

# 2021–22 Departmental Results Report

## **National Research Council Canada**

The Honourable François-Philippe  
Champagne, P.C., M.P.  
Minister of Innovation, Science and Industry



National Research  
Council Canada

Conseil national de  
recherches Canada

**Canada**<sup>ca</sup>

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## Table of contents

From the Minister .....	1
From the President .....	3
Results at a glance .....	5
Results: what we achieved .....	7
Core responsibility: Science and Innovation .....	7
Internal services .....	25
Spending and human resources.....	29
Spending .....	29
Human resources .....	31
Expenditures by vote .....	31
Government of Canada spending and activities .....	31
Financial statements and financial statements highlights .....	32
Corporate information .....	35
Organizational profile .....	35
Raison d'être, mandate and role: who we are and what we do.....	35
Operating context .....	35
Reporting framework.....	36
Supporting information on the program inventory .....	37
Supplementary information tables.....	37
Federal tax expenditures .....	37
Organizational contact information .....	37
Appendix: definitions .....	38
Endnotes.....	43

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## From the Minister

It is my pleasure to present the 2021–22 Departmental Results Report for the National Research Council of Canada (NRC).

Over the past year, the various organizations in the Innovation, Science and Economic Development (ISED) Portfolio have worked hard together to make Canada a global innovation leader and build an economy that works for everyone.

The NRC is uniquely positioned to advance research and innovation by applying leading-edge technologies and working collaboratively with partners to find solutions to Canada's current and future economic, social and environmental challenges and opportunities. While continuing research in key areas such as clean and sustainable technology solutions, artificial intelligence, quantum, and digital technologies, and supporting the government's ongoing response to the COVID-19 pandemic, the NRC achieved many milestones in 2021–22, including completing the construction of the new Biologics Manufacturing Centre in record time, launching new Challenge programs, publishing national building codes, and opening labs for advanced manufacturing and materials discovery.

I invite you to read this report to learn more about how the NRC, like ISED and its Portfolio partners, is working with and for Canadians to position Canada as a leader in the global economy.



The Honourable François-Philippe Champagne  
Minister of Innovation, Science and Industry  
[Minister of Innovation, Science and Industry Mandate Letter<sup>1</sup>](#)



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## From the President

The National Research Council of Canada (NRC) has dedicated more than 100 years to delivering scientific excellence, support for industry innovation, and collaborative platforms to achieve shared outcomes. As Canada evolves and new priorities emerge, the NRC consistently rises to the challenge – responding to the most pressing needs of Canadians today, while preparing to address the critical issues of tomorrow.

I am pleased to be back leading the NRC as we wrap up a productive year with many accomplishments, including:

**Taking effective action on climate change:** The NRC had many firsts in clean energy research and sustainable aviation, such as the first demonstration of switching from diesel to biogas generated from food waste to produce clean energy, the first flight test of a fully hybrid electric powered aircraft, and the first successful high pressure combustion testing for turbine engines using hydrogen fuel. We also opened a one-of-a-kind hybrid test facility in Ottawa to advance low-carbon aviation technology, and launched several programs in clean transportation, including the Low-emission Aviation program to help the Canadian aviation sector transition to low-carbon solutions. We advanced research in carbon neutral construction and resilient infrastructure through important work including publishing the National Building Code of Canada and National Energy Code of Canada to help make buildings and homes more energy efficient. We also supported Canadian small and medium sized enterprises (SMEs) in the development and implementation of over 400 clean technology projects.

**Developing health care solutions for the future:** Construction of the NRC’s new Biologics Manufacturing Centre in Montréal was completed, ahead of schedule, in only 10 months adding crucial domestic biomanufacturing capacity in Canada. In addition, we advanced COVID-19 vaccines with firms such as VBI, initiated the technology transfer of Novavax’s COVID-19 vaccine, established a network of testing laboratories for personal protective equipment, and provided support to innovative firms developing COVID-19 solutions.

**Supporting industry innovation and growth:** The National Research Council of Canada Industrial Research Assistance Program (NRC IRAP) continued to enhance its funding and advisory support to Canadian businesses, by expanding the Large Value Contribution (LVC) pilot program, funding 14 new projects including one with over \$3 million in funding. The NRC completed construction of its new advanced manufacturing research facility in Winnipeg, which will provide manufacturers with the latest technologies, such as machine learning, digital twinning, and sustainable food packaging. We also opened our labs in the new advanced materials research facility in Mississauga, which will help to accelerate the discovery of new catalyst materials and commercialize new disruptive products.



**Collaborating to overcome national challenges:** We formally launched three new Challenge programs in 2021–22: Aging in Place; Internet of Things: Quantum Sensors; and Arctic and Northern. These programs focus on key societal issues including improving the quality of life of Canada’s aging population, increasing Canada’s quantum capacity, and addressing pressing issues for Northern peoples and communities.

**Creating a workforce that represents Canada’s diversity:** We made several important strides as an organization to create a more equitable, inclusive and anti-racist workforce and workplace, including renewing the NRC’s commitment on anti-racism, developing a new three-year Workforce and Workplace Equity, Diversity and Inclusion Strategy, removing barriers to equitable access and participation, and increasing diverse representation across the NRC.

To achieve significant results in advancing knowledge, supporting government policy mandates, and supporting business innovation in 2021–22, the NRC:

- Generated 1,187 peer-reviewed publications, filed 270 new patent applications, and maintained a portfolio of 1,855 active patents (issued or pending);
- Labs worked with 1,035 R&D clients, of which 93 percent reported that the NRC helped them achieve positive results, such as increased jobs, sales and R&D capacity; and
- Worked with over 9,000 firms through NRC IRAP, and supported 32 percent revenue growth and 18 percent employee growth for NRC IRAP-funded clients (from 2018 to 2020).

Through these and many other achievements, we and our partners responded to the challenges Canadians and the world faced last year, many of which are challenges we continue to face today, and in doing so, enhanced the lives of Canadians from coast to coast to coast. I am very proud of the level of dedication and excellence everyone in our organization brought to their work during a challenging but productive year, and continues to bring for the benefit of our country.

Iain Stewart  
President  
National Research Council Canada  
[Mandate Letter for the NRC President](#)<sup>ii</sup>

## Results at a glance

What funds were used? (2021–22 Actual spending)	Who was involved? (2021–22 Actual full-time equivalents)
\$1,436,309,314	4,285.9

The NRC uses its network of researchers and facilities, and its national funding program for industrial innovation to advance knowledge, apply leading-edge technologies, and work with other innovators to find disruptive, relevant and sustainable solutions to Canada's economic, social and environmental challenges.

In 2021–22, the NRC continued to advance its strategic areas of focus to deliver results to Canadians and support the Canadian science, technology and innovation ecosystem.

### Scientific and technological knowledge advances

Demonstrating continued excellence in science and technology advancement plays a key role in maintaining the NRC's status as a leading research and development (R&D) organization. The NRC's R&D activities in 2021–22 continued to move the needle on some of the country's most important priorities, including climate action, digital transformation, manufacturing innovation, quantum capacity, and astronomical leadership. Advancements were made in alternative energy and fuels, sustainable transportation, and clean oceans and coasts, bringing the country closer to a healthy, safe, more resilient future. NRC expertise in digital technologies, artificial intelligence (AI), data analytics, machine learning, and nanotechnology helped lay the groundwork for progress in advanced manufacturing, innovative technologies for industrial applications, and increased cyber security.

### Innovative businesses grow

The NRC's network of research and technical services, and its national funding program, NRC IRAP help Canada's small and medium sized enterprises (SMEs) increase capacity, take ideas to market and grow globally. In 2021–22, NRC IRAP worked with over 9,000 firms, continued to sponsor and fund Canadian SMEs solving COVID-related challenges through Innovative Solutions Canada; provided support for the placement of graduates in ground-breaking Canadian companies; and advanced SME access to sustainable international partnerships, new markets, and Global Value Chains through initiatives such as the Canadian International Innovation Program and Eureka. The NRC also supported many Canadian businesses with R&D services to help increase domestic capacity of novel products and technologies, with the goal of expanding internationally.

### Evidence-based solutions inform decisions in government priority areas

Through collaborative partnerships, the NRC is able to develop the solutions needed to address Canada's most pressing needs. The pandemic demonstrated how sharing data and pooling resources can quickly lead to innovation and enable the government to successfully deliver

results for Canadians, especially those most in need. In 2021–22, the NRC continued to prioritize the goals of advancing Canada’s biomanufacturing capacity; strengthening the health care system; improving food, drug and water safety; and enhancing the resiliency of buildings and infrastructure.

