

The Role of NMSU/CEMRC at the DOE's Waste Isolation Pilot Plant (WIPP)

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Presentation Outline

- Brief WIPP Background
- Brief regulatory framework
- CEMRC and its role at WIPP
- Current challenges
- An expanded role for NMSU-CNM

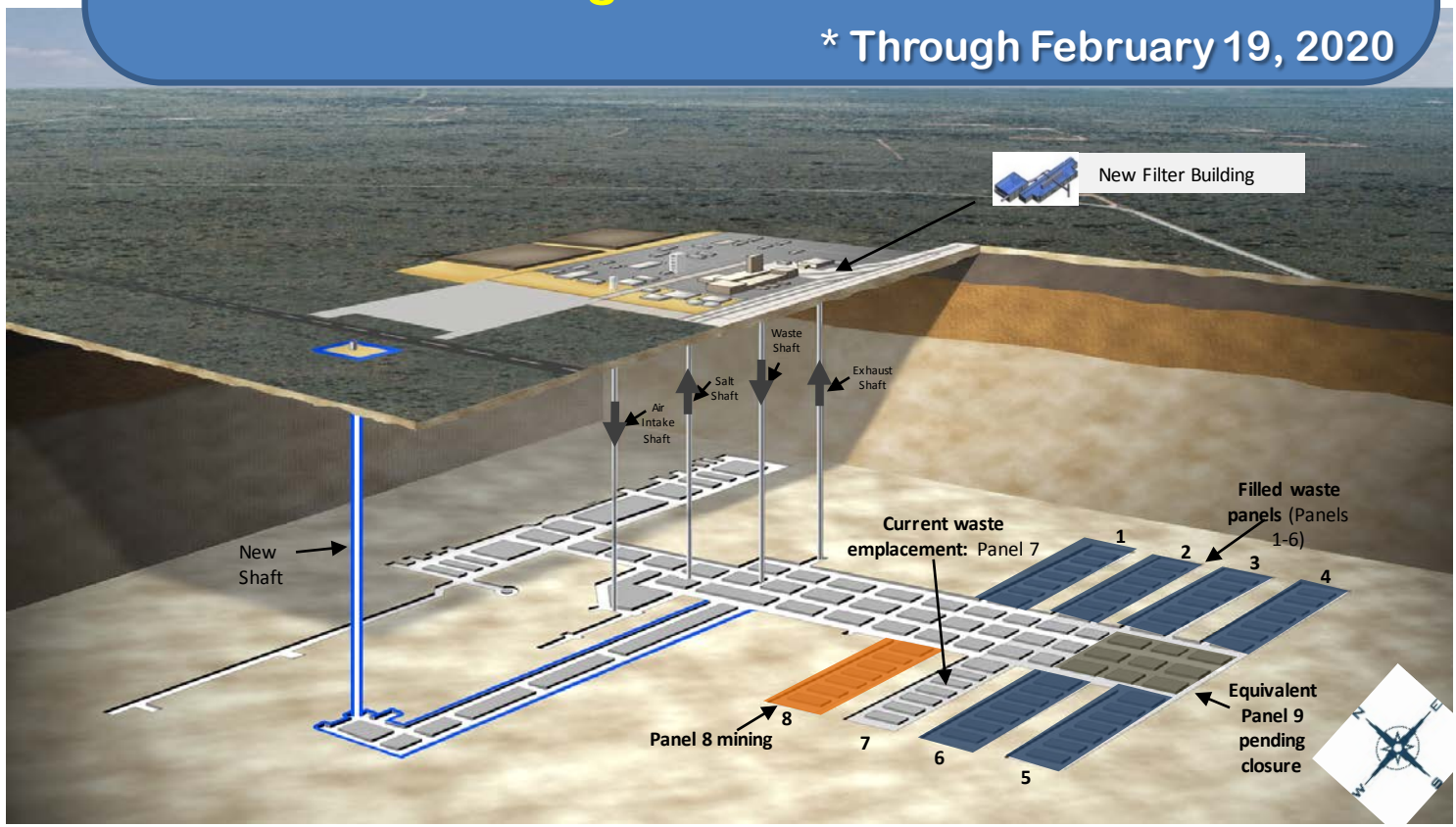


WIPP-A Working Geologic Repository



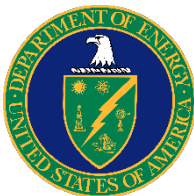
12,664 Shipments received
69,089 Cubic meters of TRU waste disposed
181,586 Containers emplaced
15,1488,308 Loaded miles
22 Storage sites cleaned

