

# **Used Nuclear Fuel Management**

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**Midwestern Radioactive Materials Transportation Committee  
Omaha, Nebraska  
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# Current Situation

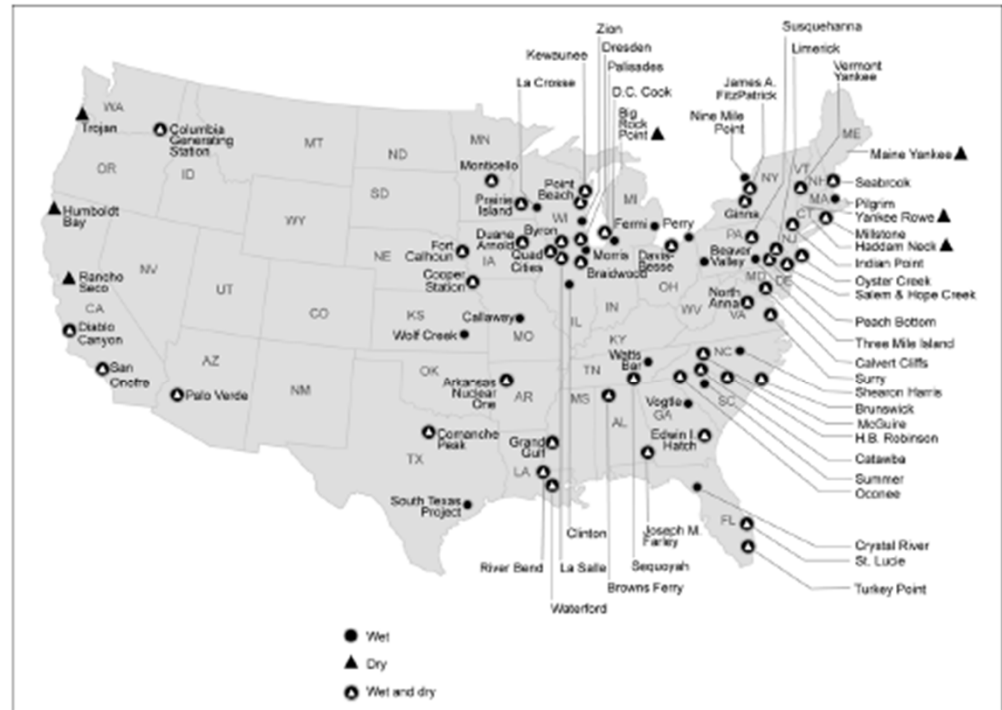
- **Dry Storage & Transportation Status**
- **Election Results (maintain status quo)**
- **BRC Recommendations**
- **Waste Confidence**
- **Extended Storage**

# Commercial Used Nuclear Fuel in Storage

June 2012

- **Used fuel inventory**
  - Approximately 69,000 MTU
  - Increases 2 - 2.4k MTU/year
- **Dry cask storage**
  - 67,691 assemblies
  - 19,000 MTU
  - 1,613 casks/modules loaded
  - 58 Operating ISFSIs
    - 1 pool ISFSI, 1 modular vault
- **Projections for 2020**
  - Estimating 88,000 MTU total
  - Estimating 31,000 MTU in dry storage
  - 3,000 casks/modules loaded
  - At 76 ISFSIs
    - All plant sites + Morris & INL
  - Fuel from 119 reactors

Figure 1: Commercial Spent Nuclear Fuel Storage Sites



Source: NRC

Note: Of the 75 sites, 65 have currently operating reactors, 7 have decommissioned reactors, 2 have reactors being decommissioned, and 1 site was constructed as a storage pool for spent fuel awaiting reprocessing.

