

# *Domestic Nuclear Detection Office (DNDO)*

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## *Isotope Utilization at DNDO*

*Briefing for the 3<sup>rd</sup> Workshop on  
Isotope Federal Supply and  
Demand*

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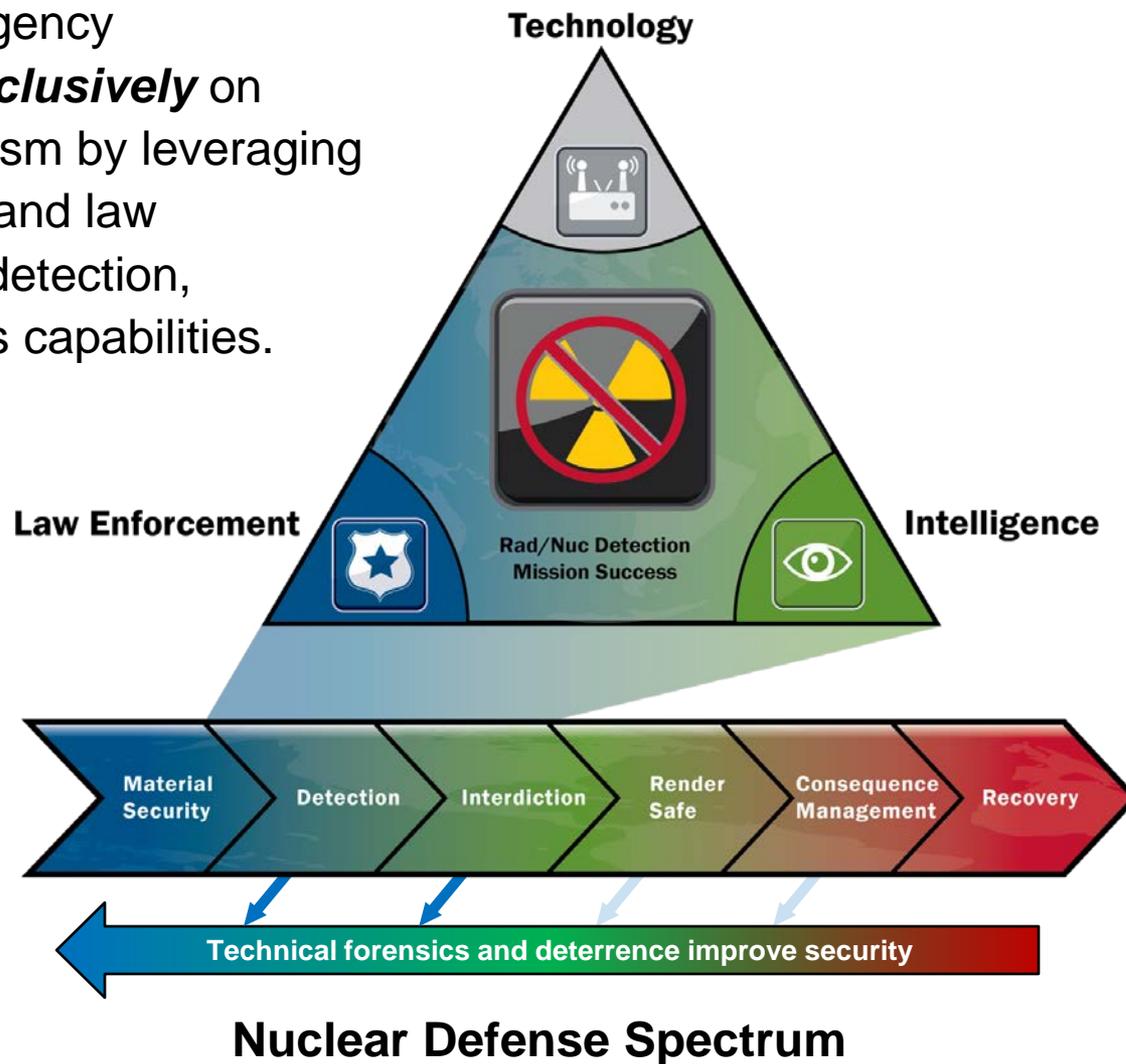
**Transformational and Applied Research**  
**Domestic Nuclear Detection Office**



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# ***DNDO Mission***

- DNDO is a unique interagency organization ***focused exclusively*** on preventing nuclear terrorism by leveraging technology, intelligence, and law enforcement to improve detection, interdiction, and forensics capabilities.

