TEMPORARY INSTRUCTION 2515/156

OFFSITE POWER SYSTEM OPERATIONAL READINESS

CORNERSTONE: INITIATING EVENTS
MITIGATING SYSTEMS

APPLICABILITY: This Temporary Instruction (TI) applies to all holders of operating licenses for nuclear power reactors, except nuclear power reactors that have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

2515/156-01 OBJECTIVE

The objective of this TI is to confirm, through inspections and interviews, the operational readiness of offsite power (OSP) systems in accordance with NRC requirements prescribed in Appendix A to 10 CFR Part 50, General Design Criterion (GDC) 17; Criterion XVI of Appendix B to10 CFR Part 50; Plant Technical Specifications for offsite power systems; 10 CFR 50.63; and 10 CFR 50.65 (a)(4).

2515/156-02 BACKGROUND

The NRC staff has issued a Regulatory Issue Summary (RIS) 2004-05 (NRC ADAMS Accession Number ML 040990550) to advise nuclear power plant (NPP) licensees of the current NRC requirements to maintain operational readiness of the OSP system following the August 14, 2003 power outage. The safety-related distribution system at NPPs are powered from a minimum of two offsite transmission lines (the offsite power system) and redundant onsite emergency power supplies. The loss of all offsite power to the safety-related buses is considered a loss of offsite power (LOOP). The loss of all alternating current (AC) power at NPPs involves the LOOP combined with the loss of the onsite emergency power supplies (typically emergency diesel generators (EDGs)). This is also referred to as a station blackout (SBO). Risk analyses performed for NPPs indicate that the loss of all AC power can be a large contributor to the core damage frequency. Although NPPs are designed to cope with a LOOP event through the use of onsite emergency power supplies, LOOP events are considered to be precursors to SBO. Therefore, an increase in the frequency or duration of LOOP events increases the risk of core damage. LOOP events have three initiators. These are either plant centered,

weather related or grid centered events. The primary focus of this TI is on grid centered events.

On August 14, 2003, the largest power outage in the history of the United States occurred in the Northeastern United States (U.S.) and parts of Canada. Nine U.S. NPPs were disconnected from the electrical grid. Eight of these, along with one NPP that was already shut down, lost offsite power. Although the onsite EDGs functioned as designed to maintain safe shutdown conditions, this event was significant in terms of the number of plants which were affected and the duration of the power outage.

In a previous event, Callaway nuclear plant experienced degraded voltage levels in the OSP supply following a plant trip on August 11, 1999. The root cause was large power flows across the transmission system, which did not have adequate reactive power support to maintain normal voltages following the trip of the Callaway plant. This power flow, coupled with high local demand and the loss of the Callaway generator, resulted in switchyard voltage at the site dropping below the minimum requirements for greater than 12 hours. Although OSP remained available during the reactor trip transient, the post-trip analysis indicated that if there had been additional onsite electrical loads at the time of the event, the plant degraded voltage relays would have separated the safety buses from OSP.

The NRC has been evaluating the reliability of OSP for NPPs over the last several years as a result of the changing nature of the surrounding electrical grids. The switchyard degraded voltage condition at the Callaway nuclear plant on August 11, 1999 was attributed to the deregulated wholesale market that has contributed to conditions in which higher grid power flows are likely to occur. The NRC staff has been working with the nuclear power industry on concerns identified in NRC Regulatory Issue Summary 2000-24 regarding OSP voltage inadequacies and grid reliability challenges. Subsequently, the August 14, 2003 U.S. - Canadian power outage has given rise to concerns about the condition of OSP.

Grid operators run real-time system models, updated frequently - usually every few minutes, to predict the response of the grid to post-contingencies (anticipatory contingencies), i.e., loss of a generator, transformer, transmission line, etc. This allows the grid operator to predict voltages across the grid system (including the NPP switchyard) if an anticipatory contingency were to occur.

2515/156-03 INSPECTION REQUIREMENTS

Using inspection and interviews, inspector should answer the questions in the attachment regarding the licensee actions that support the operational readiness of offsite power (OSP) systems in accordance with NRC requirements such as Appendix A to 10 CFR Part 50, General Design Criterion (GDC) 17; Appendix B to10 CFR Part 50, Criterion XVI; Plant Technical Specifications for offsite power systems; 10 CFR 50.63; and 10 CFR 50.65 (a)(4). Three questions in Section 03.03 have been identified as “Key” questions and listed separately on the attached worksheet page A-1. Responses to these questions are needed to assess NPP operational readiness for summer of 2004. See Section 05 for other reporting requirements.

03.01 Maintenance Rule (10 CFR 50.65)

1. Determine how the licensee obtains and assesses grid reliability (i.e., how stressed is the grid) and the probability of losing OSP when that information is required for a 10 CFR 50.65(a)(4) assessment. Specifically, determine if the assessments include input from the regional transmission organization (RTO) operator (or may also be referred to as the transmission system operator (TSO)) on the projected state of the grid over the course of the period covered by the risk assessment.

2. Determine if these assessments include the grid anticipatory contingency as well as existing grid conditions, as discussed in Background Section above.

3. Ascertain if the NPP coordinates onsite emergency AC power sources such as an EDG surveillance and maintenance outage, with the RTO/TSO.

4. If the 10 CFR 50.65(a)(4) risk assessment includes a probability of losing OSP, determine what is the out-of-service time assumed by the NPP 10 CFR 50.65(a)(4) analysis or risk model for return of the OSP.

5. Determine what, if any, risk management actions the NPP establishes with respect to grid condition and switchyard work during times of EDG maintenance or on-line EDG testing. (Do the risk management actions include actions to minimize magnitude of risk increase such as prohibiting unnecessary switchyard activities.)

6. Determine what, if any, restrictions are placed on EDG maintenance or on-line EDG testing based on the season or grid condition.

7. Determine how the OSP is scoped in the Maintenance Rule (risk significant or not) and the basis for scoping.

8. Determine what are the boundaries of the OSP included in the scope of the maintenance rule and the basis for boundaries.

03.02 Station Blackout (10 CFR 50.63)

1. Confirm the NPP grid related LOOP data (over the last 20 years) as indicated in Attachment B. How many of the LOOPs experienced by the unit related to severe weather, plant centered, or grid centered events?

2. Confirm the NPP experience in LOOP recovery time as indicated in Attachment B.

3. Determine during what season of the year the LOOPs were experienced (e.g., summer, winter, hurricane/ tornado seasons).

03.03 Offsite Electric Power Operability (10 CFR 50, Appendix A, General Design Criterion 17, Appendix B, Criterion III, and Technical Specifications)

1. Determine if the communication protocol agreements that exist between the nuclear power plants (NPPs) and the RTO/TSO are enforced by formal contract or other means.

   Key Question: Determine if the agreements in place include notification requirements to inform the NPP when the grid is stressed to the point that a trip of the NPP would result in inadequate post-trip switchyard voltages (less than the design basis voltage) for either actual grid condition or potential (i.e., anticipatory contingency) grid conditions within any predetermined time limits. How is the NPP operator warned of the potential problem? Provide a brief discussion.

2. Does the licensee monitor and record the minimum transient and steady-state voltages at the safety-related bus (voltage level monitored by the degraded voltage relays) following each plant trip from the grid ? Record the results of the last trip from power if easily obtained.

