ORIGINAL

MEMORANDUM

30A

TO: Docket Control

FROM: Ernest G. Johnson E A for EGJ
Director
Utilities Division

DATE: May 19, 2004

RE: ENGINEERING AMENDED REPORT ANALYZING QUALITY OF SERVICE MATTERS RELATED TO THE ARIZONA PUBLIC SERVICE COMPANY RATE CASE APPLICATION, DOCKET NO. E-01345A-03-0437

Attached is an engineering report documenting a Utilities Division quality of service assessment of the Arizona Public Service Company's ("APS") electric system for the calendar years 2000 through 2003. It is intended for use as a Commission Staff reference document in the pending APS rate case, Docket No. E-01345A-03-0437. Engineering finds no reason to recommend consideration of quality of service mitigation measures as part of the pending APS rate case based upon the results of the assessment. However, Engineering does recommend that the Commission continue to monitor APS' quality of service:

1. As an integral part of required Biennial Transmission Assessments,

2. Through the Commission's existing outage reporting requirements, and

3. Via ongoing resolution of consumer complaints about APS service.

Engineering further recommends that the Commission be particularly mindful of quality of service differences between the APS Metro Division and more rural service oriented APS divisions. For this reason, the APS Southeast Division merits special scrutiny to assure service does not deteriorate and become problematic.

EGJ:JDS:rdp

Originator: Jerry D. Smith

Attachment: Original and thirteen copies

ENGINEERING REPORT
UTILITIES DIVISION
ARIZONA CORPORATION COMMISSION

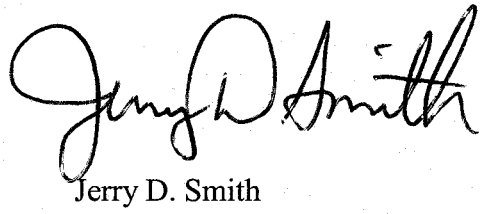
ARIZONA PUBLIC SERVICE COMPANY
RATE CASE
DOCKET NO. E-01345A-03-0437

QUALITY OF SERVICE ASSESSMENT

MAY 19, 2004

STAFF ACKNOWLEDGMENT

This Engineering Report was prepared by Jerry Smith of the Arizona Corporation Commission Utilities Division. It provides an analysis of the quality of service provided by Arizona Public Service Company ("APS") over the time period of calendar years 2000 through 2003. It is intended for use as a Commission Staff reference document in the APS rate case, Docket No. E-01345A-03-0437. Mr. Smith actively monitors quality of service matters for all Arizona utilities on an ongoing basis. He was responsible for the review and analyses of APS's response to data requests concerning quality of service matters. Mr. Smith also documents the statistics of customer complaints filed with the Commission regarding quality of service matters.



Jerry D. Smith
Electric Utility Engineer

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EXHIBITS

PURPOSE OF STAFF REPORT

This engineering report documents a quality of service assessment of Arizona Public Service Company ("APS") performed by Utilities Division Engineering Staff ("Engineering"). It is based upon data collected via data requests of APS, monthly outage summary reports routinely filed with the Arizona Corporation Commission ("Commission"), and statistics of customer quality of service complaints recorded in the Commission's Consumer Service database. This assessment covers the calendar years 2000 through 2003. This quality of service assessment is intended to serve as an ancillary component of the Commission Staff's ("Staff") evaluation of the APS rate case application.

FRAMEWORK OF QUALITY OF SERVICE ASSESSMENT

The Commission's Engineering Staff performs a Biennial Transmission Assessment in accordance with Arizona Revised Statute §40-360.02.G to determine to what degree the existing and planned transmission system facilities in Arizona adequately meet the energy needs of the state in a reliable manner. In addition, Engineering monitors quality of service matters for utilities in the state of Arizona in accordance with Arizona Administrative Code R14-2-208 which describes the provision of service required of electric utilities. APS routinely monthly files a summary report for all outages resulting in 1000 customer hours of service interruption. Consumers also may opt to file a complaint regarding quality of service with the Commission's Consumer Services Section. This quality of service assessment considers the performance of Arizona Public Service Company in each of the aforementioned categories.

Arizona's statutes and rules are silent in regard to defining a measure of reliable service. However, the Commission has adopted a North American Reliability Council ("NERC") definition of reliability for Engineering's use in the Biennial Transmission Assessment. Reliability is comprised of two components: adequacy and security. Adequacy is the ability of an electric system to supply the aggregate electrical demand and energy requirements of its customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements. On the other hand, security is the ability of an electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system elements. These components of reliability are very subjective, are not easily measured and leave much to interpretation.

Many utilities use numerical indices as a measure of an average customer's distribution service reliability. Such reliability indices are typically computed on an annual basis. A utility may then set reliability targets based upon benchmarked data from its own system. The Institute of Electrical and Electronic Engineers ("IEEE") has adopted a standard definition for several reliability indices for electric distribution systems and established a national benchmark database via a 1995 IEEE survey of the electric utility industry. The most commonly used reliability indices are System Average Interruption Frequency Index ("SAIFI"), System Average

Interruption Duration Index ("SAIDI"), and Customer Average Interruption Duration Index ("CAIDI").

SAIFI is the average number of interruptions experienced by customers per year. SAIDI is the average number of interruption minutes experienced by customers per year. CAIDI is the average duration of an interruption and is equal to SAIDI divided by SAIFI. Per Rural Utilities Service (RUS) Bulletin 161-5, the RUS considers a SAIDI of five hours (300 minutes) or more per consumer as unacceptable except under very unusual circumstances, such as a natural disaster. The IEEE 1995 Survey established typical reliability index values for the electric utilities in the United States as displayed in the following table.

Table 1
Typical Reliability Index Values for US Utilities[1]

Average	SAIFI	SAIDI	CAIDI
Top quartile	0.90	54	55
Second quartile	1.10	90	76
Average	1.26	117	88
Third quartile	1.45	138	108
Bottom quartile	3.90	423	197

[1] 1995 IEEE Survey

Engineering proposes to compare actual APS distribution system reliability indices to the typical reliability indices contained in Table 1. On this basis, Engineering can make an objective assessment of the quality of service being provided to APS distribution system customers.

BIENNIAL TRANSMISSION ASSESSMENT

Engineering conducted the Commission's second biennial transmission assessment in 2002. Engineering investigated the ability of Arizona's transmission system to adequately deliver energy to the state's retail consumer markets as well as import energy from or export energy to the regional transmission grid with which it is interconnected. Adequacy of existing Arizona transmission lines and planned additions between 2002 and 2011 was determined and documented in a Staff report adopted by the Commission via Decision No. 65476. That report is filed under Docket No. E-00000D-02-0065 and is available at the following Commission web-site address: http://www.cc.state.az.us/utility/electric/2ndBTA-FinalRpt.pdf/

Engineering concluded in its second Biennial Transmission Assessment ("BTA") that the electric industry in the State of Arizona had been very responsive to concerns raised in the Commission's first BTA performed in 2000. It further concluded that in general the existing and planned Arizona transmission system meets the load serving requirements of the state in a reliable manner. APS is a major transmission provider in the state of Arizona and therefore the

conclusions derived from the Biennial Transmission Assessment are largely a reflection of the quality of transmission service provided by APS. However, the second Biennial Transmission Assessment report continued to raise concerns about the adequacy of the state's transmission system to reliably support the competitive wholesale market emerging in Arizona. Staff's conclusions were based upon the following findings:

- Very little long-term firm regional transmission capacity is available to export or import energy over Arizona's transmission system.
- There are transmission import constraints for five geographical load zones in Arizona: Phoenix metropolitan area, Tucson, Yuma, Santa Cruz County and Mohave County. Planned transmission enhancements will help mitigate such constraints in all but Mohave County.
- Existing and planned additions to the Palo Verde transmission system fail to accommodate the full output of all new power plants interconnecting at the Palo Verde Hub.
- Some new power plants have interconnected to Arizona's bulk transmission system via a single transmission line or tie rather than continuing Arizona's best engineering practice of multiple lines emanating from power plants.