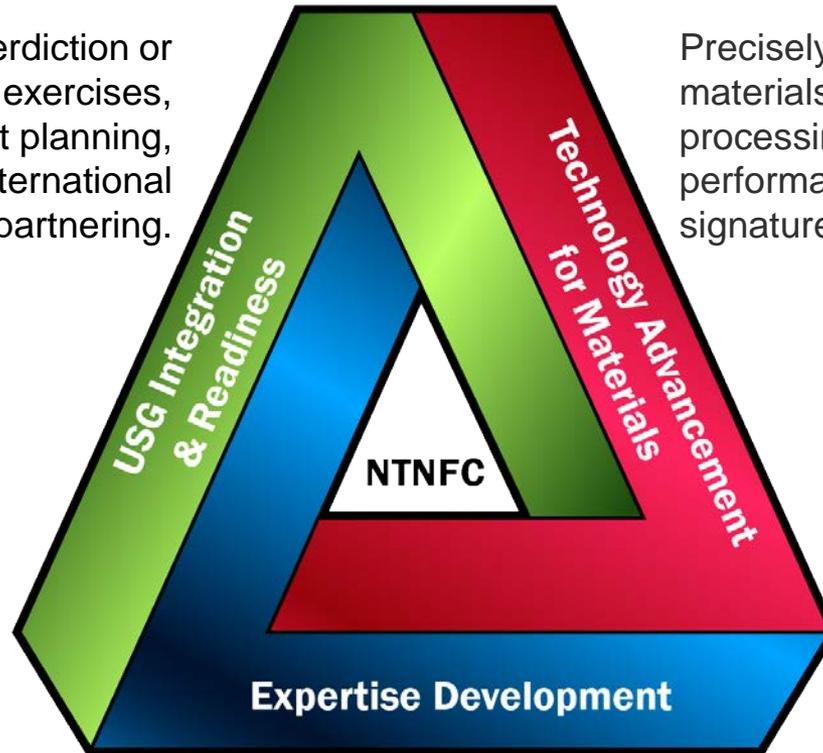


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# Technical Nuclear Forensics

Through technical means determine the source of nuclear or radiological material out of regulatory control in support of attribution.

Preparedness for interdiction or detonation through rigorous exercises, requirements, joint planning, assessments, and international partnering.



Precisely characterize nuclear materials to help identify processing history by increasing performance, identifying unique signatures, and closing gaps.



Restore the expertise pipeline by strengthening student and university programs, as well as national lab links.

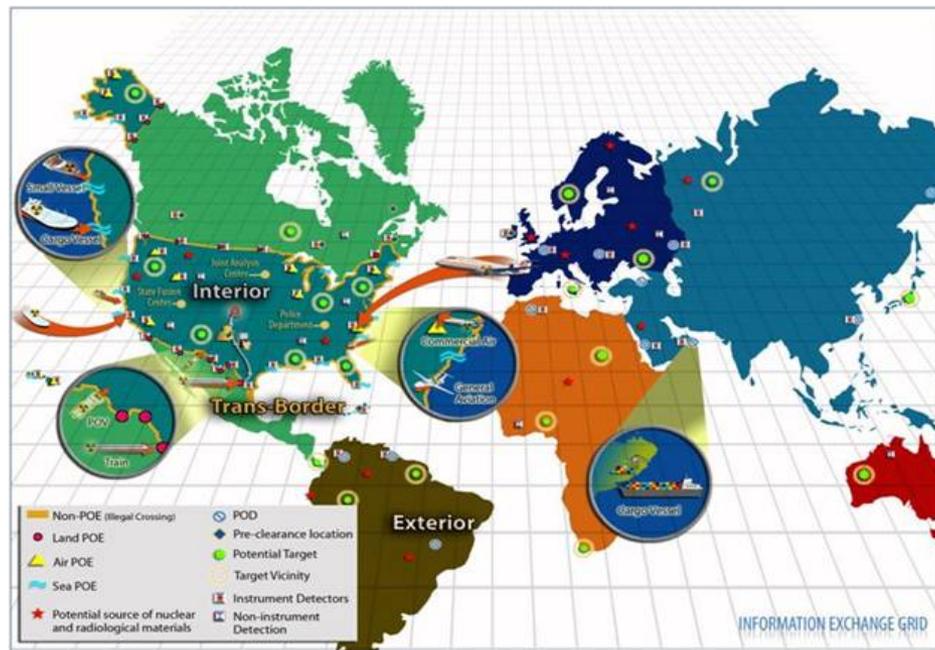


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# Nuclear Detection: Planning

Substantial risk reduction across all pathways is the aim

- Analyzes the **Global Nuclear Detection Architecture (GNDA)** and then works with stakeholders to formulate recommendations and plans to strengthen the Nation's layered defense.
- The GNDA is a framework for detecting (through technical and non-technical means), analyzing, and reporting on nuclear and other radioactive materials that are out of regulatory control.