### **Internal services**

The NRC’s common and corporate services need to run smoothly in order to support the organization’s research, engineering, and innovation activities. By continuing to deliver internal service excellence, the NRC is able to help staff focus on core work to achieve better outcomes for the organization. To support the organization in its transition to the future work environment, the NRC developed a new Telework Policy, strengthened its IT infrastructure, improved internal health, safety, and security procedures, and continued to review and renew its facilities, completing the first year of the fabrication facilities revitalization.

In 2021–22, new initiatives were introduced as part of the NRC’s Strategic Human Resources Plan to support a diverse, talented, healthy, and engaged workforce, and various projects were undertaken to promote respect, civility, and inclusion in the workplace. Building off the new Workforce and Workplace Equity, Diversity and Inclusion (EDI) Strategy, the NRC also increased efforts to strengthen representation of equity deserving groups within its research divisions and corporate branches, and implemented cross-program initiatives to increase the participation of women, Indigenous peoples, persons with disabilities, and racialized persons in science, technology, engineering and mathematics (STEM) fields.

For more information on the NRC’s plans, priorities and results achieved, see the “Results: what we achieved” section of this report.

## Results: what we achieved

### Core responsibility

#### Science and Innovation

##### Description

Grow and enhance the prosperity of Canada through: undertaking, assisting and promoting innovation-driven research and development (R&D); advancing fundamental science and Canada's global research excellence; providing government, business and research communities with access to scientific and technological infrastructure, services and information; and supporting Canada's skilled workforce and capabilities in science and innovation.

The NRC has three departmental results for tracking and reporting against its core responsibility:

- Scientific and technological knowledge advances;
- Innovative businesses grow; and
- Evidence-based solutions inform decisions in government priority areas.

##### Results

#### Departmental Result 1: Scientific and technological knowledge advances

The NRC advances science and technology solutions using its R&D expertise, facilities and staff, meeting or exceeding most of its targets for 2021–22. The NRC exceeded its target for peer-reviewed publications, essentially met its target for patents issued and had a greater proportion of women in its STEM workforce compared to the Canadian average labour market availability. Although the citation score target was not met, the NRC's field weighted citation score remains above the world average and reflects NRC efforts to scale up R&D activities and build capabilities in new priority areas. New licence agreements, while below target, still remain within the normal range observed over the past five years for the NRC's licensing activities, and licensees continue to get value from access to NRC technologies.

#### Clean renewable fuels and energy for effective action on climate change

Drawing on established partnerships with academia, industry and other government entities, as well as various R&D and testing facilities, the NRC is well positioned to contribute to solving climate-related challenges. The NRC collaborated with researchers through its new Advanced Clean Energy (ACE) program to accelerate the development of clean renewable fuels and energy storage materials for the transition to a low carbon economy. To frame this research, the NRC partnered with Natural Resources Canada (NRCan) and the Canadian Space Agency to develop a Life Cycle Analysis Framework for Hydrogen Production Pathways in Canada, as well as a comprehensive report on the current and future landscape of battery chemistries in Canada, prepared with Environment and Climate Change Canada (ECCC), NRCan, and the Battery

Materials Association of Canada. Through a research partnership with Polar Knowledge Canada, the NRC demonstrated the first fuel-switching in a diesel generator using biogas generated from community food waste to produce clean energy. In support of clean marine transportation, NRC researchers assessed the effects of hull-cleaning methods and coatings on fuel consumption, and developed energy models under various operating conditions, for data-based solutions that will lead to reduced emissions from Canadian vessels. The work will help advance analysis and provide unique support to Canadian vessel owners and operators to reduce vessel fuel consumption and emissions, and enable custom solutions based on data from their fleets.

To support metrological traceability in determining fossil fuel related carbon emissions, the NRC coordinated three international measurement comparison studies of carbon isotopes with the International Bureau of Weights and Measures, to formally assess reliability of standards and the need for new generation standards. Additionally, in collaboration with the University of Ottawa (uOttawa) and Université du Québec à Montréal (UQAM), the NRC demonstrated major discontinuity in the CO<sub>2</sub> isotope ratio measurements, almost ten times above data quality objectives of the World Meteorological Organization Global Atmosphere Watch Programme.

NRC IRAP also supported government efforts to accelerate clean growth in Canada by funding Canadian SMEs to develop and implement clean technology projects. The program contributed approximately \$73 million to support 412 clean technology projects in 2021–22, with key projects focused on emissions control, clean energy and smart grids.

### **Creating a stronger, cleaner, more sustainable Canadian transportation and aerospace sector**

The new [Clean and Energy Efficient Transportation program](#)<sup>iii</sup> was launched to address complex challenges such as vehicle performance, consumer acceptance, infrastructure deployment, component cost and supply, and reliance on critical minerals for zero emission transportation. The NRC also launched the new [Resilient Ground Transportation program](#),<sup>iv</sup> supported Canadian businesses and other government departments (OGDs), and initiated strategic projects aimed to improve resilience and address weather related challenges for freight and passenger ground transportation. In addition, the NRC's new [Low-emission Aviation program](#)<sup>v</sup> (LEAP) was launched to help revolutionize the Canadian aviation sector's low-carbon transition and propel innovation for low emission aircraft, and support other government departments in developing green technology policies and regulations.

In 2021–22, the NRC advanced a series of research projects to explore uncharted territory for transportation technologies. Under LEAP, a 40 member team of NRC research engineers and technicians converted a Cessna 337 civil aircraft to hybrid electric power by replacing the aircraft's rear engine with a fully electric propulsion system, including an electric motor, battery and support systems, and flew it for the first time. In November 2021, NRC expertise in aerosol measurement was leveraged for a pioneering study with Rolls-Royce and Airbus to investigate the impacts of 100 percent sustainable aviation fuel on aircraft engine emissions. For the first time in NRC history, high pressure combustion testing was successfully performed using

realistic engine conditions. The testing used hydrogen fuel to evaluate the performance of a Siemens SGT-A05 combustion system for turbine engines. Finally, in partnership with Defence Research & Development Canada, the NRC demonstrated the first complete autonomous flight of a medium-lift helicopter in February 2022.

In September 2021, the NRC opened a one-of-a-kind hybrid test facility in Ottawa to help the aerospace industry develop sustainable, low-carbon aviation technology. The Hybrid Electric Research Outfit offers innovators in the aircraft electrification space a flexible platform to scientifically test new ideas on a ground-based micro-grid, in order to gauge how their innovations will perform in flight.

### **Healthy coasts and ocean**

With over 200,000 kilometres of coastline and a vast network of rivers, Canada has extensive water resource opportunities. In 2021–22, the NRC continued research on engineering solutions for harsh marine environments, and to address the impacts of climate change, pollution, and contamination. NRC researchers studied the exposure of immature *spartina alterniflora*<sup>1</sup> to various waves, currents and water levels, and found that young coastal marshes do not offer the same protection as established mature wetlands. The project demonstrated the importance of adaptive management and maintenance of wetlands in the first few years after restoration or construction, and highlights a new and innovative way to protect coastal environments while maintaining and enhancing existing ecosystems.

The NRC continues to leverage both physical and digital tools to better understand Canada's oceans, coasts and waterways. In 2021–22, the NRC developed an interactive web-enabled digital atlas of tidal energy resources in northern Canada, which is now being used by communities in the north. This work could lead to future development of tidal energy resources to supply the energy needs of remote northern communities. At the NRC's coastal wave basin research facility in Ottawa, NRC experts built a physical model of Toronto's road infrastructure, and recreated scenarios, from typical light rain conditions to extreme flood conditions. Through the testing, researchers were able to evaluate the infrastructure's ability to capture water under various flooding conditions. Finally, the successful integration of the NRC's scalable testbed system in the St. John's ice tank facility has expanded the testbed's capability such that sensor platforms and autonomous control algorithms can be evaluated at model-scale, enabling work in simulation environments and de-risking full-scale deployment and evaluation.

### **Smarter, more intuitive digital technologies to solve real world problems**

The NRC has the capacity to explore the use of artificial intelligence (AI), data, analytics, and modeling to create innovative and meaningful solutions for a safer, more inclusive society.

In 2021–22, the NRC integrated social psychology theories with modern AI technology, developed new methods for detecting and analyzing abusive content in social media, and

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<sup>1</sup> Smooth cordgrass, saltmarsh cordgrass, or salt-water cordgrass, is a perennial deciduous grass which is found in intertidal wetlands, especially estuarine salt marshes.

conducted a survey of ethics-related issues in the field of online abuse detection leading to development of novel techniques to improve abuse detection systems. Novel machine learning evaluation metrics were developed to enable AI agents to identify [COVID-19 hate speech in social media](#),<sup>vi</sup> with the related technical report winning Best Paper at the 34th Canadian Conference on AI, and ethical guidelines for responsible R&D in AI were designed and made available to AI researchers and practitioners.

