The future is NU. Le nucléaire, voie de l'avenir.

Submission to the *Bureau d'audiences publiques sur l'environnement sur les enjeux de la filière uranifère au Québec*

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Canadian Nuclear Association

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I. Introduction

The Canadian Nuclear Association (CNA) is grateful for the opportunity to appear before the *Bureau d'audiences publiques sur l'environnement* (BAPE). Your work in listening to the views and concerns of communities and citizens about uranium exploration and production in certain regions of Quebec is very important.

A word or two about the Canadian Nuclear Association. Uranium lies at the heart of Canada's nuclear industry. Our association's members—some 100 companies and organizations—mine and mill uranium, and use its derivatives for peaceful purposes that benefit humankind. In so doing, they employ some 60,000 men and women, both directly and through their supply chains, generating nearly $7 billion of economic activity.

In this submission, we would like to bring to light the benefits of uranium to human health and combatting climate change. We will discuss the ways in which the public's concerns about nuclear matters can be mitigated. Uranium mining and the applications of uranium to medicine and electrical power generation are among the most regulated—if not the most regulated—industrial sectors in Canada. Stringent regulatory requirements and enforcement for radiation and the treatment of mining waste and tailings ensure the safety of citizens and employees, as well as effective environmental protection in traditional lands. Indeed, some aboriginal peoples and communities have reached their own decisions to participate in uranium development and application, not just in Canadian jurisdictions but also abroad. Uranium also offers to communities the opportunity for improving living conditions, training, and employment, because it will continue to be in demand worldwide.

II. Benefits of uranium

One should begin with a couple of fundamental questions. What is the role of this naturally occurring element called uranium? Why should it be of importance to communities on whose land uranium can be found? Does it contribute to the well-being of humankind? Can it help in the treatment and healing of sick people? Does it offer a means to bring much-needed electricity to communities, but without putting climate-changing toxins and greenhouse gases into the atmosphere?

The answer to all of the above is yes. Bringing uranium out of the ground saves lives. It spares the atmosphere millions of tons of noxious gases. Lands that contain uranium are a source of health. Communities whose land contains uranium can participate in the healing of others. In this sense, uranium is a powerful force for good, and people should be made aware of this.

Nuclear medicine

The application of uranium through nuclear medicine has significantly improved the lives of millions of people around the world. Uranium fuels nuclear reactors that produce medical isotopes and radiopharmaceuticals, which enable radiologists to scan, detect, and visualize cancers and other sources of illness with life-saving precision. Canadian radiologists perform some 30,000 diagnostic scans each week—more than 1,500,000 per year.[1]

In 2014, diagnostic scans will detect nearly 200,000 new cases of cancer, enabling the provision of timely, effective treatment.[2] Uranium is the key element here, through the production of cobalt-60 in nuclear reactors. Cobalt-60 treatment was pioneered in Canada back in 1951. It is used to control or kill malignant cancer cells. Some 15,000 Canadians will receive therapeutic radiation doses this year, improving their chances of surviving.

It's not only Canadians whose lives are saved by radiation therapy. Cobalt-60 machines are used worldwide as a reliable, simple and affordable means of providing access to cancer care. Canada is a leader in this area, delivering 76,000 treatments per day, which represents over 80% of procedures worldwide.[3]

Without uranium, many such life-saving medical interventions could not be made. For example, more than 80% of all nuclear medicine scans in Canada rely on the fission of uranium-235 in nuclear reactors. It is true that alternatives can be obtained from particle accelerators or cyclotrons, but these alternatives do not fully replace reactor-produced isotopes. So, uranium remains an essential aspect of nuclear medicine.

Electricity generation

Electricity is fundamental to our lives. It is hard to think of a world without electricity. In many parts of the world, the production of electrical power for citizens and communities is the most significant step in improving peoples' lives and health.

Electricity is produced from various energy sources. Unfortunately, many of the ones most used are carbon-intensive and emit noxious gases, including greenhouse gases (GHGs). Many scientists ascribe climate change and a warming planet to the increasing amounts of GHGs produced by human activities, including electricity generation. As more of the world becomes industrialized, global carbon dioxide emissions continue to rise, reaching a record high of 40 billion tonnes in 2014, according to the Global Carbon Project.[4]

Uranium delivers low-carbon electricity through nuclear power generation. Nuclear power sits alongside renewables such as wind and hydro as electricity sources that have lifetime carbon

emissions of under or about 20 grams per kilowatt-hour (g/kWh). As the average Canadian home consumes approximately 30 kWh/day, these sources generate very little carbon dioxide—about 600 grams or less, per home, per day.

