

# Reliability Study Update

## Auxiliary Feedwater

### 1987–2003

This report presents a performance evaluation of the auxiliary feedwater (AFW) system at 69 operating United States commercial pressurized-water reactors (PWRs). The evaluation is based on the operating experience from 1987 through 2003, from 74 PWRs, as reported in Licensee Event Reports (LERs). This is the latest update to NUREG/CR 5500 Volume 1.

This report calculates two basic models for the AFW system. The first model, failure to start (FTS), models the AFW system start and injection. The second model, 8-hour mission, models the AFW system start, injection, and pump run for 8 hours. See the AFW Fault Tree Description document for more detail.

The AFW system has been categorized into eleven groups. The AFW design classes were categorized first by number of steam generators (SG), then by number of pump trains, and finally by number of motor (M), turbine (T), and diesel (D) trains. [Table 1](#) summarizes those groups. Information that is more detailed can be found in [Section 5](#).

**Table 1. AFW design class summary.**

	Design Class	Reference Plant	Number of Plants
1	1M, 1T, 2SG	Crystal River 3	8
2	1M, 2T, 2SG	Calvert Cliffs 1	2
3	2T, 2SG	Davis-Besse	1
4	2M, 1T, 2SG	St. Lucie 1	17
5	2M, 1T, 3SG	Farley 1	12
6	3T, 3SG	Turkey Point 3	2
7	1M, 1D, 4SG	Braidwood 1	4
8	1M, 1T, 4SG	Seabrook	1
9	2T, 4SG	Haddam Neck	1
10	2M, 1T, 4SG	Salem 1	24
11	3M, 1T, 4SG	South Texas 1	2

## 1 LATEST VALUES AND TRENDS

### 1.1 Industry-Wide Unavailability and Unreliability

The industry-wide unreliability and unavailability of the AFW system has been calculated from the operating experience for an 8-hour mission and for the failure to start (FTS) and are shown in [Table 2](#). The estimates are based on failures that occurred during unplanned demands, and cyclic and quarterly surveillance tests.

**Table 2. AFW Industry values.**

Model	Lower (5%)	Mean	Upper (95%)
Failure-to-Start (Unavailability)	2.36E-05	2.50E-04	8.23E-04
8-hour Mission (Unreliability)	4.80E-05	5.07E-04	1.67E-03

## 1.2 Fail to Start Model Results

The unavailability of the AFW system for each design class has been calculated from the operating experience for the failure to start (FTS) mission. A waterfall plot is shown in [Figure 1](#) and the data table is shown in [Table 3](#).

Unavailability for currently operating plants, have been calculated for the FTS model. The estimates of AFW system unavailability using operating experience from LERs and fault tree analyses are plotted in [Figure 2](#) (FTS model) and the data table is shown in [Table 4](#).

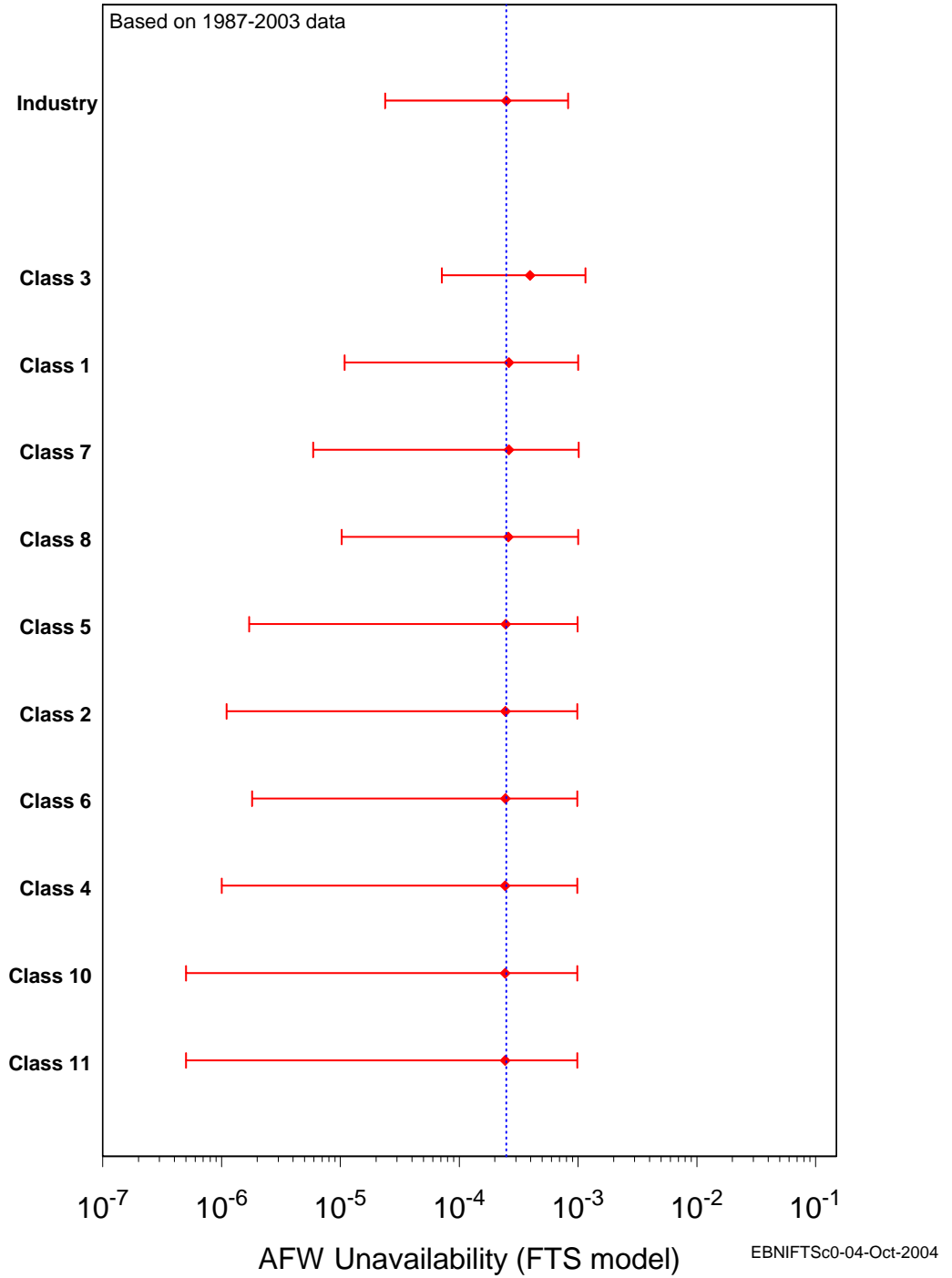


Figure 1. AFW design class unavailability (FTS model).

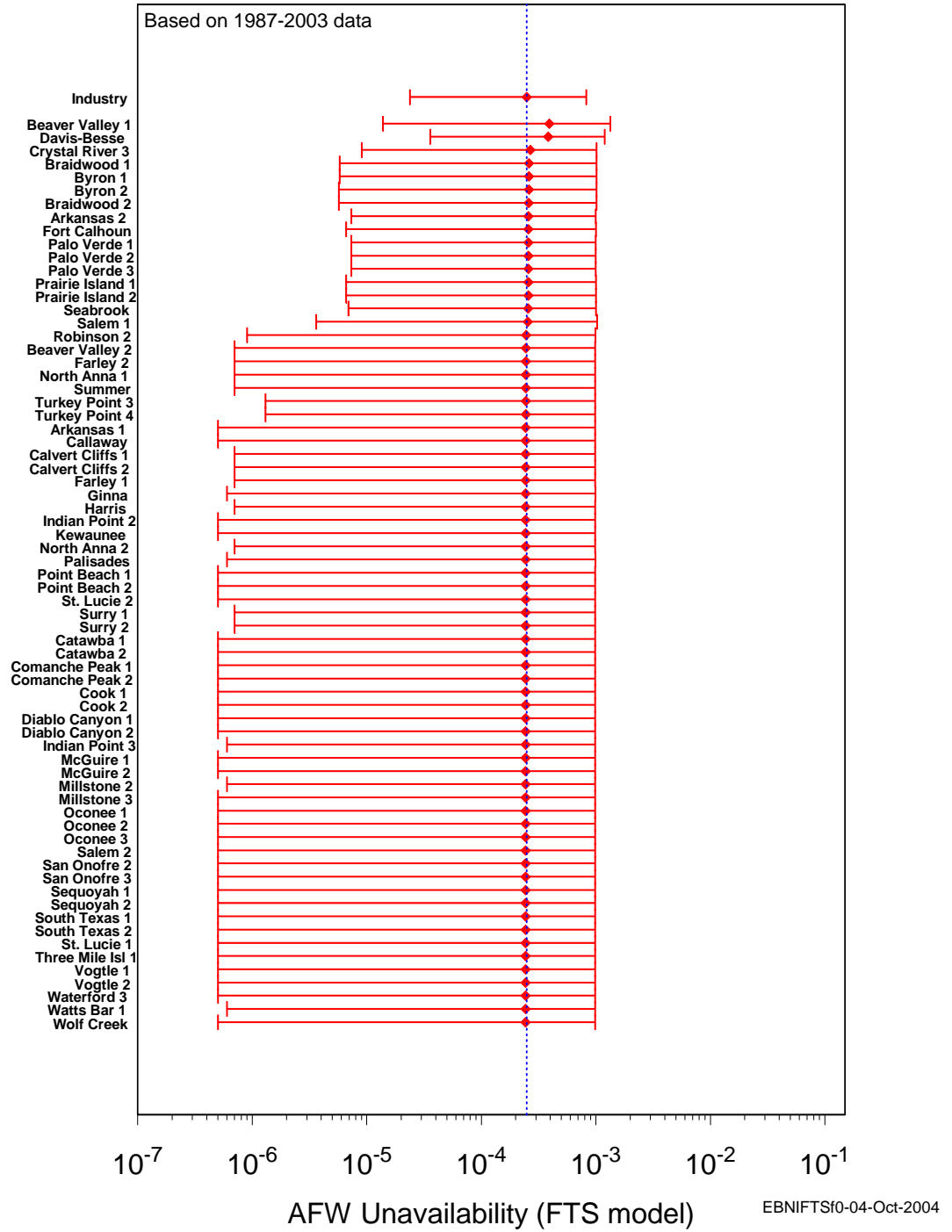


Figure 2. Plant-specific estimates of AFW system unavailability for FTS model.

**Table 3. AFW unavailability (start only model) by design class.**

Design Class	Lower (5%)	Mean	Upper (95%)
Industry	2.36E-05	2.50E-04	8.23E-04
Class 3	7.13E-05	3.96E-04	1.15E-03
Class 7	5.86E-06	2.62E-04	1.01E-03
Class 1	1.08E-05	2.62E-04	9.99E-04
Class 8	1.02E-05	2.60E-04	9.98E-04
Class 5	1.75E-06	2.47E-04	9.89E-04
Class 6	1.81E-06	2.45E-04	9.84E-04
Class 2	1.11E-06	2.45E-04	9.85E-04
Class 4	9.61E-07	2.44E-04	9.84E-04
Class 11	5.38E-07	2.43E-04	9.85E-04
Class 10	4.65E-07	2.43E-04	9.85E-04

**Table 4. AFW plant unavailability FTS model.**

Plant	Lower (5%)	Mean	Upper (95%)
Industry	2.36E-05	2.50E-04	8.23E-04
Beaver Valley 1	1.38E-05	3.94E-04	1.34E-03
Davis-Besse	3.57E-05	3.85E-04	1.19E-03
Crystal River 3	8.98E-06	2.69E-04	1.01E-03
Braidwood 1	5.76E-06	2.61E-04	1.01E-03
Byron 1	5.76E-06	2.61E-04	1.01E-03
Byron 2	5.75E-06	2.61E-04	1.01E-03
Braidwood 2	5.73E-06	2.60E-04	1.01E-03
Arkansas 2	7.30E-06	2.58E-04	9.96E-04
Fort Calhoun	6.63E-06	2.58E-04	9.98E-04
Palo Verde 1	7.30E-06	2.58E-04	9.96E-04
Palo Verde 2	7.30E-06	2.58E-04	9.96E-04
Palo Verde 3	7.31E-06	2.58E-04	9.96E-04
Prairie Island 1	6.63E-06	2.58E-04	9.98E-04
Prairie Island 2	6.63E-06	2.58E-04	9.98E-04
Seabrook	6.89E-06	2.57E-04	1.00E-03
Salem 1	3.64E-06	2.55E-04	1.02E-03
Robinson 2	9.06E-07	2.47E-04	9.87E-04
Beaver Valley 2	7.04E-07	2.45E-04	9.83E-04
Farley 2	7.00E-07	2.45E-04	9.83E-04
North Anna 1	7.00E-07	2.45E-04	9.83E-04
Summer	7.04E-07	2.45E-04	9.83E-04
Turkey Point 3	1.32E-06	2.45E-04	9.83E-04
Turkey Point 4	1.32E-06	2.45E-04	9.83E-04
Arkansas 1	5.40E-07	2.44E-04	9.84E-04
Callaway	5.33E-07	2.44E-04	9.83E-04
Calvert Cliffs 1	7.40E-07	2.44E-04	9.85E-04
Calvert Cliffs 2	7.40E-07	2.44E-04	9.85E-04
Farley 1	6.94E-07	2.44E-04	9.83E-04

Plant	Lower (5%)	Mean	Upper (95%)
Ginna	5.56E-07	2.44E-04	9.90E-04
Harris	6.79E-07	2.44E-04	9.83E-04
Indian Point 2	5.49E-07	2.44E-04	9.83E-04
Kewaunee	5.49E-07	2.44E-04	9.84E-04
North Anna 2	6.94E-07	2.44E-04	9.83E-04
Palisades	5.56E-07	2.44E-04	9.90E-04
Point Beach 1	5.49E-07	2.44E-04	9.84E-04
Point Beach 2	5.50E-07	2.44E-04	9.84E-04
St. Lucie 2	5.41E-07	2.44E-04	9.84E-04
Surry 1	6.91E-07	2.44E-04	9.83E-04
Surry 2	6.91E-07	2.44E-04	9.83E-04
Catawba 1	4.65E-07	2.43E-04	9.85E-04
Catawba 2	4.65E-07	2.43E-04	9.85E-04
Comanche Peak 1	4.65E-07	2.43E-04	9.85E-04
Comanche Peak 2	4.65E-07	2.43E-04	9.85E-04
Cook 1	4.65E-07	2.43E-04	9.85E-04
Cook 2	4.65E-07	2.43E-04	9.85E-04
Diablo Canyon 1	4.65E-07	2.43E-04	9.85E-04
Diablo Canyon 2	4.65E-07	2.43E-04	9.85E-04
Indian Point 3	6.20E-07	2.43E-04	9.84E-04
McGuire 1	4.65E-07	2.43E-04	9.85E-04
McGuire 2	4.65E-07	2.43E-04	9.85E-04
Millstone 2	5.52E-07	2.43E-04	9.83E-04
Millstone 3	4.65E-07	2.43E-04	9.85E-04
Oconee 1	4.65E-07	2.43E-04	9.85E-04
Oconee 2	4.65E-07	2.43E-04	9.85E-04
Oconee 3	4.65E-07	2.43E-04	9.85E-04
Salem 2	4.65E-07	2.43E-04	9.85E-04
San Onofre 2	4.65E-07	2.43E-04	9.85E-04
San Onofre 3	4.65E-07	2.43E-04	9.85E-04
Sequoyah 1	4.65E-07	2.43E-04	9.85E-04
Sequoyah 2	4.65E-07	2.43E-04	9.85E-04
South Texas 1	5.38E-07	2.43E-04	9.85E-04
South Texas 2	5.38E-07	2.43E-04	9.85E-04
St. Lucie 1	5.40E-07	2.43E-04	9.84E-04
Three Mile Isl 1	4.65E-07	2.43E-04	9.85E-04
Vogtle 1	4.65E-07	2.43E-04	9.85E-04
Vogtle 2	4.65E-07	2.43E-04	9.85E-04
Waterford 3	4.65E-07	2.43E-04	9.85E-04
Watts Bar 1	5.78E-07	2.43E-04	9.84E-04
Wolf Creek	4.65E-07	2.43E-04	9.85E-04

Figure 3 displays the trend by fiscal year of the AFW system FTS unavailability calculated from the 1987–2003 experience. Table 10 shows the data points for Figure 3. The trend is not statistically significant.<sup>1</sup>

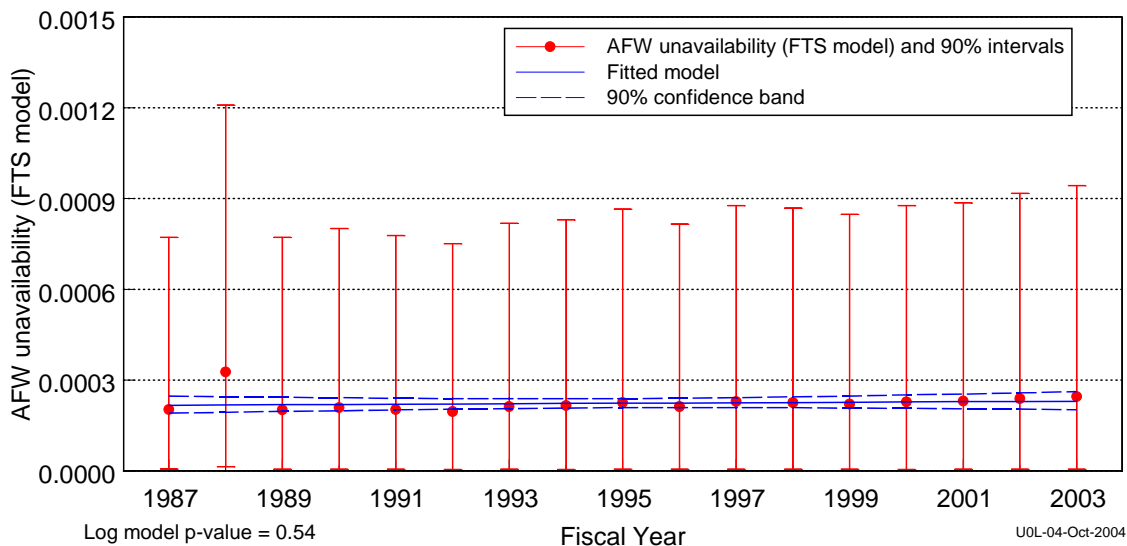


Figure 3. Trend of AFW system unavailability (FTS model), as a function of fiscal year.

### 1.3 Fail to Operate for 8-Hour Model

The unreliability of the AFW system for each design class has been calculated from the operating experience for the 8-hour mission. Waterfall plots are shown in Figure 4 and the data table is shown in Table 5.

Individual plant unreliability, for currently operating plants, has been calculated for the 8-hour mission. The estimates of AFW system unreliability using operating experience from LERs and fault tree analyses are plotted in Figure 5 (8-hour mission) and the data table is shown in Table 6.

<sup>1</sup> Statistically significant is defined in terms of the ‘p-value.’ A p-value is a probability indicating whether to accept or reject the null hypothesis that there is no trend in the data. P-values of less than or equal to 0.05 indicate that we are 95% confident that there is a trend in the data (reject the null hypothesis of no trend.) By convention, we use the "Michelin Guide" scale: p-value < 0.05 (statistically significant), p-value < 0.01 (highly statistically significant); p-value < 0.001 (extremely statistically significant).

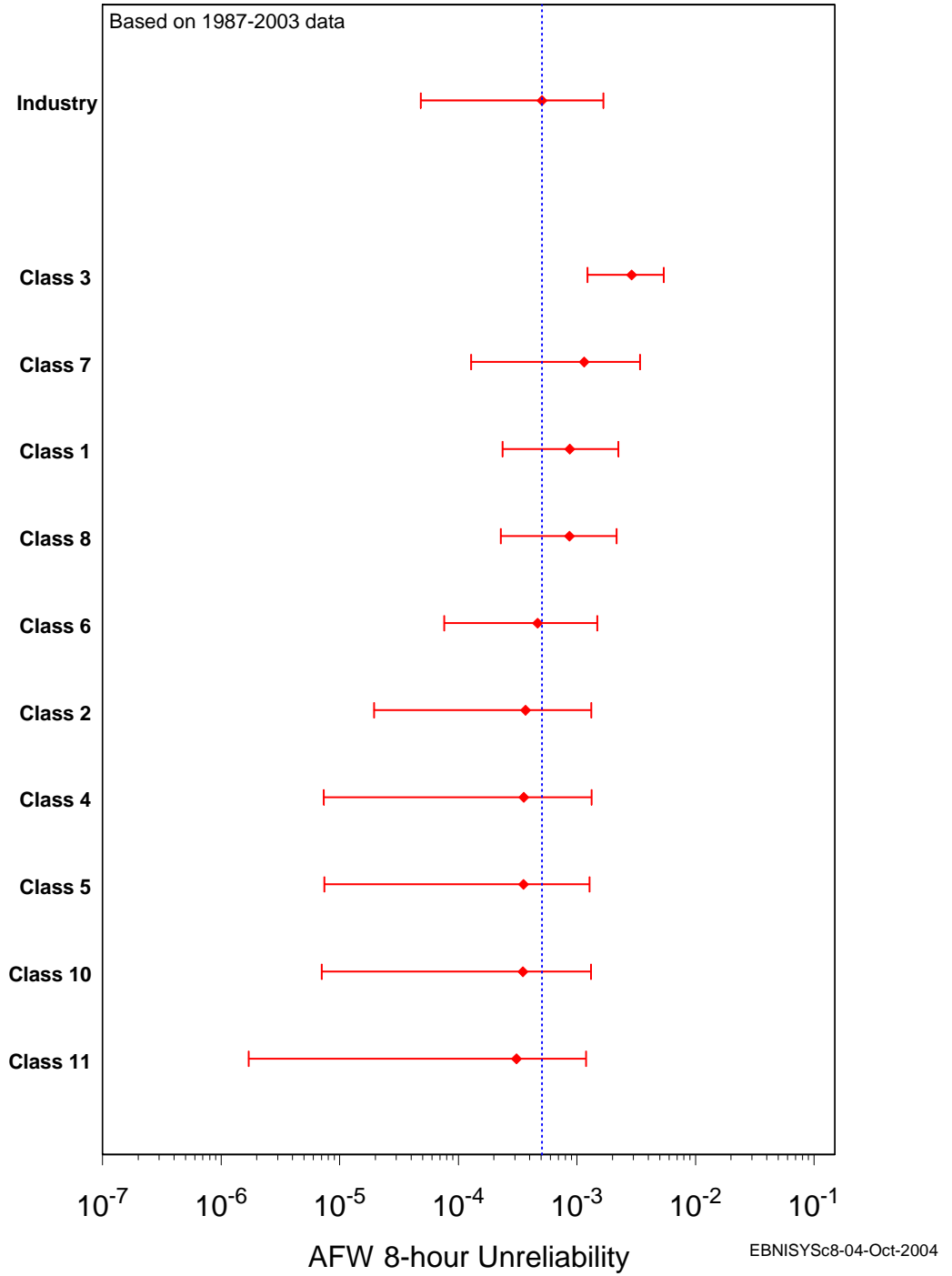


Figure 4. AFW design class unreliability (8-hour model).

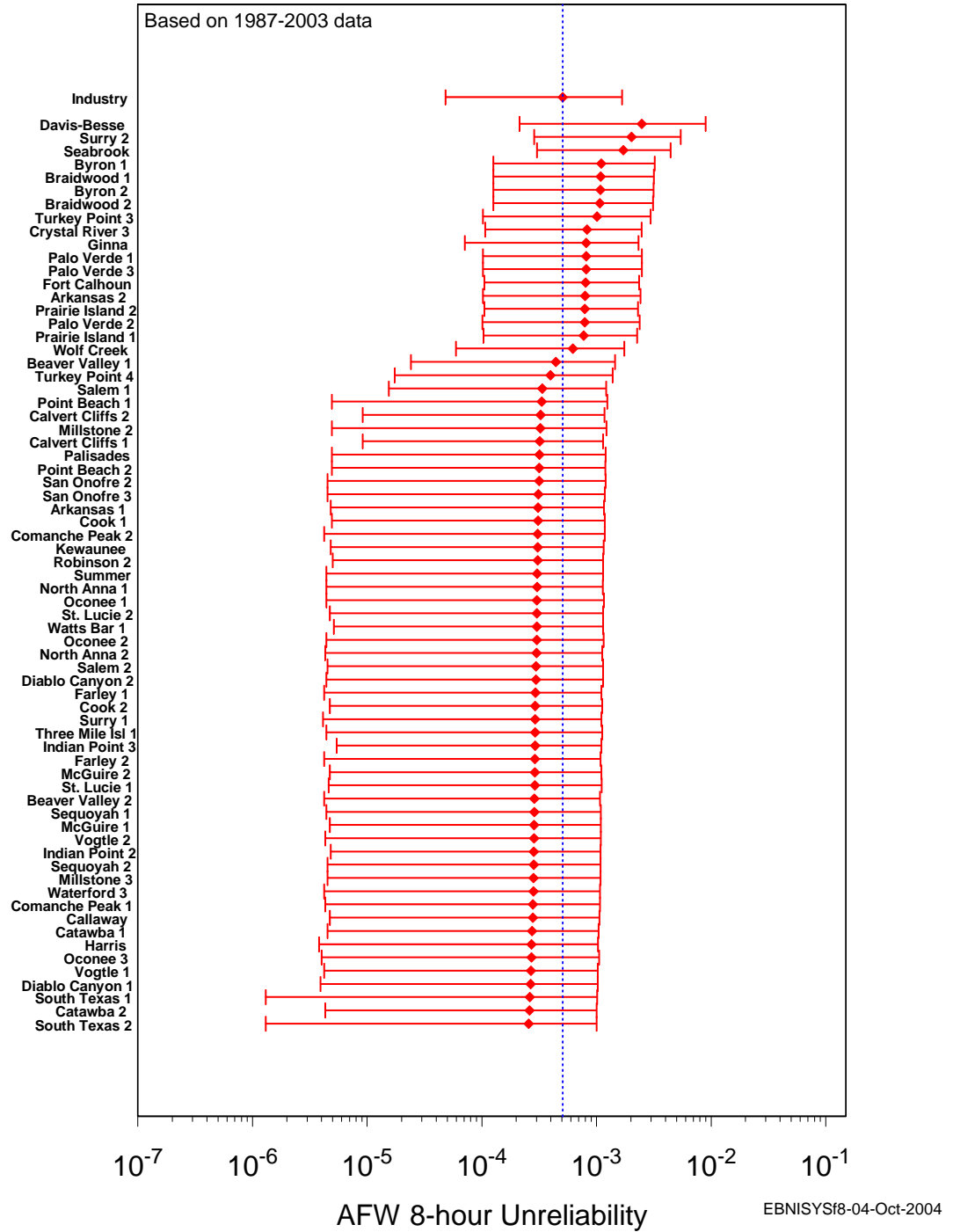


Figure 5. Plant-specific estimates of AFW system unreliability for an 8-hour mission.