   Key Question: Does the agreement between the licensee and the RTO/TSO include the required voltage range and the post-trip load from the NPP that will be connected to the grid? Provide a brief discussion including how the voltage range relates to the safety bus degraded voltage relay setpoint.

   Key Question: How often does the RTO/TSO calculate post-trip voltage at the NPP? Provide a brief discussion.

3. Determine how and how often the NPP confirms the allowable range of switchyard voltage(s) with the RTO/TSO.

4. Determine if the NPP operator is able to directly monitor projected post-trip switchyard voltages to determine if the voltages would be adequate to support the safety-related systems and components. (i.e., Not below the design basis minimum switchyard voltages without the main generator MVA support)

5. Does the licensee consider the impact of the loss of the NPP unit on the grid?

6. Determine if the status of plant and/or nearby transmission voltage regulating equipment (e.g., automatic load tap changing equipment for transformers, capacitor banks or other reactive power compensating equipment) are monitored and included in determinations of offsite power operability required by the plant Technical Specifications.

03.04 Corrective Actions

1. Determine whether any action item was captured by the licensee's corrective action program as a result of industry operating experience associated with the grid event of August 14, 2003.

2. If the grid event was entered into the corrective action program, determine what actions have been/will be taken to address offsite power reliability (LOOP frequency and time for recovery of offsite power).

Specific Guidance

04.01 Maintenance Rule (MR)

10 CFR 50.65(a)(4) requires that "Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. The scope of the assessment may be limited to structures, systems, and components that a risk-informed evaluation process has shown to be significant to public health and safety."

The Maintenance Rule therefore requires licensees to assess and manage plant risk related to maintenance activities during all modes of plant operation. Risk is assessed and managed for both scheduled maintenance and emergent work. Risk management minimizes risk-significant configurations and initiating events and maximizes availability of mitigating systems and barriers to radiological releases.

The RTO/TSO maintains a real-time system model to look into the future to predict the system condition following different contingencies (such as loss of the NPP, loss of the largest generating unit, loss of a transformer, loss of a transmission path, etc.) These post-contingency event results show what voltages could be expected at the NPP following a grid transient.

The baseline inspection procedure 71111.13 provides additional guidance regarding the implementation of 10 CFR 50.65(a)(4).

04.02 Station Blackout Rule

10 CFR 50.63(a)(1) requires that "Each light-water-cooled nuclear power plant licensed to operate must be able to withstand for a specified duration and recover from a station blackout as defined in §§ 50.2. The specified station blackout duration shall be based on the following factors:

(1) The redundancy of the onsite emergency ac power sources;

(2) The reliability of the onsite emergency ac power sources;

(3) The expected frequency of loss of offsite power; and

(4) The probable time needed to restore offsite power."

Guidance for meeting the SBO rule was provided in Reg. Guide 1.155, Station Blackout. That guide primarily addressed the following three areas:

(1) Maintaining highly reliable ac electric power systems,

(2) Developing procedures and training to restore offsite and onsite emergency ac power should either one become unavailable, and

(3) Ensuring that plants can cope with a station blackout for some period of time based on the probability of occurrence of a station blackout at a site as well as the capability for restoring ac power in a timely fashion for that site.

Regulatory Position 1.1, Emergency Diesel Generator Target Reliability Levels, establishes two target reliability groups for use in the SBO rule.

Regulatory Position 2, OFFSITE POWER, states "Procedures should include the actions necessary to restore offsite power and use nearby power sources when offsite power is unavailable. As a minimum, the following potential causes for loss of offsite power should be considered:

- Grid undervoltage and collapse
- Weather-induced power loss
- Preferred power distribution system faults that could result in loss of the normal power to essential switchgear buses."

Regulatory Position 3.1, Minimum Acceptable Station Blackout Duration Capability, states "Each nuclear power plant should be able to withstand and recover from a station blackout lasting a specified minimum duration. The specified duration of station blackout should be based on the following factors:

(1) The expected frequency of loss of offsite power, and

(2) The probable time needed to restore offsite power."

LOOP represents a significant area of risk for NPPs. One of the critical factors for recovery from station blackout is the time to restore OSP. Licensees' operations/abnormal operations procedures address recovery actions from a LOOP or an SBO.

04.03 Offsite Electric Power Operability

General Design Criterion 17, Electric Power Systems, requires that provisions shall be included to minimize the probability of losing electric power from the transmission network as a result of, or coincident with, the loss of power generated by the nuclear plant. Standard Review Plan (SRP), NUREG-0800, Section 8.2, Offsite Power System, Area of Review I.4, describes the review of the preferred power supply instrumentation required for monitoring and indicating the status of the preferred power supply to assure that any change in the preferred power system which would prevent it from performing its intended function will be immediately identified by the control room operator. SRP Draft Rev. 3 (April 1996), Section 8.1, Table 8-2, NRC Staff interpretation of the Requirements of GDC 17, item f, interprets the "...minimize the probability of losing electric power..." in the last paragraph of GDC 17 as "Analyses (performed by the utility) must verify that the grid remains stable in the event of loss of the nuclear unit generator, the largest other unit on the grid or the most critical transmission line. Branch Technical Position PSB-1, Adequacy of Electric Distribution System Voltages, states that the safety-related voltage sensors shall

automatically initiate the disconnection of offsite power sources whenever the degraded-voltage setpoint and time delay limits have been exceeded.

10 CFR 50 Appendix B, Criterion III, Design Control, requires, in part, that measures shall be established for the control of design interfaces. It also requires that design changes, including field changes, be subject to design control measures. The allowable range of the switchyard voltage is a design input for the safety-related calculation of the degraded voltage relay setpoints and must be a controlled input.

Unrecognized changes to risk-significant structures, systems, or components (SSCs) may adversely affect their availability, reliability or functional capability and may evolve into high risk configurations. A change in grid parameters (such as the allowable range of switchyard voltage) during certain stress periods on the transmission system may result in a departure from the design basis and system success criteria. Improperly evaluated degraded and/or non-conforming conditions may result in continued operation with an SSC that is not capable of performing its design function.

The baseline inspection procedure 71111.15 provides additional guidance regarding review of licensee's operability evaluations.

04.04 Corrective Action

See baseline inspection procedure 71152, "Identification and Resolution of Problems," for additional guidance.

2515/156-05 REPORTING REQUIREMENTS

Those questions identified as "Key" questions, and listed separately on worksheet page A-1, should be returned to NRR as soon as responses are available, but no later than June 01, 2004. Compile the completed worksheets electronically and forward them to NRR/DE, to the attention of Phil Ray via e-mail to PMR@nrc.gov no later than June 25, 2004.

Document inspection results in a resident inspectors' routine inspection report (i.e., quarterly integrated inspection report). At a minimum, the inspectors should be able to briefly describe the areas reviewed and results of the inspection in Section 4OA5, "Other," of the integrated inspection report. (This is an interim deviation from the requirements of IMC 0612).

Any findings identified during this inspection will be processed and documented in accordance with NRC Inspection Manual Chapter (IMC) 0612, "Power Reactor Inspection Reports." Significance of inspection findings should be evaluated in accordance with applicable appendices of IMC 0609, "Significance Determination Process." Any noncompliance resulting from this inspection will be evaluated and documented in accordance with NRC Enforcement Policy (NUREG -1600) and Section 3.12 of the NRC Enforcement Manual.

