Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

CNSC support to standards organizations and preparations for future reactors

NRC Meeting on Codes and Standards for New and Advanced Reactors

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Canada

CANADIAN NUCLEAR SAFETY COMMISSION

OUR MANDATE

REGULATE
the use of nuclear energy and materials to protect health, safety, security and the environment

IMPLEMENT
Canada's international commitments on the peaceful use of nuclear energy

DISSEMINATE
objective scientific, technical and regulatory information to the public

OVER 75 YEARS OF REGULATORY EXPERIENCE

Canadian Regulatory Approach

CNSC Responsibilities

- Set safety requirements, inform licensees, verify compliance
- Regulatory action based on level of risk
- Make independent, objective and risk-informed decisions
- Assure Parliament that licensee responsibilities are properly discharged

Licensee (Regulated Party) Responsibilities

- **Primary responsibility for safety**
- Carry on regulated activities in a manner that protects the health, safety, security and the environment, while respecting Canada's international obligations

CNSC VDR Status/ History (April 2024)

Company	Reactor type (output per unit)	VDR Status
UltraSafe Nuclear	High-temperature gas reactor (5 MWe)	PHASE 1 Complete PHASE 2 Started
X-Energy	Pebble bed HTGR (80 MWe)	COMBINED PHASE 1 & 2 Underway completed in December 2023
ARC Clean Technology	Sodium pool fast spectrum (100 MWe)	PHASE 1 Complete PHASE 2 Underway
Moltex Energy	Molten salt fast spectrum (300 MWe)	Series PHASE 1 & 2 PHASE 1 Complete
Westinghouse Electric Company, LLC	Micro Reactor solid core and heat pipes (Up to 5 MWe)	COMBINED PHASE 1 & 2 Assessment started in 2024
General Electric Hitachi	Boiling Water Reactor (300 MWe)	COMBINED PHASE 1 & 2 Complete
Terrestrial Energy	Molten salt integral (200 MWe)	PHASE 1 & 2 Complete
SMR, LLC	Light water reactor (160 MWe)	PHASE 1 Complete
CANDU Energy	Enhanced CANDU 6 (740 Mwe)	PHASE 1, 2 & 3 Complete
ATMEA	Pressurized Water Reactor (1,100 MWe)	PHASE 1 Complete
Westinghouse AP1000	Pressurized Water Reactor (1,117 MWe)	PHASE 1 & 2 Complete
AECL	Advanced Candu Reactor (1,165 Mwe)	PHASE 1, 2 & 3 Complete

Canada's SMR Landscape

Ontario

- Ontario Power Generation Darlington New Nuclear Project – 300 Mw_e
- Global First Power – EA and siting ongoing for Micro Modular Reactor – 10-45 MW_{th}

Saskatchewan

- Siting decision ongoing
- SaskPower collaborating with OPG on deploying BWRX-300

