

TRIUMF – ACCELERATING CANADIAN BUSINESS THROUGH SCIENCE AND INNOVATION

2014 Pre-Budget Consultation

EXECUTIVE SUMMARY

As Canada's national laboratory for particle and nuclear physics, TRIUMF is fundamentally committed to excellence in these fields. TRIUMF acknowledges the Government's continued investment in science, technology, and innovation, and strongly endorses leveraging this expertise to deliver value to Canada. TRIUMF has the experience, skills, and technology to help Canada develop competitive advantages in key sectors and international markets, spur innovation, and address critical challenges, such as shortages in the global supply of medical isotopes.

Aligned with the theme of “increasing the competitiveness of Canadian businesses through research, development, innovation, and commercialization,” as well as addressing national needs in health, education, training, and job creation, TRIUMF seeks the establishment of CAPTURE – Canada's Accelerator Platform To Unleash Research Excellence. Valued at \$68 million over five years, CAPTURE leverages TRIUMF's expertise and innovation in isotope research and development, nuclear medicine, and materials science to strengthen business competitiveness and generate economic and societal benefits for Canada. To seize this opportunity and realize the full value of this investment, the Government of Canada must act quickly and decisively in Budget 2015, as delayed action will compromise Canada's ability to assert ownership of these emerging areas.

TRIUMF would be pleased to present its proposal to the House of Commons Finance Committee at any of the hearings taking place across Canada.

INTRODUCTION TO TRIUMF

TRIUMF – Canada’s national laboratory for particle and nuclear physics – is a particle accelerator facility with a workforce of 350 employees and 150 students and postdoctoral researchers, owned and operated by a consortium of 18 Canadian universities stretching from Victoria to Halifax. Located on the campus of the University of British Columbia, TRIUMF has delivered leading-edge science for over 40 years.

With core operations supported by the Government of Canada and administered through five-year contribution agreements via the National Research Council Canada (NRC), TRIUMF’s research program – which includes particle physics, nuclear physics, nuclear medicine, and materials science – is based on core competencies in accelerator science and associated technologies.

Given the scope and breadth of the laboratory’s technical expertise, TRIUMF plays a critical role in Canada’s scientific ecosystem. The laboratory engages a diverse network of stakeholders, including Canada’s top research universities, funding agencies, and large science and research facilities (e.g., Perimeter Institute, SNOLAB, BC Cancer Agency), all united by a shared commitment to scientific excellence.

TRIUMF is among Canada’s most important scientific assets. A world-class facility, the laboratory is recognized internationally as a hub for global scientific cooperation and for the development of advanced particle accelerator and detector technologies. Recent independent assessments of Canada’s global competitiveness in basic research, such as “The State of Science and Technology, 2012” by the Council of Canadian Academies, name physics and astronomy – with specific mention of particle and nuclear physics – as fields where Canada rivals the best in the world. TRIUMF plays a critical role in building and fulfilling this reputation.

The Government of Canada has identified research excellence as a critical driver for Canadian prosperity. Attracting talent from across Canada and around the world, TRIUMF is renowned for training highly qualified personnel – many who transfer this experience to leading positions in academia, industry, and government. The laboratory also contributes significantly to the Canadian economy. Generating nearly \$1 billion of economic impact over the last decade, TRIUMF works closely with Canadian firms to ensure that, wherever feasible, commercial exploitation of technologies derived from TRIUMF’s basic science program produces economic and societal benefit for Canada.

TRIUMF’s vision is focused on producing high-impact results by combining research excellence with private-sector collaboration. TRIUMF seeks not only to expand Canada’s leadership in particle and nuclear physics, but also to realize high-value opportunities in isotope research, nuclear medicine, and materials science. In this way, TRIUMF will spur Canadian innovation, strengthen the competitiveness of domestic businesses, improve the quality of life for Canadians, and produce economic opportunity for the nation at large.

Canada’s Economic Action Plan 2014 committed \$222 million for TRIUMF over five years. This base funding – which has remained unchanged for 15 years – will support the

laboratory's core operations until 2020, and TRIUMF is grateful for this investment. These resources will enable the laboratory to address pressing needs within Canada's scientific community.

Over the next five years, TRIUMF will begin operating ARIEL, the nation's newest and most sophisticated isotope production facility. ARIEL will greatly expand TRIUMF's capacity, keeping the laboratory on the cutting edge of research excellence and opening a host of new commercialization opportunities. By working strategically with Advanced Applied Physics Solutions (AAPS), the laboratory's commercialization arm, TRIUMF is poised to exploit these opportunities. This paper proposes a platform to fully exploit ARIEL, unleashing economic and societal benefits for Canada and strengthening the international competitiveness of Canadian businesses. The time to act is now.

SEIZING CANADA'S COMPETITIVE ADVANTAGE

TRIUMF has a strong history of collaborating with industrial partners, receiving NSERC Synergy Awards for its work with two Canadian companies, Nordion and D-Pace. More recently, TRIUMF has helped its industrial partners access global value chains and enter new international markets. For instance, TRIUMF transferred accelerator technologies to PAVAC, a Richmond, BC-based manufacturing company, allowing them to successfully compete for business in India and China. TRIUMF is also exploring co-development and applied-research opportunities with large multi-national firms such as Toyota Central R&D Laboratory and MDA. Similarly, Cisco Systems recently partnered with TRIUMF, and recognizing the value of its facilities, invested \$150,000 to upgrade laboratory infrastructure. Broadly speaking, TRIUMF's research is relevant to a number of high-value sectors, including automotive, aerospace, health and life sciences, information communication technology, and resource extraction.

