

# Report of the Fuel Cycle Research and Development Subcommittee of NEAC

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# Context for the Meeting

- Fukushima – Increased fault tolerance for reactor systems
- Used Fuel Disposal – Response to BRC is being developed, but it is not ready. Nonetheless, there are many things that can be done
- Review of some things that were already in the works (Systems Study; Separation & Waste Form
- Budget was not available at time of meeting

# Fukushima – Accident Tolerant Fuels

- FC program began on accident tolerant fuel in 2010
  - Gas Gettering; lower pressure in rods
  - Metallic; better thermal conductivity
  - Micro-encapsulated; higher temperature
- Light Water Reactor Sustainability Program
  - Silicon Carbide; reduced hydrogen generation
- **Recommendation** - NE management assign roles and responsibilities to minimize duplication of effort

# Fukushima – Balance of Plant

- Takes many years to qualify new fuels
- Some of our reactors are old
- New fuels benefit younger reactors; BOP benefits all
- NRC already mandating some improvements
- **Recommendation** - NE adopt an R&D approach that includes the fuel, the Nuclear Steam Supply System, and BOP improvements leading to enhanced accident tolerance.

# Used Fuel Disposition

- BRC – Deep disposal in salt, granite, or alkaline clay is best (tuff is workable but these are easier) and bore holes may be possible
- Bottom Up approach recommended
- Existing site screening requirements are focused on Yucca
- **Recommendation** - DOE develop a preliminary set of site screening requirements (IAEA's looks good)

# Used Fuel Disposition

- BRC recommends consolidated interim storage (if not workable, storage at sites)
- Dry casks only licensed for 5 year for transport
- **Recommendation** – R&D to validate casks for long-term storage and on integrating storage and transport casks for cost effectiveness

# Used Fuel Disposition

- It is not necessary to reinvent the wheel
- For repositories; we know about salt and tuff, the Swedes and Finns know about granite, the French know about clay
- **Recommendation** – do a comprehensive review of national and international experiences to identify critical issue and places where advances in science and technology may address such issues.

# System Studies

- Criteria have been tuned up
- Relative weights of criteria are important since outcome is weight dependent
- “Dial a weight” program is being developed
- One problem area
- **Recommendation** - NE and NNSA try once more to come to some agreement on how to evaluate relative proliferation resistance.



# Separation & Waste Form Campaign

- A NE wide study of the linkages between waste forms and repositories is in progress
- A relevancy review is being proposed
- The need for this review is not clear to us
- **Recommendation** - the justification for this review should be examined prior to undertaking it (the review is going to be held)

## Summary of Recommendations

- 1) In accident tolerant fuels work, there is overlap with the LWR Sustainability program (LWRS) and NE management should review roles and responsibilities to minimize duplication of effort.
- 2) Since older nuclear power plants may not benefit from more accident tolerant fuels, NE should adopt an R&D approach that includes fuel, NSSS, and BOP improvements to enhance accident tolerance.
- 3) Since a repository for used fuel will be needed, DOE should develop a preliminary set of generic site screening requirements that incorporate domestic and international experiences.
- 4) In the waste disposal arena, a comprehensive review of the national and international experiences is needed to identify critical technical issues and areas where advances in science and technology may resolve such issues.
- 5) Since development of a new repository is a long-term project, storage of used fuel for longer than originally anticipated is necessary. DOE should continue efforts to determine how to validate casks for long-term storage and how to integrate storage and transport casks for cost effectiveness.
- 6) Progress in the advanced systems study program is good, but NE and NNSA have not come to agreement on evaluating relative proliferation resistance and should try once again.
- 7) The justification for the separations and waste form relevancy review is unclear to us and that justification should be examined prior to conducting this review.