



# Consolidated Interim Storage Advantages and Disadvantages from Prior Reports and Studies

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*Changing the World's Energy Future*

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This presentation summarizes the advantages and disadvantages of incorporating an interim storage facility into the waste management system from prior reports and studies. The views expressed in these past reports and summarized in this presentation do not necessarily state or reflect the current views of the U.S. Government or any agency thereof.

# Advantages and disadvantages of interim storage

- Major advantages of interim storage:
  - Providing for earlier federal acceptance of spent nuclear fuel (SNF)
  - Reducing the number of unintended long-term storage locations
  - Increased system flexibility and integration
  - Near-term development and demonstration of institutional and technical infrastructures for large-scale management of SNF
- Major disadvantages of interim storage:
  - Potential adverse impacts on the development of a repository
  - Additional transportation of SNF
  - Up-front economic investment

# Outline

- Background/motivation
- Advantages of interim storage
- Disadvantages of interim storage
- Full report details

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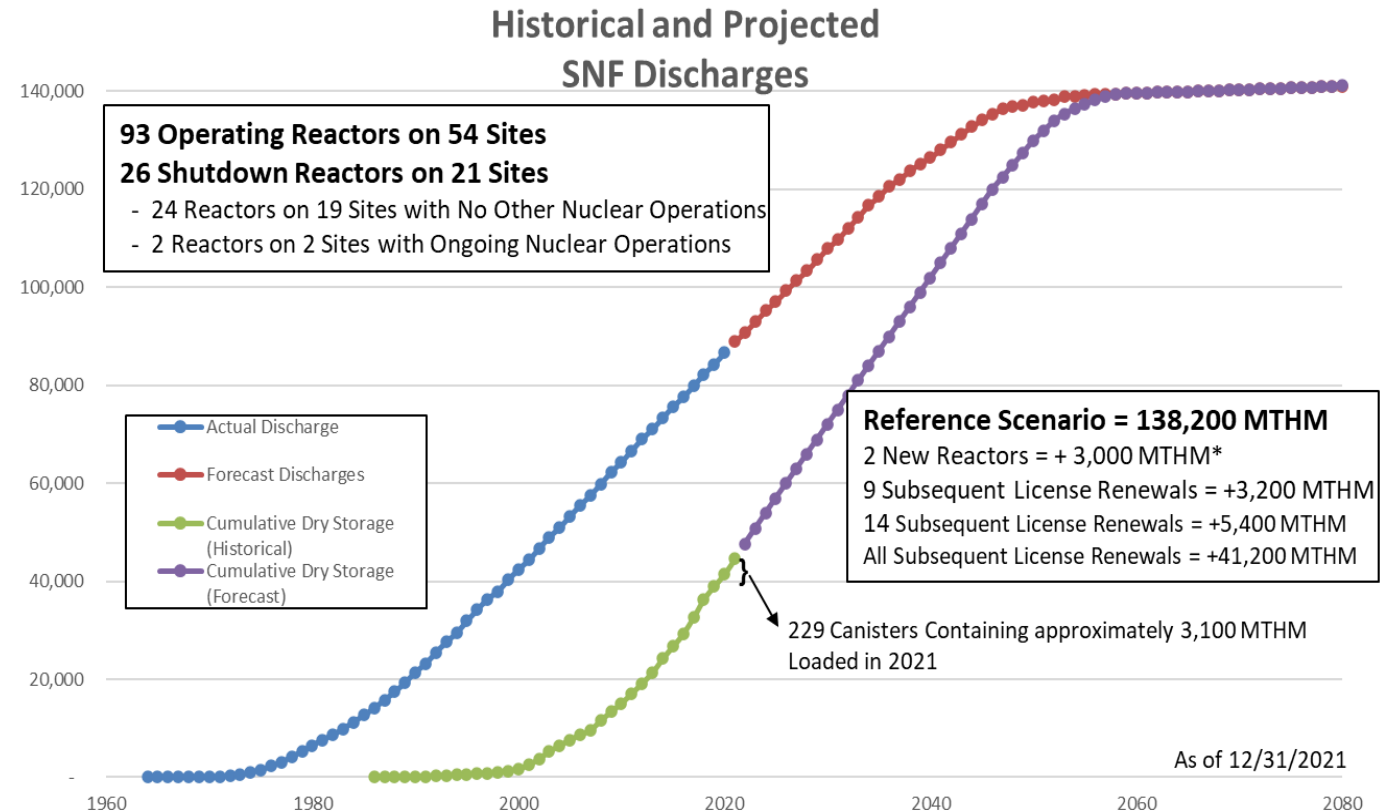
# Should consolidated interim storage be included in an integrated waste management system?

