UCS Perspective on Expedited Transfer of Spent Fuel to Dry Casks

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Dr. Edwin S. Lyman
Senior Scientist
Union of Concerned Scientists

Summary

- **UCS supports expedited transfer of spent fuel to dry casks as a prudent, passive, defense-in-depth measure for significantly reducing risk from accidents and attacks**
- **The staff has not provided adequate support for its recommendation to close out this issue; Phase 2 should proceed**

The NRC's Responsibility …

- **Is to protect the health and safety of everyone, not just the "average" citizen affected by an "average" accident**
- **Even if calculations based on average assumptions suggest action is not warranted, the danger posed by high-risk outliers needs to be addressed**

Staff Non-Concurrences

- **The staff non-concurrences to COMSECY-13-0030 raise serious issues with the study methodology and should be given great weight**
- **The management response to the non-concurrences fails to adequately address the fundamental concerns**

Three Numbers

- **Estimated atmospheric Cs-137 release from Fukushima Daiichi:**

  0.5 MCi

- **Peak release estimate, low-density pool scenario, SFPS:**

  0.33 MCi

- **Peak release estimate, high-density 1x4 pool scenario, SFPS:**

  24.2 MCi

Three More Numbers

- **Estimated collective dose to Japan from Fukushima Daiichi:**

  32,000 person-Sievert

- **Collective dose for low-density pool, no mitigation, SFPS:**

  27,000 person-Sievert (0.11 MCi)

- **Collective dose, high-density 1x4 pool, no mitigation, SFPS:**

  350,000 person-Sievert (8.8 MCi)

Dry Casks: Tomorrow's Passive Technology Today

- **Dry cask storage and low-density pool storage achieve features the NRC encourages in advanced reactors:**
  - **Highly reliable and less complex shutdown and decay heat removal systems. The use of inherent or passive means to accomplish this objective is encouraged.**
  - **Simplified safety systems that … reduce required operator actions, equipment subjected to severe environmental conditions, and components needed for maintaining safe shutdown conditions.**
  - **Designs that minimize the potential for severe accidents and their consequences …**

The Wrong Methodology

- **Staff non-concurrences question use of reactor-focused regulatory analysis guidelines**
  - **The QHOs are not the right metrics to evaluate land contamination events**
  - **Cost-benefit analysis does not give adequate weight to features such as**
    - **Impacts beyond 50 miles**
    - **Defense-in-depth**
    - **Non-quantifiable aspects of land contamination**
    - **Security considerations**

Selected Flaws in SFPS/Regulatory Analysis

- **The assumed regulatory baseline does NOT reflect the actual fleet:**
  - **Assumes immediate offloading into 1x4 configuration**
  - **Assumes full-core offload capability**
- **RA is a patchwork of different studies**
  - **Does not treat PWRs (2/3 of the fleet) on a consistent basis with BWRs**
- **Studies assume evacuations of up to 30 miles, well beyond the EPZ regulatory requirement**

Selected Flaws (cont.)

- **Base case Cs release fraction of 40% for high-density and 3% for low-density does not account for differences in frequency of these releases**
- **72-hour analysis limit is unrealistic and may underestimate base case risk**
- **50-mile truncation and use of average meteorology underestimate benefits**
  - **Use of 95th percentile weather would change the cost-benefit calculus, even for 7% NPV**
- **Although many of these issues are partially examined in sensitivity analyses, RA does not adequately account for uncertainties**

Mitigation

- **SFPS mitigated scenarios assume 50.54(hh)(2) measures, which cannot be assumed to work in BDBEEs or attacks other than a jet crash**
  - **Portable pump for SFP/core makeup only requires 12 hours of fuel and water supply**
  - **"not to be treated as safety-related equipment … (QA, seismic, EQ, etc.")**
- **SFPS/RA do not provide quantitative estimates of the likelihood of mitigation**
- **RA assumption of successful mitigation only for low-density pools appears to affect cost-benefit differential by 10 percent or less**

Security and Defense-in-Depth

- **The SFPS demonstrates the danger of uniform loading at high density compared to 1x4**
  - **Risk within 10 mi is 10 times greater for a uniform high-density pool with mitigation**
  - **Land interdiction area is 78 times greater for uniform high-density pool than low-density pool without mitigation**
  - **Land interdiction area for uniform high-density pool with mitigation is nearly 7 times low-density pool without mitigation**

Security and Defense-in-Depth

- **Yet the NRC will not tell the public how long it takes after a refueling for any reactor to achieve a 1x4 configuration or even if all reactors can do it**
  - **"… the specific time requirement is not publicly available information (because it could be … useful to an adversary)…"**
- **Transition to low-density pools could**
  - **greatly reduce the consequences of a terrorist attack soon after an outage**
  - **reduce reliance on mitigation**

Safety and Defense-in-Depth

- **Defense-in-depth has been manifested, in part, in a conditional containment failure probability of <0.1**
- **One historical measure of a large releases has been > 10 percent of Cs/I**
- **By this standard, "CCFP" (for the SFPS Bin 3 seismic event) is 0.45 for high-density pools, 0 for low-density**
- **(UCS does not agree with the NRC decision to phase out CCFP/LRF)**

Hydrogen Mitigation

- **The SPFS and RA do not give full credit to low-density pools for the low risk of hydrogen generation and combustion**
  - **Only high-density scenarios produced sufficient hydrogen for an explosion**
  - **Avoidance of hydrogen explosions is beneficial not only for reducing population dose but also for reducing occupational hazards, multi-unit accident risk, and site cleanup and decommissioning**

A New Framework

- **The Commission should defer a final decision on expedited transfer until it can be evaluated using revised regulatory analysis guidelines consistent with NTTF Recommendation 1, RMTF, the economic consequences SECY, and a defensible value of a statistical life (at least $4000/person-rem)**

Acronyms

- **BDBEE: Beyond Design Basis External Event**
- **CCFP: Conditional Containment Failure Probability**
- **EPZ: Emergency Planning Zone**
- **LRF: Large Release Frequency**
- **NPV: Net Present Value**
- **QHOs: Quantitative Health Objectives**

Acronyms

- **RA: Regulatory Analysis**
- **SFPS: Spent Fuel Pool Study**
- **UCS: Union of Concerned Scientists**