

implementation of 10 CFR 50.65(a)(4) as applied to the proposed change.

3.1.1 Temporary Risk Increases

RG 1.177 proposes the incremental conditional core damage probability (ICCDP) and the incremental conditional large early release probability (ICLERP) as appropriate measures of the increase in probability of core damage and large early release, respectively, during the period of implementation of a proposed TS change. In addition, RG 1.177 stresses the need to preclude potentially high risk configurations introduced by the proposed change. The ICCDP associated with any specified plant condition, such as the condition introduced by entering a higher mode with plant equipment inoperable, is expressed by the following equation:

$$\text{ICCDP} = \Delta R \, d = (R_1 - R_0) \, d \quad (1)$$

Where:

ΔR = the conditional risk increase, in terms of core damage frequency (CDF), caused by the specified condition

d = the duration of the specified plant condition

R_1 = the plant CDF with the specified condition permanently present

R_0 = the plant CDF without the specified condition

The same expression can be used for ICLERP by substituting the measure of risk, *i.e.*, large early release frequency (LERF) for CDF. The magnitude of the ICCDP and ICLERP values associated with plant conditions applicable to LCO 3.0.4(b) allowances can be managed by controlling the conditional risk increase, ΔR (in terms of both CDF and LERF) and the duration, d , of such conditions. The following sections discuss how the key elements of the proposed risk-informed approach, used to justify LCO 3.0.4(b) allowances, are expected to limit ΔR and d and, thus, prevent any significant temporary risk increases.

Identification of Risk-Important TS Systems and Components

A major element that limits the risk of the proposed mode change flexibility is the exclusion of certain systems and associated LCOs for the mode change allowance. Technical specifications allow operation in Mode 1 (power operation) with specified levels of inoperability for specified times. This provides a benchmark of currently

acceptable risk against which to measure any incremental risk inherent in the proposed LCO 3.0.4(b). If a system inoperability accrues risk at a higher rate in one or more of the transition modes than it would in Mode 1, then an upward transition into that mode should not be allowed without demonstration of a high degree of experience and sophistication in risk management. However, the risk management process evaluated in Section 3.1.3 is adequate if higher-risk systems/components are excluded from the scope of LCO 3.0.4(b).

The importance of most TS systems in mitigating accidents increases as power increases. However, some TS systems are relatively more important during lower power and shutdown operations, because:

- Certain events are peculiar to modes of plant operation other than power operation,
- Certain events are more probable at modes of plant operation other than power operation,
- Some modes of plant operation have less mitigation system capability than power operation.

The risk information submitted in support of the proposed changes to LCO 3.0.4 and SR 3.0.4 includes qualitative risk assessments performed by each owners group to identify higher risk systems and components at the various modes of operation, including transitions between modes, as the plant moves upward from the refueling mode of operation toward power operation. The owners groups' generic qualitative risk assessments are included as attachments to TSTF-359, Revision 8. Each of the owners groups' generic qualitative risk assessments discuss the technical approach used and the systems/components subsequently determined to be of higher risk significance; the systems/components not to be granted the LCO 3.0.4 allowances for the various modes are listed. The owners groups generic qualitative risk assessments are:

- BWR owners' group Risk-Informed Technical Specification Committee, "Technical Justification to Support Risk-Informed Improvements to Technical Specification Mode Restraints for BWR Plants," General Electric Company GE-NE A13-00464 (Rev[2])
- "B&W owners group Qualitative Risk Assessment for Increased Flexibility in MODE Restraints," Framatome Technologies BAW-2383

- Combustion Engineering owners group (CEOG) Task 1181, "Qualitative Risk Assessment for Relaxation of Mode Entry Restraints," CE Nuclear Power LLC, CE NPSD-1207 (Rev[0])

- "WOG Qualitative Risk Assessment Supporting Increased Flexibility in MODE Restraints."

Following interactions with the staff, all owners groups used the same systematic approach in their qualitative risk assessments to identify the higher-risk systems in the STS, consisting of the following steps:

- Identification of plant conditions (*i.e.*, plant parameters and availability of key mitigation systems) associated with changes in plant operating modes while returning to power
- Identification of key activities that have the potential to impact risk and which are in progress during transitions between modes while the plant is returning to power
- Identification of applicable accident initiating events for each mode or other specified condition in the applicability
- Identification of the higher-risk systems and components by combining the information in the first three steps (qualitative risk assessment)

The risk assessments properly used the results and insights from previous deterministic and probabilistic studies to systematically search for plant conditions in which certain key plant components are more important in mitigating accidents than during operation at power (Mode 1). This search was systematic, taking the following factors into account for the various stages of returning the plant to power:

- The status of accident mitigation and normally operating systems
- The status of key plant parameters such as reactor coolant system pressure
- The key activities that are in progress during transitions between modes which have the potential to impact risk (*e.g.*, the transfer from auxiliary to main feedwater at some PWR plants when Mode 1 is entered)
- The applicable accident initiating events for each mode of plant operation
- Design and operational differences among plants or groups of plants

The following systems and components were identified by each of the four owners groups as higher-risk systems and components, when the plant is entering a new mode.