Record of Proceedings, Including Reasons for Decision

In the Matter of

Applicant	Cameco Corporation
Subject	Application to Construct the Cigar Lake Uranium Mine Project
Date	December 20, 2004

RECORD OF PROCEEDINGS

Applicant:	Cameco Corporation
Address/Location:	2121-11th Street West, Saskatoon, Saskatchewan, S7M 1J3
Purpose:	Application for a licence to construct the uranium mining and support facilities at the Cigar Lake Project
Application received:	March 15, 2002 (updated March 31, 2004)
Date(s) of hearing:	July 7, 2004 and November 17, 2004
Location:	Canadian Nuclear Safety Commission (CNSC) Public Hearing Room, 280 Slater St., 14th. Floor, Ottawa, Ontario
Members present:	L.J. Keen, Chair C.R. Barnes J.A. Dosman A.R. Graham M. J. McDill
General Counsel:	J. Lavoie
Secretary:	M.A. Leblanc
Recording Secretary:	C. Taylor

Applicant Represented By	**Document Number**
• T. Rogers, Senior Vice-President and Chief Operating Officer • J. Jarrell, Vice-President of Safety, Health and Environment • B. Schmitke, General Manager of Cigar Lake Project • J. Carreiro, Project Manager, Cigar Lake • G. White, Superintendent, Environmental Assessment, Safety, Health and Environment Department • S. Donald, Senior Hydrologist with Golder Associates	CMD 04-H15.1 CMD 04-H15.1A
CNSC Staff	**Document Number**
• H. Rabski • K. Scissons • J. Leclair	CMD 04-H15 CMD 04-H15.A
Intervenor	**Document Number**
See appendix A	

Date of Decision: November 17, 2004

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1. Introduction

Cameco Corporation (Cameco) has applied to the Canadian Nuclear Safety Commission (CNSC[1]) for a licence to construct the remaining mining and support facilities at its Cigar Lake uranium mine project in Northern Saskatchewan.

Cameco is currently authorized under Uranium Mine Construction Licence (UMCL-MINE-CIGAR.00/2005 – expiry January 31, 2005) to construct specific facilities on the site surface and to continue other investigations, maintenance and testing. The current construction licence does not permit any underground construction activity or construction of facilities that would be used for the mining, handling, storage or processing of uranium ore.

In its current application, Cameco is seeking authorization to complete the construction work currently underway (specifically the construction of the No. 2 Shaft surface complex and expansion of the freeze plant) and to construct the following additional surface facilities:

- expanded waste rock stockpiles;
- expanded and modified Mine Water Treatment Plant;
- new and modified monitoring ponds;
- runoff collection systems;
- surface ore storage and handling circuit; and
- other ancillary and support facilities:

Furthermore, Cameco is requesting permission to construct and/or install the following in the underground mine:

- the No. 2 Shaft;
- bulkhead No. 3;
- mine drifts and production and freeze access drifts;
- additional mine water pumping capacity;
- mine cavities to accommodate all necessary equipment and facilities;
- ore crushing and grinding circuit;
- ore slurry pumping system;
- ventilation equipment; and
- underground ancillary and support facilities.

Other activities proposed for inclusion under the new licence include:

- operation and maintenance of the existing Cigar Lake Project facilities;
- continued geotechnical investigations;
- continued freeze hole drilling for test purposes;

[1] In this *Record of Proceedings*, the *Canadian Nuclear Safety Commission* is referred to as the "CNSC" when referring to the organization and its staff in general, and as the "Commission" when referring to the tribunal component.

- the possession, storage, transfer, import, use and disposal of nuclear substances and radiation devices;
- construction of all Phase 1 facilities as described in the *Cigar Lake Project Mining Facility Licensing Manual*; and
- commissioning and operation of all facilities required to support the construction activities.

Ore Circuit Commissioning:

In its application of March 31, 2004, Cameco had also requested permission to conduct limited commissioning of its ore extraction, processing and handling circuits in the newly constructed mine (involving the production of approximately 1,500 tonnes of ore). Cameco was of the view that this would allow for an efficient and timely transition from construction to operation of the mine and result in minimal disruption to the local employment and economy. In its intervention, the Northern Saskatchewan Environmental Quality Committee (EQC) – Athabasca Subcommittee, noting the negative impacts that project delays could have on the local communities, expressed support for a smooth and uninterrupted transition to full operation of the mine. On this part of Cameco's application, however, CNSC staff recommended that the Commission not consider the active commissioning of the ore handling circuits for inclusion under the proposed construction licence. CNSC staff argued that this type of activity should be addressed in the context of an application for an operating licence.