* Through February 19, 2020



WIPP Regulatory Framework

Public Law 102-579, WIPP Land Withdrawal Act (LWA), 102nd Congress
Withdraw certain public lands and to otherwise provide for the operation of WIPP



U.S. Department of Energy (DOE)

Worker Safety, Industrial Safety, Nuclear Safety, Radiological Safety, Security



U.S. Environmental Protection Agency (EPA)

Repository certification, TRU Waste Activity, PCB/TRU waste, air, ground water



New Mexico Environment Department (NMED)

RCRA hazardous constituents, air, water discharge, ground water



U.S. Nuclear Regulatory Commission (NRC)

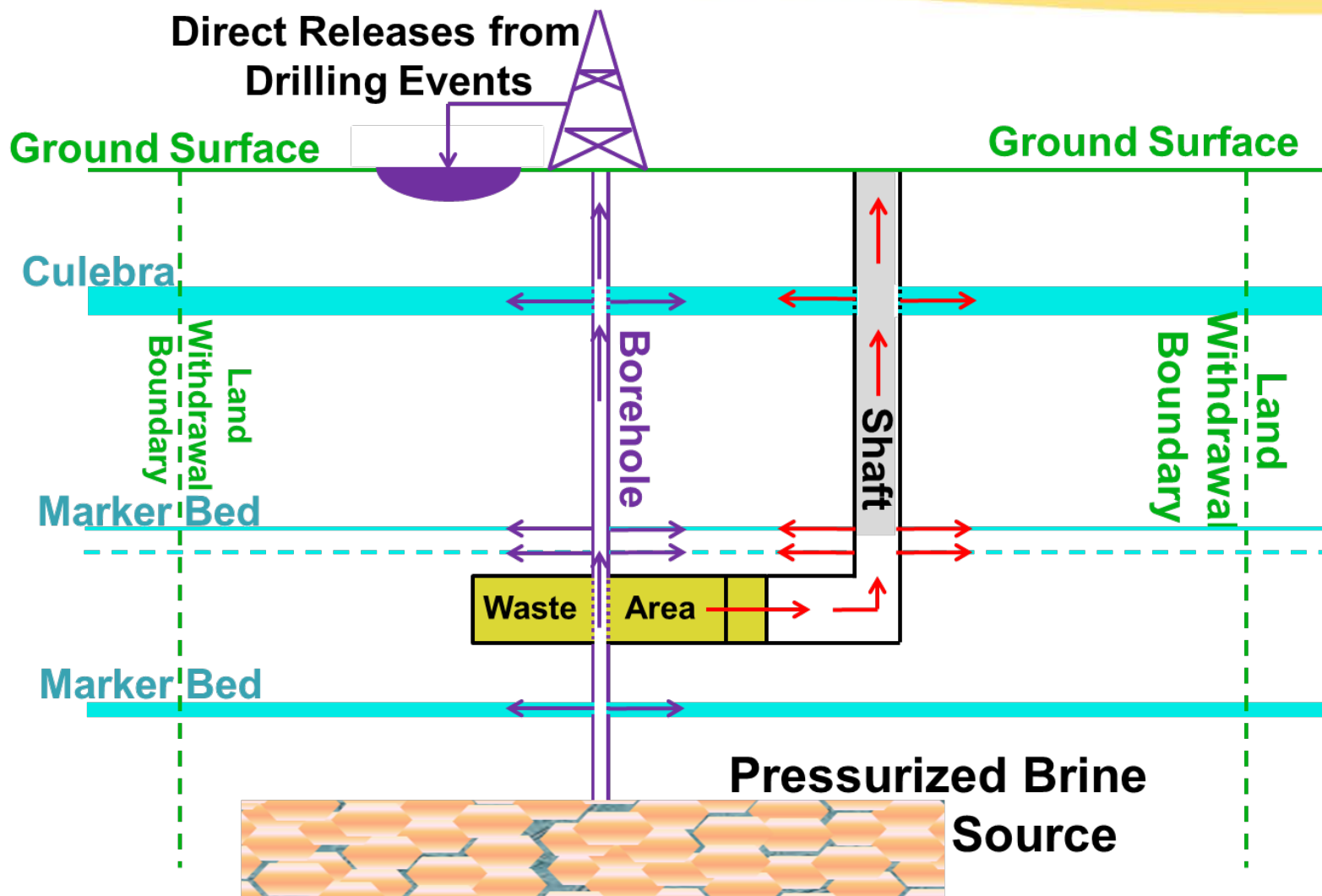
Transportation Type B packages for nuclear materials



