CANADIAN NUCLEAR SAFETY COMMISSION
An Overview of Nuclear Energy Topics

June 18th, 2025

Canadian Nuclear Safety Commission | Commission canadienne de sûreté nucléaire

Canada

Overview

- Who is the ‘CNSC’ and what do we do?
- Fission and Reactor Processes
- Waste Management - How is spent fuel dealt with?
- Transportation of Nuclear Waste
- Nuclear Security and Emergency Management
- How does the CNSC evaluate risk to people and the environment?
- CNSC Licensing Overview
- Collaborative monitoring with Indigenous Nations & Communities

The Canadian Nuclear Safety Commission

Canadian Nuclear Safety Commission

Protect communities, workers and the environment

Ensure the peaceful use of nuclear energy

Share information

Canada's Nuclear Regulator

Canadian Nuclear Safety Commission

Uranium mines and mills

Uranium fuel fabrication and processing

Nuclear power plants

Nuclear substance processing

Industrial and medical applications

Nuclear research and educational activities

Transportation of nuclear substances

Nuclear security and safeguards

Import and export controls

Waste management facilities

Regulates All Nuclear-Related Activities in Canada

What We Do, What We Don't

- Commission and staff work for Canadians, we are an **independent** regulator
- Staff **review** applications and Commission **issues** licences
- Commission's decisions based on **best available information** *(i.e., science and Indigenous Knowledge)*
- Staff **verify safety and compliance** – take action if needed

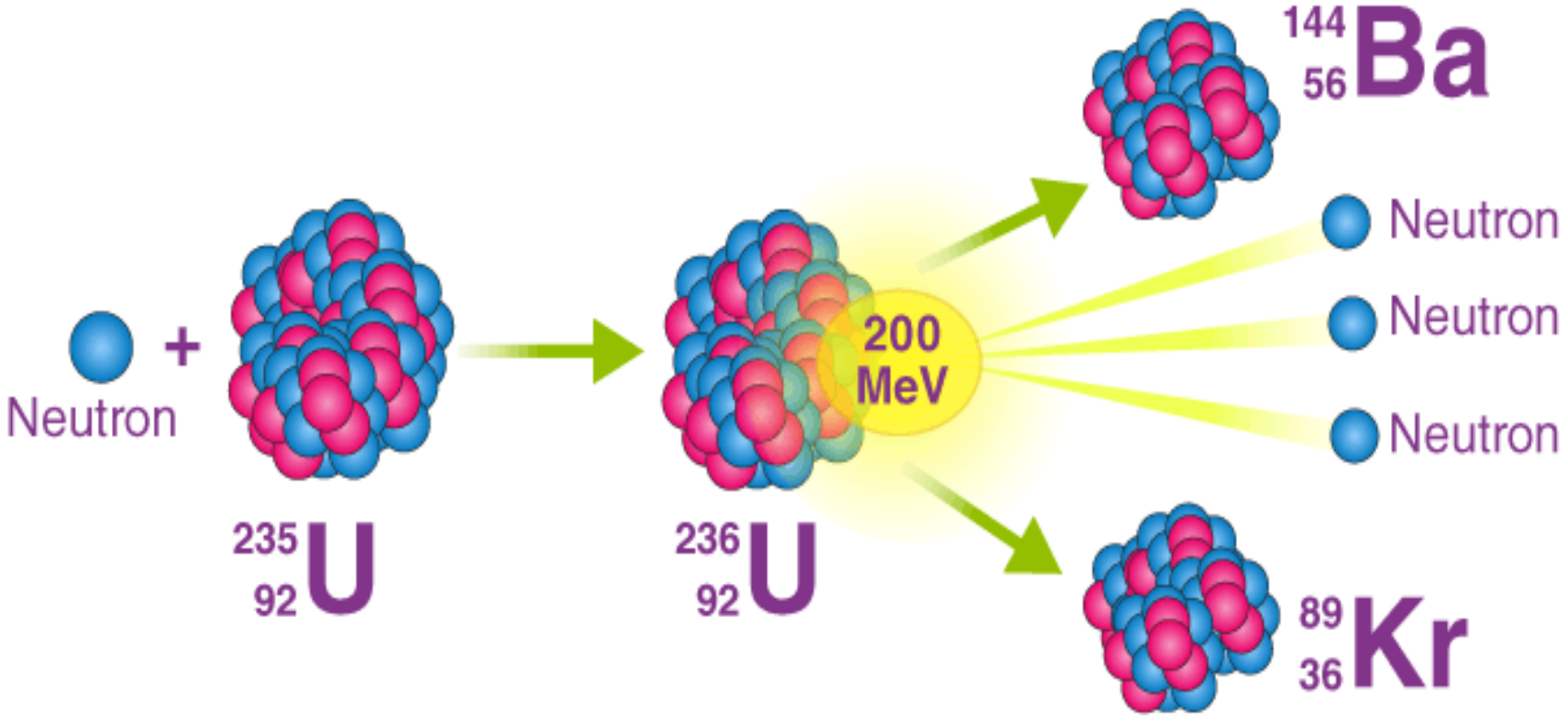
- We are **not** industry, nor are we the Province
- We do **not** select sites
- We do **not** own, manage, construct or operate projects
- We **don't** regulate exploration
- We do **not** promote the nuclear industry

Indigenous Consultation & Engagement – CNSC'S Role

- Agent of the Crown (S. 35 of the Constitution Act, 1982 - **Duty to Consult**)
- Crown Consultation Coordinator for all non-*IAA* designated nuclear related projects **throughout their entire lifecycle**
- Building long term relationships with Indigenous peoples
- Listen to and address concerns and potential impacts on rights (mitigation/accommodation)
- Provide funding and support building capacity
- Being flexible, honourable, reasonable, accessible, fair
- Support implementation of UNDRIP and advance reconciliation