**Table 5. AFW unreliability (8-hour model) by design class.**

Design Class	Lower (5%)	Mean	Upper (95%)
Industry	4.80E-05	5.07E-04	1.67E-03
Class 11	1.75E-06	3.09E-04	1.19E-03
Class 10	6.98E-06	3.51E-04	1.31E-03
Class 5	7.36E-06	3.55E-04	1.28E-03
Class 4	7.29E-06	3.56E-04	1.33E-03
Class 2	1.95E-05	3.69E-04	1.32E-03
Class 6	7.58E-05	4.67E-04	1.48E-03
Class 8	2.28E-04	8.68E-04	2.15E-03
Class 1	2.35E-04	8.72E-04	2.23E-03
Class 7	1.28E-04	1.15E-03	3.39E-03
Class 3	1.23E-03	2.90E-03	5.39E-03

**Table 6. AFW plant unreliability data.**

Plant	Lower (5%)	Mean	Upper (95%)
Industry	4.80E-05	5.07E-04	1.67E-03
South Texas 2	1.27E-06	2.57E-04	1.00E-03
Catawba 2	4.34E-06	2.61E-04	9.98E-04
South Texas 1	1.34E-06	2.62E-04	1.01E-03
Diablo Canyon 1	3.91E-06	2.67E-04	1.02E-03
Vogtle 1	4.17E-06	2.69E-04	1.02E-03
Oconee 3	4.04E-06	2.71E-04	1.05E-03
Harris	3.76E-06	2.72E-04	1.03E-03
Catawba 1	4.50E-06	2.74E-04	1.04E-03
Callaway	4.72E-06	2.79E-04	1.06E-03
Comanche Peak 1	4.29E-06	2.80E-04	1.07E-03
Millstone 3	4.53E-06	2.83E-04	1.08E-03
Waterford 3	4.24E-06	2.83E-04	1.07E-03
Indian Point 2	4.83E-06	2.84E-04	1.08E-03
Sequoyah 2	4.49E-06	2.84E-04	1.08E-03
McGuire 1	4.66E-06	2.85E-04	1.09E-03
Vogtle 2	4.34E-06	2.85E-04	1.09E-03
Sequoyah 1	4.40E-06	2.87E-04	1.09E-03
Beaver Valley 2	4.23E-06	2.88E-04	1.07E-03
Farley 2	4.24E-06	2.90E-04	1.08E-03
McGuire 2	4.67E-06	2.90E-04	1.10E-03
St. Lucie 1	4.57E-06	2.90E-04	1.11E-03
Indian Point 3	5.41E-06	2.92E-04	1.10E-03
Cook 2	4.69E-06	2.93E-04	1.12E-03
Surry 1	4.12E-06	2.93E-04	1.10E-03
Three Mile Isl 1	4.38E-06	2.93E-04	1.12E-03
Farley 1	4.24E-06	2.94E-04	1.10E-03
Diablo Canyon 2	4.37E-06	2.97E-04	1.14E-03
Salem 2	4.54E-06	2.98E-04	1.14E-03

Plant	Lower (5%)	Mean	Upper (95%)
North Anna 2	4.31E-06	3.00E-04	1.12E-03
Oconee 2	4.41E-06	3.02E-04	1.15E-03
Oconee 1	4.41E-06	3.03E-04	1.16E-03
St. Lucie 2	4.74E-06	3.03E-04	1.14E-03
Watts Bar 1	5.06E-06	3.03E-04	1.14E-03
North Anna 1	4.36E-06	3.04E-04	1.13E-03
Summer	4.38E-06	3.05E-04	1.14E-03
Comanche Peak 2	4.21E-06	3.07E-04	1.18E-03
Kewaunee	4.80E-06	3.07E-04	1.15E-03
Robinson 2	4.96E-06	3.07E-04	1.14E-03
Cook 1	4.87E-06	3.09E-04	1.18E-03
Arkansas 1	4.81E-06	3.10E-04	1.16E-03
San Onofre 3	4.50E-06	3.12E-04	1.18E-03
Point Beach 2	4.88E-06	3.17E-04	1.19E-03
San Onofre 2	4.52E-06	3.17E-04	1.20E-03
Palisades	4.88E-06	3.19E-04	1.20E-03
Calvert Cliffs 1	9.07E-06	3.20E-04	1.14E-03
Millstone 2	4.91E-06	3.24E-04	1.22E-03
Calvert Cliffs 2	9.09E-06	3.26E-04	1.17E-03
Point Beach 1	4.91E-06	3.33E-04	1.24E-03
Salem 1	1.54E-05	3.37E-04	1.21E-03
Turkey Point 4	1.74E-05	3.98E-04	1.38E-03
Beaver Valley 1	2.40E-05	4.42E-04	1.45E-03
Wolf Creek	5.93E-05	6.24E-04	1.75E-03
Prairie Island 1	1.03E-04	7.75E-04	2.26E-03
Palo Verde 2	1.01E-04	7.90E-04	2.38E-03
Prairie Island 2	1.05E-04	7.93E-04	2.30E-03
Arkansas 2	1.02E-04	7.96E-04	2.41E-03
Fort Calhoun	1.05E-04	8.06E-04	2.35E-03
GINNA	7.08E-05	8.15E-04	2.32E-03
Palo Verde 1	1.02E-04	8.15E-04	2.49E-03
Palo Verde 3	1.02E-04	8.15E-04	2.49E-03
Crystal River 3	1.07E-04	8.28E-04	2.47E-03
Turkey Point 3	1.02E-04	1.01E-03	2.96E-03
Braidwood 2	1.26E-04	1.07E-03	3.10E-03
Byron 2	1.26E-04	1.08E-03	3.14E-03
Braidwood 1	1.26E-04	1.09E-03	3.15E-03
Byron 1	1.26E-04	1.10E-03	3.21E-03
Seabrook	3.03E-04	1.72E-03	4.42E-03
Surry 2	2.85E-04	2.02E-03	5.43E-03
Davis-Besse	2.12E-04	2.49E-03	8.93E-03

No statistically significant trend within the industry estimates of AFW system unreliability (8-hour mission) on a per fiscal year basis was identified. Figure 6 displays the trend by fiscal year of the AFW system unreliability calculated from the 1987–2003 experience. Table 11 shows the data points for Figure 6.

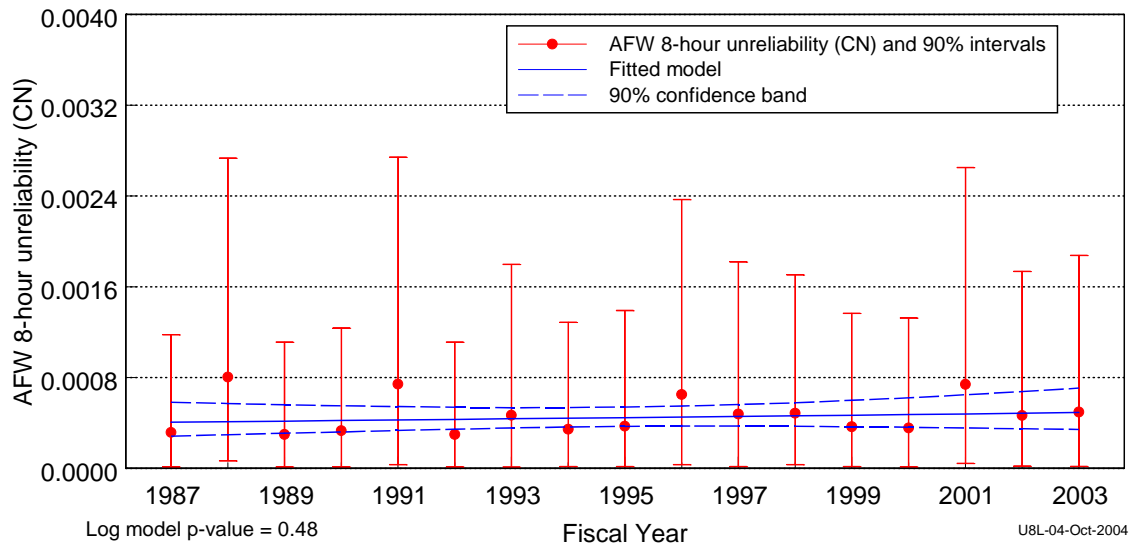


Figure 6. Trend of AFW system unreliability (8-hour mission), as a function of fiscal year.

## 2 DATA TRENDS

### 2.1 Unplanned Demand Trend

Trends were identified in the frequency of AFW unplanned demands (Figure 7). When modeled as a function of fiscal year, the unplanned demand frequency exhibited an extremely statistically significant decreasing trend. Table 12 shows the LERs that are represented in the figure.

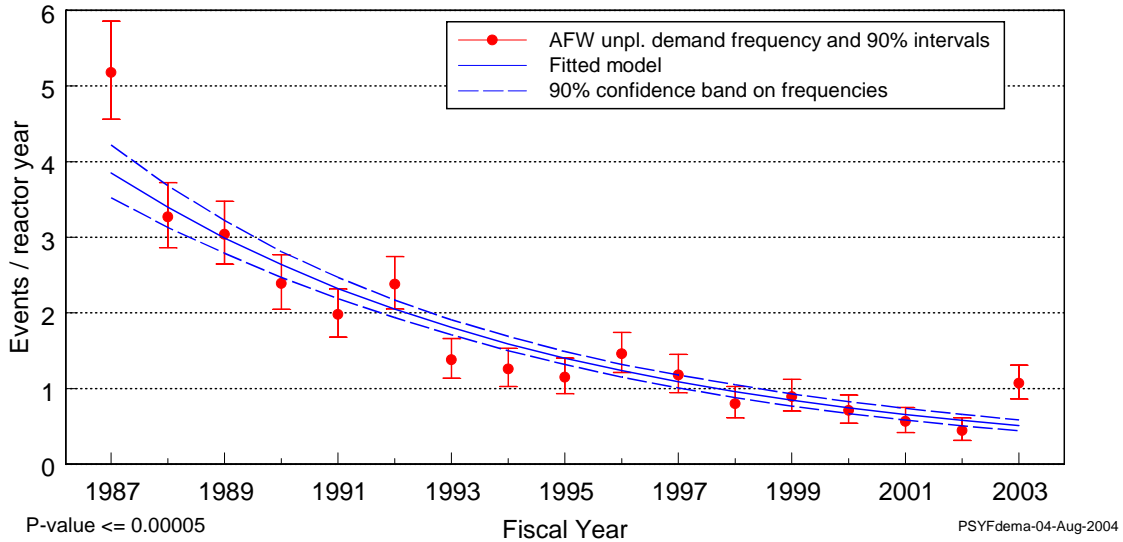
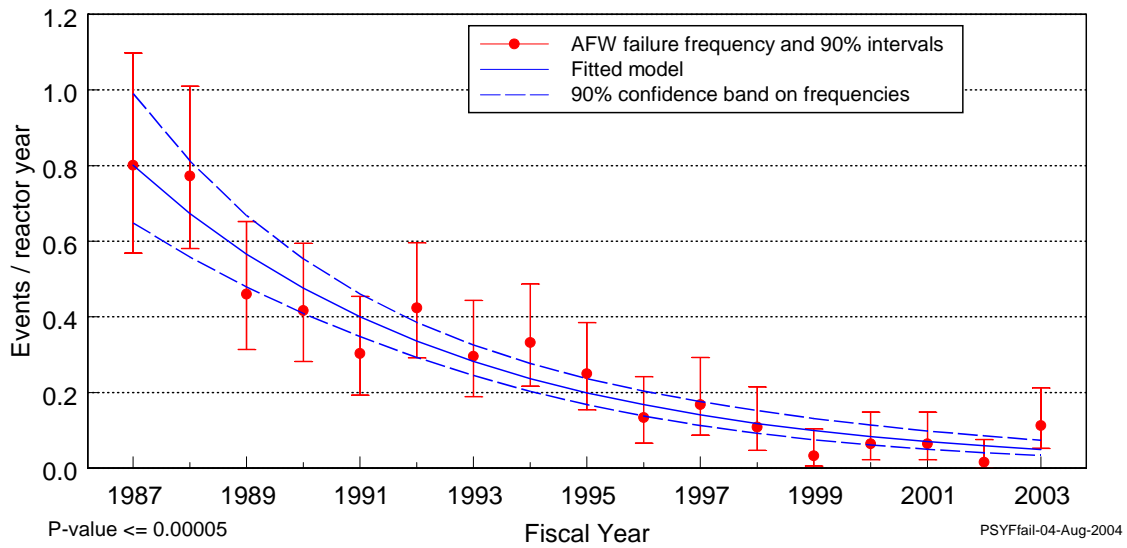


Figure 7. Frequency (events per reactor year) of unplanned demands, as a function of fiscal year.

### 2.2 Failure Trend

The frequency of all failures (unplanned demands, surveillance tests, inspections, etc.) resulting in train unavailability identified in the experience was analyzed to determine trends. When modeled as a function of fiscal year, an extremely statistically significant decreasing trend was identified. The fitted frequency is plotted against fiscal year in Figure 8. Trends for AFW failures are plotted without regard to method of detection (the trend excludes maintenance out of service and support system failures). Table 13 shows the LERs that are represented in the figure.



**Figure 8. Frequency (events per reactor year) of failures, as a function of fiscal year.**

### 3 MAJOR CONTRIBUTORS TO SYSTEM UNRELIABILITY AND UNAVAILABILITY

#### 3.1 Segment Failure Contribution to Design Class Models

The segment failure contribution has been calculated by adding up the components of each cut-set for each design class fault tree model. Only the top five segments are shown.

##### 3.1.1 Fail to Start Model

Figure 9 shows the distribution of failures by segment based on the conglomeration of all design classes for the fail to start (FTS) model.

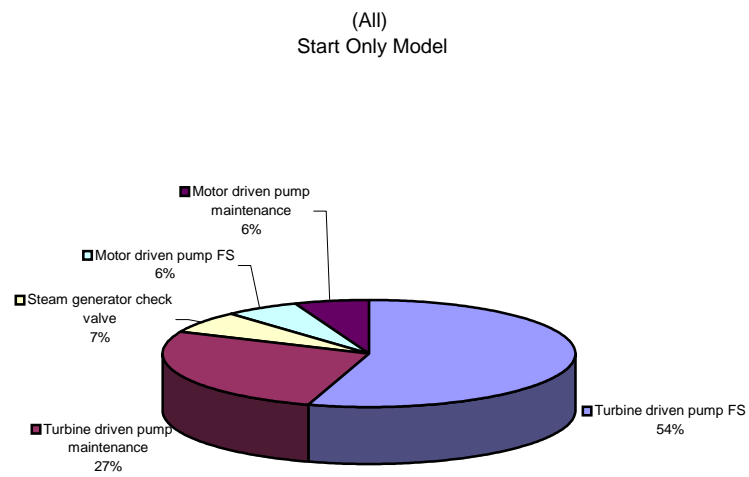


Figure 9. Segment failure distribution, FTS model All Design Classes.

Figure 10 through Figure 20 show the distributions of segment failures for the FTS model.

Design Class 1  
Start Only Model

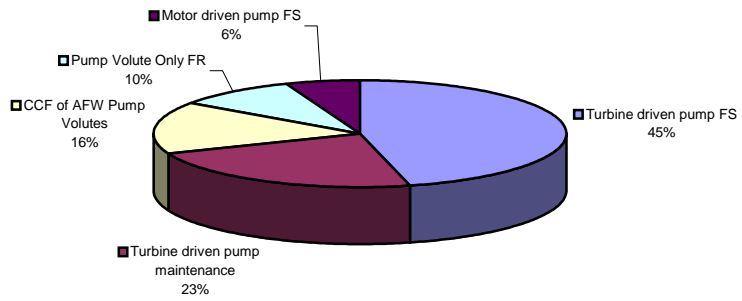


Figure 10. Segment failure distribution, FTS model Design Class 1.

Design Class 2  
Start Only Model

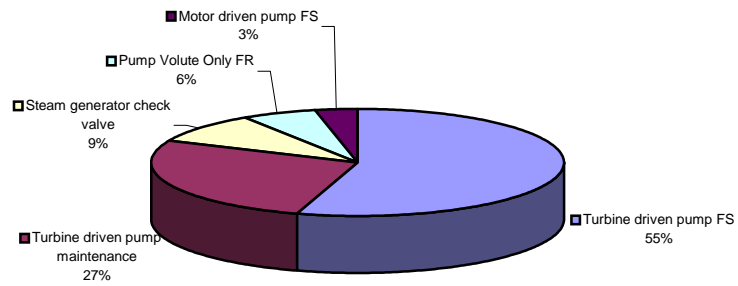


Figure 11. Segment failure distribution, FTS model Design Class 2.

Design Class 3  
Start Only Model

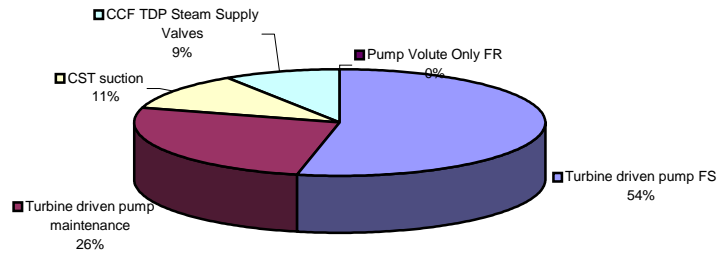


Figure 12. Segment failure distribution, FTS model Design Class 3.

Design Class 4  
Start Only Model

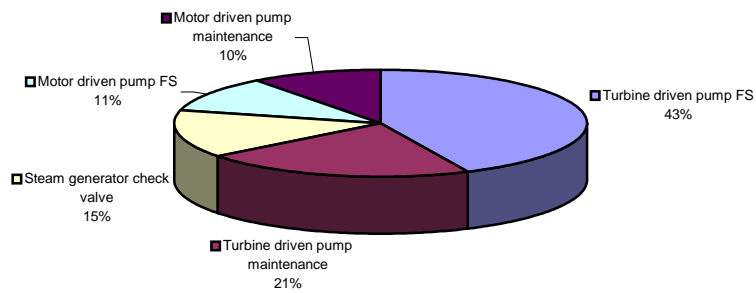


Figure 13. Segment failure distribution, FTS model Design Class 4.

Design Class 5  
Start Only Model

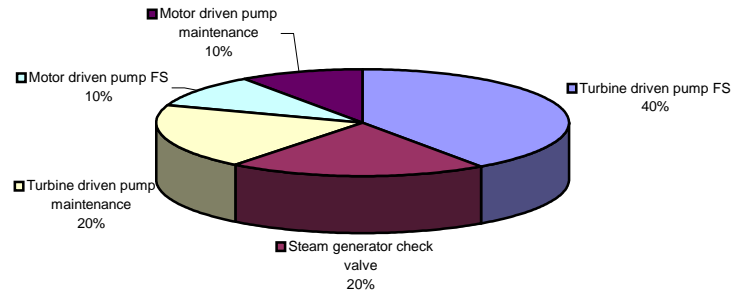


Figure 14. Segment failure distribution, FTS model Design Class 5.

Design Class 6  
Start Only Model

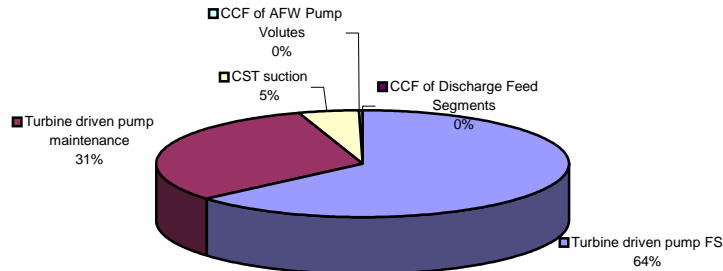


Figure 15. Segment failure distribution, FTS model Design Class 6.



Design Class 7  
Start Only Model

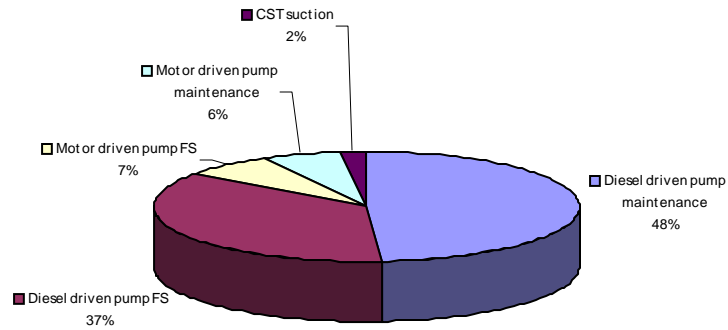


Figure 16. Segment failure distribution, FTS model Design Class 7.

Design Class 8  
Start Only Model

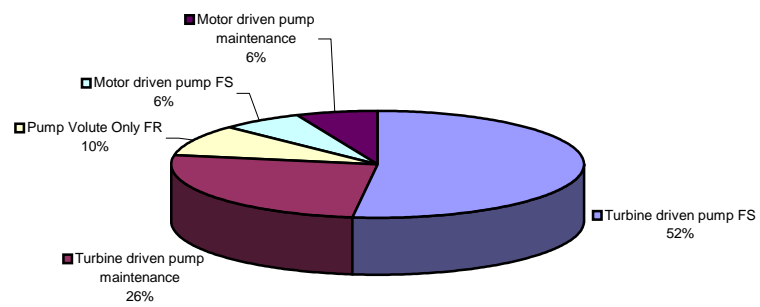


Figure 17. Segment failure distribution, FTS model Design Class 8.

Design Class 9  
Start Only Model

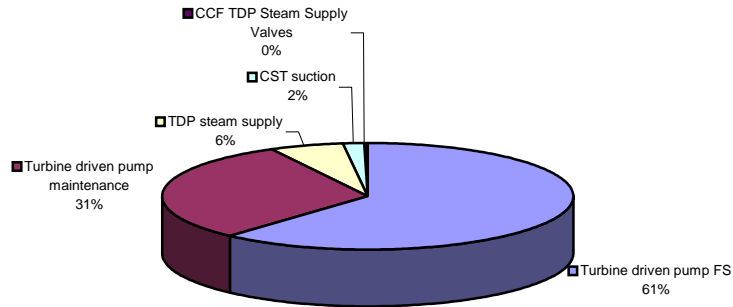


Figure 18. Segment failure distribution, FTS model Design Class 9.

Design Class 10  
Start Only Model

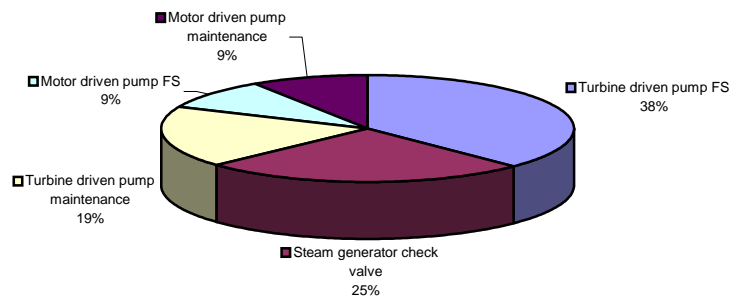
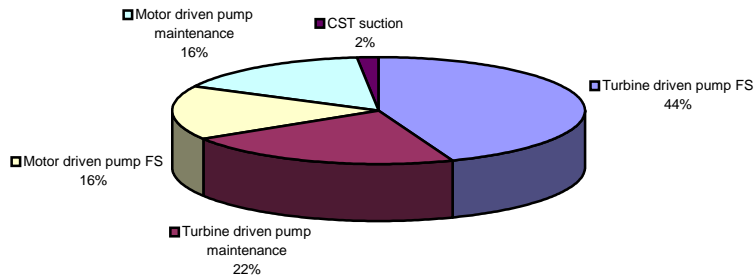


Figure 19. Segment failure distribution, FTS model Design Class 10.

