



Canadian Nuclear
Safety Commission

Commission canadienne
de sûreté nucléaire

Regulation of Uranium Mines and Mills

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Canadian Nuclear Safety Commission

Interdepartmental Committee to Review the
BAPE's Findings on the Uranium Industry

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Canada 

Overview



- The CNSC's regulatory framework
- Requirements for proposals submitted for CNSC approval
 - protection of the environment and the public
 - tailings management
 - financial guarantees
 - radiation safety for workers
- Cooperation and harmonization
- Conclusion

Canadian Nuclear Safety Commission



- Established in May 2000, under the *Nuclear Safety and Control Act* (NSCA)
- Replaced the Atomic Energy Control Board (AECB), established in 1946 under the *Atomic Energy Control Act*
- Exclusive jurisdiction over all nuclear-related matters in Canada
- The CNSC is an independent regulatory quasi-judicial tribunal:
 - arms-length from the federal government and independent in its regulatory decision-making capacity
 - members appointed for fixed terms, can be removed only for cause
- As an agent of the Crown, the CNSC has a legal duty to consult, and where appropriate, accommodate Aboriginal peoples

Canada's independent nuclear regulator

Our Mission

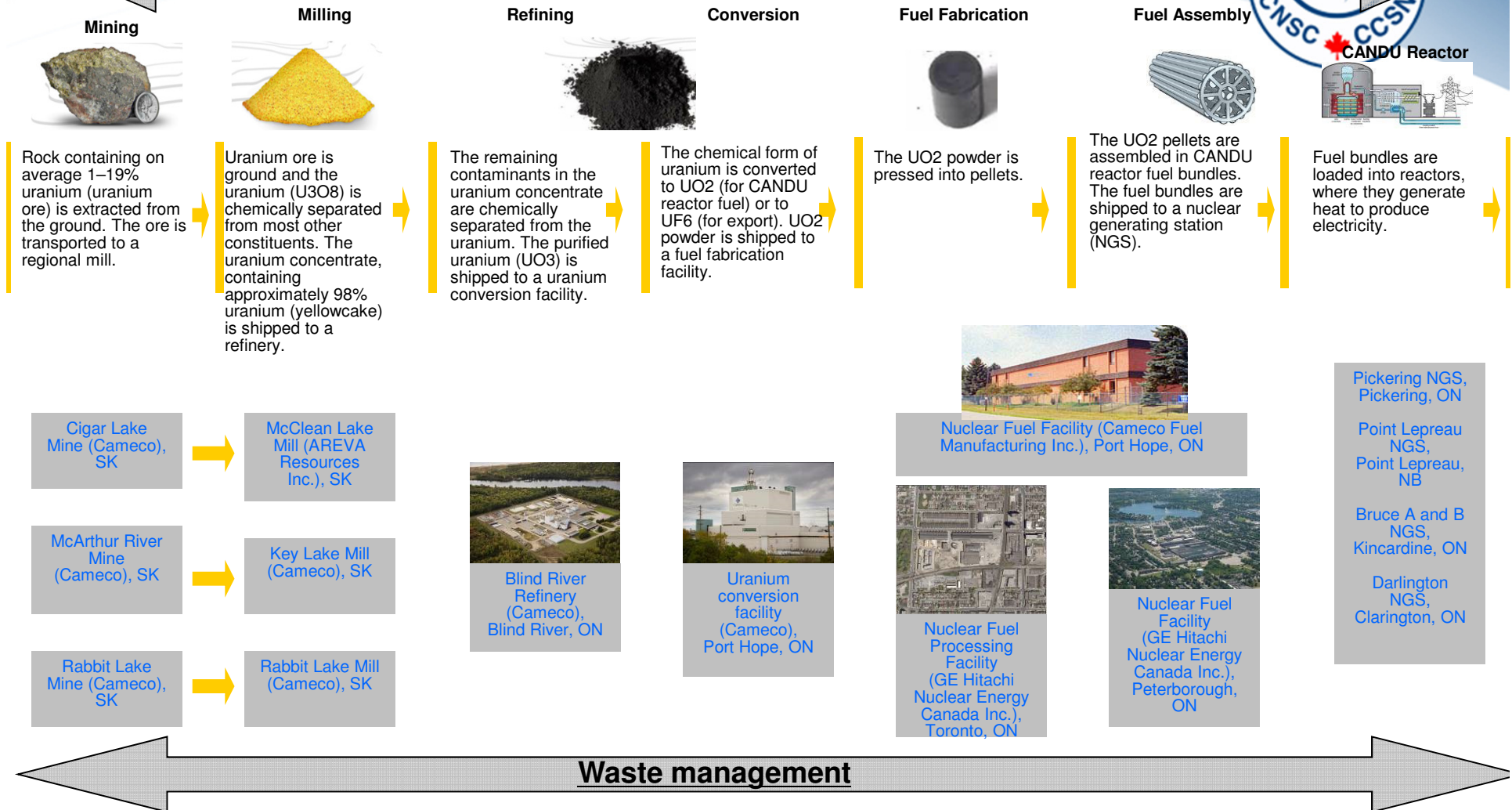


To regulate the use of nuclear energy and materials to protect **health, safety** and **security** of Canadians and the **environment**, and to implement Canada's **international commitments** on the peaceful use of nuclear energy; and to disseminate objective scientific, technical and regulatory information to the public.



CNSC Regulates All Nuclear-Related Facilities and Activities

Imports, exports and safeguards
Controlled information, controlled material, controlled equipment

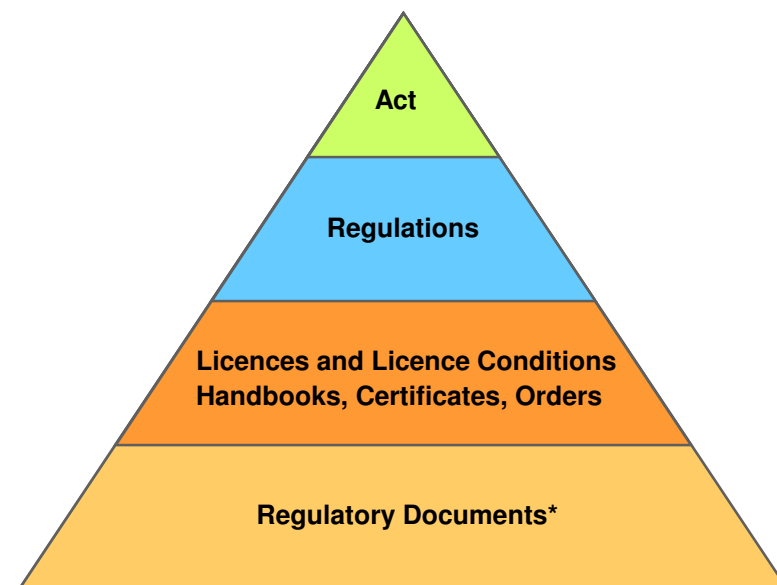


CNSC's Regulatory Framework



- *Nuclear Safety Control Act (NSCA):*
 - enabling legislation
- *Regulations:*
 - high-level and generally applicable requirements
- *Licences and licence conditions handbooks, certifications, orders:*
 - facility and/or activity specific requirements
- *Regulatory documents:*
 - include requirements and guidance

