opened in regards to loading on the feeder, the primary quantity examined was kW by-phase. The by-phase kW flow was examined for six line sections. Using their WindMil designations, these six sections are:

- PL.45024
- PL.44871
- PL.44818
- PL.45483
- PL.44284
- PL.45240

The first five of these locations were chosen as they occur at two locations in Sonoita where the feeder branches off. The sixth location, PL.45240 was chosen, as it is a line segment between Sonoita and Patagonia. Figure 3 shows these locations in relation to the rest of the V7 Feeder.

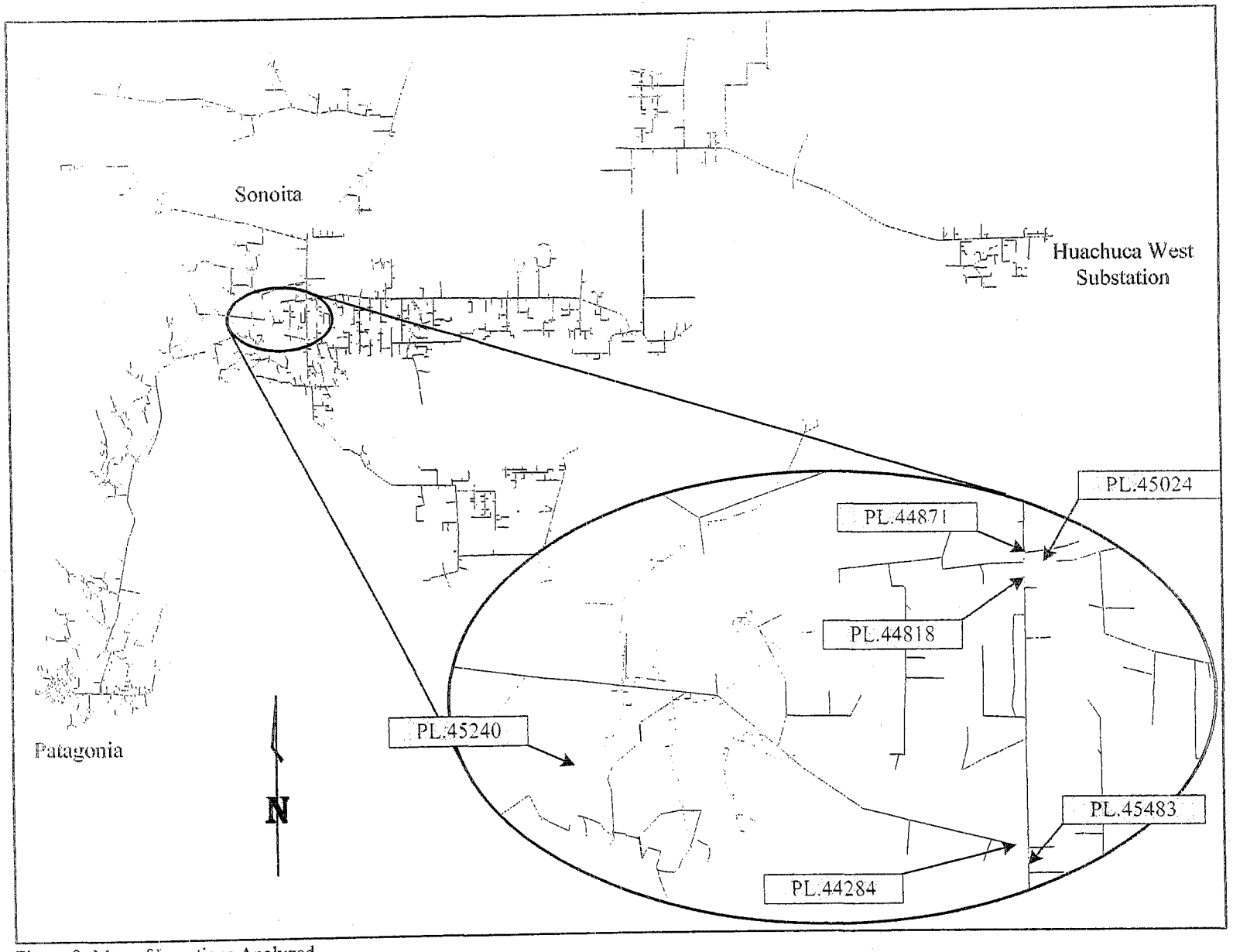

Figure 3: Map of Locations Analyzed

The results of the load flows for these six locations can be seen in Table 3. This table contains data for all six locations for the base year and three successive years utilizing a 2% load growth each year on the entire feeder.

Table 3: WindMil Load Flow Results

Element Name	A-Phase (kW)	B-Phase (kW)	C-Phase (kW)	Total (kW)
PL.45024				
Base Year	1,285	1,415	1,507	4,207
Year 1	1,308	1,442	1,539	4,289
Year 2	1,336	1,472	1,569	4,377
Year 3	1,364	1,504	1,604	4,472
PL.44871				
Base Year	138	259	675	1,072
Year 1	141	264	691	1,096
Year 2	144	269	705	1,118
Year 3	147	275	719	1,141
PL.44818				
Base Year	1,141	1,119	830	3,090
Year 1	1,162	1,140	847	3,149
Year 2	1,187	1,164	863	3,214
Year 3	1,211	1,189	884	3,284
PL.45483				
Base Year	299	647	102	1,048
Year 1	304	659	104	1,067
Year 2	311	671	106	1,088
Year 3	317	687	108	1,112
PL.44284				
Base Year	758	461	725	1,944
Year 1	772	470	739	1,981
Year 2	789	481	753	2,023
Year 3	805	489	772	2,066
PL.45240				
Base Year	742	441	693	1,876
Year 1	756	449	707	1,912
Year 2	772	459	720	1,951
Year 3	787	468	738	1,993

3.2.2 Switch and Generator Locations

Based on these results, and if this generator is only going to be utilized for three years beyond the base year, the optimal location to open the feeder is at the beginning of the line section designated as PL.45240. According to the analysis by the third year, the kW and load current flowing through this section will be just under the 2 MW capacity of the generator. This line section is approximately 4.15 miles from where the mainline branches toward Patagonia from Sonoita.

Due to the rural nature of the area, there are only two population centers fed by this section of line, Sonoita and Patagonia. Considering this, the location of where to connect the generator is limited to these two general areas. If the generator were to be connected to the line at the open point, it would be approximately 4 miles outside of Sonoita along Arizona Highway 82. Although this location is more isolated to locate the generator, it would allow personnel to open the circuit and start the generator at the same time. The downside with this location would be that it is more isolated and if the generator were to go down, crews would probably be required to travel from Patagonia to the generator site.

The other option would be to locate the generator in Patagonia, where SSVEC has a branch office. With the office in Patagonia, this location would make it easier for crews to get to in case the generator was to go down. The downside of this location is that it would be on the opposite side of the feeder from the open point on the feeder and would require coordinating opening the switch and starting the generator.

3.2.3 Results After Islanding

After the line to Patagonia is disconnected and with the generator as the power source, the voltages on this islanded section of line are maintained at or above 118 volts on a 120 volts basis whether the line is being fed from the Sonoita or Patagonia ends. The loading on this section at the generator for the base year and the three successive years, with a 2% load increase per year is as shown in Table 4.

Table 4: Sonoita to Patagonia Loading (Islanded)

Element Name	A-Phase (kW)	B-Phase (kW)	C-Phase (kW)	Total (kW)
Load at Generator				
Base Year	740	439	692	1,871
Year 1	755	448	706	1,909
Year 2	771	457	720	1,948
Year 3	786	466	734	1,986

After the line to Patagonia is disconnected the rest of the feeder fed from Huachuca West Substation maintains voltages greater than 118 volts on a 120 volts base with exception to those line sections directly preceding the voltage regulators on the system. Table 5 shows the lowest reported voltages in these areas and the voltage regulator associated with these line sections.

Table 5: Feeder V7 Marginal Voltage Sections (Islanded)

Line Section	Associated Regulator		Base Year Voltage		Year 1 Voltage		Year 2 Voltage		Year 3 Voltage	
	WindMil ID	Location	Volts	Ph.	Volts	Ph.	Volts	Ph.	Volts	Ph.
PL.44281	RG.69	Rain Valley	116.8	B	116.3	B	116.0	B	115.5	B
PL.44277							117.9	B	117.5	B
PL.70076	RG.64	Canelo					118.0	B	117.8	B
PL.70077							117.9	B	117.7	B
PL.44597							117.9	B	117.7	B
PL.45314							117.9	B	117.7	B
PL.45313							117.9	B	117.7	B
PL.45315							117.9	B	117.7	B
PL.44598							117.9	B	117.7	B
PL.46265							117.8	B	117.6	B
PL.53935								B	117.9	B
PL.70075								B	117.8	B
PL.53934								B	117.9	B

The primary reason for these low voltages is due to the substation load becoming unbalanced after the line to Patagonia is opened. After the line is opened, B-phase becomes the more predominantly loaded phase. Table 6 shows the loading at the Huachuca West Substation with the line to Patagonia opened.

Table 6: Huachuca West Loading (Islanded)

Element Name	A-Phase (kW)	B-Phase (kW)	C-Phase (kW)	Total (kW)
Load on Secondary of Substation Transformer				
Base Year	1,263	1,586	1,419	4,268
Year 1	1,297	1,630	1,445	4,372
Year 2	1,326	1,666	1,479	4,471
Year 3	1,355	1,702	1,508	4,565

In the previous studies conducted by SSVEC, the goal for the generator was to reduce the load on the 1/0 ACSR mainline to below 5 MW, and reduce the overall substation loading during the peak loading times. This would be accomplished by installing the generator and running the system islanded.

4.0 Protection Considerations

4.1 Generator

Because the generator will be used as a primary power source and not as a distributed resource in parallel with the rest of the distribution system, the protection for this generator should follow recommended IEEE practice as laid out in IEEE Standard C37.102 "IEEE Guide for AC Generator Protection." Based on this standard, at a minimum the following protection elements should be used include (referenced by their ANSI Device Number):

- 21 – Distance relay used as a backup for a system generator zone phase fault. This would require a time delay for coordination. Either this element or a 51V or 51C element should be used for this type of protection.
- 24 – Volts per hertz protection for the generator to prevent thermal damage to the generator caused by the over excitation of the generator.
- 27 – Undervoltage protection against undesirable effects such as a reduction instability and excessive import of reactive power from the feeder.
- 32 – Reverse power protection of the prime mover of the generator that may be damaged during a motoring condition.
- 40 – Loss-of-Field protection which may be caused by accidental tripping of a field breaker, field open circuit, field short circuit or voltage regulation failure.
- 46 – Stator unbalanced current protection or negative-sequence protection to protect against unbalanced system conditions or unbalanced faults.
- 51V or C – Voltage-restrained or voltage controlled time-overcurrent relay. Backup for system and generator zone phase faults. Either this element or a 21 element should be used for this type of protection.
- 59 – Overvoltage protection, which provides similar protection as the 24 element to protect the generator against overexcitation or overspeeding.
- 64S – 100% stator ground fault protection with subharmonic voltage injection.
- 81 – Frequency relay. Both underfrequency and overfrequency protection may be required.
- 87G – Differential protection. Primary phase fault protection for the generator. This can be considered optional depending on the size of the generator and whether CTs can be installed.

- 87T – Differential protection. Primary protection for a GSU transformer. This element will not be required if the generator is connected directly to the distribution system at 24.9 kV. Depending on the size of transformer use, this may not be required.

Since SSVEC already uses Schweitzer Engineering Laboratories (SEL) relays for protection within its distribution substations, the SEL 300G relay would be suitable for this application. This relay utilizes these functions and may provide a compact solution that will fit in with the trailer mounted generator scheme.

4.2 Distribution Line

For the generator to serve the section of feeder between Sonoita and Patagonia, the feeder needs to be opened. A recloser should be placed just upstream of the generator interconnection point. A recloser of the same types already in use on the V7 Feeder could be used for this function.

The fault currents on this section of line will differ depending on if this section is being fed from the Huachuca West Substation or from the generator. According to the fault analysis conducted in WindMil on the V7 Feeder, and using the source impedances provided with the model from SSVEC, the three-phase fault currents at the chosen open point (line section PL.45240) is 361 amperes. Using a subtransient reactance of 15% on the generator base of 2.5 MVA the generator will contribute 386 amperes of fault current if it is connected directly to the feeder at 24.9 kV. If the generator is connected to the feeder through a generator voltage to 24,900 volt GSU transformer using an IEEE typical impedance of 6.5% on a transformer base of 3 MVA, the three-phase fault current on the feeder will be 284 amperes.

Normally the fault currents contributed by the generator would be less than with the feeder fully connected due to the smaller capacity of the generator. However, with the V7 Feeder being of a long length, the accumulated impedance to the open point is significant. The distance back to the substation from the open point is approximately 26 miles. In this distance, the accumulated positive sequence impedance is $24.91+j31.17\ \Omega$ and the accumulated zero sequence impedance is $31.17+j39.44\ \Omega$, which accounts for the low fault currents.

If the generator is to be connected directly to the distribution system at 24.9 kV, it appears the existing feeder protection may be adequate for when the generator is in service. If the generator is to go through a GSU transformer then the protection may need to be re-evaluated on this part of the feeder due to the lower fault currents.

5.0 Communications Considerations

In order for SSVEC to monitor the generator's operating state as well as its power output, a communications processor would be required. A NovaTech Orion5r communication processor located at the generator trailer would be sufficient. SSVEC already uses this processor in other applications at its substations. This processor has 16 ports as well as 4 hardwired inputs and 4 hardwired outputs which should be able to accommodate the required IEDs for this application. The Orion5r would poll the SEL 300G as well as other IEDs installed at the generator site and would in turn then be polled by the SSVEC master station. Also to be used in this set up would be an SEL-2401. The SEL-2401 is a GPS clock that would be providing time information to all devices at the generator and is used by SSVEC at other sites. A PML 6200 would be used to meter the generator at the generator trailer. The Orion5r would communicate with the substation via radio through the SSVEC Master network.

6.0 Generator Set Data and Estimate of Probable Cost

6.1 Generator Data

The generator set data was based on the following:

- Diesel Fuel
- Portable
- Weather enclosure
- 24 hr fuel tank
- 2400/4160 voltage
- Skid mounted on a trailer
- Sound attenuation
- Automatic transfer switch
- To be connected to an existing distribution feeder

POWER contacted three suppliers that provide comparable generator sets that could be used in this application. The estimated cost for all three vendors is very competitive and estimated to be in the $675,000 to $775,000 range. Table 7 below provides a brief overview of the three models reviewed.

Table 7: Vendor Generator Data

Vendor	Model	kW/kVA	Generator	Emissions	Cooling	Fuel Consumption @ 100% load
Caterpillar	2000 ekW	2000/2500	3 phase 60 Hz brushless	EPA Tier 2	Water cooled	138.9 gal/hr
Cummins	DQKAB	2000/2500	3 phase 60 Hz brushless	EPA Tier 2	Water cooled	137.9 gal/hr
Kohler	2000REOZM	2000/2500	3 phase 60 Hz brushless	EPA Tier 2	Water cooled	134.5 gal/hr

6.2 Other Data

6.2.1 Warranty

Each vendor offers a standard limited one-year warranty with optional two, five and ten year extended warranties available.

6.2.2 Operations and Maintenance

Estimated cost for O&M is $700 per hour of operation. The units are considered self contained and can be placed in standby mode with an automatic transfer switch engaging the unit when needed. The gen set comes with system protection to prevent catastrophic failures. As with any reciprocating engine, regular preventative maintenance is required and each manufacturer has similar service interval recommendations. Running inspections are recommended during operation.

6.2.3 Noise

It is important that noise generated from the gen set is considered when locating the unit. Typical sound levels can be as high as 80 db with the sound attenuation package. Normal conversation is 58 db and freeway noise is 70 db. Locating a unit near any residential or commercial neighborhoods can be difficult.

6.2.4 Permitting

A portable gen set can be problematic with permitting. The Arizona Department of Environmental Quality (ADEQ) will most likely require that an air permit application be submitted each time the gen set is relocated. This may cause scheduling difficulties and extra costs. The gen sets reviewed meet the EPA Tier 2 criteria, which mean that the units are low emitters, and satisfy most stringent air permitting requirements. However, a stationary gen set is a better solution in obtaining an air permit because only one application process is required. It is advisable that discussions should be conducted with Sulphur Springs Valley Electric Cooperative and the ADEQ before proceeding.

6.2.5 Renting Options

There are many options to renting units for short periods of time and many levels of cost. The actual cost of renting depends on the configuration and services provided. Services that need to be identified are set up, operation oversight and fuel costs. POWER contacted a local Cummins supplier in Phoenix that is very willing to discuss renting options further. POWER can provide this contact information if interested. Typically, purchasing the unit should be considered if it will be used more than one year.

6.2.6 Natural Gas

Each gen set reviewed is also available in a natural gas model. Natural gas operating gen sets are easier to maintain and operate cleaner than diesel units. Typically, there are no visible emissions from the stack. Natural gas is typically less expensive to operate. Natural gas units should be considered if the unit will be stationary and fuel supply is nearby.

6.2.7 Recommendations

The generator set vendors are very competitive and each provides high quality and reliable products.

6.2.8 Gen Sets

Vendor information for each model reviewed can be found in Appendix A.

Appendix A:

Vendor Generator Data Sheets

DIESEL GENERATOR SET

CATERPILLAR®

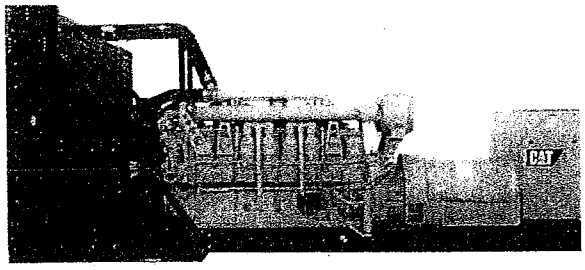

Image shown may not reflect actual package.

STANDBY
2000 ekW 2500 kVA
60 Hz 1800 rpm 480 Volts

Caterpillar is leading the power generation marketplace with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

FEATURES

FUEL/EMISSIONS STRATEGY
- EPA Tier 2

DESIGN CRITERIA
- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response.

UL 2200
- UL 2200 listed packages available. Certain restrictions may apply. Consult with your Caterpillar Dealer.

FULL RANGE OF ATTACHMENTS
- Wide range of bolt-on system expansion attachments, factory designed and tested

SINGLE-SOURCE SUPPLIER
- Fully prototype tested with certified torsional vibration analysis available

WORLDWIDE PRODUCT SUPPORT
- Caterpillar® dealers provide extensive post sale support including maintenance and repair agreements
- Caterpillar dealers have over 1,600 dealer branch stores operating in 200 countries
- The Cat® S•O•S℠ program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products

CAT 3516C TA DIESEL ENGINE
- Reliable, rugged, durable design
- Field-proven in thousands of applications worldwide
- Four-stroke-cycle diesel engine combines consistent performance and excellent fuel economy with minimum weight

CAT SR4B GENERATOR
- Matched to the performance and output characteristics of Caterpillar engines
- Segregated low voltage AC/DC accessory box provides single point access to accessory connections
- UL 1446 Recognized Class H Insulation

CAT EMCP 3 SERIES CONTROL PANELS
- Simple user friendly interface and navigation
- Scalable system to meet a wide range of customer needs
- Integrated Control System and Communications Gateway

STANDBY 2000 ekW 2500 kVA

60 Hz 1800 rpm 480 Volts

CATERPILLAR®

FACTORY INSTALLED STANDARD & OPTIONAL EQUIPMENT

System	Standard	Optional
Air Inlet	• Single element canister type air cleaner • Service indicator	• Dual element & heavy duty air cleaners (with pre-cleaners) • Air inlet adapters & shutoff
Cooling	• Radiator with guard (43°C) • Coolant drain line with valve • Fan and belt guards • Caterpillar Extended Life Coolant • Low coolant level & high temperature alarm or shutdown	• Radiator duct flange • Jacket water heater
Exhaust	• Dry exhaust manifold • Flanged faced outlets	• Mufflers and Silencers • Stainless steel exhaust flex fittings • Elbows, flanges, expanders & Y adapters
Fuel	• Secondary fuel filters • Fuel priming pump • Flexible fuel lines • Fuel cooler* *Not included with packages without radiators	• Water separator • Duplex fuel filter
Generator SR4B	• Class H insulation • Class F temperature (105°C prime/130°C standby) • Winding temperature detectors(select models)	• Oversize & premium generators • Anti-condensation space heaters • Bearing temperature detector • Stator temperature detector
Power Termination	• Bus bar (NEMA and IEC meachanicallug holes) -right side standard • Top and bottom cable entry	• Circuit breakers, UL listed, 3 pole with shunt trip, 80% or 100% rated, choice of trip units, manual or electrically operated (low voltage only) • Circuit breakers, IEC compliant, 3 or 4 pole with shunt trip (low voltage only), choice of trip units, manual or electrically operated • Shroud cover for bottom cable entry • Power terminations can be located on the left and/or rear as an option. Also, multiple circuit breakers can be ordered (up to 3)
Governor	• ADEM™ 3	• Load share module
Control Panels	• User Interface panel (UIP) - rear mount (standard) • EMCP3.1 Genset Controller • Speed adjust (on panel) • AC&DC customer wiring area (right side) • CAT digital voltage regulator (CDVR) with KVAR/PF control, 3-phase sensing • Emergency Stop Pushbutton	• EMCP 3.3 • Option for right or left mount UIP • Local & remote annunciator modules • Load share module • Discrete I/O module • Generator temperature monitoring & protection • Voltage Adjust (on panel)
Lube	• Lubricating oil and filter • Oil drain line with valves • Fumes disposal • Gear type lube oil pump	• Oil level regulator • Deep sump oil pan • Electric & air prelube pumps • Manual prelube with sump pump • Duplex oil filter
Mounting	• Structual steel tube • Anti-vibration mounts (shipped loose)	• Isolator removal
Starting/Charging	• 24 volt starting motor(s) • Batteries with rack and cables • Battery disconnect switch	• Battery chargers (10&20AMP) •45 amp charging alternator • Oversize batteries • Ether starting aid • Heavy duty starting motors • Barring device (manual) • Air starting motor with control & silencer
General	• Right-hand service • Paint - Caterpillar Yellow except rails and radiators are gloss black • SAE standard rotation • Flywheel and flywheel housing - SAE No. 00	• CSA certification • EU Certificate of Conformance
Note	Standard and optional equipment may vary for UL 2200 Listed Packages. UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics.	

STANDBY 2000 ekW 2500 kVA

60 Hz 1800 rpm 480 Volts

CATERPILLAR

SPECIFICATIONS

CAT GENERATOR

Frame.....825
Excitation..... Permanent Magnet
Pitch..... 0.6667
Number of poles.....4
Number of bearings..... 1
Number of leads.....6
Insulation..... UL 1446 Recognized Class H with tropicalization and antiabrasion
IP Rating.....Drip Proof IP22
Alignment..... Pilot Shaft
Overspeed capability..... 125%
Wave form..... 2%
Paralleling kit/Droop transformer..... Standard
Voltage regulator.3 Phase sensing with selectible volts/Hz
Voltage regulation .....Less than +/- 1/2% (steady state)
Less than +/- 1/2% (w/3% speed change)
Telephone influence factor..... Less than 50
Harmonic distortion..... Less than 5%

CAT DIESEL ENGINE

3516C ATAAC V-16, 4 Stroke, water-cooled diesel
Bore..... 170.00 mm (6.69 in)
Stroke..... 190.00 mm (7.48 in)
Displacement.....69.00 L (4210.64 in³)
Compression Ratio..... 14.7:1
Aspiration..... TA
Fuel System..... Electronic unit injection
Governor Type..... ADEM3

CAT EMCP3 CONTROL PANELS

EMCP 3.1 (standard)
EMCP 3.2 & 3.3 (Optional)
24 Volt DC control
Generator insturments designed to meet UL/CSA/CE
Integral generator terminal box
Single location for customer connection
MODBUS isolated data link (RS0485 half-duplex)
supports serial communication at data rate up to 33.6 kbaud
Auto start/stop control
True RMS metering, 3-phase
• Digital indication for:
-RPM
-Operating hours
-Oil pressure
-Coolant temperature
- System DC volts
--L-L volts, L-N volts, phase amps, Hz
-Ekw, kVA, kVAR, kW-hr, %kW, PF
• Shutdowns with indicating lights for:
-Low oil pressure
-High coolant temperature
- Low coolant level
- Overspeed
-Overspeed
-Emergency stop
- Failure to start (over crank)
• Programmable protective relay functions:
- Under and over voltage
- Under and over frequency
- Reverse power
- Overcurrent (phase & total)
-

STANDBY 2000 ekW 2500 kVA

60 Hz 1800 rpm 480 Volts

CATERPILLAR

TECHNICAL DATA

Open Generator Set - - 1800 rpm/60 Hz/480 Volts	DM8263	
EPA Tier 2		
Generator Set Package Performance		
Genset Power rating @ 0.8 pf	2500 kVA	
Genset Power rating with fan	2000 ekW	
Coolant to aftercooler		
Coolant to aftercooler temp max	50 ° C	122 ° F
Fuel Consumption		
100% load with fan	525.7 L/hr	138.9 Gal/hr
75% load with fan	408.2 L/hr	107.8 Gal/hr
50% load with fan	294.2 L/hr	77.7 Gal/hr
Cooling System[1]		
Air flow restriction (system)	0.12 kPa	0.48 in. water
Air flow (max @ rated speed for radiator arrangement)	2480 m³/min	87580 cfm
Engine Coolant capacity with radiator/exp. tank	475.0 L	125.5 gal
Engine coolant capacity	233.0 L	61.6 gal
Radiator coolant capacity	242.0 L	63.9 gal
Inlet Air		
Combustion air inlet flow rate	180.3 m³/min	6367.2 cfm
Exhaust System		
Exhaust stack gas temperature	405.4 ° C	761.7 ° F
Exhaust gas flow rate	428.6 m³/min	15135.9 cfm
Exhaust flange size (internal diameter)	203.2 mm	8.0 in
Exhaust system backpressure (maximum allowable)	6.7 kPa	26.9 in. water
Heat Rejection		
Heat rejection to coolant (total)	765 kW	43505 Btu/min
Heat rejection to exhaust (total)	1804 kW	102593 Btu/min
Heat rejection to aftercooler	666 kW	37875 Btu/min
Heat rejection to atmosphere from engine	137 kW	7791 Btu/min
Heat rejection to atmosphere from generator	74.7 kW	4248.2 Btu/min
Alternator[2]		
Motor starting capability @ 30% voltage dip	4647 skVA	
Frame	825	
Temperature Rise	130 ° C	234 ° F
Lube System		
Sump refill with filter	401.3 L	106.0 gal
Emissions (Nominal)[3]		
NOx g/hp-hr	5.39 g/hp-hr	
CO g/hp-hr	.29 g/hp-hr	
HC g/hp-hr	.11 g/hp-hr	
PM g/hp-hr	.026 g/hp-hr	

[1] For ambient and altitude capabilities consult your Caterpillar dealer. Air flow restriction (system) is added to existing restriction from factory.

[2] UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40 degree C ambient per NEMA MG1-32.

[3] Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77°F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 btu/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100% load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle.

CATERPILLAR®

RATING DEFINITIONS AND CONDITIONS

Meets or Exceeds International Specifications: AS1359, CSA, IEC60034, ISO 3046, ISO 8528, NEMA MG 1-33, UL508A, 98/37/EC

Standby - Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year. Standby power in accordance with ISO 8528. Fuel stop power in accordance with ISO 3046. Standby ambients shown indicate ambient temperature at 100% load which results in a coolant top tank temperature just below the shutdown temperature.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO 3046 standard conditions.

Fuel rates are based on fuel oil of 35° API [16° C (60° F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.). Additional ratings may be available for specific customer requirements, contact your Caterpillar representative for details. For information regarding Low Sulfur fuel and Biodiesel capability, please consult your Caterpillar dealer.

STANDBY 2000 ekW 2500 kVA

60 Hz 1800 rpm 480 Volts

CATERPILLAR®

DIMENSIONS

Package Dimensions		
Length	6424.6 mm	252.94 in
Width	2378.1 mm	93.63 in
Height	2966.3 mm	116.78 in
Weight	17 307 kg	38,155 lb

NOTE: For reference only - do not use for installation design. Please contact your local dealer for exact weight and dimensions. (General Dimension Drawing #2846051).

Performance No.: DM8263

Feature Code: 516DE5A

Gen. Arr. Number: 2628106

Source: U.S. Sourced

March 04 2008

11953836

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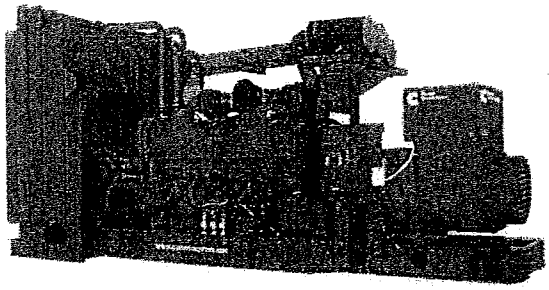
Diesel generator set QSK60 series engine EPA emissions



> Specification sheet
1600 kW - 2000 kW 60 Hz

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Cummins Power Generation

Description

Cummins Power Generation commercial generator sets are fully integrated power generation systems providing optimum performance, reliability and versatility for stationary and prime power applications.

