

Written Submission for the Pre-Budget Consultations in Advance of the 2021 Budget

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Recommendation 1: As Canada emerges from the COVID pandemic, and investment is targeted to restart the economy, the federal government should consider substantial and immediate capital investment in the national research facilities in Canada.

Recommendation 2: To facilitate economic recovery and respond effectively to the challenges that Canada will face in the coming years which will require strong scientific knowledge, technical expertise and intellectual strength, the federal government should consider substantial investment in the Canadian national research laboratory network which provide a bedrock for innovation and research.

Canada's big science and leading physics laboratories are a critical part of Canada's scientific and economic infrastructure, able to provide solutions to today's most pressing problems while creating the foundation for future economic growth and resiliency.

With our innovative spirit and our drive to provide solutions to complex problems, Canada's national laboratories are a tremendous asset to the nation. They provide a stable bedrock on which to build the technical, intellectual and inspirational growth of the nation, with the ability to connect to academia, government and industry, and to inspire the next generation of scientists and engineers. When they are brought together, the opportunity is boundless and the potential to propel Canada's prosperity is great.

The SNOLAB facility provides Canada with a world-leading and globally attractive research infrastructure, with a track record in delivering innovative research and technology, and placing Canada in the vanguard of contemporary fundamental sciences research.

SNOLAB is a world-leading international facility for deep underground science, located 2km beneath the surface within the Vale Creighton mine, near Sudbury Ontario, which has already had major impact on fundamental physics research. The initial SNO project sited at Creighton, studying the elusive sub-atomic neutrino particles produced by the Sun, was recognised by the award of the 2015 Nobel Prize in Physics to Dr. Art McDonald (Queen's University), and the 2016 Breakthrough Prize in Fundamental Physics, testament to the ability of the facility to host transformative projects. SNOLAB provides a unique capability and competitive advantage for Canada by providing the quietest radiation environment facility in the world, and being capable of deploying international large-scale experiments for astroparticle physics, subatomic physics and underground science. This capability has attracted a global research base to Canada, with SNOLAB now supporting a user community of over 850 researchers from 130 institutes across 23 countries, with SNOLAB as the preferred location for several new international projects at the \$400M scale.

SNOLAB is operated as a joint venture of five Canadian universities, and is an example of true cooperation between academia, industry and a national research infrastructure for the benefit of Canada and our research community.

SNOLAB provides globally recognized leadership to the international underground research community, as a sought-after collaborator and the location of choice for large scale experiments, providing economic benefit and innovative solutions to Canada and Canadian society.

The SNOLAB facility provides a unique combination of depth and clean room operation, both characteristics that are critical in deep underground research. This combination has allowed SNOLAB to develop an enviable research portfolio that connects Canada to the world, attracting both research experiments and highly qualified people to our site in Northern Ontario. A KPMG study on the economic impact of SNOLAB demonstrates a five to one leverage in economic volume for every dollar of federal government investment, through direct investment in the manufacturing industries and services locally, and in addition highlights the inspirational and intellectual capacity that SNOLAB fosters in Canada. The national community that SNOLAB supports has grown substantially over the last decade and includes a CFREF funded research Institute (the \$63M McDonald Institute at Queen's), a CERC chair and multiple CRC positions at universities, as well as the 120-strong staff at SNOLAB itself. SNOLAB is a success story for Canada, demonstrating government, industry and academia working together for Canada's benefit.

The solutions needed to solve the challenging questions SNOLAB addresses, in contemporary fundamental sub-atomic physics and astrophysical sciences, require innovative and technically challenging solutions. SNOLAB, in combination with its research partners in universities and other research institutes around the world, have developed cutting edge capabilities and research infrastructure, and the intellectual base required to deliver these solutions. The questions that SNOLAB addresses require substantial collaboration on a global level, a collaborative approach that allows SNOLAB to rapidly pivot to address new challenges that arise. This capability to

Canadian national research facilities provide a focal point for technical and intellectual development in Canadian science, connecting Canada to the international research community.

