

CNS | consolidated nuclear security, llc
PANTEX PLANT | Y-12 NATIONAL SECURITY COMPLEX

CNS Pantex|Y-12 Overview

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Director, Nonproliferation and Arms Control R&D
Director, Nuclear Detection and Sensor Testing Center

NONPROLIFERATION AND ARMS CONTROL R&D
PANTEX Y-12
NPACas

CNS Company Structure

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Bechtel

Project Management
Construction
Operations

Leidos

Operations Support
Engineering

ATK Launch Systems

High Explosives
High-Hazard Operations

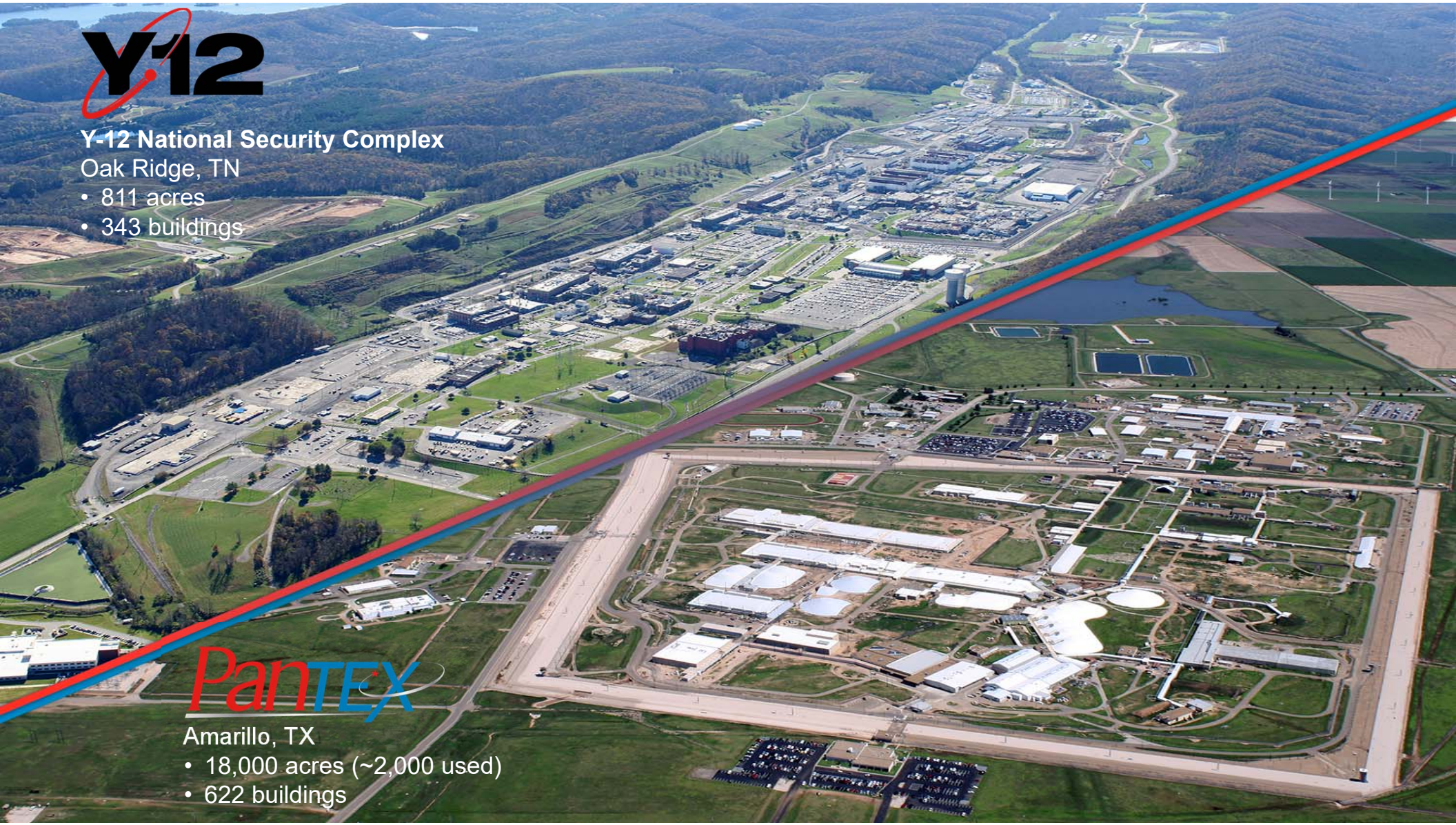
Booz, Allen, Hamilton

Transformation
Cost Savings

SOC

Security
Safeguarding SNM

Nuclear Security Enterprise: Pantex and Y-12 are the Alpha and Omega


Y-12 National Security Complex
Oak Ridge, TN
• 811 acres
• 343 buildings
PANTEX
Amarillo, TX
• 18,000 acres (~2,000 used)
• 622 buildings