During the period of this quality of service assessment, APS experienced several transmission outages that resulted in interruption of service to distribution customers. The first event was a July 2001 major storm outage of transmission and distribution facilities in the vicinity of Gila Bend. A Southern Arizona blackout also impacted APS Southeast Division during 2001 as a result of a fire in the corridor of an Arizona Electric Power Cooperative ("AEPCO") transmission line during a period when another AEPCO transmission line was out of service for repair and maintenance. In the summer of 2003 the failure of a 230 kV circuit breaker at its Pinnacle Peak substation resulted in APS and the Salt River Project ("SRP") interrupting service to customers in the Phoenix metropolitan area to prevent cascading of the disturbance to other systems. Similarly in July of 2003, APS operating personnel took steps to shed local load in response to a 500 kV switching incident at the Hassayampa Switchyard that resulted in tripping of approximately 2600 MW of generation.

In each instance APS notified and informed the Commission of its action and how it was managing restoration of service to customers. The effect of these transmission events on APS' distribution reliability performance indices is discussed later in this report. APS management of and operational response to these key transmission system events is exemplary of training and authority of APS operating personnel to respond effectively to protect the service integrity of the system at large. The August 14, 2004 Northeast blackout in the US and Canada was partially the result of a lack of operator action such as that taken by APS personnel during the above four Arizona transmission system outages.

DISTRIBUTION SYSTEM RELIABILITY INDICES

Engineering has reviewed data supplied by APS regarding its distribution system reliability indices for the years 2000 through 2003. APS provided SAIFI, SAIDI, and CAIDI data under a

confidentiality agreement for its entire distribution system and for its five geographical regions: Metro, Northeast, Northwest, Southeast, and Southwest. In addition, APS provided similar data for the Bisbee, Douglas and Gila Bend Substation areas per Engineering's request. This information is displayed in tabular and graphical form in Exhibits 1 through 4. These exhibits form the basis for Engineering's summary analysis of APS distribution system reliability performance provided below.

The APS distribution system reliability indices are determined in large part by the performance of its Metro Division. The Metro Division is comprised of the Phoenix metropolitan area and is an urban service area representing approximately three quarters of the APS load. The Metro Division SAIFI, SAIDI and CAIDI reliability indices are the best of the five APS divisions for each of the four years considered. The remaining four divisions are largely rural or small communities with limited distribution services whose operational character is more typical of rural distribution service. It is normal to expect such rural services to experience a greater number of service interruptions of longer duration due to: 1) longer length distribution feeders with aging distribution equipment due to slower growth patterns, 2) limited feeder switching capability among distribution substations, 3) remoteness of limited service personnel, and 4) geographic areas in which storm disturbances are more prominent.

The reliability indices for the entire APS distribution system for 2000 through 2003 are provided as Exhibit 1. The actual APS reliability indices in Exhibit 1 have been compared to the IEEE typical industry indices listed in Table 1. Several conclusions can be drawn from this comparison. The number of interruptions of service per customer per year for the entire APS distribution system listed on page 1-1 of Exhibit 1 correlates to the second quartile of U.S. utilities in Table 1. The average number of hours of interruption per year for the entire APS distribution system listed on page 1-2 of Exhibit 1falls within the first and second quartile of U.S. utilities in Table 1. The CAIDI reliability indices for the entire APS system listed on page 1-3 of Exhibit 1 is in the first quartile of utilities except for the year 2002 when it is in the second quartile of U.S. utilities. These statistics imply that APS is managing its entire distribution system on a comparable par with the better utilities in the nation.

Exhibit 1 documents that the APS division exhibiting the weakest reliability indices is the Southeast Division. This portion of the APS system provides service to the communities of Douglas and Bisbee. Reliability indices for the Bisbee and Douglas area substations are provided as Exhibits 2 and 3 respectively. The APS Southeast Division SAIFI (pages 2-1 and 3-1) and SAIDI (pages 2-2 and 3-2) reliability indices fall within the third quartile of U.S. utilities except for 2001 when they fall in the bottom quartile. Engineering is aware of an extreme transmission outage that caused a major blackout of much of Southern Arizona in 2001. That transmission outage accounts for the less reliable service to Southeast Division APS' customers in 2001. Reliability performance for the Southeast Division improved in 2002 and 2003. However, the CAIDI indices (pages 2-3 and 3-3) are in the third quartile for all years considered. In no instance did the Southeast Division average service interruption duration per customer exceed what the RUS would find unacceptable (300 minutes per year).

Engineering was first alerted to concerns regarding potential quality of service for the APS Southeast Division when it was investigating service complaints for Santa Cruz County in 1999. In 2000 the utilities serving Southeastern Arizona performed a regional study and presented results to the Commission. The results of those studies are documented in the Commission's first Biennial Transmission Assessment report dated July 2001. It concluded that restorative service to APS' Southeast Division following a 115 kV line outage was best accomplished with remote operational control of the APS Fairview generation and remote controlled equipment that enabled closing of two 69 kV ties with Sulphur Springs Valley Electric Cooperative substations and the addition of 69 kV capacitors for voltage control. Engineering believes it prudent for the Commission to continue to closely monitor quality of service in the APS Southeast Division given its system topology and quality of service history.

Engineering is also aware of a major storm that caused extended service interruption to APS customers served by Gila Bend Substation in July of 2001. Therefore, Engineering requested reliability indices information from APS regarding Gila Bend Substation. Those reliability indices are provided as Exhibit 4. As a result of the lengthy storm outage in 2001, customers on two Gila Bend Substation feeder circuits experienced an average of approximately 300 minutes of outage per interruption. The reliability indices for all Gila Bend feeder circuits improved significantly in 2002 and 2003. While more favorable weather may have been a contributing factor there were also some major system improvements. A 500 kV and 230 kV interconnection was placed in service at the Gila River Power Plant within several miles of Gila Bend in 2002. The net effect of this interconnection was a reinforcement of the transmission service to the Gila Bend Substation area.

QUALITY OF SERVICE COMPLAINTS

Regulatory requirement for quality of electric service to be provided by jurisdictional utilities is defined by the Commission's rules. Those rules are located in Article 2 of Title 14, Chapter 2 of the Arizona Administrative Codes. The Commission provides the opportunity for consumers to file complaints regarding the quality of service received from utilities under its regulatory jurisdiction. Table 2 summarizes the nature of quality of electric service complaints filed with the Consumer Service Section regarding service from APS for calendar years 2000 through 2003.

Table 2 statistics indicate that quality of service complaints are predominantly related to outages or interruption of service. The largest number of outage complaints occurred in 2000. However, the largest percentage of complaints regarding outages occurred in 2001. That was a year in which the reliability indices previously discussed also reflected that APS customers experienced the largest number of average hours of outage per incident. APS experienced two major outages to its distribution system in the year 2001. Even so, its quality of distribution service overall was comparable to the better performing utilities in the nation.

