



Issues and Challenges in Radiation Protection in Canada: A Status Update

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nuclearsafety.gc.ca



The Canadian Nuclear Safety Commission

- Regulates the use of nuclear energy and materials to protect health, safety, security and the environment
- Implements Canada's international commitments on the peaceful use of nuclear energy
- Disseminates objective scientific, technical and regulatory information to the public



We will never compromise safety

CNSC Regulates All Nuclear Facilities and Activities in Canada...



- Uranium mines and mills
- Uranium fuel fabrication and processing
- Nuclear power plants
- Nuclear substance processing
- Industrial and medical applications
- Nuclear research and educational activities
- Import and export controls
- Waste management facilities



Over the entire lifecycle



The Commission



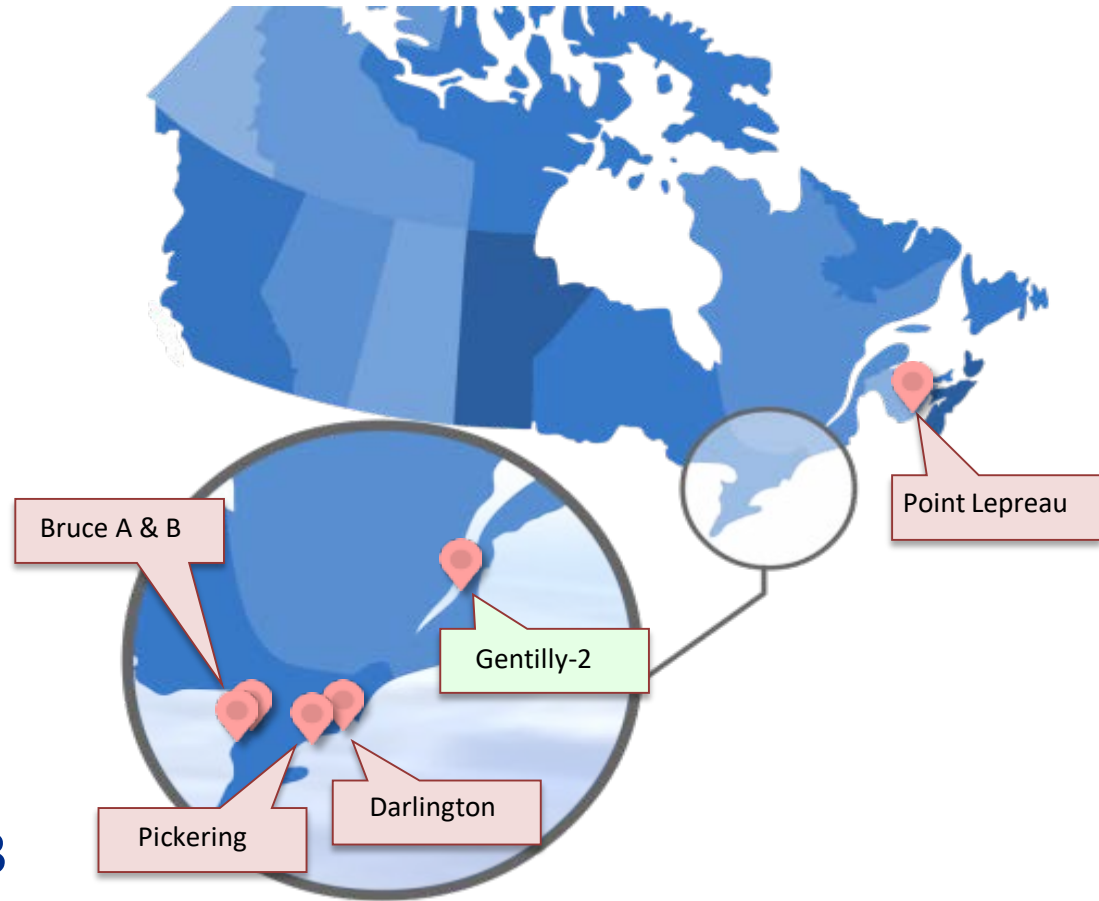
- Quasi-judicial administrative tribunal
- Reports to Parliament through the Minister of Natural Resources
- Commission members are independent and part-time
- Commission hearings are public and webcast
- Staff presentations in public