How a CANDU Reactor Works

Fission Process



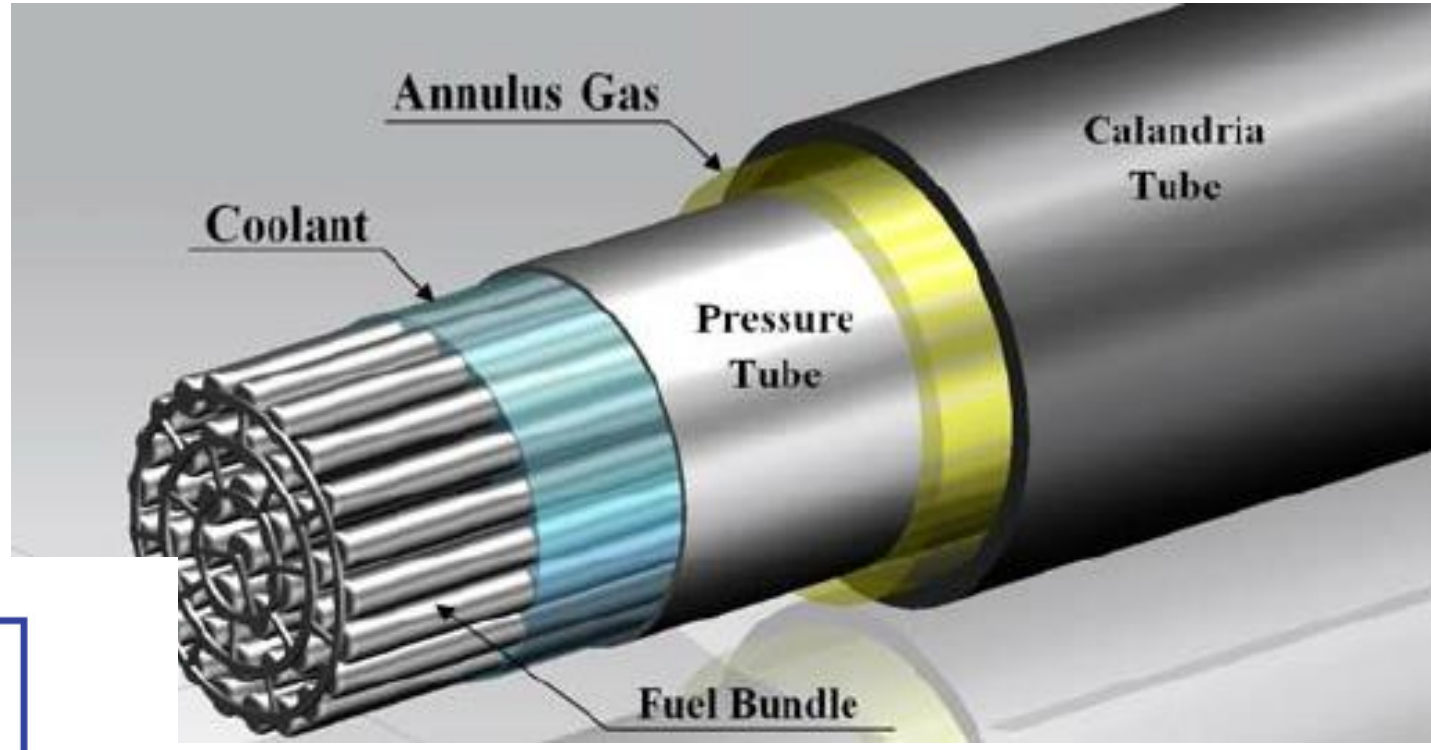
CANDU Reactor

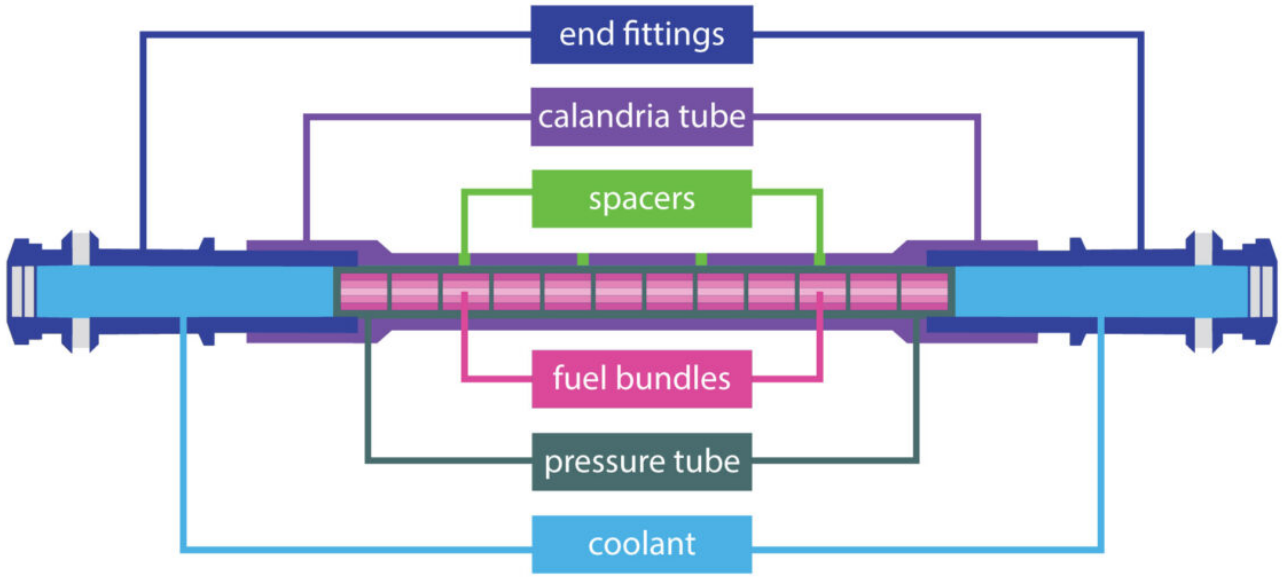
Douglas Point, ON: First time Canada designed a full-size grid-scale reactor purposed for power generation - 1967

- The CANDU reactor: **CAN**ada **D**euterium **U**ranium
- Natural uranium fuel
- Heavy water moderator
- Globally used

