

*Exceptional service in the national interest*



# Practical Monitoring Experience

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4<sup>th</sup> US/German Workshop on  
Salt Repository Research, Design and Operations

Berlin, Germany

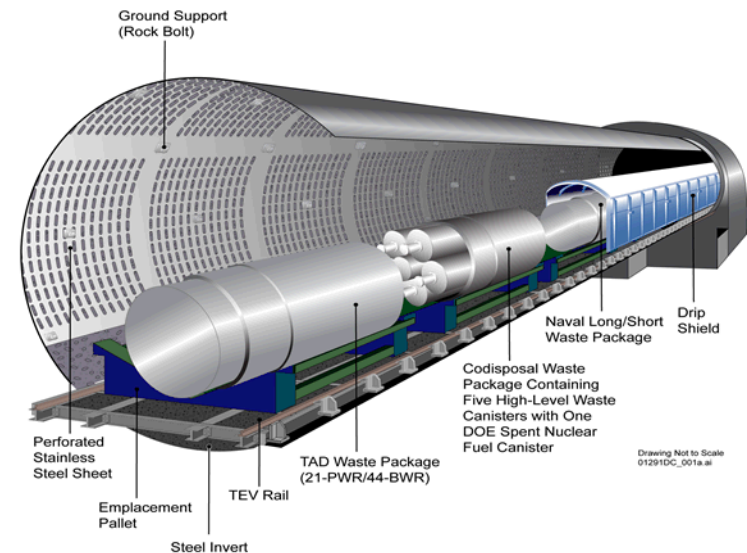
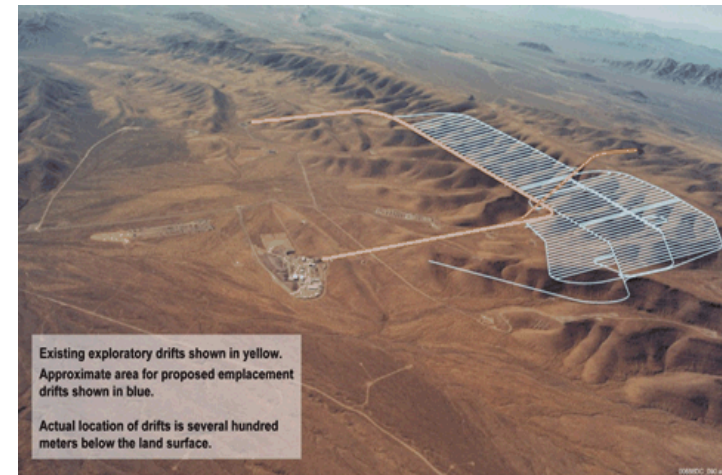
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# Introduction

- Performance confirmation monitoring versus other testing and monitoring objectives
- Performance confirmation for the Waste Isolation Pilot Plant
- Performance confirmation for Yucca Mountain
- An approach for developing, evaluating and implementing the next generation of performance confirmation monitoring

# WIPP and Yucca Mountain



# Repository Monitoring Requirements

## OPERATIONS

1. Engineering Systems Testing & Evaluation
2. Design, Construction & Operations Testing
3. Health, Safety & Effluents
4. Security and Emergency Testing
5. Licensing Specifications

## LONG-TERM SCIENCE

6. Regulatory Directed Testing
7. Elective Testing
8. Performance Confirmation

- Multi-phase program with different goals/objectives
  - Site characterization Testing and Monitoring
    - To Build a Performance Assessment (safety case)
  - Operational Phase Monitoring
    - To verify basis of Performance Assessment/Results
  - Post-Closure Monitoring
    - To enhance institutional controls and long-term stewardship

# WIPP Operational-Phase Monitoring

- EPA Regulations govern program
  - Monitoring is an Assurance Requirement
  - *“The Department shall conduct **an analysis of the effects of disposal system parameters on the containment of waste in the disposal system** .... The results of the analysis shall be used in developing plans for pre-closure and post-closure monitoring....”*

