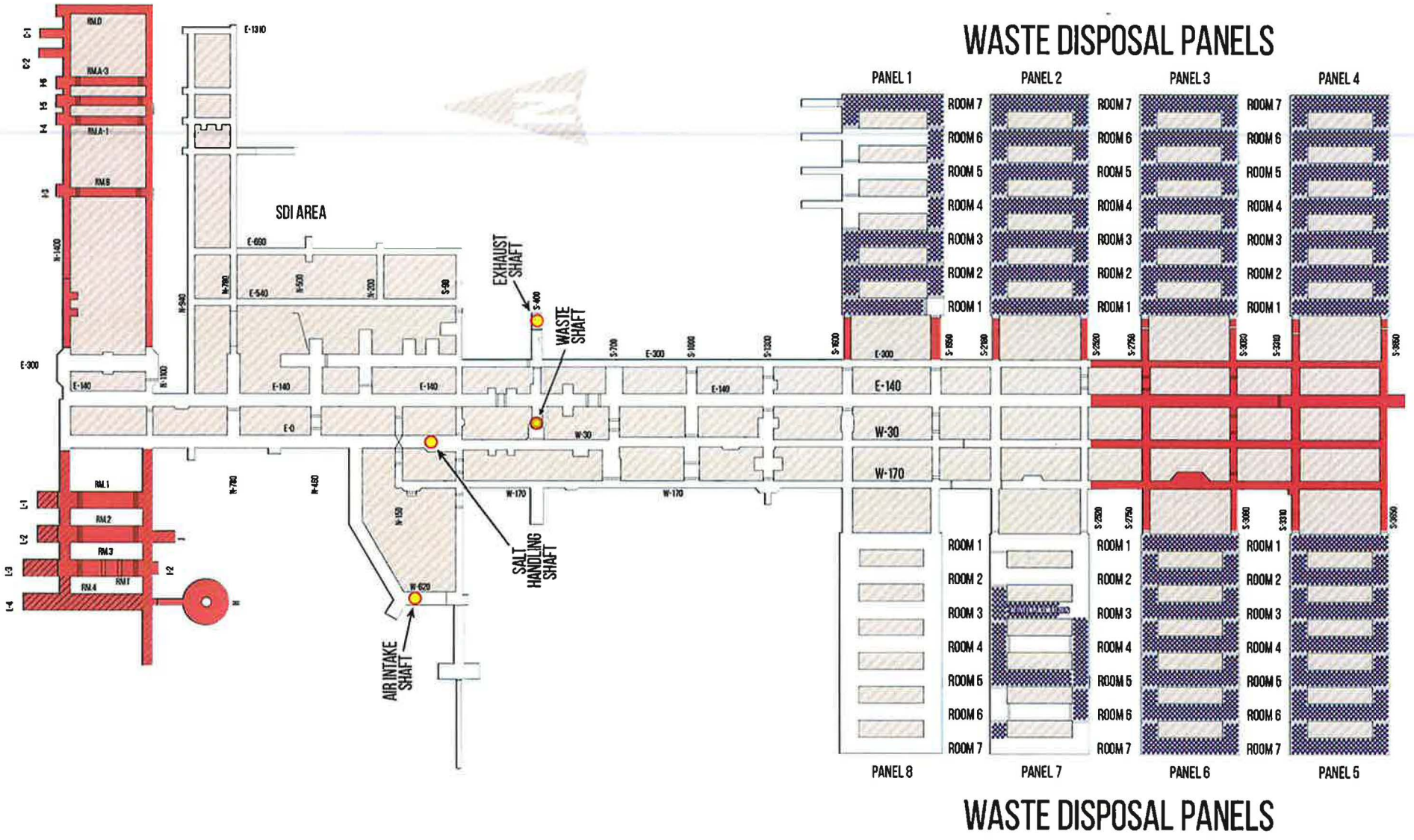
U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