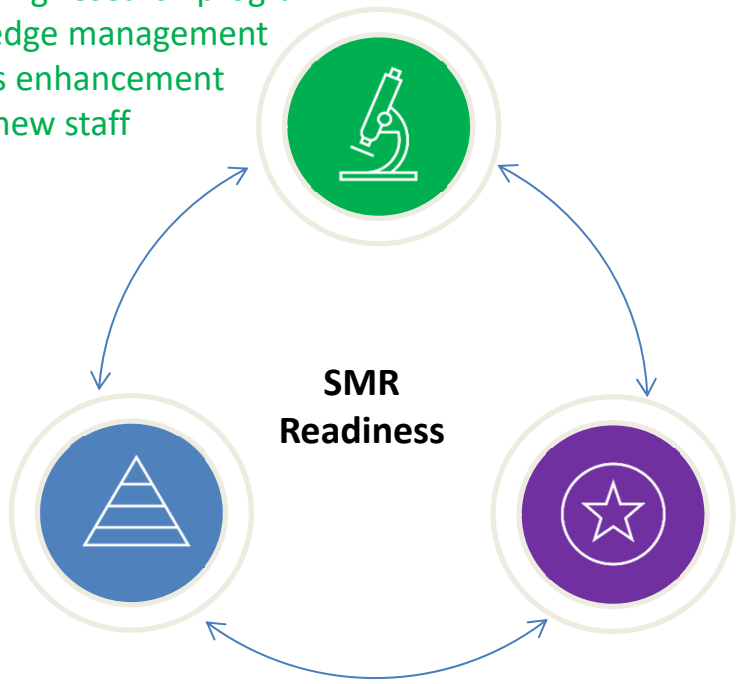
New Brunswick

- LTPS application - ARC Canada (100 MW_e)

SMR readiness activities

Ramping Up Capabilities

- Expanding research program
- Knowledge management process enhancement
- Hiring new staff



Regulatory Refinement

- Review of CNSC Regulatory Framework
- IAEA projects for advanced technologies
- Process to leverage other regulatory reviews
- US NRC and UK ONR MOC

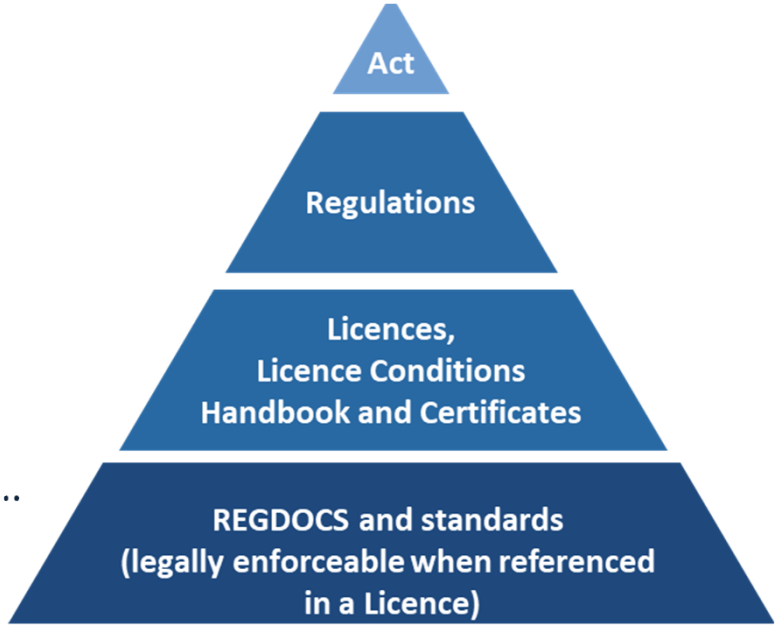
First of A Kind (FOAK)

- Addressing novel means of containment
- Addressing novel means of shutdown
- Optimization of CNSC internal management systems
- Training and capability development
- International collaboration

CNSC Regulatory Framework

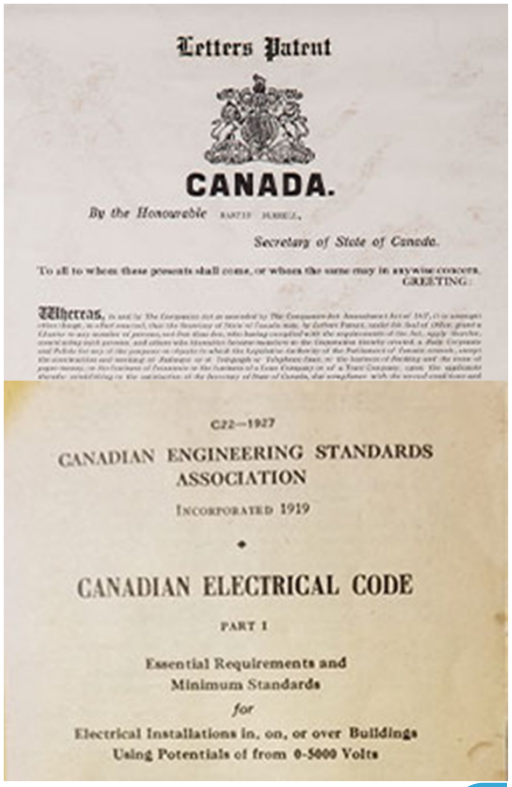
CNSC has a comprehensive regulatory framework including:

