AREVA, the world’s leading nuclear supplier, is recognized throughout the industry as a premier provider of fire protection engineering, design and analysis services.

Background
The Nuclear Regulatory Commission endorsed National Fire Protection Association (NFPA) Standard 805, “Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants,” as an acceptable voluntary approach for demonstrating compliance with 10 CFR 50.48, “Fire Protection.” This endorsement allows plants to move away from prescriptive fire protection requirements and realize the benefits of using risk-informed, performance-based methods to analyze the consequences of fires and their impact on the ability to achieve and maintain safe shutdown.

Involved and Engaged
AREVA has actively supported the development of NFPA 805 and is a leader in fire protection standards development, industry working groups, and industry forum presentations. Additionally, as part of a Nuclear Energy Institute (NEI) initiative, members of our team helped develop the advanced performance-based methods for circuit analysis described in NEI 00-01, “Guidance for Post-Fire Safe Shutdown Circuit Analysis.” We were also selected by NEI to support pilot plant evaluations of this methodology to demonstrate compliance with regulatory requirements.

Considering the Transition to NFPA 805
Adopting NFPA 805 is a significant undertaking. Potential benefits must be thoroughly evaluated against costs each step of the way. Our team of professionals can help determine if transforming your licensing basis to NFPA 805 makes sense for your plant. We do this by evaluating the following attributes of your compliance approach:

- Maximizing the use of your current licensing basis and documentation
- Minimizing the need to reconstitute the current design and licensing bases
- Identifying potential program vulnerabilities and formulating the specific cost-effective changes needed for NFPA 805 compliance
- Assessing short-term and long-term costs versus benefits

Features and Benefits
- Cost savings in addressing future FP issues
- Reduced reliance on manual operator actions
- Reduced reliance on fire barriers
- Eliminate deviations and exemption requests
- More realistic analysis of plant fire scenarios
- Reduced surveillance frequencies
- Enhanced license renewal support by meeting contemporary regulatory expectations
A Complete Solution

We offer full scope, turn-key engineering services for all three phases of the NFPA 805 transition process:

- Preliminary assessment and letter of intent
- Analysis and License Amendment Request (LAR)
- Completion of transition including revising your PRA, fire hazards analysis and safe shutdown analysis

The NFPA 805 transition assessment process is depicted in the following simplified flow chart (taken from the NEI 04-02):
Transitioning to NFPA 805

The transition to NFPA 805 requires performing several evaluations and analyses:

**Fire Protection (FP) Fundamentals Assessment**
Chapter 3 of NFPA 805 requires that licensees assess their current compliance status. Prior approved alternates to the existing FP program may take precedence over NFPA 805 criteria so it is vital that the plant licensing basis be well understood. The NRC may accept these changes, but will undoubtedly review them again in the context of the change to a performance-based approach.

**Nuclear Safety Analyses**
Most NFPA 805 nuclear safety performance goals are comparable to existing regulatory requirements (10 CFR 50 Appendix R III.G and III.L). The nuclear safety analysis includes a systematic review of the following existing program elements:
- Nuclear safety system and equipment selection
- Nuclear safety capability circuit analysis
- Nuclear safety equipment and cable location
- Fire area assessments
- Manual Action Feasibility
- Breaker Coordination /common enclosure

Those plants with well-documented safe shutdown methodologies will be able to integrate much of their current analysis for risk significant areas. However, NFPA 805 also requires the assessment of fires originating during non-power operational modes and fires that result in radioactive release that were not previously part of most FP programs.

**Non-Power Operational Mode Assessment**
This assessment requires an evaluation of different components and time-sequences from the normal safe shutdown paths (primarily assessing decay heat removal capability) as well as an evaluation of key safety functions needed for high risk evolutions during non-power modes (see NUMARC 91-06).

**Radioactive Release Assessment**
Licensees are also required to show that FP goals are also met with respect to limiting radioactive releases with the objective of showing no releases due to loss of boundary controls (other than those already evaluated as primary nuclear safety boundaries).

