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SUBMISSION BY THE CANADIAN ENVIRONMENTAL LAW ASSOCIATION TO THE CANADIAN NUCLEAR SAFETY COMMISSION REGARDING CAMECO CORPORATION'S APPLICATION TO RENEW THE URANIUM MILL LICENCE FOR ITS KEY LAKE OPERATION AND THE URANIUM MINE LICENCE FOR ITS MCARTHUR RIVER OPERATION

Hearing Reference: 2023-H-6

Prepared by:
Sara Libman, Legal Counsel

Expert Report by:
Dr. Tanya Markvart

May 1, 2023

May 1, 2023

Senior Tribunal Officer, Secretariat
Canadian Nuclear Safety Commission
280 Slater Street, P.O. Box 1046, Station B
Ottawa, Ontario K1P 5S9

Sent by email interventions@cnsc-ccsn.gc.ca

Dear Sir or Madam:

Re: Joint Submission of Inter-Church Uranium Committee Educational Co-Operative, Coalition for a Clean Green Saskatchewan, Committee for Future Generations, and the Canadian Nuclear Safety Commission Regarding Cameco Corporation's application to renew its licences for the Key Lake and McArthur River Operations (Ref. 2023-H-6)

The Canadian Environmental Law Association ("CELA") has enclosed its comments, on behalf of Inter-Church Uranium Committee Educational Co-Operative, Coalition for a Clean Green Saskatchewan, and Committee for Future Generations, on Cameco Corporation's application to renew the uranium mill licence for its Key Lake Operation and the uranium mine licence for its McArthur River Operation.

Please find below our submission for your review.

By this letter, and pursuant to the CNSC's *Rules of Procedure*, CELA request status to participate as an intervenor in the public hearing and an opportunity to make a 30-minute oral presentation at the June 2023 hearing.

Sincerely,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION

Sara Libman

Sara Libman
Legal Counsel, CELA

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I. INTRODUCTION

The Inter-Church Uranium Committee Educational Co-Operative, the Coalition for a Clean Green Saskatchewan, and the Committee for Future Generations together with the Canadian Environmental Law Association ("CELA") submit this intervention in response to the Canadian Nuclear Safety Commission's ("CNSC") Notice of Public Hearing dated September 20, 2022 requesting comments on the application by Cameco Corporation ("Cameco") to renew its licences for the Key Lake and McArthur River Operations (hereinafter "Key Lake" and "McArthur River", respectively) for a period of 20 years.[1] A public hearing with respect to this matter is scheduled for June 7-8, 2023.[2]

Inter-Church Uranium Committee Educational Co-Operative, the Coalition for a Clean Green Saskatchewan, the Committee for Future Generations and CELA's (hereinafter "the intervenors") intervention considers the CNSC's jurisdiction pursuant to the *Nuclear Safety and Control Act* ("NSCA"), which requires that in making a licensing decision, the CNSC ensure the adequate protection of the environment and human health. In meeting this objective, per section 24(4) of the *NSCA*, the intervenors' findings and concerns are itemized below. Our recommendations, including suggested licence conditions and licence condition revisions, are summarized in the section titled **Summary of Recommendations**.

II. INTEREST AND EXPERTISE OF THE INTERVENOR

i. Canadian Environmental Law Association

The Canadian Environmental Law Association ("CELA") is a non-profit, public interest law organization. For over 50 years, CELA has used legal tools to advance the public interest, through advocacy and law reform, in order to increase environmental protection and safeguard communities across Canada. CELA is funded by Legal Aid Ontario as a specialty legal clinic, to provide equitable access to justice to those otherwise unable to afford representation.

CELA has engaged in detailed research and advocacy related to public safety and environmental protection by seeking improvements to nuclear emergency preparedness. We have also appeared before the CNSC on a number of licensing matters, as well as the federal environmental assessment proceedings for multiple nuclear power generating sites ("NPGS") and proposed projects. CELA

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[1] Canadian Nuclear Safety Commission, "Notice of Public Hearing and Participant funding for the Cameco Corporation's Key Lake and McArthur River Operations Licence Renewals" (September 20, 2022), online: https://nuclearsafety.gc.ca/eng/the-commission/pdf/Notice-KeyLake-McArthur-23-H6-e.pdf.

[2] Canadian Nuclear Safety Commission, "Revised Notice of Public Hearing, Ref. 2023-H-6" (December 2, 2022), online: https://nuclearsafety.gc.ca/eng/the-commission/pdf/NoticeRevision1-KeyLake-McArthur-23-H6-e.pdf. [**Revised Notice of Public Hearing**].

also has an extensive library of materials related to Canada's nuclear sector which is publicly available on our website.[3]

Supporting this intervention is expert Dr. Tanya Markvart, who CELA has retained to provide advice on Cameco's licence renewal applications and other relevant documents pertaining to Key Lake and McArthur River.

ii. Inter-Church Uranium Committee Educational Co-operative

Inter-Church Uranium Committee Educational Co-Operative (ICUCEC) is an inter-church coalition that works to educate people about the nuclear industry in Saskatchewan and halt all nuclear development in the province, including mining uranium. ICUCEC's role is that of a nuclear "watchdog" in Saskatchewan and its members make submissions to panels and government regulatory agencies.

iii. Coalition for a Clean Green Saskatchewan

Coalition for a Clean Green Saskatchewan (CCGS) is a network of individuals across rural, northern and urban Saskatchewan that supports us quickly moving towards a sustainable society.

iv. Committee for Future Generations

Committee for Future Generations (CFG) is a group of Dene, Cree, Metis and settler people based in northern Saskatchewan. CFG joined forces to educate people and advocate for greater awareness of the long-term health and environmental consequences of the nuclear industry, inclusive of the uranium mining on Treaty Eight and Ten territory.

III. BACKGROUND/FACTS

A. Projects

Cameco Corporation ("Cameco") is applying to the Canadian Nuclear Safety Commission ("CNSC") to renew the uranium mill licence for Key Lake and the uranium mine licence for McArthur River. Both of these facilities are located in northern Saskatchewan, on Treaty 10 territory (1906), and the Homeland of the Métis, and is within the traditional territories of the Denesųłiné, Cree, and Métis peoples.

Both operations hold 10-licence terms which expire on October 31, 2023. Key Lake and McArthur River hold separate CNSC licences for their respective activities, however both facilities are

[3] Canadian Environmental Law Association, online: www.cela.ca

operationally connected as McArthur River's uranium ore is processed at Key Lake. As a result, the two licencing renewal applications at the same public hearing.[4] According to Cameco, "together, McArthur River and Key Lake are the world's largest uranium mine and mill with licensed production of 9.6 million kilograms uranium (kg U) per year."[5]

The McArthur River mine is a joint-venture owned site, with Cameco, the operator and licensee, owning 69.8% and Orano Canada Inc. ("Orano") owning 30.2%.[6] The Key Lake mill is also a joint-venture owned site with Cameco, the operator and licensee, owning 83.3%, and Orano owning 16.7%.[7] McArthur River consists of an underground mine with underground ore preparation and 3 vertical access shafts.[8] The high grade ore slurry from McArthur River is transported 80 km by truck to Key Lake for processing into uranium concentrate, and all the tailings from this processing are placed into the Deilmann Tailings Management Facility ("DTMF") at Key Lake.[9]

The Key Lake site is historically a mining site, with the Gaertner and Deilmann ore bodies being discovered on site in 1975 and 1976, respectively, with open pit mining of these ore bodies occurring between 1981 and 1997. Once these ores depleted, the Deilmann pit was converted to a tailings management facility—the DTMF. Key Lake has operated as a milling facility since 1983.[10] In addition to the tailings from McArthur River's operations, Key Lake receives recycled by-products from Cameco's Port Hope Conversion Facility and Blind River Refinery in Ontario.[11]

Both sites were issued 10-year licences in October 2013. In 2014, Key Lake submitted and received regulatory approval of an Environmental Impact Statement for the "Key Lake Extension Project", which increased the capacity in the DTMF by raising the approved average consolidation tailings elevation from 466 metres above sea level ("masl") to 505 masl, as well as receiving approval to increase the nominal mill production capacity to 9.6 million kg of uranium.[12]

In 2014, McArthur River's 2013 licence was approved to increase production to 8.1 million kg of uranium per year, and in 2015, the licence was amended to approve an additional production increase to 9.6 million kg of uranium per year.[13]

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[4] CNSC, Revised Notice of Public Hearing.
[5] Cameco, Application for the renewal of uranium mine/mill licences for McArthur River Operation and Key Lake Operation, Written Submission for Cameco Corporation, CMD 23-H6.1 at 1. [**CMD 23-H6.1**]
[6] CNSC, "Cameco Corporation McArthur River Operation and Key Lake Operation: Commission Public Hearing" Commission Member Document 23-H6 (CMD 23-H6) at 3. [**CMD 23-H6**]
[7] *Ibid*.
[8] *Ibid,* at 4.
[9] *Ibid,* at 5.
[10] *Ibid,* at 8.
[11] Ibid, at 5.
[12] Cameco, CMD 23-H6.1, at 11.
[13] *Ibid*, at 12.

In November 2017, Cameco announced the suspension of production at both McArthur River and Key Lake, with both sites entering a state of care and maintenance for an "indeterminant period of time."[14] The sites transitioned out of their states of care and maintenance and into resumed production in late 2022, with Key Lake resuming the milling of ore from McArthur River on November 9, 2022.[15]

With the 10-year licences for Key Lake and McArthur River expiring on October 31, 2023, Cameco is now applying to the CNSC for a renewal of these licences. Initially, Cameco requested that the CNSC issue these licences with indefinite licence terms. However, after receiving negative feedback from Indigenous Nations and communities, and members of the public regarding the indefinite licence terms, Cameco amended its licence applications to request 20-year licence terms for Key Lake and McArthur River.[16]

CNSC staff are recommending that the Commission grant licences to Cameco's McArthur River and Key Lake operations for a period of 20-years, stating that "…the regulatory approach in place is effective, is aligned with international practices and is able to provide appropriate regulatory oversight for [McArthur River] and [Key Lake] for any licence period chosen by the Commission."[17]

B. Scope of Review

The intervenors received participant funding to review Cameco's licence renewal applications and related documentation, including CNSC Commission Member Documents ("CMDs"), with a focus on the environment and human health, public awareness and dissemination of information, sustainable development and relevant international guidance, in order to make recommendations aimed at improving licence and licence condition handbook ("LCH") parameters specific to environmental protection, public awareness and human health.

The scope of this submission is to assess whether renewing the licences for the Key Lake and McArthur River would cause any undue risk to people and the environment; and to assess whether the applicant (Cameco) is qualified to carry out the licencing sought. In particular, this submission assesses how the CNSC has applied its principles of environmental protection to Cameco's licensing renewal application. The CNSC is required to apply RegDoc-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* in licence renewal applications such as these. RegDoc-2.9.1 notes that "…for each facility or activity that has direct

[14] CNSC, CMD 23-H6, at 8.
[15] *Ibid,* at 9.
[16] Cameco, "Licence Renewal for Cameco Corporation Key Lake, McArthur River and Rabbit Lake Operations" Application Letter dated November 4, 2022, online: http://www.nuclearsafety.gc.ca/eng/the-commission/pdf/ApplicationLetter-Cameco-Mines-20-Year-RequestRenewal-6909009.pdf
[17] CNSC, CMD 23-H6, at 116.

interactions with the environment, the applicant or licensee must demonstrate that environmental protection measures are or will be in place... In all cases, the EA (either under *CEAA 2012* or under the *NSCA*), the environmental protection measures and the ERA (where required) are commensurate with the scale and complexity of the environmental risks associated with the nuclear facility or activity."[18] This submission utilizes RegDoc-2.9.1 in both the legal analysis and the expert report on sustainable development sections to determine whether the CNSC and Cameco are considering environmental protection measures in accordance with the *NSCA*.

Our recommendations to the CNSC, including suggested licence conditions and licence condition revisions, are summarized at **Summary of Recommendations.**

Pursuant to our Participant Funding Program application, CELA has engaged the professional services of Dr. Tanya Markvart, an expert in sustainability assessments. Dr. Markvart's expert report titled: "Critical Deficiencies in Cameco Corporation's Application for the Renewal of its Uranium Mine/Mill Licences for the McArthur River Operation and Key Lake Operation," evaluates the projects' documentation and assessment of effects in compliance with relevant regulatory provisions and the principle of sustainable development (see **Expert Report** appended to this submission).

IV. PRELIMINARY MATTERS & PROCEDURAL CONCERNS

Transparency and disclosure of documents must be a priority in all licensing hearings

i. Environmental Justice and Public Disclosure

On March 21, 2023, the intervenors requested PDF format versions of the *Environmental Protection Review Reports* ("EPR Report") for Key Lake and McArthur River. These EPR Reports, which are 101-page and 93-page long documents, respectively, are publicly available as webpages,[19] but not as PDFs. Attempting to review the EPR Reports' information via the webpages proved to be inaccessible for both reading purposes and for offline reading.

While the intervenors appreciate the efforts of CNSC staff to promptly provide PDF versions of the EPR Reports (received March 22, 2023), the intervenors **submit** that key documents and materials associated with a licencing hearing ought to be publicly available in digestible, and offline-compatible formats, such as PDF versions. In doing so, it enables members of the public to access key materials in offline settings in the event they have an unstable internet connection, or to print out materials for accessible reading.

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[18] CNSC, RegDoc-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* at s 2.1. [**RegDoc-2.9.1**]

[19] Key Lake EPR Report: https://www.nuclearsafety.gc.ca/eng/resources/publications/reports/eprkeylake23/index.cfm; McArthur River ERP Report: https://www.nuclearsafety.gc.ca/eng/resources/publications/reports/eprmcarthurriver23/index.cfm

While the efforts of CNSC staff to promptly respond to information requests and questions leading up to this hearing is appreciated, unfortunately we submit that proactive disclosure of data is preferred to piecemeal, individual responses. Put another way, the documents relied upon in Cameco's and CNSC Staff's CMDs ought to be publicly available by default and not by request only.

In numerous prior submissions to the CNSC, CELA has requested that the CNSC direct the public release of studies and assessments relied upon by proponents in their licence application.[20] We once again bring this concern to the attention of the CNSC and **request** that all studies referenced in the licence applications and CMDs by CNSC staff be available for public dissemination when these documents are publicly released.

Meaningful public participation is not possible without an informed public; therefore, easy access to relevant studies, data, records, etc., is critical. Meaningful participation in decision-making is also critical to advancing environmental justice as it ensures that no population suffers disproportionate adverse environmental or human health effects. A core principle of environmental justice is the public's right to information, or "right to know", which stands for a basic human entitlement to information when there may be direct impacts to health and bodily integrity.[21]

Recommendation No. 1: The CNSC should ensure that relevant documents and information is publicly available in accessible formats.

Recommendation No. 2: Documents relied upon in Cameco's and CNSC staff's CMDs ought to be publicly available by default and not available upon request only.

ii. Public Dissemination of Information is a Purpose of the CNSC

On April 3, the intervenors requested the complete versions of a number of documents pertaining to Key Lake and McArthur River to assist Dr. Tanya Markvart's expert analysis for this submission, as these documents were only available as summaries on Cameco's website:

- Key Lake Preliminary Decommissioning Plan;

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[20] *See for instance:* Coalition for Responsible Energy Development in New Brunswick and CELA Submission to CNSC for Renewal of Point Lepreau Nuclear Generation Station Power Reactor Operating Licence (2022), online: https://cela.ca/wp-content/uploads/2022/03/Submission-Point-Lepreau-Nuclear-Generating-Station.pdf at 8; Durham Nuclear Awareness Submission to CNSC for the Application to Renew OPG's licence for the Darlington Nuclear Generating Station (CMD 15-H8.29) at 6; Durham Nuclear Awareness and CELA Submission to CNSC for the Site Preparation Licence for OPG's Darlington Site, online: https://cela.ca/wp- content/uploads/2021/05/CELA-and-DNA-Submission-to-CNSC_OPG-Site-Licence-Renewal_Ref-2021-H-04.pdf at 4-5; Citizens Against Radioactive Neighbourhoods Submission to CNSC for the Application to Renew BWXT's licence for its Peterborough and Toronto Facilities, online: https://cela.ca/wp-content/uploads/2020/03/Submission- from-CELA-on-behalf-of-CARN-BWXT-Licence-Renewal-Ref.-2020-H-01.pdf at 9-10.