2515/156-06 COMPLETION SCHEDULE

This TI will be completed no later than June 25, 2004.

2515/156-07 EXPIRATION

This TI will expire on April 30, 2005.

2515/156-08 CONTACTS

For technical support regarding the performance of this TI and emergent issues, contact Ronaldo Jenkins at 301-415-2985 or George Morris at 301-415-4074. For administrative/reporting/documentation questions, contact Phillip Ray at 301-415-2972 or Roy Mathew at 301-415-2965.

2515/156-09 STATISTICAL DATA REPORTING

All direct inspection effort expended on this TI is to be charged to 2515/156 for reporting by the STARFIRE/HRMS system with an IPE code of SI.

2515/156-10 ORIGINATING ORGANIZATION INFORMATION

10.01 Organizational Responsibility

This TI was initiated by the Electrical and Instrumentation & Controls Branch (NRR/DE/EEIB).

10.02 Resource Estimate

The estimated direct inspection effort to perform this TI is estimated to be 16-20 hours per site.

10.03 Training

No specialized training is needed to perform inspection requirements in this TI beyond basic training for inspectors (specified in IMC 1245, "Inspector Qualifications"). However, if technical support is needed during the inspection, contact EEIB technical contact stated in this TI.

2515/156-11 REFERENCES

RIS 2004-05, “Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power” (ADAMS Accession No. ML040990550)

RIS 2000-24, “Concerns about Offsite Power Voltage Inadequacies and Grid Reliability Challenges Due to Industry Deregulation” (ADAMS Accession No. ML003695551)

Information Notice 2000-06, “Offsite Power Voltage Inadequacies” (ADAMS Accession No. ML003695551)

Regulatory Guide (RG) 1.155, “Station Blackout” (ADAMS Accession No. ML003740034)

NUMARC 87-00, “Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors”

NUREG-1776, “Regulatory Effectiveness Of The Station Blackout Rule”

NUREG-1784, “Operating Experience Assessment - Effects Of Grid Events On Nuclear Power Plant Performance”

END

Attachment A, “Grid TI Worksheet”
Attachment B, “LOOP Events”

GRID TI WORKSHEET **PLANT NAME:**

Area of Questions	Potential Areas of Interface		Document Result of Review
	Engineering	Operations	
Key Questions			
I. Determine if the agreements in place include notification requirements to inform the NPP when the grid is stressed to the point that a trip of the NPP would result in inadequate post-trip switchyard voltages (less than the design basis voltage) for either actual grid condition or potential (i.e., anticipatory contingency) grid conditions within any predetermined time limits. How is the NPP operator warned of the potential problem? Provide a brief discussion.	X	X	__yes __no Any Response Time Requirements __yes __no Allowable Time Delay For RTO/TSO To Required notification time to NPP ____minutes Discussion_____ _____ _____
II. Does the agreement between the licensee and the regional transmission organization (RTO/TSO) include the required voltage range and the post-trip load from the NPP that will be connected to the grid? Provide a brief discussion including how the voltage range relates to the safety bus degraded voltage relay setpoint.	X	X	Operating Voltage __yes __no Shutdown Voltage __yes __no Post-Trip Load __yes __no Discussion _____ _____ ___
III. How often does the RTO/TSO calculate post-trip voltage at the nuclear power plant (NPP)? Provide a brief discussion.	X	X	__Every few minutes __Hourly __As requested by the NPP __Other (describe) _____ Discussion_____

GRID TI WORKSHEET **PLANT NAME:**

Area of Questions	Potential Areas of Interface			Document Result of Review
	Engineering	Operations	Maintenance/ Testing	
A. 10 CFR 50.65 (a)(4), Maintenance Rule				
1. Does licensee obtain current grid condition information from the RTO/TSO prior to maintenance on risk significant equipment as required by 10 CFR 50.65(a)(4)? Provide a brief discussion.		X	X	__yes __no Discussion _____ _____ _____ _____
2. Does the review address potential post-contingency grid conditions (i.e.,degraded grid)?		X	X	__yes __no Comments:
3. Is emergency onsite power source such as emergency diesel generator (EDG) maintenance/surveillance coordinated with the RTO/TSO?		X	X	__yes __no Comments:
4.Is the loss of offsite power (OSP) assumed in the 10 CFR 50.65(a)(4) review? If so, what recovery (out-of-service) time is assumed in the risk model?	X		X	__ yes __ no Time _____
5.a. Are risk management actions put in place for EDG out-of-service for maintenance/test?		X	X	__yes __no Comments:
5.b. Do the risk management actions include prohibiting unnecessary switchyard activities?		X	X	__yes __no Comments:

GRID TI WORKSHEET PLANT NAME:

Area of Questions	Potential Areas of Interface			Document Result of Review
	Engineering	Operations	Maintenance/ Testing	
6. Are there any seasonally based restrictions on EDG maintenance/test?		X	X	__yes __no Comments:
7. How is the OSP system scoped in the Maintenance Rule (MR) and the basis for scoping.?	X			__ Risk Significant __ Not Risk Significant __ Not in scope of MR Basis_____
8. What are the boundaries of the OSP included in the Maintenance Rule and the basis for boundaries?	X			__ Beyond Switchyard Boundaries __ Entire Switchyard __ Selected Equipment in the Switchyard __ Out to the high voltage bushings of the Reserve or Standby Station Auxiliary Transformers Basis _____ _____ _____ _____ _____

GRID TI WORKSHEET **PLANT NAME:**

Area of Questions	Potential Areas of Interface			Document Result of Review
	Engineering	Operations	Maintenance/ Testing	
B. 10 CFR 50.63, Station Blackout (SBO)				
1.a. Confirm the NPP grid related LOOP data (over the last 20 years) as indicated in Attachment B.	X	X		__yes __no
1.b. Record number of LOOPs that have been experienced.	X	X		__ LOOPs in Last 20 years
1.c. How many of the LOOPs experienced by the unit related to severe weather, plant centered, or grid centered events?	X	X		__severe weather __plant centered __grid centered Comments:
2. Confirm the NPP experience in LOOP recovery time as indicated in Attachment B (denoted by unit recovery time).		X		__ Recovery Time Comments:
3. What season of the year as defined by licensee were the LOOP experienced? (Check all that apply)		X		__ Summer __ Winter __ Hurricane __ Tornado Comments:

GRID TI WORKSHEET **PLANT NAME:**

Area of Questions	Potential Areas of Interface			Document Result of Review
	Engineering	Operations	Maintenance/ Testing	
C. Offsite Electric Power Operability **(10 CFR50.36, Technical Specifications / 10 CFR 50, Appendix A, GDC 17, Electric Power System)**				
1. What communication protocols agreement exist between the NPP and the RTO/TSO?		X		Protocol Exist? __yes __no Type: __Contract __Procedure __Informal Comments:
2. Does the licensee monitor and record the minimum transient and steady-state voltages at the safety-related bus (voltage level monitored by the degraded voltage relays) following each plant trip from the grid ? Record the results of the last trip from power if easily obtained.	X	X		Date of last recorded trip data: ___/___/_____ Minimum Transient Voltage _____ Steady State Voltage _____ Degraded Voltage Relay Setpoint Voltage _____ Time Delay _____ _____

