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# Nuclear Smuggling Detection & Deterrence (NA-213)

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Program Manager

# Agenda

- NSDD Mission
- History
- Program Metrics
- Challenges
- Summary



# NSDD Mission and Objective

## **Mission:**

Build global capability to detect, disrupt, and investigate the smuggling of nuclear and other radioactive material before it can be used in an act of terrorism.

## **Objective:**

Promote counter nuclear smuggling along high-risk pathways.



*Radioactive material seized during a Georgian sting operation in 2021*



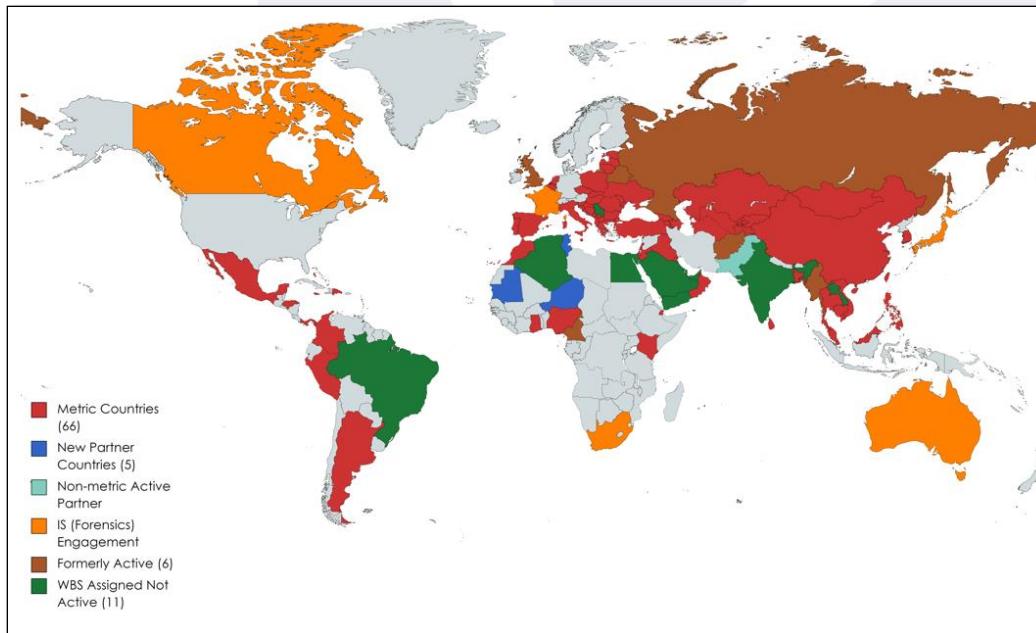
*Kazakh authorities measuring seized yellowcake in 2019*

# NSDD History



# Counter Nuclear Smuggling Global Reach

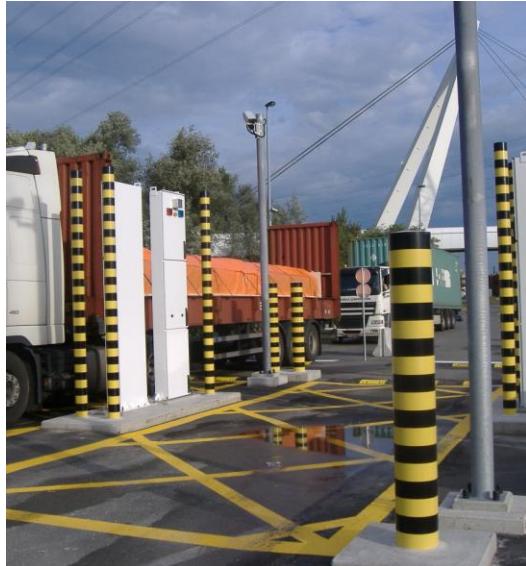
- NSDD Today:
  - Active agreements with ~90 partner agencies
  - Actively engaged with partners in 77 countries (FY23 Q3)
    - Internal security/law enforcement (ISLE): 13 countries (FY23 Q3)
    - Non-official points of entry (GBSI/MVP): 8 countries (FY23 Q3)
  - Installed equipment at more than 700 sites in over 80 countries (FY21 Q1).
    - Has installed over 4000 RPMs.
    - Performed service life extensions at over 100 sites in FY22.