The statistics provided by Table 2 also reveal the relationship of quality of service complaints to the total number of consumer complaints received from APS customers. The percent of total complaints about APS that are of a quality of service nature ranges between 5 and 10 percent. The number of complaints as a percentage of the APS customer base ranges between 0.03 and 0.08 %. Engineering believes coupling these statistics with Consumer Services' experience in working with APS to resolve all complaints serves as an indication that the quality of customer service provided by APS is excellent.

Table 2
Quality of Service Compliant Summary[1]

Complaint Code	2000	2001	2002	2003
Defective equipment	3	0	0	0
Not working	5	3	3	0
Outage / interruption	37	30	11	17
Voltage	1	0	1	0
Engineering	0	0	0	0
Subtotal	**46**	**33**	**15**	**17**
Total Complaints	649	314	257	198
% Total Complaints	**7.1 %**	**10.5 %**	**5.8 %**	**8.5 %**
Number of Customers[2]	843,413	874,537	902,029	-
% Complaints per Cust.	**0.08 %**	**0.04 %**	**0.03 %**	-

[1] Per Arizona Corporation Commission Consumer Service database.
[2] Per Schedule E-7 of APS rate application dated June 27, 2003.

STAFF CONCLUSIONS AND RECOMMENDATION

Engineering concluded in its second Biennial Transmission Assessment ("BTA") that in general the existing and planned Arizona transmission system meets the load serving requirements of the state in a reliable manner. APS is a major transmission provider in the state of Arizona. Therefore the conclusions derived from the Biennial Transmission Assessment are largely a reflection of the quality of transmission service provided by APS.

During the period of this quality of service assessment, APS experienced several transmission outages that resulted in interruption of service to distribution customers. In each instance APS notified and informed the Commission of its action and how it was managing restoration of service to customers. APS management of and operational response to these key transmission system events is exemplary of training and authority of APS operating personnel to respond effectively to protect the service integrity of the system at large while expeditiously restoring service to those customers that have been interrupted.

The reliability indices for the APS distribution system for 2000 through 2003 imply that APS is managing its entire distribution system on a par with the better utilities in the nation. Electric service in 2002 and 2003 has improved over that experienced in 2001 with extreme storm outages. The APS division exhibiting the weakest reliability indices is the Southeast Division. This portion of the APS system provides service to the communities of Douglas and Bisbee. In no instance did the Southeast Division average service interruption duration per customer exceed what the RUS would find unacceptable (300 minutes per year).

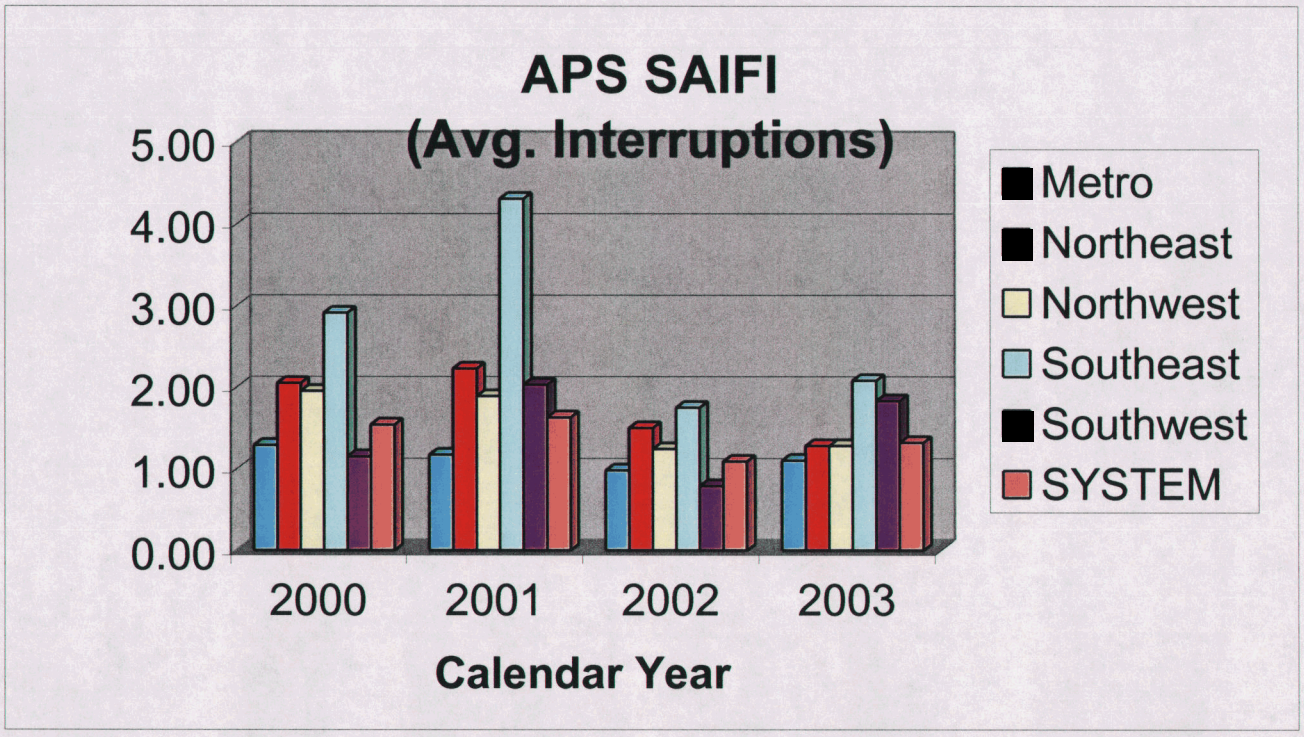
Between 5 and 10 percent of annual complaints about APS are of a quality of service nature. Quality of electric service complaints filed with the Consumer Service Section regarding APS service for the years 2000 through 2003 are predominantly related to outages or interruption of service. APS experienced two major outages to its distribution system in the year 2001. Even so, its quality of electric service overall was comparable to the better performing utilities in the nation. Given that all customer complaints total less than 0.1% of the APS customer base and that Consumer Services excellent experience with APS in resolving complaints, Engineering believes the quality of customer service provided by APS is excellent.

Engineering finds no reason to recommend consideration of quality of service mitigation measures as part of the pending APS rate case. However, Engineering does recommend that the Commission continue to monitor APS' quality of service as an integral part of required Biennial Transmission Assessments, through the Commission's existing outage reporting requirements, and via ongoing resolution of consumer complaints about APS service. Engineering further suggests that the Commission be particularly mindful of quality of service differences between the APS Metro Division and more rural service oriented APS divisions. It is for this reason that quality of service to the APS Southeast Division merits special scrutiny to assure service does not deteriorate and become problematic.