GRID TI WORKSHEET **PLANT NAME:**

Area of Questions	Potential Areas of Interface			Document Result of Review
	Engineering	Operations	Maintenance/ Testing	
3. Determine how often the NPP confirms with the RTO/TSO the RTO/TSO's allowable range of voltages at the NPP switchyards.	X			__Annually __Each Refueling Outage __Every Five Years __No Required Update
4. Determine if the NPP operator is able to directly monitor projected post-trip switchyard voltages to determine if the voltages would be adequate to support the safety-related systems and components. (i.e., Not below the design basis minimum switchyard voltages without the main generator MVA support)	X	X		___yes ___no Comments:
5. Does the licensee consider the impact of the loss of the NPP unit on the grid ?		X	X	__yes __no ___Increased Load ___Loss of Voltage Support Comments:

GRID TI WORKSHEET **PLANT NAME:**

Area of Questions	Potential Areas of Interface			Document Result of Review
	Engineering	Operations	Maintenance/ Testing	
6. a. How does the NPP operator assure OSP operability? (Check all that apply)		X		__ Breaker position __ Degraded voltage relay __ Confirmation from RTO/TSO __ Voltmeter Reading __ Other (Describe)_____
6.b. Are plant or switchyard voltage regulating equipment (e.g., automatic load tap changers, capacities banks, reactive power compensators) monitored and included in OSP operability?		X		__yes __no Comments:

GRID TI WORKSHEET **PLANT NAME:**

Area of Questions	Potential Areas of Interface			Document Result of Review
	Engineering	Operations	Maintenance/ Testing	
D. 10 CFR 50 Appendix B, Criterion XVI, Corrective Action				
1.a. Was the industry operating experience associated with the Grid Event of 8/14/2003 captured in the licensee's Corrective Action Program (CAP) and assessed for applicability to the licensee's NPPs? When? 1.b. List the major corrective actions.	X	X		__yes __no Date Entered into CAP _____ Source:_____ __ Improve RTO/TSO Communications __ Review SBO Assumptions __Review Switchyard Voltage Limits __Review OSP Design Interface
2. Did the CAP response look at LOOP frequency and OSP recovery time as it relates to the licensee's units?	X	X		LOOP Frequency__yes __no Coping Time __yes __no Comments:

LOOP Events 4/27/2004

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	LER NUMBER	UNIT NAME	Docket	Event Date	UNIT MODE	Event Category	Unit Effective Status	Switchyard Time	Unit Recovery Time	Unit Restoration Time	Consequential LOOP?	Cause Group	Specific Cause
2	3131980013	ARKANSAS 1	313	07-Apr-80	UN	Weather Related	Trip		1		FALSE	EEE	Tornado
3	3131980013	ARKANSAS 1	368	07-Apr-80	UN	Weather Related	Trip		1		FALSE	EEE	Tornado
4	3131980022	ARKANSAS 1	313	24-Jun-80	UN	Plant Centered	Trip		0		FALSE	Equip	Breaker
5	3131980022	ARKANSAS 1	368	24-Jun-80	UN	Plant Centered	Trip		0		FALSE	Equip	Breaker
6	3341993013	BEAVER VALLEY 1	412	12-Oct-93	PO	Plant Centered	Shutdown		15		FALSE	HES	Maintenance
7	3341993013	BEAVER VALLEY 1	334	12-Oct-93	PO	Plant Centered	Trip		10		FALSE	HES	Maintenance
8	4121987036	BEAVER VALLEY 2	412	17-Nov-87	PO	Plant Centered	Trip		4		FALSE	Equip	Breaker
9	1551992000	BIG ROCK POINT	155	29-Jan-92	UN	Plant Centered	Shutdown		77		FALSE	Equip	Other
10	4561987048	BRAIDWOOD 1	456	11-Sep-87	CD	Plant Centered	Shutdown*		53		FALSE	Equip	Transformer
11	4561988022	BRAIDWOOD 1	456	16-Oct-88	PO	Plant Centered	Trip		95		FALSE	Equip	Breaker
12	4561998003	BRAIDWOOD 1	456	06-Sep-98	CD	Weather Related	Shutdown	528	528	528	FALSE	SEE	High Winds
13	4571996001	BRAIDWOOD 2	457	18-Jan-96	PO	Plant Centered	Power Op		113		FALSE	SEE	High Winds
14	2591980019	BROWNS FERRY 3	296	01-Mar-80	UN	Plant Centered	Power Op		6		FALSE	SEE	High Winds
15	2961997001	BROWNS FERRY 3	296	05-Mar-97	RF	Plant Centered	Shutdown	56	56	56	FALSE	Equip	Transformer
16	3251983023	BRUNSWICK 1	325	26-Apr-83	UN	Plant Centered	Shutdown		17		FALSE	HES	Testing
17	3251986024	BRUNSWICK 1	325	13-Sep-86	PO	Plant Centered	Trip		1		FALSE	HE	Maintenance
18	3252000001	BRUNSWICK 1	325	03-Mar-00	CD	Plant Centered	Shutdown	136	136	136	FALSE	HES	Testing
19	3241989009	BRUNSWICK 2	324	17-Jun-89	PO	Plant Centered	Trip		90		FALSE	HE	Maintenance
20	3251993008	BRUNSWICK 2	324	16-Mar-93	HD	Weather Related	Shutdown		814		FALSE	SEE	Salt Spray
21	3251993008	BRUNSWICK 2	325	16-Mar-93	HD	Weather Related	Shutdown		1508		FALSE	SEE	Salt Spray
22	3241994008	BRUNSWICK 2	324	21-May-94	RF	Plant Centered	Shutdown		2		FALSE	HES	Testing
23	4541996007	BYRON 1	454	23-May-96	CD	Plant Centered	Shutdown*		1		FALSE	Equip	Transformer
24	4541998017	BYRON 1	454	04-Aug-98	PO	Switchyard Centered	Power Op	0	501	2213	FALSE	SEE	Lightning
25	4551987019	BYRON 2	455	02-Oct-87	PO	Plant Centered	Shutdown*		1		FALSE	HES	Switching
26	3171987012	CALVERT CLIFFS 2	318	23-Jul-87	PO	Plant Centered	Trip		118		FALSE	Equip	Circuits
27	3171987012	CALVERT CLIFFS 2	317	23-Jul-87	PO	Plant Centered	Trip		118		FALSE	Equip	Circuits
28	4141996001	CATAWBA 2	414	06-Feb-96	PO	Plant Centered	Trip		330		FALSE	Equip	Transformer
29	4611999002	CLINTON 1	461	06-Jan-99	HD	Plant Centered	Shutdown*	161	492	492	FALSE	Equip	Other
30	3971989016	COLUM. NUCLEAR 2	397	14-May-89	CD	Plant Centered	Shutdown		29		FALSE	HES	Maintenance
31	3151991004	COOK 1	315	12-May-91	PO	Plant Centered	Trip		1		FALSE	Equip	Other
32	3021981033	CRYSTAL RIVER 3	302	16-Jun-81	UN	Plant Centered	Trip		0		FALSE	SEE	Lightning
33	3021984003	CRYSTAL RIVER 3	302	28-Feb-84	UN	Plant Centered	Trip		2		FALSE	Equip	Transformer
34	3021987025	CRYSTAL RIVER 3	302	16-Oct-87	RF	Plant Centered	Shutdown		59		FALSE	HES	Maintenance
35	3021989023	CRYSTAL RIVER 3	302	16-Jun-89	PO	Plant Centered	Shutdown*		60		FALSE	HES	Testing
36	3021989025	CRYSTAL RIVER 3	302	29-Jun-89	HS	Plant Centered	Shutdown*		2		FALSE	SEE	Lightning
37	3021991010	CRYSTAL RIVER 3	302	20-Oct-91	CD	Plant Centered	Shutdown		4		FALSE	HES	Other
38	3021992001	CRYSTAL RIVER 3	302	27-Mar-92	PO	Plant Centered	Trip		20		FALSE	HE	Maintenance
39	3021993000	CRYSTAL RIVER 3	302	13-Mar-93	UN	Weather Related	Shutdown		0		FALSE	SEE	Salt Spray
40	3021993000	CRYSTAL RIVER 3	302	13-Mar-93	UN	Weather Related	Shutdown		72		FALSE	SEE	Salt Spray
41	3021993002	CRYSTAL RIVER 3	302	29-Mar-93	CD	Weather Related	Shutdown		37		FALSE	SEE	Flooding
42	3021993004	CRYSTAL RIVER 3	302	08-Apr-93	CD	Plant Centered	Shutdown		136		FALSE	HES	Maintenance
43	3461998006	DAVIS-BESSE	346	24-Jun-98	PO	Weather Related	Trip	1359	1560	1603	FALSE	EEE	Tornado
44	3462000004	DAVIS-BESSE	346	22-Apr-00	UN	Plant Centered	Shutdown*	10	10	10	FALSE	HES	Testing
45	3462003009	DAVIS-BESSE	346	14-Aug-03	CD	Grid Centered	Shutdown*	652	849	1337	FALSE	G	Other - load
46	2751991004	DIABLO CANYON 1	275	07-Mar-91	RF	Plant Centered	Shutdown		240		FALSE	HES	Maintenance
47	2751995014	DIABLO CANYON 1	275	21-Oct-95	RF	Plant Centered	Shutdown		917		FALSE	HES	Maintenance

