COMMENTS ON SPENT FUEL POOL ANALYSES FOR POSTULATED ACCIDENT CONDITIONS

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Sandia – Test crash-concrete interactions

B/30

EPRI NP-440
Full Scale Tornado Missile Test

RECOMMENDED APPROACH TO SPENT FUEL POOL EVALUATIONS

- All evaluations should use a mechanistically identified failure condition, e.g. a cask drop event.
- All evaluations should use the available technical basis to realistically assess the consequences of the initiating event. Specifically, what is the anticipated leakage rate from the pool.
- Evaluations should assess the results of potential recovery actions consistent with the postulated accident initiator.
- Evaluations should consider all mechanisms for cooling and for energy generation, including the results of vaporization of water in the lower regions of the pool as well as air natural circulation through the bundle.

RECOMMENDED EXPANSION OF THE TECHNICAL BASIS

- Provide estimates of the oxidation extent before the fuel slumps
  - CODEX, experiments. Oxidation % before lose bundle geometry.
  - TMI-2,
  - MELCOR calculations.
- Use the available experimental basis to estimate the Ru releases based on ZrO oxidation and debris temperature
  - ORNL tests (unclad pellets),
  - Chalk River experiments
    - unclad fuel,
    - with fuel cladding.

3. Use the Sandia experiments (EPRI sponsored) for assessing the damage potential resulting from a cask drop accident.

   Tornado Missle impact tests at Sandia

DESIGN SPECIFIC ISSUES

1. Decay power in each fuel assembly – different between BWRs and PWRs and is incorporated in the NRC staff report.
2. Air cooling during the boildown phase
   - BWRs

     Fuel cans prevent air natural circulation through the fuel bundles until the bottom of the fuel assembly is uncovered.
   - PWRs

     Open lattice design permits air natural circulation through all of the fuel bundles as the water level decreases below TOAF.
3. Consistently represent oxidation during the boildown phase
   - BWRs

     Since there is no air circulation through the bundles during the boildown phase, the oxidation is only due to the steam generated by the decay power under the water level. This results in a limited oxidation of the fuel pin cladding. I ncluding the fuel cans, there would be a large excess of metallic zirconium when the assemblies would slump.
   - PWRs

     With air circulation through the fuel bundles, there would be more oxidation than for the BWR case. However, the fuel bundles would still slump well before oxidizing most of the cladding.

CONCLUSIONS

1. The study discusses but does not represent what is known about Ru releases from cladded fuel pins. This results in overstating the consequences by two orders of magnitude.
2. The report does not adequately represent design differences between BWR and PWR fuel designs. ↑ mass of zirconium
3. The report does not reference and use major experimental information related to the possible damage resulting from postulated cask drop events.