[21] Richard M Brown, 1982 "Canadian Occupational Health and Safety Legislation" (1982) 20:1 Osgoode Hall LJ.

- McArthur River Preliminary Decommissioning Plan;
- Key Lake Extension Project Ecological and Human Health Risk Assessment, 2013, e-Doc 5998750;
- Key Lake Operation Environmental Risk Assessment, 2020, e-Doc: 6448936; and
- McArthur River Operation Environmental Risk Assessment, 2020, e-Doc: 6456322.

On April 11, 2023, only the *Key Lake Extension Project Ecological and Human Health Risk Assessment, 2013* was provided to CELA. We were informed by CNSC staff that Cameco had filed a request for confidentiality regarding other four documents. At the time of this submission being drafted, the intervenors have not gained access to any of these documents.

The lack of full, documentary disclosure remains a systemic barrier to meaningful participation before the CNSC and is contrary to one of its core statutory objectives, which is to "to disseminate objective scientific, technical and regulatory information to the public concerning the activities of the Commission and the effects, on the environment and on the health and safety of persons."[22] Per RegDoc 3.6 *Glossary of Terms,* a 'licensed activity' is "[a]n activity described in any of paragraphs 26(a) to (f) of the Act the licence authorizes the licensee to carry on." Section 26(e) of the *NSCA*, which relates to a licence to operate a nuclear facility, is applicable in this instance. Therefore, the *NSCA* clearly contemplates that licensing information, such as the documents the intervenors requested above, are among the "activities" which ought to be publicly disseminated, pursuant to the objects of the Act.

The *NSCA* also requires the CNSC to disseminate "objective" information".[23] Objective is defined as "expressing or dealing with facts or conditions as perceived without distortion by personal feelings, prejudices, or interpretations."[24] The intervenors submit that the CNSC has not fulfilled this obligation; when studies referenced in Cameco's and CNSC Staff's CMDs are not disclosed in full, the public can only rely upon either Cameco's summary of the study or CNSC staff's assessment of the study, its findings and conclusions. Furthermore, without the right to cross-examination as part of the hearing process, there is no ability for members of the public to question the authors, the methods, the scope, and findings. This means there is no ability for the public to view the full licensing record nor ability for experts, who may be retained by public interest intervenors, to provide peer review of the studies and subsequently make recommendations to the CNSC.

Recommendation No. 3: References contained in CNSC staff's and Cameco's CMDs ought to be publicly available to that subject matter experts can provide peer review of the documents. This is necessary for the CNSC to uphold its obligations to disseminate "objective" information.

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[22] *NSCA* at s 9(b).
[23] *Ibid*.
[24] Merriam-Webster dictionary, online: https://www.merriam-webster.com/dictionary/objective.

Recommendation No. 4: The right to cross-examination must be adopted as part of the hearing process so that members of the public have the ability to pose questions regarding, for instance, a study's methods, scope and findings.

V. LEGAL FINDINGS & ANALYSIS

The intervenors submit that 20-year licences are patently unreasonable in the circumstances and should be denied for the following reasons, each detailed below:

A. Cameco's request for 20-year licences for these two operations is contrary to the public interest;
B. Cameco's licence applications fail to consider the increased risk of environmental contamination
C. Cameco's licence applications fail to consider the impact of new developments and market volatility; and
D. Cameco's licence applications fail to expressly consider climate change.

A. Cameco's request for a 20-year licence is contrary to the public interest

The intervenors are highly concerned by Cameco's request for 20-year licences for the Key Lake and McArthur River operations, and submit it is contrary to the public interest mandate of the CNSC for a number of interrelated reasons, including that it shields licensee activities from the public oversight and participation mechanism provided in section 40(1) of the *NSCA*; it would mean relying on more discretionary forms of public engagement like CNSC meetings which are not subject to the licensing framework of the *NSCA*; and it would be contrary to international guidance and precedents.

i. Public Oversight and Participation

The intervenors oppose Cameco's request for 20-year licences for Key Lake and McArthur River as it removes the opportunity for a public hearing under section 40(1) of the *NSCA* for two decades.[25] This approach is contrary to the public interest mandate of the CNSC, as 20-year licence

[25] **40 (1)** Subject to subsection (2), the Commission shall provide an opportunity to be heard in accordance with the prescribed rules of procedure to
(a) the applicant, before refusing to issue a licence under section 24;
(a.1) the applicant, before refusing to authorize its transfer under section 24;
(b) the licensee, before renewing, suspending, amending, revoking or replacing a licence, or refusing to renew, suspend, amend, revoke or replace a licence, under section 25;
(c) any person named in or subject to the order, before confirming, amending, revoking or replacing an order of an inspector under subsection 35(3);
(d) any person named in or subject to the order, before confirming, amending, revoking or replacing an order of a designated officer under subsection 37(6);

terms would effectively shield Cameco's activities and potential incidents at Key Lake and McArthur River from public hearings until 2043. While the CNSC also recommended that with 20-year licences, Cameco would be subjected to complete mid-term updates to the Commission,[26] the intervenors emphasize that these mid-term reviews would not occur for 10 years following the renewals of these licences.

As CELA has previously submitted to the CNSC, the intervenors do not support the CNSC's transition to longer licences, as they significantly reduce public scrutiny of licensee operations, access to information, and effectively eliminate meaningful public participation.[27] As we submit below, there are good reasons, including the potential for harmful releases from facilities at both sites, market volatility and the potential impacts of climate change, to evaluate projects and their impacts even more frequently in the future.

First, the International Atomic Energy Agency ("IAEA") publication, *Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities*, notes that "public participation in decisions can promote a greater degree of understanding of the issues and can help to develop appreciation of the actual risks and benefits of nuclear energy."[28] As such, shorter-term licences provide more frequent opportunities to publicly reassess a licence in accordance with licensing purposes, including compliance with regulatory requirements, CNSC RegDocs and international guidance.[29]

(e) the applicant, before confirming a decision not to issue a licence or authorize its transfer — and the licensee, before confirming a decision not to renew, amend, revoke or replace a licence or authorize its transfer — under paragraph 43(4)(a); (f) the licensee, before confirming, varying or cancelling a term or condition of a licence under paragraph 43(4)(b);
(g) the licensee, before taking any measure under any of paragraphs 43(4)(c) to (f);
(h) any person named in or subject to the order, before taking any measure under any of paragraphs 43(4)(g) to (j); and
(i) any person named in or subject to the order, before making any other order under this Act.

[26] CNSC, CMD 23-H6, at 116.

[27] *See for example:* Coalition for Responsible Energy Development in New Brunswick and CELA Submission to CNSC for Renewal of Point Lepreau Nuclear Generation Station Power Reactor Operating Licence (2022), online: https://cela.ca/wp-content/uploads/2022/03/Submission-Point-Lepreau-Nuclear-Generating-Station.pdf; and Submission from CELA on behalf of Citizens Against Radioactive Neighbourhoods in response to BWXT's 10-year licence renewal for its Peterborough and Toronto facilities (2020), online: https://cela.ca/wp-content/uploads/2020/03/Submission-from-CELA-on-behalf-of-CARN-BWXT-Licence-Renewal-Ref.-2020-H-01.pdf

[28] IAEA, *Stakeholder Involvement Throughout the Life Cycle of Nuclear Facilities* (2011), online: https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1520_web.pdf at 7. [**IAEA Guidance on Stakeholder Involvement**]

[29] *See* S. Blake (2017) Administrative Law in Canada (6th Ed): Toronto: Lexis Nexis Canada at 138 [**Admin Law in Canada**]

Second, uranium mines and mills pose substantial risks to human health, safety and the environment. Our understanding of these dangers is continuously evolving, and legacies such as the decommissioned Beaverlodge uranium mine and mill in northern Saskatchewan reveal the very dire contamination risks that can flow from uranium mining operations.[30] Applications for licence renewal should, therefore, not just attract the highest level of procedural protections, but also build in rights for public intervention, including notice, awareness of the impacts, and regular opportunities to respond, interrogate industry claims, and offer independent expert advice. The intervenors submit that 20-year licences would significantly reduce the level of procedural protections and rights for the public to participate in a public hearing process per section 40(1) of the *NSCA*.

Specifically, 20-year licence terms would minimize public scrutiny of licensee operations and access to information because of the duration of time between hearings and the accompanying lack of meaningful ways for the public to engage with the Commission and licensee. The intervenors note that during a 20-year licence cycle for a site like Key Lake or McArthur River, community groups may lose knowledge holders who are familiar with and are well-versed in the history and legacy uranium/nuclear activities within their communities. With long gaps in public engagement, the public's knowledge and awareness of ongoing concerns about a facility becomes fractured, and the ability for the public, the CNSC, and a licensee to meaningfully engage with one another is lost. There needs to be continuity in public engagement surrounding sites like Key Lake and McArthur River, and the best way to prevent these gaps in knowledge sharing is to provide for frequent and meaningful public engagement opportunities.[31] Shorter licences and more frequent hearings, which are responsive to the operations being undertaken by licensees, would better serve the public interest.

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[30] Saskatchewan Environmental Society, *The Legacy of Uranium Mining in Saskatchewan: The Unacceptable Environmental Impacts of Uranium Mining* (March 2015), online: https://environmentalsociety.ca/wp-content/uploads/2015/08/The-Legacy-of-Uranium-Mining-in-Saskatchewan-FINAL.pdf at 7-11. [**Saskatchewan Environmental Society**]

[31] See for instance, Dr. Tanya Markvart's Expert Report at sections 2.5, 3.2, and 3.3, which highlights the role of meaningful public participation in sustainability-based decision making for sites like Key Lake and McArthur River.

Third, by limiting meaningful public participation and access to information for 20 years, long licence terms would also diminish public trust in the CNSC and the licensee. The intervenors were already in opposition to Cameco receiving 10-year licence renewals for these two sites, and to extend the sites' licence terms for an even longer period of time would be of great detriment to public trust. IAEA guidance on stakeholder involvement provides that "[e]stablishing trust can be enhanced when an inclusive approach to stakeholder involvement is adopted [...] to help ensure that all those who wish to take part in the process have an opportunity to express their views and have access to information on how public comments and questions have been considered and addressed."[32] Essentially, public confidence in the mining and processing of uranium concentrate can be enhanced by an authorization process that reflects a high degree of openness and transparency on the part of the authorities.[33] This is lost if there is only one chance every 20 years for the public to meaningfully engage in dialogue with the CNSC and the licensee about their concerns.

Fourth, 20-year licences would limit the opportunity for the public and community groups to raise issues of timely and urgent importance. Cameco has estimated that Key Lake and McArthur River have a projected mill/mine life to 2044, "based on current uranium prices, assumed mining rate and reserve estimates."[34] This means that a 20-year licence term would take these two operations to the end of their production lifecycles. Shorter licensing terms would allow the public to weigh in more frequently on the advisability and timing for shutting down and decommissioning of these sites, as well as engage with any environmental issues that may arise during operations of these two sites prior to decommissioning.

Recommendation No. 5: Licence renewals should be subject to shorter licensing terms as it provides the opportunity for public hearings under section 40(1) of the *NSCA*, and enhances the openness and transparency of the CNSC, and its oversight of nuclear uses and technologies. These opportunities are critical to building the public's trust in the regulator and would be lost if there is only one chance every 20 years for the public to participate in a hearing and engage in dialogue with the CNSC and the licensee about their concerns.

ii. Regulatory Framework and Oversight

The intervenors submit that CNSC staff's recommendation that the Commission renew Key Lake and McArthur River's licences for a period of 20 years is contrary to the public interest because CNSC staff erred in finding discretionary forms of public engagement, such as regulatory oversight meetings, are sufficient stand-ins for public hearings under the *NSCA*. Inter-Church

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[32] IAEA Guidance on Stakeholder Involvement at 6.

[33] Carlton Stoiber, Alec Baer, Norbert Pelzer & Wolfram Tonhauser (eds), *Handbook on Nuclear Law* (2003, IAEA: Austria), online: https://www-pub.iaea.org/mtcd/publications/pdf/pub1160_web.pdf at 36; *see also:* IAEA Guidance on Stakeholder Involvement at 6.

[34] Cameco, CMD 23-H6.1, at 15.

Uranium Committee Educational Co-Operative, the Coalition for a Clean Green Saskatchewan, and the Committee for Future Generations and CELA do not accept CNSC staff's position that 20-year terms are justified based on improvements to the regulatory framework and oversight practices of the CNSC.

First, the intervenors do not agree that the annual Regulatory Oversight Report for Uranium Mines and Mills is an appropriate alternative to more regular, site specific licensing hearings. The intervenors submit that a public hearing before the CNSC provides greater procedural rights and protections than other CNSC forums, such as the annual Regulatory Oversight Reports ("ROR") and meetings. Furthermore, while licence renewal hearings are subject to the provisions of s 24(4) of the *NSCA* and the CNSC's *Rules of Procedure*, which provide some degree of procedural rights for the public, these statutory requirements do not apply to RORs.

It has been CELA's experience that the intent of RORs is not to change or amend licences or licence conditions, but rather to receive updates on licensee activity. Further, the public is generally excluded from oral interventions which provide an opportunity for interrogations and dialogue with the proponent and Commission members. As such, the ROR is ill suited to resolving the concerns being made by the intervenors in the context of these licence renewals.

Second, the intervenors submit that the mid-term reporting requirement for licence periods greater than 10-years and other regulatory control measures—such as status reports event initial reports, periodic safety reviews and environmental risk assessments—do not justify the issuance of a longer licence term. For example, CNSC staff recommend that if the CNSC issues licences greater than 10 years for Key Lake and McArthur River, Cameco would be required to provide comprehensive performance updates to the Commission at mid-term point of the licence periods. These updates "…would consist of a report documenting a thorough licensing basis review, that is, a report documenting Cameco's performance across all 14 SCAs as well as the submission of revised programs as needed for CNSC staff review and acceptance."[35] For these mid-term updates, the performance updates would be available for the public to review in advance of the Commission meeting, and "Cameco's presentation during a Commission meeting would provide an opportunity for Indigenous Nations and communities and the public to provide input and perspective to the Commission at a frequency in line with current norms."[36] It is unclear whether the public engagement element of the mid-term updates would be limited to written submissions, or include oral submissions and the ability for stakeholders to ask questions to the licensee and the Commission.

[35] CNSC, CMD 23-H6, at 115.
[36] *Ibid*.

Additionally, CNSC staff note that Cameco is required to update environmental risk assessments, preliminary decommissioning plans and financial guarantee on a minimum 5- year frequency.[37] Contrary to CNSC staff's suggestion, the 5-year frequency of these submissions provide yet another reason to not exceed this timeframe for licensing, so that the public can have the opportunity to review and comment on the most recent iterations of these licensing basis documents.