# WIPP Operational-Phase Monitoring

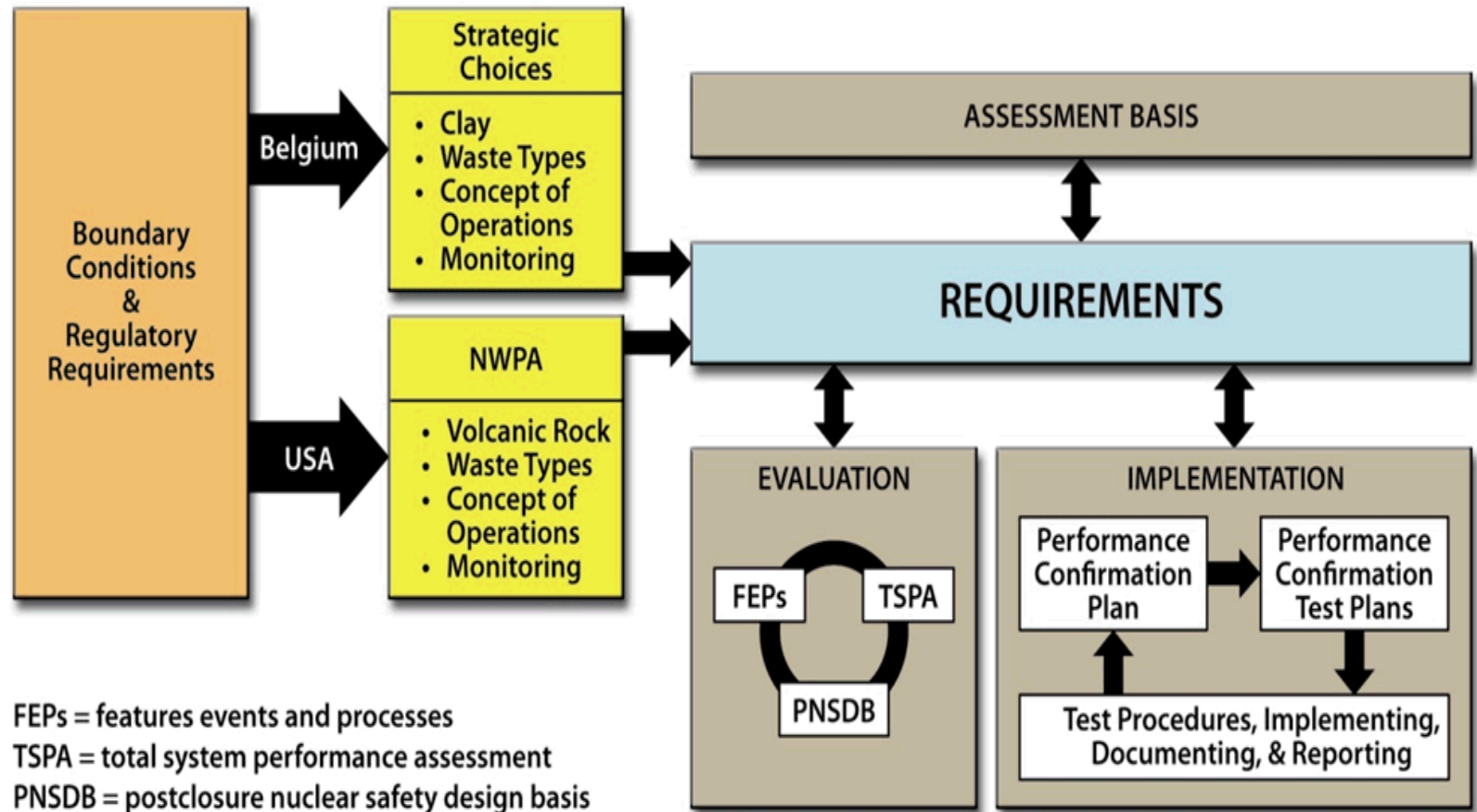
- Analysis addressed significant disposal system parameters defined by their
  - effect on the system's ability to contain waste
  - effect on the ability to verify predictions about the performance of the disposal system
- Addressed an important disposal system concern
- Obtained meaningful data in a short time period
- Will not violate disposal system integrity
- Complemented existing monitoring programs

