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UniSource Energy SERVICES
P.O. Box 711
Tucson, Arizona 85702

March 8, 2010

Docket Control
Arizona Corporation Commission
1200 West Washington Street
Phoenix, AZ 85007

Re: Docket No. E-00000D-09-0020

UNS Electric, Inc. ("UNS Electric") hereby files its Reliability Must-Run ("RMR") studies for Mohave and Santa Cruz Counties. These RMR studies were required to be filed along with UNS Electric's Ten-Year Plans in January, but were in the process of being finalized.

If you have any questions, please contact me at (520) 884-3680.

Sincerely,

Jessica Bryne

Jessica Bryne

cc: Prem Bahl, ACC
Compliance, ACC

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UNS Electric, Inc.

MOHAVE COUNTY

A STUDY OF SIMULTANEOUS IMPORT LIMIT, RELIABILITY MUST-RUN GENERATION, MAXIMUM LOAD SERVING CAPABILITY FOR YEARS 2013 AND 2018

Prepared for:
Arizona Corporation Commission
Utilities Division
1200 West Washington St.
Phoenix, Arizona 85007

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Executive Summary

Power flow simulations show that the Western Area Power Administration ("WAPA") Desert Southwest Region ("DSW") transmission network (the "Study System") within Mohave County, Arizona is reliable and capable of serving all load within the specified cut plane. The Simultaneous Import Limit ("SIL") analysis indicates that a relatively small amount of generation may be required in the 2013 and 2018 planning horizon. Hydroelectric generation within the study system must be run regardless of Reliability Must Run ("RMR") requirements in order to meet minimum river flow requirements set by the United States Bureau of Reclamation (the "Bureau"). Thus, no additional generation is needed to assure system reliability. Table 1 depicts the metric values studied for this report; they include SIL; Maximum Load Serving Capability ("MLSC"); and RMR.

Table 1: Study Results

Year	Mohave Forecasted Peak	Study System Load	Metric	Metric Value	Limiting Element	Limiting Outage	RMR & MLSC Generation	
							Station	Dispatch
2013	826MW	800MW	SIL*	816MW[1]	Black Mesa 230kV Voltage deviation	Parker - Black Mesa 230kV circuit	NONE within study area	0MW
		1050MW	MLSC	1050MW[1]	Black Mesa 230kV Voltage deviation	Parker - Black Mesa 230kV circuit	ALL within study area	1590.9MW
		826MW	RMR	10MW[1]	Black Mesa 230kV Voltage deviation	Parker - Black Mesa 230kV circuit	Davis unit # 1	10MW[3]
2018	935MW	875MW	SIL*	889MW[2]	Peacock 230kV Voltage deviation	Peacock 345/230kV transformer	NONE within study area	0MW
		1200MW	MLSC	1200MW[2]	Mercator 230kV Voltage deviation	Griffith - McConnico 230kV circuit	ALL within study area	1590.9MW
		935MW	RMR	40MW[2]	Peacock 230kV Voltage deviation	Peacock 345/230kV transformer	Davis# 1-4	40MW[3]

*SIL - import elements (1) Mead - Davis 230kV (2) McCullough - Davis 230kV (3) Peacock 345/230 xfmr (4) Round Vly - Peacock 230kV (5) Harcuvar - Parker 230kV (6) Eagle Eye - Parker 230kV (7) Gene - Parker 161kV (8a) Parker - Headgate 161kV (8b) Parker - Bouse 161kV (8c) Parker - Blythe 161kV

[1]This value assumes that the Black Mesa 230kV bus will not be tied into the Parker Davis System via Parker - N. Havasu 230kV circuit.
[2]This value assumes that the Black Mesa 230kV bus will be tied into the Parker Davis System via the Parker - N. Havasu 230kV circuit.
[3]These RMR values are less than the output achieved from water release requirements.

The Bureau has confirmed that during on-peak times, the hydroelectric units at Davis and Parker will be running in order to meet water delivery requirements. Output during this time will be in excess of the RMR requirements identified in Table 1, thus new facility construction to meet RMR requirements is unnecessary. Though new facilities would eliminate RMR conditions for 2013 and 2018, because hydroelectric generation must run regardless, facility construction at this time is not prudent.

Introduction and Purpose

UNS Electric, Inc. conducted this RMR study of the Mohave County Study System. Data was projected for the years 2013 and 2018. The scope of this study required an assessment of the portion of the WAPA DSW transmission network within Mohave County, Arizona. DSW owns and operates all of the transmission network facilities within the Study System.

Distribution systems embedded on the DSW transmission network within the Study System include the following:

- Aha Macav Power Service
- Arizona Public Service Company
- Central Arizona Water Conservation District
- Mohave Electric Cooperative, Inc., represented by Southwest Transmission Cooperative, Inc.
- UNS Electric, Inc.

The following entities provided input for this report:

- Tucson Electric Power Company
- Mohave Electric Cooperative, Inc.
- Arizona Public Service Company
- Western Area Power Administration
- Imperial Irrigation District

The Arizona Corporation Commission ("Commission") requires that RMR Studies include study of the following six components:

1. Simultaneous Import Limit: the maximum import level that the Study System can reliably support when <u>none</u> of the local thermal and hydro generation are on-line.

2. System Maximum Load Serving Capability: the maximum load level that the Study System can reliably support when <u>all</u> thermal and hydro generation is at maximum dispatch.

