National Nuclear Security Administration

United States
Department of Energy
National Nuclear Security Administration

International Nuclear Security

Advanced Reactor Nuclear Security Project

Katherine Holt
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INS
International Nuclear Security
Reducing Risk of Nuclear Terrorism

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Nuclear catastrophe is an unacceptable risk

International collaboration is imperative

Theft followed by fabrication and use of a threat device can create catastrophic loss

Sabotage can lead to loss of life, deep economic damage, and societal disruption

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Our Vision

A world in which effective security prevents nuclear theft, sabotage, and terrorism

Our Mission

Lead U.S. international efforts to prevent theft and sabotage of nuclear materials and facilities worldwide

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STRATEGY

Lead and Partner

Global nuclear security norms and standards address existing and emerging threats through U.S. leadership and partnership

Secure

Partner countries have the capabilities to prevent sabotage or the illicit use of nuclear materials through effective nuclear security practices, systems, and infrastructure

Innovate

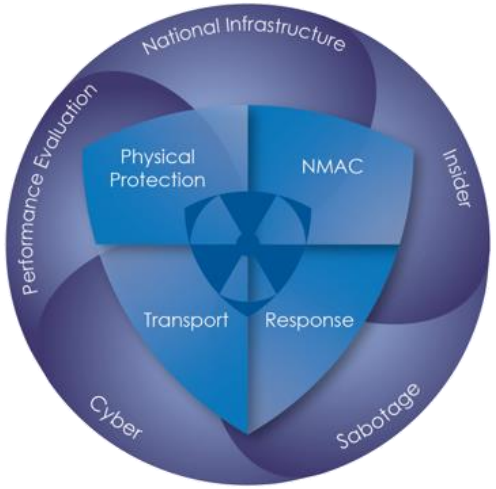
Novel and innovative approaches address current, future, and emerging nuclear security threats, risks, and mitigation strategies

IMPLEMENTATION

Address 4 Risk Areas

- Weapons-useable Nuclear Materials
- Reactors
- Nuclear Fuel Cycle Facilities
- Materials in Transit

Partner with countries in 9 Nuclear Security Functional Areas



THEFT AND SABOTAGE

Adversary interest in nuclear power plants

(2014) Turbine sabotage took Doel 4 reactor offline for months – insider suspected

(2016) Suspected terrorists in the Brussels airports and metro attacks may have considered attacking nuclear plant

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Advanced reactors present particular security challenges

- New markets that do not have experience with security and nonproliferation (e.g., Regulations)
- New fuel types require further assessment to determine whether material characteristics change theft & sabotage risk profiles
- New reactor designs:
  - Many advanced reactor designs do not have mature approaches for Nuclear Material Accounting and Control (NMAC)
  - Potential theft of the entire reactor (for small, transportable reactors)
- New operational environments: remote locations, greater reliance on offsite response, new threat environments
- New target sets: Passive safety systems

Policy Drivers:

- American leadership in nuclear technology + nonproliferation standards
- Enabling peaceful uses
- Meeting climate change goals

INS AR Nuclear Security Project

Building relationships with U.S. nuclear energy industry vendors & embarking countries on nuclear security topics to:

- Improve security of future US exports
- Support nuclear security regulatory and operational capacity in Newcomer countries
- Advancing the global nuclear security regime through IAEA collaboration

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INS approach to supporting the secure deployment of advanced reactors

Objectives

- Secure Exports
- Responsible Newcomers
- Strong Nuclear Security Regime

Implementation Approach

Secure Exports	Responsible Newcomers	Strong Nuclear Security Regime
Develop security analysis and tools + security by design technical partnerships with U.S. vendors	Work bilaterally to support strong nuclear security frameworks in future markets	Collaborate with the IAEA on technology inclusive guidance and infrastructure development

Secure Exports:

Enhance the security of future exports through analysis, tools and technical partnerships

Studies and tools to understand new risks and mitigation approaches

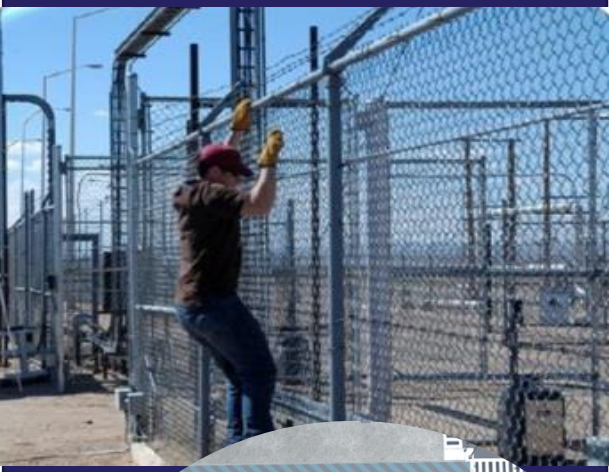
- Security economics
- Advanced reactor target set analysis
- DEPO methodology