At the hearing Day-2, Cameco reported that, following further discussions with CNSC staff on this matter, it would not seek authorization for active commissioning of the ore handling circuits at this time. Cameco noted that, if the construction licence is issued, and to help maintain the momentum of the project, it will initiate the preparation of its application for mine operation, in accordance with the applicable regulations, prior to the completion of the construction phase.

The Commission noted this modification in Cameco's application for a construction licence. The Commission therefore gave no further consideration at this public hearing to the active commissioning of the ore handling circuits.

Issues:

In considering the revised application, the Commission is required to decide, pursuant to subsection 24(4) of the *Nuclear Safety and Control Act* (NSCA)[2]:

a) if Cameco is qualified to carry on the mine construction activity that the licence would authorize; and

b) if, in carrying on that activity, Cameco would make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

[2] R.S. 1997, c.9

Public Hearing:

The Commission considered information presented during a two-day public hearing held on July 7, 2004 and November 17, 2004 in Ottawa, Ontario. The hearing was conducted in accordance with the *Canadian Nuclear Safety Commission Rules of Procedure*. During the public hearing, the Commission received written submissions and heard oral presentations from Cameco (CMD 04-H15.1, CMD 04-H15.1A) and CNSC staff (CMD 04-H15 and CMD 04-H15.A). The Commission also considered oral and written submissions from intervenors. See Appendix A to this *Record of Proceedings* for a detailed list of the interventions.

2. Decision

Based on its consideration of the matter, as described in more detail in the following sections of this *Record of Proceedings*, the Commission is satisfied that Cameco is qualified to carry on the activity that the licence will authorize. The Commission is also satisfied that Cameco, in carrying on that activity, will make adequate provision for the protection of the environment, the health and safety of persons and the maintenance of national security and measures required to implement international obligations to which Canada has agreed. Therefore,

the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, issues a licence to construct the mining and support facilities at the Cigar Lake Project to Cameco Corporation, Saskatoon, Saskatchewan. The licence (UMCL-MINE-CIGAR.00/2008) is valid until December 31, 2007, unless suspended, amended, revoked or replaced. Furthermore, concurrent with the coming into effect of the new construction licence, the Commission revokes the existing construction licence at the Cigar Lake Project (UMCL-MINE-CIGAR.00/2005).

The Commission includes in the licence the conditions recommended by CNSC staff, as set out in the draft licence attached to CMD 04-H15 and in CMD 04-H15.A.

3. Issues and Commission Findings

In making its licensing decision under section 24 of the NSCA, the Commission considered a number of issues relating to Cameco's qualifications to carry out the proposed activities, and the adequacy of the proposed measures for protecting the environment, the health and safety of persons, national security and international obligations to which Canada has agreed. The Commission's findings on these issues are outlined below.

3.1 Radiation Protection

As part of its evaluation of the adequacy of provisions for protecting the health and safety of persons, the Commission considered the past performance and future plans of Cameco in the area of radiation protection at the Cigar Lake Project.

In this regard, CNSC staff noted that, while there will be no uranium ore handling or processing during construction (activities that involve risk from gamma radiation and radioactive dust), some radon and radon progeny gas will be present in the developing mine and will required active ventilation and area radiation monitoring to protect the miners.

CNSC staff explained that, because the radon and its progeny is borne by the groundwater in the vicinity of the ore body, the related radiological risks could increase significantly in the event of a higher than anticipated inflow of groundwater to the mine during construction. With respect to such an event, CNSC staff expressed its satisfaction that Cameco has in place, or will have in place, the necessary controls to manage ground conditions in the mine and to respond to and mitigate the radiological risks from any major groundwater inflow events. Those measures include an ability to isolate the flooding mine from the rest of the workings (by closing bulkhead doors), maintain active ventilation, and require the use of personal protective equipment.

CNSC staff noted that it has reviewed Cameco's *Radiation Protection Code of Practice* which documents both normal and contingency radiation protection requirements and procedures. CNSC staff reported that it finds the document acceptable for the proposed mine construction. CNSC staff also reported that Cameco's performance in protecting workers from radiation at the former underground test mine at the Cigar Lake Project site was satisfactory.

In response to the Commission's questions on the design and operation of the underground ventilation system, Cameco explained that the system is designed so that the workers will always be at the fresh air supply side; that is, the air will always flow from areas of lower to higher potential contamination areas before venting to the surface. Cameco also explained that because the proposed mine development will avoid areas of mineralized rock (uranium ore), and that the ground will be frozen prior to development, the amount of radon-bearing water entering the workings is expected to be relatively small. Cameco noted that the capacity of the ventilation system at the Cigar Lake Project does not need to be as large, in relative terms, as that operating at its McArthur River mine. This is because, unlike the McArthur River mine, all of the mine development at the Cigar Lake Project will be remote from the ore body in the deeper, lower permeability basement rock.