This generator set is designed in facilities certified to ISO9001 and manufactured in facilities certified to ISO9001 or ISO9002.

The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Cummins Power Generation products bearing the PTS symbol meet the prototype test requirements of NFPA 110 for Level 1 systems.

All low voltage models are CSA certified to product class 4215-01.

The generator set is available Listed to UL 2200, Stationary Engine Generator Assemblies. The PowerCommand control is Listed to UL 508 - Category NITW7 for U.S. and Canadian usage. Circuit breaker assemblies are UL 489 Listed for 100% continuous operation and also UL 869A Listed Service Equipment.

U.S. EPA Engine certified to U.S. EPA Nonroad Source Emissions Standards, 40 CFR 89, Tier 2.

Features

Cummins® heavy-duty engine - Rugged 4-cycle, industrial diesel delivers reliable power, low emissions and fast response to load changes.

Alternator - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads and fault clearing short-circuit capability.

Permanent magnet generator (PMG) - Offers enhanced motor starting and fault clearing short-circuit capability.

Control system - The PowerCommand® electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, precise frequency and voltage regulation, alarm and status message display, AmpSentry™ protection, output metering, auto-shutdown at fault detection and NFPA 110 Level 1 compliance.

Cooling system - Standard integral set-mounted radiator system, designed and tested for rated ambient temperatures, simplifies facility design requirements for rejected heat.

NFPA - The genset accepts full rated load in a single step in accordance with NFPA 110 for Level 1 systems.

Warranty and service - Backed by a comprehensive warranty and worldwide distributor network.

	Standby rating		Prime rating		Continuous rating		Data sheets	
Model	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz kW (kVA)	50 Hz kW (kVA)	60 Hz	50 Hz
DQKAA	1750 (2188)		1600 (2000)				D-3335	
DQKAB	2000 (2500)		1825 (2281)				D-3336	

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S-1514d (2/08)

Generator set specifications

Governor regulation class	ISO8528 Part 1 Class G3
Voltage regulation, no load to full load	± 0.5%
Random voltage variation	± 0.5%
Frequency regulation	Isochronous
Random frequency variation	± 0.25%
Radio frequency emissions compliance	IEC 801.2 through IEC 801.5; MIL STD 461C, Part 9

Engine specifications

Design	4 cycle, V-block, turbocharged and low temperature air aftercooled
Bore	158.8 mm (6.25 in)
Stroke	190.0 mm (7.48 in)
Displacement	60.2 litres (3673 in^3)
Cylinder block	Cast iron, 60°V 16 cylinder
Battery capacity	2200 amps minimum at ambient temperature of -18 °C to 0 °C (0 °F to 32 °F)
Battery charging alternator	40 amps
Starting voltage	24 volt, negative ground
Fuel system	Cummins modular common rail
Fuel filter	Dual element, 10 micron filtration, spin-on fuel filters with 15 micron water separator
Air cleaner type	Dry replaceable element oil filters
Lube oil filter type(s)	Four spin-on, combination full flow filter and bypass filters
Standard cooling system	High ambient radiator

Alternator specifications

Design	Brushless, 4 pole, revolving field
Stator	2/3 pitch
Rotor	Single bearing, flexible disc
Insulation system	Class H on low and medium voltage, Class F on high voltage
Standard temperature rise	150 °C standby
Exciter type	PMG (permanent magnet generator)
Phase rotation	A (U), B (V), C (W)
Alternator cooling	Direct drive centrifugal blower fan
AC waveform total harmonic distortion	< 5% no load to full linear load, < 3% for any single harmonic
Telephone influence factor (TIF)	< 50 per NEMA MG1-22.43
Telephone harmonic factor (THF)	< 3

Available voltages

60 Hz line-neutral/line-line				50 Hz line-neutral/line-line			
• 219/380	• 277/480	• 2400/4160	• 7620/13200	• 220/380	• 240/415	• 1905/3300	• 3810/6600
• 254/440	• 347/600	• 7200/12470	• 7970/13800	• 230/400	• 254/440	• 3640/6300	• 6350/11000

* Note: Consult factory for other voltages.

Generator set options and accessories

Engine
- ☐ 208/240/480 V coolant heater for ambient above 4.5 °C (40 °F)
- ☐ 208/240/480 V coolant heater for ambient below 4.5 °C (40 °F)

Control panel
- ☐ 120/240 V, 100 W control anti-condensation space heater
- ☐ Paralleling configurations
- ☐ Remote fault signal package
- ☐ Run relay package

Alternator
- ☐ 80 °C rise alternator
- ☐ 105 °C rise alternator
- ☐ 125 °C rise alternator
- ☐ 120/240 V, 300 W anti-condensation heater
- ☐ Temperature sensor - RTDs, 2/phase
- ☐ Temperature sensor – alternator bearing RTD
- ☐ Differential current transformers

Exhaust system
- ☐ Industrial grade exhaust silencer
- ☐ Residential grade exhaust silencer
- ☐ Critical grade exhaust silencer

Cooling system
- ☐ Remote radiator cooling

Generator set
- ☐ AC entrance box
- ☐ Batteries
- ☐ Battery rack w/hold-down - floor standing
- ☐ Circuit breaker - set mounted
- ☐ Disconnect switch - set mounted
- ☐ PowerCommand Network
- ☐ Remote annunciator panel
- ☐ Spring isolators
- ☐ 2 year warranty
- ☐ 5 year warranty
- ☐ 10 year major components

* Note: Some options may not be available on all models - consult factory for availability.

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Power Generation

Control system

Operator panel features

Analog AC metering panel - Provides color-coded display of generator set output voltage, current, frequency, power factor and kW. All phases of voltage and current are simultaneously displayed. Easy to see output status from a distance.

Graphical data display - Allows operator to view all engine and alternator data; perform operator adjustments for speed, voltage and time delays; view fault history; and set up and adjust the generator set (set up requires password access). A portion of the display is allocated to display system status including alarm and shutdown conditions. Display is controlled by sealed membrane switches. Up to 9 lines of data can be displayed with approximately 26 characters per line.

LED status lamps - The status lamps indicate remote start command (green), not in auto (red-flashing), warning (amber) and shutdown (red).

Mode selector switch - Off/manual/auto and run/stop switches allow remote automatic starting or manual starting from the operator panel. Panel includes an LED lamp to indicate manual mode operation.

Exerciser switch - Automated exercise function in the control allows an operator to initiate an exercise period and have it automatically completed by the control.

Fault reset switch - Allows the operator to reset the control after a warning or shutdown condition. LED lamp with switch indicates that a fault is present on the system.

Panel lamps and switch - Operator panel can be illuminated by a series of high-intensity LED lamps controlled by a membrane switch on the panel. Panel lamps include a time delay to automatically switch off after a preset time period.

Emergency stop switch - Provides positive and immediate shutdown of the generator set on operation.

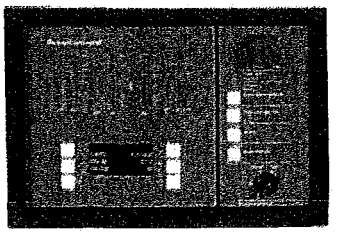
Construction - Operator panel is a sealed design with membrane switches for most functions. Mechanical switches are oil-tight design. Plug interfaces are provided to the generator set control system. Display panel labeling is configurable for language.

Standard control functions

- Integrated Isochronous governing and fuel control system.
- Integrated 3-phase sensing voltage regulation system with automatic single and three phase fault regulation.
- Integrated AC protective functions include over/under voltage, short-circuit, overcurrent (warning and shutdown) and overload.
- Integrated engine management system including configurable cycle-cranking functions and configurable start sequence.
- Comprehensive warning and shutdown protection including customer configurable warning and shutdown conditions.
- Comprehensive data displays including 3-phase AC voltage, current, power factor, kW and kVA; engine oil pressure, coolant temperature, DC volts and other service functions; operating history (load and fault conditions) and system setup information.

Options

- ☐ Integrated digital paralleling controls including options for semi-automatic and automatic (isolated bus) applications.
- ☐ LonMark compliant network interface.
- ☐ Control anti-condensation heater.
- ☐ Key-type mode select switch.
- ☐ Relay outputs for genset running, common warning and common shutdown.
- ☐ Exhaust temperature alarm.
- ☐ Alternator temperature alarm(s).
- ☐ Centinel™ lube oil burn system.
- ☐ Power transfer control function to allow generator set to control remote power circuit breakers for open, fast closed or soft (ramping) power transfer from a utility source to the genset (2 minute maximum fail-to-disconnect timer).



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Power Generation

Ratings definitions

Emergency standby power (ESP):

Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Limited-time running power (LTP):

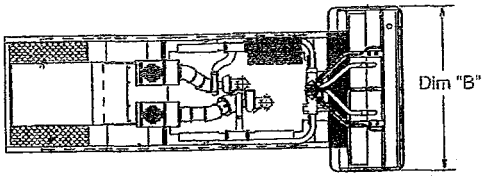
Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.

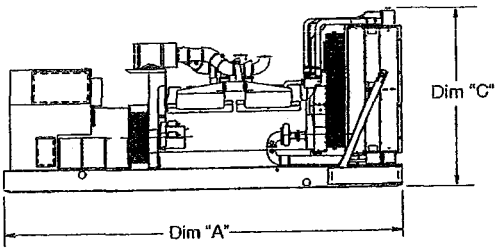
Prime power (PRP):

Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.

Base load (continuous) power (COP):

Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.





This outline drawing is for reference only. See respective model data sheet for specific model outline drawing number.

Do not use for installation design

Model	Dim "A" mm (in.)	Dim "B" mm (in.)	Dim "C" mm (in.)	Set Weight* dry kg (lbs)	Set Weight* wet kg (lbs)
DQKAA	6175 (243)	2534 (100)	3043 (120)	15231 (33569)	15396 (33932)
DQKAB	6175 (243)	2534 (100)	3043 (120)	17382 (38309)	17908 (39470)

* Note: Weights represent a set with standard features. See outline drawings for weights of other configurations.

Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432 USA
Telephone: 763 574 5000
Fax: 763 574 5298

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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Power Generation

Power Generation

Exhaust Emission Data Sheet
2000DQKAB
60 Hz Diesel Generator Set

Engine Information:

Model:	Cummins Inc. QSK60-G6 NR2	Bore:	6.25 in. (158 mm)
Type:	4 Cycle, 60°V, 16 Cylinder Diesel	Stroke:	7.48 in. (189 mm)
Aspiration:	Turbocharged and Low Temperature aftercooled	Displacement:	3673 cu. in. (60.1 liters)
Compression Ratio:	14.5:1		
Emission Control Device:	Aftercooled		

	1/4 Standby	1/2 Standby	3/4 Standby	Full Standby	Full Prime	
PERFORMANCE DATA						
BHP @ 1800 RPM (60 Hz)	730	1460	2189	2919	2639	
Fuel Consumption (gal/Hr)	43.9	76.4	105.8	137.9	124.7	
Exhaust Gas Flow (CFM)	6510	10220	12000	14920	13780	
Exhaust Gas Temperature (°F)	772	838	873	893	884	
EXHAUST EMISSION DATA						
HC (Total Unburned Hydrocarbons)	0.38	0.32	0.23	0.23	0.25	
NOx (Oxides of Nitrogen as NO2)	3.18	3.04	4.60	5.11	5.02	
CO (carbon Monoxide)	0.65	0.40	0.19	0.21	0.16	
PM (Particular Matter)	0.20	0.12	0.03	0.04	0.03	
SO2 (Sulfur Dioxide)	0.13	0.12	0.10	0.10	0.10	
Smoke (Bosch)	0.65	0.52	0.19	0.24	0.15	

All Values are Grams/HP-Hour, Smoke is Bosch #

TEST CONDITIONS

Data was recorded during steady-state rated engine speed (± 25 RPM) with full load (±2%). Pressures, temperatures, and emission rates were stabilized.

Fuel Specification:	46.5 Cetane Number, 0.035 Wt.% Sulfur; Reference ISO8178-5, 40CFR86.1313-98 Type 2-D and ASTM D975 No. 2-D.
Fuel Temperature:	99 ± 9 °F (at fuel pump inlet)
Intake Air Temperature:	77 ± 9 °F
Barometric Pressure:	29.6 ± 1 in. Hg
Humidity:	NOx measurement corrected to 75 grains H2O/lb dry air
Reference Standard:	ISO 8178

The NOx, HC, CO and PM emission data tabulated here were taken from a single engine under the test conditions shown above. Data for the other components are estimated. These data are subjected to instrumentation and engine-to-engine variability. Field emission test data are not guaranteed to these levels. Actual field test results may vary due to test site conditions, installation, fuel specification, test procedures and instrumentation. Engine operation with excessive air intake or exhaust restriction beyond published maximum limits, or with improper maintenance, may results in elevated emission levels.

Model: 2000REOZM

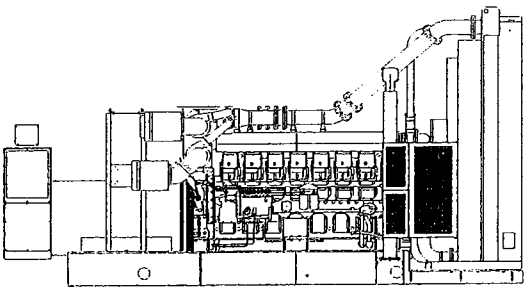
KOHLER POWER SYSTEMS

380-4160 V **Diesel**

ISO 9001
KOHLER POWER SYSTEMS
NATIONALLY REGISTERED

Ratings Range

		60 Hz	50 Hz
Standby:	**kW**	1590-2000	1496-1760
	kVA	1988-2500	1870-2200
Prime:	**kW**	1440-1820	1376-1600
	kVA	1800-2275	1720-2000



Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- At 60 Hz, the generator set accepts rated load in one step.
- The 60 Hz generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- The generator set complies with ISO 8528-5, Class G3, requirements for transient performance.
- A one-year limited warranty covers all systems and components. Two-, five-, and ten-year extended warranties are also available.
- Alternator features:
  - The pilot-excited, permanent-magnet (PM) alternator provides superior short-circuit capability.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - The generator set is direct-mounted to the skid.

Generator Set Ratings

				150°C Rise Standby Rating		130°C Rise Standby Rating		125°C Rise Prime Rating		105°C Rise Prime Rating	
Alternator	**Voltage**	**Ph**	**Hz**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**	**kW/kVA**	**Amps**
7M4054	220/380	3	60	1590/1988	3020	1590/1988	3020	1440/1800	2735	1440/1800	2735
	240/416	3	60	1840/2300	3192	1840/2300	3192	1800/2250	3123	1680/2100	2915
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
	220/380	3	50	1584/1980	3008	1528/1910	2902	1496/1870	2841	1400/1750	2659
	230/400	3	50	1624/2030	2930	1536/1920	2771	1536/1920	2771	1424/1780	2569
	240/416	3	50	1608/2010	2790	1496/1870	2595	1496/1870	2595	1376/1720	2357
7M4056	220/380	3	60	1850/2313	3513	1790/2238	3400	1750/2188	3324	1650/2063	3134
	240/416	3	60	2000/2500	3470	1950/2438	3383	1820/2275	3157	1780/2225	3088
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
	220/380	3	50	1760/2200	3343	1760/2200	3343	1600/2000	3039	1600/2000	3039
	230/400	3	50	1760/2200	3175	1760/2200	3175	1600/2000	2887	1600/2000	2887
	240/416	3	50	1760/2200	3053	1736/2170	3012	1600/2000	2776	1568/1960	2720
7M4058	220/380	3	60	2000/2500	3798	1950/2438	3703	1820/2275	3457	1790/2238	3400
	240/416	3	60	2000/2500	3470	2000/2500	3470	1820/2275	3157	1820/2275	3157
	277/480	3	60	2000/2500	3007	2000/2500	3007	1820/2275	2736	1820/2275	2736
	220/380	3	50	1760/2200	3343	1744/2180	3312	1600/2000	3039	1600/2000	3039
	230/400	3	50	1760/2200	3175	1760/2200	3175	1600/2000	2887	1600/2000	2887
	240/416	3	50	1760/2200	3053	1760/2200	3053	1600/2000	2776	1600/2000	2776
7M4176	220/380	3	60	2000/2500	3798	2000/2500	3798	1820/2275	3457	1820/2275	3457
7M4292	347/600	3	60	2000/2500	2406	2000/2500	2406	1820/2275	2189	1820/2275	2189
7M4374	2400/4160	3	60	2000/2500	347	2000/2500	347	1820/2275	316	1820/2275	316
	1905/3300	3	50	1744/2180	381	1600/2000	350	1600/2000	350	1448/1810	317

RATINGS: All three-phase units are rated at 0.8 power factor. *Standby Ratings:* Standby ratings apply to installations served by a reliable utility source. The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Ratings are in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. *Prime Power Ratings:* Prime power ratings apply to installations where utility power is unavailable or unreliable. At varying load, the number of generator set operating hours is unlimited. A 10% overload capacity is available for one hour in twelve. Ratings are in accordance with ISO-8528/1, overload power in accordance with ISO-3046/1, BS 5514, AS 2789, and DIN 6271. For limited running time and base load ratings, consult the factory. Obtain the technical information bulletin (TIB-101) on ratings guidelines for the complete ratings definitions. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. GENERAL GUIDELINES FOR DERATION: *Altitude:* Derate 2.5% per 300 m (984 ft.) elevation above 1500 m (4921 ft.). *Temperature:* Derate 11.5% per 10°C (18°F) temperature above 40°C (104°F) up to a maximum temperature of 55°C (131°F).

Alternator Specifications

Specifications	Alternator
Type	4-Pole, Rotating-Field
Exciter type	Brushless, Permanent-Magnet Pilot Exciter
Voltage regulator	Solid State, Volts/Hz
Insulation:	NEMA MG1
Material	Class H, Synthetic, Nonhygroscopic
Temperature rise	130°C, 150°C Standby
Bearing: quantity, type	1, Sealed
Coupling	Flexible Disc
Amortisseur windings	Full
Rotor balancing	125% 60 Hz
Voltage regulation, no-load to full-load (with <0.5% drift due to temp. variation)	3-Phase Sensing, ±0.25%
One-step load acceptance	100% of Rating
Unbalanced load capability	100% of Rated Standby Current
Peak motor starting kVA:	(35% dip for voltages below)
380 V 7M4176 (4 bus bar)	5400 (60Hz)
480 V, 380 V 7M4054 (4 bus bar)	7000 (60Hz), 4800 (50 Hz)
480 V, 380 V 7M4056 (4 bus bar)	7200 (60Hz), 5200 (50 Hz)
480 V, 380 V 7M4058 (4 bus bar)	11000 (60Hz), 6600 (50 Hz)
600 V 7M4292 (4 bus bar)	4250 (60Hz)
4160 V, 3300 V 7M4374 (6 lead)	6200 (60Hz), 3750 (50 Hz)

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- Superior voltage waveform from two-thirds pitch windings and skewed stator.
- Digital solid-state, volts-per-hertz voltage regulator with ±0.25% no-load to full-load regulation.
- Brushless alternator with brushless pilot exciter for excellent load response.

Application Data

Engine

Engine Specifications	60 Hz	50 Hz
Engine model	D2000 65.4A60	D2000 65.4A50
Engine type	4-Cycle, Turbocharged, Air-to-Air Charge Cooled	
Cylinder arrangement	16 V	
Displacement, L (cu. in.)	65.4 (3989)	
Bore and stroke, mm (in.)	170 x 180 (6.69 x 7.09)	
Compression ratio	14.0:1	
Piston speed, m/min. (ft./min.)	648 (2126)	540 (1772)
Main bearings: quantity, type	7, Precision Half-Shell	
Rated rpm	1800	1500
Max. power at rated rpm, kWm (BHP)	2150 (2882)	1939 (2599)
Cylinder head material	Cast Iron	
Crankshaft material	Forged Steel	
Governor type	Electronic	
Frequency regulation, no-load to full-load	Isochronous	
Frequency regulation, steady state	±0.25%	
Frequency	Fixed	
Air cleaner type, all models	Dry	

Exhaust

Exhaust System	60 Hz	50 Hz
Exhaust manifold type	Dry	
Exhaust flow at rated kW, m^3/min. (cfm)	479 (16913)	434 (15325)
Exhaust temperature at rated kW, dry exhaust, °C (°F)	519 (966)	536 (997)
Maximum allowable back pressure, kPa (in. Hg)	5.9 (1.7)	
Exhaust outlet size at engine hookup, mm (in.)	See ADV drawing	

Engine Electrical

Engine Electrical System	60 Hz	50 Hz
Battery charging alternator:		
Ground (negative/positive)	Negative	
Volts (DC)	24	
Ampere rating	30	
Starter motor rated voltage (DC)	Dual, 24	
Battery, recommended cold cranking amps (CCA):		
Quantity, CCA rating each	Four, 1150	
Battery voltage (DC)	12	

Fuel

Fuel System	60 Hz	50 Hz
Fuel supply line, min. ID, mm (in.)	25 (1.0)	
Fuel return line, min. ID, mm (in.)	19 (0.75)	
Max. lift, engine-driven fuel pump, m (ft.)	1 (3)	
Max. fuel flow, Lph (gph)	660 (174)	560 (148)
Max. fuel pump restriction, kPa (in. Hg)	10 (3.0)	
Fuel filter: quantity, type	4, Secondary	
Recommended fuel	#2 Diesel	

Lubrication

Lubricating System	60 Hz	50 Hz
Type	Full Pressure	
Oil pan capacity, L (qt.)	200 (211)	
Oil pan capacity with filter, L (qt.)	250 (264)	
Oil filter: quantity, type	4, Cartridge	
Oil cooler	Water-Cooled	

Application Data

Cooling

Radiator System	60 Hz	50 Hz
Ambient temperature °C (°F)	40 (105)	
Engine jacket water capacity, L (gal.)	170 (44.9)	
Radiator system capacity, including engine, L (gal.)	413 (109)	
Engine jacket water flow, Lpm (gpm)	1850 (489)	1650 (436)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	686 (38999)	623 (35401)
Heat rejected to charge cooling air at rated kW, dry exhaust, kW (Btu/min.)	633 (36000)	575 (32677)
Water pump type	Centrifugal	
Fan diameter, including blades, mm (in.)	1895 (75)	
Fan kWm (HP)	44 (59)	
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H_2O)	0.125 (0.5)	

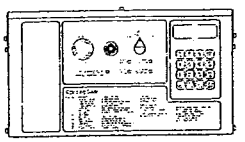
Operation Requirements

Air Requirements	60 Hz	50 Hz
Radiator-cooled cooling air, m^3/min. (scfm)†	2500 (88275)	
Combustion air, m^3/min. (cfm)	181 (6391)	164 (5791)
Heat rejected to ambient air:		
Engine, kW (Btu/min.)	158 (9000)	144 (8169)
Alternator, kW (Btu/min.)	97 (5516)	

† Air density = 1.20 kg/m^3 (0.075 lbm/ft^3)

Fuel Consumption	60 Hz	50 Hz
Diesel, Lph (gph) at % load	**Standby Rating**	
100%	509 (134.5)	462 (122.1)
75%	381 (100.6)	338 (89.2)
50%	261 (69.0)	231 (61.0)
25%	147 (38.9)	128 (33.9)
Diesel, Lph (gph) at % load	**Prime Rating**	
100%	461 (121.9)	415 (109.7)
75%	348 (92.0)	309 (81.5)
50%	243 (64.2)	214 (56.5)
25%	142 (37.4)	122 (32.2)

Controllers



Decision-Maker™ 550 Controller
Audiovisual annunciation with NFPA 110 Level 1 capability.
Programmable microprocessor logic and digital display features.
Alternator safeguard circuit protection.
12- or 24-volt engine electrical system capability.
Remote start, remote annunciation, and remote communication options.
Refer to G6-46 for additional controller features and accessories.

KOHLER CO., Kohler, Wisconsin 53044 USA
Phone 920-565-3381, Fax 920-459-1646
For the nearest sales and service outlet in the
US and Canada, phone 1-800-544-2444
KohlerPower.com

Kohler Power Systems
Asia Pacific Headquarters
7 Jurong Pier Road
Singapore 619159
Phone (65) 6264-6422, Fax (65) 6264-6455

Additional Standard Features

- Alternator Protection
- Alternator Strip Heater (standard on 3300 volt and above)
- Electronic, Isochronous Governor
- Oil Drain Extension
- Operation and Installation Literature

Available Accessories

Open Unit

- ☐ Exhaust Silencer, Hospital (kit: PA-361627)
- ☐ Exhaust Silencer, Critical (kit: PA-361625)
- ☐ Flexible Exhaust Connector, Stainless Steel

Cooling System

- ☐ Block Heater
  [recommended for ambient temperatures below 20°C (68°F)]
- ☐ Radiator Duct Flange

Fuel System

- ☐ Flexible Fuel Lines
- ☐ Fuel Pressure Gauge
- ☐ Subbase Fuel Tank with Day Tank

Electrical System

- ☐ Battery
- ☐ Battery Charger, Equalize/Float Type
- ☐ Battery Heater
- ☐ Battery Rack and Cables

Engine and Alternator

- ☐ Air Cleaner, Heavy Duty
- ☐ Air Cleaner Restriction Indicator
- ☐ Alternator Strip Heater (available up to 600 volt)
- ☐ Bus Bar Kits (standard on 7M alternators, 380-600 volt only)
- ☐ Crankcase Emissions Canister
- ☐ Fuel/Water Separator
- ☐ Line Circuit Breaker (NEMA type 1 enclosure)
- ☐ Line Circuit Breaker with Shunt Trip (NEMA type 1 enclosure)
- ☐ Oil Temperature Gauge
- ☐ Rated Power Factor Testing
- ☐ Spring Isolators

Paralleling System

- ☐ Load-Sharing Module
- ☐ Voltage Adjustment Control (manual)

Maintenance

- ☐ General Maintenance Literature Kit
- ☐ Maintenance Kit (includes air, oil, and fuel filters)
- ☐ NFPA 110 Literature
- ☐ Overhaul Literature Kit
- ☐ Production Literature Kit

Controller

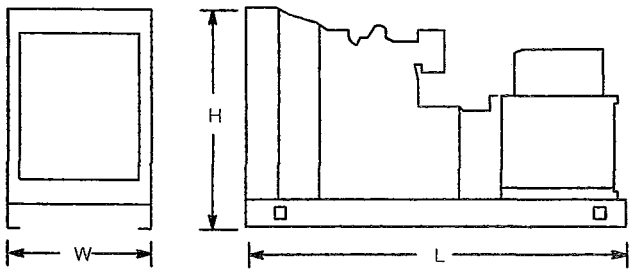
- ☐ Common Failure Relay Kit
- ☐ Communication Products and PC Software
- ☐ Customer Connection Kit
- ☐ Dry Contact Kit (isolated alarm)
- ☐ Remote Annunciator Panel
- ☐ Remote Audiovisual Alarm Panel
- ☐ Remote Emergency Stop Kit
- ☐ Remote Mounting Cable
- ☐ Run Relay Kit

Miscellaneous Accessories

- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____
- ☐ _____

Dimensions and Weights

Overall Size, L x W x H, max., mm (in.):	6005 x 2212 x 3244 (236.4 x 87.1 x 127.7)
Weight (radiator model), wet, max., kg (lb.):	15876 (35000)



Note: This drawing is provided for reference only and should not be used for planning the installation. Contact your local distributor for more detailed information.

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A Proposal

for

Apache Powder

and

10mW Interactive Distributed Generation® Services

to serve

Sulphur Springs Valley Electric Cooperative, Inc.®

A Touchstone Energy Cooperative

PowerSecure

Interactive Distributed Generation®

Confidential and Proprietary

PowerSecure ♦ 1609 Heritage Commerce Ct. ♦ Wake Forest, NC ♦ 27587
1-866 DG SKILL (347-5455)

Power Secure
Interactive Distributed Generation®

1609 Heritage Commerce Ct.
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Tel: 919-556-3056
Fax: 919-556-3596
www.powersecure.com

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September 13, 2006

Ron Orozco, PE
Engineering Manager
Sulphur Springs Valley Electric Cooperative, Inc.
311 E. Wilcox Drive
Sierra Vista, AZ 85635

RE: PowerSecure 2250kW Interactive Distributed Generation® Services
SSVEC/Apache Powder
Benson, AZ

Dear Ron;

We are pleased to submit this proposal to provide SSVEC with PowerSecure Interactive Distributed Generation® (IDG®) Services. We will provide a 2250kW Standby; 2000kW Prime; 480Y/277V – 12.47kVY IDG® System to serve the Standby, Load Curtailment and Load Management needs of SSVEC and your Apache Powder customer. This letter and the attached **Exhibits** will serve as our formal **Agreement.**

PowerSecure and our local contractor will provide this IDG® System on a turnkey basis including:

- ✓ Engineering/Design
- ✓ Generation Equipment
- ✓ *NexGear®* Advanced Paralleling Switchgear
- ✓ IDG® System Installation
- ✓ Equipment and Installation Warranties
- ✓ In-service Training
- ✓ *Annual* NexGear®Switchgear Maintenance Services
- ✓ Optional Environmental Permitting Assistance

A **Scope of Services** can be found in **Exhibit A**. **Exhibit B** includes our **Quotation** and **Standard Terms and Conditions** for this project. We would expect this project to be completed within 42 weeks from authorization to proceed. This schedule could be excelerated to 24 weeks if we received a notice to proceed by October 15, 2006.