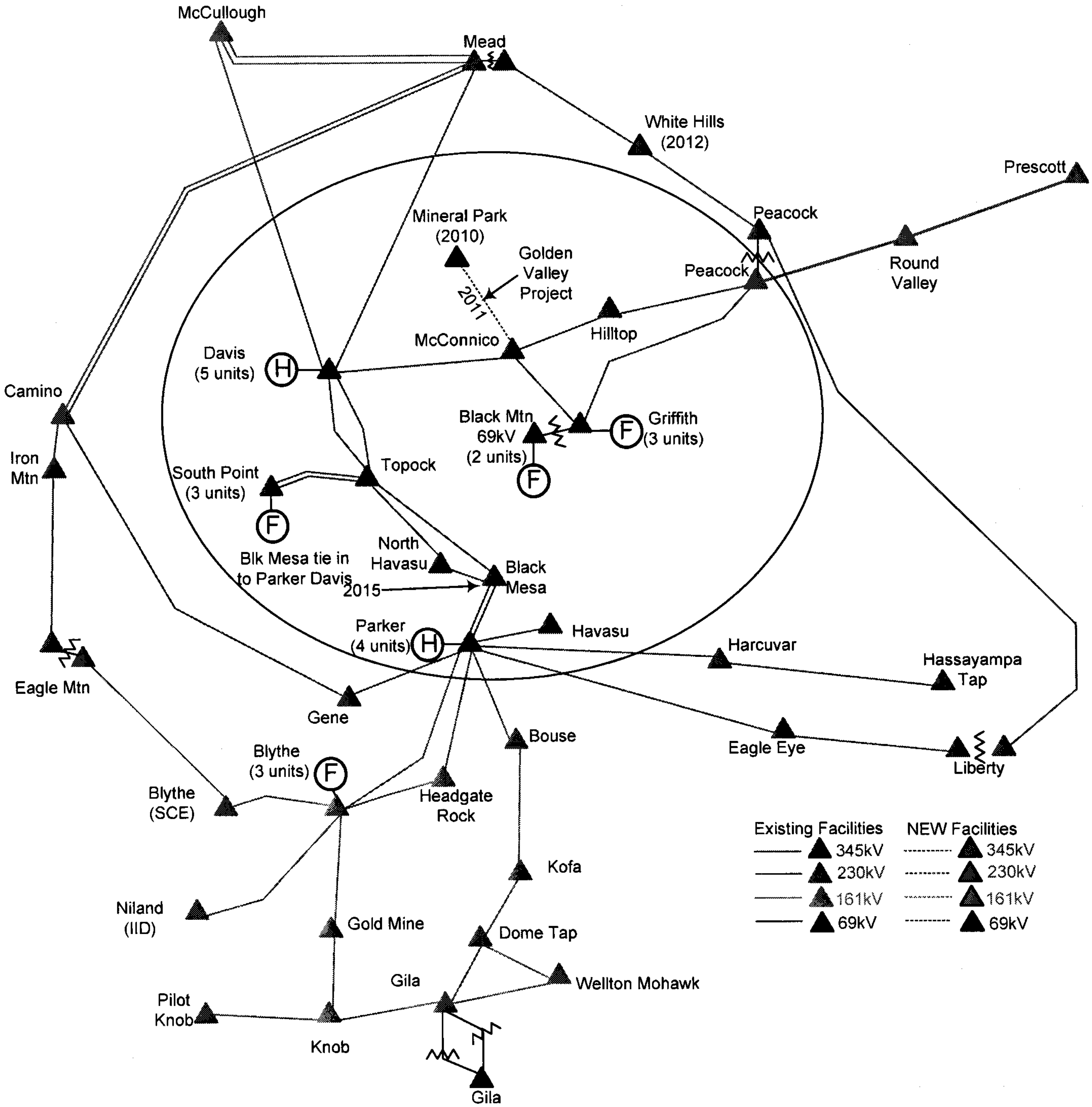
3. Reliability Must-Run conditions: these conditions exist only when the Study System cannot reliably support its projected peak load without the dispatch of some or all local generation, (i.e., when forecast load exceeds the SIL).

4. System Generator List: a list of generator(s) available for dispatch (see APPENDIX A).

5. Effectiveness of New Facilities: an evaluation of the effectiveness of new facilities is to be done only if new facilities (transmission or generation) are needed to mitigate RMR conditions in the Study System.

6. Comparative Analysis of Alternatives: an analysis to be done only if such alternatives are needed to mitigate RMR conditions in the Study System.

Figure 1 – Study System for Mohave County (2013 & 2018)



Notes:

(1) Line or transformer flows that cross the boundary are measured at the station inside the Study System.

(2) Encircled F denotes fossil generation; encircled H denotes hydro generation.

(3) Numbers of generating units are shown in parentheses; refer to APPENDIX A for Generator List.

Study Methodology and Assumptions

The 2010 study was done under the direction and guidance of the Colorado River Transmission ("CRT") study group, thus its methodology differs somewhat from the 2008 study. In 2008, SIL calculations were based on the assumption that certain hydro units were operated in a base load condition. In the 2010 study, however, the assumption used for SIL calculations was that no generation was on line.

Another key difference from the 2008 study is the change in the study interface shown in Figure 1. The 2008 cut plane passed through the Mead to White Hills, Round Valley to Peacock, and Peacock to Liberty transmission lines. The CRT agreed that the 2010 cut plane more accurately defines the transmission ties that supply the Study System.

The following summarizes the study methodology and assumptions used to determine the SIL and RMR conditions, as well as the MLSC of the Study System.

1. To develop a Starting Case for the Study System, the Western Electricity Coordinating Council ("WECC") base cases 2012hs2s and 2018HS1A were modified according to utilities within Arizona. Also incorporated into the Starting Case were the projected peak loads within the Study System for the years 2013 and 2018. APPENDIX B summarizes the 2013 & 2018 peak load projections for the Study System.
2. 2015 loop in of the Parker – North Havasu 230kV circuit into the Black Mesa 230kV substation is assumed as mitigation for Delta V issues at Black Mesa due to N-1 outages specifically the Parker – Black Mesa 230 circuit.
3. Study System buses of 115kV and above were evaluated for Post Transient Voltage Deviation of 5% for N-1 outages.
4. North Havasu – Griffith 230kV circuit has a CEC for 2012 which may be deferred to 2016 or beyond.
5. White Hills is to be determined, with no clear in-service date.
6. Thermal Violations outside of the study area were ignored because they were physically removed from the study area cut plane shown in Figure 1. As such, respective load serving entities ("LSE") are responsible for ensuring plans to serve their respective growing loads.
7. To develop a SIL case, the Starting Case was modified so that all fossil & hydro generators within the Study System were taken off-line. Replacement generation was scheduled from generation modeled within Arizona, California, and Nevada, remote from the Study System in Figure 1. Study System loads, except generating station auxiliary loads and known mining loads, were decreased by the same percentage with the load power factors held constant. The decrease in Study System loads were accounted for by turning down generation in the system external to the Study System (Mead and Palo Verde hubs). Under these SIL conditions, the load was continually decreased in the Study System until any thermal or voltage constraints were relieved for either a North American Electric Reliability Corporation ("NERC") Category A

(i.e. no contingency outage) or by a NERC Category B (i.e. single contingency outage) condition in the Study System.

8. To verify post-transient voltage stability in the SIL case, the "Voltage Support and Reactive Power" section of the NERC Planning Standards and WECC system performance criteria was applied so that the total Study System load in the SIL case was increased 5%. This SIL margin case was then evaluated for NERC Category A (i.e. no contingency outage) and NERC Category B (i.e. single contingency outage) conditions in the Study System.

9. To develop a MLSC case, the Starting Case was modified so that all generators within the Study System were on-line at maximum dispatch. The increased Study System generation was scheduled to displace an equal amount of generation in Arizona. Study System loads, except generating station auxiliary loads and known mining loads, were increased by the same percentage with the load power factors held constant. The increased Study System loads were sourced from increased generation in the external system (Mead and Palo Verde hubs). Under these MLSC conditions, the load was continually increased in the Study System until it became voltage or thermally constrained either by a NERC Category A (i.e. no contingency outage) or by a NERC Category B (i.e. single contingency outage) condition in the Study System.

10. To verify post-transient voltage stability in the MLSC case, the "Voltage Support and Reactive Power" section of the NERC Planning Standards and WECC system performance criteria was applied so that the total Study System load in the MLSC case was increased 5%. This MLSC margin case was then evaluated for NERC Category A (i.e. no contingency outage) and NERC Category B (i.e. single contingency outage) conditions in the Study System.

Study Criteria

NERC/WECC Planning Standards were applied. The following summarizes the technical criteria used to determine whether the Study System performance is acceptable.

NERC Category A (*i.e.* no contingency outage):

- Pre-outage flow on each transmission line or transformer is within its continuous rating, which has been specified by its owner or operator.
- Pre-outage voltage at each station is within its continuous high and low ratings, which have been specified by its owner or operator.
- With the SIL, RMR and MLSC case adjusted so that its Study System load level is 5% greater than the SIL or MLSC case, the adjusted SIL or MLSC pre-outage case has a power flow solution.

