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1 Overview

The request by the Government of Canada for expressions of interest in the operations of Atomic Energy of Canada Limited (AECL) follows upon its sale of AECL's CANDU design and engineering group division, located at Sheridan Park, in 2011. The Canadian Nuclear Society (CNS) has followed these developments with great interest over the past several years.

The CNS is composed of over 1200 individual scientists, engineers and researchers within Canada's nuclear industry. As a not-for-profit corporation and voluntary professional society, the CNS has no proprietary interest in the government's request. However, it has a very strong interest in the future of AECL and its research and development facilities, technology and personnel. Depending upon future government decisions in this area, changes could either greatly strengthen or gravely weaken Canada's current and future nuclear science and technology.

In this response to the government's request, the CNS wishes to address one item in particular, the future of the NRU (National Research Universal) reactor. What we wish to do is to provide our views to the Government of Canada that would help to achieve the government's objectives while strengthening nuclear science and technology infrastructure embodied in the NRU. The CNS understands that time is relatively short for making decisions about the NRU. Its operating licence expires in 2016. This means that AECL must indicate its future intentions with respect to the reactor to the Canadian Nuclear Safety Commission (CNSC) in 2014.

Throughout this paper, it should be understood that reference to the research and technology capacity of AECL includes the research personnel and facilities at Chalk River National Laboratories and at Whiteshell Laboratories.

2 An overview of the NRU

The NRU is a 200 MWth research reactor. It entered service on November 3, 1957, and as of 2012 it has been in service for 55 years. The NRU was built for three primary purposes:

- To be a major Canadian facility for neutron physics research;
- To provide engineering support and development work for CANDU power reactors; and
- To supply medical and industrial radioisotopes.

Design of the NRU began in 1949. It was intended as a larger, more capable successor to the NRX reactor, also located at Chalk River Laboratories (CRL). At the time of its construction, NRU was the largest research reactor in the world, and it is still one of the largest in operation today.

There can be no question that NRU has succeeded in its original mandate. NRU remains the heart of Canada's nuclear science and technology programme. It was the site of one Nobel Prize for Physics, that of Dr. Bertram Brockhouse in 1994. It is also the principal technical support for a large number of government and university collaborations on government policy and research programs. This will be discussed in more detail later.

With respect to CANDU engineering and development, thanks in large measure to the work done at NRU, CANDU reactors today are found in Canada, South Korea, China, Argentina, India, Pakistan and Romania. A total of 38 CANDU power reactors have been built and commissioned since 1962, and these reactors continue to lead the world in both electricity production performance and safety of operation.

For radio-isotope production, NRU has been the world's premier producer of medical and industrial radioisotopes, notably the following:
Molybdenum 99, used for medical diagnosis of internal organs,
Iodine-131, used primarily for treatment of thyroid cancer;
Iodine-125, used for a variety of medical applications including treatment of prostate cancer,
Xenon-133, used for scanning lungs,
Cobalt-60, used for cancer treatment,
Iridium-192, used for industrial imaging and radiography and welding inspections.

3 National and International Research and Collaboration

NRU is the basis for many co-operative research and development programmes in Canada and around the world. These can be most readily sorted into four basic categories:

- government programme support,
- general nuclear physics research,
- applied nuclear reactor research and development, and
- CANDU specific research and development.

3a Government programme support
The Government of Canada depends upon the capabilities of the NRU for a number of important programme areas. These are:

DFAIT: CRL provides the Department of Foreign Affairs and International Trade with subject matter expertise related to nuclear non-proliferation and safeguards. CRL provides the Government of Canada with support for its mission to the International Atomic Energy Agency (IAEA). CRL also provides direct support for the Government's participation in the Nuclear Suppliers Group (NSG). CRL also provides support to the Government in the negotiation of bilateral nuclear co-operation agreements. CRL has also supported DFAIT's Global Nuclear Partnership Programme, specifically aimed at co-operating with Russia and Ukraine institutions in securing nuclear sites and materials.

Nuclear Security: CRL facilities, including specifically its hot cells, are essential to identifying the nature and source of nuclear materials and nuclear forensics. In support of DRDC, CRL develops scanning technology such as muon tomography, important for border inspection. Also in support of this, with McMaster University, DRDC and Health Canada, CRL operates an emergency response system to be used in the event of a radiological attack or terrorist incident.

