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A COMPILATION OF BOILING WATER REACTOR OPERATIONAL EXPERIENCE for The UNITED KINGDOM'S OFFICE FOR NUCLEAR REGULATION'S ADVANCED BOILING WATER REACTOR GENERIC DESIGN ASSESSMENT

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Abstract

United States nuclear power plant Licensee Event Reports (LERs), submitted to the United States Nuclear Regulatory Commission (NRC) under law as required by 10 CFR 50.72 and 50.73 were evaluated for reliance to the United Kingdom's Health and Safety Executive – Office for Nuclear Regulation's (ONR) general design assessment of the Advanced Boiling Water Reactor (ABWR) design. An NRC compendium of LERs, compiled by Idaho National Laboratory over the time period January 1, 2000 through March 31, 2014, were sorted by BWR safety system and sorted into two categories: those events leading to a SCRAM, and those events which constituted a safety system failure. The LERs were then evaluated as to the relevance of the operational experience to the ABWR design.

Keywords: BWR operational experience, LER, ABWR, Safety system failures, safety-related

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Nomenclature

ABWR	Advanced Boiling Water Reactor
ADS	Automatic Depressurization System
ASP	Accident Precursor Program
BWR	Boiling Water Reactor
CNEN	National Nuclear Energy Commission of Mexico
CRD	Control Rod Drive
DECS	Drywell Environmental Control System
ECCS	Emergency Core Cooling System
EN	Emergency Notification
EPRI	Electric Power Research Institute
EPIX	Equipment Performance and Information Exchange
FMCRD	Fine Motion Control Rod Drive
FMEA	Failure Modes and Effects Analysis
GDA	General Design Assessment
GI	Generic Issue
GSI	Generic Safety Issue
HPCF	High Pressure Core Flood
HPCI	High Pressure Coolant Injection
HPCS	High Pressure Core Spray
HSE	Health and Safety Executive
IN	Information Notice
INL	Idaho National Laboratory
INPO	Institute for Nuclear Power Operations
ITP	Industry Trends Program
LER	Licensee Event Report
LLRT	Local Leak Rate Test
LOCA	Loss of Coolant Accident
LPCF	Low Pressure Core Flood
LPCI	Low Pressure Coolant Injection
LPCS	Low Pressure Core Spray
MSIV	Main Steam Isolation Valve
NRC	United States Nuclear Regulatory Commission
NRR	NRC Office of Reactor Regulation
ONR	Office For Nuclear Regulation
PCSR	Pre-Construction Safety Report
PPS	Plant Protection System
PSA	Probabilistic Safety Analysis
PWR	Pressurized Water Reactor
RCIC	Reactor Core Isolation Cooling
RES	NRC Office of Research
ROP	Reactor Oversight Program
RPS	Reactor Protection System
RWCU	Reactor Water Cleanup
SLC	Standby Liquid Control

SNL	Sandia National Laboratories
SSCs	Structures, Systems and Components
SPAR	Standardized Plant Analysis Risk
SRV	Safety Relief Valve
SSA	Safety System Actuation
SSF	Safety System Failure

Executive Summary

In April 2013 the United Kingdom's Health and Safety Executive Office For Nuclear Regulation (HSE ONR) formally started the Generic Design Assessment (GDA) of the Hitachi General Electric Nuclear Energy Ltd's Advanced Boiling Water Reactor (ABWR). Boiling Water Reactors (BWRs) have been operating in the US since the 1960s and currently there are 35 BWRs in operation in the U.S. This provides operational experience which will be invaluable to support the ONR GDA effort.

The principal objective of the work documented here is to evaluate BWR operational experience to provide ONR with an understanding of potential areas of concern regarding this type of reactor which warrant detailed scrutiny during the ONR GDA of the ABWR. BWR operational experience in the U.S. was compiled from available U.S. regulatory data sources. This operational experience is evaluated relative to the ABWR design.

Summary Conclusions

By in large, the operational experience of US BWRs, from 2000 through March of 2014, involving safety and non-safety system induced SCRAMs and safety system failures (SSFs) is relevant to the ABWR GDA.

SCRAM Conclusions

Since 2000, BWR licensees have submitted 415 LERs which have been categorized by the United States Nuclear Regulatory Commission (NRC) as SCRAM events. Three Hundred Seventy One involved non-safety systems that are common to both BWR and PWR designs. Eighty six of these SCRAM events were related to issues involving BWR specific systems. Fifty three involved BWR safety systems and 33 involving BWR non-safety systems. Of these, only two events – both involving the Recirculation system, can be considered irrelevant to the ABWR GDA. Those two events involved Recirculation pump trip due to leaking conditions observed in the Recirculation piping. Such faults are not relevant to the ABWR Recirculation system, the design of which has eliminated Recirculation system piping. BWR safety system related SCRAM events are dominated by the MSIVs (9), the RPS/PPS (27), the CRD (5) and the ADS/SRVs (5). The ABWR designs for these do not appear to be radically different than those from which the operational experience has been observed.

The 371 SCRAM events that involve non-safety systems common to both BWR and PWR designs largely involve the balance of plant systems (e.g., steam turbine, feedwater, main generator, switchyard). Without detailed knowledge of specific ABWR balance of plant systems, these events should not be excluded from informing the GDA.

Safety System Failure Conclusions

Seventy eight LER events since 2000 have been categorized as safety system failures by the NRC. The focus of this BWR safety system failure operational experience review is the set shown below:

Off Gas System
Main Steam Isolation Valves (MSIVs)
High Pressure Coolant Injection (HPCI)
High Pressure Core Spray (HPCS)
Reactor Isolation Core Cooling (RCIC)
Residual Heat Removal (RHR)/Low Pressure Coolant Injection (LPCI)
Low Pressure Core Spray (LPCS)
Reactor Protection System(RPS)/Plant Protection System (PPS)
Control Rod Drive (CRD) System
Standby by Liquid Control (SLC) System
Reactor Water Cleanup System (RWCU)
Automatic Depressurization System (ADS)/Safety Relief Valves (SRVs)

The ABWR design does not have a steam driven turbine pump HPCI system nor does it have a LPCS system, but the fundamental design characteristics of all of the other systems listed in Table 4-1 are essentially consistent with the design features of the same or analogous systems in the ABWR design. However, despite that the ABWR design does not include a HPCI or LPCS system; those two systems nonetheless have design and operational features which are relevant to the ABWR ECCS systems. Hence, even certain operational experience involving the HPCI and LPCS systems is relevant to the ABWR GDA.

The LER operational experience of the BWR safety systems are dominated by HPCI (43), HPCS (34), RCIC (32), RHR/LPCI (18) and RPS/PPS (31). All of these systems – except RPS/PPS - are large, water systems designed to initiate from a standby state and reach full operation within seconds in response to certain off-normal conditions. The turbine driven pump related faults of the HPCI system are irrelevant to the ABWR GDA specifically, except at they could relate to the steam driven RCIC system. All of these water systems exhibited operational experience involving issues with the functionality of both their injection lines and their suction lines. Issues include air ingress into the water lines – with the associated threat of damaging water hammer in the injection line and pump cavitation from the suction line – valve leaks, valve failures to open or close, minimum-flow line faults, isolation issues which could render the systems inoperable, and electrical pump motor faults (excluding HPCI and RCIC). Flow controller faults also have been observed in these systems. The majority of these problems have been categorized as equipment failures, but many also are due to inadequate procedures and as human errors related to operations and improper maintenance activities.

Some of the LER events involve the discovery of violations of Technical Specifications while the plant is at operations. Some events such as these may or may not constitute actual failure of a system to perform its safety function, but nonetheless such events are indicative of a failure of operational oversight. Other events involve the discovery of potential or actual component failures during post-maintenance testing. Fortunately such events represent potentially dangerous but short-lived system configurations. However, many of the events observed represent compromised system configurations which were discovered only after the discovered issue had existed over time, in some cases several years.

There are relatively few exceptions regarding the relevance of BWR safety system failure operational experience for the ABWR GDA.

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1 INTRODUCTION

1.1 Background

In April 2013 the United Kingdom's Health and Safety Executive Office For Nuclear Regulation (HSE ONR) formally started the Generic Design Assessment (GDA) of the Hitachi General Electric Nuclear Energy Ltd's Advanced Boiling Water Reactor (ABWR). Boiling Water Reactors (BWRs) have been operating in the US since the 1960s and currently there are 35 BWRs in operation in the U.S. This provides operational experience which will be invaluable to support the ONR GDA effort.

The principal objective of the work documented here is to evaluate BWR operational experience to provide ONR with an understanding of potential areas of concern regarding this type of reactor which warrant detailed scrutiny during the ONR GDA of the ABWR. BWR operational experience in the U.S. was compiled from available U.S. regulatory data sources. This operational experience is evaluated relative to the ABWR design.

The remainder of this chapter summarizes the approach taken to compiling BWR operational experience and a summary of the research undertaken during this project.

In Chapter 2, operational experience resulting in plant SCRAMs and safety system failures is summarized discussed. Operational experience for non-safety systems is also summarized and discussed in Chapter 2, but only for SCRAM events. In Chapter 3, NRC BWR specific generic issues are summarized and discussed. References are listed in Chapter. Appendix A contains SCRAM database field descriptions used by the NRC in their Licensee Event Report (LER) summary compiled for the NRC by the Idaho National Laboratory. Appendix B contains database field descriptions for the NRC's Safety System Failure database. In Appendix C, summaries of NRC Licensee Event Reports (LERs) are provided for each BWR system discussed in Chapters 2.

1.2 Relationship between US NRC and UK ONR safety classification of structures, systems and components

The United States and the United Kingdom have different standards for defining the safety classifications of structures, systems and components. Throughout this report the US safety classification system is used when refereeing to the safety classification of systems.

The US Code of Federal Regulations establishes the safety classification for nuclear plant systems in the United States. This classification is defined in 10 CFR 50.2 (Definitions) [1]:

Safety-related structures, systems and components means those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:

- (1) The integrity of the reactor coolant pressure boundary
- (2) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guideline exposures set forth in § 50.34(a) (1) or § 100.11 of this chapter, as applicable.

Additionally, a layman's definition is provided on the NRC's web site glossary:

Safety-related: *In the regulatory arena, this term applies to systems, structures, components, procedures, and controls (of a facility or process) that are relied upon to remain functional during and following [design-basis events](#). Their functionality ensures that key regulatory criteria, such as levels of radioactivity released, are met. Examples of safety-related functions include shutting down a [nuclear reactor](#) and maintaining it in a safe-shutdown condition. (<http://www.nrc.gov/reading-rm/basic-ref/glossary/safety-related.html>.)*

Throughout this report references are made to “safety systems” and “non-safety systems.” In normal US nuclear regulatory parlance the term “safety-related” is frequently shortened to simply “safety.” Thus the phrases “safety-related system failures” and “safety system failure” are equivalent.

The US safety classification of “safety-related” is comparable to compared to the UK's safety classification standard, as defined in the ONR's Safety Assessment Principles for Nuclear Facilities (SAPs) [2]. In the SAPs safety classification of structures, systems and components (SSCs) is defined in Paragraphs 148 through 156. The SAPs defines, in Paragraph 149, functional safety categories as follows:

A safety categorization scheme could be determined on the following basis:

- a) Category A – any function that plays a principal role in ensuring nuclear safety.*
- b) Category B – any function that makes a significant contribution to nuclear safety.*
- c) Category C – any other safety function.*

Nuclear plant SSC safety classification is defined by which safety functions are fulfilled by particular SSCs (Paragraph 154):

A safety classification scheme could be determined on the following basis:

- a) Class 1 – any structure, system or component that forms a principal means of fulfilling a Category A safety function.*
- b) Class 2 – any structure, system or component that makes a significant contribution to fulfilling a Category A safety function, or forms a principal means of ensuring a Category B safety function.*
- c) Class 3 – any other structure, system or component.*

A comparison of the US and UK standards for safety classification of SSCs shows that there is greater granularity in the UK standard. However, by-in-large one would expect most SSCs classified by the US standard as safety-related to be classified by the UK standard as Class 1. Some US “safety-related” systems might fall within the UK Class2 designation and even some US non-safety-related SSCs could fall into the UK Class 2 designation. As an example, Subchapter 17.3 of the Hitachi-GE UK ABWR Generic Design Assessment Pre-Construction Safety Report (PCSR) [3] classifies the Turbine Main Steam, Turbine Auxiliary Steam and Turbine Bypass Systems as Class 3. In US BWR plants those systems are non-safety-related.

1.3 US NRC requirements for the reporting of operating experience at US nuclear power plants

Each US licensee of a nuclear power reactor must send information to NRC about certain “reportable events” that occur at their facility or during their use of nuclear materials. For more information see the United States Nuclear Regulatory Commission’s (NRC) *“Event Reporting Guidelines 10 CFR 50.72 and 50.73: Final Report (NUREG-1022, Revision 3)”* [4]. 10 CFR Part 50.72 is “Immediate notification for operating nuclear reactors,” or Emergency Notifications. These are events that require, as indicated by the name, swift and immediate notification to the NRC. 10 CFR Part 50.73 is the “Licensee event reporting system,” or LER. While Emergency Notifications (ENs) focus on potentially dangerous circumstances that require immediate attention by both the licensee and the NRC, all such occurrences also ultimately fall under the criteria required for reporting under the LER system and are documented as well under the LER system (albeit at a later date). Thus, for the purposes of reviewing historical operating experience, the LER system encompasses those events reported under both 10CFR 50.72 and 50.73.

The NRC maintains on its public website a searchable repository of all licensee LERs. The searchable repository allows one to search for LERs based on a variety of criteria, including name, dates, plant characteristics, event characteristics, and abstract or document keywords.

1.4 Review of Regulatory and Industry Sources of Boiling Water Reactor operating experience.

1.4.1 Interviews with NRC staff

SNL met with NRC staff to discuss the availability of and nature of compilations of BWR operational experience. Operational experience is evaluated by both the Office For Nuclear Regulation (NRR) and the Office of Research (RES). Discussions with Harold Chernoff and Jesse Robles of the NRR’s Inspection and Operational Experience Branch indicate that NRR’s responsibility toward reviewing operational experience is of the immediate nature. LERs and ENs are reviewed real time as reported to the NRC, with the intent to determine if immediate NRC attention or intervention is required. Long term, historical compilations and assessments of operational experience are directed through the NRC’s Office of Research, and specifically the Division of Risk Analysis’s Performance and Reliability Branch.

SNL discussed the role of the Performance and Reliability Branch regarding operational experience with John Lane. The Industry Trends program (ITP) and Reactor Operational Experience Results and Databases program (discussed below in Section 1.5) are directed out of this Branch. Additionally, the Performance and Reliability Branch and other parts of the RES Division of Risk Analysis review operational experience, particularly ENs, LERs and INPO EPIX reports to assess the safety significance of specific operational events through the NRC’s Accident Sequence Precursor (ASP) program. Under the ASP, operational events are evaluated at INL against criteria to determine if an event warrants assessment as an accident sequence

precursor. If the event does warrant such attention, then its safety significance is evaluated by “mimicking” the event in the NRC’s SPAR PRA for the appropriate licensee.

NRC staff confirmed that while the NRC collects operational experience information, and conducts analyses of operational experience (e.g., the ITP, the Reactor Operational Experience Results and Databases, the ASP, the Reactor Oversight program (ROP)), the NRC does not actually publish compilations of such operating experience. However, to support the Industry Trends Program and the Reactor Operational experience Results and Databases, the NRC contracts the Idaho National Laboratory (INL) to, among other tasks, compile collections of operational experience out of the LERs, as described in Section 1.5.2.

1.4.2 Interviews with experts on Mexican nuclear power regulation

Pamela F. Nelson, Professor of Nuclear Engineering at the National Autonomous University of Mexico (UNAM), and a member of the ASME/ANS Committee on Nuclear Risk Management, was contacted regarding the nature of Mexican operational experience of the two Laguna Verde BWR units. Ms. Nelson contacted associates at the National Nuclear Energy Commission (CNEN) regarding such information. She was told by the CNEN that Mexican plants are required to report operational events consistent with the US 10 CFR 50.72 and 50.73, but that the information is proprietary.

1.4.3 Evaluation of EPRI, General Electric and INPO data sources

Specific compilations of operational data for BWRs collected by General Electric and INPO are proprietary. INPO shares information and data with the NRC under a memorandum of understanding through INPO’s Equipment Performance and Information Exchange (EPIX). The NRC treats INPO data as proprietary. The Electric Power Research Institute (EPRI) maintains an extensive library of EPRI Technical Report publications. However, access to such publications requires either a membership to EPRI or purchase of publically available EPRI reports. Preliminary discussions with HSE ONR staff lead to the conclusion that such expenditures were impracticable given the resources allocated to this project.

1.5 NRC statistical analyses of operational experience

1.5.1 The NRC Industry Trends Program

The NRC initiated the Industry Trends Program (ITP) to monitor trends in indicators of industry performance as a means to confirm that the safety of operating power plants is being maintained. Should any long term indicators show a statistically significant adverse trend, the NRC will evaluate them and take appropriate regulatory action using its existing processes for resolving generic issues and issuing generic communications. The NRC formally reviews these indicators as part of the Agency Action Review Meeting (AARM) each year, and any statistically significant adverse trends are reported to Congress in the NRC’s Performance and Accountability Report.

Much of the data that the NRC collects and analyzes under the ITP includes LERs and data provided to the NRC by INPO under a memorandum of understanding. INPO data provided to

the NRC is proprietary and not available for public release. The LER and INPO data is collected and analyzed by the Idaho National Laboratory (INL) under contract to the NRC. Statistical analyses of this data are used to develop quantitative metrics of industry performance trends under the ITP, such as:

- Automatic Reactor Scrams While Critical
- Significant Events (Initiating Events)
- Safety System Actuations
- Safety System Failures
- Forced Outage Rate
- Equipment Forced Outage Rate/1000 Critical Hours
- Collective Radiation Exposure

Statistical analysis and NRC staff review of these performance indicators are reported annually through a SECY staff report to the Commissioners. These SECY reports are available in the NRC website at:

<http://www.nrc.gov/reactors/operating/oversight/industry-trends.html#itp>.

1.5.2 The NRC Reactor Operational Experience Results and Databases

The NRC utilizes the data provided by INPO and gleaned from LERs by INL staff to develop system and component reliability and failure data to support the NRC's Standardized Plant Analysis Risk (SPAR) models, which are Level 1 probabilistic risk analysis (PRA) models for each licensee maintained by the NRC staff for their own independent PRA evaluations of licensee risk. The parameter estimates developed from the data analysis are available to the public and the NRC welcomes the use of these estimates in general PRA applications. These parameter estimates can be found at:

<http://nrcoe.inl.gov/resultsdb/>.

1.5.3 NRC compilations of operational experience.

The reporting guidelines in NUREG-1022 specify the nature of the detail that must be reported, but neither the guidelines nor the requirements of 10 CFR 50.72 and 50.73 impose reporting requirements that facilitate an automated systematic search of the LER database or a systematic analysis of data directly from the LERs. The typical LER can be approximately 5 to 10 pages long, and each licensee is permitted latitude in style and content, which can render automated systematic searches for data problematic. For example, if one desired to collect and review all LERs that specifically dwell upon reportable instances regarding issues with BWR high pressure coolant injection (HPCI) systems, a simple LER search of the NRC's LER repository using keywords "HPCI" and "high pressure coolant injection" could yield hundreds of irrelevant LERs. In any number of LERs not relevant to HPCI a licensee may have chosen to mention the operational status of several emergency core cooling systems (ECCS), as in "*during the event the HPCI system was operational.*" Thus can keyword searches of LERs be extremely inefficient.

However, as part of INL's review of operational experience under the ITP, INL staff conduct an in-depth review of each LER submitted to the NRC. This is an enormous effort which the NRC has conducted over years dating back over at least two decades – involving the full-time

equivalent of two INL staff persons annually. In 2013 alone there were 352 LERs submitted to the NRC, 126 of which were from BWR licensees. For 2014, as of November 20, 2014, 225 LERs have been submitted to the NRC, 95 of which are from BWR licensees.

In addition to the statistical analyses of data gleaned from these LER reviews and INPO data that support the NRC's ITP and SPAR PRA parameter estimate database, INL produces a non-statistical systematic compilation of LERs in which LERs are catalogued by plant system and three important performance indicators – SCRAMs, safety system actuations (SSAs), and safety system failures (SSFs). This review is summarized into a Microsoft ACCESS database, and is periodically updated.

1.6 Approach to document and evaluation BWR operational experience.

1.6.1 Selection of data source for operational experience

Based on the information and insights gained from assessing the availability and the nature of BWR operational experience, ONR and SNL staff decided that the most efficient and fruitful approach would be to focus on the NRC's non-statistical compilation of LERs. The INL ACCESS database is not readily made available to the public, although all information in the INL compilation is directly taken from publically available LERs, and all INL staff evaluations and synopses of those LERs that are included in the compilation are non-proprietary. Hence, upon request by SNL to INL for the information, INL requested permission to give its latest compilation to SNL. The NRC concurred and directed INL to provide the latest summary of this compilation to SNL.

The INL LER compilations were provided to SNL in April 2014, and cover the time period January 1, 2000 through March 31, 2014. As noted in Section 1.4.3, the LER reports are reviewed for three different performance indicators:

- Reactor Scrams,
- Safety System Actuations, and
- Safety System Failures.

For the purpose of this review, safety system actuations (SSAs) were not included. Based on consultation with INL regarding their review of the LERs, such events do not necessary constitute a fault or problem with the system reported upon in an SSA LER. SSAs must be reported according to 10 CFR 50.73(a)(2)(iv)(A). Thus, the focus of this review of the INL compilation of LER reports for BWR operational experience was on those events that resulted in a manual or automatic reactor SCRAM and the systems responsible for the event, and those events which constituted a failure of a safety system.

1.6.1.1 Criteria for categorizing LERs as SCRAM events

The Code of Federal Regulations, 10 CFR 50.73(iv)(A) and (iv)(B) require that any event or condition that results in the manual or automatic actuation of the reactor protection system (RPS),

including any reactor SCRAM or reactor trip, be reported. This would involve either automatic or manual tripping of the reactor as an immediate response to a plant condition or event, or a deliberate shutdown after a certain period of time due to conditions that eventually violates a plant's technical specifications.

Each LER reviewed and retained as a BWR SCRAM event contains the following information:

- Plant name,
- Event date,
- LER number (official record identifier for NRC searchable LER database),
- Type of SCRAM (Automatic or Manual),
- A brief synopsis of the LER report which represents the INL staff's detailed review and assessment of the LER report.
- The power level of the reactor as reported in the LER.
- The system identified as the root contributor of the SCRAM (i.e., the system that initiated the sequence of events that resulted in the trip signal). This designation reflects INL staff evaluation and interpretation of the information provided in the LER and their opinion of the event based on their review of the LER. Licensees are not required to explicitly catalogue LERs as "SCRAM" related nor explicitly identify specific systems as SCRAM initiators.
- A designation of a root mode cause:
 - Equip – Equipment failure. This code is used when the reactor scram was the direct result of a system, subsystem, component, or piece part failure or fault. This code is used if the cause of the equipment failure cannot be attributed to other causes such as improper operation or maintenance. If the scram is caused by an instrument spike of unknown origin, the cause is coded **Equip**.
 - Prsnlerr – Human Factors. This code is used when the reactor scram was the direct result of a personnel action (e.g., failure to follow procedures, insufficient training).
 - Procedure – This code is used if reactor scram was the direct result of using faulty procedures. This includes errors in writing or reviewing procedures, or lack of a procedure.
 - Unknown - This code is to be used only when the cause of the reactor scram cannot be determined from the LER, or it is stated in the LER that the cause is unknown.
 - Natural - This code is used if reactor scram can be directly attributed to natural phenomena such as lightning strikes, icing, or high winds.

1.6.1.2 Criteria for categorizing LERs as SCRAM events

The criteria for a safety system failure (SSF) are defined by the INL project (see Appendix B of this report) as:

Safety System Failures (SSFs) are any events or conditions that could prevent the fulfillment of the safety function of structures or systems. If a system consists of multiple redundant subsystems or trains, failure of all trains constitutes a safety system failure. Failure of one of two or more trains is not counted as a safety system failure.

This definition is based upon the NRC reporting requirements in 10 CFR 50.72 and 10 CFR 50.73 for reporting events that render systems inoperable.

Each LER reviewed and retained as a BWR SSF event contains the following information:

- Plant name,
- Event date,
- LER number (official record identifier for NRC searchable LER database),
- The power level of the reactor as reported in the LER.
- The safety system (or systems) identified as being failed in the context of the event reported in the LER. This designation reflects INL staff evaluation and interpretation of the information provided in the LER and their opinion of the event based on their review of the LER.
- A brief synopsis of the LER report which represents the INL staff's detailed review and assessment of the LER report.
- A designation of a root mode cause, same as with the SCRAM fields.

1.6.2 Grouping of relevant operational experience by topic areas

HSE ONR and SNL discussed the appropriate and desirable grouping of operational experience. The first consideration for this project is to provide ONR with an understanding of potential areas of concern regarding a BWR reactor. Hence all PWR LERs were excluded, and for SSFs, only safety systems relevant to BWRs were retained (e.g., LERs regarding electrical power systems, component cooling and service water systems, ultimate heat sinks were not reviewed). BWR safety systems such as the HPCI system, which is not part of the ABWR ECCS design, were included in this survey regardless. Operational experience of such systems could potentially be relevant to the ABWR HPCS. The BWR systems for which LERs were retained from the INL compellation are shown in Table 1-1.

LERs involving plant SCRAMS induced by non-safety systems unique to BWRs and those common to both BWR and PWR were reviewed. There are six systems unique to BWR designs and 183 other non-safety systems relevant to both BWR and PWR designs. . The BWR non-safety systems are shown in Table 1-2. Because of the large number of non-safety systems common to both PWR and BWR designs, those systems are listed in the discussion of results in Section 2.13 in Table 2-17.

Table 1-1 BWR plant safety systems for which LERs were reviewed.

BWR System
Off Gas System
Main Steam Isolation Valves (MSIVs)
High Pressure Coolant Injection (HPCI)
High Pressure Core Spray (HPCS)
Reactor Isolation Core Cooling (RCIC)
Residual Heat Removal (RHR)/Low Pressure Coolant Injection (LPCI)
Low Pressure Core Spray (LPCS)
Reactor Protection System(RPS)/Plant Protection System (PPS)
Control Rod Drive (CRD) System
Standby by Liquid Control (SLC) System
Reactor Water Cleanup System (RWCU)
Automatic Depressurization System (ADS)/Safety Relief Valves (SRVs)

Table 1-2 Non-safety systems for which LERs were reviewed – SCRAMs only

DESCRIPTION	ACRONYM	REACTOR TYPE
DRYWELL ENVIRONMENTAL CONTROL SYSTEM (BWR)	DECS	BWR
PRIMARY CONTAINMENT [SPECIAL NON-EIIS CODE]	PC	BWR
REACTOR BUILDING (BWR)	RB	BWR
REACTOR RECIRCULATION SYSTEM (BWR)	RR	BWR
SUPPRESSION POOL MAKEUP SYSTEM (BWR)	SPM	BWR
SUPPRESSION POOL PURIFICATION SYSTEM (BWR)	SPPS	BWR

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2 SCRAM AND SAFETY SYSTEM FAILURES

SCRAM and safety system failure data for the time period January 1, 2000 through March 31, 2014 for each BWR system is summarized in Table 2-1. Data by year is summarizing in Table 2-2. The operational experience for each system is discussed in Sections 2.1 through 2.13.

Table 2-1 SCRAM and safety system failure events by system

BWR System	Number of LER Transient Reports	Number of LER Safety System Failure Reports
Off Gas System	5	0
Main Steam Isolation Valves (MSIVs)	9	4
High Pressure Coolant Injection (HPCI)	0	42
High Pressure Core Spray (HPCS)	1	34
Reactor Isolation Core Cooling (RCIC)	0	32
Residual Heat Removal (RHR)/Low Pressure Coolant Injection (LPCI)	0	18
Low Pressure Core Spray (LPCS)	0	6
Reactor Protection System(RPS)/Plant Protection System (PPS)	27	31
Control Rod Drive (CRD) System	5	2
Standby by Liquid Control (SLC) System	0	8
Reactor Water Cleanup System (RWCU)	1	4
Automatic Depressurization System (ADS/Safety Relief Valves (SRVs)	5	5
Non Safety Systems	371	Not Applicable

Table 2-2 Transient and safety system failure events by System and Year

System		Number of LERs by Year															Total
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
Off Gas	Transients	2		2				1									5
	Safety System Failure																0
MSIVs	Transients	1	3	1	0	1	0	1		0	0	2					9
	Safety System Failure						1		1		1	1					4
HPCI	Transients																0
	Safety System Failure	3	2	1	3	8	5	1	3	2	2	1	4	3	4		42
HPCS	Transients							1									1
	Safety System Failure	3	1	1	3	0	3	2	2	2	3	3	1	4	5	1	34
RCIC	Transients																0
	Safety System Failure	2	2	5	4	7	1	3	3	2	1	0	1	0	1		32
Reshidual Heat Removal System/Low Pressure Coolant Injection	Transients																0
	Safety System Failure	4	2	2	3	0	1	0	1	0	0	2	2	0	1		18
LPCS	Transients																0
	Safety System Failure	1			1	1		1				1	1				6
Reactor Protection System/Plant Protection System	Transients	4	2				2	4	2		2	3	4	2	1	1	27
	Safety System Failure		6	7	8	1		1	3		2	1		1	1		31
Control Rod Drive	Transients			1					1		1	1		1			5
	Safety System Failure								1	1							2
Standy Liquid Control	Transients																0
	Safety System Failure	1						1	1		1	3				1	8
Rector Water Cleanup	Transients	1															1
	Safety System Failure	1		1						1			1				4
Automatic Depressuriztion/Safety Relief Valves	Transients	1	1		1	1				1							5
	Safety System Failure	1				1	2		1								5
																	0
																	0
Non Safety Systems	Transients	32	33	18	44	29	27	19	30	22	29	14	16	26	26	6	371

2.1 Off Gas system operational experience

2.1.1 Off Gas system SCRAMs

Off Gas system operational experience is summarized in Table 2-3 and Figure 2-1. The SCRAM events are summarized in greater detail in Appendix C-1.

Table 2-3 Off Gas System Operational Experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	5	0
Manual SCRAM	4	N/A
Automatic SCRAM	1	N/A
Equipment Failures	2	
Procedure/Maintenance	2	
Human Error	1	
Natural Events	0	0

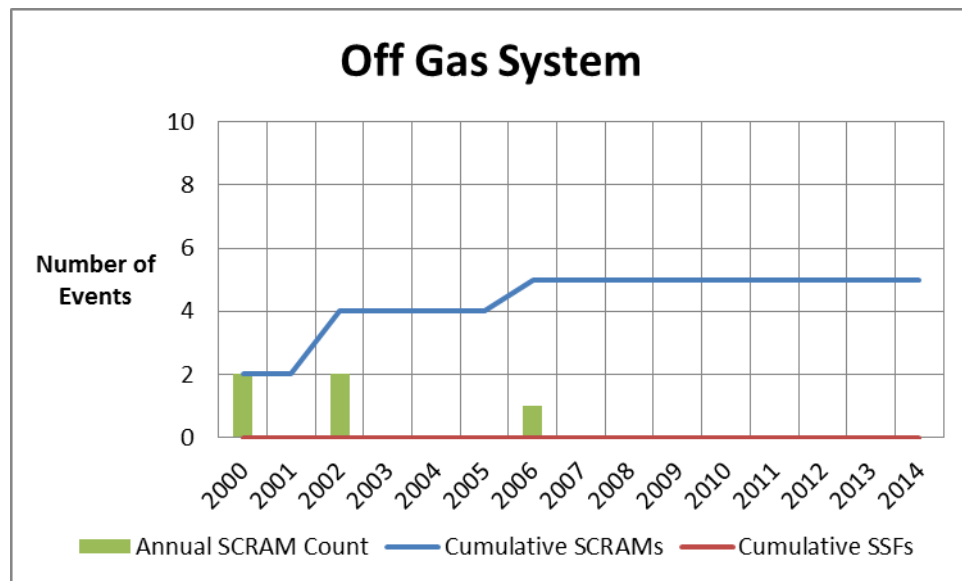


Figure 2-1 Off Gas System Operational Experience

Five SCRAM events have been identified out of the LER database since 2000. Off Gas system events involved loss of condenser vacuum, high back pressure to the condenser, high Hydrogen off gas concentration, and high temperature in the Off Gas system recombiner. Four of the five events involve the Off Gas system perturbing the back-pressure of the condensate system,

resulting in an undesirable operating condition for the power conversion system, resulting in a plant trip, either manually or automatically. Only one event involved an undesirable condition in the Off Gas system itself (high temperature in the recombiner, creating the necessary conditions for an operator initiated manual SCRAM. No incidences of excessive releases of radioactive gases were reported.

Only one SCRAM was automatic, caused by a maintenance error on a 120 VAC breaker. All others were manual in response to improper pressure or temperature indications in the condenser or Off Gas system.

2.1.2 Off Gas system safety system failures

No incidences of the Off Gas system being found inoperable or failing in response to an event were reported.

2.1.3 Relevance to ABWR

The ABWR design has an Off Gas system. Operational experience in the US BWR fleet is directly relevant to the ABWR general design assessment (GDA).

2.2 Main Steam Isolation Valves

2.2.1 Main Steam Isolation Valve SCRAMs

MSIV operational experience is summarized in Table 2-4 and Figure 2-2. The SCRAM events are summarized in greater detail in Appendix C 2.1

Nine SCRAM events have been observed since 2000, all automatic trips at operating power levels from 20% to 100%. In all events the reactor automatically trip due to conditions initiated by and unintended closure of at least one MSIV. Six events were due to equipment faults, two to procedural problems, and one to human error.

The equipment faults included failure of valve internal components, air supply failures and drain system issues. The two procedure SCRAMs occurred during testing of the MSIVs, and the human error induced SCRAM MSIV instrumentation was accidentally bumped by a worker.

2.2.2 Main Steam Isolation Valve safety system failures

Four MSIV SSF events were observed since 2000. These are summarized in greater detail in Appendix C 2.2.

Three events involved failure of an MSIV Local Leak Rate Test (LLRT) such that 10 CFR 100 limits could have been exceeded during a design base accident. These MSIV failure events were observed at power and during refueling. Either degradation of valve internals or improper sizing

Table 2-4 MSIV operational experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	9	4
Manual SCRAM	0	N/A
Automatic SCRAM	9	N/A
Equipment Failures	6	4
Procedure/Maintenance	2	
Human Error	1	
Natural Events	0	0

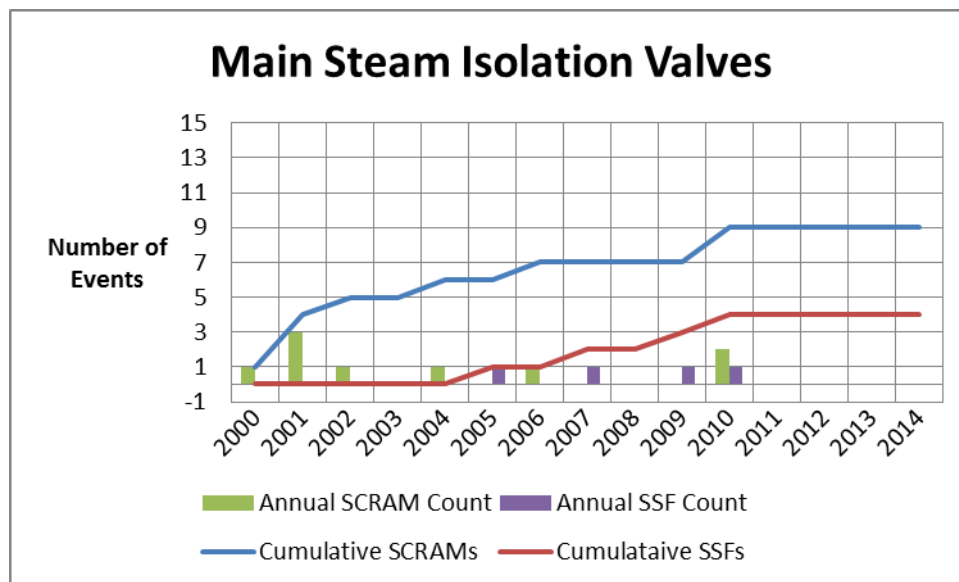


Figure 2-2 MSIV Operational Experience

of valve internals was identified as root causes. Another event involved failure of the isolation flow sensor, which would have indicated lower than actual flow.

2.2.3 Relevance to ABWR

The ABWR Design Certification Design Control Document describes the MSIV system in Section 5.4.5, and Section 5.4.5.4 describes inspection and testing. There is no indication of a significantly unique design compared to existing BWRs, so the operational experience which involves failures that cause MSIVs to unintentionally drift closed – thus initiating a SCRAM – or put an MSIV into a state such that it could fail to minimize release of radioactive steam in a designed base accident is relevant to the ABWR GDA.

2.3 High Pressure Coolant Injection

HPCI operational experience is summarized in Table 2-4 and Figure 2-3. The SCRAM events are summarized in greater detail in Appendix C 2.1.

2.3.1 High Pressure Coolant Injection SCRAM operating experience

There were no HPCI induced SCRAM events observed since 2000.

2.3.2 High Pressure Coolant Injection SSF operating experience

MSIV operational experience is summarized in Table 2-5 and Figure 2-3. These events are summarized in greater detail in Appendix C 3.

Table 2-5 High Pressure Injection operating experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	0	43
Manual SCRAM		N/A
Automatic SCRAM		N/A
Equipment Failures		33
Procedure/Maintenance		2
Human Error		8
Natural Events		

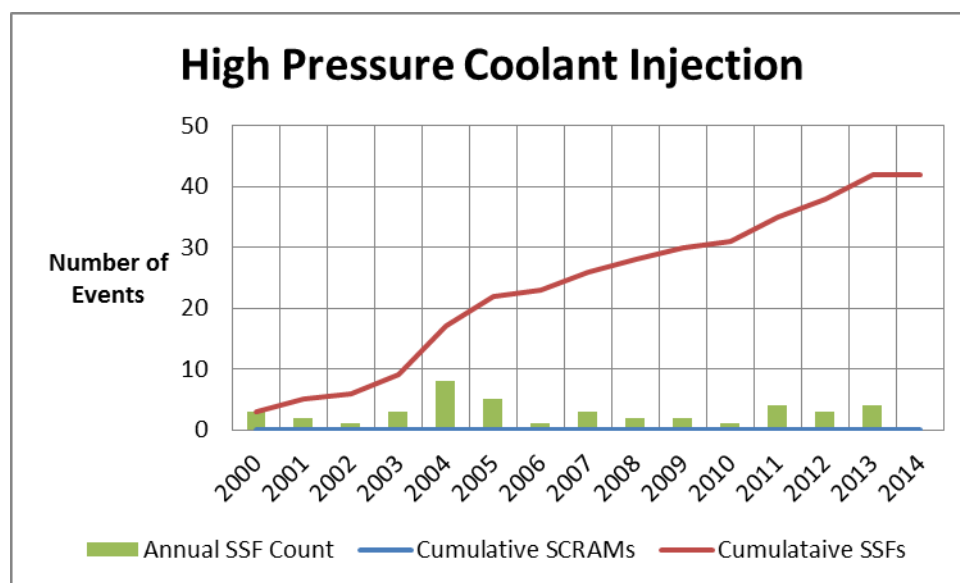


Figure 2-3 HPCI operating experience

There were 43 observed failures of the HPCI system since 2000, 33 of which were equipment failures, two procedure related failures and eight human error related failures. All events occurred at power, between 23% and 100% power.

Failures include:

- 11 in the discharges line, 10 equipment related and one human error,
- 14 in the suction lines, 13 equipment related and one human error,
- 3 in the minimum-flow lines, all equipment related,
- 3 system isolation failures, one equipment related and two human errors,
- 2 failures of the HPCI high reactor water level trip mechanism, both human errors,
- 4 related to pump motor issues which cannot be readily distinguished as unique to steam turbine pumps, one is equipment related, two human errors and one procedural issue.
- 3 turbine pump failures, all equipment related.
- One room cooling procedural failure.

Min-flow, discharge and suction line events involve issues including air in the lines, valve malfunctions due both to electrical faults in MOVs – including a total of five involving fuse failures – and leaking check valves. Suction events also included faults that would prevent realignment from the Condensate Storage Tank (CST) to the torus. Human error events tended to be involved with improperly returning HPCI back into service after maintenance.

2.3.3 Relevance to ABWR

The ABWR ECCS design contains an electric motor pump driven High Pressure Core Flooder (HPCF) system – analogous to the High Pressure Core Spray (HPCS) system in Mark IV BWRs. Four HPCI turbine pump events. HPCI is a steam driven turbine pump system. Nonetheless, with the exception of the four turbine pump steam line events, the other 39 events cannot be categorically eliminated from consideration. Valves that fail due to mechanical or electrical issues – thus allowing air into lines, minimum-flow line failures, failures of the HPCI auto trip mechanism are all failures that conceptually could occur in an ABWR. Hence those 39 events are relevant for the GDA.

2.4 High Pressure Core Spray

HPCI operational experience is summarized in Table 2-6 and Figure 2-4. The SCRAM events are summarized in greater detail in Appendix C 4-1 and the SSF events in Appendix C 4.2.

2.4.1 High Pressure Core Spray SCRAM operating experience

One HPCS SCRAM event was observed since 2000. An equipment failure resulting in the loss of the HPCS dedicated power supply induced a system actuation, which caused a reactor automatic trip on high water level.

Table 2-6 HPCS operating experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	1	34
Manual SCRAM		N/A
Automatic SCRAM	1	N/A
Equipment Failures		22
Procedure/Maintenance		4
Human Error		7
Natural Events		

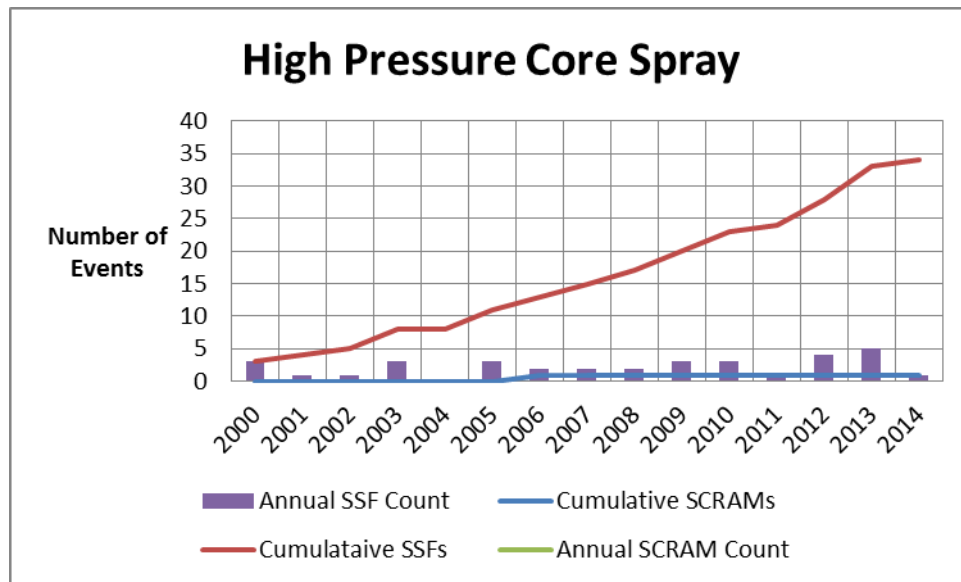


Figure 2-4 HPCS operating experience

2.4.2 High Pressure Core Spray SSF operating experience

Thirty four HPCS SSFs were observed since 2000, 22 are equipment related, four procedural and seven human errors. Two events occurred at very low power – hot shut down and 5%, the rest at power levels above 90%.

Failures include:

- 10 dedicated HPCS Diesel Generator events, eight equipment related, and two human errors.
- 6 dedicated HPCS 1E power system, three are equipment related, three human errors.
- 3 in the injection lines, one human error, two procedural.
- 4 in the suction lines, one is equipment related, two human errors and one procedural.

- 6 related to pump motor, four equipment related, one human related and one procedural.
- 2 room cooling events, both equipment related.
- 2 minimum-flow line failures, both are equipment related.

Mark III BWRs have a dedicated safety related electrical system, including an emergency diesel generator. Sixteen total events involve the dedicated safety related electrical. As with the HPCI system, both suction and injection line failures were observed, including the possibility of injection line water hammer and loss of suction, both due to air in the lines.

2.4.3 Relevance to the ABWR

The ABWR's electric motor driven HPCL system is analogous and conceptually similar to the BWR Mark III HPCS system. The ABWR diesel generators are air-cooled, but none of the 16 events related to the HPCS dedicated electrical system involved diesel water cooling events. Thus, all of the observed HPCS events should be considered relevant for the ABWR GDA.

2.5 Reactor Core Isolation Cooling

RCIC operational experience is summarized in Table 2-7 and Figure 2-5. The SSF events are summarized in greater detail in Appendix C 5.

2.5.1 RCIC SCRAM operating experience

No RCIC SCRAM events have been observed since 2000.

2.5.2 RCIC SSF operating experience

Thirty two SSF events have been observed since 2000, 25 are equipment related, four procedural and three involving human error. The events occurred during power levels between 8% and 100%, with most being at high power levels. Failures include:

- 10 events related to the turbine pump (either steam supply or exhaust issues, or turbine motor hardware), 9 equipment related and one human error.
- 5 10 CFR 50 Appendix R (fire safety) events, all equipment related. In each event it was discovered that RCIC might be inoperable from the Remote Shutdown Panel in the event of a Main Control Room fire.
- 3 unintended isolation events, on human error related, two procedural.
- One electrical power event involving DC power equipment. RCIC requires DC power for control.
- 3 suction line events, all equipment related involving either air in the lines or inadequate suction pressure.
- 2 discharge line events, one equipment related involving loss of control of the injection valve, and one procedural that could have induced water hammer in the discharge line had RCIC been initiated.
- 5 flow-control events, 4 equipment related and one human error. The flow-controller failures cause RCIC to trip.

Table 2-7 RCIC operating experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	0	32
Manual SCRAM		N/A
Automatic SCRAM		N/A
Equipment Failures		25
Procedure/Maintenance		4
Human Error		3
Natural Events		

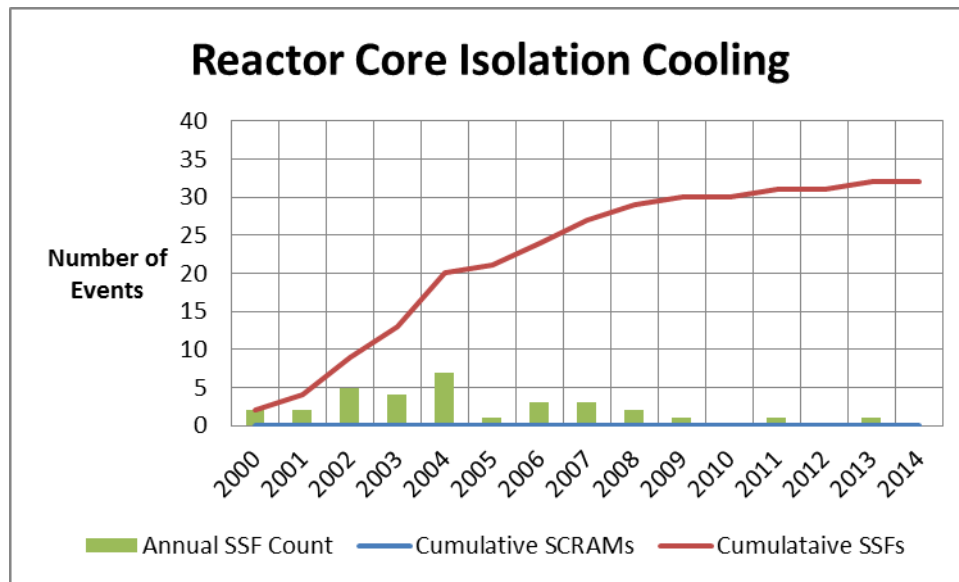


Figure 2-5 RCIC operational experience

As with HPCI and HPCS operating experience, both suction and discharge line faults were observed, including the possibility of injection line water hammer and loss of suction, both due to air in the lines.

2.5.3 Relevance to the ABWR

The RCIC system of the ABWR design is fundamentally similar to RCICs in the existing US fleet of BWRs. Thus, all operational experience should be considered relevant for the GDA.

Three issues warrant note here:

1. 10 CFR 50 Appendix R events: RCIC is commonly designated as part of the safe-shutdown path for many fire scenarios at US BWRs. If the ABWR applicant chooses RCIC as part of the safe-shutdown path, the operability of the RCIC for specific fire scenarios should be carefully verified. Several cases have been observed in the US where the initial Appendix R analysis missed critical electrical dependencies of the RCIC to the fire scenarios – especially regarding the behavior of circuits due to damaged cables.
2. RCIC Steam line isolation events: Generic Issue (GI) – 87 address a concern that HPCI steam line isolating valves may not be tested adequately to ensure that the valves would isolate under actual operating conditions. The NRC’s ABWR Safety Evaluation Report (SER), Section 5.4.6, documents that the issues of GI-87 were brought to the attention of the applicant regarding the RCIC isolation valves, and that the NRC had requested that the applicant verify test data showing that the steam isolation valves would isolate under actual operating conditions.
3. One of the three unintended isolation events warrants special attention. LER 2962002001 at Browns Ferry 3 involved the improper replacement of temperature switches in the steam tunnel temperature switches. BWR steam tunnels (the structure through which the main steam lines travel from the Reactor Building into the turbine hall) are instrumented with temperature sensors for the purpose of detecting steam leaks – an indication of loss-of-coolant-accidents (LOCAs). Should the temperature setting of the sensors be exceeded, RCIC is tripped and isolated. In this particular event, RCIC was declared inoperable when plant personnel discovered that the temperature switches were not the appropriate equipment. However, other failure modes involving poor selection of temperature trip levels for steam tunnel temperature sensors have been observed at BWRs by PSA analysts performing failure mode and effect analyses (FMEA) on RCIC systems. Steam tunnels are typically cooled by an HVAC system. However, in the event of a loss of room cooling to the steam tunnel (a common event in many fire scenarios) temperatures in the steam tunnel would rise. Depending on the local weather conditions (e.g., hot muggy summertime conditions), if the choice of steam tunnel temperature trip points has been set arbitrarily low, trip signal conditions could be achieved and the RCIC tripped for high steam tunnel temperature when no LOCA exists.

2.6 Residual Heat Removal/Low Pressure Coolant Injection

RHR and LPCI operational experience is summarized in Table 2-8Table 2-7 and Figure 2-6. The SSF events are summarized in greater detail in Appendix C 6.

2.6.1 RHR/LPCI SCRAM operating experience

No RHR/LPCI induced SCRAM events have been observed since 2000.

Table 2-8 RHR/LPCI operating experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	0	18
Manual SCRAM		N/A
Automatic SCRAM		N/A
Equipment Failures		12
Procedure/Maintenance		2
Human Error		4
Natural Events		

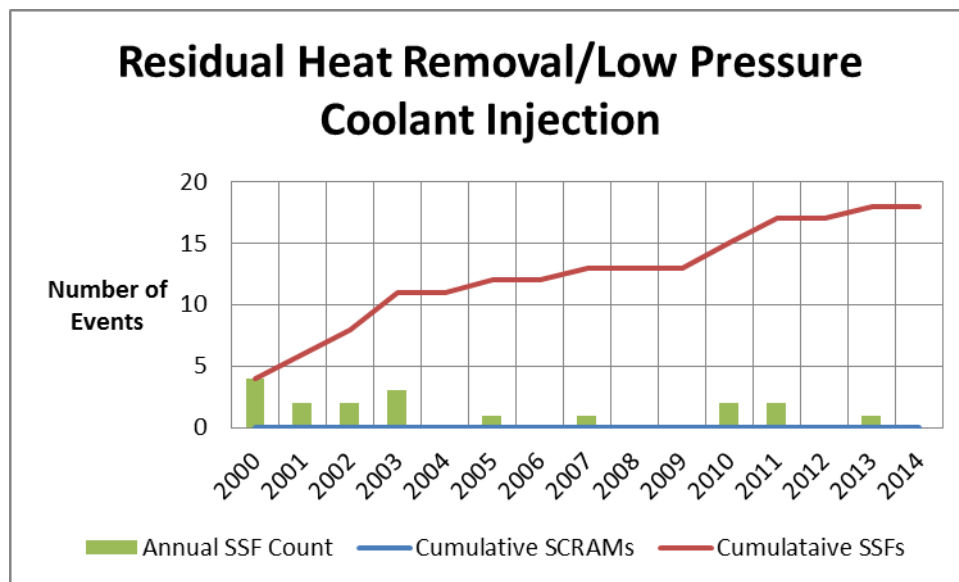


Figure 2-6 RHR/LPCI operating experience

2.6.2 RHR/LPCI SSF operating experience

Eighteen RHR/LPCI events have been observed since 2000, 12 equipment related, two procedural and four human errors. Three events occurred during cold shutdown, the rest occurred at 100% power or close to that level.