As well as complimenting the timeframes for environmental risk assessments, preliminary decommissioning plans and financial guarantee updates, shorter licensing terms would better align with the principle of adaptive management—an environmental projection measure the CNSC needs to respect in licensing application processes.[38] As this submission discusses in both Part D and in the Expert Report, adaptive management becomes essential in reviewing how a licensee like Cameco is preparing and adapting its operations to the effects of climate change.

As a result of the above noted deficiencies, the intervenors submit that the CNSC should disregard CNSC staff's recommendation for 20-year licensing terms. To align with the 5-year cycle of updating environmental risk assessments, the preliminary decommissioning plans and financial guarantees for Key Lake and McArthur River, the intervenors submit that 5-year licensing terms would be more suitable for these two operations. Regardless the length of the licences provided to Cameco, the intervenors further recommend there be a comprehensive performance update for Key Lake and McArthur River subject to public hearings and review every three years, which would greatly enhance transparency and accountability with the public.

Recommendation No. 6: Regulatory Oversight Reports, mid-term performance updates and meetings are not sufficient alternatives to licensing hearings given their limited scope and exclusion of oral intervention opportunities. They should not be relied upon to remedy outstanding issues resulting from licensing hearings, nor used as a stand-in for public hearings.

Recommendation No. 7: The CNSC should disregard CNSC staff's recommendation for 20-year licensing terms. The licensing terms for Key Lake and McArthur River should not exceed 5-years, as this would not only align with the review cycles for updating the environmental risk assessments, the preliminary decommissioning plans and financial guarantees for these sites, but would also enhance public engagement with both operations.

Recommendation No. 8: Regardless the length of the licences provided to Cameco, the intervenors further recommend there be a comprehensive performance update for Key Lake and McArthur River subject to public hearings and review every three years, which would greatly enhance transparency and accountability with the public.

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[37] *Ibid,* at 112.
[38] CNSC, RegDoc-2.9.1, at s 2.1.

iii. International Precedents

The intervenors submit that it would be contrary to the public interest to accept CNSC staff's recommendation for 20-year licensing terms based on international precedents. In making their recommendation, CNSC staff note that "internationally, nuclear fuel cycle facilities are issued licences for periods ranging from a few years to the entire lifecycle of the facility, supported by periodic, comprehensive assessments of facility safety."[39] However, in their brief analysis of international licence periods, CNSC staff have not provided sufficient information about what factors are considered by nuclear regulators in other jurisdictions during the licence application and renewal process.[40]

Indeed, the intervenors submit that nuclear licencing procedures in other jurisdictions are quite prescriptive compared to Canada's highly subjective approach. For example, CNSC staff note that in 2017, the United States Nuclear Regulatory Commission ("NRC") changed the maximum licence terms for new applications and licence renewals for uranium recovery facilities from 10 years to 20 years in a new policy on licence terms.[41] However, the NRC sets very detailed regulatory requirements that a nuclear facility and operator must meet to be licenced. The licence renewal process requires that both a technical review of safety issues and an environmental review be performed for each application, and NRC regulations –10 CFR Part 51 and 10 CFR Part 54 – contain very detailed requirements for each of these reviews, outlining their scope, content and technical basis.[42]

In contrast, the CNSCs licencing scheme is so overly reliant on guidance principles and non-binding language that it is very difficult for an observer to tell what is sufficient under the Act and regulations. The few mandatory/prescriptive provisions in the *NSCA* and accompanying regulations generally only require the license applicant to address several topics or areas of concern but offer nearly no concrete provisions for how they should be addressed or what would constitute sufficient planning and analysis under them.[43] Further, while RegDocs give license applicants and the general public some insight into what the CNSC would like to see in an application, the use of non-binding language (e.g. "should" or "may" instead of "shall" or "must") in these documents makes it difficult to discern the threshold of information the CNSC would consider to be sufficient to address a listed area of concern.[44]

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[39] CNSC, CMD 23-H6, at 112.
[40] *Ibid*.
[41] *Ibid*.
[42] United States Nuclear Regulatory Commission, Part 51, online: https://www.nrc.gov/reading-rm/doc-collections/cfr/part051/index.html; Part 54, online: https://www.nrc.gov/reading-rm/doc- collections/cfr/part054/index.html
[43] *See for example*: *NSCA* at s 24(4); *General Nuclear Safety and Control Regulations*, SOR/2000-202 at ss 3(1), 5.
[44] *See for example:* CNSC RegDoc 2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures, Version 1.1*; CNSC RegDoc 2.4.1, *Deterministic Safety Analysis*; CNSC RegDoc 2.3.3., *Periodic Safety Reviews*; CNSC RegDoc-3.1.2, *Reporting Requirements, Volume I: Non-Power Reactor Class I Nuclear Facilities and Uranium Mines and Mills*.

Another jurisdiction referred to by CNSC staff is Kazakhstan, in which the new Subsoil Use Code came into effect on June 29, 2022. Under this new Code, the maximum term for a production licence which covers uranium mining, mineral processing and operational exploration is 25 years with a possible extension for the same period, which may be granted several times.[45] What is notable about the citation relied upon by CNSC staff to discuss this licence change is that the news release states: "the mining legal framework, at least on paper, looks more straightforward and investor-friendly now (of course, with a few reservations)."[46] The intervenors submit that when setting licence terms for nuclear facilities, the priority of the CNSC should not be making licencing more investor-friendly; rather, the focus of the CNSC should be centred around ensuring the protection of human health and safety and the environment. As such, the intervenors submit that longer licencing terms are act against the obligations of the Commission under the *NSCA*.

As such, CNSC staff's recommendation for 20-year licences based on international precedent cannot be relied upon by the CNSC as a basis for granting the licence.

Recommendation No. 9: Without a more thorough review of legislation and licensing procedures in other jurisdictions, international precedence and benchmarking do not justify longer term licences in Canada.

B. Cameco's licence applications fail to consider the increased risk of environmental contamination

The intervenors emphasize that granting a 20-year licence to both Key Lake and McArthur River would be counter-intuitive to RegDoc-2.9.1, which emphasizes the importance of participation opportunities for the public and for Indigenous Nations and communities during licensing processes.[47] With 20- year licences, the ability for the public to regularly comment and engage with information surrounding environmental releases is greatly diminished, and therefore there is less accountability surrounding the monitoring, management, and preventative measures taking place to prevent these releases that will cumulatively impact human health and the environment over time.

The intervenors submit that shorter licencing terms, combined with a careful review of environmental release incidents will ensure that the precautionary principle is being applied to Key Lake and McArthur River's activities. The precautionary principle, one of the CNSC's guiding principle for protection of the environment,[48] requires a cautionary approach, whereby if there is sufficient evidence that an activity is likely to cause irreversible harm to the environment, the

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[45] CNSC, CMD 23-H6 at 112; Mining Metals Central Asia, *Kazakhstan's New Legal Regime for Mining,* online: https://mining-metals.kz/en/media-centre/news/news-blog/572-kazakhstan-s-new-legal-regime-for-mining [**Kazakhstan's New Legal Regime for Mining**]

[46] Kazakhstan's New Legal Regime for Mining.

[47] RegDoc-2.9.1 at s 2.4.

[48] CNSC, RegDoc-2.9.1 at s 2.1.

decision maker is obliged to prevent or terminate the activity.[49] This principle of international environmental law has also been adopted into Canada's application of environmental law, as held by the Supreme Court of Canada in its seminal 2001 decision in *Spray-Tech*:

> The interpretation of By-law 270 contained in these reasons respects international law's "precautionary principle", which is defined as follows at para. 7 of the Bergen Ministerial Declaration on Sustainable Development (1990):
>
> > In order to achieve sustainable development, policies must be based on the precautionary principle. Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.[50]

As such, there is a positive duty on the CNSC to ensure the activities it licences do not cause unacceptable harm to the environment.[51] The precautionary principle is an important tool in the event that Cameco decides to either transition Key Lake and McArthur River back into states of care and maintenance, or to seek an increase in annual production limits (like Cameco has done previously during the 10-year licences for these two sites), as this principle requires a careful consideration of how changes to operations may alter the type and frequency of environmental events at these sites.

Sections *i)* and *ii)* below provide an overview of some of the environmental and radiological incidents that have occurred at Key Lake and McArthur River over the course the 10-year licences for these sites. These incidents highlight the need for short-licensing terms, to enable public participation opportunities to address environmental events at these sites on a more frequent basis.

Recommendation No. 10: Shorter licencing terms, with a careful review of environmental release incidents will ensure that the precautionary principle is being applied to Key Lake and McArthur River's activities. The precautionary principle must be applied to any proposed changes in the operational activities at Key Lake and McArthur River—whether that change be transitioning back to a state of care and maintenance, or to increase the annual production/processing limits.

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[49] Cameron J and Abouchar J (1990), "The precautionary principle: a fundamental principle of law and policy for the protection of the global environment", Boston College International and Comparative Law Review, 14(1), at 3. [**Cameron & Abouchar**]

[50] 114957 Canada Ltee (Spray-Tech) v Hudson (Ville), 2001 SCC 40 (CanLII) at para 31.

[51] Cameron & Abouchar at 22.

i. McArthur River Environmental Releases

When considering the renewal of McArthur River's licence, it is important to review the trending incidents that have occurred over the course of its 10-year licence, as well as the frequency of inspections. This provides a clearer picture of whether there is adequate environmental protection measures in place, and whether the level and frequency of inspections are proactively preventing releases from occurring by ensuring McArthur River's equipment and infrastructure remains in good order.

The intervenors submit that it is difficult to see the entire picture of environmental events at McArthur River between 2013-2023. The CNSC staff's CMD for Key Lake and McArthur River provides a table listing the number of reportable events that occurred at each site between 2013-2022. At McArthur River, there was a total of 24 reportable events between 2013-2019 (no reportable events are observed for 2020-2022), and this number of reportable events include both radiation protection and environmental protection action level exceedances, effluent level exceedances, spills and lost time injuries.[52] There is no comprehensive list within the CNSC staff CMD or Cameco's licence application which summarizes each of these releases.

The intervenors submit that finding information on the various releases from McArthur River is inaccessible. For example, the CNSC has a section on their website which provides a list of Uranium Mines and Mills releases, however the list of events only goes back to 2015, and the page has not been updated since July 2021.[53] Cameco's event reporting segment on their website does not provide any deeper insight, as the oldest event summary for McArthur River is from July 29, 2020.[54] The other option for tracking down reportable events at sites like McArthur River is to read through all of the CNSC's Regulatory Oversight Reports for Uranium Mines and Mills between 2013-2021. The intervenors submit that taking this approach is time consuming and complicated for a member of the public, and highlights a lack of transparency and accessibility surrounding the track record of uranium mining and milling operations.

The intervenors submit that the licensee should be required to keep a publicly accessible record of *all* environmental incidents and events that have occurred at a licenced site. In doing so, there is a clear record of trends on the types of releases and events occurring at sites like McArthur River, and how these events are being corrected and monitored. While such events are highlighted annual in the Commission's Regulatory Oversight Reports, the intervenors submit these annual reports provide a very high level overview of mining activities, and lack sufficient depth of monitoring and assessment of environmental events occurring at sites. The public should be made aware of

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[52] CNSC, CMD 23-H6 at 25, table 3.1.

[53] CNSC, "Events Reporting: Uranium Mines and Mills", online: http://www.nuclearsafety.gc.ca/eng/acts-and-regulations/event-reports-for-major-nuclear-facilities/event-reporting/uranium-mines-mills.cfm [**Events Reporting**]

[54] Cameco, "Key Lake and McArthur River Environment and Safety", online: https://www.cameco.com/businesses/uranium-operations/canada/mcarthur-river-key-lake/environment-safety [**Environment & Safety**]

these events and their corrective measures in a timely manner, and have an understanding of how these events will be prevented in the future.

There is a relatively recent event that occurred at McArthur River that does not appear to be discussed within any of the licencing application materials. According to Cameco's Environment & Safety segment of their website, on May 10, 2021 there was a reportable event at McArthur River: "An increase in outdoor temperatures caused snow meltwater to accumulate within utilidor sump #7 and approximately 2,000 liters of meltwater overflowed the sump onto the ground. This event is classified as a reportable release."[55] According to Cameco, to correct this spill, an alternative pumping system was set up, and provincial and federal regulators were notified.[56] This event has prompted questions regarding environmental monitoring and maintenance.

First, the intervenors request that Cameco provide information on whether this event was reasonably foreseeable and preventable, and whether there are other elements of equipment or infrastructure that are susceptible to rapidly changing temperatures causing spills or leaks.

Second, as this submission discusses in greater detail in Part D, the effects of climate change are already impacting various natural resource sectors in North America, and uranium mining and milling facilities are not immune to these effects. The intervenors request that Cameco provide information on how it plans to adapt the McArthur River site (and the Key Lake site) to endure the increasingly frequent weather events and drastic temperature changes that are being caused by climate change. The intervenors submit that without adequate climate adaptation measures, spills like this event will only become more frequent during McArthur River's operations.

The intervenors are concerned about the type and frequency of inspections occurring at McArthur River over the last 5 years. For instance, McArthur River has not had an on-site inspection since 2019 and the frequency of inspections in general have decreased over the last three years. **Table 1** below provides a list of the inspections that have occurred at McArthur River between 2018-2022, according to data provided in the Regulatory Oversight Reports for these years.[57]

Table 1: List of Inspections at McArthur River between 2018-2022

Year	Inspection Conducted
2018	• March 2018: Fitness for service, conventional health and safety, environmental protection, human performance management • August 2018: Physical design, environmental protection, radiation protection, conventional health and safety • October 2018: Environmental protection, radiation protection, conventional health and safety

[55] Ibid.
[56] Ibid.
[57] *See* CNSC, Appendix B: List of Inspections in the *Regulatory Oversight Report for Uranium Mines and Mills* for 2018, 2019, 2020, and 2021.

	• October 2018: Environmental Protection
2019	• January 2019: Emergency management and fire protection • January 2019 (Compliance Inspection: Care and Maintenance Activities): Management system, Fitness for service, Environmental protection, Radiation protection, Conventional health and safety, Human performance management, Emergency management and fire protection • June 2019 (Compliance Inspection: General): Management system, Fitness for service, Operating Performance, Physical design, Radiation protection, Conventional health and safety, Waste management, Security • July 2019 (Compliance Inspection: Waste Management): Waste management, environmental protection, radiation protection
2020	• November 2020: Safety analysis; physical design; radiation protection; conventional health and safety; emergency management and fire protection; safeguards and non-proliferation; packaging and transport (remote) • December 2020: Fitness for service; safety analysis; environmental protection; conventional health and safety (remote)
2021	• January 2021: radiation protection (remote) • November 2021: radiation protection, conventional health and safety, emergency management and fire protection (remote)
2022	• January 2022: environmental protection, radiation protection, conventional health and safety, human performance management (remote)

While the COVID-19 pandemic has certainly had an impact on the ability for the CNSC to conduct its inspections while adhering to public health and safety guidelines, the downward trend in the frequency of inspections is troubling in the eyes of the intervenors. The intervenors would note that during the pandemic, on-site inspections have occurred at some mining and milling sites, just not at McArthur River.[58]

In particular, the intervenors are concerned about the lack of physical design inspections: the last physical design inspection of McArthur River occurred in 2020. Prior to 2020, this inspection seemed to occur annually. In 2021 (a year in which this inspection did not occur), a spill due to snow melt occurred). The intervenors submit that there should be more frequent inspections of McArthur River, with more frequent inspections for all relevant SCAs. SCAs like physical design and waste management, for example, should be regularly inspected at this mining site. An annual, on-site inspection for these SCAs can serve as preventative tools for environmental releases, identifying problematic elements of the mining operation that may require maintenance or refurbishing.