SAIFI by APS Division* (Avg. Interruptions)

	2000	2001	2002	2003
Metro	1.29	1.17	0.98	1.10
Northeast	2.05	2.23	1.50	1.28
Northwest	1.95	1.89	1.24	1.28
Southeast	2.91	4.31	1.75	2.08
Southwest	1.15	2.03	0.79	1.83
SYSTEM	1.54	1.63	1.09	1.32

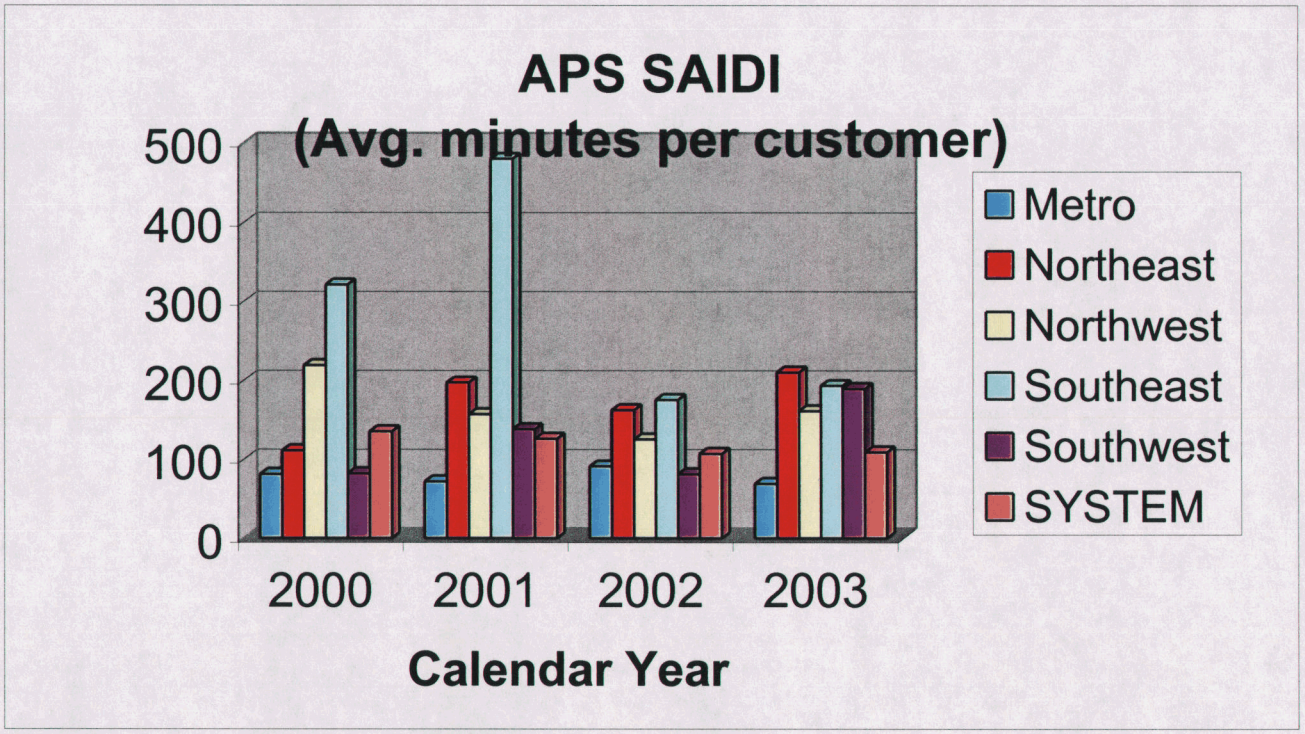
* per Staff Data Request STF 8-54



SAIDI by APS Division* (Avg minutes per customer)

	2000	2001	2002	2003
Metro	81	72	91	69
Northeast	111	197	162	210
Northwest	219	157	125	161
Southeast	321	480	175	193
Southwest	82	138	81	189
SYSTEM	135	126	107	109

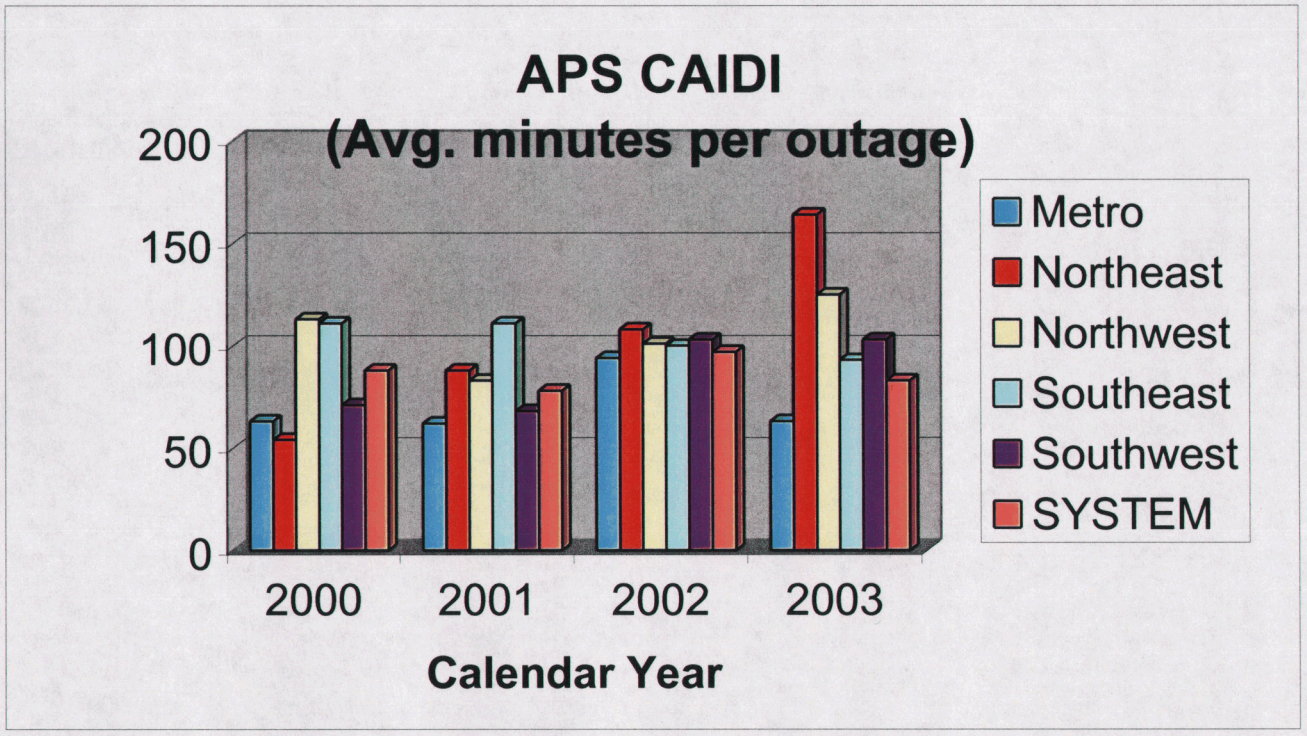
* per Staff Data Request STF 8-54



CAIDI by APS Division* (Avg. minutes per outage)

	2000	2001	2002	2003
Metro	63	62	94	63
Northeast	54	88	108	164
Northwest	113	83	101	125
Southeast	111	111	100	93
Southwest	71	68	103	103
SYSTEM	88	78	97	83