Based on the information summarized above, the Commission is satisfied that Cameco has made, and will continue to make, adequate provision for the protection of persons from radiation during construction of the Cigar Lake Project.

3.2 Environmental Protection

To determine whether Cameco will make adequate provisions to protect the environment during the proposed construction activities, the Commission considered the potential for those activities to adversely affect the environment. Specifically, the Commission examined the potential environmental effects from mine water effluent and drainage from the waste rock piles. The Commission also examined the adequacy of the proposed environmental monitoring programs.

3.2.1 Mine Water Effluent:

With respect to mine water management, Cameco stated that all mine water pumped to surface will be treated prior to reuse in the mine or released to the environment. The treatment will be a two-stage process designed to adjust pH and remove arsenic, heavy metals, radium, molybdenum and particulate. Cameco estimated that between one half and two thirds of the treated effluent will be reused in the mine during operation. Cameco also noted that no treated effluent would be released directly to the nearby Waterbury Lake. The treated effluent discharge will occur upstream in the smaller Aline Lake and Creek system which will allow for focused near-field environmental effects monitoring. CNSC staff noted that measures will be taken to also protect the environment in the Aline Lake / Creek system. The Aline Lake / Creek system is not being used as an impact buffer zone, or as part of the treatment system. CNSC staff explained that the addition of a molybdenum removal process to the effluent treatment plant was done specifically to protect this area.

Radiological Effects:

M. Shiell in her intervention, expressed concern about what she considers may be the long-term genetic effects on biota exposed to alpha-emitting radionuclides released from the mine. M. Shiell is of the view that CNSC staff has not adequately considered such effects and has, in her view, discounted them by using a Relative Biological Effectiveness (RBE) factor of 40 rather than the higher RBE value of 200 for genetic effects, as was applied by Environment Canada in its recent priority substance list evaluations (PSL-2). With reference to CNSC staff's recent report to the Commission on the effects of alpha radiation on biota (CMD 04-M39)[3], M. Shiell stated that CNSC staff has acknowledged that the scientific understanding of these effects is not complete. Also referring to the observed cataracts and other deformities in fish in proximity to the former Beaverlodge uranium mine, M. Shiell suggested that those effects could be the result of alpha radiation damage. M. Shiell recommended, therefore, that the Commission not grant a construction licence for the high-grade Cigar Lake mine until more scientific study of the genetic effects has been done.

In its consideration of M. Shiell's intervention, the Commission sought clarification from CNSC staff on the effects observed in fish at the Beaverlodge mine site. In response, CNSC staff reported that the effects were caused by exposure to relatively high levels of the non-radioactive contaminant selenium at that location. CNSC staff expressed its certainty that the effects were not the result of radiation exposure.

Concerning the potential for radiological effects at the Cigar Lake Project, CNSC staff also referred to its earlier report on the effects of alpha radiation on biota (CMD 04-M39) and concluded that the information supports CNSC staff's conclusion on the acceptability of the Cameco's environmental protection program at the Cigar Lake Project. The Commission also reviewed CMD 04-M39 in the context of this licensing hearing. The Commission is satisfied that the proposed treated effluent from the Cigar Lake Project would not pose and unreasonable risk to biota in the receiving environment.

[3] Information from Canadian Nuclear Safety Commission Staff, in the matter of: The Assessment of Radiation Effects of Alpha Emitters on Biota, (CMD 04-M39), presented at the September 17, 2004 meeting of the Canadian Nuclear Safety Commission, Agenda item 6.1

Contingencies for Higher Effluent Volumes:

Noting the potential for higher than expected groundwater inflows to the mine (i.e., from 500 cubic metres per hour to a worst case conservative estimate of 1,500 cubic metres per hour), and hence the possible need to treat larger volumes of mine water on the surface, Cameco stated that it would treat that water to the same standards prior to discharging it to the environment. Contingency storage ponds will be constructed on the surface and used during mine operation in the event the effluent treatment plant is unable to handle the increased flow. Cameco stated that, if at any time it appeared the surface storage and treatment capacities could be exceeded, Cameco would stem the flow from the mine by evacuating the production areas of the mine and sealing them off by closing the pre-installed underground bulkheads.

The Commission, noting that only between 3 and 7 days of mine water contingency storage capacity on the surface would be available in such an event, questioned whether this would provide adequate time to respond to a serious mine flooding event and ensure adequate control of the effluent releases. In response, CNSC staff expressed its satisfaction with Cameco's contingency plans for this type of event. CNSC staff is satisfied that the contingency pond storage capacity would provide Cameco with sufficient time to assess the situation and respond appropriately to protect the environment and the workers.