Design Class 11  
Start Only Model



**Figure 20. Segment failure distribution, FTS model Design Class 11.**

### 3.1.2 Fail to Operate for 8 –hour Model

Figure 21 shows the distribution of failures by segment based on the conglomeration of all design classes for the 8-hour model.

(All)  
8 Hour Model

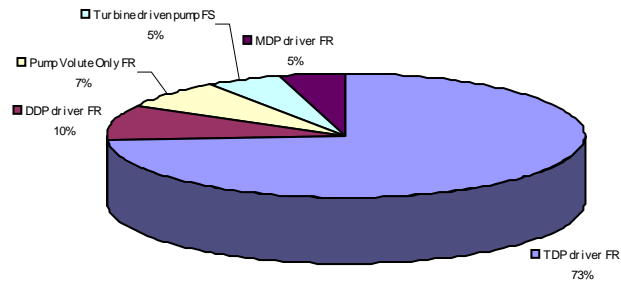


Figure 21. Segment failure distribution, 8-hour model All Design Classes.

Figure 22 through Figure 32 show the distributions of segment failures for the 8-hour model.

Design Class 1  
8 Hour Model

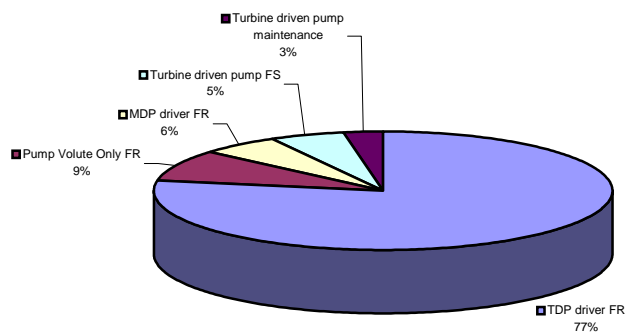


Figure 22. Segment failure distribution, 8-hour mission Design Class 1.

Design Class 2  
8 Hour Model

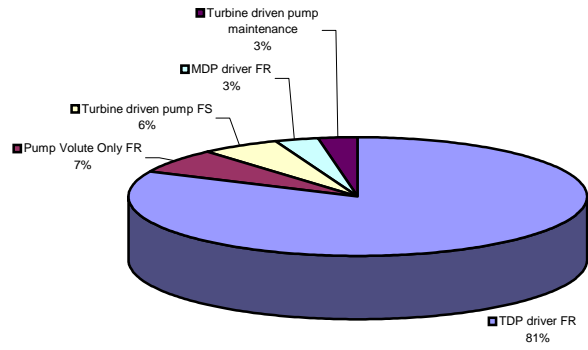


Figure 23. Segment failure distribution, 8-hour mission Design Class 2.

Design Class 3  
8 Hour Model

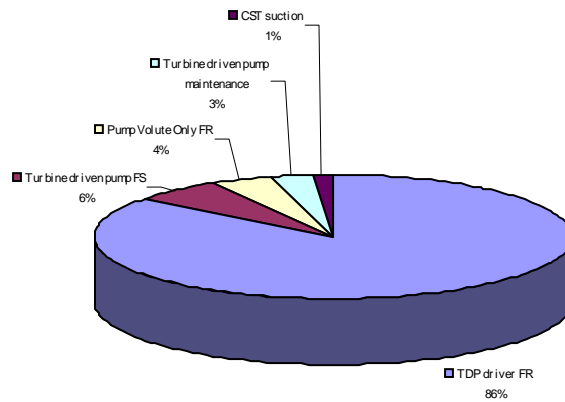


Figure 24. Segment failure distribution, 8-hour mission Design Class 3.

Design Class 4  
8 Hour Model

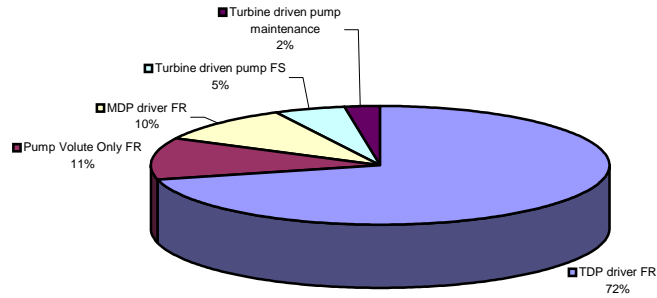


Figure 25. Segment failure distribution, 8-hour mission Design Class 4.

Design Class 5  
8 Hour Model

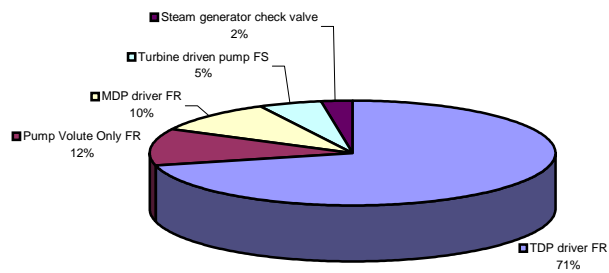


Figure 26. Segment failure distribution, 8-hour mission Design Class 5.

Design Class 6  
8 Hour Model

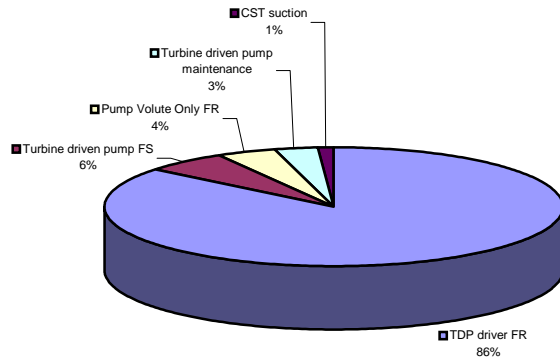


Figure 27. Segment failure distribution, 8-hour mission Design Class 6.

Design Class 7  
8 Hour Model

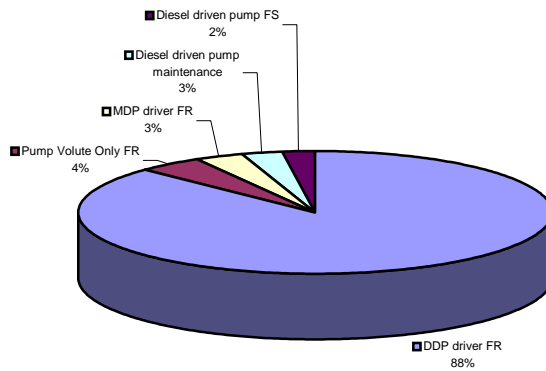


Figure 28. Segment failure distribution, 8-hour mission Design Class 7.

Design Class 8  
8 Hour Model

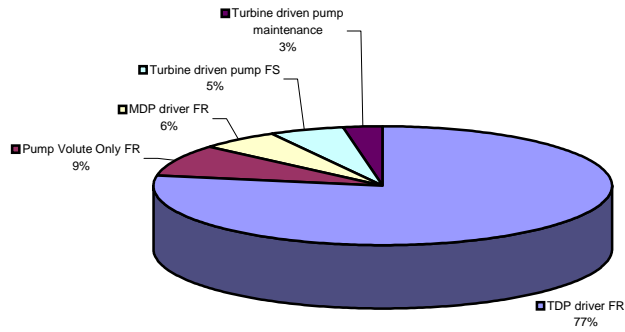


Figure 29. Segment failure distribution, 8-hour mission Design Class 8.

Design Class 9  
8 Hour Model

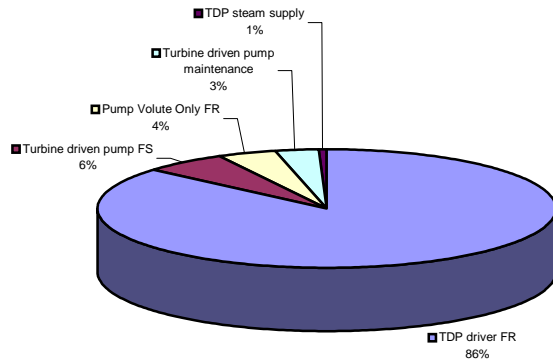


Figure 30. Segment failure distribution, 8-hour mission Design Class 9.



Design Class 10  
8 Hour Model

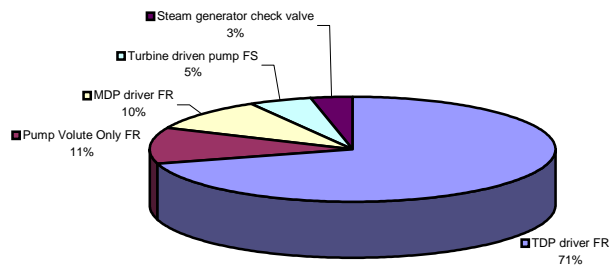


Figure 31. Segment failure distribution, 8-hour mission Design Class 10.

Design Class 11  
8 Hour Model

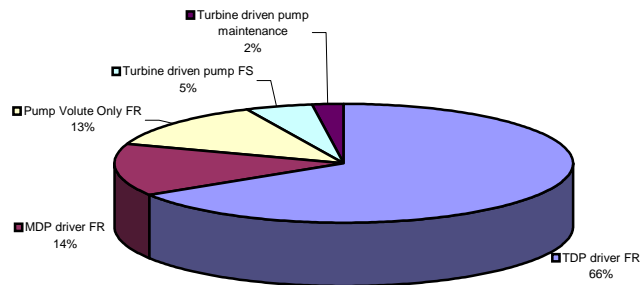


Figure 32. Segment failure distribution, 8-hour mission Design Class 11.

## 3.2 Failure Cause and Discovery Method Summary

The raw failure data were sliced to show the distribution of the failure causes and the discovery methods by the affected segment.

### 3.2.1 Leading Segment Failures.

The turbine-driven pump (40%) and the motor-driven pump (21%) were the leading segment failures identified in the database. See [Table 7](#).

### 3.2.2 Leading Discovery Methods

Periodic surveillance (38%) and unplanned demand (39%) were the leading methods of discovery. See [Table 7](#).

### 3.2.3 Leading Causes of Failure.

Forty-two percent of the failures in the AFW system observed in the experience were attributed to hardware-related problems. Personnel errors caused 17% of all AFW system failures. However, 86% of these failures were immediately identified and either recovered or were recoverable, meaning that the failures were of the nature where plant personnel were able to respond to the failures immediately after they occurred. See [Table 9](#).

**Table 7. Comparison of failed segment with the method of discovery.<sup>2</sup>**

Segments	Actual/ unplanned demand	Alarm/ indicator	Inspection/ review	Maintenance on system	Other (not counted) surveillance test	Periodic surveillance on system	Post-maintenance testing	Total	Percent
Common feed control segment	5		1			3		9	4%
Diesel-driven pump	1		2					3	1%
Instrumentation and control			4			1		5	2%
Motor-driven pump	20		6	3	1	16		46	21%
Motor-driven pump feed segment	20	1	9			4		34	16%
Pump suction	2		1					3	1%
Steam generator feed segment	5							5	2%
Turbine-driven pump	29		8	3		45	2	87	40%
Turbine-driven pump feed segment	1		4			6		11	5%
Turbine-driven pump steam supply	1		5			7		13	6%
Total	84	1	40	6	1	82	2	216	100%
Percent	39%	0%	19%	3%	0%	38%	1%	100%	

<sup>2</sup> The discovery method is the activity that is ongoing at the time of the failure.

**Table 8. Discovery method description.**

Discovery Method	Description	Used in the Failure Calculations
Actual/unplanned demand	The demand for the system was ESF, inadvertent. If the demand was inadvertent, the demand should mimic an ESF demand.	✓
Design review	Because of a design review, a deficiency was noted in the system.	
Periodic surveillance on subject system	Normally scheduled surveillance. These surveillances are to satisfy scheduled Technical Specification requirements.	✓
Maintenance on subject system	The failed condition was discovered during maintenance on the system. These include latent failures as well as maintenance-induced failures.	
Inspection/review	The failure was discovered during operator duties such as walk downs, inspections, etc.	
Alarm/indicator	The failure was evidenced by an alarm or by other indications.	
I&C functional test	The failure was discovered during testing of the instrumentation and control system for the subject system or another system.	
Post-maintenance testing	Failed condition was discovered during post-maintenance testing. The technical specification surveillance tests can be used for this testing, but cannot be counted.	
Unscheduled TS required surveillance	Failed condition was discovered during technical specification required testing. Tests are performed to show system operability per the technical specifications and are not scheduled. The technical specification surveillance tests can be used for this testing, but cannot be counted.	
Other (not counted) surveillance test	All others discovered by testing.	

**Table 9. Comparison of failed segment and failure cause.<sup>3</sup>**

Segments	Design	Environment	Gas Binding	Hardware	Maintenance	Personnel	Procedure	Support System	Water Accumulation	Total	Percent
Common feed control segment	1			7		1				9	4%
Diesel-driven pump				1		2				3	1%
Instrumentation and control				3	1		1			5	2%
Motor-driven pump	5		1	16	7	8	8	1		46	21%
Motor-driven pump feed segment	3	3		15	4	9				34	16%
Pump suction				2			1			3	1%
Steam generator feed segment				5						5	2%
Turbine-driven pump	5			38	15	11	10		8	87	40%
Turbine-driven pump feed segment				1	6	3	1			11	5%
Turbine-driven pump steam supply	4			3	2	3			1	13	6%
Total	18	3	1	91	35	37	21	1	9	216	100%
Percent	8%	1%	0%	42%	16%	17%	10%	0%	4%	100%	%

- Contamination–The failure was the result of foreign material affecting the component.
- Design–The failure was the result of a flawed design.
- Hardware–The failure was the result of some aspect of the equipment. Typically, this is used for normal wear of the component.

<sup>3</sup> The cause of the failure is assigned to a broadly defined cause classification. The cause classifications are design, environment, hardware (e.g., aging, wear, manufacturing defects), personnel, and procedure. The cause classification assigned is based on the immediate cause of the failure and not the root cause. Generally, root cause is only determined through a detailed investigation and analysis of the failure. Specifically, the mechanism that actually resulted in the failure of the segment or component is captured as the cause.

- Personnel–The failure was the result of personnel error, by either commission or omission.
- Procedure–The failure was the result of an incorrect procedure.
- Gas Binding–The failure was the result of gases coming out of solution in the pump suction. This cause is used only in the AFW and HPI studies.
- Environment–The failure was the result of the environment; room cooling and contaminated water are two examples.
- Support System–The failure was the result of a support system failure. These events do not count for the failure probability. Support systems include electricity and air.
- Water Accumulation–The failure was due to water accumulation in the turbine-driven pump steam.

## 4 DATA TABLES

### 4.1 Data Tables for Unreliability and Unavailability Trends

**Table 10. Plot data table for AFW system unavailability, FTS model, Figure 3.**

FY	Plot Trend Error Bar Points			Regression Curve Data Points		
	Lower (5%)	Mean	Upper (95%)	Lower (5%)	Mean	Upper (95%)
1987	6.12E-06	2.03E-04	7.72E-04	1.91E-04	2.17E-04	2.47E-04
1988	1.46E-05	3.27E-04	1.21E-03	1.94E-04	2.18E-04	2.45E-04
1989	5.73E-06	2.02E-04	7.72E-04	1.97E-04	2.19E-04	2.43E-04
1990	5.76E-06	2.09E-04	8.01E-04	1.99E-04	2.19E-04	2.42E-04
1991	5.24E-06	2.03E-04	7.78E-04	2.02E-04	2.20E-04	2.40E-04
1992	5.17E-06	1.96E-04	7.50E-04	2.04E-04	2.21E-04	2.39E-04
1993	5.42E-06	2.13E-04	8.17E-04	2.06E-04	2.22E-04	2.39E-04
1994	5.51E-06	2.16E-04	8.30E-04	2.08E-04	2.23E-04	2.39E-04
1995	5.97E-06	2.26E-04	8.65E-04	2.09E-04	2.24E-04	2.39E-04
1996	5.53E-06	2.13E-04	8.16E-04	2.09E-04	2.24E-04	2.40E-04
1997	6.33E-06	2.29E-04	8.78E-04	2.09E-04	2.25E-04	2.42E-04
1998	5.69E-06	2.26E-04	8.69E-04	2.09E-04	2.26E-04	2.45E-04
1999	5.57E-06	2.21E-04	8.48E-04	2.08E-04	2.27E-04	2.47E-04
2000	5.80E-06	2.28E-04	8.77E-04	2.07E-04	2.28E-04	2.51E-04
2001	5.81E-06	2.31E-04	8.86E-04	2.05E-04	2.29E-04	2.54E-04
2002	6.17E-06	2.39E-04	9.17E-04	2.04E-04	2.29E-04	2.58E-04
2003	6.63E-06	2.46E-04	9.43E-04	2.02E-04	2.30E-04	2.62E-04

**Table 11. Plot data table for AFW system unreliability, 8-hour mission, Figure 6.**

FY	Plot Trend Error Bar Points			Regression Curve Data Points		
	Lower (5%)	Mean	Upper (95%)	Lower (5%)	Mean	Upper (95%)
1987	1.33E-05	3.17E-04	1.18E-03	2.83E-04	4.06E-04	5.83E-04
1988	6.54E-05	8.04E-04	2.73E-03	2.96E-04	4.11E-04	5.72E-04
1989	1.23E-05	2.99E-04	1.11E-03	3.09E-04	4.16E-04	5.61E-04
1990	1.32E-05	3.31E-04	1.24E-03	3.21E-04	4.21E-04	5.52E-04
1991	3.29E-05	7.42E-04	2.74E-03	3.34E-04	4.26E-04	5.44E-04
1992	1.23E-05	2.99E-04	1.11E-03	3.46E-04	4.31E-04	5.38E-04
1993	1.24E-05	4.68E-04	1.79E-03	3.56E-04	4.37E-04	5.35E-04
1994	1.41E-05	3.46E-04	1.29E-03	3.64E-04	4.42E-04	5.36E-04
1995	1.50E-05	3.72E-04	1.39E-03	3.70E-04	4.47E-04	5.40E-04
1996	3.23E-05	6.50E-04	2.37E-03	3.73E-04	4.52E-04	5.49E-04
1997	1.55E-05	4.80E-04	1.82E-03	3.73E-04	4.58E-04	5.62E-04
1998	3.27E-05	4.85E-04	1.70E-03	3.71E-04	4.63E-04	5.78E-04
1999	1.49E-05	3.67E-04	1.37E-03	3.68E-04	4.69E-04	5.99E-04
2000	1.43E-05	3.55E-04	1.32E-03	3.62E-04	4.75E-04	6.22E-04
2001	4.34E-05	7.40E-04	2.65E-03	3.56E-04	4.80E-04	6.48E-04
2002	1.90E-05	4.66E-04	1.74E-03	3.50E-04	4.86E-04	6.76E-04
2003	1.73E-05	4.97E-04	1.88E-03	3.43E-04	4.92E-04	7.07E-04

## 4.2 Data Tables for Failure and Demand Trends

**Table 12. LER listing for demand trend, Figure 7.**

FY	Plant	Date	LER
1987	Arkansas 1	5/17/1987	<a href="#">3131987002</a>
1987	Arkansas 1	8/8/1987	<a href="#">3131987003</a>
1987	Arkansas 1	8/15/1987	<a href="#">3131987004</a>
1987	Arkansas 1	8/25/1987	<a href="#">3131987005</a>
1988	Arkansas 1	2/17/1988	<a href="#">3131988003</a>
1989	Arkansas 1	1/20/1989	<a href="#">3131989002</a>
1989	Arkansas 1	5/30/1989	<a href="#">3131989020</a>
1990	Arkansas 1	12/21/1989	<a href="#">3131989041</a>
1990	Arkansas 1	12/28/1989	<a href="#">3131989048</a>
1991	Arkansas 1	4/21/1991	<a href="#">3131991003</a>
1991	Arkansas 1	5/21/1991	<a href="#">3131991005</a>
1992	Arkansas 1	4/24/1992	<a href="#">3131992003</a>
1994	Arkansas 1	4/11/1994	<a href="#">3131994002</a>
1995	Arkansas 1	4/3/1995	<a href="#">3131995004</a>
1996	Arkansas 1	5/19/1996	<a href="#">3131996005</a>
1996	Arkansas 1	9/12/1996	<a href="#">3131996007</a>
1997	Arkansas 1	7/8/1997	<a href="#">3131997003</a>
1998	Arkansas 1	9/23/1998	<a href="#">3131998004</a>
1999	Arkansas 1	12/25/1998	<a href="#">3131998005</a>
1999	Arkansas 1	9/11/1999	<a href="#">3131999003</a>
2003	Arkansas 1	8/29/2003	<a href="#">3132003001</a>
1987	Arkansas 2	9/9/1987	<a href="#">3681987007</a>
1988	Arkansas 2	11/14/1987	<a href="#">3681987008</a>
1988	Arkansas 2	8/1/1988	<a href="#">3681988011</a>
1989	Arkansas 2	12/1/1988	<a href="#">3681988020</a>
1989	Arkansas 2	4/18/1989	<a href="#">3681989006</a>
1990	Arkansas 2	12/31/1989	<a href="#">3681989024</a>
1990	Arkansas 2	8/21/1990	<a href="#">3681990019</a>
1990	Arkansas 2	9/28/1990	<a href="#">3681990020</a>
1991	Arkansas 2	2/1/1991	<a href="#">3681991005</a>
1998	Arkansas 2	5/20/1998	<a href="#">3681998002</a>
1987	Beaver Valley 1	2/7/1987	<a href="#">3341987002</a>
1987	Beaver Valley 1	6/9/1987	<a href="#">3341987013</a>
1988	Beaver Valley 1	6/7/1988	<a href="#">3341988007</a>
1988	Beaver Valley 1	6/9/1988	<a href="#">3341988008</a>
1988	Beaver Valley 1	6/11/1988	<a href="#">3341988009</a>
1989	Beaver Valley 1	1/17/1989	<a href="#">3341989001</a>
1989	Beaver Valley 1	2/13/1989	<a href="#">3341989002</a>
1989	Beaver Valley 1	5/18/1989	<a href="#">3341989007</a>
1990	Beaver Valley 1	3/30/1990	<a href="#">3341990007</a>
1991	Beaver Valley 1	7/20/1991	<a href="#">3341991022</a>
1991	Beaver Valley 1	7/27/1991	<a href="#">3341991023</a>
1992	Beaver Valley 1	11/6/1991	<a href="#">3341991029</a>
1993	Beaver Valley 1	10/9/1992	<a href="#">3341992009</a>
1994	Beaver Valley 1	10/12/1993	<a href="#">3341993013</a>
1994	Beaver Valley 1	6/1/1994	<a href="#">3341994005</a>
1994	Beaver Valley 1	7/19/1994	<a href="#">3341994008</a>
1996	Beaver Valley 1	3/22/1996	<a href="#">3341996003</a>
1996	Beaver Valley 1	5/6/1996	<a href="#">3341996007</a>
1996	Beaver Valley 1	5/31/1996	<a href="#">3341996008</a>
1997	Beaver Valley 1	3/19/1997	<a href="#">3341997005</a>
1997	Beaver Valley 1	8/7/1997	<a href="#">3341997025</a>
1999	Beaver Valley 1	1/23/1999	<a href="#">3341999001</a>
1999	Beaver Valley 1	9/6/1999	<a href="#">3341999010</a>
2000	Beaver Valley 1	7/5/2000	<a href="#">3342000006</a>
2003	Beaver Valley 1	2/24/2003	<a href="#">3342003001</a>
1987	Beaver Valley 2	7/17/1987	<a href="#">4121987005</a>
1987	Beaver Valley 2	8/15/1987	<a href="#">4121987014</a>
1987	Beaver Valley 2	8/15/1987	<a href="#">4121987015</a>
1987	Beaver Valley 2	8/16/1987	<a href="#">4121987017</a>
1987	Beaver Valley 2	8/25/1987	<a href="#">4121987019</a>
1987	Beaver Valley 2	9/9/1987	<a href="#">4121987020</a>
1987	Beaver Valley 2	9/28/1987	<a href="#">4121987023</a>
1987	Beaver Valley 2	9/29/1987	<a href="#">4121987024</a>
1987	Beaver Valley 2	9/30/1987	<a href="#">4121987025</a>
1988	Beaver Valley 2	10/8/1987	<a href="#">4121987026</a>
1988	Beaver Valley 2	10/14/1987	<a href="#">4121987028</a>
1988	Beaver Valley 2	10/16/1987	<a href="#">4121987030</a>
1988	Beaver Valley 2	10/24/1987	<a href="#">4121987032</a>
1988	Beaver Valley 2	10/29/1987	<a href="#">4121987034</a>
1988	Beaver Valley 2	11/10/1987	<a href="#">4121987035</a>
1988	Beaver Valley 2	11/17/1987	<a href="#">4121987036</a>
1988	Beaver Valley 2	1/27/1988	<a href="#">4121988002</a>
1988	Beaver Valley 2	4/4/1988	<a href="#">4121988007</a>
1988	Beaver Valley 2	7/27/1988	<a href="#">4121988009</a>
1988	Beaver Valley 2	8/23/1988	<a href="#">4121988011</a>
1988	Beaver Valley 2	9/20/1988	<a href="#">4121988013</a>
1989	Beaver Valley 2	2/12/1989	<a href="#">4121989003</a>
1989	Beaver Valley 2	5/14/1989	<a href="#">4121989015</a>
1989	Beaver Valley 2	6/22/1989	<a href="#">4121989019</a>
1989	Beaver Valley 2	6/22/1989	<a href="#">4121989020</a>
1990	Beaver Valley 2	7/2/1990	<a href="#">4121990008</a>
1992	Beaver Valley 2	11/26/1991	<a href="#">4121991005</a>
1992	Beaver Valley 2	5/5/1992	<a href="#">4121992007</a>
1992	Beaver Valley 2	6/5/1992	<a href="#">4121992009</a>
1993	Beaver Valley 2	1/30/1993	<a href="#">4121993002</a>
1995	Beaver Valley 2	8/13/1995	<a href="#">4121995006</a>
2000	Beaver Valley 2	9/23/2000	<a href="#">4122000001</a>
2001	Beaver Valley 2	3/17/2001	<a href="#">4122001001</a>
1987	Braidwood 1	9/10/1987	<a href="#">4561987046</a>
1988	Braidwood 1	12/6/1987	<a href="#">4561987060</a>