Our payment terms will be as follows:

Upon	% of Contract
Agreement Signing	30%
Receipt of IDG® System Submittal	20%
Equipment Shipping Date to Site	25%
Substantial Completion of Installation	15%
Final Commissioning/Start-up	10%
Total	100%

Please let us know if you have any questions. If you are in agreement with this letter and the attached Exhibits, please sign in the space allotted below and return a copy to me at your earliest convenience.

Thank you again for this opportunity. We look forward to hearing from you.

Sincerely,

Mark S, Martyak, PE
Executive Vice President

cc: SH, Steve Hodgin, PR

Accepted:

_____ _____

SSVEC Date

SCOPE OF POWERSECURE SERVICES

I. General

A. PowerSecure (PS) will provide 2250kW Standby; 2000kW Prime; 480Y/277-12.47kVY Interactive Distributed Generation® (IDG®) System to serve SSVEC and your Apache Powder Customer.

B. PS will provide a recloser, power transformer, instrument transformers, secondary power/control wiring and auxiliary equipment necessary for interconnection of the IDG® System at the customer's site per this proposal.

C. We understand that SSVEC will provide the following scope:

1. Two (2) In-Line Poles
2. Installation of PS-furnished Recloser, PT's and CTS
3. Fused Cut-outs
4. Primary Service Drop to PS-provided power transformer
5. All fuel including initial fill

D. PS will deliver the IDG® System project, as described in this Exhibit on a complete turnkey basis including:

1. Engineering/Design
2. Generation Equipment
3. *NexGear®* Advanced Paralleling Switchgear
4. IDG® System Installation
5. Equipment and Installation Warranties
6. In-service Training
7. Annual NexGear® Maintenance Services
8. **Optional** Environmental Permitting Assistance

D. PS will deliver the project in the following estimated timeframe:

Milestone	**Completion (*Week No*)**	
	Base Schedule	Alt. Schedule
Agreement Signing	0	0
Receipt of IDG® System Submittal	4	4
Equipment Shipping Date to Site	38	16
Substantial Completion of Installation	40	20
Final Commissioning/Start-up	42	24

E. Refer to the enclosed drawings which illustrate the proposed IDG® System.

II. Engineering/Design Services

A. PS will provide all engineering and design services necessary to complete construction documents for this project in accordance with the State of AZ.

B. PS will prepare construction documents signed and sealed by a Registered Professional Engineer of Record in AZ.

III. Generation System

A. The Generation System will include:

1. Engine Generator Set rated at 480Y/277 volts; 2250kW (Standby); 2000kW (Prime), .8pf; 2812.5kVA.
2. Permanent Magnet Generator
3. Electronic Engine Governor
4. Charging Alternator 24V
5. Lead Acid Batteries, Rack and Battery Charger
6. Engine Cooling System
7. Exhaust System with Silencer
8. Double Wall (UL142), 3000 Gallon Sub-base Tank with Level Sensors.
9. Weather Resistant Enclosure
10. Lubricating Oil and Antifreeze – Initial fill
11. Sound Attenuation to 85 db at 23 ft including:

B. Add Alternate #1 – Bi Fuel Injection System

1. PS will provide a Bi-Fuel Injection System enabling the diesel engine generator to operate from 30 to 100% diesel fuel and 0% to 70% natural gas.
2. SSVEC would be responsible for providing a natural gas service line to the IDG®System Enclosure capable of providing 14,000 CFH @ 2 to 5 psi.

C. Add Alternate #2 – Pre Owned Selected Catalytic Reducer (SCR)

1. PS would provide a Pre Owned, Reconditioned Selected Catalytic Reducer to reduce NOx by a minimum of 95%.
2. This Add Alternate is strictly dependent upon the continued availability of this existing SCR in PowerSecure's inventory.

IV. NexGear® Advanced Paralleling Switchgear

A. We will provide a *NexGear®* Advanced Paralleling Switchgear (APS) to provide the following Modes of Operation:

1. **Load Management Mode**: Long-term Synchronized/Parallel Operation with SSVEC.

2. **Curtailment:** Short-term Synchronized Operation with SSVEC followed by a Make-Before-Break Separation from SSVEC.

3. **Standby Mode:** Automatic, Dead Bus, Block Load Transfer of a maximum of 2000kW during SSVEC outages.

B. Each APS will include all necessary functions to prevent connection or parallel operation of the IDG® System with SSVEC, unless the service voltage and frequency are of normal magnitude.

V. IDG® System Installation

A. PS will combine our in-house IDG® Project Management staff with a reputable local licensed electrical contractor or utilize our in house licensed electrical construction group to provide a fully coordinated high quality installation.

B. The PS Project Manager will serve as the single point interface with SSVEC and AP during construction/start-up and will be present on-site for all critical activities and key construction milestones.

VI. Equipment and Installation Warranties

A. The entire system will be Warranted for One Year.

B. We are also offering an Optional Extended 5 Year Warranty for your consideration.

VII. In-Service Training

A. PS will provide onsite in-service training on the operation and maintenance of the IDG® System.

VIII. Optional Emissions/Environmental Permitting Assistance

A. PowerSecure, will aid SSVEC and AP in the application of all environmental related permits that are required by the various federal and state agencies.

B. PowerSecure will prepare all application documents for the above-mentioned permits and will allow/request Environmental Management of SSVEC and AP to review all documents prior to submission such to avoid conflicts or impacts to the environmental strategy of SSVEC and AP Neither construction nor operation will be started until proper authority has been granted and evidence of that authority has been provided to appropriate officials within SSVEC and AP.

Power Secure

Exhibit B
Interactive Distributed Generation® Services
SSVEC/Apache Powder
Benson, AZ

Sulphur Springs Valley Electric Cooperative, Inc.

Confidential and Proprietary

I. TURNKEY INSTALLATION OF A POWERSECURE IDG® AS DESCRIBED IN EXHIBIT A INCLUDES:

- Engineering
- Generator/Enclosure
- *NexGear®* Switchgear
- Installation
- IDG® System One-Year Warranty
- In Service Training

Subtotal Turnkey Installation*	**$867,800**
Add Alternate #1 – Bi-Fuel	**$42,600**
Add Alternate #2 – SCR	**$106,000**

II. ANNUAL NexGear® Switchgear Maintenance SERVICES	**$3,200**
III. OPTIONAL EXTENDED (Five Year) WARRANTY	**$25,600**

Notes*

- Does Not Include Sales Tax
- Refer to Standard Terms and Conditions
- Quote Good For 60 Days

POWERSECURE - CONTRACT TERMS AND CONDITIONS

1. **Description of Services**

1.1 Subject to the conditions set forth in this Contract, POWERSECURE agrees to furnish labor, supervision, equipment, materials, and transportation necessary to provide the services described in the attached POWERSECURE proposal (the "Work").

1.2 POWERSECURE shall be entitled to rely on the accuracy of any information provided by Customer, which is hereby warranted by Customer to be accurate and correct. In the event of any unforeseen costs incurred due to the inaccuracy of any such information, the compensation payable to POWERSECURE shall be equitably adjusted to compensate for any such additional costs.

1.3 POWERSECURE shall exercise reasonable efforts to complete the Work in accordance with the estimated schedule specified in POWERSECURE's proposal, but is not responsible for costs incurred by customer due to late delivery or completion of the Work.

2. **Services Fee and Terms of Payment**

2.1 Customer shall pay POWERSECURE the contract price specified in POWERSECURE's proposal (the "Contract Price") within 30 days from the date of completion of the Work, unless otherwise provided in POWERSECURE's proposal. If Customer fails to pay Contract Price by the due date, Customer shall liable to POWERSECURE for any attorney fees incurred in collection of any amount due and shall pay interest to POWERSECURE on the amount past due in the amount of 1.5% per month.

2.2 Any work beyond the scope of Work described herein requested of and performed by POWERSECURE ("Additional Work") shall be billed to Customer at POWERSECURE's then current standard rates, unless otherwise agreed to in writing by the parties.

2.3 The prices for the Work and any Additional Work are exclusive of federal, state, municipal or other sales or use tax. If POWERSECURE is required by applicable law to pay or collect any such taxes on account of Work provided in fulfilling this contract, then such amount of tax and any penalties and interest thereon shall be reimbursed to POWERSECURE. Unless a Sales Tax Certificate is provided to POWERSECURE, the invoice will include a line item for sales tax.

3. **Customer's Obligations**

3.1 Customer shall be responsible to provide necessary access to and around the work site to enable POWERSECURE to perform the Services proposed herein. POWERSECURE shall have the right to suspend Work and recover additional costs in the event that there is inadequate access to the work site, or in the event that continuing with the Work might jeopardize the safety of any person or property.

3.2 Customer shall provide any necessary plans, specifications, drawings, or information that may be necessary or useful in the performance of the Work and any Additional Work at no cost to POWERSECURE.

4. **Permits and Regulatory Requirements**

If compliance with any laws, regulations, or ordinances of any government authority or agency, require any changes in the Work or services proposed herein, or should any permits, licenses, or approvals be required, Customer assumes the risk and responsibility for such compliance or change, or for securing such permits, licenses, and approvals from the proper authorities, and for paying any associated costs or fees, unless specifically stated otherwise within this proposal.

5. **Limitation of Liability**

The remedies set forth in this Contract are Customer's sole and exclusive remedies. Neither POWERSECURE nor its employees, its subcontractors or suppliers shall be liable for any indirect, special, incidental, exemplary, or consequential loss or damage of any nature arising out of or in connection with their performance or non-performance hereunder. In no event shall POWERSECURE's liability arising out of or in connection with the performance or non-performance of the Work or any Additional Work exceed the total of the Contract Price as set forth in POWERSECURE's proposal. The provisions of this Section 5 shall apply whether such liability arises in contract, tort (including negligence), strict liability, or otherwise.

6. **Insurance**

POWERSECURE represents and warrants that it has met all requirements under North Carolina law with regard to workers' compensation and automobile liability coverage.

7. **Force Majeure**

In no event shall POWERSECURE be responsible for any damages arising out of any failure to perform or delay due to any cause beyond POWERSECURE's reasonable control. In such event, POWERSECURE shall be entitled to an extension of time as necessary to overcome the cause of the failure to perform or delay.

8. **Use of Subcontractors**

POWERSECURE shall be permitted to use subcontractors to perform the work specified herein. Notwithstanding the use of subcontractors, POWERSECURE shall continue to be responsible for the quality of the work and any Additional Services under the provisions of Section 4.

9. **Non-Waiver**

The failure of either party to insist upon the performance of any term or condition of this Contract or to exercise any right hereunder on one or more occasions, shall not constitute a waiver or relinquishment of its right to demand future performance of such term or condition, or to exercise such right in the future.

10. **Governing Law**

The laws of the State of North Carolina shall govern this Contract, except that the North Carolina conflict-of-laws provisions shall not be invoked in order to apply the laws of another state or jurisdiction.

11. **Warranty**

POWERSECURE only warrants that the installation services performed by POWERSECURE or subcontractors as part of the Work shall be free from defects in material and workmanship for a period of 1 year from the completion of the Work or any Additional Work. In the event that Customer notifies POWERSECURE of any defect in materials or workmanship that is covered by this warranty within such twelve (12) month period, POWERSECURE shall correct the defect at its own expense. POWERSECURE shall not be responsible for any problems or defects attributable to improper operation, maintenance, or use of the Work or any Additional Work, or attributable to any cause beyond POWERSECURE's reasonable control. THE WARRANTIES SET FORTH ABOVE ARE EXCLUSIVE, AND NO OTHER WARRANTIES OR REMEDIES OF ANY KIND, WHETHER STATUTORY, WRITTEN, ORAL, EXPRESS, OR IMPLIED, INCLUDING WITHOUT LIMITATION WARRANTIES OF INFRINGMENT, MERCHANTABILITY, AND FITNESS FOR A PARTICULAR PURPOSE, OR WARRANTIES ARISING FROM COURSE OF DEALING OR USAGE OF TRADE, SHALL APPLY. TO THE MAXIMUM EXTENT PERMITTED, POWERSECURE HEREBY ASSIGNS TO CUSTOMER ALL EXPRESS AND IMPLIED WARRANTIES FROM THE MANUFACTURER OF ANY PARTS AND EQUIPMENT INSTALLED BY POWERSECURE AS A PART OF THE WORK (see Manufacturer's warranties for details). POWERSECURE MAKES NO ADDITIONAL WARRANTY FOR ANY PARTS OR EQUIPMENT SUPPLIED HEREUNDER. NO REPRESENTATIONS ARE MADE BY POWERSECURE WITH RESPECT TO THE QUALITY, WORKMANSHIP OR SUITABILITY OF ANY EQUIPMENT OR PARTS PROVIDED UNDER THIS CONTRACT. Except as provided in Section 8, POWERSECURE shall not be responsible for any work done by others or for any loss, damage, cost or expense arising out of or resulting from such work, unless authorized by POWERSECURE in advance.

12. **Entire Agreement**

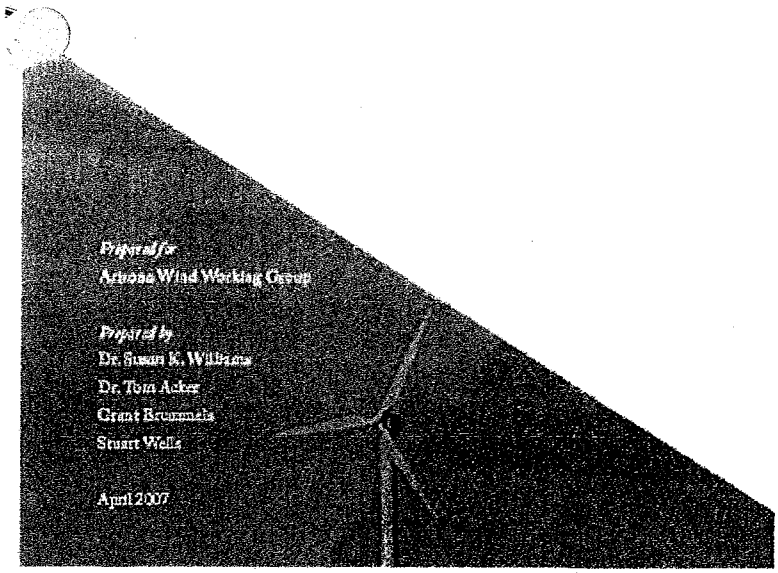
This Contract embodies the entire agreement between POWERSECURE and Customer. Any purchase order or acknowledgement issued by Customer is issued only for administrative purposes and any additional or conflicting terms and conditions appearing therein shall be void and of no effect. The parties shall not be bound by or liable for any statement, writing, representation, promise, inducement, or understanding not set forth above. In the event of any conflict between a proposal letter and the terms of this Contract, this Contract shall control. No changes, modifications, or amendments to any terms and conditions in this Contract are valid or binding unless agreed to by the parties in writing by their authorized representatives.

SSVEC _____ *Date* _____

SSVEC

Renewable Research

Arizona Wind Energy Assessment – April 2007



Arizona Wind Energy Assessment Executive Summary

Developable Windy Land and Economic Benefits:

Apache County
Cochise County
Coconino County
Graham County
Mohave County
Navajo County

Developable Windy Land:

Greenlee County
Yavapai County

Above are links to the Arizona Wind Energy Assessment reports for eight Arizona counties. For six of the counties, Apache, Cochise, Coconino, Graham, Mohave, and Navajo, the report contains both an analysis of the developable windy land and an economic benefits analysis. For Greenlee Yavapai only the developable wind energy analysis is provided.

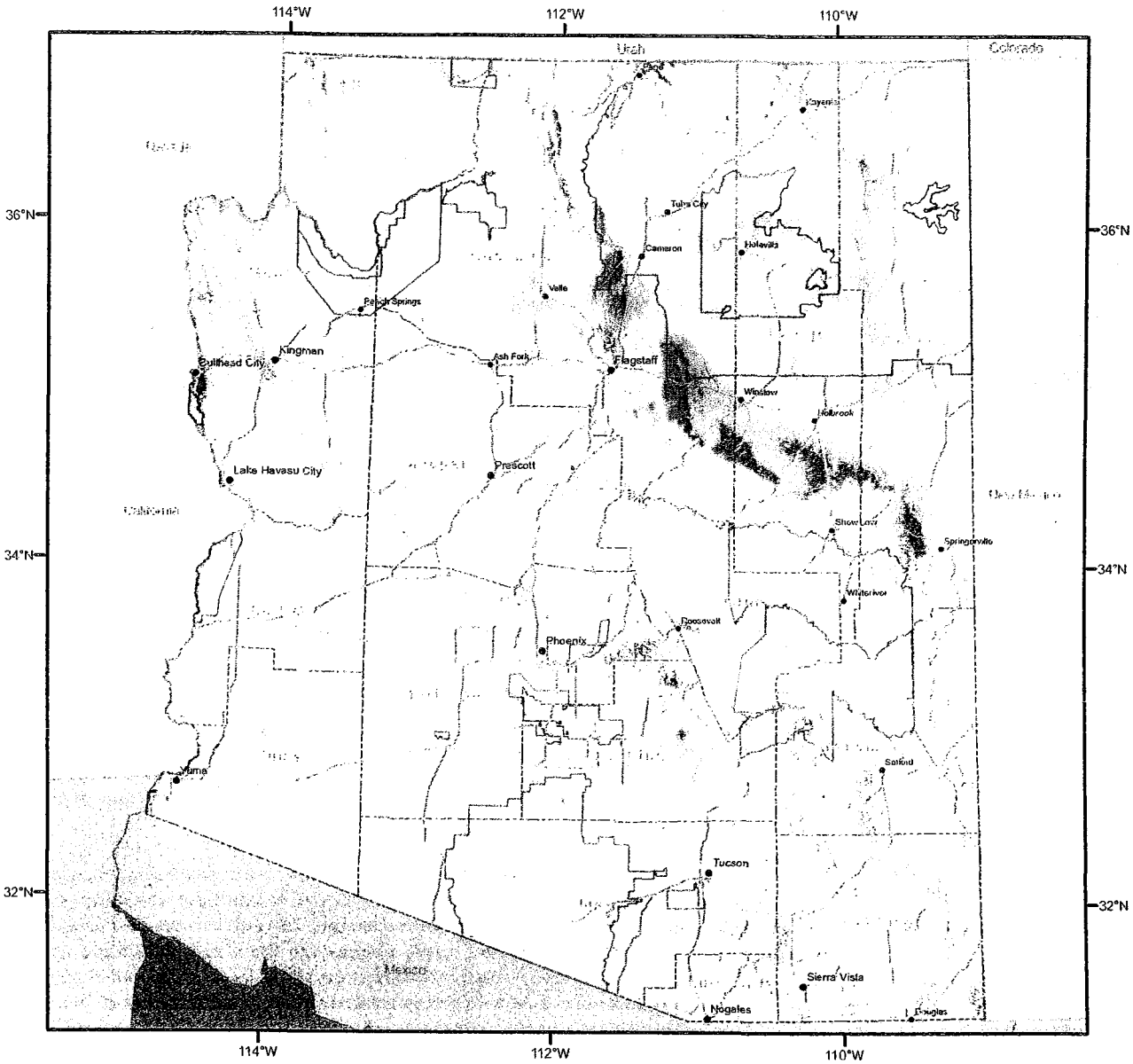
The amount of *developable windy land* in each county was determined in the first analysis. Based on the TrueWind map acquired by NAU in 200 which is the best available representation of the Arizona wind resource, the windy land for each county was determined. An extensive geographic information system analysis was then used to exclude any land not appropriate for wind development. This included land use exclusions (i.e., National Park Service land), environmental exclusions (i.e., wetlands) and any land with slopes greater than 20% (expensive to develop). More details on the exclusions are described in the reports. The remaining land, *developable windy land*, is the windy land that may be accessible for wind energy development.

Some of this developable windy land is appropriate for development in the near term based upon site specific project economics, land access, and transmission access/availability. These reports made no attempt to apply these additional development criteria because they are project specific and subject to relatively rapid change, but rather assessed the developable wind resource that the state may access over a long term planning horizon (years to decades). In a long-term view, as our traditional energy resources become more costly and the wind turbine technology continues to improve, greater portions of the developable windy land will be appropriate for development based upon these project specific metrics (economics, land and transmission access). The developable windy land information thus is an estimate of the maximum one would expect could be developed in the long term.

The second analysis estimated the economic benefits that would occur *within* the county if a wind energy project were developed in that county. The benefits are quantified by the number of jobs, wages and salaries, and general economic output within the county as a result of the construction and operation of the wind energy project. The economic benefits reported are valid for wind energy projects in these counties that may occur in the near term (present day through the next several years). The magnitudes of the wind energy project sizes analyzed are typical of what one may expect to be built in Arizona in the near term.

State of Arizona

Average Annual Wind Resource 164 ft (50m)



Created by: Grant Brummels
Date of Creation: 7/6/2005
For more information contact:
Dr. Earl Duque
Earl.Duque@nau.edu

Projection:
UTM, Zone 12, WGS84
Spatial Resolution of
Wind Resource Data: 200m

Sustainable
Energy Solutions
www.ses.nau.edu

NORTHERN
ARIZONA
UNIVERSITY

Wind Power Classification

Wind Power Class	Wind Power Density (W/m^2)	Wind Speed (mph)
1 Poor	0 - 200	0.0 - 12.3
2 Marginal	200 - 300	12.3 - 14.1
3 Fair	300 - 400	14.1 - 15.7
4 Good	400 - 500	15.7 - 16.8
5 Excellent	500 - 600	16.8 - 17.9
6 Outstanding	600 - 800	17.9 - 19.7
7 Superb	> 800	> 19.7

Legend

- County Boundary
- Indian Reservation
- Rivers and Water Bodies
- Major Roads

N
W E
S

0 12.5 25 50 75 100
Miles

NORTHERN ARIZONA UNIVERSITY

Sustainable Energy Solutions

Arizona Wind Energy Assesment

Cochise County

Developable Windy Land and Economic Benefits

Prepared for

Arizona Wind Working Group

Prepared by

Dr. Susan K. Williams

Dr. Tom Acker

Grant Brummels

Stuart Wells

April 2007

Acknowledgements

We would like to thank Dr. Michael Milligan and Dr. Suzanne Tegen at NREL for review and comments on this report. We would also like to thank Mr. Marshal Goldberg of MRG Associates who provided county multipliers and also reviewed and commented on this report. The report has benefited greatly from their expertise.

This work was funded by US Department of Energy, Wind Powering America Program through the Arizona Wind Working Group.

The College of Business Administration at Northern Arizona University provided matching funds for the publication of this report.

Abstract

This report contains two wind energy analyses for the southern-Arizona's Cochise County. In the first analysis, the developable wind energy capacity was estimated using a geographic information system. Specifically, the amount of windy land by wind class in each county was determined. Development exclusions were then applied and the developable windy land was determined. The wind energy potential in Cochise County was estimated to be 275 MW. The majority of developable windy land, 80%, was Class 3.

The second analysis determined the economic impact of constructing a wind energy project in Coconino County. Utilizing National Renewable Energy Laboratory's Job and Economic Development Impact (NREL's JEDI) model in conjunction with Monte Carlo simulation, economic benefits categorized by jobs, earnings, and economic output were estimated for three different sized wind energy projects, 10.5 MW, 60 MW and 180 MW.

For a 10.5 MW wind energy project

- *Jobs during construction*: median was 5 jobs
- *Jobs during operations and maintenance phase (O&M phase)*: median was 2 jobs
- *Earnings during construction*: the median was $0.13 million
- *Earnings during O&M phase*: median was $0.08 million annually
- *Output (economic activity) during construction*: median was $0.56 million
- *Output during O&M phase*: median was $0.17 million annually

For a 60 MW wind energy project

- *Jobs during construction*: median was 27 jobs
- *Jobs during operations and maintenance phase (O&M phase)*: median was 11 jobs
- *Earnings during construction*: the median was $0.76 million
- *Earnings during O&M phase*: median was $0.43 million annually
- *Output (economic activity) during construction*: median was $3.21 million
- *Output during O&M phase*: median was $0.98 million annually

For a 180 MW wind energy project

- *Jobs during construction*: median was 80 jobs
- *Jobs during operations and maintenance phase (O&M phase)*: median was 33 jobs
- *Earnings during construction*: the median was $2.27 million
- *Earnings during O&M phase*: median was $1.29 million annually
- *Output (economic activity) during construction*: median was $9.59 million
- *Output during O&M phase*: median was $2.92 million annually

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Introduction

The wind energy development potential and economic benefits were determined for a southern Arizona county, Cochise (see Figure 1). Using Geographic Information System (GIS) techniques on wind map data an estimate was made of the amount of developable windy land and potential installed capacity. Secondly, an analysis was made of the economic impacts of constructing and operating wind energy projects utilizing the Job and Economic Development Impact* (JEDI) model developed for National Renewable Energy Laboratory (NREL). Wind energy projects of three representative sizes were considered: 10.5 MW, 60 MW, and 180 MW. The JEDI model was used in conjunction with Monte Carlo simulation to estimate economic impacts at the county level. Direct, indirect and induced economic effects were estimated and categorized by jobs, earnings, and output (economic activity).

The wind maps and information in this report are *not* appropriate for siting wind energy projects. It is useful for discussing policy and locations that might be appropriate for further study. In order to site a wind energy project, an anemometer should be installed on the property and two years of data collected. More Arizona wind maps are available at www.ses.nau.edu.

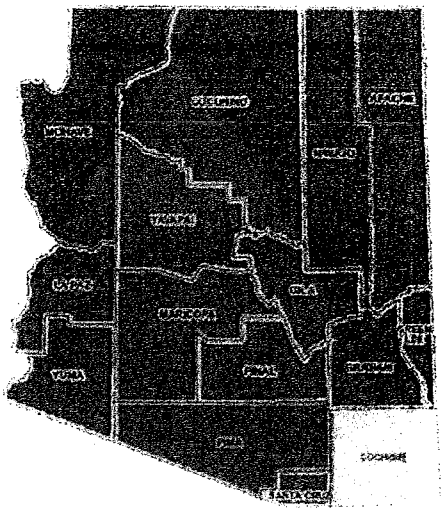

Figure 1 Cochise County in northern Arizona

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* The JEDI model was designed by Marshall Goldberg, of MRG & Associates, under contract with NREL.The model is posted on the Wind Powering America website: http://www.eere.energy.gov/windandhydro/windpoweringamerica/filter_detail.asp?itemid=107 in June 2005.

State of Arizona

According to the US Census Bureau Quick Facts[1] the population in the state of Arizona increased 40% from 1990 to 2000. During this period US population increased 13.1%. Due to this rapid population and economic growth, electricity demand increased at the rate of 2.6% per year[2].

In 2001, the average electricity retail price for Arizona residents and businesses was 7.2 cents/kwh. This is the 16th highest average electricity price in the nation behind the six New England states, New York, New Jersey, Pennsylvania, California, Alaska, Hawaii, Texas, Florida, and Nevada. In addition to Arizona's increasing population, the hot climate and resulting need for air conditioning in the summer affect the increasing demand and price of electricity. Arizona has a larger than average residential demand largely due to the demand for air conditioning. The residential sector purchases 41% of the electricity as compared to 36% nationally[2].

Arizona primarily relies on coal and nuclear fuels for electrical generation. In 2000, approximately 45% of electricity was coal-generated and 35% was nuclear with only 10% generated from natural gas and another 10% by hydroelectric. However, the balance will be shifting to natural gas in the future as there are 16,000 MW of planned generation units by 2007, of which 15,000 MW are planned to be natural gas[2].

Cochise County

Cochise County, in southeastern Arizona, is 6,219 square miles with a 2001 population of 121,040. The area is known for mining and agriculture. Historic Tombstone may be its most widely recognized town though Bisbee is the county seat and Sierra Vista is the largest community with a population of 40,415 in 2003[3]. Demographic information is given in Table 1[4] and industry sector information is given in Table 2[5]. The largest land ownership category in Cochise County, approximately 40% is individual and corporate ownership (see Table 3)[3].

