



# SUBTERRANEAN OPERATIONS – OVERSIGHT AND SAFETY INTEGRATED PROJECT TEAM (IPT)

DOE/EFCOG Fire Protection Workshop Presented: November 8, 2022



SC - SURF



NNSA – U1a



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## 2013-2014 DOE FSC Formed the Subsurface Facility Working Group

- Working group comprised a list of DOE subsurface facilities
- Specific recommendations included:
  - AU-11 should incorporate applicable provisions of the MSHA into DOE's Worker Health and Safety Program for DOE subsurface facilities.
  - AU-32, through the DOE Fire Safety Committee, should establish guidelines for coordinating both DOE O 420.1C and NFPA 520 design requirements into DOE subsurface facilities. Such guidelines should address the following areas as either an augmentation or a separate Appendix to DOE-STD-1066-2012. [COMPLETED – Incorporated into DOE-STD-1066-2016]
  - AU-32 should expand guidance for Mine Rescue or Emergency Responder organizations to address fire emergency rescue and/or suppression activities in subsurface facilities.

# Most recommendations were incorporated and/or completed into existing Fire Protection standards.





**ISSUE**- Whether DOE should address gaps in Safety & Health standards of its subterranean facilities by utilizing the Subterranean Operations IPT and if existing documents should be revised or new documents created for subterranean facilities.

#### Phase 1 Activities (January 2022 – September 2022)

- Completed Phase 1 activities described in Charter (dated January 2022)
- Created 5 Sub Teams (Electrical Safety, Fire Protection, Health Physics, IH/IS, and Operations) to review requirements in DOE documents and identify gaps and propose recommendations as they pertain to Subterranean Facilities
- IPT reviewed select Site documentation and completed three visits to EM (WIPP), NNSA (U1a), and Science (LBNF/SURF) Sites
- IPT Chairs briefed Phase 1 results to Senior Executive Sponsors from EHSS (Dressman, Smith), EM (Sosson, Hawks), NNSA (Sigg) and SC (Weiss, Verhaagen)

Subterranean Ops IPT completed Phase 1 activities and received strong endorsement from all Sponsors to proceed with Phase 2 initiatives.





#### **Compilation of Sub Team Results**

- FP Codes and standards currently have technical bases that rely on underlying assumptions for surface facilities
- Much of what DOE does with electricity to meet scientific, defense and intelligence mission objectives does not fall within the scope, or intent, of national electrical codes and standards
- IH/IS gaps include: Diesel Particulate Matter (DPM), Immediately Dangerous to Life and Health (IDLH) environments, Ground Support, Air Quality/Quantity (Ventilation), Technical Qualifications, and Hoists
- Codes and standards for current facilities were found to be inconsistently applied across nearly all facilities reviewed
- Emergency response in underground facilities by Emergency Response Teams is different than in surface facilities
- Underground radon exposure is outside the scope of 10 CFR 835 Occ. Rad. Protection, but MSHA regulations found in 30 CFR 57.5037-57.5040, Radiation -Underground Only, may have appropriate guidance

All Sub Teams completed documented analyses of gaps with proposed recommendations regarding S&H standards in DOE Subterranean Facilities.

# **ENERGY** Analyses of Facility Safety Elements



## **Facility Safety Documents**

#### DOE O 420.1C Facility Safety

- Establish facility and programmatic safety requirements for: Nuclear safety design criteria; Fire protection; Criticality safety; Natural phenomena hazards mitigation; Cognizant system engineer program
- Does not consider internal/external collapse of subterranean facilities simply as a function of geology (i.e., not necessarily initiated by a seismic event)
  - How does this affect life safety egress from the facility during a design basis accident (such as a collapse?
- Does not require modeling studies of a collapse of subterranean facilities as a function of geology and likely other internal/external events

## Facility Safety Guides/Standards/FAQS

- Explicitly/implicitly pertain to surface facilities and may not adequately address subterranean facilities
- Additional competencies targeted to address the unique needs of subterranean facilities should be considered for the Civil/Structural Engineering Qualification Standard such as familiarity-level knowledge of rock mechanics and engineering geology

The Subterranean Ops IPT identified gaps in DOE documents pertaining to safety and health and facility safety requirements in subterranean facilities, which does not imply unsafe conditions or implementation in the field.