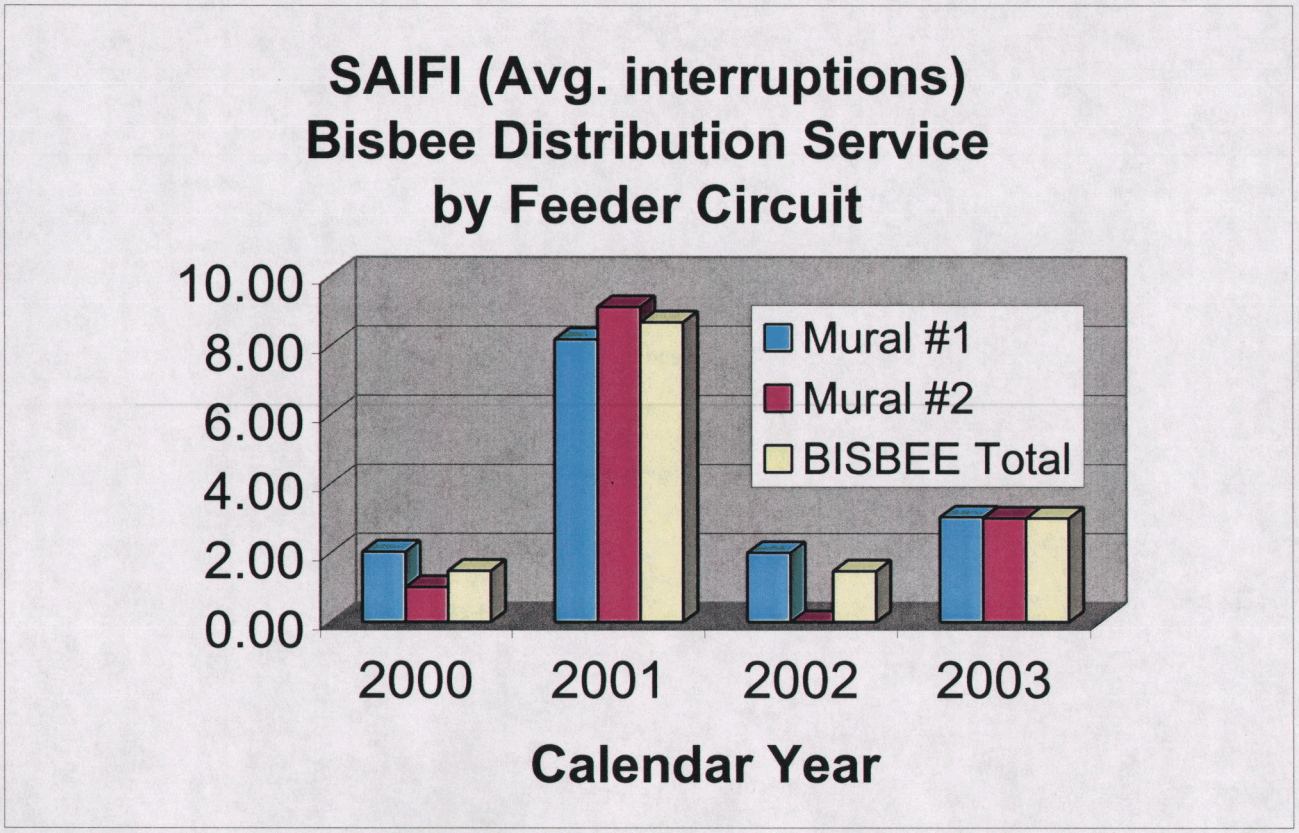
* per Staff Data Request STF 8-54



SAIFI by Feeder Circuit - Bisbee* (Avg. interruptions)

	2000	2001	2002	2003
Mural #1	2.03	8.17	2.00	3.03
Mural #2	1.01	9.11	0.00	3.00
BISBEE Total	1.48	8.67	1.47	3.00

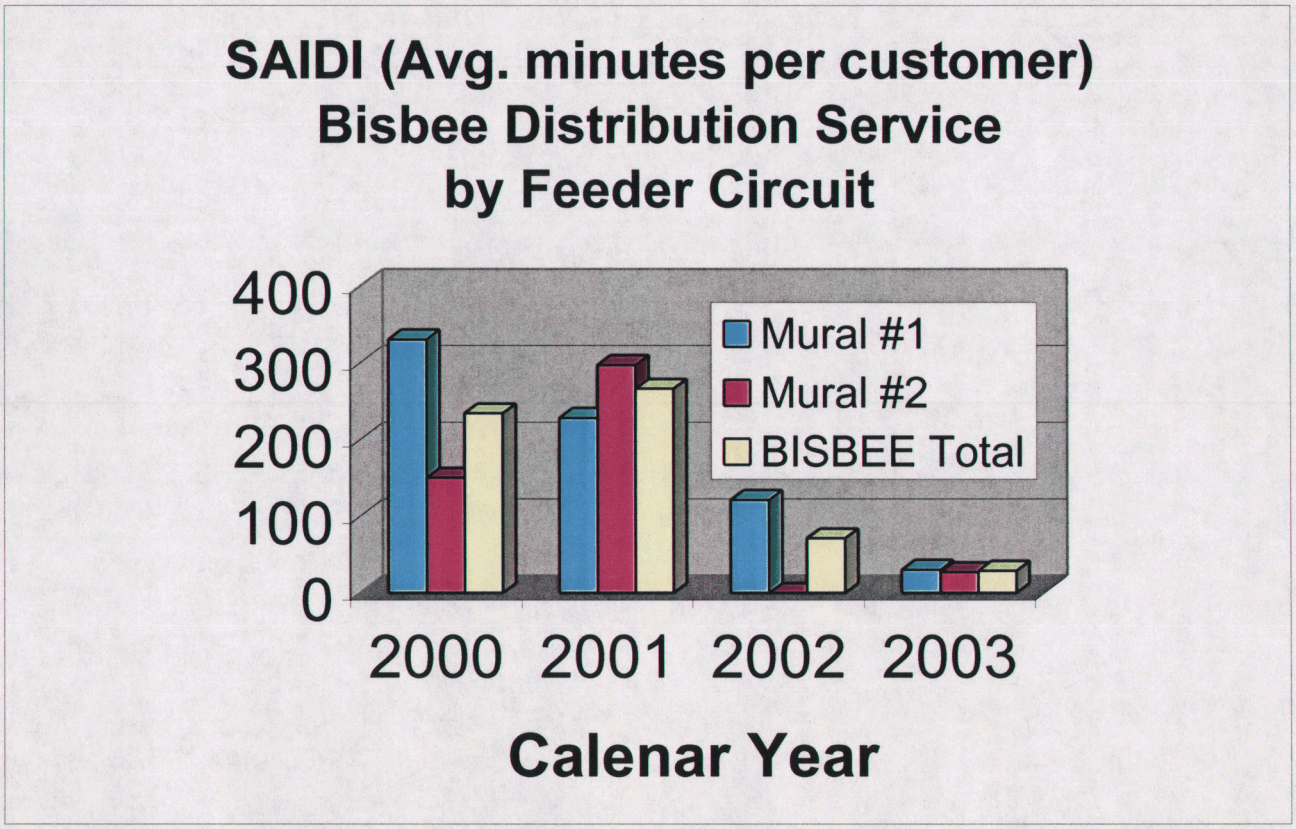
* per Staff Data Request STF 8-56



SAIDI by Feeder Circuit - Bisbee* (Avg. minutes per customer)

	2000	2001	2002	2003
Mural #1	330	228	121	30
Mural #2	150	297	0	27
BISBEE Total	234	266	71	29