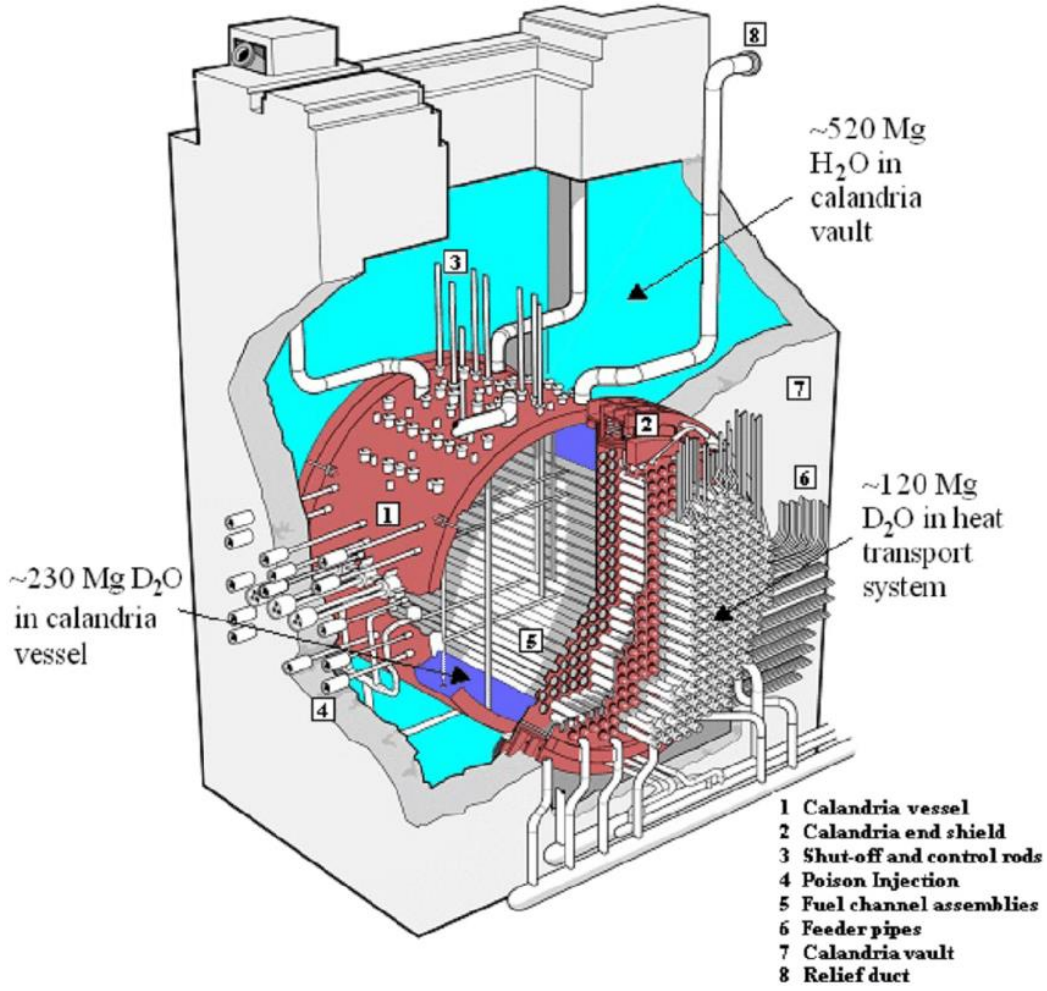
CANDU Reactor – Fuel Bundles

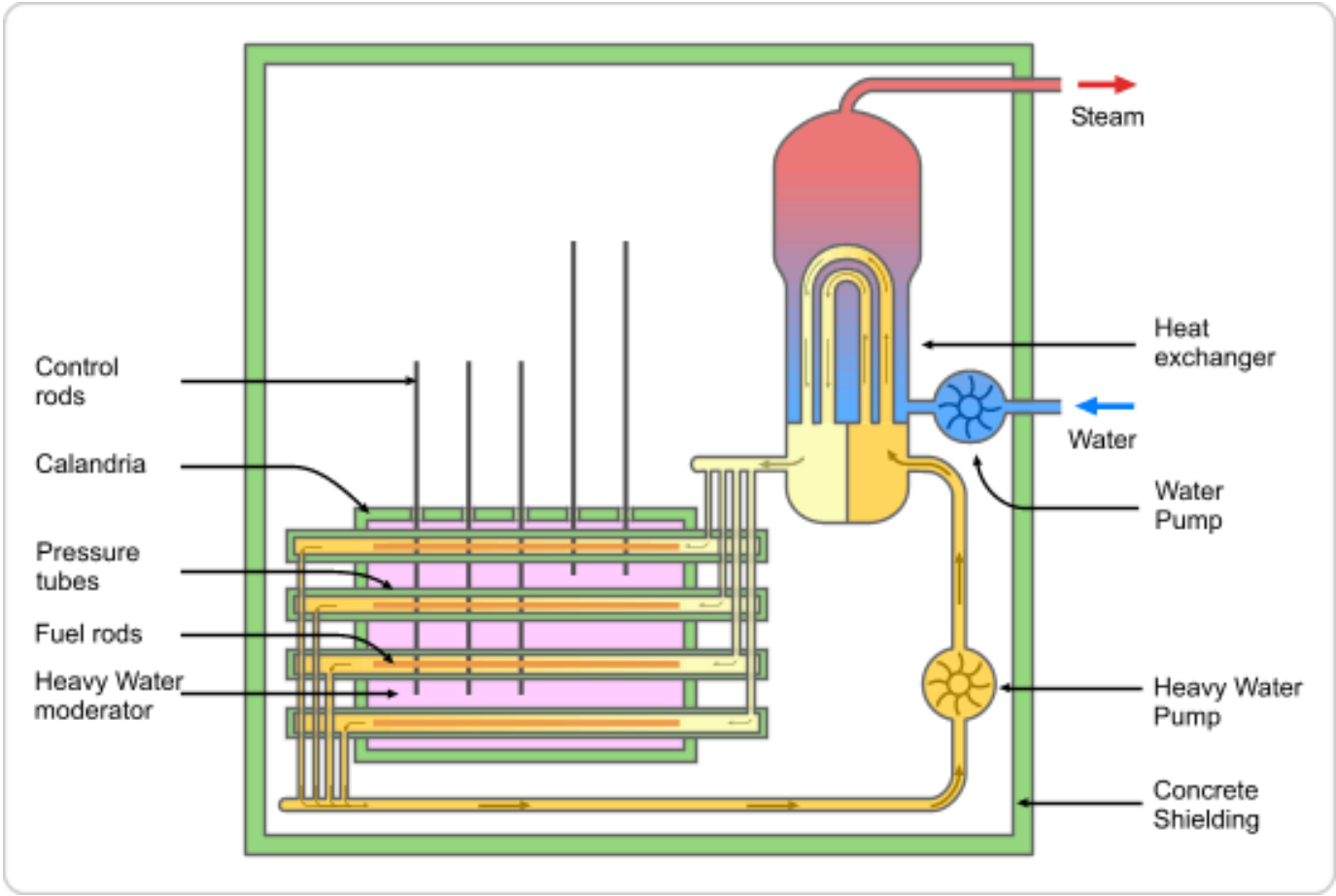
CANDU Reactor – Fuel Assembly



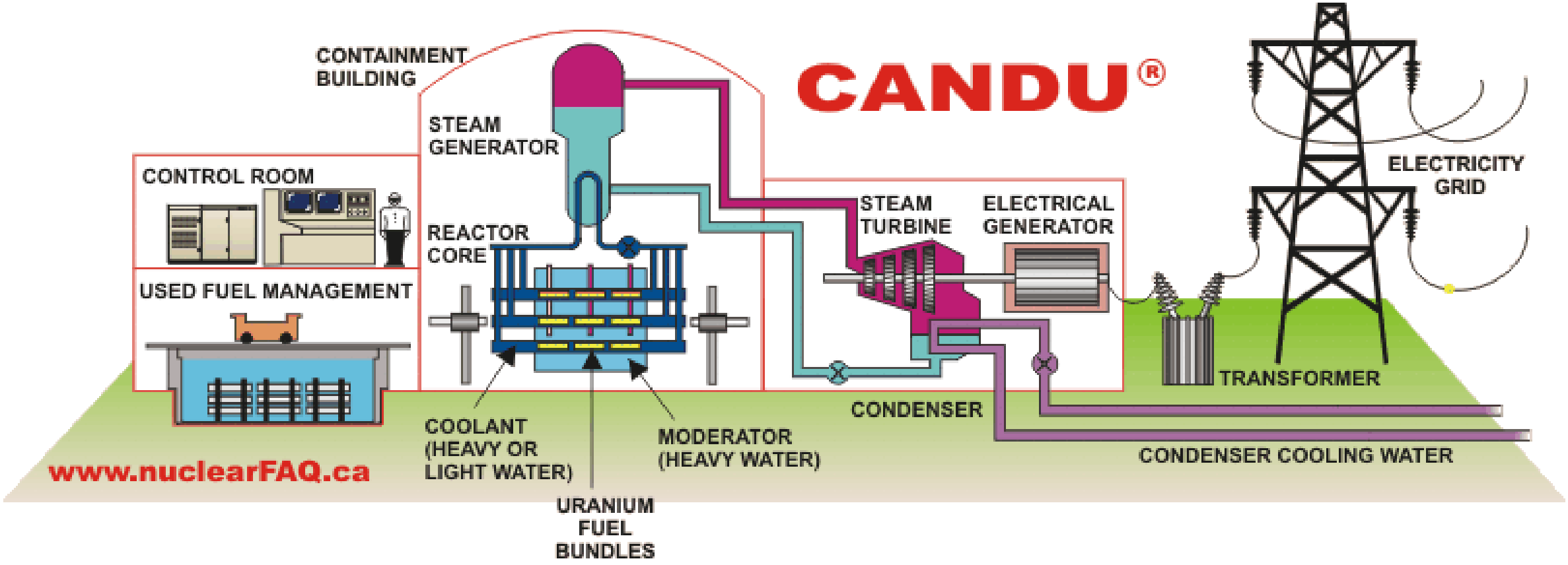


CANDU Reactor





CANDU Reactor



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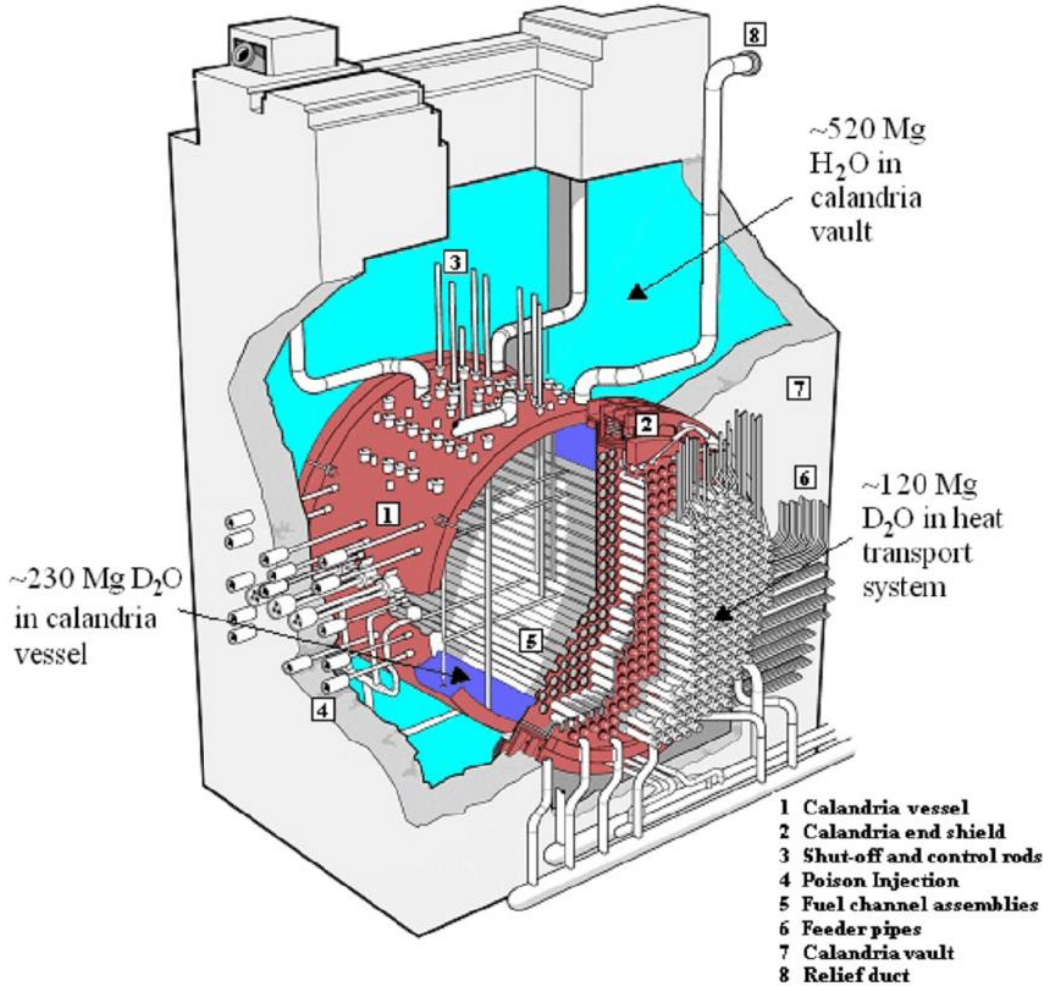
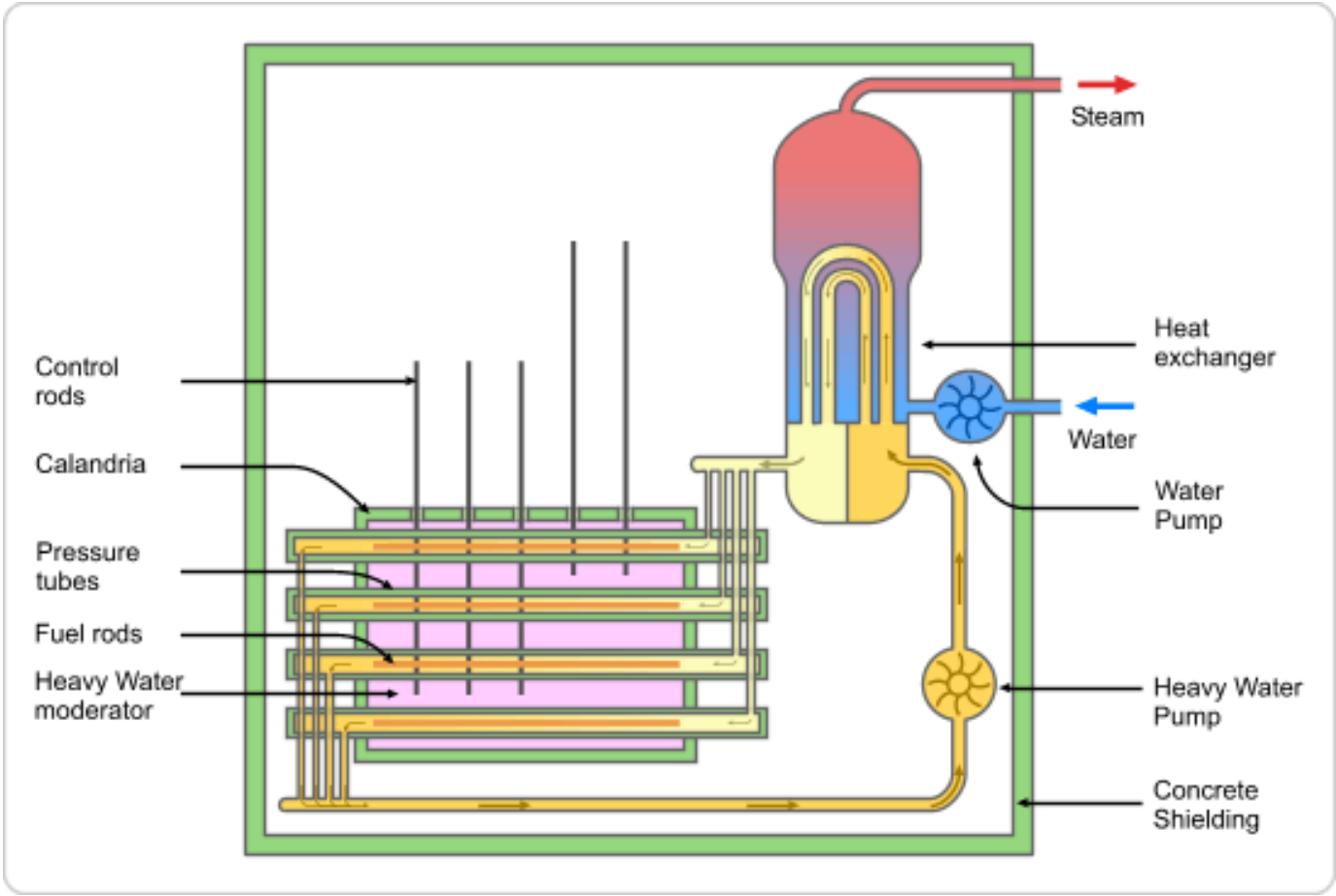
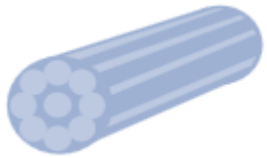




Waste Management

Waste Classification

	1	2	3	4
	Uranium mine and mill waste	**Low-level radioactive waste**	**Intermediate-level radioactive waste**	**High-level radioactive waste**
Where is it from?	From mining/milling ore into yellowcake.	Nuclear power plants, research reactors, test facilities, radioisotope manufacturers or users, uranium refining and conversion, and nuclear fuel fabrication.	Nuclear power plants, prototype and research reactors, test facilities, and radioisotope manufacturers and users.	Nuclear power plants, prototype and research reactors, and test facilities.
What does it look like?				

High level waste only makes up 0.6% of the waste inventory!

High-Level Waste

What does it look like?

Used nuclear fuel is still significantly radioactive

How is it stored now?

How long will it be radioactive?

The radioactivity of irradiated used nuclear fuel starts high but decreases quickly (by 99% in the first 10 years). It then takes about 1 million years to decrease to the original level of natural uranium.

