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JAPAN LESSONS LEARNED NEAR TERM TASK FORCE RECOMMENDATION 7.1

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Japan Lessons Learned Near Term Task Force Recommendation 7.1

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Objectives (from SECY-0137)

Provide reliable indication of spent fuel pool attributes under accident conditions:

1. Expanded instrument range (loss of coolant inventory and loss of forced cooling scenarios)
2. Functional with pool at saturation conditions (i.e., boiling)
3. Reliable power supply (e.g., battery backup)
4. Accessible indication (e.g., control room)

Recommendation 7.1

- Reliable Spent Fuel Pool Instrumentation:
  - Basis for Order:
    - Uncertainties evident during events in Japan highlighted need for enhanced spent fuel pool (SFP) instrumentation to support protection from off-site radiation releases and prioritization of actions for event mitigation and recovery
  - Requirement:
    - For beyond design basis events with simultaneous multiple safety function loss
    - Instrumentation must support maintaining SFP inventory for safety functions
    - Instrumentation must support adequate prioritization of actions for event mitigation and recovery
  - Timeline:
    - If guidance is needed by industry, it will be provided within 90 days
    - 2 years from the issuance of guidance

NRC Comments

- Major purpose is to inform decision-makers
  - Instrument level range encompasses key decision points
  - Level determination minimizes drain on limited resources
- Reliable without bounding design criteria
  - Optimize capabilities of existing structures
    - Displays and portable instruments usable from accessible locations considering potential facility conditions
    - Maximize instrument protection from potential missiles
  - Procure rugged equipment
    - Demonstrated performance in harsh conditions (boiling pool)
    - Materials and processes resistant to effects of radiation and seismic vibrations
  - Supports long-term independent operation (replaceable batteries or external power source connection)

NRC Instrumentation Criteria

Criteria	NRC Plan
Instruments	• Permanent fixed primary level instrument • Backup level instrument (portable or fixed)
Monitoring Availability	• Continuously available, indication on-demand • Calibration maintained through power interruption
Display Locations	• Control Room or Alternate Shutdown Panel • Portable device usable from accessible location
Supports Prompt Identification of these Pool Conditions	• Level adequate for operation of forced cooling • Level threatening access – inadequate shielding • Level below top of stored fuel
Qualification	• Augmented quality (e.g., fire protection QA) • Optimize missile protection using existing structures • Seismic Category I mounting of equipment • Demonstrated to function in harsh environment • Equipment resistant to radiation and vibration
Power Supply	• Non-safety power plus alternate (battery replacement or external power connection)

Schedule

- **20 day** response
  - Inability/unnecessary to comply
  - Request a hearing
- **90 day** schedule for compliance
- **275 day** response
- **2 year** compliance

Public Comments

- Website created for public comments:
  JLD_Public.Resource@nrc.gov

- Comments accepted until January 27

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Questions?

50.59 Evaluation

All Licensees shall, within **two hundred seventy-five (275) days** of the date of this Order, review the functional requirements described in below to determine whether or not existing spent fuel pool instrumentation satisfies the requirements. If existing spent fuel pool level instrumentation does not conform to the requirements listed below, the licensee shall evaluate the necessary changes to the facility to bring the instrumentation into conformance with the requirements of Section 2 in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.59, "Changes, tests, or experiments." Consistent with the requirements of 10 CFR 50.59, submit to the Commission a report containing a summary of the change and, if required, a request to amend the facility operating license.

SFP Instrument Summary

- All operating reactors shall have a reliable indication of the water level in associated spent fuel storage pools capable of identifying the following pool water level conditions:
  - level that is minimally adequate to support operation of the normal fuel pool cooling system;
  - level that is inadequate to provide substantial radiation shielding for a person standing on the spent fuel pool operating deck, and
  - level that is less than 1 foot above the top of stored fuel and
  - level that indicates below the top of spent fuel such that zirconium fire conditions could be considered imminent.
- The level indication shall be
  - in an accessible location and
  - continuously operable under a range of conditions, including environmental conditions and high radiation fields associated with the spent fuel pool water at saturation conditions.

SFP Instrument Summary (cont)

- Operators shall be able to determine spent fuel pool level
  - from an accessible location
  - on an intermittent basis
  - without reliance on the permanent plant alternating current or direct current electric power distribution system.
- Accessible locations are
  - the control room,
  - the alternate shutdown panel, and
  - portions of safety-related structures where the wet bulb temperature remains below 104°F (40°C) and radiation dose rates remain below 5 rem per hour (50 mSV/hr) under conditions associated with station blackout, reactor core damage, and spent fuel pool water at saturation conditions for a sustained period.

Instrument & Arrangement

Instruments: The instrumentation shall consist of a permanent, fixed primary instrument and a backup instrument. The backup instrument may be fixed or portable.

Arrangement: The spent fuel pool level instruments shall be arranged in a manner that provides reasonable protection against the dynamic effects of equipment damage in the spent fuel pool area. This protection shall be provided by locating the primary and fixed portions of the backup instrumentation using design criteria that consider instrument separation and inherent missile protection provided by the existing spent fuel pool structure

Mounting & Qualification

Mounting: Equipment within the spent fuel pool shall be mounted as seismic Class IE equipment.

Qualification: The instrumentation and signal transmission equipment shall be reliable at temperature, humidity, and radiation levels consistent with the spent fuel pool water at saturation conditions for an extended period. This reliability shall be established through use of an augmented quality assurance process (e.g., a process similar to that applied to the site fire protection program). This process shall consider the operating history of selected equipment in the specified environment.

Independence & Power Supplies

Independence: The primary instrument shall be independent of the backup instrument.

Power supplies: Permanently installed instrumentation channels shall each be powered by a separate power supply. Permanently installed and portable instrumentation channels shall provide for power connections from sources independent of the plant ac and dc power distribution systems, such as portable generators or replaceable batteries.

Range & Calibration

Range: The instrument shall have a minimum range from the pool level minimally adequate to support operation of the normal fuel pool cooling system to a level below the top of stored spent fuel assemblies.

Calibration: The instrument shall maintain the specified accuracy following a power interruption or change in power source without recalibration.

Testing & Display

Testing: The instrument design shall provide for routine testing and calibration. The licensee shall test the instrument at a minimum frequency of once each refueling cycle and within one week of reactor shutdown for refueling.

Display: Operators shall be able to monitor the spent fuel fool water level from the control room, alternate shutdown panel, or other appropriate and accessible location. The display shall provide on-demand or continuous indication of spent fuel pool water level.