The intervenors request that the inspections of McArthur River should primarily be conducted on site, rather than remotely/via desktop. Frequent on-site inspections are useful in the sense that they

[58] ROR 2021 at Appendix B.

may indicate areas requiring immediate attention for maintenance that may be otherwise missed by the licensee.

The intervenors request clarification on how the CNSC arranges its inspections of McArthur River, i.e., how much notice does Cameco receive prior to an inspection, or how does the CNSC decide when certain SCA inspections will take place.

Recommendation No. 11: The licensee should be required to keep a publicly accessible record of *all* environmental incidents and events that have occurred at a licenced site. In doing so, there is a clear record of trends on the types of releases and events occurring at sites like McArthur River and Key Lake, and how these events are being corrected and monitored.

Recommendation No. 12: Cameco should provide information on whether the 2021 meltwater overflow event at McArthur River was reasonably foreseeable and preventable, and whether there are other elements of equipment or infrastructure that are susceptible to rapidly changing temperatures causing spills or leaks.

Recommendation No. 13: Cameco should provide information on how it plans to adapt the McArthur River site (and the Key Lake site) to endure the increasingly frequent weather events and drastic temperature changes that are being caused by climate change. Without adequate climate adaptation measures, spills like the 2021 McArthur River event will only become more frequent during McArthur River's operations.

Recommendation No. 14: More frequent on-site inspections of McArthur River, with more frequent inspections for all relevant SCAs are required to ensure the protection of human and environmental health. SCAs like physical design and waste management, for example, should be regularly inspected at mining sites like McArthur River.

Recommendation No. 15: The intervenors request clarification on how the CNSC arranges its inspections of McArthur River, i.e., how much notice does Cameco receive prior to an inspection, or how does the CNSC decide when certain SCA inspections will take place.

ii. Key Lake Environmental Releases

The intervenors submit that a 20-year licence for Key Lake would pose undue risk to human health and the environment, as this site has had a number of environmental releases occur over the course of its 10-year licence. These releases occurred both before, during, and after Key Lake's period of being in a state of care and maintenance.

For example, on December 2, 2013, "approximately 200 m3 of treated effluent with a pH of approximately 10.8 was released to Horsefly Lake at the discharge location following an upset

condition in the water treatment plant. The pH was above the upper pH limit specified in the MDMER (9.5) and was also above the maximum grab sample limit within the provincial operating approval (9.5)."[59] Another pH limit exceedance occurred at Key Lake on October 12, 2018, with approximately 10m3 of high pH (10.16) effluent was released from the Reverse Osmosis treatment plant to Horsefly Lake.[60]

In addition to pH level exceedances, there have been other environmental releases from Key Lake that raise the concern of what environmental protection measures are in place. For instance, on December 3, 2018, "The CNSC was informed by Cameco that a sump area within the Key Lake mill has released an estimated 50 m3 of water, used for radon gas suppression, over the course of the year. The water was released to the ground at the mill. An investigation is underway, and the area will be pumped dry and further inspected."[61]

To find more information about this incident, CNSC's website prompts the reader to visit Cameco's environmental monitoring webpage for Key Lake. However, when reviewing Cameco's website, the website only provides reporting on environmental incidents and other events at Key Lake dating back to March 8, 2020.[62] As stated above regarding McArthur River, this emphasizes the need for licensees like Cameco to maintain a clear record of environmental events for each of their operational sites, and ensure it is publicly available and updated regularly.

The 2019 ROR for Uranium Mines and Mills did provide an update on this incident, noting:

> […] After a review of groundwater monitoring data, Cameco reported that an onsite monitoring well showed an increase in uranium concentrations. Cameco completed an investigation and confirmed the contamination. An initial event report was discussed at a Commission meeting on May 15, 2019. A complete facility assessment report was prepared and submitted to the CNSC in March 2020. The assessment confirmed that the contamination was limited in geographic extent; there were no impacts and no immediate risks to the surrounding environment. Cameco is using the assessment in order to develop a corrective action plan, which is expected to be submitted to the CNSC in late 2020.[63]

On October 28, 2022, yet another environmental release at the Key Lake mill occurred:

> After treatment, mill effluent is stored on 1 of 4 monitoring ponds and effluent quality is verified prior to discharge. In this instance, the pond fill sample has a uranium

[59] CNSC, CMD 23-H6 at 59. Note: MDMER is the Metal and Diamond Mining Effluent Regulations, under the Fisheries Act.
[60] *Ibid*, at 60.
[61] CNSC, Events Reporting.
[62] Cameco, Environment & Safety.
[63] CNSC, ROR 2019 at 13.

> concentration of 60 µg/L, which is acceptable for discharge, however the pond discharge composite sample was 81 µg/L, which is above the action level of 80µg/L.[64]

The CNSC noted that: "although the discharge was above the action level, the effluent quality remained within the CNSC's interim objective for uranium in effluent of 0.1 mg/L and no impact on the environment occurred."[65]

While the CNSC determined that the contamination from these events resulted in no impacts or immediate risks to the surrounding environment, the intervenors submit that as these events continue to occur, they will cumulatively effect the environment. During Key Lake's 10-year licence, there have been numerous environmental releases, with some occurring almost immediately after having the licence renewed (2013), others occurring during the site's state of care and maintenance (2018), and others occurring during the resumption of activities (2022).

The intervenors submit that a shorter licence term of 5-years would allow for more frequent reviews of environmental releases, while ensuring the public have the opportunity to meaningfully express concerns and feedback on the environmental protection measures being implemented at Key Lake.

There is a specific element within Key Lake's operations that has been a concern for the intervenors since the milling operations commenced at this site: the Deilmann Tailings Management Facility ("DTMF"). From 1989 to 1997, uranium orebodies were mined from the Deilmann open-mine pit. In 1994, Cameco submitted an environmental impact statement (EIS) to convert the Deilmann open-mine pit to an in-pit tailings management facility (the DTMF). The placement of tailings into the DTMF commenced in 1995.[66]

As previously stated, the DTMF stores waste from McArthur River. When McArthur River received approval for construction and development in 1997, the Joint Federal-Provincial Panel expressed concerns about the DTMF during its cautious approval of the project:

> Because it will eventually contain an enormous amount of waste that is both toxic and radioactive, this facility, if it is not managed carefully, could be very destructive to the northern environment. If seepage from the DTMF into the surrounding environment were to occur, extensive contamination of the now pristine northern rivers and lakes could develop….It is not likely that it will ever be possible to completely walk away from this pit once it has been filled with tailings.[67]

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[64] CNSC, CMD 23-H6 at 59.
[65] *Ibid*.
[66] Cameco, CMD 23-H6.1 at 5.
[67] McArthur River Uranium Mine Project: Report of the Joint Federal-Provincial Panel on Uranium Mining Developments in

To accommodate the tailings from McArthur River, the pit had an elevation of 466 metres above sea level (masl). However, in 2014, Cameco received approval to expand the volume of the DMTF, increasing the tailings elevation to 505 masl.[68] The intervenors submit that the increase in volume of the DMTF in 2014 has increased the risk of tailings leaching into the environment as the volume of the tailings exerts pressure on pit's barriers:

> The design changes in the Deilmann In-Pit Tailings Management Facility (DTMF) increase the risk that contaminants in the tailings could ultimately migrate into the water cover and then, via the sandy upper pit wall, into surrounding surface waters. There is increased potential for radiological contamination, as well as contamination from heavy metals such as arsenic and molybdenum.[69]

As the Joint Federal-Provincial Panel in 1997 had previously cautioned that the DTMF poses a significant threat of leaving behind a disastrous environmental legacy should seepage occur, the decision to expand the DTMF in 2014 is what the intervenors argue to be an act inconsistent with RegDoc-2.9.1, and the precautionary principle that is encompassed within the RegDoc's guiding principles for the CNSC.[70]

With the increased risk to the environment from the expansion of the DTMF, combined with the influx of release events at Key Lake over the course of its 10-year licence, the intervenors are concerned that there are no adequate monitoring measures in place to prevent leaching from the pit. The intervenors request additional information on what is being done by Cameco prevent leaching from the DTMF, and seek assurance that the pit is being adequately monitored not just by Cameco, but by the CNSC as well.

As with McArthur River, the intervenors are concerned about the type and frequency of the inspections occurring at Key Lake. **Table 2** below provides a list of the inspections that have occurred at Key Lake between 2018-2022, according to data provided in the Regulatory Oversight Reports for these years.[71]

Northern Saskatchewan, February 1997, online: https://publications.gc.ca/collections/collection_2017/acee-ceaa/En105-46-1-1997-eng.pdf at 28-29.

[68] Cameco, CMD 23-H6.1 at 11.

[69] Saskatchewan Environmental Society, *The Legacy of Uranium Mining in Saskatchewan: The Unacceptable Environmental Impacts of Uranium Mining* (March 2015), online: https://environmentalsociety.ca/wp-content/uploads/2015/08/The-Legacy-of-Uranium-Mining-in-Saskatchewan-FINAL.pdf at 14. [**Saskatchewan Environmental Society**]

[70] RegDoc-2.9.1 at s 2.1.

[71] *See* CNSC, Appendix B: List of Inspections in the *Regulatory Oversight Report for Uranium Mines and Mills* for 2018, 2019, 2020, and 2021.

Table 2: List of Inspections at Key Lake between 2018-2022

Year	Inspection Conducted
2018	• March 2018: Physical design, conventional health and safety, radiation protection • May 2018: Operating performance, safety analysis, conventional health and safety, radiation protection, human performance management, waste management, security • July 2018: Safety analysis, environmental protection, conventional health and safety, radiation protection • December 2018: Environmental protection, conventional health and safety, radiation protection
2019	• January 2019: Environmental protection, conventional health and safety, emergency management and fire protection • January 2019: Management system, Fitness for service, Environmental protection, Radiation protection, Conventional health and safety, Human performance management, Emergency management and fire protection, Waste management • April 2019: Fitness for service, Operating performance, Radiation protection, Human performance management, Emergency management and fire protection, Waste management • October 2019: Management system, Operating performance, Fitness for service, Radiation protection, Conventional health and safety, Environmental protection, Emergency management and fire protection, Waste management, Security, Packaging and transport
2020	• June 2020: management system, conventional health and safety (onsite) • November 2020: Fitness for service (remote) • December 2020: Safety analysis, environmental, protection, radiation protection, conventional health and safety, human performance management (remote) • December 2020: Management system; environmental protection; radiation protection; conventional health and safety; emergency management and fire protection (remote)
2021	• May 2021: General Management Systems, Physical Design, Human Performance Management, Security (remote) • September 2021: environmental protection (remote)
2022	• January 2022: General (remote)

The intervenors submit that environmental releases at Key Lake warrant more frequent inspections for all SCAs, and in the case of a milling site that accepts and processes waste from numerous sites, Key Lake should have more frequent inspections for radiation protection, packaging and transport, and waste management. Furthermore, Key Lake should be subjected to more on-site inspections, as there has not been an on-site inspection since 2020.

The intervenors request additional information on how the CNSC determines whether an inspection will be on-site or remote. The last on-site inspection at Key Lake focused on the management system, and conventional health and safety. The intervenors submit that inspections for SCAs like environmental protection and radiation protection should be conducted on-site rather than remote, especially for Key Lake where there have been numerous environmental releases over the last 5 years.

Taking the numerous environmental releases that have occurred at Key Lake, the intervenors request that the CNSC's inspections for physical design and fitness for service also capture the standards within the National Building Code of Canada to ensure that substandard materials are not being used in maintenance and repairs at Key Lake. To do so, the intervenors recommend that the CNSC enter into an arrangement with the National Research Council of Canada to help create a framework to shape the building standards for uranium mines and mills.[72]

Recommendation No. 16: With every additional environmental release increasing the cumulative effects that Key Lake is causing to the local environment, a shorter licence term of 5-years would allow for more frequent reviews of environmental releases, while ensuring the public have the opportunity to meaningfully express concerns and feedback on the environmental protection measures being implemented at Key Lake.

Recommendation No. 17: Additional information is requested about what is being done by Cameco prevent leaching from the DTMF at Key Lake.

Recommendation No. 18: Both Cameco and the CNSC need to provide assurance that the DTMF at Key Lake is being adequately monitored due to the increased risk of radiological and heavy metal contamination at this tailings facility.

Recommendation No. 19: More frequent on-site inspections of Key Lake, with more frequent inspections for all relevant SCAs are required to ensure the protection of human and environmental health. SCAs like radiation protection, packaging and transport, and waste management, for example, should be regularly inspected at Key Lake.

Recommendation No. 20: The intervenors request clarification on how the CNSC arranges its inspections of Key Lake, i.e., how much notice does Cameco receive prior to an inspection, or how does the CNSC decide when certain SCA inspections will take place. Additionally, the CNSC should explain how it determines whether an inspection will be on-site or remote.

Recommendation No. 21: The CNSC should enter into an arrangement with the National Research Council of Canada to help create a framework to shape the building standards for uranium mines and mills.

iii. Decommissioning Concerns

The intervenors submit a request for 20-year licences is incongruous with the current life of Key Lake and McArthur River considering that Cameco has indicated these two sites will likely wind

[72] *Note:* Section 21(1)(a) of the *NSCA* empowers the CNSC to enter into arrangements with any regulatory agency or department of a government or any international agency. The National Research Council is the body which released the *National Building Code of Canada, 2020*.

down their operations in 2044.[73] As a result, a closer review of Cameco's preliminary decommissioning plans for these two sites is necessitated.

In particular, Key Lake has been as a mine and mill site for almost 50 years (with orebody exploration occurring in 1975/1976 for the Gaertner and Deilmann deposits,[74] and there has been a substantial amount of radioactive waste and tailings produced and stored on-site. For example, the Key Lake DTMF, which was originally the Deilmann open-pit mine, began storing tailings after Cameco obtained approval in 1994. The intervenors are concerned about the radioactive legacy of the tailings from Key Lake upon the site's decommissioning, and whether the decommissioning plans are truly sufficient to protect the environment after Cameco is no longer responsible for monitoring Key Lake:

> At Key Lake the issue to consider is whether uranium mill tailings can be properly contained for thousands of years into the future. In our judgement, Cameco is taking significant risks. Instead of limiting tailings disposal to areas of its mined-out pit characterized by rock formations with low permeability, it plans to elevate tailings disposal into the sand outwash portion of its disposal pit. This increases the risk that radionuclides and heavy metal contaminants in the tailings will ultimately migrate into the larger environment.[75]

As previously discussed, there have been a number of troubling environmental releases at Key Lake since its 10-year licence was granted in 2013. The intervenors submit that with the nature of infrastructure at Key Lake's (namely the DTMF), decommissioning considerations and accompanying risks to human health and the environment must be considered more thoroughly within the context of this licence renewal hearing, per section 3 of the *Uranium Mines and Mills Regulations* which states:

> **3** An application for a licence in respect of a uranium mine or mill, other than a licence to abandon, shall contain the following information in addition to the information required by section 3 of the General Nuclear Safety and Control Regulations:
> […]
> **(C)** In relation to the plan and description of the mine or mill,
>
> **(viii)** the proposed plan for the decommissioning of the mine or mill;[76]

As section 3 is part of the application requirements for a licence to operate, it is clear that decommissioning planning is meant to be included in discussions, even when a mine/mill is still operational. The intervenors submit that the brief mention of decommissioning plans provided in

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[73] Cameco, CMD 23-H6.1 at 15.
[74] *Ibid* at 5.
[75] Saskatchewan Environmental Society at 1.
[76] Uranium Mines and Mills Regulations, SOR/2000-206 at s 3(a).

the CNSC staff's CMD for this licensing application is not sufficient in canvassing the effectiveness of the decommissioning plans for Key Lake.