CNSC: CRL provides research support for CNSC. Specifically in recent years this has focused on safeguards initiatives. CRL has also been essential for resolving Generic Action Items, which CNSC has required and continues to require utilities operating CANDU reactors to undertake.

DND: CRL provides technical advice and support to DND regarding the radioactive materials and devices that DND uses throughout Canada's armed forces. As an example, it has provided support to DND assessing the risk of exposure to soldiers exposed to depleted uranium.

Health Canada: Health Canada has collaborated with AECL on a number of projects using the unique CRL Biological Research Facility and provides funding for specific projects. Some of the collaborations are multilateral involving DRDC, Ottawa Heart Institute and Canadian universities including McMaster and RMC. Some of these projects are supported by CRTI (Chemical, Biological, Radiological-Nuclear, and Explosives (CRBNE) Research and Technology Initiative) for research and other activities that are needed to meet the threat posed by the terrorist use of radiation dispersal devices at high profile public events. CRTI encourages and funds collaboration between government agencies and universities.

The Radiological Protection Research Framework Programme (European Commission, DG XII) supports research at CRL on the effects of low-level radiation using a mouse model as part of a wider European collaborative project – the NOTE (Non-Targeted Effects) project. While other non-European partners participate in EC projects in this area (including McMaster University and the University of Ottawa) AECL is the only non-

European partner that is funded – recognising its unique animal facilities for research. Health Canada also participates in this research.

3b General Nuclear Physics Research

University Network of Excellence in Nuclear Engineering (UNENE): After the initial surge of employment in nuclear industry in late 1970s and early 1980s, there was a near freeze on employment for nearly a decade in late 1980s and early 1990s. This led to general lack of interest in pursuing a career in the nuclear industry, and consequently a decline in nuclear science and engineering programs at the universities. UNENE was launched as an industry-university alliance to ensure that the Canadian nuclear industry would continue to have a dependable supply of highly qualified and skilled professionals to meet its current obligations and emerging challenges. To this end, the nuclear industry is investing significant funds in selected universities and is contributing in-kind to enable the universities to acquire and retain the highest quality of teaching and research professoriate. The industry is also assisting the universities in developing relevant research programs, attracting bright students, educating and training them to pursue safe and efficient use of nuclear technology. The universities secure additional funds from the Natural Science and Engineering Research Council (NSERC) of Canada, and elsewhere, to match investments made by the nuclear industry. AECL is a voting member of UNENE and contributes funds along with other major contributors, including Ontario Power Generation (OPG) and Bruce Power (BP). AECL R&D plays a key role in UNENE's Research Advisory Committee that decides on the research projects and research chairs. UNENE has so far funded ten collaborative research projects and seven industrial research chairs in eight different universities.

NRC Canadian Neutron Beam Centre (CNBC): Following Program Review when other science programs were discontinued at CRL, the neutron scattering laboratory was instead transferred to NRC. The laboratory was not primarily an AECL activity but instead was operated as a national science facility that was used by a wide community of academic and industrial researchers. That community had a continued need for access to the neutron scattering facilities that are unique in Canada.

During 2008 (a typical year) the NRU reactor operated for 305 days and during 88% of this time, the CNBC neutron beam instruments were occupied by the projects of users who came from Canadian universities, foreign institutions, government laboratories or industry. The remaining 12% of beam time was occupied by NRC-driven projects to develop innovative neutron scattering methods, novel applications to new areas of science, or to contribute to research at the cutting edge of condensed matter science. In all, 118 experiments were completed, nine of which were associated with three fee-for-service projects for industry clients. The projects involved 146 individual researchers, and supported research from 29 university departments spread among 16 universities in six Canadian provinces (British Columbia, Alberta, Manitoba, Nova Scotia, Ontario and Quebec). About 17% of beam time was occupied by research projects of foreign institutions in 11 countries (Armenia, Belgium, France, Germany, Italy, the Netherlands, Russia, South Korea, Switzerland, the United Kingdom and the United States). There

were 44 students, post-doctoral fellows and research associates who accessed the NRC-CNBC for purposes of research and education.