Transport of Radioactive Waste

Who is responsible for regulating transport of radioactive material?

The transport of radioactive material in Canada is regulated by:

The federal government

- CNSC
- Transport Canada

The provinces/territories

CNSC and Transport Canada staff at Vancouver Port (Photo CNSC)

Managing Risk to Ensure Safety

- Objectives of the Transport Regulations is to protect the health and safety of persons and the environment –
  - Emphasis is on **package safety**
- Uses graded approach in limiting radioactive contents based on types of package
  - Greater the radioactivity = more **robust** is the package
- CNSC certification is required for certain types of packages

Nuclear Security and Emergency Management

Nuclear Security

- Approach follows best practices and standards recommended by the International Atomic Energy Agency

- Amended in 2006 to enhance security at nuclear facilities in the aftermath of September 11, 2001
  - Annual threat and risk assessment
  - Onsite armed response force at major nuclear facilities
  - Enhanced security screening of personnel
  - Enhanced access control to nuclear facilities
  - Threat analysis for nuclear facilities based on design
  - Uninterrupted power supplies for alarm monitoring and security systems
  - Contingency planning, drills, and exercises

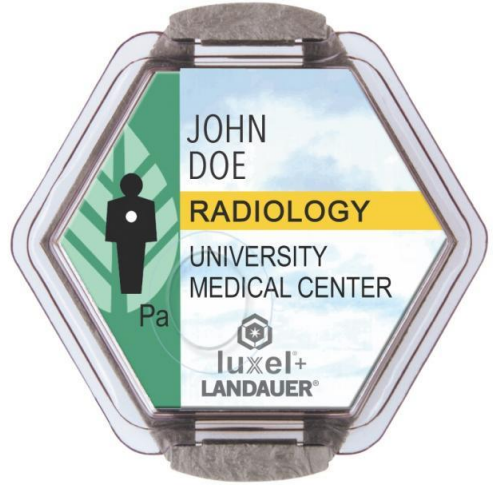
Who does what during a nuclear emergency?

Organization	Responsibilities during a nuclear emergency
Nuclear power plant operator	• Stops or mitigates the progression of the nuclear emergency and minimizes impacts on the surrounding communities • Provides clear, up-to-date information and technical support to provincial and local authorities to help them in their response
Canadian Nuclear Safety Commission	• Oversees the power plant operator's response to the event • Ensures that the appropriate response actions are taken by the operator • Provides technical advice to federal and provincial response authorities • Informs the government and the public of its assessment of the nuclear emergency
Provincial authority (provincial and municipal governments, emergency responders)	• Initiates public alerting systems • Decides and communicates the protective measures for the public (evacuate, shelter in place, take potassium iodide pills) • Monitors radiation levels outside the facility • Establishes evacuation centres

Risk Assessments & Environmental Protection Reviews

Environmental & Human Health Risk Assessments

- Science-based technical assessments conducted by licensees
- Analyses the effects of a nuclear facility on human health and environmental receptors
- Predicts radiation doses to members of the public and considers how contaminants can get into the environment
- *Quantifies* risk to human health and environment from any accidents and malfunctions
- Considers radiological and non-radiological sources of contamination



ENVIRONMENTAL RISK ASSESSMENT (CSA N288.6)

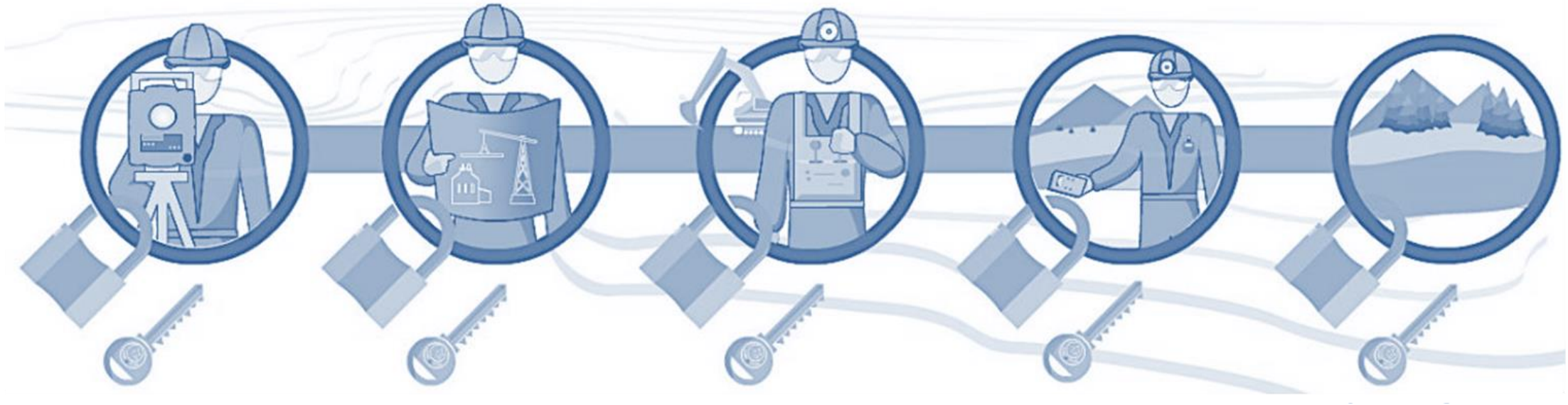
- Conceptual Site Model:
  - Source to Receptor(s)
  - Environmental Pathways
- Identify environmental interactions (points of release) and contaminants that are being released
- Screen for Contaminants of Potential Concern (COPCs)
- Evaluate exposure risk to humans and biota
- Science-based decision-making tool to prioritize mitigation measures and monitoring programs

Environmental Protection Reviews (EPR)

- Science-based technical assessments conducted by CNSC staff
- Completed cyclically during each phase of a facility's lifecycle
- CNSC staff review environmental monitoring data and environmental risk assessments
- EPR reports are considered by the Commission as part of licensing decisions and are posted on the CNSC website

Licensing Overview

Nuclear Facility Licensing Stages



Site Preparation	Construction	Operation	Decommissioning	Release from CNSC regulatory control
Licence to Prepare Site	Licence to Construct	Licence to Operate	Licence to Decommission	Licence to Abandon

