

### Safeguards Aspects of Research Reactors

Workshop on Managing the Interface between Safety and Security of Research Reactors - June 7, 2022

#### Kerrin Swan

Section of Concepts and Approaches Division of Concepts and Planning (SGCP), Department of Safeguards International Atomic Energy Agency (IAEA)



## Agenda

- Background: IAEA safeguards •
- Safeguards aspects at research reactors ullet
- Safeguards by design •





## Safeguards within the IAEA



IAEA: promoting the safe, secure, and *peaceful* use of nuclear technologies since 1957



## Role of IAEA nuclear safeguards

...credible assurance that countries are honouring their international obligations (under the NPT) to use nuclear material and technology only for peaceful purposes.



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Countries own the obligations
→ IAEA provides independent verification



## Role of IAEA nuclear safeguards

...credible assurance that countries are honouring their international obligations (under the NPT) <u>to use nuclear</u> <u>material and technology</u> only for peaceful purposes.

Scope of material and technology under safeguards depends on the specific safeguards agreement between each country and the IAEA

## Types of safeguards agreements



### **Item-Specific Safeguards Agreement**

- Safeguards apply to specific items, e.g., nuclear material, facilities, equipment (INFCIRC/66/Rev.2)
- States not currently under the NPT (safeguards system prior to the NPT)
- > 2022: 60 years since first IAEA inspections

### **Comprehensive Safeguards Agreement (CSA)**

- > Safeguards apply to <u>all nuclear material</u> in all peaceful activities in a State (INFCIRC/153 (Corr.))
- > Non-Nuclear-Weapons States (NNWS) under the NPT
- > 2022: 50 years since first CSA

### Voluntary Offer Agreement (VOA)

- Safeguards apply to nuclear material in facilities that the State <u>has offered</u> for safeguards and have been <u>selected</u> by the IAEA
- Nuclear-Weapon States (NWS) under the NPT

### Additional Protocols may be concluded for each type of agreement

> 2022: 25 years since first AP in force





## Safeguards objectives under a CSA

- Detect diversion of **declared** nuclear material in declared facilities or "locations outside of facilities" (LOFs).
- Detect **undeclared** production or processing of nuclear material in declared facilities or LOFs.
- Detect undeclared nuclear material or activities in the **State as a whole**.



# Independent verification: in-field activities at research reactors



### **Nuclear Material Accountancy**

- To verify State's declaration of nuclear material inventory and flow (e.g. item counting, weighing, non-destructive assay)
- > Can involve remote monitoring of unattended equipment

### Containment and Surveillance (C/S)

- To maintain continuity-of-knowledge (e.g. cameras, seals, measurements) between inspections
- Can involve remote data transmission of C/S

### **Design Information Verification**

> To verify State's **declared facility design** (construction, operation, modification or decommissioning)

### **Environmental Sampling, and Complementary Access to other locations**

> To assure "completeness" of declaration: i.e., absence of undeclared nuclear material or activities





## 3S – safety, security and safeguards

- The main step in developing guidance is to examine where and how 3S requirements interface.
- Considerations of 3S are essential elements of the design, construction, commissioning, operation and decommissioning stages of research reactors (RR).
- Handbook on Nuclear Law: 3S emphasizes the interrelations between safety, security and safeguards.





## 3S – safety, security and safeguards

- Many published papers address two of the 3s:
  - safety/security.
  - security/safeguards.
  - safeguards/safety.
- Recommendations are generally:
  - Recognise 3S interfaces and interactions early.
- The trend is for new RRs to be built with inherent safety and security features. Safeguards???
  - Safeguards by design (SBD)





## What is safeguards by design (SBD)?



• Otherwise, safeguards by design is needed.



## What is safeguards by design (SBD)?

- The integration of safeguards considerations into the design process (new or modified facility, at any stage of the nuclear fuel cycle), from initial planning through design, construction, operation, waste management and decommissioning.
- Awareness by all stakeholders (State, designer, operator, regulator, other IAEA Departments) of IAEA safeguards obligations, and opportunities for early discussion with the IAEA Department of Safeguards.
- A voluntary process that neither replaces a State's obligations for early provision of design information under its safeguards agreement, nor introduces new safeguards requirements.



## Benefits of SBD

- Reduce **operator burden** by optimizing inspections.
- Reduce need for **retrofitting**.
- Facilitate joint-use equipment.
- Increase flexibility for future safeguards equipment installation.
- Enhance possibility to use facility design/operator **process info**.
- **Reduce risk** to scope, schedule, budget, and licensing.
- **Potential synergies** with safety and security design choices (3S).

### SBD benefits all parties involved, not just the IAEA





### Thank you for your attention!