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	A	B	C	D	E	F	G	H	I	J	K	L	M
48	2752000004	DIABLO CANYON 1	275	15-May-00	PO	Plant Centered	Trip	443	1980	1996	FALSE	Equip	Other
49	3231988008	DIABLO CANYON 2	323	17-Jul-88	PO	Plant Centered	Trip		38		FALSE	Equip	Transformer
50	2371985034	DRESDEN 2	237	16-Aug-85	UN	Plant Centered	Trip		5		FALSE	Equip	Transformer
51	2371990002	DRESDEN 2	237	16-Jan-90	UN	Plant Centered	Trip*		45		FALSE	Equip	Transformer
52	2491989001	DRESDEN 3	249	25-Mar-89	PO	Plant Centered	Trip		45		FALSE	Equip	Breaker
53	3311984028	DUANE ARNOLD	331	14-Jul-84	UN	Grid Centered	Trip*		1		FALSE	G	Equip - other
54	3311990007	DUANE ARNOLD	331	09-Jul-90	UN	Plant Centered	Shutdown		37		FALSE	HES	Testing
55	3481981001	FARLEY 1	348	16-Jan-81	UN	Plant Centered	Shutdown		0		FALSE	HES	Maintenance
56	3482000005	FARLEY 1	348	09-Apr-00	RF	Plant Centered	Shutdown*	19	19	55	FALSE	Equip	Relay
57	3641983047	FARLEY 2	364	08-Oct-83	UN	Plant Centered	Shutdown		163		FALSE	Equip	Breaker
58	3412003002	FERMI 2	341	14-Aug-03	PO	Grid Centered	Trip	379	582	1281	FALSE	G	Other - load
59	3331988011	FITZPATRICK	333	31-Oct-88	UN	Weather Related	Shutdown		1.5		FALSE	SEE	High Winds
60	3332003001	FITZPATRICK	333	14-Aug-03	PO	Grid Centered	Trip	167	414	435	FALSE	G	Other - load
61	2851987008	FORT CALHOUN	285	21-Mar-87	RF	Plant Centered	Shutdown		37		FALSE	HES	Maintenance
62	2851987009	FORT CALHOUN	285	04-Apr-87	CD	Plant Centered	Shutdown		4		FALSE	HES	Maintenance
63	2851990006	FORT CALHOUN	285	26-Feb-90	RF	Plant Centered	Shutdown		14		FALSE	HES	Maintenance
64	2851998005	FORT CALHOUN	285	20-May-98	CD	Plant Centered	Shutdown	109	109	109	FALSE	Equip	Transformer
65	2851999004	FORT CALHOUN	285	26-Oct-99	CD	Plant Centered	Shutdown	2	2	2	FALSE	Equip	Other
66	2671983018	FORT ST. VRAIN	267	17-May-83	UN	Weather Related	Shutdown		105		FALSE	SEE	Snow and wind
67	2441981007	GINNA	244	18-Apr-81	UN	Plant Centered	Power Op		0		FALSE	Equip	Breaker
68	2441988006	GINNA	244	16-Jul-88	PO	Plant Centered	Power Op		65		FALSE	Equip	Transformer
69	2442003002	GINNA	244	14-Aug-03	PO	Grid Centered	Trip	49	269	297	FALSE	G	Other - load
70	4161982045	GRAND GULF	416	26-Aug-82	UN	Switchyard Centered	Trip		0		FALSE	Equip	Relay
71	2131984009	HADDAM NECK	213	01-Aug-84	UN	Plant Centered	Shutdown*		10		FALSE	HES	Switching
72	2131984014	HADDAM NECK	213	24-Aug-84	UN	Plant Centered	Shutdown		22		FALSE	Equip	Relay
73	2131993009	HADDAM NECK	213	22-Jun-93	CD	Plant Centered	Shutdown		12		FALSE	Equip	Circuits
74	2131993010	HADDAM NECK	213	26-Jun-93	CD	Plant Centered	Shutdown		3		FALSE	Equip	Circuits
75	3211981026	HATCH 1	321	05-Apr-81	UN	Plant Centered	Shutdown		0		FALSE	Equip	Relay
76	3541986011	HOPE CREEK	354	02-May-86	CD	Switchyard Centered	Shutdown		15		FALSE	HES	Testing
77	2471980006	INDIAN POINT 2	247	03-Jun-80	UN	Plant Centered	Trip		106		FALSE	SEE	Lightning
78	2471983035	INDIAN POINT 2	247	04-Oct-83	UN	Plant Centered	Shutdown*		11		FALSE	Equip	Relay
79	2471985016	INDIAN POINT 2	247	12-Dec-85	UN	Plant Centered	Trip*		20		FALSE	HES	Other
80	2471991006	INDIAN POINT 2	247	20-Mar-91	UN	Plant Centered	Shutdown		29		FALSE	Equip	Other
81	2471991010	INDIAN POINT 2	247	22-Jun-91	UN	Plant Centered	Shutdown		60		FALSE	Equip	Breaker
82	2471998013	INDIAN POINT 2	247	01-Sep-98	UN	Plant Centered	Shutdown*	67	67	67	FALSE	HES	Testing
83	2471999015	INDIAN POINT 2	247	31-Aug-99	PO	Plant Centered	Trip*	97	214	779	TRUE	Equip	Circuits
84	2472003005	INDIAN POINT 2	247	14-Aug-03	PO	Grid Centered	Trip	117	214	599	FALSE	G	Other - load
85	2861980008	INDIAN POINT 3	286	03-Jun-80	UN	Plant Centered	Power Op		147		FALSE	SEE	Lightning
86	2861984015	INDIAN POINT 3	286	16-Nov-84	UN	Plant Centered	Shutdown		14		FALSE	SEE	High Winds
87	2861995004	INDIAN POINT 3	286	27-Feb-95	UN	Plant Centered	Shutdown		132		FALSE	HES	Maintenance
88	2861996002	INDIAN POINT 3	286	20-Jan-96	UN	Plant Centered	Shutdown		127		FALSE	Equip	Transformer
89	2861997008	INDIAN POINT 3	286	16-Jun-97	RF	Grid Centered	Shutdown	38	43	43	FALSE	HE	Maintenance
90	2862003005	INDIAN POINT 3	286	14-Aug-03	PO	Grid Centered	Trip	97	241	599	FALSE	G	Other - load
91	4091981001	LA CROSSE	409	16-Jan-81	UN	Plant Centered	Shutdown*		120		FALSE	Equip	Breaker
92	4091981002	LA CROSSE	409	01-Feb-81	UN	Plant Centered	Shutdown*		14		FALSE	HES	Switching
93	4091981014	LA CROSSE	409	23-Dec-81	UN	Plant Centered	Shutdown*		10		FALSE	Equip	Breaker
94	4091984011	LA CROSSE	409	16-Jul-84	UN	Plant Centered	Trip*		20		FALSE	Other	Mayflies
95	4091985017	LA CROSSE	409	22-Oct-85	UN	Plant Centered	Trip		60		FALSE	HE	Maintenance
96	4091986023	LA CROSSE	409	19-Jul-86	CD	Plant Centered	Shutdown		12		FALSE	SEE	Lightning

