IAEA Safeguards

Safeguards Considerations for Advanced Nuclear Reactors

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Agenda

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- Introduction
- Safeguards Measures
- Drawing safeguards conclusions
- Safeguards challenges for Advanced Nuclear Reactors
- Safeguards by Design

Introduction

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- **IAEA Safeguards**

  ✓Timely detection of diversion of significant quantities of nuclear material from peaceful nuclear activities to the manufacture of nuclear weapons or of other nuclear explosive devices or for purposes unknown, and deterrence of such diversion by the risk of early detection

  ✓ States have different obligations depending on the State's status under the NPT:
  - Comprehensive Safeguards Agreement (NNWS)
  - Voluntary Offer Agreement (NWS)
  - Item-Specific Agreement (non-NPT)

Safeguards at a glance

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2021

safeguards implemented in **185 States** of which **138 States** had additional protocols in force

1,334

nuclear facilities & locations outside facilities under safeguards

Offices

HQ Vienna, laboratories in Seibersdorf, regional offices in Canada & Japan

226,116

significant quantities of nuclear material under safeguards

882

Staff, consultants, CFE, JPOs & other extrabudgetary staff

Safeguards at a glance

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2021

1,072
non-destructive assay systems deployed

148
facilities with remote transmission systems

3,042
in-field verifications & CAs involving

14,649 days
and
2,136 days
under quarantine in countries

1,329
DA and ES samples collected

27,900
seals verified

1,378
surveillance cameras at 254 facilities

Safeguards Measures

- Nuclear Material Accountancy
- Inspections
- Design Information Verification
- Non-destructive assay
- Destructive assay
- Environmental Sampling
- Open Source Analysis
- Satellite Imagery
- Complementary Access

Drawing safeguards conclusions

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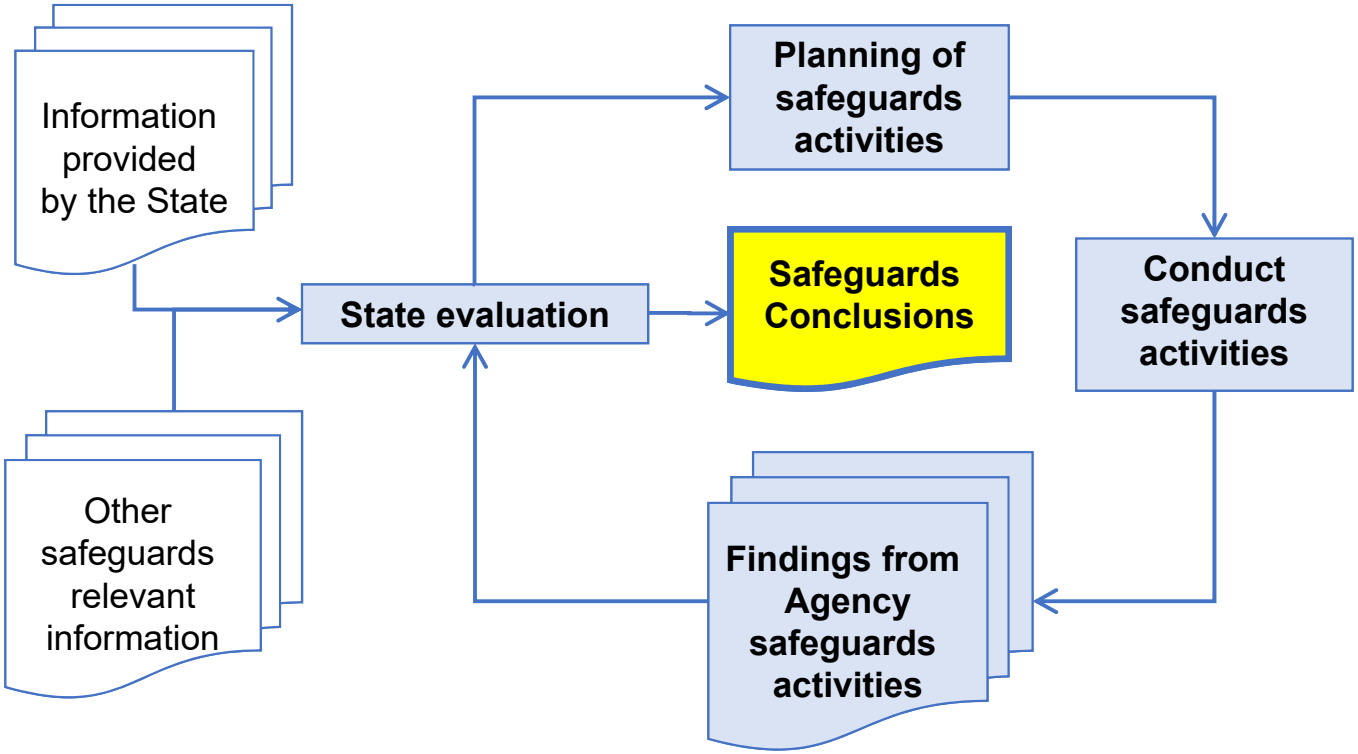