Deep River Science Academy: Deep River Science Academy (DRSA) founded in 1986 as a not-for-profit organization, provides six-week intensive hands-on R&D experience for promising high school students. DRSA receives its funding from federal and provincial government agencies and AECL. Typically 22 teams, each consisting of two high school students and a university student tutor, work independently on a research project, under general guidance from an AECL scientist during the summer months and present their findings at the graduation seminar. This provides an opportunity for both the high school and the university students to "test drive" a career in science research. AECL supports DRSA by providing funding, access to its laboratories, and making its staff available to work with the DRSA students. DRSA has graduated more than 1100 high-school alumni while hundreds of university students have had high-quality summer jobs as tutors. In 2007, the CNS recognized the accomplishments of the DRSA with an Outstanding Achievement Award and provides ongoing support to the programme.

Nuclear Ontario Research Network: This is a research network led by McMaster University, aimed at developing research facilities and capabilities for current generation of nuclear technology and for the innovative next generation technologies, such as advanced fuel cycles and advanced reactor systems. The network involves six Ontario universities (McMaster, Western Ontario, UOIT, Queen's, Carleton and Royal Military College) and is being funded by the Ontario Ministry of Research and Innovation. The Ontario government funding matches the industrial contribution to create nuclear research facilities at the Ontario universities. AECL views this important initiative as essential to the continued strength of this important industrial sector. To demonstrate this commitment, AECL is contributing funds (~$1M over 5 years) and in-kind support for projects at Carleton and McMaster. AECL is actively involved in defining the projects, providing expert advice on research direction and experimental facilities, and reviewing the progress.

Centre for Advanced Nuclear Systems (CANS): AECL supported the multi-university capital grants application for creating a major nuclear research infrastructure at McMaster University. The CANS initiative includes 10 professors from various universities and up to 20 potential industrial and academic users. This regional centre will include CNSC-licensed shielded facilities (cost ~$23M) at McMaster University for testing of irradiated materials and will be the only other such facility outside of the Chalk River Laboratories (CRL) and will complement facilities at CRL (i.e. the McMaster facilities cannot handle the highly radioactive materials handled in AECL facilities). AECL supported this initiative recognizing the need to create complementary capabilities outside of CRL for training highly qualified personnel.

3c General nuclear reactor development and research

Gen IV: One of the most important of these is the Gen IV National Program. This program has been established by NRCan to support R&D to fulfill Canada's Generation IV International Forum (GIF) Treaty commitments. The program focuses on R&D related

to two of the six Gen-IV nuclear reactor concepts that Canada has signed on (namely the supercritical water-cooled reactor (SCWR) and very high temperature reactor (VHTR)). AECL represents Canada on GIF System Steering Committees, Working Groups and Project Management Boards and contributes in-kind to the program. Projects from this program have been allocated to federal laboratories (collaborating with AECL) and AECL. Federal laboratories participating in the program include the following:

- NRCan Materials Technology Lab (MTL) located in Hamilton
- NRCan Innovation and Energy Technology Sector (IETS) located in Bells Corners
- NRC Institute for Aerospace Research (IAR) located in Ottawa
- NRC Institute for Fuel Cell Innovation (IFCI) located in Vancouver

A trilateral NSERC/NRCan/AECL program was established both to leverage the existing expertise available in the Canadian universities and to develop the capabilities for Generation IV R&D in Canadian universities. It is a three-year program with a total funding of $2M/year from NRCan and NSERC. AECL, as an industrial sponsor, does not contribute cash but provides in-kind support. AECL plays a role of national leadership and ensures that the proposed projects are relevant to the CANDU® SCWR development; assists universities in identifying suitable projects and evaluates the progress for NSERC. Universities all across Canada were encouraged to participate in the program, with a view of developing expertise in the universities outside the nuclear provinces (Ontario, Quebec and New Brunswick). Twenty universities from eight provinces are currently participating in this program. This is yet another initiative where AECL R&D is actively supporting and promoting nuclear research capabilities at the universities.

Universities: AECL is collaborating with a large number of Canadian universities directly, and through various programs (such as the Gen-IV National Program, UNENE, COG and NSERC program). The focus of these collaborations is to establish nuclear research capabilities at the Canadian Universities to complement AECL's R&D capabilities, to build or enhance university infrastructure to support nuclear research, and to train highly qualified personnel. The following figure illustrates the number of university collaborative projects with various collaborating partners at each technology area. Currently, there are over 45 collaborations with 26 universities in Canada and over 20 collaborations are being planned for the future. These collaborations leverages AECL's investment in university R&D several folds (5 to 6 times) and benefits the academic community.