However, wind, solar, and tidal power total less than 2% of all electric power generation in Canada. Moreover, because they are intermittent, they must be backed up by other sources. If that back-up is oil, diesel, propane, or natural gas, then emissions rise. Hydroelectric power is low-carbon and stands on par with nuclear power generation.

The point here is not to debate the topic of electricity generation at length. Quebec is a province blessed with many dams and waterways that produce electricity. However, in many parts of the world, hydroelectricity is simply not an option; nuclear power generation is. And since climate change knows no borders and can impact noticeably and irreversibly on environments and land use wherever these may be, our longer-term interest has to lie in seeing fossil fuels used less and less for electricity generation—and zero-carbon emitters like nuclear and hydro used more and more. Given that nuclear power is readily expandable within any given site or geographic area, and is a reliable and affordable source of power, it is a valuable instrument in the global effort to combat climate change.

Figure 1: GHG Emissions per kWh (g CO_2eq/kWh)

Source: Intergovernmental Panel on Climate Change, *Special Report on Renewable Energy Sources and Climate Change Mitigation*, 2011.

Increasingly, prominent environmentalists and climate scientists have come to support this approach. The Intergovernmental Panel on Climate Change recently identified nuclear energy as a key contributor to the world's zero- and low-carbon electrical supply, and recommended a substantial investment in nuclear generating capacity.[5]

In areas where traditional ways of life and relationships to the land are important—such as one finds in northern Quebec, Saskatchewan, and other provinces of Canada—the impact of climate change is most keenly and distressingly felt. Bringing uranium out of the ground is therefore a

vital contribution by the peoples of such regions. The energy in uranium can produce electricity; it is an essential instrument in the global fight against climate change.

III. Concerns of communities

Despite the clear benefits that uranium provides to humankind, uranium evokes some degree of public concern. Many uninformed observers readily agree with the allegations raised by nuclear opponents that radiation is inherently dangerous, that radioactive waste presents an intractable threat, and that uranium mining disrupts communities.

The James Bay Cree exemplified this approach in their testimony to the BAPE in May 2014. Grand Chief Matthew Coon-Come contended that uranium mining would present unacceptable health and environmental risks to his people, and that no uranium mine in Quebec could achieve social acceptability.[6]

The Canadian Nuclear Association fully respects the right of the Cree to determine their own approach to uranium exploration and development. At the same time, we contend that there is strong evidence that the nuclear industry can address these concerns.

Public apprehension about nuclear energy correlates inversely with the public's knowledge of radiation effects. Our own public-opinion research regularly tests Canadians' knowledge of radiation—whether it is natural or manmade, and whether all radiation can cause harm.[7] We regularly find that most Canadians do not understand radiation and cannot explain it in detail.[8] At the same time, those who can explain radiation also support nuclear energy and other applications.

Given this lack of public understanding of radiation, its occurrence in nature and in humans, and the extensive scientific research that has gone into establishing the internationally agreed-upon levels at which radiation dosages can harm human health—one can appreciate that radioactive waste from uranium mines would be perceived as a societal risk. In truth, however, this is a risk that has been adequately mitigated through the development of safe and secure treatment techniques. As the Canadian Nuclear Safety Commission (CNSC) advised the BAPE, "The extensive monitoring data and conservative exposure scenarios indicate that releases of radionuclides and hazardous substances from uranium mines and mills do not represent a risk to the health of the public."[9]

Does uranium mining interfere with traditional land uses? With the benefit of evidence-based research, it appears that a uranium mine is no more disruptive than any other type of mine. In fact, it may even prove less disruptive, given the stringent, continual monitoring and regulation

of the industry. A further consideration is the significant progress made by the industry itself in reducing health and environmental impacts to well below internationally accepted limits.

The Nuclear Energy Agency (NEA) of the Organization for Common Economic Development recently concluded that: “modern uranium mining operations successfully manage environmental and health impacts and have developed into arguably one of the safest and most environmentally responsible forms of mining in the world.”[10]

It is important to underline the role played by international expert bodies, such as the NEA, the International Atomic Energy Agency (IAEA), the UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the International Commission on Radiological Protection (ICRP) and other specialized organs and agencies of the United Nations system in developing and continually improving standards, guidelines, and best practices in all aspects of nuclear technology. For example, the IAEA has produced over 250 documents related to uranium mining, on topics such as its governance framework, nuclear safety, protection from the effects of ionizing radiation, and public consultation. This year, there are at least four new IAEA documents being developed that are specific to uranium mining or site remediation.

Canada fully subscribes to and implements these international standards. Moreover, Canada is often among the leading countries in developing the standards or providing input based on best practices in Canadian uranium mining. Recent documents such as the NEA’s “Managing Environmental and Health Impacts of Uranium Mining,” published in 2014, make detailed reference to the leadership of Canadian mining companies, which show the world how mining can be done without sacrificing environmental protection or the safety of workers and the public, while restoring mining sites to greenfields after decommissioning. In fact, Canada’s federal and provincial regulatory oversight and compliance-assurance techniques for uranium mining have received global recognition—and are being taught and demonstrated to other regulatory agencies in the USA, Central Asia, Australia, and South Africa.

