Innovation for Health

Innovations in Nuclear Technology Benefiting the Health of People

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I often wonder whether the hardy individuals who built Toronto's tallest office towers, ever thought about what they had built. Did they ever think about the meetings that would take place each and every day? Did they ever consider that the many deals signed in the finished corner offices would perhaps have far-reaching economic implications for the nation? Could they envisage the barrels of coffee that would be consumed each day? Or, do you suppose they remained focused on the immediate task at hand: the design, construction, … the placement of each steel beam, the alignment of the structure?

Being an engineer by training and someone who is responsible for working with AECL on the construction of our two MAPLE reactors and new Processing Facility at Chalk River, I admit to being impressed by the details: the sophistication of the design and complexity of the construction of our new, state-of-the-art facilities. Some truly innovative aspects have been developed and implemented in this project, both in terms of reactor and process system design.

However, I also recognize what we are really building: … a concrete demonstration of our commitment to nuclear medicine. The MAPLE project is innovative technology that will help us deliver innovative applications in health-care and provide a secure supply of essential medical isotopes. We feel proud of what we are doing, and for good reason.

Not too long ago, MDS Nordion was visited by a very special guest who touched our hearts. Emma Robinson is a Canadian rower who won gold at the Pan Am Games and World Championships last summer, and she did so only months after combating thyroid cancer.

Emma is an incredible athlete. She is also someone who never gives up. Emma recently made the Canadian rowing team, which will compete in the Olympic Games in Sydney, Australia in September. We'll be cheering her on in Sydney. The several hundred employees who heard her story also took pride in the fact that the radioisotope iodine-131 helped Emma in her extraordinary effort to battle cancer. Iodine-131 is produced in

the aging NRU reactor at Chalk River and processed at our Kanata facility. It is one of many essential radioisotopes produced at Chalk River. Although NRU has been a reliable producer, concerns about unplanned shutdowns and reactor system upgrades create supply uncertainty. The construction of MAPLE 1 and 2 will give MDS Nordion and the international nuclear medicine community a secure supply of reactor-based radioisotopes.

While I have shared with you the story of one person, there are over 100 medical applications for radioisotopes, such as determining the severity of heart disease and diagnosing brain disorders. The radioisotopes produced at MAPLE 1 and 2 will help save lives, so it is good to step back and reflect on the ultimate use and purpose of what one is building. In our case, MAPLE's output will ultimately help improve the quality of life for others.

Today, I will briefly update you on the progress being made on the MDS Nordion Medical Isotope Reactor Project, which consists of two MAPLE reactors and a processing facility. As well, I will highlight how our company is applying radioisotopes and other technology to advance global health. Finally, I will identify how Canada can retain its pre-eminence in developing nuclear technology and its beneficial applications for the world.

When we contemplate the importance of the MAPLE project, I am both pleased and obliged to acknowledge the tremendous support and leadership that AECL has demonstrated on this project. To ensure a source of supply of radioisotopes for our customers, an ambitious schedule was necessary. AECL had to meet key milestones respecting environmental screening, regulatory approvals, site preparation, procurement, construction, commissioning and acceptance testing. AECL was instrumental in galvanizing the resources and managing the myriad of issues that arise on major projects like this. Significant effort was also expended by the many other contractors. I would, on behalf of MDS Nordion, like to thank them for their effort. And of course the AECB, our Canadian nuclear regulator, is also working diligently to ensure all regulatory requirements are being addressed.

We were extremely pleased when MAPLE 1 achieved its first sustained nuclear reaction at 2:53 a.m. on February 19, 2000. This was a significant milestone in the project and congratulations to all who were part of making it happen. The MAPLE 1 reactor has been achieving all of its performance objectives and has been operating at the 2 kW level; the next step is to increase power to the 500 kW level. Also, initial consideration for the operating license for MAPLE 2 was presented and received favorably at the April 2000 AECB Board meeting. MAPLE 2, a back-up reactor, is expected to be in service by the end of this year. While there have been some delays in construction along the way, as with any large project caught in a changing regulatory environment, work is proceeding apace. Now that the fuel has been loaded, and the MAPLE 1 reactor is operating, we will

proceed with acceptance testing for MAPLE 1 and the new Processing Facility in June 2000. We expect first sample quantities of molybdenum-99 to be available this summer for customer qualification testing.

Later this year, the new Processing Facility will begin routine production when commercial quantities of molybdenum-99, the most widely used and versatile isotope, will be produced and available for our customers. This processing facility will extract the radioisotopes produced in the feedstock material, process the residuals, and prepare the shipment to our Kanata facility.

We look forward to the day when the first commercial radioisotopes are produced. So do our customers. Consider this number: some 50,000 nuclear medicine scans are performed daily around the world. We're responsible for supplying several large pharmaceutical companies with a variety of radioisotopes, which in turn, are distributed to many thousands of hospitals on six continents.

Now that MAPLE 1 has achieved a state of sustained nuclear reaction, I believe that this is a significant day for Canada as well as a tribute to our technological advances.

During all the Millennium hype, I recall reading that Canada at the end of the 20th century should be described as "hewers of wood, drawers of water and riveters of cars." But, as we enter the 21st century, shouldn't Canada also be known as innovators of technology? I believe that will come to be. We must be proud of our achievements and share them with others.

Consider our situation, MDS Nordion is a software developer, a radiopharmaceutical manufacturer and a supplier of healthcare solutions worldwide. In short, because of our technology and its applications, we treat, diagnose and prevent disease. I'll briefly touch on these in turn.

