



TRIUMF

Canada's national laboratory for particle and nuclear physics
Laboratoire national canadien pour la recherche en physique nucléaire
et en physique des particules

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Director

How TRIUMF Increases the Competitiveness of Canadian Businesses

Owned and operated by a consortium of 18 Canadian universities stretching from Halifax to Victoria, Vancouver-based TRIUMF is Canada's national laboratory for particle and nuclear physics. With some 500 employees, 150 of whom are students and postdocs, TRIUMF serves as Canada's steward of advanced particle accelerator and detector technologies, as a beacon for Canadian scientific excellence and innovation, and as a platform for Canadian participation in collaborative science projects around the globe.

TRIUMF is globally recognized not only for its science, but also for its strong and successful collaboration with the private sector. Since its construction in the early 1970s, TRIUMF has translated its scientific capabilities into competitive advantages for Canadian industry. Leveraging federal and provincial investments, TRIUMF has supported Canadian business through partnerships, research collaborations, and technology transfer arrangements – all of which have produced significant societal and economic benefits for Canada.

From the laboratory's 36 year relationship with Nordion, producing medical isotopes for the Canadian people, to TRIUMF's decade-long partnership with PAVAC Industries, giving birth to new industrial capabilities for the Canadian economy, TRIUMF's collaborations have strengthened Canada's competitive landscape. In fact, over the last five years, in partnership with Advanced Applied Physics Solutions, its commercialization arm, the laboratory has spun off five commercial ventures, each introducing new and innovative products to the global marketplace. TRIUMF serves the nation in science, medicine and business.

Moving forward into 2015, Canada has a compelling opportunity not only to increase TRIUMF's scientific output, but also to strengthen the laboratory's capability to engage Canadian businesses. TRIUMF's \$100M Advanced Rare Isotope Laboratory (ARIEL) – currently two-thirds complete – will significantly expand the laboratory's capacity for isotope production, keeping the laboratory on the cutting edge of research excellence and creating a host of new opportunities for industrial collaboration and technology commercialization.

TRIUMF's 2014 Pre-Budget Consultation proposal, CAPTURE – Canada's Accelerator Platform To Unlock Research Excellence – requests an additional \$68M in operating funds (over five years) to exploit ARIEL's tremendous potential. CAPTURE will unleash new capabilities that will produce increased scientific, economic, and societal benefits for Canada. Without CAPTURE, TRIUMF will operate at reduced capacity, and the nation will forfeit considerable opportunities in fundamental isotope research, nuclear medicine, and materials science, and compromise the competitiveness of Canadian firms operating in these areas for years to come.



To illustrate TRIUMF's multi-faceted engagement with the private sector, the rest of this briefing profiles TRIUMF's history of collaboration with Canadian business. The following vignettes provide tangible examples of how TRIUMF, through its partnerships and collaborations with business, generates economic impact for Canada.

Advanced Cyclotron Systems Inc.

From its start over 20 years ago, Advanced Cyclotron Systems (ACSI) has grown into the third largest supplier of medical cyclotrons in the world. Headquartered in Richmond, BC, ACSI is a world leader in the design and manufacturing of cyclotron equipment, including PET and SPECT radioisotope production cyclotrons.

ACSI's lineage traces back to EBCO Industries, an affiliated company that helped build TRIUMF's original 500 MeV cyclotron, over 40 years ago. The current ACSI product line derives from technology transferred from TRIUMF in 1989 to develop, promote and sell cyclotrons to the medical community. As a legacy of this collaboration, ACSI's TR line of cyclotrons (TR19, TR24, and TR30) is named in recognition of TRIUMF.

Alternative Radioisotope Technologies for Medical Systems (ARTMS™)

In 2013, Advanced Applied Physics Solutions (AAPS) established ARTMS™ to commercialize TRIUMF's solution to the looming medical isotope supply crisis. ARTMS™ will manufacture and sell targets and accessories to cyclotron manufacturers and operators for the production of essential medical isotopes.