Table 1 Cochise County Demographics

Demographic	Cochise
Population, 2005 estimate	126,106
Population, percent change, April 1, 2000 to July 1, 2005	7.1%
Population, percent change, 1990 to 2000	20.6%
High school graduates, percent of persons age 25+, 2000	79.5%
Bachelor's degree or higher, pct of persons age 25+, 2000	18.8%
Per capita money income, 1999	$15,988
Median household income, 2003	$34,755
Persons below poverty, percent, 2003	16.3%
Private nonfarm establishments, 2003	2,256
Private nonfarm employment, 2003	25,122
Private nonfarm employment, percent change 2000-2003	10.8%
Retail sales, 2002 ($1000)	917,299
Retail sales per capita, 2002	$7,641
Land area, 2000 (square miles)	6,169
Persons per square mile, 2000	19.1
Metropolitan or Micropolitan Statistical Area	Sierra Vista-Douglas

Table 2 Cochise County Industry Sectors

Industry Sectors in Cochise County	Percent	Employed
Agriculture, forestry, fishing and hunting, and mining	3.3	1418
Construction	7.4	3,164
Manufacturing	3.9	1649
Wholesale trade	1.4	615
Retail trade	14.7	6,264
Transportation and warehousing, and utilities	4.9	2,108
Information	2.4	1024
Finance, insurance, real estate, and rental and leasing	4	1695
Professional, scientific, management, administrative, and waste management services	7.9	3359
Educational, health and social services	20.3	8,640
Arts, entertainment, recreation, accommodation and food services	9.9	4,226
Other services (except public administration)	5.6	2389
Public administration	14.3	6,075

Table 3 Land Ownership in Cochise County

Land owner	Cochise
Private	40%
State of AZ	35%
US Forest Service & BLM	22%
Other public lands	3%
	100%

Windy Land Analysis using GIS

Methodology

For the purpose of this analysis, *windy land* is defined as land with a wind resource greater than or equal to class three as predicted by the Arizona Wind Map (the wind map will be discussed in the section on Input Data). That is, predicted average annual wind speeds are large enough that wind energy may be produced economically. However, not all windy land may be developed for wind power. There are many *development exclusions* that must be considered. For instance, land that is owned by the National Park Service must be excluded 100% from consideration for development. *Developable windy land*, therefore, is the windy land that remains after all development exclusions have been applied. Finally, *excluded windy land* is windy land (class 3 and above) that falls within a development exclusion.

Consistent with the methodology applied by NREL, there are three general *exclusion* categories of land unsuitable for development[6]:

- environmental exclusions
- land use exclusions
- additional windy land factors

These development exclusions are summarized in Table 4. Any windy land with 1 or more exclusion is excluded windy land and is not appropriate to be used for wind energy projects. After removing excluded windy land, the remaining land is developable and an estimate of the potential installed capacity by wind class for each county was made by assuming a conservative 5 MW of installed capacity per square kilometer.

Input Data for Windy Land Analysis

TrueWind Solutions, in collaboration with NREL, developed a high-resolution wind map and GIS data for the state of Arizona in 2003. The data for this wind map was created using a numerical weather model coupled with climactic data and a wind flow model. The wind map provides 200-meter resolution data sufficient for identifying the most promising areas for wind development in the state. The data from this map was used to analyze the wind resource of Cochise County.

A *data layer* is a geographic data set that can be represented visually using GIS software. Several data layers were required for the exclusion analysis. The data layers, their exclusion category (environmental, land use, other factors), source and brief description are listed in Table 4.

Table 4 Wind Development Exclusions

Broad Exclusion Category	Exclusion	Exclusion[†] Percentage	Exclusion Description	GIS Layer Source
Environmental Exclusions	**National Park Service**	100%	United States National Park Service Land	ALRIS [‡]
	Fish and Wildlife Service	100%	United States Fish and Wildlife service	ALRIS
	Congressionally Specially Designated Areas	100%	Special Areas, like wilderness or wild, and scenic rivers, congressionally designated as such	USFS
	Inventoried Roadless Areas	100%	These are roadless areas of the country on federal land that have been congressionally designated as such	USFS
	State and Other Environmental Land (State GAP Data)	100%	Land Stewardship Layer (includes Nature Conservancy Land available)	USGS AZ ReGAP
	Other: Wildlife, Wilderness and Recreation Areas on Federal land of any designation (predominately USFS and BLM lands)	100%	Land Stewardship Layer (includes Nature Conservancy Land available)	USGS AZ ReGAP[§]
	Remaining USFS & DOD Land	50%	United States Forest Service and Department of Defense lands that remain after all other windy land exclusions are removed	ALRIS
Land Use Exclusions	**Urban/Developed Areas**	100%	Urban or Developed land as described by USGS ReGAP data	USGS AZ ReGAP
	Airports	100%	Airports	National Atlas of the United States, USGS, ESRI
	Wetlands	100%	Wetland ecosystems as described by USGS ReGAP data	USGS AZ ReGAP
	Water bodies (includes seasonal and dry lakes)	100%	Areas covered by water all year or part of the year. Does not include Rivers and Streams	USGS AZ ReGAP
	Non-ridge Crest Forests	50%	Areas of forest cover that are not considered ridge crests by TPI analysis	ReGAP + TPI [**]
Additional Windy Land Factors	**Slopes > 20%**	100%	These are landscapes with slopes greater than 20%	Grant Brummels

[†] Windy land exclusions were excluded 100%, with the exception of "non-ridge crest forests" and "remaining USFS and DOD Land," which were excluded 50%. Additionally, all 100% exclusions were buffered 3km, except for wetlands (100m), open water (no buffer), and slopes > 20% (no buffer).[†] Non-ridge crest forests have had all 100% exclusions removed. Remaining USFS and DOD land has had all non-ridge crest forests and 100% exclusions removed.

[‡] ALRIS—Arizona Land Resource Information System

[§] ReGAP—Regional Gap Analysis Program, 30m satellite data

[**] Jenness, J. 2005. Topographic Position Index (tip_jen.avx) extension for ArcView 3.x. Jenness Enterprises. Available at: http://www.jennessent.com/arview/tpi.htm. TPI was applied to a 90m Digital Elevation Model.

Results of Windy Land Analysis

The windy land in Cochise County is shown in Figure 2. Using GIS, the square kilometers of land was then totaled by wind class. Approximately 2.2% of the land is considered windy land. Of the windy land, the majority is class 3.

The development exclusions for Cochise County are mapped in Figure 3. As displayed, the land areas highlighted in blue show the areas that cannot be developed for wind energy regardless of how windy since this land was classified as a development exclusions. In Cochise County, 3.0% of the total county land area is classified as development exclusions.

Exclusions are significant in Cochise County – 90% of windy land is excluded from consideration for development. See Figure 4 to compare the wind class breakdown of the amount of windy land with the wind class breakdown of the amount of developable windy land. When exclusions are considered, much of the excluded windy land is higher than class 3. As a result, the proportional amounts of class 4 and above decrease with a corresponding increase in the proportional amount of class 3.

Some land is excluded under multiple categories. For instance, land may have a slope greater than 20% and also be an Inventoried Roadless Area. The largest exclusion affecting windy land is Slopes>20% and excludes 67% of windy land. Other exclusion categories that remove windy land are given in Table 5. The percentages will not add to 100% because trivial categories have not been included and because some land is excluded by multiple categories.

Table 6 provides a summary of the results of the windy land analysis for Cochise County. Organized by wind class, the total area of windy land, area of developable windy land, and potential developable capacity are shown. These tables also show that the total developable capacity in Cochise County, including class 3 or better windy lands, is 276 MW. When restricting this estimate to windy lands of class 4 or better, the developable capacity for these counties is 56 MW. Finally, the developable windy land is shown in Figure 5.

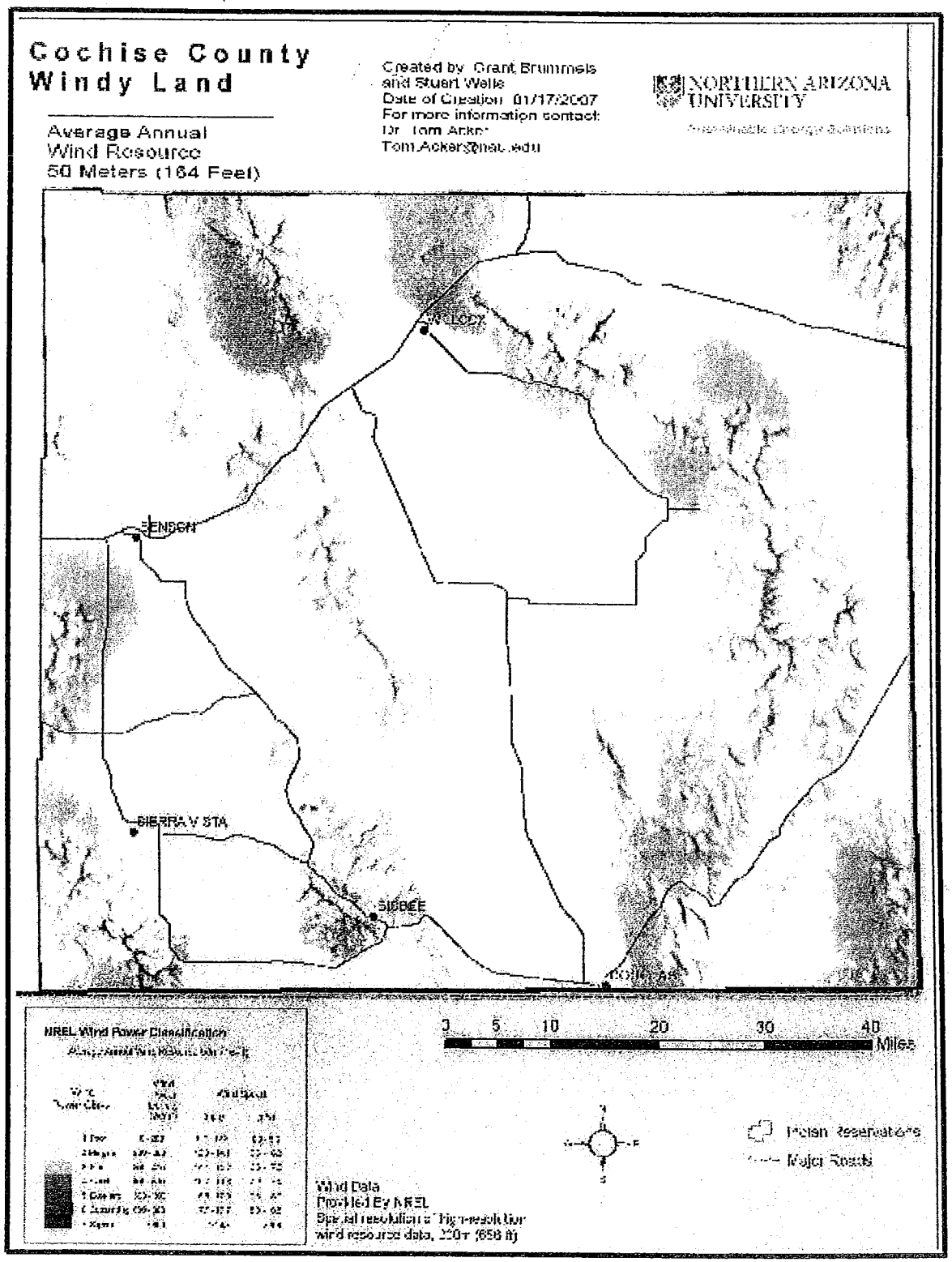

Figure 2 Map of Windy Land for Cochise County, AZ

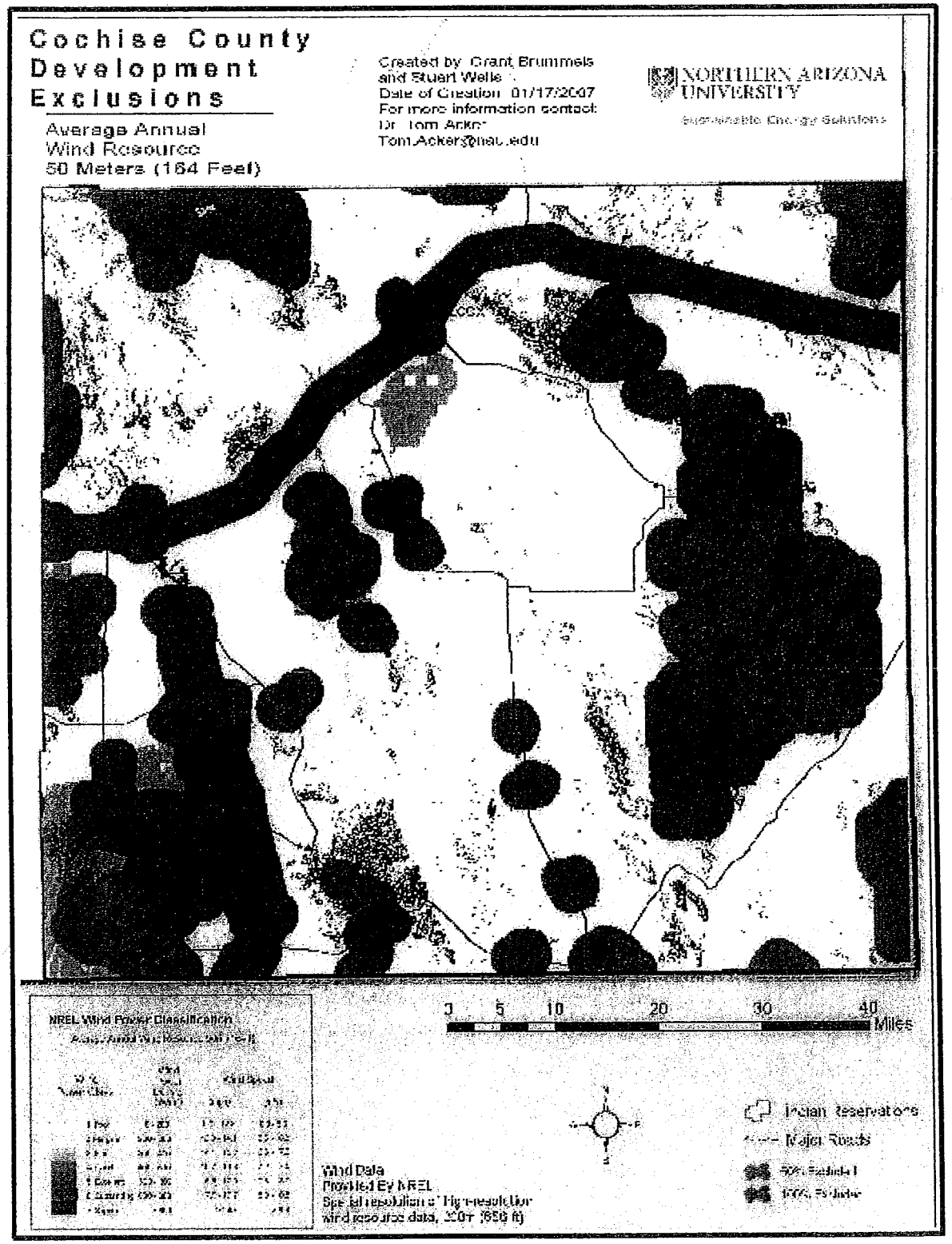

Figure 3 Map of Development Exclusions in Cochise County

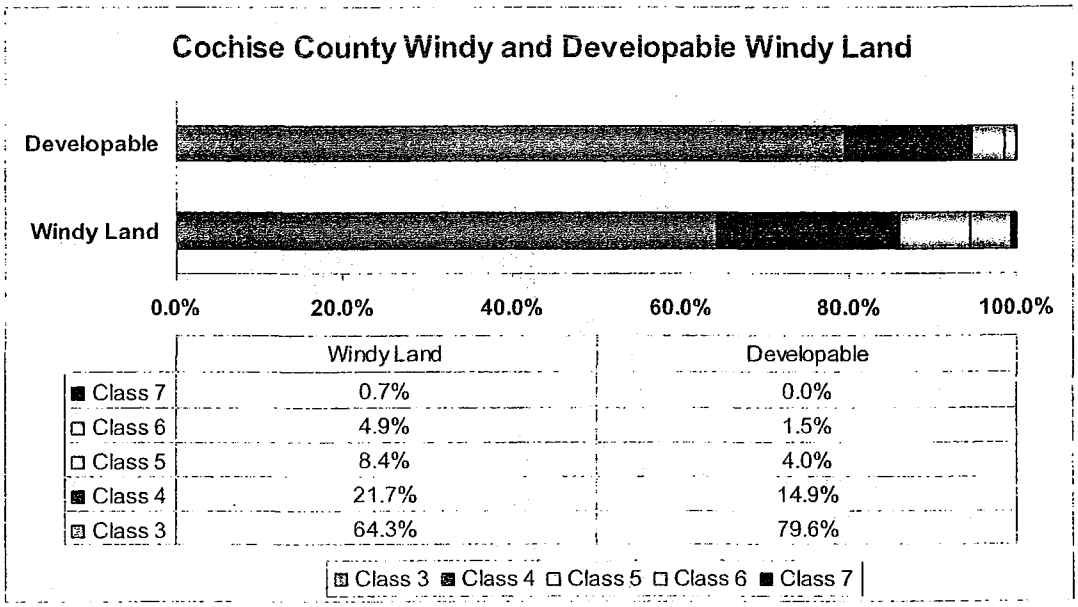

Figure 4 Windy Land by Wind Class for Cochise County

Table 5 Cochise County Exclusion Categories that Remove Windy Land

Exclusion Category	Windy Land Excluded
Slopes > 20%	67.1%
Inventoried Roadless Areas	45.2%
Environmental Lands	32.9%
Specially Designated Areas	18.5%

Table 6 Windy Land and Developable Windy Land in Cochise County

Cochise County Wind Class Area Analysis						
Wind Class	Power (w/m^2)	Total Area (km^2)	Windy Land as Percent of Total Land Area	Developable Windy Land (km^2)#	Developable Windy Land as Percent of Total Land Area	Developable Installed Capacity (MW)*
3	300-400	354	1.38%	44	0.17%	220
4	400-500	119	0.47%	8	0.03%	41
5	500-600	46	0.18%	2	0.01%	11
6	600-800	27	0.10%	1	0.00%	4
7	>800	4	0.02%	0	0.00%	0
		16,212	Cochise County Total			276

*Assuming 5 MW per sq. km.
#Exclusions determined using GIS analysis

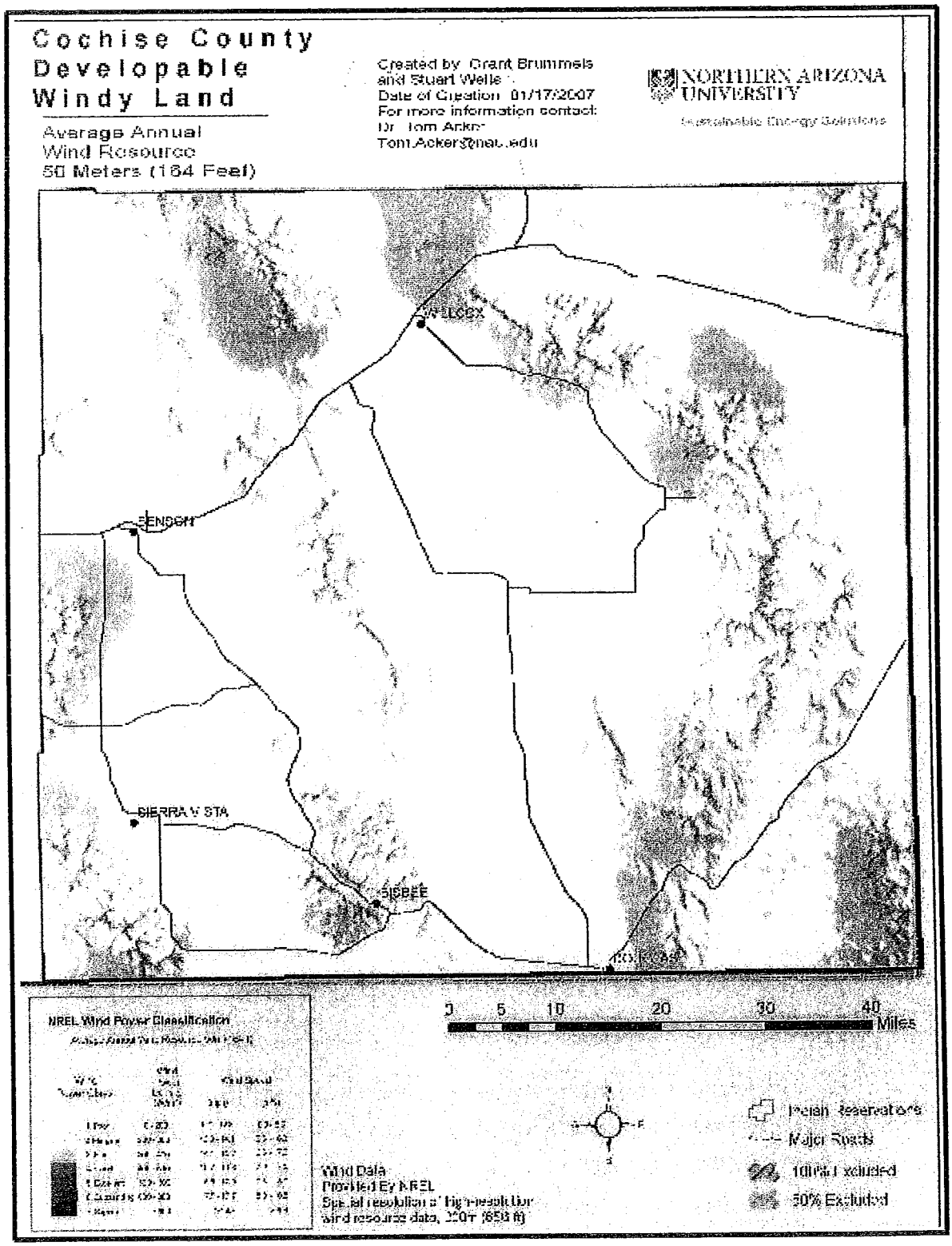

Figure 5 Map of Developable Windy Land for Cochise County

Economic Impact Analysis

In this study, economic input/output (I/O) analysis in conjunction with Monte Carlo simulation was used to estimate the economic impact for wind energy projects. The JEDI model performs I/O analysis with an Excel add-in, *@Risk*[7], used to perform the Monte Carlo simulation.

In I/O analysis, a project expenditure may have up to three impacts on the local economy:

- **Direct effects** – on-site effect created by expenditure (i.e., on-site jobs of contractors and crews, jobs at the turbine).
- **Indirect effects** – increase in economic activity that occurs when a contractor, vendor or manufacturer receives payment for goods or services and in turn is able to pay others who support their business.
- **Induced effects** – change in wealth and income that is induced by the spending of those persons directly and indirectly employed by the project (i.e., spending on food, clothes, utilities, transportation, insurance, medical, etc.).

The results of I/O analysis estimate these effects (direct, indirect, and induced) on the jobs, earnings, and economic output.

Methodology

JEDI Model

JEDI is a spreadsheet economic input/output model that accepts wind project data and estimates the direct, indirect, and induced effects of the expenditure to build and operate a wind energy project. The model separates a wind energy project into two distinct phases: construction phase and operations and maintenance (O&M) phase. The construction phase is approximately a year while the O&M phase is from the time the project is brought on-line until it is decommissioned. JEDI estimates the jobs, earnings, and economic activity for the one-time impact of the construction phase and the annual impact of the O&M phase.

JEDI was designed for users that have a variety of experience-levels in I/O analysis or with wind energy projects. To obtain results from JEDI, a user can input as little as the year of installation, the size of the project, and the state for which the economic impacts will be estimated. The remaining input has default values designed for a state-level analysis. As the user gains additional experience or information about the project, additional details can be entered into the model[8].

Why Monte Carlo simulation?

Monte Carlo simulation is a statistical simulation technique which allows input parameters that are uncertain to be randomly varied over a specified range of values. Multiple trials of the Monte Carlo model allow the user to observe and average the results of the output.[9] @Risk by Palisade Corporation[8], an add-in to Microsoft Office Excel, was utilized for Monte Carlo simulation.[10] Using Monte Carlo simulation in conjunction with the I/O analysis provided two advantages over an analysis with JEDI only:

1) Increased input flexibility – cost estimates may be entered as a range of values instead of a single estimate.

2) Increased output information –a range of output values was obtained instead of a single value.

The data required by the JEDI model to estimate the economic impact of constructing and operating a wind energy project can be difficult to accurately estimate. Some input parameters are specific to the site and design. However, estimates for economic impacts are often desired before a site and design have been selected. In addition some of this data is proprietary and industry norms must be relied on to estimate the parameters.

The approach in other work[11,12] has been to use a single estimate representing the most likely value or industry average. For each of the outputs, the JEDI model then produced a single value. By using Monte Carlo simulation any input parameters can be approximated by a range of input values. For each of these input parameters, three estimates were determined: (1) the most likely estimate, (2) the minimum estimate, and (3) the maximum estimate.

Running a simulation with these input parameters as random variables provides an expected value and a variance of the output variables. Therefore, the output is a range of values instead of a single number. This provides a measure of certainty or risk: the smaller the range, the more certainty in the results. When using the JEDI model, the economic impact is estimated using six measures: jobs during construction phase, jobs during O&M phase, earnings during construction phase, earnings during O&M phase, output during construction phase, and output during O&M phase.

Finally, the input parameter(s) which have the most influence on the output can be determined using Monte Carlo simulation. Effort can then be focused on accurately estimating those input parameters that have the most significant effect on the outputs.

Input Data for Economic Impact Analysis

Sources of information are documented. However, many modeling decisions are also based on information gained from discussion with wind energy professionals and experts. These discussions have occurred over time in many venues including the Arizona Wind Working Group and the AWEA Windpower meetings.

County Multipliers

In order to utilize JEDI for county-level analysis, appropriate multipliers for Coconino County were obtained from Marshal Goldberg via NREL. Specifically, the direct, indirect and induced multipliers for employment, earnings and output (per million dollars change in final demand) and personal consumption expenditures (i.e., average consumer expenditures on goods for the counties) were obtained[13]. Using the state-level multipliers that are provided with JEDI would overstate the economic benefits so it was important to obtain county-level multipliers for this analysis.

Wind Energy Project Size

Three wind energy project sizes were selected for the economic impact analysis. The sizes that were selected are based on discussions with wind energy experts and professionals, examination of the results of the windy land analysis and surveying the projects that came on-line in 2003-2004 in the southwest. For all analysis, 1.5 MW wind turbines were assumed.

The smallest project size considered was 10.5 MW and the largest was 180 MW. The mid-sized project was assumed to be 60 MW, which is the size of the wind project planned for another Arizona county, Coconino County (Sunshine Wind Park near Winslow, Arizona) and the size of two wind energy projects built in the southwest in 2003-2004, Caprock Wind Ranch in New Mexico and the Oasis Wind Power Project in southern California. In the southwest during 2003-04, three wind energy projects were built that were in the size range of 160-200 MW (New Mexico Wind Energy Center, Colorado Green Lamar, Brazos Wind Ranch in Texas) [14]. To date, no utility-scale wind energy projects have been built in Arizona.

Construction Cost and Operations & Maintenance Cost

Construction cost and O&M cost depend on site and design specific data. Since the site and design were not known, these costs were estimated by a range of values. The estimates used for construction cost and operations and maintenance (O&M) cost are given in Table 7. Estimates for these costs are based on several sources including conversation with a wind developer[11,12,15,16].

Table 7 Input Parameter Estimates

Input Parameter	Minimum	Most Likely	Maximum
Construction Cost ($/kw)	$1,000	$1,200	$1,500
Annual Operating Cost ($/kw)	$9.50	$12.50	$25.00
Property Tax Rate	9.6%	11.6%	15.0%

Both construction cost and O&M cost were uncertain input parameters and were therefore simulated. The triangular distribution was used to generate these costs. The triangular distribution is often used in practice because it is uni-modal and may be non-symmetrical. In addition, there are fixed endpoints for the range of values. Finally, the triangular distribution is a good distribution to use in the absence of data. In the absence of data, experts can be surveyed and industry data consulted for averages. Experts can be asked for their subjective estimates of the minimum, most likely, and maximum values.[17]

Property tax calculation

To calculate the property tax in Arizona the construction cost which includes the cost of the equipment (wind turbines), building and installation costs, must first be determined. Typically, the *full-cost value* is 80% of the construction cost. Property taxes are based on the *assessed value* which is 25% of the full-cost value. The *property tax* is the tax rate multiplied by the assessed value, see Table 8

Table 8 Arizona Property Tax Calculation

Full Cost Value = 80% * Construction Cost
Assessed Value = 25% of Full Cost Value
Tax = Tax Rate * Assessed value

The tax rate varies significantly depending on the location within the state. Examining the tax tables, it was determined that the range of tax rates vary from a minimum of 9.6% to a maximum 15%. Tax rates were estimated from information obtained in conversations with the Cochise County Tax Assessor's office[3,18]. The property tax rate was simulated using a triangular distribution.

Local Share

Local share is the percentage of expenditures spent in the state or local region where the wind energy project is constructed. For this work, it represents the percentage of expenditures spent in the county. Currently, the JEDI model provides default values for local share percentages that are estimated at the state-level (See Table 9). The JEDI model default values are not appropriate for a county-level analysis as the results will be considerably overstated.

We developed local share percentages that apply to Cochise County by consulting with a wind developer and an economist. Constanti (2004) also provides guidance for setting the local share percentages for rural counties in Montana. Finally, we examined Cochise County demographics (Table 1, Table 2) focusing particularly on population and employment. Minimum and maximum local share percentages were established and are also shown in Table 9[11]. The local share percentages were simulated using a uniform distribution which implies that all values between the minimum and maximum (default) are equally likely.