The intervenors were denied access to the preliminary decommissioning plan for Key Lake (and McArthur River), and were limited to the very high level "Preliminary Decommissioning Plan and Cost Estimate" summaries available on Cameco's website.[77] These summaries do not provide any indication of a timeline for the estimated decommissioning phases for these sites. As further discussed within Dr. Markvart's expert report, robust decommissioning plans play a key role in sustainable development—a principle which falls within the CNSC's guiding principles for protection of the environment.[78]

With the estimated lifespan of Key Lake and McArthur River being approximate 21 years (until 2044), the intervenors submit that for the licencing renewal process, there should be a clear review of Cameco's proposed decommissioning strategies, and the public should have access to the proposed decommissioning plans to ensure that there are adequate measures in place to protect human health and the environment from substantial harm.

Within the CNSC's assessment CMD for this licensing hearing, a highlight of the 2020 Environmental Review Assessment for Key Lake became a cause for concern for the intervenors, with the CMD noting:

> The 2020 ERA identified that there is the potential that aquatic biota may be influenced from continued operation and long-term post-decommissioning loads at the KLO [Key Lake Operation]. Potential influences on the aquatic community are limited to the near-field exposure zone and the aquatic community further downstream in the Wheeler River drainage is expected to remain protected and not adversely influenced by KLO.[79]

The intervenors are concerned about these potential long-term environmental effects to aquatic biota within the "near field" exposure zone. Because the environment is not defined by arbitrary radii (like exposure zones), but is interconnected, the intervenors submit that long-term post-decommissioning loads to aquatic biota need to be adequately addressed in decommissioning plans—regardless of whether the aquatic biota are located inside or outside of the near-field exposure zone. The intervenors request more information be provided on how Cameco will address

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[77] Cameco, *Preliminary Decommissioning Plan and Cost Estimate-Public Summary*, online: https://www.cameconorth.com/uploads/downloads/relicensing_documents/McArthur_River_PDP_Summary.pdf [**McArthur River Decommissioning Summary**]; https://www.cameconorth.com/uploads/downloads/relicensing_documents/Key_Lake_PDP_Summary.pdf [**Key Lake Decommissioning Summary**]

[78] CNSC, RegDoc-2.9.1, at s 2.1.

[79] CNSC, CMD 23-H6 at 69.

the findings from the Key Lake 2020 ERA which identified that there is the potential that aquatic biota may be influenced from continued operation and long-term post-decommissioning loads.

In addition to the decommissioning plans themselves, the intervenors have concerns surrounding the financial guarantees for Key Lake and McArthur River, and whether these guarantees adequately reflect the costs for decommissioning these sites. In accordance with RegDoc-2.11.2, *Decommissioning*, the financial guarantees must be reviewed and updated every 5 years, or if there are material changes to the licensee's operational activities.[80] On October 11, 2019, the CNSC approved a proposed revision to the value of Cameco's financial guarantee for Key Lake from $218.3 million to $222.5 million, primarily to account for inflation.[81]

Additionally, on January 19, 2018, the CNSC approved a proposed revision to the value of Cameco's financial guarantee for McArthur River from $48.4 million down to $42.1 million, with the CNSC noting that "the reduction in the financial guarantee was due to changes to the annual discount rate; removal of costs for the creation and submission of an additional Environmental Impact Statement prior to the beginning of decommissioning; and cost refinement based on experience at other facilities."[82]

The intervenors are concerned by the reduction in the financial guarantee at McArthur River, and find the reasoning to be contrary to ensuring environmental protection. The Intervenors submit that "cost refinement based on experience at other facilities" should not entitle a licensee to be held less financially responsible for the decommissioning of a specific licenced facility. The "polluter pays" principle must be applied to a specific site's operations carefully, and generally should not result in a reduction in the financial guarantee amount (especially with the rate of inflation increasing the financial guarantee at Key Lake, but not McArthur River).

The intervenors further submit that given the legacy of uranium mining clean-up in Saskatchewan, there are concerns that the true cost of cleaning up Key Lake operation is underestimated. Should Cameco be granted a licence to operate Key Lake for another 20 years, the costs to remediate this aging site will continue to climb, and not just because of inflation.

The intervenors' concerns surrounding Key Lake's remediation costs spring from the true costs of remediating former uranium mine sites like that of the Gunnar and Beaverlodge sites. For example, for the Gunnar mine site, remediation costs were initially valued at $24.6 million, which was to be split equally between the Government of Canada and the Government of Saskatchewan. However, this initial cost estimate was far too low, resulting in the Government of Saskatchewan posting a $208.5 million liability on the provincial ledger to cover Gunnar's remediation and

[80] CNSC, CMD 23-H6 at 84-85.
[81] *Ibid* at 85.
[82] *Ibid,* at 84.

monitoring/maintenance costs. [83] As of 2018, the remediation cost estimate ballooned to $280 million.[84] Meanwhile, the Beaverlodge mine site, for which Cameco currently holds a waste facility operating licence for this site that is valid until May 31, 2023, was decommissioned in 1985 and has been in a monitoring and maintenance phase ever since.[85] The remediation work for Beaverlodge is being led by Cameco, and is being funded by the Government of Canada.[86] This remediation work is likely to cost more than $200 million, and this remediation work is limited, as it does not encompass remediating Beaverlodge Lake, Martin Lake or other downstream waterbodies.[87]

The intervenors express their concerns that the total decommissioning and remediation costs provided for Key Lake are insufficient, taking into consideration the age of the mine and mill operations, the environmental releases that have occurred during both operational states and care and maintenance states. If the decommissioning and remediation costs are inadequate, the issues are two-fold: first, the environment is inadequately cleaned up and protected, threatening the health and well-being of future generations; and the cost burden may shift to the public, relying on tax dollars to clean up radioactive waste, heavy metals, and other hazardous materials for an uncertain amount of time.

The intervenors submit there must be more transparency surrounding financial guarantees for decommissioning, and that during licencing hearings, a deeper review of these costs ought to occur, regardless of how recently a hearing to review a financial guarantee was conducted. The intervenors submit that the cost estimates for decommissioning and remediating Key Lake and McArthur River be reviewed in a transparent manner during the licence hearing to ensure that the costs to clean up this these are not grossly underestimated, as has been the case with other uranium mines in Saskatchewan. A discussion during the hearing surrounding the project schedule and the uncertainty analysis, as described within RegDoc-3.3.1, *Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities*, would particularly be beneficial for the public's understanding of how Cameco came to its financial guarantees.[88]

Recommendation No. 22: There should be a clear review of Cameco's proposed decommissioning strategies, and the public should have access to the proposed decommissioning plans to ensure that there are adequate measures in place to protect human health and the environment from substantial harm.

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[83] Adam Hunter, " Saskatchewan sues federal government over cost to clean up abandoned uranium mine" (November 28, 2018) CBC News, online: https://www.cbc.ca/news/canada/saskatchewan/sask-sue-federal-government-cost-abandoned-uranium-mine-1.4923849

[84] Saskatchewan Environmental Society at 6.

[85] CNSC, http://www.nuclearsafety.gc.ca/eng/waste/uranium-mines-and-millswaste/index.cfm#Closed

[86] Saskatchewan Environmental Society at 5.

[87] *Ibid*, at 10-11.

[88] CNCS, RegDoc-3.3.1, Financial Guarantees for Decommissioning of Nuclear Facilities and Termination of Licensed Activities, at ss 13.4 and 13.5.

Recommendation No. 23: Long-term post-decommissioning loads to aquatic biota need to be adequately addressed in decommissioning plans—regardless of whether the aquatic biota are located inside or outside of the near-field exposure zone. More information needs to be provided on how Cameco will address the findings from the Key Lake 2020 ERA which identified that there is the potential that aquatic biota may be influenced from continued operation and long-term post-decommissioning loads.

Recommendation No. 24: Reasoning like "cost refinement based on experience at other facilities" should not entitle a licensee to seek a reduction in their financial guarantee for the decommissioning of a specific licenced facility. The "polluter pays" principle must be applied to a specific site's operations carefully, and generally should not result in a reduction in the financial guarantee amount (especially with the rate of inflation increasing the financial guarantee at Key Lake, but not McArthur River).

Recommendation No. 25: There must be more transparency surrounding financial guarantees for decommissioning, and that during licencing hearings, a deeper review of these costs ought to occur, regardless of how recently a hearing to review a financial guarantee was conducted.

Recommendation No. 26: The cost estimate for decommissioning and remediating Key Lake and McArthur River must be reviewed in a transparent manner during the licence hearing to ensure that the costs to clean up these sites are not grossly underestimated, as has been the case with other uranium mines in Saskatchewan.

iv. Remediation Considerations

With the potential for Key Lake and McArthur River being granted 20-year term licenses, despite a projected lifespan of approximately 20-years for these two sites,[89] the intervenors submit that a review of the anticipated remediation measures for Key Lake and McArthur River is relevant for these licence renewals. With decommissioning likely occurring in the next two decades, the intervenors emphasize that the public should be well-informed on the proposed methods to clean up Key Lake and McArthur River in the long-term, as the effectiveness of Cameco's decommissioning and remediation efforts will have an impact on future generations in Saskatchewan.

With Key Lake being a hub of uranium activity since the mid-1970s, in addition to the substantial amount of tailings being stored at the site, the intervenors are concerned about the baseline studies relied upon for remediation. Given the age of Key Lake, there is no true baseline for the remediation of Key Lake to its pre-extraction, natural state. The intervenors are concerned that the

[89] Cameco, CMD 23-H6.1 at 15.

shifting baseline being relied upon for remediation plans will leave significant clean-up efforts for future generations, long after Cameco is no longer responsible for the site's care and maintenance.

In terms of the environmental monitoring for Key Lake, the public does not have access to information regarding a determined length of a transitional monitoring period following active decommissioning. The *Environmental Protection Review Report* noted that the preliminary decommissioning plan for Key Lake "describes a plan to reclaim of all structures and disturbed areas to pre-mining ecological and radiological conditions, as close as is reasonably achievable, and the land suitable for certain traditional land uses."[90] Additionally, the ERP Report notes that "Cameco intends for the decommissioned Key Lake Operation site to be transferred into the Province of Saskatchewan's Institutional Control Program once it has been confirmed that decommissioning objectives and criteria have been met and that the site is in a stable or improving condition."[91] Furthermore, Cameco "expects that the site will be suitable for certain traditional land uses following acceptance into the provincial Institutional Control Program."[92]

The intervenors are concerned about the adequacy of the reclamation planned for the Key Lake site, with the site being expected to be suitable for *certain* traditional land uses. The intervenors submit that in the spirit of sustainable development, the precautionary principle, and the "polluter pays" principle, the CNSC has an obligation to ensure the environment is adequately protected for present and future generations.[93] Due to the age of Key Lake, there were no baseline studies of the local environment and biota conducted prior to mining and milling operations. As a result, reclamation plans for Key Lake are based on studies of the landscape and waterscape since operations have occurred. The intervenors are concerned that the baseline studies being relied upon to shape reclamation plans are not robust enough to minimize the contamination footprint of Key Lake's operations over the course of several decades. Therefore, the intervenors submit that it is paramount to the licencing renewal process that there is careful consideration of the site's remediation and reclamation plans, and how a shifting baseline within the environmental studies of the Key Lake site are influencing the future plans of how the former mining and milling area of Key Lake will integrate into the surrounding environment.

The intervenors further submit that there must be an assessment of how long Cameco will maintain control of these decommissioned sites, as Cameco should be held accountable beyond a 20-mark of remediation activities, and certainly should be held accountable beyond a 10-year transitional monitoring period, as seen with Cameco's Rabbit Lake site.[94] The intervenors submit that the CNSC needs to hold Cameco accountable for the long term care of Key Lake and McArthur River,

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[90] CNSC, Key Lake EPR Report at 15.
[91] *Ibid*.
[92] *Ibid*.
[93] CNSC, RegDoc-2.9.1 at s 2.1.
[94] CNSC, Environmental Protection Review Report: Rabbit Lake Operation (January 2023) at 19.

which includes frequent, and transparent monitoring of the sites during remediation.[95] Taking into consideration that Key Lake has been operating since 1983 (initially as a mining site and subsequently a milling operation, following the discovery of uranium deposits in 1975), the intervenors recommend that Cameco should be held accountable for at least a 50-year period following decommissioning (with the potential to extend this duration contingent on the results of remediation activities during that period of time), as this would reduce possible financial burden on the Province of Saskatchewan and also enhance public trust in Cameco investing in robust environmental monitoring and maintenance measures.

Recommendation No. 27: It is paramount to the licencing renewal process that there is careful consideration of the remediation and reclamation plans for Key Lake, and how a shifting baseline within the environmental studies of this site are influencing the future plans of how this former mining and milling area will integrate into the surrounding environment.

Recommendation No. 28: There must be an assessment of how long Cameco will maintain control of the decommissioned sites, as Cameco should be held accountable beyond a 20-mark of remediation activities, and certainly should be held accountable beyond the 10-year transitional monitoring period. Taking into consideration that there have been various mining activities occurring at Key Lake since 1975, the intervenors recommend that Cameco should be held accountable for at least a 50-year period following decommissioning of both this site and McArthur River (with the potential to extend this duration contingent on the results of remediation activities during that period of time), as this would reduce possible financial burden on the Province of Saskatchewan and also enhance public trust in Cameco investing in robust environmental monitoring and maintenance measures.

v. Cumulative Effects of Uranium Mining

When considering the renewal of a licence to operate a mine or mill, the CNSC should be taking into consideration what possible cumulative effects may result from renewed licences. The intervenors submit that the CNSC should not just consider the licenced site, but any other projects in the region, and regional issues caused by climate change (e.g., fire risks and flooding). For instance, there are numerous uranium mining and milling operations in Northern Saskatchewan, with more proposed activities undergoing assessment, like NexGen's Rook I Project (a uranium mine), for example.[96] As more mining projects emerge across the local landscape, it is imperative

[95] In March 2022, Nuclear Waste Watch's Radioactive Waste Review Group released a policy statement in response to the draft policy issued by Natural Resources Canada on February 1, 2022, titled "An Alternative Policy for Canada on Radioactive Waste Management", online: https://cela.ca/wp-content/uploads/2023/03/Alternative-nuclear-waste-policy-for-Canada-NWW-Statement.pdf. The intervenors note that the proposed policies for waste producers and owners, and facility operators are helpful in guiding the consideration of key Lake and McArthur Rivers's remediation on page 7.

[96] Rook I Project: https://www.ceaa-acee.gc.ca/050/evaluations/proj/80171?culture=en-CA

that any new stressors on the air, aquatic, and terrestrial environments will not cumulative effect the outputs from a licenced operation's activities.

Cumulative effect assessments occur during environmental assessments and impact assessments prior to projects being approved,[97] but the intervenors suggest that this type of assessment has value beyond the approval process for a mine, and should be revisited throughout the entire life stage of a mine and/or mill. The intervenors submit that conducting a cumulative effects assessment during licence renewal hearings can ensure that there are no environmental effects occurring or that may occur in the future that would interact with the environmental outputs from Key Lake and McArthur River and result in undue harm to human health and the environment. The intervenors request that Cameco address the interconnectivity of current and proposed mines in the region.

Shorter licensing terms would enable more frequent reviews of cumulative effects for licenced projects, and would help ensure that a licensee continues to adequately provide for the protection of the environment as recent developments in the region may emerge.[98] This cumulative effects assessment during a licence renewal hearing may help a licensee determine areas to focus adaptation and maintenance efforts on in order to reduce radiological and other environmental releases from happening.

Recommendation No. 29: Cumulative effects analyses should be required for the licence renewal hearing for Key Lake and McArthur River to ensure that there are no environmental effects occurring or that may occur in the future that would interact with the environmental outputs from these sites and result in undue harm to human health and the environment.