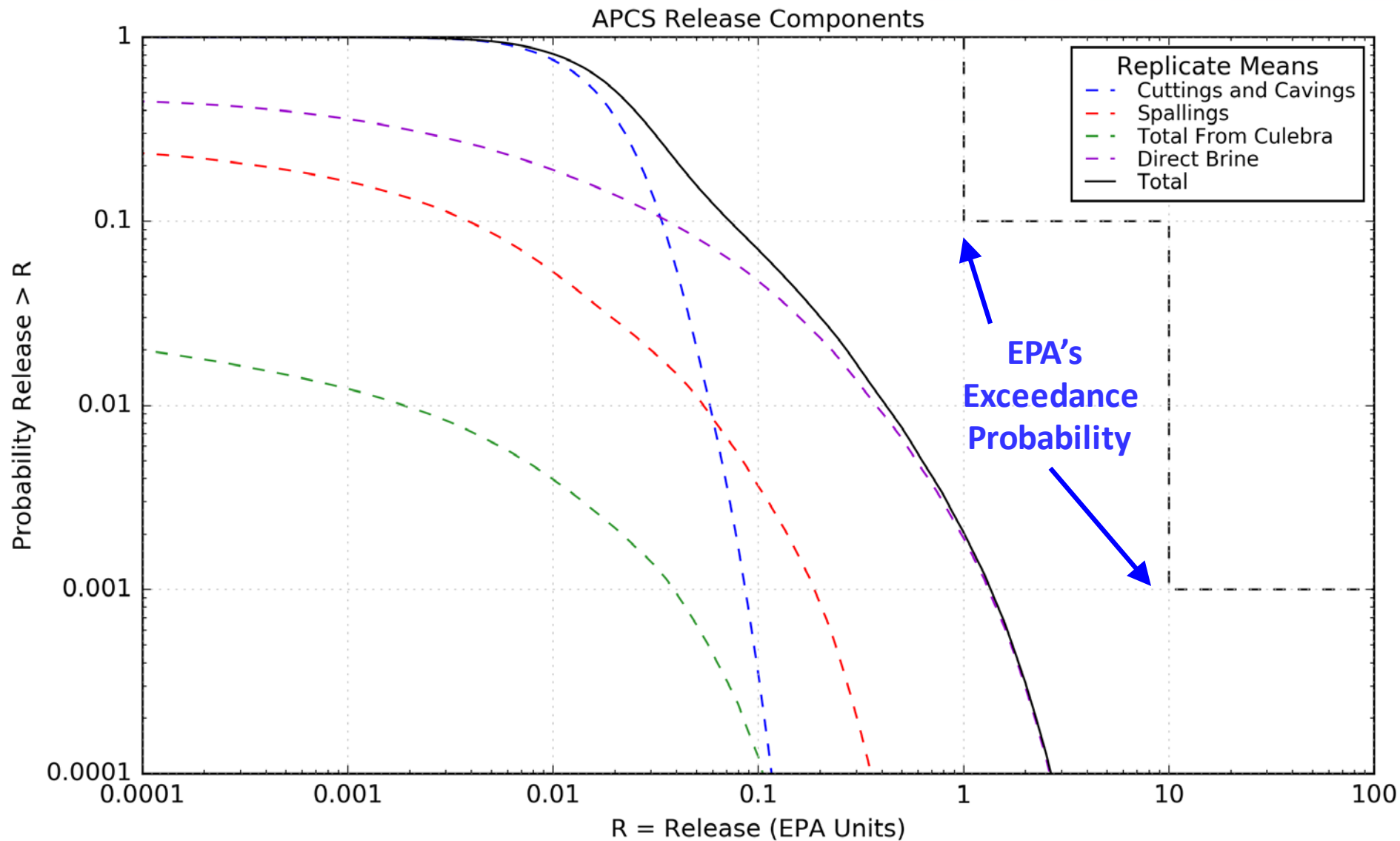
U.S. Department of Transportation (DOT)