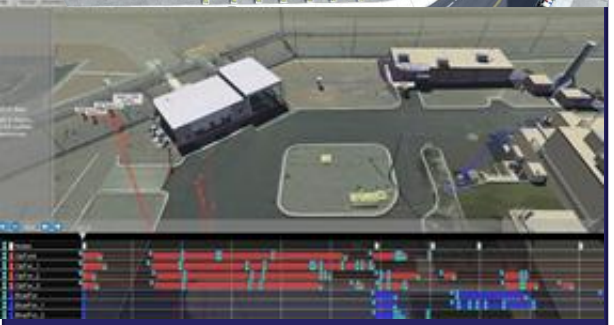
Outreach

- NGO events
- Webinars (GAIN/NEXUS websites)

Security by design technical partnerships with U.S. vendors

- RFI on safeguards and security by design projects (planned)
- Lab-lead agreements (NDA or CRADA)





AR Security Technical Studies & Tools

Security Economics

A tool that vendors and utilities can use to perform a cost-benefit analysis for design features which have the purpose of reducing O&M costs related to nuclear security

Advanced Reactor Target Sets

An approach which US-based companies can identify and evaluate advanced reactor theft/sabotage targets and vulnerabilities for a given protection strategy

Design and Evaluation Process Outline (DEPO) online training

Understanding of the DEPO methodology used to define, design, and evaluate physical protection systems for nuclear facilities

https://nstc.sandia.gov/training/smr-depo-course

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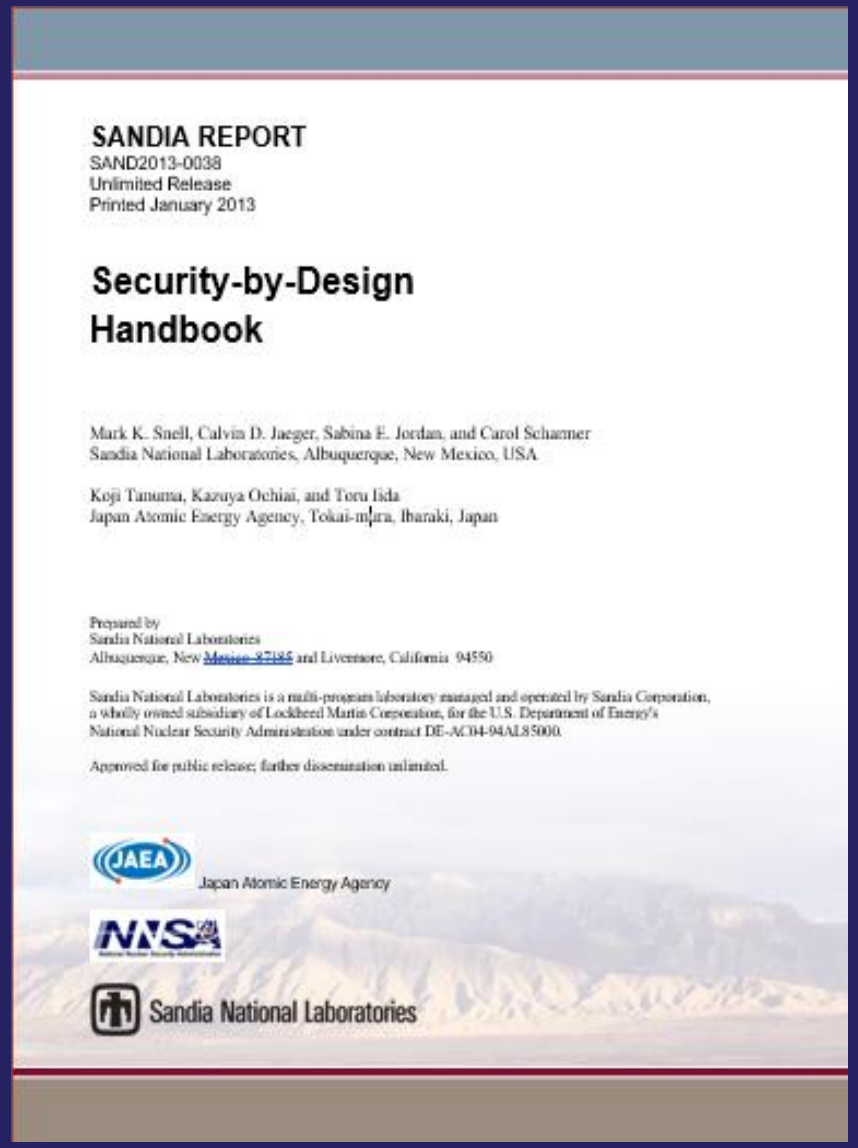