In collaboration with Indigenous communities and language experts, the [NRC's Indigenous languages technology project](#)<sup>vii</sup> continues to support the revitalization of Indigenous languages. The NRC's verb conjugation software for Southern Michif was rolled out through a course taught by the Prairies to Woodlands Indigenous Language Revitalization Circle; coverage of the Kahnawà:ke version of the Mohawk verb conjugator was increased from 200,000 to 600,000 forms; and preliminary work began on a verb conjugator for Mi'kmaw, which sparked the interest of a major Mi'kmaw organization in expanding its relationship with the NRC. In collaboration with an instructor at Northeastern University, NRC researchers have been making the ReadAlong studio speech-text alignment software for Indigenous-language videos more user-friendly.

The NRC used its data analytics capabilities to help SMEs, OGDs and internal clients adopt AI and data-driven decision making processes, leading to increased revenue for the NRC, and the development of new technologies around text analytics, causal modelling, cybersecurity, and the diagnosis of COVID-19 using medical images. The NRC also delivered several analytics tools to OGDs in 2021–22, including the upgrade of Public Health Agency of Canada (PHAC)'s Global Public Health Intelligence Network and migration to PHAC's own hosting environment; 3D image analytics application tools for the Department of National Defence; and a cyber-security pattern-recognition tool for the Communications Security Establishment. Finally, to increase Canada's quantum capacity, the NRC has engaged academic and commercial stakeholders to develop its new Applied Quantum Computing Challenge program, in alignment with Canada's National Quantum Strategy.

### **Disruptive technology solutions for advanced manufacturing, innovative printing, and nanotechnology**

The NRC uses leading-edge research and technical expertise to develop novel materials for adaptive, intelligent, multi-functional applications in advanced manufacturing, intrinsic sensing and imaging, telecommunications, and nanotechnology development.

After a two-year building process, construction of the NRC's new advanced manufacturing research facility in Winnipeg, Manitoba was completed in November 2021. The facility will help manufacturers increase their global competitive edge, focusing on additive manufacturing, digital twinning, machine learning, and sustainable food packaging. An Indigenous working group was engaged to ensure Indigenous representation in staff and student hiring, and within the scientific and research agenda, and interior of the facility. In addition, following the November 2020 opening of the NRC's new advanced materials research facility in Mississauga, the facility

officially opened its labs in September 2021. By coupling AI and machine learning with lab automation, projects will accelerate the discovery of new catalyst materials and processes, which will reduce the cost, time and risk to develop and bring new materials to market, helping Canada meet its emission reduction targets and grow the clean energy and manufacturing sectors.

To help the automotive industry meet challenges related to the manufacturing of high performance thermoplastic composites, the NRC brought together partners from the automotive supply chain to come up with low-cost, high-speed solutions through its industrial R&D group, STAMP Composites. Building on its success, the NRC began scoping out STAMP Hybrids, an industrial R&D group that will focus on cost-effective hybrid composite/metal components.

The NRC continues to explore emerging technology areas, using a range of pathways to effectively disseminate research to others in the research community and the private sector.

In 2021–22, the NRC demonstrated 100 percent fabrication yield of nanowire-based devices, establishing a viable route for the scalable fabrication of efficient single photon sources and the development of hybrid on-chip platforms. Researchers also filed two patents and published findings in *Nature*

*Communications* on work developing 3D

printed antennas and lenses for potential applications in 5G telecommunications, consumer goods, and health care. Finally, a key research focus was to understand the underlying science linking polymer science, optics, and imaging for more precise and robust 3D imaging technology. In achieving this, NRC researchers constructed micron-scale 3D printing technology and fabricated micro-optics which were then delivered to a Canadian SME.

### Revolutionizing nanoscale applications

As part of collaborations with the University of Alberta, the NRC was equipped with Canada's first state-of-the-art NanoFrazor instrument from Heidelberg Instruments, Switzerland. Capable of rapid processing to create nanoscale features on a variety of materials, with applications in materials, electronics, and photonics, the instrument was used to create a Mona Lisa replica so tiny that 1.4 million of them could fit inside a grain of salt.

## Representing the country in the field of astronomy and astrophysics

The NRC operates as Canada's foremost authority on astronomy and astrophysics, by maintaining the country's largest observatories and representing the country in leading astronomy initiatives around the world. In 2021–22, the NRC delivered 44 state-of-the-art, low-noise cryogenic amplifiers with industry partner Nanowave Technologies as part of its contribution to pre-construction of the Square Kilometer Array (SKA). This NRC-developed technology was a crucial contribution to the SKA's precursor, the MeerKAT, the most sensitive radio telescope of its kind.

In advancing our understanding of the universe, an NRC astronomer was lead author on a [Canadian-led paper from 36 international astronomers](#),<sup>viii</sup> which was published in the *Astrophysical Journal Supplement Series*. Using the world's most advanced ground-based telescope, the Atacama Large Millimeter/submillimeter Array (ALMA) in Chile, the paper presents state-of-the-art observations of molecular gas in 51 galaxies belonging to the Virgo

Cluster, providing the clearest evidence to date that the environments surrounding galaxies can reach far into the galaxies and have a lethal impact on the fuel needed to birth new stars.

### **Cross-sector research in collaboration with key partners**

The [NRC's Ideation Fund<sup>ix</sup>](#) supports the development and validation of technology concepts for high risk, bold ideas that have the potential to have disruptive socio-economic impacts for Canada. In 2021–22, six funding agreements were signed totaling \$150K for New Beginnings Round 3 projects to support small-scale exploratory research by individual NRC researchers. Through the New Beginnings Initiative, NRC researchers were able to explore chemically modified boron nitride nanotubes, which are used to reinforce materials and ensure final structures are stronger and better protected against heat, flame and radiation. NRC and McGill University researchers developed a plasma reactor to effectively carry out surface chemical functionalization<sup>2</sup>, and [findings were published in the prestigious American Chemical Society Applied Nano-Materials Journal](#).<sup>x</sup> Another New Beginnings success was the use of numerical modeling and machine learning for the prediction of sources and pathways of microplastics in aquatic environments.

In 2021–22, two new projects were selected for Round 3 of the Small Teams Initiative for the exploration of transformative ideas by NRC teams. The Speech Generation for Indigenous Language Education project will involve collaboration with Onkwawenna Kentyohkwa School, WSÁNEĆ School Board, the University of Edinburgh and Blue Quills University, and the NRC will collaborate with the University of Waterloo and SME, Brilliant Matters, on a project focused on hybrid inks for near-infrared detectors.

Through its [Collaboration centres](#),<sup>xi</sup> the NRC partners with leading Canadian institutions to develop internationally recognized expertise, and accelerate science excellence and technology development in key areas of research. The NRC has established nine centres, including the NRC-University of British Columbia Collaboration Centre for Clean Energy Transition, CIC-NRC Cybersecurity Collaboration Consortium, Karluk Collaboration Space with Memorial University of Newfoundland, NRC-Fields Mathematical Sciences Collaboration Centre, and NRC-Waterloo Collaboration on Artificial Intelligence, Internet of Things, and Cybersecurity. Results from the other four Collaboration Centres for 2021–22 include:

- New projects were launched in the rare disease space at the NRC-CHU Sainte-Justine Collaborative Unit for Translational Research, with two high potential projects renewed in the development of novel anti-cancer therapeutics and animal free models of disease.
- The Centre for Research and Applications in Fluidic Technologies held a workshop in March 2022 to showcase expertise and infrastructure at both the NRC and University of Toronto for the advancement of microfluidics-based biodevices. The centre also opened a new Device Foundry at the University of Toronto's St. George campus, an important milestone in the

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<sup>2</sup> Surface functionalization is an effective and often simpler way of altering the surface properties of a material or device to achieve specific goals, such as introducing chemical functional groups to a surface. Examples can be found in semiconductor industry and biomaterial research.

growth of microfluidics research and fabrication in Canada to help enable the deployment of advanced point-of-care technologies.