Failures include:

- 7 discharge line events, five equipment related, 2 human errors. The discharge line events involve air binding, diversion paths due to valve failures, injection valve failures and leaking valves.

- 3 unintended isolation failure events, one each equipment, procedural and human error related, rendering the system inoperable.
- 3 equipment related electrical events preventing pumps from starting.
- 2 10 CFR 50 Appendix R events. The Appendix R analyses had incorrectly assessed the operability of minimum-flow valves for certain fire scenarios.
- 1 flow-controller events, equipment related,
- 1 procedural related flood event, wherein a missing 4-in floor drain clean-out plug was discovered. This would have caused a postulated flood in one pump room to flood over into the other pump room.
- 1 suction line event, involving a human error. Improper placement of grating in the containment could have compromised the suction strainer to ensure water return from the dry-well back to the wet-well.

As with HPCI, HPCS and RCIC operating experience both suction and discharge line faults were observed, including the possibility of injection line water hammer and loss of suction, both due to air in the lines.

2.6.3 Relevance to the ABWR

The ABWR Low Pressure Core Flooder (LPCF) system is the functional equivalent to a LPCI system, and like the LPCI system is the high capacity mode of the RHR systems. In LPCF mode, the ABWR's RHR/LPCF system can inject water into the core at pressures higher than current LPCI systems, which would allow the LPCF system to address intermediate LOCA accidents. However, in all other aspects the ABWR RHR/LPCF system is conceptually similar to the RHR/LPCI system. All operational experience is relevant for the ABWR GDA.

2.7 Low Pressure Core Spray

LPCS operational experience is summarized in Table 2-9 Table 2-7and Figure 2-7. The SSF events are summarized in greater detail in Appendix C 7.

2.7.1 LPCS SCRAM operational experience

No LPCS induced SCRAM events were observed since 2000.

2.7.2 LPCS SSF operational experience

Six LPCS SSF events have been observed since 2000. Five are equipment related and one involves human error. All events occurred at high power.

The single human error event involved improper racked breakers in one train while the other train was taken out of service for maintenance. Among the equipment related events, there were:

- 2 minimum-flow events, one involving improperly environmentally qualified control circuits, and the other a loss of power to the valve due to fuse failure.
- One discharge line events due to air binding.

- One electrical event

Table 2-9 LPCS operational experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	0	6
Manual SCRAM		N/A
Automatic SCRAM		N/A
Equipment Failures		5
Procedure/Maintenance		0
Human Error		1
Natural Events		

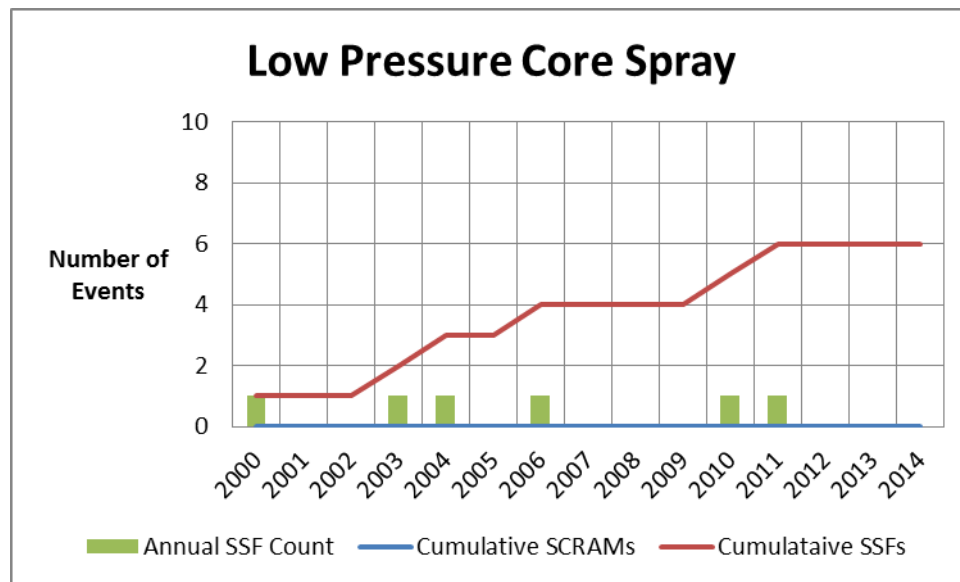


Figure 2-7 LPCS operational experience

- One electrical event wherein failed contacts in a relay would have rendered the pumps inoperable upon receipt of an actuation signal.
- One 10 CFR 50 Appendix R event. An Appendix R assessment regarding LPCS was discovered to be incorrect due to inadequate separation between trains of cables.

As with HPCI, HPCS, RCIC and RHR/LPCI operating experience, a discharge line fault was observed which involves the possibility of injection line water hammer due to air in the lines.

2.7.3 Relevance to ABWR

The LPCS system in existing BWRs offers a diverse low pressure cooling path to LPCI. The LPCS bypasses the recirculation loops and sprays cooling water into the top of the reactor vessel, whereas the RHR/LPCI system in LPCI mode injects water into the core through the recirculation loops. Since the ABWR has no recirculation loop piping, the value of the diversity of the LPCS/LPCI combination is lessened. The ABWR has a single low pressure cooling system, the RHR/LPCF system. However, conceptually the LPCS design has many components and features that are basically similar to the LPCF. Thus operational experience involving the LPCS is relevant to the ABWR GDA.

2.8 Reactor Protection System/Plant Protection System

RPS/PPS experience is summarized in Table 2-10 and Figure 2-8. The SCRAM events are summarized in greater detail in Appendix C 8.1, and the SSFs are summarized in detail in Appendix C 8.2.

Table 2-10 RPS/PPS operating experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	27	31
Manual SCRAM	3	N/A
Automatic SCRAM	24	N/A
Equipment Failures	16	23
Procedure/Maintenance	5	5
Human Error	6	3
Natural Events		

2.8.1 RPS/ADS SCRAM operating experience

Twenty seven SCRAM events involving RPS/PPS have been observed since 2000. Of those, three were manual and 24 automatic. Sixteen events were equipment related, five procedural and 6 involved human errors. Events occurred from 0% to 100% power.

The human error events involved maintenance activities which perturbed the plant protection system, resulting in an automatic trip. One event, at Nine Mile Point 2 (LER 4102010001) involved tripping the plant while performing maintenance on the RHR system by performing a maintenance action on an instrumentation line common to the RHR and the RPS.

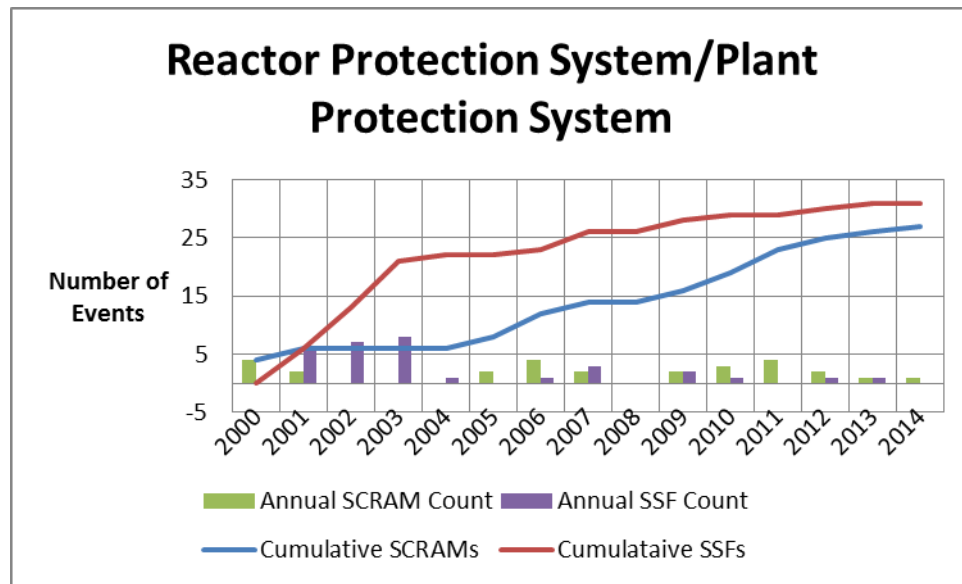


Figure 2-8 RPS/PPS operating experience

The five procedural related events involved three events where an item of the PPS was being either tested or returned to service, and two events in which the procedures led to an improper response to a startup condition and a power/load imbalance situation.

Regarding the 23 equipment related events, three were manual. The three manual trips were due to operator response to either erroneous water level indications or the observation of operators of problems involving the PPS. The remaining 20 events involved a plant trip and reactor SCRAM due to faulty equipment that caused a spurious SCRAM signal.

2.8.2 RPS/PPS SSF operating experience

Thirty one SSF events have been observed since 2000. Twenty three are equipment related, five are procedural, and three involve human error.

The three human error events involve improper setting of gains adjustments on power monitors (2) and one involving incorrect trip set on the recirculation pumps. The five procedural events involve the discovery of potential failures in the RPS due to procedures that induced incorrect system configuration.

Seventeen of the equipment related events involved faults with the oscillating power range monitors.

2.8.3 Relevance to ABWR

All operational experience of the RPS/PPS should be considered relevant for the ABWR GDA. Comparison of specific features of the ABWR RPS to the operational experience events will determine if the ABWR RPS might be susceptible to such events.

2.9 Control Rod Drive System

CRD experience is summarized in Table 2-14 and Figure 2-12. The SCRAM events are summarized in greater detail in Appendix C 9.1, and the SSFs are summarized in detail in Appendix C 9.2.

Table 2-11 CRD operating experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	5	2
Manual SCRAM	4	N/A
Automatic SCRAM	1	N/A
Equipment Failures	5	1
Procedure/Maintenance		1
Human Error		
Natural Events		

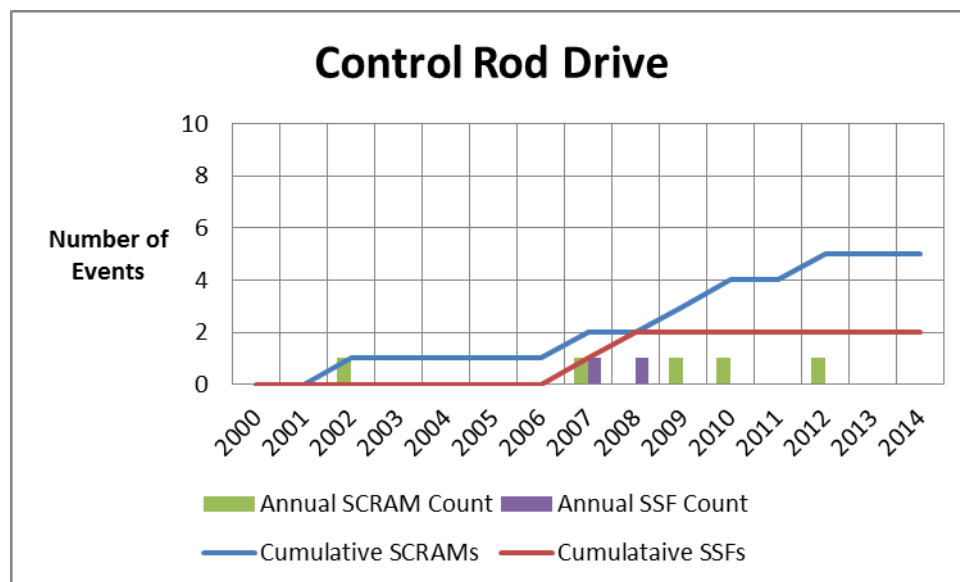


Figure 2-9 CRD operating experience

2.9.1 CRD SCRAM operating experience

Five SCRAM events have been observed since 2000, four manual and one automatic SCRAM. One event occurred at 1% power, the remainder occurred at above 50% power. All events were equipment related.

2.9.2 CRD SSF operating experience

Two SSF events have been observed since 2000, both equipment related. Both events occurred at shutdown. One event involved the discovery of an inoperable control rod out interlock during testing. The other event involved a containment isolation that caused a loss of shutdown cooling. The isolation was caused by a CRD pump start up.

2.9.3 Relevance to ABWR

The ABWR has a Fine Motion Control Rod Drive (FMCRD) system that utilizes an electric motor drive for normal operation and a conventional hydraulic accumulator for emergency insertion (SCRAM). No operational events should be excluded from the ABWR GDA. The specific design features of the FMCRD should be compared to the operational events to see if such events are relevant to the ABWR design.

2.10 Standby Liquid Control

SLC experience is summarized in Table 2-12 and Figure 2-10. The SSF events are summarized in detail in Appendix C 10.

Table 2-12 SLC operational experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	0	8
Manual SCRAM		N/A
Automatic SCRAM		N/A
Equipment Failures		7
Procedure/Maintenance		
Human Error		1
Natural Events		

2.10.1 SLC SCRAM operating experience

No SLC SCRAM events have been observed since 2000.

2.10.2 SLC SSF operating experience

Eight SSF events have been observed since 2000, seven equipment related and one human error. Four of the equipment events involve the SLC tank being seismically unqualified when water is left in the tank. Failure of the test tank from a seismic event could lead to failure of other SLC components. The other equipment events involve leaks (2) and a technical specification violation

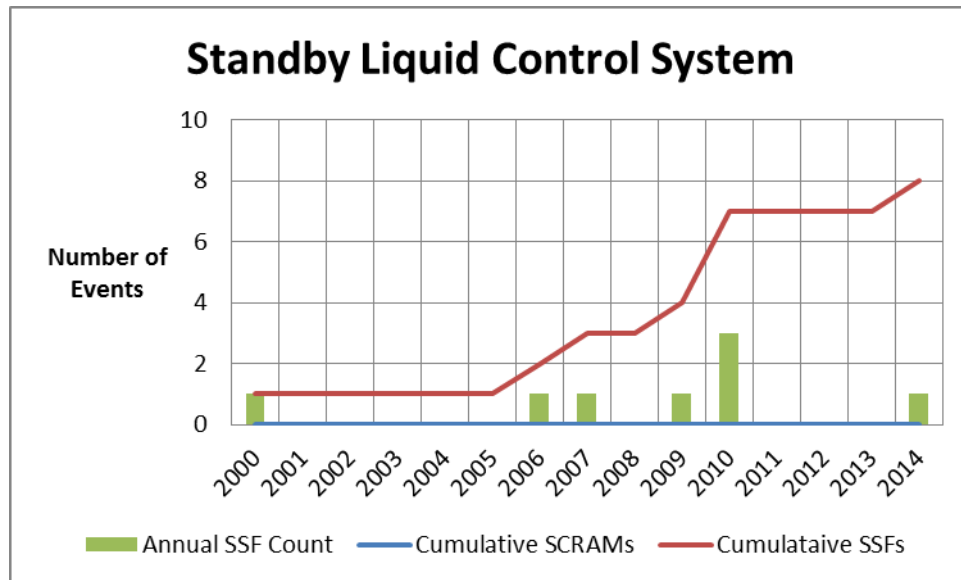


Figure 2-10 SLC operating experience

of Sodium Pentaborate concentration. The human error event involved the discovery of plastic trash bags left in the storage tank. This type of event has been the topic of an NRC generic communication, Information Notice IN02005. See Section 3.4.

2.10.3 Relevance to ABWR

All SLC operational events are relevant for the ABWR GDA.

2.11 Reactor Water Cleanup

RWCU system operational experience is summarized in Table 2-13 and Figure 2-10. The SCRAM events are summarized in greater detail in Appendix C 11.1, and the SSFs are summarized in detail in Appendix C 11.2.

Table 2-13 RWCU operational experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	1	4
Manual SCRAM		N/A
Automatic SCRAM	1	N/A
Equipment Failures		1
Procedure/Maintenance		1
Human Error		2
Natural Events		

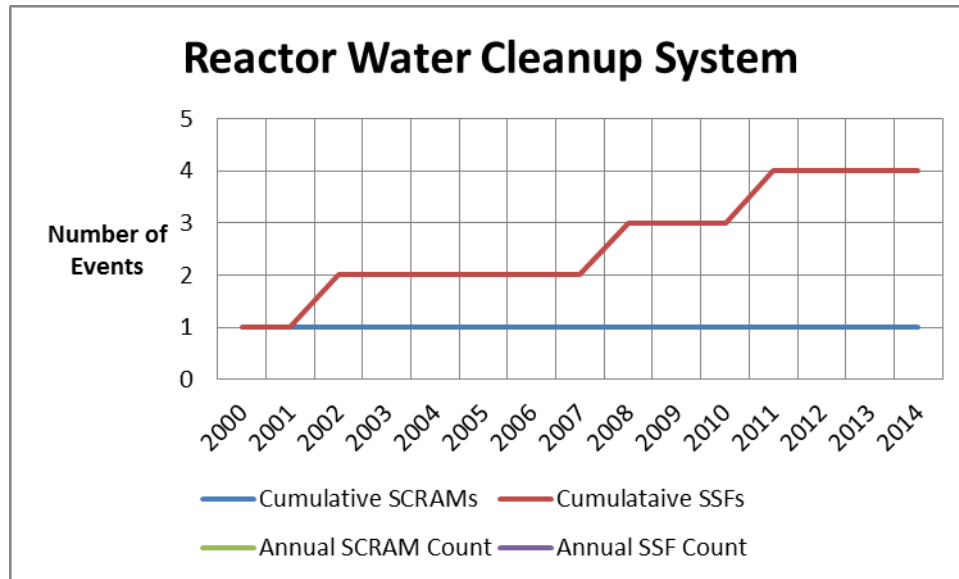


Figure 2-11 RWCU operating experience

2.11.1 RWCU SCRAM experience

One SCRAM event has been observed since 2000, at Dresden 3. The reactor scrammed on low-low water level signal. The cause was a pressure transient while bringing the RWCU back on line. It was a procedural related event. The event occurred at 100% power.

2.11.2 RWCU SSF experience

Two SSF events have been observed since 2000, one equipment related and the other human error. A failed circuit card was discovered, which could have cause RWCU isolation to failure in the event of a pipe break. This event occurred at 98% power. The human error event involved improper filling and venting of the RWCU piping after maintenance, which caused the differential flow interments to operate incorrectly.

2.11.3 Relevance to ABWR

All RWCU events should be considered relevant for the ABWR GDA.

2.12 Automatic Depressurization Systems/Safety Relief Valves

ADS/SRV experience is summarized in Table 2-14 and Figure 2-12. The SCRAM events are summarized in greater detail in Appendix C 12.1, and the SSFs are summarized in detail in Appendix C 12.2.

Table 2-14 ADS/SRV operational experience

Type of Event	Number of LER Transient Reports	Number of LER Safety System Failure Reports
	5	2
Manual SCRAM	5	N/A
Automatic SCRAM		N/A
Equipment Failures	3	
Procedure/Maintenance	1	1
Human Error	1	1
Natural Events		

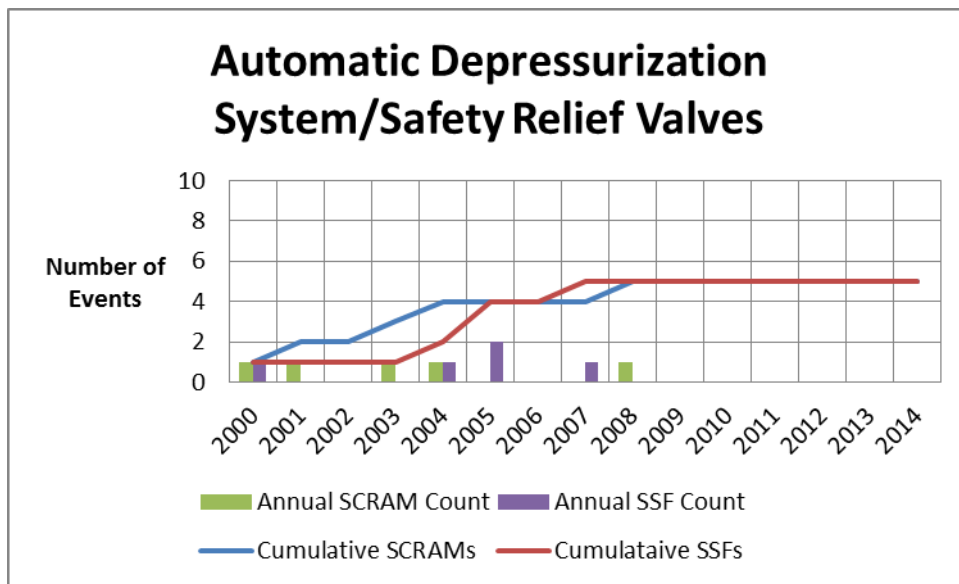


Figure 2-12 ADS/SRV operating experience

2.12.1 ADS/SRV SCRAM operating experience

Five SCRAM events have been observed since 2000. All five events were equipment related and occurred at power levels from 1% to 100% power. All SCRAMs were manual. All five events involved either leakage or a stuck open electronic ADS valve or a SRV.

2.12.2 ADS/SRV SSF operating experience

Two events have been observed since 2000, one human error related and one procedural. The human error event involved incorrect positioning of the of the long-term gas supply valves, which rendered the ADS inoperable. The procedural event was a determination that Appendix R

procedures at Cooper Station. If HPCI were not properly secured, steam lines could become flooded, failing ADS.

2.12.3 Relevance to ABWR

The ADS/SRV operational experience should be considered relevant for the ABWR GDA.

2.13 SCRAMs induced by non-safety systems

All SCRAM events induced by non-safety systems were reviewed. Non-safety system SCRAM operational experience is summarized in Table 2-15 and Figure 2-13. Non-safety system specific data is presented in Table 2-16 for those non-safety systems that have induced at least one SCRAM event since 2000. SCRAM data for all non-safety systems are shown in Table 2-17. The SCRAM events are summarized in greater detail in Appendix C 13.

Table 2-15 Non-safety system operational experience

Type of Event	Number of LER Transient Reports
	371
Manual SCRAM	144
Automatic SCRAM	227
Equipment Failures	284
Procedure/Maintenance	19
Human Error	33
Natural Events	20
Other	15

2.13.1 Non-safety system SCRAM operating experience

Of the 189 non-safety systems tracked in the INL LER database (see Table 2-17), 44 systems were observed to have induced at least one SCRAM event since 2000 (see Table 2-16). Of those events, 144 were manual SCRAMs and 227 were automatic SCRAMs.

Two BWR specific systems induced SCRAMs – the Drywell Environmental Control System (DECS) (two manual SCRAMs) and the Reactor Recirculation system (26 manual SCRAMs and five automatic SCRAMs). Both drywell related events occurred at 100% power, were categorized as equipment related and involved manual SCRAMs upon:

1. a rise in drywell temperature ultimately due to a loss of drywell cooling from a fault in the component cooling water system (LER 24920001003).
2. Excessive leakage into the drywell (LER 3412005001).

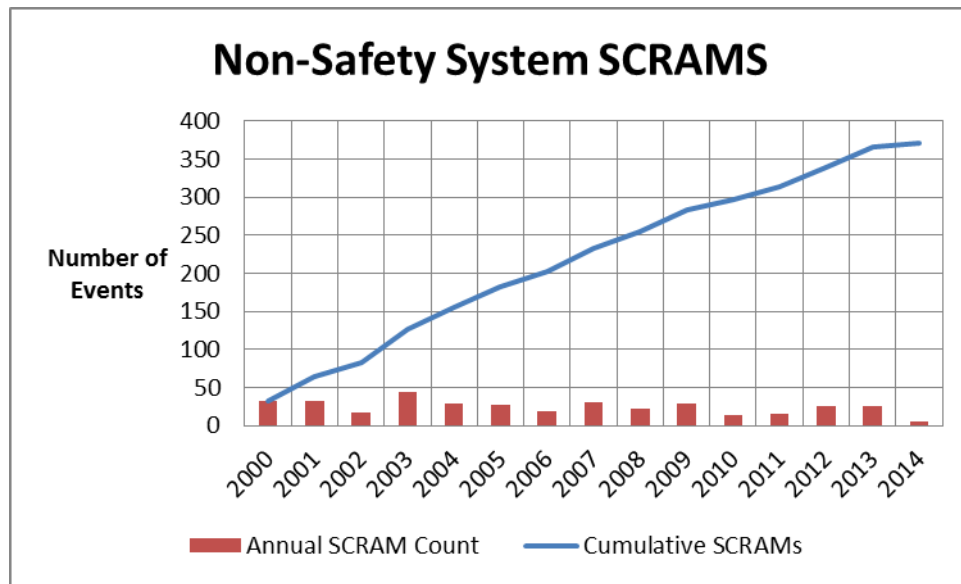


Figure 2-13 Non-safety system SCRAMs

The 31 Recirculation system events all occurred at power, from 24% up to 100% power. . Twenty five of these events involve recirculation pump trips or poor operating performance of one or more recirculation pumps which lead to either the operators manually tripping the Recirculation system or to an automatic tripping of the Recirculation system. Two events involve leaking from the Recirculation piping, and four involve automatic tripping of the recirculation pumps upon indication of unacceptable dry-well temperature or leak conditions.

The 42 non-safety systems common to both PWR and BWR designs which also induced at least one SCRAM since 2000 account for 338 of the 371 observed non-safety system induced SCRAMs. A survey of Table 2-16 shows that these non-safety system induced SCRAMs are dominated by:

- Feedwater related systems
 - Feedwater pump turbine lube oil system (2)
 - Feedwater system (44)
 - Feedwater/steam generator water level control system (9)
- Main generator related systems
 - Main generator output power system (34)
 - Main generator excitation system (5)
 - Main generator stator cooling (7)
 - Main generator system (16)
- Main Turbine control fluid (30)
- Main turbine system (41)
- Switchyard (43)

Table 2-16 Non-safety system SCRAM by system

DESCRIPTION	ACRONYM	REACTOR TYPE	Manual Scrams	Auto Scrams	Total Scrams
DRYWELL ENVIRONMENTAL CONTROL SYSTEM (BWR)	DECS	BWR	2		2
REACTOR RECIRCULATION SYSTEM (BWR)	RR	BWR	26	5	31
CIRCULATING WATER STRUCTURES	CWS	PWR & BWR		1	1
CONDENSATE DEMINERALIZER SYSTEM	CD	PWR & BWR	2	2	4
CONDENSATE SYSTEM	CONDT	PWR & BWR	6	3	9
CONDENSER SYSTEM	CONDR	PWR & BWR	6		6
CONDENSER VACUUM SYSTEM	CVS	PWR & BWR	13	6	19
DC POWER SYSTEM	DC	PWR & BWR		1	1
EMERGENCY/STANDBY GAS TREATMENT SYSTEM	SGTS	PWR & BWR	1		1
ENGINEERED SAFETY FEATURES ACTUATION SYSTEM	ESF	PWR & BWR		1	1
ESSENTIAL AIR SYSTEM	EA	PWR & BWR		1	1
FEEDWATER PUMP TURBINE LUBE OIL SYSTEM	FPTLO	PWR & BWR		2	2
FEEDWATER SYSTEM	FW	PWR & BWR	18	26	44
FEEDWATER/STEAM GENERATOR WATER LEVEL CONTROL SYSTEM	SGWLC	PWR & BWR	3	6	9
HEAT REJECTION SYSTEM	HRS	PWR & BWR	7	1	8
HP HEATER AND MSR DRAINS AND VENTS SYSTEM	HPMDV	PWR & BWR		2	2
INCORE/EXCORE NEUTRON MONITORING SYSTEM	I/ENM	PWR & BWR		2	2
INSTRUMENT AND UNINTERRUPTIBLE POWER SYSTEM - CLASS 1E	UPS1E	PWR & BWR	1	5	6
INTEGRATED CONTROL SYSTEM	ICS	PWR & BWR	1		1
LOW-VOLTAGE POWER SYSTEM - CLASS 1E	LVP1E	PWR & BWR	2	1	3
LP HEATER DRAINS AND VENTS SYSTEM	LPHDV	PWR & BWR	1		1
MAIN GENERATOR EXCITATION SYSTEM	MGE	PWR & BWR	1	4	5
MAIN GENERATOR OUTPUT POWER SYSTEM	MGOP	PWR & BWR	2	22	24
MAIN GENERATOR SEAL OIL SYSTEM	MGSO	PWR & BWR	1		1
MAIN GENERATOR STATOR COOLING SYSTEM	MGSC	PWR & BWR	5	2	7
MAIN GENERATOR SYSTEM	MG	PWR & BWR	1	15	16
MAIN TURBINE CONTROL FLUID SYSTEM	MTCF	PWR & BWR	11	19	30
MAIN TURBINE SYSTEM	MT	PWR & BWR	8	33	41
MAIN/REHEAT STEAM SYSTEM	M/RS	PWR & BWR	7	7	14
MEDIUM-VOLTAGE POWER SYSTEM - CLASS 1E	MVP1E	PWR & BWR	6	5	11

DESCRIPTION	ACRONYM	REACTOR TYPE	Manual Scrams	Auto Scrams	Total Scrams
MEDIUM-VOLTAGE POWER SYSTEM (601V THROUGH 35 KV)	MVP	PWR & BWR	4	6	10
NONESSENTIAL SERVICE WATER SYSTEM	NSW	PWR & BWR	1		1
RADIATION MONITORING SYSTEM	RM	PWR & BWR	1		1
REACTOR VESSEL SYSTEM [SPECIAL NON-EIIS CODE]	RxVSL	PWR & BWR	1		1
SERVICE AIR SYSTEM	SA	PWR & BWR	1		1
STEAM EXTRACTION SYSTEM	SE	PWR & BWR	1		1
SWITCHYARD SYSTEM	SY	PWR & BWR	2	41	43
TURBINE LUBE OIL SYSTEM	TLO	PWR & BWR	1	1	2
TURBINE STEAM BYPASS CONTROL SYSTEM	TSBC	PWR & BWR	1	3	4
TURBINE STEAM SEAL SYSTEM	TSS	PWR & BWR		1	1
TURBINE SUPERVISORY CONTROL SYSTEM	TSC	PWR & BWR		3	3
			144	227	371

2.13.2 Relevance to ABWR

The operational experience involving all of the non-safety systems common to both PWR and BWR designs should be considered relevant to the ABWR GDA, especially those systems such as the feedwater related systems, generator related systems, turbine related and switchyard related systems.

The operational experience involving the two BWR specific systems, Recirculation system and the Drywell Environmental Control System, is largely relevant to the ABWR GDA. As stated in Section 2.13.1 only two Recirculation system failures appear to involve leakage from Recirculation system piping, an issue which has been eliminated with the ABWR's Recirculation system design. The vast majority of Recirculation SCRAMs (25) involve operational problems with the Recirculation pumps themselves.

Table 2-17 Non-safety system SCRAM data – all non-safety systems

DESCRIPTION	ACRONYM	REACTOR TYPE	Manual Scrams	Auto Scrams	Total Scrams
DRYWELL ENVIRONMENTAL CONTROL SYSTEM (BWR)	DECS	BWR	2		2
PRIMARY CONTAINMENT [SPECIAL NON-EIIS CODE]	PC	BWR			
REACTOR BUILDING (BWR)	RB	BWR			
REACTOR RECIRCULATION SYSTEM (BWR)	RR	BWR	26	5	31
SUPPRESSION POOL MAKEUP SYSTEM (BWR)	SPM	BWR			
SUPPRESSION POOL PURIFICATION SYSTEM (BWR)	SPPS	BWR			
ACCESS CORRIDORS ENVIRONMENTAL CONTROL SYSTEM	ACEC	PWR & BWR			
ADMINISTRATION BUILDING	ADMIN	PWR & BWR			
ADMINISTRATION BUILDING ENVIRONMENTAL CONTROL SYSTEM	ADBEC	PWR & BWR			
ALL SYSTEMS (BALANCE OF PLANT) [SPECIAL NON-EIIS CODE]	ALL	PWR & BWR			
ANNUNCIATOR SYSTEM	ANN	PWR & BWR			
ANTICIPATED TRANSIENT WITHOUT SCRAM SYSTEM (BWR) [SPL NON-EIIS CODE]	ATWS	PWR & BWR			
AUXILIARY BUILDING	AB	PWR & BWR			
AUXILIARY BUILDING ENVIRONMENTAL CONTROL SYSTEM	ABEC	PWR & BWR			
AUXILIARY STEAM SYSTEM	AS	PWR & BWR			
BREATHING AIR SYSTEM	BA	PWR & BWR			
CABLE RACEWAY SYSTEM	CRW	PWR & BWR			
CARBON DIOXIDE SUPPLY SYSTEM	CO2	PWR & BWR			
CASK DECONTAMINATION SYSTEM	CDS	PWR & BWR			
CATHODIC PROTECTION SYSTEM	CTHDP	PWR & BWR			
CHILLED WATER SYSTEM	CW	PWR & BWR			
CIRCULATING WATER STRUCTURES	CWS	PWR & BWR		1	1
CLOSED/COMPONENT COOLING WATER SYSTEM	CCW	PWR & BWR			
COMMUNICATIONS SYSTEM	COMM	PWR & BWR			
COMPUTER SYSTEM	CPU	PWR & BWR			
CONDENSATE AND FEEDWATER CHEMISTRY CONTROL SYSTEM	CFCC	PWR & BWR			
CONDENSATE DEMINERALIZER SYSTEM	CD	PWR & BWR	2	2	4
CONDENSATE STORAGE AND TRANSFER SYSTEM	CST	PWR & BWR			
CONDENSATE SYSTEM	CONDT	PWR & BWR	6	3	9
CONDENSER SYSTEM	CONDR	PWR & BWR	6		6
CONDENSER TUBE CLEANING SYSTEM	CTC	PWR & BWR			

DESCRIPTION	ACRONYM	REACTOR TYPE	Manual Scrams	Auto Scrams	Total Scrams
CONDENSER VACUUM SYSTEM	CVS	PWR & BWR	13	6	19
CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM	CCGC	PWR & BWR			
CONTAINMENT ENVIRONMENTAL MONITORING SYSTEM	CEM	PWR & BWR			
CONTAINMENT ISOLATION CONTROL SYSTEM	CISOC	PWR & BWR			
CONTAINMENT LEAKAGE CONTROL SYSTEM	CLC	PWR & BWR			
CONTAINMENT PURGE SYSTEM [SPECIAL NON-EIIS CODE]	CP	PWR & BWR			
CONTAINMENT VACUUM RELIEF SYSTEM	CVR	PWR & BWR			
CONTROL BUILDING/CONTROL COMPLEX	CR	PWR & BWR			
CONTROL BUILDING/CONTROL COMPLEX ENVIRONMENTAL CONTROL SYSTEM	CCEC	PWR & BWR			
CORE VIBRATION MONITORING SYSTEM	CVM	PWR & BWR			
DC POWER SYSTEM	DC	PWR & BWR		1	1
DC POWER SYSTEM - CLASS 1E	DC1E	PWR & BWR			
DEMINERALIZED WATER STORAGE AND TRANSFER SYSTEM	DWST	PWR & BWR			
DIESEL COOLING WATER SYSTEM	DCW	PWR & BWR			
DIESEL FUEL OIL SYSTEM	DFO	PWR & BWR			
DIESEL GENERATOR STARTING AIR SYSTEM	DSA	PWR & BWR			
DIESEL LUBE OIL SYSTEM	DLO	PWR & BWR			
DISPLAY CONTROL SYSTEM	DSPC	PWR & BWR			
EMERGENCY DC LIGHTING SYSTEM	EDCL	PWR & BWR			
EMERGENCY ONSITE POWER SUPPLY BUILDING	EOPS	PWR & BWR			
EMERGENCY ONSITE POWER SUPPLY BUILDING ENVIRONMENTAL CONTROL SYSTEM	EPSEC	PWR & BWR			
EMERGENCY ONSITE POWER SUPPLY SYSTEM	EPS	PWR & BWR			
EMERGENCY OPERATIONS FACILITY (OFFSITE)	EOF	PWR & BWR			
EMERGENCY OPERATIONS FACILITY ENVIRONMENTAL CONTROL SYSTEM	EOFEC	PWR & BWR			
EMERGENCY/STANDBY GAS TREATMENT SYSTEM	SGTS	PWR & BWR	1		1
ENGINEERED SAFETY FEATURES ACTUATION SYSTEM	ESF	PWR & BWR		1	1
ENVIRONMENTAL/METEOROLOGICAL MONITORING SYSTEM	E/MM	PWR & BWR			
EQUIPMENT AND FLOOR DRAIN SYSTEM	EFD	PWR & BWR			
ESSENTIAL AIR SYSTEM	EA	PWR & BWR		1	1
ESSENTIAL SERVICE WATER PUMP BUILDING	ESWP	PWR & BWR			
ESSENTIAL SERVICE WATER SYSTEM	ESW	PWR & BWR			

DESCRIPTION	ACRONYM	REACTOR TYPE	Manual Scrams	Auto Scrams	Total Scrams
FEEDWATER PUMP INJECTION AND MISCELLANEOUS SYSTEM	FPIM	PWR & BWR			
FEEDWATER PUMP TURBINE INSTRUMENTATION AND CONTROL SYSTEM	FPTIC	PWR & BWR			
FEEDWATER PUMP TURBINE LUBE OIL SYSTEM	FPTLO	PWR & BWR		2	2
FEEDWATER SYSTEM	FW	PWR & BWR	18	26	44
FEEDWATER/STEAM GENERATOR WATER LEVEL CONTROL SYSTEM	SGWLC	PWR & BWR	3	6	9
FIRE DETECTION SYSTEM	FIRE	PWR & BWR			
FIRE PROTECTION SYSTEM (CHEMICAL)	FPC	PWR & BWR			
FIRE PROTECTION SYSTEM (PASSIVE) [SPECIAL NON-EIIS CODE]	FPP	PWR & BWR			
FIRE PROTECTION SYSTEM (WATER)	FPW	PWR & BWR			
FUEL BUILDING	FB	PWR & BWR			
FUEL BUILDING ENVIRONMENTAL CONTROL SYSTEM	FBEC	PWR & BWR			
FUEL OIL RECEIVING, STORAGE, AND TRANSFER SYSTEM	FORST	PWR & BWR			
FUEL POOL COOLING AND PURIFICATION SYSTEM	FPCP	PWR & BWR			
GLAND SEAL WATER SUPPLY SYSTEM	GSWS	PWR & BWR			
GROUNDING AND LIGHTNING PROTECTION SYSTEM	GLP	PWR & BWR			
HEAT REJECTION CHEMICAL TREATMENT SYSTEM	HRCT	PWR & BWR			
HEAT REJECTION SYSTEM	HRS	PWR & BWR	7	1	8
HEAT TRACING SYSTEM	HTR	PWR & BWR			
HEAT TRACING SYSTEM - CLASS 1E	HTR1E	PWR & BWR			
HP HEATER AND MSR DRAINS AND VENTS SYSTEM	HPMDV	PWR & BWR		2	2
HYDROGEN SUPPLY SYSTEM	HS	PWR & BWR			
INCORE/EXCORE NEUTRON MONITORING SYSTEM	I/ENM	PWR & BWR		2	2
INDUSTRIAL/SANITARY WASTE TREATMENT BUILDING	I/SWT	PWR & BWR			
INSTRUMENT AIR SUPPLY SYSTEM	IA	PWR & BWR			
INSTRUMENT AND UNINTERRUPTIBLE POWER SYSTEM	UPS	PWR & BWR			
INSTRUMENT AND UNINTERRUPTIBLE POWER SYSTEM - CLASS 1E	UPS1E	PWR & BWR	1	5	6
INSULATING OIL SYSTEM	IO	PWR & BWR			
INTEGRATED CONTROL SYSTEM	ICS	PWR & BWR	1		1
LABORATORY EQUIPMENT SYSTEM	LE	PWR & BWR			
LABORATORY GAS SYSTEM	LG	PWR & BWR			
LEAK MONITORING SYSTEM	LMS	PWR & BWR			
LIQUID WASTE MANAGEMENT SYSTEM	LWM	PWR & BWR			
LOOSE PARTS MONITORING SYSTEM	LPM	PWR & BWR			

DESCRIPTION	ACRONYM	REACTOR TYPE	Manual Scrams	Auto Scrams	Total Scrams
LOW-VOLTAGE POWER SYSTEM - CLASS 1E	LVP1E	PWR & BWR	2	1	3
LOW-VOLTAGE POWER SYSTEM (600V AND LESS)	LVP	PWR & BWR			
LP HEATER DRAINS AND VENTS SYSTEM	LPHDV	PWR & BWR	1		1
LUBE OIL STORAGE AND TRANSFER SYSTEM	LOST	PWR & BWR			
LUBE OIL SYSTEM	LO	PWR & BWR			
MAIN GENERATOR EXCITATION SYSTEM	MGE	PWR & BWR	1	4	5
MAIN GENERATOR GAS PURGE SYSTEM	MGGP	PWR & BWR			
MAIN GENERATOR HYDROGEN COOLING SYSTEM	MGHC	PWR & BWR			
MAIN GENERATOR OUTPUT POWER SYSTEM	MGOP	PWR & BWR	2	22	24
MAIN GENERATOR SEAL OIL SYSTEM	MGSO	PWR & BWR	1		1
MAIN GENERATOR STATOR COOLING SYSTEM	MGSC	PWR & BWR	5	2	7
MAIN GENERATOR SYSTEM	MG	PWR & BWR	1	15	16
MAIN TURBINE CONTROL FLUID SYSTEM	MTCF	PWR & BWR	11	19	30
MAIN TURBINE INSTRUMENTATION SYSTEM	MTI	PWR & BWR			
MAIN TURBINE SYSTEM	MT	PWR & BWR	8	33	41
MAIN/REHEAT STEAM SYSTEM	M/RS	PWR & BWR	7	7	14
MAINTENANCE AND WAREHOUSE BUILDING	MW	PWR & BWR			
MAKEUP DEMINERALIZER SYSTEM	MD	PWR & BWR			
MAKEUP WATER INTAKE STRUCTURE	MWI	PWR & BWR			
MATERIAL AND EQUIPMENT HANDLING SYSTEM	MEH	PWR & BWR			
MEDIUM-VOLTAGE POWER SYSTEM - CLASS 1E	MVP1E	PWR & BWR	6	5	11
MEDIUM-VOLTAGE POWER SYSTEM (601V THROUGH 35 KV)	MVP	PWR & BWR	4	6	10
MISCELLANEOUS TURBINE VENTS SYSTEM	MTV	PWR & BWR			
MULTIPLE SYSTEMS	MULT	PWR & BWR			
NITROGEN SUPPLY SYSTEM	NS	PWR & BWR			
NO SYSTEMS INVOLVED [SPECIAL NON-EIIS CODE]	NONE	PWR & BWR			
NONESSENTIAL SERVICE WATER SYSTEM	NSW	PWR & BWR	1		1
NORMAL AC LIGHTING SYSTEM	NACL	PWR & BWR			
NUCLEAR FUEL SERVICES SYSTEM	NFS	PWR & BWR			
NUCLEAR FUEL TRANSFER SYSTEM	NFT	PWR & BWR			
OTHER KNOWN SYSTEM - SEE COMMENT FIELD [SPECIAL NON-EIIS CODE]	OTHER	PWR & BWR			
PANELS SYSTEM	PNL	PWR & BWR			

DESCRIPTION	ACRONYM	REACTOR TYPE	Manual Scrams	Auto Scrams	Total Scrams
PERFORMANCE MONITORING SYSTEM	PM	PWR & BWR			
PLANT EXHAUST SYSTEM	PE	PWR & BWR			
PLANT HOT WATER SYSTEM	PHW	PWR & BWR			
PLANT MANAGEMENT [SPECIAL NON-EIIS CODE]	PLMGT	PWR & BWR			
PLANT PROTECTION SYSTEM	PPS	PWR & BWR			
PLANT SHOP SYSTEM	PS	PWR & BWR			
PLANT STAFFING [SPECIAL NON-EIIS CODE]	PSTAF	PWR & BWR			
POST-ACCIDENT MONITORING SYSTEM	PAM	PWR & BWR			
POTABLE WATER DISTRIBUTION SYSTEM	PWD	PWR & BWR			
PUMPING STATION ENVIRONMENTAL CONTROL SYSTEM	PSEC	PWR & BWR			
RADIATION MONITORING SYSTEM	RM	PWR & BWR	1		1
RADWASTE BUILDING	RWB	PWR & BWR			
RADWASTE BUILDING ENVIRONMENTAL CONTROL SYSTEM	RWBEC	PWR & BWR			
RAW WATER MAKEUP SYSTEM	RWM	PWR & BWR			
REACTOR BUILDING ENVIRONMENTAL CONTROL SYSTEM	RBEC	PWR & BWR			
REACTOR CORE SYSTEM	RC	PWR & BWR			
REACTOR POWER CONTROL SYSTEM	RPC	PWR & BWR			
REACTOR SERVICES SYSTEM	RS	PWR & BWR			
REACTOR VESSEL SYSTEM [SPECIAL NON-EIIS CODE]	RxVSL	PWR & BWR	1		1
RECIRCULATION ACTUATION SYSTEM [SPECIAL NON-EIIS CODE]	RAS	PWR & BWR			
RECORD STORAGE SYSTEM	REC	PWR & BWR			
REMOVABLE CHEMICAL CLEANING SYSTEM	RCC	PWR & BWR			
SAMPLING AND WATER QUALITY SYSTEM	SWQ	PWR & BWR			
SANITARY WASTE PROCESSING SYSTEM	SWP	PWR & BWR			
SECURITY BUILDING ENVIRONMENTAL CONTROL SYSTEM	SECBC	PWR & BWR			
SECURITY SYSTEM	SEC	PWR & BWR			
SEISMIC MONITORING SYSTEM	SM	PWR & BWR			
SEQUENCE OF EVENTS MONITORING SYSTEM	SEQ	PWR & BWR			
SERVICE AIR SYSTEM	SA	PWR & BWR	1		1
SERVICE BUILDING	SB	PWR & BWR			
SERVICE BUILDING ENVIRONMENTAL CONTROL SYSTEM	SBEC	PWR & BWR			
SHIELD ANNULUS RETURN AND EXHAUST SYSTEM	SARE	PWR & BWR			
SLUDGE WASTE DEWATERING SYSTEM	SWD	PWR & BWR			
SOLID STATE CONTROL SYSTEM/AUXILIARY LOGIC CONTROL	SSCS	PWR & BWR			

DESCRIPTION	ACRONYM	REACTOR TYPE	Manual Scrams	Auto Scrams	Total Scrams
SYSTEM					
SOLID WASTE MANAGEMENT SYSTEM	SWM	PWR & BWR			
STANDBY AC LIGHTING SYSTEM	SACL	PWR & BWR			
STATION GENERATION TELEMETERING SYSTEM	SGT	PWR & BWR			
STEAM EXTRACTION SYSTEM	SE	PWR & BWR	1		1
SWITCHYARD SYSTEM	SY	PWR & BWR	2	41	43
TECHNICAL SUPPORT CENTER ENVIRONMENTAL CONTROL SYSTEM	TSCEC	PWR & BWR			
TELEVISION SYSTEM	TV	PWR & BWR			
TEMPERATURE MONITORING SYSTEM	TM	PWR & BWR			
TOXIC GAS ISOLATION SYSTEM [SPECIAL NON-EIIS CODE]	TGIS	PWR & BWR			
TURBINE BUILDING	TB	PWR & BWR			
TURBINE BUILDING CLOSED COOLING WATER SYSTEM	TBCCW	PWR & BWR			
TURBINE BUILDING ENVIRONMENTAL CONTROL SYSTEM	TBEC	PWR & BWR			
TURBINE DRAINS AND MISCELLANEOUS PIPING SYSTEM	TDMP	PWR & BWR			
TURBINE LUBE OIL SYSTEM	TLO	PWR & BWR	1	1	2
TURBINE STEAM BYPASS CONTROL SYSTEM	TSBC	PWR & BWR	1	3	4
TURBINE STEAM SEAL SYSTEM	TSS	PWR & BWR		1	1
TURBINE SUPERVISORY CONTROL SYSTEM	TSC	PWR & BWR		3	3
ULTIMATE HEAT SINK SYSTEM	UHS	PWR & BWR			
UNKNOWN SYSTEM [SPECIAL NON-EIIS CODE]	UNK	PWR & BWR			
VISITORS CENTER	VISIT	PWR & BWR			
VISITORS CENTER ENVIRONMENTAL CONTROL SYSTEM	VCEC	PWR & BWR			
WASTEWATER DISPOSAL SYSTEM	WWDS	PWR & BWR			
WASTEWATER OUTFALL STRUCTURE	WO	PWR & BWR			
WATER FILTRATION SYSTEM	WF	PWR & BWR			
WATER TREATMENT BUILDING	WT	PWR & BWR			
WATER TREATMENT BUILDING ENVIRONMENTAL CONTROL SYSTEM	WTBEC	PWR & BWR			
WELDING GAS SYSTEM	WG	PWR & BWR			
YARD HANDLING AND MAINTENANCE SYSTEM	YHM	PWR & BWR			
			144	227	371

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3 USNRC GENERIC ISSUES AND COMMUNICATIONS

3.1 Generic Issues

3.1.1 Generic Issue 193 – BWR ECCS suction concerns

Currently, there is only one outstanding BWR related generic issue, Generic Safety Issues (GSI)-193. GI-193, "BWR ECCS Suction Concerns", evaluates possible failure of the ECCS pumps (or degraded performance) due to unanticipated quantities of noncondensable gas in the suction piping that could cause gas binding, vapor locking, or cavitation. Noncondensable gas can be present in the suppression pools in BWR Mark I, II, and III containments during LOCA conditions following downcomer flow from the drywell into the suppression pool.

The NRC has conducted literature searches on ECCS pump performance and suppression pool behavior following downcomer flow into the suppression pool. Based on the results of this search, the NRC believes that research exists which indicates that gas may reach the ECCS pumps during a LOCA.

The NRC is continuing to monitor research related to the phenomena of this issue, including research in Finland. Ultimately, the NRC believes that the resolution of this issue may require a post-LOCA suppression pool ECCS pump suction strainer "exclusion zone." "Exclusion zone" is the volume below or around the downcomer exhaust, which is expected to contain a large concentration of noncondensable gas from the drywell. The "exclusion zone" would help to define boundary zones such that if a suction strainer is located in a boundary zone, the ECCS pump may be vulnerable.

The status of this GSI and NRC plans for continued research are reported in the current *Generic Issue Management Control System Report* (GIMCS) on the NRC website at <http://pbadupws.nrc.gov/docs/ML1409/ML14091A231.pdf>.

This GSI should be considered relevant to the ABWR GDA.

3.1.2 Generic Issue 189 - Susceptibility of Ice Condenser and Mark III Containments to Early Failure from Hydrogen Combustion During a Severe Accident

This GSI has been closed as of June 12, 2013. The GIMCS is at <http://pbadupws.nrc.gov/docs/ML1319/ML13190A254.pdf>

The staff conducted studies to determine whether providing an independent power supply for the igniter systems provides a substantial increase in the overall protection of the public health and safety with implementation costs that are justified in view of the increased protection. The costs exceed the benefits for all BWR regulatory options, and none of the options for the BWRs provide a substantial increase in the overall protection of public health and safety.

3.1.3 Generic Issue 87 - Failure of HPCI Steam Line Without Isolation

Generic Issue (GI) – 87 addresses a concern that HPCI steam line isolating valves may not be tested adequately to ensure that the valves would isolate under actual operating conditions. The NRC’s ABWR Safety Evaluation Report (SER), Section 5.4.6, documents that the issues of GI-87 were brought to the attention of the applicant regarding the RCIC isolation valves, and that the NRC had requested that the applicant verify test data showing that the steam isolation valves would isolate under actual operating conditions.

3.2 Bulletins

Bulletins (1) request licensee actions and/or information to address significant issues regarding matters of safety, security, safeguards, or environmental significance that have great urgency, and (2) require a written response.

No BWR specific Bulletins have been issued since 2000

3.3 Generic Letters

Generic letters (1) request licensee actions and/or information to address issues regarding emergent or routine matters of safety, security, safeguards, or environmental significance, and (2) require a written response.

No BWR specific Generic Letters have been issued since 2000.

3.4 Information Notices

Information notices communicate operating or analytical experience to the nuclear industry. Information notices may also communicate the results of recently completed research. The industry is expected to review the information for applicability and consider appropriate actions to avoid similar problems.

Since 2000, the following Information Notices which appear to have BWR specific context have been issued.

- In2013-10.
- In2010-7 – Recirculation pump common cause failure
- In200601 – Torus cracking in Mark I containments.
- In03001 – Failure of BWR Target Rock Main Steam SRVs.
- In02026 – Failure of a steam dryer cover plate after a recent power uprate.
- In02026s2 – Additional Flow-induced vibration failures after a recent power uprate
- In02015 – Hydrogen combustion events in foreign BWR piping.
- In02005 – Foreign material in Standby Liquid Control Storage Tanks.
- In01013 – Inadequate Standby Liquid Control System Relief Valve margin.
- In00001 – Operational issues identified in BWR Trip and Transient.