# Waste Isolation Pilot Plant (WIPP) DNFSB Concerns with the Safety Significant Confinement Ventilation System Project

Presented by: Office of Environmental Management

# WIPP Underground



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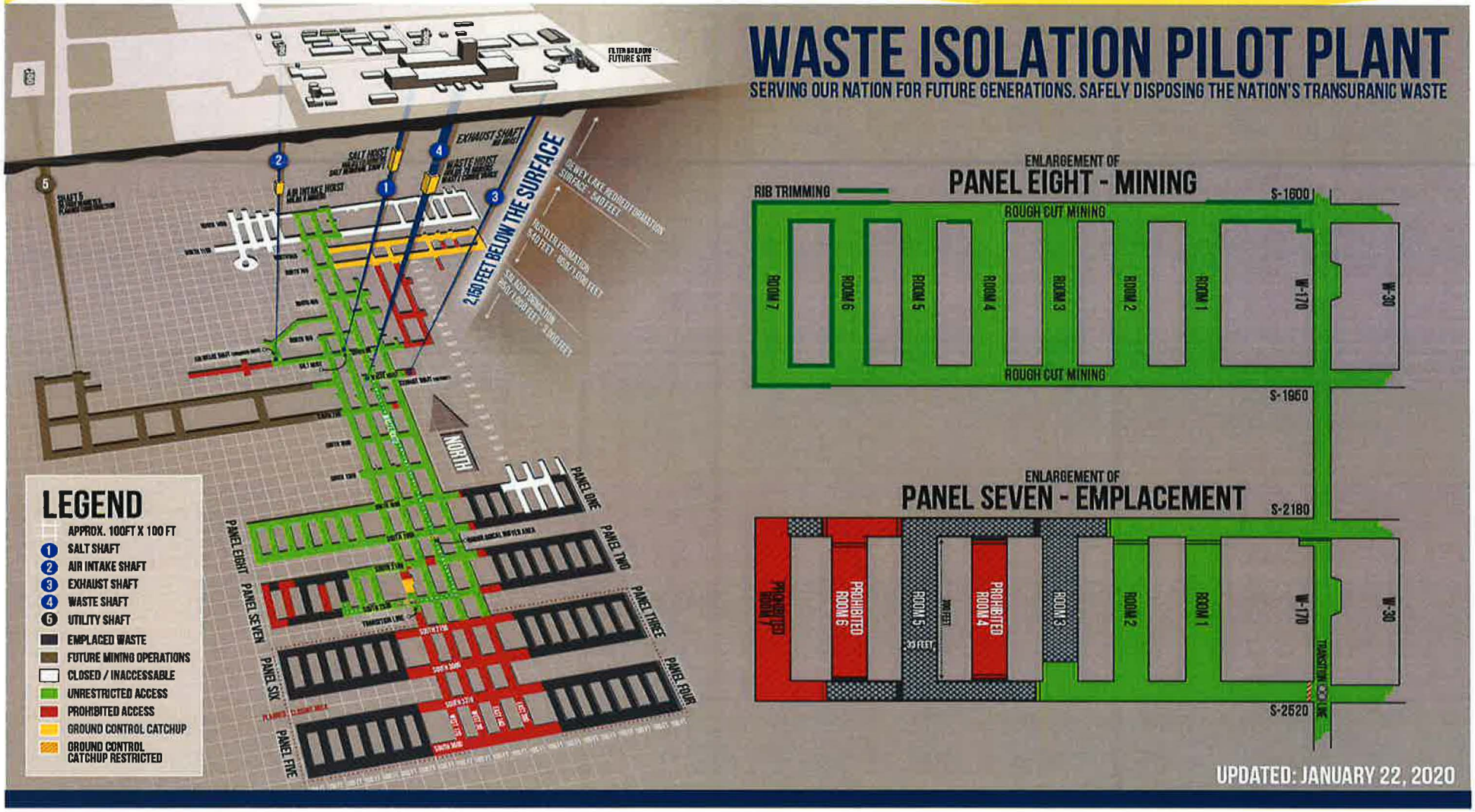
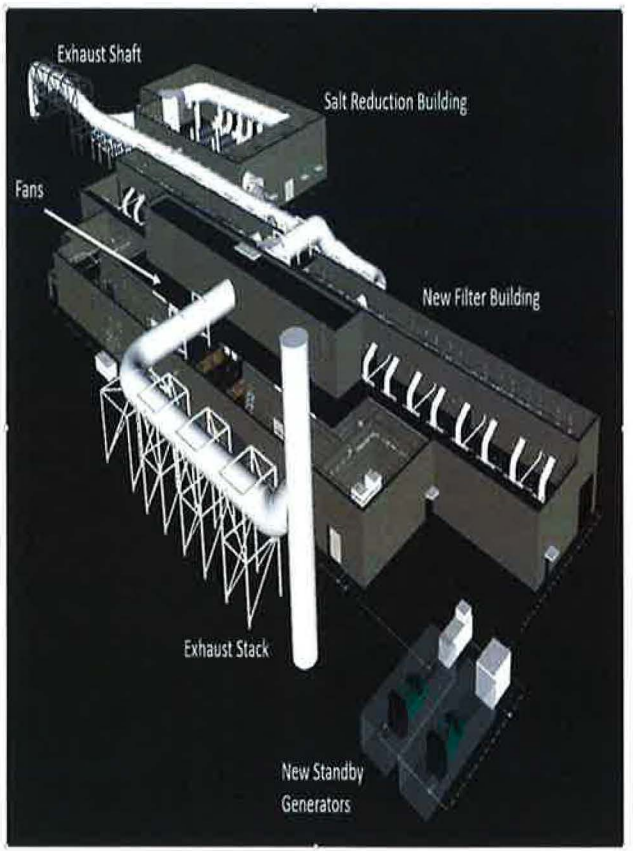
# WIPP Site Underground and Capital Projects