- A new lab with state-of-the-art equipment was commissioned by the NRC-uOttawa Joint Centre for Extreme Photonics to enhance quantum capabilities. The centre also created the Alex Szabo Fellowship with SPIE, the international society for optics and photonics, for early career researchers from the Global South to work at the centre for six months.
- Under the Collaboration Centre for Green Energy Materials, the NRC developed an ultrafast, one-step method for continuous synthesis of high-entropy alloy nanoparticles from a mixture of pure metal powders, and authored a [publication](#)<sup>xii</sup> featured on the cover of the American Institute of Physics Publishing's Journal of Chemical Physics. The next big thing in materials science, high entropy alloys are stronger, more malleable, wear and heat-resistant, and have high potential for clean energy applications.

## Departmental Result 2: Innovative businesses grow

The NRC provides funding, advice and support to Canadian SMEs to help them grow to scale and expand to global markets. Support through the organisation helped clients grow their revenues by 32 percent and employment by 18 percent (from 2018 to 2020), and 93 percent of R&D clients reported that NRC enables results. The NRC was also able to greatly surpass its target for revenue from industry clients, which demonstrates that NRC support and collaboration leads to tangible results.

### Advancement of SME work through NRC IRAP support services

NRC IRAP continued to play an important role in the advancement of SMEs in 2021–22 by working with 9,078 SME firms, providing \$467.9 million in funding to 3,657 Canadian SMEs, delivering advisory services to an additional 5,421 unfunded firms, supporting 16,160 jobs in client firms, and nominating 29 firms to the [Accelerated Growth Service](#).<sup>xiii</sup>

In its third year, NRC IRAP's Large Value Contribution (LVC) pilot program supported many enterprises affected by COVID-19 and the resulting supply chain issues. NRC IRAP funded 33 LVC projects, including 14 new projects, one of which received a contribution of over \$3 million. In response to a recent program evaluation, the program has committed to continuing to refine LVC project development and approval processes to improve workflow and optimize uptake by more Canadian SMEs.

NRC IRAP also supported the placement of 2,238 graduates in quality jobs with innovative Canadian SMEs through the Youth Employment Program. Of graduates who completed the internship, 89 percent reported that they were employed or self-employed after their placement, with 93 percent of them staying with the original employer. NRC IRAP has also been a strong advocate in supporting participation of women in STEM fields. 53 percent of participating recent grads identified as women, exceeding the program's target of 50 percent and the 30 percent representation of women among Canadian STEM graduates.

NRC IRAP provides targeted support through its Contribution to Organization (CTO) funding mechanism, and results can be measured through client feedback shared through a Post Service Assessment (PSA). PSA results indicated that 93 percent of the 140 clients supported through CTOs targeting women, visible minorities and indigenous entrepreneurs were satisfied with the services, 95 percent indicated the CTO had a positive impact on their business, and 88 percent indicated plans to implement the results within one month.

Equity, Diversity and Inclusion (EDI) is integral to the mission, mandate and goals of NRC IRAP. Building off the recommendations from the program's 2021–22 evaluation to increase awareness and promotion of EDI, NRC IRAP continued to advance efforts to reduce barriers to participation and increase diverse representation. NRC IRAP completed an assessment of its web presence, client portal and client-based forms, client and internal communications and process documents to identify content and messaging that unintentionally reduces the participation of under-represented groups in NRC IRAP programs and services. In 2021–22, the final assessment report was produced, including findings and considerations to help guide NRC IRAP's EDI strategy moving forward, and contribute to supporting SMEs grow. NRC IRAP also continued to participate in working groups and EDI initiatives, including participation on the Women's Entrepreneurship Strategy Assistant Deputy Minister Committee and Working Group to collaborate on strategies in support of women entrepreneurs, representation on the European Network of Innovation Agencies (TAFTIE) Diversity and Inclusivity Taskforce to review best practices in the EDI space, and work with UK Research and Innovation to support government EDI initiatives.

To capitalize on existing Canadian private sector capacity to address ongoing pandemic-related challenges, NRC IRAP continued to work with [Innovative Solutions Canada](#)<sup>xiv</sup> (ISC) and partners to sponsor and fund Canadian SMEs addressing COVID-related concerns. In 2021–22, six COVID-related challenges were launched, submissions from 168 Canadian SMEs were reviewed, and over 960 assessments were completed for 20 partners, with almost half of these from the ISC Testing Stream and Challenge Stream programs. Of the 168 COVID-response applications assessed, 21 firms were supported with an investment of \$9.23 million through 25 projects, 3 of which were through the testing stream.

### **Supporting innovative businesses to grow, scale-up, and export**

The NRC has explored new channels to promote the NRC's intellectual property (IP) to broader audiences, and increase the potential commercialization of Canadian research. These include licencing discussions that could benefit a wide range of Canadian clean tech firms, four direct IP outreach initiatives, and IP licencing conversations with Canadian companies. The NRC continued to focus on IP outreach through participation in the Government of Canada's [ExploreIP marketplace](#),<sup>xv</sup> and has implemented a new, streamlined client agreement process to improve consistency and efficiency when working with partners.

NRC IRAP continued to co-deliver the CanExport SMEs Program, which helps Canadian SMEs develop new export opportunities. The program supported over 1,269 projects, assisting

Canadian SMEs establish a presence in international markets. An additional 46 clients received funding from the CanExport Innovation Program, which assists Canadian SMEs, as well as academic and non-government research centres, pursue and sign collaborative R&D agreements with international partners.

A successful NRC IRAP client, Vitacore became the first authorized manufacturer of N95 respirators made in Canada and acquired Health Canada approval for an enhanced design, the first Canadian-made N99-equivalent single-use respirator. NRC IRAP guidance helped the company acquire domestic and international certifications, which will allow them to expand to other countries. Building off the success, the company is now collaborating with Canadian universities on opportunities to use recycled masks for new materials and applications.

### **NRC partnerships for international collaboration in science and technology**

The NRC fostered its global presence, supporting SMEs in accelerating their R&D through working with international partners, enabling access to networks and infrastructure to help them scale-up and grow globally.

The NRC's continued presence in Japan and Germany was crucial in the signing of six Memoranda of Understanding (MOU) with the Advanced Telecommunications Research Institute in Japan, and with Germany's DLR (German Aerospace Center) and BayFor (Bavarian Research Alliance), as part of the 50th Anniversary of Collaboration. The relationships also resulted in collaborations with CiRA (Japan's Centre for IPS Cell

Research and Application), work with large Japanese multinational organizations to facilitate SME connections with Global Value Chains, Calls for Proposals on Low-Carbon Hydrogen Technologies, and six collaborative projects in AI Solutions for Industrial Production.

The NRC continued to deliver the Canadian International Innovation Program (CIIP) with Global Affairs Canada to support SME expansion into global markets, including India, Brazil, Israel, and South Korea. In 2021–22, \$3.5 million in contributions were allocated to SMEs involved in 25 active projects, 7 new projects with a total value of \$8.6 million were initiated with \$2.3 million in funding committed on the Canadian side, and 2 virtual partnership development activities were delivered with the United Kingdom (UK) and South Korea, benefitting 20 participating Canadian SMEs.

Information Technology for European Advancement (ITEA) is the Eureka Cluster on software innovation, enabling a large international community of industry, SMEs, start-ups, academia and client organisations to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society. NRC IRAP supported two [winning](#)

#### **Eureka Network Participation**

Eureka is the world's biggest public network for international cooperation in research, development and innovation with over 45 countries. In 2021–22, Canada worked with 15 countries through Eureka, including Finland, France, Germany, the Netherlands, Spain, and Sweden, and supported 12 new projects with 88 partners for a total estimated value of \$102.7 million, of which \$13.4 million was direct support to SMEs.

[projects for the 2021 ITEA Award of Excellence](#):<sup>xvi</sup> the PARTNER project focuses on health care systems to lower costs and improve patient comfort, and the VMAP project will improve the efficiency and interoperability of virtual engineering procedures.

### Departmental Result 3: Evidence-based solutions inform decisions in government priority areas

Every year, the NRC works alongside federal partners to advance key goals and priorities for the government, the scientific community, and the country. Exceeding its targets for peer-reviewed publications co-authored with OGDs, and revenue earned from work with other departments and agencies, the NRC demonstrated the importance of leveraging work with its federal partners to achieve results in areas vital to Canada's future.

### Collaborative R&D to advance Canada's most pressing needs

Bringing together a national network of researchers and scientific facilities to bear on Canada's most significant challenges and goals, such as climate change, securing supply chains, and positioning Canada as a leader in emerging disruptive technologies, the NRC supported 356 projects with 93 unique collaborators and over \$114 million in funding to date through its Challenge programs and Cluster support programs (formerly named Supercluster support programs). In addition to the programs in the table below, the Arctic and Northern Challenge program was launched in 2021–22, with project work beginning in 2022–23, and development of the Applied Quantum Computing Challenge program has begun.