# Counter Nuclear Smuggling Challenges

- Probability of encounter: multiple mission spaces with complex smuggling pathways for material out of regulatory control (MORC)
- Probability of detection (radiation physics): implementing technical solutions to overcome MORC detection challenges
  - Background radiation, shielding, masking
- Probability of detection (operational): Integrate CNS mission with existing front line officer (FLO) duties
  - reduce burden on FLOs posed by innocent alarms, volume of traffic at POEs, and poor traffic control
- Equipment selection and sustainability: understand equipment performance/limitations (detection goals) and maintain deployed systems
- Building and maintaining partnerships

# Challenge: Probability of Encounter



## Official Ports of Entry (POEs)

Internationally recognized border crossing including land, air, and sea borders

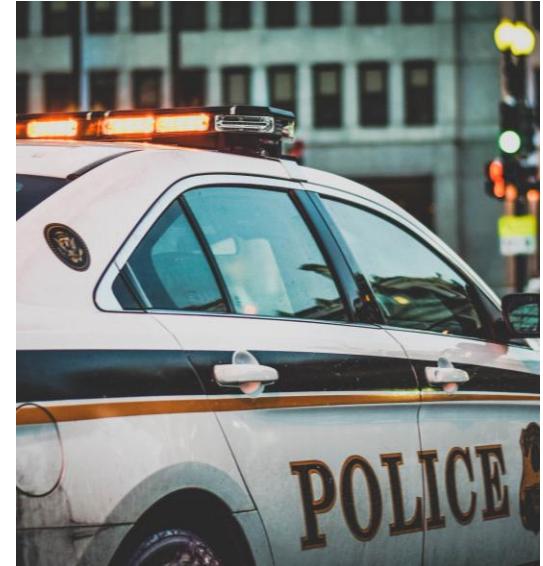
- *Detection equipment (e.g. portals, vehicle-based, man-portable, RIDs)*
- *Ancillary computers, comms, cameras*



## Frontier Areas: Green & Blue Borders

Outside of POE near an internationally recognized border, along administrative lines and/or disputed border areas

- *Detection equipment*
- *Suite of surveillance, patrol, interdiction and search equipment*

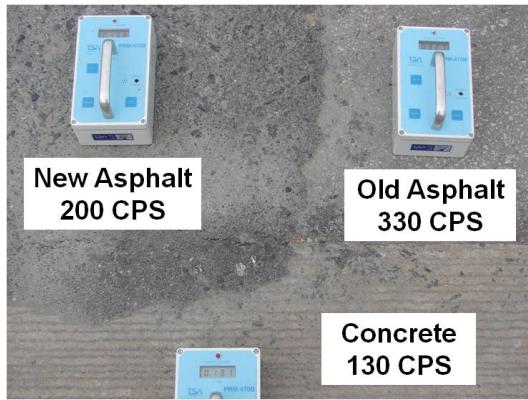


## Internal Security and Law Enforcement

Set back from an internationally recognized border at various internal locations

- *Detection equipment*
- *Suite of surveillance, patrol, interdiction and search equipment*

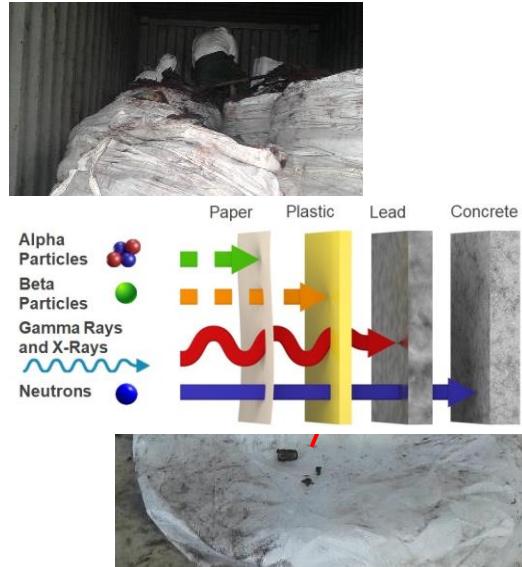
# Challenge: Probability of Detection (Radiation Physics)