FY	Plant	Date	LER
1988	Braidwood 1	8/11/1988	<a href="#">4561988016</a>
1989	Braidwood 1	10/16/1988	<a href="#">4561988022</a>
1989	Braidwood 1	10/17/1988	<a href="#">4561988023</a>
1989	Braidwood 1	11/15/1988	<a href="#">4561988025</a>
1989	Braidwood 1	3/6/1989	<a href="#">4561989004</a>
1990	Braidwood 1	1/12/1990	<a href="#">4561990001</a>
1990	Braidwood 1	6/8/1990	<a href="#">4561990008</a>
1991	Braidwood 1	12/1/1990	<a href="#">4561990021</a>
1991	Braidwood 1	12/30/1990	<a href="#">4561990023</a>
1992	Braidwood 1	11/6/1991	<a href="#">4561991012</a>
1993	Braidwood 1	1/7/1993	<a href="#">4561993001</a>
1994	Braidwood 1	8/11/1994	<a href="#">4561994012</a>
1995	Braidwood 1	4/9/1995	<a href="#">4561995004</a>
1988	Braidwood 2	6/20/1988	<a href="#">4571988012</a>
1988	Braidwood 2	6/21/1988	<a href="#">4571988013</a>
1988	Braidwood 2	6/22/1988	<a href="#">4571988014</a>
1988	Braidwood 2	6/24/1988	<a href="#">4571988016</a>
1988	Braidwood 2	7/2/1988	<a href="#">4571988018</a>
1988	Braidwood 2	7/24/1988	<a href="#">4571988019</a>
1988	Braidwood 2	9/4/1988	<a href="#">4571988020</a>
1989	Braidwood 2	10/25/1988	<a href="#">4571988029</a>
1989	Braidwood 2	11/5/1988	<a href="#">4571988031</a>
1989	Braidwood 2	11/17/1988	<a href="#">4571988028</a>
1989	Braidwood 2	5/11/1989	<a href="#">4571989002</a>
1989	Braidwood 2	9/7/1989	<a href="#">4571989004</a>
1990	Braidwood 2	6/9/1990	<a href="#">4571990010</a>
1991	Braidwood 2	8/1/1991	<a href="#">4571991003</a>
1992	Braidwood 2	12/1/1991	<a href="#">4571991006</a>
1992	Braidwood 2	2/25/1992	<a href="#">4571992001</a>
1992	Braidwood 2	3/15/1992	<a href="#">4571992002</a>
1992	Braidwood 2	9/10/1992	<a href="#">4571992006</a>
1993	Braidwood 2	11/14/1992	<a href="#">4571992007</a>
1994	Braidwood 2	10/3/1993	<a href="#">4571993007</a>
1994	Braidwood 2	4/5/1994	<a href="#">4571994003</a>
1994	Braidwood 2	8/2/1994	<a href="#">4571994005</a>
1996	Braidwood 2	5/6/1996	<a href="#">4571996005</a>
1999	Braidwood 2	4/14/1999	<a href="#">4571999001</a>
2000	Braidwood 2	4/15/2000	<a href="#">4572000002</a>
2001	Braidwood 2	5/19/2001	<a href="#">4572001001</a>
1987	Byron 1	8/11/1987	<a href="#">4541987018</a>
1987	Byron 1	8/12/1987	<a href="#">4541987019</a>
1988	Byron 1	4/18/1988	<a href="#">4541988002</a>
1988	Byron 1	7/16/1988	<a href="#">4541988004</a>
1988	Byron 1	8/4/1988	<a href="#">4541988005</a>
1989	Byron 1	1/31/1989	<a href="#">4541989002</a>
1990	Byron 1	5/3/1990	<a href="#">4541990006</a>
1990	Byron 1	8/19/1990	<a href="#">4541990011</a>
1991	Byron 1	12/3/1990	<a href="#">4541990014</a>
1992	Byron 1	1/29/1992	<a href="#">4541992001</a>
1996	Byron 1	7/2/1996	<a href="#">4541996011</a>
1999	Byron 1	5/13/1999	<a href="#">4541999003</a>
2003	Byron 1	10/15/2002	<a href="#">4542002003</a>
2003	Byron 1	11/7/2002	<a href="#">4542002003</a>

FY	Plant	Date	LER
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1987	Byron 2	4/27/1987	<a href="#">4551987006</a>
1987	Byron 2	5/4/1987	<a href="#">4551987007</a>
1987	Byron 2	6/29/1987	<a href="#">4551987009</a>
1987	Byron 2	7/25/1987	<a href="#">4551987011</a>
1988	Byron 2	10/1/1987	<a href="#">4551987018</a>
1988	Byron 2	5/6/1988	<a href="#">4551988004</a>
1988	Byron 2	6/2/1988	<a href="#">4551988006</a>
1988	Byron 2	7/14/1988	<a href="#">4551988008</a>
1988	Byron 2	7/15/1988	<a href="#">4551988009</a>
1989	Byron 2	12/15/1988	<a href="#">4551988012</a>
1990	Byron 2	1/18/1990	<a href="#">4551990001</a>
1991	Byron 2	12/20/1990	<a href="#">4551990010</a>
1992	Byron 2	11/7/1991	<a href="#">4551991005</a>
1992	Byron 2	6/10/1992	<a href="#">4551992003</a>
1993	Byron 2	5/11/1993	<a href="#">4551993003</a>
1994	Byron 2	9/24/1994	<a href="#">4551994003</a>
1998	Byron 2	10/10/1997	<a href="#">4551997003</a>
2000	Byron 2	1/13/2000	<a href="#">4552000001</a>
2000	Byron 2	7/26/2000	<a href="#">4552000002</a>
2001	Byron 2	6/26/2001	<a href="#">4552001002</a>
1988	Callaway	11/8/1987	<a href="#">4831987032</a>
1988	Callaway	1/4/1988	<a href="#">4831988001</a>
1988	Callaway	2/13/1988	<a href="#">4831988004</a>
1988	Callaway	4/16/1988	<a href="#">4831988005</a>
1988	Callaway	4/17/1988	<a href="#">4831988005</a>
1988	Callaway	4/21/1988	<a href="#">4831988006</a>
1988	Callaway	5/2/1988	<a href="#">4831988007</a>
1988	Callaway	9/2/1988	<a href="#">4831988010</a>
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1989	Callaway	11/16/1988	<a href="#">4831988015</a>
1989	Callaway	3/31/1989	<a href="#">4831989003</a>
1989	Callaway	5/18/1989	<a href="#">4831989005</a>
1989	Callaway	5/29/1989	<a href="#">4831989006</a>
1989	Callaway	6/23/1989	<a href="#">4831989008</a>
1990	Callaway	5/1/1990	<a href="#">4831990005</a>
1990	Callaway	6/11/1990	<a href="#">4831990007</a>
1991	Callaway	11/19/1990	<a href="#">4831990015</a>
1991	Callaway	11/24/1990	<a href="#">4831990016</a>
1991	Callaway	12/30/1990	<a href="#">4831990017</a>
1992	Callaway	11/5/1991	<a href="#">4831991006</a>
1992	Callaway	1/22/1992	<a href="#">4831992002</a>
1992	Callaway	1/23/1992	<a href="#">4831992003</a>
1992	Callaway	3/20/1992	<a href="#">4831992004</a>
1992	Callaway	4/10/1992	<a href="#">4831995006</a>
1992	Callaway	5/15/1992	<a href="#">4831992006</a>
1992	Callaway	5/23/1992	<a href="#">4831992007</a>
1992	Callaway	9/20/1992	<a href="#">4831992010</a>
1995	Callaway	6/8/1995	<a href="#">4831995004</a>
1995	Callaway	8/16/1995	<a href="#">4831995005</a>
1996	Callaway	4/2/1996	<a href="#">4831996001</a>
1997	Callaway	10/12/1996	<a href="#">4831996003</a>
1997	Callaway	11/11/1996	<a href="#">4831996005</a>

FY	Plant	Date	LER
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1999	Callaway	8/11/1999	<a href="#">4831999003</a>
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2000	Callaway	11/26/1999	<a href="#">4831999008</a>
2001	Callaway	3/9/2001	<a href="#">4832001003</a>
2001	Callaway	9/17/2001	<a href="#">4832001005</a>
2002	Callaway	12/3/2001	<a href="#">4832002001</a>
2003	Callaway	12/14/2002	<a href="#">4832002014</a>
1987	Calvert Cliffs 1	1/27/1987	<a href="#">3171987003</a>
1987	Calvert Cliffs 1	7/23/1987	<a href="#">3171987012</a>
1988	Calvert Cliffs 1	11/11/1987	<a href="#">3171987015</a>
1988	Calvert Cliffs 1	8/24/1988	<a href="#">3171988009</a>
1989	Calvert Cliffs 1	11/14/1988	<a href="#">3171988012</a>
1992	Calvert Cliffs 1	10/1/1991	<a href="#">3171991003</a>
1993	Calvert Cliffs 1	11/24/1992	<a href="#">3171992008</a>
1994	Calvert Cliffs 1	1/24/1994	<a href="#">3171994001</a>
1994	Calvert Cliffs 1	6/16/1994	<a href="#">3171994006</a>
1994	Calvert Cliffs 1	7/19/1994	<a href="#">3171994007</a>
1995	Calvert Cliffs 1	6/16/1995	<a href="#">3171995002</a>
1996	Calvert Cliffs 1	11/16/1995	<a href="#">3171995006</a>
1999	Calvert Cliffs 1	9/22/1999	<a href="#">3171999006</a>
2000	Calvert Cliffs 1	9/10/2000	<a href="#">3172000005</a>
1987	Calvert Cliffs 2	2/28/1987	<a href="#">3181987002</a>
1987	Calvert Cliffs 2	9/7/1987	<a href="#">3181987006</a>
1988	Calvert Cliffs 2	11/22/1987	<a href="#">3181987008</a>
1988	Calvert Cliffs 2	12/21/1987	<a href="#">3181987009</a>
1988	Calvert Cliffs 2	1/22/1988	<a href="#">3181988002</a>
1988	Calvert Cliffs 2	4/27/1988	<a href="#">3181988004</a>
1992	Calvert Cliffs 2	1/2/1992	<a href="#">3181992001</a>
1992	Calvert Cliffs 2	6/24/1992	<a href="#">3181992003</a>
1992	Calvert Cliffs 2	8/1/1992	<a href="#">3181992005</a>
1992	Calvert Cliffs 2	8/17/1992	<a href="#">3181992006</a>
1992	Calvert Cliffs 2	9/29/1992	<a href="#">3181992007</a>
1994	Calvert Cliffs 2	1/12/1994	<a href="#">3181994001</a>
1995	Calvert Cliffs 2	1/13/1995	<a href="#">3181995002</a>
1995	Calvert Cliffs 2	1/15/1995	<a href="#">3181995003</a>
1996	Calvert Cliffs 2	2/27/1996	<a href="#">3181996001</a>
1997	Calvert Cliffs 2	11/17/1996	<a href="#">3181996005</a>
1987	Catawba 1	1/31/1987	<a href="#">4131987006</a>
1987	Catawba 1	3/16/1987	<a href="#">4131987013</a>
1987	Catawba 1	4/9/1987	<a href="#">4131987015</a>
1987	Catawba 1	7/6/1987	<a href="#">4131987026</a>
1987	Catawba 1	7/11/1987	<a href="#">4131987028</a>
1987	Catawba 1	7/13/1987	<a href="#">4131987029</a>
1987	Catawba 1	8/23/1987	<a href="#">4131987034</a>
1988	Catawba 1	1/23/1988	<a href="#">4131988007</a>
1989	Catawba 1	2/6/1989	<a href="#">4131989003</a>
1989	Catawba 1	3/5/1989	<a href="#">4131989008</a>
1989	Catawba 1	6/26/1989	<a href="#">4131989017</a>
1989	Catawba 1	8/24/1989	<a href="#">4131989022</a>
1991	Catawba 1	6/20/1991	<a href="#">4131991013</a>
1991	Catawba 1	7/10/1991	<a href="#">4131991015</a>
1991	Catawba 1	9/6/1991	<a href="#">4131991018</a>

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1992	Catawba 1	10/2/1991	<a href="#">4131991021</a>
1992	Catawba 1	7/12/1992	<a href="#">4131992008</a>
1993	Catawba 1	6/12/1993	<a href="#">4131993006</a>
1993	Catawba 1	7/18/1993	<a href="#">4131993008</a>
1993	Catawba 1	7/19/1993	<a href="#">4131993008</a>
1994	Catawba 1	1/11/1994	<a href="#">4131994001</a>
1996	Catawba 1	6/13/1996	<a href="#">4131996005</a>
2000	Catawba 1	2/13/2000	<a href="#">4132000001</a>
2003	Catawba 1	2/4/2003	<a href="#">4132003001</a>
2003	Catawba 1	8/29/2003	<a href="#">4132003005</a>
1987	Catawba 2	1/28/1987	<a href="#">4141987002</a>
1987	Catawba 2	1/30/1987	<a href="#">4141987003</a>
1987	Catawba 2	2/24/1987	<a href="#">4141987007</a>
1987	Catawba 2	3/23/1987	<a href="#">4141987010</a>
1987	Catawba 2	3/24/1987	<a href="#">4141987011</a>
1987	Catawba 2	3/25/1987	<a href="#">4141987013</a>
1987	Catawba 2	5/6/1987	<a href="#">4141987018</a>
1987	Catawba 2	5/8/1987	<a href="#">4141987019</a>
1987	Catawba 2	7/27/1987	<a href="#">4141987021</a>
1987	Catawba 2	7/28/1987	<a href="#">4141987022</a>
1987	Catawba 2	8/7/1987	<a href="#">4141987024</a>
1987	Catawba 2	9/3/1987	<a href="#">4141987025</a>
1987	Catawba 2	9/15/1987	<a href="#">4141987027</a>
1988	Catawba 2	11/3/1987	<a href="#">4141987029</a>
1988	Catawba 2	2/22/1988	<a href="#">4141988007</a>
1988	Catawba 2	3/9/1988	<a href="#">4141988012</a>
1988	Catawba 2	3/17/1988	<a href="#">4141988014</a>
1988	Catawba 2	4/24/1988	<a href="#">4141988017</a>
1988	Catawba 2	5/27/1988	<a href="#">4141988019</a>
1988	Catawba 2	5/28/1988	<a href="#">4141988020</a>
1988	Catawba 2	6/3/1988	<a href="#">4141988021</a>
1988	Catawba 2	6/6/1988	<a href="#">4141988022</a>
1988	Catawba 2	6/20/1988	<a href="#">4141988023</a>
1988	Catawba 2	6/26/1988	<a href="#">4141988025</a>
1988	Catawba 2	9/29/1988	<a href="#">4141988028</a>
1989	Catawba 2	11/23/1988	<a href="#">4141988031</a>
1989	Catawba 2	11/24/1988	<a href="#">4141988032</a>
1989	Catawba 2	1/1/1989	<a href="#">4141989002</a>
1989	Catawba 2	1/12/1989	<a href="#">4141989001</a>
1989	Catawba 2	1/21/1989	<a href="#">4141989002</a>
1989	Catawba 2	2/21/1989	<a href="#">4141989003</a>
1989	Catawba 2	2/21/1989	<a href="#">4141989004</a>
1989	Catawba 2	6/9/1989	<a href="#">4141989015</a>
1991	Catawba 2	10/7/1990	<a href="#">4141990013</a>
1991	Catawba 2	4/16/1991	<a href="#">4141991006</a>
1991	Catawba 2	5/29/1991	<a href="#">4141991008</a>
1992	Catawba 2	10/17/1991	<a href="#">4141991012</a>
1992	Catawba 2	1/15/1992	<a href="#">4141992001</a>
1993	Catawba 2	12/14/1992	<a href="#">4141992006</a>
1993	Catawba 2	9/25/1993	<a href="#">4141993003</a>
1994	Catawba 2	7/10/1994	<a href="#">4141994003</a>
1994	Catawba 2	8/30/1994	<a href="#">4141994005</a>

FY	Plant	Date	LER
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1995	Catawba 2	10/18/1994	<a href="#">4141994007</a>
1995	Catawba 2	2/21/1995	<a href="#">4141995001</a>
1995	Catawba 2	4/27/1995	<a href="#">4141995004</a>
1995	Catawba 2	5/1/1995	<a href="#">4141995005</a>
1996	Catawba 2	2/6/1996	<a href="#">4141996001</a>
1997	Catawba 2	7/26/1997	<a href="#">4141997006</a>
1997	Catawba 2	8/17/1997	<a href="#">4141997006</a>
1998	Catawba 2	9/6/1998	<a href="#">4141998004</a>
2000	Catawba 2	12/30/1999	<a href="#">4141999006</a>
2000	Catawba 2	6/5/2000	<a href="#">4142000003</a>
2002	Catawba 2	12/7/2001	<a href="#">4142001003</a>
1990	Comanche Peak 1	3/12/1990	<a href="#">4451990004</a>
1990	Comanche Peak 1	4/21/1990	<a href="#">4451990009</a>
1990	Comanche Peak 1	5/9/1990	<a href="#">4451990013</a>
1990	Comanche Peak 1	5/27/1990	<a href="#">4451990017</a>
1990	Comanche Peak 1	7/26/1990	<a href="#">4451990020</a>
1990	Comanche Peak 1	7/30/1990	<a href="#">4451990021</a>
1990	Comanche Peak 1	8/8/1990	<a href="#">4451990023</a>
1990	Comanche Peak 1	8/25/1990	<a href="#">4451990025</a>
1990	Comanche Peak 1	9/7/1990	<a href="#">4451990027</a>
1990	Comanche Peak 1	9/8/1990	<a href="#">4451990028</a>
1990	Comanche Peak 1	9/10/1990	<a href="#">4451990029</a>
1990	Comanche Peak 1	9/15/1990	<a href="#">4451990030</a>
1991	Comanche Peak 1	1/23/1991	<a href="#">4451991002</a>
1991	Comanche Peak 1	2/10/1991	<a href="#">4451991004</a>
1991	Comanche Peak 1	3/17/1991	<a href="#">4451991008</a>
1991	Comanche Peak 1	4/13/1991	<a href="#">4451995007</a>
1991	Comanche Peak 1	6/9/1991	<a href="#">4451991019</a>
1991	Comanche Peak 1	7/13/1991	<a href="#">4451991020</a>
1991	Comanche Peak 1	7/28/1991	<a href="#">4451991021</a>
1991	Comanche Peak 1	9/4/1991	<a href="#">4451991022</a>
1992	Comanche Peak 1	10/3/1991	<a href="#">4451991023</a>
1992	Comanche Peak 1	1/8/1992	<a href="#">4451992001</a>
1992	Comanche Peak 1	5/8/1992	<a href="#">4451992009</a>
1992	Comanche Peak 1	6/11/1992	<a href="#">4451992014</a>
1992	Comanche Peak 1	6/23/1992	<a href="#">4451992016</a>
1992	Comanche Peak 1	7/20/1992	<a href="#">4451992020</a>
1993	Comanche Peak 1	10/12/1992	<a href="#">4451992022</a>
1993	Comanche Peak 1	1/18/1993	<a href="#">4451993001</a>
1993	Comanche Peak 1	1/24/1993	<a href="#">4451993002</a>
1993	Comanche Peak 1	6/26/1993	<a href="#">4451993007</a>
1995	Comanche Peak 1	6/5/1995	<a href="#">4451995002</a>
1995	Comanche Peak 1	6/11/1995	<a href="#">4451995003</a>
1996	Comanche Peak 1	1/17/1996	<a href="#">4451996001</a>
1996	Comanche Peak 1	1/22/1996	<a href="#">4451996002</a>
1996	Comanche Peak 1	2/4/1996	<a href="#">4451996003</a>
1996	Comanche Peak 1	8/9/1996	<a href="#">4451996007</a>
1998	Comanche Peak 1	10/27/1997	<a href="#">4451997009</a>
2003	Comanche Peak 1	3/16/2003	<a href="#">4452003002</a>
2003	Comanche Peak 1	5/15/2003	<a href="#">4452003003</a>
1993	Comanche Peak 2	5/4/1993	<a href="#">4461993003</a>
1994	Comanche Peak 2	10/1/1993	<a href="#">4461993008</a>

FY	Plant	Date	LER
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1994	Comanche Peak 2	3/5/1994	<a href="#">4461994003</a>
1994	Comanche Peak 2	6/27/1994	<a href="#">4461994010</a>
1994	Comanche Peak 2	8/15/1994	<a href="#">4461994012</a>
1996	Comanche Peak 2	12/5/1995	<a href="#">4461995004</a>
1996	Comanche Peak 2	2/23/1996	<a href="#">4461996003</a>
1996	Comanche Peak 2	5/5/1996	<a href="#">4461996005</a>
1996	Comanche Peak 2	9/18/1996	<a href="#">4461996006</a>
1997	Comanche Peak 2	10/18/1996	<a href="#">4461996007</a>
1997	Comanche Peak 2	4/15/1997	<a href="#">4461997001</a>
1998	Comanche Peak 2	10/25/1997	<a href="#">4461997002</a>
1998	Comanche Peak 2	3/8/1998	<a href="#">4461998002</a>
1999	Comanche Peak 2	1/3/1999	<a href="#">4461999002</a>
1999	Comanche Peak 2	5/22/1999	<a href="#">4461999004</a>
2000	Comanche Peak 2	1/7/2000	<a href="#">4462000002</a>
2001	Comanche Peak 2	7/18/2001	<a href="#">4462001001</a>
2002	Comanche Peak 2	6/6/2002	<a href="#">4462002001</a>
2003	Comanche Peak 2	5/15/2003	<a href="#">4452003003</a>
2003	Comanche Peak 2	7/9/2003	<a href="#">4462003001</a>
2003	Comanche Peak 2	7/25/2003	<a href="#">4462003002</a>
1987	Cook 1	6/4/1987	<a href="#">3151987008</a>
1988	Cook 1	10/13/1987	<a href="#">3151987021</a>
1988	Cook 1	1/13/1988	<a href="#">3151988001</a>
1989	Cook 1	10/19/1988	<a href="#">3151988011</a>
1989	Cook 1	11/23/1988	<a href="#">3151988013</a>
1989	Cook 1	1/16/1989	<a href="#">3151989001</a>
1989	Cook 1	3/18/1989	<a href="#">3151989003</a>
1991	Cook 1	5/12/1991	<a href="#">3151991004</a>
1995	Cook 1	7/14/1995	<a href="#">3151995003</a>
1996	Cook 1	3/17/1996	<a href="#">3151996002</a>
1997	Cook 1	9/23/1997	<a href="#">3151997025</a>
2002	Cook 1	6/14/2002	<a href="#">3152002005</a>
2003	Cook 1	1/15/2003	<a href="#">3152003001</a>
1987	Cook 2	6/1/1987	<a href="#">3161987004</a>
1987	Cook 2	6/2/1987	<a href="#">3161987005</a>
1987	Cook 2	7/14/1987	<a href="#">3161987007</a>
1987	Cook 2	7/22/1987	<a href="#">3161987008</a>
1989	Cook 2	8/14/1989	<a href="#">3161989014</a>
1990	Cook 2	6/11/1990	<a href="#">3161990004</a>
1991	Cook 2	12/12/1990	<a href="#">3161990012</a>
1991	Cook 2	12/15/1990	<a href="#">3161990013</a>
1991	Cook 2	3/13/1991	<a href="#">3161991004</a>
1991	Cook 2	8/1/1991	<a href="#">3161991006</a>
1992	Cook 2	11/15/1991	<a href="#">3161991010</a>
1993	Cook 2	8/2/1993	<a href="#">3161993007</a>
1994	Cook 2	2/21/1994	<a href="#">3161994001</a>
1994	Cook 2	8/15/1994	<a href="#">3161994005</a>
1995	Cook 2	12/11/1994	<a href="#">3161994008</a>
1995	Cook 2	2/23/1995	<a href="#">3161995002</a>
1995	Cook 2	8/26/1995	<a href="#">3161995004</a>
1995	Cook 2	8/29/1995	<a href="#">3161995005</a>
1996	Cook 2	5/8/1996	<a href="#">3161996005</a>
1997	Cook 2	3/11/1997	<a href="#">3161997001</a>