NERC Category B (*i.e.* single contingency outage):

- Post-outage flow on each transmission line or transformer is within its emergency rating, which has been specified by its owner or operator.

- Post-outage voltage at each station is within its emergency high and low ratings, which have been specified by its owner or operator.
- Post-outage post-transient voltage at each station is within 5% of its pre-outage station voltage.
- With the SIL, RMR, and MLSC case adjusted so that its Study System load level is 5% greater than the SIL or MLSC case, the adjusted SIL or MLSC post-outage case has a power flow solution.

Conclusions

Power flow simulations show the Study System is reliable and capable of serving all load within the specified cut plane. The SIL analysis indicates that a relatively small amount of generation may be required in the 2013 and 2018 planning horizon. Hydroelectric generation within the study system must be run regardless to meet minimum river flow requirements. No additional generation is needed to assure system reliability. Table 1 depicts the three metric values: (1) SIL; (2) MLSC; and (3) RMR for the 2010 Commission BTA.

Table 1: Study Results

Year	Mohave Forecasted Peak	Study System Load	Metric	Metric Value	Limiting Element	Limiting Outage	RMR & MLSC Generation	
							Station	Dispatch
2013	826MW	800MW	SIL*	816MW[1]	Black Mesa 230kV Voltage deviation	Parker - Black Mesa 230kV circuit	NONE within study area	0MW
		1050MW	MLSC	1050MW[1]	Black Mesa 230kV Voltage deviation	Parker - Black Mesa 230kV circuit	ALL within study area	1590.9MW
		826MW	RMR	10MW[1]	Black Mesa 230kV Voltage deviation	Parker - Black Mesa 230kV circuit	Davis unit # 1	10MW[3]
2018	935MW	875MW	SIL*	889MW[2]	Peacock 230kV Voltage deviation	Peacock 345/230kV transformer	NONE within study area	0MW
		1200MW	MLSC	1200MW[2]	Mercator 230kV Voltage deviation	Griffith - McConnico 230kV circuit	ALL within study area	1590.9MW
		935MW	RMR	40MW[2]	Peacock 230kV Voltage deviation	Peacock 345/230kV transformer	Davis# 1-4	40MW[3]

*SIL - import elements (1) Mead - Davis 230kV (2) McCullough - Davis 230kV (3) Peacock 345/230 xfmr (4) Round Vly - Peacock 230kV (5) Harcuvar - Parker 230kV (6) Eagle Eye - Parker 230kV (7) Gene - Parker 161kV (8a) Parker - Headgate 161kV (8b) Parker - Bouse 161kV (8c) Parker - Blythe 161kV

[1]This value assumes that the Black Mesa 230kV bus will not be tied into the Parker Davis System via Parker - N. Havasu 230kV circuit.

[2]This value assumes that the Black Mesa 230kV bus will be tied into the Parker Davis System via the Parker - N. Havasu 230kV circuit.

[3]These RMR values are less than the output achieved from water release requirements.

1. SIL: the maximum import level that the Study System can reliably support when none of its study area generation is on-line. The SIL for the 2013 and 2018 study years is 816MW and 889MW, respectfully. The limiting outage and element differ from the study years due to the planned 2015 system reinforcement project which ties the existing Parker – North Havasu 230kV circuit into the Black Mesa 230kV bus. The SIL in the 2013 study year is limited by the Parker – Black Mesa 230kV circuit outage causing a greater than 5% voltage deviation on the Black Mesa 230kV bus.

   The limiting outage and element in year 2018 is the loss of the Peacock 345/230kV transformer outage causing a greater than 5% voltage deviation on the Peacock 230kV bus (see APPENDIX D and E).

2. MLSC: the maximum load level that the Study System can reliably support when all study area generation is at maximum dispatch. The MLSC for the 2013 and 2018 study years is 1050MW and 1200MW, respectively. The limiting outage and element differ from the study years due to the planned 2015 system reinforcement project which ties the existing Parker – North Havasu 230kV circuit into the Black Mesa 230kV bus. The MLSC in the 2013 study year is limited by the Parker – Black Mesa 230kV circuit outage causing a greater than 5% voltage deviation on the Black Mesa 230kV bus. See APPENDIX D and E.

The MLSC in the 2018 study year is limited by the Griffith – McConnico 230kV circuit outage causing a greater than 5% voltage deviation on the Mercator 230kV bus. See APPENDIX D and E.

3. RMR conditions: RMR conditions exist only if the Study System cannot reliably support its projected peak load without additional dispatch of fossil generation. Hydro Generation is required to run for both the 2013 and 2018 study years. The 2013 RMR is 10MW with 1 Davis units running at 10MW. The 2018 RMR is 40MW with 4 Davis units running at 10MW. See APPENDIX D and E.

   The owner and operator, the U.S. Bureau of Reclamation, has verified that during the peak summer weekday Davis would run with three units on as a minimum and Parker would run with two units on as a minimum. The Davis units would be loaded to between 45 and 48 MW and the Parker units would be loaded to between 25 and 28 MW. Output under these conditions will be in excess of the RMR requirements identified in Table 1. As a result, the cost of running these units as an RMR requirement will be zero.

4. System Generator List: this list includes generator(s) available for dispatch (see APPENDIX A).

5. Effectiveness of New Facilities: no RMR conditions exist for the Study System if the following new facilities are in place for the designated 2013 or 2018 year of study:

   - The 2013 RMR would be zero with the addition of the new North Havasu – Griffith 230kV circuit & the loop in of the Parker – North Havasu 230kV circuit into the Black Mesa 230kV substation (see APPENDIX F).

   - The 2018 RMR would be zero with the addition of the White Hills 345/230kV transformation and a White Hills – Mercator 230kV circuit. This assumes the McConnico to Mercator 230 kV line will be in service (see APPENDIX F).

6. Comparative Analysis of Alternatives: the RMR is reduced to 0 MW if the New Facilities described above are in place. However, the RMR identified in Table 1 is satisfied at zero cost based on hydroelectric generation being run while meeting the U.S. Bureau of Reclamation's water delivery requirements. As a result, the transmission facilities described above provide no RMR related economic benefit.

APPENDIX A – Study System Generator List

Description	MW	Rating qmin [MVar]	qmax [MVar]
Fossil Generation			
GRIFFITH			
Combustion Turbine #1	152.3	-56.8	85.1
Combustion Turbine #2	152.3	-59.2	99.9
Steam Turbine #1	297.3	-50.3	103.8
Griffith Total	601.9		
SOUTH POINT			
Combustion Turbine #1	170	-52	77
Combustion Turbine #2	175	-55	18.1
Steam Turbine #1	175	-55	29.8
South point Total	520		
BLACK MOUNTAIN			
Combustion Turbine #1	47	-14	52.5
Combustion Turbine #2	47	-14	52.5
Black Mountain Total	94		
Total Fossil Generation	1215.9		
Hydro Generation			
DAVIS			
UNIT #1	51.75	-15	10
UNIT #2	51.75	-15	10
UNIT #3	48.00	-15	10
UNIT #4	51.75	-15	10
UNIT #5	51.75	-15	10
Davis Total	255		
PARKER			
UNIT #1	30	-8	4
UNIT #2	30	-8	3
UNIT #3	30	-8	2
UNIT #4	30	-8	3
Parker Total	120		
Total Hydro Generation	375		
Total STUDY SYSTEM Generation	1590.90		