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# *Operational Realities Impact GNDA Strategy*

## Land Border Pathway

- 1.1 million individuals legally cross U.S. borders every day
- 12,000 trucks cross into the U.S through our Southern Border daily
- 6,500 miles of border with Canada and Mexico
- 4,800 loaded rail cars cross into the United States every day.



## Aviation Pathway

- 2 million passengers and 1.8 million pieces of checked baggage arrive on commercial aircraft every day
- 200,000 general aviation aircraft and 19,000 landing facilities in the U.S.



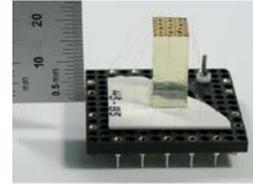
## Maritime Pathway

- 32,000 seagoing containers arrive and are offloaded at U.S. seaports each day
- 13 million registered U.S. recreational vessels, 282,000 fishing vessels, and 100,000 other commercial small vessels



# Grand R&D Challenges

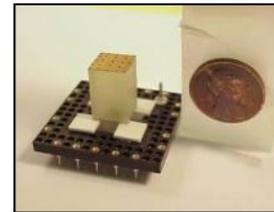
- Cost effective equipment with sufficient performance to ensure wide spread deployment (Cost)
- Detection of special nuclear material even when heavily shielded (Shielding)
- Enhanced wide area search in a variety of scenarios, to include urban and highly cluttered environments (Search)
- Monitoring along challenging GNDA pathways, to include general aviation, small vessels, and in between ports of entry (Pathways)
- Forensic determination of origin and/or route of interdicted materials (Forensics)



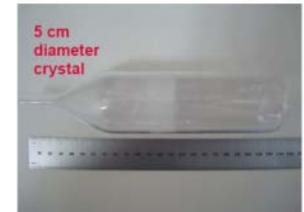
# Transformational and Applied Research

Develop break-through technologies that will have a dramatic impact on capabilities to prevent nuclear and radiological terrorism through an aggressive and expedited R&D program.

- Exploratory Research Program (ERP)
  - Driven by gaps GNDA and technical nuclear forensics
  - Feasibility studies and laboratory Proof-of-Concept (PoC) demonstrations
- Academic Research Initiative (ARI)
  - Basic and exploratory research
  - Create next generation of scientists and engineers
- Advanced Technology Demonstration (ATD)
  - Transition technology from laboratory to field prototypes
  - Characterize performance to assess operational viability and transition pathway
- Small Business Innovative Research (SBIR)
  - Strengthen the role of innovative small business
  - Augments the ATD and ERP with 2-4 new topics a year



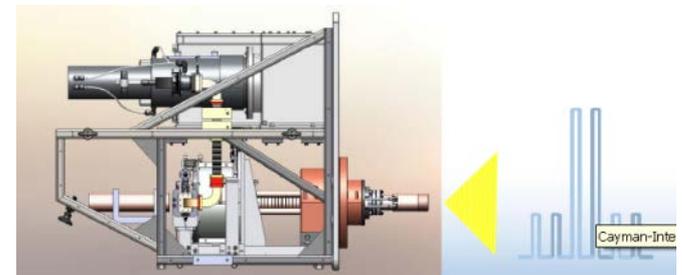
TlBr  
Semiconductor



5 cm  
diameter  
crystal  
  
 $\text{Cs}_2\text{LiYCl}_6$  (CLYC)  
Scintillator



Mobile Imaging Detector and Truck



Tri-energy, intensity  
modulated x-ray generator



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# Product Acquisition & Deployment

Engineering development, production, developmental logistics, procurement, and deployment of current and next generation nuclear detection systems.



Radiation Portal Monitor Program



Thermo IdentiFINDER GR-135 Polimaster PRD RadPacks



RadSeeker Micro Detective Hand-Held Radiation Monitor

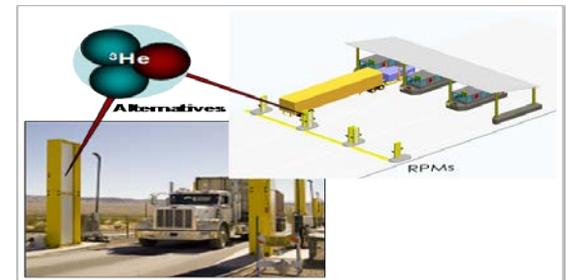
Human-Portable Radiation Detection Systems



Human Portable Tripwire (HPT)