Highway transportation, Type A containers

Post-closure Release Pathways



Performance Assessment- Key to Certification



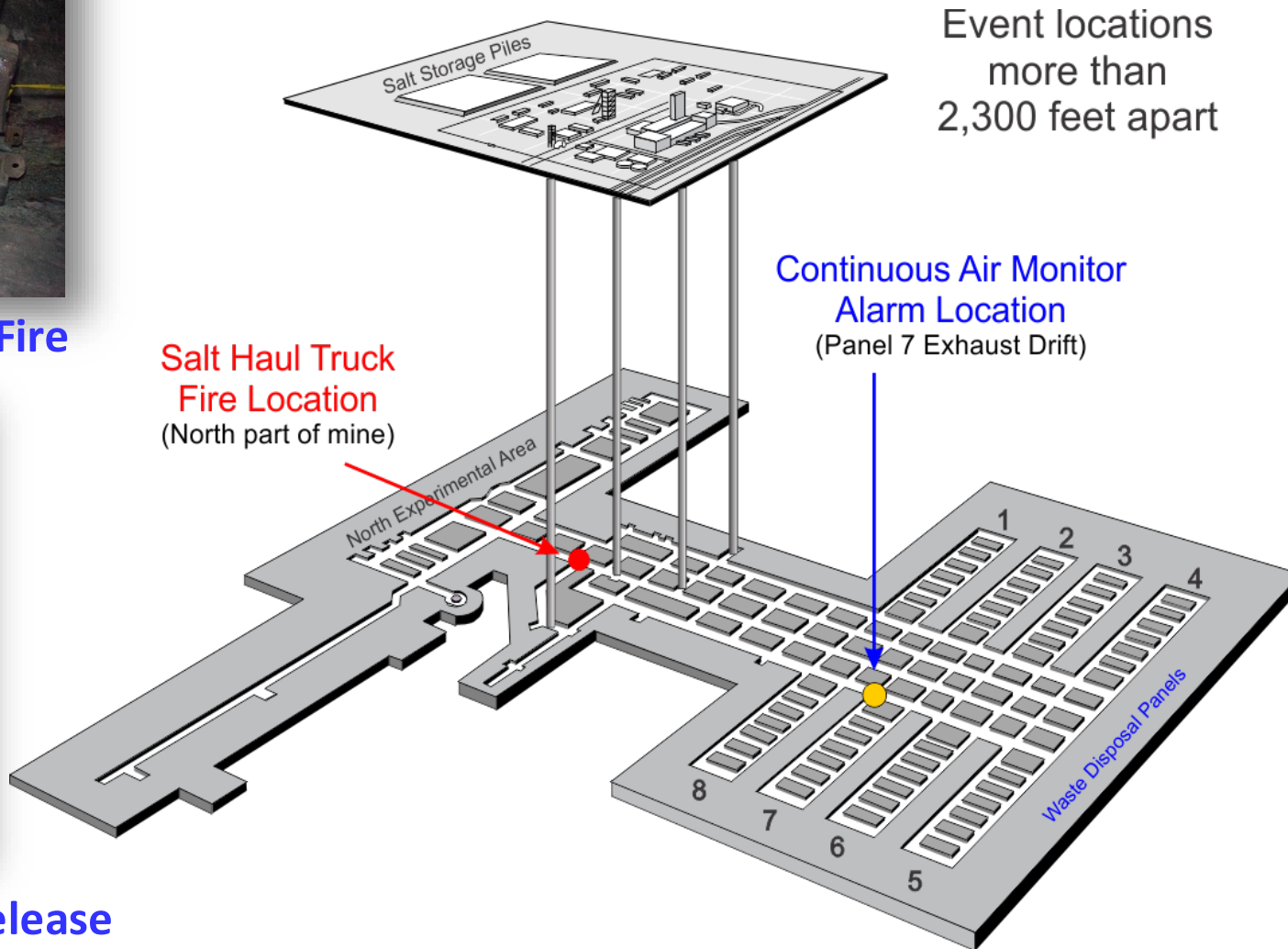
WIPP Incidents



Feb. 5, 2014 Underground Fire



Feb. 14, 2014 Radiation Release



- CEMRC- division within NMSU's College of Engineering
 - *Independent* monitoring program to evaluate impact of WIPP on human health and environment
- Created in 1995 by the DOE with a *financial assistance grant* to NMSU
 - Donated land near NMSU, CNM
 - Used to finance construction of facility
 - Paid off construction debt in 2004
- Grant specifics:
 - Authorized under DOE Organization Act, Public Law 95-91, Sec. 102(11); 42 USC Section 7101 et sec.
 - Non-competitive (10 CFR 600.6(c)[1])
 - *Less substantial* involvement by DOE, not *independent*



Why is CEMRC Important to the DOE?