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Safeguards challenges for Advanced Nuclear Reactors

- **New fuels and fuel cycles:** Th/U-233, MOX, Molten Salt fuels, higher enrichment, pyroprocessing, other new processes
- **New reactor designs:** molten salt, floating power reactors, fast reactors, pebble bed, other new technologies
- **Longer operation cycles:** continuity of knowledge between refuelling of core
- **New supply arrangements:** factory sealed cores, transportable power plants, transnational arrangements

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Safeguards challenges for Advanced Nuclear Reactors

- **Spent fuel management:** storage configurations, waste forms
- **Diverse operational roles:** district heating, desalination, hydrogen + electricity
- **Remote, distributed locations:** access issues, accessibility of nuclear material for verification, cost-benefit issues

IAEA independent verification capabilities must be ready

Safeguards by Design (SBD)

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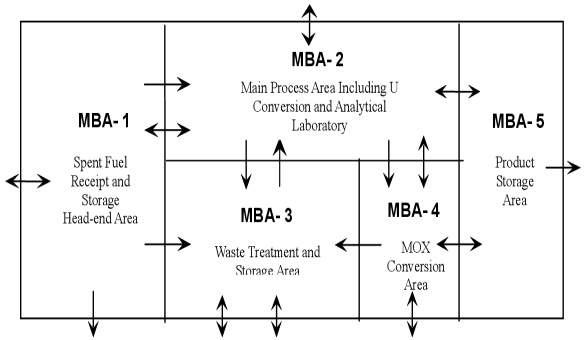
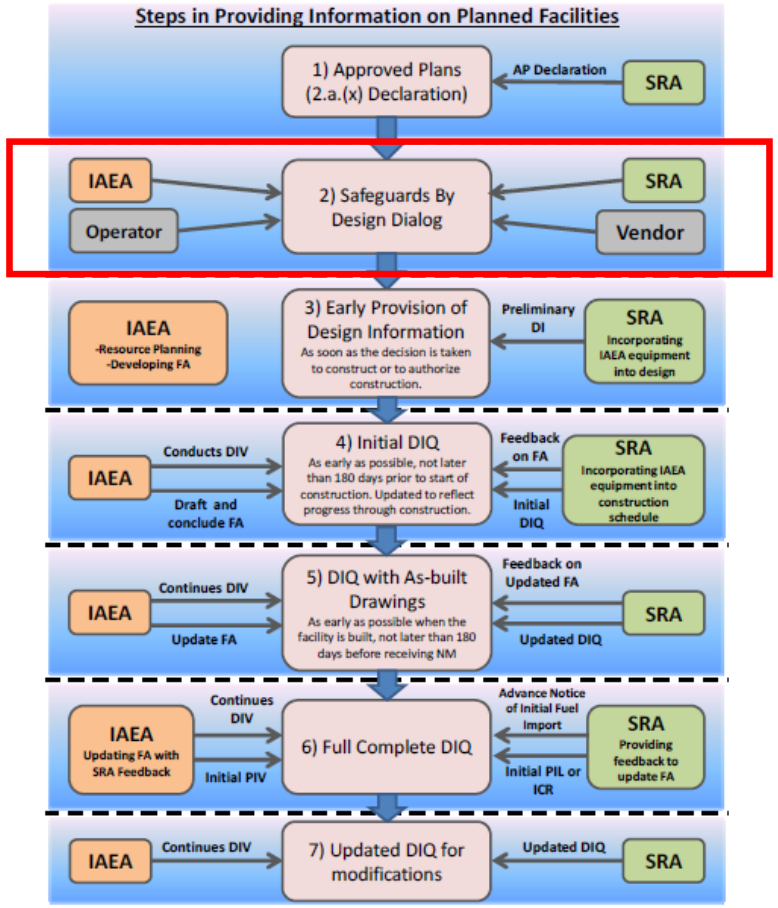
- The **integration of safeguards considerations into the design process** (e.g., new or modified facility, at any stage of the nuclear fuel cycle), from initial planning through design, construction, operation, waste management and decommissioning.
- **Awareness** by all stakeholders (State, designer, 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.