Small Vessel Standoff Detection



Helium-3 Mitigation

# Systems Engineering & Evaluation

Ensure detection devices meet or exceed the needs of the user

- Test and Evaluation Support
  - Conduct test & evaluation campaigns.
  - Establish and maintain T&E infrastructure of facilities, equipment, processes and personnel.
- Operational Analysis and Systems Engineering Support
  - Evaluate the feasibility and performance of new or emerging capabilities in an operational environment.
  - Lead development, in coordination with National Institute of Standards and Technology, of Technical Capability Standards for radiological/nuclear detection equipment



Alternative Neutron  
Detection Systems



Dolphin Test Campaign  
(Boat Mounted Systems)



ITRAP+10  
(Testing of International &  
Domestic Systems)



Gryphon Test Campaign  
(Aerial Mounted Systems)



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# Operations Support

Primary objective is to increase domestic capability and capacity

- Training, Exercise, & Assistance
  - Federal programs
  - State and Local Programs
  - Training and Exercise
  - Red Teaming
- Joint Analysis Center
  - GNDA situational awareness
  - Information analysis and information sharing
- TSA Visible Intermodal Prevention and Response Teams
- Mobile Detection Deployment Unit
- Securing the Cities



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# Nuclear Detection: Isotope Needs

Isotope	Research or Applied	User (Agency, Nat. Lab., Univ., or others)	Intended Use	Purity and/or specification	Physical Form	FY15	FY16
Li-6	Both Research and Commercial systems	DHS/DNDO and procurement of systems (i.e., ~100 portals, 300 backpacks, 26 in handhelds)	Both basic research or based on equipment purchases per year)	Max enrichment (94%)	Metal	200Kg	200Kg
B-10	Both Research and Commercial systems	DHS/DNDO and procurement of systems (i.e., ~100 portals and 300 backpacks)	Both basic research or based on equipment purchases per year)	Max enrichment of ~99%	B-10 Powder	10Kg	10Kg
U-232	Research	DHS/DNDO and DOE National Labs	Basic research, test & evaluation of detection systems, standards testing	> 90%	Oxide	25g	25g
U-238	Research	DHS/DNDO, and DOE National Labs	Standards testing, test & evaluation of detection systems	~100%	Metal	25g	25g



# *Nuclear Detection: Isotope Needs, cont.*

Isotope	Research or Applied	User (Agency, Nat. Lab., Univ., or others)	Intended Use	Purity and/or specifications	Physical Form	FY15	FY16
Pu	Research	DHS/DNDO, and DOE National Labs	Basic research, test & evaluation (T&E) of detection systems	A range from RG (>20% of Pu-240) to WGs Pu-239 is needed	Oxide	250g	
Co-57	Research	DHS/DNDO, and DOE National Labs	Basic research, T&E of detection systems and surrogate sources	~100%	Metal	25g	25g
Co-60	Research	DHS/DNDO, and DOE National Labs	Basic research, T&E of detection systems and surrogate sources	~100%	Metal	25g	25g
Ba-133	Research	DHS/DNDO, and DOE National Labs	Basic research, T&E of detection systems and surrogate sources	~100%	Metal	25g	25g
Cf-252	Research	DHS/DNDO, and DOE National Labs	Basic research, T&E of detection systems	$10^5 - 10^9$ n/s/Ci	Metal	0.25 mCi	0.25 mCi



# *Nuclear Forensics: Isotope Needs*

Isotope	Research or Applied	User (Agency, Nat. Lab.,	Intended Use	Purity and/or specifications	Physical Form	Qty. FY2015 - FY2019
Np-236	Applied	DOE, DOD, others	High purity IDMS tracer. Starting material for other	>95 % Np-236	Solution	Micro-grams
Pu-244	Applied	DOE, DOD, others	High purity IDMS tracer	>99 % Pu-244	Solution	Milli-grams
Pa-231	Applied	DOE, DOD, others	High Purity Calibration Material	>99 % Pa-231	Solution	100-500 Micro-grams
Sr-84	Applied	DOE, DOD, others	High purity IDMS tracer	>99 % Sr-84	Solution	Milli-grams
Zr-96	Applied	DOE, DOD, others	High purity IDMS tracer	>99 % Zr-96	Solution	Milli-grams



# *Nuclear Forensics: Isotope Supply*

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<b>Isotope</b>	<b>Physical Form</b>	<b>Purity and/or specifications</b>	<b>Location of reserve</b>	<b>Size of reserve</b>	<b>Comments</b>
Th-229	Nitrate Soln	>99.9% Th-229	To be transferred to NBL	20 µg (80 Units)	Currently awaiting final characterization
Am-243	Nitrate Soln	>99% Am-243	To be transferred to NBL	50 µg (25 Units + stock)	Currently awaiting final characterization
Ba-134	Nitrate Soln	>99% Ba-134	TBD	<1 mg	Currently being processed at INL.

NBL: New Brunswick Laboratory  
INL: Idaho National Laboratory





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