APPENDIX B – Study System Projected Peak Loads for Year 2013 & 2018

PSLF DATA					2013		2018	
BUS #	BUS NAME	ID	KV	Description	MW	MVAR	MW	MVAR
19109	DAVIS	WA	69	DAVIS (MEC)	9.00	1.83	11.60	2.34
19109	DAVIS	WA	69	DAVIS (AMPS)	9.00	0.00	13.00	0.00
19109	DAVIS	WA	69	DAVIS (other)	0.30	0.00	0.30	0.00
17019	RIVIERA	WA	69	RIVIERA (MEC)	173.00	35.13	190.00	38.58
17103	TOPOCK	WA	69	TOPOCK (MEC)	26.10	5.30	67.30	13.67
17103	TOPOCK	WA	69	TOPOCK (AMPS)	8.00	0.00	14.00	0.00
17103	TOPOCK	WA	69	TOPOCK (NEEDLES)	19.50	0.00	21.00	0.00
19041	PARKER	WA	161	PARKER	11.00	3.62	11.00	3.62
				WAPA TOTAL	255.90	45.88	328.20	58.21
16740	N. HAVASU	UE	69	N. HAVASU	59.81	18.10	65.26	19.78
16742	BLKMESA1	UE	69	BLACK MESA	36.13	12.50	39.42	13.64
16744	BLKMESA2	UE	69	BLACK MESA	39.52	15.87	43.11	17.31
16746	BLKMESA34	UE	69	BLACK MESA	49.04	14.02	53.51	15.29
				LAKE HAVASU	184.50	60.49	201.30	66.02
16800	HILLTOP1	UE	69	HILL TOP	44.92	13.10	51.47	15.01
16802	HILLTOP2	UE	69	HILL TOP	44.92	13.10	51.47	15.01
16804	GRIFFITH	UE	69	GRIFFITH	44.96	16.76	51.51	19.2
19109	DAVIS	UE	69	DAVIS	3.00	0.70	3.44	0.8
				GRIFFITH TOTAL	137.80	43.66	157.89	50.02
16838	MERCATR1	UE	4.16	MERCATOR	27.95	2.20	27.95	2.20
16839	MERCATR2	UE	4.16	MERCATOR	27.95	2.20	27.95	2.20
				MERCATOR TOTAL	55.90	4.40	55.90	4.40
15185	HAVASU12	CA	13.2	CAP HAVASU	64.00	0.00	64.00	0.00
15186	HAVASU34	CA	13.2	CAP HAVASU	64.00	0.00	64.00	0.00
15187	HAVASU56	CA	13.2	CAP HAVASU	64.00	0.00	64.00	0.00
				CAP TOTAL	192.00	0.00	192.00	0.00
				SYSTEM TOTAL	826.10	154.43	935.29	178.65

APPENDIX C – N-1 CONTINGENCY LIST

contigency number	Contigency Name	contigency number	Contigency Name
1	Line DAVIS 230.0 to RIVIERA 230.0 Circuit 1	38	Tran BLKMSA34 69.00 to BLK MESA 230.00 Circuit 1
2	Line DAVIS 230.0 to MEAD N 230.0 Circuit 1	39	Tran BLKMSA34 69.00 to BLK MESA 230.00 Circuit 2
3	Line DAVIS 230.0 to ZORB 230.0 Circuit 1	40	Tran HILLTOP1 69.00 to HILLTOP 230.00 Circuit 1
4	Line DAVIS 230.0 to TOPOCK 230.0 Circuit 2	41	Tran HILLTOP2 69.00 to HILLTOP 230.00 Circuit 1
5	Line DAVIS 230.0 to MCCULLGH 230.0 Circuit 1	42	Tran GRIFFITH 69.00 to GRIFFITH 230.00 Circuit 1
6	Line PARKER 230.0 to EAGLEYE 230.0 Circuit 1	43	Tran TOPOCK 69.00 to TOPOCK 230.00 Circuit 1
7	Line PARKER 230.0 to BLK MESA 230.0 Circuit 1	44	Tran DAVISG1 13.80 to DAVIS 230.00 Circuit 1
8	Line PARKER 230.0 to HAVASU 230.0 Circuit 1	45	Tran DAVISG2 13.80 to DAVIS 230.00 Circuit 1
9	Line PARKER 230.0 to HARCUVAR 230.0 Circuit 1	46	Tran DAVISG3 13.80 to DAVIS 230.00 Circuit 1
10	Line PARKER 230.0 to GENE 230.0 Circuit 1	47	Tran DAVISG4 13.80 to DAVIS 230.00 Circuit 1
11	Line LIBERTY 345.0 to PEACOCK 345.0 Circuit 1	48	Tran DAVISG5 13.80 to DAVIS 230.00 Circuit 1
12	Line MCCONICO 230.0 to DAVIS 230.0 Circuit 1	49	Tran PARKER 161.00 to PARKER 230.00 Circuit 1
13	Line MCCONICO 230.0 to GRIFFITH 230.0 Circuit 1	50	Tran PARKER 161.00 to PARKER 230.00 Circuit 2
14	Line HILLTOP 230.0 to MCCONICO 230.0 Circuit 1	51	Tran N.HAVASU 230.00 to N.HAVASU 69.00 Circuit 1
15	Line N.HAVASU 230.0 to PARKER 230.0 Circuit 1	52	Tran GRIFFITH 230.00 to GRIFFTH1 18.00 Circuit 1
16	Line N.HAVASU 230.0 to TOPOCK 230.0 Circuit 1	53	Tran GRIFFITH 230.00 to GRIFFTH2 18.00 Circuit 2
17	Line PRSCOTWA 230.0 to RNDVLYTP 230.0 Circuit 1	54	Tran GRIFFITH 230.00 to GRIFFTH3 18.00 Circuit 3
18	Line ZORB 230.0 to TOPOCK 230.0 Circuit 1	55	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19	Line GRIFFITH 230.0 to PEACOCK 230.0 Circuit 1	56	Tran WHTHILLS 345.00 to WHTHILLS 230.00 Circuit 1
20	Line PEACOCK 230.0 to HILLTOP 230.0 Circuit 1	57	Gen DAVISG1 13.8 Unit ID 1
21	Line PEACOCK 345.0 to MEAD 345.0 Circuit 1	58	Gen DAVISG2 13.8 Unit ID 1
22	Line TOPOCK 230.0 to BLK MESA 230.0 Circuit 1	59	Gen DAVISG3 13.8 Unit ID 1
23	Line TOPOCK 230.0 to SOPOINT 230.0 Circuit 1	60	Gen DAVISG4 13.8 Unit ID 1
24	Line TOPOCK 230.0 to SOPOINT 230.0 Circuit 2	61	Gen DAVISG5 13.8 Unit ID 1
25	Line RNDVLYTP 230.0 to ROUNDVLY 230.0 Circuit 1	62	Gen PARKERG1 6.9 Unit ID 1
26	Line RNDVLYTP 230.0 to PEACOCK 230.0 Circuit 1	63	Gen PARKERG2 6.9 Unit ID 1
27	Line FRANCONI 230.0 to N.HAVASU 230.0 Circuit 1	64	Gen PARKERG3 6.9 Unit ID 1
28	Line FRANCONI 230.0 to GRIFFITH 230.0 Circuit 1	65	Gen PARKERG4 6.9 Unit ID 1
29	Line WHTHILLS 230.0 to MERC230 230.0 Circuit 1	66	Gen SOPOINT1 16.0 Unit ID 1
30	Line MCCONICO 230.0 to MERC230 230.0 Circuit 1	67	Gen SOPOINT2 16.0 Unit ID 2
31	Line WHTHILLS 345.0 to MEAD 345.0 Circuit 1	68	Gen SOPOINT3 16.0 Unit ID 3
32	Line WHTHILLS 345.0 to PEACOCK 345.0 Circuit 1	69	Gen GRIFFTH1 18.0 Unit ID 1
33	Line PARKER 230.0 to BLK MESA 230.0 Circuit 2	70	Gen GRIFFTH2 18.0 Unit ID 2
34	Line N.HAVASU 230.0 to BLK MESA 230.0 Circuit 1	71	Gen GRIFFTH3 18.0 Unit ID 3
35	Tran N.HAVASU 69.00 to N.HAVASU 230.00 Circuit 1	72	Gen BLKMTN1 13.8 Unit ID 1
36	Tran BLKMESA1 69.00 to BLK MESA 230.00 Circuit 1	73	Gen BLKMTN2 13.8 Unit ID 1
37	Tran BLKMESA2 69.00 to BLK MESA 230.00 Circuit 1		