Serving the Nation

- ✓ Provide the Nuclear Deterrent for our Nation and Allies
- ✓ Support Nuclear Nonproliferation, Counterterrorism, and Counterproliferation Efforts
- ✓ Supply Fuel for Naval Reactors, Research, and Medical Isotope Production
- ✓ Develop National Security Solutions for Other Government Agencies

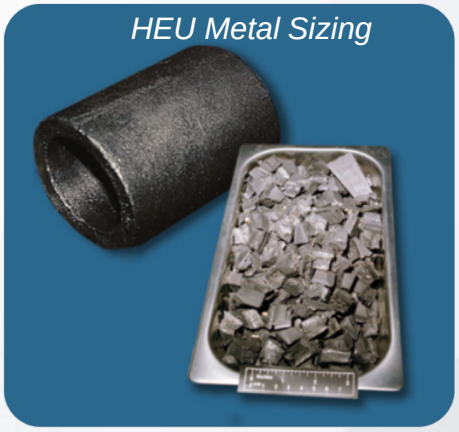
Pantex and Y-12 have decades of hands-on experience and expertise in weapons and weapons useable materials.

Foundation of Our Capabilities

Enriched Uranium Center of Excellence

- Purified highly enriched uranium (HEU) metal production
- Uranium machining, fabrication, processing, recycle, & salvage operations
- HEU storage and inventory management
- EU supply and fuel component development
- Technical expertise in all things uranium

URANIUM

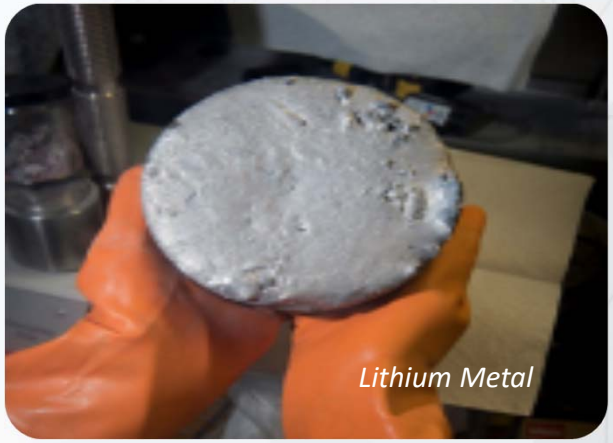


Foundation of Our Capabilities

LITHIUM

Lithium Center of Excellence

- Supply high-precision components from lithium and other special materials
- Lithium processing in all forms
- Technical expertise in all things lithium and other special materials
- Store the national supply of enriched lithium
- Produce deuterium gas for the production of lithium-deuteride
- Supply Y-12 operations with rubber and foam components



Lithium Metal

Special Material Processing Area

Foundation of Our Capabilities

High Explosives Center of Excellence

- HE Manufacturing
  - Synthesis
  - Machining
  - Pressing
  - Testing & Qualification
- HE Engineering & Physics
  - Blast effects engineering
  - Mechanical testing
  - Advanced Manufacturing
- Materials & Analytical Services
  - Aging studies
  - Forensics & characterization
  - Acoustic/Seismic characterization
- Small component assembly and disassembly
- Test fire and disposition