- Question has been asked numerous times over the years
- Consolidated storage facilities were included as a potential component of the U.S. spent fuel management system in the Nuclear Waste Policy Act (NWPA) of 1982
- The NWPA and amendments placed capacity and timing constraints on a consolidated interim storage concept referred to as a “monitored retrievable storage” (MRS) facility
  - Constraints were intended primarily to keep a focus on pressing toward a more permanent solution to the waste problem by developing a geologic repository
- This presentation provides information from past reports to further that discussion
  - Advantages and disadvantages
  - Provides a summary by the authors of the views expressed in those reports and studies
  - Should not be construed as reflecting the views of the Department of Energy



# Why is interim storage being considered? SNF continues to be generated

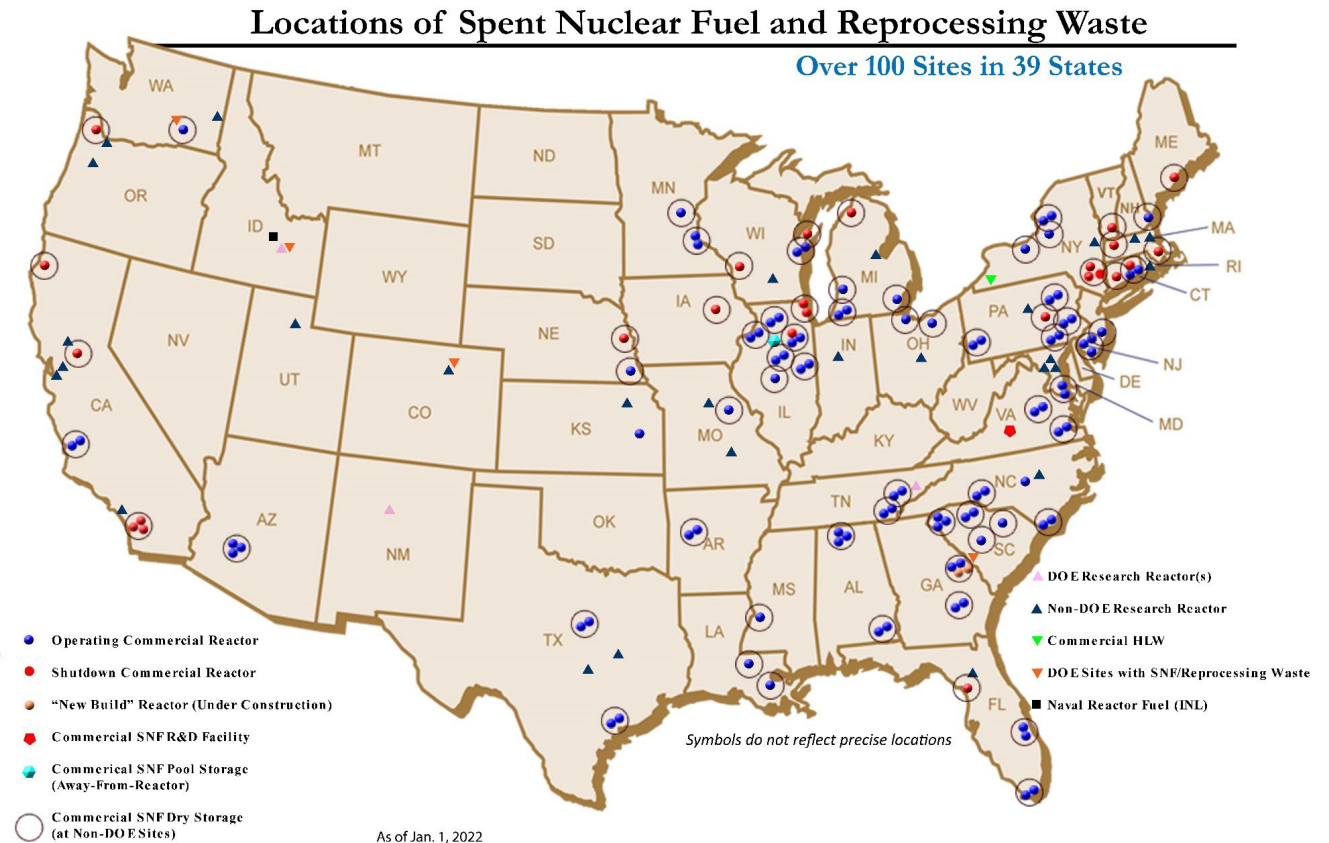
- Approximately 90,000 metric tons of heavy metal (MTHM) of SNF discharged and in interim storage at reactor sites
- About 2,000 MTHM discharged per year
- Over 3,500 dry storage canisters (over 45,000 MTHM)
- About 200 dry storage canisters added per year
- Potential growth to almost 140,000 MTHM by 2060