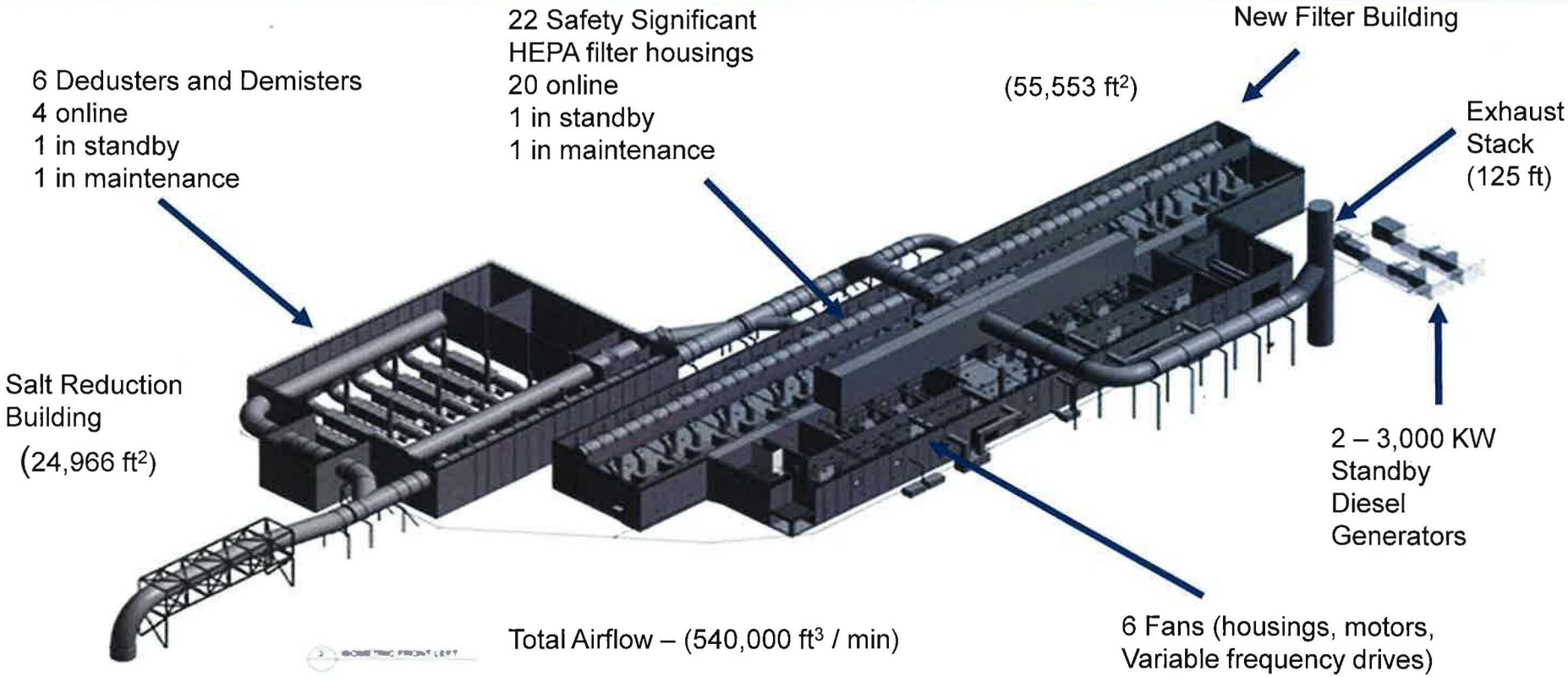
# Line Item Capital Asset Projects
# Safety Significant Confinement Ventilation System