HIGH EXPLOSIVES

Foundation of Our Capabilities

Protecting Materials and Capabilities

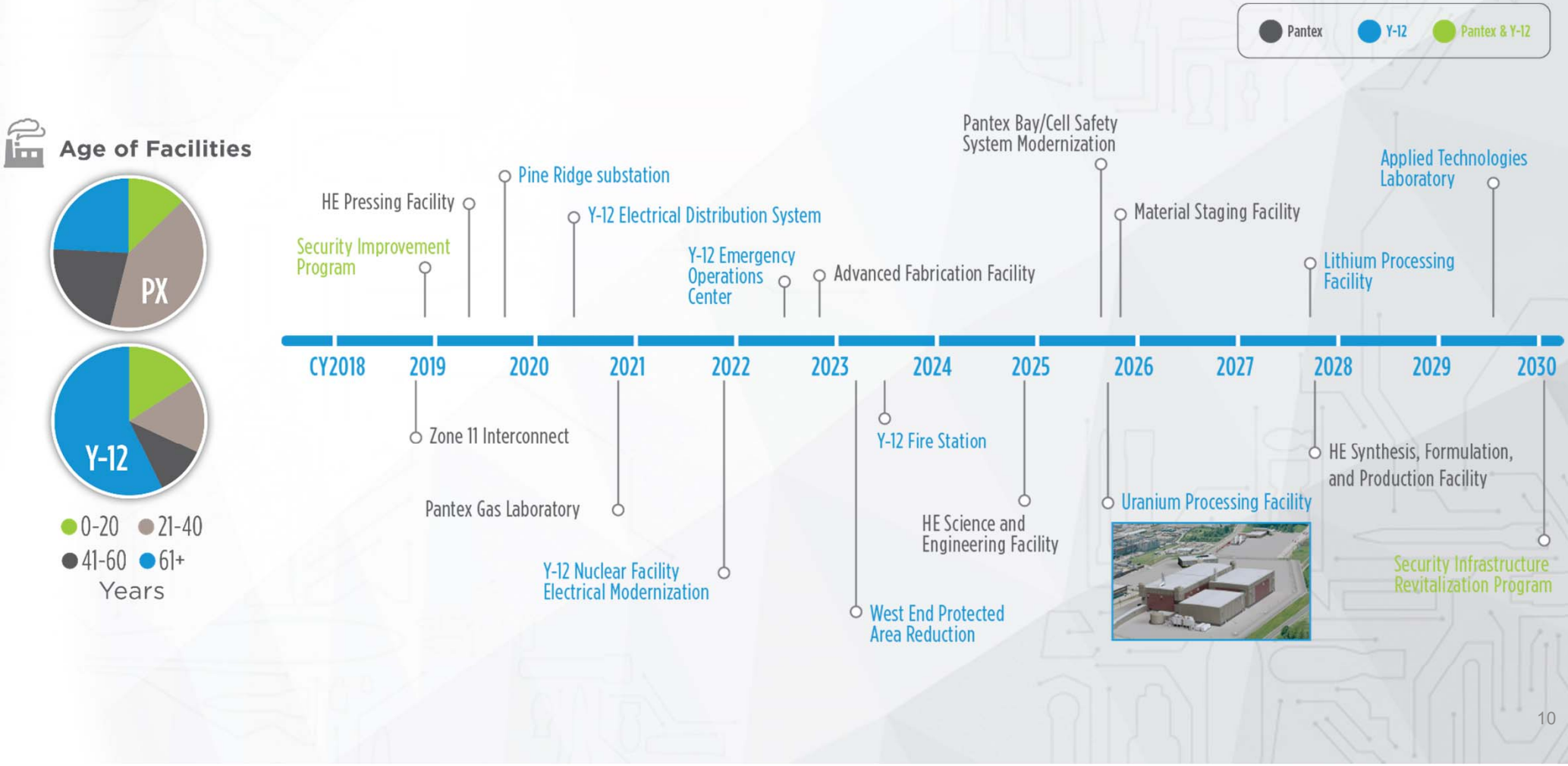
- Pantex and Y-12 are the Nation's fortresses for staging and storing weapons components, weapons materials, and production processes
- Manage storage and shipments of special nuclear and non-nuclear materials
- New Brunswick Laboratory (NBL) Certified Reference Material Distribution Center
- Maintain accountability and inventory of special nuclear materials
- Pit Storage
- Manage the NNSA Precious Metals program

HEUMF

Interim storage & surveillance of plutonium components

New Brunswick Laboratory Certified Reference Material Distribution Center

Pantex and Y-12 Infrastructure Projects





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Nonproliferation and Arms Control Research and Development (NPAC R&D)