Recommendation No. 30: Shorter licensing terms will enable more frequent reviews of potential cumulative effects that may be caused by these sites, or cumulative effects that may impact the safe operation of these sites.

C. Cameco's licence applications fail to consider the impact of new developments and market volatility

The intervenors submit Cameco's request for 20-year licences fails to account for the previous, current, and future states of operation at Key Lake and McArthur River. As detailed in this section, the intervenors submit shorter licences are more favourable to ensure that the licensing bases are responsive to site changes.

[97] CNSC, RegDoc-2.9.1 at Appendix A.3: Specific CEAA 2012 environmental assessment requirements.
[98] Which aligns with the CNSC's guiding principles for protection of the environment, per RegDoc-2.9.1.

As previously mentioned, Key Lake and McArthur River experienced a period of operational shutdown between 2018-2022. In a similar vein, another Cameco owned property seeking re-licensing—the Rabbit Lake uranium mine and mill operation—is not currently producing or processing uranium, and has not done so since 2016. The reasoning for entering a safe state of care and maintenance at Rabbit Lake is due to market conditions. This is not the first time Cameco has paused operations at Rabbit Lake due to "market conditions":

> Market conditions resulted in a temporary shutdown of the Rabbit Lake mill in June 1989. Mining of B-Zone continued during this period, with the remaining ore stockpiled until August 1991 when mill operations resumed. The D-Zone and A-Zone deposits were subsequently mined utilizing the same mining techniques applied at B-Zone, with mining completed in 1996 and 1997 respectively.
>
> Mining of the Eagle Point orebody started in 1993. In March 1999, market conditions resulted in the mine being placed into a safe state of care and maintenance. Milling was temporarily suspended in June 2001 when stockpiled ore was depleted. The mill resumed operation the next year when improved market conditions led to the restart of mining at Eagle Point. Mining at Eagle Point […] continued until 2016 when, once again, market conditions led Cameco to make the decision to place the mine and mill in a safe state of care and maintenance that continues to present day.[99]

Rabbit Lake's current status of safe state of care and maintenance is the longest shutdown period thus far, and the mine and mill has spent most of this 10-year licencing cycle not operating. Although Key Lake and McArthur River have not been subjected to the same degree of operational shutdown as Rabbit Lake, these operational shutdowns due to uranium market volatility indicate that there may be instability in the future with regard to Key Lake and McArthur River's operations.

The recently released annual Lazard Report on Costs of Energy reveals that renewable energy sources like wind and solar, are becoming increasingly cost effective compared to conventional sources of power, like coal, gas and nuclear.[100] This data reveals that the cost effectiveness of renewable energy sources over that of nuclear greatly reduces the optimism portrayed by Cameco for higher prices of uranium, and instead increases the volatility of the uranium market.

As renewable energy and low-carbon power sources becoming more reliable and more affordable, nuclear has failed to hit the mark on being an affordable source of energy, as seen in the United States where nuclear plants are over-budget, resulting in unprofitable reactors being taken

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[99] Cameco, Application for the renewal of uranium mine/mill licence for Rabbit Lake, Written Submission from Cameco Corporation, CMD 23-H7.1, at 5.

[100] *See generally* Lazard, "2023 Levelized Cost of Energy+" (April 2023), online: https://www.lazard.com/research-insights/2023-levelized-cost-of-energyplus/

offline.[101] With instability in the nuclear power generation market, the price of uranium is not as profitable. As seen in **Figure 1** below, during the period of Key Lake and McArthur River's shutdown (2018-2022) the price of uranium has not seen a drastic increase in price. Furthermore, **Figure 2** below shows how the price of uranium peaked in 2007, and has not returned to that degree of value at any other point in the last 15 years.

Figure 1: Price of Uranium from 2016-2023 (Cameco Corporation)[102]

[101] Brian Mann, "Unable to compete on price, nuclear power on the decline in the U.S." NPR (April 7, 2016), online: https://www.npr.org/2016/04/07/473379564/unable-to-compete-on-price-nuclear-power-on-the-decline-in-the-u-s

[102] Figure 1: Cameco Corporation, "Uranium Price", online: https://www.cameco.com/invest/markets/uranium-price

Figure 2: Price of Uranium from 1988-2023 (Cameco Corporation)[103]

Despite the market volatility for uranium, Cameco had initially sought licence renewals for Key Lake and McArthur River for indefinite periods of time. Cameco only revised their licence renewal applications for 20-year terms due to negative feedback from Indigenous communities and members of the public.[104] With no plans in place to resume mining and milling operations at Cameco's Rabbit Lake operation, the intervenors submit that granting long-term licences (and especially an indefinite term licence) for Cameco's uranium sites (including Key Lake and McArthur River) would be contrary to the objects of the CNSC, namely to "…prevent unreasonable risk, to the environment and to the health and safety of persons, associated with that development, production, possession or use."[105]

The intervenors submit that shorter-term licences (e.g., 5-year terms) would be beneficial for monitoring the instability of the uranium market that may impact how Key Lake and McArthur River may operate. Transitioning between regular operations and a state of care and maintenance will result in differing types of activities occurring at a site. For instance, just because a site is in a state of care and maintenance, it does not mean that environmental releases will not occur (as seen in the discussion in Part B). The intervenors recommend that the CNSC issue shorter licensing terms for uranium mine and mill operations like Key Lake and McArthur River in order to review

[103] Figure 2: Cameco Corporation, "Uranium Price", online: https://www.cameco.com/invest/markets/uranium-price *Note*: long-term prices prior to May 2004 are not industry-averages, but are from TradeTech only.
[104] CNSC, CMD 23-H6 at 12.
[105] *NSCA* at s 9(a)(i).

and respond to drastic changes in the operational practices due to issues like market volatility. This also ensures that the Indigenous Nations and communities, and members of the public are properly engaged in the process to determine that all forms of care and maintenance or returns to regular operations are satisfactory to ensure safe operations at both Key Lake and McArthur River.

Recommendation No. 31: The intervenors recommend that the CNSC issue shorter licensing terms for uranium mine and mill operations like Key Lake and McArthur River in order to review and respond to drastic changes in the operational practices due to issues like market volatility.

Recommendation No. 32: Shorter licensing terms (e.g., 5-year licensing terms) ensure that Indigenous Nations and communities, and members of the public are properly engaged in the process to determine that all forms of care and maintenance or returns to regular operations are satisfactory to ensure safe operations at both Key Lake and McArthur River.

D. Cameco's licence applications fail to expressly consider climate change

The intervenors also strongly oppose the request for 20-year licences when Cameco has failed to consider the likely impacts of climate change on the sites and their surroundings in their application, written studies, and associated studies. The intervenors submit climate considerations are a necessary component of the licence applications if the CNSC is to find, pursuant to section 24(4) of the *NSCA*, that the licensee will make adequate protection for human health and the environment.

First, the intervenors submit that it is critical to consider climate vulnerability in the CNSC's review. Potential climate impacts are directly within the purview of the CNSC because of its responsibility to protect people and the environment from unintended radioactive releases. As climate impacts become more frequent and pronounced, the intervenors urge the CNSC to review the licence renewal application with express consideration given to climate impacts and climate resiliency.

Second, mining operations and associated facilities are particularly vulnerable to climate change effects, with infrastructure being vulnerable to changes in extreme weather events causing flooding, droughts, erosion, and flash temperature changes. Mining infrastructure, transportation infrastructure, waste management, and even mine closure are all susceptible to intensity and frequency of extreme weather events caused by climate change.[106] With climate change creating conditions for more frequent and intense wildfires, Cameco's various mining and milling sites in Saskatchewan are being increasingly exposed to wildfire threats.[107]

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[106] Ontario Centre for Climate Impacts and Adaptation Resources, "Mining: in a changing climate" (2010), online: https://climateontario.ca/doc/factsheets/Mining%20Factsheet%20--%20Final.pdf

[107] *See* Cameco, Event Reporting, which indicates forest fires and wildfires having impacts on mining operations in 2015, 2018 and 2021.

Cameco does not mention how Key Lake and McArthur River will adapt to the impacts of climate change, and how climate resiliency is being implemented for present-day operations at these sites. Being prepared to adapt to climate change's impacts within the region is crucial for water source protection efforts, which ensure both humans and environmental components are protected from hazardous releases into the environment that may arise from extreme flooding events, for example.[108]

Third, to meet the requirements under section 24 (4) of the *NSCA*, it is critical that detailed climate analysis be presented within the licence application and considered at the hearing. Currently, Cameco's analysis of environmental impacts only reflect present-day circumstances at Key Lake and McArthur River. Given that climate impacts are becoming more frequent and pronounced, these documents are outdated and insufficient to support CNSC staff's conclusion that Cameco will make adequate provisions for the protection of the environment and human health for the duration of the 20- year licences.

The intervenors further submit that climate change considerations are directly relevant to the CNSC's determination about whether the licensee will make adequate provision for the protection of the environment and the health and safety of persons. As such, detailed climate analysis and site-specific modelling is necessary so that the public can fully understand the potential impacts, review the information, and provide comments to the CNSC.

Fourth, the only consideration of climate change which Cameco alludes to within its licensing applications is within the discussion of its business plan suggesting the uranium from Key Lake and McArthur River playing a role in Canada's transition to a low carbon economy and being a "sustainable source or highly strategic critical minerals for our partners and allies."[109]

The intervenors take issue with Cameco centring its business model as being a solution to climate change while operations like Key Lake and McArthur River contribute to the exacerbation of climate change to be misleading to the public. For example, Cameco notes:

> Cameco's vision – "Energizing a clean-air world" – recognizes that we have an important role to play in enabling the vast reductions in global greenhouse gas emissions required to achieve a resilient net-zero carbon economy. We are invested across the nuclear fuel cycle.

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[108] *See:* Expert Report on Source Water Protection by Dr. Robert Patrick for CELA's Submission to the CNSC on the Draft EIS for NexGen Energy Ltd.'s Proposed Rook I Project (October 12, 2022), online: https://cela.ca/wp-content/uploads/2022/10/1499-CELA-Submission-for-Rook-I-Project-Draft-EIS.pdf

[109] Cameco, CMD 23-H6.1 at 15.

> Our uranium and fuel services products are used around the world in the generation of safe, carbon-free, affordable, base-load nuclear energy.[110]

Pursuant to section 9(b) of the *NSCA*, one of the objectives of the CNSC is to "disseminate objective scientific, technical and regulatory information to the public concerning the activities of the Commission and the effects, on the environment and on the health and safety of persons, of the development, production, possession and use referred to in paragraph (a)."[111] Furthermore, RegDoc-3.2.1, *Public Information and Disclosure*, stipulates that "the primary goal of the public information program, as it relates to the licensed activities, is to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the lifecycle of nuclear facilities are effectively communicated to the public."[112]

The information being disseminated to the public, especially regarding environmental concerns like climate change (and climate change mitigation), should be objective, truthful, and accurate. This obligation for accurate and transparent information sharing with the public extends to both the Commission and to licensees.

By framing the nuclear industry as "carbon-free" and as being central to establishing "a resilient net-zero carbon economy", the licensee is suggesting to the public and to stakeholders living in close proximity to sites like Key Lake and McArthur River that there are no carbon emissions from uranium mining and milling practices, which is false.

In Europe, there is recognition by certain states that labelling nuclear power as an "environmentally sustainable economic activity" to be problematic and an act of greenwashing the nuclear power sector's full life cycle, which includes mining. Austria, several NGOs and a member of European parliament are challenging the decision to label nuclear power as a sustainable activity as a *Complementary Climate Delegated Act* (a non-legislative supplement to EU taxonomy). [113]

Typically, the "clean" narrative of nuclear refers to point of generating energy, and not the activities like mining uranium ore:

> Nuclear energy's "upstream" activities that are necessary for operation, such as mining uranium, as well as transporting fuel, building and then decommissioning a power plant, and managing the radioactive waste that is a by-product of the process – are all linked to

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[110] *Ibid*.
[111] *NSCA* at s 9(b).
[112] CNSC, RegDoc-3.2.1, Public Information and Disclosure, at s 2.1
[113] Christiana Mauro & Kacper Szulecki, "World's most promising anti-greenwashing tool scuttled" Aljazeera (March 8, 2023), online: https://www.aljazeera.com/opinions/2023/3/8/how-the-eus-most-promising-anti-greenwashing-tool-was-scuttled

> CO_2 emissions. Thus, the carbon footprint of nuclear energy generation is considerable, and according to some estimates, considerably higher than that of renewables.[114]

The intervenors submit that Cameco has an obligation to be transparent with the public regarding the carbon-emissions tied to mining and milling operations, and that these two sites are not immune to contributing to the climate crisis. The intervenors note that under the *Canadian Environmental Protection Act, 1999*, Cameco is required to monitor greenhouse gas emissions (GHGe) at both sites and report to Environment and Climate Change Canada ("ECCC"). In 2017, the reporting threshold was lowered from 50,000 tonnes of CO2 equivalent to 10,000 tonnes of CO2 equivalent. This means that both Key Lake and McArthur River were within this threshold in 2017, 2018, 2019, 2020, and 2021.[115] With both sites annually contributing to GHGe, there needs to be transparency with the public that the mining and milling operations at Key Lake and McArthur River are not zero-carbon activities. The intervenors submit that transparency about climate change and uranium mining—both in terms of the impact of mining on climate change, and the impact of climate change on mining operations—ought to be considered when assessing the licence applications for both sites.

Recommendation No. 33: The CNSC should review the licence renewal applications with express consideration given to climate impacts and climate resiliency, including in the context of site suitability and impacts on safety and the environment.

Recommendation No. 34: The criteria by which climate change impacts and natural external events have been assessed and evaluated against the 20-year licence applications must be clearly set out.

Recommendation No. 35: Detailed climate analysis must be presented in a public forum as part of the CNSC's licensing process.

VII. ORDER REQUESTED

For the foregoing reasons provided in this intervention, CELA seeks an order:

1. Granting CELA, on behalf of Inter-Church Uranium Committee Educational Co-Operative, the Coalition for a Clean Green Saskatchewan, and the Committee for Future Generations the status of intervenor;
2. Granting CELA the opportunity to make an oral presentation at the June 2023 hearing;
3. Denying Cameco's request for 20-year licences on the basis that:

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[114] *Ibid*.

[115] Key Lake EPR Report at 21; McArthur River EPR Report at 19; and Greenhouse Gas Reporting Program webpage: https://climate-change.canada.ca/facility-emissions.

a. A 5-year licence term for each site would be better suited for aligning the licensing cycle with the review cycles for updating the environmental risk assessments, the preliminary decommissioning plans and financial guarantees for Key Lake and McArthur River, while also enhancing public engagement with the Key Lake and McArthur River operations;

b. The 20-year licences would remove the right for a public hearing for two decades, compromise meaningful public participation in nuclear matters and erode public confidence in both the Commission and the licensee;

c. Climate change, which will result in increasingly dire weather events, has not been expressly considered in the licence applications nor impacts modelled; and

d. The risk for environmental contamination increases with every year that the Key Lake and McArthur River operations continue to operate;

4. Denying CNSC staff's recommendation for 20-year licences; and
5. Directing Cameco to revise its licence renewal applications, considering all of the deficiencies and recommendations herein.

Sincerely,

CANADIAN ENVIRONMENTAL LAW ASSOCIATION
on behalf of
INTER-CHURCH URANIUM COMMITTEE EDUCATIONAL CO-OPERATIVE
COALITION FOR A CLEAN GREEN SASKATCHEWAN
COMMITTEE FOR FUTURE GENERATIONS

Sara Libman
Legal Counsel, CELA

SUMMARY OF RECOMMENDATIONS

Recommendation No. 1: The CNSC should ensure that relevant documents and information are publicly available in accessible formats.