#### Key Challenge program results for 2021–22

[Disruptive Technology Solutions for Cell and Gene Therapy](#):<sup>xvii</sup> Advanced a clinical candidate AAV-LPLD<sup>3</sup> gene therapy and its manufacturing process; initiated two UK collaborations on gene therapy process optimization; finalized funding to support CAR T manufacturing infrastructure and production capabilities; and provided scientific leadership on the development of microfluidic processes and biodevices for therapeutic cell product engineering and manufacturing.

[Materials for Clean Fuels](#):<sup>xviii</sup> With the opening of labs at the NRC's advanced materials research facility in Mississauga, inaugural projects focused on accelerating discovery of new catalyst materials and processes to address challenges related to climate change. Coupling AI and machine learning with lab automation will greatly improve the discovery time of new materials, reduce cost, time and risk to bring new materials to market, help meet emission reduction targets, and grow the clean energy and manufacturing sectors.

[High-Throughput and Secure Networks](#):<sup>xix</sup> At the end of 2021–22, the program had 44 collaborative agreements in place, including a three-year US collaboration aimed to provide SI (system of units) traceability path for NRC-developed quantum dot single-photon sources, which led to the custom design of an on-chip radiometer. The chip was integrated into the demonstration apparatus being constructed at the NRC, and is expected to greatly enhance its capabilities.

[Artificial Intelligence for Design](#):<sup>xx</sup> Worked with over 23 academic partners on projects such as AI-powered design for stem cell therapy, and enhancing the design of photonic power converters. An NRC paper on materials acceleration, [Neural evolution structure generation: High Entropy Alloys](#)<sup>xii</sup> was featured on the cover of the American Institute of Physics Publishing's Journal of Chemical Physics.

[Pandemic Response](#):<sup>xxi</sup> Advanced lead therapeutics, COVID-19 antibodies, an adjuvant for improving vaccine effectiveness, and production of SARS-CoV2 spike protein variants being leveraged by partners as vaccine

<sup>3</sup> Adeno-associated virus (AAV) is a versatile viral vector technology that can be engineered for gene therapy applications; Lipoprotein lipase deficiency (LPLD) is an autosomal recessive disorder caused by loss-of-function mutations in the *LPL* gene.

candidates. Delivered tools for future pandemics such as AI-enabled radiography decision support, virus and vaccine modelling, and lipidomics-based diagnostics and personalized treatment.

[Aging in Place](#).<sup>xxii</sup> Following the program's launch in 2021–22, work began under four pillars: connection, health, safety, and standards, aiming to improve the quality of life of older adults and their caregivers by collaborating on projects such as wearable sensors that will support preventative home and community based care.

[Internet of Things \(IoT\): Quantum Sensors](#).<sup>xxiii</sup> The program launched in 2021–22, and began 35 projects with industry and academia, spanning the quantum sensors space from quantum photonics to chip-based systems, atom-defined quantum devices, quantum magnetometry, and high-resolution quantum-enhanced imaging.

### Cluster support program results for 2021–22

[Sustainable Protein Production](#).<sup>xxiv</sup> Projects focused on accelerating protein crop design, improving the quality and safety of pulse crop products, and processing and valorization technologies for sustainable protein.

[Ocean](#).<sup>xxv</sup> Projects focused on biosensing technologies to monitor ocean health, value-added marine products, and novel aquaculture feed sources, in alignment with Canada's Blue Economy. This included a Queens University collaboration to develop separation and characterization protocols for micro and nano-plastics in Arctic fauna.

[AI for Logistics](#).<sup>xxvi</sup> Projects included AI-enabled tools for reducing risks to first responders of freight transportation fires, monitoring of Ti-alloy machining to reduce scrapping of parts and optimize tool life, and AI-based cybersecurity techniques such as fog computing using IoT devices, which could lead to collaborations with several Canadian ports.

[Digital Health and Geospatial Analytics](#).<sup>xxvii</sup> Progress was made on collaborative projects with government agencies, and universities in British Columbia and Ontario, and five new projects were signed in areas such as predictive health care through machine learning, and tools for personalized assistive technologies.

[Advanced Manufacturing](#).<sup>xxviii</sup> The program leverages industrial R&D groups to share costs and risks associated with technology development while providing access to NRC experts and facilities. Projects conducted within the METALtec industrial R&D group led to a design tool and qualification procedure to assess the corrosion resistance of assemblies that incorporate high strength aluminum alloys, and robotic forming of complex sheet metal components.

### Innovating health care solutions

The NRC works with public and private sector organizations to accelerate discovery and development of innovative biologics, therapeutics, and digital platforms for quality patient health care. Aimed at improving health care for Canadians through prevention, diagnosis, monitoring, and treatment, the NRC continued its work to advance remote health through several projects last year. The NRC worked with Interactive Health International to advance development of virtual software for training of clinicians in remote communities. This large-scale project has potential applications for space, northern communities and internationally. The NRC also collaborated with NASA (National Aeronautics and Space Administration) and the Canadian Space Agency for another large-scale project to develop certified diagnostics testing for the International Space Station. Finally, the NRC collaborated with Health Canada to develop guidelines for accessible virtual care, which are available on the Ontario College of Art and Design website for public and industry use. An interactive software for mental health is also available for cohort studies, with plans to transfer the software to a patient advocacy group for wider diffusion, and planning is underway to transfer a contactless vital sign monitoring system to industry.

The NRC continued to leverage its digital technologies expertise for research collaborations in the health sector. NRC and uOttawa researchers developed bioinformatics tools for network analysis in lipidomics and metabolomics, and worked with Beaumont Medical School in the US to use the tools in determining changes in Dementia Lewy Bodies<sup>4</sup>. The NRC also worked with uOttawa to develop AI diagnostic models for dementia subtyping and began working on the development of early diagnosis methods through combined analysis of animal models and patient samples. Finally, the first open-source machine learning framework for drug discovery called [TorchDrug](#),<sup>xxix</sup> was released, aimed at accelerating the drug discovery process through open-source collaborations. The NRC reported its technical results in an International Conference on Learning Representations paper, and in two workshop papers for the International Conference on Neural Information Processing Systems.

### Canada's Biologics Manufacturing Capacity

In June 2021, the NRC completed construction of the Biologics Manufacturing Centre (BMC) only 10 months after breaking ground. By the end of the year, more than 80 specialized biomanufacturing experts were hired and the commissioning, qualification and validation process was started for targeted completion in summer 2022. The BMC also carried out technology transfer activities in collaboration with a vaccine sponsor, to prepare for its first COVID-19 vaccine production targeted for the end of 2022–23.

## Responding to the COVID-19 pandemic and preparing for future events

By being able to quickly pivot to address urgent COVID-19 needs, the NRC's response to the pandemic demonstrated its capabilities and furthered its credibility as a reliable national research and development organization. With the continued global spread and emergence of variants, the important work that began the previous year was far from over in 2021–22 and the NRC was able to progress many key initiatives.

The NRC conducted four technology transfer packages moving towards manufacturing, including a new COVID-19 vaccine lead with Oragenics/Biodextris, and initiated the technology transfer of Novavax's COVID-19 vaccine at the BMC. Two products were also advanced to preclinical studies and three products from NRC collaborators have entered clinical trials, including VBI's COVID-19 vaccine candidates, using NRC intellectual property assets as a manufacturing platform. NRC IRAP provided advisory services and more than \$37 million in funding to support 13 clients working towards made-in-Canada vaccines and therapeutics to combat the COVID-19 pandemic. NRC IRAP also supported clients to adapt their manufacturing capabilities to produce personal protective equipment (PPE), disinfection and sanitization solutions, and medical innovations for diagnostics, testing and treatment of COVID-19.

The NRC continued to improve Canada's pandemic preparedness by leading the establishment of a network of PPE testing laboratories and operating as a reference lab to address measurement challenges and provide technical support to the network. The NRC also played a leading role in establishing a standardized testing method, working with organizations such as ASTM

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<sup>4</sup> Protein deposits that affect chemicals in the brain which can lead to problems with thinking, movement, behavior, and mood.

International, and contributed to a collaborative study on the performance of labs across the network. NRC metrology experts also developed a suite of reference materials to support COVID-19 testing and began distributing them within Canada and internationally. The materials are in high demand due to their utility in determining antibody levels against COVID-19.

