# Power Reactor Decommissioning in the United States

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# Our Mission

**To license and regulate the nation's civilian use of byproduct, source and special nuclear materials to ensure adequate protection of public health and safety, promote the common defense and security, and protect the environment.**

# NRC Oversight

Uranium Conversion

Uranium Enrichment

Power Reactors

Transportation

Dry Cask Storage

Waste Disposal

Medical/Industrial

New Reactors

# Decommissioning Options

- **DECON: Equipment, structures, etc., removed or decontaminated to a level that permits release.**
- **SAFSTOR: Plant placed in a safe, stable condition and maintained in that state until it is subsequently decontaminated to levels that permits release. Up to 60 years.**
- **ENTOMB: Plant is encased in a structurally long-lived substance to allow decay until levels permit unrestricted release.**

# Reactors in DECON

- **LaCrosse BWR: ~20 years in SAFSTOR, in DECON for the last 7 years**
- **Humboldt Bay 3: ~ 30 years in SAFSTOR, in DECON for the last 8 years**
- **Zion 1 & 2: ~ 15 years in SAFSTOR, in DECON for the last 4 years**

# Why Allow 60 Years to Complete Decommissioning?

- **Studies showed that 60 years was optimal for decommissioning to reduce collective radiation exposure and minimize radioactive waste and potentially reduce waste classification.**
  - **Volume of radioactively contaminated material reduced ~ 90% after 50 years**
  - **Personnel dose reduced ~ 98% after 50 years**

# Pros and Cons of SAFSTOR

- **Pros**
  - **Licensee can focus on safe operations for operating plant rather than decommissioning activities for adjacent plant**
  - **Potential financial benefit (Decommissioning Trust Fund growth)**
- **Cons**
  - **Loss of plant institutional knowledge**
  - **Access to low level waste disposal capacity may decrease**
  - **Costs may increase**
  - **May create adverse public reaction**

# Reactors in SAFSTOR

- Fermi 1: 41 years
- San Onofre 1: 21 yrs
- San Onofre 2/3: < 1 yr
- GE Vallecitos BWR: 50 yrs
- Dresden 1: 35 yrs
- Indian Point 1: 42 yrs
- Millstone 1: 15 yrs
- Peach Bottom 1: 42 yrs
- NS Savannah: 43 yrs
- Three Mile Island 2: 34 yrs
- Crystal River 3: 1 yr
- Kewaunee: 1 yr
- Vermont Yankee: expected to start in early 2015

# Reactors Decommissioned

- **Big Rock Point:  10 years to complete; ISFSI on site**
- **Haddam Neck: 11 years, ISFSI on site**
- **Maine Yankee: 9 years, ISFSI on site**
- **Pathfinder: 40 years**
- **Rancho Seco: 20 years, ISFSI on site**
- **Shoreham: 6 years**
- **Trojan: 13 years, ISFSI on site**
- **Yankee Rowe: 16 years, ISFSI on site**
- **Fort Saint Vrain: 8 years, ISFSI under DOE**
- **Saxton: 33 years**
- **Shippingport: 6 years**

# Interim Storage

- An independent spent fuel storage installation, or ISFSI, is a facility that is designed and constructed for the interim storage of spent nuclear fuel.
- All U.S. nuclear power plants store spent nuclear fuel in spent fuel pools.
  - As the pools near capacity, older spent fuel is moved into "dry cask" storage.
- The U.S. Department of Energy is responsible for the ultimate disposal of spent fuel and high level waste.

# NRC Guidance Documents

- **NUREG-1757, Consolidated Decommissioning Guidance**
- **NUREG-1700, Standard Review Plan for Evaluating Nuclear Power Reactor License Termination Plans**
- **NUREG-1628, Staff Responses to Frequently Asked Questions Concerning Decommissioning of Nuclear Power Reactors.**

# Power Reactor Decommissioning Process

- **Licensee certifies to NRC within 30 days of decision to permanently cease operations.**
- **Certification also required once the fuel has been permanently removed from the reactor vessel.**
- **Licensee submits Post-Shutdown Decommissioning Activities Report (PSDAR) prior to or within 2 years of cessation of operations.**

# Post-Shutdown Decommissioning Activities Report

- **NRC gives public notice of submittal of the PSDAR.**
- **NRC holds a Public Meeting to discuss the PSDAR.**
- **NRC does not approve the PSDAR.**
  - **Although, NRC will review the PSDAR.**
  - **NRC will consider any public comments in its review.**
- **Licensee may begin decommissioning 90 days after NRC receives the PSDAR.**

# Power Reactor Decommissioning Process

- Licensee performs site decommissioning.
- NRC continues an active inspection and enforcement program.
- Licensee submits License Termination Plan (LTP) at least 2 years prior to requesting license termination.
- NRC gives public notice of submittal of the LTP.
- NRC holds a Public Meeting to discuss LTP.

# Power Reactor Decommissioning Process

- NRC approves LTP by amending the license.
- Licensee performs remaining decommissioning activities.
- NRC performs inspections.
- Decommissioning must be completed within 60 years of the shutdown.

# Power Reactor Decommissioning Process

- **Licensee submits Final Status Survey Report (FSSR).**
- **NRC reviews/approves FSSR.**
- **NRC performs confirmatory surveys.**
- **NRC terminates license.**

# Security and Emergency Preparedness Regulatory Approach

- Security and emergency preparedness (EP) requirements appropriate to the circumstances remain in place.
- Phased reduction of security posture and EP requirements are considered based on potential accidents that may occur at a permanently shutdown reactor plant.
- NRC sets security requirements and licensees are responsible for providing the protection.
- Focus on physically protecting and controlling spent fuel to prevent sabotage, theft, and diversion.

# Yankee Rowe completed in 2007: majority is greenfield with ISFSI on site

# Key Messages

- **A clearly defined process for all steps of decommissioning is necessary.**
- **The regulatory process must be transacted publically and candidly.**
- **An independent regulatory presence is paramount throughout the entire process to ensure safety and security.**