U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

NRC Staff Perspectives on Hydrogen Production at Nuclear Power Plants

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LWRS MOU NRC/DOE

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- The purpose of the MOU is to coordinate DOE and NRC technical readiness and sharing of technical expertise and knowledge on advanced nuclear reactor technologies and nuclear energy innovation.
  - NRC's Role for this discussion
    - Provide current information on licensing and regulatory reviews of emerging technologies to prioritize regulatory needs

Current Activities for H_2 generation

- The NRC is currently monitoring H_2 generation implementation activities and reviewing information shared through the MOU.

- Specifically, for the H_2 generation activities, NRC staff from different NRC offices have been meeting frequently to determine if any licensing and oversight impacts will appear from these emerging technologies.

NRC Regulatory Framework

- Existing NRC regulatory framework adequately supports installation and operations associated with hydrogen production and storage.
- Need for a License Amendment Request (LAR) prior to installation and operation will be determined by site specific license basis considerations.
- Topical Reports can be used as a basis for LARs to alleviate potential licensing uncertainties within the general aspects of designs.
- Those changes to facilities that do not need LARs could potentially be reviewed during the NRC oversight activities.

Licensing Basis and Facility/Procedure Changes

- Changes governed by 10 CFR 50.59
  - Technical Specifications changes will require a LAR
  - Facilities and Procedures described in Updated Final Safety Analysis Reports must be evaluated against guidance approved in RG 1.187
- Other License Basis Changes
  - Quality Assurance Plan
  - Fire Protection Plan
  - Emergency Plan / Emergency Response Facilities
  - Security Plan / Target Set
  - Independent Spent Fuel Storage Installations (ISFSIs)

Updated Final Safety Analysis Report Potential Impacts

- Hydrogen production and storage at a site has the potential to impact accidents, transients, and other discussions in the Updated Final Safety Analysis Report (UFSAR):
  - Excess Steam Flow
  - Loss of Load / Load Rejection
  - ATWS considerations (HTEF only)
  - High-Energy Line Break (HTEF only)
  - Loss of Offsite Power
  - Turbine-Generator Trip
  - Internal Flooding
  - Impact to Accident Indications
  - Control Room and Plant Operations

*LIST IS NOT ALL INCLUSIVE

Fire Protection Considerations

- Changes that impact onsite fires and explosions are governed by site specific fire protection program license conditions.
- Focus is on maintaining provisions of General Design Criterion (GDC) 3, "Fire Protection," of Appendix A to Part 50, "General Design Criteria for Nuclear Power Plants."
- NRC guidance found in:
  - RG 1.189, Revision 5 "Fire Protection for Nuclear Power Plants" (ADAMS Accession No. ML23214A287)
  - RG 1.205, Revision 2, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants" (ADAMS Accession No. ML21048A448)

Emergency Plan Considerations

- Changes to emergency plans are governed by 10 CFR 50.54, “Conditions of licenses” (specifically 10 CFR 50.54(q))
- Changes to a licensee’s emergency plan that reduce the effectiveness of the plan may not be implemented without prior approval by the NRC.
- NRC guidance found in RG 1.219, Revision 1 “Guidance on Making Changes to Emergency Plans for Nuclear Power Reactors” (ADAMS Accession No. ML16061A104)
- As an example, consider impacts to Emergency Response Facilities and Emergency Action Levels

Security Plan Considerations

- Changes to that impact the safety / security interface are governed by 10 CFR 73.58, “Safety / security interface requirements for nuclear power reactors”
- Licensees shall assess and manage the potential for adverse effects on safety and security before implementing changes.
- NRC guidance found in RG 5.74, Revision 1 “Managing the Safety / Security Interface” (ADAMS Accession No. ML14323A549)
- As an example, consider impacts to target sets, staging areas, response times and locations, and barriers.

ISFSI Considerations

- Changes that can impact ISFSIs are governed by 10 CFR 72.48, "Changes, tests, and experiments," and 10 CFR 72.212, "Conditions of general license issued under § 72.210."
- 10 CFR 72.48 discusses when a LAR is needed prior to making changes.
- NRC guidance found in RG 3.72, Revision 1 "Guidance for Implementation of 10 CFR 72.48, Changes, Tests, and Experiments" (ADAMS Accession No. ML20220A185)
- As an example, consider impacts to facility / cask designs which may differ from safety-related SSCs.

Questions?