# Advantages of interim storage

Major advantages of interim storage:

- Providing for earlier federal acceptance of SNF
- Reducing the number of unintended long-term storage locations
- Increased system flexibility and integration
- Near-term development and demonstration of institutional and technical infrastructures for large-scale management of SNF

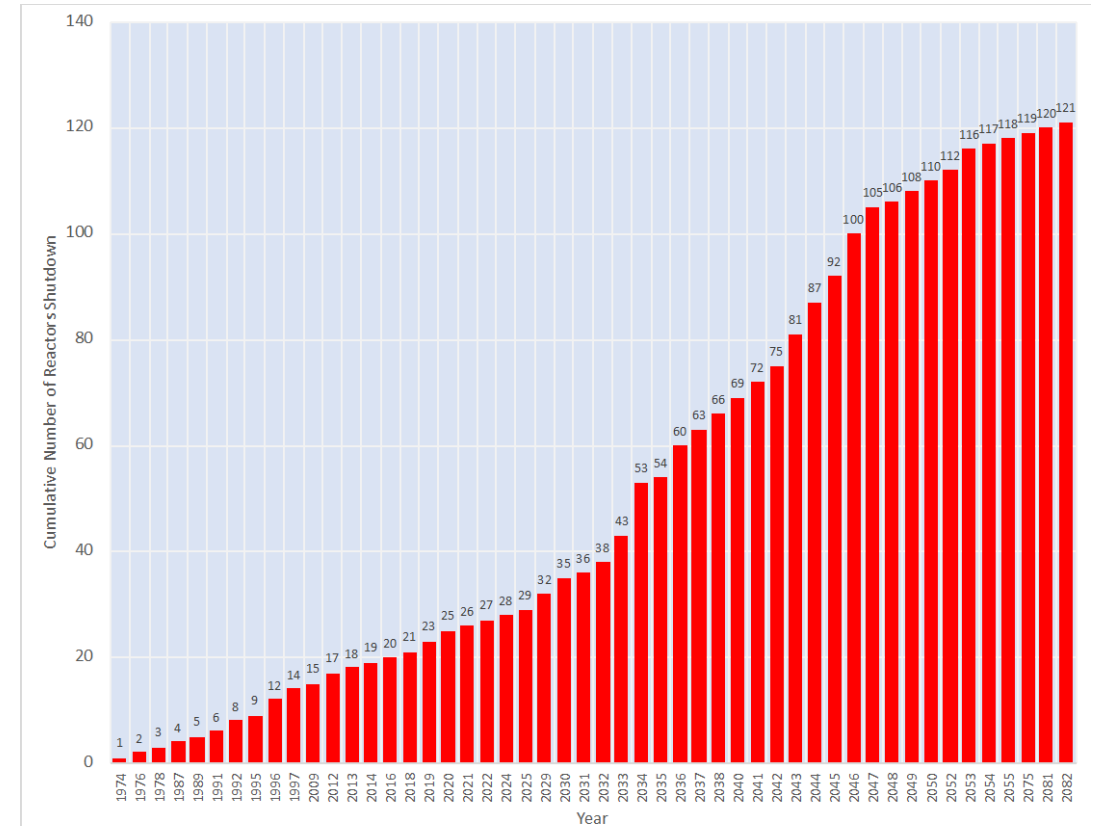


# Advantage: earlier acceptance of SNF

- Begins the fulfillment of government responsibilities and reduction of taxpayer payments for damages (*U.S. Government Accountability Office*)
  - By end of FY-22, the total liability estimate had risen to \$41.1 billion (\$10.1 billion already paid out)
- Generations who created the SNF and high-level radioactive waste (HLW) and benefited from the activities that produced them have an obligation to ensure the burden does not fall to future generations (*Blue Ribbon Commission [BRC]*)
- Could be fastest and surest path to accepting waste (*BRC*)
- Would help to restore trust and confidence (*BRC*)

# Advantages of interim storage

- Provides alternative to unplanned growth of decentralized at-reactor dry storage (*Stanford and George Washington University*)
  - Reactor sites choosing diverse storage methods to meet their needs at 70+ sites (*DOE report on MRS*)
- Would allow for earlier clearing of shutdown sites (*Nuclear Waste Technical Review Board*)
- MRS facilities previously recognized as an important backup in the event of failure or serious delay in the repository program past the point at which reactors began to be decommissioned (*U.S. House Report*)



Number of shutdown reactors  
(actual through 2021 and predicted after 2021)

# Interim storage increases system flexibility and integration

- Would provide a buffer to accommodate variations and concerns with loading and storage operations at reactor sites or repository(s) (*DOE/RW-0239*)
- Provides capabilities to deal with unexpected developments or emergencies throughout the waste management system (*BRC*)
- Confidence in the long-term safety of dry storage—NRC’s continued storage rule (CSR) — is based in part on the assurance SNF could be safely retrieved from dry casks for inspection or repackaging (if necessary) (*NRC CSR*)