For its part, the IAEA has the right of access to Canada’s uranium mining under the Additional Protocols of the Canada-IAEA Safeguards Agreement. Its job is to verify the peaceful nature of the work carried out there. To do so, IAEA inspectors conduct visual observations, collect environmental samples, use radiation-detection and measurement devices, and apply seals and other identifying and tamper-indicating devices. So, our uranium mining industry is very much under the watchful eye of the IAEA. At the same time, the practices of our industry are of such high quality that they form the template for the development of stringent international standards for safe and environmentally sustainable uranium mining worldwide.

Canadian uranium: not a source of nuclear weapons proliferation

Some commentators on uranium exploration and mining in Quebec have suggested that exports of uranium could be used in the manufacturing of nuclear weapons or somehow contribute to the proliferation of such weapons.

Robust controls are in place to prevent the diversion of Canadian uranium from peaceful, civilian purposes to nefarious and illegal ends.

To export uranium, it is first necessary to obtain a licence from the Canadian Nuclear Safety Commission, with advice from the Department of Foreign Affairs, Trade and Development. This can occur only if the proposed exporting operation meets all of Canada's stringent nuclear non-proliferation requirements. A Nuclear Cooperation Agreement must be established with the importing country and in force. These measures oblige the importing country to abide by the Nuclear Non-Proliferation Treaty in ensuring that all uses of Canadian material will be directed to peaceful uses. They also set out "administrative arrangements" that allow Canada to have confidence that its uranium will be used appropriately. Backing such arrangements is an export-controls list that tells would-be exporters in Canada what can and cannot legally be exported.

The CNSC provides oversight of the Nuclear Cooperation Agreements, while the IAEA monitors the obligations of the received state as set out in the Non-Proliferation Treaty. Together, they provide robust assurances to Canadians that material such as uranium is not diverted to illegal weapons purposes. In fact, the Canadian uranium mining and regulatory expertise in oversight and management of uranium use if internationally recognized. The IAEA is currently requesting—and getting—support from Cameco in designing procedures to improve inspection of uranium mines in other countries.

IV. Diversity of aboriginal views

Aboriginal positions on uranium exploration and mining vary considerably. Accordingly, there is no consensus of aboriginal opinion toward the practice of uranium mining. Some aboriginal groups have chosen to prevent uranium exploration and mine development; other groups have fully embraced uranium mining for its economic development potential.

Nunavut, for example, self-governed by Inuit, is processing an Areva application to mine an estimated 130,000,000 lbs. of uranium near Baker Lake. Approval of the Kiggavik project would create 750 construction jobs and sustain 400 mining jobs for more than a decade. It would deliver an estimated $1 billion to governments and Nunavut Tunngavik Inc., the Inuit birthright organization.[11]

The Government of Nunavut's Uranium Policy Statement sets five conditions to be met by any uranium-mining proponent:

1. Uranium mined in Nunavut shall be used only for peaceful and environmentally responsible purposes.

2. Nunavummiut must be the major beneficiaries of uranium exploration and mining activities.

3. The health and safety of workers involved in uranium exploration and mining and all Nunavummiut shall be protected to national standards.

4. Environmental standards must be assured for uranium exploration and mining, especially for the land, water and wildlife.

5. Uranium exploration and mining must have the support of Nunavummiut, with particular emphasis on communities close to uranium development.[12]

In a territorial economy entirely dominated by public-sector expenditure, the prospect of sustained long-term, private-sector job creation has proven highly attractive. As Premier Peter Taptuna told a Senate committee in 2012, when he served as Nunavut's Minister of Economic Development: "At the same time as we move towards developing renewable hydroelectric power, we are also hopeful that more conventional energy sources, such as oil, natural gas and uranium, will help transform our developing economy."[13]

A similar outlook now prevails in Greenland, which is also self-governed by Inuit. In October 2013, the Parliament of Greenland lifted a 25-year-old moratorium on uranium exploration and mining. The Greenland government has since implemented an oil and mineral strategy that commits Greenland to establishing a regulatory framework for uranium mining, an export-control system, and a system to implement IAEA safeguards.[14] Subsequently, a survey by the Geological Survey of Denmark and Greenland assessed 66 areas for possible uranium deposits, and concluded that 28 sites offered either high or very high potential.[15] Putting this into perspective, the Danish Institute for Strategic Studies has estimated that Greenland could enter the ranks of the world's top ten uranium producers, and potentially the top five.[16]

In Saskatchewan, the question of whether aboriginal people can successfully participate in the tangible benefits of uranium exploration and mining has been answered.