4 SUMMARY CONCLUSIONS

By in large, the operational experience of US BWRs, from 2000 through March of 2014, involving safety and non-safety system induced SCRAMs and safety system failures (SSFs) is relevant to the ABWR GDA.

4.1 SCRAM conclusions

Since 2000, BWR licensees have submitted 415 LERs which have been categorized as SCRAM events. Three Hundred Seventy One involved non-safety systems that are common to both BWR and PWR designs. Eighty six of these SCRAM events were related to issues involving BWR specific systems. Fifty three involved BWR safety systems and 33 involving BWR non-safety systems. Of these, only two events – both involving the Recirculation system, can be considered irrelevant to the ABWR GDA. Those two events involved Recirculation pump trip due to leaking conditions observed in the Recirculation piping. Such faults are not relevant to the ABWR Recirculation system, the design of which has eliminated Recirculation system piping. BWR safety system related SCRAM events are dominated by the MSIVs (9), the RPS/PPS (27), the CRD (5) and the ADS/SRVs (5). The ABWR designs for these do not appear to be radically different than those from which the operational experience has been observed.

The 371 SCRAM events that involve non-safety systems common to both BWR and PWR designs largely involve the balance of plant systems (e.g., steam turbine, feedwater, main generator, and switchyard). Without detailed knowledge of specific ABWR balance of plant systems, these events should not be excluded from informing the GDA.

4.2 SSF conclusions

Seventy eight LER events since 2000 have been categorized as safety system failures by the NRC. The focus of this BWR safety system failure operational experience review is the set of BWR safety systems shown in Table 4-1.

The ABWR design does not have a steam driven turbine pump HPCI system nor does it have a LPCS system, but the fundamental design characteristics of all of the other systems listed in Table 4-1 are essentially consistent with the design features of the same or analogous systems in the ABWR design. However, despite that the ABWR design does not include a HPCI or LPCS system, those two systems nonetheless have design and operational features which are relevant to the ABWR ECCS systems. Hence, even certain operational experience involving the HPCI and LPCS systems is relevant to the ABWR GDA.

The LER operational experience of the systems in Table 4-1 are dominated by HPCI (43), HPCS (34), RCIC (32), RHR/LPCI (18) and RPS/PPS (31). All of these systems – except RPS/PPS - are large, water systems designed to initiate from a standby state and reach full operation within seconds in response to certain off-normal conditions. The turbine driven pump related faults of the HPCI system are irrelevant to the ABWR GDA specifically, except at they could relate to the

Table 4-1 BWR plant safety systems for which LERs were reviewed.

BWR System
Off Gas System
Main Steam Isolation Valves (MSIVs)
High Pressure Coolant Injection (HPCI)
High Pressure Core Spray (HPCS)
Reactor Isolation Core Cooling (RCIC)
Residual Heat Removal (RHR)/Low Pressure Coolant Injection (LPCI)
Low Pressure Core Spray (LPCS)
Reactor Protection System(RPS)/Plant Protection System (PPS)
Control Rod Drive (CRD) System
Standby by Liquid Control (SLC) System
Reactor Water Cleanup System (RWCU)
Automatic Depressurization System (ADS)/Safety Relief Valves (SRVs)

steam driven RCIC system. All of these water systems exhibited operational experience involving issues with the functionality of both their injection lines and their suction lines. Issues include air ingress into the water lines – with the associated threat of damaging water hammer in the injection line and pump cavitation from the suction line – valve leaks, valve failures to open or close, minimum-flow line faults, isolation issues which could render the systems inoperable, and electrical pump motor faults (excluding HPCI and RCIC). Flow controller faults also have been observed in these systems. The majority of these problems have been categorized as equipment failures, but many also are due to inadequate procedures and as human errors related to operations and improper maintenance activities.

Some of the LER events involve the discovery of violations of Technical Specifications while the plant is at operations. Some events such as these may or may not constitute actual failure of a system to perform its safety function, but nonetheless such events are indicative of a failure of operational oversight. Other events involve the discovery of potential or actual component failures during post-maintenance testing. Fortunately such events represent potentially dangerous but short-lived system configurations. However, many of the events observed represent compromised system configurations which were discovered only after the discovered issue had existed over time, in some cases several years.

There are relatively few exceptions regarding the relevance of BWR safety system failure operational experience for the ABWR GDA.

5 RECOMMENDATIONS FOR FOLLOW-UP OF BWR OPERATIONAL EXPERIENCE.

The operational experience that was reviewed and summarized in this report is based on a compendium of LERs generated by the Idaho National Laboratory. Under the NRC's Industry Trends Program (ITP) INL staff conducts in-depth reviews of each LER submitted to the NRC. INL produces a non-statistical systematic compilation of LERs in which LERs are catalogued by plant system and three important performance indicators – SCRAMs, safety system actuations (SSAs), and safety system failures (SSFs). This review is summarized into a Microsoft ACCESS database, and is periodically updated. The compendium used for this report represented an assessment of LERs from January 1, 2000 through March 31, 2014.

In 2013 alone there were 352 LERs submitted to the NRC, 126 of which were from BWR licensees. For 2014, as of November 20, 2014, 225 LERs have been submitted to the NRC, 95 of which are from BWR licensees. INL's Risk Assessment and Management Services Department can be contacted to request the most recent update of LER assessments to augment the information included in this report. Thomas Smith of INEL is the manager of INL's program for compiling the database.

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6 REFERENCES

1. 10 Code of Federal Regulations, Part 50.2
2. Office For Nuclear Regulation, *Safety Assessment Principles for Nuclear Facilities Revision 1*, United Kingdom, 2006
3. Hitachi-GE Nuclear Energy, Ltd., *UK ABWR Generic Design Assessment, Generic Pre-Construction Safety Report*, 2014
4. US NRC, *Event Reporting Guidelines 10 CFR 50.72 and 50.73: Final Report*, nUREG-1022, Rev. 3. Washington, D.C., USA. January 2013.

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Appendix A INL LER SCRAM DATABASE FIELD DESCRIPTIONS

Scram Fields

RPS System (RPS_System) - The RPS system field contains the EIS system code for the system which initiated the sequence of events that resulted in the trip signal. For example, a low steam generator trip signal that resulted from a tripped condensate pump would be coded [SD] for the condensate system

Cause (RPS_Cause) - The cause field contains the reason of the RPS actuation (scram). When coding events that have multiple causes, code only the root cause. If there is enough space, provide details in the description field. The root cause is defined as the event that, if it had not occurred, would not have lead to the reactor scram. For example, if a low steam generator trip occurred due to a failed feedwater isolation valve that resulted from not following the valve maintenance procedure, the cause would be coded **Prsnlerr**. The following are the codes for this field:

Code	Cause	Description
Equip	Hardware/Design	This code is used when the reactor scram was the direct result of a system, subsystem, component, or piece part failure or fault. This code is used if the cause of the equipment failure cannot be attributed to other causes such as improper operation or maintenance. If the scram is caused by an instrument spike of unknown origin, the cause is coded Equip . If the root cause is coded Equip , the equip_system field must also be coded
Prsnlerr	Human Factors	This code is used when the reactor scram was the direct result of a personnel action (e.g., failure to follow procedures, insufficient training).
Procedur	Procedure	This code is used if reactor scram was the direct result of using faulty procedures. This includes errors in writing or reviewing procedures, or lack of a procedure.
Unknown	Unknown	This code is to be used only when the cause of the reactor scram cannot be determined from the LER, or it is stated in the LER that the cause is unknown.

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Appendix B INL LER SAFETY SYSTEM FAILURE DATABASE FIELD DESCRIPTIONS

SSF Fields

Safety System Failures (SSFs) are any events or conditions that could prevent the fulfillment of the safety function of structures or systems. If a system consists of multiple redundant subsystems or trains, failure of all trains constitutes a safety system failure. Failure of one of two or more trains is not counted as a safety system failure. The definition for the indicator parallels NRC reporting requirements in 10 CFR 50.72 and 10 CFR 50.73. The following is a list of the major safety systems, subsystems, and components monitored for this indicator:

Accident Monitoring Instrumentation	Main Steam Line Isolation Valves
Auxiliary (and Emergency) Feedwater System	Onsite Emergency AC & DC Power w/Distribution
Combustible Gas Control	Radiation Monitoring Instrumentation
Component Cooling Water System	Reactor Coolant System
Containment and Containment Isolation	Reactor Core Isolation Cooling System
Containment Coolant Systems	Reactor Trip System and Instrumentation
Control Room Emergency Ventilation System	Recirculation Pump Trip Actuation Instrumentation
Emergency Core Cooling Systems	Residual Heat Removal Systems
Engineered Safety Features Instrumentation	Safety Valves
Essential Compressed Air Systems	Spent Fuel Systems
Essential or Emergency Service Water	Standby Liquid Control System
Fire Detection and Suppression Systems	Ultimate Heat Sink
Isolation Condenser	
Low Temperature Overpressure Protection	

Operating Mode (UnitMode) - The operating mode field contains a two letter code indicating the plant status at the time of the SSF event (or the time when the event was discovered). The codes are:

PO	Operate
SU	Startup
HS	Hot Standby
HD	Hot Shutdown
CD	Cold Shutdown
RF	Refueling
UN	Unknown

System Code (CSYSTEM) - EIS code corresponding to the system involved in the event. System field contains noun name of system.

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Appendix C SUMMARY OF LERs INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – SAFETY SYSTEM INDUCED SCRAMs

Eighteen safety system induced SCRAM related LERs involving human error or procedural errors were identified from the database. These 18 LER reports were downloaded from the NRC web site and reviewed in further detail to identify possible contributing factors. Ten human factors related contributing factors were identified:

- Failure to follow procedure
- Procedure deficiency
- Inadequate training
- Insufficient work practices
- Insufficient management oversight and standards
- Ineffective team dynamics
- Poor human-system interface and ergonomics
- Inadequate analysis and design
- Insufficient error prevention tools and ineffective implementation of error prevention tools
- Poor workmanship

Multiple contributing factors were assigned to individual LERs if the nature of the event warranted such. The results are summarized below in two tables. The first table summarizes the total number of LERs associated with each contributing factor. The second table presents a summary assessment of each SCRAM related LER involving human and procedural errors.

Contributing Factors	Number of LERs with this contributing factor
Failure to follow procedure	2
Procedure deficiency	9
Inadequate training	3
Insufficient work practices	6
Insufficient management oversight and standards	1
Ineffective team dynamics	2
Poor human-system interface and ergonomics	1
Inadequate analysis and design	1
Insufficient error prevention tools and ineffective implementation of error prevention tools	0
Poor workmanship	0

LERs involving Human Error and Procedural Root Causes – Safety System Induced SCRAMs

Year	LER	Plant	Scram Description	RPS_Cause (See Appendix A)	Contributing Factors
2000	4582000012	RIVER BEND	THE RX WAS MANUALLY SCRAMMED IN RESPONSE TO DECREASING MAIN CONDENSER VACUUM, WHICH OCCURRED WHILE RESPONDING TO A LOW FLOW CONDITION IN THE OFFGAS SYSTEM. THE CAUSE WAS AN INADEQUATE OFFGAS ALARM RESPONSE PROCEDURE.	PROCEDUR	Procedure deficiency
2002	3882002004	SUSQUEHANNA 2	A TURBINE TRIP/RX SCRAM OCCURRED ON LOW CONDENSER VACUUM AFTER THE OFFGAS SYSTEM ISOLATED. THE CAUSE WAS A MOMENTARY LOSS OF 120 VAC POWER WHEN INADEQUATE WORK INSTRUCTIONS CAUSED PLANT ELECTRICIANS TO INAPPROPRIATELY CLOSE A BREAKER.	PROCEDUR	Procedure deficiency
2000	4612000007	CLINTON 1	A RX SCRAM OCCURRED ON MSIV CLOSURE DURING A STEAM LINE TUNNEL LEAK DETECTION SYSTEM SURVEILLANCE. THE PROCEDURE HAD INADEQUATE PROVISIONS FOR PREVENTING AN EXISTING FAULT IN THE OPPOSITE CHANNEL FROM COMPLETING THE ACTUATION LOGIC. OTHER CONTRIBUTING FACTORS INCLUDED INEFFECTIVE TEAM DYNAMICS, AND INADQUATE WORK PRACTICES.	PROCEDUR	Procedure deficiency, Ineffective team dynamics, Insufficient work practices
2001	4102001004	NINE MILE PT. 2	A SCRAM OCCURRED WHEN THE MSIVS FAST CLOSED WHILE RESTORING A STEAM FLOW TRANSMITTER FOLLOWING TESTING. THE CAUSE WAS AN INADEQUATE SURVEILLANCE PROCEDURE, INADEQUATE TRAINING, AND INEFFECTIVE COMMUNICATION AMONG OPERATORS.	PROCEDUR	Procedure deficiency Inadequate training Ineffective team dynamics (Ineffective communication among operators)

LERs involving Human Error and Procedural Root Causes – Safety System Induced SCRAMs

Year	LER	Plant	Scram Description	RPS_Cause (See Appendix A)	Contributing Factors
2000	3312000001	DUANE ARNOLD	A RX SCRAM OCCURRED ON A FALSE LOW RX VESSEL WATER LEVEL SIGNAL DURING RESTORATION FROM A TEST OF RX VESSEL WIDE RANGE LEVEL INSTRUMENTATION. THE CAUSE WAS THE USE OF AN INADEQUATE INSTRUMENT RESTORATION PROCESS.	PROCEDUR	Unclear management expectations and standards Insufficient work practices (ineffective pre-job brief) Procedure deficiency Inadequate training
2000	2962000005	BROWNS FERRY 3	A RX SCRAM OCCURRED ON AN INVALID LOW RX WATER LEVEL SIGNAL GENERATED WHILE RETURNING A FEEDWATER LEVEL TRANSMITTER TO SERVICE. THE CAUSE WAS A LACK OF SPECIFIC PROCEDURALIZED VALVING SEQUENCES FOR THE LEVEL TRANSMITTER.	PROCEDUR	Procedure deficiency
2006	3662006002	HATCH 2	A SCRAM OCCURRED ON A TURBINE CONTROL VALVE FAST CLOSURE RESULTING FROM A POWER LOAD IMBALANCE. THIS WAS CAUSED BY PROCEDURE DEFICIENCY.	PROCEDUR	Procedure deficiency
2010	2192010002	OYSTER CREEK	DURING STARTUP, WITH THE REACTOR CRITICAL AT 0%, THE REACTOR TRIPPED ON A LOW CONDENSER VACUUM SIGNAL. THE TRIP WAS CAUSED BY A PROCEDURAL ERROR THAT DID NOT ENSURE ALL REQUIREMENTS WERE MET PRIOR TO EXCEEDING 500-PSIG REACTOR PRESSURE.	PROCEDUR	Failure to follow procedure
2011	3522011002	LIMERICK 1	THE REACTOR TRIPPED FOLLOWING A MAIN TURBINE TRIP. THE TURBINE TRIP WAS CAUSED BY ACTUATION OF THE REACTOR LEVEL TRIP LOGIC DURING TESTING. THE LOGIC TRIP WAS THE RESULT OF USING INCOMPATIBLE TEST EQUIPMENT. THE REVISED TEST PROCEDURE WILL BE CORRECTED.	PROCEDUR	Procedure deficiency

LERs involving Human Error and Procedural Root Causes – Safety System Induced SCRAMs

Year	LER	Plant	Scram Description	RPS_Cause (See Appendix A)	Contributing Factors
2000	2492000003	DRESDEN 3	THE RX WAS MANUALLY SCRAMMED ON DECREASING CONDENSER VACUUM AND INCREASING CONDENSATE TEMPERATURE. THE CAUSE WAS FAILURE TO FOLLOW PROCEDURES DURING POST MODIFICATION TESTING OF THE SYSTEM, PROCEDURE DEFICIENCY, AND INADEQUATE TRAINING.	PRSNLERR	Failure to follow procedure, Procedure deficiency, Inadequate training
2001	2632001011	MONTICELLO	A RX SCRAM OCCURRED ON AN MSIV ISOLATION WHEN MSIV ISOLATION INSTRUMENTATION WAS INADVERTENTLY BUMPED BY AN INDIVIDUAL WORKING IN THE AREA OF THE INSTRUMENTATION DUE TO INADEQUATE WORK PRACTICES AND LESS THAN IDEAL WORK ENVIRONMENT	PRSNLERR	Insufficient work practices Poor ergonomics (less than ideal work environment)
2000	2492000002	DRESDEN 3	A RX SCRAM OCCURRED DURING THE TRANSFER OF RPS BUS POWER SUPPLIES FOLLOWING PREVENTIVE MAINTENANCE. WHILE TRANSFERRING BUS "B", BUS "A" ALSO LOST POWER. THE ASSOCIATED MG SET DRIVE MOTOR BREAKER TRIPPED BECAUSE OF PERSONNEL ERROR DURING THE MAINTENANCE.	PRSNLERR	Insufficient work practices (inadequate self-checking)
2006	3872006004	SUSQUEHANNA 1	A RX SCRAM OCCURRED ON AN APPARENT NEUTRON MONITORING TRIP WHILE TRANSFERRING RPS POWER SUPPLIES. THIS EVENT WAS CAUSED BY A DESIGN DEFICIENCY IN THE NEWLY INSTALLED POWER RANGE NEUTRON MONITORING SYSTEM.	PRSNLERR	Design deficiency (inadequate analysis)
2010	4102010001	NINE MILE PT. 2	DURING MAINTENANCE ACTIVITIES ON THE RHR SYSTEM, THE REACTOR AUTOMATICALLY SCRAMMED ON AN INVALID LOW REACTOR WATER LEVEL SIGNAL. TRANSMITTER VENTING OF A COMMON INSTRUMENT LINE WAS THE CAUSE OF THE TRIP SIGNAL. THIS WAS CAUSED BY INEFFICIENCY IN EXECUTING WORK PLANNING STANDARDS.	PRSNLERR	Insufficient work practices (inefficiency in executing work planning standards.)

LERs involving Human Error and Procedural Root Causes – Safety System Induced SCRAMs

Year	LER	Plant	Scram Description	RPS_Cause (See Appendix A)	Contributing Factors
2011	2932011003	PILGRIM	DURING REACTOR STARTUP WITH POWER AT 2%, THE REACTOR TRIPPED DUE TO A HI-HI SIGNAL FROM THE INTERMEDIATE RANGE MONITORS. THE CAUSE OF THE TRIP WAS OPERATOR ERROR DUE TO LACK OF ADMINISTRATIVE CONTROLS ON PROCEDURAL DETAILS.	PRSNLERR	Insufficient work practices (inefficiency in executing established standards.)
2012	2602012006	BROWNS FERRY 2	A 4KV SHUTDOWN BOARD DEENERGIZED DURING POST-MAINTENANCE ACTIVITIES. THIS RESULTED IN LOSS OF POWER TO THE 2B RPS SYSTEM. WHILE TRYING TO RESTORE POWER, THE 2A RPS WAS INADVERTENTLY DEENERGIZED, RESULTING IN A REACTOR TRIP. THIS WAS BECAUSE ERROR PREVENTION TOOLS WERE NOT IEFFECTIVELY USED.	Prsnlerr	Insufficient work practices Inadequate training
2000	4582000012	RIVER BEND	THE RX WAS MANUALLY SCRAMMED IN RESPONSE TO DECREASING MAIN CONDENSER VACUUM, WHICH OCCURRED WHILE RESPONDING TO A LOW FLOW CONDITION IN THE OFFGAS SYSTEM. THE CAUSE WAS AN INADEQUATE OFFGAS ALARM RESPONSE PROCEDURE.	PROCEDUR	Procedure deficiency

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Appendix D SUMMARY OF LERs INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – SAFETY SYSTEM FAILURES

Fifty LERs were identified in which a safety system failure was reported and the identified root cause was either human error or procedural errors. These 50 LER reports were downloaded from the NRC web site and reviewed in further detail to identify possible contributing factors. Ten human factors related contributing factors were identified:

- Failure to follow procedure
- Procedure deficiency
- Inadequate training
- Insufficient work practices
- Insufficient management oversight and standards
- Ineffective team dynamics
- Poor human-system interface and ergonomics
- Inadequate analysis and design
- Insufficient error prevention tools and ineffective implementation of error prevention tools
- Poor workmanship

Multiple contributing factors were assigned to individual LERs if the nature of the event warranted such. The results are summarized below in two tables. The first table summarizes the total number of LERs associated with each contributing factor. The second table presents a summary assessment of each SCRAM related LER involving human and procedural errors.

Contributing Factors	Number of LERs with this contributing factor
Failure to follow procedure	4
Procedure deficiency	25
Inadequate training	9
Insufficient work practices	17
Insufficient management oversight and standards	1
Ineffective team dynamics	1
Poor human-system interface and ergonomics	5
Inadequate analysis and design	2
Insufficient error prevention tools and ineffective implementation of error prevention tools	1
Poor workmanship	2

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2000	4582000013	RIVER BEND	STANDBY LIQUID CONTROL SYSTEM (BWR)	BOTH TRAINS OF STANDBY LIQUID CONTROL WERE DECLARED INOPERABLE WHEN SEVERAL PIECES OF PLASTIC FROM A TRASH BAG WERE FOUND IN THE STORAGE TANK. THE CAUSE WAS IMPROPER PERSONNEL WORK PRACTICES RELATED TO FOREIGN MATERIAL CONTROL.	OTHER	Insufficient work practices (inadequate foreign material control)
2000	4102000010	RIVER BEND	STANDBY LIQUID CONTROL SYSTEM (BWR)	BOTH TRAINS OF STANDBY LIQUID CONTROL WERE DECLARED INOPERABLE WHEN SEVERAL PIECES OF PLASTIC FROM A TRASH BAG WERE FOUND IN THE STORAGE TANK. THE CAUSE WAS IMPROPER PERSONNEL WORK PRACTICES RELATED TO FOREIGN MATERIAL CONTROL.	OTHER	Insufficient work practices (inadequate foreign material control)
2004	3732004001	LASALLE 1	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	RCIC WAS RENDERED INOPERABLE WHEN THE BAROMETRIC CONDENSER VACUUM PUMP DISCHARGE CONTAINMENT ISOLATION CHECK VALVES WERE DECLARED INOPERABLE AND THE ISOLATION VALVES WERE CLOSED. THE CAUSE WAS AN INADEQUATE LLRT PROCEDURE.	PROCEDUR	Procedure deficiency
2004	3972004008	COLUM. NUCLEAR 2	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	RCIC WAS RENDERED INOPERABLE WHEN ITS INBOARD STEAM SUPPLY CONTAINMENT ISOLATION VALVE INADVERTENTLY CLOSED DURING A SURVEILLANCE TEST. THE CAUSE WAS AN INADEQUATE PROCEDURE.	PROCEDUR	Procedure deficiency Insufficient work practices (self-checking, peer checking, field supervision, pre-work review)

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2006	4102006002	NINE MILE PT. 2	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	RCIC WAS DECLARED INOPERABLE BUT AVAILABLE WITH ITS STEAM EXHAUST VACUUM BREAKERS ISOLATED. IF STARTED IN THIS CONDITION, RESULTING WATER HAMMER COULD BREACH PRIMARY BOUNDARY PIPING. THE CAUSE OF THIS CONDITION IS ATTRIBUTED TO PROCEDURE DEFICIENCY AND INADEQUATE TRAINING.	PROCEDUR	Procedure deficiency Inadequate training
2008	2932008003	PILGRIM	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	WHILE PERFORMING A RCIC I&C SURVEILLANCE, THE RCIC SYSTEM RECEIVED AN ISOLATION SIGNAL, WHICH RENDERED RCIC INOPERABLE FOR A SHORT PERIOD. THE CAUSE OF THE ISOLATION WAS AN ERROR INTRODUCED IN THE RECENTLY REVISED SURVEILLANCE PROCEDURE.	PROCEDUR	Procedure deficiency
2003	2372003002	DRESDEN 2	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI COULD HAVE BEEN RENDERED INOPERABLE FROM ELEVATED ROOM TEMPERATURES DUE TO A FAILED ROOM COOLER BEARING. THE CAUSE WAS INADEQUATE BEARING LUBRICATION FREQUENCY.	PROCEDUR	Procedure deficiency

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2004	2982004004	COOPER STATION	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI HAS BEEN RENDERED INOPERABLE ON SEVERAL PAST OCCASSIONS BY TAKING THE AUXILIARY OIL PUMP TO PULL-TO-LOCK, DISABLING THE AUTO START FUNCTION WHEN SECURING THE SYSTEM FOLLOWING ACTUATION. THE CAUSE WAS INADEQUATE PROCEDURES.	PROCEDUR	Procedure deficiency Inadequate training
2001	3972001003	COLUM. NUCLEAR 2	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	HPCS WAS RENDERED INOPERABLE FROM LOW SYSTEM PRESSURE IN THE WATER LEG PUMP DISCHARGE PIPING WHILE TRYING TO REESTABLISH A SUCTION PATH FROM THE CST. THE CAUSE WAS INADEQUATE PROCEDURAL GUIDANCE AND PRE-JOB BRIEF.	PROCEDUR	Procedure deficiency Insufficient work practices (inadequate pro-job brief)
2002	4402002002	PERRY	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	HPCS BECAME INOPERABLE WHEN THE PUMP FAILED TO START ON DEMAND DURING NORMAL TESTING. THE CAUSE WAS MECHANICAL WEAR COMPOUNDED BY MISALIGNMENT OF THE CELL SWITCH LINKAGE DUE TO PROCEDURE DEFICIENCY SUCH THAT EVENTUALLY ONE OF THE CONTACTS IN THE CELL SWITCH FAILED TO MAKE CONTACT.	PROCEDUR	Procedure deficiency

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2005	4402005003	PERRY	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	HPCS HAS BEEN RENDERED INOPERABLE DURING TESTING WHICH CAUSED A TEMPORARY LOSS OF THE SUCTION FLOW PATH WITHOUT DECLARING THE SYSTEM INOPERABLE. THE CAUSE WAS A LONG STANDING PROCEDURE AND KNOWLEDGE DEFICIENCY.	PROCEDUR	Procedure deficiency Inadequate training
2006	4582006002	RIVER BEND	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	HPCS WAS RENDERED INOPERABLE FOR APPROXIMATELY 97 MINUTES WHEN THE INJECTION VALVE WAS MANUALLY ISOLATED FOLLOWING AN INVALID ACTUATION. THE CAUSE WAS A LACK OF PROCEDURAL GUIDANCE CONCERNING TEST LEADS DURING HPCS TESTING AND POOR HUMAN-SYSTEM INTERFACE FOR POSITIVE IDENTIFICATION.	PROCEDUR	Procedure deficiency Poor human-system interface (poor human-system interface for positive identification)
2003	2652003001	QUAD CITIES 2	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	BOTH TRAINS OF LPCI WERE INOPERABLE BECAUSE THE ISOLATION RELAYS FOR THE INJECTION VALVES HAD A SEALED IN ISOLATION SIGNAL WITHOUT A CURRENT SIGNAL PRESENT. THE CAUSE WAS AN INADEQUATE TEST PROCEDURE WHICH FAILED TO ENSURE ISOLATION RESET AFTER TESTING.	PROCEDUR	Procedure deficiency

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2003	3522003001	LIMERICK 1	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	A POSTULATED FLOODING EVENT FOR ONE RHR ROOM COULD HAVE FLOODED THE OTHER RHR ROOM AND RENDERED ALL FOUR RHR PUMPS INOPERABLE. THE CAUSE WAS A MISSING FOUR INCH FLOOR DRAIN LINE CLEANOUT PLUG DUE TO PROCEDURE DEFICIENCY AND POOR LABELING.	PROCEDUR	Procedure deficiency Poor human-system interface (poor labeling)
2002	2632002006	MONTICELLO	PLANT PROTECTION SYSTEM	THE FLOW BIAS NEUTRON SCRAM WOULD HAVE BEEN UNABLE TO PERFORM ITS SAFETY FUNCTION FOR BRIEF PERIODS DURING SURVEILLANCE PERFORMANCE. THE CAUSE WAS AN INCORRECT PROCEDURE REVISION IN 1992 WHICH ISOLATED THE TRANSMITTER PRIOR TO INSERTING A HALF SCRAM.	PROCEDUR	Procedure deficiency
2003	3742003002	LASALLE 2	PLANT PROTECTION SYSTEM	THE APRM FLOW BIASED SCRAM WAS DECLARED INOPERABLE WHEN ALL THE RX RECIRCULATION FLOW CONVERTERS WERE DISCOVERED TO BE OUT OF CALIBRATION IN THE NONCONSERVATIVE DIRECTION. THE CAUSE WAS AN INADEQUATE PROCEDURE.	PROCEDUR	Procedure deficiency

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2004	2602004003	BROWNS FERRY 2	PLANT PROTECTION SYSTEM	THE TURBINE CONTROL VALVE FAST CLOSURE PRESSURE SWITCH SCRAM FUNCTION WAS DEFEATED FOR APPROXIMATELY 30 DAYS FOLLOWING A SPURIOUS SCRAM FROM THE EHC POWER LOAD UNBALANCE CIRCUIT. THE CAUSE WAS FAILURE OF THE FSAR TO INCLUDE A DESCRIPTION OF THE SCRAM.	PROCEDUR	Procedure deficiency
2006	4402006004	PERRY	PLANT PROTECTION SYSTEM	IT WAS CONSERVATIVELY DETERMINED THAT ALL FOUR CHANNELS OF OPRM WERE INOPERABLE DUE TO NON-CONSERVATIVE SETTING OF THE OPRM ENABLED REGION DRIVE FLOW SETPOINT WHEN THE PLANT IS IN SINGLE REACTOR RECIRCULATION LOOP OPERATION. THIS WAS CAUSED BY PROCEDURE DEFICIENCY AND INSUFFICIENT WORK PRACTICES.	PROCEDUR	Procedure deficiency Insufficient work practices (inadequate independent verification)
2007	2592007004	BROWNS FERRY 1	PLANT PROTECTION SYSTEM	THE SCRAM INITIATION SIGNALS FOR THE TURBINE CONTROL VALVE AND THE TURBINE STOP VALVES WERE BYPASSED AT A HIGHER POWER LEVEL THAN ALLOWED BY TECH SPECS. THIS WAS CAUSED BY PROCEDURE DEFICIENCY.	PROCEDUR	Procedure deficiency
2007	2982007005	COOPER STATION	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	AN APPENDIX R REVIEW DETERMINED PROCEDURES WERE INADEQUATE TO SECURE HPCI WHEN REQUIRED AND ACHIEVE A SAFE SHUTDOWN FOLLOWING AN APPENDIX R FIRE. THE RESULTING FLOODED STEAM LINES WOULD DISABLE RCIC AND ADS.	PROCEDUR	Procedure deficiency

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2002	2962002001	BROWNS FERRY 3	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	RCIC WAS MANUALLY ISOLATED AND DECLARED INOPERABLE WHEN IT WAS DISCOVERED THAT THE STEAM LINE SPACE TEMPERATURE SWITCHES HAD BEEN REPLACED WITH THE WRONG TEMPERATURE SWITCHES. THE CAUSE WAS PERSONNEL ERROR BY MAINTENANCE TECHNICIANS DUE TO LACK OF ADEQUATE VERIFICATION PROCESS AND SIMILAR APPEARANCE OF DIFFERENT SWITCHES.	PRSNLERR	Insufficient work practices (lack of verification) Poor human-system interface
2003	3972003008	COLUM. NUCLEAR 2	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	RCIC WAS RENDERED INOPERABLE WHEN ITS OUTBOARD CONTAINMENT ISOLATION VALVE INADVERTENTLY CLOSED DURING SURVEILLANCE. THE CAUSE WAS PERSONNEL ERROR DUE TO INADEQUATE WORK PRACTICES WHEN A TECHNICIAN INADVERTENTLY APPLIED NITROGEN PRESSURE TO A SWITCH BEFORE IT WAS DEACTIVATED.	PRSNLERR	Insufficient work practices (lack of proper self-checking)
2007	4402007005	PERRY	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	RCIC WAS DECLARED INOPERABLE WHEN IT WAS DETERMINED THAT ITS FLOW CONTROLLER SETTINGS WERE INADEQUATE. THE CAUSES INCLUDED INADEQUATE TRAINING AND PROCEDURE DEFICIENCY	PRSNLERR	Procedure deficiency Inadequate training

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2003	2782003001	PEACH BOTTOM 3	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI WAS INOPERABLE FROM THE ALTERNATE CONTROL STATION FOR FIRE SAFE SHUTDOWN DURING A POSTULATED FIRE. THE CAUSE WAS A BROKEN WIRE WHICH OCCURRED DURING A MAINTENANCE ACTIVITY AND WAS NOT FOUND BECAUSE THE I&C TECHNICIANS FAILED TO FOLLOW PROCEDURES TO PERFORM REQUIRED POST MAINTENANCE TESTING.	PRSNLERR	Failure to follow procedures
2004	2372004001	DRESDEN 2	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI WAS DECLARED INOPERABLE WHEN IT WAS DISCOVERED THAT LOGIC CIRCUITRY LEADS HAD BEEN LIFTED SINCE MAINTENANCE ACTIVITIES IN MARCH 2004. THE PROBLEM PREVENTED AUTOMATIC REALIGNMENT OF HPCI SUCTION TO THE SUPPRESSION POOL. THIS WAS CAUSED BY FAILURE TO FOLLOW PROCEDURES AND INSUFFICIENT WORK PRACTICES.	PRSNLERR	Failure to follow procedures Insufficient work practices
2004	3242004001	BRUNSWICK 2	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI WAS RENDERED INOPERABLE BY REMOVING A LEVEL CHANNEL FROM SERVICE IN ORDER TO PERFORM TROUBLESHOOTING AND REPAIR. THE CAUSE WAS PERSONNEL ERROR DUE TO INEFFECTIVE SUPERVISION AND OVERSIGHT OF THE MAINTENANCE ACTIVITIES.	PRSNLERR	Insufficient work practices (ineffective supervision and oversight of maintenance activities)

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2004	2782004002	PEACH BOTTOM 3	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI WAS RENDERED INOPERABLE WHEN A LEAD REMAINED LIFTED, WHICH RENDERED THE AUTO TRIP ON HIGH RX WATER LEVEL INOPERABLE. THE CAUSE WAS INADEQUATE VERIFICATION PRACTICES FOR RELANDING LEADS LIFTED DURING SURVEILLANCE AND PROCEDURE DEFICIENCY.	PRSNLERR	Insufficient work practices (inadequate verification practices) Procedure deficiency
2004	2632004003	MONTICELLO	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI WAS INOPERABLE DUE TO A LOOSE BEARING OIL PLUG. THE PLUG COULD HAVE FALLEN OUT IF THE HPCI SYSTEM INITIATED. SYSTEM OPERATION COULD NOT BE ASSURED. THE CAUSE WAS LACK OF PROGRAMATIC CONTROLS TO ENSURE THE REQUIRED TIGHTNESS FOLLOWING REMOVAL. OPERATIONS PERSONNEL WERE NOT SUFFICIENTLY TRAINED IN THE SKILL AREA.	PRSNLERR	Inadequate training
2005	2932005001	PILGRIM	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI WAS DECLARED INOPERABLE DUE TO THE FAILURE OF A FUSE IN THE INJECTION VALVE CONTROL CIRCUIT. THE CAUSE WAS PERSONNEL FAILURE TO REPLACE FUSES IN A TIMELY MANNER AFTER A GENERIC ISSUE (MANUFACTURING DEFECT) WAS FOUND TO AFFECT MULTIPLE FUSES.	PRSNLERR	Failure to follow procedures

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2008	2932008005	PILGRIM	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	THE HPCI SYSTEM ISOLATED, RENDERING HPCI INOPERABLE, DURING A SURVEILLANCE TEST OF THE SYSTEM'S TEMPERATURE SWITCHES. THE ISOLATION WAS CAUSED BY HUMAN ERROR IN THE PERFORMANCE OF THE SURVEILLANCE.	PRSNLERR	Insufficient work practices (lack of questioning attitude, stopping when unsure)
2011	2592011008	BROWNS FERRY 1	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	An unexpected rate of increase in vibrations on the HPCI Booster Pump thrust bearings was identified during surveillance. The bearings had been installed incorrectly in a tandem arrangement due to Insufficient management oversight on work practices and procedure deficiency, which transmits thrust in only one direction.	Prsnlerr	Insufficient management oversight (lack of supervision, governance, and oversight) Procedure deficiency
2013	2592013007	BROWNS FERRY 1	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	HPCI was declared inoperable due to an inadvertent containment isolation that occurred during surveillance testing. Instrument technicians failed to complete a procedural step as written as a result of failure of using three-way communication and place keeping.	Prsnlerr	Insufficient work practices (skipping a procedural step due to failure of using three-way communication and place keeping)
2003	4582003007	RIVER BEND	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	HPCS WAS RENDERED INOPERABLE FOR SIXTEEN MINUTES WHEN OPERATORS INADVERTENTLY REMOVED THE WRONG SWITCHGEAR BREAKER FOR MAINTENANCE.	PRSNLERR	Insufficient work practices (lack of self-checking and peer checking)

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2003	3972003010	COLUM. NUCLEAR 2	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	HPCS WAS DECLARED INOPERABLE DUE TO A FAILURE TO MAINTAIN SYSTEM PRESSURE WHILE THE SYSTEM WAS BEING OPERATED WITH THE KEEP FILL PIPING ISOLATED FOR MAINTENANCE ON THE SYSTEM WATERLEG PUMP. THIS WAS CAUSED BY INADEQUATE WORK PLANNING.	PRSNLERR	Insufficient work practices (inadequate work planning)
2003	3732003004	LASALLE 1	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	HPCS COULD HAVE BEEN RENDERED INOPERABLE DURING A SEISMIC EVENT FROM AN IMPROPERLY SEATED FUSE. THE MOST PROBABLE CAUSE WAS A FAILURE TO FULLY SEAT THE FUSE DURING THE LAST CLEARANCE ORDER RESTORATION IN MARCH 2002.	PRSNLERR	Cause could not be determined
2006	4612006004	CLINTON 1	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	A SECURITY OFFICER INADVERTENTLY BUMPED THE CIRCUIT BREAKER HANDSWITCH FOR THE SERVICE WATER VALVE SUPPLYING COOLING WATER TO THE DIVISION 3 COOLING HEADER. HPCS AND THE DIVISION 3 EDG WERE DECLARED INOPERABLE AND UNAVAILABLE. THIS WAS CAUSED BY INADEQUATE HAZARD ANALYSIS AND INEFFECTIVE COMMUNICATION.	PRSNLERR	Inadequate analysis and design (inadequate hazard analysis) Ineffective team dynamics (ineffective communication)

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2007	4402007003	PERRY	MULTIPLE SYSTEMS	GRATING IN THE CONTAINMENT WAS NOT PROPERLY SECURED AND COULD HAVE IMPACTED THE ECCS SUCTION STRAINER, POTENTIALLY RESULTING IN LPCI (RHR A, B, AND C) AND HPCS SYSTEM INOPERABILITY. THIS WAS CAUSED BY INSUFFICIENT WORK PRACTICES AND INADEQUATE TRAINING.	PRSNLERR	Insufficient work practices Inadequate training
2009	4612009003	CLINTON 1	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	TWO RELAYS IN THE HPCS DG CONTROL PANEL WERE IN THE WRONG LOCATIONS. THIS WOULD HAVE PREVENTED THE HPCS PUMP FROM ACHIEVING DESIGNED FLOW IN THE REQUIRED TIME.	PRSNLERR	LER not available
2013	4612013001	CLINTON 1	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	When the division 4 NSPS bus inverter transferred to its alternate source, HPCS was declared inoperable because it was not being supplied from its inverter. THIS WAS CAUSED BY INADEQUATE RISK IDENTIFICATION	Prsnlerr	Inadequate analysis and design (inadequate hazard analysis)
2013	3972013006	COLUM. NUCLEAR 2	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	HPCS was made inoperable for a short period due to its Diesel Mixed-Air Fan's switch being bumped to the off position. THIS WAS CAUSED BY INADEQUATE ERROR PREVENTION DESIGN AND INEFFECTIVE IMPLEMENTATION OF ERROR PREVENTION TOOLS	Prsnlerr	Poor human-system interface (Inadequate error prevention design) Ineffective implementation of error prevention tools

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2000	3412000001	FERMI 2	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	BOTH TRAINS OF LPCI WERE RENDERED INOPERABLE WHEN A LPCI INBOARD INJECTION VALVE LOST POWER DURING MAINTENANCE ACTIVITIES. THE CONDITION MOST LIKELY RESULTED FROM A WORKER INADVERTENTLY CONTACTING A SWITCH WHILE ERECTING SCAFFOLDING IN THE AREA. THIS WAS CAUSED BY INSUFFICIENT WORK PRACTICES.	PRSNLERR	Insufficient work practices (failure to apply the "Stop, Think, Act, Review" [STAR] philosophy)
2001	2782001002	PEACH BOTTOM 3	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	LPCI WAS INOPERABLE FOR APPROXIMATELY TWO HOURS. WITH THE "A" TRAIN ISOLATED FOR CONTAINMENT REQUIREMENTS, THE "B" TRAIN WAS RENDERED INOPERABLE DUE TO TESTING. THE CAUSE WAS INADEQUATE PROCEDURE REVIEW BY THE WORK CONTROL AND CONTROL ROOM SUPERVISORS AND INSUFFICIENT WORK PRACTICES.	PRSNLERR	Failure to follow procedure. Insufficient work practices (Inadequate turnover between work shifts)
2002	2652002005	QUAD CITIES 2	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	BOTH TRAINS OF LPCI WERE INOPERABLE BECAUSE ONE TRAIN WOULD NOT AUTOMATICALLY START AND FLOW FROM THE OTHER TRAIN COULD HAVE BEEN DIVERTED FROM THE RX VESSEL. THE CAUSE WAS A DETACHED WIRE RESULTING FROM POOR WORKMANSHIP.	PRSNLERR	Poor workmanship (Poor installation of control wiring)

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2007	4402007003	PERRY	MULTIPLE SYSTEMS	GRATING IN THE CONTAINMENT WAS NOT PROPERLY SECURED AND COULD HAVE IMPACTED THE ECCS SUCTION STRAINER, POTENTIALLY RESULTING IN LPCI (RHR A, B, AND C) AND HPCS SYSTEM INOPERABILITY. THIS WAS CAUSED BY INADEQUATE RIGOR IN EXECUTING CONFIGURATION CONTROL STANDARDS AND INADEQUATE TRAINING.	PRSNLERR	Insufficient work practices (inadequate detail in work order, inadequate turnover) Inadequate training
2006	2542006001	QUAD CITIES 1	LOW PRESSURE CORE SPRAY SYSTEM (BWR)	ONE CORE SPRAY PUMP HAS BEEN INOPERABLE AT TIMES FOR MAINTENANCE/SURVEILLANCE WHILE THE OTHER CORE SPRAY PUMP HAS BEEN UNKNOWNLY INOPERABLE FROM AN IMPROPERLY RACKED IN BREAKER SINCE 10/6/05. THIS WAS CAUSED BY PROCEDURE DEFICIENCY.	PRSNLERR	Procedure deficiency
2007	2592007001	BROWNS FERRY 1	PLANT PROTECTION SYSTEM	THE GAIN ADJUSTMENTS FOR THE LOCAL POWER RANGE MONITORS WAS NOT SET CORRECTLY. THIS ERROR MADE ALL CHANNELS OF APRM HIGH FLUX TRIPS FOR THE RPS SYSTEM INOPERABLE. THIS WAS CAUSED BY INADEQUATE VERIFICATION OF POST-MODIFICATION TESTING AND WORK ORDER CLOSURE.	PRSNLERR	Insufficient work practices (inadequate verification of post-modification testing and work order closure)

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2010	3312010002	DUANE ARNOLD	PLANT PROTECTION SYSTEM	THE END-OF-CYCLE RECIRCULATION PUMP TRIP WAS NOT MET WHEN THE TURBINE BYPASS VALVES WERE IN THE OPEN POSITION. PLANT STAFF LACKED UNDERSTANDING OF THE TBVS BEING OPEN AND THE IMPACT ON THE TFSP SETPOINTS. THIS WAS CAUSED BY PROCEDURE DEFICIENCY AND INADEQUATE TRAINING.	PRSNLERR	Procedure deficiency Inadequate training
2012	2372012001	DRESDEN 2	PLANT PROTECTION SYSTEM	Following a power reduction, the gains of APRMs 4, 5, and 6 became out of adjustment. During the period the gains were out of adjustment, the Fixed Neutron Flux-High trip signal would have exceeded its allowed value. This was caused by lack of alarms and infrequent parameter checking.	Prsnlerr	Poor human-system interface (lack of alarms)
2002	4102002002	NINE MILE PT. 2	PRIMARY CONTAINMENT [SPECIAL NON-EIIS CODE]	THE RWCU DIVISION ONE AND TWO DIFFERENTIAL FLOW INSTRUMENTS WERE DECLARED INOPERABLE WHEN THEY FAILED TO RESPOND AS EXPECTED. THE CAUSE WAS INCOMPLETE FILLING AND VENTING OF THE RWCU PIPING POST MAINTENANCE DUE TO PROCEDURE DEFICIENCY.	PRSNLERR	Procedure deficiency

LERs involving Human Error and Procedural Root Causes – Safety System Failure						
Year	LER	Plant	SYSTEM	Description	RPS_Cause (See Appendix A)	Factors
2000	3532000002	LIMERICK 2	AUTOMATIC DEPRESSURIZATION SYSTEM [SPECIAL NON-EIIS CODE]	BOTH TRAINS OF THE AUTOMATIC DEPRESSURIZATION SYSTEM BECAME INOPERABLE WHEN THE LONG TERM GAS SUPPLY VALVES WERE MISPOSITIONED CLOSED DURING A SURVEILLANCE IN MAY OF 1999. THE CAUSE WAS PERSONNEL ERROR.	PRSNLERR	Poor workmanship (valves left at the wrong position)

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Appendix E SUMMARY OF LERs INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMs

Fifty non-safety system induced SCRAM related LERs involving human error or procedural errors were identified from the database. These 50 LER reports were downloaded from the NRC web site and reviewed in further detail to identify possible contributing factors. Ten human factors related contributing factors were identified:

- Failure to follow procedure
- Procedure deficiency
- Inadequate training
- Insufficient work practices
- Insufficient management oversight and standards
- Ineffective team dynamics
- Poor human-system interface and ergonomics
- Inadequate analysis and design
- Insufficient error prevention tools and ineffective implementation of error prevention tools
- Poor workmanship

Multiple contributing factors were assigned to individual LERs if the nature of the event warranted such. The results are summarized below in two tables. The first table summarizes the total number of LERs associated with each contributing factor. The second table presents a summary assessment of each SCRAM related LER involving human and procedural errors.

Contributing Factors	Number of LERs with this contributing factor
Failure to follow procedure	8
Procedure deficiency	20
Inadequate training	4
Insufficient work practices	6
Insufficient management oversight and standards	3
Ineffective team dynamics	2
Poor human-system interface and ergonomics	1
Inadequate analysis and design	7
Insufficient error prevention tools and ineffective implementation of error prevention tools	5
Poor workmanship	4

SUMMARY OF LERS INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMS

Year	LER	Plant	Scram Description	EIS System Code	RPS_Cause (See Appendix A)	Factors
2005	2962005001	BROWNS FERRY 3	A RX SCRAM OCCURRED ON LOAD REJECT WHEN THE OUTPUT BREAKER TRIPPED DURING A RESTORATION FROM SWITCHYARD MAINTENANCE. A SWITCHYARD DISCONNECT DEVICE WAS INSERTED OUT OF SEQUENCE FROM THE INSTRUCTIONS GIVEN IN A SWITCHING ORDER.	FK	PRSNLERR	Failure to follow procedure
2005	2962005003	BROWNS FERRY 3	A TURBINE/RX TRIP OCCURRED DURING AN ELECTRICAL DISTURBANCE WHEN A SWITCHYARD BREAKER WAS CLOSED ONTO A GROUNDED TRANSMISSION LINE. THE CAUSE WAS FAILURE TO ENSURE THE GROUNDING SWITCHES ON THE TRANSMISSION LINE WERE OPENED PRIOR TO THE ACTIVITY.	FK	PRSNLERR	Insufficient work practices
2001	4612001003	CLINTON 1	A SCRAM OCCURRED ON HIGH RX WATER LEVEL WHILE A SURVEILLANCE WAS BEING PERFORMED ON A LEVEL TRANSMITTER FOR THE FEEDWATER LEVEL CONTROL SYSTEM. THE CAUSE WAS A TECHNICIAN INCORRECTLY PERFORMING A STEP IN THE PROCEDURE.	JB	PRSNLERR	Failure to follow procedure
2009	3312009003	DUANE ARNOLD	THE REACTOR WAS MANUALLY TRIPPED DUE TO RISING WATER LEVEL DURING LEVEL INSTRUMENT CALIBRATION. THE CAUSE OF RISING LEVEL WAS AN INADEQUATE PROCEDURE THAT RESULTED IN THE LOSS OF LEVEL INDICATION AND INCREASED FEED FLOW.	JB	PROCEDUR	LER not available.