FY	Plant	Date	LER
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2002	Cook 2	5/12/2002	<a href="#">3162002005</a>
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2003	Cook 2	2/5/2003	<a href="#">3162003002</a>
1988	Crystal River 3	1/7/1988	<a href="#">3021988001</a>
1988	Crystal River 3	1/7/1988	<a href="#">3021988002</a>
1988	Crystal River 3	1/9/1988	<a href="#">3021988001</a>
1988	Crystal River 3	2/28/1988	<a href="#">3021988006</a>
1989	Crystal River 3	10/28/1988	<a href="#">3021988024</a>
1989	Crystal River 3	1/15/1989	<a href="#">3021989003</a>
1989	Crystal River 3	6/14/1989	<a href="#">3021989022</a>
1989	Crystal River 3	6/16/1989	<a href="#">3021989023</a>
1989	Crystal River 3	6/29/1989	<a href="#">3021989025</a>
1991	Crystal River 3	10/10/1990	<a href="#">3021990016</a>
1991	Crystal River 3	4/20/1991	<a href="#">3021991003</a>
1992	Crystal River 3	11/25/1991	<a href="#">3021991014</a>
1992	Crystal River 3	11/25/1991	<a href="#">3021991016</a>
1992	Crystal River 3	12/8/1991	<a href="#">3021991018</a>
1992	Crystal River 3	3/27/1992	<a href="#">3021992001</a>
1992	Crystal River 3	7/17/1992	<a href="#">3021992015</a>
1993	Crystal River 3	12/29/1992	<a href="#">3021992027</a>
1993	Crystal River 3	9/18/1993	<a href="#">3021993009</a>
1996	Crystal River 3	5/31/1996	<a href="#">3021996017</a>
1998	Crystal River 3	2/11/1998	<a href="#">3021998003</a>
2000	Crystal River 3	10/1/1999	<a href="#">3021999004</a>
2002	Crystal River 3	10/24/2001	<a href="#">3022001005</a>
1987	Davis-Besse	3/13/1987	<a href="#">3461987006</a>
1987	Davis-Besse	9/6/1987	<a href="#">3461987011</a>
1992	Davis-Besse	12/10/1991	<a href="#">3461991008</a>
1994	Davis-Besse	10/8/1993	<a href="#">3461993005</a>
1998	Davis-Besse	6/24/1998	<a href="#">3461998006</a>
1999	Davis-Besse	10/14/1998	<a href="#">3461998011</a>
1987	Diablo Canyon 1	3/15/1987	<a href="#">2751987004</a>
1987	Diablo Canyon 1	5/11/1987	<a href="#">2751987006</a>
1988	Diablo Canyon 1	12/13/1987	<a href="#">2751987023</a>
1988	Diablo Canyon 1	12/13/1987	<a href="#">2751987024</a>
1988	Diablo Canyon 1	1/8/1988	<a href="#">2751988002</a>
1988	Diablo Canyon 1	8/30/1988	<a href="#">2751988025</a>
1990	Diablo Canyon 1	10/6/1989	<a href="#">2751989009</a>
1990	Diablo Canyon 1	12/14/1989	<a href="#">2751989015</a>
1990	Diablo Canyon 1	2/20/1990	<a href="#">2751990002</a>
1990	Diablo Canyon 1	6/14/1990	<a href="#">2751990005</a>
1991	Diablo Canyon 1	12/5/1990	<a href="#">2751990014</a>
1991	Diablo Canyon 1	12/24/1990	<a href="#">2751990017</a>
1991	Diablo Canyon 1	2/1/1991	<a href="#">2751991002</a>
1991	Diablo Canyon 1	4/23/1991	<a href="#">2751991007</a>
1991	Diablo Canyon 1	5/17/1991	<a href="#">2751991009</a>
1992	Diablo Canyon 1	3/6/1992	<a href="#">2751992002</a>
1992	Diablo Canyon 1	4/25/1992	<a href="#">2751992004</a>
1994	Diablo Canyon 1	12/26/1993	<a href="#">2751993011</a>
1995	Diablo Canyon 1	12/14/1994	<a href="#">2751994020</a>
1995	Diablo Canyon 1	9/6/1995	<a href="#">2751995009</a>
1996	Diablo Canyon 1	11/28/1995	<a href="#">2751995015</a>

FY	Plant	Date	LER
1996	Diablo Canyon 1	12/13/1995	<a href="#">2751995017</a>
1996	Diablo Canyon 1	6/10/1996	<a href="#">2751996008</a>
1996	Diablo Canyon 1	8/10/1996	<a href="#">2751996012</a>
1997	Diablo Canyon 1	11/22/1996	<a href="#">2751996017</a>
1999	Diablo Canyon 1	9/22/1999	<a href="#">2751999006</a>
1999	Diablo Canyon 1	9/23/1999	<a href="#">2751999008</a>
2000	Diablo Canyon 1	10/28/1999	<a href="#">2751999009</a>
2000	Diablo Canyon 1	5/15/2000	<a href="#">2752000004</a>
2001	Diablo Canyon 1	11/20/2000	<a href="#">2752000012</a>
2002	Diablo Canyon 1	6/3/2002	<a href="#">2752002004</a>
1987	Diablo Canyon 2	3/21/1987	<a href="#">3231987003</a>
1987	Diablo Canyon 2	4/3/1987	<a href="#">3231987004</a>
1987	Diablo Canyon 2	7/1/1987	<a href="#">3231987013</a>
1987	Diablo Canyon 2	7/14/1987	<a href="#">3231987016</a>
1988	Diablo Canyon 2	11/7/1987	<a href="#">3231987024</a>
1988	Diablo Canyon 2	3/3/1988	<a href="#">3231988002</a>
1988	Diablo Canyon 2	7/17/1988	<a href="#">3231988008</a>
1989	Diablo Canyon 2	4/16/1989	<a href="#">3231989005</a>
1989	Diablo Canyon 2	7/16/1989	<a href="#">3231989007</a>
1989	Diablo Canyon 2	8/28/1989	<a href="#">3231989008</a>
1990	Diablo Canyon 2	10/27/1989	<a href="#">3231989010</a>
1993	Diablo Canyon 2	1/30/1993	<a href="#">3231993001</a>
1995	Diablo Canyon 2	12/19/1994	<a href="#">3231994012</a>
1995	Diablo Canyon 2	9/23/1995	<a href="#">3231995002</a>
1997	Diablo Canyon 2	3/29/1997	<a href="#">3231997002</a>
1997	Diablo Canyon 2	7/2/1997	<a href="#">3231997003</a>
1998	Diablo Canyon 2	10/24/1997	<a href="#">3231997005</a>
1999	Diablo Canyon 2	12/1/1998	<a href="#">3231998005</a>
2002	Diablo Canyon 2	2/9/2002	<a href="#">3232002002</a>
2003	Diablo Canyon 2	11/8/2002	<a href="#">3232002004</a>
2003	Diablo Canyon 2	4/8/2003	<a href="#">3232003006</a>
1987	Farley 1	1/8/1987	<a href="#">3481987002</a>
1987	Farley 1	1/9/1987	<a href="#">3481987003</a>
1987	Farley 1	1/22/1987	<a href="#">3481987004</a>
1987	Farley 1	5/14/1987	<a href="#">3481987010</a>
1989	Farley 1	10/21/1988	<a href="#">3481988021</a>
1990	Farley 1	11/12/1989	<a href="#">3481989006</a>
1990	Farley 1	11/12/1989	<a href="#">3481989007</a>
1990	Farley 1	7/20/1990	<a href="#">3481990005</a>
1991	Farley 1	5/24/1991	<a href="#">3481991006</a>
1991	Farley 1	6/29/1991	<a href="#">3481991007</a>
1991	Farley 1	8/2/1991	<a href="#">3481991008</a>
1991	Farley 1	8/19/1991	<a href="#">3481991009</a>
1992	Farley 1	10/3/1991	<a href="#">3481991010</a>
1993	Farley 1	12/13/1992	<a href="#">3481992008</a>
1995	Farley 1	1/13/1995	<a href="#">3481995001</a>
1995	Farley 1	6/11/1995	<a href="#">3481995005</a>
1996	Farley 1	11/5/1995	<a href="#">3481995010</a>
1996	Farley 1	6/2/1996	<a href="#">3481996003</a>
1998	Farley 1	9/9/1998	<a href="#">3481998004</a>
1999	Farley 1	5/27/1999	<a href="#">3481999002</a>
2000	Farley 1	3/4/2000	<a href="#">3482000002</a>
2000	Farley 1	5/28/2000	<a href="#">3482000006</a>



FY	Plant	Date	LER
2003	Farley 1	10/15/2002	<a href="#">3482002002</a>
2003	Farley 1	5/2/2003	<a href="#">3482003003</a>
1987	Farley 2	2/28/1987	<a href="#">3641987001</a>
1988	Farley 2	12/3/1987	<a href="#">3641987009</a>
1989	Farley 2	5/22/1989	<a href="#">3641989007</a>
1989	Farley 2	5/27/1989	<a href="#">3641989008</a>
1989	Farley 2	9/20/1989	<a href="#">3641989010</a>
1990	Farley 2	10/18/1989	<a href="#">3641989012</a>
1990	Farley 2	11/18/1989	<a href="#">3641989015</a>
1990	Farley 2	5/12/1990	<a href="#">3641990001</a>
1991	Farley 2	4/1/1991	<a href="#">3641991001</a>
1991	Farley 2	4/9/1991	<a href="#">3641991002</a>
1991	Farley 2	4/20/1991	<a href="#">3641991004</a>
1991	Farley 2	8/6/1991	<a href="#">3641991005</a>
1992	Farley 2	1/22/1992	<a href="#">3641992001</a>
1992	Farley 2	3/6/1992	<a href="#">3641992002</a>
1992	Farley 2	5/12/1992	<a href="#">3641992005</a>
1992	Farley 2	5/15/1992	<a href="#">3641992006</a>
1992	Farley 2	5/25/1992	<a href="#">3641992007</a>
1992	Farley 2	5/26/1992	<a href="#">3641992008</a>
1993	Farley 2	10/20/1992	<a href="#">3641992010</a>
1994	Farley 2	12/2/1993	<a href="#">3641993004</a>
1994	Farley 2	8/5/1994	<a href="#">3641994001</a>
1995	Farley 2	12/18/1994	<a href="#">3641994003</a>
1995	Farley 2	12/25/1994	<a href="#">3641994004</a>
1995	Farley 2	1/13/1995	<a href="#">3641994004</a>
1995	Farley 2	6/1/1995	<a href="#">3641995005</a>
1995	Farley 2	6/25/1995	<a href="#">3641995007</a>
1996	Farley 2	11/28/1995	<a href="#">3641995008</a>
1999	Farley 2	11/16/1998	<a href="#">3641998007</a>
1991	Fort Calhoun	11/19/1990	<a href="#">2851990026</a>
1992	Fort Calhoun	7/3/1992	<a href="#">2851992023</a>
1993	Fort Calhoun	6/24/1993	<a href="#">2851993011</a>
1994	Fort Calhoun	12/6/1993	<a href="#">2851993018</a>
1994	Fort Calhoun	2/11/1994	<a href="#">2851994001</a>
1988	GINNA	3/10/1988	<a href="#">2441988003</a>
1988	GINNA	6/1/1988	<a href="#">2441988005</a>
1988	GINNA	7/16/1988	<a href="#">2441988006</a>
1989	GINNA	6/1/1989	<a href="#">2441989004</a>
1990	GINNA	5/10/1990	<a href="#">2441990007</a>
1990	GINNA	6/9/1990	<a href="#">2441990010</a>
1990	GINNA	9/26/1990	<a href="#">2441990012</a>
1991	GINNA	12/11/1990	<a href="#">2441990013</a>
1991	GINNA	12/20/1990	<a href="#">2441990018</a>
1991	GINNA	12/21/1990	<a href="#">2441990019</a>
1992	GINNA	2/3/1992	<a href="#">2441992002</a>
1992	GINNA	2/29/1992	<a href="#">2441992003</a>
1994	GINNA	11/10/1993	<a href="#">2441993006</a>
1994	GINNA	4/27/1994	<a href="#">2441994007</a>
1996	GINNA	3/7/1996	<a href="#">2441996002</a>
1996	GINNA	3/9/1996	<a href="#">2441996004</a>
1996	GINNA	7/7/1996	<a href="#">2441996008</a>
1996	GINNA	8/6/1996	<a href="#">2441996010</a>

FY	Plant	Date	LER
1996	GINNA	8/7/1996	<a href="#">2441996011</a>
1996	GINNA	8/20/1996	<a href="#">2441996012</a>
1999	GINNA	4/21/1999	<a href="#">2441999006</a>
1999	GINNA	4/23/1999	<a href="#">2441999007</a>
1999	GINNA	4/27/1999	<a href="#">2441999008</a>
2001	GINNA	10/21/2000	<a href="#">2442000005</a>
2003	GINNA	8/14/2003	<a href="#">2442003002</a>
1990	Haddam Neck	9/3/1990	<a href="#">2131990018</a>
1994	Haddam Neck	7/11/1994	<a href="#">2131994018</a>
1995	Haddam Neck	7/27/1995	<a href="#">2131995016</a>
1987	HARRIS	1/22/1987	<a href="#">4001987005</a>
1987	HARRIS	2/27/1987	<a href="#">4001987008</a>
1987	HARRIS	3/11/1987	<a href="#">4001987012</a>
1987	HARRIS	3/13/1987	<a href="#">4001987013</a>
1987	HARRIS	3/31/1987	<a href="#">4001987017</a>
1987	HARRIS	4/3/1987	<a href="#">4001987018</a>
1987	HARRIS	4/12/1987	<a href="#">4001987019</a>
1987	HARRIS	4/14/1987	<a href="#">4001987021</a>
1987	HARRIS	4/21/1987	<a href="#">4001987024</a>
1987	HARRIS	4/22/1987	<a href="#">4001987025</a>
1987	HARRIS	4/23/1987	<a href="#">4001987026</a>
1987	HARRIS	4/24/1987	<a href="#">4001987026</a>
1987	HARRIS	5/2/1987	<a href="#">4001987028</a>
1987	HARRIS	5/24/1987	<a href="#">4001987031</a>
1987	HARRIS	6/17/1987	<a href="#">4001987035</a>
1987	HARRIS	6/21/1987	<a href="#">4001987037</a>
1987	HARRIS	6/22/1987	<a href="#">4001987038</a>
1987	HARRIS	7/9/1987	<a href="#">4001987042</a>
1987	HARRIS	7/22/1987	<a href="#">4001987046</a>
1987	HARRIS	8/4/1987	<a href="#">4001987041</a>
1987	HARRIS	8/4/1987	<a href="#">4001987047</a>
1987	HARRIS	8/5/1987	<a href="#">4001987047</a>
1987	HARRIS	8/31/1987	<a href="#">4001987051</a>
1987	HARRIS	9/25/1987	<a href="#">4001987049</a>
1988	HARRIS	11/7/1987	<a href="#">4001987062</a>
1988	HARRIS	11/8/1987	<a href="#">4001987063</a>
1988	HARRIS	3/9/1988	<a href="#">4001988007</a>
1988	HARRIS	7/30/1988	<a href="#">4001988018</a>
1989	HARRIS	10/14/1988	<a href="#">4001988028</a>
1989	HARRIS	10/30/1988	<a href="#">4001988032</a>
1989	HARRIS	1/16/1989	<a href="#">4001989001</a>
1989	HARRIS	2/6/1989	<a href="#">4001989003</a>
1989	HARRIS	2/7/1989	<a href="#">4001989004</a>
1989	HARRIS	2/22/1989	<a href="#">4001989005</a>
1989	HARRIS	3/14/1989	<a href="#">4001989006</a>
1990	HARRIS	10/9/1989	<a href="#">4001989017</a>
1990	HARRIS	12/27/1989	<a href="#">4001989021</a>
1991	HARRIS	5/19/1991	<a href="#">4001991015</a>
1991	HARRIS	5/21/1991	<a href="#">4001991009</a>
1991	HARRIS	6/3/1991	<a href="#">4001991010</a>
1992	HARRIS	7/12/1992	<a href="#">4001992007</a>
1992	HARRIS	7/13/1992	<a href="#">4001992008</a>
1992	HARRIS	7/15/1992	<a href="#">4001992009</a>

FY	Plant	Date	LER
1992	Harris	7/17/1992	<a href="#">4001992010</a>
1993	Harris	5/23/1993	<a href="#">4001993007</a>
1996	Harris	10/12/1995	<a href="#">4001995010</a>
1996	Harris	11/5/1995	<a href="#">4001995011</a>
1996	Harris	4/25/1996	<a href="#">4001996008</a>
1996	Harris	9/3/1996	<a href="#">4001996018</a>
1997	Harris	1/31/1997	<a href="#">4001997001</a>
1997	Harris	6/8/1997	<a href="#">4001997016</a>
1997	Harris	7/20/1997	<a href="#">4001997019</a>
1999	Harris	10/23/1998	<a href="#">4001998007</a>
1999	Harris	1/14/1999	<a href="#">4001999002</a>
1999	Harris	3/12/1999	<a href="#">4001999004</a>
2000	Harris	12/14/1999	<a href="#">4001999009</a>
2000	Harris	6/20/2000	<a href="#">4002000005</a>
2002	Harris	7/13/2002	<a href="#">4002002002</a>
2002	Harris	8/15/2002	<a href="#">4002002003</a>
2003	Harris	5/20/2003	<a href="#">4002003002</a>
2003	Harris	6/14/2003	<a href="#">4002003003</a>
2003	Harris	6/15/2003	<a href="#">4002003004</a>
2003	Harris	8/17/2003	<a href="#">4002003005</a>
1989	Indian Point 2	11/22/1988	<a href="#">2471988018</a>
1989	Indian Point 2	11/26/1988	<a href="#">2471988019</a>
1989	Indian Point 2	3/5/1989	<a href="#">2471989003</a>
1990	Indian Point 2	12/13/1989	<a href="#">2471989013</a>
1991	Indian Point 2	1/7/1991	<a href="#">2471991001</a>
1991	Indian Point 2	7/25/1991	<a href="#">2471991013</a>
1992	Indian Point 2	1/27/1992	<a href="#">2471992002</a>
1992	Indian Point 2	4/13/1992	<a href="#">2471992007</a>
1992	Indian Point 2	9/26/1992	<a href="#">2471992018</a>
1995	Indian Point 2	1/17/1995	<a href="#">2471995001</a>
1995	Indian Point 2	1/19/1995	<a href="#">2471995001</a>
1995	Indian Point 2	6/12/1995	<a href="#">2471995016</a>
1996	Indian Point 2	3/5/1996	<a href="#">2471996003</a>
1996	Indian Point 2	5/23/1996	<a href="#">2471996012</a>
1997	Indian Point 2	1/16/1997	<a href="#">2471997001</a>
1997	Indian Point 2	5/1/1997	<a href="#">2471997010</a>
1997	Indian Point 2	7/26/1997	<a href="#">2471997018</a>
1999	Indian Point 2	8/31/1999	<a href="#">2471999015</a>
2000	Indian Point 2	2/15/2000	<a href="#">2472000001</a>
2001	Indian Point 2	1/2/2001	<a href="#">2472001001</a>
2003	Indian Point 2	8/3/2003	<a href="#">2472003004</a>
2003	Indian Point 2	8/14/2003	<a href="#">2472003005</a>
1987	Indian Point 3	1/31/1987	<a href="#">2861987001</a>
1988	Indian Point 3	12/22/1987	<a href="#">2861987012</a>
1988	Indian Point 3	2/1/1988	<a href="#">2861988001</a>
1988	Indian Point 3	3/31/1988	<a href="#">2861988002</a>
1988	Indian Point 3	6/12/1988	<a href="#">2861988005</a>
1989	Indian Point 3	10/9/1988	<a href="#">2861988006</a>
1989	Indian Point 3	2/4/1989	<a href="#">2861989001</a>
1990	Indian Point 3	10/19/1989	<a href="#">2861989015</a>
1990	Indian Point 3	6/29/1990	<a href="#">2861990004</a>
1991	Indian Point 3	12/27/1990	<a href="#">2861991003</a>
1991	Indian Point 3	3/20/1991	<a href="#">2861991004</a>

FY	Plant	Date	LER
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1992	Indian Point 3	9/3/1992	<a href="#">2861992013</a>
1992	Indian Point 3	9/15/1992	<a href="#">2861992015</a>
1995	Indian Point 3	7/6/1995	<a href="#">2861995012</a>
1995	Indian Point 3	9/14/1995	<a href="#">2861995018</a>
1997	Indian Point 3	10/9/1996	<a href="#">2861996015</a>
1997	Indian Point 3	1/2/1997	<a href="#">2861997001</a>
1997	Indian Point 3	9/9/1997	<a href="#">2861997023</a>
1997	Indian Point 3	9/15/1997	<a href="#">2861997025</a>
1998	Indian Point 3	5/28/1998	<a href="#">2861998003</a>
1998	Indian Point 3	8/30/1998	<a href="#">2861998006</a>
1999	Indian Point 3	3/9/1999	<a href="#">2861999003</a>
1999	Indian Point 3	8/12/1999	<a href="#">2861999010</a>
2000	Indian Point 3	4/19/2000	<a href="#">2862000003</a>
2000	Indian Point 3	6/4/2000	<a href="#">2862000007</a>
2000	Indian Point 3	6/9/2000	<a href="#">2862000008</a>
2003	Indian Point 3	11/15/2002	<a href="#">2862002003</a>
2003	Indian Point 3	1/13/2003	<a href="#">2862003001</a>
2003	Indian Point 3	4/29/2003	<a href="#">2862003002</a>
2003	Indian Point 3	6/22/2003	<a href="#">2862003003</a>
2003	Indian Point 3	8/14/2003	<a href="#">2862003005</a>
1987	Kewaunee	4/3/1987	<a href="#">3051987005</a>
1987	Kewaunee	6/26/1987	<a href="#">3051987008</a>
1987	Kewaunee	7/10/1987	<a href="#">3051987009</a>
1988	Kewaunee	3/2/1988	<a href="#">3051988001</a>
1988	Kewaunee	4/12/1988	<a href="#">3051988004</a>
1988	Kewaunee	5/2/1988	<a href="#">3051988006</a>
1988	Kewaunee	9/1/1988	<a href="#">3051988012</a>
1990	Kewaunee	12/27/1989	<a href="#">3051989016</a>
1992	Kewaunee	10/12/1991	<a href="#">3051991010</a>
1992	Kewaunee	9/15/1992	<a href="#">3051992017</a>
1993	Kewaunee	1/28/1993	<a href="#">3051993001</a>
1993	Kewaunee	6/4/1993	<a href="#">3051993013</a>
1995	Kewaunee	9/5/1995	<a href="#">3051995005</a>
1996	Kewaunee	3/31/1996	<a href="#">3051996002</a>
1996	Kewaunee	4/2/1996	<a href="#">3051996003</a>
1998	Kewaunee	2/24/1998	<a href="#">3051998005</a>
1987	Maine Yankee	6/27/1987	<a href="#">3091987006</a>
1988	Maine Yankee	1/5/1988	<a href="#">3091988001</a>
1988	Maine Yankee	8/13/1988	<a href="#">3091988006</a>
1989	Maine Yankee	1/10/1989	<a href="#">3091989001</a>
1989	Maine Yankee	4/5/1989	<a href="#">3091989003</a>
1991	Maine Yankee	4/29/1991	<a href="#">3091991005</a>
1991	Maine Yankee	5/30/1991	<a href="#">3091991006</a>
1992	Maine Yankee	10/5/1991	<a href="#">3091991010</a>
1992	Maine Yankee	11/22/1991	<a href="#">3091991012</a>
1992	Maine Yankee	2/8/1992	<a href="#">3091992001</a>
1994	Maine Yankee	5/18/1994	<a href="#">3091994008</a>
1995	Maine Yankee	1/14/1995	<a href="#">3091995001</a>
1987	McGuire 1	4/15/1987	<a href="#">3691987009</a>
1987	McGuire 1	8/16/1987	<a href="#">3691987017</a>
1987	McGuire 1	9/4/1987	<a href="#">3691987019</a>
1988	McGuire 1	11/20/1987	<a href="#">3691987028</a>