Technical Partnership on "Security-by-Design" (SeBD)

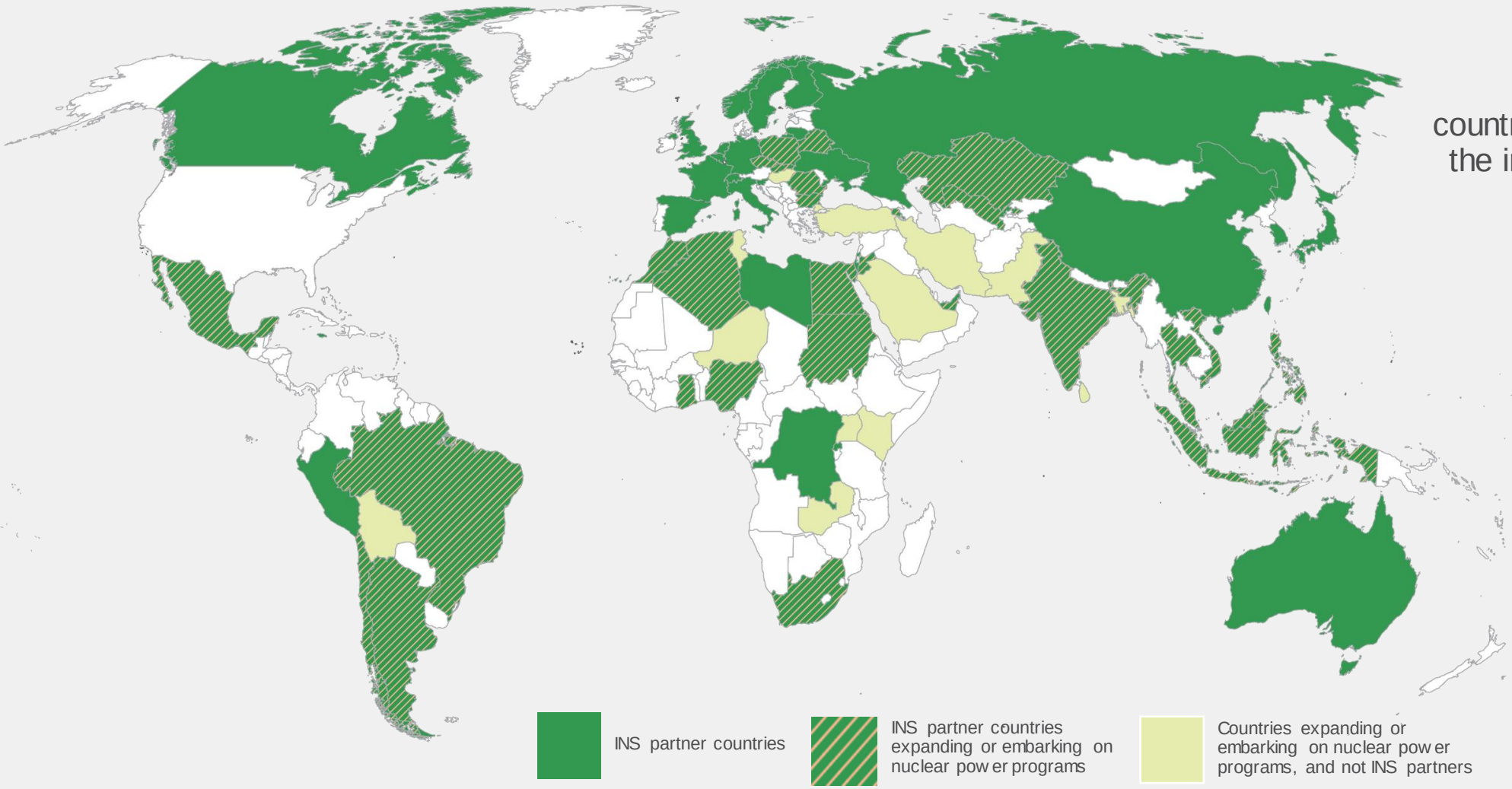
Security-by-Design (SeBD) refers to efforts to incorporate protection-related elements *early*, *frequently*, & *continuously* throughout the engineering process