outage derivative of new projects — outage before new projects

APPENDIX D – 2013 SIL, MLSC and RMR ΔV Output Tables

2013 SIL Output Table

Bus	Name	kV	Area	Zone	Outage	2013_sil [775]	2013_sil [800]	2013_sil [815]	2013_sil [826]	Outage description
19019	BLK MESA	230	14	191	line_7	-4.38%	-4.82%	-5.10%	-5.31%	Line PARKER 230.0 to BLK MESA 230.0 Circuit 1
19314	PEACOCK	230	14	191	tran_55	-4.03%	-4.53%	-4.84%	-5.10%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1

2013_sil[775] - 2013 model with 775MW of load within the study area
2013_sil[800] - 2013 model with 800MW of load within the study area [2013 SIL metric load value]
2013_sil[815] - 2013 model with 815MW of load within the study area
2013_sil[826] - 2013 model with 826MW of load within the study area [forecasted peak]

2013 MLSC Output Table

Bus	Name	kV	Area	Zone	Outage	2013_mlsc [1050]	2013_mlsc [1075]	2013_mlsc [1100]	2013_mlsc [1200]	Outage description
19019	BLK MESA	230	14	191	line_7	-4.69%	-5.05%	-5.45%	-8.34%	Line PARKER 230.0 to BLK MESA 230.0 Circuit 1

2013_mlsc[1050] - 2013 model with 1050MW of load within the study area [2013 MLSC Metric Value]
2013_mlsc[1075] - 2013 model with 1075MW of load within the study area
2013_mlsc[1100] - 2013 model with 1100MW of load within the study area
2013_mlsc[1200] - 2013 model with 1200MW of load within the study area

2013 RMR Output Table

Bus	Name	kV	Area	Zone	Outage	2013_rmr [d-10]	2013_rmr [d-51.75]	2013_rmr [dd20]	2013_rmr [0]	Outage description
19019	BLK MESA	230	14	191	line_7	-4.98%	-4.87%	-4.67%	-5.31%	Line PARKER 230.0 to BLK MESA 230.0 Circuit 1
19314	PEACOCK	230	14	191	tran_55	-4.72%	-4.48%	-4.37%	-5.10%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
2013_rmr[d-10] - 2013 model at 826MW forecasted peak with Davis Hydro unit #1 on at 10MW [2013 RMR Metric Value]										
2013_rmr[d-51.75] - 2013 model at 826MW forecasted peak with Davis Hydro unit #1 on at 51.75MW										
2013_rmr[dd20] - 2013 model at 826MW forecasted peak with Davis Hydro unit #1 and #2 on at 10MW each										
2013_rmr[0] - 2013 model at 826MW forecasted peak with no generation on in the study area										

APPENDIX E – 2018 SIL, MLSC and RMR ΔV Output Tables

2018 SIL Output Table

Bus	Name	kV	Area	Zone	Outage	2018_sil [850]	2018_sil [875]	2018_sil [900]	2018_sil [935]	Outage description
17087	RIVIERA	230	14	171	line_5	-3.91%	-4.22%	-4.58%	**-5.16%**	Line DAVIS 230.0 to MCCULLGH 230.0 Circuit 1
19022	DAVIS	230	14	191	line_5	-3.81%	-4.11%	-4.44%	-4.99%	Line DAVIS 230.0 to MCCULLGH 230.0 Circuit 1
19224	ZORB	230	14	191	line_5	-3.63%	-3.92%	-4.25%	-4.79%	Line DAVIS 230.0 to MCCULLGH 230.0 Circuit 1
14223	ROUNDVLY	230	14	140	tran_55	-3.85%	-4.27%	-4.72%	**-5.44%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19056	MCCONICO	230	14	191	tran_55	-3.93%	-4.36%	-4.83%	**-5.57%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19072	HILLTOP	230	14	191	tran_55	-4.10%	-4.55%	**-5.04%**	**-5.83%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19310	GRIFFITH	230	14	191	tran_55	-4.04%	-4.49%	-4.97%	**-5.75%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19314	PEACOCK	230	14	191	tran_55	-4.46%	-4.95%	**-5.47%**	**-6.31%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19501	RNDVLYTP	230	14	191	tran_55	-3.85%	-4.27%	-4.72%	**-5.44%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19651	HARRIS	230	14	140	tran_55	-3.93%	-4.36%	-4.83%	**-5.57%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
16841	MERC230	230	14	162	tran_55	-3.95%	-4.38%	-4.85%	**-5.60%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
2018_sil[850] - 2018 model with 850MW of load within the study area										
2018_sil[875] - 2018 model with 875MW of load within the study area [2018 SIL metric load value]										
2018_sil[900] - 2018 model with 900MW of load within the study area										
2018_sil[935] - 2018 model with 935MW of load within the study area [forecasted peak]										

2018 MLSC Output Table

Bus	Name	kV	Area	Zone	Outage	2018_mlsc[1200]	2018_mlsc[1225]	2018_mlsc[1250]	Outage description
19056	MCCONICO	230	14	191	line_13	-4.84%	**-5.10%**	**-5.39%**	Line MCCONICO 230.0 to GRIFFITH 230.0 Circuit 1
16841	MERC230	230	14	162	line_13	-4.85%	**-5.12%**	**-5.41%**	Line MCCONICO 230.0 to GRIFFITH 230.0 Circuit 1
2018_mlsc[1200] - 2018 model with 1200MW of load within the study area [2018 MLSC Metric Value]									
2018_mlsc[1225] - 2018 model with 1225MW of load within the study area									
2018_mlsc[1250] - 2018 model with 1250MW of load within the study area									

