Nuclear Power Plant Fire Ignition Frequency and Non-Suppression Probability Estimation Using the Updated Fire Events Database

United States Fire Event Experience Through 2009

U.S. Nuclear Regulatory Commission
Office of Nuclear Regulatory Research
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ABSTRACT

This report documents the development of updated fire ignition frequencies (FIFs) and non-suppression probability (NSP) estimates as potential improvements for nuclear power plant fire (NPP) fire probabilistic risk assessment (FPRA) applications. This research follows prior Electric Power Research Institute (EPRI) research aimed at providing an updated methodology to estimate FIFs and collect more recent fire event data.

Fire ignition frequencies and non-suppression probabilities were previously developed in the NUREG/CR-6850/EPRI 1011989 and revised in Supplement 1 to NUREG/CR-6850/EPRI 1019259. In this report, the FIF estimation benefits from an enhanced methodology and incorporates updated data from EPRI's updated Fire Events Database (FEDB). The report also updates low-power and shutdown (LPSD) FIFs from those published in NUREG/CR-7114. NSP estimates are calculated using the existing methodology and have been updated with new fire event experience.

The fire ignition frequencies and non-suppression probabilities published in NUREG/CR-6850 and Supplement 1 incorporate fire event experience through the year 2000. The research presented in this report incorporates U.S. NPP fire event experience through the year 2009. The fire event data are split and analyzed into three distinct periods—1968–1989, 1990–1999, and 2000–2009. The 1968–1989 data are used to develop a diffuse empirical prior to account for operating experience in that period as a starting point for the Bayesian update. Sparse bins (<2.5 fire events) use a 20-year update period, whereas medium and dense bins use only data from 2000–2009.

Approximately 400 of the events from 1990–2009 are of significance for FPRA applications. Included in the estimation of manual NSPs are 442 fire events from 1981 to 2009. The insights conclude that the data from 2000–2009 are the most complete and accurate for characterizing and estimating FIFs for FPRAs.

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EXECUTIVE SUMMARY

In 2002, the Electric Power Research Institute (EPRI) and the Nuclear Regulatory Commission (NRC) Office of Nuclear Regulatory Research (RES), embarked on a program to develop a methodology to perform internal fire probabilistic risk assessments (PRAs). The technical report, *EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, Volume 2: Detailed Methodology* [1], also referred to as NUREG/CR-6850/EPRI 1011989, was published in 2005. This report was divided into specific tasks comprised of methods, data and technical bases to evaluate risk from fire initiation to plant-response modeling as well as fire modeling and suppression.

Background

Task 6 of NUREG/CR-6850, fire ignition frequencies, divides potential plant fire sources into bins that represent location, causal and mechanistic factors deemed important to depict the likelihood of fire scenarios at different NPPs. The generic bin definitions, plant operating mode applicability, and associated frequencies used in FPRA were originally developed and provided in NUREG/CR-6850/EPRI 1011989. An interim revision of those fire frequencies to emphasize the more recent but still 10-year-old data was developed by EPRI and incorporated into Supplement 1 (1019259).

In July 2013, EPRI published *The Updated Fire Events Database: Description of Content and Fire Event Classification Guidance* (1025284), a comprehensive, consolidated source of fire incident data for nuclear power plants operating in the United States. EPRI obtained fire event data from 2000–2009 through an extensive plant-by-plant data collection effort in which more than 300,000 plant records of potential interest were collected and 12,000 potential fire events were identified. Data from 1990–1999 (from the original EPRI Fire Events Database [FEDB]) were updated in quality to the extent such information was available. Fire event data from the period 1968–1989 were retained from the original data set reported in NUREG/CR-6850/EPRI 1011989.

Objectives

This report provides updated fire ignition frequency estimates using the most current FEDB data while applying methodology enhancements. It also provides updated fire non-suppression probability estimates, also using the most current FEDB data with the existing non-suppression probability methodology.

Approach

The effort to revise the fire ignition frequencies and non-suppression probability methodology estimates spanned multiple years. An effort was made to obtain more detailed and recent fire event experience for the most current decade (2000–2009), and there was an emphasis on confirming records from 1990–1999. Published in 2013, *The Updated Fire Events Database* (1025284) provides the most complete, relevant U.S. nuclear power plant operating experience. Eighty four U.S. nuclear power plant completed the full data collection protocol. In addition to the updated database, EPRI reviewed the calculation methods for estimating fire ignition frequencies. The concluded research, titled *An Improved Methodological Approach for Estimating Fire Ignition Frequencies* (1022994), was published in 2011. The report serves as an improved methodology to derive fire ignition frequency distributions for use in FPRAs. As a benefit of the updated methodology, the 2000–2009 data heavily influence the results for the non-sparse bins, account for between-plant variability of fire ignition frequencies, and can handle sparse fire event data sets. EPRI 1022994 provides the technical approach for calculating fire ignition frequencies for the present report. The only deviation from the EPRI 1022994 methodology was to use a more diffuse prior with hyperprior parameter $\sigma_{med}=3$ for the medium-density and high-density bins with 2.5 or more PRA fire counts in the 2000–2009 period.

The non-suppression probability methodology estimates are calculated using the existing methodology as amended in FAQ 08-0050 in NUREG/CR-6850, Supplement 1 (1019259). Therefore, fire brigade response time is already included in the distribution for suppression time. Fire events with sufficient timing information are binned into one of twelve groups. A new curve was developed for low-power and shutdown suppression events in containment.

Results

The results confirm that the fire event data from 2000–2009 are the most complete and accurate. A review of the fire events shows smaller occurrence rates for fires during the 1990–1999 period, possibly due to underreporting, although this could not be confirmed. The rate of fires during shutdown has increased due to lower plant availability and fewer hours spent in shutdown. The sum of fire ignition frequencies has increased 36% relative to that previously estimated in Supplement 1 to NUREG/CR-6850 (1019259), with eight bins having notable increases and four having notable decreases. The remainder of the bins experienced less significant changes.

Keywords

Fire ignition frequency (FIF)
Fire probabilistic risk assessment (FPRA)
Non-suppression probability (NSP)
Fire events

CITATIONS

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LIST OF ACRONYMS

aa	PRA counts for AA bins (all plants all power modes)
AA	All plants all modes
AA-RY	Total reactor years for all plants (at power plus shutdown)
AL	All plants LPSD
ap	PRA counts for AP bins (all plants at power)
AP	All plants at power
apinAP	ap events in AP bins
AP-RY	At power reactor years for all plants for the period
BL	BWR plants LPSD
BP	BWR plants at power
BWR	Boiling water reactor
CD	Cold shutdown
CFR	Code of Federal Regulations
CH	Challenging
DEP	Diffuse empirical priors
EF	Error factor
EN	Emergency Notifications
EPIX	Equipment Performance Information Exchange
EPRI	Electric Power Research Institute
FAQ	Frequently Asked Questions
FEDB	Fire Events Database
FIDs	Fire Event IDs
FIF	Fire ignition frequencies
FPIE	Full-power initiating event
HB	Hierarchical Bayesian
HBDEP	Hierarchical Bayesian with Diffuse Empirical Prior
HEAF	High energy arcing fault
HS	Hot shutdown
INPO	Institute of Nuclear Power Operations
LER	Licensee Event Report
LN	Lognormal distribution
LPSD	Low power-shutdown

MCMC	Markov Chain Monte Carlo
MG	Motor generator
MOU	Memorandum of understanding
NC	Not challenging
NEI	Nuclear Energy Institute
NEIL	Nuclear Electric Insurers Limited
NFPA	National Fire Protection Association
NPE	Nuclear Power Experience
NPP	Nuclear power plant
NPRDS	Nuclear Plant Reliability Data System
NRC	Nuclear Regulatory Commission
NSP	Non-suppression probability
PC	Potentially challenging
PL	PWR plants LPSD
Pns	Probability of non-suppression
PO	Power operations
PP	PWR plants at power
PRA	Probabilistic risk assessment
PWR	Pressurized water reactor
RES	NRC Office of Nuclear Regulatory Research
RF	Refueling
RPS	Reactor protection system
RY	Reactor year
sd	PRA counts for SD bins (all plants at shutdown conditions)
SD	Shutdown
sdinSD	sd events in SD bins
SD-RY	Shutdown reactor years for all plants for the period
T/G	Turbine generator
Tdet	Detection time
Tfb	Time for detection until fire brigade begins to apply suppressant agents
Tsupp	Suppression time
U	Undetermined
U(NC-PC)	Undetermined – at least potentially challenging, with insufficient information available to make a definitive challenging fire
U(PC-CH)	Undetermined – potentially a fire, with insufficient information available to make a definitive potentially challenging fire
US	United States

1
INTRODUCTION

This report describes the analysis of recently updated fire event data to estimate fire ignition frequencies (FIFs) and non-suppression probabilities (NSPs) as potential improvements for NPP fire probabilistic risk assessment (FPRA) applications. These original analyses were previously developed in NUREG/CR-6850 [1] and revised in Supplement 1 [2] to that report. The new fire event data extend the Electric Power Research Institute's (EPRI's) Fire Events Database (FEDB) [3] through 2009—by 10 years from prior studies—and are considered a significant enhancement to the original analyses. The fire ignition frequency estimates provided in Supplement 1 [2] were limited to full-power initiating event (FPIE) FPRA applications. In this report, the FIF estimation has been expanded in scope to include low-power and shutdown (LPSD) FPRA applications according to NUREG/CR-7114 [4].

In summary, this report provides updated FIF estimates using the most current FEDB data and applying methodology enhancements. Means and uncertainties are provided in the form of point estimates and probability distributions. The report also provides updated fire NSP estimates, likewise using the most current FEDB data with the existing NSP methodology.

This report provides the details of the approach, bases, data, and methods used for recalculation of FIFs and NSP estimates. Section 2 provides relevant historical perspective on the development of FIF and NSP estimates. Section 3 examines fire event data quality, completeness, trends, and power mode implications relevant to the data's use in FIF estimates (such issues are much less relevant for NSPs, as will be covered in the relevant section). Those data, along with the existing historical data, have been analyzed for consistency and applicability for estimating updated FIFs and NSPs. Data quality and quantitative factors have also been assessed to ensure proper use of data that were collected, coded, and classified from multiple, somewhat different data sources with varying information, quality, and completeness. Section 4 provides a discussion of the methodology and results for FIF for both full-power initiating events and low-power-shutdown FPRA applications. The previously developed methodology for estimating the updated FIFs for FPRAs was adjusted to account for data anomalies. Then, the fire event data were applied to assess FIFs using the revised method. The updated frequencies have been compared with fire frequencies currently used in FPRAs with initial insights into the differences indicated. Section 5 provides a discussion of the methodology and results for NSP estimates, including comparisons with previous estimates. Appendix A provides the data used in the analyses.

2
BACKGROUND

Between 2006 and 2009, several early applications of the report *EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities* (EPRI 1011989, NUREG/CR-6850 [1]) resulted in seemingly conservative fire-induced risk estimates. These early results necessitated timely development of clarification and enhancements to the report to support the plants transitioning to the risk-informed and performance-based fire protection rule 10CFR50.48(c). This led to an increased focus on the National Fire Protection Association (NFPA) 805 frequently asked questions (FAQs) related to FPRA methods and applications. Meetings in 2008 and early 2009 regarding these FAQs indicated that there were still important technical considerations that needed to be resolved in order to generate timely resolution to support plants transitioning to NFPA 805.

In order to document the responses and final resolution of NFPA 805 FAQs related to the fire PRA methodology, specifically those in EPRI 1011989, NUREG/CR-6850, a supplement to this document was jointly prepared by EPRI and RES [2]. The FAQ resolutions were considered interim and could be expected to undergo further enhancement as supporting data and methodology evolved and became available. In particular, the fire ignition frequencies were updated in the EPRI report *Fire PRA Methods Enhancements: Additions, Clarifications, and Refinements to EPRI 1011989* [5] and included in the resolution to FAQ 08-0048 (published in Chapter 10 of Reference 2), with interim application guidance pending future acquisition of more current fire event data and reanalysis of those data. Resolution of FAQ 08-0050, manual non-suppression probability, was also provided using the original fire event data used to develop NUREG/CR-6850.

Subsequently, EPRI and the Nuclear Energy Institute (NEI) embarked on a project to update the fire event data, reanalyze the fire ignition frequencies, and evaluate apparent trends. An update to the fire non-suppression analyses was later added to the project scope. In parallel, enhanced fire frequency analysis methods were developed and tested by EPRI to better account for between-plant variability when the newer data became available for analysis [6, 7].

The development of the FEDB was led by EPRI in cooperation with the NRC Office of Nuclear Regulatory Research (RES) in accordance with the EPRI-NRC Memorandum of Understanding. As an integral part of the process, the NRC performed audits of the data to ensure accuracy, completeness, and a strong degree of agreement between EPRI and the NRC on fire severity classification and coding. The FEDB, excluding references to the actual plants, was completed and released in July 2013.

The fire events database that supported the development of NUREG/CR-6850 was primarily based on the fire incident data reported in the Nuclear Electric Insurers Limited (NEIL) fire incident database, Licensee Event Reports (LERs), Emergency Notifications (ENs), the Equipment Performance Information Exchange (EPIX), and other available sources. The

documentation and traceability of many data entries and event classifications were not rigorously provided. The updated FEDB uses data collected from a voluntary, but encouraged initiative to provide updated operating experience and enhanced incident detail. The data was collected directly from the plants with explicit traceability to source documents for classification and audit of the data records. Fire event data from the 2000–2009 period were obtained from an extensive plant-by-plant data collection effort in which more than 300,000 plant records of potential interest were collected and 12,000 potential fire events were identified. Existing events from the prior release of the FEDB from the years 1990–1999 have been upgraded in quality to the extent such information is available. This resulted in the addition of a few fire events and the removal of several others that had uncertain fire severity in the 1990–1999 period. Approximately 400 of the fire events from 1990–2009 are of significance for FPRA applications. Fire event data from the period 1968–1989 were retained from the original data set reported in NUREG/CR-6850. These data were determined to be too outdated to update for completeness and quality in a meaningful way. The fire event data collection protocol and review by individual plants had been completed for 84 plants[1] when the updated FEDB was documented and published in the EPRI report *The Updated Fire Events Database: Description of Content and Fire Event Classification Guidance* [3].

[1] Twenty nuclear power plants did not complete the full fire event report quality reviews to ensure condition reports' quality and consistency for the severity level binning process. Fire events from these plants were excluded from this analysis, and the reactor year calculations were reduced to 84 years for the period 2000–2009.

3
FIRE EVENT HISTORICAL DATA ANALYSIS AND QUALITATIVE EXAMINATION

3.1 Overview of Fire Event Data

The fire ignition sources used in FPRAs are divided into groups called *bins* that represent location, causal, and mechanistic factors deemed important to depict frequencies of initiating fire scenarios at different plants. The generic bin definitions, plant operating mode applicability, and associated frequencies used in FPRAs were originally developed and provided in NUREG/CR-6850 [1]. An interim revision of those fire frequencies to emphasize the more recent 10-year-data was developed by EPRI and incorporated in Supplement 1 to NUREG/CR-6850 [2]. Some clarification of fire bin definitions and associated fire event data was also provided in that supplement. The Supplement 1 fire bin definitions have been used in this work for FPIE FIF estimates. More recently, the NRC has defined fire ignition frequency bins for LPSD fire probabilistic risk analyses in NUREG/CR-7114 [4]. These bin definitions have been used for LPSD FIF estimates provided in this report. A simplified summary of the FPIE and LPSD fire ignition frequency bins is provided in Table 3-1. The FPRA and operating mode applicability can be traced directly back to guidance provided in NUREG/CR-6850 [1] and NUREG/CR-7114 [4]. To be consistent with plant practices, separate frequency values have been developed for certain bins where explicit differences are to be expected during LPSD operation.

Table 3-1
FPRA bin summary descriptions and applicability

Bin	Location	Ignition Source	FPRA and Operating Mode Applicability		Source
			FPIE	LPSD	
1	Battery room	Batteries	All	All	NUREG/CR-6850 and NUREG/CR-7114
2	Containment (PWR)	Reactor coolant pump	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
3	Containment (PWR)	Transients and hotwork (at power)	At power	N/A	NUREG/CR-6850
3P	Containment (PWR)	Transients and hotwork (LPSD)	N/A	LPSD	NUREG/CR-7114
3B	Containment (BWR)	Transients and hotwork (LPSD)	N/A	LPSD	NUREG/CR-7114
4	Control room	Main control board	All	All	NUREG/CR-6850 and NUREG/CR-7114

Table 3-1 (continued)
FPRA bin summary descriptions and applicability

Bin	Location	Ignition Source	FPRA and Operating Mode Applicability		Source
			FPIE	LPSD	
5	Control/Aux/ Reactor Building	Cable fires caused by welding and cutting	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
6	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
7	Control/Aux/ Reactor Building	Transients	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
8	Diesel generator room	Diesel generators	All	All	NUREG/CR-6850 and NUREG/CR-7114
9	Plant-Wide Components	Air compressors	All	All	NUREG/CR-6850 and NUREG/CR-7114
10	Plant-Wide Components	Battery chargers	All	All	NUREG/CR-6850 and NUREG/CR-7114
11	Plant-Wide Components	Cable fires caused by welding and cutting	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
12	Plant-Wide Components	Cable run (self-ignited cable fires)	All	All	NUREG/CR-6850 and NUREG/CR-7114
13	Plant-Wide Components	Dryers	All	All	NUREG/CR-6850 and NUREG/CR-7114
14	Plant-Wide Components	Electric motors	All	All	NUREG/CR-6850 and NUREG/CR-7114
15	Plant-Wide Components	Electrical cabinets (non high-energy arcing fault [HEAF])	All	All	NUREG/CR-6850 and NUREG/CR-7114
16.a	Plant-Wide Components	HEAF low-voltage electrical cabinet (480–1000 V)	All	All	FAQ 06-0017
16.b	Plant-Wide Components	HEAF medium-voltage electrical cabinet (>1000 V)	All	All	FAQ 06-0017
16.1	Plant-Wide Components	HEAF segmented bus duct	All	All	FAQ 07-0035

Table 3-1 (continued)
FPRA bin summary descriptions and applicability

Bin	Location	Ignition Source	FPRA and Operating Mode Applicability		Source
			FPIE	LPSD	
16.2	Plant-Wide Components	HEAF iso-phase bus duct	All	All	FAQ 07-0035
17	Plant-Wide Components	Hydrogen tanks	All	All	NUREG/CR-6850 and NUREG/CR-7114
18	Plant-Wide Components	Junction boxes	All	All	NUREG/CR-6850 and NUREG/CR-7114
19	Plant-Wide Components	Misc. hydrogen fires	All	All	NUREG/CR-6850 and NUREG/CR-7114
20	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
21	Plant-Wide Components	Pumps	All	All	NUREG/CR-6850 and NUREG/CR-7114
22	Plant-Wide Components	Reactor protection system (RPS) motor generator (MG) sets	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
23	Plant-Wide Components	Transformers	All	All	NUREG/CR-6850 and NUREG/CR-7114
24	Plant-Wide Components	Transient fires caused by welding and cutting	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
25	Plant-Wide Components	Transients	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
26	Plant-Wide Components	Ventilation subsystems	All	All	NUREG/CR-6850 and NUREG/CR-7114
27	Transformer yard	Transformer – Catastrophic	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
28	Transformer yard	Transformer – Non Catastrophic	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
29	Transformer yard	Yard transformers (others)	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
30	Turbine building	Boiler	All	All	NUREG/CR-6850 and NUREG/CR-7114
31	Turbine building	Cable fires caused by welding and cutting	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114

Table 3-1 (continued)
FPRA bin summary descriptions and applicability

Bin	Location	Ignition Source	FPRA and Operating Mode Applicability		Source
			FPIE	LPSD	
32	Turbine building	Main feedwater pumps	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
33	Turbine building	Turbine generator (T/G) excitor	At power	N/A	NUREG/CR-6850 and NUREG/CR-7114
34	Turbine building	T/G hydrogen	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
35	Turbine building	T/G oil	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
36	Turbine building	Transient fires caused by welding and cutting	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114
37	Turbine building	Transients	At power	LPSD	NUREG/CR-6850 and NUREG/CR-7114

Nuclear power plant fire events that are countable as PRA fires include classifications of challenging (CH), potentially challenging (PC), and undetermined (U). Note that additional distinctions for fire event severity classifications are used in the updated FEDB [3]. These are designated as *U(NC-PC)*, which is identical to *U* in this report, and *U(PC-CH)*, which is identical to *PC* in this report. In this report, fire events classified as *U* were counted as half a fire in a manner similar to the counting scheme used in NUREG/CR-6850. Fire events classified as non-challenging (NC) were not used or counted in any analyses. A summary of the fire severity classifications is provided in the following bullets. For additional details concerning event classification, refer to *The Updated Fire Events Database: Description of Content and Fire Event Classification Guidance* (EPRI 1025284) [3].

The events contained in the FEDB have been classified into one of the following fire severity groups:

- **Challenging.** CH fires are those that had an observable and substantive effect on the environment outside the initiating source, regardless of the exact location of the fire, what was potentially under threat, or what was actually damaged by the fire. The size of the fire is not the only determining characteristic, but rather the ability of the fire to adversely affect components beyond the initial fire source. These include fires in the growth, fully developed, and decay stages. Data fields considered here include those associated with the observed fire characteristics, the means of suppression applied, ignition of secondary combustibles, and the fire-induced environmental conditions. It should be emphasized that damage to additional components beyond the initiating source does not have to occur to meet this condition (for example, an explosion and resulting fire at a main transformer that is limited to the main transformer would be classified as challenging).
- **Potentially challenging.** PC fires are those events that were not judged to be CH events, but under foreseeable alternative circumstances could have reached a CH state. That is, PC fires could have led to fire growth, fire spread, equipment damage, or cable damage beyond the fire ignition source had the circumstances of the fire event been different. Foreseeable alternative circumstances could include failure of any successful defense-in-depth fire protection measure, delays in successful intervention actions, and occurrence of a similar fire involving an alternative fire ignition source. The data fields considered in the PC determination are the same as those considered in the CH fire category, but for the PC case, the fire did not develop into a challenging fire. For example, a fire occurring in an unvented electrical cabinet might be contained within the cabinet and have relatively low severity; however, if it had occurred in a vented cabinet, the potential for a more severe fire that could damage nearby cabinets would exist. Therefore, the unvented cabinet fire is likely to be PC.
- **Undetermined**. U fires are potential fire events where there is insufficient information to determine if the event should be classified as CH, PC or non-challenging (NC). The updated FEDB further classifies undetermined events into U(PC-NC) and U(PC-CH).
- **Non-challenging.** NC-classified fires did not cause or would not have caused adjacent objects or components to become damaged or to ignite, regardless of location and for essentially any amount of time. These fires could be detected automatically by an incipient fire detection system and could be related to component failures involving ignition of the component followed by self-extinguishment without any required intervention. Fires that remained in a smoldering state with no apparent potential for open flaming might also be classified as NC. Another typical example of NC would include component overheating incidents with light or moderate smoking but without any flaming. The NC classification is also applied to fires of a type or in a location that would not be considered relevant to an FPRA (such as an automobile fire in an on-site parking lot or an off-site grass fire). Fires that occurred during plant construction would also be classified as NC.

Due to its evolution over many years, the quality and content of the FEDB vary for different periods. The version of the FEDB used to support the development of NUREG/CR-6850 captured fire event data for the period 1968–2000. The update of the FEDB focused on adding fire event data from 2000 to 2009. A limited update to the fire event data for the period 1990–1999 was also included to enhance the completeness and quality of that earlier data where practical. The updated FEDB, EPRI 1025284 [3], included details and data for the latter two periods of interest—1990–1999 and 2000–2009. It reports the details only for fire events from the 84 plants that completed the full data collection protocol and plant review. The earlier data from 1968–1989 were not updated or published in EPRI 1025284. Fire events from this period remain a separate, proprietary, archived data element of the FEDB. Therefore, the FEDB can be considered to have three distinct data sets with somewhat different data sources, content, quality, and completeness. These three distinct periods are 1968–1989, 1990–1999, and 2000–2009.

Fire event data sources for all three time periods are summarized in Table 3-2. Although the data sources are similar, there are also some significant differences. For instance, in 1984, the reporting requirements for LER according to 10CFR50.73 were substantially changed to move away from component-level to significant event–level reporting. Moreover, the emphasis on and access to fire event data from many sources changed significantly. These included NEIL, the Nuclear Plant Reliability System (NPRDS), and, most important, plant-based records. The latter are the most complete and the principal source for the newer data in the FEDB for the period 2000–2009.

Table 3-2
Fire event data sources for three periods

1968–1989	1990–1999	2000–2009
Data Sources		
• LERs (component-level reporting rules) • Additional data available: ENs, NEIL, NPRDS, plant reports	• LERs (significant event and system-level reporting rules) • Additional data available: ENs, NEIL, NPRDS, plant reports	• Systematic collection of plant-supplied reports and data records • Supplemented with details from LERs and ENs
PRA Fire Event Counts and Reactor Years (all operating modes)		
413 in 1282 reactor years	163.5 in 1081 reactor years	217 in 850 reactor years
At-Power PRA Fire Event Counts and Reactor Years		
273 in 899 reactor years	102 in 848 reactor years	138.5 in 771 reactor years
LPSD PRA Fire Event Counts and Reactor Years		
140 in 383 reactor years	61.5 in 233 reactor years	78.5 in 79 years

It should be noted that the updated FEDB data collection for 2000–2009 included all plants that supplied fire event data to EPRI. However, with one exception, the only data from 2000–2009 used in this report are from the 84 plants that completed the full data collection protocol and plant review. This was to ensure that the fire event data used in the analyses were complete and that plants did a quality review of the data compiled before they were used. The fire event counts

and associated reactor years cited in Table 3-2 are for the 84 plants that completed the full data collection protocol and plant quality assurance review. The one exception involved medium-voltage electrical cabinet HEAF events (bin 16.b) and bus duct events (bins 16.1 and 16.2). With respect to the bus duct events, the potential for missing fire event data for these bins was not considered applicable because all such fire events were provided in FAQ 07-0035 in NUREG/CR-6850, Supplement 1 [2]. Similarly, HEAF events in medium-voltage electrical equipment are likely to be reported to the NRC, thus minimizing the chance for missed events. Therefore, for these bins, 1040 reactor years were used to represent all operating plant years in the period.

The FEDB data from the period 1968–1989 were classified for fire ignition bin categories in NUREG/CR-6850 with a few bin adjustments from Supplement 1. Because additional data and details were obtained for the FEDB fire event data from the 1990–1990 period, these data were re-reviewed for binning classification along with the newer data from 2000–2009. The review was performed by the NRC and EPRI in a consensus-based manner. As a result, the fire event details were checked for numerous events, and some fire data details captured in the FEDB were revised. Several fire severity reclassifications were identified. A second, similar review was conducted to ensure the correctness of fire suppression time details provided in the data from 1990 through 2009. Erroneous fire suppression times based on the FEDB default suppression time algorithm values and suppression-related coding details were corrected for several events. For instance, in some cases, fire event timelines were estimated by plant personnel and reported as the time the plant exited an emergency declaration. These estimations led to suppression times that far exceeded the reported time to fire suppression or fire control. The results of these reviews produced the data set that was used in the analyses for FIF and NSP updates provided in this report. The revised FEDB data sets for the periods 1990–1999 and 2000–2009 are provided in Appendix A for key data elements used in the analyses. The data set for 1968–1989 from the original FEDB that was used in this report is also provided in Appendix A. Events with revisions to fire ignition source, location, severity determination, and suppression timing from the updated FEDB [3] are noted. A few events were determined to be composed of two separate fires. These were identified, split, and classified for FIF and NSP use, as appropriate. Fire event identifications (FIDs) are provided as reference to the more complete fire event data that are available in the updated FEDB report [3] for 1990–2009 data and NUREG/CR-6850 for 1968–1989 data.

3.2 Qualitative Examination of Fire Event Data: Sources and Completeness

The fire event data from the 1968–2009 period were examined to better understand the implications of data quality and completeness in the selection and adaptation of the individual bin fire frequency estimation methodology. The first step was to develop a historical perspective of the occurrence rate of fires from all countable sources contained in the complete and updated FEDB over the full period of interest (1968–2009) for which data were available.