- Regulatory Framework
  - Safety & Control Areas, Licence Conditions
- Regulatory Documents & Guidance
  - REGDOC setting the general requirement and high-level compliance criteria
- CSA standards and codes such as ASME, IEC, ISOE…
- Allows for alternative approach
  - Alternative standards can be proposed by applicant for different designs



Canadian Standards Association

- Established in 1919 as the Canadian Engineering Standards Association (CESA)
- Not for profit organization independent of government and CNSC
- Committee/working groups are assembled from utilities, academia, CNSC
- Establishes consensus standards based on operating experiences and international best practices
- Only become a binding requirement once adopted in the licence condition handbook


Letters Patent

CANADA.

By the Honourable

Secretary of State of Canada.

To all to whom these presents shall come, or whom the same may in anywise concern, GREETING:

Whereas,

C22—1927

CANADIAN ENGINEERING STANDARDS ASSOCIATION

INCORPORATED 1919

CANADIAN ELECTRICAL CODE

PART I

Essential Requirements and Minimum Standards for Electrical Installations in, on, or over Buildings Using Potentials of from 0-5000 Volts

CSA GROUP™

CSA Standards

Standards:

1 CSA N285, series of standards on CANDU NPP pressure retaining systems and components
2 CSA N285B, series of standards on Periodic inspection of NPP components
3 CSA N286, Management system requirements
4 CSA N287, series of standards on concrete containment
5 CSA N288, series of standards on environmental management
6 CSA N289, series of standards on seismic design for nuclear power plants
7 CSA N290A, series of standards on reactor control systems, safety systems, and instrumentation for nuclear power plants
8 CSA N290B, series of standards on reactor safety and risk management
9 CSA N291, Requirements for nuclear safety-related structures
10 CSA N292, series of standards on radioactive waste management
11 CSA N293, Fire protection for nuclear power plants
12 CSA N294, Decommissioning of facilities containing nuclear substances
13 CSA N393, Fire protection for facilities that process, handle, or store nuclear substances
14 CSA N1600, General requirements for nuclear emergency management program