Transparent, science-based decision making



Canada's Nuclear Power Plants

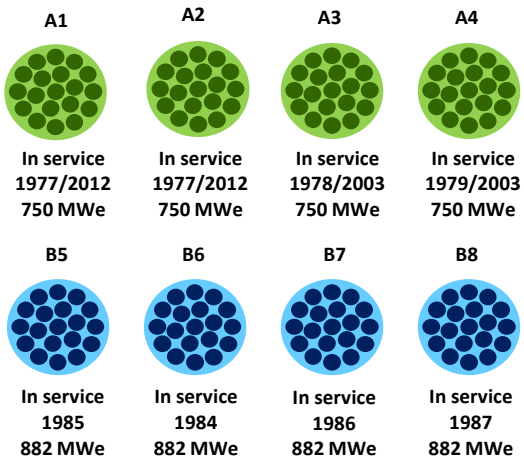
- Four nuclear power plants (NPPs) with operating licences
 - 19 reactor units were operational in 2016
 - Darlington Unit 2 started refurbishment in October 2016
- Three reactor units in safe storage
 - Gentilly-2
 - Pickering units 2 and 3



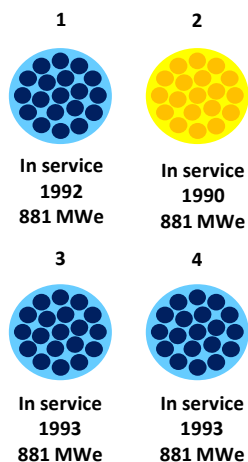


Status of Canadian NPPs

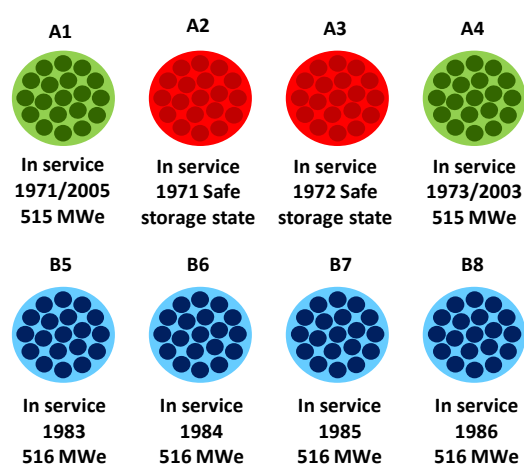
Bruce



Darlington



Pickering



Gentilly-2



Point Lepreau



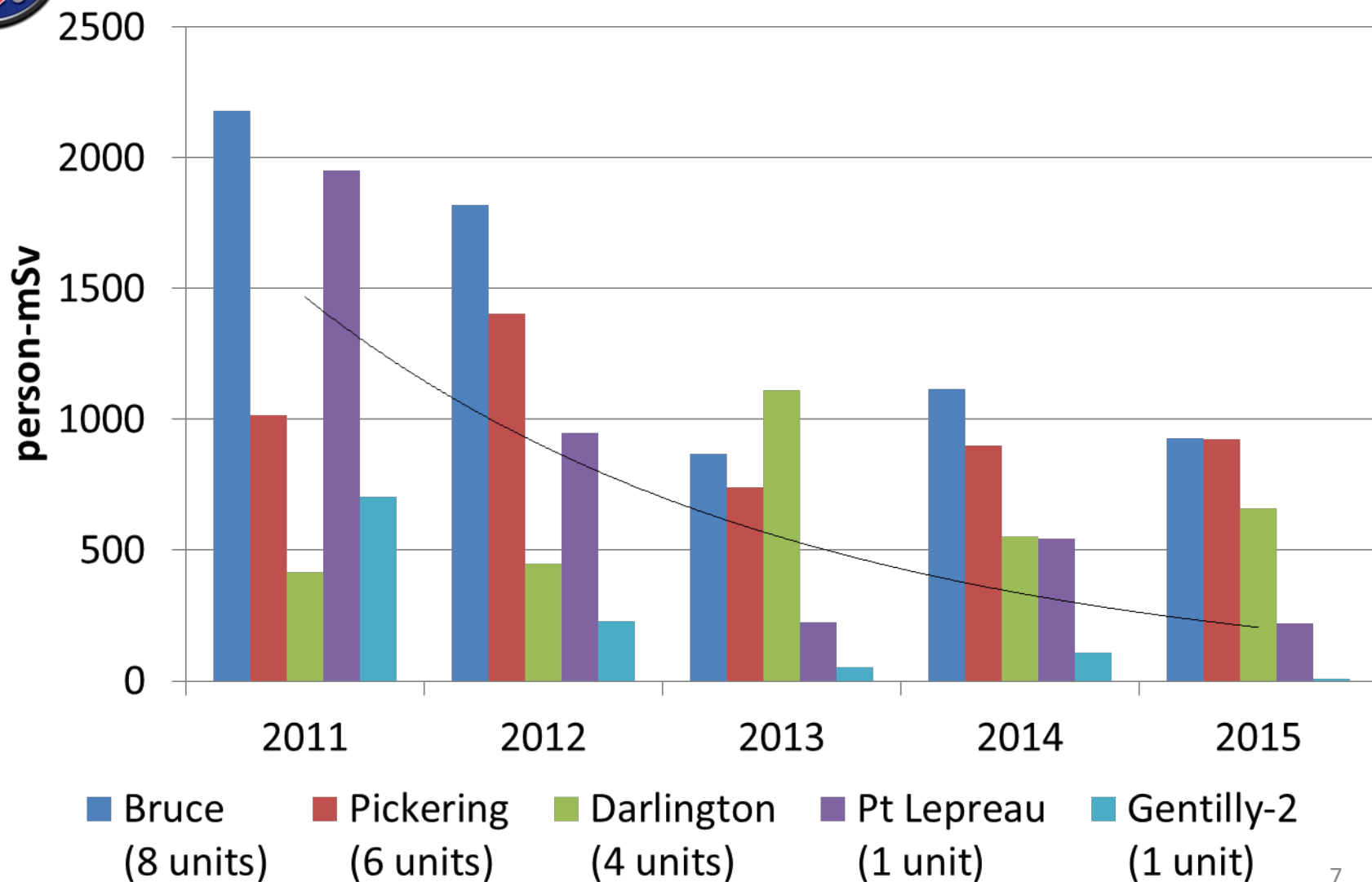
Operational status (average age – 25 years)

- In service within design life
- In service / Returned to service
- Safe storage state
- In refurbishment