Licence to Prepare Site application

Canadian Nuclear Safety Commission

Applicant must satisfy CNSC with information addressing these "Safety and Control Areas"

- Management System
- Operating Performance
- Safety Analysis
- Physical Design
- Radiation Protection
- Conventional Health and Safety
- Environmental Protection
- Emergency Management and Fire Protection
- Waste Management
- Security
- Safeguards and Non-Proliferation

CNSC's overlapping expectations on site evaluation have been incorporated into the integrated guidelines

CNSC SAFETY AND CONTROL AREAS (SCA)

Safety and Control Areas (SCAs)
Management System
Human Performance Management
Operating Performance
Safety Analysis
Physical Design
Fitness for Service
Radiation Protection
Conventional Health and Safety
Environmental Protection
Emergency Management and Fire Protection
Waste Management
Security
Safeguards and Non-Proliferation
Packaging and Transport

- Technical topics used by the CNSC to assess, review, verify and report on regulatory requirements and performance across all regulated facilities and activities
- Regulatory framework documents exist for each Safety and Control Area (SCA)
- License Application Guides articulate scope and depth considerations for each SCA
- Application comprises the safety case, and is part of the licensing basis for the regulated activity

Licensing under the Nuclear Safety and Control Act

A licence will only be issued by the Commission when the applicant:

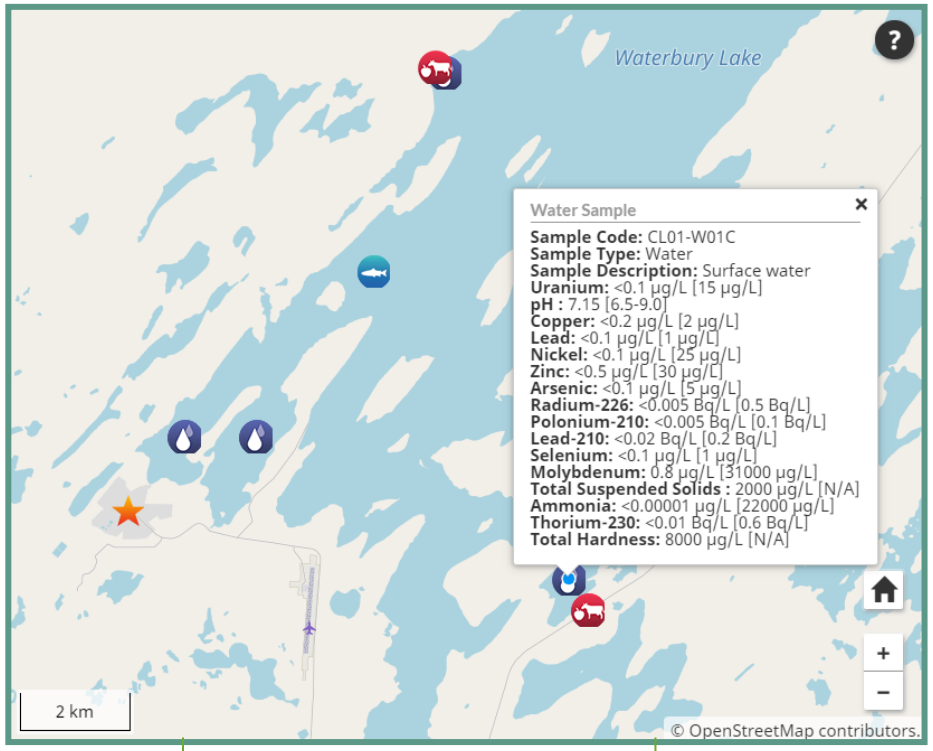
- ✓ Is deemed **qualified** to carry out the activity that the licence will authorize
- ✓ Has demonstrated that they will **protect the health and safety of persons and the environment**
- ✓ Has demonstrated that they will maintain **national security**
- ✓ Has confirmed that they will **adhere to international obligations** to which Canada has agreed

Independent Environmental Monitoring Program

Independent Environmental Monitoring Program(IEMP)

- Independent of a facility's environmental monitoring program
- We seek input from local Indigenous Nations and communities such as traditional knowledge, land use, and values and incorporate this into our sampling plans
- Air, water, soil, fish, and vegetation samples are collected in the immediate vicinity of nuclear facilities
- Samples are analyzed for radioactive and hazardous substances
- https://www.cnsc-ccsn.gc.ca/eng/resources/maps-of-nuclear-facilities/iemp/

The IEMP Process



Program and sample planning

Sampling

Laboratory analysis

Interpretation of results

Publication of results

We collaborate and engage with Indigenous Nations and communities throughout the process

IEMP IN ACTION

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Canada

Connect With Us

Join the conversation

nuclearsafety.gc.ca

1-800-668-5284

General inquiries: cnsc.info.ccsn@cnsc-ccsn.gc.ca

Project specific inquiries: er-ee@cnsc-ccsn.gc.ca

CNSC Across Canada

Human resources

Approximately **1,000** full-time equivalents

Licensees

1,700

Licenses

2,500

Canadian Nuclear Safety Commission (CNSC)

The Commission Tribunal

DR. TIMOTHY BERUBE

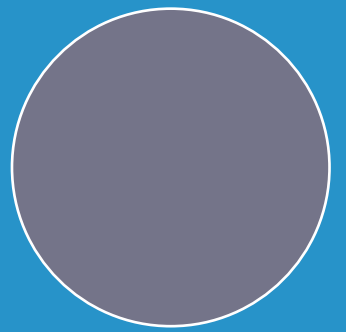
MS. ANDREA HARDIE

MR. JERRY HOPWOOD

DR. MARCEL LACROIX

DR. VICTORIA REMENDA

PRESIDENT PIERRE TREMBLAY



VACANCY

TRANSPARENT, EVIDENCE-BASED DECISION MAKING

Regulator and Licensee Responsibilities

Regulator (Canadian Nuclear Safety Commission)

- Set safety requirements, inform licensees, verify compliance
- Assure Parliament and Canadians that licensee responsibilities are properly discharged
- Make **independent, objective** and **risk informed decisions**