The following examination and depictions of the FEDB data trends were derived using “all operating modes” data. The applicability of the fire events that occur at power or shutdown conditions in deriving bin FIFs is provided in NUREG/CR-6850 [1] and Supplement 1 [2].

Figure 3-1 is an illustration of the contributions to the fire counts from the different data sources for the three time periods. It shows the comparison of fire events reported in the various data sources. There is some reporting overlap, especially for the more severe fires that have been reported in more than one source. Nonetheless, this gives a good indication of the relative magnitude of the data source reports for the three periods.

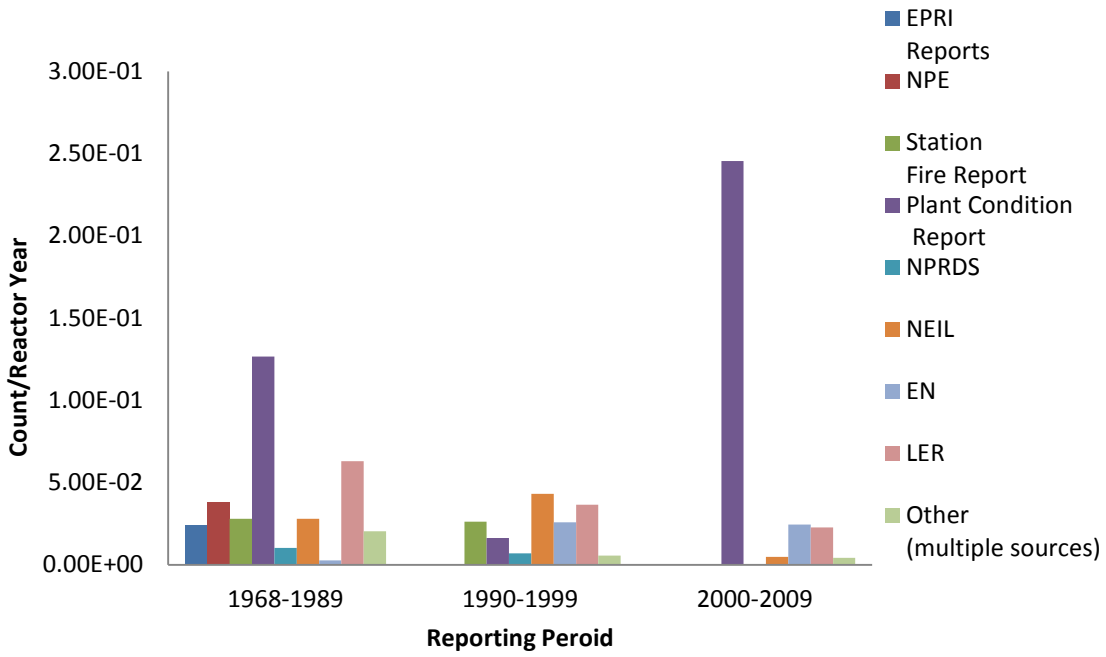

Figure 3-1
Comparison of reporting types for different periods (Overall counts, all modes)

Figure 3-2 shows the historical perspective of the annual PRA fire event occurrence rate (counts per year) over the period 1968–2009. The FEDB data are depicted as original and updated to facilitate visualizing and analyzing differences in the fire event data sets that were collected, coded, and classified over time using different data sources with varying information quality and completeness. There is an obvious discontinuity in the 1990s data. For comparison and insight as to the implications and significance of the apparent deviation in the overall fire counts and associated frequency in the 1990s, fire counts for some of the more significant fires are also shown. These include the challenging fires from the FEDB and fires that the NRC classified as "severe" fires, including any fire event reported through 10CFRCFR50.72(a)(1)(i) or any fire reported through other 50.72 or 50.73 reports that, if plant personnel had not taken action, would have likely required reporting through 10CFR50.72(a)(1)(i) [8]. A review of the challenging fires between 1990 and 2009 does not show a discernable difference in the fire occurrence rate. One possible conclusion is that there was underreporting of the more common but less severe potentially challenging fire events in the 1990–1999 period, which could have provided the frequency decrease in Reference 2.

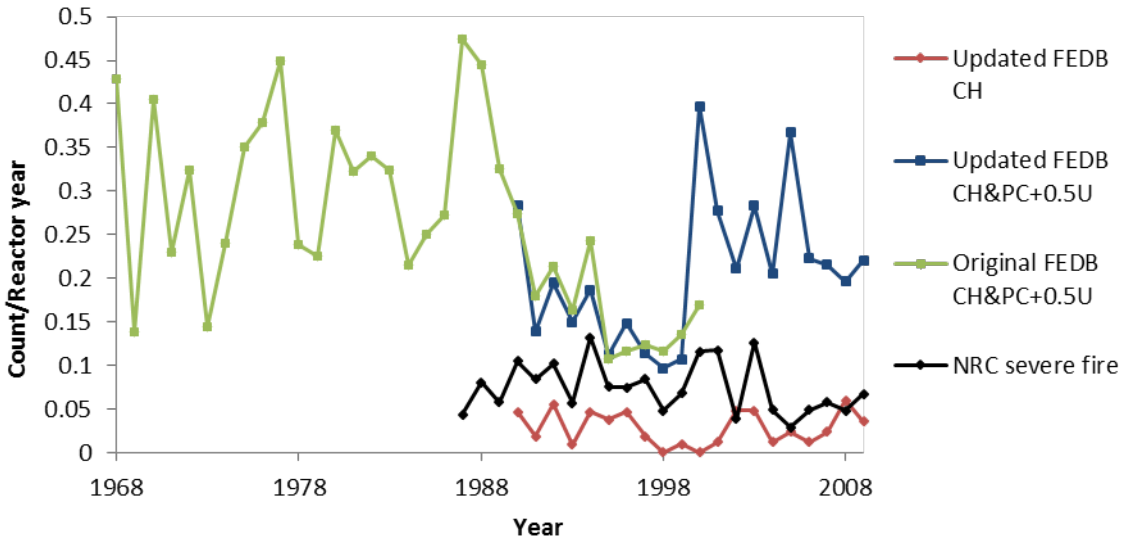

Figure 3-2
Trends in fire event data

Figure 3-3 provides a similar pattern in a simple bar chart comparison for the three periods and their different data sources. Further review suggests that the data collected in the 1990s may not have had the same level of completeness as the data from the 1968–1989 and 2000–2009 periods. As a result, additional investigation into the factors driving the differences in the three data periods was made.

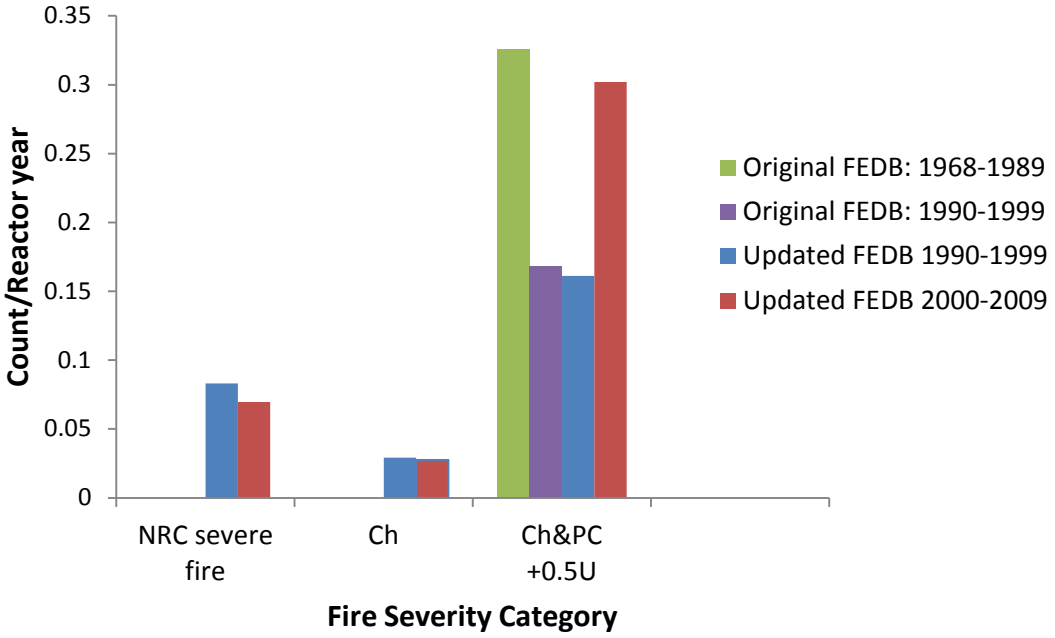

Figure 3-3
Comparison of fire event counts per reactor year for three periods

Figures 3-4 and 3-5 show the main fire ignition components and causal factors with significant fire frequency differences from the 1990–1990 period. Most follow the trend of lower frequencies in the 1990–1999 period than in the earlier and later periods. Other fire ignition components and causal factors did not exhibit this behavior in a significant way, in many cases because of their smaller data counts. Lower rates shown in the 1990–1999 period suggest the possibility of missing data.

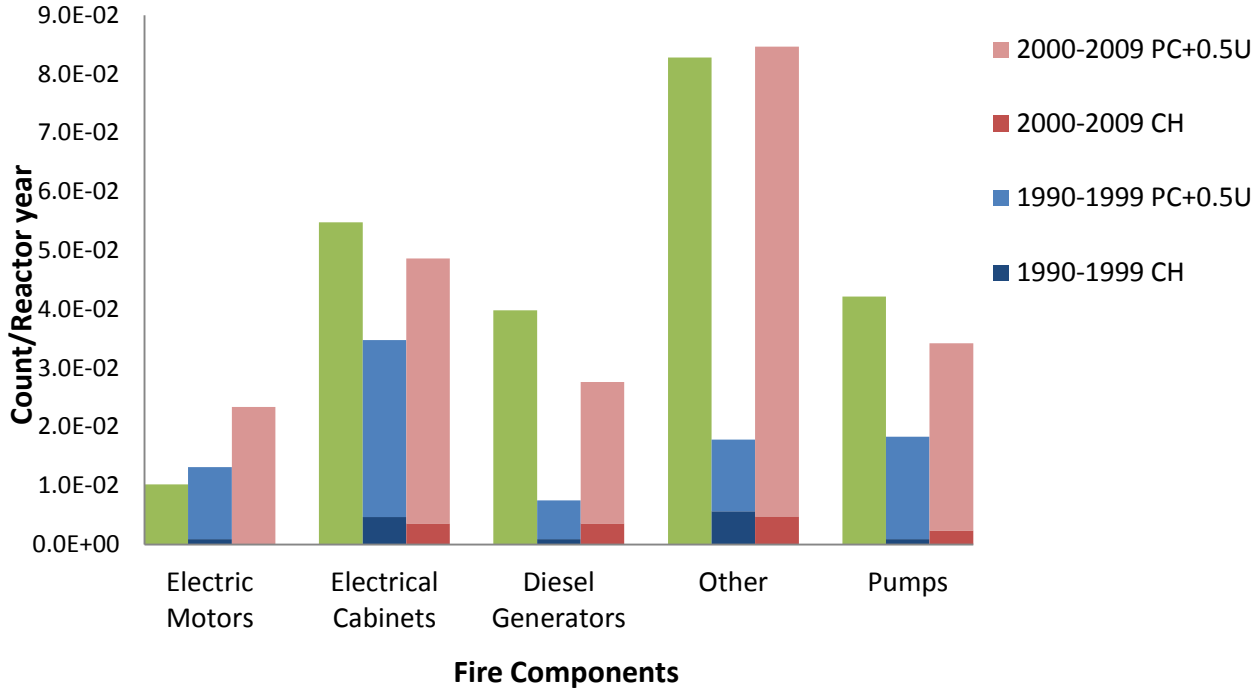

Figure 3-4
Comparison of fire ignition occurrence rates by causal factor

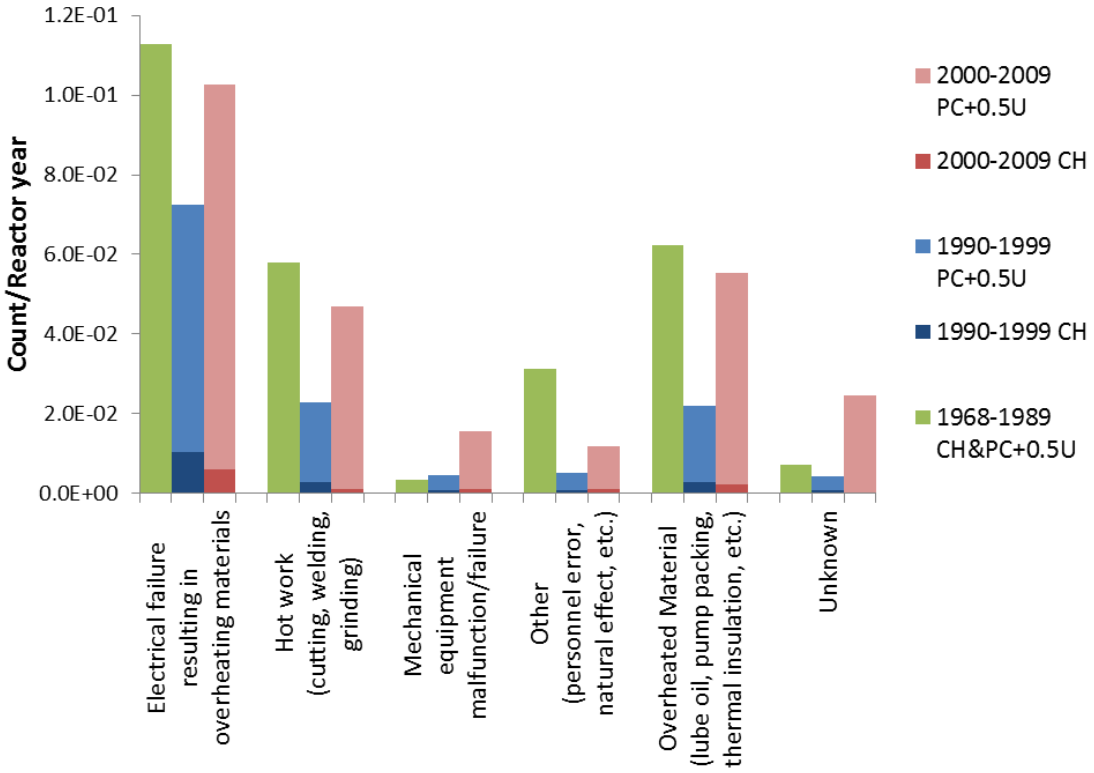

Figure 3-5
Comparison of fire ignition occurrence rates by causal factors

Given the multitude and nature of the fire data sources, including federal regulatory requirements for reporting LERs and ENs, and the trends for severe fires shown in Figure 3-1, the most severe fires are assumed to be fully reported by one or more of the reporting types for all time periods. These fires correlate to the NRC severity classifications as well as the CH fires. The fire event data collection protocol used to update the fire event data for the 2000–2009 period is also assumed to be very complete for the 84 plants that fully participated in the FEDB update. As a result, further examination of the data suggests that the less severe fires are a prominent factor in the apparent deviation in fire frequencies associated with the 1990s fire event data. In addition, the extensive effort by the NRC and its contractors to collect fire event data in the 1970s and 1980s to support development of NUREG/CR-6850 suggests that the data from 1968–1989 may be fairly complete.

3.3 Analysis of Fire Event Data for Trends in Time and Power Mode Considerations

Additional analyses of the FEDB were performed to determine if there were statistically valid inferences of the trends previously observed and power mode observations.

3.3.1 Statistical Methodology for Comparing Classes

To perform the analyses, the fire frequencies were divided into the following classes:

- Three periods—1968–1989, 1990–1999, and 2000–2009
- Selected pairs of these periods, in particular, 1968–1989 vs. 2000–2009, 1990–1999 vs. 2000–2009, and 1968–1989 vs. 1990–2009
- The two plant modes—at-power and LPSD

To test the hypothesis that the fire frequency is the same in the two or three classes under consideration, the Pearson chi-squared test was used. This is a standard test, valid for large samples. For small samples, page 6-23 of Reference 9 quotes a rule of thumb that the expected number of fires in each class should be at least one, or two if the classes are not approximately equally probable. Thus, the test is appropriate for the present work, except for bin-specific comparisons with small data (fire counts), as previously indicated.

There is another well-known test that is valid even for small samples—Fisher's exact test. However, it can be used only with integer (not fractional) counts, and only when comparing two classes, not three. Therefore, it was not considered for the present work.

Bin subgroups were also defined based on the PRA counts of fires for the bins identified in Table 3-1, in the 2000–2009 period, and in a manner consistent with the fire ignition frequency methodology described in the EPRI report *An Improved Methodological Approach for Estimating Fire Ignition Frequencies* (1022994) [7] and summarized in Section 4.1 of the present report. The sparse-density bin group was defined as all bins with fewer than 2.5 FPRA event counts in the most current period of data (2000–2009). The non-sparse bin group consisted of all other bins that are noted as high-density (>6.5 fire event counts) or medium-density (≥2.5 to 6.5 fire event counts).

3.3.2 Comparison of Time Periods

Figure 3-2 shows graphically that the fire frequency seems to vary from period to period. The present section shows the corresponding comparison using statistical tests and p-values.

First, the three periods were considered, with the fires that would be appropriate in an FPIE FPRA—the all-modes bins and the at-power portion of at-power/LPSD bins. These differ from all counts of fires and reactor years occurring at power, as shown in Table 3-2, or at shutdown as a result of bin definitions for counting fires. The counts for the 40 FPIE bins were combined to derive total FPIE fire occurrence rates for an average plant using FPIE applicable data. All of the FPIE applicable fires in the bins were counted, and the average of the FPIE applicable reactor years for the bins was used, so that the quotient estimated the average FPIE fire frequency per year at a plant. The results are shown in Table 3-3.

Table 3-3
Fire occurrence rates for each period

	1968–1989	1990–1999	2000–2009
FPIE countable fires	338.12	128.75	155.5
FPIE average reactor years	1050	930	798
Average FPIE fire frequency	0.322	0.138	0.195
LPSD countable fires	74.49	34.75	51.5
LPSD average reactor years	383	233	78.8
Average LPSD fire frequency	0.194	0.149	0.654

The four tests mentioned in the first and second items of the preceding list were performed. In every case, the p-value was small—typically, extremely small—indicating very strong evidence against the hypothesis of equal frequencies. That is, the three periods have clearly different frequencies, whether considered as a group of three or as pairs.

The results were more complicated when separate analyses were made for sparse bins and non-sparse bins. Recall that sparse bins are defined as those with <2.5 fires in the 2000–2009 period. Table 3-4 shows the results of the comparison of sparse and non-sparse bin frequency for each period.

Table 3-4
Fire occurrence rates for sparse and non-sparse bins for each period

	1968–1989	1990–1999	2000–2009
Average FPIE fire frequency, non-sparse bins	0.238	0.110	0.179
Average FPIE fire frequency, sparse bins	0.078	0.026	0.013

The sparse bins show a steadily decreasing frequency. Table 3-4 does not show whether the trend is statistically significant; this is considered next. Table 3-5 displays the p-values that were obtained when comparing various pairs of periods. P-values less than 0.05 are indicative of statistically significant differences [9].

Table 3-5
Comparison of p-values for various time periods

	All Periods	1990s vs. 2000s	1968–1989 vs. 2000s	1968–1989 vs. 1990–2009
Non-sparse bins	5E-11	1.2E-4	5.6E-3	N/A
Sparse bins	4E-12	8E-2	N/A	9E-13

Consider first the sparse bins. The p-values in Table 3-5 show that pooling sparse data from the 1990s and 2000s might be considered reasonable. For most sparse bins, it raises the estimated frequency slightly, compared to using only the fire events from the 2000s. However, the added benefit of having twice as many years of data is very desirable.

One reason that the sparse bins show a downward trend from the 1990s to 2000s may lie in the definition of *sparse*. Sparse bins are defined as having <2.5 fires in the 2000s. This puts a ceiling on the frequency in the 2000s period but not in the 1990s and makes it more likely for the trend to be downward than upward. Fire counts in the 1990s for the sparse bins are almost always larger than counts in the 2000s. Thus, the asymmetrical definition of *sparse* builds a small conservatism into the FIF methodology described in Section 4 when data from the 1990s are combined with sparse bin data from the 2000s to perform the FIF analyses. In addition, the prior distribution biases the results upward because it is based on 1968–1989; however, this bias is small because the prior is so diffuse.

For non-sparse bins, the 1990s and 2000s may not be pooled—the very small p-value shows that the two frequencies are different. The prior in this case is generated from the 1968–1989 data, which biases the results upward somewhat. However, the effect is very small because the prior distribution is made to be very diffuse—more diffuse than was planned in the methodology report [7] because when the report was issued, the abrupt changes and discontinuities in fire occurrence rates for the periods were not anticipated.

3.3.3 Analysis of Plant Modes

Before the comparisons of classes can be described, it must be mentioned that the database includes fires that occurred during two plant modes: when the plant is at power and when the plant is at LPSD conditions.

As cited in Table 3-1 and based on engineering considerations provided in NUREG/CR-6850, the estimation of fire frequency for some bins is assumed to be essentially the same during both at-power and LPSD plant modes. These bins are designated by the phrase *all modes*. Most of these bins use combined data from all plants to estimate fire frequencies, but a few are restricted to PWRs or BWRs. A simple estimate of the fire frequency for such bins is (number of fires)/(number of reactor years).

The other bins are considered to have different frequencies during power and LPSD conditions. These bins are designated by the phrase *at power/LPSD*. Again, most use combined data from both PWRs and BWRs to estimate fire frequencies. Simple estimates of these two fire frequencies are (number of fires at power)/(number of reactor years at power) and (number of fires during LPSD)/(number of reactor years during LPSD).

The total PRA fire event counts for the reactor power mode groups are provided in Table 3-6 along with the unavailability for the nuclear plant fleet during the three periods of interest. These fire counts are not the same as FPIE bin fire counts cited in Table 3-3 because they include all PRA countable fires, irrespective of bin definitions for fire counting during specified power conditions for FPIE or LPSD fire probabilistic risk assessments. Therefore, it is the total fire counts used for both FPIE and LPSD applications, without double-counting.

Table 3-6
PRA fire count data and associated total reactor years and unavailability

	Time Periods (years)		
PRA counts for:	**1968–1990**	**1990–1999**	**2000–2009**
All fire events, all modes (aa)	413	163.5	217
At-power fire events (ap)	273	102	138.5
At-shutdown fire events (sd)	140	61.5	78.5
Total reactor years in period	1282	1081	850
Unavailability for period	0.3	0.21	0.09

Unavailability is the number of reactor years when the reactor was not at power divided by the total reactor years (plant capacity factor) considered in the period of interest. Most notable is the substantial decline in unavailability, whereas the shutdown fire count is more consistent. These considerations are further developed in Table 3-7.

Table 3-7
Comparisons of all modes, at power, and shutdown occurrence rates

Occurrence Rate Category	Occurrence Rate per Period		
	1968–1989	**1990–1999**	**2000–2009**
All events in all bins			
aa/(AA-RY)	0.322	0.151	0.255
ap/(AP-RY)	0.303	0.120	0.180
sd/(SD-RY)	0.366	0.264	0.996
Events in AA bins			
aainAA/(AA-RY)	0.163	0.073	0.129
apinAA/(AP-RY)	0.160	0.061	0.120
sdinAA/(SD-RY)	0.170	0.115	0.216
Events in AP and SD bins			
(apinAP+sdinSD)/(AA-RY)	0.159	0.079	0.126
apinAP/(AP-RY)	0.144	0.059	0.060
sdinSD/(SD-RY)	0.195	0.149	0.780
All ap and sd events per calendar year			
ap/(AA-RY)	0.213	0.094	0.163
sd/(AA-RY)	0.109	0.057	0.092

Table 3-7 (continued)
Comparisons of all modes, at power, and shutdown occurrence rates

Occurrence Rate Category	Occurrence Rate per Period		
	1968–1989	1990–1999	2000–2009
Events in AA and SD bins per calendar year			
apinAP/(AA-RY)	0.101	0.046	0.054
sdinSD/(AA-RY)	0.058	0.032	0.072

Nomenclature	Description
AA	all plants, all power modes
AP	all plants, power modes only
SD	all plants, shutdown conditions only
Aa	PRA counts for AA bins (all plants all power modes)
Ap	PRA counts for AP bins (all plants at power)
Sd	PRA counts for SD bins (all plants at shutdown conditions)
apinAP	ap events in AP bins
sdinSD	sd events in SD bins
AA-RY	total reactor years for all plants (at power plus shutdown) for the period
AP-RY	at power reactor years for all plants for the period
SD-RY	shutdown reactor years for all plants for the period

Next, the data used to generate Table 3-6 were examined for FPIE bins to determine the statistical significance of the differences in fire frequencies for power condition. In each of the three periods (1968–1989, 1990–1999, and 2000–2009), the at-power and shutdown reactor years and fires were counted separately. Then, the hypothesis that the frequency at power and the frequency during LPSD conditions were equal for each of the periods was tested. The counts and p-values obtained when all of the bins were pooled by power condition are shown in Table 3-8.

Table 3-8
Fire frequencies for FPIE and LPSD bins

	1968–1989	1990–1999	2000–2009
At-power reactor years	899	848	771
At-power fires	273	102	138.5
At-power fire frequency	0.303	0.120	0.180
SD reactor years	383	233	78.8
SD fires	140	61.5	78.5
SD fire frequency	0.366	0.265	0.996
p-value comparing frequencies	0.97	2E-4	4E-20

The results in Table 3-8 show a remarkable change over time. In the early years, the at-power and shutdown fire frequencies were nearly the same. It is not clear what happened in the 1990s due to the issue of fire data completeness described in Section 3. However, in the 2000s, the

shutdown fire frequency rose greatly, not because the number of fires increased greatly, but because the time in shutdown went down sharply, consistent with the average plant unavailability factor shown in Table 3-6. When the data were examined on a bin-by-bin basis, only the bins designated as at-power/LPSD had statistically significant differences in the at-power and shutdown fire frequencies. This confirms that at least for some bins, it is necessary to have separate estimates for at-power and LPSD frequencies. On the other hand, none of the all-modes bins had statistically significant fire frequency differences depending on power condition; as a group, though, the power condition appears to have some effect on fire frequency, with a p-value of about 0.01. This suggests that the separation of data by power condition for those bins might be considered but cannot be determined for the individual bins.

Now consider only the bins that are categorized as "all modes." In the 2000s, their estimated fire frequencies for at-power and LPSD were 0.120 and 0.216, respectively. Although not the same, the two estimated frequencies are not enormously different. The p-value for testing equality of the frequencies is 0.018, which is less than 0.05 but not less by orders of magnitude. For the individual bins, no bin has a bin-specific p-value smaller than 0.079. The conclusion is that there is some difference in the frequency at power and the frequency at LPSD, but it is not statistically significant for any one bin. Splitting such a bin into two and estimating two separate frequencies would result in larger uncertainty, especially for the LPSD frequency. It is arguably best for each of these bins to estimate a single fire frequency that is used for both plant modes. This is what is done in this report.

A more complete set of comparisons for at-power and shutdown fire occurrence rates over the three periods is shown in Table 3-7. All fire events in all bins were included in the tabulations with power mode and bin specifications as noted in Table 3-7.

Some potentially important observations of the reactor operating mode data partitioning are as follows:

- All plant and operating mode data (aa/(AA-RY)) and all plant at-power data (ap/(AP-RY)) followed the pattern exhibited in prior figures.
- This held for the all-power-bins data when looking at the at-power contribution only (apinAP/(AP-RY)). On the other hand, the at-power bins with at-power-only data showed a slight decrease in rates across the three periods.
- The all-plant shutdown data (sd/(SD-RY)) showed a marked increase in the rates for 2000–2009. The rates for 2000–2009 were much higher than the 1968–1989 rates.
- This held for the all modes (sdinAA/(SD-RY)) and shutdown (sdinSD/(SD-RY)) bins when looking at shutdown data only.