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	A	B	C	D	E	F	G	H	I	J	K	L	M
97	3731993015	LASALLE 1	373	14-Sep-93	PO	Plant Centered	Trip		15		FALSE	Equip	Transformer
98	3091988006	MAINE YANKEE	309	13-Aug-88	PO	Plant Centered	Trip		14		FALSE	Equip	Transformer
99	3691984024	MCGUIRE 1	369	21-Aug-84	UN	Plant Centered	Trip		20		FALSE	Equip	Circuits
100	3691987021	MCGUIRE 1	369	16-Sep-87	RF	Plant Centered	Shutdown		29		FALSE	HES	Testing
101	3691991001	MCGUIRE 1	369	11-Feb-91	PO	Plant Centered	Trip		40		FALSE	HE	Testing
102	3691988014	MCGUIRE 2	370	24-Jun-88	RF	Plant Centered	Shutdown		8		FALSE	HES	Switching
103	3701993008	MCGUIRE 2	370	27-Dec-93	PO	Plant Centered	Trip		96		FALSE	Equip	Transformer
104	2451985027	MILLSTONE 1	245	21-Nov-85	UN	Plant Centered	Shutdown		3.5		FALSE	HES	Testing
105	2451989012	MILLSTONE 1	245	29-Apr-89	UN	Plant Centered	Shutdown		1		FALSE	HES	Other
106	2451985018	MILLSTONE 2	336	27-Sep-85	UN	Weather Related	Trip*		330		FALSE	EEE	Hurricane
107	2451985018	MILLSTONE 2	245	27-Sep-85	UN	Weather Related	Trip*		211		FALSE	EEE	Hurricane
108	3361986017	MILLSTONE 2	336	05-Nov-86	RF	Plant Centered	Shutdown		0		FALSE	HES	Maintenance
109	3361988011	MILLSTONE 2	336	25-Oct-88	PO	Plant Centered	Trip		19		FALSE	HE	Maintenance
110	2631981009	MONTICELLO	263	27-Apr-81	UN	Plant Centered	Shutdown		15		FALSE	HES	Maintenance
111	2631984021	MONTICELLO	263	04-Jun-84	UN	Plant Centered	Shutdown		2		FALSE	HES	Testing
112	2201982004	NINE MILE PT. 1	220	07-Feb-82	UN	Plant Centered	Power Op		1		FALSE	Equip	Breaker
113	2201990023	NINE MILE PT. 1	220	12-Nov-90	PO	Plant Centered	Power Op		355		FALSE	Equip	Transformer
114	2201993007	NINE MILE PT. 1	220	31-Aug-93	PO	Plant Centered	Power Op		1		FALSE	SEE	Lightning
115	2202003002	NINE MILE PT. 1	220	14-Aug-03	PO	Grid Centered	Trip	56	448	487	FALSE	G	Other - load
116	4101988062	NINE MILE PT. 2	410	26-Dec-88	CD	Plant Centered	Shutdown		9		FALSE	Equip	Transformer
117	4101992006	NINE MILE PT. 2	410	23-Mar-92	RF	Plant Centered	Shutdown		20		FALSE	HES	Maintenance
118	4102003002	NINE MILE PT. 2	410	14-Aug-03	PO	Grid Centered	Trip	384	566	852	FALSE	G	Other - load
119	2701992004	OCONEE 2	270	19-Oct-92	PO	Plant Centered	Trip		57		FALSE	HE	Maintenance
120	2871985002	OCONEE 3	287	28-Aug-85	UN	Plant Centered	Shutdown		73		FALSE	Equip	Transformer
121	2871987002	OCONEE 3	287	05-Mar-87	UN	Plant Centered	Shutdown		155		FALSE	HES	Maintenance
122	2191983000	OYSTER CREEK	219	14-Nov-83	UN	Plant Centered	Shutdown		240		FALSE	Equip	Other
123	2191984021	OYSTER CREEK	219	25-Sep-84	UN	Plant Centered	Shutdown		0		FALSE	HES	Maintenance
124	2191989015	OYSTER CREEK	219	18-May-89	PO	Plant Centered	Trip		1		FALSE	HE	Maintenance
125	2191992005	OYSTER CREEK	219	03-May-92	UN	Plant Centered	Trip		6		FALSE	SEE	Fire
126	2191997010	OYSTER CREEK	219	01-Aug-97	PO	Switchyard Centered	Trip	90	90	90	TRUE	Equip	Relay
127	2551984001	PALISADES	255	08-Jan-84	UN	Plant Centered	Shutdown		97		FALSE	HES	Maintenance
128	2551987024	PALISADES	255	14-Jul-87	PO	Plant Centered	Trip		388		FALSE	HE	Maintenance
129	2551992032	PALISADES	255	06-Apr-92	UN	Plant Centered	Shutdown		0		FALSE	HES	Testing
130	2551998013	PALISADES	255	22-Dec-98	UN	Plant Centered	Shutdown	0	20	0	FALSE	Equip	Transformer
131	2552003003	PALISADES	255	25-Mar-03	RF	Plant Centered	Shutdown	3261	3261	3261	FALSE	HES	Maintenance
132	5281985058	PALO VERDE 1	528	03-Oct-85	UN	Plant Centered	Trip		25		FALSE	Equip	Circuits
133	5281985076	PALO VERDE 1	528	07-Oct-85	UN	Plant Centered	Trip*		13		FALSE	Equip	Circuits
134	5291989001	PALO VERDE 2	529	03-Jan-89	PO	Plant Centered	Power Op		1138		FALSE	SEE	Rain
135	2772003004	PEACH BOTTOM 2	277	15-Sep-03	PO	Grid Centered	Trip	30	41	63	FALSE	Equip	Relay
136	2772003004	PEACH BOTTOM 2	278	15-Sep-03	PO	Grid Centered	Trip	30	41	63	FALSE	Equip	Relay
137	2771988020	PEACH BOTTOM 3	278	29-Jul-88	UN	Plant Centered	Shutdown		24		FALSE	Equip	Transformer
138	2771988020	PEACH BOTTOM 3	277	29-Jul-88	UN	Plant Centered	Shutdown		24		FALSE	Equip	Transformer
139	4402003002	PERRY	440	14-Aug-03	PO	Grid Centered	Trip	87	122	1662	FALSE	G	Other - load
140	2931982051	PILGRIM	293	12-Oct-82	UN	Weather Related	Shutdown		1		FALSE	SEE	Salt Spray
141	2931983007	PILGRIM	293	13-Feb-83	UN	Weather Related	Trip		1		FALSE	SEE	Salt Spray
142	2931983045	PILGRIM	293	02-Aug-83	UN	Plant Centered	Shutdown		1		FALSE	SEE	Lightning
143	2931984017	PILGRIM	293	19-Dec-84	UN	Plant Centered	Shutdown		15		FALSE	HES	Testing
144	2931986027	PILGRIM	293	19-Nov-86	UN	Weather Related	Shutdown		1		FALSE	SEE	Ice
145	2931986029	PILGRIM	293	23-Dec-86	UN	Plant Centered	Shutdown		1		FALSE	HES	Maintenance