Elements of the regulatory framework



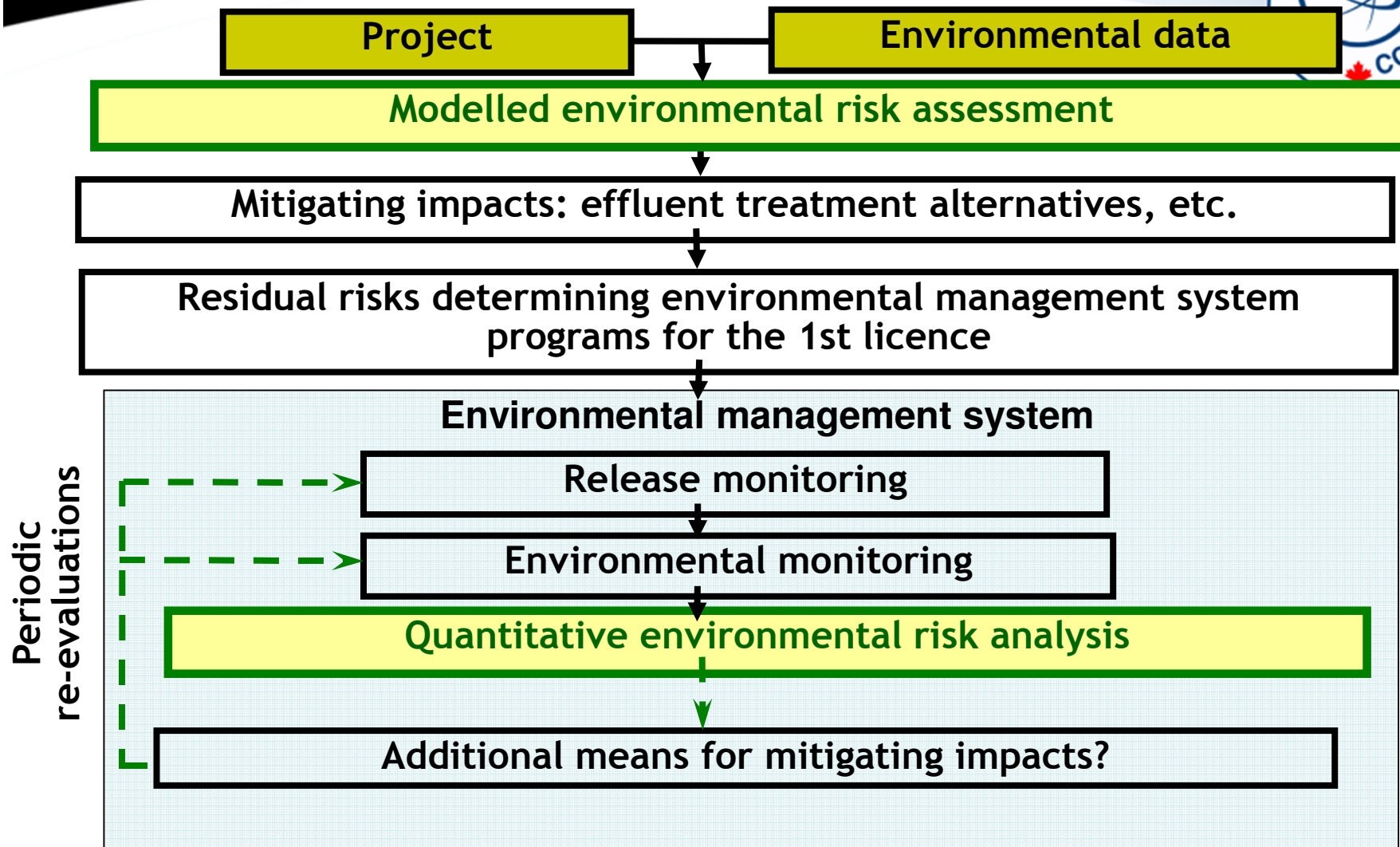
*Describes requirements and includes recommendations

Highly Qualified Scientific and Technical Staff



- CNSC staff members include experienced scientists recognized nationally and internationally
- The CNSC maintains working relations, conducts scientific exchanges and carries out joint research projects with scientists specializing in radiation protection (epidemiology, radiobiology, dosimetry, operational radiation safety), environmental sciences and geosciences, and the long-term management of radioactive waste
- CNSC experts also serve as peer reviewers for trade journals, and have taken part in the development and validation of models and codes (transport and behaviour of radionuclides in the environment, radiation doses for biota and humans, and safety assessments of systems for the long-term management of radioactive waste)
- CNSC staff members stay abreast of scientific progress in order to ensure a well-performing regulatory framework
- CNSC experts contribute to the preparation of scientific and technical documentation: IAEA, NEA, CSA, CCME