Some additional observations were made to look at the fire event data on a total reactor year basis (that is, combining at-power and shutdown reactors years, or calendar reactor years). When this was done, both the at-power (ap/(AA-RY)) and shutdown (sd/(AA-RY)) events in total followed the earlier trend in occurrence rates. However, when looking at the at-power (apinAP/(AA-RY)), the occurrence rates were consistent from the 1990s to the 2000s and about half of the 1968–1989 rate. On the other hand, the same look at the shutdown (sdinSD/(AA-RY)) showed a slightly higher occurrence rate for the 2000s than the 1968–1989 period and double the 1990s rate.

4
BIN FIRE IGNITION FREQUENCY ESTIMATION

4.1 Bin FIF Estimation Methodology

The approach to update FPIE fire ignition frequencies for individual bins is described in the EPRI report *An Improved Methodological Approach for Estimating Fire Ignition Frequencies* (1022994) [7]. This approach was designed to account for between-plant variability, which was found to be present in the fire ignition data set as a whole and for fire ignition bin combinations with denser data sets. It used a two-stage hierarchical Bayesian (HB) update process with noninformative and minimally informed diffuse empirical priors. The OpenBUGS software [10] was used to perform the calculations. The HB methodology is depicted conceptually in Figure 4-1. It is a procedure in which the uncertainty in the prior distributions is represented by diffuse "hyperprior" distributions for the parameters of the population-variability distribution. In the methodology described in *An Improved Methodological Approach for Estimating Fire Ignition Frequencies* [7], fire event data from the period 1968–1989 were used to develop diffuse empirical priors to account for the operating experience in that period as a starting point for the Bayesian update.

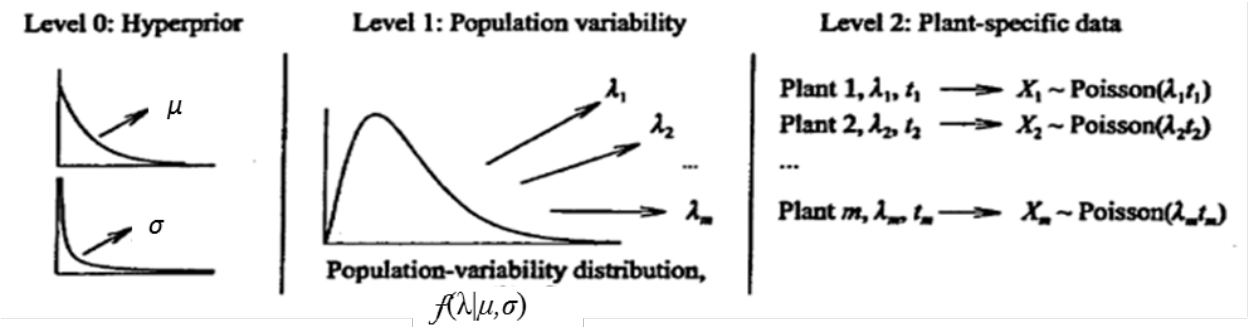

Figure 4-1
Conceptual diagram of an HB model (Adapted from Ref [10].)

The standard approach for accounting for between-plant variability is the HB. In it, the assumed fire frequency, λ, varies from plant to plant, following an underlying distribution. In the methodology described by EPRI [7], the log-normal distribution was used:

$$f(\lambda) = \frac{1}{\sigma y \sqrt{2\pi}} \exp\left[-\frac{1}{2\sigma^2} (\ln \lambda - \mu)^2 \right]$$

Then, λ was estimated as a Bayesian parameter with very diffuse hyperprior distributions for the median (μ = ln [median]) and σ. Appropriate past industry data were used to update the distribution. In this methodology, the distribution for the hyperprior median was also described as lognormal distribution, LN(med_{med}, σ_{med}). The distribution for σ was described by a uniform distribution, uniform(0,B), with B set at 6, a very broad distribution that is sufficient to cover the

posterior distribution of σ, which typically lies between 0 and 2. Thus, the basic model was termed *Hierarchical Bayes with Diffuse Empirical Priors* (HBDEP). Calculations to derive the distribution for f (λ) are carried out by Markov Chain Monte Carlo sampling using OpenBUGS. Additional details are provided in Appendix B of *An Improved Methodological Approach for Estimating Fire Ignition Frequencies* (EPRI 1022994) [7].

The selection of the priors and update period proposed in EPRI 1022994 assumed that the data from the 1990s showed a valid decrease in the fire frequency trends from the 1970s and 1980s to the 1990s. It was assumed that the data from the 1990s would be reasonably similar to or consistent with the newer data from the 2000s being collected at that time. That would allow using all of the data from the 1990s and 2000s in the HB update.

As covered in Section 3, the examination of the newer data collected for the period 2000–2009 indicates that this assumption is probably not correct in general and in particular for higher-density bins as a group and some individually. Moreover, the differences appear to be due to missing data. The sparse-density bins did not have statistically significant differences between the data for the 1990s and 2000s as a group. Examining the counts for those bins individually, but not statistically, also indicated good consistency and, in some cases, higher counts in the 1990s. As a result, the methodologies recommended in EPRI 1022994, which included both an HB model and update period, were re-evaluated for each bin density type. In general, the intention was to make minimal modifications to the recommended methodology or one of the alternatives cited in EPRI 1022994, where the data from the 1990s have highly questionable applicability.

Two primary HB models were proposed in EPRI 1022994, depending largely on the bin data density that was required to get a convergent solution using the OpenBUGS HB methodology. *High-density* bins were defined as those with more than 6.5 FPRA event counts, *medium* as those with 2.5–6.5 event counts, and *sparse* as fewer than 2.5 FPRA event counts. The data density metric applies to the most current data (2000–2009). For consistency and because the results did not vary significantly for alternative methods, the same HBDEP methodology with $\sigma_{med} = 1.3$ and a 10-year update period (termed *HBDEP-1.3, +10*) was recommended for high- and medium-density bins. A similar methodology but with a 20-year update period and a more diffuse prior ($\sigma_{med} = 3$) was recommended for the sparse bins. This model, *termed HBDEP-3, +20*, allowed the sparse data to be the principal factor driving the results, not the prior.

For sparse-density bins that have fire event count consistency or a decrease from 1990 to 2009, the HBDEP-3, +20-year update methodology was still considered applicable (as originally recommended in EPRI 1022994). This methodology model was considered still appropriate because the fire event occurrence rate from the 1990s was equal to or greater than that from the 2000s for almost all sparse bins. Thus, the asymmetrical definition of *sparse* described in Section 3.3 builds a small conservatism into the methodology when the data from the 1990s are combined with sparse bin data from the 2000s to perform the HB update analyses. In addition, the prior distribution pulls the results upward because it is based on the higher occurrence rate data from 1968–1989. However, the effect is small because the prior is so diffuse. The exception was for bins 16.b, 16.1, and 16.2, for which the data were considered complete, as covered in Section 3.1 of this report.

For the high- and medium-density bin types, the 10 years of data from the 2000s were considered sufficient to make a good Bayes updated estimate using a diffuse prior based on the 1968–1989 period and a 10-year update period using the most current data. This is based on the results of the many sensitivity studies described in EPRI 1022994 [7]. The HBDEP-3, +10-year update method was selected as a replacement for the HBDEP-1.3, +10-year method that was originally proposed for high- and medium-density bins. This model replaces $\sigma_{med} = 1.3$ with $\sigma_{med} = 3$ and uses 10 years of update data. The HBDEP-3 prior with 10 years of current data used in the update was found to give robust results that are strongly driven by the more current data.

The following is a summary of the HB models that were used:

- Bins with PRA fire event counts <2.5: HBDEP-3, +20-year update. This is the methodology that was proposed for sparse bins in EPRI 1022994. The period 1968–1989 is used to develop a prior median based on Jeffreys noninformative prior and a very diffuse prior distribution with $\sigma_{med}=3$. The update period is the 20 years from 1990 to 2009. No sparse bins had data anomalies in the 1990s that would cause potential underestimation of the updated FIFs (posterior distributions).
- Bins with PRA fire event counts ≥2.5: HBDEP-3, +10-year update. This is a modification of HBDEP-1.3 prior that was proposed for the medium- and higher-density bins in EPRI 1022994. The prior is the same as that used for the sparse bins with $\sigma_{med}=3$, creating a more diffuse prior that adds more weight to the update years. The 1968–1989 fire event data were used to develop a prior median based on Jeffreys noninformative prior, also the same as the sparse bin method. However, for the update, only fire event data from 2000–2009 were used to avoid fire count anomalies in the 1990–1999 period that would cause potential underestimation of the updated FIFs (posterior distributions).

The FPIE methodology was adapted for use in the estimation of the bin fire ignition frequencies for LPSD FPRA applications. Because the AA bins already use fire event data from all power modes and they do not change for LPSD applications, only LPSD bins designated *SD only* need to be analyzed. Therefore, the med_{med} prior's parameters for SD-only bins were derived using shutdown fire event data only for the bins designated as *SD only* by NUREG/CR-7114 [4]. The prior parameter σ_{med} was set equal to 3 as with the FPIE priors, and the update periods were used in the same manner as in the FPIE analyses. The mathematical formulation and derivation of prior parameters and posterior update results are the same as for the FPIE analyses.

Table 4-1 provides the mathematical parameters of the prior distributions used to perform the FIF updates. Additional details of the HB methodology models are provided in EPRI 1022994 [7].

Table 4-1
Parameters of the prior distributions used to perform the FIF updates

Method Designation	Variability Distribution	Hyperprior Specification		Prior Data Period	Update Period
HBDEP-3, +20-year update	LN(median,σ)	median~LN($median_{med}$, σ_{med}) where $median_{med}$=Jeffreys med and σ_{med}=3	σ~uni(0,6)	1968–1989	20 years (1990–2009)
HBDEP-3, +10-year update	LN(median,σ)	median~LN($median_{med}$, σ_{med}) where $median_{med}$=Jeffreys med and σ_{med}=3	σ~uni(0,6)	1968–1989	10 years (2000–2009)

Because the data from the 1990s were assumed to be missing fire event reports that would be comparable to those of the 2000s, special care was used in selecting and adapting methods that did or did not use the data from the 1990s.

Table 4-2 provides a summary of the FPIE bin-by-bin data, with FPRA counts provided for the three periods. The data from 1968–1989 are essentially the same as those used in NUREG/CR-6850 and EPRI 1016735. The data from 1990–1999 were updated during the update of the FEDB, as discussed in EPRI 1025284, and the data from 2000–2009 are newer data from that report, unless otherwise indicated herein. Half-counts were used for events of undetermined fire severity, as previously indicated in Section 3. In a few instances, the plant operating condition could not be accurately determined from the older data. For these instances, the at-power and shutdown counts were adjusted by weighting them according to the fraction of time that the plant was at power or shutdown, as was done in NUREG/CR-6850. The LPSD data summary is provided in Table 4-3. Counting criteria and ignition source definitions can be found in Chapter 6 of NUREG/CR-6850 [1] or in Supplement 1 to NUREG/CR-6850 [2].

Table 4-2
FPIE fire ignition bin identification and PRA counts for three periods

Bin	Location	Ignition Source	Power Modes	FPRA Counts		
				1968–1989	1990–1999	2000–2009
1	Battery room	Batteries	AA	1	0	0
2	Containment (PWR)	Reactor coolant pump	PP	5.5	1	0
3	Containment (PWR)	Transients and hotwork (at power)	PP	2.11	0	0
4	Control room	Main control board	AA	3.5	2.5	4
5	Control/Aux/ Reactor Building	Cable fires caused by welding and cutting	AP	0	1	0
6	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	AP	9.5	1	3

7	Diesel generator room	Transients	AP	2.21	2.75	2

Table 4-2 (continued)
FPIE fire ignition bin identification and PRA counts for three periods

Bin	Location	Ignition Source	Power Modes	FPRA Counts		
				1968–1989	1990–1999	2000–2009
8	Plant-Wide Components	Diesel generators	AA	42	2.5	6.5
9	Plant-Wide Components	Air compressors	AA	0.5	2	4
10	Plant-Wide Components	Battery chargers	AA	3	2	0
11	Plant-Wide Components	Cable fires caused by welding and cutting	AP	2	0	0
12	Plant-Wide Components	Cable run (self-ignited cable fires)	AA	9.5	1	0
13	Plant-Wide Components	Dryers	AA	5.5	1	3
14	Plant-Wide Components	Electric motors	AA	6.5	4	4.5
15	Plant-Wide Components	Electrical cabinets (non-HEAF)	AA	64.5	29.5	25.5
16.a	Plant-Wide Components	HEAF for low-voltage electrical cabinets (480–1000 V)	AA	0.5	0	0
16.b	Plant-Wide Components	HEAF for medium-voltage electrical cabinets (>1000 V)	AA	1	2.5	2
16.1	Plant-Wide Components	HEAF for segmented bus ducts	AA	5	0	2
16.2	Plant-Wide Components	HEAF for iso-phase bus ducts	AA	2	0	1
17	Plant-Wide Components	Hydrogen tanks	AA	3	1	4
18	Plant-Wide Components	Junction boxes	AA	2	1	3
19	Plant-Wide Components	Miscellaneous hydrogen fires	AA	4.5	0	4
20	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	BP	22.5	2.5	0

21	Plant-Wide Components	Pumps	AA	32.5	14	23

Table 4-2 (continued)
FPIE fire ignition bin identification and PRA counts for three periods

Bin	Location	Ignition Source	Power Modes	FPRA Counts		
				1968–1989	1990–1999	2000–2009
22	Plant-Wide Components	RPS MG sets	AP	3	3	0.5
23	Plant-Wide Components	Transformers	AA	13	7.5	8
24	Plant-Wide Components	Transient fires caused by welding and cutting	AP	5.975	2	3.5
25	Plant-Wide Components	Transients	AP	3.93	3.5	6.5
26	Plant-Wide Components	Ventilation subsystems	AA	8.5	7	14
27	Transformer yard	Transformer – Catastrophic	AP	6	2	5
28	Transformer yard	Transformer – Non Catastrophic	AP	13.5	7.5	5
29	Transformer yard	Yard transformers (others)	AP	0	4.5	3
30	Turbine building	Boiler	AA	1	1	1
31	Turbine building	Cable fires caused by welding and cutting	AP	1.5	0	0
32	Turbine building	Main feedwater pumps	AP	11.5	5	2
33	Turbine building	T/G excitor	AP	5	1	0
34	Turbine building	T/G hydrogen	AP	7	4.5	3
35	Turbine building	T/G oil	AP	12.5	2.5	4
36	Turbine building	Transient fires caused by welding and cutting	AP	8.74	4	3.5
37	Turbine building	Transients	AP	6.655	2.5	5

Applicable Power Modes
AA= all plants, all power modes; AP=all plants at power; BP=BWR plants at power; PP=PWR plants at power

Table 4-3
LPSD-only bins and counts

Bin	Location	Ignition Source	Power Modes	FPRA Counts		
				1968–1989	1990–1999	2000–2009
2	Containment (PWR)	Reactor coolant pump	PL	3	1	1
3B	Containment (BWR)	Transients and hotwork	BL	12	5.5	2
3P	Containment (PWR)	Transients and hotwork	PL	12.5	4	21.5
5	Control/Aux/ Reactor Building	Cable fires caused by welding and cutting	AL	0	0	0
6	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	AL	7	6.5	2
7	Control/Aux/ Reactor Building	Transients	AL	1.79	2.75	4
11	Plant-Wide Components	Cable fires caused by welding and cutting	AL	1	0.5	0
20	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	BL	2	0	0
22	Plant-Wide Components	RPS MG Sets	AL	4	0	0
24	Plant-Wide Components	Transient fires caused by welding and cutting	AL	7.025	1	3.5
25	Plant-Wide Components	Transients	AL	1.57	1.5	1.5
27	Transformer yard	Transformer – Catastrophic	AL	3	1	0
28	Transformer yard	Transformer – Non Catastrophic	AL	1	2	1
29	Transformer yard	Yard transformers (others)	AL	1	1	0
31	Turbine building	Cable fires caused by welding and cutting	AL	0	0	0
32	Turbine building	Main feedwater pumps	AL	1	0	0
34	Turbine building	T/G hydrogen	AL	1	0	0
35	Turbine building	T/G oil	AL	1	1	1
36	Turbine building	Transient fires caused by welding and cutting	AL	11.76	5	14
37	Turbine building	Transients	AL	2.845	2	10

Applicable Power Modes
AA=all plants, all power modes; AP= all plants at power; BP= BWR plants at power; PP=PWR plants at power

Bins designated as AA are applicable for both full-power initiating event and LPSD FPRA applications. Bins that are designated as AP, BP, or PP applicability have counterpart LPSD bins that are designated AL, BL, or PL, respectively. Bins with fewer than 2.5 FPRA counts in the 2000–2009 period are the sparse bins that have been updated with data from the 1990s and 2000s. Note that almost all sparse bins have FPRA counts in the 1990s that are greater than or equal to the FPRA counts in the 2000s. The exceptions are bins 16.b, 16.1, and 16.2, which do not have completeness-of-data concerns for the 1990s. They are considered to have all applicable HEAF fire events identified through the 2000s at all plants by virtue of the reporting and FAQ 07-0035 discussion provided in Section 3.

4.2 Estimation of Bin FIFs

The FIF distributions for at-power conditions and LPSD conditions are displayed in Table 4-4 and Table 4-5, respectively. Tables 4-4 and 4-5 provide the bin identifier along with PRA type applicability. Then, the OpenBUGS derived mean, median, and 5th and 95th percentiles. Since the OpenBUGS results are in the form of numerical simulation data, parameters for a log-normal distribution that are exact fits to the mean and error factor of the numerical results have also been provided (mu, sigma, EF). This fit produces small differences with the median and 95th percentile values of the lognormal distribution compared to the OpenBUGS numerical results, but less than 15% in most cases. In the two cases with the largest deviation (25–30%), the medians of the fitted distribution overestimated the numerical results. The largest underestimate of the 95th percentile is less than 10%. The log-normal distribution was used because it was of the form of the underlying distribution used for the HB model and had better fit characteristics than others tested (such as gamma). The FEDB data used in the analyses are identified in Appendix A.

Table 4-4
Fire ignition frequency distributions for FPIE PRA applications

Bin	Location	Ignition Source	Power Modes	PRA Type	Mean	Median	5th percent	95th percent	Mu	Sigma	EF
1	Battery room	Batteries	AA	FPIE/LPSD	1.96E-04	2.97E-05	1.97E-07	7.70E-04	-10.50	1.98	25.92
2	Containment (PWR)	Reactor coolant pump	PP	FPIE	1.37E-03	4.02E-04	1.68E-06	3.99E-03	-7.57	1.40	9.94
3	Containment (PWR)	Transients and hotwork (at power)	PP	FPIE	4.21E-04	7.97E-05	4.63E-07	1.59E-03	-9.43	1.82	19.96
4	Control room	Main control board	AA	FPIE/LPSD	4.91E-03	5.69E-04	8.50E-07	1.85E-02	-7.55	2.12	32.45
5	Control/auxiliary/ reactor building	Cable fires caused by welding and cutting	AP	FPIE	7.83E-04	9.75E-05	7.98E-08	2.24E-03	-8.97	1.91	23.02
6	Control/auxiliary/ reactor building	Transient fires caused by welding and cutting	AP	FPIE	4.44E-03	5.75E-04	8.78E-07	1.51E-02	-7.39	1.99	26.24
7	Diesel generator room	Transients	AP	FPIE	3.33E-03	1.64E-03	1.94E-05	9.62E-03	-6.28	1.07	5.85
8	Plant-Wide Components	Diesel generators	AA	FPIE/LPSD	7.81E-03	5.93E-03	4.87E-04	2.01E-02	-5.13	0.74	3.39
9	Plant-Wide Components	Air compressors	AA	FPIE/LPSD	4.69E-03	2.31E-03	1.50E-05	1.45E-02	-5.99	1.12	6.29
10	Plant-Wide Components	Battery chargers	AA	FPIE/LPSD	1.12E-03	4.06E-04	2.83E-06	3.52E-03	-7.66	1.31	8.67

Table 4-4 (continued)
Fire ignition frequency distributions for FPIE PRA applications

Bin	Location	Ignition Source	Power Modes	PRA Type	Mean	Median	5th percent	95th percent	Mu	Sigma	EF
11	Plant-Wide Components	Cable fires caused by welding and cutting	AP	FPIE	2.77E-04	4.70E-05	4.13E-07	9.45E-04	-9.86	1.82	20.11
12	Plant-Wide Components	Cable run (self-ignited cable fires)	AA	FPIE/LPSD	7.02E-04	3.31E-04	1.29E-05	2.21E-03	-7.93	1.15	6.66
13	Plant-Wide Components	Dryers	AA	FPIE/LPSD	3.66E-03	1.79E-03	1.89E-05	1.13E-02	-6.24	1.12	6.32
14	Plant-Wide Components	Electric motors	AA	FPIE	5.43E-03	3.36E-03	1.15E-04	1.57E-02	-5.66	.937	4.67
15	Plant-Wide Components	Electrical cabinets (non-HEAF)	AA	FPIE	3.00E-02	2.31E-02	3.72E-03	8.00E-2	-4.12	1.11	6.21
16.a	Plant-Wide Components	HEAF for low-voltage electrical cabinets (480–1000 V)	AA	FPIE/LPSD	1.52E-04	1.99E-05	1.28E-07	5.89E-04	-10.91	2.06	29.65
16.b	Plant-Wide Components	HEAF for medium-voltage electrical cabinets (>1000 V)	AA	FPIE/LPSD	2.13E-03	1.35E-03	5.36E-05	5.93E-03	-6.56	0.90	4.40
16.1	Plant-Wide Components	HEAF for segmented bus ducts	AA	FPIE/LPSD	1.10E-03	4.70E-04	1.97E-06	3.11E-03	-7.47	1.15	6.60
16.2	Plant-Wide Components	HEAF for iso-phase bus ducts	AA	FPIE/LPSD	5.91E-04	1.86E-04	1.60E-06	1.93E-03	-8.44	1.42	10.4

Table 4-4 (continued)
Fire ignition frequency distributions for FPIE PRA applications

Bin	Location	Ignition Source	Power Modes	PRA Type	Mean	Median	5th percent	95th percent	Mu	Sigma	EF
17	Plant-Wide Components	Hydrogen tanks	AA	FPIE/LPSD	4.93E-03	6.95E-04	1.37E-06	1.85E-02	-7.30	1.99	26.58
18	Plant-Wide Components	Junction boxes	AA	FPIE/LPSD	3.61E-03	1.62E-03	8.77E-06	1.13E-02	-6.32	1.18	6.98
19	Plant-Wide Components	Miscellaneous hydrogen fires	AA	FPIE/LPSD	4.82E-03	2.57E-03	3.89E-05	1.46E-02	-5.89	1.06	5.68
20	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	BP	BP	5.81E-03	3.57E-03	1.60E-04	1.72E-02	-5.60	0.96	4.82
21	Plant-Wide Components	Pumps	AA	FPIE/LPSD	2.72E-02	2.49E-02	8.85E-03	5.13E-02	-3.70	.44	2.06
22	Plant-Wide Components	RPS MG sets	AP	FPIE	2.31E-03	5.09E-04	1.96E-06	7.92E-03	-7.46	1.67	15.57
23	Plant-Wide Components	Transformers	AA	FPIE/LPSD	9.56E-3	5.29E-03	1.55E-04	3.05E-02	-5.22	1.07	5.77
24	Plant-Wide Components	Transient fires caused by welding and cutting	AP	FPIE	4.79E-03	3.07E-03	1.61E-04	1.36E-02	-5.75	0.90	4.42
25	Plant-Wide Components	Transients	AP	FPIE	8.54E-03	6.62E-03	9.35E-04	2.07E-02	-5.00	0.69	3.12
26	Plant-Wide Components	Ventilation subsystems	AA	FPIE/LPSD	1.64E-02	1.16E-02	1.06E-03	4.68E-02	-4.47	0.85	4.03
27	Transformer yard	Transformer – Catastrophic	AP	FPIE	6.61E-03	4.18E-03	1.35E-04	1.96E-02	-5.44	.913	4.49

Table 4-4 (continued)
Fire ignition frequency distributions for FPIE PRA applications

Bin	Location	Ignition Source	Power Modes	PRA Type	Mean	Median	5th percent	95th percent	Mu	Sigma	EF
28	Transformer yard	Transformer – Non Catastrophic	AP	FPIE	6.53E-03	4.40E-03	1.94E-04	1.85E-02	-5.41	0.87	4.20
29	Transformer yard	Yard transformers (others)	AP	FPIE	3.69E-03	1.07E-03	1.86E-06	1.24E-02	-6.71	1.49	11.60
30	Turbine building	Boiler	AP	FPIE/LPSD	1.09E-03	4.12E-04	2.89E-06	3.37E-03	-7.64	1.28	8.20
31	Turbine building	Cable fires caused by welding and cutting	AA	FPIE	3.47E-04	6.96E-05	6.02E-07	1.16E-03	-9.43	1.71	16.72
32	Turbine building	Main feedwater pumps	AP	FPIE	4.38E-03	2.54E-03	8.98E-05	1.35E-02	-5.95	1.01	5.31
33	Turbine building	T/G excitor	AP	FPIE	8.36E-04	2.52E-04	1.31E-06	2.74E-03	-8.14	1.45	10.88
34	Turbine building	T/G hydrogen	AP	FPIE	4.12E-03	1.84E-03	9.14E-06	1.29E-02	-6.19	1.19	7.03
35	Turbine building	T/G oil	AP	FPIE	5.49E-03	3.05E-03	6.33E-05	1.66E-02	-5.74	1.03	5.46
36	Turbine building	Transient fires caused by welding and cutting	AP	FPIE	4.67E-03	2.71E-03	7.30E-05	1.38E-02	-5.86	0.99	5.09
37	Turbine building	Transients	AP	FPIE	6.71E-03	4.51E-03	1.31E-04	1.83E-02	-5.37	0.85	4.07

Table 4-5
Fire ignition frequency distributions for LPSD PRA applications

Bin	Location	Ignition Source	Power Modes	PRA Type	Mean	Median	5th percent	95th percent	Mu	Sigma	EF
2	Containment (PWR)	Reactor coolant pump	PL	LPSD	1.17E-02	3.65E-03	9.97E-06	3.87E-02	-5.48	1.44	10.60
3B	Containment (BWR)	Transients and hotwork	BL	LPSD	6.69E-02	4.82E-02	2.77E-03	1.91E-01	-3.06	0.84	3.96
3P	Containment (PWR)	Transients and hotwork	PL	LPSD	3.76E-01	3.30E-01	8.75E-02	8.13E-01	-1.13	0.55	2.47
5	Control/Aux/ Reactor Building	Cable fires caused by welding and cutting	AL	LPSD	8.94E-04	7.97E-05	6.61E-07	2.91E-03	-9.41	2.19	36.51
6	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	AL	LPSD	2.68E-02	1.93E-02	1.80E-03	7.19E-02	-3.94	0.80	3.72
7	Control/Aux/ Reactor Building	Transients	AL	LPSD	5.62E-02	1.59E-02	2.63E-05	1.91E-01	-4.02	1.51	12.05
11	Plant-Wide Components	Cable fires caused by welding and cutting	AL	LPSD	2.07E-03	5.08E-04	4.36E-06	6.63E-03	-7.40	1.56	13.05
20	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	AL	LPSD	3.82E-03	6.24E-04	3.48E-06	1.33E-02	-7.29	1.86	21.25
22	Plant-Wide Components	RPS MG sets	BL	LPSD	1.10E-03	1.66E-04	1.32E-06	3.76E-03	-8.62	1.90	22.68
24	Plant-Wide Components	Transient fires caused by welding and cutting	AL	LPSD	4.48E-02	3.12E-02	1.65E-03	1.25E-01	-3.45	.834	3.95
25	Plant-Wide Components	Transients	AL	LPSD	9.40E-03	5.38E-03	1.13E-04	2.76E-02	-5.16	0.99	5.14
27	Transformer yard	Transformer – Catastrophic	AL	LPSD	4.82E-03	1.11E-03	9.43E-06	1.46E-02	-6.56	1.57	13.16

Table 4-5 (continued)
Fire ignition frequency distributions for LPSD PRA applications

Bin	Location	Ignition Source	Power Modes	PRA Type	Mean	Median	5th percent	95th percent	Mu	Sigma	EF
28	Transformer yard	Transformer – Non Catastrophic	AL	LPSD	9.43E-03	4.10E-03	1.42E-05	2.86E-02	-5.36	1.18	6.98
29	Transformer yard	Yard transformers (others)	AL	LPSD	3.55E-03	1.04E-03	4.86E-06	1.17E-02	-6.72	1.47	11.24
31	Turbine building	Cable fires caused by welding and cutting	AL	LPSD	9.09E-04	8.21E-05	6.08E-07	3.01E-03	-9.40	2.19	36.71
32	Turbine building	Main feedwater pumps	AL	LPSD	1.12E-03	1.37E-04	1.16E-06	4.03E-03	-8.91	2.05	29.34
34	Turbine building	T/G hydrogen	AL	LPSD	1.12E-03	1.37E-04	1.16E-06	4.03E-03	-8.91	2.05	29.34
35	Turbine building	T/G oil	AL	LPSD	6.89E-03	2.31E-03	8.84E-06	2.27E-02	-5.94	1.39	9.85
36	Turbine building	Transient fires caused by welding and cutting	AL	LPSD	1.92E-01	1.30E-01	1.10E-02	5.66E-01	-2.05	0.89	4.34
37	Turbine building	Transients	AL	LPSD	1.28E-01	1.04E-01	1.75E-02	2.97E-01	-2.26	0.64	2.86

The results of the FPIE fire bin frequency estimates in comparison to the NUREG/CR-6850 Supplement 1 [2] recommended FIFs are shown in Figure 4-2. In aggregate, the updated fire frequency results are higher than the NUREG/CR-6850 Supplement 1 results by 36%. This is primarily due to the difference in how the data from the 1990s were used in each analysis. Specifically, the update performed in this report did not apply data from the 1990s that had strong evidence of an incompleteness bias based on analyses and discussions presented in Section 3.