Martin R. Williamson, PhD, PE

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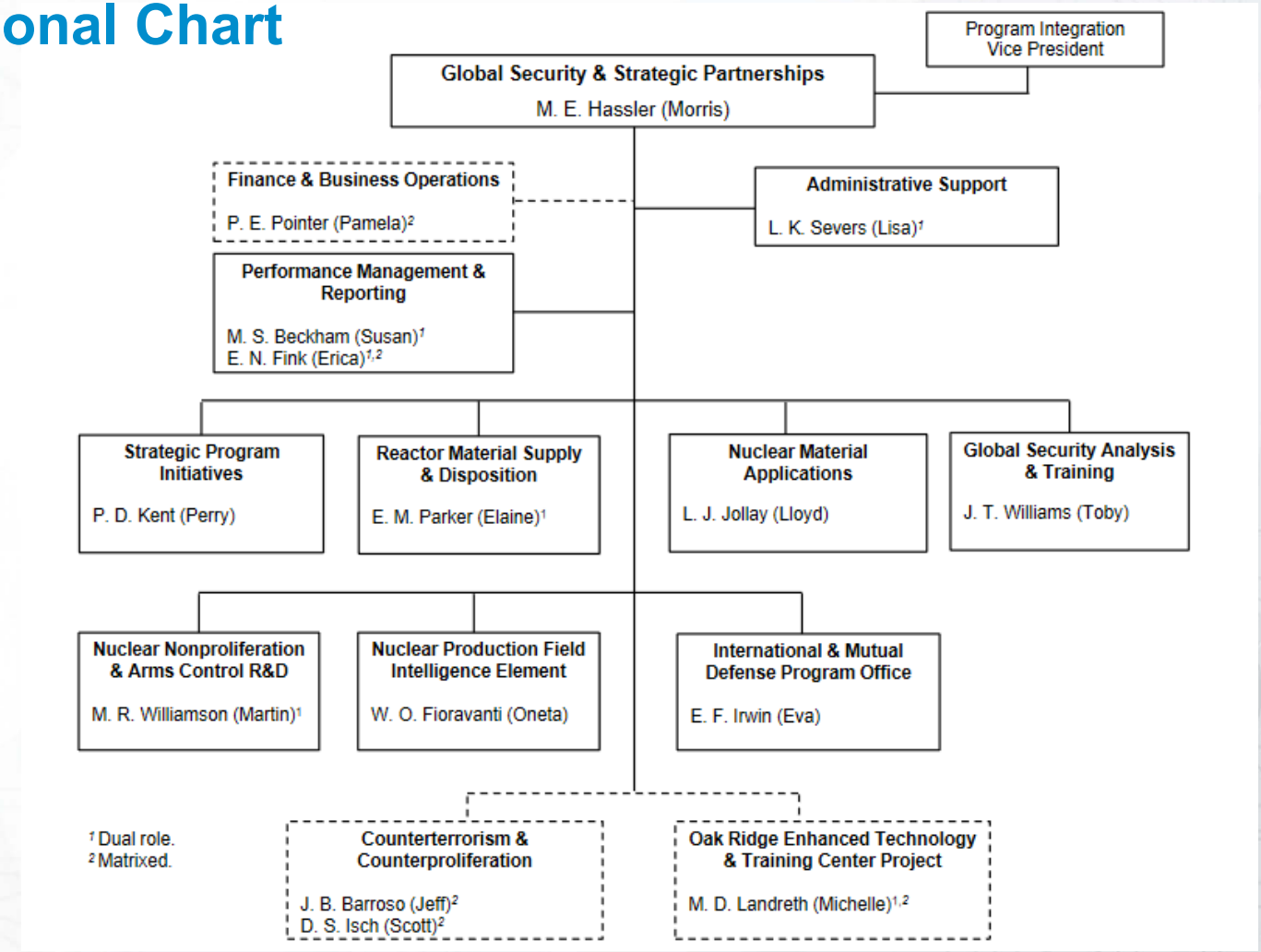
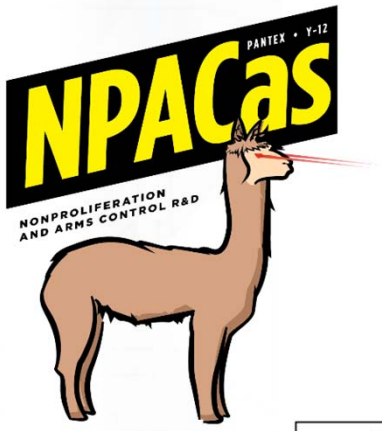
Director, Nonproliferation and Arms Control R&D
Director, Nuclear Detection and Sensor Testing Center

Global Security and Strategic Partnerships (GSSP) Organizational Chart



NPAC R&D Organizational Chart



Global Security & Strategic Partnerships Senior Director

Nuclear Nonproliferation and Arms Control R&D
M. R. Williamson (Martin)

Program Financial Analysis
G. E. Canada (Greg)[2]
C. B. Townsend (Chelsey)[2]

Administrative Support
L. K. Severs (Lisa)[1, 2]

