National Academies of Sciences, Engineering, and Medicine

- Private, non-profit, self-selecting membership organizations of eminent scientists, engineers, medical professionals
- Congressional charter to advise the Federal government
- Organization: 6 major divisions, boards/standing committees, ad hoc committees
- Operating modes: Consensus studies, convening activities (workshops, roundtables), operational programs (fellowships, etc.)
Activities of the Earth and Life Studies division cover a wide range of issues:

- Agriculture;
- Management of water and other natural resources;
- Earth, life, and chemical sciences;
- Atmospheric, ocean, and polar sciences;
- Environmental health and toxicology studies;
- Animal research; and
- **Nuclear and radiation science and technology.**
Nuclear and Radiation Studies Board

- Three mission areas:
  - Nuclear security
  - Nuclear waste and cleanup
  - Radiation health effects

- Board - 14 members, chair and vice chair

- Past work with SSEB:
  - Chris Wells, 2018 briefing to Surplus Plutonium Disposal committee
Surplus Plutonium Disposal Committee Membership

Robert C. Dynes (NAS) (Committee Chair) University of California, San Diego
Lisa M. Bendixen, ICF
Michael S. Bronzini, George Mason University (emeritus)
Leonard W. Gray, E. O. Lawrence Livermore National Laboratory (retired)
Michael R. Greenberg, Rutgers University
David W. Johnson, Jr. (NAE), Journal of the American Ceramic Society (retired), Bell Laboratories (retired)
Annie B. Kersting, E. O. Lawrence Livermore National Laboratory
M. David Maloney, Jacobs Engineering Group (formerly CH2M) (emeritus)
S. Andrew Orrell, International Atomic Energy Agency
William C. Ostendorff, United States Naval Academy
Tammy C. Ottmer, Colorado State Patrol
Cecil V. Parks, Oak Ridge National Laboratory
Matthew K. Silva, Environmental Evaluation Group (retired), Albuquerque, New Mexico

Jenny Heimberg, National Academies, study director
Dick Rowberg, National Academies, senior advisor
Statement of Task

Evaluate the general viability of the U.S. Department of Energy's (DOE's) conceptual plans for disposing of surplus plutonium in the Waste Isolation Pilot Plant (WIPP) to support U.S. commitments under the Plutonium Management and Disposition Agreement, identify gaps, and recommend actions that could be taken by DOE and others to address those gaps.

This evaluation will specifically address the following issues:

1. DOE's plans to ship, receive, and emplace surplus plutonium in WIPP.
2. DOE's understanding of the impacts of these plans on the following:
   a) Transportation safety, security, and regulatory compliance.
   b) Current and future WIPP operations, including the need to construct additional waste disposal panels and/or operate WIPP beyond its currently planned closure date.
   c) Disposal of other potential waste streams in WIPP, for example other plutonium wastes, Greater-than-Class-C-like wastes, and tank wastes.
   d) WIPP pre- and post-closure safety and performance.
   e) Compliance with WIPP waste acceptance criteria; Environmental Protection Agency disposal regulations; and The Land Withdrawal Act, National Environmental Policy Act, and Resource Conservation and Recovery Act requirements.

The Academies may examine policy options but should not make policy recommendations that require nontechnical value judgments.
Interim Report: Status

• Interim Report released in November 2018
• Limited availability of publicly releasable data and information to the committee led to decision to issue an interim report focused on:
  – High-level review of conceptual plans:
    • Proposed process
    • Current capacity at WIPP
    • Requirements of the Plutonium Management Disposition Agreement (PMDA)

• Specific tasks not yet addressed:
  – Transportation safety, security, and regulatory compliance
  – WIPP pre- and post-closure safety performance

• Final report expected to be released in March 2020
Dilute and Dispose

1. Surplus Pit Management (Pantex)
   - Surplus pits

2. Pit Disassembly and Processing (LANL)
   - 26.2 MT as oxide
   - 34 MT diluted Pu as oxide
   - Preparation for Disposal

3. Dilute (SRS)
   - 7.8 MT as oxide

4. Characterization and Packaging (SRS)

5. Geological Repository Disposal (WIPP)
The diagram illustrates the Conceptual Plan Timeline for the 34 MT Surplus Plutonium Disposition Plan. Key points include:

- **Fiscal Year 2018**: Emplace Pu at WIPP
- **Fiscal Year 2049**: DOE authorize 34 MT emplacement operations, end FY 2024

Figure 2-5 in the committee’s report.
Findings, Conclusions, Recommendations

Advice provided as:

- Findings - statements of fact based on gathered evidence,
- Conclusions - judgments based on findings and/or evidence
- Recommendations - proposed actions

Total: Seven findings, two conclusions, four recommendations.
Questions posed to DOE for additional evidence.
Dilute and dispose has been demonstrated at a small scale and has lower complexity than the MOX option (Conclusion 1)

The dilute and dispose program is in the early stages of development and changes to the conceptual plans are expected. (Finding 1)

The committee identified three barriers to implementation of the current conceptual plans (Finding 2):

1. Insufficient current statutory and current physical capacity in WIPP
2. Unclear NEPA strategy
3. Lack of Russian Federation approval

Public outreach will be needed to engage with states affected by the plan (Findings 3, 4 and 7)
CONCLUSION 1:

The dilute and dispose process has been demonstrated at a small scale by DOE-EM as it begins to process 6 MT of surplus plutonium, a quantity separate from the 34 MT associated with the Plutonium Management and Disposition Agreement (PMDA).