Recommendation No. 2: Documents relied upon in Cameco's and CNSC staff's CMDs ought to be publicly available by default and not available upon request only.

Recommendation No. 3: References contained in CNSC staff's and Cameco's CMDs ought to be publicly available to that subject matter experts can provide peer review of the documents. This is necessary for the CNSC to uphold its obligations to disseminate "objective" information.

Recommendation No. 4: The right to cross-examination must be adopted as part of the hearing process so that members of the public have the ability to pose questions regarding, for instance, a study's methods, scope and findings.

Recommendation No. 5: Licence renewals should be subject to shorter licensing terms as it provides the opportunity for public hearings under section 40(1) of the *NSCA*, and enhances the openness and transparency of the CNSC, and its oversight of nuclear uses and technologies. These opportunities are critical to building the public's trust in the regulator and would be lost if there is only one chance every 20 years for the public to participate in a hearing and engage in dialogue with the CNSC and the licensee about their concerns.

Recommendation No. 6: Regulatory Oversight Reports, mid-term performance updates and meetings are not sufficient alternatives to licensing hearings given their limited scope and exclusion of oral intervention opportunities. They should not be relied upon to remedy outstanding issues resulting from licensing hearings, nor used as a stand-in for public hearings.

Recommendation No. 7: The CNSC should disregard CNSC staff's recommendation for 20-year licensing terms. The licensing terms for Key Lake and McArthur River should not exceed 5-years, as this would not only align with the review cycles for updating the environmental risk assessments, the preliminary decommissioning plans and financial guarantees for these sites, but would also enhance public engagement with both operations.

Recommendation No. 8: Regardless the length of the licences provided to Cameco, the intervenors further recommend there be a comprehensive performance update for Key Lake and McArthur River subject to public hearings and review every three years, which would greatly enhance transparency and accountability with the public.

Recommendation No. 9: Without a more thorough review of legislation and licensing procedures in other jurisdictions, international precedence and benchmarking do not justify longer term licences in Canada.

Recommendation No. 10: Shorter licencing terms, with a careful review of environmental release incidents will ensure that the precautionary principle is being applied to Key Lake and McArthur River's activities. The precautionary principle must be applied to any proposed changes in the operational activities at Key Lake and McArthur River—whether that change be transitioning back to a state of care and maintenance, or to increase the annual production/processing limits.

Recommendation No. 11: The licensee should be required to keep a publicly accessible record of *all* environmental incidents and events that have occurred at a licenced site. In doing so, there is a clear record of trends on the types of releases and events occurring at sites like McArthur River and Key Lake, and how these events are being corrected and monitored.

Recommendation No. 12: Cameco should provide information on whether the 2021 meltwater overflow event at McArthur River was reasonably foreseeable and preventable, and whether there are other elements of equipment or infrastructure that are susceptible to rapidly changing temperatures causing spills or leaks.

Recommendation No. 13: Cameco should provide information on how it plans to adapt the McArthur River site (and the Key Lake site) to endure the increasingly frequent weather events and drastic temperature changes that are being caused by climate change. Without adequate climate adaptation measures, spills like the 2021 McArthur River event will only become more frequent during McArthur River's operations.

Recommendation No. 14: More frequent on-site inspections of McArthur River, with more frequent inspections for all relevant SCAs are required to ensure the protection of human and environmental health. SCAs like physical design and waste management, for example, should be regularly inspected at mining sites like McArthur River.

Recommendation No. 15: The intervenors request clarification on how the CNSC arranges its inspections of McArthur River, i.e., how much notice does Cameco receive prior to an inspection, or how does the CNSC decide when certain SCA inspections will take place.

Recommendation No. 16: With every additional environmental release increasing the cumulative effects that Key Lake is causing to the local environment, a shorter licence term of 5-years would allow for more frequent reviews of environmental releases, while ensuring the public have the opportunity to meaningfully express concerns and feedback on the environmental protection measures being implemented at Key Lake.

Recommendation No. 17: Additional information is requested about what is being done by Cameco prevent leaching from the DTMF at Key Lake.

Recommendation No. 18: Both Cameco and the CNSC need to provide assurance that the DTMF at Key Lake is being adequately monitored due to the increased risk of radiological and heavy metal contamination at this tailings facility.

Recommendation No. 19: More frequent on-site inspections of Key Lake, with more frequent inspections for all relevant SCAs are required to ensure the protection of human and environmental health. SCAs like radiation protection, packaging and transport, and waste management, for example, should be regularly inspected at Key Lake.

Recommendation No. 20: The intervenors request clarification on how the CNSC arranges its inspections of Key Lake, i.e., how much notice does Cameco receive prior to an inspection, or how does the CNSC decide when certain SCA inspections will take place. Additionally, the CNSC should explain how it determines whether an inspection will be on-site or remote.

Recommendation No. 21: The CNSC should enter into an arrangement with the National Research Council of Canada to help create a framework to shape the building standards for uranium mines and mills.

Recommendation No. 22: There should be a clear review of Cameco's proposed decommissioning strategies, and the public should have access to the proposed decommissioning plans to ensure that there are adequate measures in place to protect human health and the environment from substantial harm.

Recommendation No. 23: Long-term post-decommissioning loads to aquatic biota need to be adequately addressed in decommissioning plans—regardless of whether the aquatic biota are located inside or outside of the near-field exposure zone. More information needs to be provided on how Cameco will address the findings from the Key Lake 2020 ERA which identified that there is the potential that aquatic biota may be influenced from continued operation and long-term post-decommissioning loads.

Recommendation No. 24: Reasoning like "cost refinement based on experience at other facilities" should not entitle a licensee to seek a reduction in their financial guarantee for the decommissioning of a specific licenced facility. The "polluter pays" principle must be applied to a specific site's operations carefully, and generally should not result in a reduction in the financial guarantee amount (especially with the rate of inflation increasing the financial guarantee at Key Lake, but not McArthur River).

Recommendation No. 25: There must be more transparency surrounding financial guarantees for decommissioning, and that during licencing hearings, a deeper review of these costs ought to occur, regardless of how recently a hearing to review a financial guarantee was conducted.

Recommendation No. 26: The cost estimates for decommissioning and remediating Key Lake and McArthur River must be reviewed in a transparent manner during the licence hearing to ensure that the costs to clean up these sites are not grossly underestimated, as has been the case with other uranium mines in Saskatchewan.

Recommendation No. 27: It is paramount to the licencing renewal process that there is careful consideration of the remediation and reclamation plans for Key Lake, and how a shifting baseline within the environmental studies of this site are influencing the future plans of how this former mining and milling area will integrate into the surrounding environment.

Recommendation No. 28: There must be an assessment of how long Cameco will maintain control of the decommissioned sites, as Cameco should be held accountable beyond a 20-mark of remediation activities, and certainly should be held accountable beyond the 10-year transitional monitoring period. Taking into consideration that there have been various mining activities occurring at Key Lake since 1975, the intervenors recommend that Cameco should be held accountable for at least a 50-year period following decommissioning of both this site and McArthur River (with the potential to extend this duration contingent on the results of remediation activities during that period of time), as this would reduce possible financial burden on the Province of Saskatchewan and also enhance public trust in Cameco investing in robust environmental monitoring and maintenance measures.

Recommendation No. 29: Cumulative effects analyses should be required for the licence renewal hearing for Key Lake and McArthur River to ensure that there are no environmental effects occurring or that may occur in the future that would interact with the environmental outputs from these sites and result in undue harm to human health and the environment.

Recommendation No. 30: Shorter licensing terms will enable more frequent reviews of potential cumulative effects that may be caused by these sites, or cumulative effects that may impact the safe operation of these sites.

Recommendation No. 31: The intervenors recommend that the CNSC issue shorter licensing terms for uranium mine and mill operations like Key Lake and McArthur River in order to review and respond to drastic changes in the operational practices due to issues like market volatility.

Recommendation No. 32: Shorter licensing terms (e.g., 5-year licensing terms) ensure that Indigenous Nations and communities, and members of the public are properly engaged in the

process to determine that all forms of care and maintenance or returns to regular operations are satisfactory to ensure safe operations at both Key Lake and McArthur River.

Recommendation No. 33: The CNSC should review the licence renewal applications with express consideration given to climate impacts and climate resiliency, including in the context of site suitability and impacts on safety and the environment.

Recommendation No. 34: The criteria by which climate change impacts and natural external events have been assessed and evaluated against the 20-year licence applications must be clearly set out.

Recommendation No. 35: Detailed climate analysis must be presented in a public forum as part of the CNSC's licensing process.

EXPERT REPORT: Critical Deficiencies in Cameco Corporation's Application for the Renewal of Uranium Mine/Mill Licences for the McArthur River Operation and Key Lake Operation

Written by Tanya Markvart

for the Canadian Environmental Law Association April 2023

1. Introduction

This report discusses critical deficiencies in Cameco Corporation's application for the renewal of its licences to mine and mill uranium at its McArthur River and Key Lake operations, respectively. These critical deficiencies were identified through an analysis of associated CNSC Environmental Protection Review Reports (EPR) as well as studies/reports submitted by Cameco to the Canadian Nuclear Safety Commission (CNSC).

The following legislation, regulations, and best practices provide a framework for the examination:

- The Nuclear Safety and Control Act (S.C. 1997, c. 9);
- Canadian Nuclear Safety Commission REGDOC-2.9.1;
- Canadian Nuclear Safety Commission REGDOC-3.2.1; and
- Best practices in sustainability-based planning and decision making.

Section 2 summarizes best practices in sustainability-based decision making, including:

- Justification of an undertaking,
- Generic sustainability decision-making criteria, including precaution and adaptation,
- Specification of sustainability decision criteria for the case and context, and
- Application in planning and analysis.

Section 3 provides the findings of our analysis with respect to the following:

- Justification of the proposed 20-year licence,
- Consideration of sustainability, precaution, and adaptation, and
- Consideration of rolling stewardship.

Finally, Section 4 provides recommendations for the CNSC panel to consider in its final decision on Cameco's licence renewal application.

2. Sustainability-Based Decision Making

Section 2 of CNSC REGDOC-2.9.1 provides guiding principles for the protection of the environment. These principles form a framework for analysis and decision making in the CNSC's environmental review process under the NSCA. Before a licence can be granted or renewed, the CNSC must be satisfied that an applicant will make adequate provisions for the protection of the environment and the health and safety of the public.

Our review of Cameco's application rests, in part, on the CNSC's guiding principles of sustainable development, precaution, and adaptive management. It is important to note that REGDOC-2.9.1 is insufficiently helpful on the key matter of what these concepts should mean and how they should be applied in analysis to achieve lasting gains in sustainability. Three key expansions and revisions are needed to clarify the obligations of the licensee and guide CNSC staff in their evaluations and decisions:

- An obligation to justify the proposed undertaking;
- Elaboration of the main generic concerns that define sustainability, and the implications of these generic concerns for analysis; and
- Requirements for specifying generic sustainability concerns to recognize the context for each project for which an application is prepared.

Some clarification of the implications of incorporating sustainability, precaution and adaptation in analysis has been provided in previous panel review processes under the previous Canadian Environmental Assessment Act. Of particular importance have been the following documents:

- Voisey's Bay Mine and Mill Environmental Assessment Panel, "Environmental Impact Statement Guidelines for the Review of the Voisey's Bay Mine and Mill Undertaking" (20 June 1997), and *Environmental Assessment Panel Report on the Proposed Voisey's Bay Mine and Mill Project* (March 1999);
- Mackenzie Gas Project Joint Review Panel, "Joint Review Panel Determination on Sufficiency," (18 July 2005), and the panel's final report, "Mackenzie Gas Joint Review Panel, *Foundations for a Sustainable Northern Future: Report of the Joint Review Panel for the Mackenzie Gas Project,* CEAA 2009";
- Kemess North Copper-Gold Mine Project Joint Review Panel, *Joint Review Panel Report* (September 17, 2007), especially pages 233-241 on the panel's sustainability framework and its application; and
- White's Point Quarry and Marine Terminal Project Joint Review Panel, "Environmental Impact Statement Guidelines" (March 2005) and *Joint Review Panel Report* (October 2007).

Gibson (2005, Gibson 2006, 2017) and other experts in the field of sustainability-based EA provide further elaboration, including on specification of sustainability criteria for the case and context in particular applications (see also Pope et al., 2004; Morrison-Saunders & Pope, 2013; Dalal-Clayton and Sadler, 2014). In addition, Markvart (2014, 2015), Gaudreau et al., (2013), Gibson and Markvart (2008), and Gibson et al., (2008) illustrate how the concept of sustainable development should be incorporated in assessments of energy projects.

2.1 Justification

At the outset of planning and analysis, a clear explanation of the purpose of an undertaking, and a transparent demonstration of the need for an undertaking, are required to establish part of the basis for determining the most appropriate option from a range of options with respect to net contributions to sustainability for all aspects of a project over its lifetime. Appropriate, early consideration of purpose and need provides part of the framework for the public and responsible authorities to evaluate the extent to which a proponent's proposed undertaking is justified.

When CNSC responsible authorities consider the purpose of and need for the renewal of Cameco's licences, it will be important to devote attention to current and anticipated needs, including long term sustainability implications, within the project area as well as at regional, national, and global scales. The public must be confident that Cameco's application is appropriately justified and provides a sound basis for choosing through comparative analysis the best option for delivery of lasting wellbeing.

2.2 Generic Sustainability Criteria

The generic requirements of sustainability have been defined in many ways. For the purposes of analysis, Gibson's (2005, 2006, 2017) generic sustainability assessment criteria are used. Gibson's criteria are based on a synthesis of insights from the sustainability literature and applied sustainability experiences (see Appendix A). Briefly, Gibson's generic sustainability criteria devote attention to:

- the capacity of natural systems to maintain their structure and functions and to support biological diversity and productivity;
- the capacity of social and economic systems to deliver opportunities and livelihood sufficiency;
- the capacity of human environments, including local and regional institutions, to respond to and manage externally induced change;
- the attainment and distribution of lasting and equitable social and economic benefits and openings to participate meaningfully in decision making;
- respect for uncertainty, planning for learning, designing for surprise, and managing for adaptation;

- the rights of future generations to the sustainable use of renewable resources; and
- the protection and conservation of wildlife and the environment for present and future generations.

Gibson's sustainability criteria elucidate what the concept of sustainability means. They constitute a package in that it is necessary to fulfill all criteria in decision making for progress towards sustainability. The aim of sustainability-based decision making is to integrate and pursue the criteria jointly, aiming for multiple, mutually reinforcing gains.

2.3 Specification of Generic Sustainability Evaluation Criteria

It is necessary to specify the generic sustainability evaluation criteria to recognize the particular concerns raised by context-specific factors. This specification step ensures proper sensitivity to the factors that may affect how the generic requirements for sustainability can be pursued over the long term. These factors may include community and/or organizational conditions and trends, resources, capacities and other assets, opportunities and barriers, stresses, and vulnerabilities. All of these vary among different cultures, ecosystems, jurisdictions and sectors, etc.

Table 1 below provides an example of how Gibson's generic sustainability criteria would be specified for the context of Cameco's licence renewal application. Note that the table is not comprehensive of all concerns that should be considered in analyses.