Based on this information, the Commission is satisfied that Cameco's contingency plans for managing a high mine water inflow event in the mine are adequate for protection of the environment.

Disposal of Treatment Precipitates:

The Commission, noting that the contaminants removed from the effluent will take the form of contaminated precipitates at the effluent treatment plant, questioned how Cameco would ultimately dispose of that solid waste. Cameco responded that the contaminants would be produced at the treatment plant in the form of filter cakes. The filter cakes will be placed temporarily on a lined pad on the surface prior to their eventual disposal underground in the mined-out workings. CNSC staff indicated its satisfaction with the temporary storage method and noted that it continues to examine various options for the ultimate disposal of this material. The Commission finds this satisfactory.

3.2.2 Waste Rock Management

Cameco explained that the construction of the mine will involve the production and management on the surface of relatively large volumes of waste rock. In order to protect the environment from this waste rock, Cameco explained that it will segregate the rock as either "clean" or "requiring special disposal" (i.e., potentially problematic due to the contaminants that could leach from the exposed rock). Cameco stated that the special waste rock will be stored temporarily on the surface on high-density polyethylene-lined pads. The pads will be designed and built for the life of the facility and for the maximum probable precipitation event. Surface and groundwater in the vicinity of the pads will also be frequent monitored. Cameco reported that, to the extent possible, the special waste rock will be disposed of underground as backfill in

the completed mine workings. The remaining special waste rock will be eventually trucked to the McClean Lake Mine – Sue C pit for final disposal.

CNSC staff expressed its satisfaction with Cameco's proposed waste rock management plan and noted that, during construction, when the mine development will be remote from the mineralized rock in and near the ore body, the quantities of special waste rock will be relatively small.

Based on this information, the Commission is satisfied that Cameco will make adequate provisions to protect the environment from waste rock during the proposed construction of the Cigar Lake Project.

3.2.3 Environmental Effects Monitoring

CNSC staff reported that it has reviewed Cameco's environmental monitoring and environmental effects monitoring (EEM) programs and found them to be acceptable. CNSC staff noted that the EEM program was also the subject of a review by a joint federal/provincial Technical Advisory Panel. Cameco has addressed all of the Technical Advisory Panel's comments and suggestions to the satisfaction of the Panel.

The Commission sought, and was provided with during the hearing, further detailed information related to the locations and elevations of groundwater monitoring wells at the site. The Commission was also provided during the hearing with a more detailed description of the hydrogeological setting for the proposed mine. For the purpose of assessing Cameco's provisions for environmental protection, the Commission found this additional information satisfactory. Refer to section 3.4 below for a further discussion of the Commission's examination of, and findings on, the hydrogeological setting as it relates to the adequacy of the proposed design and development the mine.

Concerning the required follow-up to the earlier screening environmental assessment of the project (conducted pursuant to the *Canadian Environmental Assessment Act*), CNSC staff recommended that the Commission add a condition to the licence that would require Cameco to submit the details of the follow-up program for the approval of the Commission, or person authorized by the Commission, by April 30, 2005. The Commission accepts this recommendation and delegates the approval of the follow-up program to the applicable CNSC staff Designated Officer.

3.2.4 Conclusions on Environmental Protection

Based on the information summarized above, the Commission is satisfied that Cameco has made, and will continue to make adequate provision for protecting the environment during the proposed construction of the Cigar Lake Project.

3.3 Conventional Health and Safety

Further with respect to the protection of persons at the Cigar Lake Project, the Commission examined the planned program and past performance of Cameco in the area of conventional (i.e., non-radiological) health and safety.

In response to the Commission's questions on the collaboration between Saskatchewan Labour and the CNSC on issues related to conventional safety, CNSC staff stated that there are agreements in place between the CNSC and Saskatchewan for the purpose of harmonizing and coordinating regulatory activities in the area of conventional safety and that these are working very well. CNSC staff stated that the arrangements allow for maximum effective use of the resident knowledge and expertise within both organizations.

Cameco stated that it has implemented, and will continue to implement, an extensive and successful occupational health and safety program at the Cigar Lake Project. Cameco described the program as including detailed hazardous work planning, frequent safety communications and extensive construction safety oversight. With respect to communications, Cameco reported that daily safety meetings are held with the site management team, contractors and Cameco's own environment and safety personnel. Daily safety inspections are carried out by Cameco and the contractors' health and safety personnel. As evidence of the effectiveness of its safety program, Cameco reported that nearly 6 years have passed since the last lost-time accident at the site. Cameco expressed concern, however, about two recent minor medical-aid injuries at the site (i.e., where no lost time resulted) and stated that it is committed to preventing all types of injuries.