FY	Plant	Date	LER
1988	McGuire 1	12/28/1987	<a href="#">3691987036</a>
1988	McGuire 1	1/7/1988	<a href="#">3691988001</a>
1988	McGuire 1	3/23/1988	<a href="#">3691988005</a>
1988	McGuire 1	4/16/1988	<a href="#">3691988007</a>
1988	McGuire 1	6/20/1988	<a href="#">3691988013</a>
1988	McGuire 1	6/26/1988	<a href="#">3691988015</a>
1989	McGuire 1	12/10/1988	<a href="#">3691988042</a>
1989	McGuire 1	8/26/1989	<a href="#">3691989022</a>
1990	McGuire 1	1/8/1990	<a href="#">3691990001</a>
1991	McGuire 1	10/13/1990	<a href="#">3691990027</a>
1991	McGuire 1	11/17/1990	<a href="#">3691990032</a>
1991	McGuire 1	2/11/1991	<a href="#">3691991001</a>
1991	McGuire 1	2/19/1991	<a href="#">3691991004</a>
1992	McGuire 1	6/25/1992	<a href="#">3691992009</a>
1992	McGuire 1	7/26/1992	<a href="#">3691992008</a>
1994	McGuire 1	5/12/1994	<a href="#">3691994004</a>
1995	McGuire 1	1/29/1995	<a href="#">3691995001</a>
1995	McGuire 1	9/27/1995	<a href="#">3691995005</a>
1996	McGuire 1	10/1/1995	<a href="#">3691995006</a>
1996	McGuire 1	2/3/1996	<a href="#">3691996001</a>
1997	McGuire 1	11/9/1996	<a href="#">3691996006</a>
1997	McGuire 1	5/12/1997	<a href="#">3691997006</a>
1997	McGuire 1	9/6/1997	<a href="#">3691997009</a>
1998	McGuire 1	2/9/1998	<a href="#">3691998002</a>
2000	McGuire 1	5/25/2000	<a href="#">3692000004</a>
2002	McGuire 1	3/4/2002	<a href="#">3692002001</a>
1987	McGuire 2	1/20/1987	<a href="#">3701987003</a>
1987	McGuire 2	9/6/1987	<a href="#">3701987016</a>
1988	McGuire 2	11/5/1987	<a href="#">3701987019</a>
1988	McGuire 2	11/30/1987	<a href="#">3701987021</a>
1988	McGuire 2	1/12/1988	<a href="#">3701988001</a>
1988	McGuire 2	7/31/1988	<a href="#">3701988008</a>
1989	McGuire 2	3/3/1989	<a href="#">3701989001</a>
1989	McGuire 2	3/14/1989	<a href="#">3701989002</a>
1989	McGuire 2	4/6/1989	<a href="#">3701989003</a>
1991	McGuire 2	7/12/1991	<a href="#">3701991007</a>
1991	McGuire 2	9/25/1991	<a href="#">3701991010</a>
1992	McGuire 2	10/4/1991	<a href="#">3701991011</a>
1992	McGuire 2	11/8/1991	<a href="#">3701991012</a>
1992	McGuire 2	3/21/1992	<a href="#">3701992004</a>
1992	McGuire 2	4/9/1992	<a href="#">3701992006</a>
1992	McGuire 2	5/20/1992	<a href="#">3701992007</a>
1992	McGuire 2	8/5/1992	<a href="#">3701992009</a>
1992	McGuire 2	8/24/1992	<a href="#">3701992010</a>
1993	McGuire 2	2/22/1993	<a href="#">3701993001</a>
1993	McGuire 2	3/9/1993	<a href="#">3701993002</a>
1994	McGuire 2	12/27/1993	<a href="#">3701993008</a>
1996	McGuire 2	12/16/1995	<a href="#">3701995004</a>
1996	McGuire 2	5/22/1996	<a href="#">3701996003</a>
1997	McGuire 2	5/27/1997	<a href="#">3701997001</a>
1997	McGuire 2	7/11/1997	<a href="#">3701997002</a>
1998	McGuire 2	2/22/1998	<a href="#">3701998001</a>
1999	McGuire 2	6/16/1999	<a href="#">3701999003</a>

FY	Plant	Date	LER
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2001	McGuire 2	10/10/2000	<a href="#">3702000001</a>
2001	McGuire 2	11/15/2000	<a href="#">3702000002</a>
2001	McGuire 2	7/18/2001	<a href="#">3702001001</a>
2002	McGuire 2	8/22/2002	<a href="#">3702002002</a>
1987	Millstone 2	9/2/1987	<a href="#">3361987009</a>
1988	Millstone 2	11/16/1987	<a href="#">3361987012</a>
1992	Millstone 2	11/6/1991	<a href="#">3361991012</a>
1993	Millstone 2	5/24/1993	<a href="#">3361993012</a>
1993	Millstone 2	8/12/1993	<a href="#">3361993019</a>
1995	Millstone 2	8/8/1995	<a href="#">3361995002</a>
2000	Millstone 2	1/27/2000	<a href="#">3362000001</a>
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2001	Millstone 2	4/29/2001	<a href="#">3362001003</a>
2002	Millstone 2	4/19/2002	<a href="#">3362002002</a>
2003	Millstone 2	3/7/2003	<a href="#">3362003002</a>
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1987	Millstone 3	4/12/1987	<a href="#">4231987020</a>
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1987	Millstone 3	5/7/1987	<a href="#">4231987025</a>
1987	Millstone 3	5/14/1987	<a href="#">4231987026</a>
1987	Millstone 3	6/5/1987	<a href="#">4231987027</a>
1987	Millstone 3	6/14/1987	<a href="#">4231987031</a>
1987	Millstone 3	9/23/1987	<a href="#">4231987034</a>
1988	Millstone 3	2/10/1988	<a href="#">4231988009</a>
1989	Millstone 3	10/5/1988	<a href="#">4231988023</a>
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1990	Millstone 3	3/9/1990	<a href="#">4231990009</a>
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1990	Millstone 3	4/16/1990	<a href="#">4231990013</a>
1990	Millstone 3	5/19/1990	<a href="#">4231990014</a>
1990	Millstone 3	6/6/1990	<a href="#">4231990019</a>
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1992	Millstone 3	4/5/1992	<a href="#">4231992011</a>
1993	Millstone 3	11/20/1992	<a href="#">4231992029</a>
1993	Millstone 3	3/31/1993	<a href="#">4231993004</a>
1994	Millstone 3	9/8/1994	<a href="#">4231994011</a>
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1987	North Anna 1	4/19/1987	<a href="#">3381987004</a>
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FY	Plant	Date	LER
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1990	North Anna 1	12/5/1989	<a href="#">3381989017</a>
1994	North Anna 1	9/9/1994	<a href="#">3381994005</a>
1995	North Anna 1	1/27/1995	<a href="#">3381995001</a>
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1997	North Anna 1	10/24/1996	<a href="#">3381996010</a>
2000	North Anna 1	5/7/2000	<a href="#">3382000004</a>
2003	North Anna 1	4/19/2003	<a href="#">3382003003</a>
2003	North Anna 1	6/11/2003	<a href="#">3382003004</a>
1990	North Anna 2	8/21/1990	<a href="#">3391990003</a>
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1991	North Anna 2	9/20/1991	<a href="#">3391991009</a>
1992	North Anna 2	1/29/1992	<a href="#">3391992001</a>
1992	North Anna 2	8/6/1992	<a href="#">3391992007</a>
1993	North Anna 2	4/16/1993	<a href="#">3391993002</a>
1993	North Anna 2	4/24/1993	<a href="#">3391993003</a>
1994	North Anna 2	1/22/1994	<a href="#">3391994003</a>
1996	North Anna 2	11/11/1995	<a href="#">3391995004</a>
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2002	North Anna 2	12/22/2001	<a href="#">3392001005</a>
2003	North Anna 2	3/31/2003	<a href="#">3392003001</a>
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1992	Oconee 1	10/2/1991	<a href="#">2691991011</a>
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1994	Oconee 1	11/3/1993	<a href="#">2691993010</a>
1994	Oconee 1	2/26/1994	<a href="#">2691994002</a>
1996	Oconee 1	2/28/1996	<a href="#">2691996004</a>
1997	Oconee 1	7/1/1997	<a href="#">2691997008</a>
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1987	Oconee 2	4/20/1987	<a href="#">2701987004</a>
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1992	Oconee 3	1/14/1992	<a href="#">2871992001</a>
1992	Oconee 3	6/24/1992	<a href="#">2871992003</a>
1993	Oconee 3	1/26/1993	<a href="#">2871993001</a>
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1989	Palisades	8/4/1989	<a href="#">2551989020</a>
1990	Palisades	1/9/1990	<a href="#">2551990001</a>
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1991	Palisades	7/3/1991	<a href="#">2551991012</a>
1992	Palisades	7/1/1992	<a href="#">2551992034</a>
1992	Palisades	7/24/1992	<a href="#">2551992035</a>
1992	Palisades	8/14/1992	<a href="#">2551992037</a>
1992	Palisades	8/25/1992	<a href="#">2551992038</a>
1993	Palisades	10/30/1992	<a href="#">2551992039</a>
1995	Palisades	8/15/1995	<a href="#">2551995010</a>
1998	Palisades	7/21/1998	<a href="#">2551998010</a>
2000	Palisades	4/4/2000	<a href="#">2552000003</a>
2003	Palisades	12/1/2002	<a href="#">2552002002</a>
1987	Palo Verde 1	1/10/1987	<a href="#">5281987003</a>
1988	Palo Verde 1	8/27/1988	<a href="#">5281988024</a>
1990	Palo Verde 1	6/20/1990	<a href="#">5281990008</a>
1991	Palo Verde 1	9/14/1991	<a href="#">5281991009</a>
1992	Palo Verde 1	10/27/1991	<a href="#">5281991010</a>
1992	Palo Verde 1	5/6/1992	<a href="#">5281992007</a>
1995	Palo Verde 1	5/30/1995	<a href="#">5281995008</a>
1998	Palo Verde 1	2/22/1998	<a href="#">5281998002</a>
1987	Palo Verde 2	6/4/1987	<a href="#">5291987010</a>
1987	Palo Verde 2	7/22/1987	<a href="#">5291987008</a>
1988	Palo Verde 2	7/26/1988	<a href="#">5291988006</a>
1989	Palo Verde 2	11/16/1988	<a href="#">5291988014</a>
1989	Palo Verde 2	1/3/1989	<a href="#">5291989001</a>
1989	Palo Verde 2	2/16/1989	<a href="#">5291989003</a>
1992	Palo Verde 2	1/9/1992	<a href="#">5291992001</a>
1992	Palo Verde 2	3/23/1992	<a href="#">5291992002</a>
1993	Palo Verde 2	11/13/1992	<a href="#">5291992006</a>
1993	Palo Verde 2	3/14/1993	<a href="#">5291993001</a>
1994	Palo Verde 2	11/1/1993	<a href="#">5291993004</a>
1995	Palo Verde 2	7/17/1995	<a href="#">5291995005</a>
1996	Palo Verde 2	1/21/1996	<a href="#">5291996001</a>
1997	Palo Verde 2	9/23/1997	<a href="#">5291997005</a>
2000	Palo Verde 2	8/26/2000	<a href="#">5292000001</a>
1989	Palo Verde 3	3/3/1989	<a href="#">5301989001</a>
1991	Palo Verde 3	6/19/1991	<a href="#">5301991003</a>
1991	Palo Verde 3	8/24/1991	<a href="#">5301991006</a>
1992	Palo Verde 3	11/15/1991	<a href="#">5301991010</a>
1993	Palo Verde 3	2/4/1993	<a href="#">5301993001</a>
1994	Palo Verde 3	8/19/1994	<a href="#">5301994005</a>
1994	Palo Verde 3	8/30/1994	<a href="#">5301994007</a>
1989	Point Beach 1	5/5/1989	<a href="#">2661989006</a>
1991	Point Beach 1	6/29/1991	<a href="#">2661991008</a>
1993	Point Beach 1	10/5/1992	<a href="#">2661992008</a>
1995	Point Beach 1	7/14/1995	<a href="#">2661995006</a>
1996	Point Beach 1	4/5/1996	<a href="#">2661996001</a>
2000	Point Beach 1	11/8/1999	<a href="#">2661999013</a>
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1988	Point Beach 2	4/7/1988	<a href="#">3011988001</a>
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1989	Point Beach 2	8/20/1989	<a href="#">3011989004</a>
1992	Point Beach 2	12/17/1991	<a href="#">3011991006</a>
1993	Point Beach 2	3/28/1993	<a href="#">3011993002</a>
1996	Point Beach 2	5/18/1996	<a href="#">3011996001</a>
2001	Point Beach 2	6/27/2001	<a href="#">3012001002</a>
2003	Point Beach 2	7/10/2003	<a href="#">3012003004</a>
1989	Prairie Island 1	5/22/1989	<a href="#">2821990017</a>
1989	Prairie Island 1	7/21/1989	<a href="#">2821989010</a>
1993	Prairie Island 1	2/18/1993	<a href="#">2821993005</a>
1996	Prairie Island 1	6/30/1996	<a href="#">2821996012</a>
1997	Prairie Island 1	6/2/1997	<a href="#">2821997008</a>
1998	Prairie Island 1	6/5/1998	<a href="#">2821998008</a>
1999	Prairie Island 1	10/29/1998	<a href="#">2821998016</a>
1999	Prairie Island 1	1/5/1999	<a href="#">2821999001</a>
1999	Prairie Island 1	1/8/1999	<a href="#">2821999002</a>
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2001	Prairie Island 1	8/3/2001	<a href="#">2822001005</a>
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1990	Prairie Island 2	3/8/1990	<a href="#">3061990001</a>
1990	Prairie Island 2	3/16/1990	<a href="#">3061990003</a>
1991	Prairie Island 2	12/29/1990	<a href="#">3061990012</a>
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1994	Prairie Island 2	7/21/1994	<a href="#">3061994002</a>
1996	Prairie Island 2	3/19/1996	<a href="#">3061996001</a>
1996	Prairie Island 2	4/18/1996	<a href="#">3061996002</a>
1997	Prairie Island 2	5/17/1997	<a href="#">3061997003</a>
1987	Robinson 2	6/15/1987	<a href="#">2611987018</a>
1987	Robinson 2	7/10/1987	<a href="#">2611987020</a>
1987	Robinson 2	7/16/1987	<a href="#">2611987020</a>
1988	Robinson 2	1/19/1988	<a href="#">2611988001</a>
1988	Robinson 2	5/2/1988	<a href="#">2611988010</a>
1989	Robinson 2	3/22/1989	<a href="#">2611989005</a>
1989	Robinson 2	3/30/1989	<a href="#">2611989006</a>
1990	Robinson 2	1/17/1990	<a href="#">2611990002</a>
1990	Robinson 2	5/17/1990	<a href="#">2611990007</a>
1991	Robinson 2	8/30/1991	<a href="#">2611991011</a>
1992	Robinson 2	8/22/1992	<a href="#">2611992017</a>
1994	Robinson 2	4/3/1994	<a href="#">2611994006</a>
1994	Robinson 2	8/2/1994	<a href="#">2611994016</a>
1995	Robinson 2	6/30/1995	<a href="#">2611995004</a>
1997	Robinson 2	10/20/1996	<a href="#">2611996007</a>
1998	Robinson 2	11/16/1997	<a href="#">2611997011</a>
1998	Robinson 2	4/25/1998	<a href="#">2611998003</a>
1999	Robinson 2	10/17/1998	<a href="#">2611998005</a>
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1991	Salem 1	8/15/1991	<a href="#">2721994011</a>
1993	Salem 1	7/19/1993	<a href="#">2721993013</a>
1994	Salem 1	1/27/1994	<a href="#">2721994003</a>
1994	Salem 1	2/10/1994	<a href="#">2721994005</a>
1994	Salem 1	4/7/1994	<a href="#">2721994006</a>
1994	Salem 1	6/10/1994	<a href="#">2721994009</a>
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2000	Salem 1	1/6/2000	<a href="#">2722000001</a>
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2003	Salem 1	11/12/2002	<a href="#">2722002004</a>
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1988	Salem 2	8/31/1988	<a href="#">3111988017</a>
1989	Salem 2	11/28/1988	<a href="#">3111988024</a>
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1992	Salem 2	9/3/1992	<a href="#">3111992014</a>
1993	Salem 2	1/28/1993	<a href="#">3111993002</a>
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2003	Salem 2	3/29/2003	<a href="#">3112003001</a>
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1988	San Onofre 2	12/17/1987	<a href="#">3611987031</a>
1991	San Onofre 2	12/6/1990	<a href="#">3611990016</a>
1991	San Onofre 2	4/10/1991	<a href="#">3611991007</a>
1992	San Onofre 2	4/24/1992	<a href="#">3611992008</a>
1992	San Onofre 2	7/31/1992	<a href="#">3611992012</a>
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1988	San Onofre 3	10/11/1987	<a href="#">3621987017</a>
1989	San Onofre 3	1/6/1989	<a href="#">3621989001</a>
1989	San Onofre 3	4/7/1989	<a href="#">3621989006</a>
1990	San Onofre 3	2/23/1990	<a href="#">3621990002</a>
1991	San Onofre 3	3/15/1991	<a href="#">3621991001</a>
1992	San Onofre 3	5/15/1992	<a href="#">3621992003</a>
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FY	Plant	Date	LER
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2003	San Onofre 3	10/16/2002	<a href="#">3622002003</a>
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1990	Seabrook	8/22/1990	<a href="#">4431990022</a>
1991	Seabrook	11/9/1990	<a href="#">4431990025</a>
1991	Seabrook	2/12/1991	<a href="#">4431991001</a>
1991	Seabrook	3/30/1991	<a href="#">4431991002</a>
1991	Seabrook	6/27/1991	<a href="#">4431991008</a>
1991	Seabrook	7/4/1991	<a href="#">4431991009</a>
1992	Seabrook	9/7/1992	<a href="#">4431992017</a>
1993	Seabrook	11/27/1992	<a href="#">4431992024</a>
1993	Seabrook	12/13/1992	<a href="#">4431992025</a>
1993	Seabrook	1/14/1993	<a href="#">4431993003</a>
1993	Seabrook	5/20/1993	<a href="#">4431993009</a>
1993	Seabrook	7/27/1993	<a href="#">4431993012</a>
1993	Seabrook	9/22/1993	<a href="#">4431993018</a>
1994	Seabrook	1/25/1994	<a href="#">4431994001</a>
1996	Seabrook	1/27/1996	<a href="#">4431996001</a>
1999	Seabrook	12/22/1998	<a href="#">4431998014</a>
2000	Seabrook	6/26/2000	<a href="#">4432000004</a>
2001	Seabrook	3/5/2001	<a href="#">4432001002</a>
1989	Sequoyah 1	11/18/1988	<a href="#">3271988045</a>
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1990	Sequoyah 1	12/10/1989	<a href="#">3271989035</a>
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1990	Sequoyah 1	9/14/1990	<a href="#">3271990021</a>
1990	Sequoyah 1	9/19/1990	<a href="#">3271990022</a>
1991	Sequoyah 1	11/15/1990	<a href="#">3271990030</a>
1992	Sequoyah 1	4/28/1992	<a href="#">3271992010</a>
1992	Sequoyah 1	5/16/1992	<a href="#">3271992012</a>
1993	Sequoyah 1	10/26/1992	<a href="#">3271992018</a>
1993	Sequoyah 1	12/31/1992	<a href="#">3271992027</a>
1994	Sequoyah 1	7/15/1994	<a href="#">3271994011</a>
1995	Sequoyah 1	11/29/1994	<a href="#">3271994014</a>
1995	Sequoyah 1	6/23/1995	<a href="#">3271995008</a>
1996	Sequoyah 1	6/23/1996	<a href="#">3271996006</a>
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1998	Sequoyah 1	5/19/1998	<a href="#">3271998001</a>
1999	Sequoyah 1	11/9/1998	<a href="#">3271998003</a>
2000	Sequoyah 1	3/21/2000	<a href="#">3272000003</a>
2000	Sequoyah 1	9/25/2000	<a href="#">3272000004</a>
2002	Sequoyah 1	7/12/2002	<a href="#">3272002004</a>
2003	Sequoyah 1	6/15/2003	<a href="#">3272003901</a>
2003	Sequoyah 1	6/15/2003	<a href="#">3272003903</a>
1988	Sequoyah 2	3/20/1988	<a href="#">3281988014</a>
1988	Sequoyah 2	5/19/1988	<a href="#">3281988023</a>
1988	Sequoyah 2	5/23/1988	<a href="#">3281988024</a>
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FY	Plant	Date	LER
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1990	Sequoyah 2	4/10/1990	<a href="#">3281990008</a>
1991	Sequoyah 2	11/23/1990	<a href="#">3281990017</a>
1991	Sequoyah 2	1/3/1991	<a href="#">3281991001</a>
1992	Sequoyah 2	11/7/1991	<a href="#">3281991006</a>
1992	Sequoyah 2	2/10/1992	<a href="#">3281992001</a>
1992	Sequoyah 2	6/27/1992	<a href="#">3281992008</a>
1992	Sequoyah 2	8/21/1992	<a href="#">3281992011</a>
1992	Sequoyah 2	9/4/1992	<a href="#">3281992012</a>
1993	Sequoyah 2	12/8/1992	<a href="#">3281992015</a>
1995	Sequoyah 2	1/5/1995	<a href="#">3281995001</a>
1995	Sequoyah 2	4/28/1995	<a href="#">3281995002</a>
1995	Sequoyah 2	5/31/1995	<a href="#">3281995003</a>
1996	Sequoyah 2	12/21/1995	<a href="#">3281995007</a>
1996	Sequoyah 2	4/18/1996	<a href="#">3281996001</a>
1997	Sequoyah 2	10/11/1996	<a href="#">3281996005</a>
1997	Sequoyah 2	12/6/1996	<a href="#">3281996006</a>
1997	Sequoyah 2	12/7/1996	<a href="#">3281996007</a>
1998	Sequoyah 2	8/27/1998	<a href="#">3281998001</a>
1999	Sequoyah 2	10/16/1998	<a href="#">3281998002</a>
2000	Sequoyah 2	1/18/2000	<a href="#">3282000001</a>
2001	Sequoyah 2	11/17/2000	<a href="#">3282000004</a>
2003	Sequoyah 2	12/26/2002	<a href="#">3282002004</a>
2003	Sequoyah 2	3/10/2003	<a href="#">3282003004</a>
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1988	South Texas 1	8/16/1988	<a href="#">4981988048</a>
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1990	South Texas 1	6/20/1990	<a href="#">4981990014</a>
1990	South Texas 1	6/28/1990	<a href="#">4981990015</a>
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1991	South Texas 1	4/12/1991	<a href="#">4981991012</a>
1992	South Texas 1	10/10/1991	<a href="#">4981991021</a>
1992	South Texas 1	10/14/1991	<a href="#">4981991022</a>
1992	South Texas 1	3/14/1992	<a href="#">4981992003</a>
1994	South Texas 1	2/28/1994	<a href="#">4981994009</a>
1994	South Texas 1	9/20/1994	<a href="#">4981994015</a>
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1995	South Texas 1	8/29/1995	<a href="#">4981995009</a>
1996	South Texas 1	12/18/1995	<a href="#">4981995013</a>
1998	South Texas 1	11/10/1997	<a href="#">4981997012</a>
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FY	Plant	Date	LER
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2001	South Texas 1	12/16/2000	<a href="#">4982000007</a>
1989	South Texas 2	4/5/1989	<a href="#">4991989009</a>
1989	South Texas 2	4/10/1989	<a href="#">4991989011</a>
1989	South Texas 2	4/15/1989	<a href="#">4991989013</a>
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1989	South Texas 2	7/13/1989	<a href="#">4991989017</a>
1989	South Texas 2	8/23/1989	<a href="#">4991989019</a>
1989	South Texas 2	8/29/1989	<a href="#">4991989020</a>
1989	South Texas 2	9/5/1989	<a href="#">4991989021</a>
1989	South Texas 2	9/19/1989	<a href="#">4991989022</a>
1989	South Texas 2	9/22/1989	<a href="#">4991989023</a>
1990	South Texas 2	10/13/1989	<a href="#">4991989026</a>
1990	South Texas 2	2/2/1990	<a href="#">4991990002</a>
1990	South Texas 2	3/26/1990	<a href="#">4991990004</a>
1990	South Texas 2	4/14/1990	<a href="#">4991990005</a>
1990	South Texas 2	7/13/1990	<a href="#">4991990012</a>
1990	South Texas 2	9/17/1990	<a href="#">4991990013</a>
1991	South Texas 2	1/9/1991	<a href="#">4991991001</a>
1991	South Texas 2	3/14/1991	<a href="#">4991991003</a>
1991	South Texas 2	3/30/1991	<a href="#">4991991004</a>
1992	South Texas 2	12/24/1991	<a href="#">4991991010</a>
1992	South Texas 2	1/22/1992	<a href="#">4991992001</a>
1992	South Texas 2	2/24/1992	<a href="#">4991992003</a>
1993	South Texas 2	12/27/1992	<a href="#">4991992010</a>
1993	South Texas 2	1/23/1993	<a href="#">4991993001</a>
1993	South Texas 2	2/3/1993	<a href="#">4991993004</a>
1994	South Texas 2	6/25/1994	<a href="#">4991994007</a>
1995	South Texas 2	3/28/1995	<a href="#">4991995003</a>
1996	South Texas 2	11/15/1995	<a href="#">4991995008</a>
1997	South Texas 2	3/19/1997	<a href="#">4991997004</a>
1997	South Texas 2	3/26/1997	<a href="#">4991997005</a>
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1998	South Texas 2	11/21/1997	<a href="#">4991997007</a>
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2001	South Texas 2	2/7/2001	<a href="#">4992001001</a>
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2001	South Texas 2	5/8/2001	<a href="#">4992001004</a>
2002	South Texas 2	6/14/2002	<a href="#">4992002002</a>
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1987	St. Lucie 1	5/21/1987	<a href="#">3351987011</a>
1987	St. Lucie 1	6/14/1987	<a href="#">3351987013</a>
1988	St. Lucie 1	10/29/1987	<a href="#">3351987016</a>
1988	St. Lucie 1	12/21/1987	<a href="#">3351987017</a>
1988	St. Lucie 1	3/28/1988	<a href="#">3351988003</a>
1988	St. Lucie 1	6/30/1988	<a href="#">3351988004</a>
1988	St. Lucie 1	9/20/1988	<a href="#">3351988008</a>
1989	St. Lucie 1	7/17/1989	<a href="#">3351989003</a>
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FY	Plant	Date	LER
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1991	St. Lucie 1	9/18/1991	<a href="#">3351991006</a>
1992	St. Lucie 1	9/24/1992	<a href="#">3351992006</a>
1994	St. Lucie 1	1/9/1994	<a href="#">3351994001</a>
1994	St. Lucie 1	3/28/1994	<a href="#">3351994003</a>
1994	St. Lucie 1	4/3/1994	<a href="#">3351994004</a>
1996	St. Lucie 1	11/16/1995	<a href="#">3351995010</a>
1996	St. Lucie 1	2/22/1996	<a href="#">3351996002</a>
1997	St. Lucie 1	3/4/1997	<a href="#">3351997003</a>
1998	St. Lucie 1	1/4/1998	<a href="#">3351998001</a>
1998	St. Lucie 1	1/10/1998	<a href="#">3351998003</a>
1999	St. Lucie 1	8/23/1999	<a href="#">3351999003</a>
2000	St. Lucie 1	10/29/1999	<a href="#">3351999006</a>
2001	St. Lucie 1	6/5/2001	<a href="#">3352001007</a>
2003	St. Lucie 1	10/24/2002	<a href="#">3352002002</a>
1987	St. Lucie 2	3/3/1987	<a href="#">3891987001</a>
1987	St. Lucie 2	3/5/1987	<a href="#">3891987002</a>
1987	St. Lucie 2	4/9/1987	<a href="#">3891987003</a>
1987	St. Lucie 2	4/22/1987	<a href="#">3891987004</a>
1988	St. Lucie 2	11/25/1987	<a href="#">3891987007</a>
1989	St. Lucie 2	9/23/1989	<a href="#">3891989007</a>
1990	St. Lucie 2	1/14/1990	<a href="#">3891990001</a>
1992	St. Lucie 2	7/8/1992	<a href="#">3891992004</a>
1992	St. Lucie 2	7/10/1992	<a href="#">3891992005</a>
1992	St. Lucie 2	8/10/1992	<a href="#">3891992006</a>
1995	St. Lucie 2	2/21/1995	<a href="#">3891995002</a>
1996	St. Lucie 2	1/5/1996	<a href="#">3891996001</a>
1996	St. Lucie 2	6/6/1996	<a href="#">3891996002</a>
1998	St. Lucie 2	9/18/1998	<a href="#">3891998006</a>
2003	St. Lucie 2	4/1/2003	<a href="#">3892003001</a>
2003	St. Lucie 2	6/11/2003	<a href="#">3892003003</a>
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1987	Summer	9/2/1987	<a href="#">3951987021</a>
1988	Summer	10/29/1987	<a href="#">3951987027</a>
1988	Summer	2/16/1988	<a href="#">3951988002</a>
1988	Summer	5/12/1988	<a href="#">3951988006</a>
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1988	Summer	7/26/1988	<a href="#">3951988009</a>
1989	Summer	5/28/1989	<a href="#">3951989011</a>
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1989	Summer	8/25/1989	<a href="#">3951989015</a>
1990	Summer	12/2/1989	<a href="#">3951989020</a>
1993	Summer	1/12/1993	<a href="#">3951993001</a>
1997	Summer	4/26/1997	<a href="#">3951997002</a>
1999	Summer	5/18/1999	<a href="#">3951999008</a>
2002	Summer	6/17/2002	<a href="#">3952002004</a>
1987	Surry 1	9/20/1987	<a href="#">2801987024</a>
1988	Surry 1	2/16/1988	<a href="#">2801988003</a>
1988	Surry 1	8/15/1988	<a href="#">2801988029</a>
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FY	Plant	Date	LER
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1993	Surry 1	2/9/1993	<a href="#">2801993002</a>
1994	Surry 1	5/11/1994	<a href="#">2801994006</a>
1995	Surry 1	1/8/1995	<a href="#">2801995001</a>
1995	Surry 1	4/12/1995	<a href="#">2801995003</a>
1997	Surry 1	2/19/1997	<a href="#">2801997003</a>
1998	Surry 1	2/2/1998	<a href="#">2801998002</a>
1999	Surry 1	11/22/1998	<a href="#">2801998013</a>
1999	Surry 1	11/26/1998	<a href="#">2801998014</a>
2001	Surry 1	10/24/2000	<a href="#">2802000004</a>
2003	Surry 1	12/31/2002	<a href="#">2802002001</a>
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2003	Surry 1	9/18/2003	<a href="#">2802003004</a>
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1988	Surry 2	5/16/1988	<a href="#">2811988010</a>
1989	Surry 2	9/19/1989	<a href="#">2811989010</a>
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1990	Surry 2	8/27/1990	<a href="#">2811990004</a>
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1993	Surry 2	6/23/1993	<a href="#">2811993002</a>
1993	Surry 2	8/3/1993	<a href="#">2811993003</a>
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1994	Surry 2	11/15/1993	<a href="#">2811993006</a>
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1996	Surry 2	8/3/1996	<a href="#">2811996005</a>
1997	Surry 2	12/13/1996	<a href="#">2811996006</a>
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2003	Surry 2	1/25/2003	<a href="#">2812003001</a>
2003	Surry 2	9/18/2003	<a href="#">2802003004</a>
1988	Three Mile Isl 1	8/13/1988	<a href="#">2891988004</a>
1991	Three Mile Isl 1	9/27/1991	<a href="#">2891991003</a>
1993	Three Mile Isl 1	3/12/1993	<a href="#">2891993003</a>
1997	Three Mile Isl 1	6/21/1997	<a href="#">2891997007</a>
1987	Turkey Point 3	1/4/1987	<a href="#">2501987001</a>
1988	Turkey Point 3	3/18/1988	<a href="#">2501988004</a>
1989	Turkey Point 3	2/15/1989	<a href="#">2501989005</a>
1990	Turkey Point 3	12/23/1989	<a href="#">2501989020</a>
1990	Turkey Point 3	6/9/1990	<a href="#">2501990011</a>
1995	Turkey Point 3	12/6/1994	<a href="#">2501994006</a>
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FY	Plant	Date	LER
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1997	Turkey Point 3	7/30/1997	<a href="#">2501997007</a>
1998	Turkey Point 3	2/16/1998	<a href="#">2501998001</a>
2003	Turkey Point 3	1/27/2003	<a href="#">2502003002</a>
2003	Turkey Point 3	4/28/2003	<a href="#">2502003006</a>
1987	Turkey Point 4	1/6/1987	<a href="#">2511987001</a>
1988	Turkey Point 4	8/16/1988	<a href="#">2511988009</a>
1988	Turkey Point 4	8/19/1988	<a href="#">2511988010</a>
1989	Turkey Point 4	9/15/1989	<a href="#">2511989011</a>
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1990	Turkey Point 4	8/12/1990	<a href="#">2511990008</a>
1992	Turkey Point 4	10/29/1991	<a href="#">2511991006</a>
1992	Turkey Point 4	9/29/1992	<a href="#">2511992007</a>
1993	Turkey Point 4	8/16/1993	<a href="#">2511993003</a>
1994	Turkey Point 4	9/23/1994	<a href="#">2511994004</a>
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1987	Vogtle 1	3/26/1987	<a href="#">4241987009</a>
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1987	Vogtle 1	4/5/1987	<a href="#">4241987012</a>
1987	Vogtle 1	4/10/1987	<a href="#">4241987013</a>
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1987	Vogtle 1	4/13/1987	<a href="#">4241987015</a>
1987	Vogtle 1	4/29/1987	<a href="#">4241987018</a>
1987	Vogtle 1	5/4/1987	<a href="#">4241987018</a>
1987	Vogtle 1	5/9/1987	<a href="#">4241987025</a>
1987	Vogtle 1	5/10/1987	<a href="#">4241987026</a>
1987	Vogtle 1	5/13/1987	<a href="#">4241987027</a>
1987	Vogtle 1	5/24/1987	<a href="#">4241987029</a>
1987	Vogtle 1	6/3/1987	<a href="#">4241987030</a>
1987	Vogtle 1	6/7/1987	<a href="#">4241987033</a>
1987	Vogtle 1	6/7/1987	<a href="#">4241987034</a>
1987	Vogtle 1	6/14/1987	<a href="#">4241987035</a>
1987	Vogtle 1	6/23/1987	<a href="#">4241987041</a>
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1988	Vogtle 1	11/11/1987	<a href="#">4241987066</a>
1988	Vogtle 1	1/17/1988	<a href="#">4241988001</a>
1988	Vogtle 1	2/15/1988	<a href="#">4241988006</a>
1988	Vogtle 1	4/7/1988	<a href="#">4241988008</a>
1988	Vogtle 1	4/24/1988	<a href="#">4241988013</a>
1988	Vogtle 1	7/14/1988	<a href="#">4241988022</a>
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1989	Vogle 1	7/8/1989	<a href="#">4241989016</a>
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1990	Vogle 1	1/24/1990	<a href="#">4241990001</a>
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1994	Vogle 1	3/11/1994	<a href="#">4241994002</a>
1995	Vogle 1	7/23/1995	<a href="#">4241995002</a>
1996	Vogle 1	5/25/1996	<a href="#">4241996006</a>
1997	Vogle 1	11/27/1996	<a href="#">4241996012</a>
1997	Vogle 1	8/4/1997	<a href="#">4241997005</a>
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1989	Vogle 2	5/12/1989	<a href="#">4251989020</a>
1989	Vogle 2	5/22/1989	<a href="#">4251989021</a>
1989	Vogle 2	7/20/1989	<a href="#">4251989023</a>
1989	Vogle 2	7/26/1989	<a href="#">4251989024</a>
1990	Vogle 2	10/11/1989	<a href="#">4251989027</a>
1990	Vogle 2	11/5/1989	<a href="#">4251989029</a>
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1990	Vogle 2	6/28/1990	<a href="#">4251990008</a>
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1991	Vogle 2	2/18/1991	<a href="#">4251991005</a>
1991	Vogle 2	2/23/1991	<a href="#">4251991006</a>
1991	Vogle 2	5/7/1991	<a href="#">4251991007</a>
1992	Vogle 2	3/9/1992	<a href="#">4251992002</a>
1992	Vogle 2	5/14/1992	<a href="#">4251992010</a>
1993	Vogle 2	6/28/1993	<a href="#">4251993004</a>
1993	Vogle 2	9/8/1993	<a href="#">4251993006</a>
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1997	Vogle 2	10/14/1996	<a href="#">4251996006</a>
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1998	Vogle 2	5/9/1998	<a href="#">4251998003</a>
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1999	Vogle 2	3/21/1999	<a href="#">4251999001</a>
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FY	Plant	Date	LER
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1987	Waterford 3	5/25/1987	<a href="#">3821987016</a>
1987	Waterford 3	7/31/1987	<a href="#">3821987020</a>
1988	Waterford 3	12/11/1987	<a href="#">3821987028</a>
1988	Waterford 3	1/26/1988	<a href="#">3821988002</a>
1988	Waterford 3	6/14/1988	<a href="#">3821988016</a>
1989	Waterford 3	12/8/1988	<a href="#">3821988033</a>
1989	Waterford 3	7/15/1989	<a href="#">3821989013</a>
1990	Waterford 3	12/23/1989	<a href="#">3821989024</a>
1990	Waterford 3	3/22/1990	<a href="#">3821990002</a>
1990	Waterford 3	3/29/1990	<a href="#">3821990003</a>
1990	Waterford 3	8/25/1990	<a href="#">3821990012</a>
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1991	Waterford 3	8/25/1991	<a href="#">3821991019</a>
1992	Waterford 3	11/17/1991	<a href="#">3821991022</a>
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2001	Waterford 3	10/14/2000	<a href="#">3822002901</a>
2001	Waterford 3	2/13/2001	<a href="#">3822001003</a>
1996	Watts Bar 1	2/19/1996	<a href="#">3901996004</a>
1996	Watts Bar 1	3/13/1996	<a href="#">3901996009</a>
1996	Watts Bar 1	3/27/1996	<a href="#">3901996011</a>
1996	Watts Bar 1	4/16/1996	<a href="#">3901996014</a>
1996	Watts Bar 1	4/21/1996	<a href="#">3901996015</a>
1996	Watts Bar 1	4/28/1996	<a href="#">3901996016</a>
1997	Watts Bar 1	1/22/1997	<a href="#">3901997002</a>
1997	Watts Bar 1	3/6/1997	<a href="#">3901997006</a>
1997	Watts Bar 1	3/6/1997	<a href="#">3901997008</a>
1997	Watts Bar 1	4/20/1997	<a href="#">3901997010</a>
1998	Watts Bar 1	10/19/1997	<a href="#">3901997015</a>
1998	Watts Bar 1	3/7/1998	<a href="#">3901998001</a>
2000	Watts Bar 1	9/10/2000	<a href="#">3902000004</a>
2001	Watts Bar 1	10/6/2000	<a href="#">3902000005</a>
2001	Watts Bar 1	6/29/2001	<a href="#">3902001001</a>
2001	Watts Bar 1	9/4/2001	<a href="#">3902001002</a>
2002	Watts Bar 1	12/19/2001	<a href="#">3902001004</a>
2002	Watts Bar 1	7/13/2002	<a href="#">3902002003</a>
2002	Watts Bar 1	9/21/2002	<a href="#">3902002004</a>
2002	Watts Bar 1	9/27/2002	<a href="#">3902002005</a>
2003	Watts Bar 1	3/10/2003	<a href="#">3902003001</a>
2003	Watts Bar 1	8/25/2003	<a href="#">3902003003</a>
1987	Wolf Creek	1/8/1987	<a href="#">4821987002</a>
1987	Wolf Creek	1/17/1987	<a href="#">4821987005</a>
1987	Wolf Creek	1/20/1987	<a href="#">4821987004</a>
1987	Wolf Creek	1/21/1987	<a href="#">4821987005</a>
1987	Wolf Creek	4/19/1987	<a href="#">4821987017</a>
1987	Wolf Creek	4/23/1987	<a href="#">4821987017</a>
1987	Wolf Creek	5/28/1987	<a href="#">4821987022</a>
1987	Wolf Creek	6/29/1987	<a href="#">4821987027</a>

