Safeguards-by-Design (SBD) for Small Modular Reactors (SMRs)

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Summary of presentation

- What SBD is
- What SBD for SMRs is
- Who Stakeholders are
- How we can help each other
Safeguards-by-Design (SBD)

- Integration of safeguards considerations into the design process (new or modified facility) from **initial planning** through **design, construction, operation, modification** and **decommissioning**
SBD Principles of Interaction

- Target audience: Design community
- Early and continuous voluntary interaction between stakeholders (Designers, IAEA, State Authority, Operators)
  - Success relies on each stakeholder’s understanding of the benefits that can be realized by active participation in the process
- All stakeholders contribute to the development of effective and efficient safeguards
- Synergies are realized between the safety, security, environmental and safeguards systems
SBD Goals

AWARENESS:

making all stakeholders aware of Safeguards obligations, and opportunities for **early discussion with the IAEA**
Priorities for SBD

- Develop communication channels among all the stakeholders
- Foster the development of a Safeguards culture in the design community
- Publicize the benefits of SBD application to the nuclear facilities
- Promote SBD concept successfully
SBD Benefits

- **Reduces need for retrofit** for the installation of safeguards instrumentation
- **Facilitates more effective and cost-efficient safeguards implementation**
- **Reduces operator burden** by optimizing inspector time in the facility
- **Increases flexibility** for future safeguards equipment installation
- **Facilitates joint-use** of equipment (Operator/IAEA)
MSSP task: SBD for SMRs

- SBD Member State Support Programme (MSSP) task on SMRs was proposed to Member States (Russia, USA, ROK, Canada and China) in July 2018
- Four States have accepted the proposal so far
- Task Work Plans were communicated and selection of SMRs are being discussed
  - KLT-40S for Russia
  - SMART for ROK
- Development of safeguards measures for the HTR-PM plant in China
SBD for SMRs (Russia)

- Floating Nuclear Heat and Power Plant
  - KLT-40S reactors have been commissioned in 2018
  - SBD MSSP task on SMRs equipped with KLT-40S was accepted by Russia in October 2018
  - Details of working plan on KLT-40S have been communicated to Russia
  - Akademik Lomonosov was successfully brought up to 100% capacity in March 2019
  - Operating license is expected to be issued for the Akademik Lomonosov in July 2019
SBD for SMRs (Russia)

Open Source: CredibleCarbon site
SBD for SMRs (China)

- High Temperature Reactor Pebble-bed Module (HTR-PM)
  - The HTR-PM has been constructed in China (Initial core loading scheduled for early 2020)
  - A SBD MSSP task on the HTR-PM was proposed to China in September 2017 and accepted in January 2019
  - SBD kick-off meeting for the HTR-PM was held in March 2019

Note: A MSSP task ‘SBD for SMRs’ was proposed to China in July 2018
SBD for SMRs (China)

Open Source: SG symposium 2018
Benefits for SBD Stakeholders

- IAEA
- Designers/Contractors
- Operators/Owners
- Regional/State Authority
- Equipment Suppliers
- Technology R&D Community
Benefits for SBD Stakeholders

- IAEA
  - Increase safeguards effectiveness
  - Optimize the use of IAEA resources
  - Improve facility conditions for safeguards implementation
  - Increase the safeguards awareness of designers/operators
  - Prepare early safeguards approach
Benefits for SBD Stakeholders

- Designers/Contractors
  - Reduce construction costs
  - Avoid construction delays
  - Improve public and customer acceptance of and interest in new facility designs
  - Provide an opportunity to integrate compliance with safeguards requirements
Benefits for SBD Stakeholders
Benefits for SBD Stakeholders

- Owners/Operators
  - Reduce the impact of safeguards on facility operations
  - Minimize safeguards equipment installation costs
  - Minimize retrofitting for safeguards equipment installations
  - Provide assurance that the design meets treaty and regulatory requirements
Benefits for SBD Stakeholders

- Regional/State Authorities
  - Early agreement on a conceptual safeguards approach
  - Identify opportunities for the utilization of Joint Use Equipment
  - Provide mechanism to improve the reporting of facility data/information
  - Enhance possibilities for communication with other stakeholders
  - Improve domestic safeguards implementation at the facility level
Benefits for SBD Stakeholders

➤ Equipment Suppliers

- Design modifications to meet safeguards needs
- Development to satisfy multiple requirements
- More efficient development, delivery and installation of safeguards equipment
Benefits for SBD Stakeholders

- Equipment Suppliers
Benefits for SBD Stakeholders

ICVD

DCVD
Benefits for SBD Stakeholders

Metallic Seals (CAPS)

Optical Seals (COBRA)

Electronic Seals (EOSS)
Benefits for SBD Stakeholders

- Technology R&D Community
  - Development of new safeguards strategies and tools
  - Development of new fuel cycle technology concepts
SBD Working Group

The SBD-WG is an interdepartmental working group that will coordinate the Agency’s SBD activities.

Goals

1. Advance SBD by ensuring safeguards are taken into account early in the design;

2. Leverage and establish partnerships across the Agency and externally;

3. Ensure clear and consistent messaging to all stakeholders
## SBD-WG Outcomes

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Providing value to the Agency and External Stakeholders
SBD Guidance

Coming in 2019...
Reprocessing, Enrichment
In conclusion ...

- We contribute together to the development of safeguards approaches on new nuclear facilities
- Benefits for all stakeholders come from a common safeguards understanding among all stakeholders
Thank you!