In response to a number of questions from the Commission on the occupational health and safety programs, Cameco assured the Commission that personnel on the site, regardless of whether they are employees of Cameco or its contractors, undergo the same rigorous safety training and are required to meet the same safety standards. Cameco is of the view that a good safety culture exists at the project site, partly as a result of Cameco having embedded the requirements for direct participation in the site safety programs in its contractual arrangements, and through its continuous promotion and enforcement efforts. Cameco also noted that Occupational Health and Safety Committees for Cameco and each of its major contractors are active on the site.

In response to follow-up questions on the Occupational Health and Safety Committees, a representative from Saskatchewan Labour (E. Becker) attested to the effectiveness of these committees at the Cigar Lake Project. Saskatchewan Labour stated that it works closely with the committees and provides them with the necessary training to fulfill their responsibilities effectively. Saskatchewan Labour also noted that it issues exams to all persons who are required to work underground in the mine, regardless of whether they are Cameco or contract employees. Saskatchewan Labour also noted its satisfaction with the safety training provided by Cameco and the overall safety performance at the site.

With reference to the ammonia that will be used in the ground-freeze plant, the Commission asked whether exposure of worker to that ammonia in normal or upset conditions could be a safety issue. Cameco noted in reply that ammonia would not be used or present underground in the mine. Cameco also noted that, in the event ammonia is detected by sensors in the freeze

plant on the surface, an automatic sprinkler system would activate to dilute and mitigate any potential risk to the workers.

Concerning a possible mine flooding incident, the Commission questioned whether this could pose a conventional safety risk to the miners. In reply, Cameco stated that it could not conceive of any circumstances where a person could become trapped by water flowing into the mine. Emergency plans are in place to effect an orderly evacuation of any flooding areas, including, if necessary, the closing of bulkhead doors to protect the remaining occupied areas and points of egress from the mine.

Based on this information, the Commission concludes that Cameco has made, and will continue to make, adequate provision for the protection of workers from conventional (i.e., non-radiological) hazards during the proposed construction activities.

3.4 Mine Design and Development

To further assess Cameco's likely performance during the proposed construction phase, the Commission examined Cameco's past performance at the Cigar Lake Project, as well as the adequacy of the proposed mine design and development approach within the geological setting at the site.

3.4.1 Past Performance

With respect to Cameco's past performance, CNSC staff reported that no serious process failures or non-compliances were detected or reported during the earlier test mining and current surface construction activities. All effluent controls and waste systems performed as designed, and there have been no measurable off-site effects observed. The Commission is satisfied with this past good performance of the licensee.

3.4.2 Proposed Mine Development

With respect to the planned construction of the mine, Cameco provided the Commission with a detailed summary of the construction approach, sequencing and schedule. Cameco explained how the layout and design of the mine takes into account the variety of anticipated ground conditions. Those conditions, for example, led to decisions to: construct the production levels in the underlying, lower-permeability basement rock; freeze the ore body prior to mine development; use a remotely operated jet-bore ore cutting tool; install contingency pumping capacity and flood control bulkheads; use a specialized Mine Development System (MDS) for ground control during construction[4]; and construct the No. 2 Shaft for multiple purposes (process water collection, ventilation intake and exhaust, ore slurry piping, and secondary (emergency) worker egress). Cameco described its six fundamental design objectives as being: 1) control water and ground conditions; 2) provide for safety and radiation protection of the workers; 3) minimize the release of treated effluent; 4) control potential for accidental releases to the

[4] The MDS is a tunnelling machined that installs pre-cast concrete tunnel lining and grout filling for added support as it excavates.

environment; 5) control decommissioning liabilities; and 6) follow a formalized and structured management approach.

CNSC staff stated that, while it is satisfied with the mine plans and general mining approach proposed by Cameco, further review is required of the mine development program and procedures that will be use to control the mine development throughout the project. In this regard, CNSC staff elaborated on how the local geology poses challenges for the control of ground conditions, groundwater inflow and ventilation.

To address these remaining issues, CNSC staff recommended that the Commission add a condition to the licence (condition 1.5) that would require Cameco to provide the mine development and control program, processes and procedures acceptable to the Commission, or person authorized by the Commission, prior to any new mine development taking place.

In response to this CNSC staff recommendation, Cameco acknowledged the need to complete its supporting process and procedural-level documentation for CNSC acceptance, but noted that Cameco views the remaining issues to be a function of timing, rather than any fundamental disagreements between Cameco and the CNSC staff on substance. Cameco reported that it has submitted to the CNSC its first draft of the required documentation and expects to address the remaining requirements prior to the end of 2004. Cameco did not object to the additional licence condition recommended by CNSC staff.