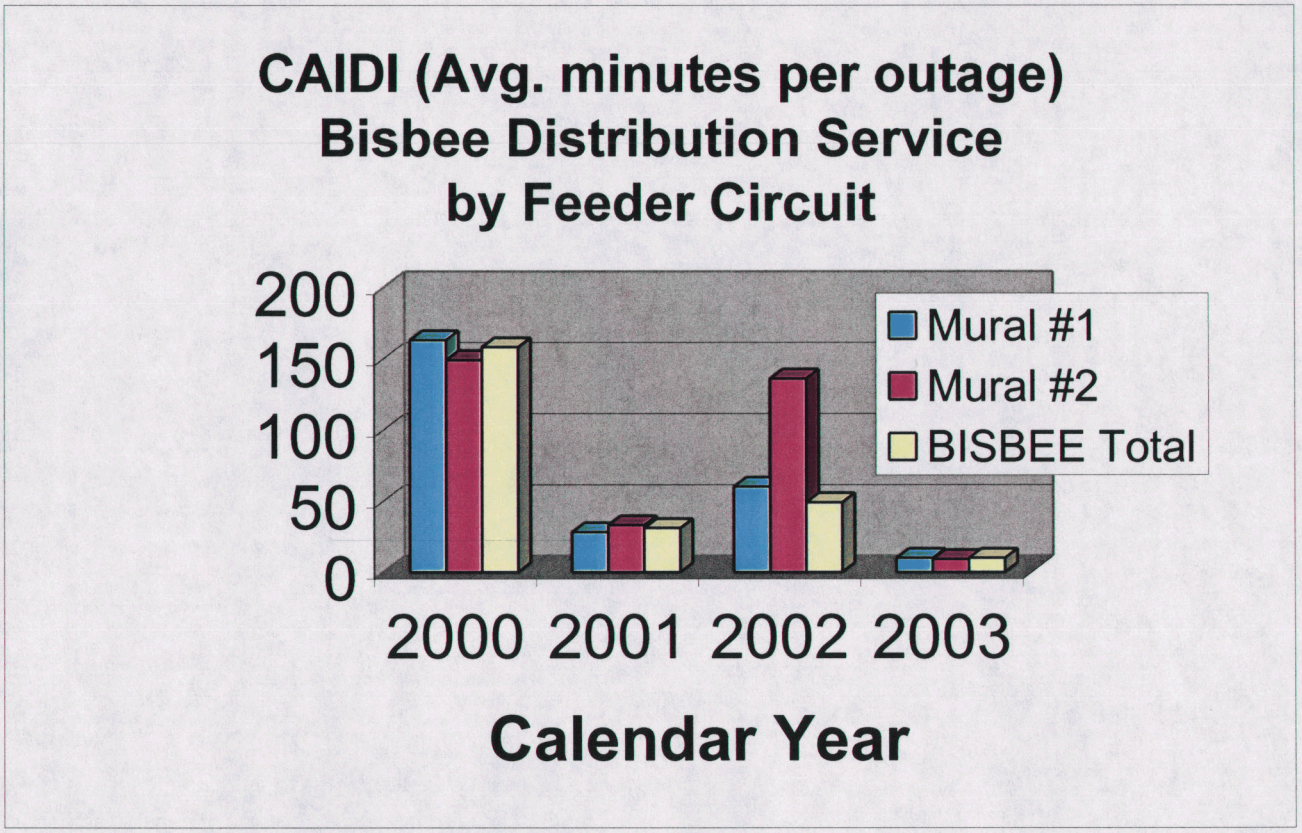
* per Staff Data Request STF 8-56



CAIDI by Feeder Circuit - Bisbee* (Avg. minutes per outage)

	2000	2001	2002	2003
Mural #1	163	28	60	10
Mural #2	149	33	136	9
BISBEE Total	158	31	49	10

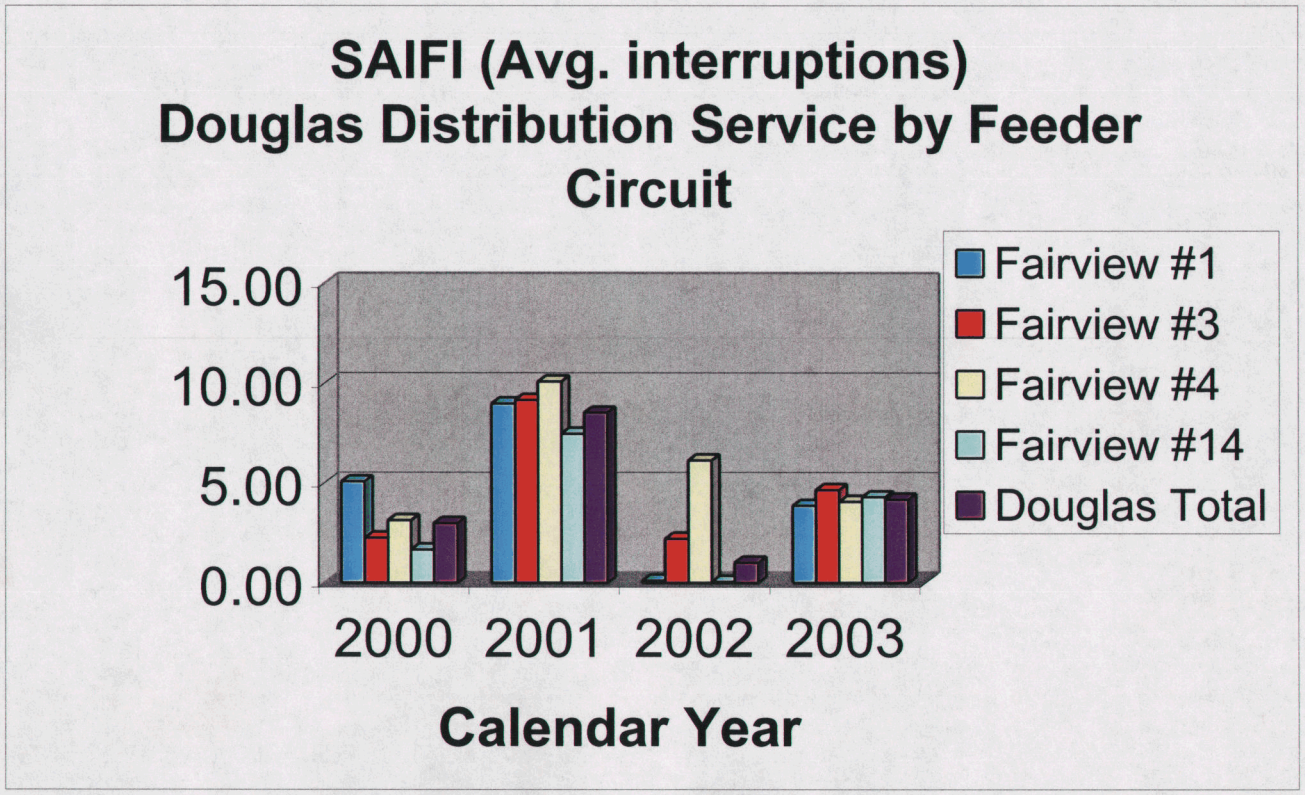
* per Staff Data Request STF 8-54



SAIFI by Feeder Circuit - Douglas* (Avg. interruptions)

	2000	2001	2002	2003
Fairview #1	5.06	8.98	0.11	3.85
Fairview #3	2.25	9.15	2.20	4.64
Fairview #4	3.13	10.07	6.12	4.05
Fairview #14	1.66	7.46	0.05	4.28
Douglas Total	2.98	8.52	1.00	4.16