Canadian NPPs



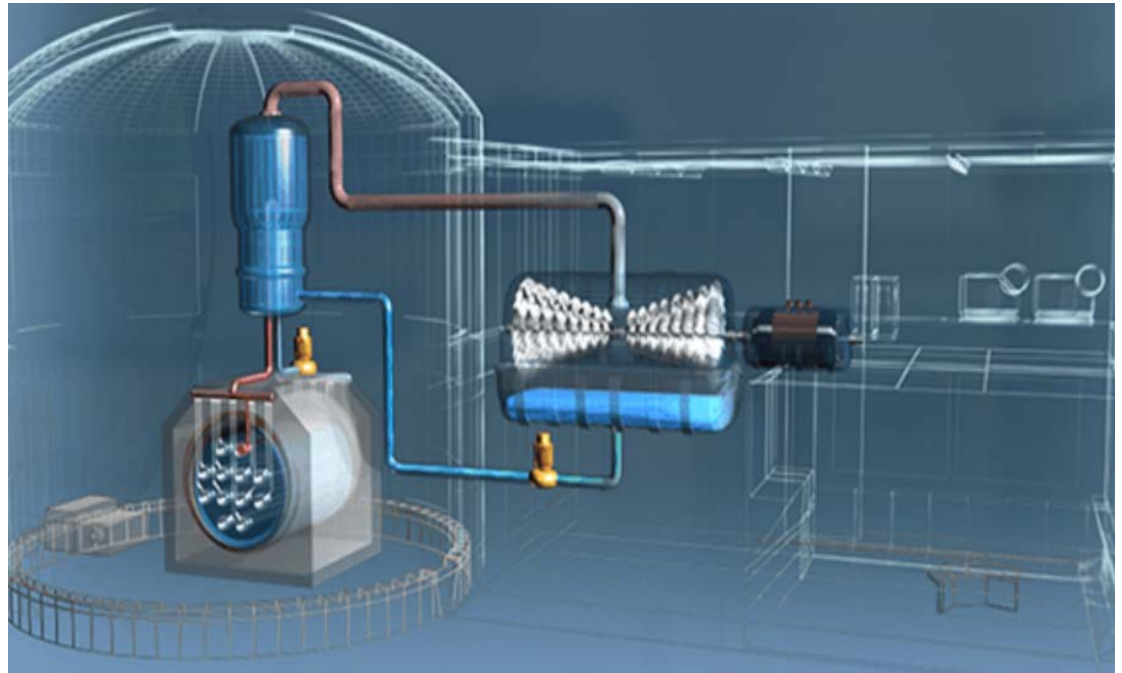
Collective Radiation Exposure





Refurbishment and Life Extension

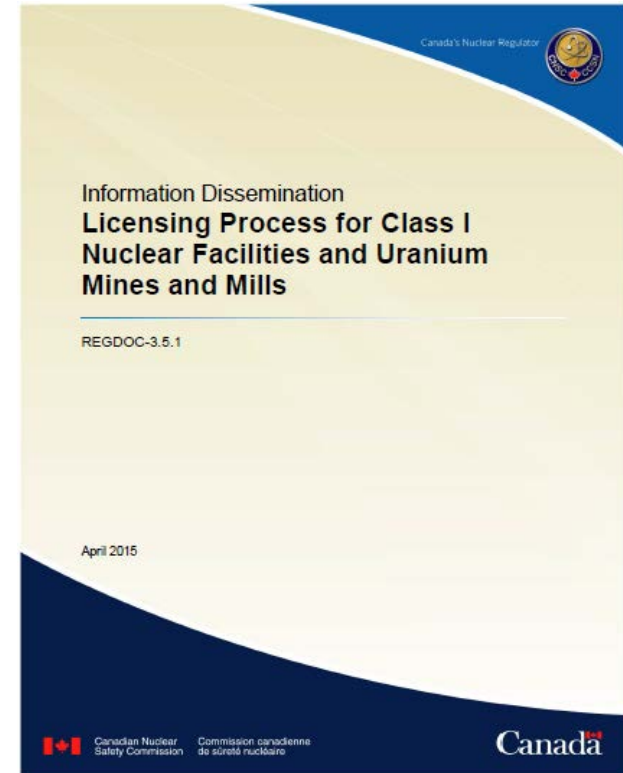
- Darlington
units 1-4
 - timeframe
2016–2025
- Bruce
units 3-8
 - timeframe
2020–2033





Canadian Licensing Process

- Application
- Technical assessment
- Public hearing
- Deliberation and decision
- Licence to operate for a defined period of time, after which licensee must apply for a renewal