SBD: early discussion with the IAEA



sometimes part of "pre-licensing" phase

From: *Safeguards Implementation Practices Guide on Provision of Information to the IAEA*, IAEA Services Series 33, 2016

SBD Stakeholders

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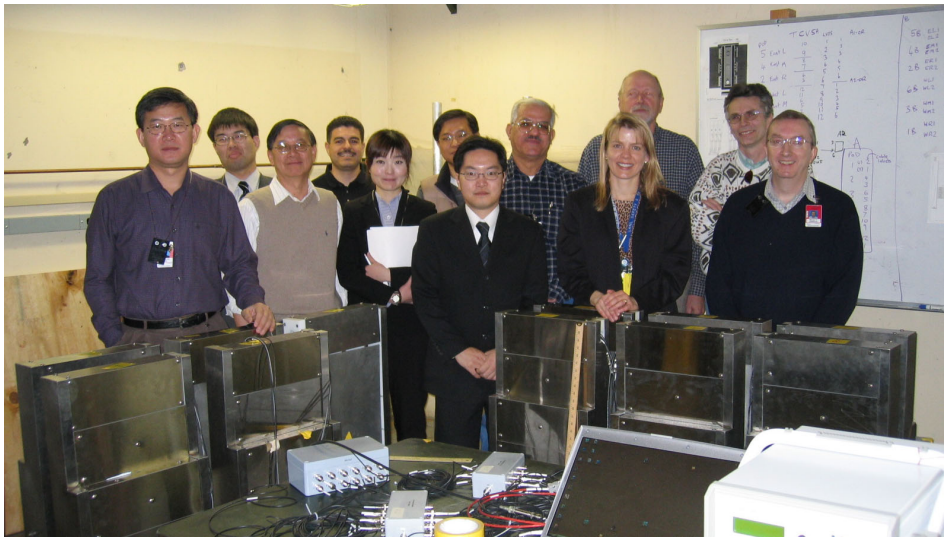
- ✓ Designer/Contractors
- ✓ Operators/Owners
- ✓ Regional/State Authority
- ✓ Equipment Suppliers
- ✓ Technology R&D Community
- ✓ IAEA



Benefits of SBD Application

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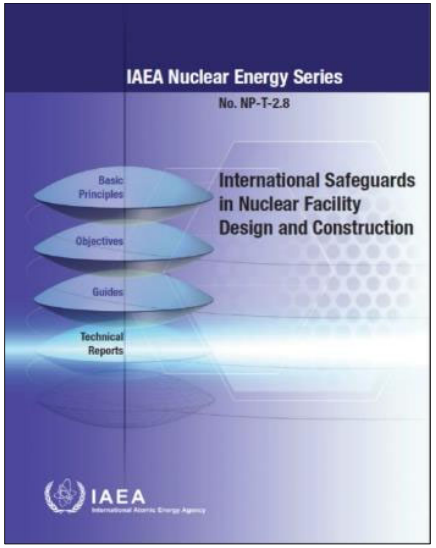
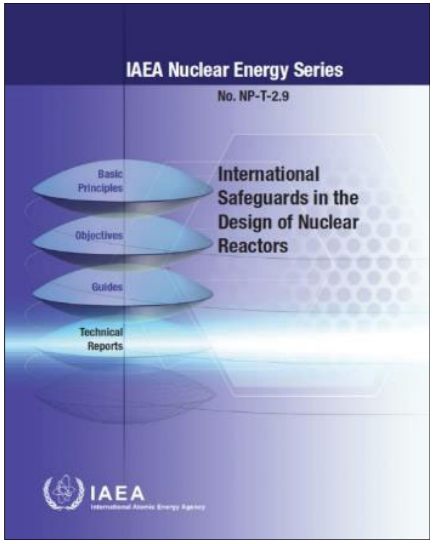
- ✓ Reduces need for retrofit
- ✓ Facilitates more effective and efficient Safeguards implementation
- ✓ Reduces operator burden
- ✓ Increases flexibility for future safeguards equipment installation