2018 RMR Output Table

Bus	Name	kV	Area	Zone	Outage	2018_rmr [4d40]	2018_rmr [3d30]	2018_rmr [2d40]	2018_rmr [2d20]	Outage description
19072	HILLTOP	230	14	191	tran_55	-4.10%	-4.55%	-4.83%	-4.99%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19310	GRIFFITH	230	14	191	tran_55	-4.03%	-4.47%	-4.76%	-4.90%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19314	PEACOCK	230	14	191	tran_55	-4.66%	**-5.08%**	**-5.34%**	**-5.50%**	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
2018_rmr[4d40] - 2018 model at 935MW forecasted peak with Davis Hydro units #1-4 on at 10MW each [2018 RMR Metric Value]										
2018_rmr[3d30] - 2018 model at 935MW forecasted peak with Davis Hydro units #1-3 on at 10MW each										
2018_rmr[3d30] - 2018 model at 935MW forecasted peak with Davis Hydro units #1-2 on at 20MW each										

2018_rmr[3d30] - 2018 model at 935MW forecasted peak with Davis Hydro units #1-2 on at 10MW each

APPENDIX F – 2013 and 2018 Effectiveness of New Facilities

2013 Effectiveness of New Facilities

Bus	Name	kV	Area	Zone	Outage	2013_rmr [0(pbh-ng)]	2013_rmr [0(pbh)]	2013_rmr [0(ng)]	2013_rmr [0]	Outage description
19019	BLK MESA	230	14	191	line_7	-0.48%	-0.59%	-5.31%	-5.31%	Line PARKER 230.0 to BLK MESA 230.0 Circuit 1
19314	PEACOCK	230	14	191	tran_55	-3.89%	-5.10%	-3.87%	-5.10%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1

2013_rmr[0] - 2013 model at 826MW forecasted peak with no generation on in the study area

2013_rmr[0(ng)] - 2013 model at 826MW forecasted peak with no generation on in the study area, with the N. Havasu - Griffith 230kV project in-service

2013_rmr[0(pbh)] - 2013 model at 826MW forecasted peak with no generation on in the study area, with the loop in of the Parker – N. Havasu 230kV circuit into the Black Mesa project in-service.

2013_rmr[0(pbh-ng)] - 2013 model at 826MW forecasted peak with no generation on in the study area, with the N. Havasu - Griffith 230kV and the loop in of the Parker – N. Havasu 230kV circuit into the Black Mesa project in-service

2018 Effectiveness of New Facilities

Bus	Name	kV	Area	Zone	Outage	2018_rmr [0(ng-wm)]	2018_rmr [0(wm)]	2018_rmr [0(ng)]	2018_rmr [0]	Outage description
17087	RIVIERA	230	14	171	line_5	-3.78%	-4.07%	-4.94%	-5.16%	Line DAVIS 230.0 to MCCULLGH 230.0 Circuit 1
19022	DAVIS	230	14	191	line_5	-3.66%	-3.94%	-4.77%	-4.99%	Line DAVIS 230.0 to MCCULLGH 230.0 Circuit 1
19224	ZORB	230	14	191	line_5	-3.47%	-3.76%	-4.56%	-4.79%	Line DAVIS 230.0 to MCCULLGH 230.0 Circuit 1
14223	ROUNDVLY	230	14	140	tran_55	-1.02%	-1.03%	-4.45%	-5.44%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19056	MCCONICO	230	14	191	tran_55	-0.67%	-0.71%	-4.43%	-5.57%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19072	HILLTOP	230	14	191	tran_55	-0.83%	-0.86%	-4.66%	-5.83%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19310	GRIFFITH	230	14	191	tran_55	-0.76%	-0.81%	-4.45%	-5.75%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19314	PEACOCK	230	14	191	tran_55	-1.20%	-1.22%	-5.15%	-6.31%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19501	RNDVLY TP	230	14	191	tran_55	-1.02%	-1.03%	-4.46%	-5.44%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
19651	HARRIS	230	14	140	tran_55	-0.67%	-0.71%	-4.43%	-5.57%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1
16841	MERC230	230	14	162	tran_55	-0.46%	-0.49%	-4.45%	-5.60%	Tran PEACOCK 345.00 to PEACOCK 230.00 Circuit 1

2018_rmr[0] - 2018 model at 935MW forecasted peak with no generation on in the study area

2018_rmr[0(ng)] - 2018 model at 935MW forecasted peak with no generation on in the study area, with the N. Havasu - Griffith 230kV project in-service

2018_rmr[0(wm)] - 2018 model at 935MW forecasted peak with no generation on in the study area, with the addition of White Hills 345/230kV transformation and a White Hills – Mercator 230kV circuit

2018_rmr[0(ng-wm)] - 2018 model at 935MW forecasted peak with no generation on in the study area, with the N. Havasu - Griffith 230kV and the addition of White Hills 345/230kV transformation and a White Hills – Mercator 230kV circuit projects in-service

SANTA CRUZ COUNTY

A STUDY OF SIMULTANEOUS IMPORT LIMIT, RELIABILITY MUST-RUN GENERATION, MAXIMUM LOAD SERVING CAPABILITY FOR YEARS 2010, 2013 AND 2019

Prepared for:
Arizona Corporation Commission
Utilities Division
1200 West Washington St.
Phoenix, Arizona 85007

Results

The following table represents the findings discussed in the balance of this report:

Table 1: Load Serving Analysis for Santa Cruz County (N-1 analysis)

Year	Santa Cruz Forecasted Peak	Study System Load	Metric	Metric Value	Limiting Element	Limiting Outage	RMR & MLSC Generation	
							Station	Dispatch
2010	85 MW	49 MW	SIL	51 MW	Valencia 115 kV bus □V	Del Bac – Nogales 115 kV line	None	0 MW
		130 MW	MLSC	130 MW	Nogales 115 kV bus □V	Del Bac – Nogales 115 kV line	Valencia CT1, 2, 3, 4	62 MW
2013	95 MW	120 MW	SIL	127 MW	Nogales-Kantor 138 kV line overload	N-0	None	0 MW
		190 MW	MLSC	190 MW	Nogales-Kantor 138 kV line overload	N-0	Valencia CT1, 2, 3, 4	62 MW
		100 MW(1)	RMR	0 MW	n/a	n/a	None	0 MW
2019	112 MW	120 MW	SIL	127 MW	Nogales-Kantor 138 kV line overload	N-0	None	0 MW
		190 MW	MLSC	190 MW	Nogales-Kantor 138 kV line overload	N-0	Valencia CT1, 2, 3, 4	62 MW
		117 MW[1]	RMR	0 MW	n/a	n/a	None	0 MW

[1]Study System Load includes a 5% load margin used in determining voltage stability issues

Introduction

UNS Electric, Inc. ("UNS Electric") serves Santa Cruz County with a radial system interconnected to the Western Area Power Administration ("WAPA") 115 kV transmission system (see Exhibit 1 on the following page). From the interconnection point at WAPA's Nogales Tap substation near Tucson, the UNS Electric 115 kV system proceeds down to the Kantor substation. From the Kantor substation, the system moves in order from the Canez substation to the Sonoita substation to the Valencia substation.