FY	Plant	Date	LER
1987	Wolf Creek	7/20/1987	<a href="#">4821987030</a>
1987	Wolf Creek	9/10/1987	<a href="#">4821987037</a>
1987	Wolf Creek	9/11/1987	<a href="#">4821987037</a>
1987	Wolf Creek	9/12/1987	<a href="#">4821987037</a>
1987	Wolf Creek	9/27/1987	<a href="#">4821987041</a>
1988	Wolf Creek	12/26/1987	<a href="#">4821987051</a>
1989	Wolf Creek	1/23/1989	<a href="#">4821989002</a>
1989	Wolf Creek	2/2/1989	<a href="#">4821989004</a>
1989	Wolf Creek	7/11/1989	<a href="#">4821989013</a>
1990	Wolf Creek	2/6/1990	<a href="#">4821990001</a>
1990	Wolf Creek	5/14/1990	<a href="#">4821990011</a>
1990	Wolf Creek	5/17/1990	<a href="#">4821990012</a>
1990	Wolf Creek	5/19/1990	<a href="#">4821990013</a>
1990	Wolf Creek	6/13/1990	<a href="#">4821990014</a>
1991	Wolf Creek	10/23/1990	<a href="#">4821990023</a>
1991	Wolf Creek	5/12/1991	<a href="#">4821991006</a>
1992	Wolf Creek	2/19/1992	<a href="#">4821992002</a>
1993	Wolf Creek	11/10/1992	<a href="#">4821992016</a>
1994	Wolf Creek	2/19/1994	<a href="#">4821994002</a>
1995	Wolf Creek	3/8/1995	<a href="#">4821995001</a>
1996	Wolf Creek	11/10/1995	<a href="#">4821995006</a>
1996	Wolf Creek	1/30/1996	<a href="#">4821996001</a>
1996	Wolf Creek	6/6/1996	<a href="#">4821996006</a>
1999	Wolf Creek	5/12/1999	<a href="#">4821999005</a>
1999	Wolf Creek	8/5/1999	<a href="#">4821999008</a>
2000	Wolf Creek	9/4/2000	<a href="#">4822000003</a>
2002	Wolf Creek	5/8/2002	<a href="#">4822002003</a>
2002	Wolf Creek	9/9/2002	<a href="#">4822002005</a>
2003	Wolf Creek	8/18/2003	<a href="#">4822003003</a>
1987	Zion 1	2/27/1987	<a href="#">2951987005</a>
1988	Zion 1	5/7/1988	<a href="#">2951988011</a>
1989	Zion 1	6/20/1989	<a href="#">2951989009</a>
1990	Zion 1	1/27/1990	<a href="#">2951990004</a>
1992	Zion 1	11/7/1991	<a href="#">2951991016</a>
1994	Zion 1	4/3/1994	<a href="#">2951994005</a>
1994	Zion 1	7/2/1994	<a href="#">2951994010</a>
1996	Zion 1	4/17/1996	<a href="#">2951996015</a>
1996	Zion 1	8/18/1996	<a href="#">2951996021</a>
1989	Zion 2	10/8/1988	<a href="#">3041988007</a>
1990	Zion 2	1/18/1990	<a href="#">3041990001</a>
1990	Zion 2	9/7/1990	<a href="#">3041990010</a>
1991	Zion 2	11/11/1990	<a href="#">3041990013</a>

**Table 13. LER listing for failure trend, Figure 8.**

FY	Plant	Date	LER
1989	Arkansas 1	11/26/1988	<a href="#">3131988021</a>
1992	Arkansas 1	5/19/1992	<a href="#">3131992005</a>
1994	Arkansas 1	1/31/1994	<a href="#">3131994001</a>
1995	Arkansas 1	4/20/1995	<a href="#">3131995005</a>
1989	Arkansas 2	4/18/1989	<a href="#">3681989006</a>
1991	Arkansas 2	12/5/1990	<a href="#">3681990024</a>

FY	Plant	Date	LER
1994	Arkansas 2	4/22/1994	<a href="#">3681994002</a>
1997	Beaver Valley 1	3/19/1997	<a href="#">3341997005</a>
1988	Beaver Valley 2	11/10/1987	<a href="#">4121987035</a>
1989	Beaver Valley 2	5/14/1989	<a href="#">4121989015</a>
1990	Beaver Valley 2	7/2/1990	<a href="#">4121990008</a>
1994	Beaver Valley 2	11/29/1993	<a href="#">4121993014</a>
1989	Braidwood 2	5/11/1989	<a href="#">4571989002</a>
1990	Braidwood 2	11/1/1989	<a href="#">4571989007</a>
1990	Braidwood 2	11/1/1989	<a href="#">4571989007</a>
1988	Byron 2	5/6/1988	<a href="#">4551988004</a>
1988	Byron 2	7/14/1988	<a href="#">4551988008</a>
1987	Callaway	4/2/1987	<a href="#">4831987003</a>
1992	Callaway	4/10/1992	<a href="#">4831992005</a>
2002	Callaway	12/3/2001	<a href="#">4832002001</a>
2003	Callaway	12/14/2002	<a href="#">4832002014</a>
1987	Calvert Cliffs 1	7/23/1987	<a href="#">3171987012</a>
1993	Calvert Cliffs 1	11/24/1992	<a href="#">3171992008</a>
2001	Calvert Cliffs 1	5/16/2001	<a href="#">3172001001</a>
1989	Calvert Cliffs 2	3/1/1989	<a href="#">3181989004</a>
1995	Calvert Cliffs 2	1/13/1995	<a href="#">3181995002</a>
1998	Calvert Cliffs 2	3/5/1998	<a href="#">3181998002</a>
1987	Catawba 1	7/6/1987	<a href="#">4131987026</a>
1988	Catawba 1	3/9/1988	<a href="#">4131988015</a>
1989	Catawba 1	1/27/1989	<a href="#">4131989007</a>
1989	Catawba 1	1/27/1989	<a href="#">4131989007</a>
1991	Catawba 1	7/10/1991	<a href="#">4131991015</a>
1992	Catawba 1	7/12/1992	<a href="#">4131992008</a>
1994	Catawba 1	12/25/1993	<a href="#">4131993012</a>
1987	Catawba 2	8/7/1987	<a href="#">4141987024</a>
1987	Catawba 2	9/12/1987	<a href="#">4141987026</a>
1988	Catawba 2	11/3/1987	<a href="#">4141987029</a>
1988	Catawba 2	3/9/1988	<a href="#">4141988012</a>
1988	Catawba 2	3/9/1988	<a href="#">4141988012</a>
1989	Catawba 2	3/14/1989	<a href="#">4141989010</a>
1989	Catawba 2	7/31/1989	<a href="#">4141989017</a>
1989	Catawba 2	9/12/1989	<a href="#">4141989019</a>
1995	Catawba 2	10/18/1994	<a href="#">4141994007</a>
1992	Comanche Peak 1	12/4/1991	<a href="#">4451991029</a>
1995	Comanche Peak 1	6/21/1995	<a href="#">4451995004</a>
1989	Cook 1	1/16/1989	<a href="#">3151989001</a>
1990	Cook 2	10/19/1989	<a href="#">3161989017</a>
1991	Cook 2	3/13/1991	<a href="#">3161991004</a>
1991	Cook 2	8/1/1991	<a href="#">3161991006</a>
1993	Cook 2	8/2/1993	<a href="#">3161993007</a>
1995	Cook 2	8/29/1995	<a href="#">3161995005</a>
2003	Cook 2	3/8/2003	<a href="#">3162003003</a>
1987	Crystal River 3	2/21/1987	<a href="#">3021987002</a>
1987	Crystal River 3	2/21/1987	<a href="#">3021987002</a>
1987	Crystal River 3	7/12/1987	<a href="#">3021987013</a>
1987	Crystal River 3	7/12/1987	<a href="#">3021987013</a>
1988	Crystal River 3	1/7/1988	<a href="#">3021988002</a>
1989	Crystal River 3	6/16/1989	<a href="#">3021989023</a>
1992	Crystal River 3	11/19/1991	<a href="#">3021991013</a>

FY	Plant	Date	LER
2000	Davis-Besse	6/8/2000	<a href="#">3462000005</a>
1989	Diablo Canyon 2	12/31/1988	<a href="#">3231988024</a>
1989	Diablo Canyon 2	1/17/1989	<a href="#">3231989001</a>
2003	Diablo Canyon 2	4/4/2003	<a href="#">3232003005</a>
1990	Farley 1	11/12/1989	<a href="#">3481989007</a>
1991	Farley 1	5/18/1991	<a href="#">3481991005</a>
1994	Fort Calhoun	12/9/1993	<a href="#">2851993019</a>
1991	Ginna	12/11/1990	<a href="#">2441990013</a>
1990	Haddam Neck	3/16/1990	<a href="#">2131990004</a>
1991	Haddam Neck	3/4/1991	<a href="#">2131991005</a>
1987	Harris	6/17/1987	<a href="#">4001987035</a>
1989	Harris	1/16/1989	<a href="#">4001989001</a>
1990	Harris	10/9/1989	<a href="#">4001989017</a>
1997	Harris	6/2/1997	<a href="#">4001997015</a>
1997	Harris	8/29/1997	<a href="#">4001997022</a>
1991	Indian Point 2	1/7/1991	<a href="#">2471991001</a>
1992	Indian Point 2	4/13/1992	<a href="#">2471992007</a>
1996	Indian Point 2	3/5/1996	<a href="#">2471996003</a>
1987	Indian Point 3	1/31/1987	<a href="#">2861987001</a>
1988	Indian Point 3	3/31/1988	<a href="#">2861988002</a>
1993	Indian Point 3	1/13/1993	<a href="#">2861993004</a>
1988	Kewaunee	8/31/1988	<a href="#">3051988011</a>
1990	Kewaunee	4/14/1990	<a href="#">3051990006</a>
1992	Kewaunee	4/13/1992	<a href="#">3051992010</a>
1996	Kewaunee	11/9/1995	<a href="#">3051995007</a>
1992	Maine Yankee	4/11/1992	<a href="#">3091992006</a>
1994	Maine Yankee	10/12/1993	<a href="#">3091993020</a>
1996	Maine Yankee	6/12/1996	<a href="#">3091996012</a>
1988	McGuire 1	8/17/1988	<a href="#">3691988021</a>
1989	McGuire 1	12/10/1988	<a href="#">3691988045</a>
1993	McGuire 1	12/10/1992	<a href="#">3691992011</a>
1993	McGuire 1	12/10/1992	<a href="#">3691992011</a>
1991	McGuire 2	4/22/1991	<a href="#">3701991004</a>
1988	Millstone 2	11/16/1987	<a href="#">3361987012</a>
1994	Millstone 2	1/18/1994	<a href="#">3361994001</a>
1988	Millstone 3	4/25/1988	<a href="#">4231988016</a>
1989	Millstone 3	5/11/1989	<a href="#">4231989009</a>
1990	Millstone 3	10/23/1989	<a href="#">4231989026</a>
1994	Millstone 3	9/8/1994	<a href="#">4231994011</a>
1995	Millstone 3	11/21/1994	<a href="#">4231994014</a>
1988	North Anna 1	1/8/1988	<a href="#">3381988002</a>
1992	North Anna 1	3/19/1992	<a href="#">3381992008</a>
1993	North Anna 1	4/11/1993	<a href="#">3381993014</a>
1987	North Anna 2	6/1/1987	<a href="#">3391987005</a>
1987	North Anna 2	6/1/1987	<a href="#">3391987005</a>
1993	North Anna 2	4/16/1993	<a href="#">3391993002</a>
1993	North Anna 2	4/16/1993	<a href="#">3391993002</a>
1994	North Anna 2	1/5/1994	<a href="#">3391994001</a>
1989	Oconee 1	1/2/1989	<a href="#">2691989001</a>
1992	Oconee 1	5/8/1992	<a href="#">2691992004</a>
1994	Oconee 2	2/8/1994	<a href="#">2701994001</a>
1991	Oconee 3	7/3/1991	<a href="#">2871991007</a>
1993	Oconee 3	1/26/1993	<a href="#">2871993001</a>