- CEMRC is part of the larger working relationship between the DOE, the state of NM, and the region
- DOE and WIPP remain welcomed neighbors in SE NM, largely because of transparency and commitment to safety
- Minimal concern in the region over radioactive releases in large part because of CEMRC
- Work used exclusively to support WIPP:
 - Range of radiochemistry, environmental, human health monitoring services
 - Detected global fallout from the 2011 Fukushima NPP accident
 - First to detect radioactive release following the 2014 event



Station A, Fixed Air Sampler



3-way airstream split



High-vol., aerosols



Soils and sediments



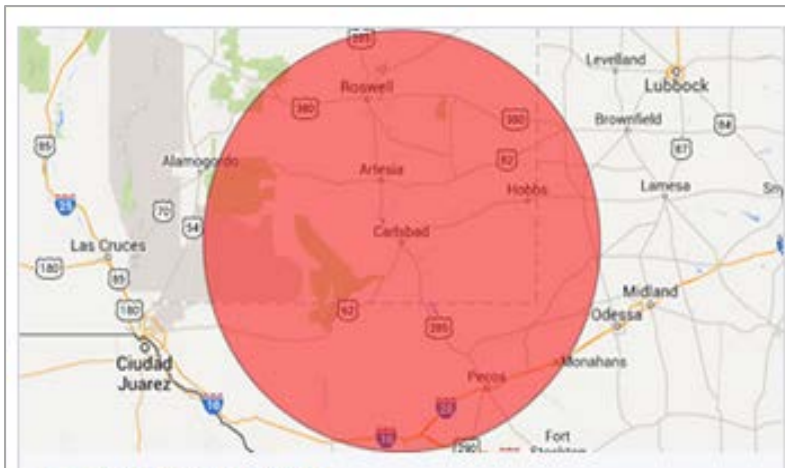
Surface and groundwater

Media Reactions to the 2014 Event

Eddy County Sheriff's Office

★★★★★ (90 ratings)

2,295 likes · 158 talking about this · 11 were here



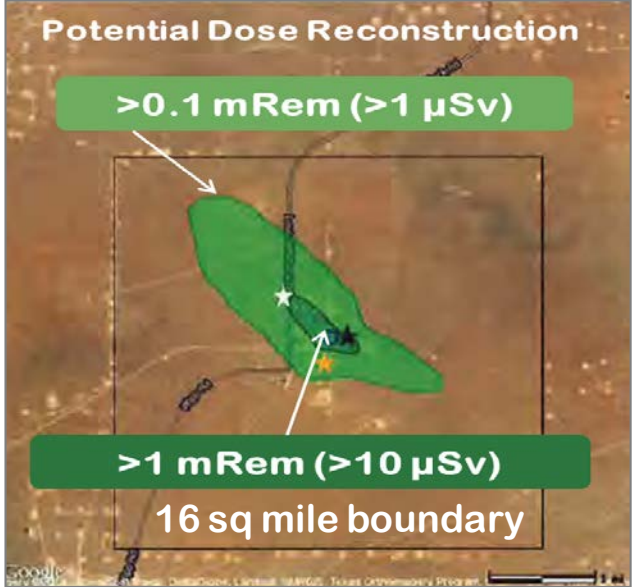
“BE READY TO EVACUATE; The federal government knew this on day one it took place, but did not tell the public the true extent of the radiation release.”
www.turnerradionetwork.com

“The conspiracy theories abound. Don’t believe it. No evacuations are in the works nor are they needed.” Eddy County Sheriff

climateviewer.com/2014/02/20/above-ground-plutonium-detected-new-mexico/

“Levels are highest ever detected” around site. Approximately 96,000x background.

The area of Maximum Alert for New Mexico, Texas, and Oklahoma are circled in red. Each numbered segment represents a total of 5 hours wind travel at current wind speed of 17 mph. So in section 6, the wind from WIPP would have reached Oklahoma City in approximately 30 hours, assuming particles carried that far, and winds have remained fairly constant. Precipitation bands are also appearing on water vapor.





News Report Following the First Town-hall meeting in Carlsbad, NM

CARLSBAD, N.M. (KRQE) – A lot questions remain about the WIPP radiation leak.

On Thursday at a town hall meeting in Carlsbad, residents and many WIPP supporters told officials they're frustrated.

They say they're not getting enough answers and the rumor mill is running wild. Some residents say they're flat out concerned for their safety, while others just want more information faster.

On Thursday, Carlsbad area residents, many of whom strongly support WIPP, pleaded for more information about the Feb. 14 underground radiation leak that seeped outside.

"We think that we should be the number one partner and know everything that's going on from A to Z," said resident John Hearton.

The Department of Energy worked to reassure people they are safe, even though the underground storage areas remained sealed off.

"There are no health impacts to you, to your family, the members of your community from the event," said WIPP technical advisor Fran Williams.

WIPP officials say the radiation levels around the WIPP site have now tested normal and there is no threat to the Carlsbad community.

The DOE says a second and third round of biological tests of the 13 contaminated WIPP workers show levels were extremely low and not likely to cause any serious health problems.

Some residents remain concerned.