As a network, the Canadian national research facilities provide world-leading infrastructure and capabilities to the Canadian research ecosystem, both academic and industrial. This world-leading infrastructure is backed up by a highly talented and skilled workforce that supports and amplifies the users of these facilities, providing a stable cadre of technically expert staff, a broad interdisciplinary team that allows innovative solutions to be developed, and an environment for fostering and promoting highly qualified personnel and talent. The questions that these facilities address, are often at the edge of knowledge, and provide inspirational and attractive challenges for the next generation of researcher.

The technical and intellectual capability of the Canadian national laboratories allows them to adroitly adapt and pivot to new challenges that may arise. These can be within the natural area of the facility or, through mission driven challenges, through broader societal challenges such as public health and national security. The facilities act as contact points to the international research community, often as nexus points for a particular research field, which allows investment in these facilities to be leveraged on the international arena to multiply impact.

The COVID-19 pandemic has demonstrated the vital role that our national research institutions play in Canada, and the value these institutions offer to all Canadians.

When the threat of COVID-19 became clear, Canada's multidisciplinary "big science" institutions quickly mobilized to contribute our expertise and capabilities to the response. In a far-reaching collaboration, TRIUMF, Canadian Nuclear Laboratories, SNOLAB and the MacDonald Institute joined to become lead partners in an international project that developed a novel, low-cost, ventilator in less than 3 months. The expertise of Canada's scientists was critically important to this initiative, as was our partnership with the federal government. The Government of Canada has ordered 10,000 of these ventilators to be produced by Canadian manufacturers.

Canadian multi-disciplinary research institutions can, and are, helping to create better ventilators, develop vaccines, produce medical isotopes, and discover effective therapeutics, all in an effort to help our country better respond to COVID-19. But this is simply the start of what Canadian scientists and Canadian science facilities can contribute to Canada.

When needed — and most importantly, when working together — the depth and breadth of scientific and engineering excellence within Canada's network of national research facilities can be redeployed to solve some of the most demanding and urgent of problems facing our country and the world. Our laboratories stand ready to be of service to the nation especially when borders are closed, international supply chains are limited, and the country needs to employ its own ingenuity and know-how to weather

a storm. During the pandemic, we have designed much-needed ventilators; in the past, we have mobilized to produce medical isotopes in the face of a global shortage; and tomorrow we stand ready to tackle the next challenge our country will face.

Canada's big science and leading physics laboratories are uniquely positioned to aid in Canada's immediate, medium-range and long-term economic recovery.

Research and big science institutions will undoubtedly play a role in bolstering the recovery of several key Canadian economic sectors, from agri-food and health to transportation, energy, and beyond. From developing clean sources of energy for Canada's northern communities, to pioneering new technologies for monitoring air quality, to creating new therapeutics to treat untreatable cancers, to harnessing the quantum world, Canada's big science facilities stand ready to help power Canada's economic recovery.

As a vehicle for restarting the economy, investment in the large-scale infrastructure of the national research facilities would provide for rapid stimulus of the local and associated economy via capital investment in infrastructure that also has long term benefit to the scientific, research and industrial communities of Canada. This investment would be made through augmentation of existing funding routes through established funding agencies, that have well understood and managed funding processes.

Recommendation 1: *As Canada emerges from the COVID pandemic, and investment is targeted to restart the economy, the federal government should consider substantial and immediate capital investment in the infrastructure of the national research facilities in Canada.*

Not only can science fuel Canada's rebound, it can also act as a springboard for sustained economic growth. A key element is the important role we play in the training and development of world-class talent. Our national research institutes allow Canada to compete internationally, enabling Canadian researchers to make major contributions to some of the world's most challenging problems – both at home and abroad. With this unique capacity, our research institutions play a critical role in ensuring Canada has the experts and innovators it needs to thrive in the increasingly competitive global knowledge economy.

The competitiveness of Canada's economy critically depends on its investment and support of research, including discovery-driven fundamental research. Fundamental research is critical for Canada to develop the technologies that are transformative, the so-called "disruptive technologies" which will ensure the global competitiveness of our economy and secure prosperity and safety of current and coming generations of Canadians.

Recommendation 2: *To facilitate economic recovery and respond effectively to the challenges that Canada will face in the coming years which will require strong scientific knowledge, technical expertise and intellectual strength, the federal government should consider substantial investment in the Canadian national research laboratory network which provide a bedrock for innovation and research.*