SUMMARY OF LERS INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMS

Year	LER	Plant	Scram Description	EIIS System Code	RPS_Cause (See Appendix A)	Factors
2000	2652000006	QUAD CITIES 2	A RX SCRAM OCCURRED DURING CALIBRATION OF MAIN STEAM LINE HIGH FLOW SWITCHES. A TECHNICIAN ADJUSTED A SWITCH THAT WAS NOT ISOLATED AND PREPARED FOR CALIBRATION, COMPLETING THE LOGIC FOR A GROUP I ISOLATION, WHICH RESULTED IN THE SCRAM.	JE	PRSNLERR	LER not available.
2007	2192007003	OYSTER CREEK	WITH REDUCED POWER FOR B REACTOR RECIRC PUMP MAINTENANCE, LOSS OF CONDENSER VACUUM CAUSED A MAIN FEEDWATER PUMP TRIP. THE OPERATOR MANUALLY TRIPPED THE REACTOR ON LOW REACTOR WATER LEVEL.	KE	PROCEDUR	Inadequate analysis and design
2003	2932003002	PILGRIM	A RX SCRAM OCCURRED ON MSIV CLOSURE RESULTING FROM SWELL AFTER THE MAIN TURBINE BYPASS VALVES WERE INADVERTENTLY OPENED AND DEPRESSURIZED THE RX VESSEL. THE CAUSE WAS OPERATOR ERROR WHEN THE SWITCH TO OPEN THE TURBINE BYPASS VALVES WAS OPERATED.	SB	PRSNLERR	Insufficient error prevention tools and ineffective implementation of error prevention tools Poor workmanship
2003	3522003003	LIMERICK 1	A RX SCRAM OCCURRED ON LOW RX VESSEL WATER LEVEL FOLLOWING A LOSS OF FEEDWATER. THE FEEDPUMPS TRIPPED ON LOW SUCTION PRESSURE FOLLOWING THE CLOSURE OF THE CONDENSATE DEEP BED DEMINERALIZER INLET HEADER BLOCK VALVE FROM INADVERTENT PERSONNEL CONTACT.	SD	PRSNLERR	Insufficient error prevention tools and ineffective implementation of error prevention tools

SUMMARY OF LERS INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMS

Year	LER	Plant	Scram Description	EIIS System Code	RPS_Cause (See Appendix A)	Factors
2007	2962007001	BROWNS FERRY 3	LOWERING CONDENSATE FLOW RESULTED IN LOWERING FEEDWATER FLOW, CAUSING THE REACTOR TO SCRAM ON LOW REACTOR WATER LEVEL. THE CAUSE OF THE LOWERING CONDENSATE FLOW WAS LOSS OF THE CONDENSATE DEMINERALIZER DUE TO PERSONNEL ERROR.	SF	PRSNLERR	Inadequate analysis and design Failure to follow procedure
2008	3662008002	HATCH 2	THE REACTOR TRIPPED ON LOW REACTOR LEVEL FOLLOWING A LOSS OF FEEDWATER. THE FEEDWATER LOSS WAS CAUSED BY LOSS OF THE CONDENSATE DEMINERALIZERS CONTROL DUE TO A PERSONNEL ERROR DURING SOFTWARE TESTING.	SF	PRSNLERR	LER not available.
2000	2492000003	DRESDEN 3	THE RX WAS MANUALLY SCRAMMED ON DECREASING CONDENSER VACUUM AND INCREASING CONDENSATE TEMPERATURE. THE CAUSE WAS FAILURE TO FOLLOW PROCEDURES DURING POST MODIFICATION TESTING OF THE SYSTEM.	SH	PRSNLERR	Failure to follow procedure Procedure deficiency Inadequate training
2000	4582000012	RIVER BEND	THE RX WAS MANUALLY SCRAMMED IN RESPONSE TO DECREASING MAIN CONDENSER VACUUM, WHICH OCCURRED WHILE RESPONDING TO A LOW FLOW CONDITION IN THE OFFGAS SYSTEM. THE CAUSE WAS AN INADEQUATE OFFGAS ALARM RESPONSE PROCEDURE.	SH	PROCEDUR	Procedure deficiency
2001	4402001001	PERRY	THE RX WAS MANUALLY SCRAMMED ON DECREASING MAIN CONDENSER VACUUM AFTER THE GENERATOR WAS TAKEN OFFLINE. THE CAUSE WAS INADEQUATELY TORQUED COVERS ON THE MOISTURE SEPARATOR DRAIN TANKS WHICH ALLOWED AIR TO ENTER THE CONDENSER.	SH	PROCEDUR	Procedure deficiency

SUMMARY OF LERS INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMS

Year	LER	Plant	Scram Description	EIIS System Code	RPS_Cause (See Appendix A)	Factors
2002	3532002001	LIMERICK 2	THE RX WAS MANUALLY SCRAMMED ON DECREASING CONDENSER VACUUM WHEN THE CONDENSER AIR REMOVAL SYSTEM FAILED DUE TO TEMPERATURE IN THE STEAM JET AIR EJECTOR CONDENSER EXCEEDING THE DESIGN LIMIT. THE CAUSE WAS INADEQUATE OPERATING PROCEDURES.	SH	PROCEDUR	Procedure deficiency Inadequate analysis and design
2007	2932007005	PILGRIM	DURING A POWER REDUCTION TO BACKWASH THE MAIN CONDENSER, THE MAIN TURBINE TRIPPED RESULTING IN A SCRAM. THE CAUSE OF THE TURBINE TRIP LOW CONDENSER VACUUM DUE TO A CALIBRATION ERROR OF THE LOW VACUUM TURBINE TRIP MECHANISM.	SH	PRSNLERR	Insufficient error prevention tools and ineffective implementation of error prevention tools
2012	2932012002	PILGRIM	While reducing power to support thermal backwash of the Main Condenser, the reactor was manually tripped due to a degrading condenser vacuum. The cause of the degrading vacuum was loss of the SJAE due to a partially opened steam supply valve, which involved procedure deficiency.	SH	Procedur	Procedure deficiency
2000	3742000006	LASALLE 2	A TURBINE TRIP/RX SCRAM OCCURRED ON HIGH RX VESSEL WATER LEVEL WHILE PLACING THE TURBINE DRIVEN RX FEEDWATER PUMP IN SERVICE. THE CAUSE WAS INADEQUATE EVOLUTION PREPARATION COMBINED WITH SLUGGISH RESPONSE FROM THE FEEDWATER AND RX LEVEL CONTROL SYSTEM.	SJ	PRSNLERR	Poor human-system interface and ergonomics Insufficient work practices

SUMMARY OF LERS INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMS

Year	LER	Plant	Scram Description	EIIS System Code	RPS_Cause (See Appendix A)	Factors
2003	3872003006	SUSQUEHANNA 1	A RX SCRAM OCCURRED ON LOW RX VESSEL LEVEL AFTER A FEED PUMP TRIPPED DURING FEED PUMP TESTING. THE CAUSE WAS PERSONNEL ERROR DURING THE TESTING.	SJ	PRSNLERR	Insufficient work practices
2004	3972004006	COLUM. NUCLEAR 2	THE RX WAS MANUALLY TRIPPED DURING A STARTUP WHEN THE OPERATING RX FEEDWATER PUMP TRIPPED ON LOW SUCTION PRESSURE. OPERATOR ERROR RESULTED IN UNCONTROLLED FEEDWATER HEATER FILLING THAT CAUSED THE FEEDWATER SYSTEM TRANSIENT.	SJ	PRSNLERR	Failure to follow procedure
2005	3242005002	BRUNSWICK 2	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL AFTER THE ONLY OPERATING FEEDPUMP TRIPPED ON LOW SUCTION PRESSURE DURING POWER ASCENSION TESTING. THE CAUSE WAS NO PROCEDURAL GUIDANCE EXISTED FOR LIMITING CONDENSATE SYSTEM FLOW RATE DURING THE TESTING.	SJ	PROCEDUR	Procedure deficiency
2005	3972005004	COLUM. NUCLEAR 2	A SCRAM OCCURRED ON LOW RX WATER LEVEL AFTER A FEEDWATER PUMP WAS LOST. THE CAUSE WAS A FALSE LOW SUCTION PRESSURE SIGNAL RESULTING WHEN A TECHNICIAN TOUCHED THE WRONG TERMINATION POINT WITH A MULTI METER DURING MAINTENANCE.	SJ	PRSNLERR	Inadequate analysis and design Poor workmanship
2006	4582006007	RIVER BEND	AN AUTOMATIC SCRAM OCCURRED FOLLOWING CLOSURE OF THE FEEDWATER ISOLATION VALVES. THE VALVES CLOSED WHEN THE OPERATOR DROPPED A CHART RECORDER ON THEIR PUSHBUTTONS.	SJ	PRSNLERR	Insufficient error prevention tools and ineffective implementation of error prevention tools

SUMMARY OF LERS INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMS

Year	LER	Plant	Scram Description	EIIS System Code	RPS_Cause (See Appendix A)	Factors
2007	4402007001	PERRY	DURING DIGITAL FEEDWATER TUNING, THE REACTOR TRIPPED ON LOW REACTOR LEVEL. WITH THE FEEDWATER PUMP IN MANUAL, LEVEL STARTED GOING DOWN, THE OPERATOR WAS UNABLE TO RESTORE SUFFICIENT FLOW. THIS EVENT WAS CAUSED BY AN UNDETECTED DESIGN LOGIC ERROR.	SJ	PRSNLERR	Inadequate analysis and design Procedure deficiency
2008	4162008004	GRAND GULF	A REACTOR FEED PUMP SPEED DECREASED TO ZERO RESULTING IN A REACTOR TRIP ON LOW REACTOR LEVEL. THE CAUSE OF THE FEEDWATER FLOW LOSS WAS ACCIDENTAL ISOLATION OF THE STEAM INLET VALVES BY AN OPERATOR.	SJ	PRSNLERR	Insufficient work practices
2001	3742001004	LASALLE 2	THE RX WAS MANUALLY SCRAMMED FOLLOWING THE LOSS OF TWO LOW PRESSURE FEEDWATER HEATER STRINGS. THE CAUSE WAS INADEQUATE PROCEDURES THAT ALLOWED THE HEATER DRAINS TO BE LINED UP INCORRECTLY FOR EXISTING PLANT CONDITIONS.	SM	PROCEDUR	Procedure deficiency
2000	2192000011	OYSTER CREEK	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL WHILE WARMING THE MAIN TURBINE. AS A RESULT OF PERSONNEL ERROR, SEVERAL TURBINE BYPASS VALVES OPENED, CAUSING RX LEVEL TO INCREASE. OPERATORS OVERCOMPENSATED WHEN LOWERING FEEDWATER FLOW AND INCREASING LETDOWN.	TA	PRSNLERR	Ineffective team dynamics Procedure deficiency Inadequate training
2001	2372001005	DRESDEN 2	A SCRAM RESULTED FROM HIGH TURBINE FIRST STAGE PRESSURE WITH THE TURBINE STOP VALVES CLOSED DURING TURBINE SHELL WARMING ACTIVITIES. THE CAUSE WAS PERSONNEL ERROR IN THAT PRESSURE WAS INADEQUATELY MONITORED AS REQUIRED BY PROCEDURE.	TA	PRSNLERR	Inadequate training Failure to follow procedure

SUMMARY OF LERS INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMS

Year	LER	Plant	Scram Description	EIIS System Code	RPS_Cause (See Appendix A)	Factors
2003	4612003002	CLINTON 1	THE RX WAS MANUALLY TRIPPED FROM VIBRATIONS ON THE MAIN TURBINE TRENDING UP TO THE TRIP SETPOINT. THE CAUSE WAS DEFICIENT OPERATING PROCEDURES WHICH DID NOT PROVIDE SUFFICIENT OPERATING RESTRICTIONS OF THE NEW MONOBLOCK TURBINE ROTOR.	TA	PROCEDUR	Procedure deficiency Insufficient management oversight and standards
2004	2652004003	QUAD CITIES 2	A TURBINE TRIP/RX SCRAM OCCURRED DURING TURBINE THRUST BEARING WEAR DETECTOR TESTING. THE CAUSE WAS THE INAPPROPRIATE USE OF THE WRONG SURVEILLANCE PROCEDURE.	TA	PRSNLERR	Failure to follow procedure (use of wrong procedure)
2004	3872004003	SUSQUEHANNA 1	THE RX WAS MANUALLY SCRAMMED ON MAIN TURBINE HIGH VIBRATION DURING STARTUP TURBINE TESTING FOLLOWING TURBINE REPLACEMENT. THE CAUSE WAS INADEQUATE PLANS TO DEAL WITH DEVELOPING CONDITIONS.	TA	PROCEDUR	Insufficient management oversight and standards
2005	2772005001	PEACH BOTTOM 2	A TURBINE TRIP/RX SCRAM OCCURRED WHEN A FAILED MAIN TURBINE MECHANICAL TRIP VALVE ROUTINE TEST WAS INCORRECTLY ABORTED. THE CAUSE WAS FAILURE TO FOLLOW A PROCEDURE.	TA	PRSNLERR	Failure to follow procedure
2004	2492004002	DRESDEN 3	A TURBINE/RX TRIP OCCURRED ON LOW MAIN TURBINE LUBE OIL PRESSURE WHILE SWAPPING LUBE OIL COOLERS. THE CAUSE WAS INADEQUATE PROCEDURAL GUIDANCE FOR SWAPING MAIN TURBINE LUBE OIL COOLERS.	TD	PROCEDUR	Procedure deficiency

SUMMARY OF LERS INVOLVING HUMAN ERRORS AND PROCEDURAL ROOT CAUSES – NON-SAFETY SYSTEM INDUCED SCRAMS

Year	LER	Plant	Scram Description	EIIS System Code	RPS_Cause (See Appendix A)	Factors
2004	2602004001	BROWNS FERRY 2	A RX SCRAM OCCURRED ON A SPURIOUS TURBINE GENERATOR LOAD REJECT SIGNAL. THE CAUSE WAS AN INADEQUATE PROCEDURE GOVERNING TRANSFER OF A 120 VAC UPS BUS AND A CONTRIBUTING FACTOR WAS AN INADEQUATE EHC SYSTEM SOFTWARE CONFIGURATION.	TG	PROCEDUR	Procedure deficiency
2013	4612013003	CLINTON 1	The reactor was manually tripped due to a rapidly decreasing level in the main Turbine's EHC oil reservoir. The cause of the oil loss was broken/loose socket head cap screws used to attach a hydraulic shutoff valve to a main steam turbine control valve due to inadequate work instructions.	TG	Procedur	Procedure deficiency
2009	3662009003	HATCH 2	A MAIN GENERATOR RUNBACK OCCURRED DUE TO THE RECEIPT OF A MAIN GENERATOR HIGH TEMPERATURE SIGNAL. A HIGH REACTOR PRESSURE SCRAM OCCURRED DURING THE RUNBACK. THE CAUSE OF THE HIGH GENERATOR TEMPERATURE SIGNAL WAS IMPROPER SET-UP OF THE CONTROL INSTRUMENT.	TJ	PRSNLERR	LER not available.

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Appendix F LER SUMMARIES – BWR SCRAMS - OFF-GAS - 2000-2014

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mode
DRESDEN 3	5/4/2000	2492000003	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING CONDENSER VACUUM AND INCREASING CONDENSATE TEMPERATURE. THE CAUSE WAS FAILURE TO FOLLOW PROCEDURES DURING POST MODIFICATION TESTING OF THE SYSTEM.	POWER OPERATIONS AT 44%	PRSNLERR	RAISING
RIVER BEND	8/21/2000	4582000012	MAN	THE RX WAS MANUALLY SCRAMMED IN RESPONSE TO DECREASING MAIN CONDENSER VACUUM, WHICH OCCURRED WHILE RESPONDING TO A LOW FLOW CONDITION IN THE OFFGAS SYSTEM. THE CAUSE WAS AN INADEQUATE OFFGAS ALARM RESPONSE PROCEDURE.	POWER OPERATIONS AT 100%	PROCEDUR	TRBLSHOT
HATCH 1	2/8/2002	3212002001	MAN	THE RX WAS MANUALLY SCRAMMED ON DEGRADING CONDENSER VACUUM AFTER THE INSERVICE STEAM JET AIR EJECTOR WAS REMOVED FROM SERVICE DUE TO HIGH HYDROGEN OFFGAS CONCENTRATION. THE CAUSE WAS BLOCKED DRAIN LINES IN THE OFFGAS SYSTEM.	27% POWER FOLLOWING REDUCTION FROM 100%	EQUIP	REDUCING
SUSQUEHANNA 2	9/30/2002	3882002004	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON LOW CONDENSER VACUUM AFTER THE OFFGAS SYSTEM ISOLATED. THE CAUSE WAS A MOMENTARY LOSS OF 120 VAC POWER WHEN INADEQUATE WORK INSTRUCTIONS CAUSED PLANT ELECTRICIANS TO INAPPROPRIATELY CLOSE A BREAKER.	POWER OPERATIONS AT 72%	PROCEDUR	MAINTEN
PILGRIM	3/13/2006	2932006001	MAN	THE RX WAS MANUALLY SCRAMMED ON HIGH TEMPERATURE IN THE AUGMENTED OFFGAS SYSTEM RECOMBINER. THE CAUSE WAS FAILURE OF THE CONTROLLER OF A PRESSURE CONTROL VALVE.	POWER OPERATIONS AT 43%	EQUIP	OPERATE

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Appendix G ACCESS DATABASE SUMMARIES – MSIV SCRAMS - 2000-2014

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mode
CLINTON 1	12/18/2000	4612000007	AUTO	A RX SCRAM OCCURRED ON MSIV CLOSURE DURING A STEAM LINE TUNNEL LEAK DETECTION SYSTEM SURVEILLANCE. THE PROCEDURE HAD INADEQUATE PROVISIONS FOR PREVENTING AN EXISTING FAULT IN THE OPPOSITE CHANNEL FROM COMPLETING THE ACTUATION LOGIC.	POWER OPERATIONS AT 100%	PROCEDUR	TESTING
NINE MILE PT. 2	10/15/2001	4102001004	AUTO	A SCRAM OCCURRED WHEN THE MSIVS FAST CLOSED WHILE RESTORING A STEAM FLOW TRANSMITTER FOLLOWING TESTING. THE CAUSE WAS AN INADEQUATE SURVEILLANCE PROCEDURE.	POWER OPERATIONS AT 100%	PROCEDUR	TESTING
MONTICELLO	10/23/2001	2632001011	AUTO	A RX SCRAM OCCURRED ON AN MSIV ISOLATION WHEN MSIV ISOLATION INSTRUMENTATION WAS INADVERTENTLY BUMPED.	POWER OPERATIONS AT 98%	PRSNLERR	OPERATE
HATCH 2	12/25/2001	3662001003	AUTO	A RX SCRAM OCCURRED ON HIGH NEUTRON FLUX FOLLOWING A RAPID PRESSURE INCREASE RESULTING FROM A SUDDEN MSIV CLOSURE. THE MSIV STEM FAILED FROM HIGH CYCLE FATIGUE.	POWER OPERATIONS AT 100%	EQUIP	OPERATE
NINE MILE PT. 2	11/11/2002	4102002004	AUTO	A RX SCRAM OCCURRED ON HIGH RX PRESSURE AFTER AN MSIV FAILED CLOSED. THE MSIV DISC SEPARATED FROM ITS STEM ALLOWING THE DISC/PISTON ASSEMBLY TO DROP INTO THE VALVE SEAT. THE CAUSE WAS DEFICIENT DESIGN, INADEQUATE STEM TO DISC THREAD LOADING.	POWER OPERATIONS AT 100%	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mode
DRESDEN 2	4/24/2004	2372004002	AUTO	A RX SCRAM OCCURRED ON AN MSIV CLOSURE. THE ISOLATION CONDENSER WAS MANUALLY INITIATED FOR PRESSURE CONTROL. THE CAUSE WAS INADEQUATE DRAINAGE OF THE MAIN STEAM LEAD DRAIN SYSTEM.	POWER OPERATIONS AT 20%	EQUIP	OPERATE
DRESDEN 2	7/4/2006	2372006004	AUTO	A REACTOR SCRAM OCCURRED WHEN MAIN STEAM ISOLATION VALVE 1A CLOSED DUE TO LOSS OF AIR SUPPLY.	STEADY STATE AT 98%	EQUIP	OPERATE
BROWNS FERRY 2	6/9/2010	2602010003	AUTO	DURING RPS BUS TRANSFER FOR MAINTENANCE, THE MSIVS CLOSED, RESULTING IN A REACTOR SCRAM. THE CAUSE OF THE MSIV CLOSURE WAS INDETERMINATE.	STEADY STATE AT 100%.	EQUIP	OPERATE
NINE MILE PT. 1	11/10/2010	2202010001	AUTO	WHILE PERFORMING LO-LO LEVEL TESTING, TWO OF THE MSIVS WENT CLOSED. THIS RESULTED IN A REACTOR TRIP. THE MSIV CLOSURE WAS CAUSED BY MISALIGNED CONNECTOR PINS IN THE MSIV CHANNEL 11 SOLENOID VALVES AND A MISALIGNED CHANEL 12 LOGIC RELAY DURING TESTING.	STEADY STATE AT 100%.	EQUIP	TESTING

Appendix H LER SUMMARIES – MSIV SAFETY SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
HATCH 2	2/20/2005	3662005001	PRIMARY CONTAINMENT [SPECIAL NON-EIIS CODE]	0	THE INBOARD AND OUTBOARD MSIVS IN THE "A" MAIN STEAM LINE FAILED LLRT SUCH THAT 10 CFR 100 LIMITS COULD HAVE BEEN EXCEEDED DURING A POSTULATED ACCIDENT.	EQUIP	CONDITION DISCOVERED DURING REFUELING
HATCH 2	2/12/2007	3662007001	CONTAINMENT LEAKAGE CONTROL SYSTEM	0	THE MSIVS FAILED LLRT WITH TOTAL LEAKAGE EXCEEDING THE T.S. VALUES AND MAY HAVE EXCEEDED 10 CFR 100 LIMITS DURING A DESIGN BASIS ACCIDENT.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
MONTICELLO	5/12/2009	2632009003	MAIN STEAM ISOLATION VALVES [SPECIAL NON-EIIS CODE]	50	THE "B" MAIN STEAM LINE FLOW ISOLATION FLOW SENSOR FAILED DUE TO THE FAILURE OF ITS MANIFOLD EQUALIZING VALVE. THIS RESULTED IN A LOSS OF SAFETY FUNCTION DUE TO THE INSTRUMENT INDICATING FLOW AT 25% LOWER THAN ACTUAL FLOW.	EQUIP	INCREASING POWER AT 50%.
FITZPATRICK	9/17/2010	3332010004	MAIN STEAM ISOLATION VALVES [SPECIAL NON-EIIS CODE]	0	BOTH THE INBOARD AND OUTBOARD MAIN STEAM ISOLATION VALVES IN THE "C" MAIN STEAM LINE FAILED THEIR LEAK RATE TEST.	EQUIP	REFUELING

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Appendix I LER SUMMARIES – HPCI SYSTEM FAILURES - 2000-2014

Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
3/15/2000	3412000003	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	97	HPCI WAS RENDERED INCAPABLE OF AUTOMATICALLY INITIATING WHEN BOTH DIVISIONS OF THE LEVEL EIGHT TRIP SIGNAL UNEXPECTEDLY SEALED IN DURING SURVEILLANCE ON THE LEVEL EIGHT TRIP LOGIC. A FAILURE METHOD COULD NOT BE CONCLUSIVELY DETERMINED.	EQUIP	EVENT OCCURRED DURING OPERATION AT 97% POWER
3/21/2000	2542000003	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE BECAUSE THE AUXILIARY OIL PUMP FAILED TO CONTINUOUSLY OPERATE DURING A FUNCTIONAL TEST. THE CAUSE WAS INADEQUATE DESIGN MARGIN BETWEEN THE AOP HIGH PRESSURE TRIP SETPOINT AND THE CONTROL OIL HEADER PRESSURE.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
8/29/2000	3532000003	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE WHEN THE OUTBOARD SUPPRESSION POOL SUCTION CONTAINMENT ISOLATION VALVE FAILED TO OPEN DURING SURVEILLANCE TESTING. THE CAUSE WAS AN OUT OF TOLERANCE VALVE SPRING PACK COMBINED WITH A RECENTLY REDUCED TORQUE SWITCH SETTING.	EQUIP	CONDITION EXISTED SINCE 06/19/2000
7/5/2001	2492002005	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI BECAME INOPERABLE FOLLOWING A WATER HAMMER EVENT ON 7/5/01 THAT DAMMAGED A DISCHARGE PIPE SUPPORT. THE CAUSE WAS INADEQUATE VENTING OF THE SYSTEM.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
7/25/2001	2782001001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	90	HPCI WAS REMOVED FROM SERVICE AND DECLARED INOPERABLE AS A RESULT OF THE DISCHARGE LINE NOT BEING COMPLETELY FULL OF WATER. THE CAUSE WAS A LEAKING CHECK VALVE IN THE ALTERNATE SUCTION PATH.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 90% POWER

Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
7/7/2002	2932002001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE WHEN THE THE CONTROL POWER FUSE FOR THE DISCHARGE VALVE FAILED. THE CAUSE WAS A SEPARATION THAT HAD OCCURRED AT AN INTERNAL SOLDER CONNECTION.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
11/1/2002	3242002001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS AUTOMATICALLY ISOLATED AND RENDERED INOPERABLE BY AN INDICATED STEAM LINE BREAK HIGH DIFFERENTIAL PRESSURE ALARM. THE CAUSE WAS SPURIOUS ACTUATION OF THE ANALOG TRIP UNIT DUE TO THE MALFUNCTION OF THE OUTPUT TRANSISTOR.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
5/5/2003	2782003001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS INOPERABLE FROM THE ALTERNATE CONTROL STATION FOR FIRE SAFE SHUTDOWN DURING A POSTULATED FIRE. THE CAUSE WAS A BROKEN WIRE WHICH OCCURRED DURING A MAINTENANCE ACTIVITY.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 100% POWER
7/10/2003	2372003002	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI COULD HAVE BEEN RENDERED INOPERABLE FROM ELEVATED ROOM TEMPERATURES DUE TO A FAILED ROOM COOLER BEARING. THE CAUSE WAS INADEQUATE BEARING LUBRICATION FREQUENCY.	PROCEDUR	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
12/10/2003	2772003005	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS RENDERED INOPERABLE WHEN THE TORUS SUCTION CHECK VALVE PERMITTED REVERSE FLOW DURING TESTING. THE VALVE WAS NOT SEATING PROPERLY DUE TO EXCESSIVE CLEARANCES OF CERTAIN INTERNAL COMPONENTS.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER

Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
4/12/2004	2372004001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE WHEN IT WAS DISCOVERED THAT LOGIC CIRCUITRY LEADS HAD BEEN LIFTED SINCE MAINTENANCE ACTIVITIES IN MARCH 2004. THE PROBLEM PREVENTED AUTOMATIC REALIGNMENT OF HPCI SUCTION TO THE SUPPRESSION POOL.	PRSNLERR	CONDITION EXISTED SINCE MARCH 9, 2004
4/20/2004	3522004001	MULTIPLE SYSTEMS	100	BOTH HPCI AND RCIC WERE INOPERABLE AT VARIOUS TIMES IN THE PAST DUE TO AIR IN THE SUCTION LINES. THE CAUSE WAS A SYSTEM DESIGN DEFICIENCY AND FILL AND VENT PROCEDURE DEFICIENCIES.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
6/22/2004	3242004001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	96	HPCI WAS RENDERED INOPERABLE BY REMOVING A LEVEL CHANNEL FROM SERVICE IN ORDER TO PERFORM TROUBLESHOOTING AND REPAIR. THE CAUSE WAS PERSONNEL ERROR DUE TO INEFFECTIVE SUPERVISION AND OVERSIGHT OF THE MAINTENANCE ACTIVITIES.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 96% POWER
7/16/2004	3542004006	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	95	HPCI WAS DECLARED INOPERABLE BECAUSE THE FLOW RATE WAS DETERMINED BY CALCULATION AND SURVEILLANCE TEST TO BE LESS THAN THE DESIGN REQUIREMENTS OF 5600 GPM AT 1156 PSIA. THE CAUSE WAS UNDERSIZED INJECTION LINE RESTRICTOR ORIFICES.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION
8/3/2004	2782004002	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS RENDERED INOPERABLE WHEN A LEAD REMAINED LIFTED, WHICH RENDERED THE AUTO TRIP ON HIGH RX WATER LEVEL INOPERABLE. THE CAUSE WAS INADEQUATE VERIFICATION PRACTICES FOR RELANDING LEADS LIFTED DURING SURVEILLANCE.	PRSNLERR	CONDITION EXISTED IN ALL MODES UP TO 100% POWER FROM 8/3/04 TO 9/14/04

Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
8/30/2004	2982004004	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI HAS BEEN RENDERED INOPERABLE ON SEVERAL PAST OCCASSIONS BY TAKING THE AUXILIARY OIL PUMP TO PULL-TO-LOCK, DISABLING THE AUTO START FUNCTION WHEN SECURING THE SYSTEM FOLLOWING ACTUATION. THE CAUSE WAS INADEQUATE PROCEDURES.	PROCEDUR	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
10/9/2004	2782004003	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE AFTER THE CST SUCTION VALVE FAILED TO AUTO CLOSE WHEN THE SUPPRESSION POOL SUCTION VALVE WAS OPENED DURING SURVEILLANCE TESTING. THE CAUSE WAS A LOOSE WIRE ON A LOGIC RELAY ASSOCIATED WITH THE VALVE.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
12/15/2004	2632004003	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS INOPERABLE DUE TO A LOOSE BEARING OIL PLUG. THE PLUG COULD HAVE FALLEN OUT IF THE HPCI SYSTEM INITIATED. SYSTEM OPERATION COULD NOT BE ASSURED. THE CAUSE WAS LACK OF PROGRAMATIC CONTROLS TO ENSURE THE REQUIRED TIGHTNESS FOLLOWING REMOVAL.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 100% POWER
1/20/2005	2602005001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE BASED ON THE INABILITY TO VERIFY THE KEEP FILL FUNCTION AFTER THE SUCTION AUTOMATICALLY SWAPPED TO THE SUPPRESSION POOL WITH THE DISCHARGE PIPING IN A TEMPORARY CONFIGURATION TO SUPPORT A MAINTENANCE ACTIVITY.	OTHER	EVENT OCCURRED DURING OPERATION AT 100% POWER
2/13/2005	2932005001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE DUE TO THE FAILURE OF A FUSE IN THE INJECTION VALVE CONTROL CIRCUIT. THE CAUSE WAS PERSONNEL FAILURE TO REPLACE FUSES IN A TIMELY MANNER AFTER A GENERIC ISSUE (MANUFACTURING DEFECT) WAS FOUND TO AFFECT MULTIPLE FUSES.	PRSNLERR	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME

Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
3/21/2005	2782005002	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE WHEN THE CST SUCTION VALVE FAILED TO CLOSE AFTER THE HPCI TORUS SUCTION VALVES WERE FULL OPEN DURING SURVEILLANCE. THE CAUSE WAS AN OUT OF ADJUSTMENT LIMIT SWITCH.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
3/28/2005	3532005002	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS RENDERED INOPERABLE BY A LOOSE CONTROL POWER FUSE CLIP ASSOCIATED WITH THE PUMP SUCTION FROM SUPPRESSION POOL VALVE. THE RESULT WAS A LOSS OF SUCTION AUTOMATIC TRANSFER FUNCTION. THE CAUSE WAS A MANUFACTURING DEFECT IN THE CONTROL POWER BUS.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
11/16/2005	2982005005	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE DUE TO A LOSS OF CONTROL POWER FOR THE INJECTION VALVE RESULTING FROM AN OPEN FUSE. THE CAUSE WAS INTERMITTENT OVER CURRENT CONDITION IN THE CONTROL CIRCUIT AND/OR FUSE WEAKNESS.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
5/16/2006	3662006003	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE DUE TO A LEAK OCCURRING IN THE DISCHARGE CHECK VALVE. THE LICENSEE IS INVESTIGATING THE CAUSE.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
2/8/2007	3212007001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	DURING HPCI OPERABILITY TEST, THE HPCI STEAM SUPPLY VALVE FAILED TO OPEN. ITS SUPPLY BREAKER TRIPPED AND ITS MOTOR WAS HOT TO THE TOUCH.	EQUIP	STEADY STATE AT 100%.
6/8/2007	2712007002	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	81	HPCI WAS DECLARED INOPERABLE WHEN ITS PUMP INJECTION ISOLATION VALVE (MOV) FAILED TO STROKE OPEN DURING QUARTERLY VALVE TESTING. TWO CLOSING CONTACTS IN THE MOV SUPPLY BREAKER WERE FAILED IN THE INTERMEDIATE POSITION.	EQUIP	81%.

Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
7/31/2007	3542007004	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE WHEN ITS FEEDWATER INJECTION VALVE FAILED TO OPEN DURING STROKE TIMING. THE CAUSE OF THE VALVE FAILURE WAS A THERMAL BOND THAT RESULTED FROM A SHORT DURATION INJECTION EVENT.	EQUIP	STEADY STATE AT 100%.
10/21/2008	2932008004	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	AN UNDERVOLTAGE RELAY FOR THE HPCI INJECTION VALVE FAILED. THIS WOULD PREVENT THE VALVE FROM OPENING AND PREVENT HPCI FROM PERFORMING ITS SAFETY FUNCTION.	EQUIP	STEADY STATE AT 100%.
11/20/2008	2932008005	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	THE HPCI SYSTEM ISOLATED, RENDERING HPCI INOPERABLE, DURING A SURVEILLANCE TEST OF THE SYSTEM'S TEMPERATURE SWITCHES. THE ISOLATION WAS CAUSED BY HUMAN ERROR IN THE PERFORMANCE OF THE SURVEILLANCE.	PRSNLERR	STEADY STATE AT 100%.
3/15/2009	2372009002	PRIMARY CONTAINMENT [SPECIAL NON-EIIS CODE]	100	THE HPCI MOV REQUIRED TO CLOSE TO SWAP FROM CST TO TORUS SUCTION WOULD NOT CLOSE. THE CAUSE OF THE VALVE FAILURE WAS INTERNAL BINDING. THIS COULD RESULT IN A HIGH TORUS WATER LEVEL THAT EXCEEDS TORUS STRUCTURAL DESIGN.	EQUIP	STEADY STATE AT 100%.
11/17/2009	2602009009	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	AN INADVERTENT HPCI SYSTEM ISOLATION OCCURRED DURING SURVEILLANCE TESTING. THE ISOLATION WAS CAUSED BY A FAULTY TEST EQUIPMENT CONNECTOR.	EQUIP	STEADY STATE AT 100%.
12/28/2010	3412010004	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	75	HPCI WAS DECLARED INOPERABLE WHEN THE HPCI MINIMUM FLOW VALVE FAILED ITS QUARTERLY SURVEILLANCE STROKE TEST.	EQUIP	POWER OPERATION AT 75%.
3/16/2011	2772011001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE WHEN A VOID WAS DISCOVERED IN ITS SUPPRESSION POOL SUCTION PIPING. THE VOID WAS CAUSED BY A LEAK FROM THE COOLING WATER HEADER RELIEF VALVE.	EQUIP	STEADY STATE AT 100%.

Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
5/20/2011	2592011006	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	23	WHEN THE HPCI INJECTION VALVE WAS OPENED DURING TESTING, THE DISCHARGE PIPING RAPIDLY PRESSURIZED AND A FLOODING ALARM WAS RECEIVED. THE CAUSE WAS LEAKAGE PAST THE HPCI TESTABLE CHECK VALVE. THE HPCI INJECTION VALVE WAS CLOSED, RENDERING HPCI INOPERABLE.	EQUIP	STARTING UP AT 23% POWER.
7/20/2011	2592011008	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	An unexpected rate of increase in vibrations on the HPCI Booster Pump thrust bearings was identified during surveillance. The bearings had been installed incorrectly in a tandem arrangement, which transmits thrust in only one direction.	Prsnlerr	Condition existed in all modes up to 100% power.
9/6/2011	3412011001	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI WAS DECLARED INOPERABLE DURING SURVEILLANCE TESTING WHEN THE CONTROL ROOM POSITION INDICATION WAS LOST ON THE MIN-FLOW CONTROL VALVE. THE VALVE'S POWER FUSES WERE CHECKED AND FOUND BLOWN.	EQUIP	STEADY STATE AT 100%.
6/7/2012	3332012010	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI was declared inoperable during testing, when its Suppression Pool Suction Isolation MOV failed to completely open. The most probable cause was high contact resistance on the open torque limit switch due to corrosion.	Equip	Steady State at 100%.
8/30/2012	3332012002	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI was declared inoperable due to a failed pressure control valve that resulted in a safety valve lifting. The most probable cause was foreign material in a sensing line after being filled using Torus water.	Equip	Steady State at 95%.
9/3/2012	3332012003	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI was declared inoperable. This was caused by air in a sensing line for the HPCI discharge flow causing a false flow indication while HPCI was in standby. The cause was the sensing line was improperly sloped preventing the line from self venting.	Equip	Steady State at 93%.

Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist	
7/20/2013	2592013004	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI was declared inoperable during testing when the CST level switches were inoperable for a time longer than allowed due to problems with test equipment.	Equip	Steady State at 100%.	
9/24/2013	2602013002	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI was declared inoperable when an unqualified splice was discovered that could impact the operability of the minimum flow control valve.	Equip	Condition existed in all modes up to 100% power.	
10/16/2013	2592013007	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI was declared inoperable due to an inadvertent containment isolation that occurred during surveillance testing. Instrument technicians failed to complete a procedural step as written.	Prsnlerr	Steady State at 100%.	
12/17/2013	3332013006	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	HPCI was declared inoperable due to the failure of the CST to suppression pool suction path shift due to CST level instrument failures.	Equip	Steady State at 100%.	

Appendix J LER SUMMARIES – HPCS SCRAMs - 2000-2014

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mode
CLINTON 1	8/27/2006	4612006003	AUTO	THE HPCS SYSTEM ACTUATED RESULTING IN A REACTOR TRIP DUE TO HIGH WATER LEVEL. THE CAUSE OF THE HPCS ACTUATION IS A MOMENTARY LOSS OF THE DIVISION 4 NSPS INVERTER DUE TO A BAD SOLDER JOINT.	STEADY STATE AT 96%	EQUIP	OPERATE

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Appendix K LER SUMMARIES – HPCS SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
LASALLE 2	2/9/2000	3742000001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	THE HPCS EDG BECAME INOPERABLE AT THE END OF THE MONTHLY OPERABILITY RUN. DC CONTROL POWER FUSES BLEW FOLLOWING AN UNEXPECTED EDG REVERSE POWER TRIP. A SHORTED DIODE CAUSED THE TWO FUSES TO BLOW.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
CLINTON 1	2/28/2000	4612000002	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE AFTER THE DIVISION III EDG STATOR WAS DAMAGED. THE EDG HAD BEEN PARALLELED OUT OF PHASE WITH AN OFFSITE POWER SOURCE.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
CLINTON 1	8/31/2000	4612000003	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	THE HPCS EDG BECAME INOPERABLE WHEN THE EDG VENTILATION FANS TRIPPED DURING RESTORATION FROM FIRE DETECTOR TESTING. A MALFUNCTIONING RELAY IN A FIRE PROTECTION SUPERVISORY CIRCUIT CAUSED THE FANS TO TRIP.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
COLUM. NUCLEAR 2	5/21/2001	3972001003	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	0	HPCS WAS RENDERED INOPERABLE FROM LOW SYSTEM PRESSURE IN THE WATER LEG PUMP DISCHARGE PIPING WHILE TRYING TO REESTABLISH A SUCTION PATH FROM THE CST. THE CAUSE WAS INADEQUATE PROCEDURAL GUIDANCE.	PROCEDUR	EVENT OCCURRED IN HOT SHUTDOWN

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
PERRY	10/23/2002	4402002002	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	98	HPCS BECAME INOPERABLE WHEN THE PUMP FAILED TO START ON DEMAND DURING NORMAL TESTING. THE CAUSE WAS MECHANICAL WEAR COMPOUNDED BY MISALIGNMENT OF THE CELL SWITCH LINKAGE SUCH THAT EVENTUALLY ONE OF THE CONTACTS IN THE CELL SWITCH FAILED TO MAKE CONTACT.	PROCEDUR	CONDITION DISCOVERED DURING OPERATION AT 98% POWER
RIVER BEND	6/17/2003	4582003007	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS RENDERED INOPERABLE FOR SIXTEEN MINUTES WHEN OPERATORS INADVERTENTLY REMOVED THE WRONG SWITCHGEAR BREAKER FOR MAINTENANCE.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 100% POWER
COLUM. NUCLEAR 2	10/7/2003	3972003010	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE DUE TO A FAILURE TO MAINTAIN SYSTEM PRESSURE WHILE THE SYSTEM WAS BEING OPERATED WITH THE KEEP FILL PIPING ISOLATED FOR MAINTENANCE ON THE SYSTEM WATERLEG PUMP.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 100% POWER
LASALLE 1	11/17/2003	3732003004	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS COULD HAVE BEEN RENDERED INOPERABLE DURING A SEISMIC EVENT FROM AN IMPROPERLY SEATED FUSE. THE MOST PROBABLE CAUSE WAS A FAILURE TO FULLY SEAT THE FUSE DURING THE LAST CLEARANCE ORDER RESTORATION IN MARCH 2002.	PRSNLERR	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE MARCH 2002

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
COLUM. NUCLEAR 2	3/16/2005	3972005002	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE WHEN SEVERE CRACKING AND DEGRADATION WAS FOUND ON THE UPPER AIR DEFLECTOR OF THE PUMP MOTOR DURING A MAINTENANCE ACTIVITY. THE CAUSE WAS CRITICAL DIMENSIONS WERE NOT MAINTAINED DURING THE MOTOR REASSEMBLY PROCESS IN 1992.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
LASALLE 1	8/18/2005	3732005004	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	THE HPCS SYSTEM WAS RENDERED INOPERABLE WHEN A FAULT OCCURRED IN THE DIVISION III POWER SYSTEM WITH AN EDG PARALLELED TO ITS ASSOCIATED BUS. THE CAUSE WAS A PHASE TO GROUND FAULT IN THE EDG VOLTAGE REGULATOR.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
PERRY	9/20/2005	4402005003	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS HAS BEEN RENDERED INOPERABLE DURING TESTING WHICH CAUSED A TEMPORARY LOSS OF THE SUCTION FLOW PATH WITHOUT DECLARING THE SYSTEM INOPERABLE. THE CAUSE WAS A LONG STANDING PROCEDURE AND KNOWLEDGE DEFICIENCY.	PROCEDUR	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION
RIVER BEND	1/24/2006	4582006002	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS RENDERED INOPERABLE FOR APPROXIMATELY 97 MINUTES WHEN THE INJECTION VALVE WAS MANUALLY ISOLATED FOLLOWING AN INVALID ACTUATION. THE CAUSE WAS A LACK OF PROCEDURAL GUIDANCE CONCERNING TEST LEADS DURING HPCS TESTING.	PROCEDUR	EVENT OCCURRED DURING OPERATION AT 100% POWER

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
CLINTON 1	11/9/2006	4612006004	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	96	A SECURITY OFFICER INADVERTENTLY BUMPED THE CIRCUIT BREAKER HANDSWITCH FOR THE SERVICE WATER VALVE SUPPLYING COOLING WATER TO THE DIVISION 3 COOLING HEADER. HPCS AND THE DIVISION 3 EDG WERE DECLARED INOPERABLE AND UNAVAILABLE.	PRSNLERR	EVENT OCCURRED AT 95.5% POWER.
CLINTON 1	2/7/2007	4612007001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	96	PRIOR TO 8/12/2006, THE ELEVATION OF THE MINIMUM WATER LEVEL IN THE RCIC WATER STORAGE TANK ABOVE THE HPCS SUCTION COULD NOT ENSURE THAT A VORTEX WOULD NOT OCCUR WITH SUBSEQUENT AIR ENTRAINMENT THAT WOULD CAUSE LOSS OF HPCS FUNCTION.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION
PERRY	8/27/2007	4402007003	MULTIPLE SYSTEMS	100	GRATING IN THE CONTAINMENT WAS NOT PROPERLY SECURED AND COULD HAVE IMPACTED THE ECCS SUCTION STRAINER, POTENTIALLY RESULTING IN LPCI (RHR A, B, AND C) AND HPCS SYSTEM INOPERABILITY.	PRSNLERR	STEADY STATE AT 100%.
PERRY	5/28/2008	4402008003	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE AFTER IT WAS DETERMINED THAT DIVISION 3 OF ESW WAS INOPERABLE DUE TO A CONDITION THAT WOULD NOT ALLOW IT TO MAINTAIN KEEP-FILL PRESSURE IN THE EVENT OF LOSS OF OFFSITE POWER.	EQUIP	STEADY STATE AT 100%.

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
LASALLE 2	6/11/2008	3742008001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE DUE TO FAILURE OF THE DIVISION 3 SWITCHGEAR ROOM VENTILATION SUPPLY FAN. INOPERABILITY WAS BASED ON LONG-TERM HEATUP CONCERNS.	EQUIP	STEADY STATE AT 100%.
CLINTON 1	7/2/2009	4612009001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	97	HPCS WAS DECLARED INOPERABLE WHEN IT WAS DETERMINED THAT A FAILED SYSTEM LOGIC CARD WOULD PREVENT ITS AUTOMATIC INITIATION.	EQUIP	STEADY STATE AT 95%.
NINE MILE PT. 2	8/23/2009	4102009001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE DUE TO A LOOSE CONNECTION ON ITS DC CONTROL POWER CIRCUITRY.	EQUIP	STEADY STATE AT 100%.
CLINTON 1	9/24/2009	4612009003	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	92	TWO RELAYS IN THE HPCS DG CONTROL PANEL WERE IN THE WRONG LOCATIONS. THIS WOULD HAVE PREVENTED THE HPCS PUMP FROM ACHIEVING DESIGNED FLOW IN THE REQUIRED TIME.	PRSNLERR	CONDITION EXISTED IN ALL MODES UP TO 100% POWER.
RIVER BEND	6/25/2010	4582010003	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE WHEN ITS ROOM COOLER FAN STARTED MAKING NOISE AND SMOKING. THE CAUSE OF THE FAN FAILURE WAS INADEQUATE BEARING LUBRICATION RESULTING FROM POORLY IMPLEMENTED PREVENTIVE MAINTENANCE RECOMMENDATIONS.	EQUIP	STEADY STATE AT 100%.
LASALLE 2	9/25/2010	3742010001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE DUE TO FINDING THE HPCS ROOM COOLING FANS NOT OPERATING. THE FANS FAILED TO RUN DUE TO A FAILED SWITCHGEAR CONTROL RELAY.	EQUIP	STEADY STATE AT 100%.

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
RIVER BEND	11/7/2010	4582010004	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS WAS DECLARED INOPERABLE DUE TO A STEADY STREAM OF OIL LEAKING FROM THE LOWER MOTOR BEARING DRAIN PLUG.	EQUIP	STEADY STATE AT 100%.
GRAND GULF	3/19/2011	4162011001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	96	HPCS WAS DECLARED INOPERABLE WHEN IT WAS DISCOVERED THAT ITS MINIMUM FLOW VALVE WAS INOPERABLE DUE TO A DEGRADED POWER SUPPLY BREAKER.	EQUIP	STEADY STATE AT 96%.
RIVER BEND	5/8/2012	4582012001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	5	Fuel oil from a leaking gasket contaminated the HPCS EDG lube oil. This rendered the HPCS EDG incapable of running for its full 30-day mission.	Equip	Shutdown
PERRY	6/11/2012	4402012002	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	73	HPCS was declared inoperable when the Division 3 DC Battery Trouble Alarm was received with indication of lowering voltage. The cause was failure of the normal battery charger.	Equip	Steady State at 73%.
LASALLE 2	8/31/2012	3742012001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	During the HPCS DG air start receiver blowdown, the starting air pressure dropped to the point where HPCS was required to be declared inoperable. This event was caused by a degraded receiver drain valve.	Equip	Steady State at 100%.
CLINTON 1	11/23/2012	4612012003	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	97	To stop the control room chiller breaker from cycling, the Control Building Sub B was tripped. This resulted in loss of power to the Instrument Air Containment Isolation Valves and HPCS inoperability.	Equip	Steady state at 97%.

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
CLINTON 1	2/18/2013	4612013001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	90	When the division 4 NSPS bus inverter transferred to its alternate source, HPCS was declared inoperable because it was not being supplied from its inverter.	Prsnlerr	Steady State at 90%.
NINE MILE PT. 2	2/28/2013	4102013002	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS was declared inoperable due to the failure of the HPCS pressure pump motor windings.	Equip	Steady State at 100%.
LASALLE 2	4/18/2013	3742013001	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	0	HPCS was declared inoperable following the discovery of pin hole leaks in the HPCS min flow line.	Equip	Hot Shutdown
COLUM. NUCLEAR 2	6/27/2013	3972013006	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	62	HPCS was made inoperable for a short period due to its Diesel Mixed-Air Fan's switch being bumped to the off position.	Prsnlerr	Increasing power at 62%.
CLINTON 1	8/15/2013	4612013004	HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	92	A ventilation damper for the HPCS EDG room failed to open on demand, resulting in HPCS being declared inoperable.	Equip	Steady State at 92%.
NINE MILE PT. 2	2/27/2014		HIGH PRESSURE CORE SPRAY SYSTEM (BWR)	100	HPCS was declared inoperable during PMT do to erratic operation of the HPCS DG's voltage regulator.	Equip	Steady State at 100%.

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Appendix L LER SUMMARIES – RCIC SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
HATCH 1	1/26/2000	3212000002	MULTIPLE SYSTEMS	100	HPCI FAILED TO AUTOMATICALLY TRIP ON HIGH RX WATER LEVEL DURING A SCRAM TRANSIENT. SUBSTANTIAL QUANTITIES OF REACTOR COOLANT ENTERED THE MAIN STEAM LINES. WHEN MANUALLY STARTED, RCIC TRIPPED ON OVERSPEED DUE TO WATER IN ITS STEAM SUPPLY LINE.	EQUIP	EVENT OCCURRED IN HOT SHUTDOWN
NINE MILE PT. 2	4/25/2000	4102000010	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS ISOLATED AND DECLARED INOPERABLE AS A RESULT OF ERRATIC INDICATIONS ON THE RCIC HIGH STEAM FLOW INSTRUMENTATION. AIR HAD BEEN INTRODUCED INTO THE INSTRUMENT LINES DURING THE REFUELING OUTAGE BECAUSE OF AN INADEQUATE WORK PACKAGE.	PROCEDUR	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
LIMERICK 2	7/20/2001	3522001002	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	A POSTULATED CONTROL ROOM FIRE COULD RENDER RCIC INOPERABLE FROM THE REMOTE SHUTDOWN PANEL. THE CAUSE WAS INADEQUATELY DESIGNED REPLACEMENT INVERTERS FOR THE 125/250 VDC DISTRIBUTION SYSTEM.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 1999
LIMERICK 1	7/20/2001	3522001002	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	A POSTULATED CONTROL ROOM FIRE COULD RENDER RCIC INOPERABLE FROM THE REMOTE SHUTDOWN PANEL. THE CAUSE WAS INADEQUATELY DESIGNED REPLACEMENT INVERTERS FOR THE 125/250 VDC DISTRIBUTION SYSTEM.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 1998

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
BROWNS FERRY 3	1/9/2002	2962002001	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS MANUALLY ISOLATED AND DECLARED INOPERABLE WHEN IT WAS DISCOVERED THAT THE STEAM LINE SPACE TEMPERATURE SWITCHES HAD BEEN REPLACED WITH THE WRONG TEMPERATURE SWITCHES. THE CAUSE WAS PERSONNEL ERROR BY MAINTENANCE TECHNICIANS.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 100% POWER
DUANE ARNOLD	8/21/2002	3312002003	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	8	RCIC FAILED AN OPERABILITY TEST DUE TO OIL FLOODING AT THE GOVERNOR END BEARING. THE CAUSE WAS INTRODUCTION AND ENTRAINMENT OF AIR IN THE OIL SYSTEM DUE TO INADEQUATE SYSTEM DESIGN BUT WAS NOT DISCOVERED UNTIL AFTER 9/3/2002. FIRST OF TWO SIMILAR EVENTS.	EQUIP	CONDITION EXISTED FOR AN INDETERMINAT E PERIOD OF TIME
DUANE ARNOLD	9/2/2002	3312002003	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	8	RCIC WAS DECLARED INOPERABLE DUE TO OIL FLOODING AT THE GOVERNOR END BEARING. THE CAUSE WAS INTRODUCTION AND ENTRAINMENT OF AIR IN THE OIL SYSTEM RESULTING FROM INADEQUATE SYSTEM DESIGN. THIS IS THE SECOND OF TWO SIMILAR EVENTS.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 8% POWER
BRUNSWICK 2	12/19/2002	3242002002	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	A POSTULATED CONTROL ROOM FIRE COULD RENDER RCIC INOPERABLE FROM THE REMOTE SHUTDOWN PANEL. THE CAUSE WAS INADEQUATE ORIGINAL DESIGN OF A POWER SUPPLY INVERTER.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
PEACH BOTTOM 2	12/21/2002	2772002001	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS DETERMINED TO HAVE BEEN TECHNICALLY INOPERABLE WHEN THE FLOW CONTROLLER OPERATED ERRATICALLY (ABOVE AND BELOW THE REQUIRED 600 GPM) WHEN IN AUTO CONTROL FOLLOWING A SCRAM. THE CAUSE WAS IMPROPER ADJUSTMENT OF THE CONTROLLER IN 1994.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 1994
COLUM. NUCLEAR 2	7/8/2003	3972003008	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	73	RCIC WAS RENDERED INOPERABLE WHEN ITS OUTBOARD CONTAINMENT ISOLATION VALVE INADVERTENTLY CLOSED DURING SURVEILLANCE. THE CAUSE WAS PERSONNEL ERROR WHEN A TECHNICIAN INADVERTENTLY APPLIED NITROGEN PRESSURE TO A SWITCH BEFORE IT WAS DEACTIVATED.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 73% POWER
LASALLE 1	7/10/2003	3732003003	PRIMARY CONTAINMEN T [SPECIAL NON-EIIS CODE]	100	BOTH DIVISIONS OF THE RCIC STEAM LINE HIGH FLOW ISOLATION WERE INOPERABLE AT THE SAME TIME. THE DIFFERENTIAL PRESSURE SWITCHES WERE FOUND FAILED WITH RUPTURED DIAPHRAGMS DURING SURVEILLANCE.	EQUIP	CONDITION EXISTED FOR AN INDETERMINAT E PERIOD OF TIME
PEACH BOTTOM 2	7/22/2003	2772003003	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS DETERMINED TO HAVE BEEN TECHNICALLY INOPERABLE WHEN THE FLOW CONTROLLER OPERATED ERRATICALLY (ABOVE AND BELOW THE REQUIRED 600 GPM) WHEN IN AUTO CONTROL FOLLOWING A SCRAM. THE CAUSE WAS IMPROPER ADJUSTMENT OF THE GOVERNOR IN 1994.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 1994
COLUM. NUCLEAR 2	8/22/2003	3972003009	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS ISOLATED AND DECLARED INOPERABLE DUE TO A DEGRADED PILOT CELL IN THE DIVISION ONE 250 VDC BATTERY.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
COLUM. NUCLEAR 2	2/21/2004	3972004002	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS RENDERED INOPERABLE BY A LOSS OF CONTROL POWER TO THE INJECTION VALVE. THE CAUSE WAS AN UNDERVOLTAGE RELAY FAILURE.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
LIMERICK 2	4/20/2004	3522004001	MULTIPLE SYSTEMS	100	BOTH HPCI AND RCIC WERE INOPERABLE AT VARIOUS TIMES IN THE PAST DUE TO AIR IN THE SUCTION LINES. THE CAUSE WAS A SYSTEM DESIGN DEFICIENCY AND FILL AND VENT PROCEDURE DEFICIENCIES.	EQUIP	CONDITION EXISTED FOR AN INDETERMINAT E PERIOD OF TIME
LIMERICK 1	4/20/2004	3522004001	MULTIPLE SYSTEMS	100	BOTH HPCI AND RCIC WERE INOPERABLE AT VARIOUS TIMES IN THE PAST DUE TO AIR IN THE SUCTION LINES. THE CAUSE WAS A SYSTEM DESIGN DEFICIENCY AND FILL AND VENT PROCEDURE DEFICIENCIES.	EQUIP	CONDITION EXISTED FOR AN INDETERMINAT E PERIOD OF TIME
PILGRIM	7/30/2004	2932004004	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS RENDERED INOPERABLE WHEN THE SYSTEM FAILED TO ACHIEVE DESIGN PRESSURE AND FLOW DURING SURVEILLANCE TESTING. THE CAUSE WAS A FAILED POTENTIOMETER IN THE FLOW CONTROLLER.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
LASALLE 1	8/2/2004	3732004001	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS RENDERED INOPERABLE WHEN THE BAROMETRIC CONDENSER VACUUM PUMP DISCHARGE CONTAINMENT ISOLATION CHECK VALVES WERE DECLARED INOPERABLE AND THE ISOLATION VALVES WERE CLOSED. THE CAUSE WAS AN INADEQUATE LLRT PROCEDURE.	PROCEDUR	CONDITION EXISTED FOR AN INDETERMINAT E PERIOD OF TIME

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
RIVER BEND	10/1/2004	4582004002	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC BECAME INOPERABLE WHEN THE STEAM SUPPLY ISOLATION VALVE ISOLATED FOLLOWING A SCRAM. THE CAUSE WAS A FALSE HIGH FLOW SIGNAL IN THE LEAK DETECTION INSTRUMENTATION RESULTING FROM PARTIAL BLOCKAGE IN THE LOW PRESSURE SENSING LINE.	EQUIP	EVENT OCCURRED IN HOT SHUTDOWN
COLUM. NUCLEAR 2	11/22/2004	3972004008	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS RENDERED INOPERABLE WHEN ITS INBOARD STEAM SUPPLY CONTAINMENT ISOLATION VALVE INADVERTENTLY CLOSED DURING A SURVEILLANCE TEST. THE CAUSE WAS AN INADEQUATE PROCEDURE.	PROCEDUR	EVENT OCCURRED DURING OPERATION AT 100% POWER
COLUM. NUCLEAR 2	6/23/2005	3972005004	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	23	RCIC FAILED TO MANUALLY RESTART FOLLOWING A SCRAM AND INITIAL SUCCESSFUL RCIC RUN. THE CAUSE WAS INADEQUATE SYSTEM DESIGN WHICH ALLOWED SHORT DURATION LOW SUCTION PRESSURE TO CAUSE THE PUMP TO TRIP.	EQUIP	EVENT OCCURRED IN HOT SHUTDOWN
RIVER BEND	1/5/2006	4582006001	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	A POSTULATED APPENDIX R CONTROL ROOM FIRE COULD CAUSE THE RCIC INBOARD STEAM SUPPLY VALVE TO SPURIOUSLY CLOSE RENDERING RCIC INOPERABLE FROM THE REMOTE SHUTDOWN PANEL.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION
PERRY	1/17/2006	4402006001	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	84	RCIC COULD BE RENDERED INOPERABLE FROM THE REMOTE SHUTDOWN PANNEL BY A FIRE INDUCED HOT SHORT CAUSING THE EXHAUST VALVE TO CLOSE DURING A POSTULATED CONTROL ROOM FIRE. THE CAUSE WAS AN INCORRECTLY INSTALLED WIRE JUMPER ON A SWITCH.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
NINE MILE PT. 2	5/26/2006	4102006002	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS DECLARED INOPERABLE BUT AVAILABLE WITH ITS STEAM EXHAUST VACUUM BREAKERS ISOLATED. IF STARTED IN THIS CONDITION, RESULTING WATER HAMMER COULD BREACH PRIMARY BOUNDARY PIPING.	PROCEDUR	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
LIMERICK 2	4/24/2007	3532007003	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS DECLARED INOPERABLE DUE TO SPEED AND FLOW OSCILLATIONS EXHIBITED DURING OPERATION FOLLOWING A SCRAM. THE OSCILLATIONS WERE CAUSED BY IMPROPER RCIC GAIN AND RESET SETTINGS.	EQUIP	0% FOLLOWING REACTOR TRIP.
PERRY	11/28/2007	4402007004	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	FOLLOWING A REACTOR SCRAM, RCIC STARTED AND THEN TRIPPED ON LOW SUCTION PRESSURE. A SECOND ATTEMPT TO RESTART RCIC RESULTED IN ANOTHER TRIP. THE CAUSE OF THE RCIC TRIPS WAS IMPROPER TUNING OF THE RCIC FLOW CONTROLLER.	EQUIP	0% FOLLOWING SCRAM FROM 100%.
PERRY	12/12/2007	4402007005	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	89	RCIC WAS DECLARED INOPERABLE WHEN IT WAS DETERMINED THAT ITS FLOW CONTROLLER SETTINGS WERE INADEQUATE.	PRSNLERR	89% FOLLOWING RETURN TO POWER.
PERRY	1/14/2008	4402008001	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS INOPERABLE FOR 35 DAYS DUE TO AN INTERMITTENT FAILURE OF A CONNECTOR IN THE FLOW CONTROLLER.	EQUIP	STEADY STATE AT 100%.