Other laboratories and institutes: AECL works with and supports a number of laboratories and institutes across Canada, some on a case-by-case basis: e.g. Kinectrics (previously Ontario Power Generation's research institute), Stern Laboratories in Hamilton, and L'Institut de recherchée d'Hydro-Québec (IREQ), Hydro Québec's research institute. AECL works with other institutes, like the Centre for Nuclear Energy Research (CNER) in New Brunswick, on a more strategic basis. CNER is a not-for-profit research and corrosion monitoring company located at the University of New Brunswick (UNB), Fredericton campus. AECL is a collaborator in the CNER along with UNB, New

Brunswick Power (NB Power), CANDU Owners Group (COG), Atlantic Nuclear Services Technologies (ANS Technologies) and the New Brunswick Research and Productivity Council (RPC). CNER has equipment and facilities to carry out research and development in various areas of chemistry, material science and chemical engineering, including radiation chemistry, corrosion science, and automated chemical monitoring. The CNER collaboration led to successful implementation of AECL's distributed control system for a CANDU® reactor located in China.

3d CANDU-specific research and development

CANDU Owners Group: The CANDU Owners Group (COG) is an affiliation of CANDU Nuclear Power Plant Operators and the original CANDU designer AECL. COG provides a framework for co-operation, mutual assistance and exchange of information for the successful support, development, operation, maintenance and economics of CANDU technology. COG has four main programs, namely, Research and Development, Joint Projects and Services, Regulatory Affairs and Information Exchange. AECL, as a member of COG, participates in all four programs and provides the funding as required by the membership agreement. AECL is also a major supplier of services to COG through a General Services Agreement. R&D is the largest COG program and a major source of revenue for AECL, followed by the Joint Projects and Services. The work in the Joint Projects area is growing, as the plant owners are looking for solutions to address specific plant aging issues using AECL R&D expertise and facilities. For example, the Fuel Channel Life Management Project is a 4-year, ~$32M, joint project addressing the fuel channel integrity issue as the fuel channels approach the end of design life.

In summary then, AECL is party to a wide range of agreements, programmes and projects, both domestic and international. These agreements affect Canadian government departments and other institutions across Canada. Central to meeting obligations in all of them is the availability of a large research reactor with the capabilities of the NRU and the highly educated, trained and skilled laboratory personnel that accompany it. Over the longer term, CRL will slowly lose all of the research personnel instrumental in carrying them out.

4 Operating and Financial Structures

The nuclear industry is typical of other large, advanced technology industries insofar as it requires a large research and development component. Similar to it are defence, aerospace, and space. In total, these four industries have more than 1500 companies dependent upon their activity.

Industry	Companies	Workforce	Annual Revenues
Aerospace	400	80,000	$23 billion
Defence	800	90,000	$10 billion
Nuclear	200	71,000	$6.6 billion
Space	150	10,000	$3 billion

In total, these industries can normally be expected to produce revenues within Canada and around the world of about $10 trillion over the next two decades.

Research requires infrastructure, and the the case of the Canadian nuclear industry, that infrastructure is the NRU at CRL. As outlined above, the NRU carries out its research mission through hundreds of programs and agreements, large and small.

The funding for NRU and CRL comes primarily from the federal government. For 2010-11, this totaled $494 million. Of this amount, $102 million is the Base Allocation, with the remainder being primarily specific program grants for specific projects. These projects include long term management of legacy wastes, decommissioning of obsolete structures within CRL, and funding to ensure isotope production and supply to 2016. It should be noted that the Base Allocation is used to cover all of the research and techology programms noted above. It should further be observed that this Base Allocation has diminished by more than half since 1990-91 in constant dollars.

Beyond direct grants from the federal government, CRL also receives commercial revenues for its work. These have three main sources:

- Provision of isotopes to Nordion;
- Contracted research by COG; and
- Pressure tube life extension research program by Ontario Power Generation (OPG) and Bruce Power, funded through COG.

With respect to personnel at CRL, the total workforce since 2001 has increased from 1,900 to 2,900. However, Operations and Decommissioning and Waste Management increased over the same period from 1300 to 2300, while the Research component at CRL has declined from 660 to 550.

In short, the employment and financial characteristics of CRL show that during the past decade the productive end of the laboratories has been shrinking in both personnel and in financial support, while the only growth has been in waste and decommissioning, and in meeting enhanced regulatory requirements and performance.