We will never compromise safety



Technical Assessment

➤ Integrated safety review

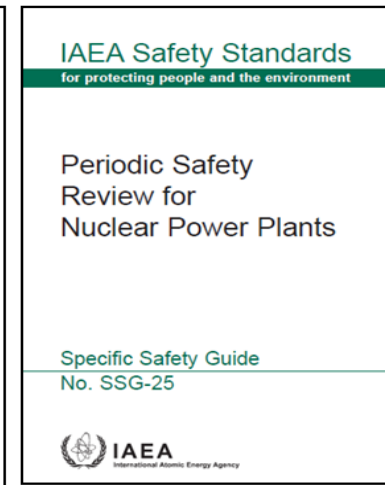
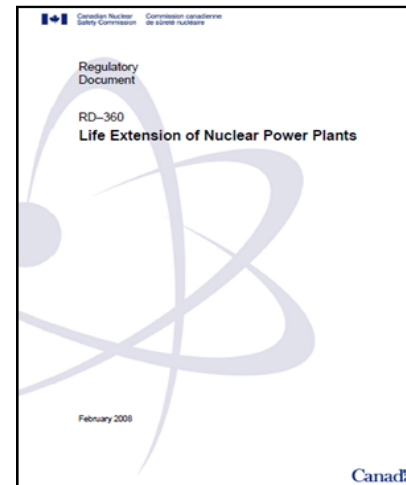
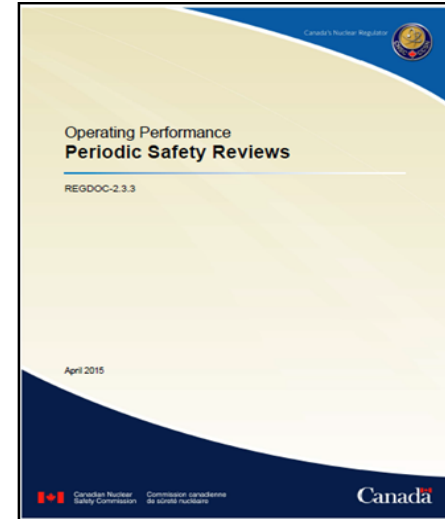
- regulatory requirements
- international practices
- modern codes and standards
- environmental assessment





Periodic Safety Review

- CNSC regulatory document REGDOC-2.3.3, *Periodic Safety Reviews*
- IAEA SSG-25, *Periodic Safety Review For Nuclear Power Plants*



Consistent with international guidance



Project Execution

➤ Replace

- pressure tubes
- calandria tubes
- feeders
- in-core systems
(e.g., flux detectors)



➤ Rehabilitate

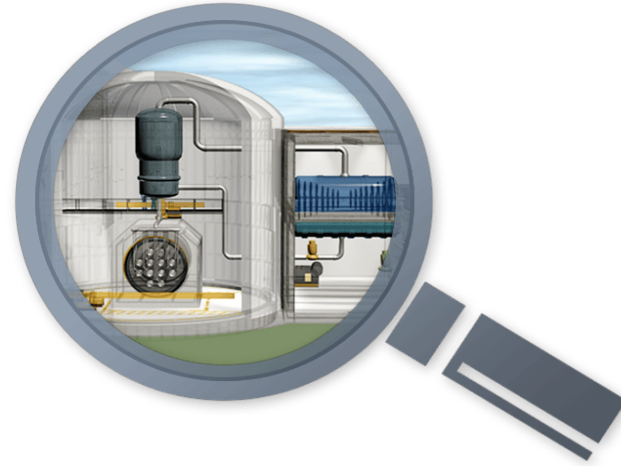
- fuel handling systems
- steam turbines
- electrical generators
- balance of plant
components





Regulatory Oversight

➤ Qualified staff verify that work is:



- performed according to process/procedures
- performed according to licence conditions
- installed and commissioned according to design
- done safely



Return to Service

- Refill PHT and moderator
- Reload fuel
- Regulatory hold points for restart
 - prior to fuel load
 - prior to removal of guaranteed shutdown state
 - prior to exceeding 1 percent full power
 - prior to exceeding 35 percent full power