HQ M&O Assignment
J. R. Knowles (Justin), (ONV)
A. K. Milojevich (Allyn), (NEC)

Defense Nuclear Nonproliferation Research & Development
M. W. Francis (Matthew), Lead

J. J. Charlton (Jennifer)
K. Ventura (Karen)
M. Ward (Matt)
Vacant (2)

Nonproliferation and Arms Control

A. L. Swift (Alicia), Lead

J. T. Creasy (John)
A. W. Drescher (Adam)
H. R. Hale (Hannah)
C. Juarez (Carlos)
C. L. Murphy (Chantell)
M. L. Thornbury (Matt)[1]
Vacant (1)

Department of Homeland Security & Nuclear Forensics
D. M. Speaks (David), Lead

J. J. McCall (Jason)[1]

Nuclear Detection and Sensor Testing Centers
Vacant (1), Lead

J. J. McCall (Jason)[1]
M. L. Thornbury (Matt)[1]

Program & Technical Support

S. K. Dameron (Sharon)[1,2]
N. E. Williams (Nathan)

[1] Dual Role.
[2] Matrixed.

NPAC R&D Mission

Leverage current and historic Pantex/Y-12 activities, infrastructure, materials, and core competencies, which exist for our primary Nuclear Deterrent mission, to support broader nuclear security science and technology development missions within NNSA, Department of Homeland Security (DHS), and Department of Defense (DoD).

NPAC R&D focus areas include:

- Advancing U.S. capabilities to detect and characterize nuclear weapon development activities globally, including material production, the movement of special nuclear materials and nuclear weapons, and the testing or use of nuclear weapons,
- Supporting the development and testing of policy options and technical capabilities for international nuclear safeguards, arms control / treaty verification, nuclear export controls, and nonproliferation initiatives consistent with U.S. Government goals and objectives to enable monitoring and verification,
- Utilizing uranium, lithium, and high explosives (HE) materials expertise to support national-level activities in nuclear forensics and nuclear detection technology testing and evaluation,
- Providing unique training and capacity-building programs, particularly with the Nuclear Detection and Sensor Testing Center (NDSTC), and
- Engaging internationally to promote nonproliferation and arms control norms and best practices through bilateral and multilateral work.

Operational experience drives problem solving

NPAC R&D Statistics

FY21 NPAC R&D Portfolio

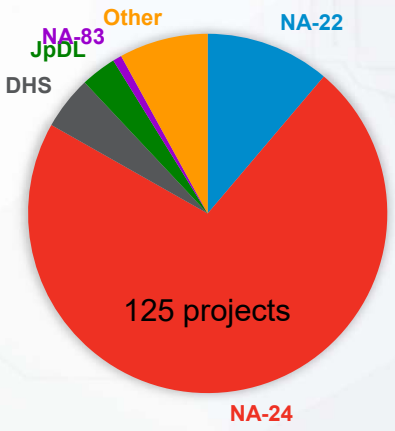
- 125 projects
- $23.9M in ACB

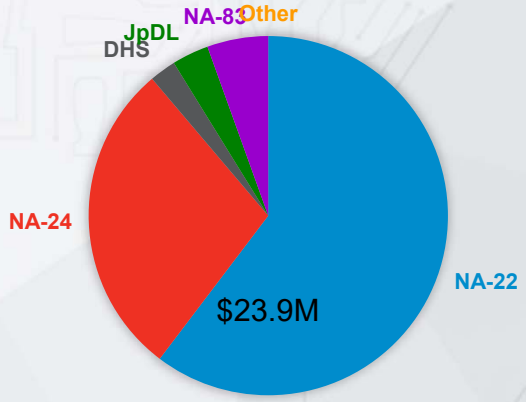
Current Customers:

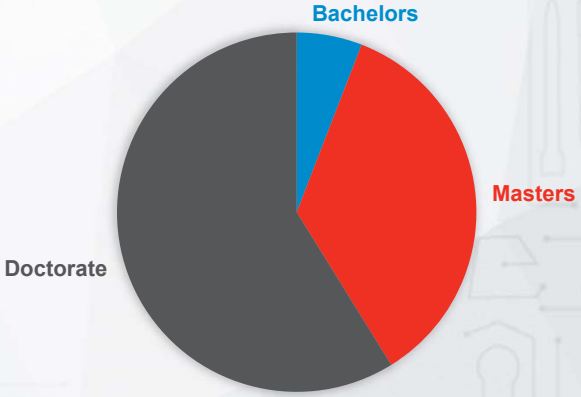
- Defense Nuclear Nonproliferation R&D (NA-22)
- Nonproliferation and Arms Control (NA-24)
- Stockpile Stewardship and Surveillance (NA-10)
- Department of Homeland Security (DHS)
- Joint Product Leader for Rad & Nuc Defense (DoD JPdL-RND)
- Nuclear Forensics (NA-83)