5 Medical radio-isotope supply

The NRU produces about 85% of Canada's requirement for medical radioisotopes at this time. It has been in the past the world's principal supplier of these materials. The only other such sources around the world are from research reactors similar to the NRU. These are the Dutch reactor HFR and the French reactor OSIRIS.

The Government of Canada indicated in 2008 that it was exiting from the requirement to produce these isotopes. In recent years, all of the above-mentioned reactors have been affected by occasionally lengthy shutdowns for maintenace or repair.

Nordion has indicated it was seeking new sources of supply. Other institutions including university research reactors have indicated an interest in filling in the gap provided by the

withdrawal of NRU from its supply mandate. However there are two clear difficulties with this approach.

The first difficulty is that these new methods of supply require the construction of new facilities for handling and processing the material. It is entirely uncertain that these facilities will be available by 2016 when the withdrawal of NRU from its supply mission takes effect.

The second difficulty is that many of the radioisotopes require very high neutron flux fields to produce them. It is entirely unclear that any of the proposed alternative sources of supply can actually produce the needed materials in both the commercial quantity and the quality required.

There is thus a clear risk that the withdrawal of the NRU could create a supply crisis if the alternative sources fail to appear over the next five years. One inevitable consequence of this would be public demands upon the Government of Canada to solve the domestic supply problem. It should be noted that such a demand cannot be readily referred elsewhere, as nuclear technology is the exclusive responsibility of the federal government.

6 Future of CANDU reactors

Canada has sold eight CANDU reactors to other nations over the past 20 years. These include four to South Korea, two to Romania, and two to China. It should be noted that all of these sales have generated at least $50 billion in revenues to the Government of Canada and to Canadian manufacturers and service companies. These sales have generated further revenues to the Government of Canada where it has made provision for financing these overseas sales through loans or loan guarantees by Export Development Canada.

Today the prospect exists of further sales of CANDU reactors overseas with the expected return in revenues. Indeed one such sale agreement has been delayed over the past few years, pending the Government of Canada's restructuring of AECL. All of these sales agreements will require a research and technology component to provide support, just as the previous ones did.

That science component cannot be provided in the absence of the NRU. Should it withdraw from service starting in 2016, there is no significant possibility of future sales of CANDU reactors anywhere.

Similar considerations apply domestically as well. Canada has at this time 20 commissioned nuclear power reactors. All of these reactors have undergone or are expected to undergo life extension programs. This will be greatly handicapped over the next 20 years if the NRU and its research capabilities are not available. Ontario will be the province most greatly affected by this. Over the long term, Ontario is expecting eight reactors at Bruce and four reactors at Darlington to continue in service for at least the

next two decades. The refurbishment of these reactors represents the lowest cost source of base load power for nearly 50 per cent of the province's electricity supply.

Ontario is also expecting to build new nuclear reactors in Ontario. The CNS expects that these new reactors will be CANDU 6 reactors. And based upon the Ontario Government's statements, the CNS expects that these new reactors will be built at the Darlington site.

If the NRU starts closure in 2016, these projects in Ontario will not take place. Ontario will have little choice but to turn to offshore suppliers to meet its needs or to burn fossil fuels. Having no fossil fuels of its own, this will only serve to increase dependence upon out of province sources of either fuel or technology. It will in fact be a double loss for the province, since most of the CANDU research and manufacturing technology is located in Ontario, and it will be lost as well.

In short, the CNS is of the view that the closure of the NRU will inevitably lead to the loss of most of Canada's nuclear manufacturing and service capability.

7 Prospects for future operation

The NRU reactor has operated successfully for 55 years. During that time, essentially every component has been replaced at least once. This includes the reactor vessel itself. In 2009, CRL demonstrated how the internals of the reactor could be repaired by robotic method, for example.

It should be clearly understood that there is no technical reason that requires a closure of NRU. The entire reactor can be replaced, and for all practical purposes it can be available for the foreseeable future. And unlike many research reactors around the world, the configuration of the NRU allows it to undertake any required project involving neutrons. The NRU is capable of duplicating conditions within nuclear power reactors, whereas most university research reactors cannot. Thus the NRU is not only capable of answering the nuclear science and technology questions we have today, it is also most likely to be capable of anwering the questions of tomorrow with which we have not yet been confronted.