# Used Nuclear Fuel Storage at Shutdown Reactors



	Reactor Name	State	Shutdown Date	Storage Type	Decommissioning Status	Used Fuel Stored On Site (MTUs)
1	Indian Point 1*	NY	1974	Dry Cask	SAFSTOR	33
2	Humboldt Bay	CA	1976	Dry Cask	DECON in progress	31
3	Dresden 1*	IL	1978	Dry Cask	SAFSTOR	69
4	LaCrosse	WI	1987	Pool	SAFSTOR	38
5	Rancho Seco	CA	1989	Dry Cask	DECON complete	228
6	Fort St. Vrain†	CO	1989	Dry Cask	DECON complete	25
7	Yankee Rowe	MA	1991	Dry Cask	DECON complete	122
8	Trojan	OR	1992	Dry Cask	DECON complete	345
9	San Onofre 1*	CA	1992	Dry Cask	DECON in progress	146
10	Haddam Neck	CT	1996	Dry Cask	DECON complete	422
11	Maine Yankee	ME	1996	Dry Cask	DECON complete	542
12	Zion 2	IL	1996	Pool	SAFSTOR	1,019 (combined pool)
13	Zion 1	IL	1997	Pool	SAFSTOR	
14	Big Rock Point	MI	1997	Dry Cask	DECON complete	70
15	Millstone 1*	CT	1998	Pool	SAFSTOR	522
<b>Total MTUs</b>						<b>3,612</b>

\* Collocated with operating reactors

Source: Gutherman Technical Services

† Transferred to the U.S. Department of Energy on June 4, 1999

# Used Fuel Storage Projections and Cask Transportability

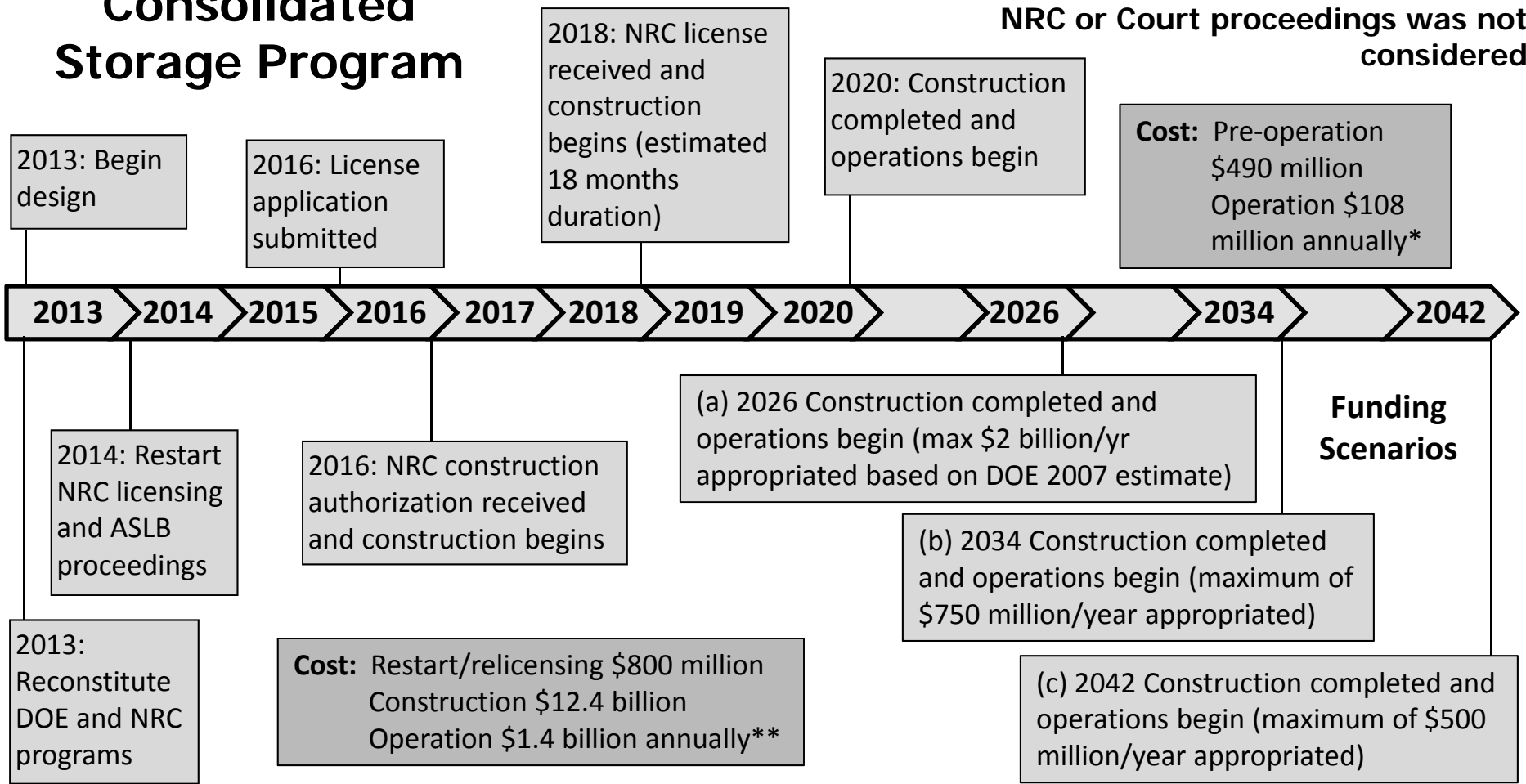
Year	Metric Tons Heavy Metal (MTHM) Total	MTHM Pools	MTHM Dry Storage	Dry Cask Systems						
				Total	Non-transportable		Transportable			
					Bare fuel	Canister	Bare fuel	Bare fuel, <i>trans license pending</i>	DPCs	DPCs <i>Trans. license pending</i>
2010	64,461	49,666	14,795	1,242	29	209	47	89	651	217
2020	87,721	57,611	30,110	2,231	29	259	176	0	1,767	0
2030	117,071	64,895	52,176	3,593	29	309	216	0	3,036	0
2040	143,741	65,599	78,142	5,196	29	356	252	0	4,759	0