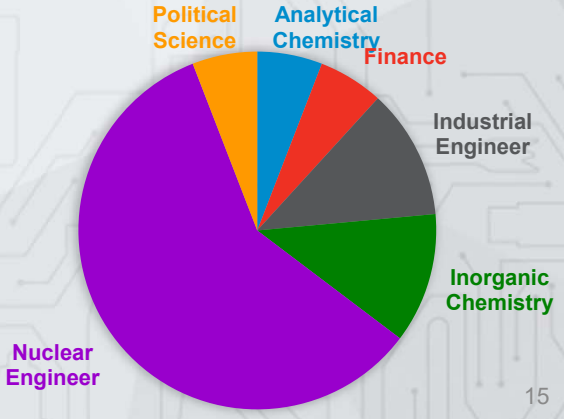
NPAC R&D Team:

- 17 Direct Staff (+3 in the process of hiring)
- 6 Subcontractors
- 2 Post-Docs
- 3 Interns





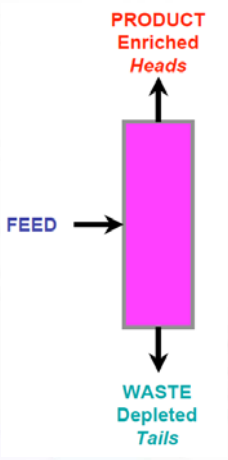




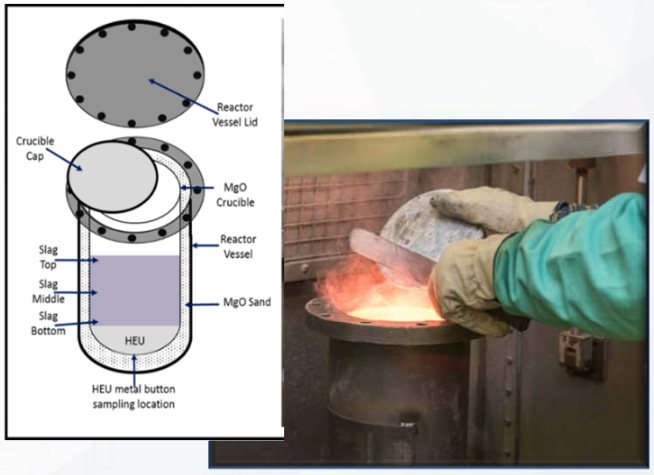
NPAC R&D: Advancing U.S. capabilities to detect and characterize nuclear weapon development activities globally, including material production, the movement of special nuclear materials and nuclear weapons, and the testing or use of nuclear weapons

Significant FY21 Activities:

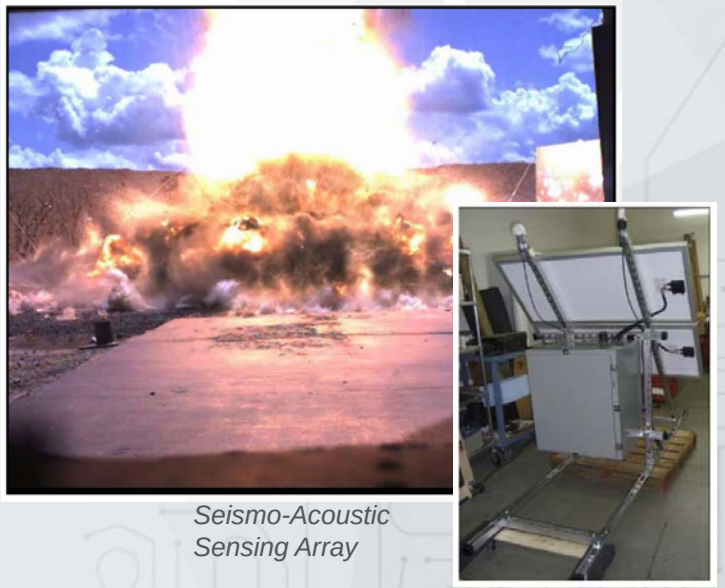
- *Novel Purification Methodologies – Advancing novel technology for isotope purification*
- *Signatures of Calcium Bomb Reduction – DU bomb reductions at varying size and sophistication for assessment of potential propagated signatures*
- *Seismo-Acoustic Wavefields at Pantex – Data collection to discern legitimate from potential proliferant activities*