Cameco Corporation, headquartered in Saskatoon, Saskatchewan, is the world's largest publicly traded uranium company. Cameco's relationship with aboriginal peoples is exemplary. The company actively seeks the views and concerns of the people and communities in lands where

uranium is found and mined. It has learned much from this engagement about aboriginal knowledge and how to protect traditional uses of the land. Its management team constantly consults northern Saskatchewan communities.

This is a relationship of respect and consultation. It is a long-term relationship that is open, serious, and mutually beneficial. Through it, communities learn more about the company and hold it to account through open forums.[17] Community members are encouraged to ask questions or voice any concerns they may have about uranium mining and its impact on the environment, on the workforce and conditions of work, or on hunting and fishing and other traditional activities. At the same time, the communities furnish the company with much wisdom and insight on how they view their relationship with the earth and the natural elements in it. As a result, aboriginal communities in the region have been able to benefit from economic opportunities that uranium mining provides, with dignity and respect.

Aboriginal people comprise 21% of Cameco's 3,600-member workforce and 5% of its management. This makes it the country's largest industrial employer of aboriginal people. Areva, another prominent uranium-mining company, also employs a large aboriginal workforce. Together, Cameco and Areva employ more than 1,600 northern Saskatchewan residents, primarily Cree, Dené, and Métis.[18] Together, they have created and supported scholarships and other training initiatives for Saskatchewan youth, spending $340,500 to provide better opportunities for young aboriginal people in northern regions.

Uranium mining injects significant economic stimulus into northern Saskatchewan. Canada's Manufacturers and Exporters reported in 2012 that the two mining companies had spent $331 million in 2010 on direct employees. Of this, they paid $96 million to northern residents, who represented about 50% of their mine-site workers.

In addition to direct employment, Cameco also procured more than 70% of needed products and services from northern or aboriginal-owned businesses.[19] To give an idea of the scale of economic stimulus in northern Saskatchewan, the uranium industry purchased $1.08 billion in goods and services in 2011, of which 43% ($464 million) went to businesses based there.

This approach to uranium mining has earned the company frequent recognition. For the past five years, Cameco has been named one of Canada's "Best Diversity Employers," an award that recognizes its commitment to dealing fairly and respectfully with all of its employees.[20] The company has been awarded gold-level distinction three times by the Canadian Council for Aboriginal Business, through the Council's Progressive Aboriginal Relations program.[21] Since 2009, it has donated $24 million to organizations and community groups in its operating area. In 2010, its Blind River refinery signed an agreement with the Mississauga First Nation in northern

Ontario to work together for community benefit. In 2003, it created and funded the Cameco Chair in Aboriginal Health at the Royal University Hospital Foundation in Saskatoon.

V. Excellent safety record

Uranium mining has become one of the safest and most environmentally sound forms of mining today. This is because it is among the most—if not the most—regulated industry in Canada.

Why is it so regulated, so monitored and scrutinized? The key difference between uranium mining and other types of mining is radiation. That is why uranium mining has more oversight and regulation; and that is why it has a better health and safety record than other comparable mining industries do.

As the OECD's Nuclear Energy Agency reported this year: "In countries with the appropriate regulatory requirements and a regulatory agency staffed with qualified personnel, successful companies develop innovative strategies to manage all potential impacts of mining and processing on workers, communities and the environment."[22]

Canada's uranium-mining industry is regulated and licenced by the Canadian Nuclear Safety Commission (CNSC), an independent body that reports to Parliament. Its mission is to protect the health, safety, and security of Canadians; to protect the environment; and to respect Canada's international commitments on the peaceful use of nuclear energy. To achieve these objectives, the CNSC ensures compliance with its stringent regulation.

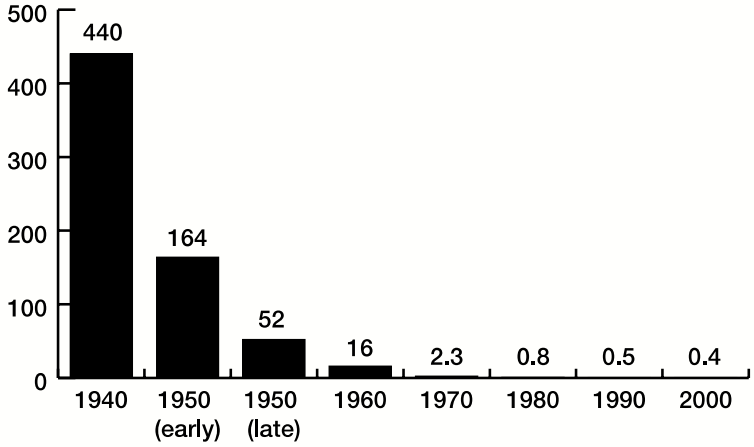
The CNSC issues licences for all phases in the life cycle of uranium mines and mills, from site preparation, construction, and operation, to decommissioning and abandonment. It ensures compliance through regular inspections. In its most recent public report, CNSC staff declared that "each regulated facility met performance expectations with respect to the health and safety of persons and to the protection of the environment, and to Canada's international obligations."[23]