	A	B	C	D	E	F	G	H	I	J	K	L	M
146	2931987005	PILGRIM	293	31-Mar-87	UN	Weather Related	Shutdown		1		FALSE	SEE	High Winds
147	2931987014	PILGRIM	293	12-Nov-87	UN	Weather Related	Shutdown		1263		FALSE	SEE	Salt Spray
148	2931989010	PILGRIM	293	21-Feb-89	UN	Plant Centered	Shutdown		1		FALSE	Equip	Other
149	2931991024	PILGRIM	293	30-Oct-91	UN	Weather Related	Trip*		120		FALSE	SEE	Salt Spray
150	2931993004	PILGRIM	293	13-Mar-93	PO	Weather Related	Trip		1		FALSE	SEE	Snow
151	2931993010	PILGRIM	293	19-May-93	UN	Plant Centered	Shutdown		37		FALSE	HES	Testing
152	2931993022	PILGRIM	293	10-Sep-93	PO	Plant Centered	Trip		10		FALSE	SEE	Lightning
153	2931997007	PILGRIM	293	01-Apr-97	RF	Weather Related	Shutdown	174	385	1198	FALSE	SEE	High Winds
154	2661985004	POINT BEACH 1	266	25-Jul-85	UN	Plant Centered	Power Op		45		FALSE	Equip	Relay
155	2661992003	POINT BEACH 1	266	28-Apr-92	UN	Plant Centered	Shutdown		10		FALSE	HES	Maintenance
156	2661998002	POINT BEACH 1	266	08-Jan-98	PO	Switchyard Centered	Power Op	342	342	557	FALSE	Equip	Other
157	3011984005	POINT BEACH 2	301	22-Oct-84	UN	Plant Centered	Shutdown		3		FALSE	HES	Testing
158	3011989002	POINT BEACH 2	301	29-Mar-89	PO	Plant Centered	Trip		90		FALSE	HE	Maintenance
159	2661994010	POINT BEACH 2	301	27-Sep-94	CD	Plant Centered	Shutdown		1		FALSE	HES	Switching
160	3061980020	PRAIRIE ISLAND 2	306	15-Jul-80	PO	Plant Centered	Trip		62		FALSE	SEE	Lightning
161	3061980020	PRAIRIE ISLAND 2	282	15-Jul-80	PO	Plant Centered	Shutdown		62		FALSE	SEE	Lightning
162	2821996012	PRAIRIE ISLAND 2	306	29-Jun-96	PO	Weather Related	Trip		296		FALSE	SEE	High Winds
163	2821996012	PRAIRIE ISLAND 2	282	29-Jun-96	PO	Weather Related	Trip		296		FALSE	SEE	High Winds
164	2651991005	QUAD CITIES 1	254	02-Apr-91	RF	Plant Centered	Shutdown		0		FALSE	Equip	Transformer
165	2541982012	QUAD CITIES 2	265	22-Jun-82	UN	Plant Centered	Trip		29		FALSE	Equip	Relay
166	2651985011	QUAD CITIES 2	265	07-May-85	UN	Plant Centered	Shutdown		43		FALSE	HES	Maintenance
167	2651992011	QUAD CITIES 2	265	02-Apr-92	HD	Plant Centered	Shutdown		35		FALSE	Equip	Transformer
168	2652001001	QUAD CITIES 2	265	02-Aug-01	PO	Switchyard Centered	Trip	154	154	154	FALSE	SEE	Lightning
169	3121981034	RANCHO SECO	312	19-Jun-81	UN	Grid Centered	Shutdown*		360		FALSE	G	Other - load
170	3121981039	RANCHO SECO	312	07-Aug-81	UN	Grid Centered	Shutdown*		180		FALSE	G	Other - load
171	4581986002	RIVER BEND	458	01-Jan-86	HD	Plant Centered	Trip*		46		FALSE	Equip	Circuits
172	2611986005	ROBINSON 2	261	28-Jan-86	PO	Plant Centered	Trip		100		FALSE	Equip	Relay
173	2611992017	ROBINSON 2	261	22-Aug-92	PO	Plant Centered	Trip		454		FALSE	Equip	Transformer
174	2721983033	SALEM 1	272	11-Aug-83	UN	Plant Centered	Trip*		1		FALSE	Equip	Transformer
175	2721984014	SALEM 1	272	05-Jun-84	UN	Plant Centered	Shutdown		120		FALSE	Equip	Breaker
176	2722003002	SALEM 1	272	29-Jul-03	PO	Switchyard Centered	Trip	30	480	480	TRUE	Equip	Circuits
177	2721984013	SALEM 2	311	02-Jun-84	UN	Plant Centered	Shutdown		0.5		FALSE	HES	Switching
178	2721984013	SALEM 2	272	02-Jun-84	UN	Plant Centered	Shutdown		0.5		FALSE	HES	Switching
179	3111986007	SALEM 2	311	26-Aug-86	PO	Plant Centered	Trip*		1		FALSE	Equip	Other
180	3111994007	SALEM 2	311	11-Apr-94	PO	Plant Centered	Power Op		385		FALSE	HE	Testing
181	3111994014	SALEM 2	311	18-Nov-94	RF	Plant Centered	Shutdown		1675		FALSE	Equip	Relay
182	2061980015	SAN ONOFRE 1	206	22-Apr-80	UN	Plant Centered	Shutdown		4		FALSE	HES	Testing
183	2061984038	SAN ONOFRE 1	206	22-Nov-80	UN	Plant Centered	Shutdown		0.25		FALSE	HES	Switching
184	2061985017	SAN ONOFRE 1	206	21-Nov-85	UN	Plant Centered	Trip		4		FALSE	Equip	Transformer
185	4431988004	SEABROOK	443	10-Aug-88	CD	Plant Centered	Shutdown		0		FALSE	HES	Switching
186	4431991008	SEABROOK	443	27-Jun-91	PO	Plant Centered	Trip		20		FALSE	Equip	Relay
187	4432001002	SEABROOK	443	05-Mar-01	PO	Weather Related	Trip	43	2122	2122	FALSE	SEE	Snow
188	3271992027	SEQUOYAH 2	328	31-Dec-92	PO	Plant Centered	Trip		95		FALSE	Equip	Breaker
189	3271992027	SEQUOYAH 2	327	31-Dec-92	PO	Plant Centered	Trip		95		FALSE	Equip	Breaker
190	4991999003	SOUTH TEXAS 2	499	12-Mar-99	PO	Switchyard Centered	Power Op	101	101	101	FALSE	Equip	Breaker
191	3351982041	ST. LUCIE 1	335	07-Sep-82	UN	Plant Centered	Trip		1		FALSE	Equip	Breaker
192	3951989012	SUMMER	395	11-Jul-89	PO	Grid Centered	Trip*		130		FALSE	G	Equip - other
193	3881984013	SUSQUEHANNA 2	388	26-Jul-84	UN	Plant Centered	Trip		11		FALSE	HE	Testing
194	2891997007	THREE MILE ISL 1	289	21-Jun-97	PO	Switchyard Centered	Trip	90	90	90	FALSE	Equip	Circuits