  - This could be done more effectively and safely at a central storage site (*INL/EXT-12-26218*)
- Provides opportunities for better integration of storage with disposal and transportation functions, system standardization, and exploration of technical challenges in the integrated waste management system (*BRC*)

## Interim storage results in near-term development and demonstration of institutional and technical infrastructures for large-scale management of SNF

- “[B]oth early acceptance of spent fuel and demonstrating progress towards disposal of spent fuel would enhance confidence in the waste management program and these two means of achieving confidence are not necessarily incompatible” (*MRS Review Commission*)
- Would provide experience working with host communities (*2013 DOE Strategy*)
- Provides an opportunity to explore technical and institutional challenges instead of leaving them all to be faced for the first time at the first repository site (*DOE/RW-0239*)



# Disadvantages of interim storage

- With any significant action, there is always potential for negative impacts on specific activities or stakeholders
  - Possible disadvantages are discussed
- Major disadvantages of interim storage:
  - Potential adverse impacts on the development of a repository
  - Additional transportation of SNF
  - Up-front economic investment



## Interim storage may adversely impact the development of a repository

- Reduces the urgency to provide permanent disposal
  - Could become a de facto repository (*BRC, DOE/RW-0035/1*)
- Linkage between interim storage and disposal has been debated since DOE proposed such a linkage in 1987
  - Done to assure communities that could be affected by a proposed MRS facility that the SNF would be removed (*DOE/RW-0035/1*)
- Interim storage may result in reduced priority and resources given to repository development (*GAO*)
- An interim storage facility (ISF) per se does not “provide public confidence that the nuclear waste problem has been solved” (*U.S. Senate Report*)

