

# Addressing Nuclear Proliferation Globally



How PNNL uses science, technology, and policy to detect and prevent nuclear proliferation

The United States faces a range of daunting nuclear nonproliferation dilemmas and challenges, from extending the New START treaty, to reassessing the approach to Iran, to countering the threat posed by North Korea. Beyond these high-profile issues, the United States must reassert leadership and restore relationships internationally to advance broader nonproliferation objectives, while at the same time combating climate change by supporting peaceful applications of nuclear energy and nuclear technology. PNNL is a recognized global leader in coupling cutting-edge science, technology, and policy with excellence in execution to address the nation's most difficult nonproliferation challenges.

PNNL staff, capabilities, and facilities are critical to the nation's ability to thwart global threats, detect the undetectable, and hold adversaries accountable.

## PARTNER TO THWART GLOBAL THREATS

Addressing the threat of nuclear proliferation requires engagement with like-minded partner nations and international organizations. PNNL leads many U.S. efforts to build partner capacity to stop the trafficking of nuclear material, secure nuclear and radiological facilities against all threats, and interrupt the acquisition of sensitive technologies. Examples include the following:

- More than 130 nations have strengthened capacities to counter would-be proliferators as a result of PNNL's extensive, long-term engagement directly with foreign partners in support of DOE/NNSA Programs, to share expertise, equip, train, and sustain their nuclear and radiological security capabilities—even in the face of the COVID-19 pandemic.
- PNNL co-leads a multi-laboratory team of experts that conducts cyber vulnerability assessments of deployable nuclear verification equipment.
- Governments of more than 20 nations, as well as U.S. law enforcement agencies, have strengthened their implementation and enforcement of strategic trade controls as a result of PNNL-led capacity-building efforts—thereby interrupting proliferators' access to sensitive commodities and technologies.

## DETECT THE UNDETECTABLE

Proliferators work in the shadows to avoid condemnation from the world. PNNL's experts, tapping unique capabilities and facilities, work to detect and expose illicit proliferation activities by building innovative solutions—from developing the world's most sensitive radiation detection systems to applying novel data science approaches to identify evidence of illicit activities hiding in the sea of global data. These tools stem from PNNL's expertise in fundamental science, which inspires new solutions for activities deemed undetectable and include the following:

- Purpose-built radionuclide detectors in PNNL's shallow underground laboratory deny adversaries new pathways to acquiring nuclear materials without detection.

- PNNL scientists developed nuclear explosion detection systems that are now deployed across the globe—including the R&D 100 award-winning Xenon International—and serve as senior advisors to the Comprehensive Nuclear-Test-Ban Treaty Organization.
- Discovery of financial pathways and exploitation of multi-modal data-driven signatures developed and implemented by PNNL are key to denying proliferators the opportunities to operate in the shadows.

## HOLD ADVERSARIES ACCOUNTABLE

Deterring ambitions and exposing activities of proliferators are central to nuclear nonproliferation. These efforts include verification of and adherence to existing nuclear agreements, expert technical analysis, and policy and legal expertise. PNNL is recognized for identifying signatures of nuclear proliferation, inventing technology to exploit key signatures, and creating policy mechanisms to achieve U.S. objectives. Examples of PNNL's contributions include the following:

- Nuclear archaeology, a scientifically based method invented by PNNL, that quantifies the amount of nuclear material produced by foreign countries such as North Korea.
- PNNL technical experts are on-call to rapidly deploy to support verification and emergency response missions, including on-site inspection in foreign countries.
- Chemists trained in plutonium production at PNNL's Radiochemical Processing Laboratory now lead international efforts in the forensic analysis of special nuclear materials to address questions of material provenance.

PNNL's contributions toward advancing U.S. nonproliferation objectives result from our drive to build multidisciplinary teams of talented staff from diverse fields and deliver solutions that survive real-world applications. PNNL's leadership in nonproliferation stems from our ability to translate policy and technical objectives established by the National Nuclear Security Administration, the U.S. Department of State, and the intelligence community into realizable solutions informed by strong partnerships with foreign end-users, other USG partners, and DOE national laboratories.

## ABOUT PNNL

Pacific Northwest National Laboratory advances the frontiers of knowledge, taking on some of the world's greatest science and technology challenges. Distinctive strengths in chemistry, Earth sciences, biology, and data science are central to our scientific discovery mission. PNNL's research lays a foundation for innovations that advance sustainable energy through decarbonization and energy storage and enhance national security through nuclear materials and threat analyses.

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