# BRC Recommendations

- **Industry priorities**
  - **Waste fee**
  - **Consolidated storage**
  - **New management entity (FedCorp)**
- **Industry is working to develop congressional support to influence DOE strategy/action**
- **Incoming Congress may consider implementing legislation**
- **Consolidated storage represents a near term opportunity**
  - **Willing volunteer community**
  - **Move shutdown plant fuel first**

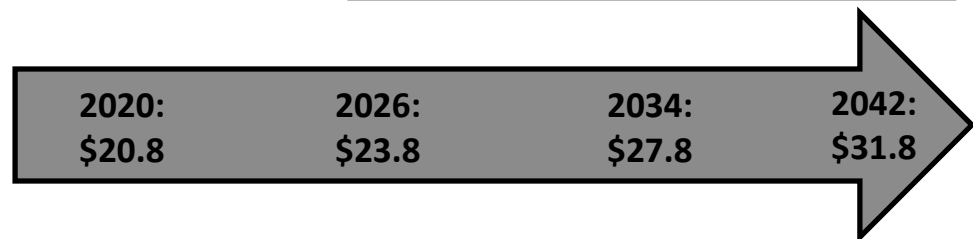
# Consolidated Storage Program

The potential for delays due to additional NRC or Court proceedings was not considered



# Yucca Mountain Project

Damage awards from taxpayer-funded Judgment Fund (billions)



\* Based on EPRI report 1018722 "Cost Estimate for an Away-From-Reactor Generic Interim Storage Facility (GSIF) for Spent Nuclear Fuel."

