

Remarks by Christopher Heysel, Director of Nuclear Operation and Facilities, McMaster University, to the House of Commons Standing Committee on Natural Resources

Good morning Mr. Chairman and Members of the Committee,

My name is Chris Heysel, and I'm the Director of Nuclear Operation and Facilities at McMaster University. Prior to coming to McMaster, I spent 14 years working at the National Research Universal reactor or NRU at Chalk River and served as the Engineering Manager for the facility before coming to the University. McMaster is a mid-sized, research-intensive, university, located in Hamilton, Ontario. It is home to an extensive array of nuclear research facilities, including the McMaster Nuclear Reactor, a 5 MW research reactor. Once NRU is permanently shut down in March, 2018, McMaster's Nuclear Reactor will be the most powerful research reactor in Canada.

Nuclear research reactors are important because they produce neutrons. Neutrons are important because are used by hundreds of Canadian researchers to solve research problems in all five of Canada's Science and Technology Priority areas.

Neutrons are used in Environmental and Agricultural research to improve Canadians' understanding of plant nutrition as we work toward global food security in an era of climate change. They are used to analyze the flow of pollutants in our ecosystems, and to understand the impacts of these pollutants on Canada's lakes, streams, and aquatic life. Researchers are also using neutrons to examine how radiation exposure affects organisms at the cellular level.

In the Natural Resources and Energy sectors, neutrons are used to identify deposits of resources including gold and uranium; they are used to determine the composition and geological age of Canada's landmasses. In fact, tens of thousands of assays are conducted at McMaster's nuclear reactor every year in support of Canada's mining industry. Neutrons are used to create the nuclear gauges used in the oil and gas sector to characterize underground wells and pipes, and to detect leaks. Emerging Small Modular Reactor technologies have tremendous potential to power resource extraction equipment at remote sites, and provide energy for remote communities in Northern Canada.

In the Health and Life Sciences sector, Canada has a long and proud history of using neutron-based medical isotopes to diagnose and treat disease. Research into new medical isotopes and new pharmaceuticals using these medical isotopes is ongoing throughout Canada. Researchers at McMaster are also developing neutron based techniques for diagnosing heavy metal poisoning in occupationally exposed workers.

Neutrons are especially important for research into materials science because they penetrate deep inside materials and provide information about interior structures at the atomic level. This is important for developing Advanced Materials for clean energy technologies, high efficiency engines, and Information Technology hardware. Neutrons are routinely used to detect flaws in parts for the aerospace industry to ensure the safety of Canada's air transportation industry. Researchers are also examining the effects of cosmic radiation on aerospace components toward designing the next generation of satellites, space telescopes, and interplanetary space probes.

Neutrons are important. Nuclear research reactors are important. Maintaining Canada's small fleet of nuclear research reactors – which includes several SLOWPOKE reactors and the higher power McMaster Nuclear Reactor – is critically important, especially post-2018. Without research reactors to serve as sources of neutrons, none of this research can be done.

The McMaster Nuclear Reactor also plays an important role in education, especially through our outreach program. Thousands of high school students, science camp participants, and everyday Canadians visit McMaster's Nuclear Reactor every year to learn about nuclear energy and nuclear research in Canada.

McMaster has an extensive suite of nuclear facilities that complement its research reactor, including a nuclear laboratory facility, and a new cyclotron facility that produces the medical isotope fluorine-18 for cancer diagnosis. Our new post irradiation examination facility allows researchers to safely handle and test highly radioactive materials, such as components from Canada's power reactors. This enables scientists to ensure the safety of Canada's existing nuclear fleet, while developing appropriate materials for use in next-generation technologies.

This expansive suite of nuclear infrastructure and equipment has earned McMaster the title of "Canada's Nuclear University".

Speaking more specifically to the questions posed by the Committee:

The main challenge facing nuclear energy development in Canada today is the impending closure of the NRU reactor, with no clear plan to relocate the vital research being done at this facility. The McMaster Nuclear Reactor is the only facility in Canada capable of supporting this work. While we are working toward expanding our capacity to accommodate researchers from the NRU, we cannot do so without support.

The McMaster Nuclear Reactor is the only self-funded research reactor in the world: it is not directly funded by the University, or by any level of government. We attempted to secure funding to expand our research capacity through the Canadian Foundation for Innovation's Major Science Initiatives program. However, the MSI committee ruled that it was not able to consider our application, on the grounds that neutron based research activities remain a responsibility of the Federal government.

The future of nuclear research and development and technology in Canada is very precarious. When the NRU closes, a community of approximately 250 Canadian neutron beam researchers will be displaced. These scientists may relocate to foreign countries to access neutron sources, or change their research areas entirely. The Canadian industries that rely on this research, including advanced manufacturing and medical sciences, are also in jeopardy. We at the McMaster Nuclear Reactor are working to increase our capacity to support Canada's neutron source researchers and technologies, and to minimize the impact of the closing of the NRU.

Canada is among the world's leading nations in nuclear research, as described earlier. Canada is also a world leader in the production of medical isotopes. The NRU reactor currently supplies more than half a dozen different medical isotopes to the world. McMaster University's nuclear reactor is the world's biggest supplier of the medical isotope Iodine-125, which is used to treat prostate cancer. Our staff are proud to produce cancer treatments for "200 dads a day!"

The McMaster Nuclear Reactor's research and development team works with researchers from across Canada to develop new medical isotopes and technologies. We are also developing our capacity to produce many of the medical isotopes now produced at the NRU.

In conclusion, Canada is facing a massive disruption of its neutron-based research in 2018. The McMaster Nuclear Reactor already plays a large role in Canada's neutron-based research, and that role will only grow going forward, particularly if a reactor core upgrade is explored as a solution to the impending "neutron gap". We are excited to have the opportunity to work with some of Canada's best scientists and engineers as they pursue research that will meet Canada's domestic Science and Technology Priorities, and improve the health, environment, and standard of living, of all Canadians.

Thank you very much for your time and attention.

I would be happy to answer any questions you may have.

Christopher Heysel,
Director of Nuclear Operations and Facilities
McMaster University