Simulation Parameters

For each county and wind project size, a simulation was run. For each simulation, the number of trials was determined by observing the convergence of the distribution statistics for the output variables (construction phase: jobs, earnings, output; O&M phase: jobs, earnings, output). When the measured statistics changed no more than 1%, the output distribution was considered 'stable' and the simulation was considered to have converged. The number of trials in each simulation varied between 900 and 1100. The output distribution statistics that were measured are the average percent change of the percentiles, the mean, and the standard deviation.

Table 9 Local Shares Values[††]

Project Cost Data	JEDI default State-level Local Share	Cochise County Minimum Local Share	Cochise County Maximum Local Share
Construction Costs			
Materials			
Construction (concrete, rebar, equip, roads and site prep)	90%	25%	50%
Transformer	0%	0%	0%
Electrical (drop cable, wire,)	100%	10%	25%
HV line extension	100%	0%	10%
Labor			
Foundation	100%	40%	60%
Erection	75%	10%	15%
Electrical	75%	25%	50%
Management/supervision	0%	0%	0%
Equipment Costs			
Turbines (excluding blades and towers)	0%	0%	0%
Blades	0%	0%	0%
Towers	0%	0%	0%
Other Costs			
HV Sub/Interconnection	100%	10%	25%
Engineering	0%	0%	5%
Legal Services	100%	25%	50%
Land Easements	100%	100%	100%
Site Certificate/Permitting	100%	100%	100%
Wind Plant Annual Operating and Maintenance Costs			
Personnel			
Field Salaries	100%	60%	75%
Administrative	100%	60%	75%
Management	100%	60%	75%
Materials and Services			
Vehicles	100%	50%	75%
Misc. Services	80%	25%	50%
Fees, Permits, Licenses	100%	100%	100%
Utilities	100%	100%	100%
Insurance	0%	0%	0%
Fuel (motor vehicle gasoline)	100%	100%	100%
Tools and Misc. Supplies	100%	60%	75%
Spare Parts Inventory	2%	2%	2%

[††] JEDI default values should not be used for a county-level analysis. The JEDI default values are appropriate only for a state-level analysis. If used for a county-level analysis, benefits will be greatly overstated.

Results of Economic Impact Analysis

All economic outputs from JEDI are divided into benefits that occur during the construction phase (usually less than a year) and annual benefits that occur during the operational life of the wind project. For each phase, the model estimates:

- Jobs – the number of full-time equivalent employment for a year.
- Earnings - wage and salary compensation paid to workers.
- Output - economic activity or the value of production in the county economy.

For all three estimates, the simulation in conjunction with the JEDI model produces a frequency distribution. We report the percentiles for these distributions. The 50th percentile is the median. That is there is 50% chance that the number of jobs will be above the median and a 50% chance that the number of jobs will be below the median. We report the minimum, 5th percentile, 50th percentile, 95th percentile and maximum. There is a 95% likelihood that the number of jobs will be less than the 95th percentile.

Jobs

Results pertaining to job creation for each wind energy project size and project phase are given in Figure 6 and Figure 7. A summary table is given in Appendix A-1. Based on simulation, there is a 90% likelihood that the number of jobs created during the construction phase in Cochise County will be between 21 and 33 for a 60 MW wind energy project. During the O&M phase, there is a 90% likelihood that the number of jobs created in Cochise County will be between 10 and 12.

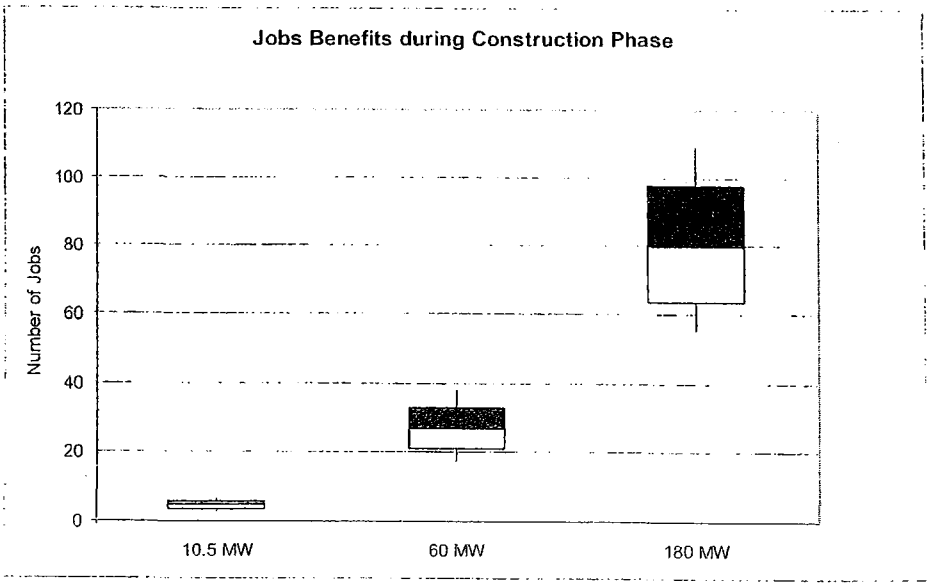

Figure 6 Wind Energy Project Impact on JOBS during Construction Phase

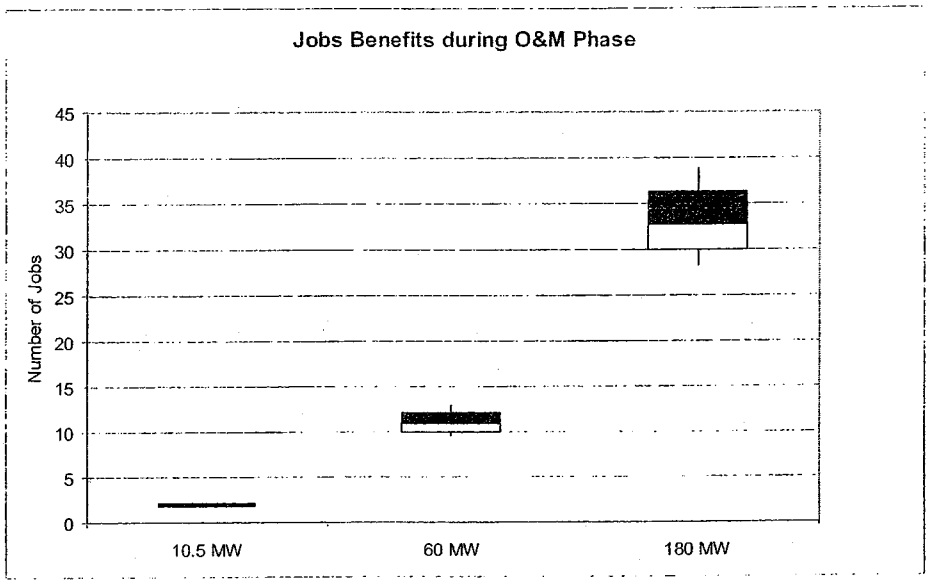

Figure 7 Wind Energy Project Impact on JOBS during O&M Phase

Earnings

Earnings refer to millions of dollars in wages and salary paid to workers. Results for earnings for all wind energy project sizes and phases are given in Figure 8 and Figure 9. A summary table is given in Appendix A-2. Based on simulation, there is a 90% likelihood that the earnings paid during the construction phase in Cochise County will be between $0.60 and $0.93 million annually for a 60 MW wind energy project (in 2007 dollars). During the O&M phase, there is a 90% likelihood that the annual earnings in Cochise County will be between $0.33 and $0.58 million.

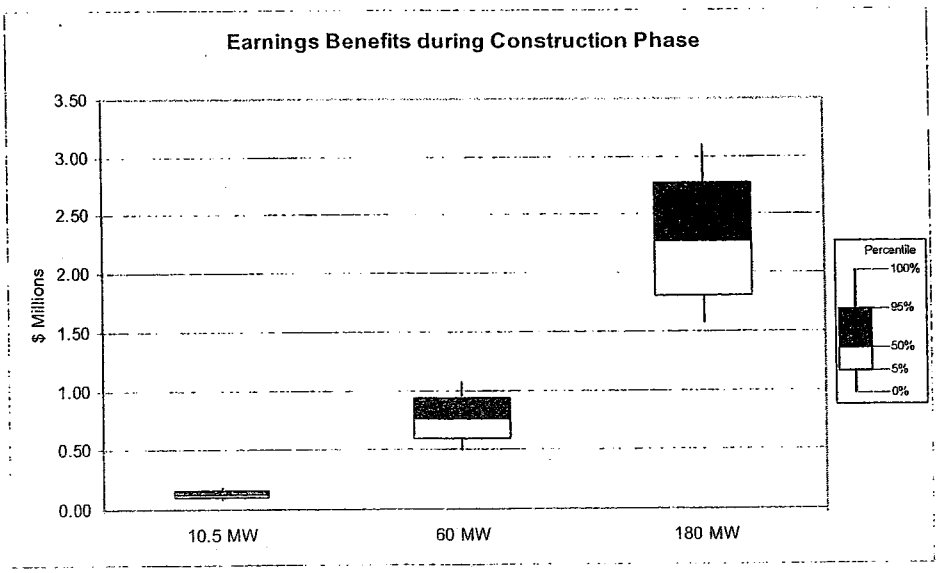

Figure 8 Wind Energy Project Impact on EARNINGS during Construction

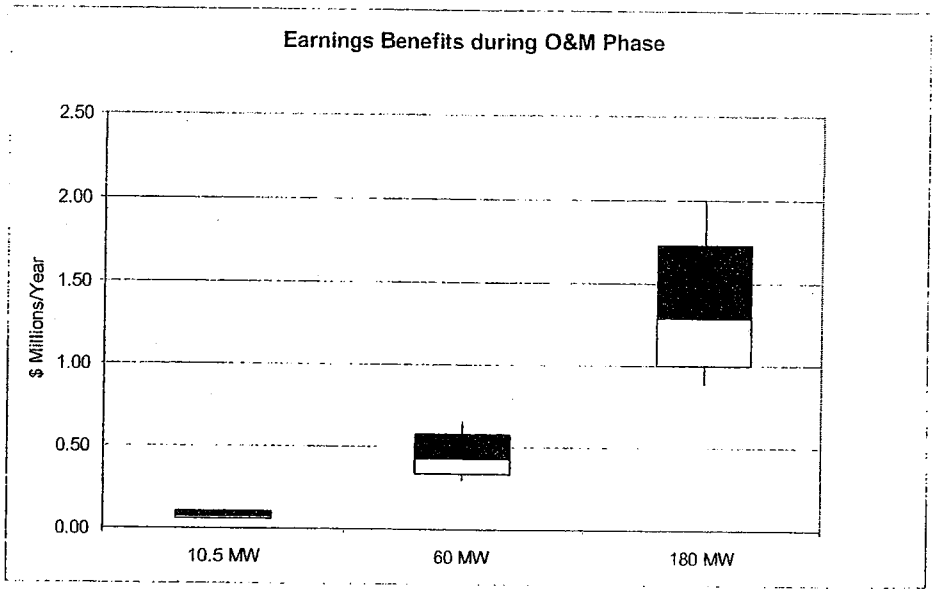

Figure 9 Wind Energy Project Impact on EARNINGS during O&M Phase

Output

Figure 10 and Figure 11 show a summary of output results for all wind energy project sizes and phases. A summary table is given in Appendix A-3. Output refers to economic activity or the value of production in the county and is also in millions of 2007 dollars. Based on the simulation results there is a 90% likelihood that the output will be between $2.52 and $3.95 million annually for Cochise County. During the O&M phase, there is a 90% likelihood that the annual output in Cochise County will be between $0.83 and $1.21 million.

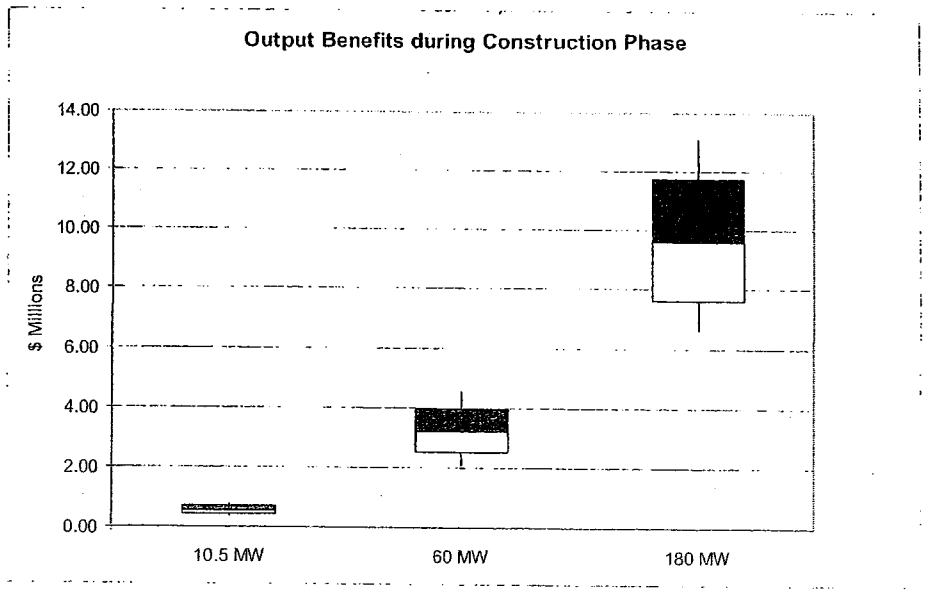

Figure 10 Wind Energy Project Impact on OUTPUT during Construction Phase

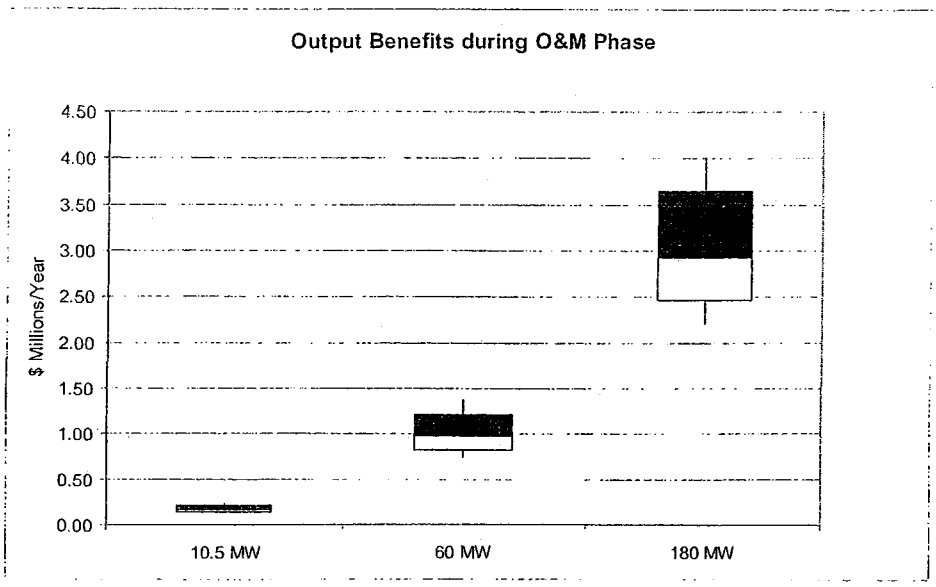

Figure 11 Wind Energy Project Impact on OUTPUT during O&M Phase

Conclusions

The first objective of this project was to estimate the wind energy development potential for Cochise County. Based on high-resolution wind map data analyzed in a GIS while considering development exclusions, it was estimated that the developable windy land and potential installed capacity for Cochise is approximately 275 MW. The majority of this capacity is from Class 3 wind. When this estimate is restricted to windy lands of class 4 or better, the developable capacity is 50 MW.

The second objective of this work was to estimate the economic impact of constructing and operating wind energy projects of various sizes in Cochise County. Monte Carlo simulation was conducted in conjunction with the JEDI model and provided a range of outputs corresponding to a range of estimated input parameters. For a 60 MW wind energy project, there is 90% likelihood that:

- number of jobs created during the construction phase is between 21 and 33 with a median of 27 jobs.
- number of jobs created during the O&M phase is between 10 and 12 with a median of 11.
- earnings during the construction phase is between $0.60 and $0.93 million with a median of $0.76 million in Cochise.
- earnings during the O&M phase is between $0.33 and $.58 million annually with a median of $0.43 million.
- output during the construction phase is between $2.52 and $3.95 million with a median of $3.21 million.
- output during the O&M phase is between $1.02 and $1.55 million annually with a median of $1.24 million.

Appendix A Tables of JEDI/Monte Carlo Simulation Results

Appendix A- 1 Wind Energy Project Impact on JOBS

	Jobs for 10.5 MW Wind Farm	
Percentile	Construction	O & M
0th	3	2
5th	4	2
50th	5	2
95th	6	2
100th	6	2
	Jobs for 60 MW Wind Farm	
Percentile	Construction	O & M
0th	17	10
5th	21	10
50th	27	11
95th	33	12
100th	38	13
	Jobs for 180 MW Wind Farm	
Percentile	Construction	O & M
0th	55	28
5th	63	30
50th	80	33
95th	98	36
100th	109	39

Note: Percentile is a descriptive statistic. When we simulate 1000 times, there are 1000 measurements of each output (i.e. Construction Jobs for 60 MW Wind Farm). The 95th percentile tells us that 95% of those 1000 simulations had 33 or fewer Construction Jobs for a 60 MW Wind Farm. We interpret this as a 95% probably that the number of Construction Jobs for a 60 MW Wind Farm will be 33 or less. The 50th percentile represents the median.

Appendix A- 2 Wind Energy Project Impact on EARNINGS

($ millions)

	Earnings for 10.5 MW Wind Farm	
Percentile	Construction	O & M
0th	0.09	0.05
5th	0.10	0.06
50th	0.13	0.08
95th	0.16	0.10
100th	0.18	0.11
	Earnings for 60 MW Wind Farm	
Percentile	Construction	O & M
0th	0.49	0.30
5th	0.60	0.33
50th	0.76	0.43
95th	0.93	0.58
100th	1.07	0.66
	Earnings for 180 MW Wind Farm	
Percentile	Construction	O & M
0th	1.56	0.89
5th	1.80	1.00
50th	2.27	1.29
95th	2.77	1.73
100th	3.10	2.00

Note: Percentile is a descriptive statistic. When we simulate 1000 times, there are 1000 measurements of each output (i.e. Earnings for 60 MW Wind Farm). The 95th percentile tells us that 95% of those 1000 simulations had $0.93 million or less Earnings from a 60 MW Wind Farm. We interpret this as a 95% probably that the amount of Earnings from a 60 MW Wind Farm will be $0.93 million or less. The 50th percentile represents the median.

Appendix A- 3 Wind Energy Project Impact on OUTPUT

($ millions)

	Output for 10.5 MW Wind Farm	
Percentile	Construction	O & M
0th	0.36	0.13
5th	0.44	0.14
50th	0.56	0.17
95th	0.69	0.21
100th	0.78	0.23
	Output for 60 MW Wind Farm	
Percentile	Construction	O & M
0th	2.06	0.75
5th	2.52	0.83
50th	3.21	0.98
95th	3.95	1.21
100th	4.55	1.38
	Output for 180 MW Wind Farm	
Percentile	Construction	O & M
0th	6.63	2.21
5th	7.62	2.47
50th	9.59	2.92
95th	11.73	3.65
100th	13.10	4.02

Note: Percentile is a descriptive statistic. When we simulate 1000 times, there are 1000 measurements of each output (i.e. Output from a 60 MW Wind Farm). The 95th percentile tells us that 95% of those 1000 simulations had $3.95 million or less Output from a 60 MW Wind Farm. We interpret this as a 95% probably that the amount of Output from a 60 MW Wind Farm will be $3.95 million or less. The 50th percentile represents the median.

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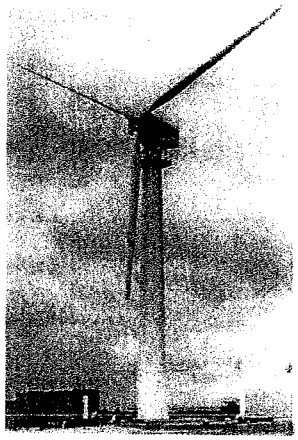
1 MW Wind Turbine Generator



Model: Raduga-1

Brand: SAVOIA(TM)

Origin: -

Category: Metallurgy , Mining & Energy / New Energy / Winc Power

Keywords: Wind Power , Wind Power Generator , HAWT

Price: - Min. Order: -

Post Time: 14 Jan, 2006 Last Modified: 21 Jun, 20

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Product Description

SAVOIA(TM) "Raduga-1" windpower unit is intended for electric power generation in two ways:
a) Operating as part of windpower stations or independently interconnected with power systems and
b) Stand-alone operation or operation in parallel with other windpower units as part of windpower stat

Annual Electric Power Output Depending on Average Winds : MWh----2600 - 4900

MAIN FEATURES
· Version "Raduga-1" Generator power rating, kW--------1000
· Output voltage (three-phase),V----380 or 6600 - Other by request
· Operating wind speed range, m/s---5 - 25
· Propeller diameter, m----------48
· Tower height, m----------36
· Number of propeller blades----------3
· Propeller speed (variable), r/min--21 - 42
· Generator speed (variable) depending on make, r/min--500 or 650 - 1300
Design stormy wind speed, m/s----60

· Operating temperature range, °C--------minus 50 - plus 40
· Design seismic stability at earthquake shocks of---------8
· Design service life of main load-bearing units, years----25
· Windpower unit mass, Ton--127 - 130

CONTROL SYSTEM
1. Ensures orientation of the propeller into wind.
2. Diagnoses the technical condition of the wind-power unit components.
3. Controls the propeller blade pitch.
4. Provides automatic starting and braking.
5. Generates signals to connect/disconnect the windpower unit to/from the network.
6. Generates emergency braking signals and executes the emergency braking algorithms.
7. Controls the windpower unit in response to remote control signals.

Product Image

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Img 1

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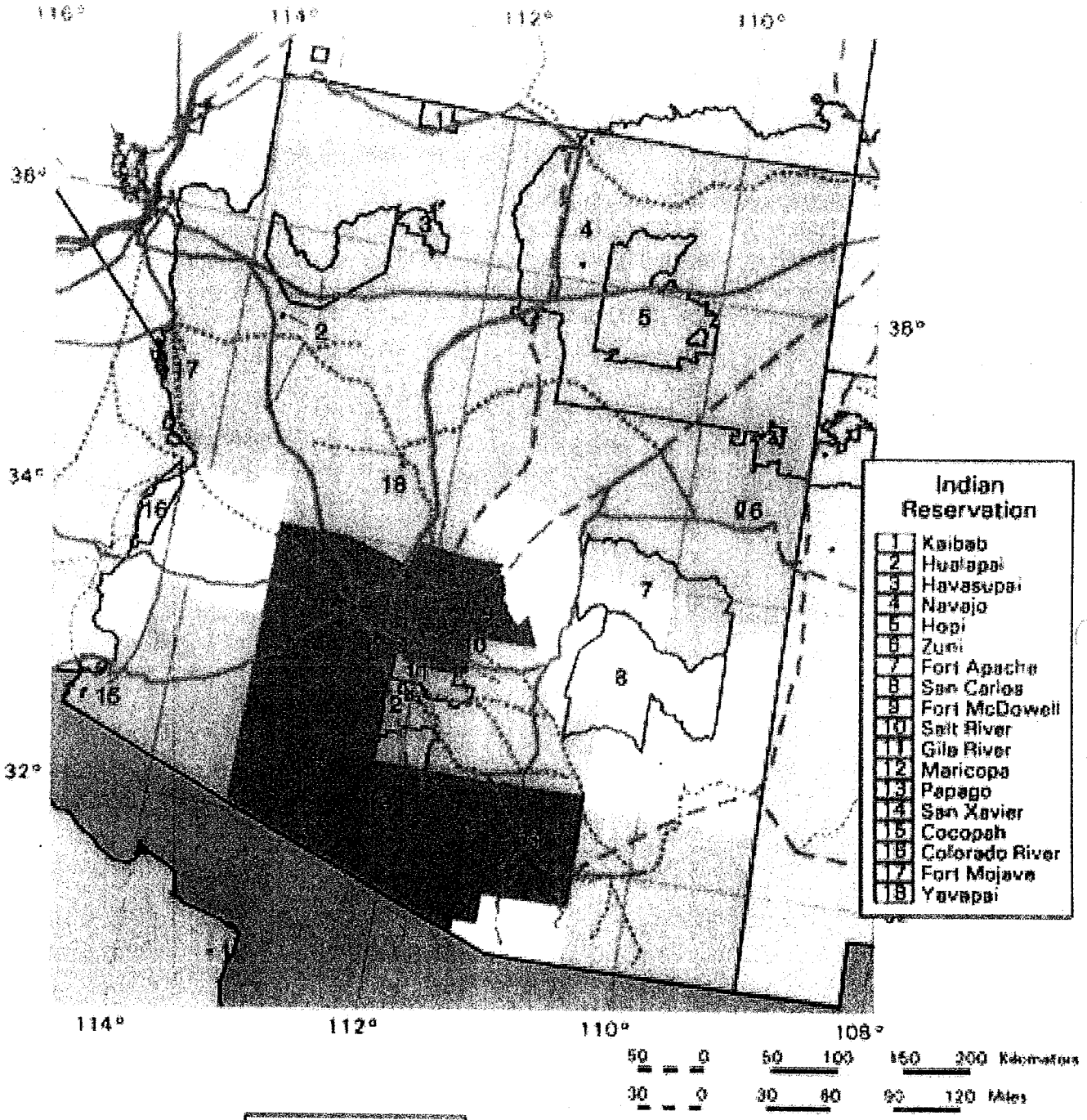
Arizona - Biomass Resource Map



Biomass resource includes municipal solid waste and forestry residues.

Potential Kilowatts
Per County

- more than 40,000
- 5,000 - 40,000
- 0 - 5,000
- No Data

Transmission Line*
Kilovolts

- 1000
- 500
- 345
- 230
- 161
- 120
- 115
- 69

* Source: EPRI Energy

U.S. Department of Energy
National Renewable Energy Laboratory

NREL

HERALD

NOVEMBER 21, 2004

The County is reviewing a proposal to change trash into recyclable material. But the plan hasn't come without voices of caution

By Michael Sullivan

Although intrigued by the prospect of converting trash into energy at the Cochise County landfill. county officials are taking a go-slow approach to a proposal presented to representatives of local government on Nov. 9 by Global Energy Resources LLC.

The 6-month-old company, based in Pacific Palisades, Calif.. is proposing to spend millions of investors' dollars to build a plant at the landfill.

Using an intense heating process for converting virtually everything now being buried there into energy, clean water and a solid, recyclable material, the plant would purportedly release no hazardous emissions.

Board of Supervisors Chairman Pat Call and Facilities Director L.H. Hamilton find the concept fascinating but are not leaping on the plasma gasification bandwagon just yet.

District 2 Supervisor Paul Newman is downright suspicious.

In an interview. last week. Call recalled thinking during the Nov. 9 presentation by Global Energy Resources President John D. Cummings that the proposal sounded "too good to be true." Although wary, Call said the county has nothing to lose at this point. The burden of proof is on Global Energy Resources.

Hamilton is of the same mind.

"The bottom line here is that people have to understand that this has to be permitted from the get-go," Hamilton said on Wednesday.

Before anything is built, the plasma gasification process would need to be approved by the Arizona Department of Environmental Quality.

"We're not scientists here. As long as they (GER) can meet those requirements. they have assumed all the risk," Hamilton said.

Newman is uneasy about the entire process, saying that meetings were held by Call and Hamilton with representatives for GER and General Electric that he was not advised of in advance.

"That's rather unusual," he said Wednesday.

"The technology is intriguing, but I don't think the answers regarding emissions satisfied me," Newman added.

The proposal

A plasma-arc process would be used in combination with "pyrolysis" to reduce virtually everything now being buried in the county landfill - including refrigerators and car batteries - to a recyclable, glassy material.

Pyrolysis is chemical decomposition brought about by using very high heat in the absence of air.

The glass can be used as roadfill or by the abrasives industry, Cummings said. The bulk of the trash would be converted to "syn" gas and ethanol and also could be used to generate electricity. Whatever liquid is contained in the trash would be converted to clean water and recharged into the aquifer, he said.

The technology is already being used around the world, Cummings noted during the work session of the supervisors and local government officials.

The only material not acceptable is radioactive waste.

Cummings described plasma as "an intense energy force" consisting of an ionized gas source that, "when subjected to the proper combination of conditions, becomes an electrical conductor generating extremely intense energy, such as lightning."

"This is not a burner," he said. "We're not incinerating trash."

The only emissions from the process would come from the Jenbacher engine that runs the gasification operation, said Paul McGuire of GE. McGuire appeared with Cummings at the work session.

During the session. McGuire showed photos of plants located in Gussing, Austria; Harboore, Denmark; Chiba, Japan; Profusa, Spain; and Italy that are using this technology. More than 900 Jenbacher engines are in use at landfills worldwide, McGuire said. None, however, are located in the United States.

Confirmation of those plants can be found on the World Wide Web, but no emissions information was available.

The proposal is that a $25 million, 2,000-square-foot plant would be built by GER at the county's 240-acre landfill, at no cost to the county. The company asked that the county arrange for a 20-year "feedstock" supply contract to include 100,000 tons of municipal solid waste and 100,000 waste tires per year.