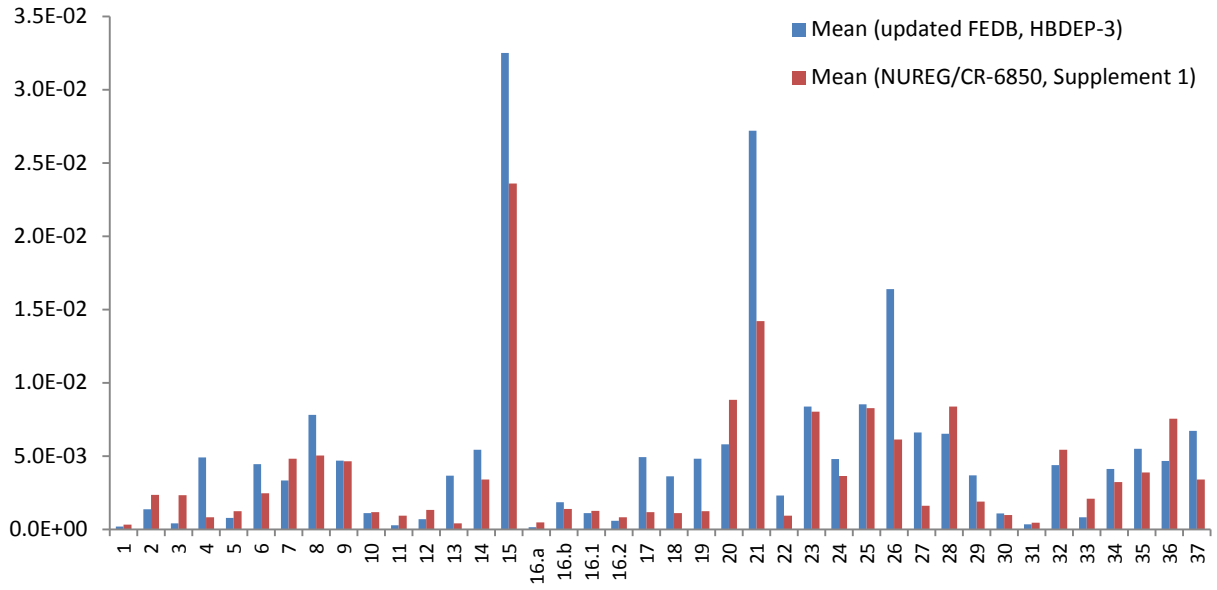

Figure 4-2
Comparison of bin fire ignition frequencies using recent FEDB updated data (new FEDB) to values provided in NUREG/CR-6850, Supplement 1 [5]

Table 4-6 provides a numerical tabulation and comparison between this update and the previous FIF estimates from NUREG/CR-6850, Supplement 1. There are some substantial differences; however, they are not larger than the estimated uncertainties. Typically, there are fewer FPRA event counts in the 1990s than the 2000s, but there are fewer applicable reactor years in the 2000s. This combination is a primary contributor to the difference in the mean of the two estimates. The uncertainty is much larger for the current updated estimate, which is primarily due to the methodology used in the update.

Table 4-6
FPIE bin fire frequency comparisons to previous estimates

Bin	Location	Ignition Source	Power Modes	Fire Ignition Frequency	
				Updated FEDB	NUREG/ CR-6850, Supplement 1
1	Battery room	Batteries	AA	1.96E-04	3.26E-04
2	Containment (PWR)	Reactor coolant pump	PP	1.37E-03	2.35E-03
3	Containment (PWR)	Transients and hotwork (at power)	PP	**4.21E-04**	**2.34E-03**
4	Control Room	Main control board	AA	**4.91E-03**	**8.24E-04**
5	Control/Auxiliary/ Reactor Building	Cable fires caused by welding and cutting	AP	7.83E-04	1.25E-03
6	Control/Auxiliary/ Reactor Building	Transient fires caused by welding and cutting	AP	**4.44E-03**	**2.46E-03**
7	Control/Auxiliary Reactor Building	Transients	AP	3.33E-03	4.81E-03
8	Diesel Generator Room	Diesel generators	AA	**7.81E-03**	**5.04E-03**
9	Plant-Wide Components	Air compressors	AA	4.69E-03	4.65E-03
10	Plant-Wide Components	Battery chargers	AA	1.12E-03	1.18E-03
11	Plant-Wide Components	Cable fires caused by welding and cutting	AP	**2.77E-04**	**9.43E-04**
12	Plant-Wide Components	Cable run (self-ignited cable fires)	AA	7.02E-04	1.32E-03
13	Plant-Wide Components	Dryers	AA	**3.66E-03**	**4.20E-04**
14	Plant-Wide Components	Electric motors	AA	**5.43E-03**	**3.41E-03**
15	Plant-Wide Components	Electrical cabinets (non-HEAF)	AA	3.00E-02	2.36E-02
16.a	Plant-Wide Components	HEAF for low-voltage electrical cabinet (480-1000 V)	AA	**1.52E-04**	**4.80E-04**
16.b	Plant-Wide Components	HEAF for medium-voltage electrical cabinet (>1000 V)	AA	2.13E-03	1.40E-03
16.1	Plant-Wide Components	HEAF for segmented bus duct	AA	1.10E-03	1.27E-03
16.2	Plant-Wide Components	HEAF for iso-phase bus duct	AA	5.91E-04	8.24E-04
17	Plant-Wide Components	Hydrogen tanks	AA	**4.93E-03**	**1.18E-03**
18	Plant-Wide Components	Junction boxes	AA	**3.61E-03**	**1.11E-03**
19	Plant-Wide Components	Miscellaneous hydrogen fires	AA	**4.82E-03**	**1.24E-03**
20	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	BP	5.81E-03	8.83E-03

Table 4-6 (continued)
FPIE bin fire frequency comparisons to previous estimates

Bin	Location	Ignition Source	Power Modes	Fire Ignition Frequency	
				Updated FEDB	NUREG/ CR-6850, Supplement 1
21	Plant-Wide Components	Pumps	AA	**2.72E-02**	**1.42E-02**
22	Plant-Wide Components	RPS MG sets	AP	**2.31E-03**	**9.33E-04**
23	Plant-Wide Components	Transformers	AA	9.56E-03	8.02E-03
24	Plant-Wide Components	Transient fires caused by welding and cutting	AP	4.79E-03	3.65E-03
25	Plant-Wide Components	Transients	AP	8.54E-03	8.28E-03
26	Plant-Wide Components	Ventilation subsystems	AA	**1.64E-02**	**6.12E-03**
27	Transformer yard	Transformer – Catastrophic	AP	**6.61E-03**	**1.62E-03**
28	Transformer yard	Transformer – Non Catastrophic	AP	6.53E-03	8.38E-03
29	Transformer yard	Yard transformers (others)	AP	**3.69E-03**	**1.89E-03**
30	Turbine building	Boiler	AA	1.09E-03	9.78E-04
31	Turbine building	Cable fires caused by welding and cutting	AP	3.47E-04	4.50E-04
32	Turbine building	Main feedwater pumps	AP	4.38E-03	5.44E-03
33	Turbine building	T/G excitor	AP	**8.36E-04**	**2.10E-03**
34	Turbine building	T/G hydrogen	AP	4.12E-03	3.23E-03
35	Turbine building	T/G oil	AP	5.49E-03	3.89E-03
36	Turbine building	Transient fires caused by welding and cutting	AP	4.67E-03	7.55E-03
37	Turbine building	Transients	AP	**6.71E-03**	**3.41E-03**
FPIE Frequency Totals				2.06E-01	1.51E-01

Results Comparison Categories
> 100% increase from EPRI 1016735
50–100% increase from EPRI 1016735
25% to <50% increase from EPRI 1016735
-50% or more reduction from EPRI 1016735
25% to <50% reduction from EPRI 1016735

Power Modes: AA=all plants, all modes; AP=all plants at power; BP=BWR plants at power; PP=PWR plants at power

There are eight bins with FIF increases greater than a factor of two, the largest being dryers (bin 13) with a factor of about nine. One of the more important bins involves main control board (bin 4) fires. It has an increase of about a factor of six. Hydrogen fires (bin 17 and bin 34) also showed significant increases. One particularly notable result is bin 15, which has been a risk-significant contributor in many FPRAs. It is the largest contributor to the total FIF. It has a similar FPRA event count in the 1990s and 2000s, but there are fewer applicable reactor years in the 2000s, as noted previously. Again, the difference in the two estimates is well bounded by the uncertainty.

Notable decreases in FIFs were obtained for transients and hotwork inside PWR containments at power (bin 3), with none reported in the last 20 years of data; plantwide cable fires caused by welding and cutting (bin 11); low-voltage (480–1000V) HEAF (bin 16.a); and T/G-related (bin 33) fires. It is also notable that the self-ignited cable run fire bin had a decrease by nearly a factor of two—only one such fire event was included in the last 20 years of the data. The differences in the rest of the fire ignition bins are smaller. Nonetheless, the differences observed between the NUREG/CR-6850 Supplement 1 FIFs and the current updated values are of limited significance with regard to trending due to the fire event data completeness issues for the data from the 1990s, as discussed in Section 3.

A review of the split fractions by FIF bin was completed as part of the recalculation process. The split fractions were reviewed against those reported in NUREG/CR-6850 [1]. All but one split fraction was deemed to be representative of the NUREG/CR-6850 reported values. One discrepancy was noted—pumps (bin 21) had a split fraction of 0.54 electrical and 0.46 oil in Reference 1. Combining the legacy NUREG/CR-6850 experience with the updated FEDB experience, the new Bayesian estimate is 0.69 electrical and 0.31 oil. Although the new split fraction has a smaller percentage of oil fires, the split fraction provided in NUREG/CR-6850 is bounding as more risk would be going toward the more challenging oil fires.

5
NON-SUPPRESSION PROBABILITY

5.1 NSP Methodology

The following description of the fire NSP methodology is a condensed and minimally edited description of the NSP methodology derived from NUREG/CR-6850 Supplement 1 [2], FAQ 08-0050.

Figure 5-1 shows the conceptual relationship between the fire start time, fire detection time, and fire suppression time. The detection time (T_{det}) is the time interval from the start of the fire up to the time when the fire is initially detected. The suppression time (T_{supp}) is the time interval from when the fire is detected until it is suppressed. The time from fire detection until the fire brigade begins to apply suppressant agents (T_{fb}) is also noted.

As discussed in NUREG/CR-6850, EPRI 1011989, the probability of non-suppression by time t, $P_{ns}(t)$, is given by

$$P_{ns}(t) = Pr(T_{supp} \geq t)$$

Note that in accordance with the revised methodology described in NUREG/CR-6850 Supplement 1, the fire brigade response time is already included in the distribution for T_{supp}. This definition of time available to suppress the fire differs from NUREG/CR-6850 in that it does not require an adjustment for T_{fb} (the fire brigade response time).

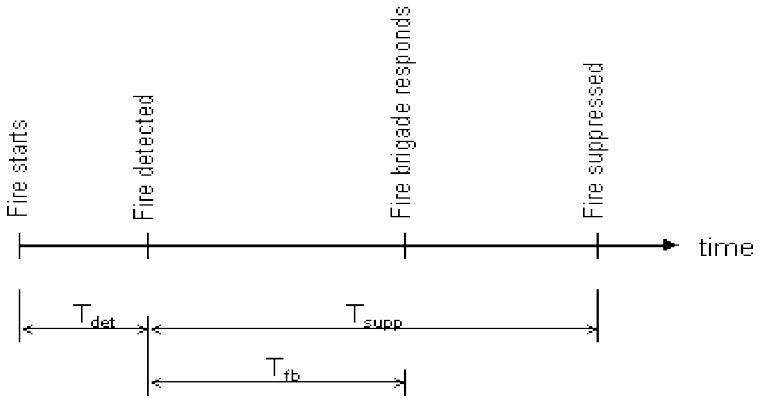

Figure 5-1
Conceptual relationship between the fire detection time, suppression time, and fire brigade response time

FAQ 08-0050 resolution provided clarification and revised guidance for the estimation of $P_{ns}(t)$. It re-estimated the industry average response for the fire suppression time and associated fire NSP, and it provided a new model to account for plant-specific fire brigade response adjustments. This update addresses only the reassessment of the non-suppression curves used for industry average fire suppression response (NSP curves) for the 11 fire suppression groups and the overall fire non-suppression curve. In addition, a new fire suppression group was added for fires that occur inside containment during LPSD plant conditions. The following suppression probability categories have been developed:

- **Transients**. All transient events not specified as belonging to any of the following categories were used.
- **Welding**. Welding events are usually labeled "transient fires caused by welding and cutting" or "cable fires caused by welding and cutting." This curve should be used for calculating the probability of prompt suppression.
- **Electrical**. This data set contains events involving electrical cabinets, electric motors, indoor transformers, and junction boxes, among other electrical equipment. Electrical events in the control room, transformer yard, and T/G excitor bins were excluded. Note that events including overheated electrical equipment, such as bearings due to lack of lubricating oil, were included in this set. Events labeled as high-energy arcing faults were not included in this curve.
- **Cable**. This category refers to cables in raceways. Extension cord–related fires were included in the transient data set. Events describing wiring or cable fires inside cabinets or other electrical equipment were included in the electrical data set. Records with insufficient details, simply reporting a "cable/wiring" fire, were included in this cable data set.
- **Oil**. The oil data set includes all the events in which a lubricating substance was ignited.
- **Flammable gas**. This data set includes only events involving hydrogen fires. Fires and explosions in off-gas/H_2 recombiners are also included.
- **Transformer yard**. This data set includes events labeled as transformer yard. As previously mentioned, events suppressed by fixed fire suppression system only were excluded. Events in which the fire brigade decided to let the fire burn out were also excluded from the set.
- **Containment PWR**. A separate curve is developed for the PWR containment at power. It is considered that fire brigade access to the building in the event of a fire is relatively different from other locations in the plant. Events in this data set include all the ignition source bins in the containment (PWR) location for at power conditions.
- **Containment (LPSD)**. This is a new containment suppression curve category that applies to LPSD only conditions. It would be applicable when the containment is open to maintenance and operations staff when the reactor is not at power. It primarily includes hotwork of all types but can include electrical or other in-containment fires. It applies to both PWRs and BWRs.
- **Control room**. Events in this bin are the ones labeled Control Room/Electrical Cabinets or other fires occurring within the control room location.

- **Turbine-generator**. Events in this set include the ones labeled as T/G oil, T/G hydrogen, and T/G excitor. Some of the T/G hydrogen events were excluded from the data set because they were suppressed with an automatic system.
- **HEAFs**. These includes events labeled as high-energy arcing faults.
- **All events**. This data set includes all events that were not considered as "prompt suppression" cases. The purpose of this data set is to generate a generic suppression time probability curve that may be used for those cases where the analyst cannot find a proper match from the preceding list of categories.

The probability that the fire brigade or other first responders failing to suppress the fire [$Pr(T_{supp} \geq t)$] is estimated with suppression probability curves developed using the suppression time data reported in the FEDB. The data used for this analysis are provided in Appendix A. They include the same data used in NUREG/CR-6850 Supplement 1 updated with a few corrections and additional data from the 1990–2009 period. Fire events before 1/1/1981 were excluded from the manual NSP curves. This is the date when Appendix R of 10 CFR Part 50 was issued. The curves were developed using events where manual suppression was involved and suppression time information was available. Suppression time was defined as the time the fire was extinguished or the time the fire was reported to have been brought under control by the fire brigade on scene. Events including self-extinguished fires, supervised burnouts, and fires extinguished with automatic fire suppression systems were excluded from the curves. If the time from detection to suppression was not known but the duration of the fire event from start to suppression was known, the reported fire duration was used instead.

The mathematical model to derive $Pr(T_{supp} \geq t)$ is described in NUREG/CR-6850 as follows:

> The data for analysis consists of reported fire durations in commercial U.S. NPPs. These times are treated as being generated by an underlying probabilistic model. The final output of interest is the suppression curve, which gives the probability that a fire lasts longer than a specified time. If T is the random variable describing when the fire is suppressed, and $\lambda(t)$ is the rate at which the fire is suppressed (possibly time-dependent), this probability of non-suppression is given by:
>
> $$Pr(T>t) = \exp\left(-\int_0^t \lambda(s)ds\right)$$
>
> In this equation, $\lambda(t)$ is a function of the parameters of the probabilistic model chosen for T. The simplest model for T is the exponential distribution, whose probability density function is:
>
> $$f(t) = \lambda e^{-\lambda t}$$
>
> In this model, λ is estimated directly and is not a function of time, giving
>
> $$Pr(T > t) = e^{-\lambda t}$$
>
> The non-suppression probability is calculated using the above equation, usually selecting t as the time to target damage.

The same mathematical model has been used in this report unless otherwise noted.

5.2 NSP Estimation Update

The update of the NSP curves for $Pr(T_{supp} \geq t)$ for the 12 fire suppression categories plus the overall industry average curves are represented by the summary data, and non-suppression curve parameters are provided in Table 5-1. The numerical values of the non-suppression curve probabilities are provided in Table 5-2. A cutoff or 0.001 in NSP has been used, consistent with the guidance of NUREG/CR-6850, Supplement 1. The uncertainty in the NSPs is given by the uncertainty in the mean of the non-suppression parameter estimates for λ, also in a manner consistent with NUREG/CR-6850, Supplement 1. The results for NSP curves are also shown graphically in Figure 5-2.

Table 5-1
Probability distribution for rate of fires suppressed per unit time, λ (Originally, Table P-2 from NUREG/CR-6850)

Suppression Curve	Number of Events in Curve	Total Duration (minutes)	Rate of Fire Suppressed (λ)			
			Mean	5th Percent	50th Percent	95th Percent
T/G fires	30	1167	0.026	0.019	0.025	0.034
Control room	12	37	0.324	0.187	0.315	0.492
PWR containment (AP)	3	40	0.075	0.020	0.067	0.157
Containment (LPSD)	31	299	0.104	0.075	0.103	0.136
Outdoor transformers	24	928	0.026	0.018	0.026	0.035
Flammable gas	8	234	0.034	0.017	0.033	0.056
Oil fires	50	562	0.089	0.069	0.088	0.111
Cable fires	4	29	0.138	0.047	0.127	0.267
Electrical fires	177	1815	0.098	0.086	0.097	0.110
Welding fires	52	484	0.107	0.084	0.107	0.133
Transient fires	43	386	0.111	0.085	0.111	0.141
HEAFs	8	602	0.013	0.007	0.013	0.022
All fires	442	6583	0.067	0.062	0.067	0.072

Table 5-2
Updated numerical results for suppression curves (Originally, Table 14-1 from NUREG/CR-6850, Supplement 1)

Time (min)	T/G fires	HEAFs	Outdoor transformers	Flammable gas	Oil fires	Electrical fires	Transient fires	PWR containment (AP)	Containment (LPSD)	Welding	Control room	Cable fires	All fires
0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
5	0.879	0.936	0.879	0.843	0.641	0.614	0.572	0.687	0.595	0.584	0.198	0.502	0.715
10	0.773	0.876	0.772	0.710	0.411	0.377	0.328	0.472	0.355	0.341	0.039	0.252	0.511
15	0.680	0.819	0.678	0.599	0.263	0.232	0.188	0.325	0.211	0.200	0.008	0.126	0.365
20	0.598	0.767	0.596	0.505	0.169	0.142	0.108	0.223	0.126	0.117	0.002	0.063	0.261
25	0.526	0.717	0.524	0.425	0.108	0.087	0.062	0.153	0.075	0.068	*	0.032	0.187
30	0.462	0.671	0.460	0.359	0.069	0.054	0.035	0.105	0.045	0.040	*	0.016	0.133
35	0.407	0.628	0.404	0.302	0.044	0.033	0.020	0.072	0.027	0.023	*	0.008	0.095
40	0.358	0.588	0.355	0.255	0.028	0.020	0.012	0.050	0.016	0.014	*	0.004	0.068
45	0.314	0.550	0.312	0.215	0.018	0.012	0.007	0.034	0.009	0.008	*	0.002	0.049
50	0.277	0.515	0.274	0.181	0.012	0.008	0.004	0.024	0.006	0.005	*	0.001	0.035
55	0.243	0.481	0.241	0.153	0.007	0.005	0.003	0.016	0.003	0.003	*	*	0.025
60	0.214	0.451	0.212	0.129	0.005	0.003	0.002	0.011	0.002	0.002	*	*	0.018
65	0.188	0.422	0.186	0.108	0.003	0.002	*	0.008	0.001	0.001	*	*	0.013
70	0.165	0.394	0.164	0.091	0.002	0.001	*	0.005	*	*	*	*	0.009
75	0.145	0.369	0.144	0.077	0.001	*	*	0.004	*	*	*	*	0.007
80	0.128	0.345	0.126	0.065	*	*	*	0.002	*	*	*	*	0.005
85	0.112	0.323	0.111	0.055	*	*	*	0.002	*	*	*	*	0.003
90	0.099	0.302	0.098	0.046	*	*	*	0.001	*	*	*	*	0.002
95	0.087	0.283	0.086	0.039	*	*	*	*	*	*	*	*	0.002
100	0.076	0.265	0.075	0.033	*	*	*	*	*	*	*	*	0.001

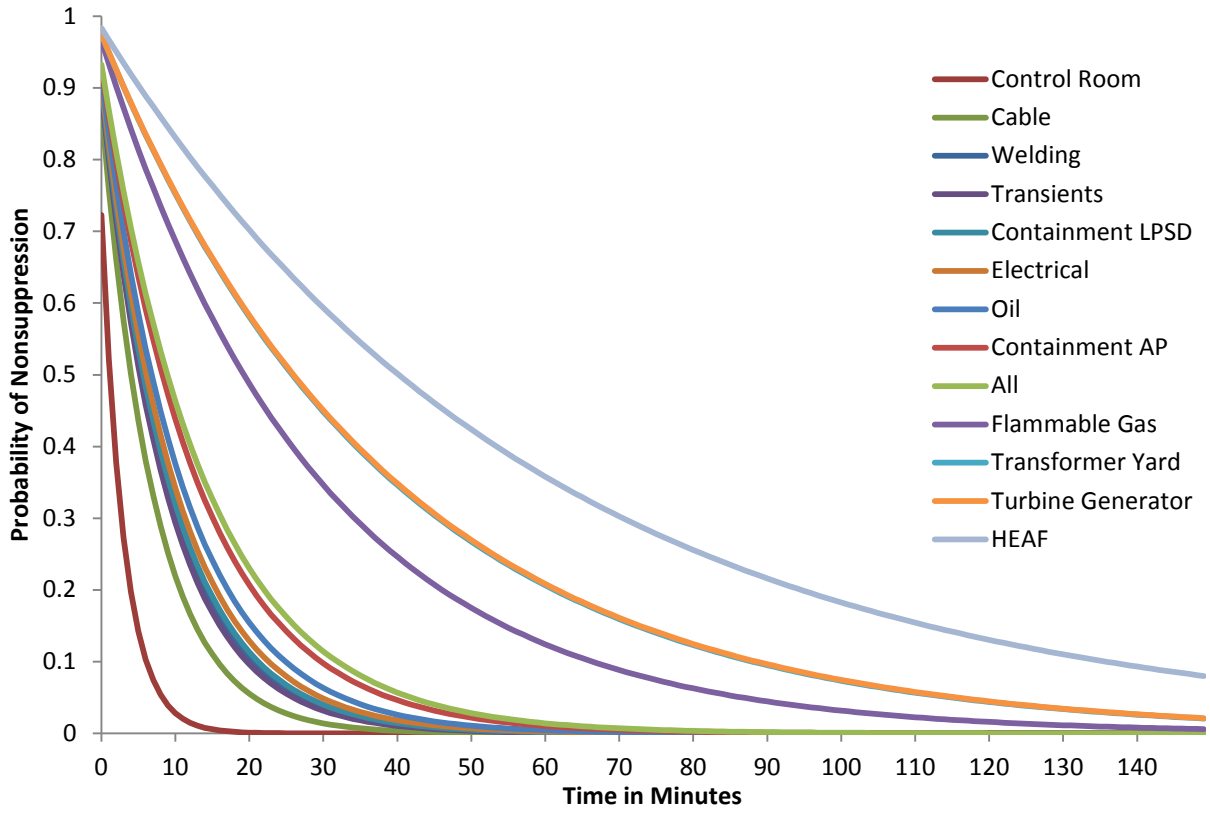

Figure 5-2
Non-suppression curve plots: probability vs. time to suppression

Note that the data for the PWR containment suppression curve group include only three fire suppression events. There were no fire events identified for this fire suppression curve after 1994 in NUREG/CR-6850, Supplement 1, and no new fire events with suppression time data were included in the 2000s FEDB data. Another small fire suppression data group involved cable fires. This group has only four recorded manual fire suppression events, all of which occurred before 1990.

The fire suppression curves were developed from 442 FPRA applicable events for which suppression time information was available. There were 108 PRA countable fire events from the 1990s and 2000s data that had insufficient details to estimate a fire suppression time. Fire events with undetermined suppression times from the pre-1990 timeframe were also excluded from the NUREG/CR-6850, Supplement 1 suppression data and were not reviewed to ascertain their count in this project. There were 22 self-extinguished fires and three supervised burnouts in the PRA countable fire suppression events for the 1990s and 2000s data that were not used to derive fire NSPs, consistent with the practice used in NUREG/CR-6850, Supplement 1.

5.3 NSP Sensitivity and Supplemental Considerations

For comparison, the mean of the NSP rate parameter, λ, from NUREG/CR-6850, Supplement 1, and this update are provided in Table 5-3. Although the overall NSP curve is very similar and most individual curves are similar given the limited data for many of the curves, there is one

notable difference—a marked increase in the mean suppression time (smaller suppression rate) for the welding curve. An examination of the longer-duration welding fires did not indicate a consistent reason for this increase.