Ground Control and Groundwater Flow Management:

In its examination of the above-noted issues and CNSC staff recommendation, the Commission posed a number of questions to Cameco and CNSC staff with respect to how the ground conditions and hydrogeological characteristics of the site were evaluated.

In response Cameco and CNSC staff described the history of extensive hydrogeological investigations that have taken place at the site, dating back to the late 1980s. In particular, CNSC staff noted that the site was the subject of an intensive study conducted as part of the former Canadian Nuclear Fuel Waste Disposal Program. CNSC staff is of the view that this testing and modelling provided a particularly good understanding of the groundwater flow system present at the location.

To further assist the Commission in its examination, Cameco provided additional detailed information on the piezometer locations and elevations that are in place in and near the ore body, and in the overburden material. Cameco observed that there is an area of enhanced permeability (fractured zone) in the region close to the ore body (likely formed during the genesis of the ore body) and that a 3-dimensional porous media groundwater flow model has been able to reasonably reproduce the observed responses to the pumping tests conducted in that altered zone. Cameco explained that the pump testing and modelling analysis (which included what Cameco and CNSC staff view as conservative assumptions about the nature and extent of the fracture zones extending to surface) were designed to help estimate the maximum emergency inflow conditions that could arise during mining (500 to 1,500 cubic metres per hour).

In its examination of this information, the Commission posed a number of questions related to whether the results of the analysis do actually provide a reasonable and reliable prediction of the potential inflows to the mine. Specifically, in response to the Commission's questions on why a porous media modelling approach was used to simulate a fractured rock environment, Cameco stated that the porous media approach proved to best replicate the groundwater performance observed during three separate field pump tests and flow tests. When asked by the Commission why a zero pressure head condition was assumed to exist in area above the ore zone, Cameco explained that this helps to simulate a conservative worst-case condition; that is, a situation where there would be no local restriction to flow in the postulated ground failure area. Furthermore, in response to the Commission's observation that all of the underground drilling and shaft work to date has been remote from the altered zone near the ore body, Cameco explained that the peizometers in the altered zone did show a connection between the fractured zone and the test mine excavations and that this information was pertinent to, and was used in, the modelling analysis.

In its responses to the above line of questioning by the Commission, CNSC staff stated that, while no inflow predictions will be 100% accurate, the predictions made by Cameco and its expert consultants appear reasonable to the CNSC staff for the purpose of this application. CNSC staff noted that one must also take into account the contingency measures that will be in place, including the bulkhead doors, that will ensure adequate protection of the workers and the environment even in the event of an inflow that forces closure of the mine. CNSC staff also noted that, unlike the McArthur River mine, where a serious inflow event did occur in 2003, the production levels will be in the low-permeability basement rock and that the ore body will be fully frozen prior to mine development.

Based on the information summarized above, the Commission is satisfied that there exists sufficient knowledge about the site geology and hydrogeology to derive reasonably conservative estimates about ground conditions and the potential for groundwater inflow to the mine during development. The Commission considers, however, that these factors will require ongoing close monitoring and continued assessment throughout the development of the mine. The Commission therefore concurs with the CNSC staff recommendation that detailed documentation of the mine development processes and procedures, acceptable to the CNSC, must be in place prior to any new mine development proceeding.

Shaft No. 2 Design:

Concerning another aspect of the proposed mine development, the Commission asked a number of questions with respect to the design, construction and operation of the multi-purpose No. 2 Shaft. As noted above, the No. 2 Shaft will be used for ore slurry pipes, electrical conduits, ventilation, emergency egress and mine process water collection.

In particular, the Commission questioned whether allowing groundwater to enter the shaft as means of collecting process water for the mine operations could pose a risk to the other critical functions of the shaft. In response, Cameco explained how the groundwater inflow to the mine will be highly controlled using back-wall sheeting and extensive grouting in the exposed rock. Cameco also explained that the water collected will be channeled in dedicated piping and thus

will not be in contact with other services in the mine. Cameco noted that the shaft design has been proven effective and safe in many locations throughout the world.

In response to a question on the damage to the shaft that could result from an ore slurry pipeline break, Cameco noted that the ore slurry pipes will be separately enclosed within the shaft to ensure that any spill would be contained and kept separate from the other shaft services.

Based on this information, the Commission is satisfied that the design of the No. 2 Shaft is acceptable.