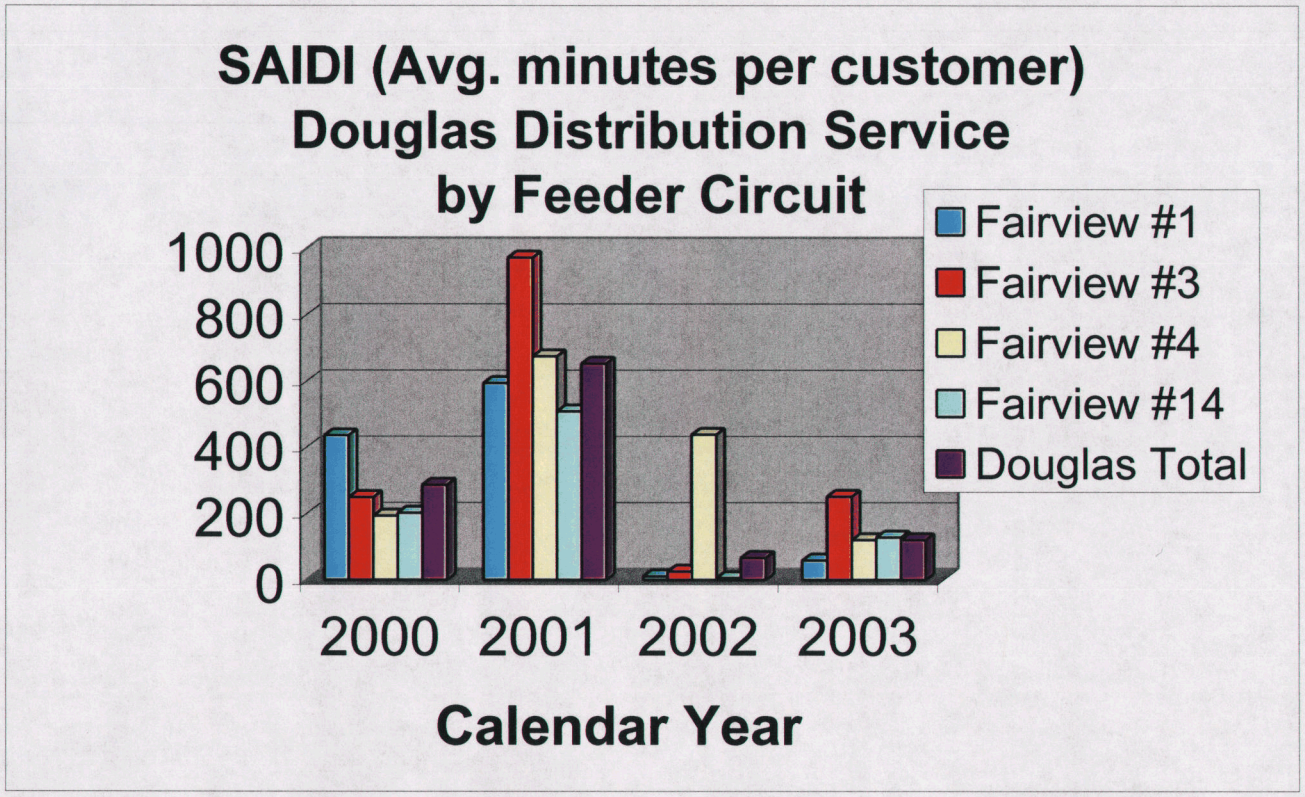
* per Staff Data Request STF 8-56



SAIDI by Feeder Circuit - Douglas* (Avg. minutes per customer)

	2000	2001	2002	2003
Fairview #1	436	594	10	58
Fairview #3	249	973	25	251
Fairview #4	193	675	438	120
Fairview #14	202	509	5	128
Douglas Total	286	653	66	120

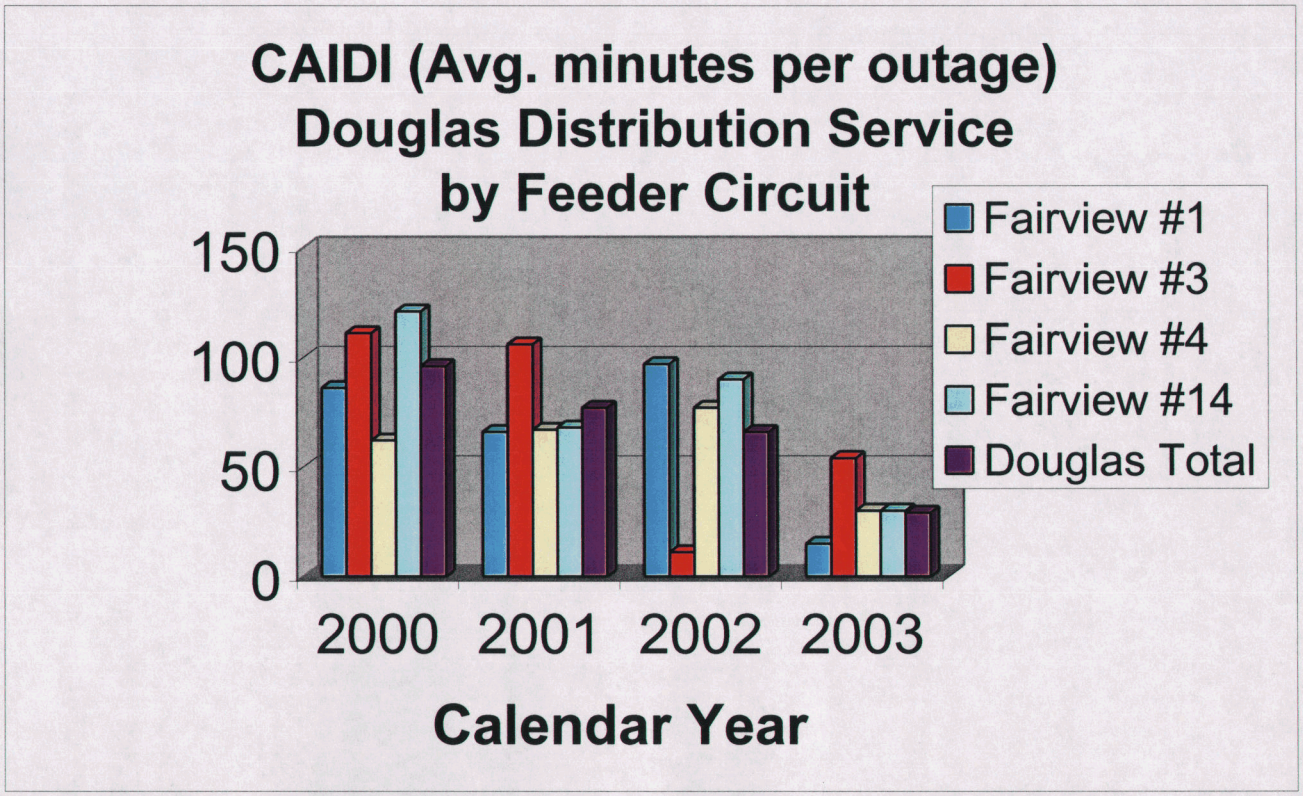
* per Staff Data Request STF 8-56



CAIDI by Feeder Circuit - Douglas* (Avg. minutes per outage)

	2000	2001	2002	2003
Fairview #1	86	66	97	15
Fairview #3	111	106	11	54
Fairview #4	62	67	77	30
Fairview #14	121	68	90	30
Douglas Total	96	77	66	29