Table 5-3
Comparisons of the mean NSP rate parameter, λ , from NUREG/CR-6850, Supplement 1, and updated suppression rates (λ)

		NUREG/CR-6850, Supplement 1		Updated FEDB Analysis	
Suppression Curve	**Number Supplement 1 Events/ Updated Events**	**Total Suppression Time (minutes)**	**Mean Suppression Rate [/min]**	**Updated Total Suppression Time (minutes)**	**Updated Mean Suppression Rate [/min]**
T/G fires	21/30	846	0.025	1167	0.026
Control room	6/12	18	0.33	37	0.324
PWR containment (AP)	3/3	40	0.075	40	0.075
Containment (LPSD)	N/A/31	N/A	N/A	299	0.104
Outdoor transformers	14/24	390	0.036	928	0.026
Flammable gas	5/8	197	0.025	234	0.034
Oil fires	36/50	474	0.076	562	0.089
Cable fires	5/4	31	0.161	29	0.138
Electrical fires	113/177	1113	0.102	1815	.098
Welding fires	18/52	106	0.188	484	0.107
Transient fires	22/42	174	0.126	386	0.111
HEAFs	3/8	276	0.011	602	0.013
All fires	246/442	3655	0.067	6583	0.067

For both the electrical and all-fire suppression curve categories, two other NSP curve distribution functions were examined—log-normal and two-parameter Weibull. The log-normal had a better overall fit to the data, producing somewhat lower NSP values in the 5-minute to about 30-minute time frame, but it had a much more substantial NSP tail. During a review of the NSP data, questions were raised regarding the correctness of using some of the very long-duration fire suppression times in the development of the NSP curves. The use of an exponential probability distribution ameliorates this issue somewhat. However, it also produces sometimes notably higher NSP values in the 5- to 30-minute time frame.

6
OBSERVATIONS AND CONCLUSIONS

Several key observations and results are described in this section.

6.1 Fire Event Data

Fire event data collected for the 2000–2009 period are believed to be the most complete and accurate data for characterizing fire events and estimating fire ignition frequencies for U.S. FPRAs. The data from this period were collected in a uniform manner and underwent extensive review for fire severity classification, ignition frequency binning, and suppression analysis.

Fire event data exhibit a discontinuity for the period 1990–1999 that is statistically significant. That anomaly may actually start a year or two earlier, but the detailed level of determination has not been attempted. The discontinuity appears to be related to the nature of the fire event data sources and completeness of the collection of the potentially challenging fires in the 1990s.

The 1990s has a smaller occurrence rate for reported fire events than either the earlier or later time periods, and this difference is statistically significant. This supports but does not confirm the more qualitative observation cited previously that the completeness of the fire data for the 1990s is highly questionable and that the data might be missing some fire events important to the determination of FIF.

The overall fire occurrence frequency for full-power PRA bins combined has declined since the 1970s and 1980s by about 39%. This difference in the fire occurrence rate between the 1968–1989 and 2000–2009 periods is statistically significant. No attempt was made to correlate this decrease in frequency to improvements in fire protection regulations or plant practices.

Bins with fewer than 2.5 fires in the 2000s had a lower overall fire occurrence rate in the 2000s than the 1990s. Although the statistical significance could not be established for individual bins due to the small data population of each bin, in just about every case, the fire counts in the 2000s were less than the 1990s for sparse bins only. The exceptions involved medium-voltage electrical cabinet HEAF and bus duct HEAF bins with known fire event counts from all plants in both the 1990s and 2000s.

The rate of fires during shutdown increased significantly (by nearly 300%) in 2000–2009 in comparison to earlier periods, when these rates are expressed as fires per shutdown reactor year. The number of such fires was roughly consistent with the earlier data, but the time spent in shutdown was shorter in the most recent period, leading to higher calculated fire frequencies per shutdown reactor year.

6.2 Fire Ignition Frequency

The methodology used to estimate the updated FIFs for the individual FPRA bins is essentially the same as that developed in the EPRI report *An Improved Methodological Approach for Estimating Fire Ignition Frequencies* (1022994) [7]. The only change was to use a more diffuse prior with hyperprior parameter $\sigma_{med}=3$ for the medium-density and high-density bins with 2.5 or more PRA fire counts in the 2000–2009 period. This prior weights the data from the update period more than the original proposal using $\sigma_{med}=1.3$ and produces a slightly larger error factor (uncertainty). However, it is now consistent with the hyperprior specification for the sparse bins with fewer than 2.5 PRA fire counts. The revised methodology provides very similar fire frequency estimates to the original proposal. See EPRI 102294 [7] for insights from sensitivities performed for variations prior models.

The updated fire ignition frequencies for full-power PRA applications had an overall increase from the revised fire frequencies in NUREG/CR-6850, Supplement 1, of 36%. However, the results varied considerably for individual bins, including the following:

- Notable increases in eight bins, ranging from a factor of two to nine (largest increase for dryers)
- Notable decreases in four bins, ranging from a factor of two to four decrease
- Variations of less significance for the remaining bins

The data used to estimate fire frequencies consisted of fire events with significant variation in the magnitude and consequence of fires, including many relatively low-severity fire events that did not grow vigorously but still were deemed to be potentially challenging in the context of FPRA.

6.3 Fire Non-Suppression Probabilities

Fire non-suppression methodology from NUREG/CR-6850, Supplement 1, was used to derive updated fire suppression curves using the data from that report supplement with newer and updated fire event data from the FEDB. The plant-specific correction factor for fire brigade response time was not addressed in this report because it is not dependent on updating the fire suppression time data.

One new fire suppression curve category was created to address the suppression of fire events inside containment during plant shutdown periods for both PWRs and BWRs, designated containment (LPSD). The data for this bin were primarily associated with hotwork fires and transients that would be expected to occur only during shutdown conditions.

Several fire suppression curves are derived with very small data sets. These include the PWR containment fire suppression curve group, which has only three recorded fire events, all of which occurred before 1995. Another is the cable fire suppression curve group, which has only four recorded manual fire suppression events that all occurred before 1990.

6.4 Future Research

To maintain a sustainable and consistent process of gathering future fire event data, the Institute of Nuclear Power Operations (INPO), is collecting events in their INPO Consolidated Event System (ICES). It is envisioned that this process will help streamline the effort required to produce fire frequencies on a more frequent basis to support risk-informed, performance based fire protection programs.

The new EPRI updated FEDB, containing reference event reports, captures more details and fire attributes than prior releases of the database. Future research can benefit from this expanded information by evaluating data from the FEDB against existing assumptions and methods. The current effort was focused on updating the current fire frequency bins with an enhanced methodology and updated fire event data. No changes (for example, further subdivisions) were considered for binning of fire events. Future evolution of frequency and NSP estimation can benefit from insights from recent fire events and changes in methodology and binning.

A preliminary review of the electrical cabinet fires over the past 20 years of experience has demonstrated that it would be feasible to break bin 15 into smaller subcategories. This bin has the highest PRA count out of all bins and is often a current driver for plant risk. Future revisions should evaluate subdividing bin 15 to better characterize plant risk and reflect fire event trends more accurately in the future.

The frequencies in this report, like the original frequencies, are plant-based. This can cause redistribution of frequencies if components are added or removed. Moving toward a component-based approach eliminates the need for counting and redistribution when plant equipment changes occur. The first steps in moving to component-based fire frequencies include a feasibility and methodology exploration as well as understanding the variability of fixed ignition source counts from plant to plant.

The review of fire suppression events suggests that many fire events are rapidly suppressed by personnel other than the fire brigade. Differentiating the suppression curves into two curves based on extinguishing roles—that is, plant personnel versus fire brigade—may provide further enhancement to the non-suppression methodology. Research to improve the methodology based on separating fire severity classifications (potentially challenging versus challenging fire events) is also being investigated.

7
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Appendix A
DATA FROM THE FEDB

Table A-1
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppressi on Time	Review Comments
8	5/7/2000	Transformer Yard	Yard transformers (others)	PO	PC	29	Excluded	30	Self-extinguish (no plant intervention)
100	5/15/2000	Plant-Wide Components	HEAF segmented bus duct	PO	CH	16.1	HEAF	78	Not used in NUREG/CR-6850 Supplement 1 suppression analysis
101	9/3/2000	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	29	
106	2/3/2001	Plant-Wide Components	HEAF medium-voltage electrical cabinet (>1000 V)	PO	CH	16.b	HEAF	154	
109	4/24/2001	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	2	
111	8/2/2001	Transformer Yard	Transformer – Catastrophic	PO	CH	27	Excluded	22	Extinguished by automatic suppression only
112	8/3/2001	Plant-Wide Components	HEAF medium-voltage electrical cabinet (>1000 V)	PO	PC	16.b	HEAF	90	Revised to HEAF based on additional details from plant
113	6/12/2002	Transformer Yard	Yard transformers (others)	PO	CH	SB4	Excluded	46	Special bin, not FPRA applicable
114	8/21/2002	Plant-Wide Components	Pumps	PO	CH	21	Excluded	NA	Extinguished by automatic suppression only

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
115	8/22/2002	Turbine Building	T/G hydrogen	PO	CH	34	Turbine Generator	18	Fire source and location revised
116	10/3/2002	Transformer Yard	Transformer – Non Catastrophic	PO	CH	28	Excluded	N/A	Extinguished by automatic suppression system
117	10/9/2002	Plant-Wide Components	Pumps	PO	U	21	Electrical	23	
118	1/15/2003	Transformer Yard	Transformer – Catastrophic	PO	CH	27	Excluded	35	Extinguished by automatic suppression only
120	4/7/2003	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	33	
121	4/26/2003	Plant-Wide Components	Pumps	PO	U	21	Electrical	37	
122	4/29/2003	Turbine Building	T/G oil	PO	CH	35	Turbine Generator	15	Suppression time revised
125	1/6/2004	Control/Aux/ Reactor Building	Transients	PO	CH	7	Transients	22	
126	5/21/2004	Transformer Yard	Yard transformers (others)	PO	PC	29	Transformer Yard	33	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
127	6/18/2004	Plant-Wide Components	HEAF iso-phase duct	PO	CH	16.2	HEAF	71	Not used in NUREG/CR-6850 Supplement 1 suppression analysis
128	8/31/2004	Plant-Wide Components	Pumps	PO	PC	21	Oil	8	
129	11/6/2004	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	17	
130	12/14/2004	Turbine Building	T/G oil	PO	PC	35	Turbine Generator	9	
131	1/14/2005	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	23	
132	3/4/2005	Turbine Building	Transients fires caused by welding and cutting	RF	NC	NC	Excluded	64	Fire severity revised
133	5/4/2005	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	20	
134	6/27/2005	Transformer Yard	Transformer – Catastrophic	PO	CH	27	Transformer Yard	27	Extinguished by automatic suppression and manual means
135	8/25/2005	Plant-Wide Components	Pumps	PO	PC	21	Electrical	13	Suppression time revised

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
136	10/25/2005	Turbine Building	T/G oil	HS	PC	35	Turbine Generator	13	
137	10/29/2005	Transformer Yard	Transformer – Non Catastrophic	PO	CH	28	Transformer Yard	28	Extinguished by automatic suppression and manual means
139	2/24/2006	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	NA	153	Special bin, not FPRA applicable
141	5/1/2006	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	NA	11	Special bin, not FPRA applicable
143	8/15/2006	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	NA	36	Special bin, not FPRA applicable
144	10/30/2006	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	4	
146	2/27/2007	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	23	
148	4/6/2007	Transformer Yard	Transformer – Catastrophic	PO	CH	28	Transformer Yard	12	Extinguished by automatic suppression and manual means

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Designation	NSP Category	Suppression Time	Review Comments
150	4/25/2007	Plant-Wide Components	Hydrogen tanks	PO	CH	17	Flammable Gas	28	
152	10/23/2007	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Excluded	NA	Self-extinguish (no plant intervention)
154	9/20/2008	Turbine Building	T/G hydrogen	PO	CH	34	Turbine Generator	23	
157	2/1/2009	Transformer Yard	Transformer – Catastrophic	PO	CH	27	Transformer Yard	31	Extinguished by automatic suppression
160	2/7/2009	Turbine Building	T/G hydrogen	PO	CH	34	Turbine Generator	18	
161	4/22/2009	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	5	Suppression time revised
169	11/13/2003	Plant-Wide Components	Pumps	PO	PC	21	Electrical	2	
172	12/7/2003	Turbine Building	Main feedwater pumps	PO	CH	32	Oil	20	
175	11/22/2009	Plant-Wide Components	Electrical cabinets (non-HEAF)	CD	CH	15	Electrical	45	
176	12/12/2009	Control/Aux/ Reactor Building	Transients fires caused by welding and cutting	PO	PC	6	Welding	23	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
266	11/9/2006	Turbine Building	Transients	PO	PC	37	Transients	10	
267	6/1/2000	Plant-Wide Components	Transients fires caused by welding and cutting	PO	U	24	Welding	NA	Suppression time indeterminate
269	12/12/2000	Plant-Wide Components	Transients fires caused by welding and cutting	PO	PC	24	Welding	2	
270	11/18/2005	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	8	
275	10/14/2003	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	2	
288	10/10/2006	Plant-Wide Components	Pumps	RF	NC	NA	N/A	3	Fire severity revised
303	3/1/2000	Plant-Wide Components	Electrical cabinets (non-HEAF)	CD	PC	15	Electrical	2	
308	10/14/2005	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	2	
320	10/24/2000	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	2	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
333	5/11/2007	Diesel Generator Room	Diesel generators	PO	PC	8	Oil	2	
335	8/3/2007	Diesel Generator Room	Diesel generators	PO	NA	NA	N/A	6	Fire severity revised
346	3/1/2002	Plant-Wide Components	Electric motors	RF	PC	14	Electrical	2	
350	7/11/2002	Turbine Building	Transients	RF	PC	37	Excluded	N/A	Self-extinguish (no plant intervention)
356	4/19/2006	Plant-Wide Components	Ventilation subsystems	CD	PC	26	Electrical	8	
375	10/16/2009	Plant-Wide Components	Pumps	CD	NC	NC	Excluded	2	Fire severity revised
381	3/6/2005	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	13	
411	3/8/2001	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Excluded	N/A	Self-extinguish (no plant intervention)
420	6/24/2001	Plant-Wide Components	Pumps	PO	U	21	Electrical	N/A	Suppression time indeterminate
422	3/7/2003	Plant-Wide Components	Transients	PO	PC	25	Transients	N/A	Suppression time indeterminate

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
423	6/23/2003	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	N/A	Suppression time indeterminate
424	3/10/2005	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	N/A	N/A	Special bin, not FPRA applicable; suppression time indeterminate
498	12/19/2000	Plant-Wide Components	Pumps	PO	U	21	Electrical	N/A	Suppression time indeterminate
504	10/9/2002	Turbine Building	Transients	RF	U	37	Transients	N/A	Suppression time indeterminate
515	10/5/2005	Control/Aux/ Reactor Building	Transients	RF	PC	7	Transients	N/A	Suppression time indeterminate
516	10/25/2005	Plant-Wide Components	Transformers	PO	PC	23	Electrical	N/A	Suppression time indeterminate
517	3/23/2006	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	15	
520	6/6/2006	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	8	
588	11/30/2006	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	CH	15	Excluded	N/A	Extinguished by automatic suppression only

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
591	7/19/2006	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	2	
592	6/11/2009	Plant-Wide Components	Transients fires caused by welding and cutting	RF	U	24	Welding	N/A	Suppression time indeterminate
595	2/13/2000	Plant-Wide Components	Transients fires caused by welding and cutting	CD	U	24	Welding	N/A	Suppression time indeterminate
598	10/12/2000	Plant-Wide Components	Transients fires caused by welding and cutting	CD	U	24	Welding	2	
602	9/29/2006	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	N/A	Suppression time indeterminate
603	11/14/2007	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	10	
606	10/31/2006	Plant-Wide Components	Ventilation subsystems	RF	PC	26	Electrical	2	
607	11/13/2008	Plant-Wide Components	Ventilation subsystems	CD	U	26	Electrical	17	
10286	5/10/2004	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	2	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppres sion Time	Review Comments
10287	5/19/2004	Turbine Building	Transients fires caused by welding and cutting	RF	U	36	Welding	2	
10291.1	9/18/2004	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	PO	PC	6	Welding	9	Treated as two fire events; suppression time revised
10291.2	9/18/2004	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	PO	PC	6	Welding	11	Treated as two fire events; suppression time revised
10313	4/3/2009	Turbine Building	Transients fires caused by welding and cutting	RF	U	36	Welding	2	
10331	3/24/2009	Diesel Generator Room	Diesel generators	PO	PC	8	Oil	10	
10334	3/30/2000	Containment (PWR)	Transients and hotwork (LPSD)	RF	U	3P	Electrical	2	
10338	9/13/2001	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	N/A	Suppression time indeterminate
10386	3/1/2003	Plant-Wide Components	Crane	PO	U	SB2	N/A	2	Special bin, not FPRA applicable
10389	9/8/2003	Control Room	Main control board	PO	PC	4	Control Room	2	Fire source revised

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppres sion Time	Review Comments
10394	2/22/2005	Control Room	Main control board	PO	PC	4	Excluded	N/A	Fire source revised; self-extinguish (no plant intervention)
10397	10/12/2005	Plant-Wide Components	Electric motors	PO	PC	14	Electrical	2	
10407	6/3/2007	Control Room	Main control board	PO	PC	4	Control Room	2	
10430	12/21/2000	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	8	
10482	10/22/2006	Plant-Wide Components	Pumps	PO	U	21	Electrical	2	
10489	4/6/2008	Diesel Generator Room	Diesel generators	PO	CH	SB5	Oil	5	Special bin, not FPRA applicable
10492	9/30/2008	Turbine Building	Transients	RF	PC	37	Transient	N/A	Fire source revised; suppression time indeterminate
10493	10/23/2008	Plant-Wide Components	Cable run (self-ignited cable fires)	PO	U (NC-PC)	SB4	NA	Indetermi nate	Special bin, not FPRA applicable
10508	3/28/2001	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	U	SB4	N/A	N/A	Special bin, not FPRA applicable

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
10514	8/26/2001	Diesel Generator Room	Diesel generators	PO	PC	8	Oil	2	
10515	9/30/2001	Diesel Generator Room	Diesel generators	RF	PC	SB5	Oil	10	Special bin, not FPRA applicable
10516	11/20/2001	Containment (PWR)	Transient and hotwork (LPSD)	RF	PC	3P	Containment	10	
10522	11/2/2003	Diesel Generator Room	Diesel generators	PO	PC	SB5	Oil	2	Special bin, not FPRA applicable
10524	1/7/2004	Diesel Generator Room	Diesel generators	PO	PC	SB5	Oil	2	Special bin, not FPRA applicable
10555	5/5/2004	Turbine Building	Transients	RF	U	37	Transients	N/A	Suppression time indeterminate
10558	1/19/2005	Plant-Wide Components	Air compressors	RF	PC	9	Oil	12	
10565	8/15/2005	Exclude	Exclude	RF	PC	SB4	NA	Indeterminate	Special bin, not FPRA applicable
10576	7/26/2006	Plant-Wide Components	Misc. hydrogen fires	PO	PC	19	Flammable Gas	2	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
10579	4/4/2008	Turbine Building	Transients fires caused by welding and cutting	RF	U	36	Welding	2	
10582	12/9/2005	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	N/A	Suppression time indeterminate
10584	7/27/2008	Plant-Wide Components	HEAF for segmented bus duct	PO	U (NC-PC)	16.1	HEAF	Indetermi nate	Suppression time indeterminate
10585	4/24/2003	Plant-Wide Components	Electric motors	RF	U	14	Electrical	N/A	Suppression time indeterminate
10599	3/25/2006	Diesel Generator Room	Diesel generators	PO	PC	SB4	Excluded	2	Special bin, not FPRA applicable
10604	5/14/2001	Turbine Building	T/G oil	PO	PC	35	Turbine Generator	14	
10605	1/31/2006	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	1	
10611	8/20/2009	Plant-Wide Components	Pumps	PO	PC	21	Electrical	10	
10614	2/25/2004	Plant-Wide Components	Lighting, ballast, or electric outlet	PO	U	SB1	N/A	N/A	Special bin, not FPRA applicable

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
10615	10/15/2005	Containment (PWR)	Reactor coolant pump	RF	NC	NA	N/A	N/A	Fire severity revised; suppression time indeterminate
10617	2/14/2003	Plant-Wide Components	Pumps	PO	U	21	Electrical	N/A	Suppression time indeterminate
10618	2/15/2000	Plant-Wide Components	Dryers	PO	PC	13	Transients	33	Suppression time indeterminate
10626	12/11/2002	Plant-Wide Components	Pumps	PO	PC	21	Electrical	27	Suppression time revised
10628	12/30/2005	Plant-Wide Components	Transients	PO	U	25	Transients	N/A	Suppression time indeterminate
10630	6/6/2007	Plant-Wide Components	Air compressors	PO	PC	9	Electrical	2	Suppression time indeterminate
10664	10/2/2000	Diesel Generator Room	Diesel generators	PO	U	8	Excluded	N/A	Self-extinguish (no plant intervention)
10665	11/3/2000	Diesel Generator Room	Diesel generators	PO	U	SB5	Oil	2	Special bin, not FPRA applicable
10684	4/6/2005	Turbine Building	Transients fires caused by welding and cutting	PO	PC	36	Excluded	N/A	Self-extinguish (no plant intervention)

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
10699	4/24/2008	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	N/A	N/A	Special bin, not FPRA applicable; suppression time indeterminate
10708	9/22/2004	Diesel Generator Room	Diesel generators	PO	U	SB5	Oil	2	Special bin, not FPRA applicable
10713	3/25/2007	Diesel Generator Room	Diesel generators	PO	U	SB5	Oil	2	Special bin, not FPRA applicable
10715	2/5/2009	Turbine Building	Boiler	RF	PC	30	Electrical	2	
10720	4/8/2006	Diesel Generator Room	Diesel generators	PO	U	SB5	Oil	2	Special bin, not FPRA applicable
10723	10/4/2007	Diesel Generator Room	Diesel generators	PO	PC	SB5	Oil	2	Special bin, not FPRA applicable
10729	4/3/2009	Turbine Building	Transients fires caused by welding and cutting	CD	U	36	Welding	2	
20378	2/25/2000	Plant-Wide Components	Pumps	PO	PC	21	Electrical	12	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
20380	8/16/2000	Plant-Wide Components	Pumps	PO	PC	21	Electrical	21	
20381	10/17/2000	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	U	6	Welding	2	
20382	10/23/2000	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	PC	15	Electrical	2	
20383	11/5/2000	Plant-Wide Components	Lighting, ballast, or electric outlet	RF	U	SB1	N/A	10	Special bin, not FPRA applicable
20385	12/27/2000	Plant-Wide Components	Pumps	PO	PC	21	Electrical	2	
30266	1/20/2009	Plant-Wide Components	Ventilation subsystems	PO	NA	See FID 50728	Electrical	5	Repeat event
30270	3/16/2003	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	5	
30271	9/11/2003	Turbine Building	Main feedwater pumps	PO	PC	32	Oil	N/A	Suppression time indeterminate
30276	7/24/2006	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Control room	2	Suppression time indeterminate
30277	12/3/2007	Turbine Building	Transients	PO	PC	37	Transients	2	Suppression time indeterminate

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30281	6/5/2008	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	PC	15	Control room	N/A	Suppression time indeterminate
30292	6/17/2001	Exclude	Exclude	PO	PC	SB4	NA	2	Decommissioned plant
30296	11/22/2002	Plant-Wide Components	Lighting, ballast, or electric outlet	RF	PC	SB1	N/A	10	Special bin, not FPRA applicable
30302	1/26/2007	Plant-Wide Components	Electric motors	PO	PC	14	Electrical	2	
30312	3/29/2003	Plant-Wide Components	Pumps	HS	PC	21	Electrical	2	Suppression time revised
30314	12/19/2001	Control/Aux/ Reactor Building	Transients	PO	PC	7	Transients	10	
30317	4/18/2005	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	2	
30322	10/28/2006	Turbine Building	Transients	RF	PC	37	Transients	2	
30324	1/11/2007	Plant-Wide Components	Transformers	PO	PC	23	Electrical	2	
30327	3/6/2009	Plant-Wide Components	Pumps	PO	PC	21	Electrical	10	
30330	4/30/2000	Turbine Building	Transients	RF	PC	37	Transients	2	Fire source revised

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30333	7/31/2003	Plant-Wide Components	Transients	PO	PC	25	Transients	N/A	Suppression time indeterminate
30338	3/30/2006	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	3	
30340	11/10/2000	Plant-Wide Components	Air compressors	PO	PC	9	Electrical	2	
30341	1/2/2001	Plant-Wide Components	Under-capacity component	PO	PC	SB3	N/A	10	Special bin, not FPRA applicable
30342	2/11/2002	Plant-Wide Components	Crane	PO	U	SB2	N/A	N/A	Special bin, not FPRA applicable; suppression time indeterminate
30344	1/23/2003	Plant-Wide Components	Air compressors	PO	PC	9	Electrical	8	
30350	7/26/2004	Turbine Building	Transients	PO	PC	37	Transients	7	
30354	2/8/2005	Plant-Wide Components	Transients	PO	U (NC-PC)	SB4	Exclude	19	Special bin, not FPRA applicable
30355	2/17/2005	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U (NC-PC)	SB4	NA	Indetermi nate	Special bin, not FPRA applicable
30357	6/20/2007	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	CD	U	6	Welding	8	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30358	8/2/2007	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	SB4	NA	2	Special bin, not FPRA applicable
30361	4/11/2001	Turbine Building	Transients	RF	PC	37	Transients	N/A	Suppression time indeterminate
30362	12/16/2001	Plant-Wide Components	Pumps	RF	PC	21	Electrical	45	
30363	5/5/2003	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	2	
30370	10/31/2005	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	2	
30374	11/30/2005	Control/Aux/ Reactor Building	Transients	RF	PC	7	Transients	N/A	Suppression time indeterminate
30380	12/17/2007	Turbine Building	Transients	RF	U	37	Transients	N/A	Suppression time indeterminate
30392	3/20/2000	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	9	
30393	3/24/2000	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	N/A	Suppression time indeterminate
30394	2/2/2003	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	N/A	Suppression time indeterminate

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30395	3/21/2004	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	N/A	Suppression time indeterminate
30404	4/21/2009	Plant-Wide Components	Transients fires caused by welding and cutting	PO	U	24	Excluded	N/A	Self-extinguish (no plant intervention)
30407	4/30/2002	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	5	
30408	3/19/2001	Turbine Building	Transients	PO	PC	37	Transients	N/A	Suppression time indeterminate
30409	8/21/2000	Transformer Yard	Yard transformers (others)	PO	PC	29	Excluded	N/A	Self-extinguish (no plant intervention)
30410	10/25/2000	Plant-Wide Components	Pumps	PO	PC	21	Electrical	5	
30412	4/25/2002	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	1	
30418	2/19/2002	Plant-Wide Components	Transients	RF	U	25	Excluded	N/A	Suppression time indeterminate; self-extinguished
30421	3/5/2002	Turbine Building	Transients	RF	U	37	Excluded	N/A	Supervised burnout
30422	11/27/2001	Plant-Wide Components	Pumps	PO	PC	21	Electrical	5	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30424	4/11/2001	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	N/A	Suppression time indeterminate
30425	10/7/2002	Plant-Wide Components	Ventilation subsystems	PO	NA	NA	N/A	3	Fire severity revised
30429	5/6/2004	Containment (PWR)	Reactor coolant pump	RF	PC	2	Containment (PWR, LPSD) or Oil	5	
30434	8/12/2007	Diesel Generator Room	Diesel generators	PO	PC	8	Oil	11	
30437	10/6/2000	Containment (PWR)	Transients and hotwork (LPSD)	CD	PC	3P	Containment	10	
30439	3/21/2008	Plant-Wide Components	Pumps	PO	U	21	Oil	N/A	Suppression time indeterminate
30440	10/26/2005	Diesel Generator Room	Diesel generators	PO	U	SB4	N/A	N/A	Special bin, not FPRA applicable; suppression time indeterminate
30446	4/1/2003	Plant-Wide Components	Transformers	PO	PC	23	Electrical	N/A	Suppression time indeterminate
30447	7/11/2004	Transformer Yard	Transformer – Non Catastrophic	PO	PC	28	Transformer Yard	N/A	Fire source revised; suppression time indeterminate