Back-up Power Supply:

In response to the Commission's questions on the capacity and reliability of the back-up electrical power supply that will be installed at the site, Cameco explained that 3.8 megawatts of stand-by diesel-powered generators will be installed. The stand-by generators will be capable of operating all ventilation, pumping, treatment and hoist systems in the event of a loss of grid power. This includes the additional mine-water pumping and treatment that may be required during an emergency groundwater inflow event in the mine. Cameco noted that the back-up generators will be tested on a monthly basis and that there will be enough units installed so that one generator may be out of service for maintenance at any one time. The Commission finds these provisions for back-up power supply acceptable.

3.4.3 Conclusions on the Mine Design and Development:

Based on the information and conclusions outlined above, the Commission concludes that the conceptual design and development plan for the Cigar Lake Project is acceptable. The Commission notes, however, that the details of the mine development procedures and processes remain to be documented to the CNSC's satisfaction and that this must be in place prior to any mine development proceeding. The Commission therefore accepts the CNSC staff's recommendation to add the following condition (1.5) to the construction licence:

> *"The licensee shall provide the mine development and control program, processes and procedures acceptable to the Commission or a person authorized by the Commission prior to any new mine development."*

The Commission further confirms that the authorized Designated Officer may consider and decide on the matters pertaining to this licence condition.

3.5 Quality Assurance

The Commission notes that, if the mine development plan described in the foregoing section of this *Record of Proceedings* is to be properly and safely executed, it must be accompanied by an acceptable quality assurance program.

In this regard, Cameco stated that a *Cigar Lake Quality Management System* (QMS) is in place. Cameco noted that the system integrates corporate and on-site quality activities and reflects the

principles established by the Project Management Institute; including those for systematic and structured program level documentation, detailed work planning, communications, work quality inspection and verification, and continuous improvement.

By the close of the public hearing, CNSC staff had completed its review and audit of Cameco's QMS Manual and related programs and procedures. CNSC staff reported that, despite some minor deviations from the requirements, the quality assurance program is acceptable, both in terms of the program definition and its implementation. CNSC staff is of the view that the remaining action notices do not pose an unreasonable risk and may be resolved in the context of the ongoing compliance program.

With reference to the corporate and site level organization charts submitted by Cameco in respect of its quality assurance program, the Commission sought clarification as to how a design change would be handled by, and communicated across, the various reporting lines illustrated in those charts. In response, Cameco explained how, for example, a *Change-In-Condition Form* produced at the site would be processed through the Construction Management Team, Design Lead, and Quality Assurance Team, resulting in the issue of site instructions, revised drawings, and inspection and testing protocols as appropriate.

In response to follow-up questions from the Commission pertaining to engineering governance and document control as part of that process and quality assurance in general, Cameco stated that the engineering team is physically located in the same place and that it holds regular engineering and project review meetings to ensure effective cross-disciplinary communications and interface within the team. Cameco also explained that all current documents and drawings are shared electronically and that they are maintained in rigorous compliance with the Engineering Design Control Program.

Based on this information, the Commission is satisfied that Cameco has an acceptable quality assurance program in place for the proposed Cigar Lake Project construction.

3.6 Emergency Preparedness

With respect to the protection of persons and the environment during emergencies that could arise at the Cigar Lake Project, Cameco reported that it has detailed emergency response plans and equipment in place to address all plausible situations that could arise at the mine, or along the associated transportation and access routes. Cameco also noted that, in the event additional resources are needed to address an emergency, it is a signatory to a Mutual Assistance Agreement with the other mines in the area.

In response to a related question from the Commission, Cameco stated that the mine rescue team at the site is trained and equipped to handle all situations that may arise. The rescue team practices regularly and participates in provincial competitions.

CNSC staff expressed its satisfaction with emergency preparedness at the site and has concluded that the program and its implementation will continue to meet requirements during the proposed construction project.

Based on this information, the Commission concludes that Cameco is, and will continue to be adequately prepared for emergencies that could arise during the construction of the Cigar Lake Project.

3.7 Security

With regard to the maintenance of security at the project site during the proposed construction project, CNSC staff reported that Cameco has in place, and is successfully implementing, an acceptable Security Program. In CNSC staff's view, security risks at the site will remain low during the mine construction. CNSC staff also noted that access to the site is controlled through a single locked gate. CNSC staff noted that the adequacy of the security program will be reviewed at each future stage of the project.

Based on this information, the Commission concludes that Cameco will continue to make adequate provision for maintaining security at the Cigar Lake Project site.

3.8 Safeguards and Non-proliferation

With respect to whether Cameco will continue to make adequate provision to ensure maintenance of Canada's international obligations in respect of nuclear safeguards and safeguards and non-proliferation, CNSC staff reported that Cameco meets, and is expected to continue to meet, all applicable requirements.