FY	Plant	Date	LER
1995	Palisades	6/29/1995	<a href="#">2551995006</a>
1995	Palisades	6/29/1995	<a href="#">2551995006</a>
1988	Palo Verde 1	11/27/1987	<a href="#">5281987025</a>
1988	Palo Verde 1	11/27/1987	<a href="#">5281987025</a>
1988	Palo Verde 1	3/25/1988	<a href="#">5281988013</a>
1987	Prairie Island 1	5/16/1987	<a href="#">2821987007</a>
1991	Prairie Island 2	10/9/1990	<a href="#">3061990011</a>
1991	Prairie Island 2	10/9/1990	<a href="#">3061990011</a>
1987	Robinson 2	6/15/1987	<a href="#">2611987018</a>
1992	Salem 1	8/5/1992	<a href="#">2721992019</a>
2000	Salem 1	1/6/2000	<a href="#">2722000001</a>
2000	Salem 1	1/6/2000	<a href="#">2722000001</a>
2003	Salem 1	5/23/2003	<a href="#">2722003001</a>
1998	Salem 2	7/25/1998	<a href="#">3111998012</a>
1989	San Onofre 2	1/12/1989	<a href="#">3611989001</a>
1990	San Onofre 2	8/26/1990	<a href="#">3611990012</a>
1991	San Onofre 2	9/10/1991	<a href="#">3611991014</a>
1992	San Onofre 2	2/22/1992	<a href="#">3611992007</a>
1996	San Onofre 3	3/12/1996	<a href="#">3621996001</a>
1990	Seabrook	6/20/1990	<a href="#">4431990015</a>
1996	Seabrook	5/21/1996	<a href="#">4431996003</a>
2001	Seabrook	3/5/2001	<a href="#">4432001002</a>
1989	Sequoyah 1	2/10/1989	<a href="#">3271989005</a>
1988	Sequoyah 2	3/5/1988	<a href="#">3281988012</a>
1988	Sequoyah 2	6/11/1988	<a href="#">3281988026</a>
1997	Sequoyah 2	10/11/1996	<a href="#">3281996005</a>
1988	South Texas 1	2/28/1988	<a href="#">4981988032</a>
1988	South Texas 1	2/28/1988	<a href="#">4981988032</a>
1990	South Texas 1	7/30/1990	<a href="#">4981990006</a>
1990	South Texas 1	7/30/1990	<a href="#">4981990006</a>
1992	South Texas 1	3/18/1992	<a href="#">4981992006</a>
1992	South Texas 1	3/18/1992	<a href="#">4981992006</a>
1993	South Texas 1	2/4/1993	<a href="#">4981993007</a>
1999	South Texas 1	5/19/1999	<a href="#">4981999005</a>
2003	South Texas 1	9/4/2003	<a href="#">4982003005</a>
1989	South Texas 2	4/15/1989	<a href="#">4991989013</a>
1993	South Texas 2	2/3/1993	<a href="#">4991993004</a>
1987	St. Lucie 2	4/9/1987	<a href="#">3891987003</a>
1989	St. Lucie 2	9/23/1989	<a href="#">3891989007</a>
1990	St. Lucie 2	1/14/1990	<a href="#">3891990001</a>
1996	St. Lucie 2	6/6/1996	<a href="#">3891996002</a>
2003	St. Lucie 2	4/1/2003	<a href="#">3892003001</a>
2000	Summer	9/21/2000	<a href="#">3952000006</a>
1995	Surry 1	1/8/1995	<a href="#">2801995001</a>
2003	Surry 1	1/25/2003	<a href="#">2802003002</a>
1988	Surry 2	3/27/1988	<a href="#">2811988004</a>
1988	Surry 2	5/16/1988	<a href="#">2811988010</a>
1988	Surry 2	5/16/1988	<a href="#">2811988010</a>
1997	Surry 2	2/18/1997	<a href="#">2811997001</a>
1998	Surry 2	12/2/1997	<a href="#">2811997004</a>
1999	Three Mile Isl 1	5/10/1999	<a href="#">2891999004</a>
2001	Three Mile Isl 1	1/6/2001	<a href="#">2892001001</a>
1996	Turkey Point 3	2/9/1996	<a href="#">2501996002</a>

FY	Plant	Date	LER
1997	Turkey Point 3	7/30/1997	<a href="#">2501997007</a>
1998	Turkey Point 3	2/16/1998	<a href="#">2501998001</a>
1987	Vogtle 1	3/20/1987	<a href="#">4241987009</a>
1987	Vogtle 1	4/30/1987	<a href="#">4241987020</a>
1987	Vogtle 1	6/15/1987	<a href="#">4241987036</a>
1988	Vogtle 1	10/28/1987	<a href="#">4241987062</a>
1988	Vogtle 1	4/7/1988	<a href="#">4241988008</a>
1989	Vogtle 1	2/10/1989	<a href="#">4241989005</a>
1992	Vogtle 1	9/9/1992	<a href="#">4241992007</a>
1994	Vogtle 2	10/19/1993	<a href="#">4251993007</a>
1987	Waterford 3	7/31/1987	<a href="#">3821987020</a>
2001	Watts Bar 1	9/4/2001	<a href="#">3902001002</a>
1987	Wolf Creek	9/10/1987	<a href="#">4821987037</a>
1987	Wolf Creek	9/10/1987	<a href="#">4821987037</a>
1993	Wolf Creek	5/8/1993	<a href="#">4821993010</a>
1996	Wolf Creek	1/30/1996	<a href="#">4821996001</a>
1990	Zion 1	12/18/1989	<a href="#">2951989025</a>
1990	Zion 1	1/16/1990	<a href="#">2951990002</a>
1992	Zion 1	9/9/1992	<a href="#">2951992014</a>
1992	Zion 1	9/26/1992	<a href="#">2951992016</a>
1993	Zion 1	10/21/1992	<a href="#">2951992020</a>
1994	Zion 1	6/10/1994	<a href="#">2951994008</a>
1991	Zion 2	6/8/1991	<a href="#">3041991003</a>
1994	Zion 2	3/7/1994	<a href="#">3041994002</a>
1994	Zion 2	4/7/1994	<a href="#">3041994004</a>
1994	Zion 2	4/7/1994	<a href="#">3041994004</a>
1994	Zion 2	4/7/1994	<a href="#">3041994004</a>



## 5 DESIGN CLASSES

The AFW systems analyzed can be grouped into 11 different design classes as shown in [Table 14](#). Each system typically consists of at least two independent divisions. The divisions consist of a number of different combinations of electric-motor-driven and/or turbine-driven pump trains. Electrical power, control, and instrumentation associated with each division are independent from one another. Typically, the electric-motor-driven pump trains make up one division and the turbine-driven pump train the other. Some plants have a diesel-driven pump in place of the turbine-driven pump, or a second turbine-driven pump in place of the electric-motor-driven pumps.

The AFW system is typically started automatically by the engineered safety features actuation system (ESFAS) or equivalent, depending on plant design and terminology. The ESFAS system automatic start signals include a predetermined low water level condition in one or more steam generators, a loss of the operating main feedwater pumps, a loss of electrical power on safety-related buses, and a safety injection signal. There are additional start signals, but these four are the most common. There is significant variation among the plants in how the system responds given a start signal. However, in most cases, a low-level condition in one steam generator starts only the electric-motor-driven pumps, while a low-level condition in two or more steam generators starts both the electric and turbine-driven pumps. For the plants that have two divisions consisting of one train per division (i.e., an electric-motor and turbine-driven pump train), most start signals start both pumps.

A typical AFW system is configured with two separate mechanical divisions. Each division has independent initiation and control functions, and is designed to feed all the steam generators at full capacity. One division may consist of two electric-motor-driven pumps, while the other division may have only one turbine-driven pump. Typically, in a four-steam generator plant, each electric-motor-driven pump train has the capacity to supply two steam generators, while the turbine-driven pump train can supply all four steam generators. In the two-division two-train plants, both pumps are aligned and rated to supply all the steam generators.

Feedwater flow to each steam generator is normally controlled by a flow control valve that will modulate either open or closed to maintain steam generator level. The flow control valve can be controlled either automatically or manually. A flow recirculation line is provided downstream of each pump discharge. The recirculation line allows for continuous flow back to the suction source to provide minimum flow protection for the pump. In addition, a test return line is provided downstream of each pump discharge to allow for either full or partial testing of the pumps. To limit the flow, as steam generator pressure lowers during a cool down, the system utilizes several different methods depending on plant design. Some plants use a current limiter that acts to increase downstream pump pressure thereby reducing motor amps, others use flow restricting orifices or pipe design configurations, and others use the flow control valve that modulates closed when a flow reduction signal is received.

The turbine for each turbine-driven pump is classified as an atmospheric discharge, non-condensing turbine. Typically, driving steam is supplied from the main steam lines upstream of the main steam isolation valves from at least two steam generators. (Design class 11 turbine steam supply is from one steam generator.) Each steam supply line to the turbine contains a normally closed fail-open air-operated steam isolation valve. Some plants have a dc-powered motor-operated valve. A bypass is provided around each of these isolation valves with a flow-restricting orifice and a normally-closed fail-open air-operated bypass isolation valve. The bypass provides a small, controlled rate of steam flow to the AFW turbine for warming the steam lines and turbine. Steam drain traps are provided in the low points of the steam line to drain condensate from the lines as condensate present in the steam lines could have an adverse affect on turbine reliability during an unplanned demand.

Each turbine is supplied with a hydraulic governor control valve, and a trip and throttle valve with motor reset capability. The turbine is brought up to speed by governor control upon being supplied with steam by opening the steam supply isolation valve(s). The governor then controls the turbine speed at the pump rated speed by modulating the governor control valve. The governor controlled turbine speed can be adjusted from the control room, the remote shutdown panel, or manually at the governor.

The turbine is stopped by remotely closing the trip throttle valve from the control room or the remote shutdown panel. The trip and throttle valve is automatically (electrically) tripped on turbine overspeed at 115% of rated speed. The electric overspeed trip can be reset from either the control room or remote shutdown panel. A mechanical overspeed trip also provides automatic overspeed protection at 125% of rated speed. The mechanical overspeed trip can only be reset at the trip and throttle valve.

Feedwater is supplied to both divisions through either a single condensate storage tank with separate suction supply lines or two storage tanks with redundant supply lines. Each tank typically will have its level maintained above the minimum volume needed to provide a net positive suction head to the pumps and allow for 6 hours of system operation. For extended operation of the system or as a backup for the storage tanks, an ensured source of water is provided from a service water system. The switchover to the ensured source can be accomplished by either an automatic re-alignment of the suction valves based on a sensed, low-suction pressure condition or manually by operator action depending on the plant design (typical alignment at most plants is by manual capability). This switchover is not included in the models.

For the purposes of this analysis, the AFW system was partitioned into several different segments. These segments are (1) suction, (2) turbine-driven pump, (3) turbine steam supply, (4) turbine-driven pump feed control, (5) electric-motor-driven pump, (6) electric-motor-driven pump feed control, (7) diesel-driven pump, (8) diesel-driven pump feed control, (9) common feed control, and (10) steam generator feed. These segments are described in more detail below:

1. The suction segment includes all piping and valves (including valve operators) from the condensate storage tank (or equivalent based on plant terminology) to the pump suction isolation.
2. The turbine-driven pump segment includes the turbine, trip and throttle valve, governor assembly with the associated controls, the turbine steam supply isolation just upstream of the trip throttle valve, and the valve operators. Also included with this segment are the pump and associated piping from and including the suction isolation up to and including the discharge isolation valve, and associated valve operators. The minimum flow and test recirculation line is included if the associated tap off is prior to the discharge isolation valve.
3. The turbine steam supply segment includes the associated piping, valves, and valve operators from the main steam line penetrations (but not including) to the turbine steam supply isolation valve. The instrument air supply and dc power to the solenoid-operated valves were excluded.
4. The turbine-driven pump feed control segment includes the piping and valves from the pump discharge isolation up to the steam generator for plants with only one AFW injection header per steam generator or plants where AFW has no connection with the main feedwater system. For plants with more than one injection header per steam generator or AFW connects with the main feedwater system, the turbine-driven pump feed control segment includes the pump discharge isolation valve and upstream piping up to the connection point for the alternate injection path or main feedwater system. Included with the segment are the

associated valves and valve operators, the flow control valve and the control logic, and the test recirculation line where applicable.

5. The electric-motor driven pump segment includes the motor and associated breaker at the power board (excluding the power board itself). Also included with this segment are the pump and associated piping from and including the suction isolation up to and including the discharge isolation valve, and associated valve operators. The minimum flow and test recirculation line is included if the associated tap off is prior to the discharge isolation valve.
6. The electric motor driven pump feed control segment includes the piping and valves from the pump discharge isolation up the steam generator for plants with only one AFW injection header per steam generator or plants where AFW has no connection with the main feedwater system. For plants with more than one injection header per steam generator or AFW connects with the main feedwater system, the electric-motor driven pump feed control segment includes the pump discharge isolation valve and upstream piping up to the connection point for the alternate injection path or main feedwater system. Included with the segment are the associated valves and valve operators, the flow control valve and the control logic, and the test recirculation line where applicable
7. The diesel-driven pump segment includes the diesel engine, the associated fuel oil including the day tank, diesel-cooling water back to the supply isolation and the governor, and the engine starting system. Also included with this segment are the pumps and associated piping from and including the suction isolation up to and including the discharge isolation valve, and associated valve operators. The minimum flow and test recirculation line is included if the associated tap off is prior to the discharge isolation valve.
8. The diesel-driven pump feed control segment includes the piping and valves from the pump discharge isolation up to the steam generator for plants with only one AFW injection header per steam generator or plants where AFW has no connection with the main feedwater system. For plants with more than one injection header per steam generator or AFW connects with the main feedwater system, the diesel-driven pump feed control segment includes the pump discharge isolation valve and upstream piping up to the connection point for the alternate injection path or main feedwater system. Included with the segment are the associated valves and valve operators, the flow control valve and the control logic, and the test recirculation line where applicable.
9. The common feed control segment applies to plants where the turbine/diesel and electric-motor-driven pumps discharge to a shared header with flow to the steam generator being regulated in the common header. This segment includes the piping and valves from (but not including) the pump discharge isolation up to the steam generator for plants with only one AFW injection header per steam generator or plants where AFW has no connections with the main feedwater system. For plants with more than one injection header per steam generator or AFW connects with the main feedwater system, the feed control segment includes the pump discharge isolation valve and upstream piping up to the connection point for the alternate injection path or main feedwater system. Included with this segment are the associated valves and valve operators, the flow control valve and the control logic, and the test recirculation line where applicable.
10. The steam generator feed segment includes the check valve(s) and associated piping downstream of the common or turbine/motor feed segments. This segment generally

includes the last check valves in the feedwater system piping that prevent short cycling of AFW flow to the main feedwater system.

The Instrumentation and Control subsystem includes the circuits for the system initiation, operation, and the containment isolation function of the AFW turbine steam lines. However, each of the component failures in these circuits were screened to ensure that the failed component identified in the circuit was dedicated to the AFW system. Instrumentation and Control failures are implicit in the segment boundaries. That is, the segment affected by this type of failure would be recorded as a segment failure caused by instrumentation and control.

Additional components that were considered part of the AFW system are the circuit breakers at the motor control centers (MCCs) (but not the MCCs themselves). Heating, ventilating, and air conditioning systems and room cooling associated with the AFW system were also included. Losses of a specific AFW room cooler are included, but not failures within the service water system.

### **5.1.1 Design Class 1**

The AFW system configuration for Design Class 1 plants consists of one motor-driven and one turbine-driven train supplying two steam generators.

### **5.1.2 Design Class 2**

The AFW system configuration for Design Class 2 plants consists of one motor-driven and two turbine-driven trains supplying two steam generators. Overall, the two plants assigned to this design class had an operational unreliability lower than the industry average. This design class consists of Calvert Cliffs Units 1 and 2.

### **5.1.3 Design Class 3**

The AFW system configuration for Design Class 3 plants consists of two turbine-driven trains supplying two steam generators. Overall, there is only one plant (Davis-Besse) assigned to this design class.

### **5.1.4 Design Class 4**

The AFW system configuration for Design Class 4 plants consists of two motor-driven pump trains and a turbine-driven train supplying two steam generators.

### **5.1.5 Design Class 5**

The AFW system configuration for Design Class 5 plants consists of two motor-driven pump trains and a turbine-driven train supplying three steam generators.

### **5.1.6 Design Class 6**

The AFW system configuration for Design Class 6 plants consists of only three turbine-driven trains supplying three steam generators. Turkey Point Units comprise this design class.

### **5.1.7 Design Class 7**

The AFW system configuration for Design Class 7 plants consists of only one motor-driven train and a diesel-driven pump train supplying four steam generators. The Byron and Braidwood Units comprise this design class.

### **5.1.8 Design Class 8**

The AFW system configuration for Design Class 8 plants consists of a turbine-driven train and motor-driven train supplying four steam generators. Seabrook is the only plant that comprises this design class.

### **5.1.9 Design Class 9**

The AFW system configuration for Design Class 9 plants consists of two turbine-driven trains supplying four steam generators. Haddam Neck is the only plant that comprises this design class.

### **5.1.10 Design Class 10**

The AFW system configuration for Design Class 10 plants consists of two motor-driven pump trains and a turbine-driven train supplying four steam generators.

### **5.1.11 Design Class 11**

The AFW system configuration for Design Class 11 plants consists of one turbine-driven train and three motor-driven trains with each train supplying one of four steam generators. This design class is comprised of the two South Texas plants.



**Table 14. Listing of the AFW design classes, PWRs associated with each design class, the number and type of AFW trains, the number of steam generators, and the success criterion (as stated in the IPEs).**

AFW Design Class	Plant Name	Motor Trains	Turbine Trains	Diesel Trains	Total Pump Trains	Steam Generators	Success Criterion Reported in the IPE
1	Arkansas Nuclear One 2	1	1		2	2	1 of 2 trains to 1 of 2 SGs
1	Crystal River 3	1	1	1*	2	2	1 of 2 trains to 1 of 2 SGs. Crystal River 3, in 2002, added a diesel driven emergency feedwater pump to the system, functionally replacing the motor driven pump. The system now has 3 pumps - 1 TD, 1 DD, and 1 MD. The TDP and the DDP start automatically, whereas, now, the MDP is a manual start.
1	Fort Calhoun	1	1	1*	3	2	<u>1 of 2 trains or FW-54 (diesel-driven)</u> to 1 of 2 SGs; since diesel is non-safety and manual start—model as 1 of 2 trains with diesel as recovery train
1	Palo Verde 1, 2, & 3	2*	1		3	2	1 of 3 pumps to one (1 of 2) SGs; <u>one motor train (MD-N) is nonessential; so net is 1 of 2 trains</u>
1	Prairie Island 1 & 2	1	1		2	2	1 of 2 trains to 1 of 2 SGs
2	Calvert Cliffs 1 & 2	1	2		3	2	300 gpm to 1 (or 2) SGs -- <u>IPE models pumps as 1 of 4 (3 plus xtie) available</u>
3	Davis-Besse	1*	2		3	2	<u>1 of 3 trains</u> to at least 1 SG (1 of 2 SGs); the MDFP serves as the MDP train and as BU to turbines, needs to be manually started; treat the MD train as recovery if the auto turbines fail. Success is 1 of 2 safety trains to 1 of 2 SGs
4	Arkansas Nuclear One 1	1	1		2	2	1 of 2 trains to 1 of 2 SGs
4	Ginna	2	1		3	2	1 of 3 pumps to 1 of 2 SGs
4	Kewaunee	2	1		3	2	200 gpm to 1 of 2 SGs from 1 of 3 AFW pumps
4	Millstone 2	2	1		3	2	1 of 2 MDP or the steam-driven pump delivers flow to 1 of 2 SGs
4	Oconee 1, 2, & 3	2	1		3	2	1 of 3 trains to 1 of 2 SGs
4	Palisades	2	1		3	2	1 of 3 pumps to 1 of 2 SGs
4	Point Beach 1 & 2	2	1		3	2	The units have only one MDP but supplies a SG at each unit net effect is 2 MD trains; 1 of 3 trains to 1 of 2 SGs
4	San Onofre 1, 2 & 3	2	1		3	2	1 of 3 AFW pumps to 1 of 2 SGs
4	St. Lucie 1 & 2	2	1		3	2	1 of 3 AFW pumps to 1 of 2 SGs
4	Three Mile Island 1	2	1		3	2	1 of 3 pumps to 1 of 2 SGs
4	Waterford 3	2	1		3	2	Any pump (1 of 3 AFW ) to 1 of 2 SGs
5	Beaver Valley 1 & 2	2	1		3	3	1 of 3 trains to 1 of 3 SGs
5	Farley 1 & 2	2	1		3	3	1 of 3 trains to 2 of 3 SGs
5	Harris 1	2	1		3	3	1 of 3 trains to 1 of 3 SGs
5	Maine Yankee	2	1		3	3	1 of 3 trains to 1 of 3 SGs (2 of 2 pumps with flow diversion)
5	North Anna 1 & 2	2	1		3	3	1 of 3 trains to 1 of 3 SGs
5	Robinson	2	1		3	3	1 of 3 pumps to 1 of 3 SGs
5	Summer 1	2	1		3	3	1 of 2 MDPs OR 1 TDP to 1 of 3 SGs
5	Surry 1 & 2	2	1		3	3	1 of 3 pumps to any one SG

AFW Design Class	Plant Name	Motor Trains	Turbine Trains	Diesel Trains	Total Pump Trains	Steam Generators	Success Criterion Reported in the IPE
6	Turkey Point 3 & 4		3		3	3	1 of 3 pumps to at least 1 of 3 SGs (375 gpm)
7	Braidwood 1 & 2	1		1	2	4	1 of 2 trains to 1 of 4 SGs
7	Byron 1 & 2	1		1	2	4	1 of 2 trains to 1 of 4 SGs
8	Seabrook	1	1		2	4	PRA states 1 of 2 pumps to 2 of 4 SGs
9	Haddam Neck		2		2	4	(1 of 2 AFW pumps to 3 of 4 SGs) OR (2 of 2 pumps to 2 of 4 SGs)
10	Callaway	2	1		3	4	1 of 3 trains delivering flow to at least 2 SGs
10	Catawba 1 & 2	2	1		3	4	1 of 3 trains to 2 SGs
10	Comanche Peak 1 & 2	2	1		3	4	At least 300 gpm (1 of 3 trains) to 1 of 4 SGs; also have a 860 gpm (2 of MDP to 1 of 4 SGs or 1 TDP flow to 2 SGs); full flow--3 of 3 pumps with MDPs to 1 SG and TDP to 2 SGs
10	Cook 1 & 2	2	1		3	4	450 gpm AFW flow (1 of 3 trains) to 2 of 4 SGs
10	Diablo Canyon 1 & 2	2	1		3	4	1 of 3 trains to 1 of 4 SGs
10	Indian Point 2	2	1		3	4	1 of 3 AFW pumps to 1 SG
10	Indian Point 3	2	1		3	4	1 of 3 trains injecting to 1 of 4 SGs
10	McGuire 1 & 2	2	1		3	4	1 of 3 trains to 2 of 4 SGs
10	Millstone 3	2	1		3	4	1 of 3 pumps to any 2 of 4 SGs
10	Salem 1 & 2	2	1		3	4	426 gpm flow (1 of 3 pumps) to 2 SGs (MDP 440 gpm; TDP 880 gpm)
10	Sequoyah 1 & 2	2	1		3	4	at least one pump (1 of 3) feeding 2 SGs
10	Vogtle 1 & 2	2	1		3	4	Flow to 2 of 4 SGs from 1 of 2 MDPs or 1 TDP
10	Watts Bar	2	1		3	4	1 of 3 trains to 2 of 4 SGs
10	Wolf Creek	2	1		3	4	1 of 3 trains to 2 of 4 SGs
10	Zion 1 & 2	2	1		3	4	1 of 3 pumps to 4 of 4 SGs or 1 of 4 SGs w/o all power. Page 4-48 states 1 MDP supplying 2/4 SGs is enough to safely cool down plant to RHR temp.
11	South Texas 1 & 2	3	1		4	4	1 of 4 AFW trains to 1 of 4 SGs (pump flow to its respective SG) no xtie to other SGs modeled in PRA

Note: \* denotes plants that used non-safety pump trains as part of the IPE success criteria.