Approximately 52% of UNS Electric's Santa Cruz load is located at the Valencia substation and another 30% at the Sonoita substation. Hence, 82% of the total load is located on the last 8.5 miles of the system. In addition to the 8.5 mile section just mentioned, lengthy 115 kV ties are also being used to connect the Saguaro and Apache generating stations to the Nogales Tap station. Because the bulk of the UNS Electric Santa Cruz load is being serviced in this manner, low voltage becomes an issue at higher loads.

Presently, the low voltage issues are mitigated by dispatching local gas turbine generators at the Valencia substation during peak load periods. These turbines supply some power locally, which helps reduce loading on the 115 kV network. They also enhance voltage support by contributing a modest amount of reactive power ("VAR"s). The gas turbines are acting as Reliability Must-Run ("RMR") generation by supporting the system this way. The purpose of this study is to quantify the effectiveness of the turbines in supplying RMR generation.

Though local generation is being used now, UNS Electric is planning to upgrade the 115 kV radial line for operation at 138 kV, served from Tucson Electric Power Company's ("TEP") 345/138 kV transformer at its Vail substation (see Exhibit 2 on page 4). This work is scheduled for completion by 2012. The 2013 and 2019 representations in this RMR study assume that the 138 kV upgrade work is complete.

Exhibit 1: UNSE-Santa Cruz 115 kV System (2010-2012)

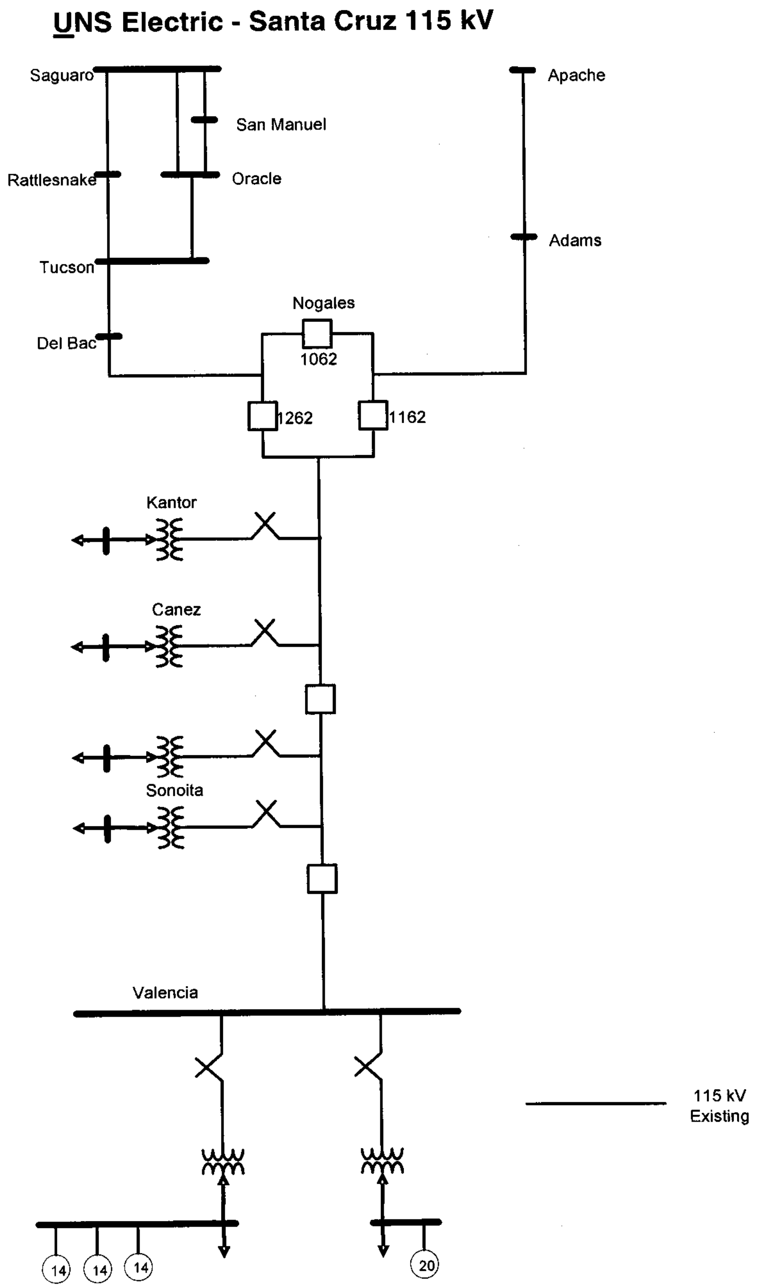
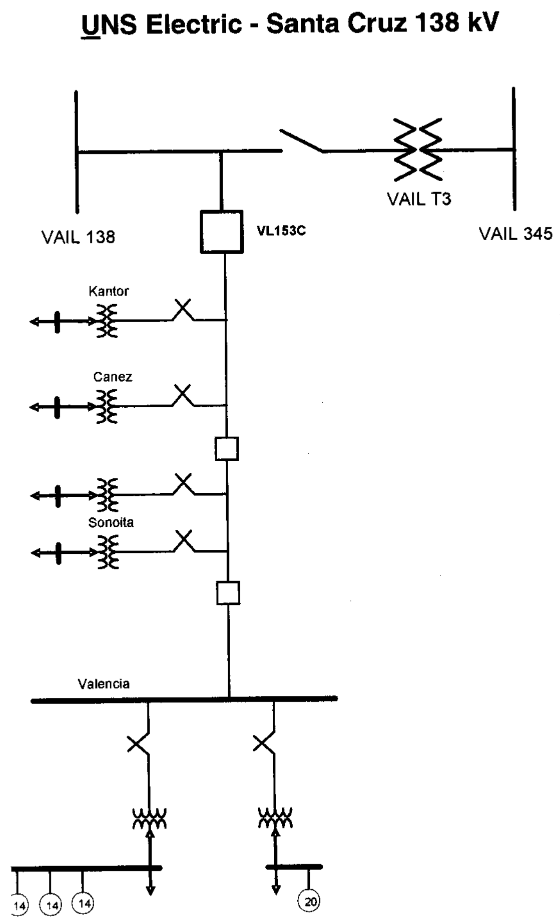


Exhibit 2: UNSE-Santa Cruz Proposed 138 kV System (2013 and beyond)



Study Assumptions

The existing Santa Cruz UNS Electric system was explicitly modeled within the 2010, 2013 and 2019 Arizona coordinated heavy summer cases prepared by the Southeast Arizona Transmission Study ("SATS") group. The cases were revised to include detailed representations of TEP's 138 kV system and UNS Electric's 115 kV transmission radial line in Santa Cruz County. The 115 kV to 138 kV conversion is detailed in the 2013 and 2019 cases.

A new substation was planned for installation between the Kantor and Canez substations in the 2008 RMR Report (the "Tubac substation"); it is no longer under consideration.

Also, there are plans in-place to maintain unity power factor on-peak at UNS Electric's 13.2 kV load buses in Santa Cruz County. In the 2008 RMR Report unity power factor was assumed. Actual power factor data, that is representative of UNS Electric's power factor improvement program, was used to determine loads that are modeled in this study.