- CD2/3 Approved – April 2018
  - Design 100% Complete
  - On-going progress:
    - Long lead procurements
      - Fabrication in progress for filter housings (IONEX) and Exhaust Fans (ENCORUS)
      - Fabrication complete for diesel generators
    - Construction Subcontract awarded to Critical Applications Alliance
      - Contractor mobilized at site, underground utilities installed, completed Salt Reduction building foundation slab and preparing to start New Filter Building foundation
    - Fabrication Assembly Building (frame, roof and walls) completed, interior finishes being worked

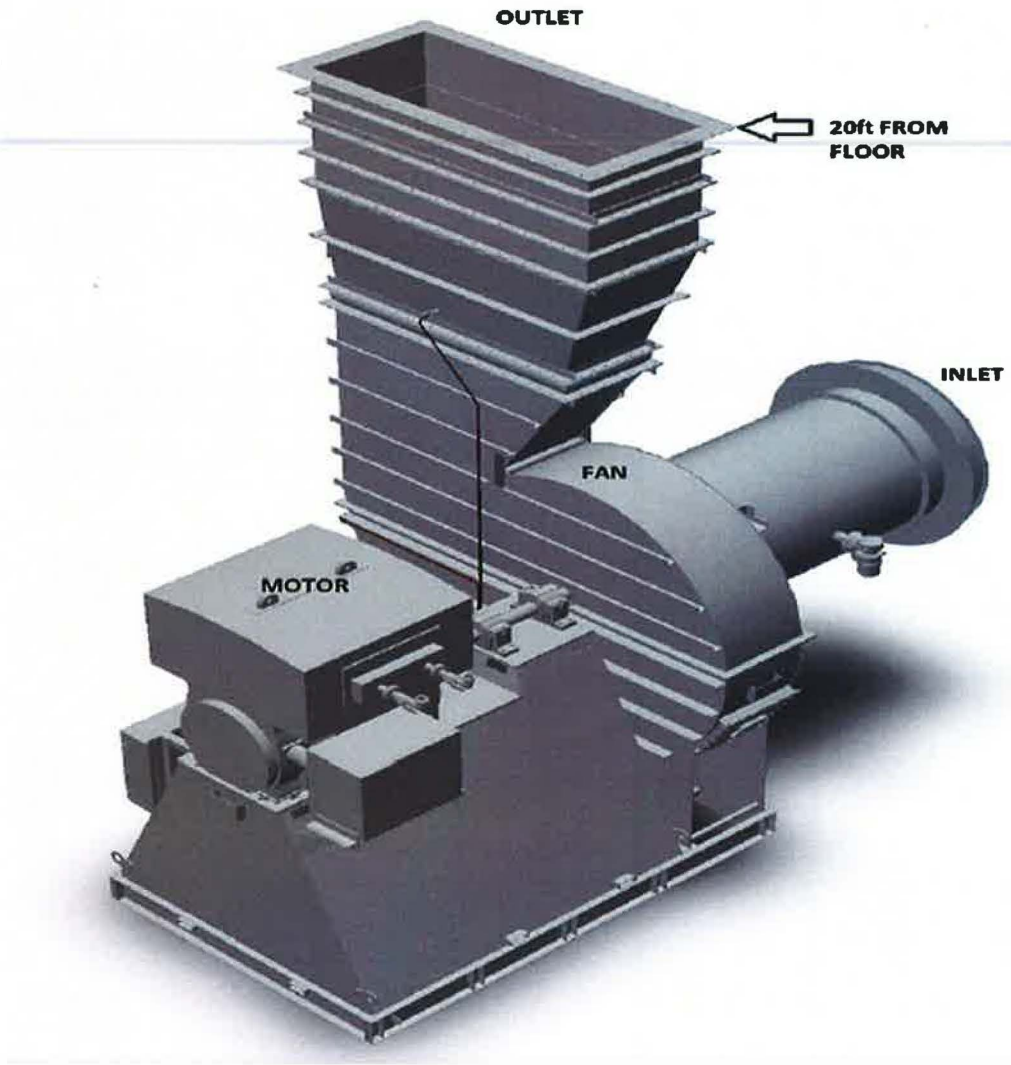
**38% Complete**



# Safety Significant Confinement Ventilation System 15-D-411



# Line Item Capital Asset Projects
# Safety Significant Confinement Ventilation System




## Critical Decision(CD) Status

- ✓ CD-0 Approve Mission Need
- ✓ CD-1 Approve Alternative Selection and Cost Range
- ✓ CD-2/3
  - Approve Performance Baseline
  - Approve Start of Construction
  - Received approval on May 10, 2018
- CD-4
  - Approve Start of Operations or Project Completion
  - November 2022

This schematic shows one of the six fans being built for the new SSCVS. The 1,000 horsepower fan is 20 feet tall. The intake is 6 feet in diameter, and the outlet is 4x10 feet. The fan weighs more than 20 tons.

# SSCVS Modes of Operations

## SSCVS Preferred Operation Mode:

- Extract air from the Underground
- Air flows through the Salt Reduction Units in the Salt Reduction Building (SRB) to remove nominally 90% of the salt from the airflow
- Air flows from the SRB to the New Filter Building (NFB) for the airflow to go through the HEPA filtration process
- Air flows out the NFB to atmosphere

## SSCVS Alternate Operation

- Extract air from the underground
- Airflow bypasses the SRB and flows to the NFB, through HEPA filtration
- Air flows out of the NFB to atmosphere

# DNFSB Concerns

- **Letter to Secretary Perry from the Board on August 27, 2019**
- **Safety Issues:**

1. *Safety Instrumented Systems' Performance Criteria Are Not Adequate*—The SSCVS project established performance criteria for the ventilation dampers to ensure that they reach their fail-safe positions (salt reduction building bypassed and HEPA filters enabled) within 60 seconds of receiving an actuation signal. The Board Staff has determined a 60 second damper closure time may not be adequate to prevent radiological contamination releases for all potential event initiation locations.