## Background Radiation

Substantial global variability and can differ significantly over short distances

- High background radiation can decrease even stationary detector sensitivity



## Shielding

High-density material such as lead and low-density material such as concrete shield gamma and neutron radiation, respectively

- Metal in vehicles can reduce the detector response
- An adversary may use these materials to attempt to evade detection



## Masking

Radioactive material used to hide or “mask” the presence of another radioactive material

- Masking materials could be NORM, medical, or industrial isotopes
- These materials could be used by an adversary to hide or “mask” the signature from MORC

# Challenge: Probability of Detection (Operational)



## Naturally Occurring Radioactive Material (NORM)

Common in shipments (~2% of all occupancies) and may cause innocent alarms

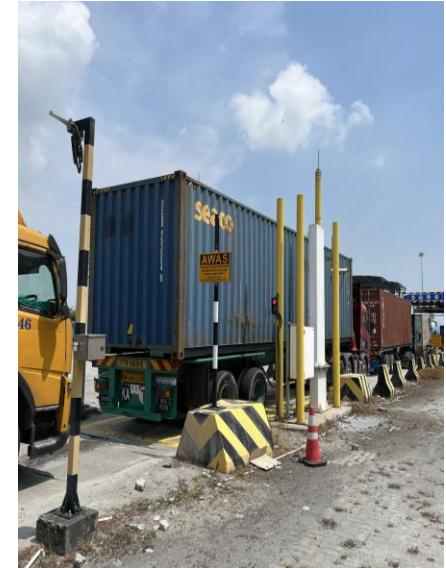
- Requires substantial FLO time to process alarms
- Potentially increases FLO complacency



Photo by Stella Kalinina/NYT  
**POE Traffic Volume**

Traffic volume at all types of POEs poses multiple operational challenges

- Global container traffic in last 20 yrs quadrupled to over 800 M TEUs



## Traffic Control

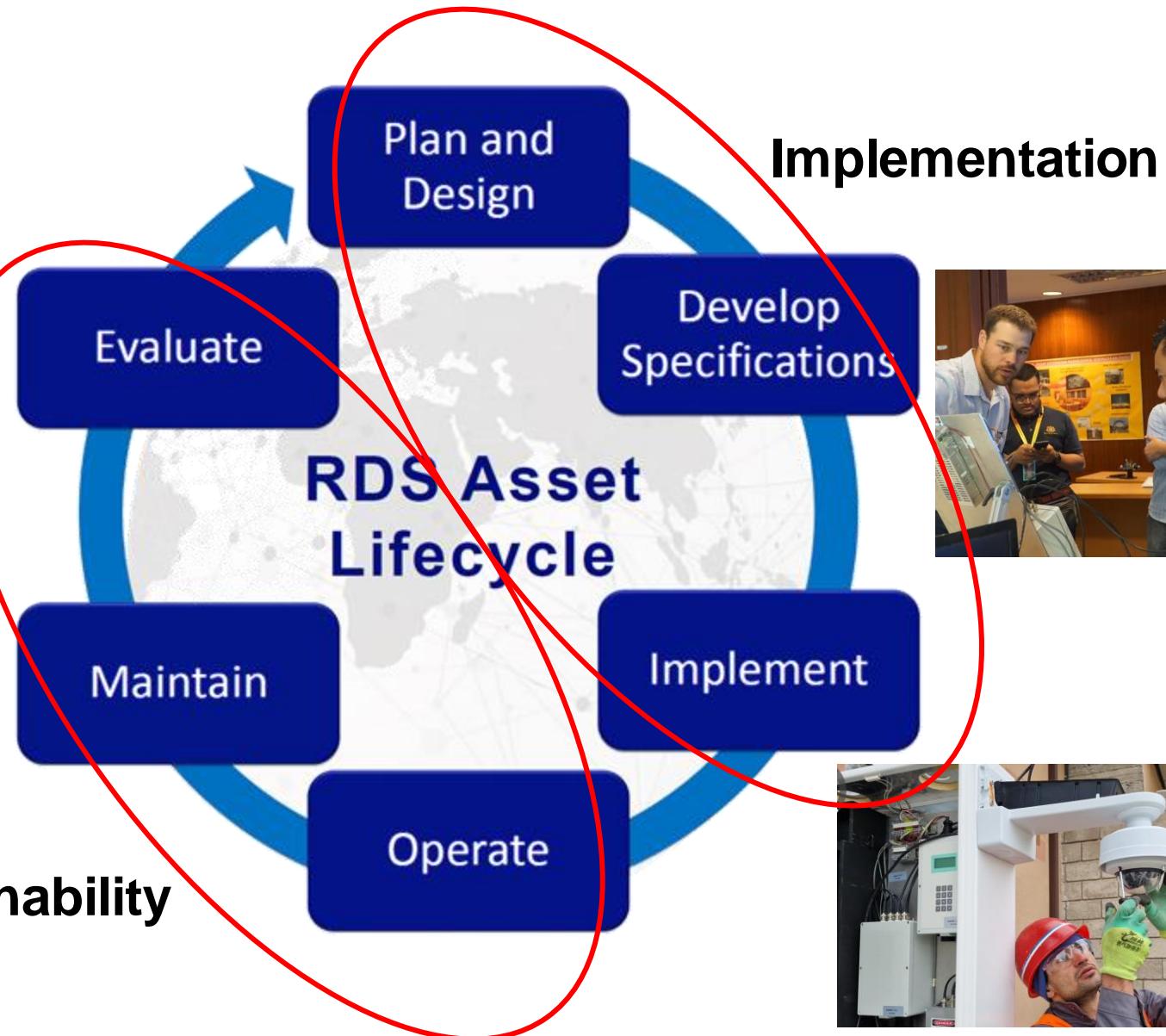
Speed control and crowding/tailgating can significantly impact the ability of RPMs to detect MORC.