Environment and Public Risk Assessment and Control Process



Environmental Protection Requirements



- Control releases
 - to the air
 - to the land
 - to surface water
 - to ground water
- Measure
 - releases
 - environmental concentrations
- Assess
 - effects on the environment and the public
- Implement supplementary mitigation measures, when required



The CNSC has an Independent Environmental Monitoring Program

CNSC Comments on the Findings and Recommendations of the BAPE – Environmental Protection (1)



The 2003 assessment report on the list of substances of primary interest: Releases of radionuclides from nuclear facilities

- Conclusion: radionuclides released into the environment by uranium mines and mills are not toxic
- This conclusion is supported by environmental monitoring conducted over a period of decades
- Studies show that total measurable biological effects a short distance from the source are mainly associated with hazardous substances commonly used by other industries and metal mining operations – they are not the result of radioactivity

CNSC Comments on the Findings and Recommendations of the BAPE – Environmental Protection (2)



- There are conclusive scientific data showing that environmental risks are associated rather with the presence of metals and metalloids – such as arsenic (As), nickel (Ni) and selenium (Se) – which differ little from the risks associated with conventional mines
- Release control measures for uranium mines and mills are stricter than those for other mining sectors in Canada
 - this has been demonstrated repeatedly in the documented performance of uranium mines under the federal *Metal Mining Effluent Regulations* (MMER)
 - the uranium sector has posted the best performance since the MMER came into force in 2004; during the 1990s, it was the only sector with programs to monitor environmental impact

Protection of the Public



- Risks must be assessed and the necessary mitigation measures put in place in order to keep risks at an acceptable level
- Assessments of health risks take into account normal operations, as well as potential incidents and accidents
- All significant sources of exposure are taken into account, as well as all nuclear and hazardous substances of potential concern

CNSC Comments on the Findings and Recommendations of the BAPE – Dangerousness of Radioactivity



- All environmental assessments and monitoring data have shown a negligible risk to the public, on the basis of conservative assumptions
- A number of studies have shown that the tailings of abandoned mine sites represent only a negligible risk to human health, even when the site was used for traditional activities

Tailings Management Requirements



- The CNSC regulates mining operations and related tailings management systems, as well as site preparation and construction, operation, decommissioning and abandonment
- Regulatory document RD/GD-370, *Management of Uranium Mine Waste Rock and Mill Tailings*:
 - requires applicants for licences to identify the best way of disposing of mine waste, based on environmental, technical, economic and socio-economic criteria
 - is based on well-established scientific and technical principles
 - is consistent with the requirements and recommendations of the International Atomic Energy Agency
- A safety case is prepared at each stage of a project to show that tailings management systems are performing well

Safety Case



- Must explicitly identify remaining uncertainties, and demonstrate that the public and the environment are protected, despite such uncertainties
- Uses multiple arguments based on:
 - a systematic impact analysis, based on proven principles of physics, chemistry and mathematics, and assumptions that are sufficiently pessimistic to allow for uncertainties
 - laboratory testing, scale models and analysis of available on-site observations
 - natural analogies
 - a review of precedents
 - development, implementation and periodic review of monitoring programs to check that the performance of the tailings management system is consistent with the projections in the impact analysis
 - a demonstration of the system's ability to resist extreme events, such as earthquakes and climate change

Demonstration of long-term effectiveness and reliability

CNSC Comments on the Findings and Recommendations of the BAPE – Tailings Management



- Because of the many arguments in favour of it, management of tailings in-pit has been regarded by many countries since the early 1990s as one of the preferred options for the long-term protection of the environment
- The in-pit management method is consistent with modern concepts of confinement within a geologically stable structure, for optimization of groundwater protection and minimization of long-term maintenance requirements
- The in-pit management method minimizes the need for active or passive human intervention in the long term
 - in case intervention is required, a financial guarantee is calculated both to cover the costs of routine activities such as inspection and maintenance, and to allow for unexpected major events