Regulatory Experience (1)

- Refurbishment is not new – both licensees and the CNSC have experience
 - Pickering units 1 and 4
 - Bruce units 1 and 2
 - Pt Lepreau

- CNSC generic project plan
 - Basis for managing regulatory oversight

Regulatory Experience (2)



CNSC Generic Project Plan - RP

- CNSC staff will verify that the licensee has:
 - identified radiological hazards
 - produced work plans and ALARA plans
 - performed ALARA reviews
 - monitored and controlled radiological hazards
 - prevented unplanned exposures
 - maintained doses ALARA

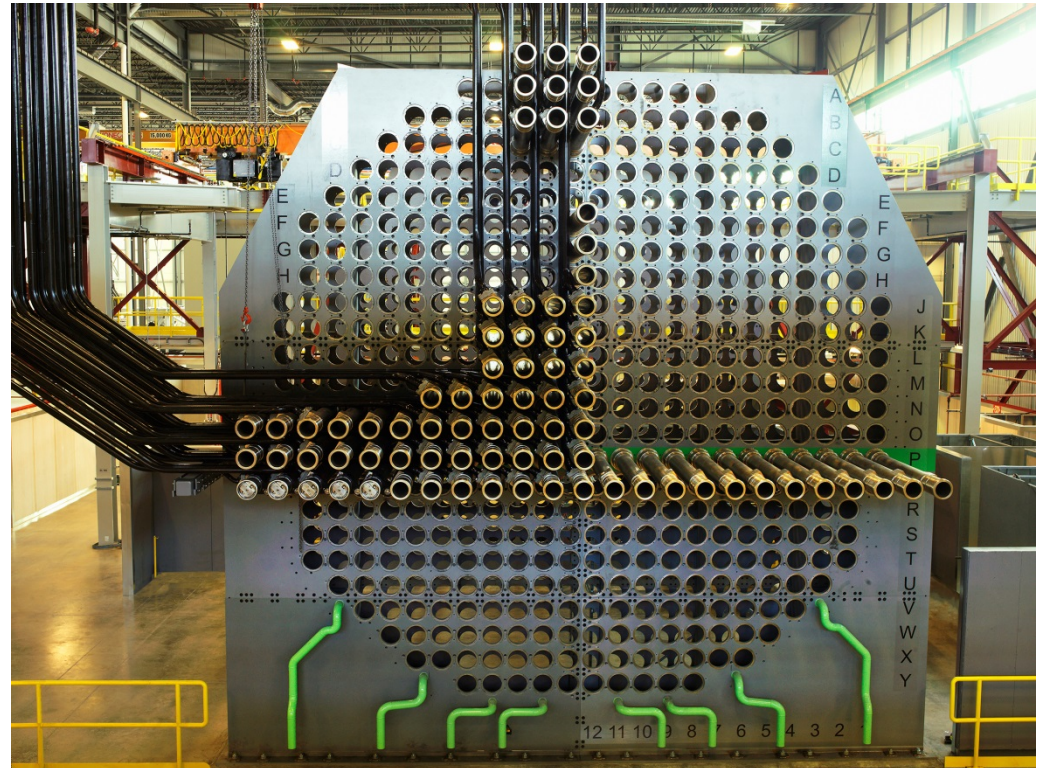


Regulatory Experience (3)



Lessons Learned

- Mockups
- Contractor oversight and training
- Scope creep and rework
- Need for a questioning attitude





Canadian Involvement in ISOE

- Member since ISOE's inception (1992)
- CNSC staff have held active roles within the ISOE
 - Vice-Chair ISOE, Vice-Chair EG-SAM,
Member WGDA, Member WGDECOM
- Canadian utilities have also accepted the responsibilities
 - Chair ISOE, Chair WGDA, Member WGDECOM



Questions?

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