

# **Developing Post Accident Decommissioning & Remediation Implementation Plans**

**IAEA Experts Meeting on Decommissioning  
& Remediation after a Nuclear Accident**

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# Severe LWR Reactor Accidents



**Three Mile Island Units 1 & 2**  
**March 28, 1979**



**Fukushima Daiichi Units 1-6**  
**March 11, 2011**

# Initial Phases Of Reactor Accident Response

- **Energy Control**
  - Cool the Core
- **Air Effluent Control**
  - Containment & Filtration
- **Water Effluent Control**
  - Storage, Treatment & Mitigation
- **Solid Waste Management**
  - Storage, Treatment, & Control

# **Decommissioning & Remediation (D&R) Phase**

- **Starts After Initial Accident Response Completed**
  - **Cold Shutdown Is Achieved**
  - **Airborne Effluents Mostly Mitigated**
  - **Liquid Effluents Being Controlled & Mitigated**
  - **Solid Wastes Being Managed On Site**
- **Off Site Situation Is Defined**

# **National Decommissioning & Recovery Plan**

- **National Post Accident Management Plan Concept Is Required**
  - **What Organization Is Responsible For D&R Implementation**
  - **What Organization Is Responsible For Regulatory Oversight**
  - **Social & Political Interfaces**

# Decommissioning Plan Principles

- **Management Structure**
  - **Responsible Organization**
    - **New Function Different From Past Utility Management Function**
  - **Responsibilities**
  - **Authorities**
  - **Resources**
- **Safety Culture**
- **Environmental Protection**
- **Social/Political Considerations**
- **Regulatory Construct**

# Regulatory Structure

- **Independent Regulator**
- **Uniqueness of Decommissioning & Remediation Task Likely Requires Changes to National Regulatory Approach**
  - **Modify Existing Regulatory-Utility Interfaces to Meet the Unique Challenges of Accident Cleanup**
  - **Regulatory Decisions Need to Be Promptly Made With Goal of Reducing Societal Risk**

# Regulatory Structure-1

- **Implementer-Regulator Interfaces**
  - **Special Organizational Arrangements**
  - **Special Processes With Decommissioning Safety & Environmental Protection Risk Based Standards**
  - **Need to Consider Overall Societal Benefits Of Decisions from a Cost Benefit Perspective as Well as Traditional Nuclear Safety Criteria**
  - **Social/Political Considerations**



# End State Definitions

- **Equivalent to Normal End of Life Reactor Plant**
  - **Plant is In a Post Remediation Physical Condition Similar to Any Normal Reactor Ready for Normal Decommissioning**
    - **Three Mile Island (TMI) State**
- **How Clean is Clean Enough**
- **Normal Waste Management Processes or New Special Restrictions?**
  - **Post Accident Special Restrictions Based on Social Considerations**

# **Radioactive Waste Management**

- **Disposition of Gaseous & Liquid Wastes**
  - **TMI Tritiated Accident Water Not Allowed to Be Discharged as water into the Susquehanna River**
  - **Stored & Evaporated into Atmosphere**
- **Significant Social/Political Considerations**
- **Independent Confirmation**
  - **Local Government & Non-Government Organization Involvement**
  - **Public Trust & Confidence**

# Radioactive Waste Management-1

- **Disposition of Accident Spent Fuels**
  - **Defueling Retrieval/Storage Systems**
  - **On-Site Storage Management**
  - **Final Fuel Disposition Location**
    - **TMI Moved Offsite to Idaho**
    - **Major Social/Political Issue**

# Radioactive Waste Management -2

- **Disposition of High Gamma & Transuranic Wastes**
  - Retrieval/Storage Systems
  - On-Site Storage Management
  - Final Waste Disposition Location
    - TMI Moved Offsite For R&D Purposes
    - Major Social/Political Issue

# Radioactive Waste Management -3

- **Disposition of Low Level Wastes**
  - **Retrieval/Storage Systems**
  - **On-Site Storage Management**
  - **Final Waste Disposition Location**
    - **TMI Moved Offsite For R&D Purposes**
    - **Major Social/Political Issue**

# **Radioactive Waste Management -4**

- **Disposition of Very Low Level Wastes**
  - **On-Site Storage /Management**
  - **Off-Site Storage/Management**
    - **If Offsite Contamination**
  - **Final Waste Disposition Locations**
  - **Major Social/Political Issue**
- **Accident Cleanup Wastes May Significantly Influence National Radioactive Waste Management Policies**

# Implementation Plan Challenges

- **Integrate National & International Industrial Resources Efficiently**
  - Utilize Locals As Much As Possible
- **Effectively Balance Advanced State of the Art Concepts with Proven Known Technologies**
  - Utilize University Input Appropriately
- **Maintain Public & Political Confidence Under Difficult Conditions**

# Conclusions

- **Nations Should Develop Decommissioning Plans As Soon After The Accident As Possible**
- **Accident Cleanup Management is Special**
- **Reactor Accident Implementation Plans Should be Developed In Relationship to Existing Regulations and Emergency Response Plans**
  - **Radiological Dispersal Device Cleanup Response Plans**
  - **Normal Reactor D&D Experiences**
  - **Normal Reactor D&D Regulatory & Environmental Rules**
  - **However Risk & Cost Benefit Considerations Should be Added**



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Lake Barrett is a part time independent consultant in the energy field. He has worked in the nuclear energy and nuclear materials management areas for over 4 decades, most recently as the former head of the US Department of Energy's Office of Civilian Nuclear Waste Management which is responsible for implementing the United States' programs for spent nuclear fuel and high-level radioactive waste, as mandated by the Nuclear Waste Policy Act. In that capacity, he led the complex scientific Yucca Mountain Geologic Repository program through the statutory site selection process culminating with the Presidential site designation and following successful House and Senate votes.

He also served at U. S. Nuclear Regulatory Commission, where he was directly involved with the early response to the Three Mile Island reactor accident and became the Site Director, responsible for regulatory programs during the stabilization, recovery, and cleanup of the damaged reactor. He also has had extensive managerial and engineering experiences in DOE's Defence Programs and private industry at both Bechtel Power Corporation, with commercial nuclear power plants, and Electric Boat Division of General Dynamics with nuclear reactor and submarine systems design, operation, and decommissioning.