Radiation therapy machines rely on sophisticated software to plan the patient's treatment. For a physician, think of the benefits of seeing a detailed, three-dimensional image of a tumour and being able to rotate and zoom in on the picture. Our software allows physicians to tailor the treatment to a patient's anatomy and ensure the optimal radiation dose. Moreover, Canadian cobalt provides us with the platform to deliver over 15 million radiation treatments every year in over 80 countries.

We've become a producer and manufacturer of innovative radiopharmaceuticals for cancer treatment. Today we are partnering with biotechnology companies to attach radioisotopes to monoclonal antibodies to create a new class of products for radio-immunotherapy. The first commercially available products in this new class will be

Bexxar, a radiopharmaceutical to treat non-Hodgkin's lymphoma. Radiolabelled antibodies for other types of cancer are expected to follow.

MDS Nordion also has a unique product for liver cancer called TheraSphere®. It consists of tiny glass spheres containing yttrium-90 that become lodged in cancerous tissues within the liver. We're also working with a medical devices company to develop an iodine-125 source for brain cancer.

Heart disease is a leading cause of death. We're now applying radioisotopes to cardiology. Radiation can prevent or diminish restenosis, or reclogging of the blood vessels, following an angioplasty, a common procedure that uses a small balloon to inflate an artery in an attempt to open it up. Many times angioplasties fail and the arteries re-clog. Our work here may prevent having another costly angioplasty or subjecting a patient to surgery, a far more dangerous alternative.

We are very excited about these therapies and we are involved in other innovative applications for radioisotopes.

Fighting disease is not only about treatment; it is also about effective diagnosis. We've all heard of x-rays, "CaT" scans [Computed Tomography], and MRI's [Magnetic Resonance Imaging]. Nuclear medicine scans have distinct advantages over all of these. X-rays and other technologies provide static pictures of the body, whereas a nuclear scan provides a dynamic view. A nuclear scan uses a special camera to reveal blood flow and metabolic changes, such as infections. In cancer, metabolic changes happen before anatomic changes. For this reason, a nuclear scan can be much more accurate in detecting a variety of cancers, because malignant cancers have high metabolic rates, which show up as "hot spots" on the scan.

Preventing disease is also key. Canada's nuclear industry is helping to advance health in homes and hospitals around the world. Surely, cobalt-60 is a case in point.

By using cobalt-60 produced by Ontario Power Generation and Quebec Hydro, Canadian technology allows for the sterilization of medical and consumer products. In fact, just over 40% of the world's disposable medical supplies, such as surgeon's gloves, sutures and catheters, are sterilized by gamma irradiation. All together, we have shipped more than 500 million curies of cobalt-60 from CANDU reactors, which equates to approximately 150 reactor-years of cobalt-60 production. As well, cobalt produced at the NRU reactor is used in cancer therapy. This demonstrates the reliance that the world community has on cobalt-60 production from a Canadian technology innovation.

When I reflect on how we are advancing global health, it is clear that we have done so only because of a number of essential prerequisites. We must retain these if we are to continue to help saves lives around the world. I'll outline four of these necessary ingredients.

First, good policy decisions led to getting the right infrastructure in place. Canada' s nuclear reactors at Chalk River have provided us with many radioisotopes for over 40 years. As well, by tapping into the capabilities of CANDU reactors, we were provided with a critical source of cobalt-60. The construction of the MAPLE reactors, which was facilitated by forward-thinking regulatory approval, ensures that Canada can remain a leading supplier of medical radioisotopes to the world.

A second prerequisite is a responsive, effective and balanced regulatory environment. We are an industry tha t is subject to an incredible amount of regulation, and the industry works very hard to find the right balance. However, I believe that working with regulators is a partnership. Together we are able to ensure that we can continue to supply these essential radioisotopes to the healthcare community.

There are areas where more can be done. I am thinking of food irradiation. Last February, regulations allowing for the irradiation of red meat took effect in the United States. U.S. estimates suggest that food poisoning may sicken up to 30% of the American population each year. Incredible! No wonder the Mayo Clinic, the American Medical Association and many others support food irradiation as a solution. Irradiation virtually eliminates all food-borne pathogens such as harmful E.coli, salmonella, listeria bacteria. Moreover, the World Heath Organization embraces irradiation as "safe and wholesome." We remain hopeful that Health Canada will approve food irradiation here in Canada.

A third prerequisite for advancing health is the constant pursuit of innovation. Like many high tech companies, we are "spinning off" new opportunities by tapping into our core capabilities. We have the distinct advantage of processing and handling radioisotopes. We are also developing new therapies or better treatment delivery based on this technology and expertise, as I outlined above. In a competitive pharmaceutical and medical business environment we only have one option: we must continue to innovate.

My fourth prerequisite is having dedicated, creative people. The employees involved in radioisotope production are essential. Curie after curie, they process radioisotopes every day. They are also driving new ideas forward, ideas on new product development, innovative cancer treatment applications, creative ways to use nuclear technology to benefit the lives of people. It is these dedicated people that ensure there is a constant supply of medical isotopes for nuclear medicine applications.

For our part, we have a clear responsibility to nurture a supportive work environment. We're proud of the fact that MDS Nordion received the Healthy Workplace Award from the National Quality Institute last year. We're doing more to enhance training, promote teamwork and ensure that we constantly seek out continuous improvement.

These are the necessary preconditions for retaining this country's leading role in developing nuclear technology and its beneficial applications for the world.

When we step back and look at what we have built, I believe it is an achievement. But, MAPLE is not just a structure dedicated to producing radioisotopes. Emma Robinson reminded us that our day to day production of radioisotopes has an ultimate purpose. We are in business to help beat disease, and to apply innovative technologies to improve peoples' health. People are depending on it.