Today, ageing research reactors produce much of the world's supply of Technetium-99m (Tc-99m). The reactors will be expensive to replace, and when they break, they disrupt diagnostic testing for heart disease, bone disease, and cancer in hospitals and medical clinics across Canada. ARTMS™ is developing products and services that empower local hospitals and radiopharmacies to manufacture and supply Tc-99m for Canadian patients using the nation's existing network of medical cyclotrons in hospitals and research facilities.

CRM GeoTomography Technologies Inc.

CRM GeoTomography Technologies (CRM) was established in 2012 to develop and sell a new geophysical mineral exploration technology, one that will enable mining companies to detect, locate and characterize dense ore bodies using state-of-the-art muon detectors created at TRIUMF. With this technology, CRM will deliver 3D insights to geologists, reducing the cost and waste associated with traditional mineral exploration.

CRM is an AAPS spin-off company that is supported by project revenue from mining companies. It is currently based at the TRIUMF site. CRM is, at present, a wholly-owned subsidiary of AAPS.



D-Pace Inc.

Founded in 1995, Dehnel-Particle Accelerator Components and Engineering (D-Pace) provides state-of-the-art engineering products and services to the particle accelerator industry. In 2001, D-Pace began the successful commercialization of TRIUMF-licensed ion source, target, and detector technologies, and now sells them internationally.

With TRIUMF's support, D-Pace has grown into a successful business with a strong international reputation with customers in France, Japan, South Korea, Taiwan, the Netherlands, and the United States. In 2007, the Government of Canada recognized the strong collaboration between TRIUMF and D-Pace by an NSERC Synergy Award.

Frontier Sonde Inc.

Frontier Sonde was established in 2014 to commercialize the technology developed via a collaborative research and development agreement between AAPS and GPN Petroleum Technology. The company is a partially-owned subsidiary of AAPS; it currently operates from the TRIUMF site.

Frontier Sonde will manufacture and sell multi-modality pulsed neutron well logging tools developed for the oil and gas sector. The tools aim to improve yields and reduce environmental impacts associated with energy production.

IKOMED Technologies Inc.

IKOMED Technologies is a Vancouver-based small business that currently employs seven full-time employees. IKOMED has developed “shutter” technology that reduces radiation exposure to patients and medical staff during imaging procedures.

IKOMED was established in 2011 with an initial capital investment from AAPS, since repaid by outside investors. IKOMED has reached agreement with General Electric to include IKOMED technology in its imaging products within the next two years.

Nordion

Founded in 1946, Nordion is a global health sciences company offering over 30 products to over 500 clients in more than 40 countries around the world. TRIUMF has worked closely with Nordion for 36 years; the company's Vancouver operations are located on the TRIUMF campus. This unique collaboration has pioneered the development of a range of medical isotopes, including those used in the treatment of cancer, as well as the imaging of cardiac and neurological disorders.

In 2004, the Government of Canada recognized the TRIUMF-Nordion relationship with an NSERC Synergy Award.



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PAVAC Industries Inc.

PAVAC Industries, based in Richmond, BC, has over 25 years of experience in developing hybrid electron beam technology for industrial applications. TRIUMF and PAVAC have been collaborating since 2004, jointly developing processes to manufacture ultra-sophisticated superconducting accelerator technology. This achievement has created new advanced manufacturing capabilities for Canada, and has established the nation as one of only six in the world with the industrial capability to produce such accelerators.

The TRIUMF-PAVAC partnership has enabled PAVAC to win projects at major laboratories and institutions around the world. It has triggered the rapid growth of the firm, from 6 employees to nearly 60. Reaffirming the importance of TRIUMF's contribution to this success, PAVAC estimates that at least 45% of its sales derive directly from its relationship with the laboratory.

About TRIUMF: TRIUMF is Canada's national laboratory for particle and nuclear physics. Located on the south campus of the University of British Columbia, TRIUMF is owned and operated as a joint venture by a consortium of the following Canadian universities, via a contribution through the National Research Council Canada and building capital funds from the Government of British Columbia: University of Alberta, University of British Columbia, University of Calgary, Carleton University, University of Guelph, University of Manitoba, McGill University, McMaster University, Université de Montréal, University of Northern British Columbia, Queen's University, University of Regina, Saint Mary's University, Simon Fraser University, University of Toronto, University of Victoria, University of Winnipeg, York University.

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