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
PILGRIM	10/6/2008	2932008003	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	WHILE PERFORMING A RCIC I&C SURVEILLANCE, THE RCIC SYSTEM RECEIVED AN ISOLATION SIGNAL, WHICH RENDERED RCIC INOPERABLE FOR A SHORT PERIOD. THE CAUSE OF THE ISOLATION WAS AN ERROR INTRODUCED IN THE RECENTLY REVISED SURVEILLANCE PROCEDURE.	PROCEDUR	STEADY STATE AT 100%.
QUAD CITIES 1	5/24/2009	2542009002	PRIMARY CONTAINMEN T [SPECIAL NON-EIIS CODE]	15	DURING RCIC SURVEILLANCE, THE RCIC TURBINE TRIPPED ON HIGH EXHAUST PRESSURE CAUSED BY THE EXHAUST ISOLATION CHECK VALVE FAILING. PARTS FROM THE FAILED CHECK VALVE LODGED IN THE DOWNSTREAM ISOLATION VALVE CAUSING IT TO FAIL OPEN.	EQUIP	STARTING UP AT 15%.
LIMERICK 2	5/23/2011	3532011003	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	RCIC WAS INOPERABLE DUE TO LEAKAGE FROM TWO FEEDWATER LONG-PATH-FLUSH MOVES. THE VALVES FAILED TO FULLY CLOSE AFTER THEIR USE DURING THE REFUELING OUTAGE. THE RESULTING LEAKAGE WOULD DIVERT RCIC OUTPUT TO THE MAIN CONDENSER.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER.
NINE MILE PT. 2	1/23/2013	4102013001	REACTOR CORE ISOLATION COOLING SYSTEM (BWR)	100	Failure of a RB General Area Temperature Trip Unit resulted in the closure of the RCIC system steam supply line isolation valve. This rendered RCIC inoperable. HPCS was inoperable for surveillance testing.	Equip	Steady State at 100%.

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Appendix M LER SUMMARIES – RHR-LPCI SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_numbe	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
FERMI 2	1/7/2000	3412000001	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	97	BOTH TRAINS OF LPCI WERE RENDERED INOPERABLE WHEN A LPCI INBOARD INJECTION VALVE LOST POWER DURING MAINTENANCE ACTIVITIES. THE CONDITION MOST LIKELY RESULTED FROM A WORKER INADVERTENTLY CONTACTING A SWITCH WHILE ERECTING SCAFFOLDING IN THE AREA.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 97% POWER
BROWNS FERRY 2	7/24/2000	2602000002	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	AN APPENDIX R FIRE COULD HAVE RENDERED BOTH LPCI PUMPS INOPERABLE DUE TO RUNNING AT SHUTOFF HEAD. THE APPENDIX R ANALYSIS WAS INADEQUATE REGARDING THE OPERATION OF THE MINIMUM FLOW VALVES.	OTHER	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 05/1991
BROWNS FERRY 3	7/24/2000	2602000002	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	AN APPENDIX R FIRE COULD HAVE RENDERED BOTH LPCI PUMPS INOPERABLE DUE TO RUNNING AT SHUTOFF HEAD. THE APPENDIX R ANALYSIS WAS INADEQUATE REGARDING THE OPERATION OF THE MINIMUM FLOW VALVES.	OTHER	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 11/1995
PILGRIM	12/11/2000	2932000003	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	LPCI WAS DECLARED INOPERABLE WHEN THE 125 VDC SWING BUS AUTOMATIC TRANSFER SWITCH FAILED TO OPERATE IMMEDIATELY DURING A SURVEILLANCE. A REVIEW INDICATED PAST DEGRADED PERFORMANCE. THE LICENSEE IS INVESTIGATING THE CAUSE OF THE SWITCH/RELAY FAILURE.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME

PL_NAME	Event_Date	LER_numbe	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
PILGRIM	1/2/2001	2932001001	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	THE LPCI ISOLATION VALVES WOULD HAVE BEEN PREVENTED FROM OPENING UNDER CERTAIN DESIGN BASIS CONDITIONS RENDERING THE LPCI SYSTEM INOPERABLE. THE CAUSE WAS TWO INCORRECTLY CONFIGURED RELAYS WHICH WERE INSTALLED DURING THE 1999 REFUELING OUTAGE.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE THE 1999 REFUELING OUTAGE
PEACH BOTTOM 3	11/16/2001	2782001002	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	LPCI WAS INOPERABLE FOR APPROXIMATELY TWO HOURS. WITH THE "A" TRAIN ISOLATED FOR CONTAINMENT REQUIREMENTS, THE "B" TRAIN WAS RENDERED INOPERABLE DUE TO TESTING. THE CAUSE WAS INADEQUATE PROCEDURE REVIEW BY THE WORK CONTROL AND CONTROL ROOM SUPERVISORS.	PRSNLERR	EVENT OCCURRED DURING OPERATION AT 100% POWER
DUANE ARNOLD	3/8/2002	3312002001	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	0	THE PLANT TRANSITIONED FROM MODE FOUR TO MODE THREE DURING A STARTUP WITH LPCI INOPERABLE. THE CAUSE WAS INABILITY TO OPEN AN RHR CROSS-TIE VALVE DUE TO THE FAILURE OF A SETSCREW IN THE MANUAL OPERATOR OF THE VALVE.	EQUIP	EVENT OCCURRED IN COLD SHUTDOWN
QUAD CITIES 2	10/7/2002	2652002005	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	97	BOTH TRAINS OF LPCI WERE INOPERABLE BECAUSE ONE TRAIN WOULD NOT AUTOMATICALLY START AND FLOW FROM THE OTHER TRAIN COULD HAVE BEEN DIVERTED FROM THE RX VESSEL. THE CAUSE WAS A DETACHED WIRE RESULTING FROM POOR WORKMANSHIP.	PRSNLERR	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE MARCH 2002

PL_NAME	Event_Date	LER_numbe	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
QUAD CITIES 2	1/9/2003	2652003001	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	BOTH TRAINS OF LPCI WERE INOPERABLE BECAUSE THE ISOLATION RELAYS FOR THE INJECTION VALVES HAD A SEALED IN ISOLATION SIGNAL WITHOUT A CURRENT SIGNAL PRESENT. THE CAUSE WAS AN INADEQUATE TEST PROCEDURE WHICH FAILED TO ENSURE ISOLATION RESET AFTER TESTING.	PROCEDUR	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
LIMERICK 1	1/31/2003	3522003001	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	A POSTULATED FLOODING EVENT FOR ONE RHR ROOM COULD HAVE FLOODED THE OTHER RHR ROOM AND RENDERED ALL FOUR RHR PUMPS INOPERABLE. THE CAUSE WAS A MISSING FOUR INCH FLOOR DRAIN LINE CLEANOUT PLUG.	PROCEDUR	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
PERRY	8/14/2003	4402003002	MULTIPLE SYSTEMS	100	LPCS AND LPCI WERE INOPERABLE FOR INJECTION AS THE RESULT OF SYSTEM AIR BINDING. THE CAUSE WAS INADEQUATE SYSTEM DESIGN.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
FERMI 2	6/16/2005	3412005004	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	BOTH TRAINS OF LPCI WERE DECLARED INOPERABLE WHEN THE DIVISION "2" LPCI OUTBOARD INJECTION VALVE FAILED TO OPEN DURING A SURVEILLANCE TEST. THE CAUSE WAS DEBRIS IN, OR A MECHANICAL BINDING OF, THE VALVE'S OPEN CONTACTOR AUXILIARY INTERLOCK CONTACT.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
PERRY	8/27/2007	4402007003	MULTIPLE SYSTEMS	100	GRATING IN THE CONTAINMENT WAS NOT PROPERLY SECURED AND COULD HAVE IMPACTED THE ECCS SUCTION STRAINER, POTENTIALLY RESULTING IN LPCI (RHR A, B, AND C) AND HPCS SYSTEM INOPERABILITY.	PRSNLERR	STEADY STATE AT 100%.

PL_NAME	Event_Date	LER_numbe	SYSTEM	PowerLevel	Descrption	Cause	Pwr_Hist
PEACH BOTTOM 3	5/4/2010	2782011002	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	A through body leak on an RHR check valve rendered one train of RHR inoperable. During the period of inoperability, the other train was taken out of service for maintenance.	Equip	Condition existed in all modes up to 100% power.
BROWNS FERRY 1	10/23/2010	2592010003	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	0	THE LPCI FLOW CONTROL VALVE FAILED TO OPEN, RENDERING LOOP II INOPERABLE. DURING THE POTENTIAL PERIOD OF INOPERABILITY, THE OTHER LOOPS WERE PERIODICALLY INOPERABLE FOR TESTING AND MAINTENANCE.	EQUIP	REFUELING
QUAD CITIES 2	1/12/2011	2652011001	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	BOTH TRAINS OF LPCI WERE DECLARED INOPERABLE WHEN POWER WAS LOST TO 480V ESSENTIAL SERVICE BUS 29 AND BUS 28/29-5 FAILED TO TRANSFER TO ITS RESERVE FEED DUE TO BINDING OF ITS CONTACTS. BUS 29 WAS LOST DUE TO INADVERTENT CONTACT WITH ITS FEEDER BREAKER.	EQUIP	STEADY STATE AT 100%.
DUANE ARNOLD	12/2/2011	3312012001	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	LPCI was declared inoperable when voiding was discovered in the 'B' RHR injection vent line.	Equip	POWER OPERATIONS AT 100%
DRESDEN 2	11/14/2013	2372013006	LOW PRESSURE COOLANT INJECTION SYSTEM (BWR)	0	The LPCI Swing Bus Automatic Transfer Scheme did not operate as expected. The cause was a high resistance in the control circuit portion of the control switch.	Equip	Refueling.

Appendix N LER SUMMARIES – LPCS SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
FITZPATRICK	8/23/2000	3332000009	MULTIPLE SYSTEMS	100	CORE SPRAY AND HPCI WERE DECLARED INOPERABLE BECAUSE CIRCUITS WHICH CONTROL THE MINIMUM FLOW MOTOR OPERATED VALVES WERE NOT ENVIRONMENTALLY QUALIFIED. THE CAUSE WAS AN INADEQUATE ORIGINAL INSTALLATION.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION
PERRY	8/14/2003	4402003005	MULTIPLE SYSTEMS	100	LPCS AND LPCI WERE INOPERABLE FOR INJECTION AS THE RESULT OF SYSTEM AIR BINDING. THE CAUSE WAS INADEQUATE SYSTEM DESIGN.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
MONTICELLO	9/1/2004	2632004002	MULTIPLE SYSTEMS	100	BOTH TRAINS OF RHR AND CORE SPRAY COULD HAVE BEEN RENDERED INOPERABLE BY A POSTULATED FIRE DUE TO INADEQUATE APPENDIX R CABLE SEPARATION. THE CAUSE WAS FAILURE TO RECOGNIZE APPENDIX R NONCOMPLIANCE DURING THE ORIGINAL SAFE SHUTDOWN ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION
QUAD CITIES 1	1/4/2006	2542006001	LOW PRESSURE CORE SPRAY SYSTEM (BWR)	85	ONE CORE SPRAY PUMP HAS BEEN INOPERABLE AT TIMES FOR MAINTENANCE/SURVEILLANCE WHILE THE OTHER CORE SPRAY PUMP HAS BEEN UNKNOWNLY INOPERABLE FROM AN IMPROPERLY RACKED IN BREAKER SINCE 10/6/05.	PRSNLERR	CONDITION DISCOVERED DURING OPERATION AT 85% POWER

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
COLUM. NUCLEAR 2	12/20/2010	3972010002	LOW PRESSURE CORE SPRAY SYSTEM (BWR)	100	LPCS WAS DECLARED INOPERABLE DUE TO LOSS OF POWER TO THE LPCS MINIMUM FLOW VALVE. LOSS OF POWER WAS CAUSED BY THE CLEARING OF ALL THREE LINE POWER FUSES, POSSIBLY DUE TO A RANDOM FUSE FAILURE.	EQUIP	STEADY STATE AT 100%.
BROWNS FERRY 2	8/8/2011	2602011001	MULTIPLE SYSTEMS	100	Failed contacts in a normally opened relay could have resulted in the failure of the RHR and LPCS pumps by the failure of the C Bus coincident with an accident signal.	Equip	Condition could have existed in all modes up to 100% power.

Appendix O LER SUMMARIES – RPS-PPS SCRAMs 2000-2014

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mod
DUANE ARNOLD	1/5/2000	3312000001	AUTO	A RX SCRAM OCCURRED ON A FALSE LOW RX VESSEL WATER LEVEL SIGNAL DURING RESTORATION FROM A TEST OF RX VESSEL WIDE RANGE LEVEL INSTRUMENTATION. THE CAUSE WAS THE USE OF AN INADEQUATE INSTRUMENT RESTORATION PROCESS.	POWER OPERATIONS AT 100%	PROCEDUR	TESTING
DRESDEN 3	5/3/2000	2492000002	AUTO	A RX SCRAM OCCURRED DURING THE TRANSFER OF RPS BUS POWER SUPPLIES FOLLOWING PREVENTIVE MAINTENANCE. WHILE TRANSFERRING BUS "B", BUS "A" ALSO LOST POWER. THE ASSOCIATED MG SET DRIVE MOTOR BREAKER TRIPPED BECAUSE OF PERSONNEL ERROR DURING THE MAINTENANCE.	POWER OPERATIONS AT 100%	PRSNLERR	MAINTEN
BROWNS FERRY 3	5/24/2000	2962000005	AUTO	A RX SCRAM OCCURRED ON AN INVALID LOW RX WATER LEVEL SIGNAL GENERATED WHILE RETURNING A FEEDWATER LEVEL TRANSMITTER TO SERVICE. THE CAUSE WAS A LACK OF SPECIFIC PROCEDURALIZED VALVING SEQUENCES FOR THE LEVEL TRANSMITTER.	POWER OPERATIONS AT 100%	PROCEDUR	OPERATE
PEACH BOTTOM 3	8/7/2000	2782000001	AUTO	A RX SCRAM RESULTED FROM AN INVALID LOW RX WATER LEVEL SIGNAL. THE CAUSE WAS A FAILURE OF A PACKING GLAND FOLLOWER, WHICH DEPRESSURIZED THE VARIABLE LEG TO VARIOUS INSTRUMENTS.	POWER OPERATIONS AT 100%	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mod
VERMONT YANKEE	3/19/2001	2712001001	AUTO	A RX SCRAM OCCURRED DURING TESTING WHEN A BACKUP SCRAM VALVE ACTUATED. THE CAUSE WAS A TRAIN B RPS AUX CONTACT WHICH FAILED IN THE TRIPPED POSITION, RESULTING IN AN INVISIBLE HALF SCRAM. TESTING OF THE A TRAIN COMPLETED THE BACKUP SCRAM VALVE LOGIC.	POWER OPERATIONS AT 100%	EQUIP	TESTING
PILGRIM	12/27/2001	2932001007	AUTO	A RX SCRAM OCCURRED ON AN AVERAGE POWER RANGE HI-HI TRIP AFTER BOTH RECIRCULATION MOTOR GENERATOR SETS TRIPPED. THE MOST LIKELY CAUSE WAS A FAILED MICRO SWITCH IN AN ANALOG TRIP SYSTEM CALIBRATING UNIT.	POWER OPERATIONS AT 100%	EQUIP	TESTING
SUSQUEHANNA 2	4/28/2005	3882005003	MAN	WHILE SHUTTING DOWN FROM 100% POWER DUE TO LOSS OF COOLING TO THE B MAIN TRANSFORMER, REACTOR WAS MANUALLY SCRAMMED AT 75% POWER.	MAN SCRAM AT 75% WHILE REDUCING FROM 100%	EQUIP	OPERATE
NINE MILE PT. 1	8/18/2005	2202005003	AUTO	A SCRAM OCCURRED ON LOSS OF A POWER BOARD WHICH RESULTED IN A HALF SCRAM SIGNAL WHILE A HALF SCRAM SIGNAL ALREADY EXISTED DUE TO TESTING. THE CAUSE WAS INADVERTANT MECHANICAL RELAY JARRING WHICH OCCURRED DURING A MAINTENANCE ACTIVITY.	POWER OPERATIONS AT 100%	OTHER	MAINTEN
HATCH 2	4/5/2006	3662006002	AUTO	A SCRAM OCCURRED ON A TURBINE CONTROL VALVE FAST CLOSURE RESULTING FROM A POWER LOAD IMBALANCE. THE LICENSEE IS INVESTIGATING THE CAUSE.	POWER OPERATIONS AT 100%	PROCEDUR	OPERATE
RIVER BEND	4/15/2006	4582006004	AUTO	A RX TRIP OCCURRED ON HIGH APRM HEAT FLUX AFTER BOTH RECIRCULATION PUMPS DOWNSHIFTED TO SLOW SPEED. THE CAUSE WAS A FAILED OPTICAL ISOLATOR IN THE CONTROL CIRCUIT FOR THE END OF CYCLE RECIRCULATION PUMP TRIP.	POWER OPERATIONS AT 100%	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mod
SUSQUEHANNA 1	6/15/2006	3872006004	AUTO	A RX SCRAM OCCURRED ON AN APPARENT NEUTRON MONITORING TRIP WHILE TRANSFERRING RPS POWER SUPPLIES. THIS EVENT WAS CAUSED BY A DESIGN DEFICIENCY IN THE NEWLY INSTALLED POWER RANGE NEUTRON MONITORING SYSTEM.	POWER OPERATIONS AT 100%	PRSNLERR	OPERATE
BRUNSWICK 2	12/25/2006	3242006003	AUTO	THE REACTOR TRIPPED UPON RECEIPT OF TWO CHANNELS OF OPRM NEUTRON MONITORING TRIP SIGNALS.	AT 64% POWER.	EQUIP	OPERATE
RIVER BEND	9/26/2007	4582007005	AUTO	A REACTOR TRIP OCCURRED DURING AVERAGE POWER RANGE MONITOR SURVEILLANCE. THE TRIP WAS CAUSED WHEN THE GROUP 2 CONTROL RODS DROPPED UNEXPECTEDLY. AS THE REACTOR OPERATOR WAS RESPONDING TO THE DROPPED RODS, THE REACTOR TRIPPED ON LOW WATER LEVEL.	STEADY STATE AT 100%.	EQUIP	TESTING
FERMI 2	11/15/2007	3412007002	MAN	AN ALTERNATE ROD INSERTION/RECIRC PUMP TRIP INITIATED DUE TO AN INVALID REACTOR WATER LEVEL SIGNAL. A MANUAL SCRAM WAS PERFORMED. THE INVALID LEVEL SIGNAL RESULTED FROM AN OPERATOR PERFORMING A SAFETY TAG-OUT OF THE REACTOR LEVEL REFERENCE LEG.	STARTING UP AT 9%.	EQUIP	OPERATE
HATCH 1	5/10/2009	3212009004	AUTO	THE REACTOR TRIPPED AT 8% POWER, WHEN THE MODE SWITCH WAS PLACED IN RUN. THE TRIP WAS CAUSED BY UPSCALE TRIP SIGNALS FROM THE INTERMEDIATE RANGE NUCLEAR INSTRUMENTS. THE UPSCALE TRIP SIGNALS WERE CAUSED BY AN ELECTRICAL NOISE SPIKE.	STARTING UP AT 8%.	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mod
DUANE ARNOLD	10/8/2009	3312009004	AUTO	THE REACTOR SCRAMMED WHILE RESTORING THE REACTOR WATER LEVEL/PRESSURE INSTRUMENTS FOLLOWING CALIBRATION. THE EVENT WAS CAUSED BY FAILURE TO CLOSE AN INSTRUMENT ISOLATION VALVE, WHICH RESULTED IN A SENSED LOW REACTOR WATER LEVEL ON TWO RPS CHANNELS.	STEADY STATE AT 100%.	EQUIP	TESTING
NINE MILE PT. 2	1/7/2010	4102010001	AUTO	DURING MAINTENANCE ACTIVITIES ON THE RHR SYSTEM, THE REACTOR AUTOMATICALLY SCRAMMED ON AN INVALID LOW REACTOR WATER LEVEL SIGNAL. TRANSMITTER VENTING OF A COMMON INSTRUMENT LINE WAS THE CAUSE OF THE TRIP SIGNAL.	STEADY STATE AT 100%.	PRSNLERR	MAINTEN
DRESDEN 3	10/11/2010	2492010001	AUTO	THE REACTOR TRIPPED WHILE SWITCHING THE "A" RPS BUS FROM THE NORMAL TO THE RESERVE POWER SUPPLY. BEFORE THE EXPECTED HALF SCRAM SIGNAL COULD BE RESET A POWER SUPPLY FAILURE OCCURRED IN THE OPRM SYSTEM ON THE OPPOSITE RPS DIVISION.	STEADY STATE AT 100%.	EQUIP	MAINTEN
OYSTER CREEK	12/23/2010	2192010002	AUTO	DURING STARTUP, WITH THE REACTOR CRITICAL AT 0%, THE REACTOR TRIPPED ON A LOW CONDENSER VACUUM SIGNAL. THE TRIP WAS CAUSED BY A PROCEDURAL ERROR THAT DID NOT ENSURE ALL REQUIREMENTS WERE MET PRIOR TO EXCEEDING 500-PSIG REACTOR PRESSURE.	STARTING UP AT 0%.	PROCEDUR	OPERATE
PILGRIM	5/10/2011	2932011003	AUTO	DURING REACTOR STARTUP WITH POWER AT 2%, THE REACTOR TRIPPED DUE TO A HI-HI SIGNAL FROM THE INTERMEDIATE RANGE MONITORS. THE CAUSE OF THE TRIP WAS OPERATOR ERROR DUE TO LACK OF ADMINISTRATIVE CONTROLS ON PROCEDURAL DETAILS.	STARTING UP AT 2%.	PRSNLERR	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mod
LIMERICK 1	6/3/2011	3522011002	AUTO	THE REACTOR TRIPPED FOLLOWING A MAIN TURBINE TRIP. THE TURBINE TRIP WAS CAUSED BY ACTUATION OF THE REACTOR LEVEL TRIP LOGIC DURING TESTING. THE LOGIC TRIP WAS THE RESULT OF USING INCOMPATIBLE TEST EQUIPMENT. THE REVISED TEST PROCEDURE WILL BE CORRECTED.	STEADY STATE AT 100%.	PROCEDUR	TESTING
SUSQUEHANNA 2	8/19/2011	3882011003	AUTO	DURING REACTOR WATER LEVEL FUNCTIONAL TESTING, THE MAIN TURBINE TRIPPED UNEXPECTEDLY WHEN A SINGLE CHANNEL TEST SIGNAL WAS INSERTED. THIS RESULTED IN A REACTOR TRIP.	STEADY STATE AT 100%.	UNKNOWN	TESTING
HATCH 2	10/24/2011	3662011003	MAN	While starting up, the reactor was manually tripped from about 1% power. The trip was in response to two of Intermediate Range monitors acting erratically.	Starting up.	Equip	Operate
SUSQUEHANNA 2	12/16/2012	3882012003	AUTO	DURING CONTROL VALVE TESTING, AN EXPECTED 1/2 SCRAM WAS RECEIVED. FOR UNKNOWN REASONS, THE OTHER CHANNEL RECEIVED A 1/2 SCRAM, RESULTING IN A REACTOR TRIP.	STEADY STATE AT 98%.	Equip	Operate
BROWNS FERRY 2	12/22/2012	2602012006	AUTO	A 4KV SHUTDOWN BOARD DEENERGIZED DURING POST-MAINTENANCE ACTIVITIES. THIS RESULTED IN LOSS OF POWER TO THE 2B RPS SYSTEM. WHILE TRYING TO RESTORE POWER, THE 2A RPS WAS INADVERTENTLY DEENERGIZED, RESULTING IN A REACTOR TRIP.	STEADY STATE AT 100%.	Prsnlerr	Mainten
OYSTER CREEK	10/3/2013	2192013001	AUTO	DURING STARTUP, WHILE CRITICAL IN THE INTERMEDIATE RANGE, THE REACTOR TRIPPED DUE TO AN INVALID IRM SIGNAL. THE IRMS SPIKED WHEN SRM-22 WAS BEING WITHDRAWN FROM THE CORE.	STARTING UP AT 0%.	Equip	Operate

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mod
NINE MILE PT. 2	3/10/2014		AUTO	THE REACTOR AUTOMATICALLY TRIPPED DUE TO ACTUATION OF THE ALTERNATE ROD INSERTION SYSTEM. THE ACTUATION MAY HAVE BEEN CAUSED BY PERSONNEL WORKING IN AN AREA WHERE THEY MAY HAVE AGITATED THE LEVEL INSTRUMENTS COMMON DRAIN LINE.	STEADY STATE AT 100%.	Equip	Operate

Appendix P LER SUMMARIES – RPS-PPS SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
HATCH 2	6/25/2001	3212001003	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
HATCH 1	6/25/2001	3212001003	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
PERRY	6/27/2001	4402001002	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE MARCH 2001
NINE MILE PT. 2	6/29/2001	4102001003	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE APRIL 2000
BROWNS FERRY 3	7/2/2001	2602001002	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE MAY 2000

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
BROWNS FERRY 2	7/2/2001	2602001002	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE MAY 1999
PILGRIM	10/3/2002	2932002003	PLANT PROTECTION SYSTEM	100	AN AUTOMATIC SCRAM WOULD NOT HAVE OCCURRED WHEN ENTERING THE EXCLUSION REGION AFTER A RUNBACK OF BOTH RECIRCULATION PUMPS TO MINIMUM SPEED. THE CAUSE WAS NONCONSERVATIVE DRIFT FROM THE RECIRCULATION LOOP "A" FLOW CONVERTER.	EQUIP	EVENT OCCURRED DURING OPERATION AT 100% POWER
MONTICELLO	10/8/2002	2632002006	PLANT PROTECTION SYSTEM	100	THE FLOW BIAS NEUTRON SCRAM WOULD HAVE BEEN UNABLE TO PERFORM ITS SAFETY FUNCTION FOR BRIEF PERIODS DURING SURVEILLANCE PERFORMANCE. THE CAUSE WAS AN INCORRECT PROCEDURE REVISION IN 1992 WHICH ISOLATED THE TRANSMITTER PRIOR TO INSERTING A HALF SCRAM.	PROCEDUR	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 1992
FERMI 2	11/21/2002	3412002005	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 4/24/2000
BROWNS FERRY 2	11/22/2002	2602002003	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE MAY 1999

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
NINE MILE PT. 2	11/22/2002	4102002005	PLANT PROTECTION SYSTEM	0	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE APRIL 2000
BROWNS FERRY 3	11/22/2002	2602002003	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE MAY 2000
BRUNSWICK 1	11/22/2002	3252002001	PLANT PROTECTION SYSTEM	94	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE SPRING 2002
LASALLE 2	2/25/2003	3742003002	PLANT PROTECTION SYSTEM	100	THE APRM FLOW BIASED SCRAM WAS DECLARED INOPERABLE WHEN ALL THE RX RECIRCULATION FLOW CONVERTERS WERE DISCOVERED TO BE OUT OF CALIBRATION IN THE NONCONSERVATIVE DIRECTION. THE CAUSE WAS AN INADEQUATE PROCEDURE.	PROCEDUR	CONDITION DISCOVERED DURING OPERATION AT 100% POWER
COOPER STATION	9/28/2003	2982003005	PLANT PROTECTION SYSTEM	61	IT WAS DETERMINED DURING TESTING THAT THE TURBINE TRIP AND RESULTING SCRAM WOULD NOT HAVE OCCURRED WHEN REQUIRED DURING A HIGH WATER LEVEL CONDITION. THE CAUSE WAS ESTER CONTAMINATION OF THE TURBINE LUBRICATING OIL.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 61% POWER

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
NINE MILE PT. 2	10/2/2003	4102003003	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THEY MAY NOT PROVIDE ADEQUATE MCPR PROTECTION. THE CAUSE WAS NON-CONSERVATIVE SETTINGS FOR ADJUSTABLE PARAMETERS.	EQUIP	CONDITION EXISTED SINCE APRIL 2000
FERMI 2	10/2/2003	3412003003	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THE SCRAM SETPOINTS WERE SET NONCONSERVATIVELY. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
HATCH 2	10/3/2003	3212003002	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THEY MAY NOT PROVIDE ADEQUATE MCPR PROTECTION. THE CAUSE WAS NON-CONSERVATIVE SETTINGS FOR ADJUSTABLE PARAMERERS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 1997
HATCH 1	10/3/2003	3212003002	PLANT PROTECTION SYSTEM	100	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE BECAUSE THEY MAY NOT PROVIDE ADEQUATE MCPR PROTECTION. THE CAUSE WAS NON-CONSERVATIVE SETTINGS FOR ADJUSTABLE PARAMETERS.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 1997
BRUNSWICK 1	10/5/2003	3252003002	PLANT PROTECTION SYSTEM	96	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE DUE TO THE POTENTIAL FOR NUMEROUS UNEXPECTED CONFIRMATION COUNT RESETS IN THE EVENT OF AN INSTABILITY CONDITION. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
BRUNSWICK 2	10/5/2003	3252003002	PLANT PROTECTION SYSTEM	96	THE OSCILLATION POWER RANGE MONITORS WERE DECLARED INOPERABLE DUE TO THE POTENTIAL FOR NUMEROUS UNEXPECTED CONFIRMATION COUNT RESETS IN THE EVENT OF AN INSTABILITY CONDITION. THE CAUSE WAS AN INADEQUATE GE ANALYSIS.	EQUIP	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
BROWNS FERRY 2	7/12/2004	2602004003	PLANT PROTECTION SYSTEM	43	THE TURBINE CONTROL VALVE FAST CLOSURE PRESSURE SWITCH SCRAM FUNCTION WAS DEFEATED FOR APPROXIMATELY 30 DAYS FOLLOWING A SPURIOUS SCRAM FROM THE EHC POWER LOAD UNBALANCE CIRCUIT. THE CAUSE WAS FAILURE OF THE FSAR TO INCLUDE A DESCRIPTION OF THE SCRAM.	PROCEDUR	CONDITION EXISTED DURING POWER OPERATIONS FOR APPROXIMATELY 30 DAYS
PERRY	9/21/2006	4402006004	PLANT PROTECTION SYSTEM	100	IT WAS CONSERVATIVELY DETERMINED THAT ALL FOUR CHANNELS OF OPRM WERE INOPERABLE DUE TO NON-CONSERVATIVE SETTING OF THE OPRM ENABLED REGION DRIVE FLOW SETPOINT WHEN THE PLANT IS IN SINGLE REACTOR RECIRCULATION LOOP OPERATION.	PROCEDUR	STEADY STATE AT 100% POWER.
BROWNS FERRY 1	5/27/2007	2592007001	PLANT PROTECTION SYSTEM	4	THE GAIN ADJUSTMENTS FOR THE LOCAL POWER RANGE MONITORS WAS NOT SET CORRECTLY. THIS ERROR MADE ALL CHANNELS OF APRM HIGH FLUX TRIPS FOR THE RPS SYSTEM INOPERABLE.	PRSNLERR	STARTING UP REACTOR AT 4%.
BROWNS FERRY 1	6/3/2007	2592007004	PLANT PROTECTION SYSTEM	38	THE SCRAM INITIATION SIGNALS FOR THE TURBINE CONTROL VALVE AND THE TURBINE STOP VALVES WERE BYPASSED AT A HIGHER POWER LEVEL THAN ALLOWED BY TECH SPECS.	PROCEDUR	STARTING UP REACTOR AT 34%.

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
QUAD CITIES 1	11/16/2007	2542007002	PLANT PROTECTION SYSTEM	97	THE MAIN TURBINE FIRST STAGE LOW PRESSURE SCRAM ENABLE WERE FOUND OUT OF TOLERANCE HIGH. THIS PREVENTED FULFILLMENT OF A REACTOR SCRAM SAFETY FUNCTION.	EQUIP	STEADY STATE AT 97%.
DRESDEN 2	11/27/2009	2372009007	PLANT PROTECTION SYSTEM	0	IT WAS IDENTIFIED THAT THE ALL THE PRESSURE SWITCHES FOR SEVERAL TURBINE-RELATED RPS TRIPS SHARED A COMMON SENSING LINE AND ISOLATION VALVE. FAILURE OF THIS LINE WOULD RENDER ALL TRIP CHANNELS UNAVAILABLE.	EQUIP	REFUELING
DRESDEN 3	11/27/2009	2372009007	PLANT PROTECTION SYSTEM	0	IT WAS IDENTIFIED THAT ALL THE PRESSURE SWITCHES FOR SEVERAL TURBINE-RELATED RPS TRIPS WERE SUPPLIED FROM A SINGLE SENSING LINE AND ISOLATION VALVE. FAILURE OF THIS LINE WOULD RENDER ALL TRIP CHANNELS INOPERABLE.	EQUIP	STEADY STATE AT 98%.
DUANE ARNOLD	1/4/2010	3312010002	PLANT PROTECTION SYSTEM	100	THE END-OF-CYCLE RECIRCULATION PUMP TRIP WAS NOT MET WHEN THE TURBINE BYPASS VALVES WERE IN THE OPEN POSITION. PLANT STAFF LACKED UNDERSTANDING OF THE TBVS BEING OPEN AND THE IMPACT ON THE TFSP SETPOINTS.	PRSNLERR	STEADY STATE AT 100%.
DRESDEN 2	2/19/2012	2372012001	PLANT PROTECTION SYSTEM	73	Following a power reduction, the gains of APRMs 4, 5, and 6 became out of adjustment. During the period the gains were out of adjustment, the Fixed Neutron Flux-High trip signal would have exceeded its allowed value.	Prsnlerr	Reduced power at 73%.
LASALLE 2	12/7/2013	3742013003	PLANT PROTECTION SYSTEM	60	The Average Power Range Monitors were declared inoperable due to exceeding the allowable difference from calculated power.	Equip	Reducing power at 60%.

Appendix Q LER SUMMARIES – CRD SCRAMs 2000-2014

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mod
FERMI 2	12/29/2002	3412002006	MAN	THE RX WAS MANUALLY SCRAMMED DUE TO THE INABILITY TO DRIVE IN CONTROL RODS. THE CAUSE WAS A FAULTY VOLTAGE REGULATOR ASSOCIATED WITH THE MASTER POWER UNIT.	SCRAM FROM 73% FOLLOWING REDUCTION FROM 100%	EQUIP	REDUCING
COOPER STATION	5/19/2007	2982007004	MAN	WHILE PERFORMING MAINTENANCE ON THE CRD HYDRAULIC CONTROL UNITS, A WATER LEAK DEVELOPED PAST THE SEATS OF ONE OR BOTH OF THE MANUAL ISOLATION VALVES. HIGH AIRBORNE ACTIVITY LEVELS RESULTED IN EVACUATION OF THE REACTOR BUILDING AND A MANUAL SCRAM.	POWER REDUCED TO 50% FOR MAINTENANCE.	EQUIP	MAINTEN
HOPE CREEK	5/17/2009	3542009004	AUTO	THE REACTOR AUTOMATICALLY TRIPPED ON THE REACTOR VESSEL LEVEL TWO SECONDS PRIOR TO THE MODE SWITCH BEING PLACED IN SHUTDOWN DUE TO MULTIPLE CONTROL RODS DRIFTING. THE CONTROL RODS WERE DRIFTING DUE TO AN AIR LEAK IN A HYDRAULIC CONTROL UNIT.	STEADY STATE AT 100%.	EQUIP	OPERATE
PERRY	5/11/2010	4402010003	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO LOSS CONTROL ROD DRIVE CHARGING HEADER PUMPS. THE LOSS OF THE PUMPS WAS DUE TO THE LOSS OF POWER ON A DIVISION 2 INSTRUMENT RACK.	STEADY STATE AT 100%.	EQUIP	OPERATE
BROWNS FERRY 3	5/24/2012	2962012004	MAN	The reactor was manually tripped during startup due to multiple control rods inserting. As the operator was resetting a half-scrum on Channel B IRM, a spike on Channel A IRM resulted in Control Rod Groups 1 and 4 inserting.	Starting up at 1%.	Equip	Operate

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Appendix R LER SUMMARIES – CRD SYSTEM FAILURES - SYSTEM FAILURES - 2000-2010

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
MONTICELLO	4/20/2007	2632007003	CONTROL ROD DRIVE SYSTEM	0	WHILE PERFORMING CONTROL ROD TESTING, A ROD OUT INTERLOCK WAS FOUND INOPERABLE. THE FAILURE WAS DISCOVERED WHILE TESTING ANOTHER CONTROL ROD.	EQUIP	SHUTDOWN - REFUELING
MONTICELLO	9/20/2008	2632008007	RESIDUAL HEAT REMOVAL SYSTEM (BWR) [SPECIAL NON-EIIS CODE]	0	THE CONTAINMENT ISOLATED DUE TO A PRESSURE PULSE IN A REACTOR LEVEL INSTRUMENT WHEN A CRD PUMP STARTED. THE ISOLATION RESULTED IN LOSS OF SHUTDOWN COOLING AND A SUBSEQUENT 25-DEGREE INCREASE IN REACTOR COOLANT TEMPERATURE.	EQUIP	COLD SHUTDOWN

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Appendix S LER SUMMARIES – SLC SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
RIVER BEND	9/14/2000	4582000013	STANDBY LIQUID CONTROL SYSTEM (BWR)	100	BOTH TRAINS OF STANDBY LIQUID CONTROL WERE DECLARED INOPERABLE WHEN SEVERAL PIECES OF PLASTIC FROM A TRASH BAG WERE FOUND IN THE STORAGE TANK. THE CAUSE WAS IMPROPER PERSONNEL WORK PRACTICES RELATED TO FOREIGN MATERIAL CONTROL.	OTHER	CONDITION EXISTED FOR AN INDETERMINATE PERIOD OF TIME
QUAD CITIES 1	10/12/2006	2542006004	STANDBY LIQUID CONTROL SYSTEM (BWR)	100	SLC WAS DECLARED INOPERABLE WHEN A THROUGH-WALL LEAK WAS DISCOVERED ON THE SLC TANK.	EQUIP	UNKNOWN
DRESDEN 2	1/18/2007	2372007001	STANDBY LIQUID CONTROL SYSTEM (BWR)	100	SLC WAS DECLARED INOPERABLE WHEN AN UNISOLABLE LEAK WAS DISCOVERED ON THE SLC TANK TEMPERATURE SWITCH WELL.	EQUIP	STEADY STATE AT 100%.
RIVER BEND	1/14/2009	4582009001	STANDBY LIQUID CONTROL SYSTEM (BWR)	100	THE SLC SYSTEM COULD POTENTIALLY BE RENDERED INOPERABLE BY A SEISMIC EVENT DUE TO THE PRACTICE OF ALLOWING WATER TO REMAIN IN THE TEST TANK, WHICH IS NOT SEISMICALLY QUALIFIED WHEN FULL OF WATER.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER.
LASALLE 2	10/28/2010	3732010003	STANDBY LIQUID CONTROL SYSTEM (BWR)	100	THE STANDBY LIQUID CONTROL SYSTEM TEST TANK WAS FOUND TO BE NOT SEISMICALLY QUALIFIED WHEN FILLED WITH WATER. DURING A SEISMIC EVENT IT COULD POTENTIALLY COLLAPSE AND IMPACT ADJACENT SAFETY-RELATED EQUIPMENT.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
LASALLE 1	10/28/2010	3732010003	STANDBY LIQUID CONTROL SYSTEM (BWR)	100	THE STANDBY LIQUID CONTROL SYSTEM TEST TANK WAS FOUND TO BE NOT SEISMICALLY QUALIFIED WHEN FILLED WITH WATER. DURING A SEISMIC EVENT IT COULD POTENTIALLY COLLAPSE AND IMPACT ADJACENT SAFETY-RELATED EQUIPMENT.	EQUIP	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE INITIAL OPERATION
DUANE ARNOLD	11/10/2010	3312010006	STANDBY LIQUID CONTROL SYSTEM (BWR)	0	IT WAS DETERMINED THAT THE SBLC TEST TANK WAS NOT SEISMICALLY QUALIFIED WHEN IT WAS 3/4 FULL. DURING A SEISMIC EVENT, IT COULD POTENTIALLY RESULT IN THE FAILURE OF OTHER SAFETY-RELATED SBLC EQUIPMENT.	EQUIP	REFUELING
HOPE CREEK	3/13/2014		STANDBY LIQUID CONTROL SYSTEM (BWR)	100	Standby Liquid Control System was declared inoperable due to the concentration of its Sodium Pentaborate being outside the TS limits.	Equip	Steady State at 100%.

