Canada's Nuclear Regulator

# Safeguards-by-Design: The Canadian Experience

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# Introduction

## Safeguards-by-Design (SBD)

- Relatively new concept in most States
- Refers to the integration of safeguards considerations at the early design phase of a new nuclear facility
- Should also be applied to situations involving certain isolated components or structures that require integral safeguards installations

# SBD General Overview

- 1st major multinational meeting on SBD hosted by IAEA in Vienna – October 2008
- Final report on meeting submitted to IAEA Division of Concepts and Planning – January 2009
- IAEA goal is to produce SBD guidance document for stakeholder use

# SBD Stakeholders

1. The IAEA
2. Owners/Operators
3. Designers/Builders
4. Regional or State System of Accounting and Control (R/SSACs)
5. Equipment providers
6. Licensing authorities

# Definition of SBD

Definition of SBD from 2008 Vienna meeting:

*"an approach wherein international safeguards are fully integrated into the design process of a nuclear facility - from initial planning through design, construction, operation, and decommissioning"*

# SBD in Canada

- Not a new concept in Canada
- Has been considered for many years to be the most logical approach regarding new facilities and/or facility components
- Is currently incorporated as an important element in the early design of the Advanced CANDU Reactor (ACR)

# Canadian Examples of SBD

- Dry Storage Containers for Spent Fuel
- Darlington Waste Management Facility
- The Advanced CANDU Reactor

# Dry Storage Containers for Spent Fuel (early designs)

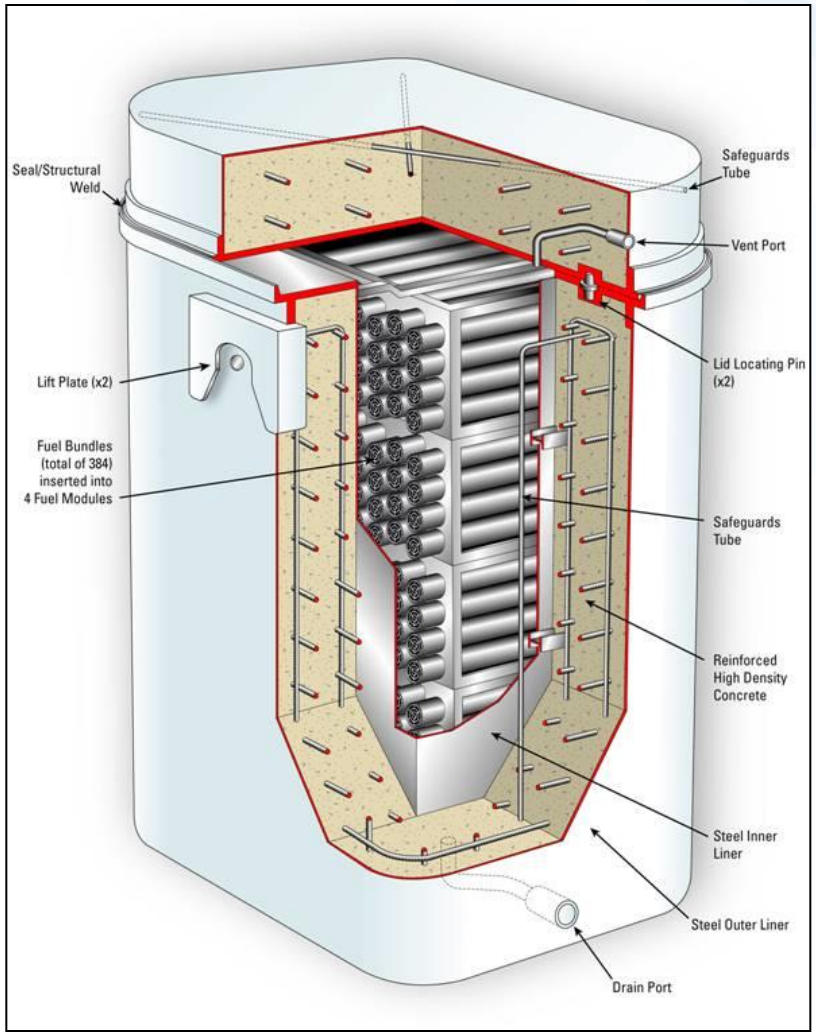
- Initial development started 1976
- Original design:
  - on-site construction
  - cylindrical, reinforced concrete structure
- Design modified to include safeguards sealing tubes and verification tubes embedded in concrete shell
- External design changed later to allow higher density storage

# Dry Storage Containers for Spent Fuel (alternate design)

- Alternate design of DSC involves:
  - off-site construction
  - smaller reinforced concrete structure
  - portable application
- Safeguards sealing tubes and verification tubes embedded in concrete shell as in earlier designs

# DSC Designs

# Cross-Section of Portable DSC



# Darlington Waste Management Facility

- Series of 7 trilateral meetings (CNSC, IAEA, OPG) over 18 months
- Meetings started in April 2005
- Discussions on wide range of topics; e.g. office space, parking, RM, power supplies, DSC spacing, etc.
- Final meeting October 2006; initial transfer April 2008
- First time in Canada for a new facility to enter into service under IS

# DWMF

# Advanced CANDU Reactor - ACR

- ACR is an evolutionary Gen III+ power reactor
- Most complex example of SBD in Canada
- Will require close collaboration among
  - CNSC
  - IAEA
  - AECL
- Must consider some major changes from existing CANDU design to ensure optimal incorporation of safeguards equipment

# ACR Timeline

- Regulatory review by CNSC first requested by AECL in November 2002 for ACR-700
- To determine if design can be licensed in Canada
- Allowed CNSC safeguards staff to examine facility design at very early stage and inform IAEA
- AECL decision in February 2005 to shift design focus to ACR-1000
- CNSC review on hold in May 2005 until design at a more advanced stage
- ACR review resumed in mid-2008

# Status of ACR Safeguards Review and Initial Meetings

- formal review of AECL safeguards documents by CNSC started in early 2009
- bilateral (CNSC-AECL) meeting on ACR safeguards in February 2009
- first trilateral (CNSC-AECL-IAEA) discussions in June 2009
  - preliminary presentation by AECL to IAEA on ACR plant layout and fuel handling
  - focus on design elements with potential impact on safeguards

# Most Recent Trilateral Meetings

- March 2010 – Vienna (IAEA Headquarters)
  - to provide latest design information on ACR
  - to identify specific ACR features that differ from those in existing CANDU design
  - to discuss technical aspects of these features from a safeguards perspective
- May 2010 – Toronto (AECL - Sheridan Park)
  - to continue discussions following IAEA review of ACR design information
  - to interface with AECL technical experts on topics of potential safeguards concern

# Conclusions

- SBD for nuclear facilities and specialized applications in Canada:
  - is a well-established concept
  - has a history of successful implementation
- Valuable practical experience has been gained
- The next application of the SBD concept in Canada is expected to be in the context of new-build reactor projects, such as an ACR-1000
- Canada will continue to offer support for the ongoing development and implementation of the SBD concept within the IAEA or other fora (NGSI).

# Questions?