   *DOE response* - The 60 seconds mentioned in the Preliminary Documented Safety Analysis (PDSA) for the SSCVS is considered to be a nominal closure time. The placement of the CAMs in the underground has not been finalized, and the credited closure time that will eventually be included in the WIPP Documented Safety Analysis (DSA) will ensure that the dampers close in time to prevent an unfiltered release of radioactive materials to the atmosphere. If necessary, the dampers are capable of closing in 30 seconds or less. Furthermore, several events that could push contamination from the waste shaft station toward the exhaust shaft, which are represented by the three cases discussed in your staff's report, do not credit the SSCVS to protect collocated workers or the public.

# DNFSB Concerns

2. *Supply Fans Are not Interlocked with Exhaust Fans*—The final SSCVS design did not establish any requirements for an interlock with supply fans as recommended by Table A-1 of DOE Guide 420.1-1A, *Nonreactor Nuclear Safety Design Guide for use with DOE O 420.1C, Facility Safety.*

   *DOE Response* - In the early stages of the SSCVS project, the Carlsbad Field Office (CBFO) made a conscious decision to limit the capital project scope to above-ground facilities and equipment. As a result, these topics were not addressed in the PDSA. However, CBFO now recognizes the need for an interlock between SSCVS exhaust fans and future supply fans. This issue was initially identified in February 2019, during a Department of Energy (DOE) project peer review team. The SSCVS project has committed to installing such an interlock before the supply fans begin operation. The safety classification of the interlock awaits further analysis of the reconfigured mine airflow.

# DNFSB Concerns

3. *The Radiological Protection Program Establishes CAM Locations and Setpoints*—WIPP currently uses CAMs as part of an occupational radiological protection program under Title 10, Code of Federal Regulations, Part 835 (10 CFR 835), *Occupational Radiation Protection Program*. A radiological protection program established under 10 CFR 835 does not establish equivalent setpoints to ensure 10 CFR 830 requirements are met. This safety item results from the failure to properly consider the CAMs during the SSCVS design.

   *DOE Response* - Similar to the interlock, the CAMs were deliberately excluded from the PDSA. The responsibility for CAM design, procurement, and placement was assigned to existing facility operations. The CAM locations and set points, and the bases for them, will be included in the WIPP safety basis prior to SSCVS startup.

# DNFSB Concerns

## Observations:

1. *WIPP Does Not Specify CAM Performance Criteria*—WIPP must consider the long term effect of the underground salt environment on CAM performance, as well as the effects of a smoke environment that may co-exist with a radiological release event.

   *DOE Response* - The safety-significant underground CAM system will meet a Safety Integrity Level (SIL)-2 or equivalent reliability, with a minimum of three instruments in service. However, design of the full safety-significant architecture for this control system is not yet complete. The system should be installed and commissioned well before SSCVS becomes operational.

# DNFSB Concerns

2. *Redundancy Objectives Are Unclear*—The Safety Evaluation Report indicated that the radiation detection "instrument system will be connected to a programmable logic controller [PLC] with redundant voter logic to initiate alarm signals to the central monitoring system [CMS]." It is not clear if this redundant voter logic will be designed to maximize the probability of detection (e.g., one out of two logic), to minimize the probability of a false or spurious actuation (e.g., two out of two logic), or to use some type of an optimization scheme (e.g., two out of three logic).

   *DOE Response* - The SIL-2 calculations indicate the system will use one-out-of-three voter logic to maximize the probability of detection. The performance criteria and redundancy objectives will be fully described in the WIPP DSA before the CAM system enters service.

# Summary

- The Department expects that for all activities and phases in the lifecycle of missions (design, construction, research and development, operations, and decommissioning and decontamination), appropriate mechanisms are in place to ensure that exposures to workers, the public, and the environment to radiological and nonradiological hazards are maintained below regulatory limits - DOE P 450.4A
- DOE and its contractor have taken actions to address DOE and Board concerns.