Appendix T LER SUMMARIES – RWCU SCRAMs - 2000-2014

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mode
DRESDEN 3	10/3/2009	2492009001	AUTO	THE REACTOR TRIPPED DUE TO A REACTOR WATER LEVEL LOW-LOW SIGNAL ALONG WITH A GROUP 1 MSIV CLOSURE. THE ISOLATION SIGNAL WAS MOST LIKELY CAUSED BY A PRESSURE TRANSIENT RESULTING FROM THE RESTORATION OF RWCU.	STEADY STATE AT 99%.	PROCEDUR	OPERATE

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Appendix U LER SUMMARIES – RWCU SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
NINE MILE PT. 2	3/16/2002	4102002002	PRIMARY CONTAINMENT [SPECIAL NON- EIS CODE]	18	THE RWCU DIVISION ONE AND TWO DIFFERENTIAL FLOW INSTRUMENTS WERE DECLARED INOPERABLE WHEN THEY FAILED TO RESPOND AS EXPECTED. THE CAUSE WAS INCOMPLETE FILLING AND VENTING OF THE RWCU PIPING POST MAINTENANCE.	PRSNLERR	CONDITION DISCOVERED DURING OPERATION AT 18% POWER DURING A SHUTDOWN
HOPE CREEK	8/29/2004	3542004008	PRIMARY CONTAINMENT [SPECIAL NON- EIS CODE]	98	A BREAK IN THE RWCU SYSTEM MAY NOT HAVE RESULTED IN A REQUIRED ISOLATION WITH THE OUTBOARD VALVE ISOLATION ACTUATION CHANNEL INOPERABLE AND THE INBOARD ISOLATION VALVE DEENERGIZED IN THE OPEN POSITION FOR TESTING. THE CAUSE WAS A FAILED CIRCUIT CARD.	EQUIP	EVENT OCCURRED DURING OPERATION AT 98% POWER

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Appendix V LER SUMMARIES – ADS-SRV SCRAMs - 2000-2014

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_Cause	Root_Mode
NINE MILE PT. 1	10/2/2000	2202000004	MAN	THE RX WAS MANUALLY SCRAMMED AFTER A MAIN STEAM ELECTROMATIC RELIEF VALVE OPENED AND COULD NOT BE SHUT. THE CAUSE WAS A BENT PILOT VALVE STEM COMBINED WITH PARTIAL DISENGAGEMENT OF THE DISC AND STEM ASSEMBLY.	STARTUP MODE AT 1%	EQUIP	OPERATE
LIMERICK 2	2/23/2001	3532001001	MAN	THE RX WAS MANUALLY TRIPPED WHEN A SAFETY RELIEF VALVE OPENED WHILE PERFORMING A PLANNED PLANT SHUTDOWN. THE CAUSE WAS EROSION AND OXIDATION OF THE STELLITE DISC MATERIAL IN THE FIRST STAGE PILOT VALVE.	TRIP FROM 85% DURING A SHUTDOWN FROM 92%	EQUIP	REDUCING
QUAD CITIES 2	4/16/2003	2652003002	MAN	THE RX WAS MANUALLY SCRAMMED ON INCREASING TORUS TEMPERATURE AFTER THE "3B" MAIN STEAM RELIEF VALVE FAILED OPEN. THE CAUSE WAS EXCESSIVE LEAKAGE PAST THE PILOT VALVE SEAT.	POWER OPERATIONS AT 100%	EQUIP	OPERATE
NINE MILE PT. 1	5/2/2004	2202004001	MAN	THE RX WAS MANUALLY SCRAMMED WHEN AN ELECTROMATIC RELIEF VALVE STUCK OPEN AND FAILED TO CLOSE DURING POST MAINTENANCE TESTING.	POWER OPERATIONS AT 19%	EQUIP	TESTING
BRUNSWICK 2	11/9/2008	3242008002	MAN	AN SRV SPURIOUSLY OPENED AND WOULD NOT SHUT. THE REACTOR WAS MANUALLY TRIPPED WHEN TORUS TEMPERATURE REACHED 109.8-DEGREES.	STEADY STATE AT 100%.	EQUIP	OPERATE

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Appendix W LER SUMMARIES – ADS-SRV SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_number	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
LIMERICK 2	2/2/2000	3532000002	AUTOMATIC DEPRESSURIZATION SYSTEM [SPECIAL NON- EHS CODE]	100	BOTH TRAINS OF THE AUTOMATIC DEPRESSURIZATION SYSTEM BECAME INOPERABLE WHEN THE LONG TERM GAS SUPPLY VALVES WERE MISPOSITIONED CLOSED DURING A SURVEILLANCE IN MAY OF 1999. THE CAUSE WAS PERSONNEL ERROR.	PRSNLERR	CONDITION EXISTED IN ALL MODES UP TO 100% POWER SINCE 5/99
COOPER STATION	6/14/2007	2982007005	HIGH PRESSURE COOLANT INJECTION SYSTEM (BWR)	100	AN APPENDIX R REVIEW DETERMINED PROCEDURES WERE INADEQUATE TO SECURE HPCI WHEN REQUIRED AND ACHIEVE A SAFE SHUTDOWN FOLLOWING AN APPENDIX R FIRE. THE RESULTING FLOODED STEAM LINES WOULD DISABLE RCIC AND ADS.	PROCEDUR	CONDITION EXISTED IN ALL MODES UP TO 100% POWER

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Appendix X LER SUMMARIES – ADS-UPRATE SYSTEM FAILURES - 2000-2014

PL_NAME	Event_Date	LER_numbe	SYSTEM	PowerLevel	Description	Cause	Pwr_Hist
QUAD CITIES 2	4/19/2004	265200400 4	MAIN/REHEAT STEAM SYSTEM	88	THE APPENDIX R ANALYSIS CRITERIA FOR THE TORUS MAY NOT HAVE BEEN MET DUE TO INCREASED HEAT LOAD RESULTING FROM A MAIN STEAM SAFETY RELIEF VALVE LIFTING OUTSIDE ITS ALLOWED VALUE. THE CAUSE WAS VIBRATION RESULTING FROM EXTENDED POWER UPRATE LEVELS.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 88% POWER
QUAD CITIES 2	12/30/2005	265200500 2	MAIN/REHEAT STEAM SYSTEM	24	A COMMON CAUSE RESULTED IN DAMAGE AND THE POTENTIAL INOPERABILITY OF ALL FOUR ELECTROMATIC RELIEF VALVE ACTUATORS. THE CAUSE WAS EXCESSIVE MAIN STEAM LINE VIBRATION DURING OPERATION AT EXTENDED POWER UPRATE LEVELS.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 24% POWER
QUAD CITIES 1	12/30/2005	265200500 2	MAIN/REHEAT STEAM SYSTEM	24	A COMMON CAUSE RESULTED IN DAMAGE AND THE POTENTIAL INOPERABILITY OF ALL FOUR ELECTROMATIC RELIEF VALVE ACTUATORS. THE CAUSE WAS EXCESSIVE MAIN STEAM LINE VIBRATION DURING OPERATION AT EXTENDED POWER UPRATE LEVELS.	EQUIP	CONDITION DISCOVERED DURING OPERATION AT 85% POWER

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Appendix Y LER SUMMARIES – NonSAFETY SYSTEMS SCRAMs 2000-2014

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
OYSTER CREEK	1/21/2000	2192000001	MAN	THE RX WAS MANUALLY SCRAMMED WHEN MULTIPLE RX RECIRCULATION PUMPS TRIPPED DURING SURVEILLANCE TESTING. AS A RESULT OF PERSONNEL ERROR, THE RECIRCULATION PUMP TRIP SYSTEM WAS NOT PROPERLY RESET.	POWER OPERATIONS AT 65%	AD	PRSNLERR	TESTING
FERMI 2	4/1/2000	3412000004	MAN	THE RX WAS MANUALLY SCRAMMED AFTER A RX RECIRC PUMP WAS TRIPPED BECAUSE OF SPEED FLUCTUATIONS. LACKING SPECIFIC PROCEDURAL GUIDANCE CONCERNING LOW POWER SINGLE RECIRC PUMP OPERATIONS, OPERATORS SCRAMMED THE PLANT.	SCRAM FROM 24% POWER DURING A SHUTDOWN	AD	PROCEDUR	REDUCING
PEACH BOTTOM 2	9/15/2000	2772000003	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING AN UNPLANNED RX RECIRCULATION PUMP TRIP. THE CAUSE WAS IMPROPER TAGOUT COORDINATION.	POWER OPERATIONS AT 16%	AD	PRSNLERR	REDUCING
LIMERICK 2	2/23/2001	3532001001	MAN	THE RX WAS MANUALLY TRIPPED WHEN A SAFETY RELIEF VALVE OPENED WHILE PERFORMING A PLANNED PLANT SHUTDOWN. THE CAUSE WAS EROSION AND OXIDATION OF THE STELLITE DISC MATERIAL IN THE FIRST STAGE PILOT VALVE.	TRIP FROM 85% DURING A SHUTDOWN FROM 92%	AD	EQUIP	REDUCING
DRESDEN 2	4/3/2001	2372001002	MAN	THE RX WAS MANUALLY TRIPPED ON A RECIRCULATION PUMP TRIP WHILE THE UNIT WAS IN SINGLE LOOP OPERATION. THE CAUSE WAS INADEQUATE SYSTEM DESIGN THAT DOES NOT PROVIDE FOR STARTING THE STANDBY OIL PUMP WHEN THE OPERATING OIL PUMP TRIPS.	POWER OPERATIONS AT 31%	AD	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
DRESDEN 3	4/27/2001	2492001002	AUTO	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL RESULTING DURING FLOW AND POWER OSCILLATIONS FROM A RX RECIRCULATION PUMP. THE CAUSE WAS DEBRIS IN THE RX RECIRCULATION MG SET SCOOP TUBE POSITIONER MOTOR.	POWER OPERATIONS AT 99%	AD	EQUIP	OPERATE
HATCH 2	10/26/2001	3662001002	AUTO	A SCRAM OCCURRED ON APRM HIGH FLUX FOLLOWING A RAPID INCREASE, AFTER AN UNEXPECTED DECREASE, IN RECIRCULATION PUMP FLOW. THE CAUSE WAS A FAILED AMPLIFIER BOARD IN THE SCOOP TUBE POSITIONER CIRCUIT.	POWER OPERATIONS AT 100%	AD	EQUIP	OPERATE
NINE MILE PT. 2	12/15/2001	4102001007	MAN	THE RX WAS MANUALLY SCRAMMED WHEN THE PRIMARY SYSTEM UNIDENTIFIED LEAK RATE EXCEEDED FIVE GPM. THE CAUSE WAS FAILED PACKING IN A RX COOLANT SYSTEM GATE VALVE DUE TO AN INADEQUATE TORQUE SPECIFICATION FROM THE PACKING PROGRAM.	SCRAM FROM 60% FOLLOWING REDUCTION FROM 100%	AD	PROCEDUR	REDUCING
SUSQUEH ANNA 1	4/22/2002	3872002004	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING A SINGLE RECIRCULATION PUMP TRIP WHEN CORE FLOW INDICATIONS PLACED THE UNIT IN AN UNANTICIPATED LOCATION ON THE POWER TO FLOW MAP. THE CAUSE WAS A HIGH RESISTANCE CONNECTION ON THE RECIRCULATION MG SET EXCITER.	POWER OPERATIONS AT 17% DURING A STARTUP	AD	EQUIP	RAISING
PILGRIM	2/21/2003	2932003001	MAN	THE RX WAS MANUALLY SCRAMMED AFTER A RECIRC PUMP RUNBACK CAUSED CONFLICTING INDICATIONS THAT CORE FLOW COULD BE IN THE PROHIBITED REGION OF THE POWER TO FLOW MAP. A POST TRIP REVIEW FOUND THAT ACTUAL FLOW WAS CONSERVATIVE.	POWER OPERATIONS AT 22%	AD	EQUIP	REDUCING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BROWNS FERRY 2	3/26/2003	260200300 3	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING A TRIP OF THE '2B' RX RECIRCULATION PUMP, THE "2A" RX RECIRCULATION PUMP HAD TRIPPED EARLIER IN THE SHIFT. THE CAUSE WAS SPIKING IN THE NEUTRAL VOLTAGE SIGNALS IN THE VARIABLE FREQUENCY DRIVES FOR UNKNOWN REASONS.	POWER OPERATIONS AT 63%	AD	EQUIP	OPERATE
QUAD CITIES 2	4/16/2003	265200300 2	MAN	THE RX WAS MANUALLY SCRAMMED ON INCREASING TORUS TEMPERATURE AFTER THE "3B" MAIN STEAM RELIEF VALVE FAILED OPEN. THE CAUSE WAS EXCESSIVE LEAKAGE PAST THE PILOT VALVE SEAT.	POWER OPERATIONS AT 100%	AD	EQUIP	OPERATE
DUANE ARNOLD	11/7/2003	331200300 5	MAN	THE RX WAS MANUALLY SCRAMMED ON INCREASING RX COOLANT SYSTEM CONDUCTIVITY. THE CAUSE WAS RESIN INTRUSION FROM A CONDENSATE DEMINERALIZER THAT HAD A MANUFACTURING DEFECT.	POWER OPERATIONS AT 45%	AD	EQUIP	TRBLSHOT
DRESDEN 2	4/28/2004	237200400 4	MAN	THE RX WAS MANUALLY TRIPPED WHEN A SPURIOUS TRIP OF THE "2A" RX RECIRCULATION MG SET AND PUMP PUT THE PLANT IN A RESTRICTED REGION OF THE POWER TO FLOW MAP. THE CAUSE WAS A FAILED RX RECIRCULATION PUMP MOTOR.	POWER OPERATIONS AT 66%	AD	EQUIP	OPERATE
PERRY	12/23/2004	440200400 2	AUTO	A SCRAM OCCURRED WHEN CORE OSCILLATIONS WERE DETECTED BY THE OPRM MONITOR AFTER BOTH RECIRC PUMPS DOWNSHIFTED TO SLOW SPEED. THE CAUSE WAS DETERMINED TO BE AN INTERMITTENT FAULTY OPTICAL ISOLATOR IN THE PUMP CONTROL CIRCUIT.	POWER OPERATIONS AT 44%	AD	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
PERRY	1/6/2005	440200500 1	MAN	THE RX WAS MANUALLY SCRAMMED ON UNDESIRABLE POWER TO FLOW CONDITIONS AFTER BOTH RX RECIRCULATION PUMPS DOWN-SHIFTED TO SLOW SPEED AND THAN PUMP "A" TRIPPED OFF. THE CAUSE WAS A FAILED OPTICAL ISOLATOR IN THE RX RECIRCULATION SYSTEM LOGIC CIRCUITRY.	SCRAM FROM 44% FOLLOWING REDUCTION FROM 100%	AD	EQUIP	OPERATE
HOPE CREEK	6/7/2005	354200500 3	MAN	THE RX WAS MANUALLY SCRAMMED WHEN DRYWELL FLOOR DRAIN LEAKAGE INCREASED TO GREATER THAN 10 GPM. THE CAUSE WAS A 285 DEGREE CIRCUMFERENTIAL CRACK IN THE POSITION INDICATING TUBE FOR THE RHR CHECK VALVE.	POWER OPERATIONS AT 100%	AD	EQUIP	OPERATE
BROWNS FERRY 3	8/19/2006	296200600 2	MAN	THE REACTOR WAS MANUALLY SCRAMMED FOLLOWING THE TRIP OF BOTH REACTOR RECIRCULATION PUMPS. THE CAUSE OF THE PUMPS TRIPPING WAS A MALFUNCTION OF THE VARIABLE FREQUENCY DRIVE MICROPROCESSORS.	SCRAM FROM 100%	AD	EQUIP	OPERATE
BROWNS FERRY 1	8/11/2007	259200700 7	AUTO	THE REACTOR SCRAMMED DUE TO AN APRM TRIP SIGNAL. THE CAUSE WAS THE RECIRCULATION SYSTEM FLOW TRANSMITTER SENSING LINE BECOMING SEPARATED, GIVING A LOW FLOW SIGNAL TO THE NEUTRON MONITORING SYSTEM.	STEADY STATE AT 100%.	AD	EQUIP	OPERATE
CLINTON 1	2/10/2008	461200800 1	AUTO	THE B REACTOR RECIRCULATION PUMP TRIPPED CAUSING THE REACTOR VESSEL LEVEL TO SWELL TO GREATER THAN 48 INCHES. THE REACTOR TRIPPED AUTOMATICALLY ON HIGH REACTOR WATER LEVEL.	STEADY STATE AT 95%.	AD	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
RIVER BEND	9/20/2009	4582009002	MAN	WHILE SHUTTING DOWN THE REACTOR, THE RECIRC PUMPS WERE BEING TRANSFERRED FROM FAST TO SLOW. INSTEAD OF TRANSFERRING TO SLOW, THE RECIRC PUMPS TRIPPED AND THE OPERATOR INSERTED A MANUAL REACTOR TRIP.	SHUTTING DOWN AT 23%.	AD	EQUIP	OPERATE
CLINTON 1	10/15/2009	4612009005	MAN	THE REACTOR WAS MANUALLY TRIPPED FOLLOWING THE TRIP OF A REACTOR RECIRCULATION PUMP TRIP. THE CAUSE OF THE RECIRC PUMP TRIP WAS FAILURE OF THE PUMP MOTOR DUE TO INSULATION BREAKDOWN.	STEADY STATE AT 97%.	AD	EQUIP	OPERATE
PERRY	10/16/2009	4402009004	MAN	WHILE SHUTTING DOWN, A REACTOR RECIRCULATION PUMP TRIPPED WHILE BEING SHIFTED TO SLOW SPEED. THE REACTOR WAS MANUALLY TRIPPED. THIS WAS DIFFERENT THAN THE PLANNED SHUTDOWN SEQUENCE.	SHUTTING DOWN AT 30%.	AD	EQUIP	OPERATE
LIMERICK 1	6/23/2010	3522010001	MAN	THE REACTOR WAS MANUALLY TRIPPED FOLLOWING THE LOSS OF BOTH RECIRC PUMPS. THE RECIRC PUMPS TRIPPED DUE TO LOSS OF THEIR MG SETS, FOLLOWING THE LOSS OF THE 114A LOAD CENTER, CAUSED BY THE TRIP OF ITS SUPPLY BREAKER DUE TO A FAILED 13KV CABLE.	STEADY STATE AT 100%.	AD	EQUIP	OPERATE
QUAD CITIES 2	8/17/2010	2652010002	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO INCREASING REACTOR WATER LEVEL. THE WATER LEVEL WAS INCREASING DUE TO A TRIP OF A REACTOR RECIRCULATION PUMP, WHICH WAS HAVING ITS PROGRAMMABLE LOGIC CONTROLLER ADJUSTED.	STEADY STATE AT 100%.	AD	EQUIP	TESTING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LIMERICK 2	2/25/2011	353201100 2	MAN	THE REACTOR WAS MANUALLY TRIPPED AFTER THE RECIRCULATION PUMPS TRIPPED. THE RECIRCULATION PUMPS TRIPPED DUE TO A MAIN GENERATOR STATOR WATER COOLANT RUNBACK. THE RUNBACK WAS CAUSED BY FAILURE TO MANUALLY CONTROL A DEGRADED TEMPERATURE CONTROL VALVE.	STEADY STATE AT 100%.	AD	EQUIP	OPERATE
LIMERICK 1	4/19/2012	352201200 2	MAN	The reactor was manually tripped following loss of the Recirculation Pumps. The Recirculation Pumps tripped due to an electrical fault that caused the loss of non-safety related 480V Load Centers 144D and 114A.	Steady State at 100%.	AD	Equip	Operate
LIMERICK 1	7/18/2012	352201200 5	MAN	The reactor was manually tripped following the loss of both Recirculation Pumps. The Recirc Pumps were lost due to flashover occurring in an electrical transformer. Damage was confined to the load center transformer cabinet.	Steady State at 100%.	AD	Equip	Operate
PILGRIM	1/10/2013	293201300 1	MAN	The reactor was manually tripped following a spurious trip of both Recirculation Pumps. The cause of the Recirculation pumps tripping is under investigation.	Steady State at 100%.	AD	Equip	Operate
NINE MILE PT. 2	12/2/2013	410201300 4	MAN	The reactor was manually scrammed following the loss of both Reactor Recirculation Pumps when they failed to transfer to their low frequency motor generators.	Decreasing power at 25%.	AD	Equip	Operate
NINE MILE PT. 2	3/4/2014		MAN	The reactor was manually tripped due to rising Reactor Recirculation pump Seal cavity temperatures. The rising temperatures were do to the loss of a vital UPS.	Steady State at 100%.	AD	Equip	Operate

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BRUNSWICK 2	11/16/2011	3242011002	MAN	With Unit 2 operating in Mode 2 at a maximum of 7 percent of rated thermal power, a manual reactor scram was inserted due to elevated drywell leakage. With Unit 2 operating in Mode 4, leak investigation activities determined that the reactor pressure vessel (RPV) head was not fully tensioned. The root cause of this event is the failure to provide the proper training and procedure guidance to correctly interpret critical data used to validate that the RPV head nuts were properly tightened.	Increasing power at 7%.	AV	Prsnlerr	Raising
PILGRIM	3/13/2006	2932006001	MAN	THE RX WAS MANUALLY SCRAMMED ON HIGH TEMPERATURE IN THE AUGMENTED OFFGAS SYSTEM RECOMBINER. THE CAUSE WAS FAILURE OF THE CONTROLLER OF A PRESSURE CONTROL VALVE.	POWER OPERATIONS AT 43%	BH	EQUIP	OPERATE
HATCH 1	3/28/2001	3212001002	AUTO	A TURBINE TRIP/RX TRIP OCCURRED FOLLOWING THE LOSS OF A UNIT AUXILIARY TRANSFORMER. THE CAUSE WAS AN INTERNAL TRANSFORMER FAULT.	POWER OPERATIONS AT 100%	EA	EQUIP	OPERATE
PILGRIM	6/1/2003	2932003003	AUTO	A RX SCRAM OCCURRED ON LOAD REJECT AFTER THE MAIN GENERATOR LOCKOUT RELAY TRIPPED. THE CAUSE WAS FAILURE OF A CONDUCTOR WITHIN THE LOW VOLTAGE PORTION OF THE UNIT AUXILIARY TRANSFORMER.	POWER OPERATIONS AT 100%	EA	EQUIP	OPERATE
DUANE ARNOLD	4/2/2007	3312007007	MAN	DURING PLANNED PREVENTIVE MAINTENANCE OF A NON-ESSENTIAL BUS, LOSS OF 4160V BUS 1A2 RESULTED IN LOSS OF THE B CONDENSATE AND REACTOR FEED PUMPS. THE REACTOR WAS MANUALLY TRIPPED DUE TO LOWERING REACTOR VESSEL LEVEL.	STEADY STATE AT 98%.	EA	PROCEDUR	MAINTEN

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
HOPE CREEK	5/29/2007	3542007002	MAN	AN ELECTRICAL TRANSIENT RESULTED IN LOSS OF THE REACTOR FEED PUMPS. THE REACTOR WAS MANUALLY TRIPPED DUE TO LOWERING REACTOR LEVEL.	STEADY STATE AT 100%.	EA	EQUIP	TESTING
HATCH 2	8/7/2007	3662007008	AUTO	THE REACTOR TRIPPED ON LOW REACTOR WATER LEVEL. THE CAUSE OF THE TRIP WAS A PARTIAL LOSS OF CONDENSATE CAUSED BY LOSS OF NON-VITAL 2D 4160V STATION SERVICE BUS. THE CAUSE OF THE BUS TRIP WAS DETERMINED TO BE INEFFECTIVE EXECUTION OF I&C RELAY CALIB.	STEADY STATE AT 100%.	EA	EQUIP	OPERATE
GRAND GULF	1/12/2008	4162008001	MAN	THE REACTOR WAS MANUALLY SCRAMMED DUE TO DEGRADED COOLING ON THE MAIN TRANSFORMERS. AN ELECTRICAL FAULT ON THE B PHASE POWER CABLE RESULTED IN LOSS OF TRANSFORMER COOLING SYSTEM.	STEADY STATE AT 100%.	EA	EQUIP	OPERATE
FERMI 2	1/31/2008	3412008001	MAN	THE REACTOR WAS MANUALLY TRIPPED FOLLOWING THE TRIP OF BOTH REACTOR RECIRC PUMPS. THE RECIRC PUMPS TRIPPED DUE TO AN INTERMITTENT FAILURE OF THE 65G BUS UNDERVOLTAGE TRIP LOGIC.	STEADY STATE AT 100%.	EA	EQUIP	OPERATE
OYSTER CREEK	11/28/2008	2192008001	AUTO	A REACTOR SCRAM OCCURRED DUE TO A MAIN TRANSFORMER FAULT. THE FAULT WAS CAUSED BY AN ELECTRICAL FAULT INTERNAL TO THE MAIN TRANSFORMER.	STEADY STATE AT 98%.	EA	EQUIP	OPERATE
OYSTER CREEK	7/12/2009	2192009005	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE DUE TO LOSS OF OFFSITE POWER CAUSED BY LIGHTNING STRIKES.	STEADY STATE AT 100%.	EA	NATURALP	OPERATE
COLUM. NUCLEAR 2	8/5/2009	3972009004	AUTO	THE REACTOR TRIPPED FROM 100% POWER FOLLOWING A FIRE IN A NON-SAFETY-RELATED BUS THAT RESULTED IN A MAIN TURBINE TRIP. THE PROBABLE CAUSE OF THE LOSS OF BUS WAS THE RELAXATION OF A BOLTED CONNECTION DUE TO REPEATED THERMAL CYCLES.	POWER OPERATIONS AT 100%	EA	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
OYSTER CREEK	3/1/2000	2192000003	MAN	THE RX WAS MANUALLY SCRAMMED AFTER THREE RECIRCULATION PUMPS TRIPPED FROM A LOSS OF POWER. WHILE SHIFTING ELECTRIC LOADS FROM THE STARTUP TRANSFORMERS TO THE AUX TRANSFORMER, A 4160 VAC BUS LOST POWER. THE ROOT CAUSE WAS INADEQUATE PROCEDURAL GUIDANCE.	POWER OPERATIONS AT 25%	EB	PROCEDUR	MAINTEN
CLINTON 1	5/17/2000	4612000001	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING A LOSS OF FEEDWATER. THE CAUSE WAS A LOSS OF A 4160 VAC BUS DUE TO A MISLABELED TEST SWITCH.	POWER OPERATIONS AT 100%	EB	OTHER	MAINTEN
PILGRIM	8/13/2001	2932001006	AUTO	A SCRAM OCCURRED FROM THE TRIP OF BOTH RPS CHANNELS. ONE CHANNEL TRIPPED FROM A LOSS OF POWER DURING AN ELECTRICAL SURVEILLANCE AND THE OTHER FROM HIGH FLUX FOLLOWING A TRIP OF BOTH RECIRC MG SETS. THE CAUSE WAS AN INADEQUATE SURVEILLANCE PROCEDURE.	SCRAM AT 49% FOLLOWING TRANSIENT FROM 100%	EB	PROCEDUR	TESTING
LASALLE 2	9/3/2001	3742001003	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING THE LOSS OF POWER TO THE FEEDWATER CONTROL SYSTEM. THE CAUSE WAS FAILED FUSES IN THE POTENTIAL TRANSFORMER PORTION OF THE DIVISION "1" UNDER VOLTAGE PROTECTIVE CIRCUIT.	POWER OPERATIONS AT 100%	EB	EQUIP	OPERATE
GRAND GULF	6/22/2002	4162002003	AUTO	A SCRAM OCCURRED ON A TURBINE CONTROL VALVE FAST CLOSURE FOLLOWING A GROUND FAULT ON THE SECONDARY SIDE OF A SERVICE TRANSFORMER. THE CAUSE WAS A RACCOON BRIDGING THE 34.5 KV PHASE "B" TO A GROUNDED STANCHION.	POWER OPERATIONS AT 100%	EB	OTHER	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
SUSQUEH ANNA 2	10/3/2002	387200200 6	MAN	THE RX WAS MANUALLY SCRAMMED WHEN THE RX RECIRCULATION PUMPS TRIPPED. THE CAUSE WAS A LOSS OF POWER DURING A FIRE AT STARTUP TRANSFORMER "T-20" RESULTING FROM AN INTERNAL FAULT.	RX SCRAM FROM 1% POWER DURING A STARTUP	EB	EQUIP	RAISING
OYSTER CREEK	5/20/2003	219200300 2	MAN	THE RX WAS MANUALLY SCRAMMED FROM 60% POWER DURING A TECHNICAL SPECIFICATION REQUIRED SHUTDOWN AFTER THE LICENSEE WAS UNABLE TO REMOVE THE SECOND STAGE REHEATERS AND FEEDWATER HEATERS FROM SERVICE. THE CAUSE WAS THE LOSS OF A 4161 V SAFETY BUS.	POWER OPERATIONS AT 60% DURING A SHUTDOWN	EB	EQUIP	OPERATE
DRESDEN 3	5/5/2004	249200400 3	AUTO	A SCRAM OCCURRED ON A MAIN GENERATOR LOAD REJECT AND LOOP THAT OCCURRED WHEN A 345 KV SWITCHYARD BREAKER WAS OPENED TO SUPPORT TESTING AN OFFSITE LINE. THE CAUSE WAS AN EQUIPMENT FAILURE IN THE "C" PHASE OF THE 345 KV CIRCUIT BREAKER.	POWER OPERATIONS AT 100%	EB	EQUIP	TESTING
GRAND GULF	2/11/2005	416200500 1	AUTO	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL FOLLOWING A LOSS OF FEEDWATER. A PARTIAL LOSS OF OFFSITE POWER OCCURRED WHEN A RACOON SHORTED TWO PHASES OF A SERVICE TRANSFORMER. THE CAUSE WAS AN ANIMAL INTRUSION FENCE THAT HAD BEEN LEFT DEENERGIZED.	POWER OPERATIONS AT 100%	EB	PRSNLERR	OPERATE
FERMI 2	7/29/2006	341200600 3	AUTO	A REACTOR SCRAM OCCURRED BECAUSE OF A PARTIAL LOSS OF FEEDWATER THAT RESULTED FROM LOSS OF DIVISION 1 POWER.	STEADY STATE AT 100%.	EB	PRSNLERR	OPERATE
BRUNSWI CK 2	11/1/2006	324200600 1	MAN	THE REACTOR WAS MANUALLY SCRAMMED FOLLOWING LOSS OF THE STARTUP AUXILIARY TRANSFORMER.	STEADY STATE AT 100%	EB	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
SUSQUEH ANNA 2	9/30/2002	388200200 4	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON LOW CONDENSER VACUUM AFTER THE OFFGAS SYSTEM ISOLATED. THE CAUSE WAS A MOMENTARY LOSS OF 120 VAC POWER WHEN INADEQUATE WORK INSTRUCTIONS CAUSED PLANT ELECTRICIANS TO INAPPROPRIATELY CLOSE A BREAKER.	POWER OPERATIONS AT 72%	ED	PROCEDUR	MAINTEN
CLINTON 1	12/2/2003	461200300 3	MAN	THE RX WAS MANUALLY SCRAMMED ON LOW FEEDWATER SUCTION PRESSURE AND DECREASING RX WATER LEVEL. THE CAUSE WAS A LOST 480 V BUS DUE TO A LACK OF OVERLOAD CIRCUIT PROTECTION FOR A BRANCH CIRCUIT.	POWER OPERATIONS AT 88%	ED	EQUIP	OPERATE
CLINTON 1	12/8/2013	461201300 8	MAN	Following loss of a Div 1 480VAC bus due to a transformer failure, the reactor was manually tripped due to loss of Instrument Air to the Containment and Scram Air Header.	Steady State at 97%.	ED	Equip	Operate
DUANE ARNOLD	10/17/2001	331200100 6	MAN	THE RX WAS MANUALLY TRIPPED IN ANTICIPATION OF LOW RX WATER LEVEL FOLLOWING A LOSS OF FEED. ONE OF TWO FEED PUMPS TRIPPED FOLLOWING THE LOSS OF AN INSTRUMENT BUS. THE CAUSE WAS A FAILED INVERTER BUT NO DEFINITIVE ROOT CAUSE COULD BE FOUND.	POWER OPERATIONS AT 100%	EF	EQUIP	OPERATE
NINE MILE PT. 2	7/24/2003	410200300 1	AUTO	A RX SCRAM OCCURRED ON POWER OSCILLATIONS AFTER A POWER SUPPLY TO THREE OF FOUR MAIN STEAM LINE FLOW INSTRUMENTS FOR THE FEEDWATER LEVEL CONTROL SYSTEM FAILED. THE CAUSE WAS AGE RELATED FAILURE OF INTERNAL COMPONENTS.	SCRAM FROM 45% FOLLOWING REDUCTION FROM 100	EF	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
RIVER BEND	12/10/2004	4582004005	AUTO	A SCRAM OCCURRED ON POWER TO FLOW FOLLOWING THE LOSS OF A VITAL INSTRUMENT BUS AND RESULTING LOSS OF FEEDWATER LEVEL CONTROL. THE CAUSE WAS A FAULT IN A NONSAFETY RELATED VITAL INVERTER.	POWER OPERATIONS AT 100%	EF	EQUIP	OPERATE
FITZPATRICK	9/14/2005	3332005005	AUTO	A SCRAM OCCURRED ON LOW RX VESSEL LEVEL FOLLOWING A MOMENTARY LOSS OF UPS AND RESULTING LOCKOUT OF THE RX FEED PUMP CONTROLS. THE CAUSE WAS OPERATOR ERROR RESPONDING TO THE TRANSIENT WITH CONTRIBUTION FROM AN INADEQUATE ABNORMAL OPERATING PROCEDURE.	POWER OPERATIONS AT 100%	EF	PRSNLERR	MAINTEN
CLINTON 1	8/27/2006	4612006003	AUTO	THE HPCS SYSTEM ACTUATED RESULTING IN A REACTOR TRIP DUE TO HIGH WATER LEVEL. THE CAUSE OF THE HPCS ACTUATION IS A MOMENTARY LOSS OF THE DIVISION 4 NSPS INVERTER DUE TO A BAD SOLDER JOINT.	STEADY STATE AT 96%	EF	EQUIP	OPERATE
BROWNS FERRY 3	5/22/2012	2962012003	AUTO	THE REACTOR AUTOMATICALLY TRIPPED DUE TO THE RPS BEING DE-ENERGIZED. DURING THE TRANSFER OF 4KV BOARD 3C FROM ALTERNATE TO NORMAL POWER, THE USST DIFFERENTIAL RELAY ACTUATED, RESULTING IN LOSS OF 500KV POWER TO UNIT 3.	AT 19% POWER.	EF	Equip	Operate
LIMERICK 2	1/8/2000	3532000001	AUTO	A RX SCRAM OCCURRED FOLLOWING A MAIN GENERATOR LOCKOUT/TURBINE TRIP FROM A GROUND ON A PLANT SERVICES TRANSFORMER ALARM CIRCUIT. THE GROUND WAS CAUSED BY AN EXPOSED SPARE WIRE ON THE TRANSFORMER LOW LIQUID LEVEL SWITCH.	POWER OPERATIONS AT 100%	EI	EQUIP	TRBLSHOT

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LIMERICK 1	5/1/2000	352200000 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED FOLLOWING A GENERATOR LOCKOUT. THE CAUSE WAS AN INADEQUATE ELECTRICAL CONNECTION ON THE MAIN TRANSFORMER, RESULTING FROM AN INADEQUATE WORK PACKAGE.	POWER OPERATIONS AT 92%	EL	EQUIP	OPERATE
COLUM. NUCLEAR 2	6/26/2000	397200000 3	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED FOLLOWING A MAIN GENERATOR AND TRANSFORMER OVERALL DIFFERENTIAL PROTECTIVE RELAY TRIP. THE CAUSE WAS A SHORT TO GROUND IN AN UNUSED TAP OF ONE OF THE 500KV CURRENT TRANSFORMER'S SECONDARY CONTROL CIRCUIT WIRING.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
COOPER STATION	10/14/2000	298200001 1	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED FOLLOWING A "C" PHASE DIFFERENTIAL CURRENT TRIP. THE CAUSE WAS VIBRATION INDUCED INSULATION WEAR IN A CURRENT TRANSFORMER LEAD WIRE WITHIN THE MAIN TRANSFORMER, RESULTING IN A SHORT TO GROUND.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
DRESDEN 2	11/30/2000	237200000 4	AUTO	A RX SCRAM OCCURRED FOLLOWING A GENERATOR LOAD REJECT. A BUS TO PHASE DIFFERENTIAL TRIP WAS RECEIVED WHILE CLOSING A MAIN GENERATOR OUTPUT BREAKER, CAUSING BOTH OUTPUT BREAKERS TO OPEN. THE CAUSE WAS IMPROPER RESTORATION FOLLOWING BREAKER MAINTENANCE.	POWER OPERATIONS AT 100%	EL	PRSNLERR	MAINTEN
LASALLE 1	1/31/2001	373200100 1	AUTO	A TURBINE TRIP/RX SCRAM RESULTED FROM A PHASE-TO-GROUND FAULT BETWEEN THE MAIN POWER TRANSFORMER AND THE SWITCHYARD. THE CAUSE WAS A BUILDUP OF BIRD EXCREMENT ON A TRANSMISSION LINE SUPPORT INSULATOR.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LIMERICK 2	6/26/2001	353200100 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A GENERATOR LOCKOUT. THE CAUSE WAS A FAILED WIRE LUG IN THE ALTERREX PHASE DIFFERENTIAL CURRENT PROTECTIVE RELAY SYSTEM.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
PEACH BOTTOM 2	10/23/2001	277200100 4	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A MAIN GENERATOR LOCKOUT. AN ISOPHASE BUS GROUND FAULT RESULTED WHEN A DUCTWORK VENTILATION DAMPER DETACHED AND FELL ONTO THE CONDUCTOR. THREE DAMPER MOUNTING SCREWS HAD BEEN STRIPPED DURING PREVIOUS MAINTENANCE.	POWER OPERATIONS AT 100%	EL	PRSNLERR	OPERATE
CLINTON 1	7/4/2002	461200200 3	AUTO	A TURBINE TRIP AND RX SCRAM OCCURRED FOLLOWING A GENERATOR TRIP AND LOCKOUT RESULTING FROM A FALSE ACTUATION OF THE MAIN TRANSFORMER SUDDEN PRESSURE FAULT RELAY. THE CAUSE WAS A FAULTY RELAY RESULTING FROM A MANUFACTURING DEFECT.	POWER OPERATIONS AT 95%	EL	EQUIP	OPERATE
BROWNS FERRY 2	7/27/2002	260200200 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A MAIN GENERATOR TRIP RESULTING FROM A GROUND FAULT ON A MAIN BANK TRANSFORMER BUSHING. THE CAUSE WAS THERMAL DEGRADATION OF THE PAPER INSULATION OF THE BUSHING'S INTERNAL CONDENSER.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
COLUM. NUCLEAR 2	6/30/2003	397200300 7	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A MAIN TRANSFORMER DIFFERENTIAL CURRENT RELAY ACTUATION. THE CAUSE WAS FAILURE OF A NONJACKETED CABLE THROUGH FRETTING ACTION.	POWER OPERATIONS AT 79%	EL	EQUIP	OPERATE
LASALLE 2	7/7/2003	374200300 4	AUTO	A RX SCRAM/TURBINE TRIP OCCURRED ON A MAIN GENERATOR LOCKOUT. THE CAUSE WAS A FAULT ON ONE PHASE OF THE MAIN POWER DISCONNECT IN THE SWITCHYARD.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
PEACH BOTTOM 2	7/22/2003	277200300 3	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED FOLLOWING A MAIN GENERATOR PROTECTIVE RELAY ACTUATION. THE CAUSE WAS REMNANTS OF FAILED BUS COOLING FAN BELTS IN THE ISOPHASE BUS DUCT WHICH CAME IN CONTACT WITH A BUS CONDUCTOR.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
COOPER STATION	10/28/2003	298200300 6	MAN	THE RX WAS MANUALLY SCRAMMED DUE TO A FIRE ON THE 345 KV WOODEN CROSS-ARM ON THE PLANT'S OUTPUT LINE FROM THE MAIN POWER TRANSFORMER TO THE 345 KV SWITCH YARD. THE CAUSE WAS FAILURE TO PROPERLY GROUND THE INSULATOR STRINGS ON THE WOODEN STRUCTURE.	POWER AT 75% FOLLOWING REDUCTION FROM 100%	EL	EQUIP	OPERATE
BRUNSWI CK 2	11/4/2003	324200300 4	AUTO	A TURBINE/RX TRIP OCCURRED ON LOSS OF EXCITATION. THE CAUSE WAS FAILURE OF THE GENERATOR EXCITER INNER COLLECTOR RING AND BRUSH HOLDERS WHICH RESULTED FROM A FABRICATION DEFICIENCY AT INITIAL INSTALLATION.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
CLINTON 1	3/22/2004	461200400 1	AUTO	A RX SCRAM RESULTED FROM A GENERATOR TRIP. THE CAUSE WAS VIBRATION FATIGUE OF COMPONENTS (CABLE AND OR PIECE OF ALUMINUM LAMINATE) WITHIN THE "B" ISOLATED PHASE BUS DUCT COOLING SYSTEM RESULTING FROM AN INCREASE IN THE DESIGN AIR FLOW RATE.	POWER OPERATIONS AT 93%	EL	EQUIP	OPERATE
VERMON T YANKEE	6/18/2004	271200400 3	AUTO	A RX SCRAM/GENERATOR TRIP OCCURRED AS A RESULT OF AN ISO-PHASE BUS DUCT TWO-PHASE ELECTRICAL FAULT AND RESULTING FIRE. THE CAUSE WAS INADEQUATE PREVENTATIVE MAINTENANCE ON PORTIONS OF THE ISO-PHASE BUS AND FAILURE TO MONITOR AGE RELATED DEGRADATI	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BRUNSWICK 1	7/13/2005	3252005005	AUTO	A TURBINE/RX TRIP OCCURRED WHEN ONE PHASE OF THE GENERATOR NO-LOAD DISCONNECT SWITCH SHORTED TO GROUND. THE CAUSE WAS INADEQUATE DESIGN AND TESTING OF THE SWITCH BY THE VENDOR; RESULTING IN THE SWITCH NOT MEETING ITS NAMEPLATE DESIGN RATING.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
LIMERICK 1	7/18/2005	3522005003	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON AN INVALID MAIN GENERATOR LOCKOUT RELAY ACTUATION. THE CAUSE WAS A CORRODED DISCONNECT POSITION SWITCH AND CONCURRENT GROUND ON THE BALANCE OF PLANT DC POWER DISTRIBUTION SYSTEM.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
HATCH 1	10/29/2005	3212005002	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A MAIN TRANSFORMER INTERNAL FAULT WHICH RESULTED IN A MAIN GENERATOR NEUTRAL GROUND OVERCURRENT LOCKOUT.	POWER OPERATIONS AT 100%	EL	EQUIP	OPERATE
QUAD CITIES 1	2/22/2006	2542006002	AUTO	A RX SCRAM OCCURRED ON A TURBINE GENERATOR LOAD REJECT SIGNAL DUE TO A TRIP OF THE MAIN POWER TRANSFORMER PHASE DIFFERENTIAL OVERCURRENT RELAY. THE CAUSE WAS DEGRADED WIRING INSULATION RESULTING IN A GROUND IN THE CURRENT TRANSFORMER.	POWER OPERATIONS AT 85%	EL	EQUIP	OPERATE
CLINTON 1	3/20/2006	4612006001	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED DUE TO AN OPEN CIRCUIT IN THE CURRENT TRANSFORMER OF THE MAIN GENERATOR OUTPUT. THE CAUSE WAS INADEQUATE WORKMANSHIP RESULTING IN A LOOSE TERMINAL SCREW ON THE CURRENT TRANSFORMER LEAD WIRE.	POWER OPERATIONS AT 96%	EL	PRSNLERR	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
FERMI 2	6/15/2006	341200600 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON MAIN TRANSFORMER OIL HIGH TEMP FOLLOWED BY GENERATOR DIFFERENTIAL RELAYING DURING A MAIN TRANSFORMER CLEANING ACTIVITY. THIS EVENT WAS CAUSED BY AN INTERNAL FAULT TO GROUND ON THE TRANSFORMER'S HIGH VOLTAGE WINDING.	POWER OPERATIONS AT 100%	EL	EQUIP	MAINTEN
RIVER BEND	5/4/2007	458200700 2	MAN	THE REACTOR WAS MANUALLY TRIPPED FOLLOWING LOSS OF COOLING TO THE NO. 2 MAIN TRANSFORMER.	AT 67%, REDUCING POWER FROM 100%.	EL	EQUIP	OPERATE
LIMERICK 2	2/1/2008	353200800 2	AUTO	AN AUTOMATIC REACTOR SCRAM OCCURRED DUE TO THE TRIP OF THE MAIN TURBINE. THE TURBINE TRIP WAS CAUSED BY A PHASE TO GROUND FAULT ON THE MAIN TRANSFORMER LOW VOLTAGE BUSHING CONNECTION TO THE ISO-PHASE BUS.	STEADY STATE AT 100%.	EL	EQUIP	OPERATE
QUAD CITIES 2	7/18/2000	265200000 8	AUTO	A RX SCRAM RESULTED FROM A C-PHASE DIFFERENTIAL RELAY TRIP. THE TRIP RESULTED FROM AN INSULATOR FAULT ON A 345 KV LINE CONNECTED TO THE STATION. BECAUSE OF DISTRIBUTION YARD CHANGES, INSUFFICIENT RELAY OPERATING MARGIN EXISTED DURING FAULTED CONDITIONS.	POWER OPERATIONS AT 100%	FK	EQUIP	OPERATE
GRAND GULF	9/15/2000	416200000 5	AUTO	A RX SCRAM OCCURRED ON A TURBINE CONTROL VALVE FAST CLOSURE SIGNAL. THE SIGNAL RESULTED FROM A GENERATOR LOAD TRANSIENT CAUSED BY THE FAILURE OF A 500 KV CIRCUIT BREAKER IN AN OFFSITE SWITCHYARD.	POWER OPERATIONS AT 100%	FK	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BRUNSWICK 2	9/22/2000	3242000002	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED FOLLOWING A MAIN TRANSFORMER FAULT. THE TRANSFORMER FAULT RESULTED FROM A LOSS OF COOLING. THE BREAKER SUPPLYING POWER TO THE COOLING COMPONENTS TRIPPED FOR UNKNOWN REASONS.	POWER OPERATIONS AT 100%	FK	EQUIP	OPERATE
QUAD CITIES 2	8/2/2001	2652001001	AUTO	A RX SCRAM OCCURRED WHEN A LIGHTNING STRIKE CAUSED A MAIN TRANSFORMER FAILURE AND A LOSS OF OFFSITE POWER.	POWER OPERATIONS AT 100%	FK	NATURALP	OPERATE
GRAND GULF	8/7/2001	4162001003	AUTO	A TURBINE TRIP/SCRAM OCCURRED AS THE RESULT OF A GENERATOR LOAD TRANSIENT. THE CAUSE WAS THE FAILURE OF A 500 KV DISCONNECT IN AN OFFSITE SWITCHYARD.	POWER OPERATIONS AT 100%	FK	EQUIP	MAINTEN
NINE MILE PT. 1	8/22/2001	2202001001	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED FOLLOWING A MAIN GENERATOR LOAD REJECT RESULTING FROM A GRID PERTURBATION COUPLED WITH A MALFUNCTION OF THE NEGATIVE PHASE SEQUENCE CURRENT RELAY. THE CAUSE WAS A DESIGN FLAW IN THE RELAY.	POWER OPERATIONS AT 100%	FK	EQUIP	OPERATE
GRAND GULF	4/24/2003	4162003002	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A LOSS OF LOAD FOLLOWING A PARTIAL LOSS OF OFFSITE POWER. THE CAUSE WAS A SWITCHYARD FAULT FROM HIGH WINDS.	POWER OPERATIONS AT 100%	FK	NATURALP	OPERATE
PERRY	8/14/2003	4402003002	AUTO	A RX SCRAM OCCURRED ON A TURBINE CONTROL VALVE FAST CLOSURE. THE CAUSE WAS A MAJOR GRID DISTURBANCE AND BLACKOUT.	POWER OPERATIONS AT 100%	FK	OTHER	OPERATE
OYSTER CREEK	8/14/2003	2192003003	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A MAIN GENERATOR LOCKOUT FOLLOWING OFFSITE ELECTRICAL GRID INSTABILITY. THE CAUSE WAS A MAJOR GRID DISTURBANCE HOWEVER, OFFSITE POWER REMAINED AVAILABLE.	POWER OPERATIONS AT 100%	FK	OTHER	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
FITZPATRI CK	8/14/2003	333200300 1	AUTO	A RX SCRAM OCCURRED ON A TURBINE CONTROL VALVE FAST CLOSURE. THE CAUSE WAS A MAJOR GRID DISTURBANCE AND BLACKOUT.	POWER OPERATIONS AT 100%	FK	OTHER	OPERATE
NINE MILE PT. 2	8/14/2003	410200300 2	AUTO	A RX SCRAM RESULTED FROM A TURBINE CONTROL VALVE FAST CLOSURE SIGNAL THAT WAS GENERATED AS THE EHC SYSTEM ATTEMPTED TO CONTROL TURBINE SPEED AND RX PRESSURE IN RESPONSE TO A SEVERE DISTURBANCE IN THE ELECTRIC GRID.	POWER OPERATIONS AT 100%	FK	OTHER	OPERATE
NINE MILE PT. 1	8/14/2003	220200300 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A LOAD REJECT. THE CAUSE WAS A MAJOR GRID DISTURBANCE AND BLACKOUT.	POWER OPERATIONS AT 100%	FK	OTHER	OPERATE
FERMI 2	8/14/2003	341200300 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED DURING ELECTRICAL GRID VOLTAGE FLUCTUATIONS. THE CAUSE WAS A MAJOR GRID DISTURBANCE AND BLACKOUT.	POWER OPERATIONS AT 100%	FK	OTHER	OPERATE
PEACH BOTTOM 2	9/15/2003	277200300 4	AUTO	A SCRAM OCCURRED WITH AN MSIV CLOSURE FOLLOWING THE LOSS OF OFFSITE POWER. THE CAUSE WAS A GRID DISTURBANCE RESULTING FROM FAILURE OF OFFSITE PROTECTIVE RELAYING DURING A LIGHTNING STORM.	POWER OPERATIONS AT 100%	FK	NATURALP	OPERATE
PEACH BOTTOM 3	9/15/2003	277200300 4	AUTO	A SCRAM OCCURRED WITH AN MSIV CLOSURE FOLLOWING THE LOSS OF OFFSITE POWER. THE CAUSE WAS A GRID DISTURBANCE RESULTING FROM FAILURE OF OFFSITE PROTECTIVE RELAYING DURING A LIGHTNING STORM.	POWER OPERATIONS AT 91%	FK	NATURALP	OPERATE
HOPE CREEK	9/19/2003	354200300 7	AUTO	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL FOLLOWING A PARTIAL LOSS OF OFFSITE POWER AND THE LOSS OF TWO OF THREE RFP'S. THE CAUSE WAS SALT DEPOSITS IN THE SWITCHYARD RESULTING IN A FLASH-OVER OF A 500 KV INSULATOR.	POWER OPERATIONS AT 100%	FK	NATURALP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LIMERICK 2	6/22/2004	353200400 1	AUTO	A RX SCRAM OCCURRED FOLLOWING A GENERATOR LOCKOUT AND ELECTRICAL YARD MANIPULATION. THE CAUSE WAS A FAILED 500 KV CIRCUIT BREAKER AND CONCURRENT FAILURE OF A CURRENT TRANSFORMER ASSOCIATED WITH A DIFFERENT 500 KV CIRCUIT BREAKER.	POWER OPERATIONS AT 100%	FK	EQUIP	MAINTEN
CLINTON 1	7/13/2004	461200400 3	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED DUE TO A FAULT ON THE GRID EXTERNAL TO THE STATION FROM A LIGHTNING STRIKE ON THE "A" PHASE OF THE BROKAW LINE. LEGACY DESIGN VULNERABILITIES ALLOWED THE FAULT TO RESULT IN AN UNEXPECTED RX TRIP.	POWER OPERATIONS AT 95%	FK	NATURALP	OPERATE
BRUNSWICK 1	8/14/2004	325200400 2	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING A LOSS OF OFFSITE POWER AND RESULTING LOSS OF RX RECIRCULATION PUMPS. THE CAUSE WAS A SWITCHYARD BREAKER FAILURE AND BREAKER SCHEME IN AFFECT DURING AN OFFSITE WEATHER RELATED TRANSMISSION LINE FAULT.	POWER OPERATIONS AT 67%	FK	NATURALP	OPERATE
RIVER BEND	8/15/2004	458200400 1	AUTO	A RX SCRAM OCCURRED FOLLOWING A PARTIAL LOSS OF OFFSITE POWER. THE CAUSE WAS SLOW SWITCHYARD BREAKER OPERATION AND FAULT CLEARING TIME IN RESPONSE TO AN OFFSITE TRANSMISSION LINE FAULT.	POWER OPERATIONS AT 100%	FK	EQUIP	OPERATE
RIVER BEND	10/1/2004	458200400 2	AUTO	A MAIN GENERATOR/TURBINE TRIP AND RX SCRAM OCCURRED AS THE RESULT OF A SECOND INSULATOR FLASHOVER ON THE 230KV MAIN GENERATOR OUTPUT LINE. THE CAUSE WAS THE BUILDUP OF CONTAMINANTS ON SWITCHYARD INSULATORS OVER TIME DUE TO COOLING TOWER DRIFT.	POWER OPERATIONS AT 100%	FK	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BROWNS FERRY 3	2/11/2005	296200500 1	AUTO	A RX SCRAM OCCURRED ON LOAD REJECT WHEN THE OUTPUT BREAKER TRIPPED DURING A RESTORATION FROM SWITCHYARD MAINTENANCE. A SWITCHYARD DISCONNECT DEVICE WAS INSERTED OUT OF SEQUENCE FROM THE INSTRUCTIONS GIVEN IN A SWITCHING ORDER.	POWER OPERATIONS AT 100%	FK	PRSNLERR	MAINTEN
OYSTER CREEK	6/1/2005	219200500 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A GENERATOR TRIP FOLLOWING AN OFFSITE ELECTRICAL TRANSIENT ON THE 230 KV TRANSMISSION LINE. THE CAUSE WAS A FAILURE OF LIGHTNING ARRESTORS IN THE TRANSMISSION UTILITY SUBSTATION.	POWER OPERATIONS AT 100%	FK	EQUIP	OPERATE
VERMON T YANKEE	7/25/2005	271200500 1	AUTO	A SCRAM OCCURRED ON A LOAD REJECT GENERATOR TRIP FOLLOWING A CATASTROPHIC FAILURE IN THE 345 KV SWITCHYARD. THE CAUSE WAS A FAILED INSULATOR RESULTING IN FAILURE OF A MOTOR OPERATED 345 KV DISCONNECT SWITCH.	POWER OPERATIONS AT 100%	FK	EQUIP	OPERATE
BROWNS FERRY 3	10/31/2005	296200500 3	AUTO	A TURBINE/RX TRIP OCCURRED DURING AN ELECTRICAL DISTURBANCE WHEN A SWITCHYARD BREAKER WAS CLOSED ONTO A GROUNDED TRANSMISSION LINE. THE CAUSE WAS FAILURE TO ENSURE THE GROUNDING SWITCHES ON THE TRANSMISSION LINE WERE OPENED PRIOR TO THE ACTIVITY.	POWER OPERATIONS AT 100%	FK	PRSNLERR	OPERATE
MONTICE LLO	9/11/2008	263200800 5	AUTO	WITH THE 1R TRANSFORMER OUT FOR MAINTENANCE, THE 2R TRANSFORMER EXPERIENCED A LOCKOUT RESULTING IN LOSS OF OFFSITE POWER, WHICH RESULTED IN A REACTOR TRIP.	STEADY STATE AT 100%.	FK	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
PILGRIM	12/19/2008	2932008006	AUTO	THE REACTOR TRIPPED FOLLOWING LOAD REJECTION. THE LOAD REJECTION WAS CAUSED BY A SEVERE WINTER STORM. SNOW AND ICE BUILD-UP ON ACB-105 RESULTED IN A POWER LOSS TO THE SAFEGUARDS PANELS.	STEADY STATE AT 100%.	FK	NATURALP	OPERATE
OYSTER CREEK	2/1/2009	2192009001	AUTO	THE REACTOR TRIPPED FROM FULL POWER DUE TO A FIRE IN THE MAIN TRANSFORMER.	STEADY STATE AT 100%.	FK	EQUIP	OPERATE
OYSTER CREEK	4/25/2009	2192009003	MAN	THE REACTOR WAS MANUALLY TRIPPED WHEN COOLING WAS LOST TO ONE OF THE MAIN TRANSFORMERS. POWER TO THE COOLING SYSTEM WAS LOST WHEN THE CONTROL POWER TRANSFER TO THE COOLING SYSTEM FAILED.	STEADY STATE AT 100%.	FK	EQUIP	OPERATE
LASALLE 1	5/21/2009	3732009001	AUTO	THE REACTOR TRIPPED DUE TO A FAULT ON THE MAIN POWER TRANSFORMER. THE FAULT WAS CAUSED BY A FAILED SURGE ARRESTOR. THE SURGE ARRESTOR FAILED DUE TO A MANUFACTURING DEFECT.	STEADY STATE AT 100%.	FK	EQUIP	OPERATE
VERMONT YANKEE	5/26/2010	2712010001	AUTO	THE REACTOR TRIPPED FOLLOWING A GENERATOR LOCKOUT. THE CAUSE OF THE LOCKOUT WAS IMPROPER RATIO SETTINGS ON A NEWLY INSTALLED SWITCHYARD CURRENT TRANSFORMER.	INCREASING POWER AT 72%.	FK	EQUIP	OPERATE
LASALLE 1	2/1/2011	3732011001	AUTO	THE REACTOR TRIPPED ON THROTTLE CONTROL VALVE FAST CLOSURE FOLLOWING A MAIN POWER TRANSFORMER TRIP AND SUBSEQUENT LOAD REJECTION. THE ROOT CAUSE WAS DETERMINED TO BE EXTERNAL BUSHING FLASHOVER DUE TO SNOW AND ICE BUILDUP ALONG THE BUSHING SKIRT.	STEADY STATE AT 100%.	FK	EQUIP	OPERATE
BROWNS FERRY 3	4/27/2011	2592011001	AUTO	THE REACTOR TRIPPED FROM 100% FOLLOWING A LOSS OF OFFSITE POWER. OFFSITE POWER WAS LOST DUE TO A SEVERE WEATHER EVENT.	STEADY STATE AT 100%.	FK	NATURALP	OPERATE

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PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BROWNS FERRY 1	4/27/2011	2592011001	AUTO	THE REACTOR TRIPPED FROM 75% POWER DUE TO LOSS OF OFFSITE POWER CAUSED BY A SEVERE WEATHER EVENT.	REDUED POWER AT 75%.	FK	NATURALP	OPERATE
BROWNS FERRY 2	4/27/2011	2592011001	AUTO	THE REACTOR TRIPPED FROM 75% DUE TO LOSS OF OFFSITE POWER. OFFSITE POWER WAS LOST DUE TO A SEVERE WEATHER EVENT.	REDUCED POWER AT 75%.	FK	NATURALP	OPERATE
MONTICELLO	10/21/2011	2632011008	AUTO	THE 2R AUXILIARY TRANSFORMER EXPERIENCED A LOCKOUT. THE REACTOR TRIPPED DUE TO THE RESULTING TRANSIENT. BOTH EDGS AUTOSTARTED ON A LOSS OF VOLTAGE SIGNAL BUT DID NOT LOAD THEIR RESPECTIVE BUSES.	100% STEADY STATE	FK	Equip	Operate
OYSTER CREEK	7/23/2012	2192012001	AUTO	A LOSS OF OFFSITE POWER RESULTED IN A TURBINE/REACTOR TRIP AND THE STARTING AND LOADING OF BOTH EDGS.	STEADY STATE AT 100%.	FK	Equip	Operate
FERMI 2	9/14/2012	3412012005	AUTO	LOSS OF THE 120KV SWITCHYARD RESULTED IN A REACTOR TRIP, BOTH EDGS STARTED AND LOADED, AND HPCI AND RCIC AUTOMATICALLY STARTED AND RESTORED REACTOR WATER LEVEL. THE LOSS OF THE SWITCHYARD WAS DUE TO A BIRD PECKING AT A SURGE PROTECTOR PROTECTIVE COVER.	AT 68% POWER.	FK	Naturalp	Operate
FITZPATRICK	11/11/2012	3332012008	AUTO	THE REACTOR TRIPPED FOLLOWING A TRIP OF THE MAIN TURBINE. THE TURBINE TRIP RESULTED FROM A MAIN TRANSFORMER ELECTRICAL FAULT.	STEADY STATE AT 100%.	FK	Equip	Operate
PILGRIM	2/8/2013	2932013003	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE TRIP DUE TO LOSS OF OFFSITE POWER. THE CAUSE OF THE LOSS OF POWER WAS FAILURE OF THE STARTUP TRANSFORMER DURING A WINTER STORM.	POWER LEVEL AT 80%.	FK	Equip	Operate