The committee agrees with earlier assessments that the technical complexity of the dilute and dispose process is lower than that of the construction of a MOX fuel option.

Due to lack of information, the committee makes no judgment in this interim report on the DOE’s ability and the associated risks of scaling up the current infrastructure and processes to address the 34 MT.

The committee has, however, identified several barriers that will need to be addressed by DOE-NNSA and others before the dilute and dispose conceptual plans can be implemented to support U.S. commitments under the PMDA.
1. WIPP is the only deep geologic repository currently available in the United States for surplus plutonium disposal.
2. Demand for future defense-generated transuranic (TRU) waste disposal at WIPP exceeds its congressionally legislated capacity.
3. Access to WIPP is controlled by DOE-EM and the state of New Mexico, which have different legal obligations and programmatic priorities than DOE-NNSA.

RECOMMENDATION 1:
The remaining statutory capacity as defined in the Land Withdrawal Act (LWA) and New Mexico Environment Department (NMED) permit at WIPP should be treated as a valuable and limited resource by DOE. DOE-EM and the Carlsbad Field Office should modify its current emplacement planning process to allow for guaranteed long-term allocation of disposal capacity for waste streams of highest priority to DOE.
Unclear NEPA Strategy

The committee finds that a full programmatic environmental impact statement (PEIS) of the dilute and dispose option, encompassing all sites, transportation, and activities involved in the dilute and dispose process rather than a supplemental EIS would help ensure the proper scope and scale of the proposed change... (Finding 6)

Rationale:
- The quantities of surplus plutonium are much larger than previous EISs (i.e., 6 MT)
- Details of processing methods are not clear
- Program crosses many sites and offices within DOE
- Changes and increased knowledge since previous PEIS conducted in 1996
Lack of Russian Federation Approval

- PMDA-approved method for dispositioning plutonium: irradiated MOX fuel containing surplus plutonium
  - Incorporate surplus plutonium into MOX fuel assemblies, irradiate the assemblies in light water nuclear reactors

- PMDA allows for other methods of disposition as agreed to in writing
- The dilute and dispose option is neither recognized nor approved by the existing PMDA (Finding 5)
- Barriers to recovery of dispositioned plutonium via dilute and dispose are less than the currently approved method (irradiated MOX fuel)
Public Trust

- Public and state-level engagement will be important to the success of the program as the dilute and dispose conceptual plans rely on a number of significant permit modifications for WIPP operations to be approved by the state of New Mexico. The process is likely to require periods of public comments. (Findings 3 and 4)
- Also, the large number of transports of weapons grade material and diluted plutonium waste between New Mexico and South Carolina are likely to raise public concern.
- Concerns have been voiced by the public over the changing mission of WIPP.

RECOMMENDATION 2:
DOE-NNSA should engage New Mexico and South Carolina as well as their congressional delegations prior to the public engagement required by the NEPA process to assess prospects for successfully amending the existing legal agreements to allow for the dilution and packaging of 34 MT of surplus plutonium at the Savannah River Site and its disposal in WIPP.
Public trust will need to be developed and maintained throughout the lifetime of the dilute and dispose program . . . These changes will require ensuring the regulators and the public of the safety and security of the DOE plans.

This is particularly challenging for the dilute and dispose program due to several factors:

- classification of aspects of the planning (constituents of the adulterant, processing steps, security and safeguards assessments);
- early stage of program development with changes likely to occur as more information is known; and
- potential impacts that cross many States and DOE sites.
RECOMMENDATION 3:
. . .DOE should consider re-initiating the Environmental Evaluation Group, as an independent technical review organization that can represent the concerns of the state of New Mexico, throughout the lifetime of the dilute and dispose program.

RECOMMENDATION 4:
In addition to and separate from the independent review organization representing the state of New Mexico, periodic classified reviews for Congress by a team of independent technical experts should be required until classified aspects of the dilute and dispose plan, including the safety and security plans, are completed and implemented. . .
Topics of the Questions for DOE:

- WIPP Disposal Capacity
- Environmental Impact Statements
- WIPP’s Compliance Recertification Application
Download the Interim Report, *Disposal of Surplus Plutonium at the Waste Isolation Pilot Plant*, at:


Thank you for your time.