Novel Purification Analysis



Bomb Reduction



Seismo-Acoustic Sensing Array

NPAC R&D: Supporting the development and testing of policy options and technical capabilities for international nuclear safeguards, arms control / treaty verification, nuclear export controls, and nonproliferation initiatives consistent with U.S. Government goals and objectives to enable monitoring and verification

Significant FY21 Activities:

- *Pantex Monitoring Project – Developed working-level concepts for conceptual verification approaches that could be applied at Pantex*
- *Ensuring Deployment Readiness (EDR) – Lead the EDR, providing an integrated vision for training toward achieving a field-tested, deployment-ready U.S. nuclear verification and disablement capability*
- *Uranium Verification Team (UVT) – Serving as co-lead of the UVT, as well as serving as a member of the UVT*
- *Containment and Surveillance (C&S) – Lead C&S program for NNSA Nuclear Compliance Verification*

Pantex Monitoring Project

Unique Identifier Utilization

UVT Leadership

Containment and Surveillance

NPAC R&D: Utilizing uranium, lithium, and high explosives (HE) materials expertise to support national-level activities in nuclear forensics and nuclear detection technology testing and evaluation

Significant FY21 Activities:

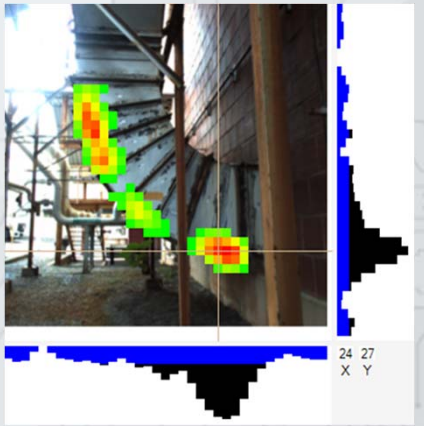
- *Light Element Enrichment and Production Signatures – Developing the forensic profile for Lithium through sampling and analysis*
- *Confirmation of High Explosives - Exploring sensor performance for verifying HE in a hypothetical dismantlement scenario*
- *Forensic Signatures from Uranium Part Production - Developing a method for building a production process history of uranium metal parts capable of going back multiple generations*
- *Holdup Quantification – Developing improved methods of quantifying deposits of Uranium holdup through gamma and neutron imaging*


Special Material Processing Area


PINS


ACE-ID


Mobile Trace



Uranium Holdup

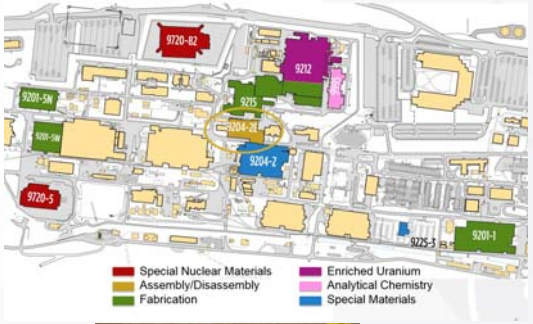
NPAC R&D: Providing unique training and capacity-building programs, particularly with the Nuclear Detection and Sensor Testing Center (NDSTC) Sites

- ***NDSTC Site 1: Standing capability to enable testing of equipment / techniques using significant quantities of HEU***

- *Library of Test Objects*
  - *25 primaries/secondaries*
  - *17 different programs*
  - *Weapon components*
  - *Depleted uranium (DU) and HEU 161 castings*

- *Active and Passive Measurements*
  - *Unshielded/on-shift: 4 x 10^7 n/s*
  - *Shielded/off-shift: 2 x 10^8 n/s*