### **Enhancing food, drug and water safety**

In alignment with a recent program evaluation recommendation to expand its strategic plan to focus on sustainability, the NRC supported an ecosystem of collaborative projects to develop technology solutions for a sustainable Canadian food system, including:

- Work with Agriculture and Agri-Food Canada (AAFC) on solutions for food waste reduction, value-added products from pulse crops and agricultural waste streams, and foodborne pathogen detection;
- Work with NRCan, ECCC, and Health Canada to monitor technologies and sustainable approaches to upscale renewable bioresources into platform chemicals and bioplastics;
- Collaboration with the Canadian Space Agency, AAFC, and the Arctic Research Foundation on year-round local food production in the Arctic, including a test facility for novel controlled-environment agricultural technologies using renewable energy; and
- Work with researchers from the US Department of Agriculture on a routine AI assessment of wheat infestation to better understand wheat's response to Fusarium Head Blight – an increasingly potent agricultural pest.

Building on previous studies supported by Health Canada, on measuring contaminants in illegal dried cannabis and vape liquids, in 2021–22, the NRC completed a large-scale study, comparing legal and illegal edible cannabis products, funded by the Ontario Cannabis Store in partnership with the Ontario Provincial Police (OPP). The study found that most illegal products had less than 20 percent of the promised levels of THC (Tetrahydrocannabinol); levels in illegal samples varied drastically, making decisions on safe portions impossible; nearly all illegal samples contained at least one pesticide; and some contained pesticides up to 1000-times higher than allowed Health Canada limits. Results from the study led to a legal cannabis media campaign by the Ontario Cannabis Store and the OPP.

Ensuring Canada's water is clean and free of contaminants is pivotal to protecting the health and safety of Canadians across the country. In 2021–22, the NRC advanced its own collaborative research efforts, as well as developed tools and infrastructure to support other research efforts. In partnership with industry and the municipality of Grande Prairie, Alberta, the NRC built a bio-electrochemical wastewater treatment demonstration plant and successfully demonstrated removal of 90-95 percent of BOD (biochemical oxygen demand) in compliance with current regulations. This facility and associated novel biological technique will improve communities' access to more reliable drinking water and wastewater systems that meet legislated standards.

NRC-developed novel sensors for monitoring environmental health are being applied for water toxicity indicators that can operate in remote environments, with easy-to-use IoT platforms for real-time monitoring of fresh water from anywhere in Canada. Working in collaboration with

ECCC and NRCan, the application for monitoring waters around developing areas and for quality control in water treatment facilities could potentially reduce costs of more expensive testing and focus resources where most required. Working with NRCan on another research project, the NRC also developed an IoT-enabled biosensor that uses a microbial fuel cell capable of detecting the presence of toxic compounds and biodegradable organic materials in water, for instant access to environmental water characterization across Canada.

As the world's top analytical chemistry labs for marine and freshwater toxins, an NRC team developed nearly 40 biotoxin certified reference materials and began research on tetrodotoxin – a deadly neurotoxin most commonly found in pufferfish usually found in tropical waters. With potentially harmful levels in shellfish in Europe and the UK, NRC researchers worked with the Canadian Food Inspection Agency to develop analytical tools to help evaluate whether the neurotoxin has also moved into Canadian waters and poses a risk to shellfish.

### **Working collaboratively to drive resilient infrastructure forward**

Addressing challenges related to climate change and working to build more sustainable infrastructure requires key players to bring together expertise and resources. To make progress on long-term climate action goals and advance research in carbon neutral construction, waste reduction, and resiliency of infrastructure, in collaboration with federal partners, the NRC:

- Initiated an industry consortium to discuss topics such as asphalt shingle durability and waste; and nature based solutions for commercial roofs.
- Published online design and compliance tools for climate-resilient roofing systems.
- Investigated the effects of various smart grid technologies (including time-of-day electricity rates, smart thermostats, rooftop solar power, battery storage, and thermal storage) installed in homes to assess benefits and power utility.
- Partnered with the Nuclear Waste Management Organization to develop safe and durable repository technologies for storage of Canada's spent nuclear fuel.
- Published the National Building Code of Canada 2020 and the National Energy Code of Canada for Buildings 2020 in March 2022, which include emergency performance tiers that will help enable regulating jurisdictions to make new buildings and homes more energy efficient; the new Codes will also facilitate mass timber construction up to 12 storeys.
- Supported the Construction Codes Reconciliation Agreement, making progress on updates to the code development system processes, including the approval process for code changes, as well as advancing methodologies for the identification, assessment, and reporting of variations.
- Continued to develop guidelines for safe and efficient homes and buildings, including: studies related to radon exposure, ventilation, mold, wildfire smoke exposure, overheating and formaldehyde emissions; de-risking and validating novel energy efficient office lighting systems for light-sensitive individuals; and collaborating on design tools for building codes to control impact noise in the multi-unit residential market.

### **Gender-based analysis plus (GBA Plus)**

The NRC is committed to employing a diverse and representative workforce and to fostering an open, accessible, inclusive, and anti-racist work environment and culture. This commitment extends to the creation of a more inclusive Canadian innovation system, recognizing that diversity fuels innovation. Engagement is an important tool in making progress in these areas, and the NRC actively works to engage on GBA Plus with its employees, in its research, and with its innovative SME clients.

To help ensure NRC research benefits as many Canadians as possible, diverse groups need to be represented, especially in management discussions and decision-making, which is why the NRC continues to increase representation in all aspects of the organization. The NRC incorporates GBA Plus into research initiatives at all stages of the process from ideation to evaluation. To measure progress and impact, the NRC monitors and tracks statistics on under-represented groups and women in science, technology, engineering and mathematics (STEM), and collects success stories on research that impacts diverse populations.

NRC IRAP is designed so that no one particular group of firm owners is selected or favoured over any other, allowing for subscribed firms to represent a cross-section of the Canadian economy. The nature of the program permits it to, at times, choose to target initiatives, such as to serve Indigenous led SMEs, Indigenous entrepreneurship, and benefits to Indigenous communities. In keeping with this ability, NRC IRAP began to set goals for diversifying participation in its programs and build on work already underway to provide support to women and Indigenous-led firms through a number of agreements with not-for-profit organizations. Through NRC IRAP's Contribution to Organization (CTO) funding mechanism, in 2021–22, four CTOs targeting women, visible minorities and Indigenous entrepreneurs supported 140 firms for a total contribution of \$1.1M. Detailed GBA Plus information can be found in the supplementary tables.

### **United Nations 2030 Agenda for Sustainable Development and the Sustainable Development Goals**

In 2021–22, the NRC advanced its environmental sustainability priorities and met or exceeded targets set out in its [Departmental Sustainable Development Strategy \(DSDS\) 2020 to 2023](#),<sup>xxx</sup> including 269 NRC publications in support of at least one Sustainable Development Goal (SDG). In accordance with the [Federal Sustainable Development Strategy](#),<sup>xxxi</sup> the NRC advanced work in greening government, effective action on climate change, clean growth, modern and resilient infrastructure, clean energy, and safe and healthy communities, in support of SDGs (see the NRC's DSDS Report for more detail):

- [SDG 7: Access to affordable, reliable, sustainable and modern energy](#):<sup>xxxii</sup> the NRC has published research in bioenergy and low-carbon intensity fuels, and engaged remote and Indigenous communities to de-risk microgrid installations and train at the facility, supporting access to affordable, reliable and sustainable energy.
- [SDG 9: Resilient infrastructure and sustainable industrialization](#):<sup>xxxiii</sup> contributing to the government goal of supporting modern and resilient infrastructure, the NRC has released

national life cycle assessment guidelines, reports and publications related to wildland-urban interface fires, and collaborated on clean technology projects and pilot demonstrations using satellite-based health monitoring technologies.

- [SDG 11: Inclusive, safe, resilient and sustainable cities:](#)<sup>xxxiv</sup> the NRC has developed long term risk management plans and site file closures, helping to reduce potential environmental and human health risks from identified contaminated sites.
- [SDG 12: Sustainable consumption and production patterns:](#)<sup>xxxv</sup> the NRC has put in place maintenance and service contracts with green considerations, helping to reduce environmental impact and ensure best value in government procurement decisions.
- [SDG 13: Combatting climate change and its impacts:](#)<sup>xxxvi</sup> the NRC advanced initiatives for green operations, including major energy retrofits, LED lighting retrofits, zero-emission fleet vehicles, and vehicles equipped with telematics to lower emissions. The NRC's National Energy Code for Buildings also helps reduce Canadian GHG emissions.