"I want to believe what they're saying that the levels are practically non-existent, but truthfully, I don't really believe that," said Karen Armendaruz.

Why is CEMRC Important to the DOE?

- Communicated unfiltered monitoring results to the public
- Disseminated *independently measured and interpreted* data following the event in local media and Town Halls
 - provided public a key element of trust and transparency
- Public had access to all data, and free access to whole-body counting program
- CEMRC helped calm community fears and restored confidence because of its independence



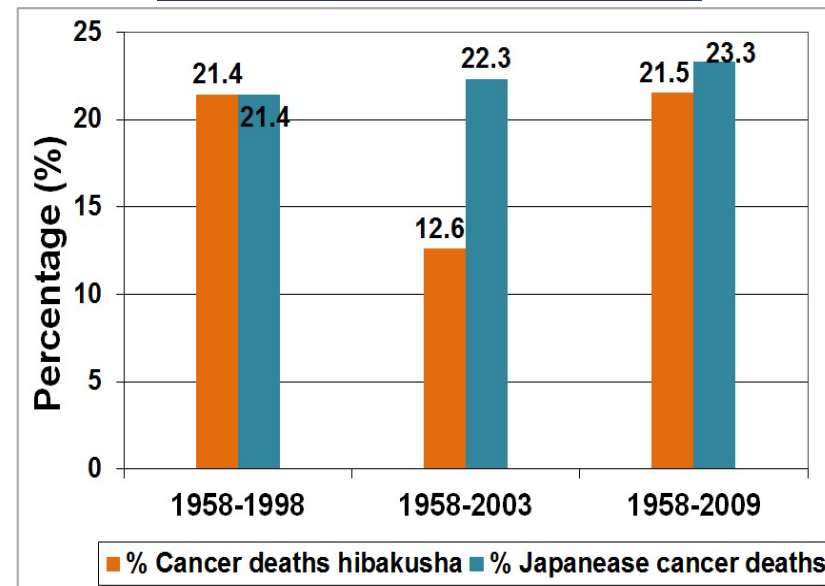
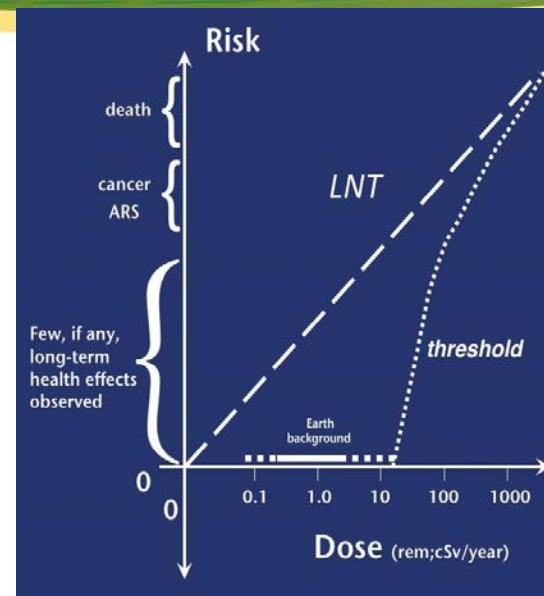
Controlling the Narrative Who is Trusted?

Least reliable source of information on nuclear accidents



Dispelling the Fear of Radiation: NMSU Low Background Radiation Experiments

- The fear of radiation originated around 1959 with the adoption of the **Linear No-Threshold (LNT)** hypothesis.
 - assumes that radiation doses > 0 (i.e. Earth's background) increases cancer risk
- Data show health effects only at high (>100 mSv) exposures
 - Leukemia incidence of 96,000 Hiroshima atomic bomb survivors is compelling evidence that the LNT model is wrong
- LBRE is showing that the LNT does not consider an organisms defense mechanisms, and that they may have evolved to thrive in the presence of non-zero background radiation