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	A	B	C	D	E	F	G	H	I	J	K	L	M
195	2501984006	TURKEY POINT 3	250	12-Feb-84	UN	Plant Centered	Trip		90		FALSE	Equip	Relay
196	2501984007	TURKEY POINT 3	250	16-Feb-84	UN	Plant Centered	Trip		15		FALSE	HE	Switching
197	2501985012	TURKEY POINT 3	250	29-Apr-85	UN	Plant Centered	Shutdown		335		FALSE	HES	Maintenance
198	2501991003	TURKEY POINT 3	250	24-Jul-91	UN	Plant Centered	Shutdown		11		FALSE	Equip	Breaker
199	2511985011	TURKEY POINT 4	251	17-May-85	PO	Grid Centered	Trip		125		FALSE	G	Other - fire
200	2511985011	TURKEY POINT 4	250	17-May-85	PO	Grid Centered	Shutdown		156		FALSE	G	Other - fire
201	2511991001	TURKEY POINT 4	251	13-Mar-91	UN	Plant Centered	Shutdown		67		FALSE	Equip	Relay
202	2501992000	TURKEY POINT 4	251	24-Aug-92	UN	Weather Related	Trip*		7908		FALSE	EEE	Hurricane
203	2501992000	TURKEY POINT 4	250	24-Aug-92	UN	Weather Related	Trip*		7950		FALSE	EEE	Hurricane
204	2512000004	TURKEY POINT 4	251	21-Oct-00	HS	Plant Centered	Shutdown*	111	111	140	FALSE	Equip	Circuits
205	2711987008	VERMONT YANKEE	271	17-Aug-87	UN	Plant Centered	Shutdown		2		FALSE	Equip	Other
206	2711991009	VERMONT YANKEE	271	23-Apr-91	PO	Plant Centered	Trip		277		FALSE	HE	Maintenance
207	4241990006	VOGTLE 1	424	20-Mar-90	RF	Plant Centered	Shutdown		140		FALSE	HES	Other
208	3821985054	WATERFORD 3	382	12-Dec-85	UN	Plant Centered	Shutdown		1		FALSE	SEE	Lightning
209	3902002005	WATTS BAR 1	390	27-Sep-02	PO	Grid Centered	Power Op	1021	1021	1116	FALSE	G	Other - fire
210	4821987048	WOLF CREEK	482	14-Oct-87	RF	Plant Centered	Shutdown		17		FALSE	HES	Maintenance
211	0291984008	YANKEE-ROWE	029	03-May-84	UN	Plant Centered	Shutdown		5		FALSE	HES	Maintenance
212	0291991002	YANKEE-ROWE	029	15-Jun-91	PO	Plant Centered	Trip		24		FALSE	SEE	Lightning
213	2951997007	ZION 1	295	11-Mar-97	CD	Plant Centered	Shutdown	20	20	20	FALSE	Equip	Circuits
214	3041980001	ZION 2	304	13-Jan-80	UN	Plant Centered	Shutdown		0		FALSE	SEE	High Winds
215	3041991002	ZION 2	304	21-Mar-91	PO	Plant Centered	Trip		60		FALSE	Equip	Transformer

Loss of Offsite Power Events

Loss of offsite power (LOOP) events for 1980 through 1996 are taken from the report "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980 –1996," NUREG/CR-5496. Events for 1997 through 2003 have been identified from LERs. NRC is currently reviewing and coordinating the list with EPRI. The following definitions are those used in NUREG-1032 and NUREG/CR-5496.

Definitions of Key Terms

Loss of offsite power (LOOP) event – the simultaneous loss of electrical power to all unit safety buses (the non-essential busses will also be de-energized as a result of this), requiring all emergency diesel generators to start and supply power to the safety buses.

Restoration time – the actual time taken to restore offsite power for the first available source to a vital bus. This is usually the time reported in the LER.

Recovery time – the time, in minutes, from the event initiation until the first offsite electrical power could have been available at a safety bus. This restoration time is NOT when the emergency generator was actually unloaded but rather the elapsed time until the bus could have been powered from an offsite source had they chosen to restore it immediately when it was available at the switchyard. (N.B., this is the definition used by EPRI in its LOOP report.)

Station blackout (SBO) – the complete loss of alternating (ac) electrical power to essential switchgear busses in a nuclear power plant. Station blackout involves the loss of offsite power concurrent with the failure of the onsite emergency alternating current power system. It does not include the loss of available ac power to busses fed by station batteries through inverters or successful HPCS operation.

Unit Effective Status Column Definitions

TRIP – The electrical event caused a unit trip from power. This includes cases in which the trip preceded the loss of offsite power by several seconds but both the reactor trip and the LOSP were part of the same plant transient and resulted in the same root cause

TRIP* – The event occurred during unit hot shutdown. The event characteristics and unit configuration apply to power operation conditions. This includes cases when the reactor trip preceded the loss of offsite power, but the electrical plant was still at power operation configuration. A TRIP* event can be classified as either a non-initiator or an initiator, depending upon the causes of the reactor trip and the LOSP event.

POWEROP – The event occurred during unit power operation and the unit remained at power.

SHUTDOWN – The event occurred during unit cold shutdown.

SHUTDOWN* – The event occurred during unit hot shutdown or during unit startup. The event characteristics and unit configuration apply to shutdown conditions.