- Crowding at pedestrian RPMs
- Speeding through RPMs
- Tailgating vehicles

# Challenge: Equipment Selection and Sustainability



# Challenge: Building and Maintaining Partnerships



# LANL/NSDD Teams



## Field Engineer Team

Field engineers support both implementation and sustainability in partner countries as subject matter experts for equipment, operations, and training.

## Sustainability Managers

Sustainability managers work closely with the federal country manager to provide partner countries the tools they need to execute the CNS mission.

## Investigation Support Team

Members of the Investigation Support team are nuclear material subject matter experts that build partners' capacity to properly respond to a nuclear smuggling event.

## Science and Engineering Team

The science and engineering team proactively and reactively perform critical testing that creates and improves solutions to the radiation detection challenges mentioned earlier.

# Recent NSDD SET Projects at LANL



Marc Paff conducting measurements on a rail RPM.

## Source Replacement Program

Testing was conducted that resulted in NSDD's ability to replace legacy check sources that have short half-lives with new sources that last much longer.



Ukraine Radiation Equipment (URE) installed in Aspect portal monitor

## Ukraine Module Testing

In an effort to become more self-sufficient and independent, Ukraine has begun producing their own radiation detection equipment compatible with Aspect RPMs. NSDD has performed testing and provided feedback.