## Experimentation

In 2021–22, NRC teams advanced processes and solutions for five key projects: client agreements, procurement, project management, onboarding and hiring. Over the course of the year, client agreement and procurement solutions were rolled out and project management changes were adopted. Performance of the new solutions in the first year already shows a 5 to 10-fold decrease in project time recording and an increased value of goods acquired through procurement cards, both representing a significant reduction in administrative effort. Following an in-depth review, improvements to the NRC onboarding process were embedded in ongoing operations, including an online solution to streamline supervisors' preparation for new employees. To ensure successful implementation, wide engagement activities took place with stakeholder groups and various service providers involved in the onboarding process. Implementation of a streamlined hiring process began last year, including preparations for an online proctoring tool for written assessments, and analysis of alternative second language evaluation options. In addition, use of government acquisition cards for low value, low complexity transactions was greatly increased, reducing lead times for receiving goods and freeing up capacity for procurement services.

In June 2020, NRC IRAP signed a two-year MOU with the Business Development Bank of Canada (BDC), designed to create value for clients through access to capital with preferential loan rates. In 2021–22, NRC IRAP made 34 referrals to BDC resulting in 15 contracts with an average loan size of \$277,000, with an additional 9 contracts pending, for a total of \$9.16 million lent to SMEs, of which \$7.5 million was allocated to Ontario-based firms. BDC is an approved partner of the Canada Digital Adoption Program network launched in March 2022 and NRC IRAP provides continued support to BDC in delivering company referrals through the network.

## Key risks

Given the rapidly evolving context within which the NRC operates, it has become more important than ever to identify and respond to emerging risks that could impact the achievement of its results. Several new threats emerged in 2021–22, including record high inflation, the Russian invasion of Ukraine, supply chain disruptions, and the growing labour shortage. In response to these and other events, the NRC worked to mitigate risks related to organizational financial constraints, security threats, external crises such as the pandemic, competition for highly skilled talent, and barriers to employee engagement.

To mitigate the risk of having insufficient funds for necessary investments in facilities, equipment and infrastructure, the NRC finalized its Facilities Renewal Plan, and worked to assess and prioritize its building recapitalization through a real property portfolio strategy, which includes potential cost savings. To guard against possible cyber-attacks and data breaches, the NRC updated its Departmental Security Plan and stood-up three task forces to enhance the security of information assets. The NRC continues to explore various models to improve its agility when responding to crises, such as the pandemic. Finally, to attract top talent and support the mental health and wellbeing of employees, the NRC developed a Wellness Strategy, and set the stage for the development of a Talent Attraction Strategy and Employer Value Proposition in 2022–23.

## Results achieved

The following table shows, for Science and Innovation, the results achieved, the performance indicators, the targets and the target dates for 2021–22, and the actual results for the three most recent fiscal years for which actual results are available.

Departmental results	Performance indicators	Targets	Date to achieve target	2019–20 actual results	2020–21 actual results	2021–22 actual results
Scientific and technological knowledge advances	Citation score of NRC-generated publications relative to the world average <sup>5</sup>	1.40	March 31, 2022	1.38	1.38	1.21
	Number of peer-reviewed publications generated by the NRC <sup>6</sup>	900	March 31, 2022	1,003	1,090	1,187
	Number of patents issued to the NRC	100	March 31, 2022	173	118	99
	Number of licence agreements	40	March 31, 2022	37	54	30
	Ratio of the NRC's workforce made up of underrepresented groups relative to Canadian average labour market availability in Science, Technology, Engineering, and Mathematics (STEM) <sup>7</sup>	1.00	March 31, 2022	1.01	1.02	1.03
Innovative businesses grow	Percentage of R&D clients who report positive benefits of working with the NRC	86%	March 31, 2022	92%	87%	93%
	Percentage revenue growth of firms engaged with the NRC (IRAP-engaged firms) <sup>8</sup>	10%	March 31, 2022	31%	32%	32%
	Percentage growth in Canada's science & technology related jobs through NRC supported firms (IRAP-engaged firms) <sup>8</sup>	5%	March 31, 2022	20%	20%	18%
	Revenue earned from clients and collaborators	\$70M	March 31, 2022	\$88.5M	\$65.1M	\$86.2M
Evidence-based solutions inform decisions in Government priority areas	Revenue earned from other federal government departments	\$62M	March 31, 2022	\$77.7M	\$76.4M	\$79.6M
	Number of NRC peer-reviewed publications co-authored with other federal government departments	45	March 31, 2022	51	62	83

Financial, human resources and performance information for the NRC's Program Inventory is available in [GC InfoBase](#).<sup>xxxvii</sup>

<sup>5</sup> Field-Weighted Citation Impact Score (FWCI) measured over a period of three calendar years. Based on NRC peer-reviewed publications indexed in Scopus as of April 2022.

<sup>6</sup> Based on NRC peer-reviewed publications indexed in Scopus as of April 2022.

<sup>7</sup> Results in the table are focused on the workforce representation of women up to fiscal year-end 2021–22. Results for Indigenous peoples were 0.46 in 2021–22, 0.44 in 2020–21 and 0.38 in 2019–20. Results for persons with disabilities were 0.36 in 2021–22, 0.33 in 2020–21 and 0.27 in 2019–20. Results for racialized persons were 1.01 in 2021–22, 0.99 in 2020–21 and 0.95 in 2019–20. Results are based on 2016 census data.

<sup>8</sup> Measured over a period of two calendar years and lagging by two years.

## Budgetary financial resources (dollars)

The following table shows, for Science and Innovation, budgetary spending for 2021–22, as well as actual spending for that year. Explanations on the variance between planned and actual spending are provided in the spending and human resources section of this report.

2021–22 Main Estimates	2021–22 planned spending	2021–22 total authorities available for use	2021–22 actual spending (authorities used)	2021–22 difference (actual spending minus planned spending)
1,183,443,723	1,183,443,723	1,613,964,828	1,285,688,819	102,245,096

Financial, human resources and performance information for the NRC’s Program Inventory is available in [GC InfoBase](#).<sup>xxxvii</sup>

## Human resources (full-time equivalents)

The following table shows, in full-time equivalents, the human resources the department needed to fulfill this core responsibility for 2021–22. Explanations on the variance between planned and actual full-time equivalents are provided in the spending and human resources section of this report.

2021–22 planned full-time equivalents	2021–22 actual full-time equivalents	2021–22 difference (actual full-time equivalents minus planned full-time equivalents)
3,251.3	3,307.7	56.4

Financial, human resources and performance information for the NRC’s Program Inventory is available in [GC InfoBase](#).<sup>xxxvii</sup>

## Internal services

### Description

Internal services are those groups of related activities and resources that the federal government considers to be services in support of programs and/or required to meet corporate obligations of an organization. Internal services refers to the activities and resources of the 10 distinct service categories that support program delivery in the organization, regardless of the internal services delivery model in a department. The 10 service categories are:

- ▶ acquisition management services

- ▶ communication services
- ▶ financial management services
- ▶ human resources management services
- ▶ information management services
- ▶ information technology services
- ▶ legal services
- ▶ material management services
- ▶ management and oversight services
- ▶ real property management services

### **Leveraging NRC common and corporate services to support R&D work**

The NRC continued efforts to review and streamline its common corporate services, adapt the workspace to comply with COVID-19 measures and support the transition to the future work environment, and implement initiatives to improve the organization's ability to attract, develop, and retain a diverse, talented, healthy, and engaged workforce.

In 2021–22, the NRC's Human Resources (HR) Branch continued to face significant demands related to the COVID-19 pandemic, and was still able to make progress on initiatives from its Strategic HR Plan. The NRC's refreshed Wellness Strategy 2021-2024 focuses on raising awareness of employee and workplace wellness, equipping employees and managers to support workplace wellness, and improving psychological health at the NRC. As part of early implementation, mental health response crisis training was offered to NRC supervisors, and wellness sessions and speaker events were provided to support employee mental health. The NRC also continued to promote mental health resources such as the Employee Assistance Program and LifeSpeak, with increased usage rates for the year.

The NRC also launched its new Workforce and Workplace EDI Strategy last year, which sets out a path of action for the next three years under five strategic areas of focus: hiring diverse talent, supporting career development and talent advancement, fostering an inclusive, accessible and anti-racist culture, addressing barriers in policies and systems, and enabling progress through governance and accountability. In this first year of the Strategy, new EDI initiatives included:

- Launching a grassroots speaker series and antiracism training for senior leaders and all staff;
- Establishing hiring and representation goals for designated employment equity groups and management-led actions to increase representation through hiring;
- Launching the NRC Guide to Land Acknowledgements, NRC Anti-racism Library Guide, and the NRC's Indigenous Engagement Network; and
- Forming the NRC Black Employee Resource Community (BERC) and promoting employee networks across the public service.