Cummings said the time from the start of the process to beginning of operations would be about 18 months.

Intergovernmental agreements between the municipalities and the county for the landfill will expire in 2007, so the agreements will have to be extended, Call told the audience at the work session.

Each municipality could extract whatever recyclable materials they choose, such as paper and aluminum, before sending the refuse to the plant, Hamilton said.

The county now sends about 78,000 tons of refuse per year to the landfill, which has increased by 5,000 tons during the past three years, Hamilton said.

The process would not only accept new trash but could "mine" the trash already buried, Hamilton said.

All local units of government that are now paying a "tipping fee" of $41.50 per ton to have their trash buried at the landfill, would see at least a $10-per-ton reduction, Hamilton said.

The next step, if local government officials wish to pursue the proposal, is a letter of intent or memo of understanding, leading to a contract. This will enable the company to start the engineering process. This is where the matter now stands.

Wait a minute

Newman is in no hurry to proceed.

"I think we should be very cautious about entering into a multi-year contract," he said. "I don't think they're telling us everything we need to know."

One of Newman's concerns was a news report that GER's chief executive officer, Armen Kazanchian, was charged with fraud in California. A medical doctor, Kazanchian was one of seven people charged in 2003 by the state Attorney General's Office with defrauding Medi-Cal, plus identify theft and money laundering.

Hamilton said he was aware of the situation three weeks ago and checked it out. All charges were dropped on July 16, according to court records provided to the Herald/Review.

An "overzealous prosecutor charged everybody," Hamilton said. The court records cited "insufficiency of the evidence granted."

Whether or not the charges were dismissed, Newman said he should have been apprised of the matter.

"I want to know more about these people's backgrounds," Newman said.

Environmental organizations also are urging caution.

Daniel R. Patterson, with the Center for Biological Diversity in Tucson, wrote County Administrator Jody Klein on Nov. 9, recommending the county seek independent verification of the proposal rather than from "incinerator promoters."

Bradley Angel, of Greenaction in California, and Terry Nordbrock, with Families Against Cancer in Tucson, cite a number of objections to the proposal.

"We're up to our eyeballs in very similar proposals, all over California," Angel said during an interview by cell phone last week while en route to a public forum in Hanford, Calif. "We're seeing a pattern. The incineration industry has repackaged the incineration technology. There are always toxic emissions from incinerations. They can't possibly eliminate all the waste."

Burning plastic, for example, results in the creation and emission of toxic dioxin, Angel said.

Angel, executive director of Greenaction, said a garbage gasification plant in the Alameda, Calif., area was recently rejected by the Alameda Public Utilities Board. The Santa Cruz, Calif., County Board of Supervisors recently voted to study a proposal from American Ref-Fuel to build a giant waste-to-energy garbage incinerator to burn waste from several counties.

The Hanford public forum was a follow-up to the Alameda rejection, Angel said. He hopes to arrange a similar forum in Cochise County.

"The potential for liability is enormous," he said. "There's been an alarming trend for government agencies to approve these without sufficient data. We're urging everyone to take a deep breath, have a public process and put all the facts on the table. The companies are making wild, fantastic claims that are not holding up to scrutiny."

Nordbrock is also concerned about whether GER's promises regarding emissions can be validated.

"It's potentially interesting technology," she said. "But it does not seem safe. You can make money accepting hazardous waste."

Does it work?

During his presentation on Nov. 9, Cummings showed a video to the audience that was produced by Startech Environmental Corp., a producer of plasma torch technology.

At that time, Startech had not yet been approached by GER, said Chad Gonzalez, a Startech sales associate.

Contacted by the Herald/Review on Thursday, Gonzalez said, "We just made contact with them last week. They want us (to submit a proposal) and two other companies (which were unknown to Gonzalez)."

The Startech process uses a plasma torch to create temperatures inside a chamber up to 30,000 degrees Fahrenheit, "four times the temperature of the sun's surface," Gonzalez said. The process does not, however, use pyrolysis, he added.

Although not in use anywhere in the United States, the plasma torch technology is being successfully used in Japan to turn waste into bricks, Gonzalez said.

Gonzalez also referred to plasma torch technology first being used to dispose of chemical weapons at the Army's Aberdeen, Md., Proving Grounds in 1999.

Conflicting information exists on the success of the tests.

An October 2000 Startech press release, headlined "Startech Environmental and Burns & Roe selected by U.S. Army for Chemical Weapons Destruction Program," says the process was selected for "the safe and irreversible destruction of the United States' stockpile of chemical weapons."

However, an examination of the Board on Army Science and Technology's "Evaluation of Demonstration Test Results of Alternative Technologies for Demilitarization of Assembled Chemical Weapons" shows that Startech's technology did not pass with flying colors.

The test was conducted for the Assembled Chemical Weapons Assessment program by Burns & Roe, in partnership with Startech.

"The chemistries of all four of the primary technologies, (including plasma arc) can decompose the chemical agents with destruction efficiencies of 99.9999 percent. However, each technology package raises other technical issues that must be resolved. One of the crucial issues is the identity and disposition of byproducts," the report said.

"Based on input from the ACWA Dialogue, the plasma arc process was deemed unlikely to obtain public acceptability due to the incomplete demonstration and the perceived similarity to incineration," according to ACWA's Sept. 30, 1999, report to Congress. "The process was not validated for agent destruction."

That assessment was confirmed Thursday by Kathy DeWeese, public information officer for ACWA.

"The process was approved for demonstration," she said. It is not now being used by the Army.

The U.S. Environmental Agency, in a February 2002 fact sheet, said: "EPA believes the gasification systems processing hazardous secondary materials are better viewed as a production or manufacturing operation rather than a hazardous waste management activity."

The origins

How did this all come about in the first place?

Lee Basnar, a columnist for the Herald/Review, said he was investigating ways to remove cardboard from the landfill for recycling about a year ago. He approached Call to discuss an idea he'd come across for converting cardboard to energy, but that bore no fruit, Basnar said Thursday. About two or three months ago, Call asked Basnar to research the GER proposal, knowing of Basnar's interest in the landfill.

Cummings said that Robert Brown of Green Valley, a consultant for Arizona Public Service, approached Hamilton with information about GER and arranged a meeting. Basnar was privy to what was happening and wrote a column about the proposal, which was published Nov. 4 in the Herald/Review.

Why Cochise County?

"It fits our profile," Cummings said last week.

The county's size, lack of opposition to the idea, control over waste and the "ability to put energy onto the grid" make the county attractive, he said.

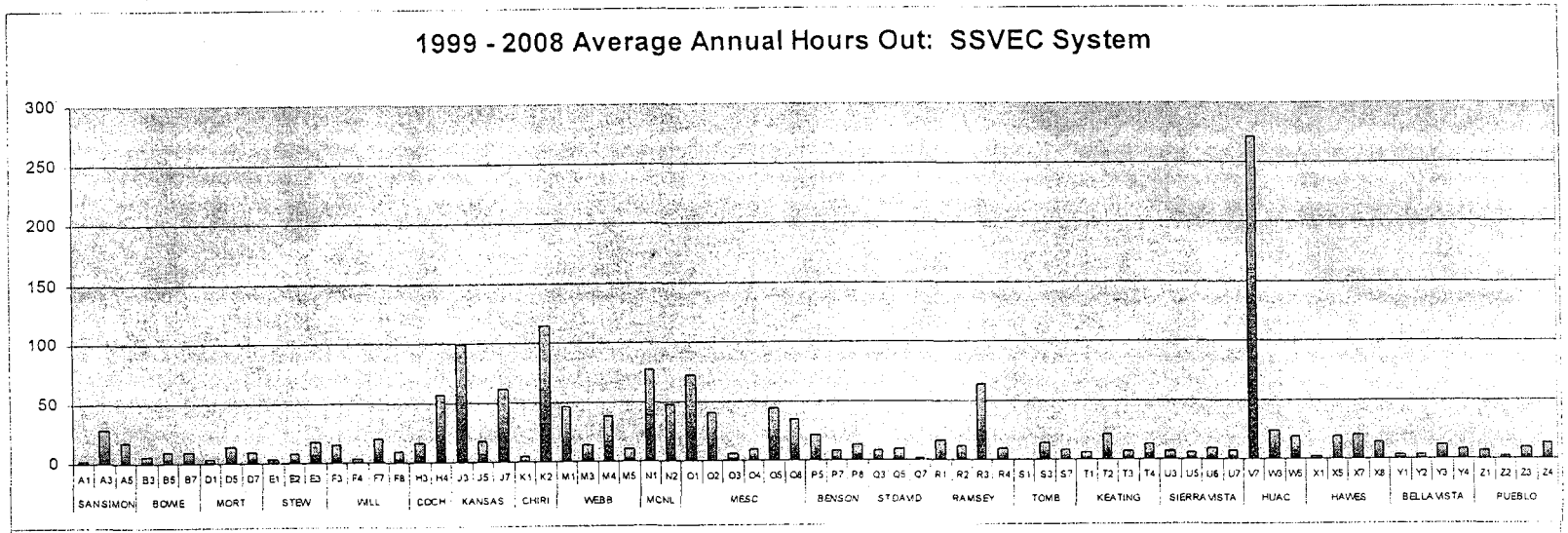
Cummings characterized his reception in Bisbee Nov. 9 as "outstanding," adding, "The majority of the board seems to be very positive."

Newman was in the minority. He feels Call and Hamilton were overly enthusiastic about the proposal.

"The spirit of the meeting was that the county was leading the effort, and that's why I urged caution," he said.

Attachment F

V-7 Feeder Outages and Length in Miles as Compared to all SSVEC feeders



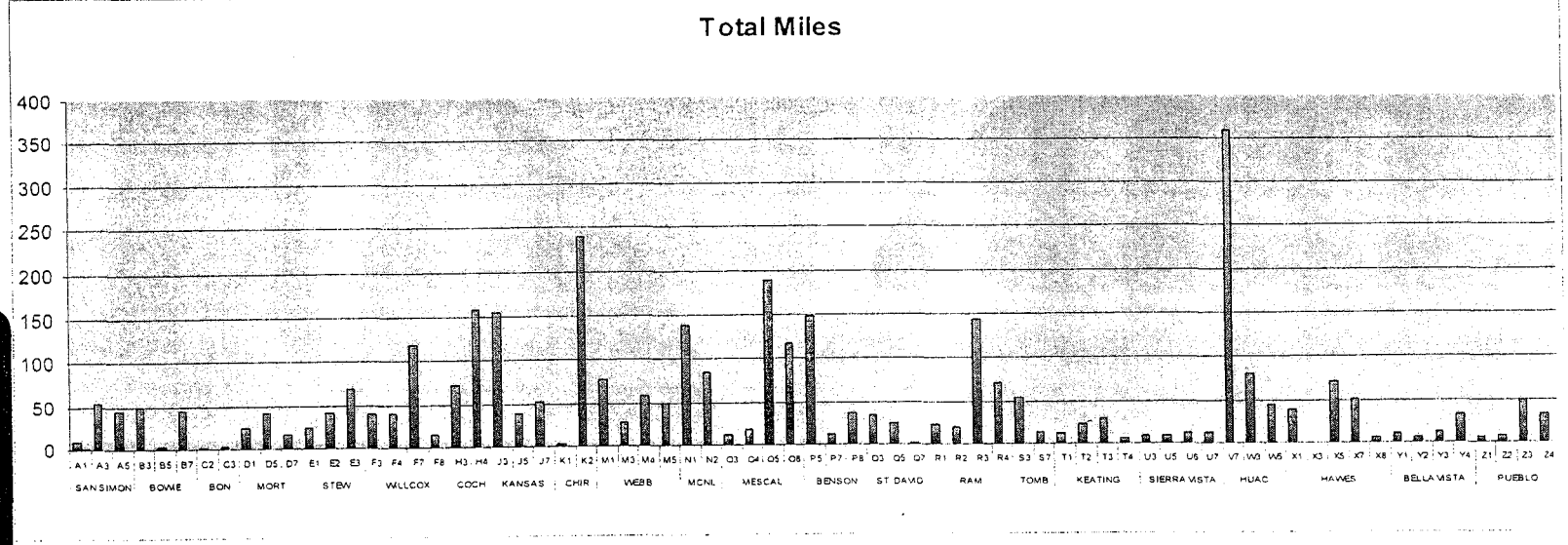
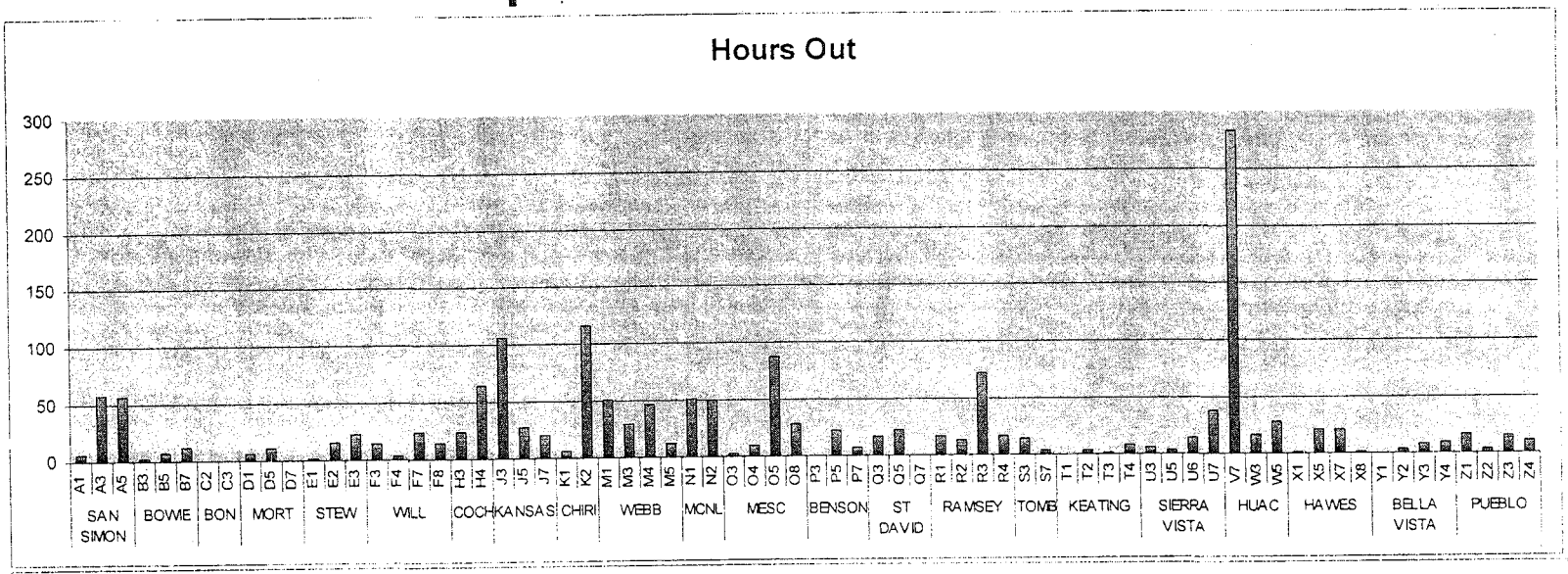
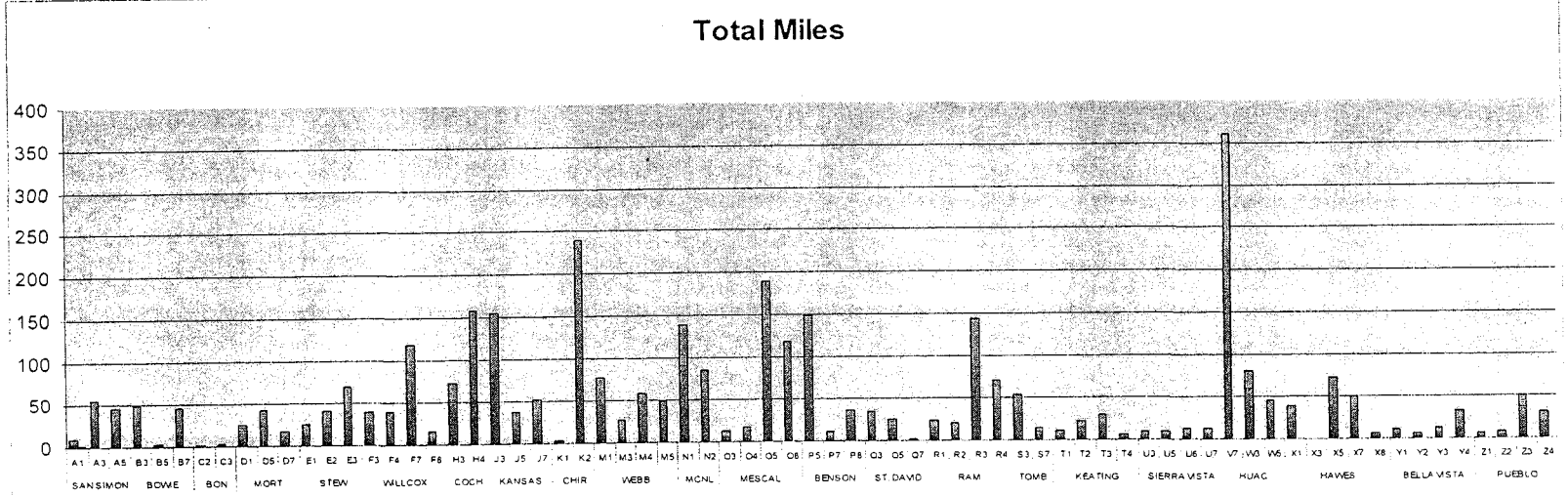


EXHIBIT A-4

V-7 Feeder Outages per Year and Length in Miles as compared to all SSVEC feeders





Attachment G

THIS AMENDMENT:		
_____ Passed	_____ Passed as amended by	_____
_____ Failed	_____ Not Offered	_____ Withdrawn

RECEIVED
2009 AUG 13 P 3: 42
AZ CORP COMMISSION
DOCKET CONTROL

NEWMAN PROPOSED AMENDMENT # 1

TIME/DATE PREPARED: August 13, 2009 at 9:32 a.m.

COMPANY: Sulphur Springs Valley Electric Cooperative, Inc.

DOCKET NOS. E-01575A-08-0328

OPEN MEETING DATE: August 17, 2009 AGENDA ITEM NO. U-1

Delete page 38 lines 23-25.
Delete page 39 lines 1-4.

Insert page 38 lines 23 the following paragraph:

> However, we are concerned that once constructed, the project will permanently change the landscape for the impacted communities and the manner in which electric service is provided to the Cooperative's customers. We need to ensure that the goals of some in the local communities who want more investment in renewable generation to mitigate the need for the project have been fully considered by the Cooperative. We believe a feasibility study prepared on behalf of the Cooperative by an independent third party is necessary for further analysis and consideration of the issues presented, prior to proceeding with construction of the project. Therefore, we shall require the Cooperative to docket a feasibility study on the project and possible alternatives and hold public forums in the impacted communities. The public forums shall include an opportunity for community members' discussion on the feasibility study, including alternatives prior to construction of the project. At the conclusion of the public forums the Cooperative shall docket a report and minutes from the public forums.

Insert page 47, line 11, new ordering paragraph:

> IT IS FURTHER ORDERED that Sulphur Springs Valley Electric Cooperative, as a matter of compliance, shall docket by December 31, 2009, a feasibility study prepared by an independent third party that includes alternatives (including use of distributed renewable energy) that could mitigate the need for construction of the Cooperative's proposed 69kV project. The feasibility study shall be available for discussion in public forums conducted by the Cooperative in the impacted communities. A report and minutes from these public forums shall be docketed by Cooperative no later than July 30, 2010.

IT IS FURTHER ORDERED that Sulphur Springs Valley Electric Cooperative shall not commence construction of the referenced 69kV line until the public has had an opportunity to review and comment on the report and until further order of the Commission.

Conforming changes.

Attachment H

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BEFORE THE ARIZONA CORPORATION COMMISSION

COMMISSIONERS

KRISTIN K. MAYES–Chairman
GARY PIERCE
PAUL NEWMAN
SANDRA D. KENNEDY
BOB STUMP

IN THE MATTER OF THE APPLICATION OF SULPHUR SPRINGS VALLEY ELECTRIC COOPERATIVE, INC. FOR AN ORDER INSTITUTING A MORATORIUM ON NEW CONNECTIONS TO THE V-7 FEEDER LINE SERVING THE WHETSTONE, RAIN VALLEY, ELGIN, CANELO, SONOITA, AND PATAGONIA, ARIZONA AREAS.	DOCKET NO. E-01575A-09-0453 **APPLICATION** *Expedited Consideration Requested*

On September 8, 2009, the Arizona Corporation Commission ("Commission") issued Decision No. 71274 ("Decision") in Docket No. E-01575A-08-0328 (the "Rate Case Docket") that expressly prohibits (until further Order of the Commission) Sulphur Springs Valley Electric Cooperative, Inc. ("SSVEC" or "Cooperative") from constructing a 69 kV sub-transmission power line ("69 kV line") to serve the Whetstone, Rain Valley, Elgin, Canelo, Sonoita, and Patagonia, Arizona areas (collectively the " Affected Areas"). SSVEC had previously planned and scheduled principle construction of the 69 kV line in the fall of 2009 because the Cooperative's documentation and analysis determined it necessary to alleviate significant power quality, reliability, and capacity constraints resulting in power fluctuations and outages in the Affected Areas that are currently served by the Cooperative's existing V-7 Feeder Line.[1]

The Decision further ordered SSVEC to: (i) commission an independent feasibility study regarding alternatives (including use of distributed renewable energy) that could

[1] A map depicting the V-7 Feeder Line is attached as Exhibit 1.

mitigate the need for construction of the 69 kV line and to report the findings of such study to the Commission by December 31, 2009; (ii) conduct public forums in the Affected Areas to include topics relating to the results of the independent feasibility study and addressing how renewable energy generation (in particular, distributed generation) could be incorporated into the generation plans to serve the area covered by the planned 69 kV line and associated upgrades; and (iii) prepare a report to be filed with the Commission by July 30, 2010, that discusses the outcome of the public forums.

In light of the Commission's Decision ordering SSVEC to stop construction of the 69 kV line, SSVEC, through counsel undersigned, hereby requests the Commission to issue an order authorizing the Cooperative to institute a moratorium on new and/or expanded service connections to its V-7 Feeder Line so the power quality, reliability, and capacity problem resulting in power fluctuations and outages that will continue to exist within the Affected Areas, will not be further exacerbated, nor further degrade, the service to existing members.

I. BACKGROUND AND BASIS FOR THIS APPLICATION

SSVEC is an Arizona member-owned non-profit rural electric distribution cooperative headquartered in Willcox, Arizona. SSVEC is a Class A electric public service corporation that serves most of Cochise County and portions of Santa Cruz, Pima, and Graham Counties (which includes the Affected Areas), pursuant to a Certificate of Convenience and Necessity issued by the Commission.

SSVEC has been assiduously working toward a solution to bring quality, reliable power to the Affected Areas through its Sonoita Reliability Project ("Project"). The Project has taken years of planning, analysis, design consideration, cost estimation, community participation, and review and provided SSVEC the information necessary to make sound decisions based upon a balance of community concerns and requirements of the Cooperative with respect to its obligation to provide safe and reliable service within its

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service territory. As initially identified, the solution to this area's reliability issues is a new substation in Sonoita. Based upon the Community's concerns, SSVEC obtained a new substation property in a commercial land use area of Sonoita, rather than using its existing parcel in a residential subdivision.

The 69 kV line necessary to energize the substation has been the most contentious and emotional issue for the Project. The routing of this line has been the primary focus of the community, and SSVEC has conducted numerous community meetings, met with representative groups and individual property owners, welcomed presentations to its Board, and received e-mails and letters with opinions regarding the line location. There was also considerable public comment made in this Rate Case Docket.

As a non-partisan entity, SSVEC compiled the route arguments and balanced such with basic aspects of business practices and cost analysis. With these facts in mind, SSVEC determined that the most cost-effective option that impacted the least amount of its members was for the route for the 69 kV line follow the existing known easements within the San Ignacio del Babocomari Land Grant ("SIDB") and the Sonoita Hills subdivision, location of SSVEC's original substation property, Buchanan. The SIDB easement and affiliated easements to SSVEC's original substation property, Buchanan, have been on record for more than a quarter of a century. SSVEC's 1982 purchase of nearly 20 miles of SIDB easement, along with utilizing designated utility corridors, has allowed SSVEC to significantly reduce overall project costs due to acquisition of rights-of-way.

Due to some public opposition to the proposed siting of the 69 kV line, the issues relating to the Project were interjected into SSVEC's Rate Case Docket.[2] In the Rate Case Docket, SSVEC provided the Commission information demonstrating the need and necessity to construct a new substation and affiliated 69 kV line as the electric distribution

[2] SSVEC hereby incorporates herein the relevant portions of the Rate Case Docket.

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facilities currently servicing the Affected Areas, have significant deterioration of power quality resulting from an inordinately long feeder line, insufficient line and transformer capacity, nonconforming equipment serialization, and an average reliability occurrence of 270 outage hours per year over the last 10 years[3]. The existing line does not adequately and reliably serve the existing customers, and will continue to decline with the increased load of new customers.

The Cooperative presented uncontroverted evidence to the Commission at the rate case hearing that: (i) the proposed construction and siting of the new line through the SSVEC-acquired right-of-way impacted the least number of SSVEC members at the least cost [4]; (ii) the Affected Areas would continue to be plagued by outages if SSVEC did not timely move forward with the Project[5]; and (iii) the Cooperative had concerns for the elderly and businesses in the Affected Areas if the outages and unreliable service continued for a prolonged period of time.[6]

Additionally, the Cooperative had previously provided the Commission's Utilities Division ("Staff") information regarding the existing electric distribution facility's in the Affected Areas, voltage instability as shown by SSVEC's Milsoft WindMil Distribution Analysis Software.[7] The distribution analysis shows a 15% voltage drop on a 120-volt base which exceeds acceptable limits set by manufacturers of electrical apparatus design to withstand +/-10% voltage fluctuations. This analysis clearly demonstrated that voltages do not meet Commission-mandated (A.A.C. R14-2-208 Provision of Service) voltage levels set forth in the 1989 edition of ANSI C84.1.[8] ANSI C84.1 requires

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[3] *See* discussion in Decision at page 36, lines 7-24; *see* also V-7 Outage Chart attached hereto as Exhibit 2 referenced in footnote 122 of the Decision.
[4] Rate Case Docket Hearing Transcript at page 301, line 3 through page 309, line 17; also *see* late-filed Hearing Exhibit A-26.
[5] Decision at page 36, lines 19-21.
[6] *Id.* at lines 21-22.
[7] *See* Exhibit 3 attached hereto.
[8] There are no updated editions.

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voltages to be maintained between 126-117 volts and analysis for this circuit indicates voltages as low as 113V. The information provided to Staff further demonstrated that: i) the existing substation transformer has exceeded its maximum capacity rating of 7MVA multiple times in the past five years, leading to loss of functional life of the equipment;[9] and (ii) the Arizona Department of Economic Security Population Statistics for June 6, 2007, indicate a population growth forecast for the Affected Areas within Santa Cruz County of 70-80 persons per year, using an average household size of 2.3 persons; this would indicate a growth of at least 30 homes (or services) per year to the Affected Areas thereby increasing the amount of load on the substation transformer.[10] SSVEC's new service/expansion of service records indicate an actual average of 83 new/expanded services per year over the past five years.[11]

Notwithstanding the evidence presented at the hearing (or information provided to Staff) to the contrary, as well as the concerns raised by Staff at the Open Meeting regarding the impacts on health and safety resulting from the voltage drops that occur on the line,[12] the Commission ordered SSVEC to delay the construction of the 69 kV line.[13] The Decision also references SSVEC's testimony that a delay of the construction of the 69 kV line would lead to the imposition of a moratorium on new hookups in the Affected Areas because the existing V-7 Feeder line has poor power quality and is at capacity.[14]

The Cooperative believes that based upon the requirements of the Decision and as there is not a definite time period for solutions to be effected to resolve these issues from the as yet-to-be-performed independent study results and recommendations, there is a

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[9] *See* Exhibits 4 and 4-A attached hereto.
[10] *See* Exhibit 5 attached hereto.
[11] *See* Exhibit 6 attached hereto.
[12] Rate Case Docket Open Meeting Transcript at page 155, line 23 through page 157, line 15.
[13] Decision at page 48, lines 24-26.
[14] Decision at page 37, lines 4-5; Rate Case Docket Hearing Transcript at page 303, line 18 through page 304, line 3; *See* also Transcript of Rate Case Docket Open Meeting at page 154, line 23 through page 155, line 5 and page 178, lines 21-24.

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likelihood of a delay of at least several years before rectification may occur to alleviate the Affected Areas' capacity and reliability problems, thereby continuing the degradation of the existing electric system. Allowance of additional load in the form of new service connections or expansion of existing services will only further degrade the quality and reliability of electric service in the Affected Areas by increasing the risk for: (i) voltage brown-outs, causing damage and possible safety hazards; (ii) overload damage to the substation transformer, including total failure; and (iii) an increased number of significant outages due to line and/or equipment failures.