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30453	1/30/2009	Plant-Wide Components	Pumps	PO	PC	21	Oil	N/A	Suppression time indeterminate
30456	3/7/2001	Plant-Wide Components	Crane	PO	PC	SB2	N/A	N/A	Special bin, not FPRA applicable; suppression time indeterminate
30457	10/24/2006	Turbine Building	Transients fires caused by welding and cutting	RF	U	36	Welding	13	
30459	3/9/2003	Plant-Wide Components	Transients	PO	PC	25	Transients	N/A	Suppression time indeterminate
30460	3/18/2003	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	N/A	N/A	Special bin, not FPRA applicable; suppression time indeterminate
30465	9/24/2008	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	N/A	Suppression time indeterminate
30469	11/11/2007	Plant-Wide Components	Transformers	PO	PC	23	Electrical	13	
30471	4/4/2008	Diesel Generator Room	Diesel generators	PO	PC	8	Oil	2	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30478	9/9/2005	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	5	
30493	7/24/2008	Transformer Yard	Transformer – Catastrophic	PO	CH	28	Transformer yard	162	
30507	7/26/2005	Diesel Generator Room	Diesel generators	PO	PC	8	Oil	2	
30508	3/26/2009	Turbine Building	Transients	RF	PC	37	Transients	10	
30512	2/15/2006	Turbine Building	Transients	RF	PC	37	Transients	2	
30513	5/27/2008	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	2	Fire source revised
30516	6/25/2005	Transformer Yard	Switch yard breaker	PO	U (PC-CH)	SB4	NA	13	Special bin, not FPRA applicable
30517	7/29/2005	Exclude	Exclude	PO	NC	NA	NA	13	
30522	9/12/2000	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	N/A	Suppression time indeterminate
30524	12/14/2000	Plant-Wide Components	Pumps	PO	U	21	Electrical	N/A	Suppression time indeterminate
30525	3/7/2001	Plant-Wide Components	Transients	PO	U (NC-PC)	SB4	NA	Indetermi nate	Decommissioned plant

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30541	7/6/2005	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	12	
30556	4/4/2008	Plant-Wide Components	Transients fires caused by welding and cutting	RF	U	24	Welding	N/A	Suppression time indeterminate
30558	10/20/2008	Plant-Wide Components	Ventilation subsystems	PO	NC	NC	N/A	N/A	Fire severity revised
30566	9/11/2000	Plant-Wide Components	Transients	PO	PC	25	Transients	N/A	Suppression time indeterminate
30578	2/27/2003	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	N/A	Suppression time indeterminate
30586	1/11/2006	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	NC	NC	N/A	N/A	Fire severity revised; suppression time indeterminate
30587	3/4/2009	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	SB1	N/A	N/A	Special bin, not FPRA applicable
30593	2/7/2008	Plant-Wide Components	Transformers	PO	PC	23	Electrical	6	
30597	2/5/2009	Plant-Wide Components	Miscellaneous hydrogen fires	PO	PC	19	Flammable Gas	5	Fire source revised
30598	11/20/2009	Turbine Building	Turbine generator oil	PO	PC	35	Turbine Generator	N/A	Suppression time indeterminate

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30604	5/28/2005	Plant-Wide Components	Transients	PO	PC	25	Transients	N/A	Fire source revised; suppression time indeterminate
30693	2/3/2004	Diesel Generator Room	Diesel generators	PO	N/A	N/A	N/A	N/A	Fire severity revised; suppression time indeterminate
30712	4/24/2002	Exclude	Exclude	PO	NC	NA	NA	Indetermi nate	Excluded by location
30717	12/10/2002	Plant-Wide Components	Transients	PO	U	25	Transients	2	
30718	4/15/2003	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	U	SB4	N/A	N/A	Special bin, not FPRA applicable; suppression time indeterminate
30719	6/11/2003	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	N/A	N/A	Special bin, not FPRA applicable; suppression time indeterminate
30722	10/19/2003	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	U	SB4	N/A	N/A	Special bin, not FPRA applicable
30725	4/12/2000	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	N/A	Suppression time indeterminate

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30727	10/30/2000	Plant-Wide Components	Transients	PO	NA	NA	N/A	N/A	Fire severity revised
30730	3/5/2001	Containment (PWR)	Transients and hotwork (LPSD)	RF	U	3P	Containment	N/A	Suppression time indeterminate
30731	3/19/2001	Containment (PWR)	Transients and hotwork (LPSD)	CD	PC	3P	Containment	N/A	Suppression time indeterminate
30732	12/3/2001	Plant-Wide Components	Ventilation subsystems	RF	NC	NC	N/A	N/A	Fire severity revised
30733	6/27/2002	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	N/A	N/A	Special bin, not FPRA applicable
30734	8/26/2002	Plant-Wide Components	Junction boxes	PO	PC	18	Electrical	10	
30736	3/13/2003	Plant-Wide Components	Unknown	PO	U	SB4	N/A	N/A	Special bin, not FPRA applicable
30740	2/6/2004	Plant-Wide Components	Transients fires caused by welding and cutting	PO	PC	24	Welding	8	
30750	5/9/2005	Plant-Wide Components	Miscellaneous hydrogen fires	CD	PC	19	Flammable Gas	N/A	Suppression time indeterminate
30752	4/3/2007	Turbine Building	Transients	PO	PC	37	Transients	9	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppress ion Time	Review Comments
30756	11/23/2008	Plant-Wide Components	Transients fires caused by welding and cutting	RF	U	24	Welding	N/A	Suppression time indeterminate
30757	8/24/2009	Plant-Wide Components	Transients	PO	U	25	Transients	N/A	Suppression time indeterminate
40733	3/14/2001	Plant-Wide Components	Hydrogen tanks	PO	PC	17	Flammable Gas	N/A	Suppression time indeterminate
40735	4/4/2001	Plant-Wide Components	Hydrogen tanks	PO	PC	17	Flammable Gas	N/A	Suppression time indeterminate
40749	6/13/2008	Turbine Building	Transients fires caused by welding and cutting	PO	CH	36	Excluded	9	Extinguished by automatic suppression only
50358	6/1/2000	Plant-Wide Components	Transient fires caused by welding and cutting	PO	CH	SB4	NA	50	Special bin, not FPRA applicable
50361	4/11/2001	Containment (PWR)	Transients and hotwork (LPSD)	CD	PC	3P	Containment	2	
50378	7/27/2005	Plant-Wide Components	Transformers	PO	PC	23	Electrical	10	
50409	10/5/2006	Containment (PWR)	Transients and hotwork (LPSD)	RF	U	3P	Containment	N/A	Suppression time indeterminate
50411	7/9/2005	Plant-Wide Components	Ventilation subsystems	PO	U	26	Electrical	N/A	Suppression time indeterminate

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppres sion Time	Review Comments
50425	3/16/2000	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	2	
50426	5/2/2000	Plant-Wide Components	Pumps	PO	PC	21	Electrical	13	
50442	11/8/2004	Plant-Wide Components	Miscellaneous hydrogen fires	PO	PC	19	Excluded	N/A	Self-extinguish (no plant intevention)
50447	9/14/2005	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	14	Electrical	2	Fire source revised
50448	10/11/2005	Turbine Building	Transients fires caused by welding and cutting	PO	PC	36	Welding	N/A	Suppression time indeterminate
50449	2/21/2006	Containment (PWR)	Transients and hotwork (LPSD)	RF	U	3P	Containment	2	
50452	8/18/2006	Plant-Wide Components	Transients fires caused by welding and cutting	PO	U	24	Welding	4	
50457	7/28/2007	Transformer Yard	Switch yard breaker	PO	CH	SB4	NA	102	Special bin, not FPRA applicable
50467	2/4/2006	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	N/A	Suppression time indeterminate
50473	6/26/2000	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	3	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppres sion Time	Review Comments
50477	3/18/2000	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	2	
50479	3/22/2000	Plant-Wide Components	Dryers	RF	PC	13	Transients	19	
50482	3/8/2006	Plant-Wide Components	Pumps	UN	PC	21	Electrical	Indetermi nate	Suppression time indeterminate
50494	2/5/2009	Plant-Wide Components	Transients	PO	CH	SB4	Exclude	16	Special bin, not FPRA applicable
50504	5/20/2002	Plant-Wide Components	Transients	RF	PC	25	Electrical	2	
50515	11/30/2001	Containment (PWR)	Transients and hotwork (LPSD)	CD	U	3P	Containment	N/A	Suppression time indeterminate
50518	11/18/2001	Containment (PWR)	Transients and hotwork (LPSD)	RF	U	3P	Containment	N/A	Suppression time indeterminate
50522	9/8/2003	Plant-Wide Components	Pumps	PO	U	21	Electrical	N/A	Suppression time indeterminate
50530	10/21/2008	Transformer Yard	Transformer: non catastrophic	RF	PC	28	Transformer Yard	4	Fire source revised
50543	3/27/2001	Containment (PWR)	Transients and hotwork (LPSD)	RF	PC	3P	Containment	8	
50553	5/2/2003	Control Room	Main control board	RF	PC	4	Control Room	2	Fire source revised

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppres sion Time	Review Comments
50556	2/25/2005	Plant-Wide Components	RPS MG sets	PO	U	22	Excluded	N/A	Self-extinguish (no plant intervention)
50563	11/16/2005	Plant-Wide Components	Hydrogen tanks	PO	PC	17	Flammable gas	N/A	Suppression time indeterminate
50570	6/21/2004	Plant-Wide Components	Pumps	PO	NC	NA	N/A	8	Fire severity revised
50650	9/26/2003	Plant-Wide Components	Pumps	UN	U (NC-PC)	21	Electrical	2	
50655	12/4/2007	Plant-Wide Components	Ventilation subsystems	PO	NC	NC	N/A	N/A	Fire severity revised; suppression time indeterminate
50686	4/4/2007	Containment (PWR)	Transients and hotwork (LPSD)	RF	U	3P	Containment	2	
50700	5/13/2000	Plant-Wide Components	Transient fires caused by welding and cutting	RF	PC	24	Welding	2	
50701	5/24/2000	Transformer Yard	Transformer – Catastrophic	PO	CH	27	Transformer Yard	Excluded	XFMR HEAF Extinguished by automatic suppression
50703	8/22/2000	Exclude or Transformer Yard	Exclude or Transformer – Catastrophic	PO	CH	SB4	NA	85	Special bin, not FPRA applicable

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppres sion Time	Review Comments
50728	1/20/2009	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	5	
50732	11/7/2002	Plant-Wide Components	Ignition source is specified but does not belong to any bin	RF	NC	N/A	N/A	10	Fire severity revised
50733	4/23/2004	Turbine Building	Transients fires caused by welding and cutting	RF	U	36	Welding	2	
50740	5/16/2000	Plant-Wide Components	Lighting, ballast, or electric outlet	PO	U	SB1	N/A	N/A	Special bin, not FPRA applicable
50744	8/3/2001	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	PC	SB4	N/A	10	Special bin, not FPRA applicable
50754	1/23/2009	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	N/A	Suppression time indeterminate
50763	11/14/2008	Plant-Wide Components	Transformers	PO	NC	NC	N/A	N/A	Fire severity revised; suppression time indeterminate
50768	1/1/2002	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	N/A	Suppression time indeterminate
50771	5/6/2003	Plant-Wide Components	Dryers	PO	PC	13	Transients	2	

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppres sion Time	Review Comments
50784	11/20/2005	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	0	
50796	11/4/2009	Control/Aux/ Reactor Building	Transients	RF	PC	7	Transients	2	
50809	11/9/2000	Control/Aux/ Reactor Building	Transients	RF	PC	7	Transients	2	
50811	1/9/2001	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	N/A	Suppression time indeterminate
50820	10/23/2008	Plant-Wide Components	Junction box	PO	PC	18	Electrical	7	
50821	10/30/2008	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	18	
50825	10/1/2009	Plant-Wide Components	Transients	PO	U (NC-PC)	SB1	NA	Indetermi nate	Special bin, not FPRA applicable
50829	9/11/2004	Plant-Wide Components	Transformer (plant-wide components)	PO	PC	23	Electrical	45	
50833	9/23/2008	Turbine Building	Transients	RF	PC	37	Transients	N/A	Suppression time indeterminate

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppres sion Time	Review Comments
50866	3/28/2001	Plant-Wide Components	Lighting, ballast, or electric outlet	PO	PC	SB1	N/A	8	Special bin, not FPRA applicable
50871	1/24/2002	Plant-Wide Components	Pumps	PO	PC	21	Electrical	13	
50874	7/12/2002	Plant-Wide Components	Electrical cabinets (non-HEAF)	CD	PC	15	Electrical	2	
50876	11/13/2002	Plant-Wide Components	Junction box	RF	PC	18	Electrical	25	
50878	11/12/2002	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	PC	6	Welding	13	
50884	2/23/2004	Turbine Building	Transients fires caused by welding and cutting	PO	U	36	Welding	8	
50893	12/2/2005	Plant-Wide Components	Transformers	PO	PC	23	Electrical	13	
50895.1	5/13/2007	Turbine Building	Transient fires caused by welding and cutting	RF	PC	36	Welding	40	Treated as two fire events; suppression time revised
50895.2	5/13/2007	Turbine Building	Transient fires caused by welding and cutting	RF	PC	36	Welding	35	Treated as two fire events; suppression time revised

Table A-1 (continued)
Fire event data for 2000–2009

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	Review Comments
50896	5/13/2007	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	2	Suppression time revised
50898	2/29/2008	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	SB4	NA	2	Special bin, not FPRA applicable
50899	10/27/2008	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	CH	SB4	N/A	2	Special bin, not FPRA applicable

Special Bin Designation *Applicable to Table A-1 and Table A-2*

Special Bin	Bin Name	Description
SB1	Lighting ballast and electric plug	This is for lighting, ballast, outlet/electric plug. If the fire was propagated, it will be re-evaluated later.
SB2	Crane	This is for fires related to intermittent maintenance in a particular crane (but it may other equipment). This fire in general does not harm the operation. If the fire was propagated, it will be re-evaluated later. If the fire involved a crane motor, the event may also belong to motor bin.
SB3	Under capacity event	This bin is for motor, pump, or ventilation subsystems with motors under 5 kV or dry transformers under 45 kVA.
SB4	Doesn't belong to any bin	The ignition source and the location of the event are known, but this event cannot be mapped to any existing bin.

Table A-2
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
2	1/5/1999	Transformer Yard	Transformer – Catastrophic	PO	CH	27	Transformer Yard	14	
3	1/14/1999	Plant-Wide Components	Hydrogen tanks	PO	CH	17	Flammable Gas	52	Use control time at 13:58 to derive suppression time
5	5/18/1999	Transformer Yard	Transformer – Non Catastrophic	RF	PC	28	Transformer Yard	22	Use original FEDB suppression time: 22 minutes
6	7/13/1999	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	PO	PC	6	Welding	40	
7	10/9/1999	Plant-Wide Components	Yard transformers (others)	PO	U	29	Excluded	N/A	Self-extinguished; counted in FIF: excluded from NSP
9	1/3/1990	Plant-Wide Components	Transformers	PO	PC	23	Electrical	13	Suppression time derived from duration based on NUREG/CR-6850 Appendix P
14	5/24/1990	Transformer Yard	Yard Transformer (Others)	PO	PC	SB4	Excluded	N/A	Reclassified as non-FPRA bin, also supervised burnout
17	6/28/1990	Plant-Wide Components	Ventilation subsystems	RF	PC	26	Containment	29	Containment

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
18	7/13/1990	Plant-Wide Components	HEAF for medium-voltage electrical cabinet (>1000 V)	CD	PC	16.b	HEAF	10	Bin as HEAF in FIF and NSP
19	8/4/1990	Plant-Wide Components	Dryers	CD	CH	13	Excluded	N/A	Extinguished by automatic suppression only
20	8/25/1990	Transformer Yard	Transformer – Non Catastrophic	PO	CH	28	Transformer Yard	90	Suppression time derived from duration based on NUREG/CR-6850 Appendix P
21	9/22/1990	Transformer Yard	Transformer – Catastrophic	PO	CH	27	Transformer Yard	29	Include as 29-minute suppression duration
22	12/3/1990	Containment (BWR)	Transients and hotwork (LPSD)	RF	CH	3B	Containment	76	Fire took time to get to and remove power to temporary cables before water could be applied. Consider setting suppression <30 minutes.
23	12/19/1990	Turbine Building	Transients	PO	PC	37	Transients	40	Suppression time derived from duration based on NUREG/CR-6850 Appendix P

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
24	12/22/1990	Turbine Building	Main feedwater pumps	PO	PC	32	Oil	20	Fire source revised; revised suppression time
25	1/11/1991	Turbine Building	Transients fires caused by welding and cutting	PO	U	36	Welding	85	
26	2/14/1991	Containment (PWR)	Transient and hotwork (LPSD)	RF	CH	3P	Containment	8	Use 8 minutes suppression time as reported and in original FEDB
29	2/23/1991	Plant-Wide Components	Electrical cabinets (non-HEAF)	HS	PC	15	Electrical	6	
30	4/29/1991	Turbine Building	T/G hydrogen (Turbine Building)	PO	CH	34	Excluded	N/A	No action by fire brigade
31	6/15/1991	Transformer Yard	Transformer – Non Catastrophic	PO	U	28	Transformer Yard	23	
32	6/27/1991	Transformer Yard	Yard transformers (others)	PO	PC	29	Excluded	N/A	Excluded by self-extinguishment
33	8/1/1991	Transformer Yard	Yard transformers (others)	PO	PC	SB4	Exclude	183	Reclassified as non-FPRA bin
34	8/11/1991	Turbine Building	Main feedwater pumps	PO	PC	32	Oil	11	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
36	11/9/1991	Turbine Building	T/G hydrogen	PO	CH	34	Turbine Generator	15	
38	3/21/1992	Plant-Wide Components	Electrical cabinets (non-HEAF)	CD	CH	15	Electrical	8	
41	6/17/1992	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	14	
42	7/3/1992	Plant-Wide Components	Transients	PO	PC	SB4	Excluded	12	Reclassified as non-FPRA bin
43	7/4/1992	Transformer Yard	Transformer – Non Catastrophic	PO	CH	28	Transformer Yard	23	
44	7/13/1992	Turbine Building	Main feedwater pumps	PO	CH	32	Oil	13	
45	7/29/1992	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	16	Suppression time derived from duration based on NUREG/CR-6850 Appendix P
46	8/4/1992	Plant-Wide Components	Battery chargers	PO	PC	10	Electrical	13	
48	9/4/1992	Transformer Yard	Transformer – Non Catastrophic	PO	CH	28	Transformer Yard	27	
49	9/15/1992	Transformer Yard	Yard transformers (others)	PO	CH	SB4	Excluded	77	Reclassified as non-FPRA bin

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
50	11/24/1992	Transformer Yard	Yard transformers (others)	PO	PC	SB4	Excluded	N/A	Reclassified as non-FPRA bin
52	6/19/1993	Plant-Wide Components	Pumps	RF	PC	21	Electrical	10	
55	10/13/1993	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	PC	6	Welding	8	
56	10/21/1993	Turbine Building	T/G oil	PO	PC	35	Turbine Generator	10	
58	12/25/1993	Turbine Building	T/G hydrogen	PO	CH	34	Turbine Generator	2	Fire source revised; first fire counted in FIF, excluded from NSP. Second fire NSP only.
59	1/29/1994	Plant-Wide Components	Ignition source is specified but does not belong to any bin	CD	CH	SB4	N/A	20	Reclassified as non-FPRA bin; suppression time derived from duration based on NUREG/CR-6850 Appendix P
61	4/3/1994	Turbine Building	T/G hydrogen	PO	CH	34	Turbine Generator	167	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
63	6/15/1994	Turbine Building	T/G oil	CD	PC	35	Turbine Generator	85	
64	6/1/1994	Transformer Yard	Transformer – Non Catastrophic	PO	CH	28	Transformer yard	10	Automatic suppression and manual
65	7/2/1994	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	CH	SB4	Excluded	31	Reclassified as non-FPRA bin
66	7/11/1994	Containment (PWR)	Reactor coolant pump	PO	PC	2	Containment	10	
67	7/29/1994	Turbine Building	T/G oil	PO	PC	35	Turbine Generator	10	
68	8/10/1994	Plant-Wide Components	Transients fires caused by welding and cutting	PO	PC	24	Welding	30	Suppression time derived from duration based on NUREG/CR-6850 Appendix P
69	8/29/1994	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	10	
71	3/1/1995	Turbine Building	Main feedwater pumps	PO	PC	32	Oil	23	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
72	4/14/1995	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	CH	6	Welding	19	
74	6/10/1995	Plant-Wide Components	HEAF for medium-voltage electrical cabinet (>1000 V)	PO	CH	16.b	HEAF	136	
75	8/22/1995	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	PC	6	Welding	8	
76	10/21/1995	Transformer Yard	Transformer – Catastrophic	RF	CH	27	Transformer Yard	30	Use original FEDB suppression time: 30 min
78	1/24/1996	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	CH	6	Welding	13	
79	2/5/1996	Transformer Yard	Transformer – Non Catastrophic	RF	CH	28	Transformer Yard	37	Suppression time derived from duration based on NUREG/CR-6850 Appendix P
80	2/29/1996	Turbine Building	Transients fires caused by welding and cutting	CD	PC	36	Welding	23	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
81	3/25/1996	Plant-Wide Components	Transients	PO	U	25	Transients	23	
82	3/27/1996	Plant-Wide Components	Ignition source is specified but does not belong to any bin	RF	PC	36	Transients	14	Move to transients for FIF and NSP
83.1	4/4/1996	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	PC	15	MCR	9	Treated as two fire events: second fire caused by initial fire (NA for FIF); second fire suppression time revised
83.2	4/4/1996	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	NA	NA	Electrical	25	Treated as two fire events: second fire caused by initial fire (N/A for FIF); second fire suppression time revised
84	4/19/1996	Control Room	Main control board	PO	PC	4	Control Room	10	
86	6/23/1996	Transformer Yard	Yard transformers (others)	PO	CH	29	Transformer Yard	18	Fire source revised
87	8/19/1996	Plant-Wide Components	Pumps	PO	PC	21	Oil	2	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
88	10/5/1996	Transformer Yard	Yard transformers (others)	PO	CH	29	Transformer Yard	16	Fire source revised
89	10/15/1996	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	10	Suppression time derived from duration in NUREG/CR-6850 Appendix P
90	10/17/1996	Containment (PWR)	Reactor coolant pump	HD	CH	2	Containment	16	
91	11/19/1996	Plant-Wide Components	Transients fires caused by welding and cutting	PO	U	24	Welding	19	Suppression time derived from duration based on NUREG/CR-6850 Appendix P
92	11/22/1996	Transformer Yard	Yard transformers (others)	PO	PC	29	Exclude	N/A	Exclude as self-extinguished
93	3/4/1997	Plant-Wide Components	RPS MG sets	PO	PC	22	Electrical	10	
94	8/1/1997	Turbine Building	T/G excitor	PO	PC	33	Turbine Generator	18	
95	10/9/1997	Diesel Generator Room	Diesel generators	PO	PC	8	Oil	2	Suppression time derived from duration based on NUREG/CR-6850 Appendix P

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
96	10/28/1997	Plant-Wide Components	Transients fires caused by welding and cutting	RF	PC	24	Transients	19	
97	6/10/1998	Plant-Wide Components	RPS MG sets	PO	PC	22	Electrical	29	
98	10/8/1998	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	PC	15	Electrical	46	
159	1/16/1990	Plant-Wide Components	Pumps	PO	PC	21	Electrical	13	Fire source revised
181	2/13/1997	Plant-Wide Components	Pumps	PO	PC	21	Electrical	10	
184	6/27/1997	Plant-Wide Components	Battery chargers	PO	CH	10	Excluded	N/A	Based on EPRI screenshot; fire brigade team responded but fire was suppressed by automatic suppression system
187	8/16/1999	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	8	Use 8 minutes suppression time as designated by plant
188	8/24/1999	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	13	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
194	5/22/1990	Transformer Yard	Transformer – Non Catastrophic	PO	PC	28	Excluded	N/A	Self-extinguished
199	1/22/1990	Plant-Wide Components	Pumps	RF	PC	21	Excluded	N/A	Suppression time indeterminate
200	2/6/1990	Plant-Wide Components	Transient fires caused by welding and cutting	CD	PC	SB4	Excluded	7	Special bin, not FPRA applicable
201	3/8/1990	Plant-Wide Components	Pumps	CD	PC	21	Electrical	N/A	Suppression time indeterminate
202	3/23/1990	Control Room	Main control board	PO	PC	4	Control Room	2	
203	4/6/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	CH	15	Electrical	24	Use 24 minutes suppression time as designated in original FEDB
206	6/11/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	CD	U	15	Electrical	2	Actual location is reactor building
207	7/15/1990	Plant-Wide Components	Cable run (self-ignited cable fires)	PO(1), RF(2)	PC	12	Excluded	N/A	Based on EPRI screenshot; fire brigade team responded but fire was suppressed by automatic suppression system

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
208	8/8/1990	Turbine Building	Transients	PO	PC	37	Transients	2	
209	8/22/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	2	
210	10/16/1990	Containment (PWR)	Transient and hotwork (LPSD)	RF	U	3P	Excluded	N/A	Excluded as undetermined based on limited detail in RFI (fire put out quickly)
211	11/2/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	PC	15	Electrical	2	
214	3/8/1991	Turbine Building	Boiler	RF	PC	30	Oil	6	Use original FEDB suppression time: 6 minutes
216	7/12/1991	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	N/A	Suppression time indeterminate
217	7/19/1991	Plant-Wide Components	Pumps	PO	PC	21	Oil	N/A	Suppression time indeterminate
218	9/12/1991	Turbine Building	T/G oil	PO	U	35	Turbine Generator	2	
219	9/27/1991	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	10	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
220	10/20/1991	Plant-Wide Components	Transformers	RF	PC	23	Electrical	N/A	Suppression time indeterminate
224	3/8/1992	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	U	15	Electrical	10	
226	4/17/1992	Diesel Generator Room	Diesel generators	PO	U	8	Oil	2	
228	8/14/1992	Plant-Wide Components	Pumps	PO	PC	21	Excluded	N/A	Extinguished by automatic suppression only
229	8/21/1992	Control/Aux/ Reactor Building	Cable fires caused by welding and cutting	PO	CH	5	Welding	N/A	Suppression time indeterminate
230	8/31/1992	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	PO	PC	20	Exclude	N/A	Supervised burnout
231	10/22/1992	Turbine Building	Transients fires caused by welding and cutting	PO	PC	36	Welding	N/A	Suppression time indeterminate
233	11/29/1992	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	2	Use original FEDB suppression time of 2 minutes as no new info provided and no RFI

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
235	12/30/1992	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	25	Use 25 minutes suppression time from RFI
236	1/6/1993	Control/Aux/ Reactor Building	Transients	PO	U	7	Control room	2	
237	3/19/1993	Containment (PWR)	Transient and hotwork (LPSD)	RF	PC	3P	Containment	2	
238	4/1/1993	Control/Aux/ Reactor Building	Transients	PO	PC	7	Transients	2	
239	7/14/1993	Turbine Building	Transients fires caused by welding and cutting	PO	PC	36	Welding	25	
240	7/19/1993	Containment (PWR)	Transient and hotwork (LPSD)	RF	PC	3P	Containment	N/A	Suppression time indeterminate
241	11/3/1993	Containment (BWR)	Transients and hotwork (LPSD)	RF	PC	3B	Containment	2	
242	11/13/1993	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	U	SB4	N/A	10	Reclassified as non-FPRA bin

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
243	12/1/1993	Containment (BWR)	Transients and hotwork (LPSD)	RF	PC	3B	Containment	2	
244	12/7/1993	Turbine Building	Transients	RF	PC	37	Transients	2	Plant states that fire lasted <5 minutes from RFI = 2 minutes
246	1/12/1994	Control/Aux/ Reactor Building	Transients	RF(1), SD(2)	CH	7	Transients	2	
247	1/12/1994	Plant-Wide Components	Pumps	PO	PC	21	Electrical	22	Use 22 minutes suppression time from NEIL
248	3/5/1994	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	2	
249	3/7/1994	Plant-Wide Components	Ventilation subsystems	RF	PC	26	Electrical	2	
250	7/19/1994	Transformer Yard	Transformer – Non Catastrophic	PO	PC	28	Excluded	N/A	Extinguished by automatic suppression only
251	10/11/1994	Plant-Wide Components	Transformers	CD	PC	23	Electrical	2	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
252	3/18/1995	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	U	6	Excluded	N/A	Fire source revised; extinguished by automatic suppression only
253	7/6/1995	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	10	
254	9/25/1995	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF(1), PO(2)	PC	15	Electrical	4	Use 4 minutes suppression time to correct coding error
255	11/19/1995	Plant-Wide Components	Transformers	RF(1), PO(2)	CH	23	Electrical	10	
256	7/22/1996	Plant-Wide Components	Cable fires caused by welding and cutting	Decom (1), SD(2and3)	U	11	Welding	2	
258	11/3/1997	Turbine Building	Transients fires caused by welding and cutting	RF	PC	36	Welding	2	
259	12/26/1997	Control/Aux/ Reactor Building	Transients	PO	PC	7	Excluded	N/A	Extinguished by automatic suppression only
260	2/3/1998	Plant-Wide Components	Pumps	PO	PC	21	Oil	N/A	Suppression time indeterminate