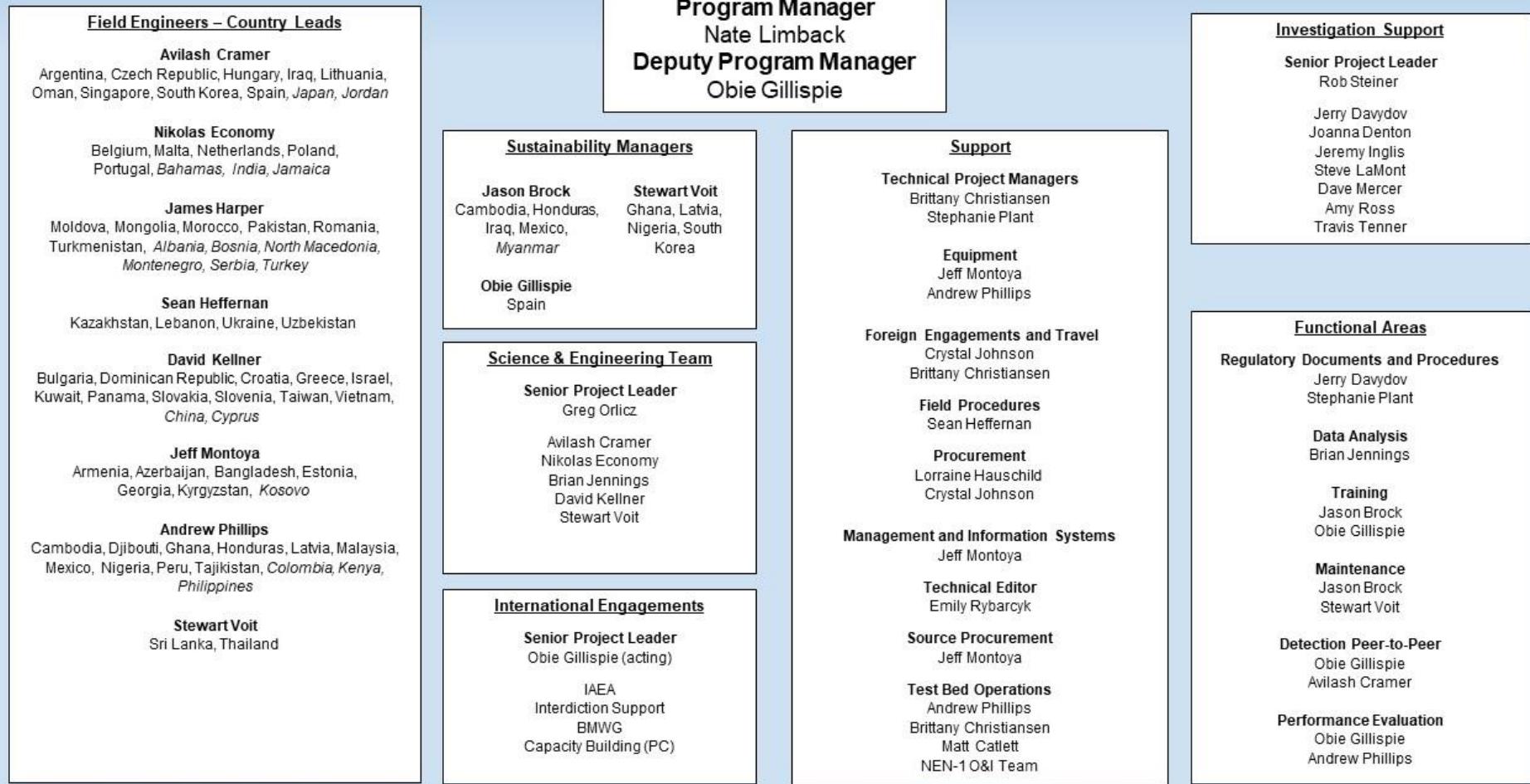
Seven pedestrian portals from different vendors during testing