- Includes protection-related thinking earlier into the design process
- Infuses protection-related decisions frequently throughout the engineering lifecycle
- Incorporates protection-related metrics continuously in evaluation efforts
- Emphasizes efficiency (e.g., same/better performance @ lower cost)
- Based on systems engineering principles
- Better aligns security elements with traditional emphasis points

The Security-by-Design Handbook, Sandia National Labs (2013)

The demand for nuclear power is growing

Defining "nuclear newcomers"



"Embarking Countries" countries that are embarking on the introduction of new nuclear power programs for the first time

"Expanding Countries" countries are considering or actively undertaking an expansion of their nuclear power programs, many of them after an extended introductory period, including traditional builds and new advanced reactor technologies

Responsible Newcomers:

Support nuclear security infrastructure development in newcomer countries

IAEA Milestones Approach to Nuclear Power Infrastructure Development
(IAEA Nuclear Energy Series NG-G-3.1 Rev.1)

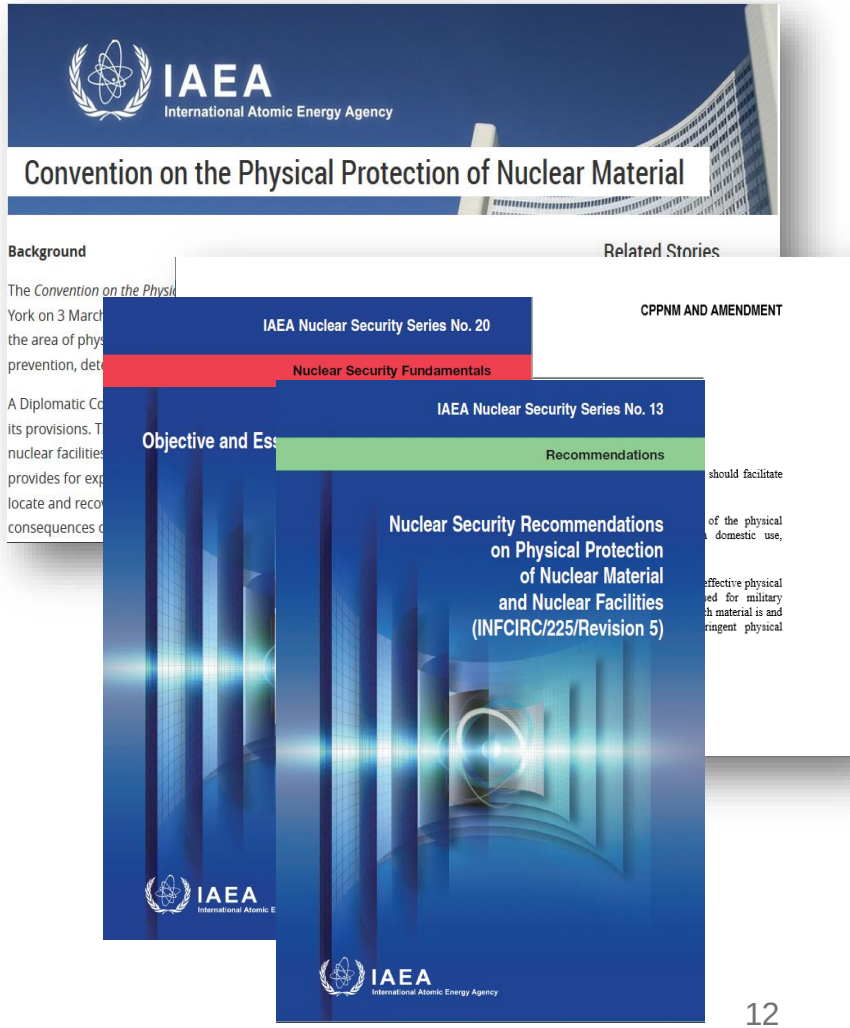
INS's nuclear security focus for embarking/expanding countries is tailored by phase of development (commitment; contracting; commissioning)

Phase 1 Commitment	– Regulatory development – Threat assessments
Phase 2 Contracting	– PPS design – Security plan – Trustworthiness
Phase 3 Commissioning	– Testing and validation – Insider threat mitigation – Cyber security

Strong Security Regime:

Maintain and adapt the global nuclear security regime for AR Technology Considerations & Newcomers

- **Guidance:** Actively involved in developing future good practices with the IAEA to include SeBD for SMR/ARs and other revisions to security guidance including Vital Area Identification, Cybersecurity for SMR's, and others.
- **Missions:** Collaborate with the IAEA on nuclear security aspects of infrastructure missions support to embarking and expanding countries.



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Thank you!

Comments/Questions?

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