The Commission concludes, therefore, that Cameco has made, and will continue to make, adequate provision for maintaining Canada's international obligations for safeguards and non-proliferation.

3.9 Decommissioning Plan and Financial Guarantee

With respect to the requirement to maintain a decommissioning plan and related financial guarantee for the Cigar Lake Project, Cameco reported that it is revising its financial guarantee for decommissioning to reflect the proposed construction activities, as well as the corporate and regulatory organizational changes that have occurred. The value of four letters of credit (one for each of the parent companies) will be increased to a total of $6.36 million by the end of the construction phase.

CNSC staff reported that the existing letter of credit for $4.21 million has remained in good standing and that Cameco's revised Preliminary Decommissioning Plan and cost estimates have been reviewed and found acceptable by CNSC staff and the Province of Saskatchewan.

The Commission questioned why the proposed mine development would increase the decommissioning liability by only $2.15 million. In response, CNSC staff explained that this apparently modest increase is due to the fact that the proposed construction project does not involve any processing or handling of radioactive materials and therefore none of the circuits and

equipment would be contaminated in the event the mine is decommissioned without having operated. CNSC staff noted that the amount of the financial guarantee will be revised accordingly for the purpose of any approved mine operation.

Based on this information, the Commission is satisfied that Cameco, in accordance with subsection 5 of the NSCA, has an adequate decommissioning plan and financial guarantee in place for the purpose of the proposed construction project.

3.10 Public Information Program

The Commission requires, among other things, that licensees maintain acceptable public information programs. In this regard, Cameco outlined for the Commission the various types of public information activities that it engages in on a routine basis and for the purpose of the proposed construction project at the Cigar Lake Project. Cameco noted in particular the effective use of the community-based Environmental Quality Committee (EQC) established for this purpose.

The Northern Saskatchewan EQC – Athabasca Subcommittee, in its intervention, attested to the high quality of Cameco's information program, including the facility tours that provide first-hand understanding of what is being proposed.

CNSC staff indicated its satisfaction with Cameco's Public Information Program and concluded that the program meets regulatory requirements and uses a suitably varied range of communication products and strategies.

Based on this information, the Commission is satisfied that Cameco has an adequate Public Information Program in place for the purpose of the proposed construction project.

3.11 Canadian Environmental Assessment Act

Before making a licensing decision, the Commission must be satisfied that all applicable requirements of the *Canadian Environmental Assessment Act* (CEAA)[5] have been fulfilled.

In this case, the Commission concludes that all applicable requirements under the CEAA have been fulfilled.

3.12 Licence Period

With respect to the proposed duration of the licence, CNSC staff recommended that the Commission issue a licence for a period of three years. CNSC staff is of the view that the proposed construction project will be completed within that period. CNSC staff is also of the view that the duration of the construction licence is consistent with the CNSC staff's criteria for

[5] R.S. 1992, c.37

recommending licence terms, as set out in CMD 02-M12. In particular, CNSC staff noted that the recommended licence term is commensurate with the duration of the planned activities to be permitted under the licence.

Cameco expressed its agreement with the licence period recommended by CNSC staff and confirmed that it is seeking the same term from the Commission.

The Commission accepts the proposed licence term and decides that the licence will be valid until December 31, 2007.

4. Conclusion

The Commission has considered the written and oral submissions of the applicant, CNSC staff and intervenors as presented in the material available for reference on the record.

The Commission concludes that Cameco is qualified to carry on the activity that the licence will authorize. The Commission also concludes that Cameco, in carrying on that activity, will make adequate provision for the protection of the environment, the health and safety of persons, and the maintenance of national security and measures required to implement international obligations to which Canada has agreed.

Therefore, the Commission, pursuant to section 24 of the *Nuclear Safety and Control Act*, issues Uranium Mine Construction Licence UMCL-MINE-CIGAR.00/2007. The Commission adds conditions to the licence as recommended by CNSC staff in the draft licence attached to CMD 04-H15 and CMD 04-H15.A. The licence is valid until December 31, 2007 unless suspended, amended, revoked or replaced.

Furthermore, concurrent with the coming into effect of the new construction licence, the Commission revokes the existing licence at the Cigar Lake Project (UMCL-MINE-CIGAR.00/2005).

Marc A. Leblanc
Secretary,
Canadian Nuclear Safety Commission

Date of decision: November 17, 2004
Date of release of Reasons for Decision: December 20, 2004

Appendix A – Intervenors

Intervenors	Document Number
Northern Saskatchewan Environmental Quality Committee, represented by J. Lepine	CMD 04-H15.2
M. Shiell	CMD 04-H15.3