

FLEX Implementation

Background

In March 2012, the U.S. Nuclear Regulatory Commission (NRC) issued order EA-12-049 requiring nuclear power plants to develop mitigation strategies for beyond-design-basis external events (i.e., FLEX). The industry, through the Nuclear Energy Institute (NEI), developed a generic framework for response to this order that is documented in the NEI FLEX Implementation Guide (NEI 12-06). The framework outlines an approach for adding diverse and flexible mitigation capabilities to increase defense-in-depth for beyond-design-basis scenarios to address an extended loss of AC power and loss of normal access to the ultimate heat sink at all units on a site.

The objective of FLEX is to provide a programmatic and controlled approach to transition to mobile equipment intended to mitigate a beyond-design-basis external event. Portable equipment that supplements installed systems will enable key safety functions to be maintained despite a postulated extended loss of normal AC power and loss of normal access to the ultimate heat sink. Protection, access and connections for the portable equipment must also be provided.

The NRC expects that FLEX will:

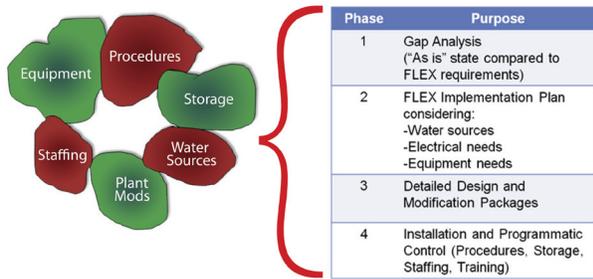
- Provide an additional layer of safety for beyond-design-basis external events to prevent fuel damage
- Focus on maintaining key safety functions of core cooling, containment integrity and spent fuel pool cooling
- Provide multiple supplies of electrical power and cooling water
- Maintain portable equipment in protected housings
- Follow and maintain system-based guidance and instructions
- Implement programmatic controls
- Utilize off-site support centers 24 hours after event

Description

Westinghouse has a comprehensive, four-phase, site-specific approach to FLEX implementation to minimize demands on operations staff, reduce plant costs, support plant schedules and integrate with existing site processes.

- Phase 1: Evaluate current operating conditions compared to the expectations of FLEX and identify areas requiring enhancement
- Phase 2: Walk-downs, engineering evaluations, initial coping study validation and procedure review to help define a customer's FLEX Implementation Plan

- Phase 3: Coping/distribution solutions, detailed designs, modification packages, procedure updates and training
- Phase 4: Procurement, construction and installation



FLEX implementation process

Why Westinghouse?

Westinghouse has key understanding of the nuclear steam supply system (NSSS), which is critical to effectively implementing FLEX. With industry-recognized expertise as an original equipment manufacturer for the pressurized water reactor (PWR) and boiling water reactor (BWR) designs, Westinghouse utilizes an extensive knowledge base for efficient customer solutions focused on enhanced safety. Optimizing the use of limited resources (power, water, people) will be the key to successfully implementing FLEX strategies. Westinghouse's experience provides a natural fit to evaluate current conditions and provide streamlined design and procedure changes necessary to meet FLEX requirements.

Westinghouse is qualified in all areas of both BWR and PWR power generation and possesses the analytical capability to address unforeseen issues or regulatory guideline changes, should they occur during project execution.

The Westinghouse value includes:

- BWR and PWR experience and expertise in NSSS and balance of plant plant modifications; staff background in operations

- Participation in the task force to develop the NEI FLEX Implementation Guide
- PWR Owners Group activities to develop generic guidance for FLEX implementation and analytical models developed as part of the generic evaluations (application of Pressurized Water Reactor Owners Group results are used to provide similar solutions to BWRs)

Benefits

Westinghouse's FLEX solution:

- Considers the schedule of improvements and integration with existing site processes, identifying solutions with the lowest-impact on operations, staffing and plant modifications
- Emphasizes the up-front planning and analysis for effective FLEX strategies
- Supports site-specific procedures with an integrated understanding of the safety functions and the many analyses that form the basis of FLEX

Experience

- Thermal-hydraulic analyses for 72+ hours to identify resources needed (e.g., water)
- Analyses of long-term heat transfer and pump operation with poor-quality water
- Electrical coping with current equipment, battery load analyses and lighting improvements
- Emergency Operating Procedure impacts and new FLEX Response Guides
- Plant modifications, walk-downs and conceptual designs (for example, reactor coolant system fill, steam generator fill, spent fuel pool fill, and 480V and 4160V connections)