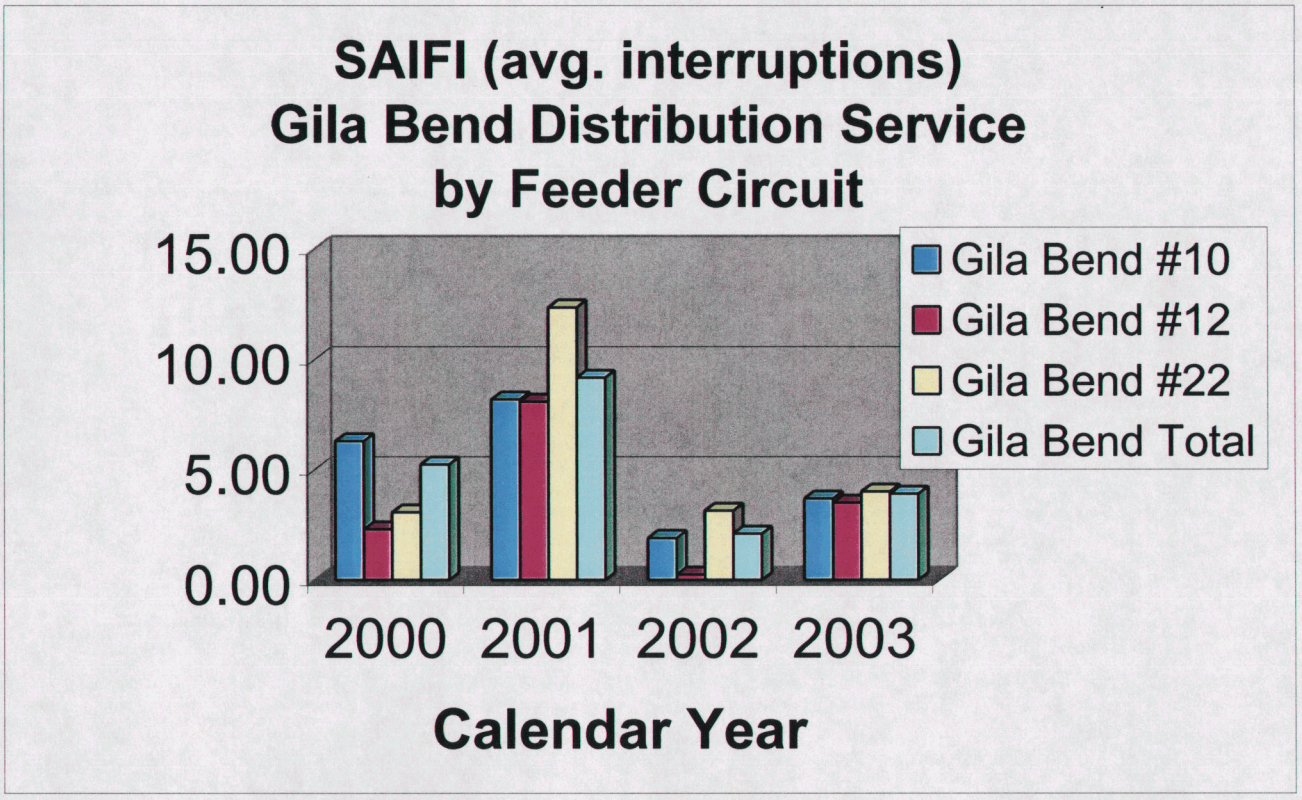
* per Staff Data Request STF 8-56



SAIFI by Feeder Circuit - Gila Bend* (Avg. interruptions)

	2000	2001	2002	2003
Gila Bend #10	6.30	8.19	1.90	3.68
Gila Bend #12	2.30	8.09	0.25	3.50
Gila Bend #22	3.06	12.35	3.13	4.00
Gila Bend Total	5.23	9.17	2.10	3.90

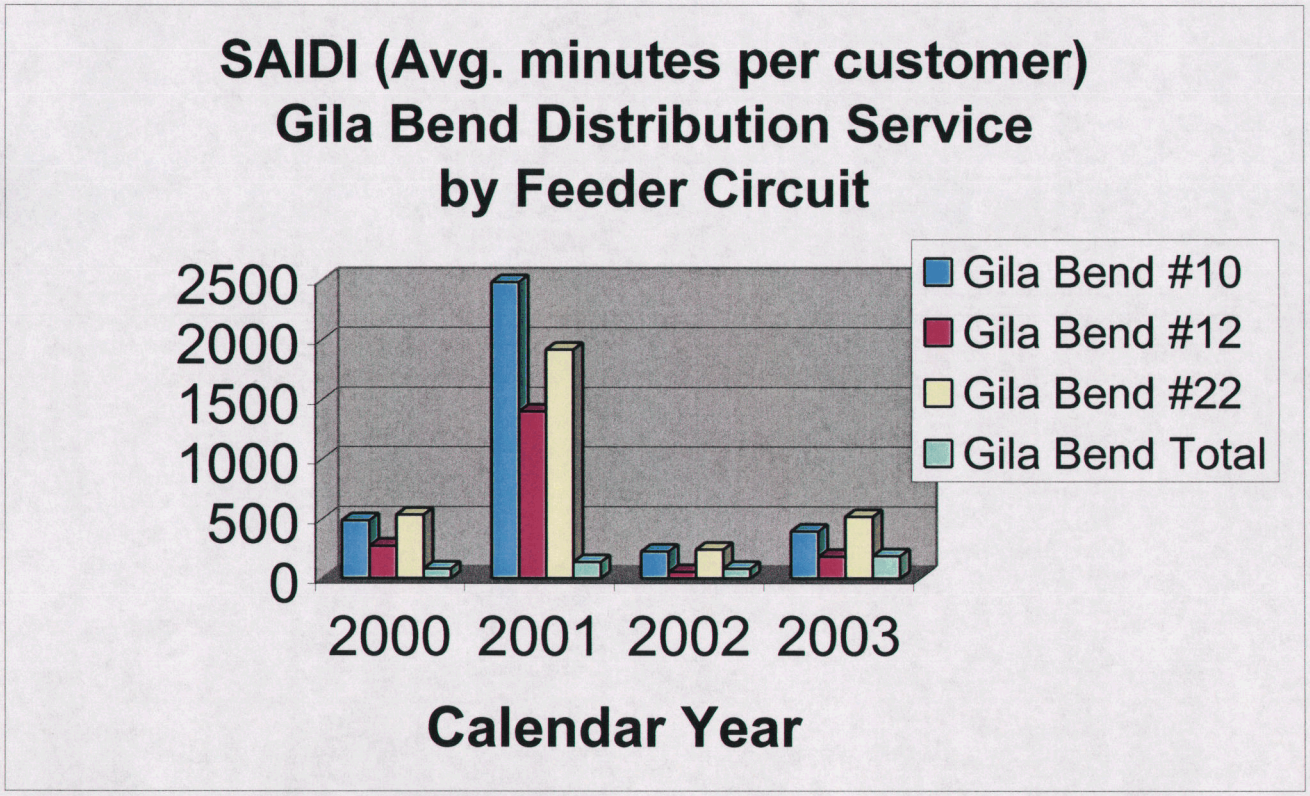
* per Staff Data Request STF 8-56



SAIDI by Feeder Circuit - Gila Bend* (Avg. minutes per customer)

	2000	2001	2002	2003
Gila Bend #10	484	2484	225	394
Gila Bend #12	272	1400	55	183
Gila Bend #22	533	1917	242	517
Gila Bend Total	82	138	81	189

* per Staff Data Request STF 8-56



CAIDI by Feeder Circuit - Gila Bend* (Avg. minutes per outage)

	2000	2001	2002	2003
Gila Bend #10	77	303	118	107
Gila Bend #12	118	297	218	52
Gila Bend #22	174	155	77	129
Gila Bend Total	92	255	79	123

* per Staff Data Request STF 8-56