Occupational health and safety

Occupational health and safety in uranium mining is, as in other types of mining, under provincial jurisdiction and therefore subject to the same laws. At the same time, uranium's radioactive properties require an additional layer of protection for mine workers, the public, and the environment. This protection is assured by the CNSC, the federal body.

Effective regulation, safe working practices, and modern ventilation technologies have transformed uranium mining into one of the safest occupations. The poor working conditions of long ago—so often cited by the industry's critics—no longer exist.

Figure 2: Levels of radon decay product exposure in underground mines expressed in working-level months in Canada from 1940



Source : CNSC, *Radon and Health*, 2012

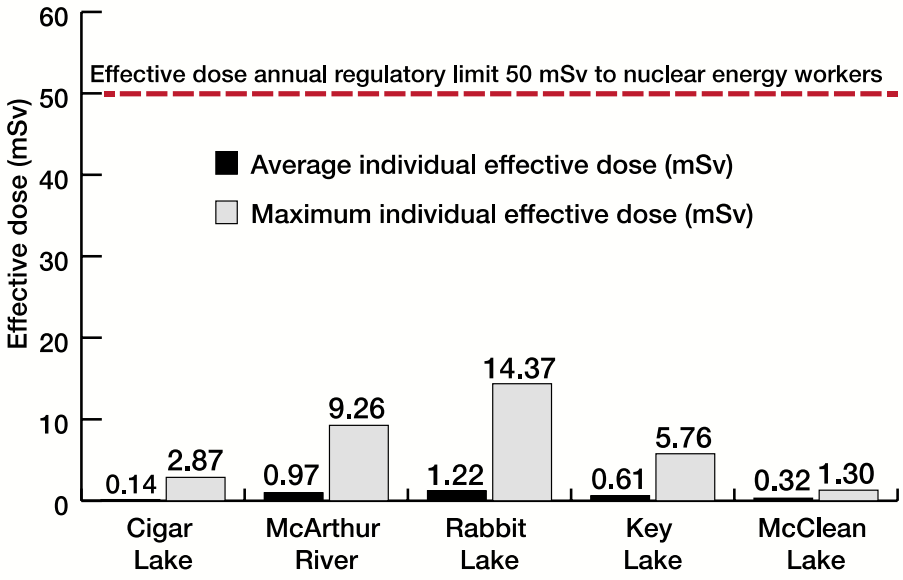
How can this be proven? The best way is to look at the internationally recognized effects of radiation exposure over time and the threshold above which human health is negatively affected.

After extensive research, the International Commission on Radiological Protection determined in 1990 that a dosage limit of 100 millisieverts/year (mSv/year) is the lowest exposure at which an increased cancer incidence could be demonstrated. No cancer incidence has been shown to occur below this threshold. [24]

For uranium miners, Canada's nuclear safety regulator goes even further in the direction of increased margins of safety, lowering the dosage limit by another 50%. The CNSC has set effective dose limits of 50 mSv/year for uranium miners and a cumulative five-year limit of 100 mSv. In comparison, the effective dose limit for the general public is 1 mSv/year.[25]

It can be shown and documented that the uranium mining industry operates well within the limit for nuclear workers. This operational performance is carefully watched and verified by CNSC regulators and provincial authorities (see Figure 3).

Figure 3: Uranium mines and mills – comparisons of individual average and maximum effective dose to nuclear energy workers, 2012



Source: CNSC, *Staff Report on the Performance of Canadian Uranium Fuel Cycle and Processing Facilities, 2012*

The uranium-mining industry's excellent safety performance is all the more remarkable when one takes into account the exceptionally high grade of Saskatchewan uranium. The McArthur River mine, for example, produces an average yield of 15.8% triuranium octoxide (U_3O_8), which vastly exceeds the 0.1% yield typically obtained from the world's other large uranium mines.[26] Putting this into perspective: the uranium concentration at McArthur is some 150 times greater than the global average, and yet the company's performance on radiation doses remains well within regulatory limits.

The uranium industry's excellent safety record extends beyond radiation protection to embrace all aspects of occupational safety, as recognized by the Canadian Institute of Mining, Metallurgy and Petroleum. It has awarded Cameco the 2013 John T. Ryan National Safety Trophy—the third such win for Cameco since 2000.