However, once the NRU enters a path to closure, an irrevocable step has been taken. Once shut down, it is far more difficult to restart it at some future time. The longer a reactor is closed, the more difficult and expensive is the restart process.

In short, the CNS believes that just as the NRU has operated successfully for 55 years, so too there are no signficant technical reasons that it cannot continue to operate for many years to come. By continuing to operate into the future, the NRU avoids the need for the future design and construction of another nuclear research reactor. It should be noted that at various times AECL has developed new designs for research reactors over the past 10 to 20 years. It should be observed that by and large all of these designs would have

resulted in a research reactor smaller and less capable than the NRU and much more expensive than continued operation and maintenance of the NRU.

8 Future business and financial models

To the present day, CRL and the NRU reactor have been the sole responsibility of the Government of Canada for both the operation of the laboratories and for their provisioning. With the issuance of its Request, the government has indicated an interest in acquiring partners interested in the future of CRL and of the NRU. It has indicated an interest in acquiring new sources of funding and activities for these facilities.

There are a number of models that could be used with respect to CRL. The first is a joint agreement between the Government of Canada and the directly affected provinces, in particular, Ontario. It should be observed that this model has been used before for nuclear science and technology.

8a Federal-Provincial Partnership

The first full scale power reactors in Canada were Ontario Hydro's Pickering Units 1 and 2. The governments of Canada and Ontario entered into a risk-sharing agreement with these reactors. In essence, there was a cost and revenue guarantee.

A second such federal-provincial agreement came with the Canadian fusion research program in the early 1980s. Canada and the provinces of Quebec and Ontario agreed to split the research and development costs of the program, with the federal government providing half the funding, and the provinces one-quarter each. The funds were largely used in Quebec at the Tokamak de Varennes and in Ontario at the Canadian Fusion Fuels Technology Project (CFFTP).

It should be observed that all of these projects worked well for all of the parties involved. There was a mutual sharing of both risks and benefits.

8b Private Contract Management

A second management model for CRL and NRU could be that used for nuclear laboratories in the United States. In essence, a private company is recruited to manage and operate the facility. The operation of the facility is specified in the contract terms and conditions. These can include penalties for performance failures and bonuses for performance success beyond what is required. In the case of CRL, for example, an operating company would find rewards in finding efficiencies in operations and in lower cost methods of maintaining and operating the NRU reactor. It should be noted that under this model the actual research and much of the development is funded by the US Department of Energy (DOE).

This method has had some success in the United States. While a few management organizations have had difficulties, such as that of the University of California with Lawrence Livermore Laboratories during the 2000s, others have had great success. Former British Nuclear Fuels (BNFL) had considerable success in projects related to the

cleanup of wastes at Hanford Reservation from the US strategic nuclear materials programme.

8c Shared Responsibilities

A third method of managing CRL could be a full partnership between the Government of Canada and a private entity. In return for operating and maintaning the facility, the private operator would be free to seek new commercial research and development projects and receive the revenues from such. The agreement with the Government of Canada would specify from which partner operating funds and development capital are received and to which partner the revenues would accrue. For example, if a private entity invests capital to continue operation of the NRU, it could be entitled to the revenue stream from any new activity that such operation allows.

Canada does not have experience with this form of public-private joint activity in the nuclear industry. As such, there are a number of caveats that should apply here. The first is that the private entity should have considerable experience in nuclear fields of activity. These should include management and operation of nuclear facilities, financing or construction of nuclear facilities, and access to capital. The private entity should also have an expectation of long continued operation from its future commercial or business activities not related to CRL or the NRU. The private entity should also be of sufficiently large size that operation of the NRU does not constitute a large burden.

9 Closing Observations

The CNS accepts that any or all of these methods of future operation can work. Within each of these models, provision can readily be made for maintaining and enhancing the important research and development functions of CRL and the NRU while sharing both risks and benefits among a wide variety of partners.

What the Government of Canada does not have is the luxury of time. In 2014, AECL must indicate to the CNSC what the future of the NRU is to be. Two years is very little time to put in place such a new structure. What the CNS recommends is that the Government of Canada commence the process of seeking new partners for CRL while ensuring that the NRU will continue in operation. Should the NRU start on a closure path, the Government of Canada will find itself holding a deteriorating asset with a disappearing research and technology base. Such an outcome will benefit neither the nuclear industry nor the Government of Canada. As outlined earlier, such a path results in the collapse of a large number of federal government policies and capabilities.