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LASALLE 1	4/17/2013	373201300 2	AUTO	A LIGHTNING STRIKE IN THE SWITCHYARD RESULTED IN A LOOP AND SCRAM OF BOTH UNITS. ALL EDGS STARTED AND LOADED. HPCS ACTUATED AND RCIC WAS USED FOR LEVEL CONTROL.	STEADY STATE AT 100%.	FK	Naturalp	Operate
LASALLE 2	4/17/2013	373201300 2	AUTO	A LIGHTNING STRIKE IN THE SWITCHYARD RESULTED IN A LOOP AND SCRAM OF BOTH UNITS. ALL EDGS STARTED AND LOADED. HPCS ACTUATED AND RCIC WAS USED FOR LEVEL CONTROL.	STEADY STATE AT 100%.	FK	Naturalp	Operate
PILGRIM	10/14/2013	293201300 9	AUTO	A LOSS OF OFFSITE POWER RESULTED IN A REACTOR TRIP. A 345KV TOWER SUPPORT (WOODEN POLE) FAILED AT THE CARVER SUBSTATION.	STEADY STATE AT 100%.	FK	Equip	Operate
OYSTER CREEK	5/27/2004	219200400 3	AUTO	A RX SCRAM OCCURRED AFTER THE IRMS SPIKED CAUSING SCRAM SIGNALS IN BOTH RPS CHANNELS. THE CAUSE WAS ELECTROMAGNETIC INTERFERENCE AFFECTING THE IRM CHANNELS DUE TO LOOSE CONNECTIONS, DAMAGED CABLING, AND GROUNDING DEFICIENCIES.	POWER OPERATIONS AT 2%	IG	EQUIP	REDUCING
BROWNS FERRY 2	7/10/2004	260200400 2	AUTO	A SCRAM OCCURRED ON A SPURIOUS UPSCALE TRIP ON THE INTERMEDIATE RANGE MONITORS. THE CAUSE WAS ELECTRICAL NOISE GENERATED BY MOVEMENT OF IRM "C".	STARTUP MODE AT 1%	IG	OTHER	RAISING
HOPE CREEK	1/12/2004	354200400 1	MAN	THE RX WAS MANUALLY SCRAMMED WHEN TWO INBOARD MSIVS WERE OBSERVED DRIFTING CLOSED FROM A LOSS OF PNEUMATIC PRESSURE AS A RESULT OF AN INVALID CONTAINMENT ISOLATION SIGNAL. THE CAUSE WAS A LOOSE RADIATION MONITOR ELECTRICAL CONTACT.	POWER OPERATIONS AT 67%	IL	EQUIP	CALIBRTN

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
SUSQUEH ANNA 2	11/9/2012	388201200 2	MAN	The reactor was manually tripped following the failure of the Integrated Control System. The cause of the loss of ICS a latent design deficiency in the ICS C2 series core switches.	At 90% power.	JA	Equip	Operate
PERRY	7/11/2001	440200100 3	AUTO	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL FOLLOWING A LOSS OF FEEDWATER. THE CAUSE WAS A BLOWN FUSE IN A 24 VDC POWER SUPPLY TO FEEDWATER CONTROL INSTRUMENTATION.	POWER OPERATIONS AT 100%	JB	EQUIP	OPERATE
CLINTON 1	7/24/2001	461200100 3	AUTO	A SCRAM OCCURRED ON HIGH RX WATER LEVEL WHILE A SURVEILLANCE WAS BEING PERFORMED ON A LEVEL TRANSMITTER FOR THE FEEDWATER LEVEL CONTROL SYSTEM. THE CAUSE WAS A TECHNICIAN INCORRECTLY PERFORMING A STEP IN THE PROCEDURE.	POWER OPERATIONS AT 100%	JB	PRSNLERR	TESTING
DUANE ARNOLD	8/12/2001	331200100 3	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING RX WATER LEVEL AFTER A FEEDWATER PUMP MINIMUM FLOW BYPASS VALVE FAILED OPEN. THE AFFECTED FEEDPUMP TRIPPED ON LOW SUCTION PRESSURE. THE CAUSE WAS A FAILED MINIMUM FLOW VALVE CONTROLLER.	POWER OPERATIONS AT 100%	JB	EQUIP	OPERATE
PERRY	12/15/2001	440200100 5	AUTO	A RX SCRAM OCCURRED ON HIGH RX WATER LEVEL DUE TO AN EXCESSIVE FEEDWATER DEMAND TRANSIENT. THE CAUSE WAS A FAILED LOGIC CARD IN THE FEEDWATER LEVEL CONTROL SYSTEM.	POWER OPERATIONS AT 100%	JB	EQUIP	OPERATE
QUAD CITIES 2	4/5/2002	265200200 2	MAN	THE RX WAS MANUALLY SCRAMMED ON INCREASING RX WATER LEVEL. THE CAUSE WAS A BLOWN FUSE IN THE DIGITAL FEEDWATER LEVEL CONTROL SYSTEM RESULTING FROM INADVERTENT GROUNDING OF TEST LEADS DURING AN INSTRUMENT SURVEILLANCE. THE ROOT CAUSE WAS EQUIP DESIGN.	POWER OPERATIONS AT 100%	JB	EQUIP	TESTING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
COOPER STATION	11/28/2003	2982003007	AUTO	A SCRAM OCCURRED ON LOW RX WATER LEVEL AFTER FEEDWATER PUMP "B" SPEED LOWERED UNEXPECTEDLY. THE CAUSE WAS A SPURIOUS SIGNAL THAT ENTERED THE RX FEED PUMP TURBINE CONTROLLER.	POWER OPERATIONS AT 100%	JB	OTHER	OPERATE
COOPER STATION	4/15/2005	2982005001	AUTO	A RX SCRAM OCCURRED ON LOW REACTOR WATER LEVEL. THE LOW LEVEL WAS THE RESULT OF A FEEDWATER TRANSIENT CAUSED BY AN INSTRUMENT FAILURE IN THE RFPT SPEED CONTROL.	POWER OPERATIONS AT 100%	JB	EQUIP	OPERATE
DUANE ARNOLD	4/3/2009	3312009003	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO RISING WATER LEVEL DURING LEVEL INSTRUMENT CALIBRATION. THE CAUSE OF RISING LEVEL WAS AN INADEQUATE PROCEDURE THAT RESULTED IN THE LOSS OF LEVEL INDICATION AND INCREASED FEED FLOW.	STEADY STATE AT 100%.	JB	PROCEDUR	TESTING
HATCH 2	6/23/2009	3662009004	AUTO	THE REACTOR AUTOMATICALLY TRIPPED FOLLOWING A MAIN TURBINE TRIP. THE TURBINE TRIPPED DUE TO HIGH REACTOR WATER LEVEL. THE CAUSE OF THE TRANSIENT WAS A FAILED CAPACITOR IN THE INTERNAL POWER SUPPLY OF THE REACTOR WATER LEVEL CONTROLLER.	RAISING POWER AT 61%.	JB	EQUIP	OPERATE
QUAD CITIES 2	5/5/2000	2652000006	AUTO	A RX SCRAM OCCURRED DURING CALIBRATION OF MAIN STEAM LINE HIGH FLOW SWITCHES. A TECHNICIAN ADJUSTED A SWITCH THAT WAS NOT ISOLATED AND PREPARED FOR CALIBRATION, COMPLETING THE LOGIC FOR A GROUP I ISOLATION, WHICH RESULTED IN THE SCRAM.	POWER OPERATIONS AT 100%	JE	PRSNLERR	MAINTEN

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BROWNS FERRY 2	7/25/2001	2602001003	AUTO	A TURBINE/RX TRIP OCCURRED ON AN ERRONEOUS POWER-LOAD UNBALANCE SIGNAL DURING COMBINED INTERMEDIATE VALVE TESTING. THE SIGNAL RESULTED FROM AN ERROR IN THE EHC CONTROLLER SOFTWARE.	POWER OPERATIONS AT 100%	J1	EQUIP	TESTING
MONTICELLO	1/21/2002	2632002001	AUTO	A RX SCRAM OCCURRED ON A TURBINE CONTROL VALVE FAST CLOSURE (LOAD REJECT) SIGNAL RESULTING FROM FAILURE OF THE MAIN TURBINE PRESSURE CONTROL SYSTEM. THE CAUSE WAS FAILURE OF THE MECHANICAL PRESSURE REGULATOR CAUSED BY A DAMAGED RATE FEEDBACK BELLOWS.	POWER OPERATIONS AT 100%	J1	EQUIP	OPERATE
CLINTON 1	11/29/2011	4612011004	AUTO	DURING A REACTOR SHUTDOWN, THE REACTOR AUTOMATICALLY TRIPPED AT 16% AFTER TRIPPING THE MAIN TURBINE. THE SCRAM WAS DUE TO HIGH RCS PRESSURE CAUSED BY FAILURE OF THE TURBINE BYPASS VALVES.	SHUTTING DOWN AT 16%.	J1	Equip	Reducing
SUSQUEHANNA 1	6/7/2013	3872013002	MAN	The reactor was manually tripped while starting up at 7% power due to the unexpected opening of all turbine bypass valves, which caused a reactor level swell. The cause was an age-related failure of the EHC "B" pressure setpoint potentiometer.	Starting up at 7% power.	J1	Equip	Raising
LIMERICK 2	10/12/2005	3532005004	AUTO	A RX SCRAM OCCURRED ON HIGH APRM FLUX WHEN THE TURBINE CONTROL VALVES CLOSED FOLLOWING A FAILURE IN THE EHC SYSTEM. THE MOST LIKELY CAUSE WAS A TRANSIENT MALFUNCTION OF A CIRCUIT CARD.	POWER OPERATIONS AT 100%	J2	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
MONTICELLO	1/10/2007	2632007001	AUTO	A REACTOR SCRAM OCCURRED AT 87% POWER WHILE PERFORMING TURBINE VALVE TESTING. THE CAUSE WAS FAILURE OF THE SUPPORTS FOR THE TURBINE CONTROL VALVE ENCLOSURE.	REACTOR AT 87% POWER.	JJ	EQUIP	TESTING
NINE MILE PT. 1	7/17/2012	2202012001	AUTO	NINE MILE POINT UNIT 1 (NMP1) EXPERIENCED AN AUTOMATIC REACTOR SCRAM ON HIGH NEUTRON FLUX DUE TO A FAILURE OF THE ELECTRONIC PRESSURE REGULATOR (EPR).	STEADY STATE AT 100%.	JJ	Equip	Operate
FERMI 2	10/2/2002	3412002004	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED WHEN CONDENSER PRESSURE INCREASED ABOVE THE TURBINE TRIP SETPOINT. CONDENSER VACUUM WAS LOST WHEN CIRCULATING PUMP NUMBER TWO FAILED. THE CAUSE WAS A SEPARATION OF THE MOTOR AND PUMP FROM FATIGUE FAILURE OF THE BOLTS.	POWER OPERATIONS AT 100%	KE	EQUIP	OPERATE
FITZPATRICK	9/12/2007	3332007002	MAN	HIGH WINDS RESULTED IN DEBRIS CAUSING LOWERING INTAKE CANAL LEVEL DUE TO PLUGGING OF THE TRAVELING SCREENS AND TRASH BASKETS. THE OPERATOR BEGAN A RAPID POWER REDUCTION. THE REACTOR WAS MANUALLY TRIPPED WHEN THE INTAKE LEVEL DROPPED TO 240 FEET.	REDUCING POWER FROM 100%.	KE	NATURALP	OPERATE
FITZPATRICK	10/28/2007	3332007002	MAN	THE REACTOR WAS MANUALLY SCRAMMED WHEN THE TRAVELING WATER SCREENS BECAME BLOCKED WITH DEBRIS.	STEADY STATE AT 100%	KE	NATURALP	OPERATE
OYSTER CREEK	12/19/2007	2192007003	MAN	WITH REDUCED POWER FOR B REACTOR RECIRC PUMP MAINTENANCE, LOSS OF CONDENSER VACUUM CAUSED A MAIN FEEDWATER PUMP TRIP. THE OPERATOR MANUALLY TRIPPED THE REACTOR ON LOW REACTOR WATER LEVEL.	POWER REDUCED TO 55% FOR MAINTENANCE.	KE	PROCEDUR	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
DUANE ARNOLD	2/1/2009	331200900 1	MAN	THE REACTOR WAS MANUALLY TRIPPED WHILE SHUTTING DOWN DUE TO LOSS OF CIRC WATER. ONE CIRC WATER TOWER WAS SHUTDOWN WHEN A RISER IN THE OTHER TOWER RUPTURED RESULTING IN A LOSS OF SUPPLY TO THE CIRC WATER PUMPS.	SHUTTING DOWN AT 53%.	KE	EQUIP	OPERATE
SUSQUEH ANNA 1	7/16/2010	387201000 3	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO AN UNISOLABLE LEAK IN THE CIRC WATER SYSTEM NEAR THE MAIN CONDENSER AREA. POWER WAS INITIALLY REDUCED TO 39% WHEN THE REACTOR WAS TRIPPED DUE DUE TO RISING WATER LEVEL IN THE CONDENSER AREA.	AT 39%, REDUCING FROM 89%.	KE	EQUIP	OPERATE
BRUNSWI CK 1	2/22/2012	325201200 1	MAN	While reducing power, the reactor was manually tripped due to a high delta-pressure across the Circulating Water intake Pump traveling screen. The high delta-p was caused by loss of power to the traveling screen motors.	Reducing Power at 73%.	KE	Equip	Reducing
LASALLE 2	4/25/2013	374201300 2	MAN	The reactor was manually tripped following the loss of the Circ Water pumps. The Circ Water pumps tripped due to high level in the Turbine Building condenser pit.	At 57% power.	KE	Equip	Operate
HOPE CREEK	1/17/2009	354200900 1	MAN	THE REACTOR WAS MANUALLY SCRAMMED DUE TO FAILURE OF THE TURBINE AUXILARY COOLING SYSTEM. THE CAUSE OF THE LOSS WAS FAILURE OF A SOLENOID VALVE ON THE TACS SUPPLY ISOLATION VALVES.	73% FOLLOWING TURBINE RUNBACK FROM 100%.	KG	EQUIP	OPERATE
PEACH BOTTOM 2	4/12/2003	277200300 1	AUTO	A RX SCRAM OCCURRED ON HIGH RX PRESSURE AFTER AN OUTBOARD MSIV CLOSURE. THE CAUSE WAS FATIGUE FAILURE OF A COPPER AIR LINE RESULTING FROM INADEQUATE SUPPORT.	POWER OPERATIONS AT 100%	LE	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
COOPER STATION	5/22/2006	2982006004	MAN	THE RX WAS MANUALLY SCRAMMED ON LOWERING PLANT SERVICE AIR. THE MOST LIKELY CAUSE IS FAILURE OF THE SAC AUTO CONTROL SYSTEM.	POWER OPERATIONS AT 100%	LF	EQUIP	OPERATE
QUAD CITIES 1	8/12/2010	2542010002	AUTO	WHILE PERFORMING CONDENSER FLOW REVERSAL TESTING, THE REACTOR TRIPPED FOLLOWING A MAIN TURBINE TRIP.	STEADY STATE AT 100%	NN	Equip	Testing
NINE MILE PT. 1	10/2/2000	2202000004	MAN	THE RX WAS MANUALLY SCRAMMED AFTER A MAIN STEAM ELECTROMATIC RELIEF VALVE OPENED AND COULD NOT BE SHUT. THE CAUSE WAS A BENT PILOT VALVE STEM COMBINED WITH PARTIAL DISENGAGEMENT OF THE DISC AND STEM ASSEMBLY.	STARTUP MODE AT 1%	SB	EQUIP	OPERATE
PILGRIM	5/19/2003	2932003002	AUTO	A RX SCRAM OCCURRED ON MSIV CLOSURE RESULTING FROM SWELL AFTER THE MAIN TURBINE BYPASS VALVES WERE INADVERTENTLY OPENED AND DEPRESSURIZED THE RX VESSEL. THE CAUSE WAS OPERATOR ERROR WHEN THE SWITCH TO OPEN THE TURBINE BYPASS VALVES WAS OPERATED.	STARTUP MODE AT 3%	SB	PRSNLERR	RAISING
OYSTER CREEK	8/22/2003	2192003004	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON HI MOISTURE SEPARATOR WATER LEVEL. THE CAUSE WAS SPURIOUS ACTUATION OF THE MOISTURE SEPARATOR HI LEVEL SWITCH.	POWER OPERATIONS AT 100%	SB	EQUIP	OPERATE
HOPE CREEK	10/10/2004	3542004010	MAN	THE RX WAS MANUALLY SCRAMMED DUE TO A STEAM LEAK IN THE TURBINE BUILDING. THE CAUSE WAS FAILURE OF A MOISTURE SEPARATOR DUMP LINE TO THE CONDENSER.	RX AT 69% FOLLOWING REDUCTION FROM 100%	SB	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BROWNS FERRY 1	6/9/2007	2592007005	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE TRIP. THE TURBINE TRIPPED DUE TO HIGH LEVEL IN A MOISTURE SEPARATOR DRAIN TANK. THE ROOT CAUSE IS THE SIZING OF THE MOISTURE SEPARATOR LEVEL CONTROL DUMP VALVE.	AT 79%.	SB	EQUIP	OPERATE
BROWNS FERRY 1	10/12/2007	2592007009	AUTO	AN AUTOMATIC REACTOR SCRAM OCCURRED FOLLOWING A TURBINE TRIP. THE CAUSE OF THE TURBINE TRIP WAS A FALSE HIGH MOISTURE SEPARATOR LEVEL SIGNAL.	STEADY STATE AT 100%.	SB	EQUIP	OPERATE
COOPER STATION	8/9/2008	2982008001	MAN	WHILE PERFORMING MAIN TURBINE REHEAT STOP VALVE TESTING, THE VALVE FAILED TO REOPEN WHEN REQUIRED DUE TO A JAMMED TEST SOLENOID VALVE. THE OPERATORS MANUALLY SCRAMMED THE REACTOR.	POWER REDUCED TO 69% FOR TESTING.	SB	EQUIP	TESTING
NINE MILE PT. 1	10/23/2008	2202008002	MAN	THE REACTOR WAS MANUALLY TRIPPED WHEN IT WAS DETERMINED THAT THE ELECTRONIC PRESSURE REGULATOR WAS NOT FUNCTIONING PROPERLY AND WOULD NOT ALLOW TRANSFER TO THE BACKUP REGULATOR. THE CAUSE OF THE FAILURE WAS DEBRIS PLUGGING THE INTERNAL EPR SERVO FILTER.	STEADY STATE AT 100%.	SB	EQUIP	OPERATE
BRUNSWICK 2	11/9/2008	3242008002	MAN	AN SRV SPURIOUSLY OPENED AND WOULD NOT SHUT. THE REACTOR WAS MANUALLY TRIPPED WHEN TORUS TEMPERATURE REACHED 109.8-DEGREES.	STEADY STATE AT 100%.	SB	EQUIP	OPERATE
QUAD CITIES 1	6/13/2011	2542011002	MAN	THE REACTOR WAS MANUALLY SCRAMMED FOLLOWING THE DISCOVERY OF A STEAM LEAK IN THE TURBINE BUILDING DOWNSTREAM OF THE MAIN TURBINE STOP VALVES.	STARTING UP AT 34%.	SB	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
HOPE CREEK	12/1/2013	3542013008	AUTO	THE REACTOR TRIPPED FOLLOWING A MAIN TURBINE TRIP ON MOISTURE SEPARATOR HIGH LEVEL. THE MS HIGH LEVEL WAS CAUSED BY A FAILED LEVEL CONTROLLER.	STEADY STATE AT 100%.	SB	Equip	Operate
HOPE CREEK	12/5/2013	3542013009	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE TRIP. THE TURBINE TRIP WAS CAUSED BY A HIGH MOISTURE SEPARATOR LEVEL. THE MS LEVEL CONTROLLER WAS BEING TUNED WHEN THE DUMP VALVE CYCLED REPEATEDLY THEN FAILED CLOSED.	AT 76% POWER.	SB	Equip	Operate
GRAND GULF	3/17/2014		MAN	The reactor was manually tripped due to a steam leak in the Turbine Building. The leak was in a Low Pressure Turbine Line.	AT 41% power.	SB	Equip	Operate
BROWNS FERRY 3	3/18/2014		AUTO	THE REACTOR TRIPPED DUE TO A MAIN TURBINE TRIP. THE TURBINE TRIPPED DUE TO HIGH MOISTURE SEPARATOR LEVEL DUE TO THE INABILITY TO AUTOMATICALLY OR MANUALLY CONTROL THE MS LEVEL.	RAISING POWER AT 35%.	SB	Equip	Operate
HATCH 1	9/29/2000	3212000011	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING RX WATER LEVEL FOLLOWING A LOW SUCTION PRESSURE TRIP OF THE OPERATING RX FEED PUMP. THE CAUSE WAS AIR INTRODUCED INTO THE CONDENSATE PUMP SUCTION HEADER THROUGH A LEAKING PUMP SUCTION ISOLATION VALVE.	POWER OPERATIONS AT 55%	SD	EQUIP	OPERATE
HOPE CREEK	6/22/2002	3542002004	AUTO	A RX SCRAM/TURBINE TRIP OCCURRED ON HIGH MOISTURE SEPARATOR LEVEL THAT RESULTED FROM THE TRIP OF A SECONDARY CONDENSATE PUMP AND INTERMEDIATE RUNBACK OF THE RX RECIRCULATION PUMPS. A FAILED LOGIC CARD CAUSED THE CONDENSATE PUMP TRIP.	60% POWER FOLLOWING REDUCTION FROM 100%	SD	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LASALLE 2	1/10/2003	374200300 1	MAN	THE RX WAS MANUALLY SCRAMMED ON LOWERING VESSEL WATER LEVEL FOLLOWING THE LOSS OF A CONDENSATE PUMP AND THE "2A & 2C" HEATER DRAIN PUMPS WHICH RESULTED IN A LOSS OF BOTH TURBINE DRIVEN FEED PUMPS. THE CONDENSATE PUMP "B" PHASE MOTOR LUG FAILED.	POWER OPERATIONS AT 90%	SD	EQUIP	OPERATE
GRAND GULF	1/30/2003	416200300 1	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING VESSEL WATER LEVEL FOLLOWING A LOSS OF FEED. THE CAUSE WAS AN ELECTRICAL SHORT DURING MAINTENANCE WHICH RESULTED IN ISOLATION OF ALL OPERATING CONDENSATE DEMINERALIZERS AND THE LOSS OF FEED.	POWER OPERATIONS AT 100%	SD	EQUIP	MAINTEN
LIMERICK 1	4/23/2003	352200300 3	AUTO	A RX SCRAM OCCURRED ON LOW RX VESSEL WATER LEVEL FOLLOWING A LOSS OF FEEDWATER. THE FEEDPUMPS TRIPPED ON LOW SUCTION PRESSURE FOLLOWING THE CLOSURE OF THE CONDENSATE DEEP BED DEMINERALIZER INLET HEADER BLOCK VALVE FROM INADVERTENT PERSONNEL CONTACT.	POWER OPERATIONS AT 100%	SD	PRSNLERR	OPERATE
DRESDEN 2	5/4/2007	237200700 2	MAN	THE REACTOR WAS MANUALLY SCRAMMED FOLLOWING LOSS OF FEEDWATER. THE CONDENSATE PREFILTERS ISOLATED EARLIER AND THE BYPASS VALVES SHUT WHEN THE COMPUTER CONTROLLING THE VALVES WAS BEING REPLACED.	STEADY STATE AT 100%.	SD	EQUIP	MAINTEN
COLUM. NUCLEAR 2	6/28/2007	397200700 4	AUTO	AT 70% POWER WITH ONE CONDENSATE PUMP SECURED, THE RUNNING CONDENSATE PUMP TRIPPED DUE TO INCORRECT CONFIGURATION OF THE PUMP LUBE OIL FILTER VALVES AND THE DECISION TO TRANSFER FILTERS WITH THE PUMP IN SERVICE. THE REACTOR TRIPPED ON LOW WATER LEVEL.	70%	SD	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
HATCH 1	11/22/2008	3212008004	MAN	A CONDENSATE BOOSTER PUMP TRIPPED ON LOW SUCTION PRESSURE CAUSING BOTH FEEDWATER PUMPS TO TRIP. THE REACTOR WAS MANUALLY TRIPPED. THE CAUSE OF THE LOW SUCTION PRESSURE WAS FAILURE OF THE DC POWER SUPPLY FOR THE STEAM JET AIR EJECTOR DP CONTROLLER.	STEADY STATE AT 100%.	SD	EQUIP	OPERATE
BROWNS FERRY 2	9/29/2009	2602009007	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE RAPIDLY LOWERING REACTOR VESSEL LEVEL CAUSED BY LOSS OF ONE OF THE TWO AVAILABLE CONDENSATE BOOSTER PUMPS. WITH ONE PUMP UNAVAILABLE FOR MAINTENANCE, A SECOND PUMP TRIPPED WHILE REMOVING A FEEDWATER PUMP FROM SERVICE.	STEADY STATE AT 100%.	SD	EQUIP	OPERATE
SUSQUEH ANNA 1	1/25/2011	3872011002	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO AN UNISOLABLE LEAK IN THE STEAM EXTRACTION SYSTEM. THE STEAM LEAK WAS ISOLATED AFTER THE TURBINE WAS TRIPPED.	REDUCING POWER AT 65%.	SE	EQUIP	OPERATE
BROWNS FERRY 3	2/9/2007	2962007001	AUTO	LOWERING CONDENSATE FLOW RESULTED IN LOWERING FEEDWATER FLOW, CAUSING THE REACTOR TO SCRAM ON LOW REACTOR WATER LEVEL. THE CAUSE OF THE LOWERING CONDENSATE FLOW WAS LOSS OF THE CONDENSATE DEMINERALIZER DUE TO PERSONNEL ERROR.	STEADY STATE AT 100%.	SF	PRSNLERR	MAINTEN
DUANE ARNOLD	3/18/2007	3312007006	MAN	THE REACTOR WAS MANUALLY SCRAMMED DUE TO HIGH LEVELS OF CHLORIDES, SULFATES, AND CONDUCTIVITY, DUE TO RESIN INTRUSION FOLLOWING THE PLACEMENT OF A CONDENSATE DEMINERALIZER IN SERVICE.	28%.	SF	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
HATCH 2	3/7/2008	366200800 2	AUTO	THE REACTOR TRIPPED ON LOW REACTOR LEVEL FOLLOWING A LOSS OF FEEDWATER. THE FEEDWATER LOSS WAS CAUSED BY LOSS OF THE CONDENSATE DEMINERALIZERS CONTROL DUE TO A PERSONNEL ERROR DURING SOFTWARE TESTING.	STEADY STATE AT 100%.	SF	PRSNLERR	TESTING
BROWNS FERRY 3	8/24/2009	296200900 1	MAN	THE REACTOR WAS MANUALLY TRIPPED FOLLOWING THE LOSS OF 2 OF THE 3 CONDENSATE BOOSTER PUMPS. THE PUMPS TRIPPED ON LOW SUCTION PRESSURE. THE CAUSE OF THE LOW CONDENSATE SUCTION PRESSURE WAS FAILURE OF THE CONDENSATE DEMINERALIZERS LOGIC CONTROL.	STEADY STATE AT 100%.	SF	EQUIP	OPERATE
COLUM. NUCLEAR 2	9/18/2000	397200000 7	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING CONDENSER VACUUM. THE CAUSE WAS A BROKEN TURBINE DRAIN LINE WHICH ALLOWED AIR TO ENTER THE CONDENSER.	RX SCRAM AT 65% FOLLOWING REDUCTION FROM 100%	SG	EQUIP	OPERATE
DUANE ARNOLD	2/1/2003	331200300 1	MAN	THE RX WAS MANUALLY SCRAMMED ON THE RATE AND MAGNITUDE OF CONTINUED CONDUCTIVITY INCREASES IN THE CONDENSER HOTWELL, RX FEEDWATER, AND RCS. THE CAUSE WAS A PUNCTURED CONDENSER TUBE RESULTING FROM FATIGUE FAILURE OF A CONDENSER STEAM DEFLECTOR PLATE.	POWER OPERATIONS AT 93%	SG	EQUIP	OPERATE
DUANE ARNOLD	11/25/2003	331200300 6	MAN	THE RX WAS MANUALLY SCRAMMED ON DEGRADING CONDENSER VACUUM DURING POWER ASCENSION FOLLOWING REPAIR OF CONDENSER EXPANSION JOINT. THE CAUSE WAS AIR INLEAKAGE FROM A FAILED WELDED SEAM BETWEEN THE HIGH PRESSURE CONDENSER AND THE CROSSOVER LOOP SEAL.	POWER OPERATIONS AT 20% DURING ASCENSION	SG	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
HATCH 2	5/23/2005	3662005003	MAN	CONDENSER TUBE LEAK CAUSED BAD WATER CHEMISTRY. SHUTTING DOWN FROM 100%, MANUALLY SCRAMMED AT 57%. VOID COLLAPSE RESULTED IN GROUP 2 PCIS ISOLATION. LEVEL RECOVERED WITH FEEDWATER PUMPS.	MAN SCRAM 57% SHUTTING DOWN FROM 100%	SG	EQUIP	OPERATE
BRUNSWICK 2	11/11/2006	3242006002	MAN	DURING STARTUP AT 1% POWER, THE REACTOR WAS MANUALLY TRIPPED DUE TO HIGH CONDUCTIVITY IN THE CONDENSER. THE CAUSE OF THE HIGH CONDUCTIVITY WAS LEAKING TUBES DUE TO MISSING TUBE PLUGS.	STARTUP MODE AT 1%	SG	EQUIP	OPERATE
HATCH 1	2/10/2013	3212013001	MAN	The reactor was manually tripped due to degrading reactor water chemistry. The cause was a Main Condenser tube leak.	Reducing power at 47%.	SG	Equip	Operate
FITZPATRICK	4/1/2000	3332000003	AUTO	A RX SCRAM OCCURRED ON A MANUAL TURBINE TRIP DUE TO DECREASING CONDENSER VACUUM. DURING RECOMBINER MAINTENANCE, THE BYPASS VALVE FAILED CLOSED, ISOLATING THE OFF GAS SYSTEM. THE CAUSE WAS AN AGE-RELATED FAILURE OF THE ASSOCIATED SOLENOID OPERATED VALVE.	POWER OPERATIONS AT 25%	SH	EQUIP	MAINTEN
DRESDEN 3	5/4/2000	2492000003	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING CONDENSER VACUUM AND INCREASING CONDENSATE TEMPERATURE. THE CAUSE WAS FAILURE TO FOLLOW PROCEDURES DURING POST MODIFICATION TESTING OF THE SYSTEM.	POWER OPERATIONS AT 44%	SH	PRSNLERR	RAISING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
RIVER BEND	8/21/2000	4582000012	MAN	THE RX WAS MANUALLY SCRAMMED IN RESPONSE TO DECREASING MAIN CONDENSER VACUUM, WHICH OCCURRED WHILE RESPONDING TO A LOW FLOW CONDITION IN THE OFFGAS SYSTEM. THE CAUSE WAS AN INADEQUATE OFFGAS ALARM RESPONSE PROCEDURE.	POWER OPERATIONS AT 100%	SH	PROCEDUR	TRBLSHOT
VERMONT YANKEE	9/13/2000	2712000004	MAN	THE RX WAS MANUALLY SCRAMMED ON A LOSS OF CONDENSER VACUUM. AN ELECTRICAL SHORT OCCURED WHILE CHANGING AN AIR EJECTOR STEAM SUPPLY VALVE INDICATION LIGHT BULB, WHICH CAUSED THE VALVE TO SHUT. THE USE OF AN INCORRECT BULB EXTRACTION TOOL CAUSED THE SHORT.	SCRAM FROM 77% FOLLOWING REDUCTION FROM 100%	SH	OTHER	MAINTEN
PERRY	4/29/2001	4402001001	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING MAIN CONDENSER VACUUM AFTER THE GENERATOR WAS TAKEN OFFLINE. THE CAUSE WAS INADEQUATELY TORQUED COVERS ON THE MOISTURE SEPARATOR DRAIN TANKS WHICH ALLOWED AIR TO ENTER THE CONDENSER.	POWER OPERATIONS AT 16%	SH	PROCEDUR	REDUCING
LIMERICK 2	7/23/2002	3532002001	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING CONDENSER VACUUM WHEN THE CONDENSER AIR REMOVAL SYSTEM FAILED DUE TO TEMPERATURE IN THE STEAM JET AIR EJECTOR CONDENSER EXCEEDING THE DESIGN LIMIT. THE CAUSE WAS INADEQUATE OPERATING PROCEDURES.	POWER OPERATIONS AT 100%	SH	PROCEDUR	OPERATE
COOPER STATION	9/23/2005	2982005004	MAN	THE RX WAS MANUALLY SCRAMMED ON DEGRADING MAIN CONDENSER VACUUM. THE CAUSE WAS A TURBINE BEARING SLOP DRAIN LINE THAT FAILED FROM HIGH CYCLE FATIGUE.	POWER OPERATIONS AT 76%	SH	EQUIP	TRBLSHOT

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
QUAD CITIES 2	2/28/2007	2652007001	MAN	THE REACTOR WAS MANUALLY TRIPPED AT 30% POWER DUE TO DECREASING CONDENSER VACUUM. THE CAUSE WAS FAILURE OF AN AUX STEAM TO OFFGAS CONTROLLER RESULTING IN DECREASED NONCONDENSIBLE GAS REMOVAL EFFICIENCY, WHICH CAUSED INCREASED CONDENSER BACKPRESSURE.	POWER REDUCED TO 30% FOR MAINTENANCE.	SH	EQUIP	OPERATE
GRAND GULF	5/19/2007	4162007002	AUTO	THE REACTOR TRIPPED DUE TO A TURBINE TRIP CAUSED BY LOSS OF CONDENSER VACUUM. THE LOSS OF VACUUM WAS FROM LEAKS IN THE HIGH PRESSURE CONDENSER EXPANSION JOINT.	AT 78% REDUCING POWER FROM 100%.	SH	EQUIP	OPERATE
PILGRIM	7/10/2007	2932007005	AUTO	DURING A POWER REDUCTION TO BACKWASH THE MAIN CONDENSER, THE MAIN TURBINE TRIPPED RESULTING IN A SCRAM. THE CAUSE OF THE TURBINE TRIP LOW CONDENSER VACUUM DUE TO A CALIBRATION ERROR OF THE LOW VACUUM TURBINE TRIP MECHANISM.	POWER REDUCED TO 48% FOR MAINTENANCE.	SH	PRSNLERR	OPERATE
FERMI 2	10/24/2010	3412010003	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE TRIP DUE TO LOSS OF CONDENSER VACUUM. THE LOSS OF VACUUM WAS CAUSED BY EROSION OF A STEAM JET AIR EJECTOR STEAM SUPPLY FIRST STAGE NOZZLE, WHICH RESULTED IN LOSS OF EJECTOR CAPACITY.	STEADY STATE BAT 97%.	SH	EQUIP	OPERATE
RIVER BEND	5/21/2012	4582012002	AUTO	THE REACTOR TRIPPED DUE TO A TURBINE TRIP. THE TURBINE TRIP WAS CAUSED BY LOW CONDENSER VACUUM THAT RESULTED FROM THE LOSS OF A NON-SAFETY-RELATED 4160V BUS THAT POWERS TWO OF THE FOUR CIRCULATING WATER PUMPS.	STEADY STATE AT 100%.	SH	Equip	Operate

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
PILGRIM	5/22/2012	293201200 2	MAN	While reducing power to support thermal backwash of the Main Condenser, the reactor was manually tripped due to a degrading condenser vacuum. The cause of the degrading vacuum was loss of the SJAE due to a partially opened steam supply valve.	Reducing power at 35%.	SH	Procedur	Reducing
NINE MILE PT. 2	7/12/2012	410201200 4	MAN	The reactor was manually tripped due to lowering condenser vacuum. The cause of the lowering vacuum was loss of sealing steam caused by failure of the B Clean Steam Reboiler and failure of the backup steam supply.	Power Reduced to 85%.	SH	Equip	Operate
BROWNS FERRY 3	2/25/2013	296201300 3	AUTO	THE REACTOR TRIPPED DUE TO A TURBINE TRIP. THE TURBINE TRIPPED ON LOW CONDENSER VACUUM, CAUSED BY A REACTOR FEEDWATER RECIRC PIPING SEPARATION.	STEADY STATE AT 92%.	SH	Equip	Operate
BROWNS FERRY 1	3/19/2013	259201300 2	MAN	The reactor was manually tripped due to lowering condenser vacuum. Vacuum was deteriorating following steam extraction isolation due to a leak in the FW heater level control line.	Steady State at 95%.	SH	Equip	Operate
HOPE CREEK	6/12/2013	354201300 2	MAN	The reactor was manually tripped due to low condenser vacuum caused by a Circ Water pump tripping with a stuck open discharge valve. The pump tripped due to a conductive filament growth that created a short circuit on a relay card.	Reducing Power for 100%.	SH	Equip	Operate
OYSTER CREEK	10/6/2013	219201300 2	MAN	During startup, the reactor was manually tripped due to lowering condenser vacuum. Operations and maintenance personnel identified an approximate 1" hole on the Condenser Steam Inlet Expansion Joint on the south side of 'B' Condenser.	Starting up at 20%.	SH	Unknown	Raising

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
CLINTON 1	3/25/2014		MAN	Plant power was being reduced from 85% due to lowering condenser vacuum. When vacuum reached 24 in. Hg, the reactor was manually tripped from 46% power.	Reducing power at 46%.	SH	Equip	Operate
HATCH 1	1/26/2000	321200000 2	AUTO	A RX SCRAM OCCURRED ON LOW RX WATER VESSEL WATER LEVEL. THE INADVERTENT CLOSURE OF A HIGH PRESSURE FEEDWATER HEATER INLET VALVE ISOLATED ONE OF TWO FEEDWATER INLET LINES. THE CAUSE WAS ATTRIBUTED TO A FAILED VALVE CONTROL SWITCH.	POWER OPERATIONS AT 100%	SJ	EQUIP	OPERATE
NINE MILE PT. 2	3/3/2000	410200000 2	MAN	WHILE PERFORMING A NORMAL PLANT SHUTDOWN, THE RX WAS MANUALLY SCRAMMED DUE TO THE POTENTIAL LOSS OF THE ONLY OPERATING FEED PUMP. OPERATORS WERE CONCERNED ABOUT THE PUMP DUE TO LOW SEAL INJECTION FLOW, HIGH PRESSURE INDICATIONS, AND A STEAM LEAK.	POWER OPERATIONS AT 28% DURING A SHUTDOWN	SJ	EQUIP	REDUCING
LASALLE 2	6/22/2000	374200000 3	AUTO	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL WHEN A TURBINE DRIVEN RX FEED PUMP WAS LOST. THE CAUSE WAS THE INTRUSION OF WEAR PRODUCTS INTO THE HIGH PRESSURE CONTROL OIL PRESSURE REGULATING RELIEF VALVE WHICH CAUSED THE FEED PUMP CONTROL VALVE TO CLOSE.	POWER OPERATIONS AT 98%	SJ	EQUIP	OPERATE
LASALLE 2	12/1/2000	374200000 6	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON HIGH RX VESSEL WATER LEVEL WHILE PLACING THE TURBINE DRIVEN RX FEEDWATER PUMP IN SERVICE. THE CAUSE WAS INADEQUATE EVOLUTION PREPARATION COMBINED WITH SLUGGISH RESPONSE FROM THE FEEDWATER AND RX LEVEL CONTROL SYSTEM.	POWER OPERATIONS AT 33%	SJ	PRSNLERR	RAISING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode	
QUAD CITIES 1	12/6/2000	254200001 0	AUTO	A RX SCRAM OCCURRED ON LOW RX VESSEL WATER LEVEL WHEN A FEED WATER REGULATING VALVE LOCKED UP. THE CAUSE WAS AGE RELATED FAILURE OF A SOLDER JOINT ON THE MASTER CONTROLLER FOR THE FEED WATER REGULATING VALVE.	POWER OPERATIONS AT 100%	SJ	EQUIP	OPERATE	
LASALLE 2	4/6/2001	374200100 1	AUTO	A TURBINE/RX TRIP OCCURRED ON HIGH RX WATER LEVEL. THE CAUSE WAS A BLOWN FUSE IN THE FEEDWATER CONTROL SYSTEM WHICH CAUSED THE RX RECIRCULATION PUMPS TO DOWN SHIFT.	POWER OPERATIONS AT 100%	SJ	EQUIP	MAINTEN	
NINE MILE PT. 2	12/2/2001	410200100 6	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING RX WATER LEVEL FOLLOWING THE LOSS OF A FEEDWATER PUMP. THE FEEDWATER PUMP MOTOR FAILED AS A RESULT OF A FAULTY DESIGN THAT LED TO CORONA INDUCED DAMAGE.	SCRAM FROM 75% FOLLOWING REDUCTION FROM 100%	SJ	EQUIP	REDUCING	
CLINTON 1	5/13/2002	461200200 2	AUTO	A RX SCRAM OCCURRED ON HIGH RX WATER LEVEL WHEN A RX FEED PUMP FAILED TO RESPOND TO A LOWERED DEMAND SIGNAL DURING POWER UPRATE TESTING ON FEEDWATER LEVEL CONTROL. THE CAUSE WAS LOCK UP OF THE RX FEED PUMP LIMIT SWITCH GUIDE FROM MECHANICAL BINDING.	POWER OPERATIONS AT 86%	SJ	EQUIP	TESTING	
SUSQUEH ANNA 1	9/24/2003	387200300 6	AUTO	A RX SCRAM OCCURRED ON LOW RX VESSEL LEVEL AFTER A FEED PUMP TRIPPED DURING FEED PUMP TESTING. THE CAUSE WAS PERSONNEL ERROR DURING THE TESTING.	POWER OPERATIONS AT 100%	SJ	PRSNLERR	TESTING	
DRESDEN 2	9/30/2003	237200300 3	AUTO	A RX TRIP OCCURRED ON LOW RX VESSEL WATER LEVEL AFTER A RX FEEDPUMP TRIPPED. THE CAUSE WAS A FAULT ON ONE PHASE OF THE RX FEEDPUMP CABLE.	POWER OPERATIONS AT 85%	SJ	EQUIP	OPERATE	

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LASALLE 1	11/27/2003	373200300 5	MAN	THE RX WAS MANUALLY SCRAMMED ON DECREASING RX WATER LEVEL WHILE PERFORMING A POWER REDUCTION AND TRANSFER FROM THE TURBINE TO MOTOR DRIVEN RX FEED PUMP. THE CAUSE WAS A STUCK OPEN TURBINE DRIVEN FEED PUMP DISCHARGE CHECK VALVE.	POWER OPERATIONS AT 20%	SJ	EQUIP	REDUCING
PEACH BOTTOM 2	2/22/2004	277200400 1	MAN	THE RX WAS MANUALLY SCRAMMED ON DEGRADING MAIN CONDENSER VACUUM. THE CAUSE WAS A LEAKING RX FEEDPUMP TURBINE EXHAUST EXPANSION JOINT.	SCRAM FROM 43% FOLLOWING REDUCTION FROM 100%	SJ	EQUIP	OPERATE
COLUM. NUCLEAR 2	8/15/2004	397200400 5	MAN	THE RX WAS MANUALLY SCRAMMED WHEN THE RUNNING RX FEEDWATER PUMP TRIPPED ON HIGH RX FEEDWATER TURBINE DRAIN TANK LEVEL. THE CAUSE WAS INADEQUATE INTERFACE REQUIREMENTS BETWEEN NORMAL AND SHUTDOWN OPERATING CONDITIONS.	18% POWER DURING A RX STARTUP	SJ	OTHER	RAISING
COLUM. NUCLEAR 2	8/17/2004	397200400 6	MAN	THE RX WAS MANUALLY TRIPPED DURING A STARTUP WHEN THE OPERATING RX FEEDWATER PUMP TRIPPED ON LOW SUCTION PRESSURE. OPERATOR ERROR RESULTED IN UNCONTROLLED FEEDWATER HEATER FILLING THAT CAUSED THE FEEDWATER SYSTEM TRANSIENT.	POWER OPERATIONS AT 20%	SJ	PRSNLERR	RAISING
NINE MILE PT. 1	8/30/2004	220200400 4	MAN	THE RX WAS MANUALLY SCRAMMED ON OSCILLATING RX VESSEL WATER LEVEL AFTER A FEEDWATER LEVEL CONTROL VALVE BEGAN OPERATING ERRATICALLY. THE CAUSE WAS A RUPTURED DIAPHRAGM IN THE OUTPUT PILOT VALVE FOR THE "13" FEEDWATER FLOW CONTROL VALVE POSITIONER.	POWER OPERATIONS AT 100%	SJ	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BRUNSWICK 2	4/9/2005	3242005002	AUTO	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL AFTER THE ONLY OPERATING FEEDPUMP TRIPPED ON LOW SUCTION PRESSURE DURING POWER ASCENSION TESTING. THE CAUSE WAS NO PROCEDURAL GUIDANCE EXISTED FOR LIMITING CONDENSATE SYSTEM FLOW RATE DURING THE TESTING.	POWER OPERATIONS AT 65%	SJ	PROCEDUR	TESTING
COLUM. NUCLEAR 2	6/23/2005	3972005004	AUTO	A SCRAM OCCURRED ON LOW RX WATER LEVEL AFTER A FEEDWATER PUMP WAS LOST. THE CAUSE WAS A FALSE LOW SUCTION PRESSURE SIGNAL RESULTING WHEN A TECHNICIAN TOUCHED THE WRONG TERMINATION POINT WITH A MULTI METER DURING MAINTENANCE.	POWER OPERATIONS AT 23%	SJ	PRSNLERR	MAINTEN
BROWNS FERRY 2	8/5/2005	2602005007	AUTO	A SCRAM OCCURRED ON LOW RX WATER LEVEL FOLLOWING THE LOSS OF THE "2C" AND "2B" RX FEED PUMPS. THE CAUSE WAS DISCONNECTED CONTROL VALVE LINKAGE FOR ONE PUMP AND A THRUST BEARING WEAR DETECTOR TRIP ON THE OTHER PUMP.	POWER OPERATIONS AT 100%	SJ	EQUIP	OPERATE
RIVER BEND	10/19/2006	4582006007	AUTO	AN AUTOMATIC SCRAM OCCURRED FOLLOWING CLOSURE OF THE FEEDWATER ISOLATION VALVES. THE VALVES CLOSED WHEN THE OPERATOR DROPPED A CHART RECORDER ON THEIR PUSHBUTTONS.	STEADY STATE AT 100%.	SJ	PRSNLERR	OPERATE
PERRY	12/13/2006	4402006005	MAN	LOSS OF INSTRUMENT AIR CAUSED A FEEDWATER TRANSIENT WITH THE REACTOR FEED BOOSTER PUMPS CAVITATING. THE REACTOR WAS MANUALLY SCRAMMED.	STEADY STATE AT 100%.	SJ	EQUIP	OPERATE
HOPE CREEK	1/29/2007	3542007001	AUTO	AN AUTOMATIC SCRAM OCCURRED DUE TO LOW REACTOR WATER LEVEL. THE LOW LEVEL WAS CAUSED BY THE REACTOR FEED PUMP MINIMUM FLOW RECIRCULATION VALVE OPENING IN RESPONSE TO A FAILED INSTRUMENT TAP WELD.	POWER OPERATIONS AT 22%	SJ	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LIMERICK 2	4/24/2007	353200700 3	AUTO	THE REACTOR TRIPPED ON LOW REACTOR WATER LEVEL, THIS EVENT WAS CAUSED BY FAILURE OF A REDUNDANT REACTIVITY CONTROL SYSTEM CARD COINCIDENT WITH SURVEILLANCE TESTING OF THE FEEDWATER CONTROL SYSTEM.	STEADY STATE AT 100%.	SJ	EQUIP	TESTING
PERRY	5/15/2007	440200700 1	AUTO	DURING DIGITAL FEEDWATER TUNING, THE REACTOR TRIPPED ON LOW REACTOR LEVEL. WITH THE FEEDWATER PUMP IN MANUAL, LEVEL STARTED GOING DOWN, THE OPERATOR WAS UNABLE TO RESTORE SUFFICIENT FLOW. THIS EVENT WAS CAUSED BY AN UNDETECTED DESIGN LOGIC ERROR.	AT 30% POWER FOR FEEDWATER TUNING.	SJ	PRSNLERR	TESTING
OYSTER CREEK	7/17/2007	219200700 1	AUTO	THE REACTOR TRIPPED ON LOW REACTOR WATER LEVEL FOLLOWING LOSS OF THE "C" FEEDWATER PUMP. THE FEEDWATER PUMP TRIPPED DUE TO AN ELECTRICAL FAULT.	STEADY STATE AT 100%.	SJ	EQUIP	OPERATE
GRAND GULF	8/21/2007	416200700 3	AUTO	WITH THE IC TECH GROUP WORKING IN A FEEDWATER CONTROL PANEL, THE "A" FEEDWATER PUMP CONTROLLER FAILED DOWNSCALE, RESULTING IN A LOW REACTOR LEVEL SCRAM. NO DEFINITIVE CAUSE HAS BEEN DETERMINED.	STEADY STATE AT 100%.	SJ	EQUIP	MAINTEN
RIVER BEND	11/7/2007	458200700 6	MAN	THE REACTOR WAS MANUALLY SCRAMMED WHEN A FAULT ON A 480V SWITCHGEAR TRANSFORMER RESULTED IN LOSS OF THE "A" NON-SAFETY 13.8KV BUS, WHICH CAUSED THE CONDENSATE AND FEED PUMPS TO TRIP.	AT 75%.	SJ	EQUIP	OPERATE
GRAND GULF	10/23/2008	416200800 4	AUTO	A REACTOR FEED PUMP SPEED DECREASED TO ZERO RESULTING IN A REACTOR TRIP ON LOW REACTOR LEVEL. THE CAUSE OF THE FEEDWATER FLOW LOSS WAS ACCIDENTAL ISOLATION OF THE STEAM INLET VALVES BY AN OPERATOR.	10%	SJ	PRSNLERR	TESTING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
PEACH BOTTOM 3	9/13/2009	278200900 6	MAN	DURING REACTOR SHUTDOWN, THE REACTOR WAS MANUALLY TRIPPED WHEN THE FEEDWATER LEVEL CONTROLLER ADDED ENOUGH COLD WATER TO CAUSE REACTOR PERIOD TO DROP BELOW 50 SECONDS.	SHUTTING DOWN AT 0%.	SJ	EQUIP	OPERATE
NINE MILE PT. 1	10/5/2009	220200900 3	MAN	THE REACTOR WAS MANUALLY SCRAMMED DUE TO FAILURE OF THE FEEDWATER LEVEL CONTROL SYSTEM. THE CAUSE OF THE FAILURE WAS A PROGRAMMING ERROR IN THE FIRMWARE THAT CONTROLS THE FEEDWATER PUMP FLOW CONTROL VALVE.	STEADY STATE AT 100%.	SJ	EQUIP	OPERATE
GRAND GULF	3/8/2010	416201000 1	AUTO	THE REACTOR TRIPPED ON DECREASING REACTOR WATER LEVEL. THE DECREASING LEVEL WAS CAUSED BY A REACTOR FEED PUMP MIN FLOW VALVE FAILING OPEN DUE TO AN ERRONEOUS FLOW SIGNAL AND THE RFP TRIPPING DUE TO A SPEED DEMAND MISMATCH CAUSED BY A LINKAGE BINDING.	STEADY STATE AT 100%.	SJ	EQUIP	OPERATE
SUSQUEH ANNA 1	4/22/2010	387201000 2	AUTO	THE REACTOR AUTOMATICALLY TRIPPED AT 32% POWER DURING TESTING OF THE INTEGRATED FEEDWATER CONTROL SYSTEM. THE REACTOR TRIPPED ON LOW WATER LEVEL.	32%.	SJ	EQUIP	TESTING
BRUNSWI CK 1	5/5/2010	325201000 3	AUTO	FOLLOWING LOSS OF A REACTOR FEEDWATER PUMP WITH FAILURE OF THE RECIRC PUMPS TO RUN BACK, THE REACTOR TRIPPED ON LOW REACTOR WATER LEVEL. THE CAUSE OF THE FEEDWATER PUMP TRIP WAS A PULSATION DAMPER INSTALLED IN THE RFP FLOW SENSING LINE.	STEADY STATE AT 100%.	SJ	EQUIP	OPERATE
SUSQUEH ANNA 1	5/14/2010	387201000 2	AUTO	THE REACTOR TRIPPED ON HIGH WATER LEVEL DURING TESTING OF THE INTEGRATED FEEDWATER CONTROL SYSTEM.	66% FOR TESTING.	SJ	EQUIP	TESTING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
NINE MILE PT. 2	8/11/2011	4102011003	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO THE DISCOVERY OF A THROUGH WALL LEAK ON THE FEEDWATER PUMP MINIMUM FLOW LINE.	STARTING UP AT 15%.	SJ	EQUIP	OPERATE
GRAND GULF	2/19/2012	4162012002	MAN	The reactor was manually tripped at 23% during shutdown due to lowering reactor vessel level. The "B" RFP had been running and is being investigated.	Reducing Power at 23%.	SJ	Equip	Reducing
RIVER BEND	5/24/2012	4582012003	MAN	The operator manually tripped the reactor due to loss of feedwater. An electrical transient concurrent with the attempted start of The B RFP resulted in loss of all feedwater. Smoke but no fire was observed coming from the RFP B termination cabinet.	At 33%.	SJ	Equip	Operate
FERMI 2	6/25/2012	3412012003	MAN	At 1322 to 1325 EDT multiple vibration related alarms were received for the south reactor feed pump, and the pump tripped at 1325 EDT. Manual operation of the north reactor feed pump was used initially to recover reactor level. At 1330 hours a manual scram was performed by placing the reactor mode switch in shutdown in response to degrading condenser vacuum.	Raising Power at 26%.	SJ	Equip	Raising
MONTICE LLO	9/25/2012	2632012003	AUTO	A BUS 12 LOCKOUT OCCURRED DURING MAINTENANCE ON THE BUS 12 AMMETER. THIS RESULTED IN LOSS OF A REACTOR FEED PUMP AND A RECIRC PUMP. THE RESULTING HIGH REACTOR WATER LEVEL CAUSED A TURBINE TRIP, TRIPPED THE REACTOR FEED PUMP, AND SCRAMMED THE REACTOR.	STEADY STATE AT 100%.	SJ	Equip	Mainten
NINE MILE PT. 1	11/3/2012	2202012005	AUTO	THE REACTOR TRIPPED ON LOW REACTOR WATER LEVEL, FOLLOWING A TURBINE TRIP ON HIGH REACTOR WATER LEVEL. THE CAUSE WAS AN ELECTRONIC FAILURE IN THE FEEDWATER CONTROL SYSTEM.	AT 24% POWER.	SJ	Equip	Operate