- *Various Reflectors*



ORNL Researcher with NMIS System
Photo Use Courtesy of ORNL

ThermoFisher P-385

161 Casting

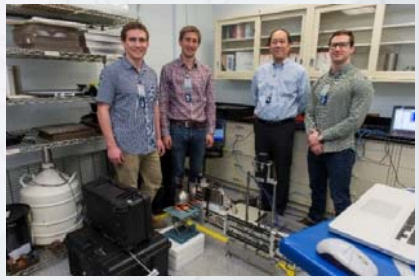
NDSTC Site 2

- Y-12 Development facilities
- Does not require a clearance
- Approvals for range of sensors
- Ability to leverage NA-10 activites
- Source Materials:
  - EU-HEU metallic enrichment standards
    - Eleven, ranging from 0.2 to 93 wt%
  - U metal mass standards
    - Three at 93 wt% (10, 50, 100 g)
    - Three at 0.2 wt% (100, 1000, 5000 g))
  - Two Radiological Signature Training Devices (RSTDs)
    - 5 kg and 10 kg HEU equivalent
  - National Uranium Forensics Archive at Y-12
  - NBL Center certified reference materials
  - Compounds, alloys, and solutions with various ^{235}U enrichments

BME BASELINE MONITORING EXERCISE
ANL • LANL • LLNL • NNSA • ORNL • PANTEX • PNNL • SNL • SRNL • Y-12

X-Ray Radiography

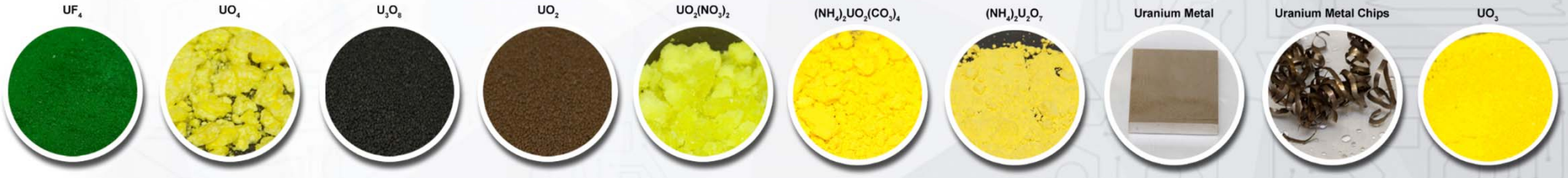
B61 Mock Up



Univ. of Michigan measurements

Enrichment/Mass Standards

RSTD



Uranium Source Materials of Interest

NDSTC Pantex

- Pantex production facilities, bays, cells, and storage magazines
- Requires clearance
- Source Materials:
  - Full Weapon Systems
  - Pu pits
  - Nuclear Explosive-Like Assemblies (NELAs)
  - Wide range of HE types/forms
- Ability to leverage ongoing NA-10 activities

Portal Monitor for Authentication and Certification (PMAC)

W76 Measurements During the Warhead Measurement Campaign

HE Manufacturing

Component "Sanitization" (removal of hazard/usefulness)

Storage Bunkers

DEMONSTRATED EXPERIENCE IN SCENARIO-BASED VERIFICATION AT PANTEX/Y-12

PAST

FY16
Component Dismantlement Transparency (Y-12)

FY18
Warhead Measurement Campaign (Pantex)

FY18
Uranium Verification Team (UVT) Exercise in 9212 Uranium Processing (Y-12)

FY19
Portal Monitor for Authentication and Certification (Pantex)

FY19
UVT Demonstration in 9202 / 9203 Development (Y-12)

FY20
- UVT Springfield Fuel Fab Tabletop Exercise (TTX) (Y-12)
- Containment and Surveillance Program TTX for UVT (Y-12)
- UVT / Mobile Uranium Facility TTX (Y-12)
- Baseline Monitoring Exercise TTX (Y-12)

FY21
Containment and Surveillance Program TTX for PVT (Y-12)

FUTURE

FY21
Baseline Monitoring Exercise (Y-12)

Baselandia - Simulation Host Country

FY21
Quad Nuclear Verification Partnership Data Authentication Demonstration (Y-12)

NPAC R&D: Engaging internationally to promote nonproliferation and arms control norms and best practices through bilateral and multilateral work.

Significant FY21 Activities:

- *Bilateral US/UK Activities –*
  - *Authentication and Certification Working Group*
  - *Chain of Custody Working Group*
- *Quad Nuclear Verification Partnership – Two staff supporting disarmament R&D*
- *International Partnership for Nuclear Disarmament Verification (IPNDV)*
- *International Atomic Energy Agency (IAEA) – Providing support through both international training engagements and R&D*

US UK 1958 MUTUAL DEFENSE AGREEMENT

QUAD Nuclear Verification Partnership

IPNDV INTERNATIONAL PARTNERSHIP FOR Nuclear Disarmament Verification

Domestic and International Safeguards Training

IAEA International Atomic Energy Agency

Thank you!

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