UNS Electric's Santa Cruz system load was assumed to be distributed among the substations in the following manner:

Substation	Percentage of total
Kantor	9.0%
Canez	9.0%
Sonoita	30%
Valencia	52%

The Valencia gas turbines were modeled based on the following characteristics:

	Power Output		Reactive Output	
Turbine	Maximum	Minimum	Maximum	Minimum
Valencia turbine #1 (1)	14 MW	10 MW	8 MVAR	-5 MVAR
Valencia turbine #2 (1)	14 MW	10 MW	8 MVAR	-5 MVAR
Valencia turbine #3 (1)	14 MW	10 MW	8 MVAR	-5 MVAR
Valencia turbine #4 (2)	20.0 MW	10 MW	15 MVAR	-25 MVAR

(1) Based on compliance reports
(2) Based on nameplate

The forecasted peak demand for the three study years is:

Santa Cruz UNS Electric Peak Demand[1]	
Year	Demand
2010	85 MW
2013	95 MW
2019	112 MW

[1]UNS Electric prepared by TEP Forecasting Group 02/02/09

The UNS Electric Santa Cruz County electric system was modeled with two basic configurations:

- The existing 115 kV radial line served from WAPA's Nogales Tap substation (2010); and
- The planned 138 kV radial line served from TEP's Vail substation (2013, 2019).

N-1 contingencies on surrounding systems were considered for these cases since the system might be prone to voltage perturbations for disturbances on the WAPA/SWTC system. SIL was previously determined based on N-0 (NERC/WECC Category A). The methodology was changed for the 2010 RMR study to be consistent with TEP and UNS Electric planning practices that consider N-1 (NERC/WECC Category B) contingencies.

It should also be noted that, through 2011, WAPA's worst case NERC/WECC Category C contingency on its system – a breaker failure on the 1062 breaker at the Nogales Tap substation – will isolate the UNS Electric Santa Cruz system. The same holds true beyond 2012 for a loss of TEP's Vail T3. Also, any contingency involving the UNS Electric transmission radial will result in at least partial loss of load; however, load restoration plans are in place. UNS Electric has made substantial improvements to operating procedures. The Company has also invested in facilities to improve reliability and reduce outage restoration time. For results, refer to Table 1 on page 1. The Outage Restoration Plan was updated to include the following improvements:

- Integrated operational control of the facilities with those at the TEP operating center;
- Use of both TEP and UNS Electric field personnel for outage response;
- Analysis and implementation of procedures to improve restoration times for transmission outages (e.g., interconnecting radio systems, cross-training employees, especially those in dispatching, field operations or field crews);
- A comprehensive vegetative management program that includes biannual patrols by air to eliminate events caused by vegetation contact with lines; and
- Completion of GIS data conversion to Smallworld software and integration with STORMS software, and OMS software.

Facility investments include:

- Construction and operation of new shunt capacitors dispersed among feeders served by each of the UNS Electric substations;
- Addition of black start capability at the Valencia generating station, in service by 2010;
- Remote control startup of the Valencia generating units and synchronization with the transmission system;
- Completion of a 46 kV emergency tie line of approximately 20 MW capacity between the TEP Canoa substation and the UNS Electric Kantor substation;

- Remote restorative switching capability to serve Kantor and Canez substations from Canoa, and remote switching for service restoration to the Sonoita and Valencia substations via the Valencia generators; and
- Replacement of wood structures with steel poles to improve reliability of the existing 115 kV line.

Simultaneous Import Limit

For N-1 contingencies the SIL was calculated to be 51 MW (load at SIL = 49 MW) for the 2010 case. At this import there is a voltage drop exceeding 5% at the Valencia 115 kV bus for loss of the Del Bac-Nogales 115 kV line. Post-contingency delta-V > 5% at any load serving bus is reason to reduce the SIL. As the forecast load of 85 MW exceeds the load at SIL there is an RMR condition in 2010.

In 2013 the SIL increases to 127 MW (load @ SIL = 120 MW) due to the increased transfer capability at 138 kV and the improved voltage regulation afforded by the stiffer source served directly from TEP's Extra High Voltage ("EHV") system via a 345/138 kV transformer, Vail T3. The limit in this case is an N-0 overload on the Nogales-Kantor section of the line. Since the load at SIL is well above the 95 MW forecast load in this case there is no need to reconductor this line section. There is no RMR requirement in 2013.

In 2019, the SIL remains at 127 MW (load @ SIL = 120 MW) with the same limiting condition. Since SIL is above the 112 MW forecast load in this case there is no RMR requirement in 2019.

Reliability Must-Run

In 2013 and 2019 the SIL exceeds the forecast load so there is no RMR requirement in these years.

Maximum Load Serving Capability ("MLSC")

MLSC is determined with all four combustion turbines operating at maximum output, representing a 62 MW capacity at the Valencia substation.

In 2010 the MLSC for the 115 kV system is 130 MW. The limit in this case is a delta-V > 5% at the Nogales 115 kV bus for loss of the Del Bac-Nogales 115 kV line.

In 2013 and 2019 the MLSC increases to 190 MW due to the conversion to 138 kV and associated system upgrades. The limit here is an N-0 overload on the Nogales-Kantor line.

RMR Environmental Output Estimates for 2010

All pollutants are estimated based on the 2010 generation found in this study. There was no RMR in 2013 or 2019:

Table 2: 2010 - RMR Environmental Outputs

2010 RMR Environmental Output	Estimated SO2	Estimated NOx	Estimated PM	Estimated CO2
Valencia 4 CT (lbs)	99	4,887	1,553	19,522,028
Valencia 1 CT (lbs)	49	2,430	772	9,707,160

N-1-1 and Extreme Contingencies

N-1-1

As the UNS Electric Santa Cruz system is a radially served system, the most serious N-1-1 conditions are:

- In 2010, having one of the WAPA 115 kV ties into their Nogales Tap station out-of-service ("OOS") and subsequent loss of the other 115 kV tie, i.e. Del Bac-Nogales Tap OOS then loss of Nogales Tap-Adams, or vice-versa. This would be a load interruption scenario. Service restoration would be in accordance with the Outage Restoration Plan to include remote control startup and synchronization of the Valencia generating units, switching to serve the Kantor and Canez substations from Canoa and remote switching for service restoration to Sonoita and Valencia substations via the Valencia generators, and dispatch of TEP and UNS Electric personnel as required.
- In 2013 and 2019 the most serious contingency is either an N-1 outage of TEP's Vail T3 345/138 kV transformer or the 138 kV line segment between Vail and Kantor. This condition would require load restoration.

Extreme Contingencies

The extreme contingency regarding the UNS Electric Santa Cruz system is loss of the radial transmission for an extended period of time.

Conclusions

The UNS Electric transmission system in Santa Cruz County is capable of serving up to 100 MW reliably in the current 115 kV configuration that is supplied by the WAPA system at the Nogales switching station. Generation at Valencia is required when the load reaches 49 MW (or 51 MW measured at the Nogales station), with the output increased to 24 MW as the load increases to approximately 90 MW.

MLSC is 130 MW with all Valencia generation operating at full output; this exceeds the forecasted load by 45 MW.

Restoration of service would be required for all Santa Cruz load in the event of loss of the Nogales Switchyard to Kantor line. Partial restoration would be required for transmission line outages south of Sonoita, wherein the load served from Sonoita, Canez and Kantor would remain energized from Nogales.

The Vail to Valencia 138 kV upgrade, which is scheduled for completion in 2012, will eliminate the RMR requirement through the end of this study period.