Table 1. Specified Sustainability Criteria for Cameco's Licence Renewal Application

Sustainability Criteria	Cameco Application-Specific Sustainability Concerns
Socio-Ecological System Integrity **Resource Maintenance and Efficiency**	• Long term, cumulative impacts from radioactive and toxic pollutants (air, water, soil, vegetation, animals): The impacts of uranium mining have been so severe, that many jurisdictions around the world have adopted bans on the establishment of new uranium mines (see Pembina Institute, 2007). • Uranium tailings management facilities have been associated with severe pollution of surface and ground water from radionuclides (principally uranium), heavy metals and conventional pollutants. In addition, dust from tailings facilities contains radionuclides, heavy metals and particulate matter. Uranium mining operations can also be significant sources of radon gas (Pembina Institute, 2007). • Insufficiently low standards for cancer risk arising from radiological hazards, with greatest risks to women and young children. • Occupational health and safety risks associated with plant operations: Major failures of tailings management facilities have occurred in Canada (Rabbit Lake, Key Lake and Elliot Lake) and around the world (the United States, Australia, Germany, Hungary, Bulgaria, Kyrgyzstan, Kazakhstan) (Pembina Institute, 2007) • Community-scale exposure to routine and accidental releases of toxic and radiological contaminants.

Livelihood Sufficiency and Opportunity **Intragenerational Equity** **Intergenerational Equity**	• Costs of health and environmental impacts of operations for individuals, families, and communities • Operational performance and maintenance costs • Costs of decommissioning, decontamination, and restoration of uranium mines • Costs of long-term monitoring and remediation of contaminated sites • Costs to public of accidents, malfunctions, malevolent acts • Boom and bust effects of uranium mining/milling and associated undertakings (loss of jobs and livelihoods over the course of different phases of nuclear energy generation)
Socio-Ecological Civility and Democratic Governance	• Capacity for long-term environmental management and monitoring. • Decommissioned mines must be managed essentially forever to prevent the release of contaminants from tailings and waste rock to the surrounding ecosystem and community. • Capacity for long-term "rolling stewardship": the institutional capacity to manage, safely store, and pass along vital information to future generations. • Capacity to deal with accidents and malfunctions over the long term. • Capacity for emergency planning and response over the long term. • Capacity to implement open, inclusive, transparent public decision-making processes over the long term. • Capacity to provide easily accessible, relevant information to the public over the long term. • Capacity to educate public on emergency planning over the long term.
Precaution and Adaptation	• Need for comprehensive, long-term emergency planning (e.g., forest fires). • Need for long-term precautionary management of facilities. • Need for adaptive management in response to surprises, new learning, changing circumstances, new technologies, public opinion, etc.

Once the generic sustainability requirements have been recognized and the context-specific concerns have been identified, the next step is to consolidate them into one comprehensive set of criteria for application in planning and analysis.

2.4 Application in Planning and Analysis

The sustainability objective and specified criteria should inform all steps in the planning process, including but not limited to the following:

- how interested stakeholders should be engaged in the planning process, including how different perspectives should be accommodated;
- what operational options and components (methods, technologies, monitoring programs, etc.) should be examined, and how alternative system options should be elaborated and subjected to comparative evaluation;
- what possible effects (direct, indirect, cumulative effects) deserve detailed attention;
- which effects are likely to be most significant, given sustainability objectives;

- what important opportunities or perils need attention;
- how anticipated positive effects could be enhanced and how adverse effects and risks could be mitigated;
- the strengths and limitations of each system component, including interconnections;

what specifics are needed in the plan, and/or what arrangements are needed for subsidiary and subsequent deliberations and decisions to ensure proper consideration of purposes, alternatives, effects, mitigation and enhancement options, trade-offs, etc. in light of the sustainability objective and criteria;

- whether and under what terms and conditions the proposed plan should be approved;
- what monitoring and adaptive response requirements are imposed; and
- what preparations by various parties are necessary and desirable to ensure that negative effects are avoided or mitigated, that unanticipated effects are identified and addressed quickly, that subsidiary planning and project development proceeds appropriately, that the plan is reviewed and revised regularly, that maximum mutually reinforcing gains are achieved and that significant adverse effects are avoided.

With respect to Cameco's application documentation and the CNSC staff's Environmental Protection Review Reports, the CNSC should consider whether a comprehensive sustainability framework was applied throughout the five basic stages of sustainability-based decision making:

- establishment and delineation of the public interest purpose of and need for an undertaking;
- comparative evaluation of the options for meeting the need and purpose (the "alternatives to"), leading to selection of the preferred alternative as the proposed undertaking;
- the design of the preferred alternative, including a comparative evaluation of alternative means;
- plans for all monitoring, and decommissioning; and
- plans to respond to new and unexpected outcomes and understanding.

The CNSC must be convinced that Cameco's application demonstrates that the preferred options pose the least likelihood and potential severity of risk while providing the greatest capacity to adapt to new information and conditions, and monitoring and response programs aim to address unanticipated events and new information and conditions.

2.5 Precaution and Adaptation

The concept of precaution, or the precautionary principle, has been defined in many ways, and it is beyond the scope of this report to provide a comprehensive review. For the purposes of analysis, CELA's understanding of the precautionary principle and how it should be applied in decision making is adopted.

Applying precaution in planning, analysis, and decision making requires a proactive versus a reactive approach in that the precautionary principle should be invoked when there are reasonable grounds for concern so that measures can be truly precautionary. CELA supports the following core elements of the precautionary principle (see CELA, 2002):

- A recognition of scientific uncertainty and fallibility;
- Favour of erring on the side of wrongly assuming risk versus wrongly assuming safety;
- Burden of proof rests on the proponent to establish that evidence does not support the potential for serious risk;
- Upholding the basic right of each individual (and future generations) to a healthy, life-sustaining environment as called for in the United Nations Declaration on Human Rights;
- Action on early warnings, when there is credible evidence that harm is occurring or likely to occur, even if the exact nature and magnitude of the harm are not fully understood;
- Identification, evaluation and implementation of the safest feasible approaches to meeting social needs;
- Placing responsibility on originators of potentially dangerous activities to thoroughly study and minimize risks, and to evaluate and choose the safest alternatives to meet a particular need, with independent review;
- Application of transparent and inclusive decision-making processes that increase the participation of all stakeholders and communities, particularly those potentially affected by a policy choice;

One overarching concept central to a precautionary approach is ‘adaptive management capacity’, which has been widely adopted in natural resource management sectors as an iterative approach to management in the face of

- scientific uncertainty and human error;
- technological innovations and/or advances in scientific understanding;
- new technical or scientific information regarding the design and operation of a project;
- changes in social and political opinion;
- changes in policy and regulatory frameworks, including safety standards; and
- unforeseen events (including natural disasters, malfunctions, accidents and malevolent acts) (see Walker & Salt, 2006).

Associated design concepts that may increase the level of adaptive management capacity in uranium mining and milling facilities include reversibility, retrievability, diversity and redundancy.

Reversibility is the possibility of reversing one or a series of decisions taken during the lifetime of a project. Reversal is the actual action of changing a previous decision. The associated implication for design includes making provisions for reversal should it be required. Retrievability denotes the

action of recovery of toxic wastes, which enhances the reversibility of decisions by providing an additional degree of flexibility.

Diversity and redundancy are major sources of adaptive management capacity (see Walker & Salt, 2006). The diversity requirement seeks to ensure that decision makers evaluate and compare a range of different alternatives that could achieve the same objective. If the preferred option fails there should be sufficient knowledge about other options to make adaptation feasible. The concept of redundancy is central to enhancing the safety and reliability of complex technologies. An element of a system is redundant if there are backups to do its work if it fails.

The public and the CNSC must be satisfied that Cameco has adequately considered the precautionary principle and adaptive management throughout planning and analysis.

3. Findings

Cameco's application documentation and the CNSC staff's Environmental Protection Review Reports are fundamentally flawed in the following ways critical to the CNSC's decision:

- Justification of the proposed 20-year licence,
- Consideration of sustainability, precaution, and adaptation, and
- Consideration of rolling stewardship in preliminary decommissioning plans.

3.1 Justification of the Proposed Licence

In its application documentation, Cameco emphasizes the role of uranium market conditions in the historic, current, and future state of uranium production. For example, Cameco rests its proposed 20-year licence term partly on that basis that it would allow Cameco to take advantage of the long-term growth in the industry, while maintaining the ability to respond to market conditions as they evolve.

The key issue of uranium market conditions is ignored throughout Cameco's application, and it requires elaboration with appropriate data and transparent analyses. Indeed, Cameco seems to situate its understanding of uranium market conditions within an assumed context of uranium demand fluctuations trending towards a future of increased demand that would provide the basis for resumption of production. But Cameco does not support this assumption with evidence.

The uranium supply and demand relationship is complex and it is beyond the scope of this report to provide a comprehensive explanation. Some important factors that affect the market conditions for uranium products include, to name a few,

- increasing public recognition of the severe environmental impacts of uranium mining in the context of Canada's Sustainable Development goals, specifically to generate 100% of electricity from clean, renewable resources by 2030;
- widespread concerns about the safety of nuclear energy generation, especially in the context of the Fukushima Daiichi accident;
- Canada's ties to the foreign market for uranium products; and
- increasing negative public perception of the potential for Canadian uranium products to contribute to the proliferation of nuclear weapons.

Considering these and other factors that affect market conditions for uranium products, the lack of discussion and evidence around Cameco's assumption is a fundamental weakness in its application. Firstly, it raises critical, unanswered questions about precisely which market(s) it is referring to, the precise projected demand scenario(s), and the subsequent implications of the answers to these questions for the natural environment, human health and safety, precaution, adaptive management, and inter- and intragenerational equity.

Indeed, Cameco's lack of discussion and evidence of market conditions fails to provide a sound rationale for its proposed 20-year licence renewal. Cameco must appropriately situate its application within the larger context of a demonstrated demand for uranium production, so the public can review and comment.

3.2 Consideration of Sustainability, Precaution, and Adaptation

The CNSC's EPR and Cameco's application documentation incorporate some important concerns related to sustainability, precaution, and adaptation, e.g., they consider the impacts of uranium production on the environment and human health, and adaptive management is mentioned in monitoring programs. But neither the CNSC nor Cameco give explicit attention to sustainability, including precaution and adaptation, in a framework that is applied in a systematic way throughout analysis and decision making. In addition, the EPR lacks sufficient detail for an in-depth investigation of how these considerations were applied in all engineering-related components of the project.

The CNSC and Cameco must clearly demonstrate to the public how sustainability, precaution, and adaptation were incorporated in analysis and decision making, including an explicit explanation of the following:

- An explanation of the sustainability criteria adopted to evaluate the impacts of the licences, including a comparative evaluation of options for all mine and mill components and operational stages, from state of care and maintenance through to decommissioning.
- An explanation of the process by which sustainability criteria, including precaution and adaptation, were incorporated throughout analysis, including a comparative evaluation of

options for all mine and mill components and operational stages, from state of care and maintenance through to decommissioning.

- An explanation of how the associated concepts of reversibility, retrievability, diversity and redundancy were considered in the design and all operational aspects of the mine and mill, from state of care and maintenance through to operational, decommissioning, and post-decommissioning phases.

3.3 Consideration of Rolling Stewardship

In addition to precaution and adaptation, a foundational principle of sustainability is a long- term planning, decision-making, and monitoring lens, especially with respect uranium mining and milling facilities, which require monitoring and management in perpetuity.

At this juncture in the licence application process, the CNSC and Cameco have an opportunity to incorporate the concept of 'rolling stewardship' in preliminary decommissioning planning. Rolling stewardship represents an alternative to abandonment, and it requires the following:

- Plans for the accurate transmission of information from one generation to the next;
- Plans for the transfer of responsibility from one generation to the next, e.g., a 'changing of the guard' every 20 years;
- Plans for the recharacterization of waste;
- Plans to rapidly detect and correct any leakages or other problems;
- Plans for the retrieval of waste; and
- Plans for continual adaptive management and monitoring (see Canadian Coalition for Nuclear Responsibility, 2022)

Because of their hazardous nature, uranium mine tailings and waste rock require perpetual care. Operating and now-closed uranium operation facilities have been associated with severe pollution, e.g., contamination of surface and ground water with radionuclides, heavy metals, and conventional pollutants. In addition, decommissioned mines must be managed forever to prevent the release of contaminants from tailings and waste rock to the surrounding ecosystem and community, and major failures of tailings management facilities have occurred in Canada (see Pembina, 2007).

Given these and other serious, long-term social-ecological impacts, the public must be reassured that the CNSC and Cameco have incorporated a rolling stewardship approach in the preliminary decommissioning plan by devoting attention to the above-listed considerations.

4. Recommendations

4.1 Justification of Proposed Licence

In its application documentation, Cameco emphasizes the role of uranium market conditions in the historic, current, and future state of uranium production. The key issue of uranium market conditions requires elaboration with appropriate data and transparent analyses. Cameco's lack of evidence and discussion of market conditions represents a critical failure in its application in that Cameco does not provide a sound rationale for the proposed 20-year licence. Cameco must provide evidence for its assumption of future market conditions as part of its justification.

4.2 Consideration of Sustainability, Precaution, and Adaptation

The CNSC and Cameco must clearly demonstrate to the public how sustainability, precaution, and adaptation were incorporated in analysis and decision making, including an explicit explanation of the following:

- An explanation of the sustainability criteria adopted to evaluate the impacts of the operations, including a comparative analysis of options for all mine and mill components and stages.
- An explanation of the process by which sustainability criteria, including precaution and adaptation, were incorporated throughout analysis, including a comparative evaluation of options for all mine and mill components and stages.
- An explanation of how the associated concepts of reversibility, retrievability, diversity and redundancy were considered in the design and all operational aspects of the mine and mill, from state of care and maintenance through to operational, decommissioning, and post-decommissioning phases.

4.3 Consideration of Rolling Stewardship

Given the serious, long-term social-ecological impacts of uranium production, the CNSC and Cameco must incorporate a rolling stewardship approach in the preliminary decommissioning plans by explicitly devoting attention to the following:

- Plans for the accurate transmission of information from one generation to the next;
- Plans for the transfer of responsibility from one generation to the next, e.g., a 'changing of the guard' every 20 years;
- Plans for the recharacterization of waste;
- Plans to rapidly detect and correct any leakages or other problems;
- Plans for the retrieval of waste; and
- Plans for continual adaptive management and monitoring.

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Appendix A - Gibson's (2012, 2017) generic sustainability assessment criteria.

Socio-ecological system integrity

Build human-ecological relations to establish and maintain the long term integrity of sociobiophysical systems and protect the irreplaceable life support functions upon which human as well as ecological well-being depends.

Livelihood sufficiency and opportunity

Ensure that everyone and every community has enough for a decent life and that everyone has opportunities to seek improvements in ways that do not compromise future generations' possibilities for sufficiency and opportunity.

Intragenerational equity

Ensure that sufficiency and effective choices for all are pursued in ways that reduce dangerous gaps in sufficiency and opportunity (and health, security, social recognition, political influence, etc) between the rich and the poor.

Intergenerational equity

Favour present options and actions that are most likely to preserve or enhance the opportunities and capabilities of future generations to live sustainably.

Resource maintenance and efficiency

Provide a larger base for ensuring sustainable livelihoods for all while reducing threats to the long term integrity of socio-ecological systems by reducing extractive damage, avoiding waste and cutting overall material and energy use per unit of benefit.

Socio-ecological civility and democratic governance

Build the capacity, motivation and habitual inclination of individuals, communities and other collective decision-making bodies to apply sustainability requirements through more open and better informed deliberations, greater attention to fostering reciprocal awareness and collective responsibility, and more integrated use of administrative, market, customary and personal decision-making practices.

Precaution and adaptation

Respect uncertainty, avoid even poorly understood risks of serious or irreversible damage to the foundations for sustainability, plan to learn, design for surprise, and manage for adaptation.

Immediate and long term integration

Apply all principles of sustainability at once, seeking mutually supportive benefits and multiple gains.