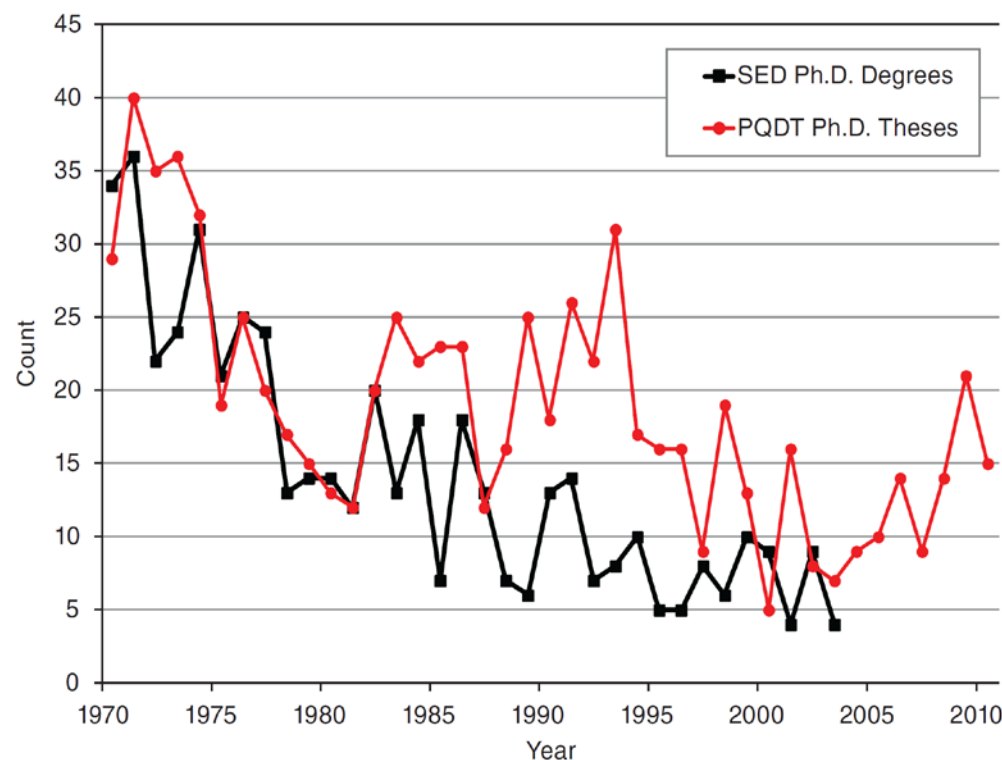
Current Challenges

- Nuclear Energy Institute estimated 39% of nuclear workforce eligible for retirement by 2018
 - 20,000 new workers needed by 2022
 - Maintain/increase technical competence

- DOE recognizes need for a Science & Technology Workforce Development Program

- Oil and Gas, unconventional drilling
 - Produced and flowback water
 - TENORMs
 - VOCs

- CEMRC- 2020, doing the same things
 - We understand the system much better
 - Moving from assumption-based PA to evidence-based PA



Meeting a Need

- National Nuclear Security Administration (NNSA)- Safeguards Human Capital Development
 - works to maintain and grow a competent safeguards workforce in the US

- DOE-EM Science & Technology Workforce Development Program
 - develop STEM students
 - DOE/FIU *cooperative agreement* since 1996

- Recently expanded to DOE-LM
 - Over 50% of LM sites perform long-term surveillance and monitoring

- Columbia Basin College (WA)- nuclear technology program maintains stream of qualified applicants to Hanford and Richland NPP