Therefore, consistent with the arguments and evidence presented in the Rate Case Docket and to Staff, SSVEC has no choice but to request that the Commission authorize SSVEC to institute a moratorium on new service connections and expanded service within the Affected Areas that are served by the V-7 Feeder Line until such time that the power quality, capacity, and reliability issues can be resolved. Although the requested moratorium will not alleviate the existing power quality, reliability, and capacity problem in the Affected Areas, it will assist in ensuring that the problem is not further exacerbated.

As of the date of the filing of this Application, SSVEC has twenty three (23) requests for new service and/or expansion of service, which have been assigned a construction work order or have an application pending.[15] SSVEC will continue to honor these requests. Any request for service made after the date of filings will be put in a queue to be addressed on a first come, first served basis following the lifting of the moratorium.

III. COMMUNICATION AND NOTICES

All communications, notices, and correspondence regarding this Application should be served upon the following:

[15] *See* Exhibit 7 attached hereto.

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Bradley S. Carroll
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Phoenix, AZ 85004-2202
602-382-6578 (Direct)
602-382-6070 (Fax)
bcarroll@swlaw.com (Email)

IV. REQUESTED RELIEF

WHEREFORE, on the basis of the foregoing, SSVEC requests that the Commission issue an order as expeditiously as possible that authorizes the Cooperative to:

1. Immediately institute a moratorium on new and expanded service connections that will be serviced by the existing V-7 Feeder Line within the Affected Areas in the manner set forth in this Application; and

2. Maintain such moratorium until such time that SSVEC determines that a long-term, safe, affordable, and reliable solution is defined and fully implemented. This will allow SSVEC to provide the best possible service to existing customers (under the circumstances) without further degrading the already marginal service in the area that would result if additional load were allowed on the V-7 Feeder Line.

RESPECTFULLY SUBMITTED this 18th day of September, 2009.

SNELL & WILMER L.L.P.

By _____
Bradley S. Carroll
One Arizona Center
400 East Van Buren Street
Phoenix, Arizona 85004-2202
Attorneys for Sulphur Springs Valley Electric Cooperative, Inc.

Snell & Wilmer L.L.P. LAW OFFICES One Arizona Center, 400 E. Van Buren Phoenix, Arizona 85004-2202 (602) 382-6000

ORIGINAL and 13 copies filed this
18th day of September, 2009, with:

Docket Control
ARIZONA CORPORATION COMMISSION
1200 West Washington
Phoenix, Arizona 85007

COPIES of the foregoing hand-delivered
this 18th day of September, 2009, to:

Steve Olea Johnson, Director
Utilities Division
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

Janice Alward, Chief Counsel
Legal Division
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

Lyn Farmer, Chief Administrative Law Judge
Hearing Division
ARIZONA CORPORATION COMMISSION
1200 West Washington Street
Phoenix, Arizona 85007

By

10513949.2

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EXHIBIT 1

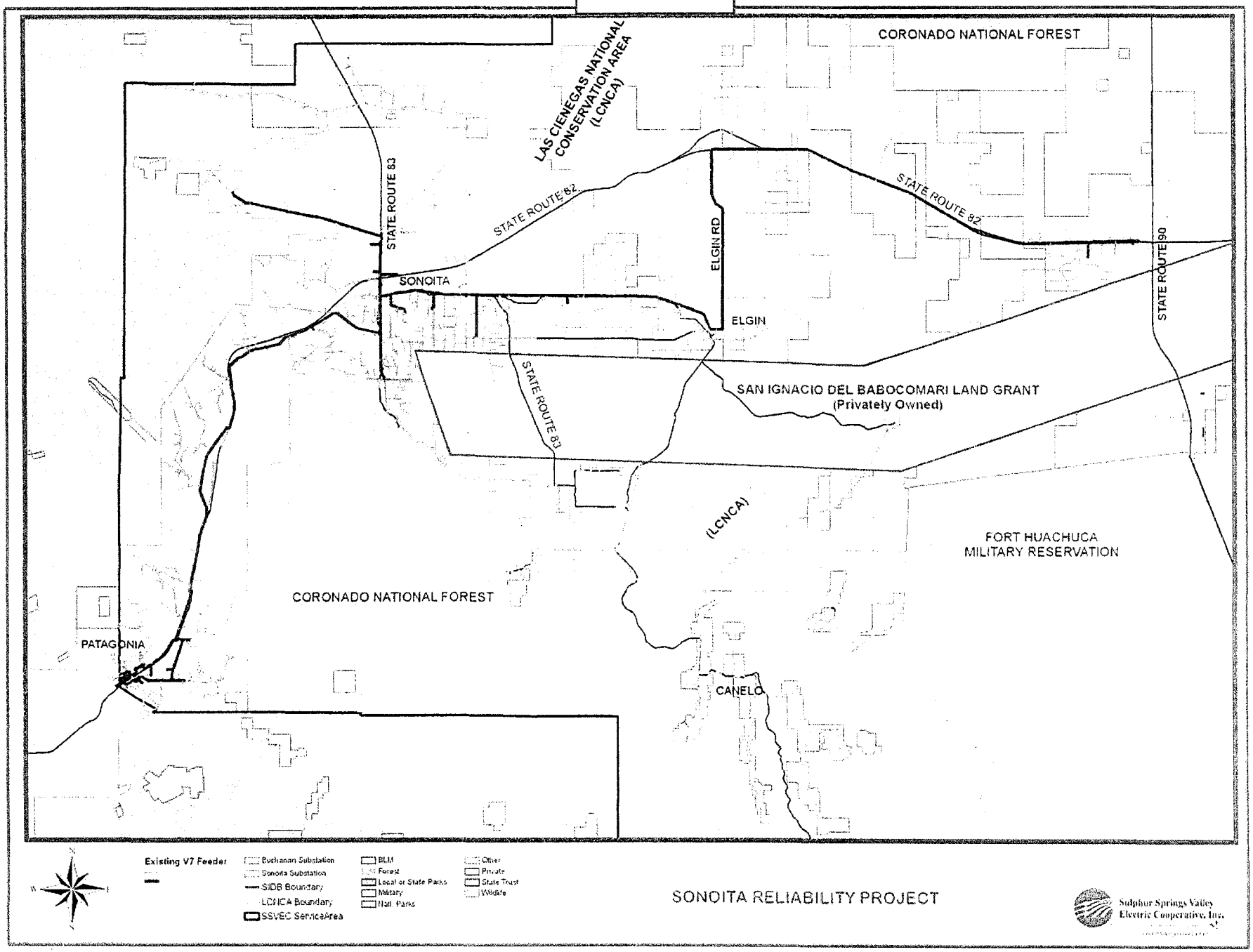
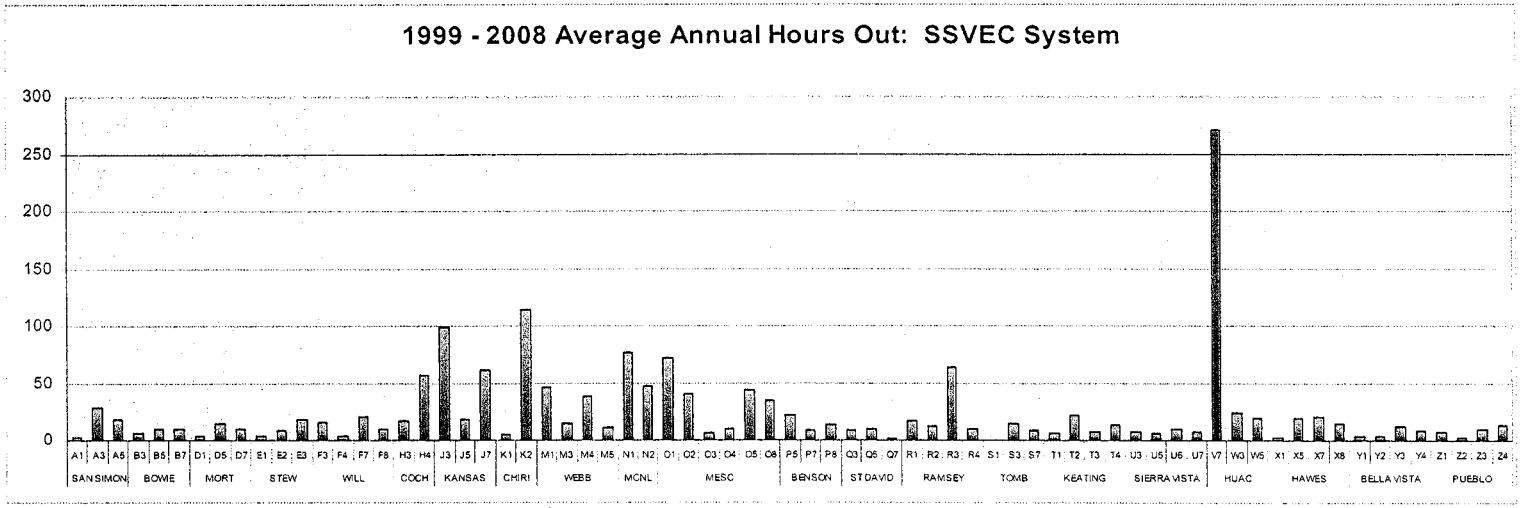

CORONADO NATIONAL FOREST
LAS CIENEGAS NATIONAL CONSERVATION AREA (LCNCA)
STATE ROUTE 83
STATE ROUTE 82
STATE ROUTE 82
ELGIN RD
STATE ROUTE 90
SONOITA
ELGIN
STATE ROUTE 83
SAN IGNACIO DEL BABOCOMARI LAND GRANT
(Privately Owned)
(LCNCA)
FORT HUACHUCA
MILITARY RESERVATION
CORONADO NATIONAL FOREST
PATAGONIA
CANELO
Existing V7 Feeder
Buchanan Substation
Sonoita Substation
SIDB Boundary
LCNCA Boundary
SSVEC ServiceArea
BLM
Forest
Local or State Parks
Military
Natl. Parks
Other
Private
State Trust
Wildlife
SONOITA RELIABILITY PROJECT
Sulphur Springs Valley Electric Cooperative, Inc.

EXHIBIT 2

V-7 Feeder Outages and Length in Miles as Compared to all SSVEC feeders



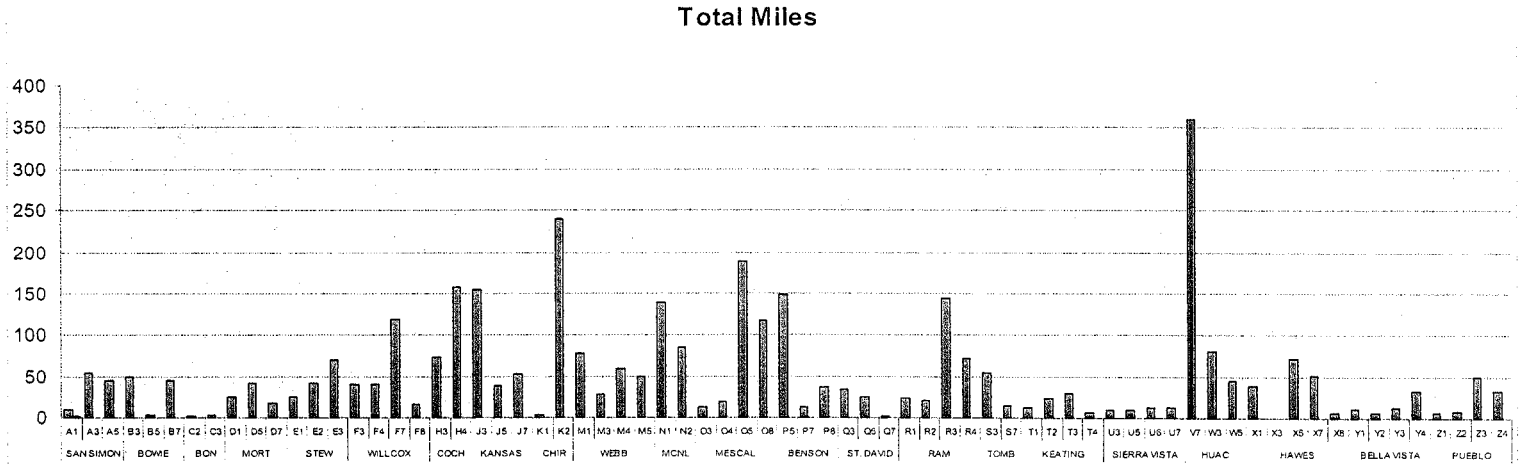


EXHIBIT 3

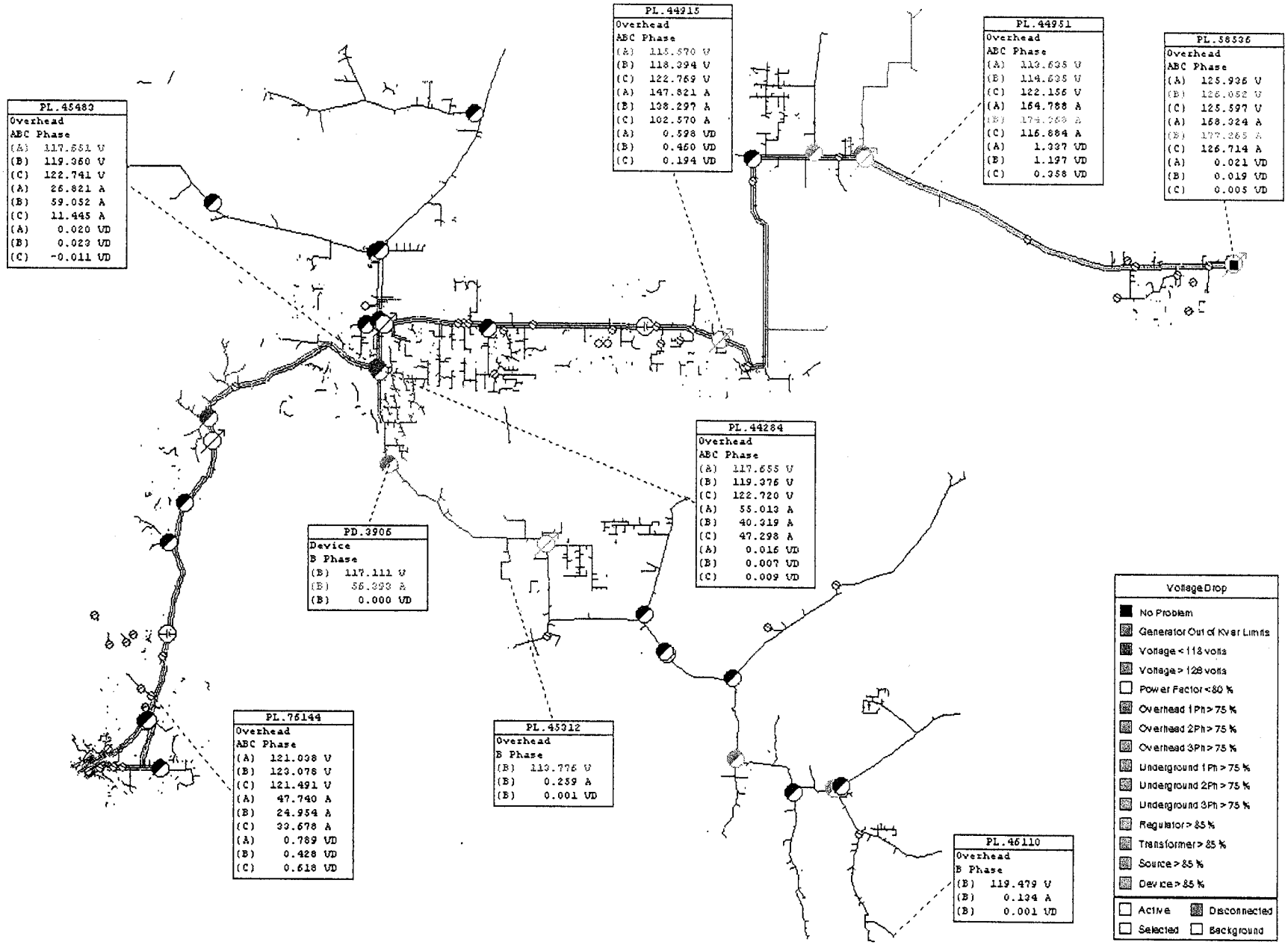


Figure 1: Base Case, Feb 2008 loads, no improvements

V7 Feeder: Milsoft WindMil Distribution Analysis

EXHIBIT 4

Maximum V7 Feeder Kilowatts vs. Half-hour Intervals for 5 Year Period 2004-2008 Showing Periods of Substation Transformer Overload

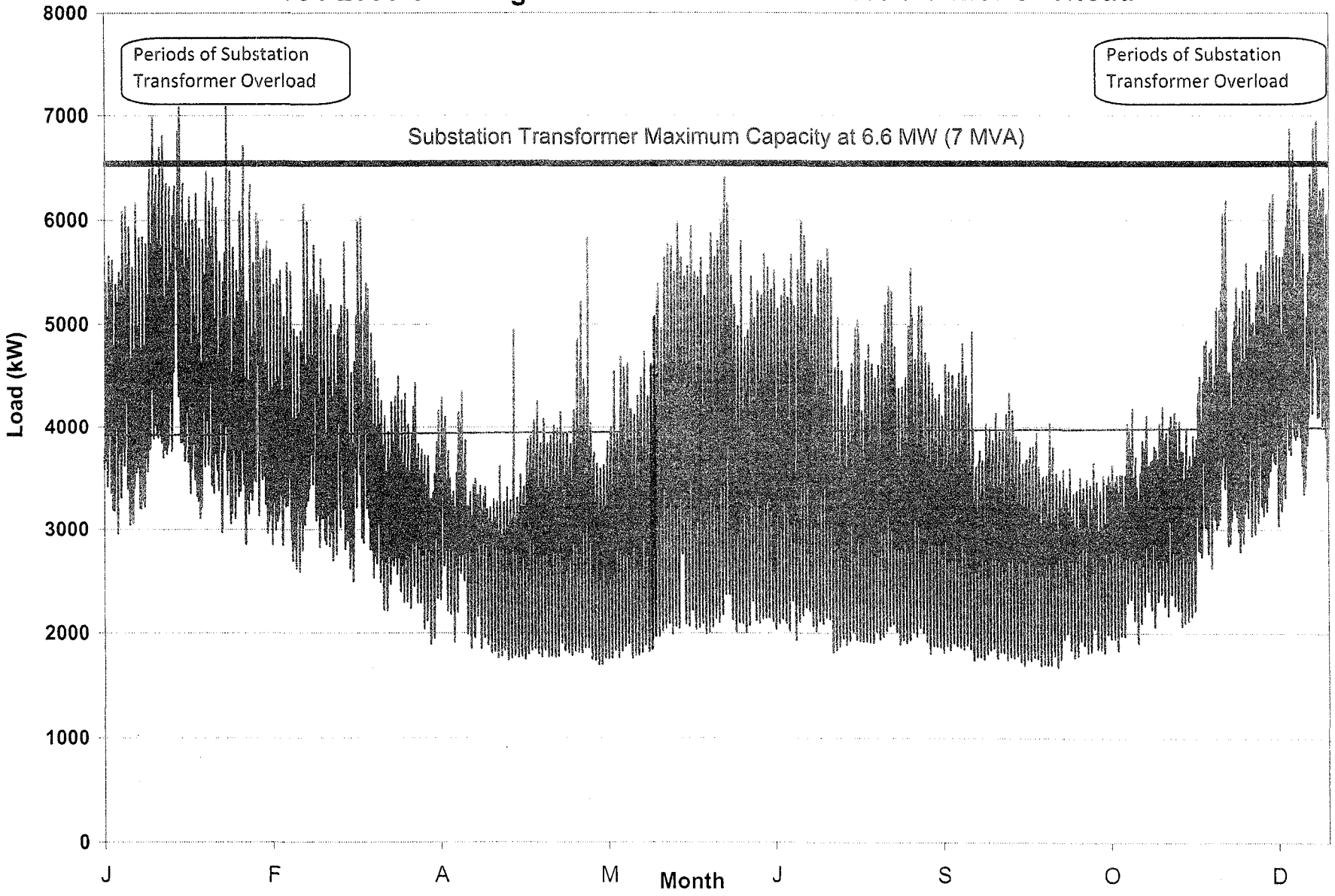
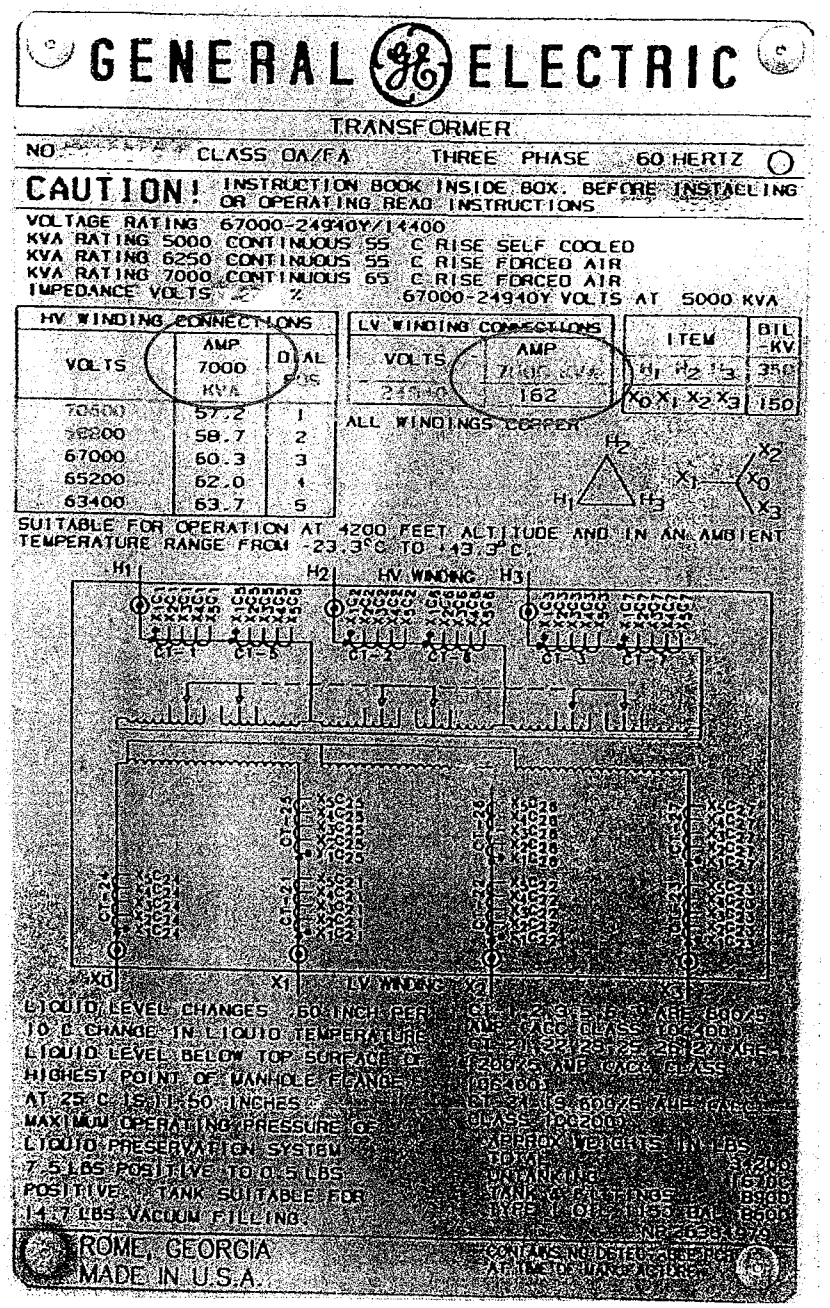


EXHIBIT 4-A

Huachuca West

Transformer Nameplate



GENERAL ELECTRIC

TRANSFORMER

NO. CLASS OA/FA THREE PHASE 60 HERTZ

CAUTION! INSTRUCTION BOOK INSIDE BOX. BEFORE INSTALLING OR OPERATING READ INSTRUCTIONS

VOLTAGE RATING 67000-24940Y/14400
KVA RATING 5000 CONTINUOUS 55 C RISE SELF COOLED
KVA RATING 6250 CONTINUOUS 55 C RISE FORCED AIR
KVA RATING 7000 CONTINUOUS 65 C RISE FORCED AIR
IMPEDANCE VOLTS % 67000-24940Y VOLTS AT 5000 KVA

HV WINDING CONNECTIONS		
VOLTS	AMP 7000 KVA	DIAL POS
70500	57.2	1
68800	58.7	2
67000	60.3	3
65200	62.0	4
63400	63.7	5

LV WINDING CONNECTIONS	
VOLTS	AMP 7000 KVA
24940	162

ITEM	BIL -KV
H_1 H_2 H_3	350
X_0 X_1 X_2 X_3	150

ALL WINDINGS COPPER

SUITABLE FOR OPERATION AT 4200 FEET ALTITUDE AND IN AN AMBIENT TEMPERATURE RANGE FROM -23.3°C TO +43.3°C.

LIQUID LEVEL CHANGES .60 INCH PER 10 C CHANGE IN LIQUID TEMPERATURE
LIQUID LEVEL BELOW TOP SURFACE OF HIGHEST POINT OF MANHOLE FLANGE AT 25 C IS 11.50 INCHES
MAXIMUM OPERATING PRESSURE OF LIQUID PRESERVATION SYSTEM 7.5 LBS POSITIVE TO 0.5 LBS POSITIVE. TANK SUITABLE FOR 14.7 LBS VACUUM FILLING.

CT-1,2,3,5,6,7 ARE 800/5 AMP CACC CLASS 10C400
CT-21,22,23,25,26,27 ARE 1200/5 AMP CACC CLASS 10C400
CT-24,25,26 ARE 600/5 AMP CACC CLASS 10C200

APPROX WEIGHTS IN LBS
TOTAL 34200
UNTANKING 16700
TANK & FITTINGS 8900
TYPE I OIL 1150 GAL 8600

ROME, GEORGIA
MADE IN U.S.A.