On the provincial side, the Saskatchewan Workers' Compensation Board has clearly established that underground hard-rock mining, which includes uranium, has a lower time-loss injury rate than most other occupational categories have. In fact, the injury rate for uranium is considerably lower than for jobs in the Saskatchewan government, the construction industry, and agriculture.[27]

Public health and safety

Uranium exploration and mining activities do not increase radon or radiation levels in the environment beyond mine sites. According to the CNSC, "The level of radon near uranium mines is similar to natural radon levels monitored in background locations. Radon exposure to members of the public from CNSC-regulated activities is virtually zero."[28]

This is an important point, as claims are often made that mines could harm human health if humans chose to live nearby. Some medical researchers seem unaware that mine monitoring has consistently indicated the absence of toxic releases.

This bears explanation. Last year, the College of Family Physicians of Canada informed its members that "Canadian studies have linked lung cancer in uranium miners to exposure to radiation."[29] The studies were conducted on men who had worked at the Beaverlodge and Port Uranium mines between 1932 and 1980. During this time, uranium-mine safety was neither well understood nor effectively implemented, in sharp contrast to today's safety practices. These historical studies found elevated rates of lung cancer among the miners. At the same time, the studies gathered no data on smoking or other cancer-risk factors—an important oversight, given that tobacco smoking is related to more than 85% of lung-cancer cases in Canada.[30]

More recently, the *Institut national de santé publique du Quebec* (INSPQ) published a study on uranium mining that missed many important facts and introduced a number of errors into the public debate. These errors are fully documented in a separate submission to the BAPE by Dr. Michel Plante, the former medical officer at Hydro Quebec's Gentilly-2 nuclear station.[31] The CNA commissioned Dr. Plante to examine the INSPQ study.

One example of error involves the level of radiation exposure to general public. In estimating the health hazards for people who live near a uranium mine, INSPQ used an epidemiological approach, which studies the patterns and effects of health and disease conditions to identify risk factors for disease.

The key to this approach is causality: the ability to conclude that a specific factor has caused a specific result. For instance, an epidemiological study might show that the people living closest to a mine are more likely than their fellow citizens are to develop a specific disease. But the study cannot blame the mine. Instead, a scientific experiment would be required, one that compares an exposed population to a control group that has not been exposed.

The INSPQ also failed to report that no person living near a Canadian uranium mine site has ever received a radiation exposure greater than 0.01 mSv—an amount equal to 0.01% of the dose at which cancer probabilities begin to rise measurably.

Environmental protection

As in other metal mines, uranium operations must safely manage waste rock, contain mill tailings, effectively treat water used in mine and mill processes, and reclaim disturbed lands once mining is complete.

Uranium mines involve extensive environmental assessment before construction begins. Baseline studies document the pre-development state of the environment, identify potential effects, and set out measures for their mitigation.

Typical monitoring programs include regular testing of air, water, plants, and animals adjacent to a mine, and downstream. The quality of treated water released by an operation, the air emissions, and the performance of waste-management facilities are also closely monitored.

When stored on the surface, waste rock can generate acidic runoff that can transport heavy metals into the environment. All waste rock is tested to identify its properties and determine the type of measures required to safely store it on the surface. When required, runoff water from waste-rock storage areas is collected and treated to remove contaminants. Special covers and drainage systems are also developed to control runoff and minimize all impacts to the environment.

Tailings are the solid waste materials that result from the processing of uranium ore, as well as fine chemical residues from water-treatment facilities. Uranium-mine tailings typically contain heavy metals such as arsenic, cadmium, cobalt, copper, molybdenum, nickel, lead, selenium, and zinc. The tailings also contain radionuclides such as uranium, thorium-230, radium-226, lead-210, and polonium-210. Modern uranium mines use engineered tailings-management facilities designed to securely contain tailings through the operating life of a facility and for thousands of years after decommissioning.

Uranium-mill tailings may also be safely stored in above-ground tailings-management facilities. Above-ground facilities use earthworks to contain the tailings; runoff is managed to ensure that contaminants are contained. These facilities can be safely be decommissioned in place and remain environmentally safe for very long periods.

All water used in mining and milling processes is treated to remove contaminants before it is released to the environment.

The uranium mining industry's excellent performance on these points is confirmed by the CNSC in its 2012 report on the sector: "All treated effluents released to the environment from licenced mining and milling activities met effluent discharge limits stipulated in the CNSC operating licences."[32] Moreover, the industry's performance compliance with the *Metal Mining Effluent Regulations* compares favourably with the other mining sectors of base metal, precious metal and iron metal mines, as shown in Figure 4.