NFPA 805 Transition Software (DATATRAK)

The NFPA 805 Transition Data Tracking System (DATATRAK) has been developed by AREVA as a tool for modeling, managing and reporting data related to performing an NFPA 805 Transition analysis. The application has been designed to integrate the data elements and relationships required to support the various tasks related to performing both Fire Safe Shutdown and NFPA 805 Transition Analyses. Data screens and reports have been designed to accommodate the data input and reporting requirements for NFPA 805 Transition tasks such as the following:
- Safe Shutdown System and Component Selection
- Modeling Interlock, Power and Sub-component Dependencies
- Cable Selection – for SSD, PRA and NPO
- Cable Routing and Location
- Fire Area SSD Assessments
- Non-Power Operation Assessments
- Basic Event Mapping to Cables
- Fire PRA Impact Assessments
- Fire PRA Scenario Zone of Influence Calculations
- Determining impact to analyses due to data revisions
- Generate LAR Tables

This analysis involves modeling information associated with components, cables and raceways to determine the impact of fire damage on the ability to achieve safe shutdown within each fire zone or fire area. The DATATRAK application supports both the Nuclear Safety Analysis plus the additional NFPA 805 related tasks such as Non-Power Operational Mode assessments and calculating Fire PRA cable impacts including Basic Event mapping and Fire Scenario cable impacts.

The database system is also designed to link to external data sources such as selected plant cable raceway data tables and selected PRA CAFTA Basic Event data tables in support of the analysis. In addition, the software is also designed to identify the delta resulting from revisions to these external data sources used as design input to the Transition Analysis in order to maintain data configuration control.

This software solution has been developed from AREVA’s expertise in supporting various NFPA 805 transition projects and has received favorable reviews from the NRC during Pilot Plant reviews. Furthermore, the design of the application supports customization to meet the needs of each plant-specific project by integrating all the elements required to support this analysis.
Probabilistic Risk Analysis (PRA)

Fire PRA is dependent on the application of event tree/fault tree analysis, which is a core competency of AREVA fire PRA personnel. Our detailed knowledge of plant accident sequences, design and operation helps customers understand the overall risk to their plant — especially from postulated fire-induced component failures, system interactions, and dependencies.

AREVA has supported the latest methods for fire PRA for full power operations as contained in “EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities,” NUREG/CR-6850. This methodology enhances cable selection and circuit analysis, and uncertainty analysis. Significant changes include development of ignition frequencies, post-fire HRA and fire modeling. Plus, the methodology improves component selection, development of the fire-induced risk model, and quantitative screening.

Fire Modeling

As an integral component of NFPA 805, fire modeling is used to determine the survivability of plant structures, systems and components as well as predict tenability within the fire areas of concern. However, for fire modeling to be effective, each program must be applied with a clear understanding of its limitations. Fire scenario construction must be fully cognizant of the following attributes:

• Proper characterization of fire source term
• Target pass/fail criteria
• Plume and ceiling jet/layer development and orientation
• Direct flame radiation exposure
• Ignition criteria for proximate/contributory combustibles

AREVA has the expertise and experience to construct the proper scenarios and apply the right fire modeling tools to yield technically sound results.

Program Change and Licensing Basis

Other aspects of the transition to the risk-informed, performance-based approach of NFPA 805 is evaluating the convertability of the program itself. The adequacy of existing configuration control, quality assurance, program surveillance and monitoring, administrative control attributes, and corrective action processes are all items that must be considered and appropriately integrated/updated as needed. This process ensures that the new licensing basis for fire protection is correctly oriented to accommodate and manage future change and will stand up to regulatory scrutiny for the life of the plant.

Experience You Can Count On

AREVA offers the complete range of engineering services needed to help you navigate a successful transition to NFPA 805. Working in concert with your fire protection personnel, we will help map the transition process, develop the cost-benefit analyses needed to support key decisions, and perform the required engineering analyses, licensing submittals and supporting documentation.

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