## Pedestrian Portal Project

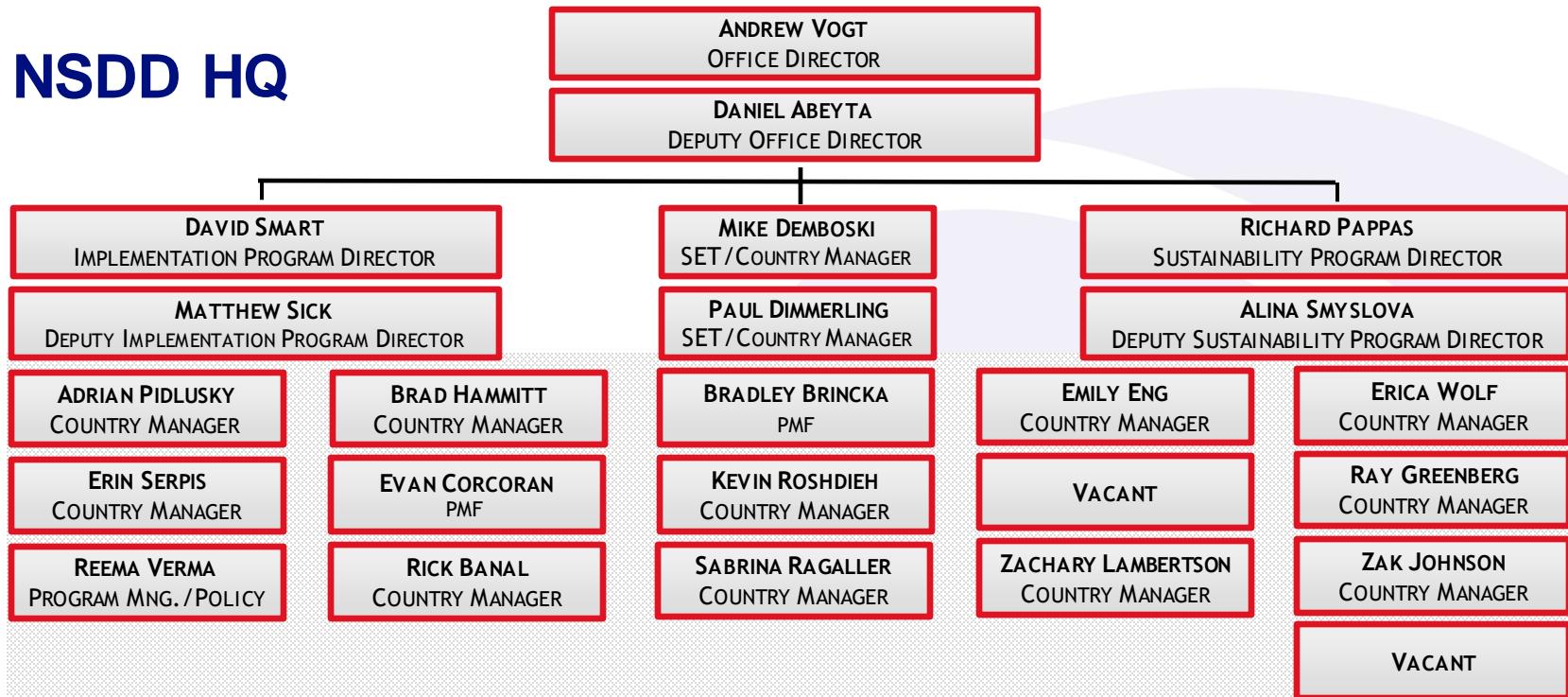
NSDD performed testing on seven modern pedestrian portal monitors as part of a market survey to evaluate new capabilities so the program can continue to adapt into the future.

# LANL NSDD Org Chart

## LANL Nuclear Smuggling Detection and Deterrence Program



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APRIL 2023

# Summary

- **Mission:** The risk of a terrorist group acquiring radioactive/nuclear materials requires NSDD's continuous efforts to build capacity of partner countries to deter, detect, and investigate acts of nuclear smuggling.
- Over the past 25 years, NSDD has and continues to deploy radiation detection equipment tailored to operational requirements with the goal of developing a layered, flexible, varied, and unpredictable nuclear detection architecture.
- An effective counter nuclear smuggling strategy considers both technical and operational challenges to develop the tools necessary to achieve the mission.
- LANL provides expert support to the NSDD mission to constantly improve and adapt to any future challenges.

# Backup Slides

# NSDD Detection Methods at Ports of Entry

- **All Sites**
  - Primary gamma screening with polyvinyl toluene, (PVT) based RPM (gross counting; detects but does not identify)
  - Neutron detection (He-3)
- **Secondary Inspection at Seaports**
  - Typical innocent alarm: NORM bulk cargo – fertilizer, ceramics, melt salt, sand and gravel
  - High Purity Germanium (HPGe) and Sodium Iodide (NaI) Radioisotope Identification Device (RIDs)
  - Spectroscopic portal monitors at a few sites
- **Secondary Inspection at other sites (vehicle and pedestrian traffic)**
  - Typical innocent alarm: radiopharmaceutical – meds and treated patient, NORM
  - NaI RIDs
  - Remove driver and other occupants, inspect separately
  - Inspect vehicle separately



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INNOVATE. COLLABORATE. DELIVER.

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