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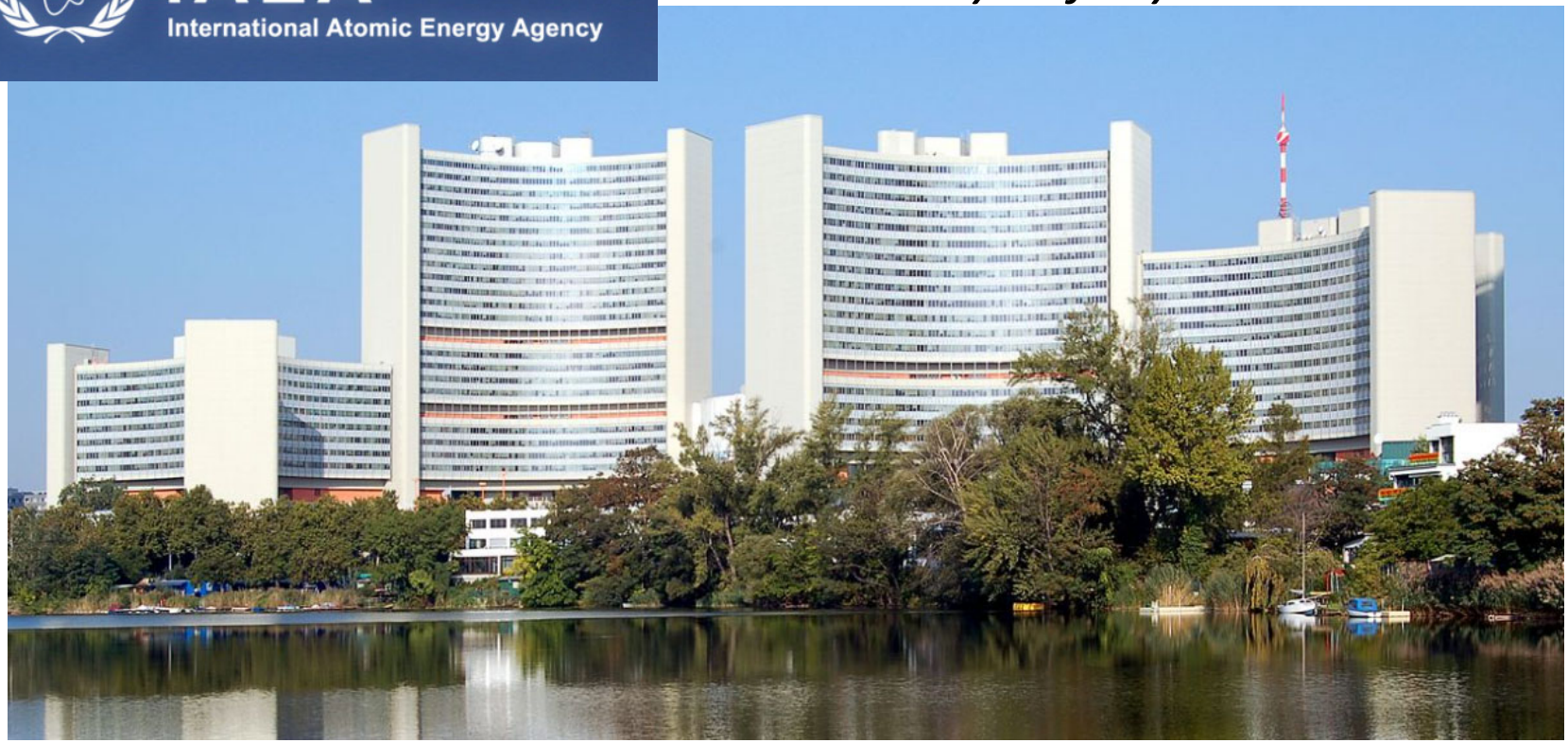

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