# Performance Confirmation for WIPP since 1999

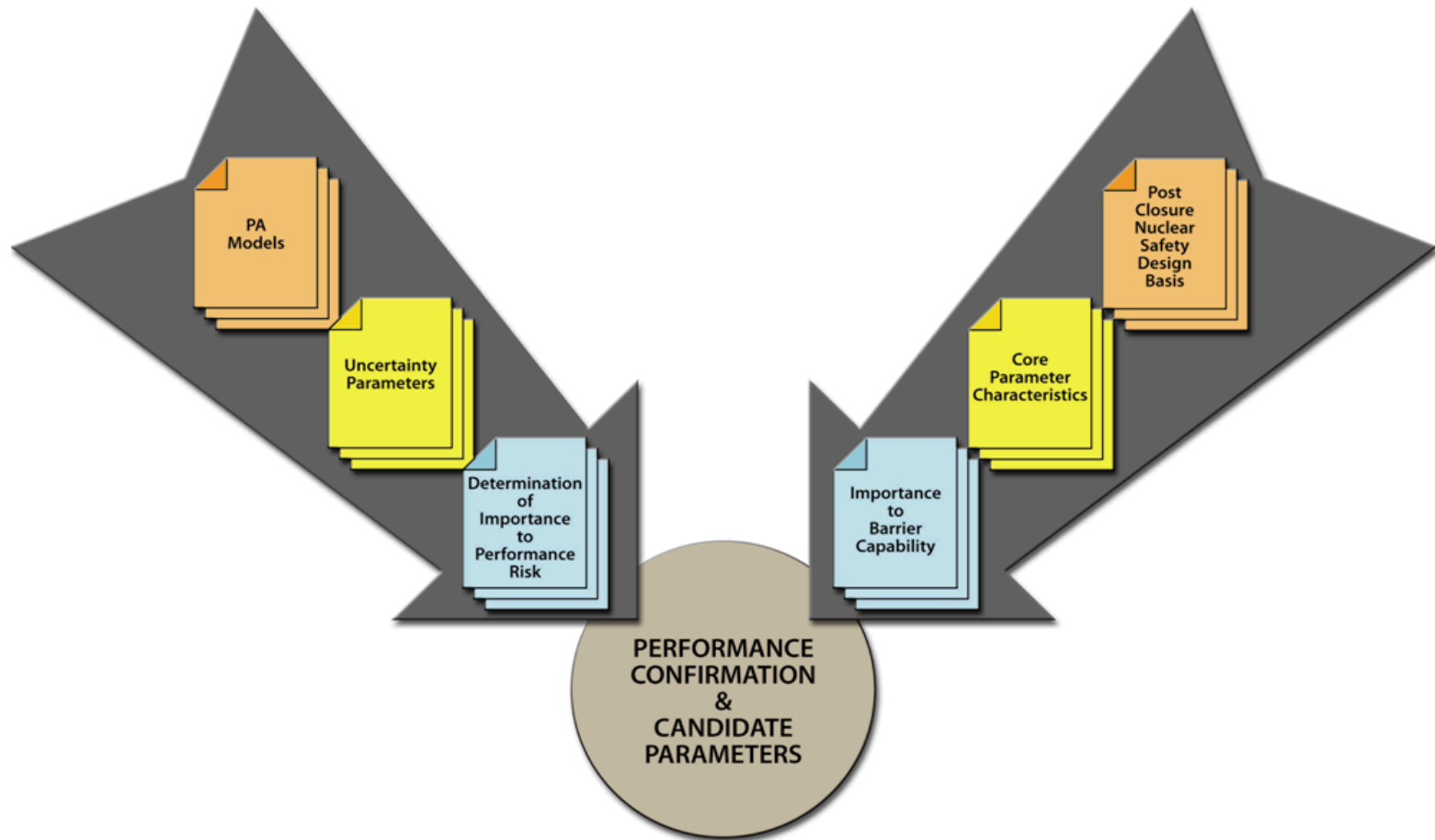
1. Creep Closure and Stresses
2. Extent of Deformation
3. Initiation of Brittle Deformation
4. Displacement of Deformation Features
5. Culebra Ground Water Compositions
6. Change in Culebra Ground Water Flow
7. Drilling Rate
8. Probability of Encountering a Castile Brine Reservoir
9. Subsidence Measurements
10. Waste Activity



# Developing and Assessing Performance Confirmation



# Confirmation Parameter Sources





# Performance Confirmation for Yucca Mountain

In September 2011 NRC released its findings on the performance confirmation section of the SAR.

*“The NRC finds that the performance confirmation program is consistent with the NRC’s Yucca Mountain Review Plan (YMRP). The SAR includes a description of the Performance Confirmation Program, which evaluates the adequacy of the supporting assumptions, data, and analyses in the SAR...On the basis of the NRC staff’s review of the SAR and other information submitted in support of the SAR, the NRC staff notes that DOE has provided a reasonable description of its Performance Confirmation Program that is consistent with the guidance in the YMRP.”*

## Concluding Remarks

- Performance confirmation parameters should be demonstrably linked to the safety assessment
- In some manner, performance confirmation begins during site characterization but formally becomes a commitment when it is included in a license submittal
- Because PC test plans require detail including acceptable ranges and relevance to performance assessment, care should be exercised in development of and commitment to each PC test plan

## References

- Hansen, F.D. 2012. *Repository Performance Confirmation*. SAND2011-6277C-12119. WM2012 Conference, February 26-March 1, 2012, Phoenix, AZ--Also SAND2011-6277. Sandia National Laboratories Albuquerque, New Mexico.
- Hansen, F.D. and S.W. Wagner. 2013. *Confirmation Monitoring of Repositories in the United States*. SAND2012-10498C. Monitoring in Geological Disposal of Radioactive Waste – Conference and Workshop. Luxembourg.
- MoDeRn Project, Monitoring development for salt repository operation and staged closure: [www.modern-fp7.eu](http://www.modern-fp7.eu)
- <http://www.nrc.gov/waste/hlw-disposal/yucca-lic-app/yucca-lic-app-safety-report.html>