An organization that is innovative, adaptive, and anticipatory as it responds to current and evolving global nuclear risks.
International Safeguards

Security

Export Controls

Proliferation Resistance

Cross-Cutting Initiatives
NNSA’s Office of Nonproliferation and Arms Control (NA-24) has been engaged with advanced reactor designers for over a decade.

A Safeguards-By-Design (SBD) Working Group has been formed to formalize our outreach with the focus on US designers.

The focus of international safeguards is different from domestic safeguards due to who is the potential adversary and the commitment to the Treaty on the Nonproliferation of Nuclear Weapons (NPT).

There is a wide range of potential safeguards challenges depending on advanced reactor designs.

Safeguards challenges are best addressed through the early consideration of safeguards in the design process.

We are coordinating our Safeguards-By-Design effort with a parallel Security-By-Design effort.
**DOE/NNSA Safeguards-By-Design (SBD) Goal** – Help ensure international safeguards requirements are fully integrated into the design process of a new nuclear facility from the initial planning through design, construction, operation, and decommissioning.

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<tr>
<th>Technical &amp; Policy Analysis</th>
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<tr>
<td>Survey of International Safeguards Challenges Posed by Small Modular Reactors (BNL) – 2013</td>
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<td>International Safeguards for Microreactors (PNNL) - 2017</td>
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<th>Recommendations</th>
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<td>Implementing Safeguards-by-Design (INL) - 2010</td>
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<td>Safeguards-By-Design: Guidance and Tools for Stakeholders (INL) - 2012</td>
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<th>Industry Design Concepts</th>
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<tr>
<td>Microreactors</td>
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<td>Small Modular Reactors</td>
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<td>Molten Chloride Fast Reactors</td>
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Interlabatory working group that will support NNSA SBD activities:

- Funded by NA-24
- Brings together SBD and IAEA expertise from across the lab complex
- Focused on identifying stakeholders and needs

Goals

1. Advance adoption of SBD
2. Provide clear and consistent messaging
3. Facilitate communication and collaboration

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<th>Value to U.S. Industry</th>
<th>Value to NNSA</th>
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<tr>
<td>• Communicate the tangible applications of SBD</td>
<td>• Identify stakeholders and document priorities</td>
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<td>• Articulate the value of SBD for each stakeholder</td>
<td>• Collect and disseminate lessons learned</td>
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<tr>
<td>• Source of knowledge and information</td>
<td>• Leverage partnerships across the USG</td>
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SBD is a voluntary collaboration

- Sharing of information for the SBD approach precedes the legal requirements for provision of design information

- Success relies on each stakeholder’s understanding of the benefits that can be realized by active participation in the process
Stakeholder Responsibilities

- **IAEA**
  - Verify that nuclear materials & technologies are used only for peaceful purposes

- **Designers and vendors**
  - Understand export control requirements and nonproliferation policy when exporting to a country
  - Understand the safeguards, security, and safety requirements
  - Keep safeguards considerations in mind (required access, installation of instrumentation, and key measurement points)

- **Operators**
  - Facilitate communication between the facility, State, and implementing nuclear material accountancy and safeguards at the facility level; complying with State regulations and assisting IAEA inspection

- **State or Regional Safeguards Authority**
  - Fulfil the obligations of the State as defined by treaties and agreements, including formal communications with the IAEA
**Our Mission:** Lead U.S. international efforts to prevent theft and sabotage of nuclear materials and facilities worldwide.

**INS Civil Nuclear Security Project**

Building relationships with U.S. nuclear energy industry vendors & embarking countries on nuclear security topics to support:
- Restoring U.S. leadership in nuclear
- Advancing peaceful uses
- Upholding the global nuclear security regime
### Tools Under Development

- Economic costs and benefits of security
- Identifying sabotage target sets for advanced reactors
- Physical Protection Systems Design Training- Design Evaluation Process Outline (DEPO) Methodology Videos

[https://nstc.sandia.gov/training/smr-depo-course](https://nstc.sandia.gov/training/smr-depo-course)

### Standard Nuclear Security Tools

**Tool Examples:**
- Scribe 3D (tabletop exercises)
- Pathtrace (pathway analysis)
- JCATS (combat simulation instrument)
Upcoming Opportunities for Joint Discussion:

- **Outreach:** Webinars, RFI’s (from NNSA to industry), & Stakeholder Meetings via GAIN/NEXUS, Industry Associations/NGO’s (TBD)

- **IAEA:** Providing experts to INS supported IAEA activities (ongoing) on international security guidance for AR/SMR’s

- **Technical Support:** INS-funded activities at DOE Labs to support overall industry needs (ongoing)

- **International Market:** Nuclear “newcomer” engagements (expanding & embarking countries) to connect on regulatory frameworks and operational requirements for security

To develop a partnership with industry, the DOE National Labs can enter:

- **Nondisclosure Agreements (NDAs)** to have detailed discussions of technologies that can include proprietary information

- **Cooperative Research and Development Agreements (CRADAs)** to expand a company’s proprietary capabilities or knowledge-set
U.S. NUCLEAR EXPORT CONTROL REGULATIONS

Nuclear Regulatory Commission (NRC)
Special nuclear material (SNM) and equipment used to produce SNM

Energy
Technology that can indirectly or directly assist in production of SNM

Commerce
Dual-use commercial items
Key Points:

- The Part 810 regulation controls transfers of unclassified nuclear technology and assistance (i.e., “know-how”) to foreign entities and nationals.