Licensee

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

Commission Hearings and Meetings

Commission Member Documents (CMD)

- Used during licensing hearings
- Is an overview/summary document of the License
- Is provided in advance of a Licensing Hearing allowing for intervenor participation

Regulatory Oversight Reports (ROR)

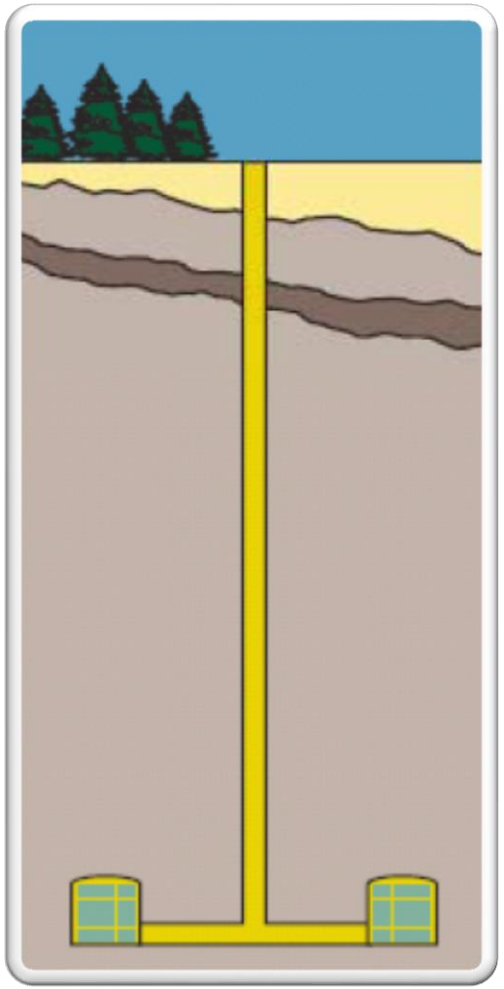
- Acts as a “report card” for the license/licensee
- Is provided in advance of a Commission Meeting allowing for intervenor participation

Long Term Waste Management

Recommendations from integrated strategy and the Nuclear Fuel Waste Act:

- High-level waste to be disposed in a deep geological repository implemented by the NWMO
- Intermediate-level waste and non-fuel high-level waste be disposed of in another deep geological repository implemented by NWMO
- Low-level waste disposed of in multiple near-surface disposal facilities implemented by waste owners

In October 2023, Minister of Energy and Natural Resources Canada released a public statement signaling the Government of Canada's acceptance of the Strategy.



Decommissioning

Requires licence applicants for nuclear facilities at every licencing stage to submit to the CNSC a Preliminary Decommissioning Plan that documents:

- Selected decommissioning strategy
- Main decontamination and dismantling activities
- End-state objectives
- Principal hazards and protection strategies
- Waste management strategy
- Cost estimate
- Financial guarantee arrangements

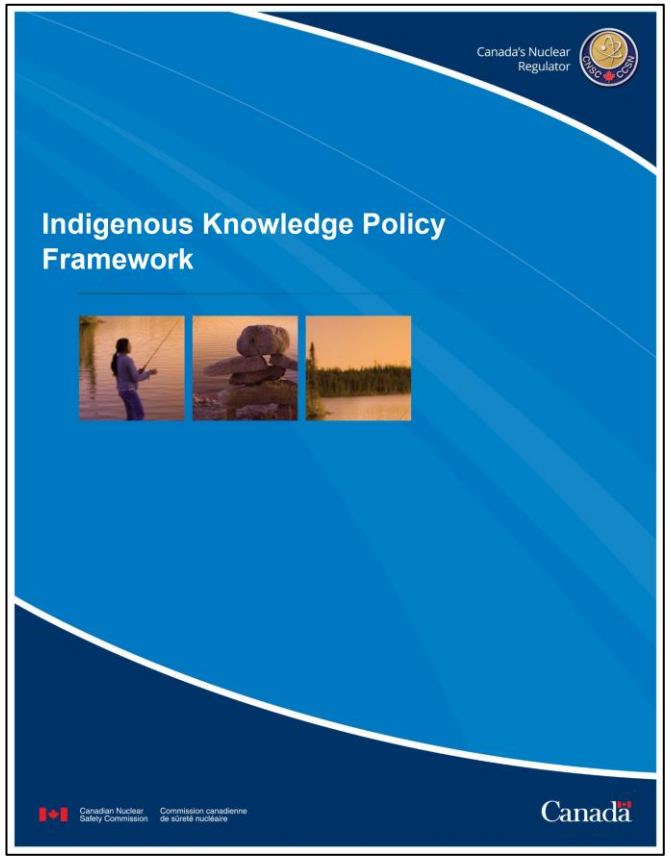
Facilities cannot be built unless the proponents knows how to decommission their facility, and have the funds set aside to do

Environmental Assessment

- Can be a federal or provincial-led process
- Determined by, and subject to the Physical Activities Regulation (PAR) from the *Impact Assessment Act* (2019)
- CNSC always leads environmental review for licensing activities under the *Nuclear Safety and Control Act*
- CNSC act as subject matter experts in all EAs related to nuclear developments

Key Consultation and Engagement Tools

- Oversight of proponent engagement and commitments (REGDOC 3.2.2: Indigenous Engagement)
- Support for gathering and consideration of Indigenous Knowledge (IK Policy Framework)
- Rights Impact Assessments
- Collaborative drafting of CNSC reports and documents
- Commitment to long-term engagement and collaboration (11 ToRs Signed to Date)
- Collaboration on monitoring activities (IEMP)
- Indigenous and Stakeholder Capacity Fund (Launched in May 2023)



CNSC Participant and Capacity Funding

- Participant Funding Program (PFP) provides funds to assist members of the public and Indigenous Nations and communities to take part in our regulatory processes including Commission proceedings.
- The Capacity Fund (ISCF) aims to build organizational capacity and support relationship-building with Indigenous Nations and communities and stakeholders.

Capacity Fund Funding Streams

- **Stream 1:** Indigenous Capacity Support
- **Stream 2:** Regulatory Policy Dialogue
- **Stream 3:** Engagement and Collaboration Support

PFP Participant Funding Program