## Table of 26 Subterranean Facilities (EM, NE, NNSA, SC)

- Descriptive/Characteristic information covering 'Facility Description,' 'Facility Status,' 'Geologic Information,' 'Worker Safety & Health,' 'Ventilation,' 'Natural Phenomena Hazards,' ' Fire Protection and Life Safety.'
- Information will inform Task Teams (*discussed next*) on Phase 2 activities based on longitudinal (Intra-Site) and cross-sectional (Inter-Site) comparative analyses.
- Table will be first Phase 2 Deliverable to Sponsors (early November).

Table 1. Com	pliation of DUE	Subterranea	n Facilities pr	oviding high le	vel description, charac	cterization and	status.	
(Note 1: The Sub	terranean Operatio	ns IPT will perio	dically update th	is table to reflect o	changes to identified faciliti	ies and to include a	ndditional fa	cilities as appropriate)
(Note 2: Refer to	'Rationale' worksh	eet for explanat	ion of column inf	ormation)				
Facility Description						Facility Status		
Facility Name	Location	DOE Office (EM/NNSA/SC)	DOE Owned/ Leased/Other	Mission	Information entered by:	Construction/ Operations/Other (see Note 2)	Nuclear Facility (Y/N)	List of Modeling Studies (e.g., Evacuation, Fire, Ventilation) (see Note 2)
Ula	NNSS Area 1	NNSA/NFO	DOE-Owned	Subcritical Experiments	Allred/Jensen/Edlund/Ra chels/Collins	Operation and Construction	Yes: Haz Cat 2	Ventilation (VENTSIM), Geotechnical

6





<u>Creation of 4 Task Teams (TT)</u>: Need determined by Phase 1 activities and results. TT Leads have developed and presented FY23 initiatives at Full IPT meeting.

- Facility Safety (NPH/Geotechnical) (Lead Gibson)
- International Facilities & Standards (Lead Allred)
- Subterranean Modeling (Lead Sellers)
- Worker Safety and Health (Lead Sobieraj)

# **Reference Library of Relevant Publications:**

- Perform structured and documented literature review.
- IPT Microsoft Teams Site will serve as repository of information.
- Example: Underground Engineering for Sustainable Urban Development: National Academies of Sciences, Engineering, and Medicine. 2013.
  - "... risk in underground infrastructure has not received the same level of regulatory scrutiny as risk associated with surface infrastructure, and the levels of certain risks may not be well understood. Existing codes tend to be prescriptive in nature—prescribing specific procedures or materials—but underground space poses different safety challenges that codes intended for surface space were not designed to address."





#### **Phase 1 IPT Activities (Completed)**

- Substantiated previously identified WSH and Facility Safety gaps;
- Identified new Facility Safety gaps with respect to DOE O 420.1C and its associated Guides and Standards;
- Expanded the IPT Membership with strategic additions of EFCOG Electrical Safety Task Team, Nuclear Safety Basis, and NPH SMEs from across DOE;
- Completed Site Visits providing invaluable Field Truth;
- Microsoft Teams Site includes analyses and reports and serves as DOE reference library.

# Phase 2 Activities (In Progress)

- Task Teams to comprehensively and systematically evaluate all DOE Subterranean facilities (Document Reviews and select Site Visits);
- **By end of FY2023**, provide informed recommendation to Sponsors on benefit of creating new Subterranean Facilities document or revising existing documents;
- Scheduling strategic Site visits to Nevada (January 2023) and Fermi Labs (Spring/Summer 2023).
- Utilize cadre of SMEs to support ad hoc requests.





#### So where do we need your help?

- The Modeling Task Team will need assistance developing recommendations to include in future guidance/requirements specifically for life safety/egress, geotechnical, and fire
- Future input to potential changes to DOE orders, standards, and regulations





# QUESTIONS?

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