- Laboratories, plants, and sites require Part 810 authorization for such transfers unless the transfer is both funded and directed by DOE, and does not involve potential SNT.

- The new U.S. Policy Framework on Civil Nuclear Cooperation has important impacts on any transfers of controlled technology and assistance to Chinese entities or nationals.

- Individuals with knowledge of controlled nuclear know-how have a legal obligation to protect that information from unauthorized disclosure to foreign entities and nationals, including disclosure through informal conversations.
  - These restrictions apply even after retirement.

- Review by NPAC is required prior to any transfer of information related to enrichment, reprocessing, or heavy water production to foreign entities and nationals, even if the transfer is funded and directed by DOE.
Application of Part 810 Regulation to Advanced Reactor Technology:

- The Part 810 regulation controls transfers of nuclear reactor technology, using a definition of “nuclear reactor” that applies to both conventional and advanced reactor designs.

- Transfers of many types of advanced reactor technology are eligible for an existing “general authorization” when transferred to any of the 50 destinations listed in Appendix A to the Part 810 regulation (e.g., the United Kingdom, Canada, and Japan).

- The Part 810 team maintains a robust industry outreach program on nuclear export controls, including outreach to large light-water reactor developers, advanced reactor developers, other companies in the supply chain, and academia.

- NNSA is closely monitoring the development of advanced, small modular, and micro-reactor technologies in the United States, including any potential implications for the Part 810 regulation, and we will issue new guidance or even rulemakings if needed.
**Mission:** The Proliferation Resistance Optimization program provides a framework for all nuclear facility and capability designs to maximize proliferation resistance and optimize performance for stated peaceful uses.

**Program Targets -**
- Limit weapons useable nuclear material (WUNM) production
- Reduce attractiveness of all applicable nuclear material
- Ensure that whole facility and capability is scaled to meet mission objectives
- Coordinate measures with facility operations, security, safety, safeguards and forensics to ensure compatibility and effectiveness
Proliferation Resistance Optimization for Advanced Reactors (PRO-AR)

- PRO-X is expanding its facility wide, multivariate analysis approach to other nuclear facilities, including advanced reactors
- Currently assembling PRO-AR national laboratory team to develop AR specific framework, drawing from research reactor work
- PRO-AR will seek to develop partnerships with AR designers to smoothly integrate proliferation resistance and design optimization into designer/client processes
- PRO-AR will offer support for regulatory review, licensing and commissioning of PRO nuclear systems (domestic and international)
- Program will post opportunities to the GAIN site for project partnership

Key Dates

- Fall 2021 - PRO-AR will be launching demonstration project
- Early 2022 - PRO-AR will be ramping up outreach to AR designers to solicit feedback on framework approach
- Late 2022 – PRO-AR plans to launch initial AR partnerships
Your Resource to Engage with NNSA on Global Deployment of U.S. Civilian Nuclear Technology

- Tool to provide a dynamic means for U.S. industry to interact with NNSA
  - Expected to go live Spring 2021, to learn more contact nexus@anl.gov

- Builds on “DOE-NNSA Recommendations and Resources for Advanced Reactor Developers”

- Single point of entry and liaison to collaborate with NNSA offices

- Interactive web portal and human connection that:
  - Helps educate U.S. companies on navigating export control policies and regulations
  - Enhances U.S. competitive advantage by promoting understanding and timely implementation of safeguards by design, security by design, and proliferation resistance in nuclear systems
  - Tracks and shepherds requests for support and engagement
U.S. NUCLEAR NEXUS

Your resource to engage with the NNSA on global deployment of U.S. civilian technology

STREAMLINED DEPLOYMENT

- Single Point of Contact with a Human Connection
- Enhance U.S. Competitiveness
- Online Resources and Tools

ASSISTANCE FOR U.S. INDUSTRY

- Understand 10 CFR 810 export control compliance
- Connect with NNSA expertise
- Accelerate time to market

☑ Early integration of safeguards, security and proliferation resistance, along with safety
☑ Responsive and positive experience in connecting industry partners with the right NNSA resources
☑ Expand understanding of U.S. export control laws and regulations