Financial Guarantees



- Subsection 24(5) of the NSCA stipulates that:
“A licence may contain any term or condition that the Commission considers necessary for the purposes of this Act, including a condition that the applicant provide a financial guarantee in a form that is acceptable to the Commission.”
- Financial guarantees are required for uranium mines and mills to ensure the availability of funds for decommissioning
- Total costs (100%) are estimated on the basis of a decommissioning plan that is reviewed and approved by the CNSC and the province
- Regulatory documents:
 - G-206, *Financial Guarantees for the Decommissioning of Licensed Activities*
 - G-219, *Decommissioning Planning for Licensed Activities*

Financial Guarantees: Uranium Mines and Mills



Facility	Amount in Canadian dollars (2013)
Cigar Lake Project	49.2
McArthur River Operation	48.4
Rabbit Lake Operation	202.7
Key Lake Operation	225.1
McClean Lake Operation (includes Midwest)	43.1
Total financial guarantees for the five facilities	568.5

CNSC would not accept a financial guarantee lower than the estimated decommissioning costs

Radiation Safety Requirements for Workers



- Features of the radiation safety program
 - risk assessment
 - monitoring of work practices
 - based on the ALARA principle: as low as reasonably achievable
 - dose limits, action levels, codes of practice
 - worker training
- Monitoring of workers and working conditions
 - extraction method, ventilation and dust control
 - exposure monitoring
 - personal dosimeters
 - continuous monitoring with warning lights
 - area/time monitoring
 - dosimetry services licensed by the CNSC (licence required)
 - National Dose Registry (Health Canada)

CNSC Comments on the Findings and Recommendations of the BAPE – Radiation Safety for Workers



- International safety standards for radiation have been applied in Canadian uranium mines for more than 40 years
- Improvements in mine ventilation systems, the strict enforcement of international standards, and the implementation of radiation protection programs have significantly reduced the doses of radiation to which workers in underground uranium mines are exposed
- A recent epidemiological study of the Ontario uranium miners cohort (1965–2007) showed that their risk for lung cancer was no higher than for the Canadian population
- Since the doses to which miners are exposed today are about 10 times lower than those to which Ontario miners were exposed in the past, their risk of lung cancer will also be lower

Cooperation and Harmonization

(1)



- The CNSC works closely with its provincial counterparts on environmental assessments, authorizations, compliance programs and inspections
 - paragraph 21(1)(a) of the NSCA authorizes the CNSC to enter into arrangements with any regulatory agency or department of a foreign government or any international agency
- *CNSC-Saskatchewan administrative agreement for the regulation of health, safety and the environment in uranium mines and mills in Saskatchewan, 2003*
 - harmonization of regulatory requirements and activities between the CNSC and the province of Saskatchewan

Harmonization to reduce inefficiencies and avoid duplication of effort

Cooperation and Harmonization

(2)



- *Canadian Environmental Assessment Act (2012)* [CEAA]
 - an environmental assessment (EA) is required for any proposed uranium mine or mill for which the CNSC is the responsible authority
 - the principles embodied in the CEAA (2012) include promoting cooperation and the coordination of activities between the federal and provincial governments
 - to the extent possible, the CNSC coordinates federal and provincial EAs

Possible Cooperation With the Interdepartmental Committee



- Regulation
- Scientific and technical sectors
 - tailings management and safety case
 - impact of radioactivity on the environment
 - impact of radioactivity on the health of workers and the public
- Assistance with training and the development of expertise

Conclusion



- Uranium mines are strictly regulated in Canada
- The continuous process of assessment, control and monitoring provides a better understanding of the risks to humans and the environment, and how to minimize them
- Uranium mines and mills are regulated throughout their life cycle, and financial guarantees are in place to cover the decommissioning of such facilities and ensure their safety in the long term
- The CNSC works closely with its provincial counterparts to regulate uranium mines and mills



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