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
262	2/19/1999	Plant-Wide Components	Air compressors	PO	PC	9	Electrical	2	
20264	1/19/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO/SD	U	15	Electrical	10	
20265	2/2/1990	Turbine Building	Main feedwater pumps	PO	U	32	Oil	5	Use original FEDB suppression time of 5 minutes
20266	2/19/1990	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	2	
20267	3/12/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	CD	U	15	Electrical	N/A	Suppression time indeterminate
20268	4/19/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	N/A	Suppression time indeterminate
20269	4/30/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	N/A	Suppression time indeterminate
20270	6/7/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	U	15	Electrical	2	
20271	7/9/1990	Plant-Wide Components	Transformers	PO	U	23	Electrical	3	Use 3 minutes suppression time to correct coding error
20272	9/10/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO(1), SD(2)	U	15	Electrical	5	Use 5 minutes suppression time to correct coding error

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20273	9/18/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	N/A	Suppression time indeterminate
20274	10/9/1990	Plant-Wide Components	RPS MG sets	PO	PC	22	Excluded	N/A	Suppression time indeterminate
20275	10/11/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO(1),. SD(2)	U	15	Electrical	N/A	Suppression time indeterminate
20276	10/12/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	U	15	Excluded	N/A	Self-extinguished
20277	11/16/1990	Control/Aux/ Reactor Building	Transients	RF	U	7	Transients	6	Fire source revised; revised suppression to NUREG/CR-6850, Supplement 1
20278	11/24/1990	Plant-Wide Components	Ventilation subsystems	PO	U	26	Electrical	2	Use 2 minutes suppression time per plant input from RFI
20279	11/28/1990	Plant-Wide Components	Transformers	PO	U	23	Electrical	N/A	Suppression time indeterminate
20280	12/5/1990	Transformer Yard	Yard transformers (others)	CD	PC	29	Transformer Yard	N/A	Fire source revised; suppression time indeterminate

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20281	6/24/1991	Plant-Wide Components	Ignition source is specified but does not belong to any bin	PO	U	25	Excluded	N/A	Suppression time indeterminate
20282	9/17/1991	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	N/A	Suppression time indeterminate
20283	10/3/1991	Plant-Wide Components	Electric motors	PO	U	14	Electrical	2	
20284	10/14/1991	Plant-Wide Components	HEAF for medium-voltage electrical cabinet (>1000 V)	RF	U	16.b	HEAF	2	Fire source revised
20287	2/29/1992	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF(1), PO(2)	U	15	Electrical	5	Use 5 minutes suppression time based on original FEDB to correct coding error
20288	3/9/1992	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	N/A	Suppression time indeterminate
20289	3/16/1992	Control/Aux/ Reactor Building	Transients	RF(1), PO(2)	U	7	Transients	10	
20291	4/28/1992	Plant-Wide Components	Pumps	RF	PC	21	Electrical	N/A	Suppression time indeterminate

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20292	6/25/1992	Turbine Building	T/G hydrogen	PO	U	34	Excluded	N/A	Self-extinguished
20293	9/1/1992	Turbine Building	Transients fires caused by welding and cutting	PO	U	36	Welding	2	
20294	10/5/1992	Plant-Wide Components	Transients fires caused by welding and cutting	PO	U	24	Welding	N/A	Suppression time indeterminate
20295	10/12/1992	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	2	
20296	10/23/1992	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	U	6	Welding	10	
20297	11/17/1992	Control/Aux/ Reactor Building	Transients	RF	U	7	Transients	N/A	Suppression time indeterminate
20298	1/11/1993	Plant-Wide Components	Electric motors	PO(1), RF(2)	U	14	Electrical	2	
20300	3/30/1993	Turbine Building	Transients	RF	U	37	Transients	N/A	Suppression time indeterminate
20301	4/13/1993	Turbine Building	Transients	PO	U	37	Transients	2	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20302	7/25/1993	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	35	Use 35 minutes suppression time from original FEDB
20303	10/14/1993	Plant-Wide Components	Transients	RF	PC	25	Transients	2	
20304	11/2/1993	Control/Aux/ Reactor Building	Transients	CD	PC	NC	Excluded	2	Plant construction work; exclude from FIF and NSP
20306	12/30/1993	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	2	
20308	3/9/1994	Turbine Building	Transients fires caused by welding and cutting	RF	U	36	Welding	N/A	Suppression time indeterminate
20310	3/26/1994	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	N/A	Suppression time indeterminate
20311	4/4/1994	Containment (PWR)	Transient and hotwork (LPSD)	RF	U	3P	Containment	N/A	Suppression time indeterminate
20312	7/27/1994	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	N/A	Suppression time indeterminate

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20313	9/29/1994	Plant-Wide Components	Transients	PO(1), PO(2)	U	25	Transients	25	Reclassified from Boiler Room to Transients and PWC; use original FEDB suppression time 25 minutes
20314	12/19/1994	Plant-Wide Components	Electric motors	PO	U	14	Electrical	10	Fire source revised
20316	2/24/1995	Turbine Building	Transients fires caused by welding and cutting	PO	U	36	Welding	N/A	Suppression time indeterminate
20317	4/10/1995	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	U	6	Welding	2	
20319	8/15/1995	Plant-Wide Components	Pumps	RF	U	21	Exclude	2	Exclude: assume fault caused interruption of power; self-extinguished
20320	3/21/1996	Plant-Wide Components	Pumps	PO	U	21	Electrical	2	
20321	7/10/1996	Exclude	Exclude	CD	NC	SB4	N/A	N/A	Decommissioned plant
20322	9/13/1996	Turbine Building	Main feedwater pumps	PO	U	32	Oil	46	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20323	1/8/1997	Plant-Wide Components	RPS MG sets	PO	NC	NC	Exclude	46	Remove FIF and NSP; plant says not a fire. Extent of damage appears to be classified incorrectly.
20324	8/12/1997	Plant-Wide Components	Ventilation subsystems	PO	U	26	Electrical	2	
20325	1/16/1998	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	10	
20326	10/12/1998	Turbine Building	Transients	RF	U	37	Transients	2	
20328	5/6/1999	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	2	
20329	9/1/1999	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	2	
20330	10/3/1999	Plant-Wide Components	Electric motors	RF	U	14	Electrical	N/A	Suppression time indeterminate
20334	2/20/1990	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	U	15	Electrical	N/A	Suppression time indeterminate
20336	2/14/1991	Plant-Wide Components	Transients	PO	U	25	Transients	N/A	Suppression time indeterminate

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20337	4/21/1991	Turbine Building	Transients fires caused by welding and cutting	PO	U	36	Welding	N/A	Suppression time indeterminate
20338	10/11/1991	Plant-Wide Components	Pumps	CD	U	21	Electrical	N/A	Suppression time indeterminate
20340	12/1/1992	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	CD	U	6	Welding	2	
20341	3/31/1993	Plant-Wide Components	Transients	RF	U	25	Transients	15	Use 15 minutes suppression time to correct coding error
20342	4/30/1993	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	RF	U	6	Welding	N/A	Suppression time indeterminate
20344	2/20/1994	Plant-Wide Components	Electric motors	RF	U	14	Electrical	10	
20346	3/30/1994	Plant-Wide Components	Electrical cabinets (non-HEAF)	RF	U	15	Excluded	N/A	Self-extinguished
20348	4/16/1994	Containment (BWR)	Transients and hotwork (LPSD)	RF	U	3B	Containment	2	
20349	4/23/1994	Turbine Building	Transients fires caused by welding and cutting	RF	U	36	Welding	2	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20350	6/9/1994	Plant-Wide Components	Crane	CD	U	SB2	N/A	8	Reclassified as non-FPRA bin
20351	6/21/1994	Control Room	Main control board	PO	U	4	Control Room	N/A	Suppression time indeterminate
20352	6/23/1994	Transformer Yard	Transformer – Non Catastrophic	PO	PC	28	Transformer yard	2	
20353	7/13/1994	Diesel Generator Room	Diesel generators	PO	PC	8	Electrical	2	Fire source revised; suppression time revised
20354	10/8/1994	Containment (PWR)	Transients and hotwork (at power)	PO	PC	SB1	N/A	N/A	Special bin, not FPRA applicable
20356	2/19/1995	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	5	Use 5 minutes suppression time from original FEDB
20357	5/24/1995	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Excluded	N/A	Self-extinguished
20358	1/23/1996	Plant-Wide Components	Air compressors	PO	U	9	Electrical	N/A	Suppression time indeterminate
20359	3/3/1996	Plant-Wide Components	Air compressors	RF	NA	NA	Excluded	N/A	Reclassified as non-FPRA bin; suppression time indeterminate

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20360	5/25/1996	Plant-Wide Components	Transformers	PO/SD(2), SD(3)	PC	23	Electrical	13	Use 13 minutes suppression time based on plant input from RFI and NEIL
20361	1/7/1997	Plant-Wide Components	Transients	PO	U	25	Transients	N/A	Suppression time indeterminate
20362	3/2/1997	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	PC	15	Electrical	2	
20363	7/27/1997	Plant-Wide Components	Junction boxes	PO	PC	18	Electrical	N/A	Suppression time indeterminate
20364	12/4/1997	Plant-Wide Components	Electric motors	PO	U	14	Electrical	2	Use 2 minutes suppression time as provided by plant in RFI
20365	1/13/1998	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	PO	PC	20	Flammable gas	20	Use 20 minutes suppression time per original FEDB plus plant RFI
20366	2/6/1998	Plant-Wide Components	Pumps	PO	U	21	Oil	N/A	Suppression time indeterminate
20367	2/24/1998	Plant-Wide Components	Pumps	PO	PC	21	Oil	2	

Table A-2 (continued)
Fire event data for 1990–1999

Fire ID	Event Date	Location	Ignition Source	Power Mode	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time	FIF Report Comment
20368	6/7/1998	Plant-Wide Components	Air compressors	PO	U	9	Electrical	2	
20369	6/14/1998	Plant-Wide Components	Transformers	PO	PC	23	Excluded	N/A	Self-extinguished
20370	7/1/1998	Plant-Wide Components	Transformers	PO	U	23	Electrical	10	
20371	9/9/1998	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	PO	U	20	Excluded	N/A	No indication of suppression action or timing
20372	11/23/1998	Plant-Wide Components	Electric motors	CD	PC	14	Electrical	2	
20373	3/16/1999	Plant-Wide Components	Transients	PO	PC	25	Excluded	N/A	Self-extinguished
20374	3/19/1999	Plant-Wide Components	Ventilation subsystems	PO	PC	26	Electrical	2	
50607	3/1/1997	Plant-Wide Components	Electrical cabinets (non-HEAF)	PO	NC	NC	Excluded	N/A	Reclassified as non-FPRA event, also self-extinguished
50608	5/28/1997	Control/Aux/ Reactor Building	Transients	RF	U	7	Transients	2	

Table A-3
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
2	2/7/1968	Plant-Wide Components	Cable run	Power operation	Challenging	12	N/A	N/A
3	3/9/1968	Plant-Wide Components	Cable run	Power operation	Challenging	12	N/A	N/A
4	3/12/1968	Plant-Wide Components	Cable run	Power operation	Challenging	12	N/A	N/A
5	12/30/1969	Plant-Wide Components	Electrical cabinets	Low Power operation	Challenging	15.1	N/A	N/A
6	7/7/1970	Containment (PWR)	Reactor coolant pump	Low Power operation	Challenging	2	N/A	N/A
7	8/15/1970	Containment (PWR)	Reactor coolant pump	Power operation	Undetermined	2	N/A	N/A
8	8/19/1970	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	N/A	N/A
9	9/15/1970	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Low Power operation	Challenging	20	N/A	N/A
10	12/15/1970	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	N/A	N/A
11	2/19/1971	Turbine Building	Transient fires caused by welding and cutting	Low Power operation	Challenging	36	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
12	3/24/1971	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	N/A	N/A
14	8/15/1971	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
16	11/15/1971	Turbine Building	Transient fires caused by welding and cutting	Low Power operation	Undetermined	36	N/A	N/A
20	6/15/1972	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
21	6/16/1972	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
22	6/27/1972	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
24	9/13/1972	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	N/A	N/A
25	11/8/1972	Transformer Yard	Transformer – Catastrophic	Low-power operation	Challenging	27	N/A	N/A
26	11/12/1972	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A
29	12/22/1972	Plant-Wide Components	Pumps	Power operation	Undetermined	21	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
32	3/15/1973	Plant-Wide Components	Transient fires caused by welding and cutting	Power operation	Undetermined	24	N/A	N/A
33	3/15/1973	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Low-power operation	Challenging	20	N/A	N/A
34	3/27/1973	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
35	6/10/1973	Turbine Building	T/G oil	Power operation	Challenging	35	N/A	N/A
36	8/15/1973	Turbine Building	T/G oil	Power operation	Challenging	35	N/A	N/A
37	1/23/1974	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
38	2/15/1974	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
39	3/15/1974	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
40	4/19/1974	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Challenging	6	N/A	N/A
41	5/13/1974	Plant-Wide Components	Transformers	Power operation	Undetermined	23	N/A	N/A
42	6/15/1974	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
43	6/15/1974	Turbine Building	Transient fires caused by welding and cutting	Power operation	Undetermined	36	N/A	N/A
46	9/20/1974	Turbine Building	Transients	Power operation	Challenging	37	N/A	N/A
47	10/15/1974	Plant-Wide Components	Transient fires caused by welding and cutting	Power operation	Undetermined	24	N/A	N/A
48	11/15/1974	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
50	12/15/1974	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
52	1/31/1975	Containment (PWR)	Reactor coolant pump	Power operation	Undetermined	2	N/A	N/A
54	3/15/1975	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
55	3/22/1975	Control/Aux/ Reactor Building	Transients	Power operation	Challenging	7	N/A	N/A
56	3/31/1975	Control/Aux/ Reactor Building	Transients	Low-power operation	Undetermined	7	N/A	N/A
57	4/2/1975	Transformer Yard	Transformer – Catastrophic	Power operation	Challenging	27	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
60	5/22/1975	Turbine Building	Main feedwater pumps	Low-power operation	Challenging	32	N/A	N/A
62	6/27/1975	Turbine Building	T/G Oil	Power operation	Challenging	35	N/A	N/A
63	9/15/1975	Diesel Generator Room	Diesel generators	Power operation	Undetermined	8	N/A	N/A
64	9/15/1975	Turbine Building	T/G oil	Power operation	Undetermined	35	N/A	N/A
65	11/4/1975	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
66	11/5/1975	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
67	12/4/1975	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
68	12/21/1975	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
69	1/7/1976	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
70	1/19/1976	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
72	3/4/1976	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	N/A	N/A
73	3/18/1976	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
74	3/24/1976	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
75	4/1/1976	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
76	4/15/1976	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
77	4/15/1976	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
79	4/17/1976	Diesel Generator Room	Diesel generators	Power operation	Undetermined	8	N/A	N/A
80	5/4/1976	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3B	N/A	N/A
81	5/15/1976	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
82	6/11/1976	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
83	6/15/1976	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
84	8/16/1976	Plant-Wide Components	RPS MG sets	Power operation	Undetermined	22	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
85	9/1/1976	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
86	9/15/1976	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
87	10/15/1976	Diesel Generator Room	Diesel generators	Power operation	Undetermined	8	N/A	N/A
89	11/4/1976	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
90	11/15/1976	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
92	12/15/1976	Containment (PWR)	Reactor coolant pump	Power operation	Undetermined	2	N/A	N/A
94	3/3/1977	Containment (PWR)	Transients and hotwork	Power operation	Challenging	3	N/A	N/A
96	3/14/1977	Containment (PWR)	Reactor coolant pump	Low-power operation	Challenging	2	N/A	N/A
97	3/15/1977	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
99	3/24/1977	Transformer Yard	Transformer – Non Catastrophic	Power operation	Undetermined	28	N/A	N/A
100	4/3/1977	Turbine Building	T/G hydrogen	Power operation	Challenging	34	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
101	4/4/1977	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
102	4/7/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
103	4/14/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
106	5/7/1977	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	N/A	N/A
107	5/13/1977	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Challenging	36	N/A	N/A
108	5/15/1977	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	N/A	N/A
110	6/9/1977	Turbine Building	Cable fires caused by welding and cutting	Power operation	Challenging	31	N/A	N/A
111	6/15/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
112	6/15/1977	Containment (PWR)	Reactor coolant pump	Low-power operation	Undetermined	2	N/A	N/A
113	6/30/1977	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
115	7/11/1977	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
116	7/15/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
117	7/15/1977	Turbine Building	Cable fires caused by welding and cutting	Power operation	Undetermined	31	N/A	N/A
118	7/17/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
121	8/15/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
122	8/15/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
123	9/3/1977	Turbine Building	Transients	Low-power operation	Challenging	37	N/A	N/A
124	9/15/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
125	9/15/1977	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
127	12/10/1977	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
128	12/13/1977	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
131	2/10/1978	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
132	3/15/1978	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
134	3/20/1978	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	N/A	N/A
135	4/13/1978	Plant-Wide Components	Electrical cabinets	Power operation	N/A	15.1	N/A	N/A
138	7/4/1978	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
139	7/5/1978	Turbine Building	Boiler	Power operation	Undetermined	30	N/A	N/A
142	7/28/1978	Transformer Yard	Transformer – Catastrophic	Power operation	Challenging	27	N/A	N/A
143	8/11/1978	Plant-Wide Components	Hydrogen tanks	Power operation	Challenging	17	N/A	N/A
144	8/15/1978	Diesel Generator Room	Diesel generators	Power operation	Undetermined	8	N/A	N/A
145	8/16/1978	Plant-Wide Components	Pumps	Low-power operation	Challenging	21	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
148	10/27/1978	Containment (PWR)	Transients	Low-power operation	Challenging	3P	N/A	N/A
149	11/13/1978	Turbine Building	T/G hydrogen	Low-power operation	Challenging	34	N/A	N/A
150	11/15/1978	Diesel Generator Room	Diesel generators	Low-power operation	Undetermined	8	N/A	N/A
151	12/12/1978	Transformer Yard	Transformer – Non Catastrophic	Power operation	Undetermined	28	N/A	N/A
153	12/23/1978	Transformer Yard	Transformer – Non Catastrophic	Low-power operation	Undetermined	28	N/A	N/A
155	1/15/1979	Plant-Wide Components	Transformers	Power operation	Undetermined	23	N/A	N/A
157	2/23/1979	Transformer Yard	Transformer – Non Catastrophic	Power operation	Undetermined	28	N/A	N/A
158	4/4/1979	Battery Room	Batteries	Power operation	Challenging	1	N/A	N/A
159	4/15/1979	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
162	6/12/1979	Plant-Wide Components	Dryers	Power operation	Challenging	13	N/A	N/A
163	7/12/1979	Control Room	Main control board	Low-power operation	Challenging	4	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
164	7/15/1979	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
166	7/24/1979	Diesel Generator Room	Diesel generators	Power operation	Undetermined	8	N/A	N/A
167	8/15/1979	Containment (PWR)	Reactor coolant pump	Low-power operation	Undetermined	2	N/A	N/A
168	9/4/1979	Containment (PWR)	Reactor coolant pump	Power operation	Undetermined	2	N/A	N/A
169	9/30/1979	Containment (PWR)	Reactor coolant pump	Power operation	Challenging	2	N/A	N/A
170	9/30/1979	Containment (PWR)	Transients and hotwork	Power operation	Undetermined	3	N/A	N/A
172	10/15/1979	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
175	11/27/1979	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
176	12/7/1979	Plant-Wide Components	Electric motors	Low-power operation	Undetermined	14	N/A	N/A
177	12/15/1979	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
178	12/27/1979	Containment (PWR)	Transients and hotwork	Power operation	Undetermined	3	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
179	1/2/1980	Plant-Wide Components	Transients	Low-power operation	Undetermined	25	N/A	N/A
180	1/16/1980	Containment (PWR)	Reactor coolant pump	Power operation	Undetermined	2	N/A	N/A
181	1/21/1980	Plant-Wide Components	Cable run	Low-power operation	Challenging	12	N/A	N/A
183	2/1/1980	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Undetermined	6	N/A	N/A
186	2/22/1980	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	N/A	N/A
192	3/20/1980	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
195	4/15/1980	Plant-Wide Components	Bus duct	Power operation	Challenging	16.1	N/A	N/A
198	4/16/1980	Plant-Wide Components	Transient fires caused by welding and cutting	Power operation	Challenging	24	N/A	N/A
201	4/22/1980	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	N/A	N/A
202	4/30/1980	Plant-Wide Components	Transient fires caused by welding and cutting	Power operation	Challenging	24	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
204	5/5/1980	Diesel Generator Room	Diesel generators	Low-power operation	Undetermined	8	N/A	N/A
209	5/21/1980	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
211	6/3/1980	Plant-Wide Components	Transformers	Power operation	Challenging	23	N/A	N/A
214	7/6/1980	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
215	7/15/1980	Diesel Generator Room	Diesel generators	Power operation	Undetermined	8	N/A	N/A
217	8/8/1980	Plant-Wide Components	RPS MG sets	Power operation	Challenging	22	N/A	N/A
219	8/23/1980	Plant-Wide Components	Pumps	Low-power operation	Challenging	21	N/A	N/A
222	9/23/1980	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	N/A	N/A
223	10/2/1980	Plant-Wide Components	Electric motors	Power operation	Challenging	14	N/A	N/A
224	10/5/1980	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
226	10/14/1980	Containment (PWR)	Transients	Low-power operation	Undetermined	3P	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
230	11/21/1980	Turbine Building	Transient fires caused by welding and cutting	Power operation	Challenging	36	N/A	N/A
231	11/28/1980	Plant-Wide Components	Cable run	Low-power operation	Undetermined	12	N/A	N/A
232	12/9/1980	Containment (PWR)	Transients	Low-power operation	Undetermined	3P	N/A	N/A
234	12/15/1980	Turbine Building	T/G excitor	Power operation	Undetermined	33	N/A	N/A
236	12/31/1980	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
238	1/24/1981	Plant-Wide Components	Pumps	Power operation	Challenging	21	Electrical	30
240	2/2/1981	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
242	2/24/1981	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Challenging	6	Welding	2
244	3/9/1981	Diesel Generator Room	Diesel generators	Power operation	Undetermined	8	N/A	N/A
247	5/1/1981	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
250	5/12/1981	Turbine Building	T/G hydrogen	Power operation	Challenging	34	N/A	N/A
257	6/3/1981	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Challenging	6	Welding	3
258	6/15/1981	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Undetermined	6	N/A	N/A
260	6/30/1981	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	Oil	5
261	7/3/1981	Transformer Yard	Transformer – Catastrophic	Power operation	Challenging	27	N/A	N/A
262	7/14/1981	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	Oil	8
263	7/16/1981	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	Oil	1
264	7/17/1981	Plant-Wide Components	Miscellaneous hydrogen fires	Power operation	Challenging	19	N/A	N/A
266	7/24/1981	Plant-Wide Components	Pumps	Power operation	Challenging	21	Oil	15
269	8/10/1981	Plant-Wide Components	Pumps	Power operation	Challenging	21	Electrical	1

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
270	8/15/1981	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
279	10/26/1981	Turbine Building	Transients	Power operation	Challenging	37	N/A	N/A
282	10/30/1981	Plant-Wide Components	Cable Run	Low-power operation	Undetermined	12	N/A	N/A
286	11/7/1981	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
287	11/7/1981	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3B	N/A	N/A
288	11/11/1981	Turbine Building	Main feedwater pumps	Power operation	Undetermined	32	N/A	N/A
289	11/15/1981	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A
291	11/23/1981	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	N/A	N/A
293	11/29/1981	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3B	N/A	N/A
294	12/17/1981	Plant-Wide Components	Transient fires caused by welding and cutting	Undetermined	Undetermined	24	Welding	0

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
296	1/9/1982	Plant-Wide Components	Ventilation subsystems	Low-power operation	Undetermined	26	Oil	45
297	1/12/1982	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A
299	1/19/1982	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	N/A	N/A
300	1/19/1982	Plant-Wide Components	Transformers	Low-power operation	Challenging	23	N/A	N/A
304	2/4/1982	Turbine Building	T/G hydrogen	Power operation	Challenging	34	Turbine Generator	20
316	4/9/1982	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3B	N/A	N/A
319	4/14/1982	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Challenging	6	Welding	2
322	5/19/1982	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
323	5/27/1982	Plant-Wide Components	Dryers	Power operation	Challenging	13	Transient	20
324	5/27/1982	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
326	6/11/1982	Turbine Building	T/G excitor	Power operation	Challenging	33	Turbine Generator	45
328	8/11/1982	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
330	8/15/1982	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
333	9/2/1982	Plant-Wide Components	Transformers	Power operation	Challenging	23	N/A	N/A
334	9/9/1982	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A
337	9/13/1982	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A
339	9/19/1982	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A
343	9/28/1982	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A
344	10/1/1982	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
345	10/4/1982	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A
347	10/7/1982	Plant-Wide Components	Electric motors	Power operation	Challenging	14	N/A	N/A
349	10/15/1982	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
352	11/3/1982	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	Electrical	5
353	11/9/1982	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
354	11/11/1982	Plant-Wide Components	Electric motors	Power operation	Challenging	14	N/A	N/A
357	11/27/1982	Plant-Wide Components	Battery chargers	Power operation	Challenging	10	Electrical	4
359	12/26/1982	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Challenging	36	N/A	N/A
363	2/2/1983	Plant-Wide Components	Transformers	Power operation	Undetermined	23	N/A	N/A
368	2/16/1983	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	Outdoor Transform ers	12

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
369	3/12/1983	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
370	3/16/1983	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	N/A	N/A
371	3/18/1983	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A
373	3/21/1983	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3B	N/A	N/A
376	4/26/1983	Plant-Wide Components	Transformers	Low-power operation	Undetermined	23	N/A	N/A
384	5/20/1983	Turbine Building	T/G excitor	Power operation	Challenging	33	Turbine Generator	20
385	5/25/1983	Plant-Wide Components	Cable fires caused by welding and cutting	Power operation	Challenging	11	N/A	N/A
387	6/10/1983	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3B	N/A	N/A
388	6/19/1983	Plant-Wide Components	Pumps	Power operation	Challenging	21	Electrical	4