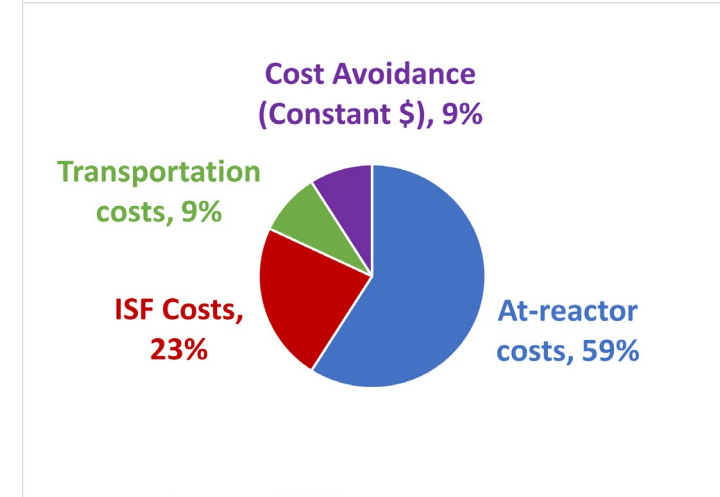
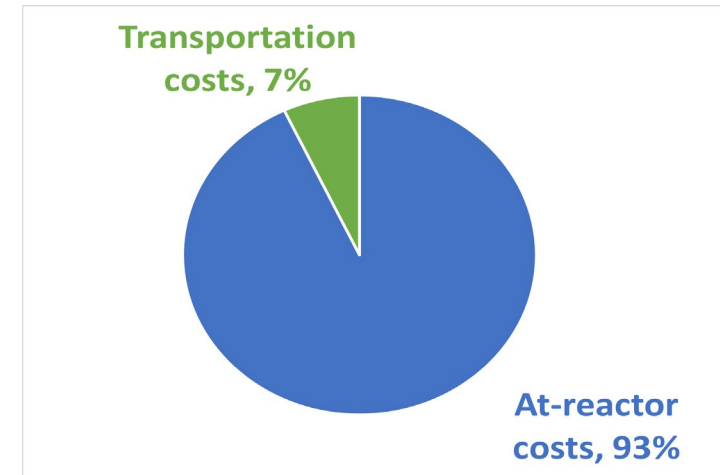


## Interim storage would result in additional transportation of SNF

- Caveat: if interim storage and repository are not co-located
- Would require additional handling of SNF and HLW (*BRC*)
  - Increasing safety and security risks, as well as costs
  - “[C]onsolidating the waste from operating nuclear reactors would likely not significantly change the overall risks associated with the storage of spent fuel” (*American Physical Society*)
  - Radiological and non-radiological risks for waste management system alternatives (no-MRS vs. MRS) were compared (*MRS Commission*)
    - The differences were deemed to be so small that they should not affect the system choice

# Interim storage requires an up-front economic investment

- Including an MRS facility would increase system costs by about 5%
  - Amount that was small in comparison with the benefits (*1987 DOE MRS Proposal*)
- Cost differences between an MRS and no-MRS system decreased the longer a repository was delayed (*MRS Review Commission*)
- 2016 study: bulk of the cost avoidances would not occur for multiple decades, so assumptions about inflation, escalation, and discount rates have a significant effect on potential economic impacts of an ISF
  - While system-wide cost avoidance could be significant, it would not offset the initial investment in an ISF for multiple decades (*Jarrell et. al*)