CONTAINS NO DETECTABLE PCB AT TIME OF MANUFACTURE

EXHIBIT 5

Arizona Subcounty Population Projections
July 1, 2006 to July 1, 2055
by County, Census County Division, Place, and Reservation

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Santa Cruz County	45,303	46,545	47,777	48,998	50,210	51,418	52,607	53,800	54,973	56,144	57,291	58,412	59,514	60,595
Patagonia CCD (Sum of Below)	3,180	3,252	3,323	3,394	3,464	3,533	3,602	3,671	3,738	3,806	3,872	3,937	4,000	4,063
% increase		2.25%	2.19%	2.12%	2.06%	2.01%	1.94%	1.91%	1.84%	1.81%	1.74%	1.67%	1.62%	1.56%
5-10-20 Year % Increase from 2009				**0.00%**					**10.16%**					**19.72%**
5-10-20 Year Population Increase from 2009					**70**	**140**	**208**	**277**	**345**					**669**
Elgin CDP	406	424	441	458	475	492	509	525	542	558	574	590	605	621
% increase		4.29%	4.08%	3.89%	3.71%	3.57%	3.39%	3.29%	3.13%	3.03%	2.88%	2.74%	2.62%	2.50%
5-10-20 Year % Increase from 2009				**0.00%**					**18.30%**					**35.53%**
5-10-20 Year Population Increase from 2009					**17**	**34**	**51**	**67**	**84**					**163**
Patagonia town	929	937	946	954	962	971	979	987	995	1,003	1,011	1,019	1,026	1,034
% increase		0.92%	0.90%	0.89%	0.87%	0.86%	0.84%	0.84%	0.82%	0.81%	0.79%	0.76%	0.74%	0.72%
5-10-20 Year % Increase from 2009				**0.00%**					**4.31%**					**8.36%**
5-10-20 Year Population Increase from 2009					**8**	**17**	**25**	**33**	**41**					**80**
Sonoita CDP	1,016	1,050	1,084	1,117	1,151	1,184	1,217	1,249	1,281	1,314	1,345	1,376	1,406	1,436
% increase		3.36%	3.22%	3.09%	2.98%	2.88%	2.76%	2.69%	2.58%	2.51%	2.40%	2.29%	2.20%	2.11%
5-10-20 Year % Increase from 2009				**0.00%**					**14.68%**					**28.49%**
5-10-20 Year Population Increase from 2009					**33**	**66**	**99**	**132**	**164**					**318**
Remainder of Patagonia CCD	830	841	853	864	876	887	898	909	920	931	942	952	963	973
% increase		1.40%	1.37%	1.34%	1.31%	1.29%	1.25%	1.24%	1.21%	1.19%	1.15%	1.11%	1.08%	1.05%
5-10-20 Year % Increase from 2009				**0.00%**					**6.47%**					**12.55%**
5-10-20 Year Population Increase from 2009					**11**	**23**	**34**	**45**	**56**					**108**

A census-designated place(**CDP**) is a type of place (a concentration of population) identified by the United States Census Bureau for statistical purposes. CDPs are delineated for each decennial census as the statistical counterparts of incorporated places such as cities, towns and villages. CDPs are populated areas that lack separate municipal government, but which otherwise physically resemble incorporated places. CDPs are delineated solely to provide data for settled concentrations of population that are identifiable by name but are not legally incorporated under the laws of the state in which they are located. The boundaries of a CDP have no legal status

A Census County Division(**CCD**) is a subdivision of a county used by the United States Census Bureau for the purpose of presenting statistical data. A CCD is a relatively permanent statistical area delineated cooperatively by the Census Bureau and state and local government authorities. CCDs are defined in states that do not have well-defined and stable minor civil divisions (e.g., townships) that have local governmental purposes

Source: Arizona Department of Economic Security, Research Administration, Population Statistics Unit. 12/01/06.
Seago / DES Population Statistics approved June 6, 2007

EXHIBIT 6

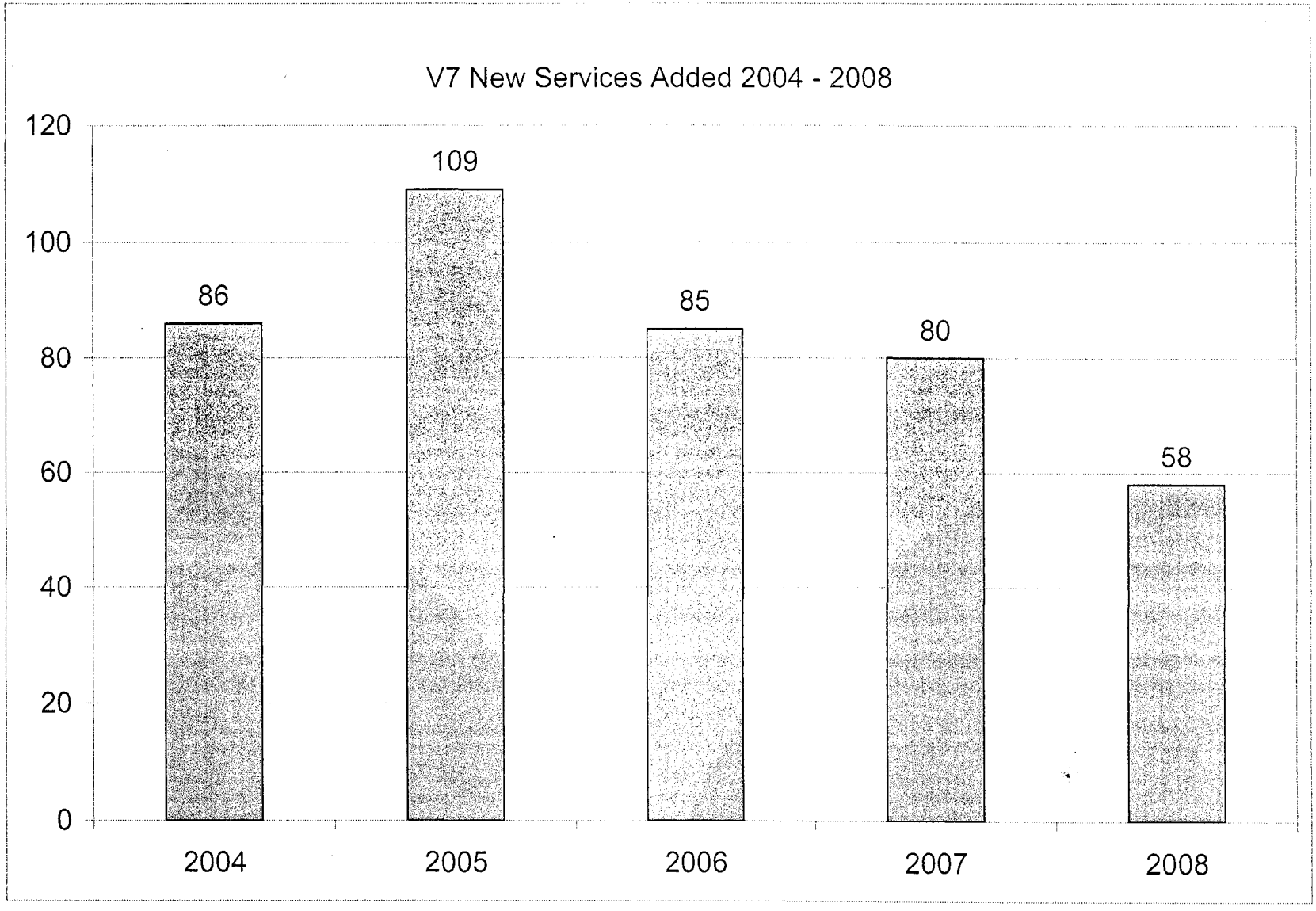

V7 New Services Added 2004 - 2008
120
100
80
60
40
20
0
86
109
85
80
58
2004
2005
2006
2007
2008

EXHIBIT 7

V-7 WORK ORDER STATUS
16-Sep-09

DATE REQUESTED	W/O #	DISCRIPTION	COMMENTS/EXPLANATION OF FILE STATUS
3/3/2009	81043	UG PRIM & SEC 400 AMP HOUSE	PENDING PAYMENT
6/14/2008	80128	400 AMP FOR NEW STORE	HOLDING FOR CUSTOMER INFO
8/14/2008	80402	UG PRIM $ SEC 200 AMP HOUSE	PENDING PAYMENT
6/4/2009	81370	NEW SERVICE 200 AMP FOR HOUSE	IN ROW PENDING PERMITS
7/22/2009	81540	NEW 200 AMP SERVICE FOR MH	CONSTRUCTION PENDING
8/21/2009	81641	NEW 400 AMP SERVICE FOR SHOP	CUSTOMER WILL CALL WHEN READY
8/21/2009	81640	200 AMP SERVICE FOR WELL	CONSTRUCTION PENDING
8/25/2009	81651	200 AMP SERVICE FOR WELL	PENDING PAYMENT
8/31/2009	81667	200 AMP SERVICE FOR HOUSE	PENDING PAYMENT
PENDING	PENDING	200 AMP TO HOUSE PRI & SEC	APPLICATION
9/8/2009	81863	200 AMP TO HOUSE PRI & SEC	STAKING IN PROGRESS
PENDING	PENDING	200 AMP SEC TO HOUSE	APPLICATION
PENDING	PENDING	UPGRADE TO 200 AMP FOR HOUSE	APPLICATION
7/27/2009	81660	UG SEC TO HOUSE 200 AMP	STAKING IN PROGRESS
PENDING	PENDING	SERVICE FOR HOUSE	APPLICATION
8/24/2009	81649	SERVICE FOR HOUSE 200 AMP	STAKING IN PROGRESS
9/9/2009	81685/81686	SERVICE FOR 2 HOUSES	READY TO STAKE
9/15/2009	81697	200 AMP RAMADA	READY TO STAKE
9/16/2009	81700	SERVICE FOR HOUSE 200 AMP	READY TO STAKE
PENDING	PENDING	SERVICE FOR HOUSE 200 AMP	IN ESCROW
PENDING	PENDING	SERVICE FOR HOUSE 200 AMP	APPLICATION
PENDING	PENDING	SERVICE FOR HOUSE 200 AMP	HOUSE FOR SALE IN TUCSON
PENDING	PENDING	SERVICE FOR HOUSE 200 AMP	DRAWING UP PLANS

Attachment I

Ron Orozco, P.E., CEM, CDSM

Engineering Manager, SSVEC

Phone: (520) 609-5026

e-mail: rorozco@ssvec.com

Ron possesses a unique background of education and work experience on both the electric utility side and the industry side of various renewable energy technologies. This experience spans thirty years beginning in 1979 with early solar and wind energy system research at the University of Arizona to current position as Engineering Manager at Sulphur Springs Valley Electric Cooperative. Included in this period is: increasingly more challenging and professional development in conventional rural electric utility engineering; energy efficiency, and demand-side management; renewable energy system design, installation and maintenance; renewable energy program design, implementation and evaluation worldwide; solar and wind energy training worldwide; wind resource assessment.

Ron holds the following credentials: B.Sc. Engineering – University of Arizona; registered Professional Engineer in Arizona (AZ#21623) and New Mexico (NM#12607); Certified Energy Manager (#5266) and Certified Demand Side Manager (#83) through Association of Energy Engineers; Journeyman Electrician (EE-98J in NM #35084) and Licensed Electrical Contractor (EE98 in NM #91998) in New Mexico (neither current to avoid any conflict of interest with current position at SSVEC); NABCEP Certified Solar PV Installer™ (not current to avoid conflict of interest); Member of the NRECA Cooperative Research Council's Renewable and Distributed Energy Management Advisory Group; graduate of the NRECA/University of Nebraska Management Internship Program.

Electric Utility Experience

- **Conventional Electric Utility Engineering**
  - Engineering Manager with direct management responsibility for a team of 28, including five Professional Engineers, for all design, field staking, right-of-way acquisition, power quality, construction standards, and planning for a $25M+ construction work plan
  - Transmission line (up to 115 kV), distribution line (7.2/12.47 kV and 14.4/24.9 kV), and substation design and construction
  - Load flow analysis and system losses evaluation
  - Development, training, and use of distribution line staking manuals
  - Power requirements studies
  - Rate studies and presentation to state utility commission

- **Energy Management**
  - Certified Energy Manager and Certified Demand Side Manager through Association of Energy Engineers
  - Completed energy audits of dozens of irrigated farms in Arizona establishing metric for energy conservation program goals leading to implementation of a demand-side load management program to shed 20+ MW of irrigation load for peak shaving
  - Taught irrigation load management programs for Western Area Power Authority
  - Conducted dozens of residential energy audits as part of marketing and application assessment for grid and off-grid renewable energy applications

- Provided technical assistance in energy conservation programs to various Central American electric utilities during nationwide power shortages
- Arranged for representatives of the National Association of Energy Service Companies to visit Central American utilities and present ESCO and ESPC concepts
- Developed and implemented energy conservation training programs and materials for use in newly electrified rural villages of Central America
- Successfully identified funding for, and completed field installation of, 100+ residential electric meters in previously unmetered solar/wind/diesel hybrid village in Mexico

Renewable Energy Experience

➢ **Renewable Energy System Design, Installation and Maintenance**

- Charter NABCEP Certified Solar PV Installer™ through the North American Board of Certified Energy Practitioners dedicated to recognizing the most qualified and experienced solar energy professionals (not current)
- Responsible for design review and field inspection of forty-one 21kW, 3-phase grid connected photovoltaic systems installed at schools in Cochise County
- Responsible for design review and field inspection of dozens of residential grid-connected solar and wind energy systems through SSVEC's SunWatts program.
- Owned and managed Energía Total – an electrical contracting firm specializing in solar and wind energy system design, installation and maintenance in New Mexico (1996-2001)
- Designed and installed over 50kW of solar and wind electric systems for domestic, Arctic, Antarctic and Latin American markets
- Designed, built and marketed the "FireFly" line of pre-assembled, skid-mounted solar and solar/wind/gasoline genset systems
- Designed and built DC power control system for remote telecomm application in the Amazon of Brazil
- Designed and built two solar/wind/gasoline hybrid systems for Arctic application
- Designed and installed more than six wind energy systems using turbines ranging from 10kW to 500 watts
- Designed and installed approximately 20kW of grid-connected solar electric systems including a one commercial 10kW and one 6kW – 3 phase system and several residential systems
- Field engineer for 75MW+ wind energy project in Appalachia responsible for site evaluation, permitting, and project design including array layout, substation design and underground sub-distribution system design

➢ **Renewable Energy Program Design, Implementation and Evaluation**

- Renewable Energy Consultant to World Bank, US Agency for International Development, Sandia National Laboratories, Southwest Technology Development Institute, American Wind Energy Association, Solar Energy Industries Association, Solar Energy Research and Development Fund and others in design and evaluation of renewable energy programs in US, Mexico, Central and South America and Africa.
- World Bank assessment of renewable energy opportunities in rebuilding of energy infrastructure for Mozambique

- **Solar and Wind Energy Training**
  - Developed training materials and presented dozens of training sessions ranging from community meetings to week-long technical training courses in US, Mexico, Central and South America, and Africa for audiences ranging from national Ministers of Energy to small farmers

- **Village Power**
  - Established and implemented a private ownership model for a 6MW diesel generation station and associated transmission and distribution system on the island of Roatan, Honduras including interim management and implementation of a demand- and supply-side energy management programs
  - Directly engaged in design, installation, review and/or maintenance of numerous diesel only, wind/diesel, and wind/solar/diesel village power systems in Mexico, Central America, Brazil and Peru
  - Conducted field evaluation of 10+ village diesel systems in Amazon for potential conversion to hybrid renewable systems
  - Institutional and Energy Management Specialist for large diesel/solar village power system in the Peruvian Amazon with International Lead Zinc Research Institute, the Solar Energy Industry Association and the Solar Energy Research and Education Fund

- **Domestic Wind Energy Experience**
  - **Western Maryland**
    - Installation of 50-meter meteorological tower and supervision of two other towers
    - Implement project scheduling, land acquisition, permitting, micro-siting, and town meetings
    - Engineering representative to transmission utility on substation and interconnect issues
    - Oversee various site environmental studies, surveying, and sub-contractor activities
  - **New Mexico**
    - Owner/Operator of company that installed seven 40-meter anemometer towers for State of NM Energy, Minerals and Natural Resources
    - Personally installed two 40-meter resource assessment towers
    - Isleta Pueblo Wind energy proposal for DOE/Kirtland Air Force Base/Sandia Labs
  - **South Dakota**
    - Site assessment, partnering agreements, PPA discussions with local utilities, interconnect review, avian issue paper, oversight of environmental assessment, detailed financial analysis, for single-turbine grid-connected 750kW-1MW project with Rosebud Sioux tribe and DOE.
    - Integrated Resource Plan for Rosebud Sioux tribe including wind energy

- **International Wind Energy Experience**
  - **Mexico**
    - Baja California – Directed wind resource assessment program for DOE/Sandia. Arranged institutional partnering, general and micro siting for anemometer towers, local fabrication and installation of 15-meter towers in seven sites along Pacific coast of Baja California. Facilitated data collection and delivery of data.
    - Yucatan Assessment – Pilot and project director for aerial and ground survey of potential wind energy sites along Southern Yucatan coastline.
    - Oaxaca Assessment - Pilot and project director for aerial and ground survey of potential wind energy sites along the coastline and Isthmus of Tehuantepec (La Ventosa).
  - **Brazil**
    - Co-author of Training Needs Assessment for USAID/Brazil including support large wind energy technologies
    - Taught technical and commercial portions training course on commercial development of large wind energy projects in Brazil
  - **Guatemala**
    - Assisted in identification and project development for Huité Wind Energy Project and facilitated tour of US manufacturers
    - Consultant to Ministry of Energy of Guatemala for development of energy policy friendly to renewables
  - **Honduras**
    - Facilitate wind project near Tegucigalpa
    - INCAE/REETI Wind Energy Training
  - **Peru**
    - Host Ministry of Energy representative to Tehachapi and beyond
  - **Canada**
    - Prepare Wind/Gas project proposal for First Nations of Canada
    - Prepare Wind/Gas project proposal to Canadian Department of Energy

Attachment J

OPEN MEETING AGENDA ITEM

E-01575A-08-0328

From: Lee Sims [leesims2@gmail.com]
Sent: Thursday, August 13, 2009 11:18 AM
To: Kennedy-Web
Subject: Sulphur Springs Valley Electric Co-op (SSVEC)'s Proposed 69 kv Sub-Transmission Line

ORIGINAL

Dear Ms. Kennedy:

I have been a member of SSVEC since 1961 and a resident of Sonoita since 1967, Over the years, I have experienced many blinks and power outages that come with living in a rural area. However, the situation is now becoming critical since the 14 kv feeder line (V-7 Feeder) from the sub-station 20 miles east at the junction of highways 82 and 90, has reached capacity. The V-7 Feeder serves 2400 homes in the Elgin, Sonoita and Patagonia area, has 360 miles of line and is the longest feeder line in the SSVEC inventory. The rate hearing scheduled to begin on August 17th will in part deal with a proposed 69 kv sub- transmission line from the Huachuca City / Sierra Vista area to Sonoita. This line will serve to rectify brownouts, blinks and outages now experienced.

SSVEC has provided the members served by the V-7 Feeder with an eight page report which discussed five options and costs ranging from $55M to $13.3M. SSVEC chose the $13.5M option which is the most cost efficient route, affects the fewest members and uses existing easements. I support SSVEC in the choice of this option.

A very small, but exceedingly loud group of members has by means of irrational rants managed to delay construction of this much needed 69 kv sub-transmission line. They are now circulating petitions saying that new technologies would be significantly less expensive ($3-9
million) to implement, but they offer zero information on this new technology and they are requesting that SSVEC initiate a feasibility study of all alternative techniques of power generation.

The V-7 Feeder is at maximum capacity now and any new power generation in the V-7 Feeder area would require a back-up sub-transmission line.
There are some alternative methods of power generation in use today such as wind and solar, but the amount of power produced is exceedingly small. Furthermore wind and solar power generation is much more expensive than the methods used by the Arizona Electric Power Cooperative (AEPCO) which supplies power to SSVEC.

As I stated earlier, I support SSVEC's choice in the 69 kv sub- transmission line and I hope that the Arizona Corporation Commission also approves so that construction can begin forthwith.

Lee Sims, P. E., retired
PO Box 206
Sonoita Az 85637

Arizona Corporation Commission
DOCKETED
AUG 25 2009
DOCKETED BY

RECEIVED
2009 AUG 25 P 4: 25
AZ CORP COMMISSION
DOCKET CONTROL

E-01575A-08-0328

OPEN MEETING AGENDA ITEM

ORIGINAL

ARIZONA CORPORATION COMMI

UTILITY COMPLAINT FORM

Investigator: Al Amezcua **Phone:** **Fax:** (

Priority: Respond Within Five Days

Opinion No. 2009 - 81352 **Date:** 8/21/2009

Complaint Description: 08E Rate Cases Items - In Favor
N/A Not Applicable

	First:	Last:
Complaint By:	Dale W	Wykes

Account Name: Dale W Wykes **Home:** (000) 000-0000
Street: n/a **Work:** (000) 000-0000
City: n/a **CBR:** (
State: AZ **Zip:** 00000 **is:** E-Mail

Utility Company. Sulphur Springs Valley Electric Cooperative, Inc.
Division: Electric
Contact Name: Lainie Keltner **Contact Phone:**

Arizona Corporation Commission
DOCKETED
AUG 24 2009
DOCKETED BY

AZ CORP COMMISSION
DOCKET CONTROL

RECEIVED
2009 AUG 24 P 4: 11

Nature of Complaint:
8/21/09 REFERRED BY CHAIRMAN MAYES OFFICE.

From: DALE WYKES
Sent: Tuesday, August 18, 2009 9:33 AM
To: Mayes-WebEmail
Subject: ACC Docket No. E-1057A-08-0328

Dear Commissioners,

I am appalled at the continuing attempts by individuals in the Sonoita/Patagonia area to change, delay and even preclude this action. The complaints of destroying native grass line and ruining senic views are nonsense. SSVEC has done an outstanding job to plan minimal impact on people in the area and has tried, to no avail, to placate the concerns. I personally know many of the people who have been among the complainers and know that they, as a group, would never be satisfied by any single action SSVEC took. I regret that information on the change of the hearing location to Tuscon was poorly circulated. I did not hear of the Tuscon hearing until Saturday and was unable to change plans for Monday to attend.

I live 22 miles southast of Sonoita, near the end of SSVEC's longest distribution line. A line which for many years has had the dubious distinction of having the highest outage rate in the total SSVEC service area. The outage rate has always been attributed to the old ineffective power transmission line to the Sonoita/Patagonia area. My only complaint with this planned Sonoita transmission line and substation is that it's not done yet! I have looked at the substation location and the route of the transmision line and fail to understand the reasoning of those who oppose them. SSVEC has done a good job in coming up with an effective plan that has minimal impact on all area residents.

I am not opposed to solar or wind or other alternatives but I think these should be approached as long range improvements in the overall power generation scheme not as partial fixes in a transmission line and distribution upgrade. I am vehemently opposed to any further delays in correcting this long know situation. I have already

ARIZONA CORPORATION COMMISSION

UTILITY COMPLAINT FORM

suffered long enough with the poorest least reliable electrical power in the SSVEC system. I am tired of waiting to get more reliable power with less outages/blinks. I know going "Green" is one of the most popular things currently but everything has it's time and place and this action is neither the time or the place for it.

I strongly urge the Corporation Commision not to exacerbate my situation of poor power reliability by doing anything that delays or impedes completion of this long overdue task. As for SSVEC's rate increase, I don't see how they have gone as long as they have without a rate increase. The costs of everything else has gone up dramatically in the time since SSCEC's current rates were set. I will gladly pay more for better more reliable service. I am asking you allow SSVEC to continue this project as planned and as soon as possible, not delaying another year or for some unknown future time. Again, please do not delay SSVEC in making this improvement.

Sincerely,

Dale W. Wykes
End of Complaint

Utilities' Response:

Investigator's Comments and Disposition:

8/21/09 Good morning Mr. Wykes

This is to acknowledge receipt of your email dated August 18, 2009 to Chairman Mayes Office. My name is Alfonso Amezcua with the Arizona Corporation Commission Utilities Division ("Commission"). Your opinion will be placed on file with the Docket Control Center of the Commission to be made part of the record.

Staff appreciates your comments and the interest taken on the application. CLOSED.
End of Comments

Date Completed: 8/21/2009

Opinion No. 2009 - 81352

E 0157A-08-0328

ARIZONA CORPORATION COMMISSION

UTILITY COMPLAINT FORM

Investigator: Brad Morton **Phone:** (602) 542-0836 **Fax:** (602) 542-2129

Priority: Respond Within Five Days

Opinion No. 2009 - 81398 **Date:** 8/24/2009

Complaint Description: 08A Rate Case Items - Opposed
N/A Not Applicable

	First:	Last:	
Complaint By:	Susan	Andersen	
Account Name:	Susan Andersen		**Home:** (520) 000-0000
Street:	n/a		**Work:**
City:	n/a		**CBR:**
State:	AZ Zip: 00000		**is:**

Utility Company. Sulphur Springs Valley Electric Cooperative, Inc.
Division: Electric
Contact Name: Lainie Keltner **Contact Phone:** (520) 515-3440

Nature of Complaint:

From: Jack Blair [mailto:jblair@ssvec.com] On Behalf Of senior_management
Sent: Monday, August 24, 2009 8:25 AM
To: Utilities Div - Mailbox
Subject: FW: Sonoita Reliablity Project Docket # E-0157A-08-0328

This member asked that this letter docketed in the SSVEC rate case

-----Original Message-----
From: Susan L. Andersen [mailto:nycnowaz@hotmail.com]
Sent: Tuesday, August 18, 2009 9:37 PM
To: senior_management@ssvec.org
Subject: Sonoita Reliablity Project

The following message was sent from the SSVEC.org Contact Us email form:

****
Sent by: Susan L. Andersen
Email: nycnowaz@hotmail.com
Address: 63 Palomino Trail, Sonoita, AZ 85637 Member #: 246541 Submit Date: August 18, 2009, 9:36 pm

****

Dear Mr. Blair,

I implore you to get this project up and running tout de suite.
Please know that there are a higher number of residents in favor of this project going forward than this NIMBY group that feels they speak for all of Sonoita... which by the way, they don\'t. Sonoita was without power for

ARIZONA CORPORATION COMMISSION

UTILITY COMPLAINT FORM

approx. two hours today, and to have to wait for another year to get this project going is unacceptable.

Must SSVEC abide by what the ACC has handed down?
What are your options to negate their decision?

Sincerely,
Susan Andersen
End of Complaint

Utilities' Response:

.

Investigator's Comments and Disposition:

Opinion docketed.
End of Comments

Date Completed: 8/24/2009

Opinion No. 2009 - 81398

E-01575A-08-0328

ORIGINAL

ARIZONA CORPORATION COM

UTILITY COMPLAINT FORM

Investigator: Al Amezcua **Phone:** **Fax:**

Priority: Respond Within Five Days

Opinion No. 2009 - 81478 **Date:** 8/26/2009

Complaint Description: 08E Rate Cases Items - In Favor
N/A Not Applicable

	First:	Last:		
Complaint By:	Sabrina	Miller		
Account Name:	Sabrina Miller		**Home:**	(000) 000-0000
Street:	n/a		**Work:**	(000) 000-0000
City:	n/a		**CBR:**	
State:	AZ	**Zip:** 00000	**is:**	

RECEIVED
2009 AUG 28 P 3: 51
AZ CORP COMMISSION
DOCKET CONTROL

Utility Company. Sulphur Springs Valley Electric Cooperative, Inc.
Division: Electric
Contact Name: Lainie Keltner **Contact Phone:**

Arizona Corporation Commission
DOCKETED
AUG 28 2009
DOCKETED BY

Nature of Complaint:

From: Sabrina [mailto:
Sent: Sunday, August 23, 2009 5:20 PM
To: Newman-Web; Pierce-Web; Mayes-WebEmail; kennedy-web@azcc.org; stump-web@azcc.org
Subject: SSVEC Rate Hearing

The ACC should reconsider the Sonoita line matter that I read in the Sierra Vista Herald about a few days ago. I know the people who are leading the charge against building this line and all of this environmental stuff that they are bringing up is a bunch of crap. When SSVEC first proposed the line, I know for a fact that the Getzwillers were for it. The reason I know that is that they wanted the line to run across most of the ranch but then turn off of it before they reached their view. I know it because they tried to get the community to get behind the new line route. When I found out about it, I was enraged since their new proposed line was now going across my backyard where there was no easement. Many of us got together and went to SSVEC and got that proposal stopped. These people will do anything for this line to be built somewhere else and I think that this is wrong. It is also wrong to spend a quarter of a million dollars on a study that in fact will end up costing all of us a lot more money since delays always mean increased costs. I think that SSVEC has done a great job in keeping us informed and working with us.

After reading the article I think that the entire commission caved in to a few extremists who made themselves sound really loud. A lot louder than their numbers. Most of us down here want the line built and built now. I'm tired of the outages and spikes and drops in power. Delaying this does no good. I DO NOT want to have my rates go up for another study. And how can you do this? I went to the Sierra Vista meeting and clearly remember the Chairwoman even saying that you don't have jurisdiction. And now you feel you do? So I now consider the commission responsible for the power issues and will direct my ire to you when the power goes out. It is no longer SSVEC's problem, it is yours.

Sabrina Miller

OPEN MEETING AGENDA ITEM

E-01575A-08-0328

From: Dave Grieshop [38daze@cox.net]
Sent: Sunday, August 23, 2009 9:31 PM
To: Newman-Web
Cc: Mayes-WebEmail
Subject: SSVEC Rate Hearing, Tuesday, August 25, 2009

ORIGINAL

Commissioner Newman:

It was regrettable you made a motion last week during the SSVEC rate hearing (aka, the Sonoita 69 KV line caper) to go against the administrative law judge and the ACC staff recommendation to require an independent review of the alternatives to the only viable course of action for upgrading the 69 KV line to improve reliable service to the Sonoita area residents. Had SSVEC not seriously studied the alternatives over the last few years for upgrading the line in question and addressing the grass land issues of the area, then I would have agreed with your motion. Unfortunately, you and all but one of your fellow commissioners allowed politics to get in the way of good corporate governance. SSVEC had done their due diligence; the ACC, led by you on this matter, capitulated!

From a jurisdictional perspective, anything less than 100KV is not within the purview of the ACC at several levels the most grievous being Constitutional. Second, a small group of self appointed "experts" from Sonoita held not only the vast majority of Sonoita residents' hostage but their vociferous vocal blather corralled a majority of the ACC itself. As if that was not bad enough, the statement in essence "for SSVEC to recoup the cost ($250K) of the independent study in a SSVEC future rate increase request defies belief.

Personally I am not impacted by the 69 KV line upgrade, per se. But as a member of the SSVEC, I will be impacted (as will all coop members) when the additional cost of the independent study is passed along to the members. You have caused a substantial additional expense to be incurred by SSVEC and have delayed reliable upgraded electrical service to the Sonoita area. I fully expect a year from now that the independent study and analysis you have demanded will result in the same conclusions SSVEC engineering reached years ago. In short, political gain will delay reliable electricity to all resident of Sonoita and the SSVEC members will incur an unnecessary expense on behalf of your ego.

Stay tuned because a lot of folks in the SSVEC service area already are.

David Grieshop
Sierra Vista

Arizona Corporation Commission
DOCKETED
AUG 25 2009
DOCKETED BY

RECEIVED
2009 AUG 25 P 2: 02
AZ CORP COMMISSION
DOCKET CONTROL

OPEN MEETING AGENDA ITEM

E-01575A-08-0328

From: Bruce Dockter [dockterbc@cox.net]
Sent: Monday, August 24, 2009 10:17 AM
To: Newman-Web
Subject: SSVEC Rate Case

ORIGINAL

Paul,

I was distressed to read in the paper recently that the Corporation Commission made a determination to delay the badly needed 69 KV line between Whetstone and Sonoita. As you know, the line is necessary to solve serious outage problems in Sonita, Elgin and Patagonia. The year delay you have imposed will only exacerbate the problem and I object to your mandate that the I, as a member of SSVEC, a Cooperative, must pay for yet another study when it appears that SSVEC has met all the requirements, already done a study of alternative recommendations, and done an environmental impact study.
This is a burden on the members of the cooperative imposed by the Corporation Commission that is unnecessary, and unappreciated.

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