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
389	6/20/1983	Plant-Wide Components	Transformers	Low-power operation	Challenging	23	N/A	N/A
391	7/8/1983	Plant-Wide Components	Cable fires caused by welding and cutting	Power operation	Challenging	11	N/A	N/A
397	9/7/1983	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	N/A	N/A
398	9/7/1983	Plant-Wide Components	Cable run	Low-power operation	Undetermined	12	Cable	2
401	9/19/1983	Turbine Building	T/G oil	Power operation	Challenging	35	Turbine Generator	5
402	9/25/1983	Turbine Building	T/G oil	Power operation	Challenging	35	Turbine Generator	1
403	10/9/1983	Plant-Wide Components	Ventilation subsystems	Low-power operation	Challenging	26	N/A	N/A
405	11/14/1983	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	Outdoor Transformers	40
407	12/23/1983	Transformer Yard	Transformer – Catastrophic	Power operation	Challenging	27	Outdoor Transformers	120
410	1/15/1984	Diesel Generator Room	Diesel generators	Low-power operation	Undetermined	8	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
413	2/13/1984	Turbine Building	Transient fires caused by welding and cutting	Power operation	Challenging	36	Welding	0
415	3/19/1984	Turbine Building	T/G hydrogen	Power operation	Challenging	34	N/A	N/A
418	4/28/1984	Plant-Wide Components	Battery chargers	Low-power operation	Challenging	10	Electrical	60
421	5/21/1984	Plant-Wide Components	Transformers	Low-power operation	Challenging	23	N/A	N/A
426	6/6/1984	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3B	N/A	N/A
429	6/29/1984	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3B	N/A	N/A
431	7/11/1984	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
433	7/20/1984	Plant-Wide Components	Hydrogen tanks	Power operation	Challenging	17	Flammable Gas	46
434	8/2/1984	Plant-Wide Components	Electrical cabinets with HEAF	Power operation	Undetermined	16.a	N/A	N/A
435	8/6/1984	Plant-Wide Components	Pumps	Power operation	Undetermined	21	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
436	8/7/1984	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	N/A	N/A
444	10/29/1984	Plant-Wide Components	Pumps	Undetermined	Challenging	21	N/A	N/A
445	11/4/1984	Transformer Yard	Transformer – Catastrophic	Power operation	Challenging	27	N/A	N/A
448	11/20/1984	Turbine Building	Transient fires caused by welding and cutting	Power operation	Challenging	36	N/A	N/A
450	11/27/1984	Control/Aux/ Reactor Building	Transients	Low-power operation	Challenging	7	N/A	N/A
454	12/18/1984	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	N/A	N/A
455	12/19/1984	Turbine Building	T/G hydrogen	Power operation	Challenging	34	N/A	N/A
464	3/29/1985	Control/Aux/ Reactor Building	Transients	Undetermined	Challenging	7	Transient	5
465	4/8/1985	Turbine Building	T/G hydrogen	Power operation	Challenging	34	N/A	N/A
469	5/2/1985	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	Electrical	11
471	5/8/1985	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
474	6/14/1985	Turbine Building	Transient fires caused by welding and cutting	Power operation	Challenging	36	Welding	5
475	6/25/1985	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	N/A	N/A
476	6/26/1985	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	Oil	10
477	6/29/1985	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	Oil	10
480	7/14/1985	Control Room	Main control board	Power operation	Challenging	4	N/A	N/A
484	8/14/1985	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	Electrical	15
485	8/24/1985	Containment (PWR)	Reactor coolant pump	Power operation	Challenging	2	Containment (PWR)	24
486	9/7/1985	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
487	9/12/1985	Turbine Building	T/G excitor	Power operation	Challenging	33	Turbine Generator	35
490	10/11/1985	Plant-Wide Components	Electric motors	Undetermined	Undetermined	14	Electrical	11
491	10/15/1985	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
492	10/28/1985	Plant-Wide Components	Electrical cabinets	Undetermined	Undetermined	15.1	N/A	N/A
493	10/31/1985	Plant-Wide Components	Electrical cabinets	Power operation	N/A	15.1	Electrical	1
494	10/31/1985	Plant-Wide Components	Transformers	Power operation	Challenging	23	N/A	N/A
495	11/2/1985	Plant-Wide Components	Pumps	Low-power operation	Challenging	21	Oil (Deleted)	23
498	12/3/1985	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	Electrical	10
499	12/3/1985	Plant-Wide Components	Dryers	Undetermined	Undetermined	13	N/A	N/A
502	12/15/1985	Containment (BWR)	Transients	Low-power operation	Challenging	3B	N/A	N/A
505	1/8/1986	Plant-Wide Components	Pumps	Low-power operation	Undetermined	21	Electrical	36
506	1/20/1986	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Challenging	6	N/A	N/A
508	1/25/1986	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	Oil	1

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
509	2/1/1986	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	N/A	N/A
510	2/1/1986	Plant-Wide Components	Cable run	Power operation	Challenging	12	Cable	10
511	2/7/1986	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Challenging	6	N/A	N/A
512	2/17/1986	Plant-Wide Components	Miscellaneous hydrogen fires	Power operation	Challenging	19	Flammable Gas	9
513	2/19/1986	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	Electrical	6
515	3/6/1986	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
516	3/8/1986	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	Electrical	8
518	3/22/1986	Plant-Wide Components	Pumps	Low-power operation	Undetermined	21	Electrical	1
522	4/17/1986	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	Electrical	10
524	5/10/1986	Containment (BWR)	Main feedwater pumps	Power operation	Challenging	32	Oil	34

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
529	6/22/1986	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	Electrical	1
531	7/23/1986	Turbine Building	T/G oil	Power operation	Challenging	35	Turbine Generator	8
532	7/24/1986	Plant-Wide Components	RPS MG sets	Low-power operation	Undetermined	22	N/A	N/A
535	8/13/1986	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	Oil	11
541	9/19/1986	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	Electrical	10
544	10/14/1986	Plant-Wide Components	Ventilation subsystems	Undetermined	Challenging	26	Electrical	12
545	10/24/1986	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Undetermined	24	N/A	N/A
551	12/16/1986	Plant-Wide Components	Transformers	Power operation	Challenging	23	Electrical	1
552	12/23/1986	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Challenging	24	N/A	N/A
554	1/2/1987	Turbine Building	T/G oil	Power operation	Challenging	35	Turbine Generator	95

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
557	1/31/1987	Plant-Wide Components	RPS MG sets	Low-power operation	Challenging	22	Electrical	30
559	2/8/1987	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	Oil	21
562	2/16/1987	Turbine Building	T/G oil	Power operation	Challenging	35	Turbine Generator	45
566	3/1/1987	Plant-Wide Components	Pumps	Low-power operation	Challenging	21	Oil	30
567	3/2/1987	Plant-Wide Components	Transients	Power operation	Challenging	25	Transient	4
570	3/5/1987	Plant-Wide Components	Hydrogen tanks	Power operation	Challenging	17	N/A	N/A
572	3/14/1987	Plant-Wide Components	Pumps	Power operation	Challenging	21	Electrical	8
575	3/19/1987	Plant-Wide Components	Bus duct	Power operation	Challenging	16.1	N/A	N/A
577	3/27/1987	Turbine Building	Transients	Power operation	Challenging	37	Transient	5
580	4/7/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Challenging	36	N/A	N/A
582	4/10/1987	Turbine Building	Transients	Low-power operation	Undetermined	37	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
583	4/11/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	36	N/A	N/A
586	4/15/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	36	N/A	N/A
587	4/20/1987	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	N/A	N/A
588	4/20/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	36	N/A	N/A
589	4/22/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Challenging	36	N/A	N/A
590	4/22/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	36	N/A	N/A
591	4/25/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	36	N/A	N/A
601	5/28/1987	Turbine Building	T/G oil	Low-power operation	Challenging	35	N/A	N/A
608	6/17/1987	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	Electrical	1

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
611	7/2/1987	Plant-Wide Components	RPS MG sets	Low-power operation	Challenging	22	Electrical	12
613	7/9/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Challenging	36	N/A	N/A
614	7/10/1987	Plant-Wide Components	Transformers	Power operation	Challenging	23	Electrical	3
625	9/17/1987	Plant-Wide Components	Ventilation subsystems	Power operation	Challenging	26	Electrical	14
626	9/19/1987	Turbine Building	Boiler	Low-power operation	Undetermined	30	N/A	N/A
631	10/9/1987	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
632	10/13/1987	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	N/A	N/A
633	10/13/1987	Plant-Wide Components	Ventilation subsystems	Power operation	Challenging	26	N/A	N/A
634	10/14/1987	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	N/A	N/A
636	10/16/1987	Turbine Building	T/G oil	Power operation	Challenging	35	Turbine Generator	8

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
638	10/30/1987	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A
639	10/31/1987	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A
640	11/2/1987	Containment (BWR)	Cable fires caused by welding and cutting	Low-power operation	Challenging	11	N/A	N/A
641	11/2/1987	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Challenging	6	N/A	N/A
642	11/4/1987	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	Electrical	50
643	11/10/1987	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Challenging	36	N/A	N/A
644	11/10/1987	Diesel Generator Room	Diesel generators	Undetermined	Challenging	8	Electrical	10
646	11/18/1987	Plant-Wide Components	Battery chargers	Power operation	Undetermined	10	N/A	N/A
648	11/24/1987	Containment (BWR)	Transients	Low-power operation	Undetermined	3B	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
650	11/30/1987	Control/Aux/ Reactor Building	Transients	Power operation	Undetermined	7	Transient	1
651	12/3/1987	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	N/A	N/A
653	12/10/1987	Plant-Wide Components	Transients	Power operation	Challenging	25	Transient	15
654	12/11/1987	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	Electrical	1
656	12/17/1987	Plant-Wide Components	RPS MG sets	Power operation	Challenging	22	Electrical	30
659	12/30/1987	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	Control Room	2
660	12/30/1987	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
662	1/8/1988	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	Oil	60
665	1/19/1988	Plant-Wide Components	Junction boxes	Low-power operation	Challenging	18	Electrical	10
667	1/28/1988	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	Electrical	7
668	1/28/1988	Turbine Building	T/G oil	Power operation	Undetermined	35	Turbine Generator	217

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
669	2/1/1988	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
670	2/1/1988	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
673	2/8/1988	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	Electrical	2
676	2/16/1988	Turbine Building	T/G excitor	Power operation	Undetermined	33	N/A	N/A
677	2/27/1988	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
678	3/2/1988	Plant-Wide Components	Bus duct	Power operation	Challenging	16.1	N/A	N/A
681	3/9/1988	Plant-Wide Components	Cable run	Low-power operation	Challenging	12	Cable	15
682	3/9/1988	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A
683	3/12/1988	Plant-Wide Components	Dryers	Low-power operation	Undetermined	13	N/A	N/A
700	4/15/1988	Turbine Building	Transient fires caused by welding and cutting	Power operation	Challenging	36	Welding	15

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
704	4/20/1988	Plant-Wide Components	Dryers	Power operation	Challenging	13	Transient	10
708	5/10/1988	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	Electrical	8
710	5/10/1988	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	Oil	27
713	5/21/1988	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Undetermined	24	N/A	N/A
715	5/24/1988	Plant-Wide Components	Dryers	Power operation	Challenging	13	N/A	N/A
717	5/27/1988	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Challenging	24	N/A	N/A
718	5/27/1988	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Challenging	24	N/A	N/A
720	5/28/1988	Plant-Wide Components	RPS MG sets	Low-power operation	Challenging	22	N/A	N/A
722	6/4/1988	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3B	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
724	6/6/1988	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Undetermined	24	N/A	N/A
726	6/11/1988	Plant-Wide Components	Electric motors	Low-power operation	Challenging	14	Electrical	17
732	7/6/1988	Plant-Wide Components	Bus duct	Power operation	Challenging	16.1	N/A	N/A
734	7/17/1988	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	Outdoor Transformers	2
735	7/21/1988	Plant-Wide Components	Pumps	Power operation	Challenging	21	Electrical	13
736	7/24/1988	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	Oil	23
737	7/29/1988	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	Oil	7
738	7/29/1988	Transformer Yard	Transformer – Non Catastrophic	Low-power operation	Undetermined	28	N/A	N/A
739	7/30/1988	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	N/A	N/A
740	8/2/1988	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Undetermined	24	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
743	8/11/1988	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Challenging	6	N/A	N/A
745	8/17/1988	Plant-Wide Components	Junction boxes	Power operation	Challenging	18	Electrical	10
747	9/4/1988	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Challenging	20	N/A	N/A
751	9/27/1988	Turbine Building	Transient fires caused by welding and cutting	Undetermined	Challenging	36	Welding	10
752	9/28/1988	Turbine Building	T/G oil	Power operation	Undetermined	35	N/A	N/A
755	10/5/1988	Plant-Wide Components	Pumps	Power operation	Challenging	21	Electrical	3
756	10/14/1988	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	Control Room	1
763	11/11/1988	Transformer Yard	Transformer – Catastrophic	Power operation	Challenging	27	N/A	N/A
765	11/27/1988	Diesel Generator Room	Diesel generators	Low-power operation	Undetermined	8	Oil	3
770	2/21/1980	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Undetermined	6	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
772	2/14/1981	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3B	N/A	N/A
773	1/21/1989	Plant-Wide Components	Transients	Low-power operation	Undetermined	25	N/A	N/A
777	5/11/1989	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
778	7/11/1989	Plant-Wide Components	Pumps	Power operation	Undetermined	21	N/A	N/A
781	4/27/1989	Plant-Wide Components	Pumps	Power operation	Undetermined	21	N/A	N/A
785	5/19/1989	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	N/A	N/A
792	7/15/1988	Plant-Wide Components	Iso-phase ducts	Power operation	Challenging	16.2	Electrical	5
794	3/31/1989	Plant-Wide Components	RPS MG sets	Power operation	Undetermined	22	N/A	N/A
795	8/28/1989	Containment (PWR)	Reactor coolant pump	Power operation	Undetermined	2	N/A	N/A
797	2/3/1989	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
801	11/6/1988	Plant-Wide Components	RPS MG sets	Low-power operation	Undetermined	22	N/A	N/A
805	4/12/1989	Plant-Wide Components	Battery chargers	Low-power operation	Undetermined	10	N/A	N/A
808	3/24/1989	Diesel Generator Room	Diesel generators	Undetermined	Undetermined	8	N/A	N/A
809	12/23/1989	Turbine Building	T/G oil	Power operation	Challenging	35	Turbine Generator	44
831	11/1/1988	Diesel Generator Room	Diesel generators	Low-power operation	Undetermined	8	N/A	N/A
832	10/7/1989	Plant-Wide Components	Transformers	Power operation	Undetermined	23	N/A	N/A
835	11/18/1989	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Undetermined	24	N/A	N/A
842	12/8/1988	Plant-Wide Components	Pumps	Power operation	Undetermined	21	N/A	N/A
845	5/29/1989	Transformer Yard	Transformer – Catastrophic	Low-power operation	Challenging	27	N/A	N/A
846	9/16/1989	Plant-Wide Components	Transformers	Power operation	Undetermined	23	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
848	1/7/1989	Plant-Wide Components	Miscellaneous hydrogen fires	Low-power operation	Undetermined	19	N/A	N/A
853	12/1/1989	Plant-Wide Components	Miscellaneous hydrogen fires	Undetermined	Undetermined	19	N/A	N/A
864	11/28/1989	Diesel Generator Room	Diesel generators	Low-power operation	Undetermined	8	N/A	N/A
870	1/29/1988	Plant-Wide Components	Electric motors	Power operation	Undetermined	14	N/A	N/A
872	11/19/1989	Transformer Yard	Transformer – Non Catastrophic	Power operation	Undetermined	28	N/A	N/A
886	7/10/1980	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
887	8/27/1980	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
888	3/28/1981	Plant-Wide Components	Electric motors	Power operation	Undetermined	14	N/A	N/A
891	3/15/1982	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
893	4/20/1982	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
897	3/8/1983	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
901	5/7/1983	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	N/A	N/A
902	5/15/1983	Diesel Generator Room	Diesel generators	Power operation	Undetermined	8	N/A	N/A
905	8/27/1983	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	N/A	N/A
907	12/9/1983	Plant-Wide Components	Pumps	Low-power operation	Challenging	21	N/A	N/A
908	7/3/1984	Plant-Wide Components	Cable Run	Power operation	Challenging	12	N/A	N/A
914	11/20/1985	Plant-Wide Components	Pumps	Low-power operation	Challenging	21	Electrical	23
916	1/7/1986	Plant-Wide Components	Transformers	Power operation	Undetermined	23	N/A	N/A
919	7/17/1986	Transformer Yard	Yard transformers (others)	Low-power operation	Challenging	29	N/A	N/A
922	7/10/1987	Plant-Wide Components	Bus duct	Power operation	Challenging	16.1	Electrical	3
926	1/20/1989	Turbine Building	T/G hydrogen	Power operation	Challenging	34	Turbine Generator	20
928	3/1/1989	Control Room	Main control board	Power operation	Challenging	4	Control Room	2

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
929	10/9/1989	Plant-Wide Components	Iso-phase ducts	Power operation	Challenging	16.2	Turbine Generator	160
934	4/13/1986	Transformer Yard	Transformer – Non Catastrophic	Power operation	Undetermined	28	Outdoor Transform ers	120
935	8/2/1985	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
940	10/2/1987	Turbine Building	T/G oil	Power operation	Challenging	35	Turbine Generator	25
941	9/1/1989	Transformer Yard	Transformer – Catastrophic	Low-power operation	Challenging	27	N/A	N/A
942	3/5/1989	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	Electrical	15
944	10/7/1989	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	N/A	N/A
945	9/16/1989	Diesel Generator Room	Diesel generators	Undetermined	Undetermined	8	N/A	N/A
947	1/3/1989	Plant-Wide Components	Electrical cabinets with HEAF	Power operation	Challenging	16.b	High-Energy Arcing Faults	59
949	1/9/1982	Plant-Wide Components	Pumps	Low-power operation	Challenging	21	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
955	2/12/1988	Plant-Wide Components	Pumps	Power operation	Challenging	21	N/A	N/A
957	10/27/1989	Turbine Building	T/G excitor	Power operation	Challenging	33	N/A	N/A
963	6/11/1988	Containment (PWR)	Transients and hotwork	Undetermined	Undetermined	3	N/A	N/A
968	4/3/1989	Plant-Wide Components	Transients	Undetermined	Challenging	25	Transient	8
969	5/2/1989	Turbine Building	Transient fires caused by welding and cutting	Undetermined	Challenging	36	N/A	N/A
971	9/19/1989	Plant-Wide Components	Electrical cabinets	Undetermined	Undetermined	15.1	N/A	N/A
972	9/27/1989	Turbine Building	Transients	Undetermined	Undetermined	37	N/A	N/A
975	11/9/1989	Plant-Wide Components	Pumps	Undetermined	Undetermined	21	N/A	N/A
1050	1/1/1989	Turbine Building	Transients	Power operation	Challenging	37	Transient	5
1051	2/12/1989	Turbine Building	Transients	Low-power operation	Undetermined	37	N/A	N/A
1052	8/16/1989	Plant-Wide Components	Miscellaneous hydrogen fires	Power operation	Undetermined	19	N/A	N/A
1053	8/19/1989	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	Electrical	7

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
1054	9/28/1989	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A
1094	11/4/1983	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A
1095	9/8/1986	Turbine Building	Transient fires caused by welding and cutting	Power operation	Undetermined	36	Welding	2
1097	11/15/1986	Plant-Wide Components	Ventilation subsystems	Low-power operation	Undetermined	26	Electrical	95
1098	2/7/1989	Plant-Wide Components	Transients	Power operation	Undetermined	25	N/A	N/A
1099	2/11/1989	Plant-Wide Components	Pumps	Low-power operation	Undetermined	21	N/A	N/A
1100	4/18/1989	Plant-Wide Components	Ventilation subsystems	Power operation	Undetermined	26	Electrical	5
1108	6/6/1989	Plant-Wide Components	Air compressors	Power operation	Undetermined	9	Oil	4
1109	10/28/1989	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
1117	2/16/1980	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Undetermined	24	N/A	N/A
1119	2/23/1989	Turbine Building	Transients	Power operation	Undetermined	37	Transient	1
1120	10/28/1989	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3B	N/A	N/A
1121	11/5/1989	Plant-Wide Components	Transient fires caused by welding and cutting	Low-power operation	Undetermined	24	N/A	N/A
1124	10/7/1986	Plant-Wide Components	Electric motors	Undetermined	Undetermined	14	Electrical	4
1128	3/10/1988	Turbine Building	Transients	Power operation	Undetermined	37	Transient	10
1129	2/15/1989	Plant-Wide Components	Transformers	Low-power operation	Undetermined	23	Electrical	1
1132	11/6/1989	Plant-Wide Components	Dryers	Undetermined	Undetermined	13	N/A	N/A
1133	11/7/1989	Plant-Wide Components	Electrical cabinets	Undetermined	Undetermined	15.1	Electrical	5
1134	12/16/1989	Plant-Wide Components	Transformers	Low-power operation	Undetermined	23	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
1143	2/28/1975	Plant-Wide Components	Transient fires caused by welding and cutting	Undetermined	Undetermined	24	N/A	N/A
1144	3/26/1975	Turbine Building	Transients	Undetermined	Undetermined	37	N/A	N/A
1145	5/2/1975	Turbine Building	Transient fires caused by welding and cutting	Undetermined	Undetermined	36	N/A	N/A
1147	6/2/1975	Plant-Wide Components	Electrical cabinets	Undetermined	Undetermined	15.1	N/A	N/A
1149	12/2/1975	Turbine Building	Transients	Undetermined	Challenging	37	N/A	N/A
1151	3/10/1977	Diesel Generator Room	Diesel generators	Low-power operation	Undetermined	8	N/A	N/A
1153	10/16/1977	Turbine Building	Transients	Low-power operation	Undetermined	37	N/A	N/A
1154	3/10/1978	Turbine Building	Transient fires caused by welding and cutting	Undetermined	Undetermined	36	N/A	N/A
1155	4/26/1978	Plant-Wide Components	Miscellaneous hydrogen fires	Power operation	Undetermined	19	N/A	N/A
1157	11/5/1983	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	36	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
1178	4/29/1975	Plant-Wide Components	Pumps	Power operation	Undetermined	21	N/A	N/A
1179	7/7/1975	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
1180	10/18/1975	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3B	N/A	N/A
1181	3/30/1976	Plant-Wide Components	Transients	Power operation	Undetermined	25	N/A	N/A
1182	8/17/1976	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Undetermined	6	N/A	N/A
1184	9/2/1976	Plant-Wide Components	Pumps	Power operation	Undetermined	21	N/A	N/A
1185	1/8/1977	Plant-Wide Components	Ventilation subsystems	Power operation	Undetermined	26	N/A	N/A
1186	2/17/1977	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Challenging	6	N/A	N/A
1191	7/19/1979	Plant-Wide Components	Off-gas/H_2 recombiner (BWR)	Power operation	Undetermined	20	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
1235	2/3/1975	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3B	N/A	N/A
1238	10/9/1975	Plant-Wide Components	Cable run	Undetermined	Undetermined	12	N/A	N/A
1239	5/24/1976	Plant-Wide Components	Pumps	Low-power operation	Undetermined	21	N/A	N/A
1240	9/11/1976	Turbine Building	Main feedwater pumps	Power operation	Undetermined	32	N/A	N/A
1242	11/3/1976	Turbine Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	36	N/A	N/A
1243	12/3/1976	Plant-Wide Components	Transient fires caused by welding and cutting	Undetermined	Undetermined	24	N/A	N/A
1244	2/8/1977	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
1245	2/24/1977	Turbine Building	Transient fires caused by welding and cutting	Power operation	Undetermined	36	N/A	N/A
1246	4/25/1977	Plant-Wide Components	Electrical cabinets	Undetermined	Undetermined	15.1	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
1247	4/27/1977	Plant-Wide Components	Transients	Undetermined	Undetermined	25	N/A	N/A
1249	10/27/1977	Containment (BWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3B	N/A	N/A
1252	6/7/1978	Plant-Wide Components	Transient fires caused by welding and cutting	Undetermined	Undetermined	24	N/A	N/A
1253	6/25/1978	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
1254	8/24/1978	Plant-Wide Components	Transient fires caused by welding and cutting	Power operation	Undetermined	24	N/A	N/A
1258	12/19/1978	Plant-Wide Components	Transformers	Power operation	Undetermined	23	N/A	N/A
1259	1/25/1979	Plant-Wide Components	Electrical cabinets	Power operation	Undetermined	15.1	N/A	N/A
1260	4/29/1979	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	N/A	N/A
1297	11/18/1989	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Power operation	Undetermined	6	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
1308	8/7/1984	Transformer Yard	Transformer – Non Catastrophic	Power operation	Challenging	28	N/A	N/A
1311	3/31/1988	Control/Aux/ Reactor Building	Transient fires caused by welding and cutting	Low-power operation	Undetermined	6	N/A	N/A
1315	12/12/1989	Plant-Wide Components	Electrical cabinets	Undetermined	Undetermined	15.1	N/A	N/A
1317	4/13/1978	Plant-Wide Components	Miscellaneous hydrogen fires	Power operation	Undetermined	19	N/A	N/A
1337	3/31/1989	Plant-Wide Components	Ventilation subsystems	Low-power operation	Challenging	26	Electrical	9
1482	1/22/1986	Turbine Building	Main feedwater pumps	Power operation	Challenging	32	Oil	5
1483	3/13/1986	Diesel Generator Room	Diesel generators	Power operation	Challenging	8	Oil	5
1485	7/20/1986	Diesel Generator Room	Diesel generators	Low-power operation	Challenging	8	Oil	5
1487	4/17/1987	Plant-Wide Components	Ventilation subsystems	Power operation	Challenging	26	Electrical	2
1488	10/21/1987	Containment (PWR)	Reactor coolant pump	Power operation	Undetermined	2	Containme nt (PWR)	2

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
1489	10/26/1987	Plant-Wide Components	Electrical cabinets	Low-power operation	Challenging	15.1	Electrical	2
2361	3/10/1986	Plant-Wide Components	Cable run	Power operation	Undetermined	12	Cable	2
2367	12/13/1983	Plant-Wide Components	Electrical cabinets	Power operation	Challenging	15.1	N/A	N/A
2368	10/16/1983	Plant-Wide Components	Electrical cabinets	Low-power operation	Undetermined	15.1	N/A	N/A
2370	11/19/1976	Plant-Wide Components	Electrical cabinets	Undetermined	Undetermined	15.1	N/A	N/A
2373	12/2/1976	Control Room	Main control board	Undetermined	Undetermined	4	N/A	N/A
2374	12/31/1975	Diesel Generator Room	Diesel generators	Undetermined	Undetermined	8	N/A	N/A
2445	10/5/1987	Plant-Wide Components	Pumps	Undetermined	Undetermined	21	Electrical	2
2447	8/1/1987	Plant-Wide Components	Electrical cabinets	Undetermined	Undetermined	15.1	Electrical	2
2456	2/3/1987	Turbine Building	Main feedwater pumps	Power operation	Undetermined	32	N/A	N/A
2463	10/16/1988	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3P	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
2465	9/23/1988	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3P	N/A	N/A
2466	9/12/1988	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Challenging	3P	N/A	N/A

Table A-3 (continued)
Fire event data for 1968–1989

Incident Number	Event Date	Location	Ignition Source	Power Condition	Fire Severity	Bin Desig-nation	NSP Category	Suppression Time
2467	7/27/1988	Containment (PWR)	Transient fires caused by welding and cutting	Low-power operation	Undetermined	3P	N/A	N/A
2469	7/14/1988	Plant-Wide Components	Transient fires caused by welding and cutting	Undetermined	Challenging	24	Welding (Removed)	10
2476	1/23/1989	Plant-Wide Components	Ventilation subsystems	Undetermined	Undetermined	26	Electrical	10

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10. SUPPLEMENTARY NOTES

11. ABSTRACT (200 words or less)

This report documents the development of updated fire ignition frequencies (FIFs) and non-suppression probability (NSP) estimates as potential improvements for nuclear power plant fire (NPP) fire probabilistic risk assessment (FPRA) applications. This research follows prior Electric Power Research Institute (EPRI) research aimed at providing an updated methodology to estimate FIFs and collect more recent fire event data.

Fire ignition frequencies and non-suppression probabilities were previously developed in the NUREG/CR-6850/EPRI 1011989 and revised in Supplement 1 to NUREG/CR-6850/EPRI 1019259. In this report, the FIF estimation benefits from an enhanced methodology and incorporates updated data from EPRI's updated Fire Events Database (FEDB). The report also updates low-power and shutdown (LPSD) FIFs from those published in NUREG/CR-7114. NSP estimates are calculated using the existing methodology and have been updated with new fire event experience.

The fire ignition frequencies and non-suppression probabilities published in NUREG/CR-6850 and Supplement 1 incorporate fire event experience through the year 2000. The research presented in this report incorporates U.S. NPP fire event experience through the year 2009. The insights conclude that the data from 2000–2009 are the most complete and accurate for characterizing and estimating FIFs for FPRAs.

12. KEY WORDS/DESCRIPTORS (List words or phrases that will assist researchers in locating the report.)
Fire Ignition Frequencies (FIFs), Non-suppression probability(NSP), Fire Events Database (FEDB), low-power and shutdown (LPSD)

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