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
SUSQUEH ANNA 2	12/19/2012	388201200 4	AUTO	THE REACTOR TRIPPED ON LOW RPV LEVEL WHILE TRANSITIONING RFP "A" FROM DISCHARGE PRESSURE MODE TO FLOW CONTROL MODE. WHEN THE RFP DISCHARGE VALVE FAILED TO OPEN, OPERATORS OPENED THE VALVE'S BKR, INADVERTENTLY ISOLATING FEEDWATER FLOW TO THE VESSEL.	RAISING POWER AT 18%.	SJ	Equip	Raising
PERRY	1/22/2013	440201300 1	AUTO	THE REACTOR TRIPPED ON LOW REACTOR WATER LEVEL DUE TO LOSS OF FEEDWATER FLOW. THE CAUSE WAS A FAILURE IN THE DIGITAL FEED CONTROL SYSTEM.	STEADY STATE AT 100%.	SJ	Equip	Operate
PILGRIM	8/22/2013	293201300 8	MAN	The reactor was manually tripped due to lowering reactor level caused by the trip of all three MFPs. The pumps tripped due to a loss of pump seal cooling water power.	Steady State at 98% power.	SJ	Equip	Operate
SUSQUEH ANNA 2	9/14/2013	388201300 3	MAN	While shutting down, the reactor was manually tripped following a trip of all RFPs due to high reactor level. The high level resulted from an error in the feed control system when transitioning the operating RFP from flow control to pressure control mode.	Shutting down at 14% power.	SJ	Equip	Reducing
CLINTON 1	12/13/2013		MAN	The reactor was manually tripped due to RPV level approaching a trip setpoint, while swapping to a turbine-driven feedwater pump.	Raising power at 18%.	SJ	Unknown	Operate
BROWNS FERRY 3	4/15/2000	296200000 1	AUTO	A RX SCRAM OCCURRED ON LOW RX VESSEL WATER LEVEL FOLLOWING A MARKED SPEED REDUCTION OF A RX FEED PUMP. THE CAUSE WAS A CLOGGED FEED PUMP CONTROL OIL FILTER. AFTER RECEIVING A HIGH DP ALARM, OPERATORS DELAYED SWAPPING THE FILTER WITH A CLEAN ONE.	POWER OPERATIONS AT 70%	SL	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BRUNSWICK 1	1/12/2003	3252003001	AUTO	A RX TRIP OCCURRED ON LOW RX VESSEL WATER LEVEL FOLLOWING A FEED PUMP TRIP. THE CAUSE WAS INSUFFICIENT LUBE OIL PRESSURE MARGIN ON THE RX FEED PUMP BEARING HEADER AFTER THE RUNNING FEEDPUMP LUBE OIL PUMP TRIPPED.	POWER OPERATIONS AT 94%	SL	EQUIP	OPERATE
LASALLE 2	9/7/2001	3742001004	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING THE LOSS OF TWO LOW PRESSURE FEEDWATER HEATER STRINGS. THE CAUSE WAS INADEQUATE PROCEDURES THAT ALLOWED THE HEATER DRAINS TO BE LINED UP INCORRECTLY FOR EXISTING PLANT CONDITIONS.	POWER ASCESION AT 75%	SM	PROCEDUR	RAISING
NINE MILE PT. 1	3/7/2005	2202005001	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED FOLLOWING A SPURIOUS ACTUATION OF THE MOISTURE SEPARATOR TANK LEVEL SWITCH. THE CAUSE WAS A SHORT CIRCUIT RESULTING FROM WATER INTRUSION INTO A JUNCTION BOX.	POWER OPERATIONS AT 100%	SN	EQUIP	OPERATE
BROWNS FERRY 3	9/17/2005	2962005002	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON LOW MAIN CONDENSER VACUUM DURING A MAINTENANCE ACTIVITY TO REPAIR IN PLACE A SECONDARY PLANT HIGH PRESSURE FEEDWATER HEATER LEVEL CONTROL VALVE. AN AIR INLEAKAGE PATH WAS CREATED DURING THE MAINTENANCE ACTIVITY.	POWER OPERATIONS AT 73%	SN	EQUIP	MAINTEN
HATCH 1	7/10/2000	3212000004	AUTO	A TURBINE TRIP/RX SCRAM RESULTED FROM AN INVALID TURBINE BEARING HIGH VIBRATION TRIP SIGNAL. THE TURBINE BEARING VIBRATION INSTRUMENT FAILED.	POWER OPERATIONS AT 100%	TA	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
NINE MILE PT. 2	9/17/2000	4102000014	AUTO	A TURBINE TRIP/RX TRIP RESULTED FROM HIGH TURBINE BEARING VIBRATION. THE CAUSE WAS OIL WHIP/WHIRL (MOVEMENT OF THE OIL WEDGE BETWEEN THE TURBINE SHAFT AND BEARING SLEEVE). LOW LUBE OIL TEMP MADE CONDITIONS FAVORABLE FOR OIL WHIP/WHIRL.	POWER OPERATIONS AT 70%	TA	OTHER	RAISING
OYSTER CREEK	11/15/2000	2192000011	AUTO	A RX SCRAM OCCURRED ON LOW RX WATER LEVEL WHILE WARMING THE MAIN TURBINE. AS A RESULT OF PERSONNEL ERROR, SEVERAL TURBINE BYPASS VALVES OPENED, CAUSING RX LEVEL TO INCREASE. OPERATORS OVERCOMPENSATED WHEN LOWERING FEEDWATER FLOW AND INCREASING LETDOWN.	STARTUP MODE AT 5%	TA	PRSNLERR	RAISING
LASALLE 2	5/27/2001	3742001002	AUTO	A TURBINE TRIP/RX SCRAM RESULTED FROM HIGH TURBINE VIBRATION DURING TURBINE CONTROL VALVE (TCV) TESTING. THE CAUSE WAS A HIGH RESISTANCE CONNECTION IN THE TCV #3 POSITION INDICATION CIRCUITRY.	POWER OPERATIONS AT 80%	TA	EQUIP	TESTING
DRESDEN 2	11/7/2001	2372001005	AUTO	A SCRAM RESULTED FROM HIGH TURBINE FIRST STAGE PRESSURE WITH THE TURBINE STOP VALVES CLOSED DURING TURBINE SHELL WARMING ACTIVITIES. THE CAUSE WAS PERSONNEL ERROR IN THAT PRESSURE WAS INADEQUATELY MONITORED.	POWER OPERATIONS AT 8%	TA	PRSNLERR	RAISING
LIMERICK 1	5/19/2002	3522002003	AUTO	A RX SCRAM/TURBINE TRIP OCCURRED ON TURBINE THRUST BEARING WEAR DETECTOR ACTUATION DURING TURBINE COMBINED INTERMEDIATE VALVE TESTING. THE CAUSE WAS MOST LIKELY LOOSENESS IN THE STRUCTURE THAT HOLDS THE THRUST BEARING IN PLACE.	POWER OPERATIONS AT 94%	TA	EQUIP	TESTING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
DRESDEN 3	7/21/2002	249200200 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON LOW DISCHARGE PRESSURE FROM THE TURBINE SHAFT BEARING OIL PUMP. THE CAUSE WAS DEGRADATION OF THE ROTOR GEAR COUPLING INSULATION RESULTING IN CURRENT FLOW THROUGH THE GEAR SHAFTS AND ACCELERATED WEAR OF THE BEARINGS.	POWER OPERATIONS AT 100%	TA	EQUIP	OPERATE
PERRY	9/22/2002	440200200 1	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED DURING TESTING WHEN THE TURBINE PROTECTION DEVICE TRIP TEST MALFUNCTIONED AND CAUSED THE MAIN TURBINE TO TRIP. THE CAUSE WAS FAILURE OF THE TURBINE TRIP LATCH ASSEMBLY TO RESET AS A RESULT OF TWO MISSING SETSCREWS.	POWER OPERATIONS AT 90%	TA	EQUIP	OPERATE
LIMERICK 2	3/3/2003	353200300 1	AUTO	A RX SCRAM OCCURRED ON A MANUAL TURBINE TRIP DUE TO ELEVATED MAIN TURBINE VIBRATION LEVELS. THE CAUSE WAS INADEQUATE OIL DEFLECTOR GAPS ON THE MAIN TURBINE AND INADEQUATE LOW PRESSURE TURBINE GLAND SEAL CLEARANCES.	POWER OPERATIONS AT 26%	TA	EQUIP	REDUCING
CLINTON 1	4/11/2003	461200300 2	MAN	THE RX WAS MANUALLY TRIPPED FROM VIBRATIONS ON THE MAIN TURBINE TRENDING UP TO THE TRIP SETPOINT. THE CAUSE WAS DEFICIENT OPERATING PROCEDURES WHICH DID NOT PROVIDE SUFFICIENT OPERATING RESTRICTIONS OF THE NEW MONOBLOCK TURBINE ROTOR.	POWER OPERATIONS AT 33% WHILE SHUTTING DOWN	TA	PROCEDUR	REDUCING
COOPER STATION	5/26/2003	298200300 4	MAN	THE RX WAS MANUALLY SCRAMMED ON HIGH MAIN TURBINE VIBRATION. THE MOST PROBABLE CAUSE FOR TURBINE BLADE FAILURE IN THE LOW PRESSURE TURBINE WAS MATERIAL CONDITION CONSISTANT WITH AGE-RELATED/END-OF-LIFE TYPE FAILURES.	SCRAM FROM 89% FOLLOWING REDUCTION FROM 100%	TA	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
RIVER BEND	9/22/2003	4582003008	AUTO	A RX SCRAM OCCURRED ON HIGH RX PRESSURE DURING MAIN TURBINE CONTROL VALVE TESTING. THE CAUSE WAS ERRATIC SPEED SIGNALS POSSIBLY RESULTING FROM ELECTROSTATIC DISCHARGE IN THE TURBINE THAT CAUSED THE CONTROL VALVES TO CLOSE.	POWER OPERATIONS AT 78%	TA	EQUIP	TESTING
DRESDEN 3	1/24/2004	2492004001	AUTO	A TURBINE/RX TRIP OCCURRED DURING MAIN TURBINE TESTING. THE CAUSE WAS A MALFUNCTION OF THE MAIN TURBINE MASTER TRIP SOLENOID VALVES RESULTING FROM IMPROPER DESIGN.	POWER OPERATIONS AT 96%	TA	EQUIP	TESTING
QUAD CITIES 2	3/30/2004	2652004003	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED DURING TURBINE THRUST BEARING WEAR DETECTOR TESTING. THE CAUSE WAS THE INAPPROPRIATE USE OF THE WRONG SURVEILLANCE PROCEDURE.	POWER OPERATIONS AT 72%	TA	PRSNLERR	TESTING
SUSQUEH ANNA 1	4/21/2004	3872004003	MAN	THE RX WAS MANUALLY SCRAMMED ON MAIN TURBINE HIGH VIBRATION DURING STARTUP TURBINE TESTING FOLLOWING TURBINE REPLACEMENT. THE CAUSE WAS INADEQUATE PLANS TO DEAL WITH DEVELOPING CONDITIONS.	POWER OPERATIONS AT 17%	TA	PROCEDUR	TESTING
BROWNS FERRY 3	11/23/2004	2962004002	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED AS THE RESULT OF A GRID DISTURBANCE CAUSED BY A LIGHTNING STRIKE.		TA	NATURALP	OPERATE
PEACH BOTTOM 2	7/10/2005	2772005001	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED WHEN A FAILED MAIN TURBINE MECHANICAL TRIP VALVE ROUTINE TEST WAS INCORRECTLY ABORTED. THE CAUSE WAS FAILURE TO FOLLOW A PROCEDURE.	POWER OPERATIONS AT 100%	TA	PRSNLERR	TESTING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
COLUM. NUCLEAR 2	10/31/2006	397200600 1	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE TRIP CAUSED BY LOW AUTO STOP OIL PRESSURE. THE CAUSE OF THE FAILURE WAS A FAILED DIGITAL ELECTRO-HYDRAULIC DIGITAL INPUT CARD.	STEADY STATE AT 100%	TA	EQUIP	OPERATE
DUANE ARNOLD	11/6/2006	331200600 5	AUTO	THE REACTOR TRIPPED AUTOMATICALLY FOLLOWING A TURBINE TRIP DURING TURBINE TESTING. THE CAUSE OF THE TRIP IS A NOISE SPIKE IN COMBINATION WITH NORMALLY OPEN CONTACTS BEING STUCK CLOSED.	STEADY STATE AT 100%.	TA	EQUIP	TESTING
VERMON T YANKEE	8/30/2007	271200700 3	AUTO	DURING SURVEILLANCE TESTING OF THE TURBINE STOP VALVE, THE VALVE CLOSED AND WOULD NOT OPEN. THE VALVE WAS OPENED WITH MECHANICAL ASSISTANCE. HOWEVER, A STOP VALVE CLOSURE SIGNAL WAS GENERATED, WHICH TRIPPED THE REACTOR.	OPERATING AT REDUCED POWER (63%).	TA	EQUIP	TESTING
PERRY	11/28/2007	440200700 4	AUTO	THE REACTOR TRIPPED DUE TO A TURBINE CONTROL VALVE FAST CLOSURE SIGNAL. THE CAUSE OF THE TRIP WAS FAILURE OF THE POWER SUPPLIES IN THE DIGITAL FEEDWATER CONTROL SYSTEM.	STEADY STATE AT 100%.	TA	EQUIP	OPERATE
RIVER BEND	3/5/2008	458200800 2	AUTO	THE REACTOR TRIPPED ON HIGH REACTOR PRESSURE. THE APPARENT CAUSE WAS A MALFUNCTION OF THE MAIN TURBINE CONTROL SYSTEM DUE TO A LOOSE, OIL-CONTAMINATED, ELECTRICAL CONNECTOR.	60%.	TA	EQUIP	OPERATE
HATCH 1	7/4/2008	321200800 3	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE TRIP. THE CAUSE OF THE TURBINE TRIP WAS DUE TO MODIFICATIONS TO THE TURBINE ELECTRO-HYDRAULIC CONTROLLER SUCH THAT A LOW PRESSURE WAS SENSED IN THE EHC DURING TESTING, RESULTING IN A TURBINE TRIP.	STEADY STATE AT 100%.	TA	EQUIP	TESTING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BRUNSWICK 1	11/26/2008	3252008007	AUTO	AN APPARENT MALFUNCTION OF THE EHC WHILE SYNCHRONIZING THE MAIN GENERATOR TO THE GRID RESULTED IN THE MSIVS GOING CLOSED AND A SUBSEQUENT AUTOMATIC REACTOR SCRAM.	22%, SYNCHRONIZING MAIN GEN TO GRID.	TA	EQUIP	OPERATE
FERMI 2	3/28/2009	3412009001	MAN	WHILE REDUCING POWER FOR SHUTDOWN, THE MAIN TURBINE #1 BEARING EXPERIENCED HIGH VIBRATIONS. THE OPERATORS MANUALLY TRIPPED THE REACTOR. THE CAUSE OF THE HIGH VIBRATIONS WAS ATTRIBUTED TO HIGH PRESSURE TURBINE RUB TRANSVERSING BEARING 1.	REDUCING POWER AT 24%.	TA	EQUIP	OPERATE
PERRY	6/21/2009	4402009001	AUTO	THE REACTOR TRIPPED FOLLOWING A MAIN TURBINE TRIP. THE CAUSE OF THE TURBINE TRIP WAS AN INVALID MOISTURE SEPARATOR REHEATER HIGH LEVEL SIGNAL. THE INVALID SIGNAL WAS DUE TO INCORRECT ADJUSTMENT OF THE LEVEL SWITCH FOLLOWING MAINTENANCE.	STEADY STATE AT 100%.	TA	EQUIP	OPERATE
LASALLE 2	8/15/2009	3742009001	AUTO	THE REACTOR SCRAMMED FOLLOWING A TURBINE TRIP. THE TURBINE TRIPPED DURING WEEKLY TURBINE TRIP TESTING. THE CAUSE OF THE TURBINE TRIP WAS FAILURE OF A CARD IN THE ELECTRO-DIGITAL CONTROL SYSTEM.	STEADY STATE AT 100%.	TA	EQUIP	TESTING
FERMI 2	3/25/2010	3412010001	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE TRIP. THE TURBINE TRIP WAS CAUSED BY A SHORTED CURRENT TRANSFORMER WIRE IN THE MAIN GENERATOR Z PHASE LINE TERMINAL BUSHING ENCLOSURE.	AT 63%.	TA	EQUIP	OPERATE
DUANE ARNOLD	4/26/2010	3312010003	MAN	DURING A PLANNED SHUTDOWN, THE REACTOR WAS MANUALLY TRIPPED DUE TO INCREASING VIBRATIONS ON A MAIN TURBINE BEARING.	SHUTTING DOWN AT 14%.	TA	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
FERMI 2	6/6/2010	341201000 2	AUTO	FOLLOWING A PARTIAL LOSS OF OFFSITE POWER DUE TO SEVERE WEATHER, THE REACTOR TRIPPED FOLLOWING A TRIP OF THE MAIN TURBINE GENERATOR. THE TURBINE TRIPPED DUE TO FAST CLOSURE OF A TURBINE CONTROL VALVE.	STEADY STATE AT 100%.	TA	NATURALP	OPERATE
MONTICELLO	11/19/2011	263201100 9	AUTO	THE REACTOR AUTOMATICALLY TRIPPED DURING TURBINE BYPASS VALVE TESTING. THE CAUSE OF THE TRIP WAS ACTUATION OF THE MAIN TURBINE ACCELERATION RELAY (LOAD REJECTION) PRESSURE SWITCHES. THE ROOT CAUSE IS UNDER INVESTIGATION.	AT 90%.	TA	Equip	Testing
RIVER BEND	12/23/2011	458201100 3	AUTO	THE REACTOR TRIPPED FOLLOWING A TRIP OF THE MAIN TURBINE. THE CAUSE OF THE TURBINE TRIP IS BELIEVED TO BE DUE TO THE LOSS OF A SPEED SENSOR.	POWER OPERATIONS AT 100%	TA	Equip	Operate
PERRY	3/1/2012	440201200 1	MAN	The reactor was manually tripped following an automatic turbine runback. At the time, the stator water Cooling Pressure gauge was being restored from maintenance. The turbine generator runback resulted from restoration of a generator stator water cooling system pressure gauge after calibration. A low pressure condition was created in a sensing line common to the gauge and associated pressure switch when a technician opened the gauge isolation valve. The low pressure condition resulted in pressure switch actuation on low pressure and was the direct cause of the turbine generator runback.	Steady State at 100%.	TA	Equip	Mainten
QUAD CITIES 2	4/18/2012	265201200 3	AUTO	THE REACTOR SCRAMMED ON HIGH REACTOR PRESSURE. THE PRESSURE INCREASE OCCURRED DURING POST-MODIFICATION TESTING OF THE MAIN GENERATOR VOLTAGE REGULATOR.	AT 20%.	TA	Equip	Testing

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
FITZPATRI CK	11/4/2012	333201200 7	AUTO	THE REACTOR TRIPPED FOLLOWING A TRIP OF THE MAIN TURBINE. THE TURBINE TRIP WAS CAUSED BY FAILURE OF THE TURBINE EMERGENCY LOCKOUT VALVE.	STEADY STATE AT 100%.	TA	Equip	Operate
GRAND GULF	12/29/2012	416201200 8	AUTO	THE REACTOR TRIPPED DUE TO A TURBINE TRIP. FOLLOWING A SECOND SCRAM ON JANUARY 4, 2013, THE CAUSE WAS DETERMINED TO BE GROUNDING OF THE MAIN GENERATOR "A" PHASE NEUTRAL CURRENT TRANSFORMER.	STEADY STATE AT 100%.	TA	Equip	Operate
GRAND GULF	1/4/2013	416201300 1	AUTO	THE REACTOR AUTOMATICALLY TRIPPED. THE CAUSE WAS A TURBINE/GENERATOR TRIP DUE TO A MAIN GENERATOR PHASE NEUTRAL CURRENT TRANSFORMER PARTIAL GROUNDING DUE TO INADEQUATE CLEARANCE.	STEADY STATE AT 94%.	TA	Equip	Operate
GRAND GULF	7/30/2013	416201300 3	AUTO	THE REACTOR TRIPPED ON HIGH REACTOR PRESSURE DUE TO THE TURBINE CONTROL VALVES GOING CLOSED. THE CAUSE WAS A HUMAN PERFORMANCE-INDUCED ERROR DUE TO INADEQUATE TROUBLESHOOTING ON THE TURBINE STRESS EVALUATOR.	STEADY STATE AT 100%.	TA	Equip	Operate
OYSTER CREEK	12/14/2013	219201300 4	MAN	During Turbine Valve testing, the reactor was manually tripped when the plant experienced a rise in reactor pressure. Turbine Control Valves 2 and 3 had failed closed due to loose Servo Motor feedback lever brackets.	Steady State at 100%.	TA	Equip	Testing
LIMERICK 1	3/4/2014		MAN	The reactor was manually scrammed in response to Main Turbine EHC system failure. The UHC failure resulted in the LP Turbine's Intercept Valves failing closed.	Steady State at 100%.	TA	Equip	Operate
GRAND GULF	3/29/2014		AUTO	THE REACTOR TRIPPED FOLLOWING A TRIP OF THE MAIN TURBINE. THE CAUSE OF THE TRIP IS UNDER INVESTIGATION.	AT 87% POWER.	TA	Equip	Operate

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
DUANE ARNOLD	6/23/2000	331200000 2	AUTO	A TURBINE TRIP/RX TRIP OCCURRED FOLLOWING A MAIN GENERATOR LOCKOUT. THE CAUSE WAS A LOOSE CONNECTION ON A MAIN GENERATOR CURRENT TRANSFORMER SECONDARY LEAD.	POWER OPERATIONS AT 100%	TB	EQUIP	OPERATE
RIVER BEND	1/15/2005	458200500 1	MAN	THE RX WAS MANUALLY SCRAMMED DUE TO INDICATIONS AND ALARMS OF A GENERATOR FIELD GROUND FAULT. ONE OF THE FIVE RECTIFIER BANKS IN THE GENERATOR EXCITATION CONTROL SYSTEM WAS THE SOURCE OF THE GROUND. THE CAUSE WAS DEPOSITION OF STATOR CORROSION PRODUCTS.	POWER OPERATIONS AT 100%	TB	EQUIP	OPERATE
SUSQUEH ANNA 1	11/25/2006	387200600 6	AUTO	THE REACTOR TRIPPED AUTOMATICALLY FOLLOWING A TURBINE TRIP. THE APPARENT CAUSE WAS IMPROPER SETTINGS OF THE CURRENT COMPENSATOR IN THE GENERATOR AUTOMATIC VOLTAGE REGULATOR.	STEADY STATE AT 100%.	TB	EQUIP	OPERATE
BROWNS FERRY 2	1/11/2007	260200700 1	AUTO	THE REACTOR SCRAMMED DUE TO A TURBINE TRIP. THE TURBINE TRIPPED DUE TO THE MAIN 500KV OUTPUT BREAKER OPENING. THE CAUSE OF THE GENERATOR LOAD REJECTION WAS A FAILED RELAY IN THE MAIN GENERATOR VOLTAGE REGULATOR.	STEADY STATE AT 100%.	TB	EQUIP	MAINTEN
BROWNS FERRY 3	12/31/2007	296200700 5	AUTO	THE REACTOR TRIPPED FOLLOWING A MAIN GENERATOR LOAD REJECTION. THE CAUSE OF THE LOAD REJECTION WAS A SPURIOUS OPERATION OF THE GENERATOR PHASE DISCORDANCE RELAY.	STEADY STATE AT 100%.	TB	EQUIP	OPERATE
GRAND GULF	3/21/2008	416200800 2	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE STOP AND CONTROL VALVE FAST CLOSURE. THE PROBABLE CAUSE WAS A C PHASE DIFFERENTIAL TRIP OF THE MAIN TRANSFORMER.	STEADY STATE AT 100%.	TB	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
LIMERICK 1	3/22/2008	3522008002	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE TRIP. THE CAUSE OF THE TURBINE TRIP WAS A DEFECTIVE RELAY IN THE MAIN GENERATOR PROTECTION LOGIC.	POWER ASCENSION AT 87%.	TB	EQUIP	OPERATE
BRUNSWICK 2	8/30/2008	3242008001	AUTO	A MALFUNCTION OF THE ELECTRO-HYDRAULIC CONTROL SYSTEM CAUSED THE TURBINE BYPASS VALVES TO CYCLE. THE REACTOR AUTOMATICALLY TRIPPED JUST PRIOR TO BEING MANUALLY TRIPPED. THE TRIP WAS PROBABLY DUE TO A SHORT IN THE MAIN GENERATOR'S CURRENT MONITOR CIRCUIT.	STEADY STATE AT 100%.	TB	EQUIP	OPERATE
BROWNS FERRY 2	10/4/2008	2602008001	AUTO	THE REACTOR TRIPPED FOLLOWING A TURBINE-GENERATOR LOAD REJECTION SIGNAL. THE CAUSE OF THE LOAD REJECTION SIGNAL WAS A FAILED RELAY IN THE TURBINE GENERATOR VOLTAGE REGULATOR.	STEADY STATE AT 100%.	TB	EQUIP	OPERATE
GRAND GULF	10/26/2008	4162008005	AUTO	A TURBINE TRIP AND SUBSEQUENT REACTOR TRIP OCCURRED FOLLOWING A TURBINE CONTROL VAVE FAST CLOSURE. THE FAST CLOSURE WAS CAUSED BY FAILURE OF THE MAIN GENERATOR VOLTAGE REGULATOR.	50%.	TB	EQUIP	OPERATE
BROWNS FERRY 1	2/18/2009	2592009001	AUTO	THE RX TRIPPED FOLLOWING A MAIN TURBINE TRIP. THE TURBINE TRIP WAS CAUSED BY A POWER LOAD UNBALANCED SIGNAL DUE TO A NEUTRAL OVER VOLTAGE CONDITION. THE CAUSE OF THE TRIP WAS A GROUND CAUSED BY WATER ENTRAINED IN THE ISOPHASE BUS DUCT COOLING SYSTEM.	STEADY STATE AT 100%.	TB	EQUIP	OPERATE
BROWNS FERRY 3	9/28/2011	2962011003	AUTO	THE REACTOR TRIPPED FOLLOWING A MAIN TURBINE TRIP. THE TURBINE TRIPPED DUE TO A GENERATOR-NEUTRAL-OVERVOLTAGE RELAY ACTUATION. THE CAUSE OF THE RELAY ACTUATION IS UNDER INVESTIGATION.	STEADY STATE AT 100%.	TB	Equip	Operate

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
BROWNS FERRY 3	5/29/2012	2962012005	AUTO	THE REACTOR TRIPPED DUE TO TURBINE CONTROL VALVE FAST CLOSURE CAUSED BY A LOAD REJECTION SIGNAL FROM THE MAIN GENERATOR. THE LOAD REJECTION WAS CAUSED BY THE MAIN TRANSFORMER DIFFERENTIAL RELAY 387T.	AT 75% POWER.	TB	Equip	Operate
NINE MILE PT. 1	10/29/2012	2202012004	AUTO	THE REACTOR AUTOMATICALLY TRIPPED DUE TO GENERATOR LOAD REJECTION. THE CAUSE OF THE LOAD REJECTION WAS A GENERATOR LOCKOUT RELAY RESULTING FROM A SWITCHYARD FAULT.	STEADY STATE AT 100%.	TB	Equip	Operate
GRAND GULF	1/14/2013	4162013002	AUTO	THE REACTOR TRIPPED DUE TO A GENERATOR/TURBINE TRIP. THE CAUSE WAS A GROUND IN THE GENERATOR ISOLATED PHASE BUS COOLING SYSTEM.	STEADY STATE AT 100%.	TB	Equip	Operate
CLINTON 1	3/7/2013	4612013002	AUTO	THE REACTOR AUTOMATICALLY TRIPPED FOLLOWING A GENERATOR/TURBINE TRIP. THE CAUSE WAS A BLOWN FUSE IN THE C PHASE VOLTAGE REGULATING POTENTIAL TRANSFORMER. THE FUSE FAILED DUE TO A MANUFACTURING DEFECT IN THE SOLDER CONNECTION.	STEADY STATE AT 97%.	TB	Equip	Operate
NINE MILE PT. 2	3/9/2006	4102006001	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED ON A LOSS OF CONDENSER VACUUM. THE CAUSE WAS A LOSS OF SEALING STEAM WHEN MECHANICAL LINKAGE FOR THE PRESSURE INDICATING CONTROLLER BECAME DISCONNECTED.	POWER OPERATIONS AT 85%	TC	EQUIP	OPERATE
DRESDEN 3	1/30/2004	2492004002	AUTO	A TURBINE/RX TRIP OCCURRED ON LOW MAIN TURBINE LUBE OIL PRESSURE WHILE SWAPPING LUBE OIL COOLERS. THE CAUSE WAS INADEQUATE PROCEDURAL GUIDANCE FOR SWAPING MAIN TURBINE LUBE OIL COOLERS.	POWER OPERATIONS AT 97%	TD	PROCEDUR	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
COLUM. NUCLEAR 2	6/26/2009	397200900 3	MAN	THE REACTOR WAS MANUALLY TRIPPED WHEN A FIRE WAS OBSERVED BETWEEN THE MAIN TURBINE BEARINGS. THE FIRE THAT WAS CAUSED BY LEAKING LUBE OIL WAS EXTINGUISHED IN 17 MINUTES. THE LUBE OIL LEAK WAS DUE TO AN OUT OF CAL PRESS SWITCH ON THE LO EXHAUSTER SYSTEM.	INCREASING POWER AT 75%.	TD	EQUIP	OPERATE
QUAD CITIES 2	5/22/2000	265200000 7	AUTO	A RX SCRAM OCCURRED ON HIGH FLUX WHILE RETURNING A TURBINE CONTROL VALVE TO SERVICE FOLLOWING CORRECTIVE MAINTENANCE. THE HIGH FLUX RESULTED FROM AN UNANTICIPATED RESPONSE OF THE CONTROL VALVES, MOST LIKELY RESULTING FROM AIR ENTRAPPED IN THE EHC SYSTEM.	POWER OPERATIONS AT 100%	TG	OTHER	OPERATE
CLINTON 1	2/4/2001	461200100 2	AUTO	A TURBINE TRIP/RX SCRAM OCCURRED DUE TO LOW TURBINE EMERGENCY TRIP SYSTEM PRESSURE DURING TURBINE VALVE TESTING. THE CAUSE WAS FAILURE TO INSTALL AN EHC FLUID FLOW RESTRICTING ORIFICE AS RECOMMENDED IN A GENERAL ELECTRIC TECHNICAL INFORMATION LETTER.	POWER OPERATIONS AT 96%	TG	OTHER	TESTING
BRUNSWI CK 2	2/23/2001	324200100 1	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING A TURBINE EHC SYSTEM FAILURE. THE CAUSE WAS AN INTERMITTENT ELECTRICAL CONNECTION THAT RESULTED IN A FALSE HIGH TURBINE SPEED SIGNAL AND TURBINE TRIP.	POWER OPERATIONS AT 37% WHILE SHUTTING DOWN	TG	EQUIP	REDUCING
RIVER BEND	4/21/2001	458200100 1	AUTO	A RX SCRAM OCCURRED ON RX PRESSURE VESSEL HIGH PRESSURE RESULTING FROM CLOSURE OF THE MAIN TURBINE CONTROL VALVES DURING TURBINE CONTROL VALVE TESTING. THE LIKELY CAUSE WAS DETERMINED TO BE A TURBINE SPEED SIGNAL ERROR GENERATED DURING TESTING.	POWER OPERATIONS AT 58%	TG	EQUIP	TESTING

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
NINE MILE PT. 2	5/16/2001	410200100 1	AUTO	A TURBINE/RX TRIP RESULTED FROM THE FAILURE OF A RELAY IN THE ELECTRO HYDRAULIC CONTROL SYSTEM.	POWER OPERATIONS AT 90%	TG	EQUIP	OPERATE
PEACH BOTTOM 2	7/1/2001	277200100 2	AUTO	A TURBINE/RX TRIP OCCURRED DURING TROUBLESHOOTING OF THE TURBINE EHC SYSTEM. THE CAUSE WAS THE FAILURE OF AN EHC SYSTEM POWER SUPPLY.	POWER OPERATIONS AT 100%	TG	EQUIP	TRBLSHOT
RIVER BEND	9/18/2002	458200200 1	AUTO	A RX SCRAM OCCURRED ON HIGH NEUTRON FLUX AFTER THE MAIN TURBINE CONTROL VALVES CLOSED. THE MOST LIKELY CAUSE WAS A MOMENTARY GROUND CONDITION ON THE +22V TURBINE ELECTROHYDRAULIC CONTROL SYSTEM BUS.	POWER OPERATIONS AT 100%	TG	EQUIP	OPERATE
PEACH BOTTOM 2	12/21/2002	277200200 1	AUTO	A RX SCRAM OCCURRED ON AN MSIV CLOSURE RESULTING FROM LOW RX PRESSURE. THE CAUSE WAS A TURBINE EHC CIRCUIT CARD FAILURE THAT CAUSED MULTIPLE TURBINE BYPASS VALVES TO OPEN.	POWER OPERATIONS AT 100%	TG	EQUIP	OPERATE
RIVER BEND	2/22/2003	458200300 1	MAN	THE RX WAS MANUALLY TRIPPED ON A MAIN TURBINE ELECTRO HYDRAULIC CONTROL SYSTEM OIL LEAK. THE LEAK OCCURRED WHEN A SECTION OF HYDRAULIC TUBING NEAR THE MAIN TURBINE CONTROL VALVES DEVELOPED A THROUGH WALL CRACK.	POWER OPERATIONS AT 90%	TG	EQUIP	OPERATE
BRUNSWICK 2	4/4/2003	324200300 3	AUTO	A RX SCRAM OCCURRED ON AN MSIV CLOSURE AFTER AN ELECTROHYDRAULIC CONTROL MALFUNCTION CAUSED THE MAIN TURBINE BYPASS VALVES TO OPEN. THE CAUSE WAS AN INTERMITTENT ERROR SIGNAL FROM AN EHC CARD THAT WAS IMPROPERLY ENGAGED IN ITS HARDWARE SLOT.	POWER OPERATIONS AT 22%	TG	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
HOPE CREEK	10/4/2003	3542003008	MAN	THE RX WAS MANUALLY SCRAMMED DUE TO AN EHC SYSTEM OIL LEAK ASSOCIATED WITH A COMBINED INTERMEDIATE CONTROL VALVE. THE VALVE WAS NOT PROPERLY REASSEMBLED FOLLOWING MAINTENANCE.	POWER OPERATIONS AT 100%	TG	EQUIP	OPERATE
BROWNS FERRY 2	7/8/2004	2602004001	AUTO	A RX SCRAM OCCURRED ON A SPURIOUS TURBINE GENERATOR LOAD REJECT SIGNAL. THE CAUSE WAS AN INADEQUATE PROCEDURE GOVERNING TRANSFER OF A 120 VAC UPS BUS AND A CONTRIBUTING FACTOR WAS AN INADEQUATE EHC SYSTEM SOFTWARE CONFIGURATION.	POWER OPERATIONS AT 100%	TG	PROCEDUR	MAINTEN
COLUM. NUCLEAR 2	7/30/2004	3972004004	AUTO	A RX SCRAM OCCURRED ON HIGH RCS PRESSURE FOLLOWING THE CLOSURE OF A TURBINE GOVERNOR VALVE. THE CAUSE WAS FAILURE OF A CIRCUIT BOARD IN THE TURBINE DIGITAL ELECTRONIC CONTROL SYSTEM.	POWER OPERATIONS AT 100%	TG	EQUIP	OPERATE
PEACH BOTTOM 2	12/22/2004	2772004003	AUTO	A SCRAM OCCURRED ON MSIV CLOSURE RESULTING FROM LOW MAIN STEAM LINE PRESSURE FOLLOWING A MALFUNCTION OF THE ELECTROHYDRAULIC CONTROL SYSTEM. THE CAUSE WAS A FAILED EHC PRESSURE REGULATOR CIRCUIT CARD.	POWER OPERATIONS AT 100%	TG	EQUIP	OPERATE
DRESDEN 2	3/24/2005	2372005002	AUTO	A RX SCRAM OCCURRED ON MSIV CLOSURE FOLLOWING MAIN STEAM LINE HIGH FLOW. THE CAUSE WAS AN INCREASE IN ELECTRICAL RESISTANCE BETWEEN PINS ON A TURBINE EHC SYSTEM CIRCUIT CARD THAT RESULTED IN OPENING THE TURBINE BYPASS VALVES.	POWER OPERATIONS AT 96%	TG	EQUIP	OPERATE
COLUM. NUCLEAR 2	6/15/2005	3972005003	AUTO	A RX SCRAM OCCURRED ON TURBINE THROTTLE VALVE CLOSURE. THE MOST LIKELY CAUSE WAS FAILURE OF DEH CIRCUIT CARDS.	POWER OPERATIONS AT 100%	TG	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
QUAD CITIES 1	6/17/2005	2542005005	AUTO	A RX SCRAM OCCURRED ON HIGH PRESSURE FOLLOWING A FAILURE IN THE EHC SYSTEM WHICH RESULTED IN CLOSURE OF THE MAIN TURBINE CONTROL VALVES. THE CAUSE WAS A FAILURE IN ONE OF THE CONTROL VALVE INPUT CIRCUIT CARDS IN THE EHC SYSTEM.	POWER OPERATIONS AT 85%	TG	EQUIP	OPERATE
LASALLE 1	2/20/2006	3732006001	AUTO	A RX SCRAM OCCURRED ON LOW RCS PRESSURE AFTER A TURBINE CONTROL SYSTEM MALFUNCTION RESULTED IN OPENING ALL MAIN TURBINE BYPASS VALVES DURING A NORMAL SHUTDOWN. THE CAUSE WAS A FAILED POWER SUPPLY IN THE MAIN TURBINE EHC SYSTEM.	POWER OPERATIONS AT 6% DURING A SHUTDOWN	TG	EQUIP	REDUCING
COOPER STATION	2/26/2006	2982006001	MAN	THE RX WAS MANUALLY SCRAMMED ON HIGH MOISTURE SEPARATOR LEVEL AFTER A REHEAT VALVE FAILED TO OPEN DURING CONDUCT OF A SURVEILLANCE TEST. THE CAUSE WAS CONTAMINATION OF EHC FLUID IN THE TURBINE CONTROL SYSTEM.	POWER OPERATIONS AT 70%	TG	UNKNOWN	TESTING
BROWNS FERRY 3	8/29/2006	2962006003	MAN	THE REACTOR WAS MANUALLY TRIPPED AT 78% POWER DUE TO AN OIL LEAK IN THE #2 MAIN TURBINE CONTROL VALVE HYDRAULIC SYSTEM.	REDUCING POWER FROM 100%	TG	EQUIP	OPERATE
BROWNS FERRY 1	5/24/2007	2592007002	MAN	THE REACTOR WAS MANUALLY TRIPPED DURING STARTUP DUE TO AN OIL LEAK IN THE MAIN TURBINE ELECTRO-HYDRAULIC CONTROL SYSTEM.	STARTING UP AT 3%.	TG	EQUIP	MAINTEN
BROWNS FERRY 1	9/3/2007	2592007008	MAN	A REACTOR TRIP WAS MANUALLY INITIATED DUE TO AN INCREASING LEAK IN THE TURBINE GENERATOR'S ELECTRO-HYDRAULIC CONTROL SYSTEM. THE CAUSE WAS A THROUGH WALL LEAK DUE TO FRETTING OF THE EHC TUBING AGAINST A STEEL SUPPORT MEMBER.	STEADY STATE AT 72%.	TG	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
COLUM. NUCLEAR 2	8/21/2008	397200800 1	AUTO	DURING TESTING OF A NEW DIGITAL ELECTRO-HYDRAULIC QUADVOTER VALVE, A LEAK DEVELOPED, WHICH DROPPED DEH RESERVOIR LEVEL 8 INCHES. THIS RESULTED IN BOTH A MAIN TURBINE TRIP AND REACTOR TRIP.	DOWN POWERED TO 65% FOR MAINTENANCE.	TG	EQUIP	TESTING
COLUM. NUCLEAR 2	2/8/2009	397200900 1	AUTO	THE REACTOR TRIPPED DURING DEH TESTING FOLLOWING MAINTENANCE ON THE DEH QUADVOTER VALVE SOLENOID. THE CAUSE OF THE SCRAM WAS A GOVERNOR VALVE FAST CLOSURE DUE TO A DEH TRIP HEADER PRESSURE FLUCTUATION DUE TO AIR INTRODUCED DURING MAINTENANCE.	REDUCED POWER AT 75% FOR PMT.	TG	EQUIP	MAINTEN
COOPER STATION	11/6/2009	298200900 2	MAN	THE REACTOR WAS MANUALLY TRIPPED FOLLOWING A MANUAL TRIP OF THE MAIN TURBINE. THE TURBINE WAS TRIPPED DUE TO AN UN-ISOLABLE LEAK IN THE TURBINE HIGH-PRESSURE FLUID SYSTEM.	REDUCING POWER AT 20%.	TG	EQUIP	OPERATE
COLUM. NUCLEAR 2	11/7/2009	397200900 5	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO A LEAK IN THE DIGITAL ELECTRO-HYDRAULIC CONTROL SYSTEM. THE LEAK IN THE AREA OF THE QUAD-VOTER HYDRAULIC TRIP SUBSYSTEM WAS CAUSED BY AN O-RING FAILURE DUE TO INCORRECT ASSEMBLY FOLLOWING MAINTENANCE.	POWER REDUCED TO 52% FOR MAINTENANCE.	TG	EQUIP	OPERATE
COOPER STATION	11/11/2009	298200900 4	MAN	THE REACTOR WAS MANUALLY TRIPPED FOLLOWING A MANUAL TRIP OF THE MAIN TURBINE DUE TO AN UN-ISOLABLE LEAK ON THE TURBINE HIGH-PRESSURE FLUID SYSTEM.	ASCENDING POWER AT 15%.	TG	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
NINE MILE PT. 1	5/2/2011	2202011001	AUTO	WITH THE POWER REDUCED TO 47% FOR FEED PUMP MAINTENANCE, THE REACTOR AUTOMATICALLY TRIPPED FOLLOWING A MAIN TURBINE TRIP. THE CAUSE OF THE TURBINE TRIP FLUCTUATIONS IN THE OIL PRESSURE TO THE MASTER TRIP SOLENOID CAUSED BY LOOSE FITTINGS.	POWER REDUCED TO 47% FOR MAINT.	TG	EQUIP	OPERATE
LIMERICK 2	5/29/2011	3532011004	AUTO	REACTOR TRIPPED DUE TO LOW FLUID PRESSURE IN THE TURBINE-GENERATOR ELECTRO-HYDRAULIC-CONTROL SYSTEM. THE SYSTEM WAS BEING RESTORED FOLLOWING MAINTENANCE.	AT 75%.	TG	EQUIP	MAINTEN
CLINTON 1	4/26/2013	4612013003	MAN	The reactor was manually tripped due to a rapidly decreasing level in the main Turbine's EHC oil reservoir. The cause of the oil loss was broken/loose socket head cap screws used to attach a hydraulic shutoff valve to a main steam turbine control valve.	Steady State at 97%.	TG	Procedur	Operate
COLUM. NUCLEAR 2	5/8/2009	3972009002	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO THE LOSS OF THE MAIN GENERATOR SEAL OIL SYSTEM. THE SEAL OIL FILTER BECAME CLOGGED DURING TESTING AND SEAL OIL PRESSURE COULD NOT BE RESTORED.	STEADY STATE AT 87%.	TI	EQUIP	TESTING
FERMI 2	12/6/2001	3412001004	MAN	THE RX WAS MANUALLY SCRAMMED FOLLOWING THE LOSS OF STATOR WATER COOLING. A HEAT EXCHANGER VENT LINE BROKE OFF WHILE TAKING A STATOR WATER SAMPLE. THE CAUSE WAS INADEQUATE PROBLEM RESOLUTION DATING BACK TO 1996 AND INADEQUATE ORIGINAL VENT LINE DESIGN.	POWER OPERATIONS AT 100%	TJ	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
NINE MILE PT. 2	12/16/2002	4102002006	AUTO	A RX SCRAM OCCURRED ON HIGH RX PRESSURE FOLLOWING A LOSS OF MAIN GENERATOR STATOR WATER COOLING AND TURBINE RUNBACK. THE STATOR WATER COOLING TEMPERATURE CONTROLLER MECHANICAL LINKAGE CONNECTION FAILED FROM VIBRATION INDUCED FATIGUE FAILURE.	SCRAM FROM 60% FOLLOWING RUNBACK FROM 100%	TJ	EQUIP	OPERATE
DRESDEN 2	12/11/2003	2372003007	MAN	THE RX WAS MANUALLY SCRAMMED AFTER AN UNEXPECTED STATOR WATER COOLING RUNBACK ON HIGH STATOR COOLING WATER SYTEM TEMPERATURE. THE CAUSE WAS A FAILED TEMPERATURE CONTROL VALVE TEMPERATURE CONTROLLER.	POWER OPERATIONS AT 96%	TJ	EQUIP	OPERATE
BROWNS FERRY 2	2/16/2009	2602009001	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO LOSS OF STATOR WATER COOLING TO THE MAIN GENERATOR. THE CAUSE OF THE LOSS OF STATOR WATER COOLING WAS THE SINGLE-POINT FAILURE OF THE TEMPERATURE CONTROL VALVE.	STEADY STATE AT 100%.	TJ	EQUIP	OPERATE
HATCH 2	6/20/2009	3662009003	AUTO	A MAIN GENERATOR RUNBACK OCCURRED DUE TO THE RECEIPT OF A MAIN GENERATOR HIGH TEMPERATURE SIGNAL. A HIGH REACTOR PRESSURE SCRAM OCCURRED DURING THE RUNBACK. THE CAUSE OF THE HIGH GENERATOR TEMPERATURE SIGNAL WAS IMPROPER SET-UP OF THE CONTROL INSTRUMENT.	STEADY STATE AT 100%.	TJ	PRSNLERR	OPERATE
FERMI 2	9/30/2009	3412009002	MAN	THE REACTOR WAS MANUALLY TRIPPED IN RESPONSE TO HYDROGEN GAS IN-LEAKAGE INTO THE STATOR COOLING WATER SYSTEM FROM THE MAIN TURBINE GENERATOR. THE IN-LEAKAGE WAS CAUSED BY A HOLE WORN INTO THE COPPER STATOR WATER BAR.	STEADY STATE AT 100%.	TJ	EQUIP	OPERATE

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode	
FERMI 2	11/7/2012	3412012006	MAN	The reactor was manually tripped due to hydrogen gas in-leakage into the Main Turbine Generator Stator Water Cooling System.	At 68% power.	TJ	Equip	Operate	
FERMI 2	9/3/2004	3412004002	AUTO	A TURBINE/RX TRIP OCCURRED WHEN AN AUTOMATIC VOLTAGE REGULATOR TRIP RELAY CAUSED A MAIN GENERATOR TRIP. THE CAUSE WAS A FAILED ELECTRONIC COMMUNICATION SYSTEM IN THE MAIN GENERATOR EXCITATION SYSTEM.	POWER OPERATIONS AT 100%	TL	EQUIP	OPERATE	
FERMI 2	12/4/2004	3412004004	AUTO	A TURBINE/RX TRIP OCCURRED ON A MAIN GENERATOR TRIP FROM AN AUTO VOLTAGE REGULATOR TRIP. THE CAUSE WAS THE INSTALLATION OF THREE NEW ELECTRONIC CARDS IN THE GENERATOR EXCITER THAT WERE INCOMPATIBLE WITH THE ORIGINAL SYSTEM DESIGN.	POWER OPERATIONS AT 60%	TL	EQUIP	RAISING	
SUSQUEH ANNA 2	6/6/2005	3882005005	AUTO	A RX SCRAM OCCURRED ON A LOAD REJECTION. THE MAIN GENERATOR EXCITATION SYSTEM HAD FAILED TO POSITIVELY RESPOND TO CHANGES TO THE OFFSITE GRID WHICH RESULTED IN A LOSS OF GENERATOR FIELD CAUSING THE LOCKOUT.	POWER OPERATIONS AT 100%	TL	EQUIP	OPERATE	
BROWNS FERRY 3	12/26/2010	2962010004	MAN	THE REACTOR WAS MANUALLY TRIPPED DUE TO HIGH VIBRATIONS ON THE GENERATOR EXCITER INBOARD AND OUTBOARD JOURNAL BEARINGS.	STEADY STATE AT 100%.	TL	EQUIP	OPERATE	
NINE MILE PT. 1	9/20/2012	2202012002	AUTO	AN AUTOMATIC REACTOR SCRAM OCCURRED FOLLOWING A GENERATOR TRIP. DUE TO A PROCEDURAL ERROR, THE GENERATOR EXCITATION CONTROLS FAILED TO MAINTAIN REACTIVE LOAD BELOW THE TRIP SETPOINT WHEN TRANSFERRED FROM AUTO TO MANUAL REGULATION.	STEADY STATE AT 100%.	TL	Equip	Operate	

PL_NAME	EvDate	LER	Scram	ScramDescription	PowerHistory	RPS_System	RPS_Cause	Root_Mode
DRESDEN 3	7/5/2001	249200100 3	MAN	THE RX WAS MANUALLY SCRAMMED DUE TO INCREASING DRYWELL PRESSURE. THE CAUSE WAS A LOSS OF CONTAINMENT COOLING AFTER A COMPONENT COOLING WATER TEMPERATURE CONTROL VALVE DISK AND STEM SEPARATED.	POWER OPERATIONS AT 100%	VB	EQUIP	OPERATE
FERMI 2	1/24/2005	341200500 1	MAN	THE RX WAS MANUALLY SCRAMMED ON INDICATIONS OF UNIDENTIFIED RX COOLANT LEAKAGE GREATER THAN TEN GPM. THE LEAKAGE WAS LATER DISCOVERED TO BE FROM THE RX BUILDING CLOSED COOLING WATER SYSTEM VIA A FAILED END BELL GASKET ON DRYWELL COOLER NUMBER FOUR.	POWER OPERATIONS AT 100%	VB	EQUIP	OPERATE

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