Figure 4: Percentage of mines in compliance with MMER by sector, 2007–2011

Mining sector	Year				
	2007	2008	2009	2010	2011
Uranium	100 %	100 %	100 %	100 %	100 %
Base metal	67 %	60 %	58 %	65 %	65 %
Precious metal	74 %	80 %	79 %	87 %	70 %
Iron	50 %	67 %	50 %	20 %	33 %
All metal mines	71 %	71 %	69 %	75 %	67 %

Source: CNSC, *Staff Report on the Performance of Uranium Fuel Cycle and Processing Facilities: 2012*

VI. Regulation and oversight: the provincial role

Uranium mines and mills are subject to both federal and provincial environmental regulations. Mining is a provincial jurisdiction; the federal government becomes involved because of the presence of radiation, however low that might be. The role of the province, however, is extensive: the province exercises cradle-to-grave control of licences and permits, establishes requirements for decommissioning and reclamation, and holds financial assurances from uranium miners to ensure that these activities will occur.

In Saskatchewan, uranium mining operates under provincial approval, issued under the *Environmental Management and Protection Act, 2002*. The provincial approval contains numerous environmental protection requirements, including a requirement to produce a "State of the Environment" report every five years, comparing monitoring results to predicted results for each mine. Proposed projects are also subject to the federal *Canadian Environmental Assessment Act*.

The Saskatchewan Ministry of Environment regularly inspects uranium mines and mills. For example, in 2013 Cameco was subject to 12 inspections: two at Rabbit Lake, four at McArthur River, three at Cigar Lake, and three at Key Lake.[33] The Ministry also regulates uranium

exploration and provides guidance through the Mineral Exploration Guidelines for Saskatchewan.[34]

Health and safety in uranium mining in Saskatchewan comes under the province's *Occupational Health and Safety Regulations, 1996* and *The Mines Regulations, 2003*. The Saskatchewan Ministry of Labour Relations and Workplace Safety regularly conducts mine-safety inspections. Cameco again provides an example. In 2013 it was subject to 24 inspections: eight at Rabbit Lake, six at McArthur River, eight at Cigar Lake, and two at Key Lake.

Decommissioning activities occur under the Environment Ministry's Guidelines for Northern Mine Decommissioning and Reclamation. Specific examples of completed and ongoing progressive decommissioning and reclamation activities at Saskatchewan uranium mining operations include the A-Zone, D-Zone, and B-Zone open-pit mining areas at Cameco's Rabbit Lake operation.

Most importantly, the *Mineral Industry Environmental Protection Regulations* require all mining operations in Saskatchewan to maintain a financial assurance for decommissioning and reclamation of their entire operations. The financial assurance amount is based on a hypothetical "decommission tomorrow" scenario in which the operator ceases to exist and therefore cannot meet its decommissioning and reclamation obligations. The amount is reviewed and updated at a maximum of five-year intervals and can be updated more frequently if an operator makes significant changes to a mine or mill. As of 2013, the financial guarantees for the five facilities in Saskatchewan totalled $568.5 million.

Once an operator has completed decommissioning and reclamation activities to the regulators' satisfaction, the company can apply to turn its site over to the Province under the Institutional Control Program, established under the *Reclaimed Industrial Sites Act*. Again, there are financial assurances. The operator must post funds sufficient to cover the future costs of monitoring and maintaining the site. It cannot just shut down operations and leave the community; the engagement of the mining company continues well past decommissioning and remediation, supported by considerable funds and with provincial oversight.

Involvement of communities

In addition to fully complying with federal and provincial legislation and regulations, uranium producers have taken steps voluntarily to ensure that communities and governments (provincial and municipal) understand, and can influence, decisions about mining and milling.

For example, uranium companies in Saskatchewan liaise regularly with the Northern Saskatchewan Environmental Quality Committee to enable northern residents to see first-hand