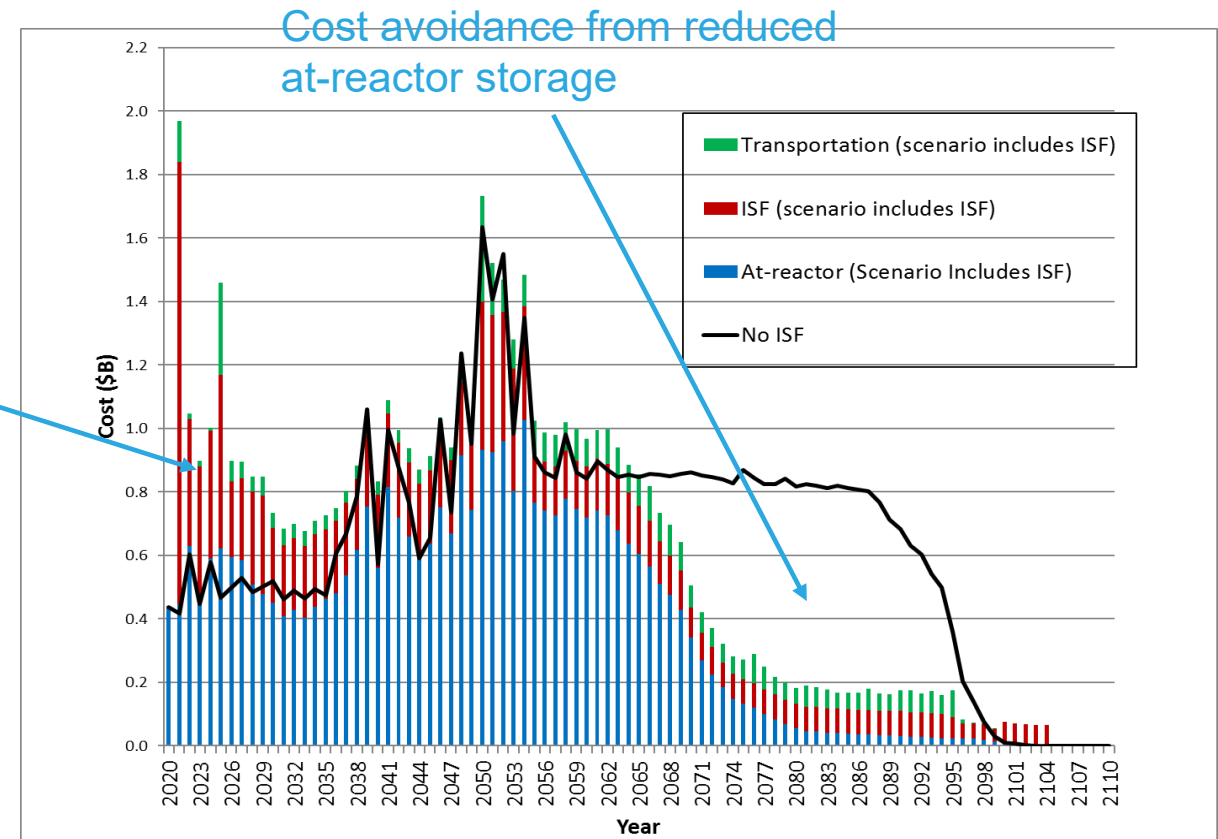
Percentage of total system costs broken down by activity when an ISF is not included (top) and when an ISF is included in the system (bottom)

# Prior analysis: constant dollar results show potential cost avoidance in the long term

- Example scenario shown for illustration purposes only (*Jarrell et al.*)

Increased costs due to ISF operations as well as transportation

- Total system cost (no repackaging or repository)
  - Without an ISF ~ \$59.5 billion
  - With an ISF ~ \$54.4 billion



Costs (at-reactor, ISF, and transportation) as function of year for scenarios with and without an ISF (2025). Repository Operations begin in 2050.

## Full 84-page report with full list of references now available

- Main body of report similar to ANS paper but with additional references
  - Many references are included as full quoted texts in footnotes
- Appendix A: More detailed discussions than covered in this presentation
- Appendix B: “Historical Recommendations Regarding Implementation of an ISF and the SNF Management System”

<https://curie.pnnl.gov/document/summary-consolidated-interim-storage-advantages-and-disadvantages-integrated-systems>

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# Questions?

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