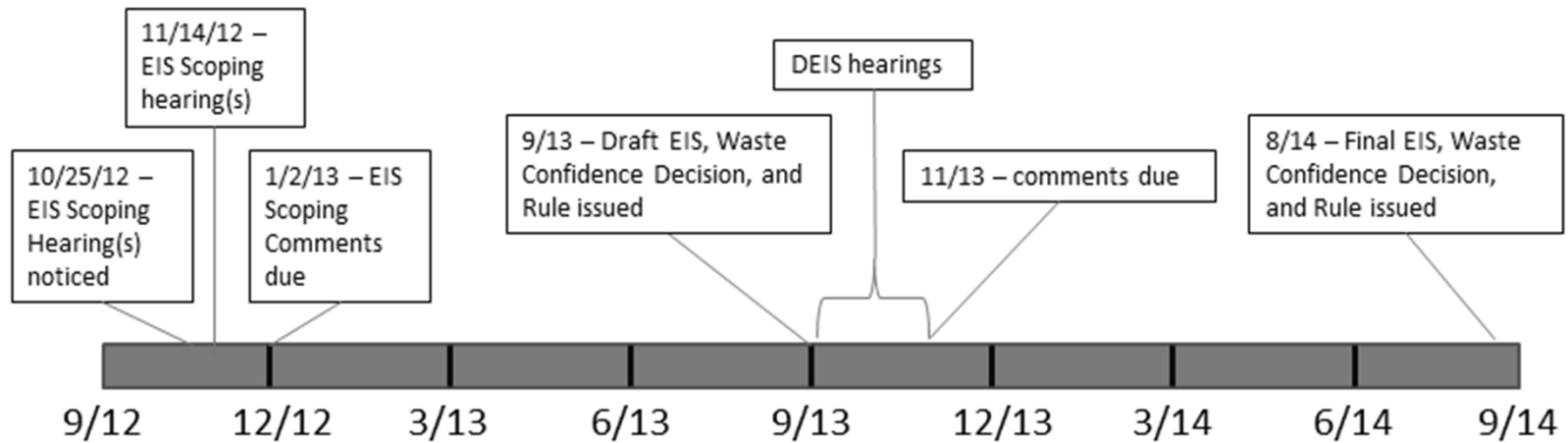
\*\*Restart cost based on industry judgment. Construction and operation estimates based on DOE/RW-0591 "Analysis of the Total System Life Cycle Cost of the Civilian Radioactive Waste Management Program, Fiscal Year 2007" (July 2008) and actual appropriations for 2007 through 2009.

# Waste Confidence

- **NRC's longstanding waste confidence rule is a generic finding of no significant environmental impact pertaining to the storage of used nuclear fuel**
- **On 6/8/12 US Court of Appeals vacated and remanded NRC Waste Confidence Rule (updated in 2010) for:**
  - Failure to consider consequences of a repository never being built
  - Failure to consider spent fuel pool fires and leaks
- **On 8/7/12 NRC suspended issuance of new licenses, but allowed licensing to proceed until remand is addressed**
  - NRC is preparing an EIS & revised rule to address the remand
  - The Commission gave staff 24 months to complete this task and directed that focus be on existing information specific to the remand
  - EIS scoping process is ongoing, comments are due 1/2/13



# Waste Confidence Timeline



Waste Confidence EIS/Rulemaking Timeline

# Extended Storage

- **There is a strong technical basis for extended storage**

- **Dry Casks are robust systems with no moving parts**

- **NRC has evaluated longer term storage**

- **“This increase [in dry cask license and renewal terms from 20 to 40 years] is consistent with the NRC staff’s findings regarding the safety of spent fuel storage as documented in the renewal exemptions issued to the Surry and H.B. Robinson ISFSIs”** 76 Fed. Reg. 8874 2/16/2011
- **“Studies performed to date have not identified any major issues with long-term use of dry storage”** 75 Fed. Reg. 81072, 12/23/2010

- **EPRI and NRC Dry Storage PRAs conducted in 2007 indicate Annual cancer risk between 1.8E-12 and 3.2E-14 \***

- **Dry Storage Characterization Project opened a cask stored from 1985 to 1999 after transport and examined contents**

- **Verified “long-term storage has not caused detectable degradation of the spent fuel cladding or the release of gaseous fission products”**

- **Projects to further confirm performance is being pursued**

\* Compares to 2E-6 LCF/yr. public & 1E-5 LCF/yr . worker thresholds of negligible risk from NRC's framework for “Risk-Informed Decision-making for Nuclear Material and Waste Applications”, Revision 1, February 2008

# Conclusion

- **Dry cask storage has become a routine part of nuclear plant operations and most casks are or will be transportable**
- **Industry supports moving forward with BRC recommendations**
- **Removal of used fuel in dry cask storage from shutdown plant sites is highest priority**
- **Consolidated storage, or perhaps confirmatory extended storage projects, represent earliest opportunity for transportation**