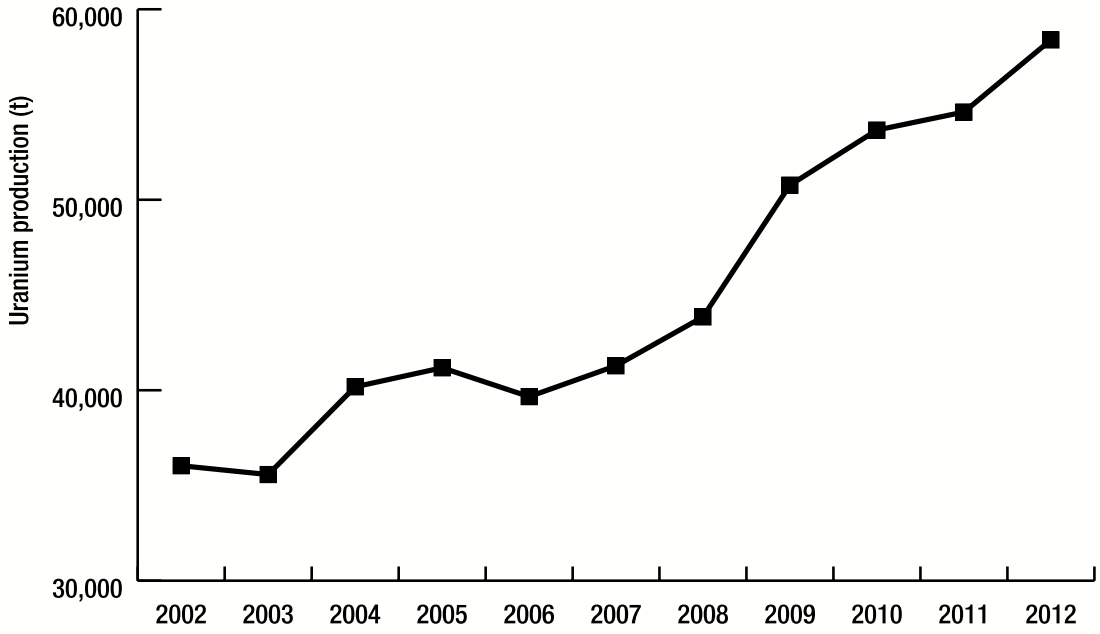
the industry's environmental protection measures. The Committee's members are nominated by northern communities. They work with the industry and government to ensure that all mining activities take into account the needs and aspirations of the people most affected by the industry's operations.

The Environmental Quality Committee receives technical and organizational support from the Northern Mines Monitoring Secretariat, a provincial government organization that includes relevant provincial ministries as well as the CNSC. Additionally, five uranium mines in Saskatchewan are ISO 14001-certified, voluntarily complying with an international set of standards that assures environmental performance and pollution prevention.

VII. Opportunities for the community

Is uranium mining viable economically for the community? Would exploration and development give the community confidence that this kind of activity yields tangible economic benefits to local people and their families, especially in providing employment, training and opportunities for youth? While it is difficult to make hard and fast predictions on these topics, there are some key indicators that point to continued growth of the uranium market.

Figure 5: World uranium production, 2002 - 2012



Source: World Nuclear Association

ExxonMobile's World Energy Outlook forecasts that world electricity demand will rise 90% between 2010 and 2040, with the vast majority of the growth occurring in developing countries. Electricity supplied by nuclear energy should double during this period.[35] If so, then uranium

will be needed to fuel the reactors that produce the electricity. This means continued demand for uranium.

The figures from the global uranium market also provide confidence that demand will stay strong. In the decade from 2002 to 2012, global uranium production increased by 62% (see Figure 5). Further growth is therefore anticipated, in light of credible forecasts for energy demand over the next few decades.

Where is the demand coming from? Currently, there are 436 operable nuclear reactors installed in 30 countries worldwide. Construction is underway on 71 reactors, including five in the United States. Project approvals and financing have been secured for a further 174 reactors. Proposals have been advanced for another 301 reactors.[36] Given this evidence and projected construction, uranium mining can look forward to strong demand and growth prospects.

This means that uranium from a mine in Quebec or in other parts of Canada will find buyers. It means a source of revenue for the community over time. Planning and investment for the future of the community and its people can take place on solid economic foundations.

VIII. Conclusion

Uranium offers clear benefits to humankind in the areas of nuclear medicine and electricity generation. In health care, uranium-based technologies have saved and improved millions of lives and will undoubtedly contribute further improvements as nuclear innovation continues. In electricity generation, uranium provides a safe, reliable, and affordable power source that emits virtually no climate-changing greenhouse gases.

The uranium-mining industry's safety performance is exemplary, as demonstrated by regular inspections and recognized through many safety awards. Uranium production takes place within a regulatory framework that enables provincial governments to exercise their jurisdictional authority fully.

Were Quebec to permit uranium exploration and mine development, it would exercise the same decision-making power that the provincial government brings to all other forms of mining. As we have seen in Saskatchewan, the federal nuclear regulator would provide effective protection in matters of radiation. This effective, collaborative approach, applied on a mine-by-mine basis, ensures human safety and environmental protection.

Awareness of the health, economic, and climate-change benefits of uranium is the first step in a process of engagement with communities on uranium mining. The BAPE hearings have demonstrated that many people in Quebec are not aware of these benefits, or are not prepared

to recognize them. The BAPE commission can help to augment the public's understanding of uranium by recommending an approach through which Quebec communities and members of the public can consider and further explore options for a successful, safe, and responsible uranium-mining industry in their region. Respectful, serious discussion and consultation are the means by which such an approach can be developed and continued.

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