TRIUMF is seeking additional resources to spur innovation and competitiveness through expanded partnerships with the private sector. We propose the establishment of CAPTURE – Canada's Accelerator Platform To Unleash Research Excellence. CAPTURE will leverage TRIUMF's scientific capacity to produce economic and societal benefits for Canada in the areas of isotope research, nuclear medicine, and materials science.

Requiring an investment of \$68 million over five years, CAPTURE aligns with governmental priorities related to business innovation and technology commercialization. CAPTURE will enable Canadian business to secure a global competitive advantage while producing economic and societal benefits. This being said, Canada's window of opportunity will close, and a decision in Budget 2015 is necessary to seize ownership of these areas. Without CAPTURE, Canada will forfeit its advantage and compromise the ability for Canadian partners to thrive in increasingly competitive international markets.

THREE DIMENSIONS, ONE VISION

Although composed of three distinct dimensions (isotope research and development, nuclear medicine, and materials science), CAPTURE is driven by a single vision: growing Canadian prosperity by leveraging TRIUMF-developed innovation to strengthen business competitiveness and generate significant economic and societal benefits for Canada.

1. Isotope Research and Development

CAPTURE will advance isotope research and development by accelerating the pace of scientific discovery, strengthening TRIUMF's human capital and scientific expertise in this field. In addition to bolstering nuclear medicine and materials science, increasing TRIUMF's research capacity will support the development of new technologies with a variety of scientific and industrial applications.

Key Benefits:

- Accelerates the completion and exploitation of ARIEL, TRIUMF's world-leading isotope production facility.
- Creates economic opportunities for Canadian firms through the transfer and commercialization of TRIUMF's cutting-edge accelerator and detector technologies.
- Supports the advanced training of approximately 750 highly qualified personnel over five years in an interdisciplinary research environment.
- Attracts world-class researchers and graduate students to Canada, who will foster Canadian innovation, create highly skilled jobs, and generate economic growth through start-up and spin-off companies.
- Strengthens interest in the STEM (science, technology, engineering and mathematics) fields, and through increased outreach and education, develops Canada's next generation of innovation-driven business, research, and public policy leaders.
- Elevates Canada's standing as a world-leader in subatomic physics and secures participation in the next generation of high-profile international projects.

2. Nuclear Medicine

CAPTURE will unleash TRIUMF's capabilities in the research, development, and application of accelerator-based medical isotopes. Recent shutdowns of the Chalk River reactor have highlighted the fragility of the global supply chain for key medical isotopes. With Chalk River anticipated to cease medical isotope production in 2016, there is growing concern – domestically and internationally – about how this gap will be filled. In partnership with the private sector, TRIUMF-developed technology will ensure that Canada can provide an adequate supply to domestic and international markets, and increase the competitiveness of Canadian firms in this field. Additionally, sustained investment in TRIUMF's nuclear medicine program will position Canada as a world leader in the development of the next-

generation of isotopes and radiopharmaceuticals for the diagnosis and therapeutic treatment of serious illnesses, such as cancer and Parkinson’s disease.

Key Benefits:

- Leverages the formation of the recently announced Institute for Accelerator-based Medical Isotopes (IAMI) to create significant economic opportunities and high-value jobs in Canada, fostering the development of “Isotope Valley” in the BC Lower Mainland.
- Strengthens TRIUMF’s ability to provide national leadership with regard to the potential shortage of medical isotopes, and offers domestic firms “first mover” advantage in positioning Canadian technology as a viable solution to help satisfy global demand for the production of Tc-99m – one of the worlds’ most used medical isotopes.
- Accelerates research and development of new medical isotopes and radiopharmaceuticals for diagnostic imaging and cancer treatment, which will generate, through spin-offs and technology transfer to industry, significant economic and health benefits for Canada.
- Supports the ongoing deployment of proton-based cancer therapy for ocular melanoma at TRIUMF – currently the only site in Canada to offer this treatment.

3. *Materials Science*

CAPTURE will strengthen and expand TRIUMF’s materials research program. It will enable increased collaboration with private-sector partners in probing the structure and properties of new materials, such as those used in microprocessors, batteries, and data storage. This work will put TRIUMF and Canada on the forefront of research and development into game-changing technologies that have promising commercial and economic potential.

Key Benefits:

- Strengthens existing industrial partnerships and creates new strategic opportunities to advance Canada’s materials science capabilities.
- Accelerates the development of next-generation technologies to characterize materials for commercial applications in the aerospace, automotive, energy, and semiconductor industries.
- Creates new opportunities for training highly qualified personnel with industrially relevant skills.

CONCLUSION

TRIUMF is a national resource. CAPTURE will unleash the laboratory's full potential to solve critical problems and improve quality of life for Canadians. Unleashing TRIUMF's untapped capacity will produce tangible outcomes that will drive innovation, improve health and education, and increase the prosperity and competitiveness of Canadian businesses. To fully realize the value of this investment, the Government of Canada must act quickly and decisively in Budget 2015. Should Canada not seize this opportunity, the nation will forfeit a considerable advantage in the areas of isotope research, nuclear medicine, and materials science, and reduce the ability of Canadian businesses to compete in these areas.

RECOMMENDATION

TRIUMF seeks an investment of \$68 million over five years to establish CAPTURE – Canada's Accelerator Platform To Unleash Research Excellence. CAPTURE will leverage TRIUMF's expertise and innovation in isotope research and development, nuclear medicine, and materials science to strengthen business competitiveness and generate significant economic and societal benefits for Canada.