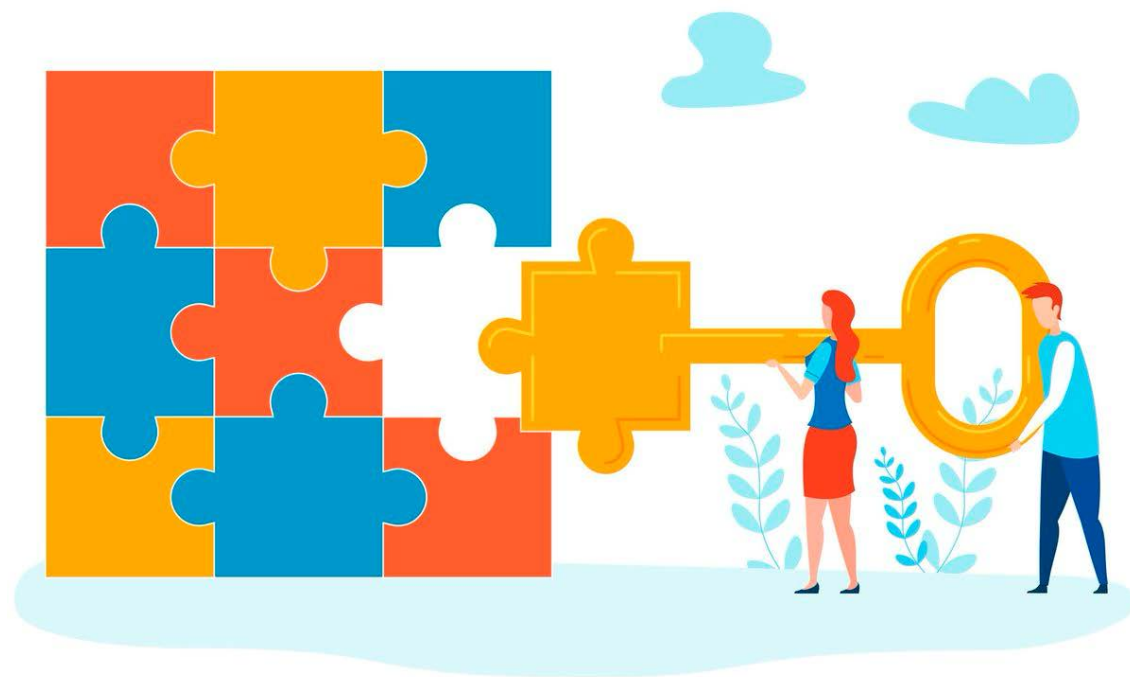
Strengthen Collaborations

- **Academia**
 - Other Universities (Era of MOOC)
 - Florida International University

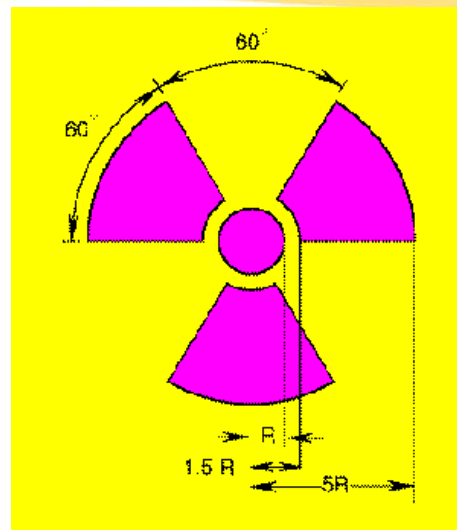
- **Government**
 - DOE and other federal agencies (BLM, EPA)
 - National Laboratories (2 in CNM)

- **Private Sector/Industry**
 - Urenco, AREVA, Terra Power, Holtec International

- **Non-Profit Organizations**
 - American Nuclear Society (ANS-Carlsbad)
 - Health Physics Society
 - American Chemical Society
 - Nuclear Threat Initiative



- Anticipate community needs and build a strong SE NM coalition
 - Promote program regionally and nationally
- Passive Institutional Controls
 - Markers, warnings that transcend generations
- Radiological Safety Training
 - Radiological Worker I and II
 - Radiological Control Technicians
 - International Safeguard Program
- Radiochemistry Specialization
 - based on health physics curriculum
 - introduction to radiochemistry
 - application of radiochemistry
 - radiochemistry laboratory
 - leverage existing analytical chemistry programs



Example Radiochemistry Track (Illinois Institute of Technology)

Fall Semester	Spring Semester
PHYS 571 Radiation Physics (3)	PHYS 573 Standards, Statutes & Regs. (3)
PHYS 561 Radiation Biophysics ** (3)	PHYS 580 Introduction to Radiochemistry (3)
PHYS 575 Case Studies (3)	CHEM 509 Phys. Methods of Characterization (3)
PHYS 574 Introduction to Nuclear Fuel Cycle (2)	PHYS 582 Applications of Radiochemistry (3)
Professional Courses	Summer Semester
MATH 525 Statistical Models and Methods (3)	PHYS 581 Radiochemistry Lab. (3)
SCI 522 Public Engagement for Scientists (3)	PHYS 550 Instrumentation for Health Physics (3)
SCI 511 Project Management (3)	CHEM 512 Spectroscopy II Inorganic (2)

Required courses in **RED** (5 of 5 in radiological sciences) and **PURPLE** (3 of 3 in radiochemistry).

Radiochemistry electives in **BLUE** (1 out of 3).

Other professional electives in **GREEN** (2 out of 3).

PHYS 770 is a prerequisite of CHEM 581.

*Note: with your advisor's concurrence, you may also take PHYS 597, Reading and Special Problems (1-4 credits).

**PHYS 561 will be available in 2017, and will be offered every other years since.

Total minimum credit hours = 32. (Credit hours in parentheses.)

Questions

Weighing the Fear of Radiation

WIPP radiation release Event (>0.01 mSv)

Average annual US radiation dose (6.2 mSv)

1 average full-body CT scan (15 mSv)

Maximum annual dose for US radiation workers (50 mSv)

Lowest annual radiation dose linked to increased cancer risk (100 mSv)

Maximum allowed radiation dose for emergency workers (250 mSv)

1600 m (~1 mile) from Hiroshima hypocenter (360 mSv)

Average thyroid radiation dose observed in Chernobyl evacuees (490 mSv)

Radiation Poisoning > 5 Sv