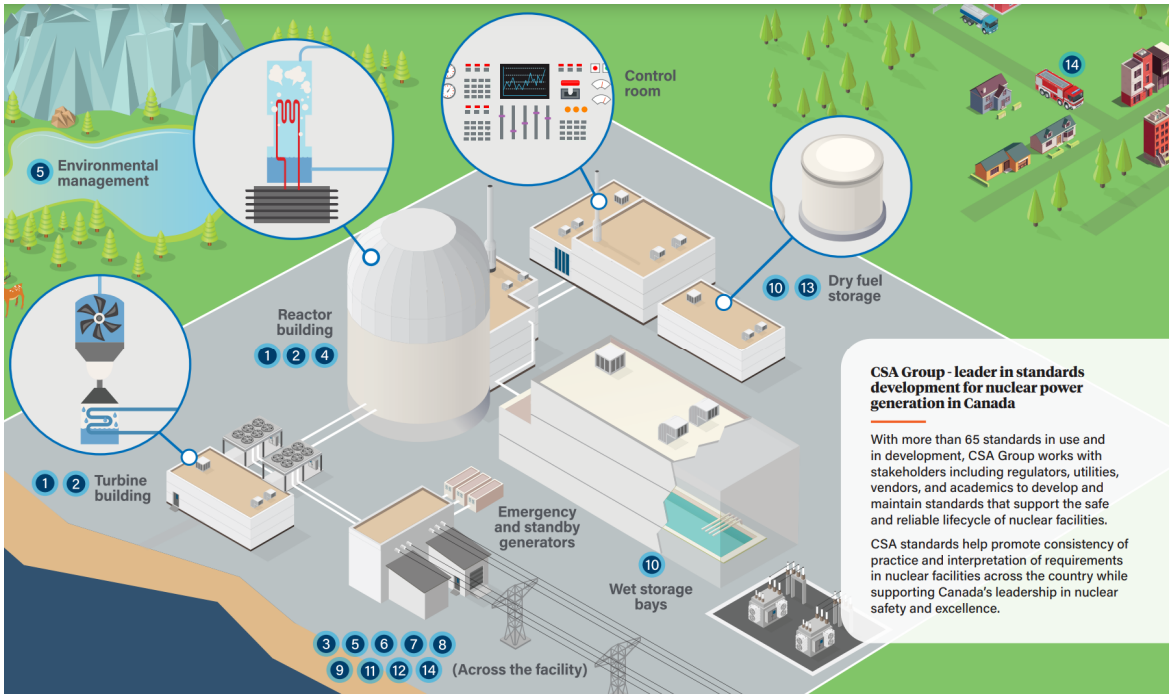


Illustration represents a generic NPP and applicable CSA standards (www.csagroup.org)

CSA Small Reactor Task Force

- CSA Group is actively working with stakeholders, including Natural Resources Canada, CNSC, utilities, provincial authorities and technology vendors, to identify and address SMR standards-related needs.
- SMR priority areas have been identified and include areas such as pressure boundary, steel-concrete composite, functional containment, in-service and periodic inspection and embedded or deeply embedded structures.
- Establishing a dedicated Harmonization Task Force to review and develop an approach to assess, and potentially act on, needs/opportunities for new or enhanced standards harmonization

Priorities for CSA

- ✓ Proactive review of standards to support SMRs
- ✓ Assembled a task force to identify areas for improvement
- ✓ Priority list included

- Pressure boundary
- Steel-concrete composite
- Functional containment
- Emergency management
- In-service and periodic inspection
- Reliability and integrity management
- Risk-based/Graded approach
- Emergency planning zones
- Embedded or deeply embedded structures
- Probabilistic safety assessment
- Accident management
- Cyber security
- Siting
- Design for decommissioning

Standards update status

- Standards currently under evaluation include:
  - CSA N285.0-17, General requirements for pressure-retaining systems and components in CANDU nuclear power plants
  - CSA N287, suite of standards for concrete containment structures for nuclear power plants
  - CSA N290.9:19, Reliability and maintenance programs for nuclear power plants
  - CSA N1600:21, General requirements for nuclear emergency management programs
- Recently, Supplement No.1 to CSA N293-12, Fire Protection for Nuclear Power Plants was published to provide direction for application and adaptation of fire protection requirements to SMRs.
- Standards for small modular reactors (csagroup.org)

Specific challenges with SMR

- CSA N285.0 pressure boundary, primarily established for CANDU technology
- Code classification aspect not directly applicable to BWR as an example and may be other types down the road.
- In the interim CNSC is accepting alternative approach to current classification rules.
- CSA N285.0 established a task force to look at improvements, including a technology neutral annex that may be added to the standard to account for design differences between technologies.

CSA N285.0:23/
CSA N285.6 Series:23

General requirements for pressure-retaining systems and components in CANDU nuclear power plants/Material Standards for reactor components for CANDU nuclear power plants

Summary

- CSA group develops consensus standards with stakeholders from across the sector
- CNSC is actively involved in the development and periodic update of standards
- CSA standards are not part of the regulatory requirements and are not binding until they are adopted in the licence conditions for specific utility.
- Task force identified prioritized list to ensure readiness for SMR deployment.
- Several improvements have been introduced and others are under development.

THANK YOU

Questions?

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