To support the growth and development of NRC employees, an NRC-wide mentoring program "Mentoring@theNRC" was launched in April 2021 as a component of the NRC's Leadership Development Framework, with close to 500 registered employees. Consultations with stakeholders, including equity deserving networks, and an internal survey to determine reasons

people are attracted to the NRC as an employer were completed as part of the development of a new Talent Attraction Strategy, planned for a 2022–23 launch. The HR Branch also led the development and implementation of the NRC’s new Telework Policy to support the organization in its transition to the future work environment, and training sessions were conducted with supervisors and employees to prepare for implementation.

The NRC continued to augment its values and ethics policy framework, and made headway on various projects to promote respect, civility, and inclusion in the workplace. This included a new Policy on Conflict of Interest (COI) with directives, training sessions in conflict resolution, managing difficult conversations and strengthening civility in the workplace, mandatory scenario-based training sessions, and a declaration system for NRC employees as well as a new COI protocol for Research Centre Advisory Boards. The NRC also delivered a new Directive on Breaches of the Research and Scientific Integrity Policy, and a Workplace Assessment on Risk Factors for Workplace Harassment and Violence, which complements the continued delivery of Ombud and informal conflict resolution services and training sessions to all the NRC employees. The Ombud continues to meet regularly with senior management to raise systemic issues for resolution.

In 2021–22, the NRC continued to work diligently to improve its IT infrastructure and modernize its research IT platforms, with initiatives focused on secure research collaboration and enabling leading edge research. The NRC launched an initiative to provide a secure IT environment that enables world-class research and cooperation, with pilots to improve online collaboration and

resolve barriers that prevented research functions from migrating to secure environments. The NRC also developed a proof of concept sandbox environment to test faster access to experimental computation, tested cloud-based high performance computing (HPC) clusters, piloted an approach for interoperability across multiple environments, and deployed new on-site HPC to support research into quantum computing. To determine what other digital infrastructure will be required to support world class research, the NRC worked with science-based departments to launch a cross-departmental Research IT Policy Project.

The NRC has continued to conduct a comprehensive review of its buildings and real estate in order to support the organization's growing needs and modernise the existing infrastructure. The remaining building condition assessments for the national capital region (NCR) were completed, resulting in about 50 percent completion of the real property portfolio. The NRC also completed accessibility assessments for the built environment for over 60 buildings across the country, and carbon neutral studies were launched for the Montreal Road, Saskatoon and Royalmount sites to support portfolio capital planning. The first year of the Advanced Electronics and Photonics fabrication facilities revitalization was also completed, leveraging

### Advancing open science

The NRC’s first Open Science Action Plan was developed, draft open data and open publication toolkits were produced, and the NRC signed its first Open Access transformational agreement with major science publisher, Springer. The agreement covers Open Access publishing expenses for NRC researchers and supports the NRC and government-wide data strategy.

Budget 2021 funding of \$90 million over five years to enable facility upgrades and the latest equipment needed for basic research and technology deployment in the fields of quantum and semiconductor photonics.

The NRC has continued its efforts to enhance health, safety, and security procedures to address COVID-19 measures, the future of work environment, and an evolving workspace. Last year, the NRC introduced a new Departmental Security Plan (DSP) for 2021-2024, ensuring the NRC's security priorities are aligned with the Policy on Government Security. The Plan's implementation is already underway, with a new Security Risk Management team focused on identifying and mitigating emerging risks in areas such as cyber security as well as improvements to the physical security access for a number of NRC buildings.

To provide current information on the changing external landscape, the NRC's Travel Security program was enhanced with the addition of a health and safety section focused on global legislation and constraints imposed by COVID-19 control procedures, to complement existing guidance on security while traveling. The Travel Security Briefing has become an important part of the travel preparation process and is required for any employee travelling outside of Canada.

### Budgetary financial resources (dollars)

The following table shows, for internal services, budgetary spending for 2021–22, as well as spending for that year.

2021–22 Main Estimates	2021–22 planned spending	2021–22 total authorities available for use	2021–22 actual spending (authorities used)	2021–22 difference (actual spending minus planned spending)
148,943,324	148,943,324	159,255,983	150,620,495	1,677,171

### Human resources (full-time equivalents)

The following table shows, in full-time equivalents, the human resources the department needed to carry out its internal services for 2021–22.

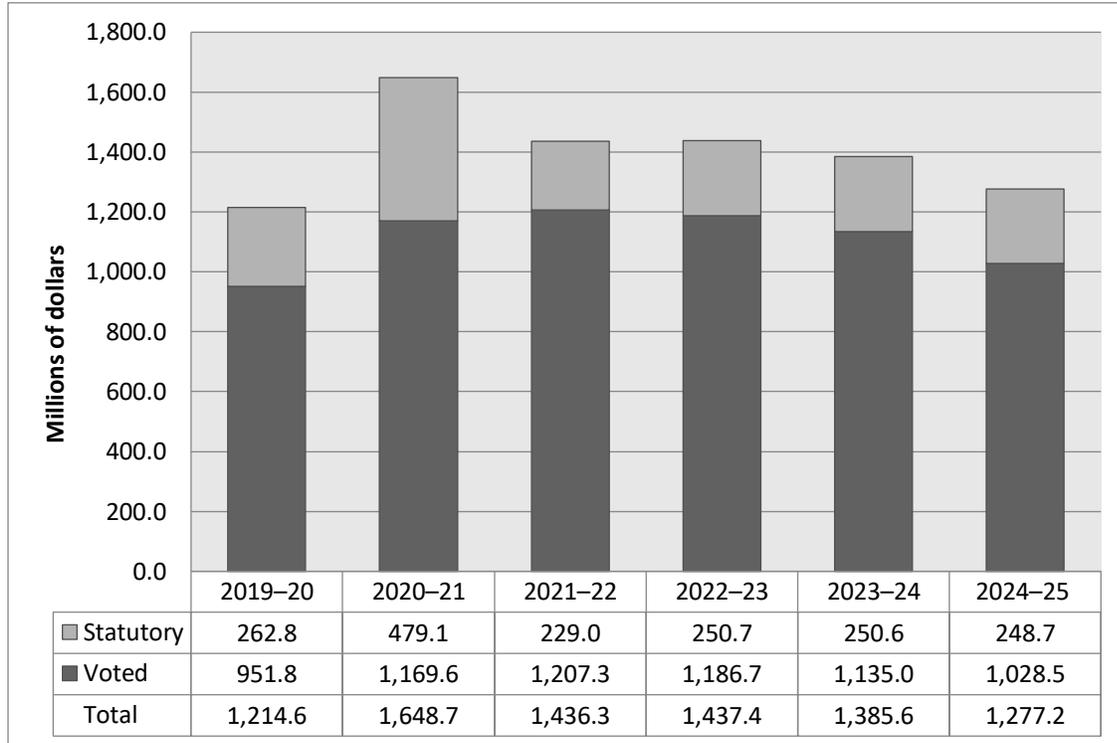
2021–22 planned full-time equivalents	2021–22 actual full-time equivalents	2021–22 difference (actual full-time equivalents minus planned full-time equivalents)
984.1	978.2	-5.9

## Sending and human resources

### Spending

#### Spending 2019–20 to 2024–25

The following graph presents planned (voted and statutory spending) over time.



The NRC’s actual spending of \$1,436.3M in 2021–22 represents a decrease of \$212.4M from the \$1,648.7M spent in 2020–21. This decrease is largely associated with additional funding received and spent in 2020–21 as a result of COVID-19. This includes incremental statutory funding under the *Public Health Events of National Concern Payments Act*.

#### Budgetary performance summary for core responsibility and internal services (dollars)

The “Budgetary performance summary for core responsibility and internal services” table presents the budgetary financial resources allocated for the NRC’s core responsibility and for internal services.

Core responsibility and internal services	2021–22 Main Estimates	2021–22 planned spending	2022–23 planned spending	2023–24 planned spending	2021–22 total authorities available for use	2019–20 actual spending (authorities used)	2020–21 actual spending (authorities used)	2021–22 actual spending (authorities used)
Science and Innovation	1,183,443,723	1,183,443,723	1,056,941,850	1,041,053,943	1,613,964,828	1,059,106,699	1,503,588,404	1,285,688,819
Internal services	148,943,324	148,943,324	152,575,603	152,246,011	159,255,983	155,495,166	145,066,909	150,620,495
<b>Total</b>	<b>1,332,387,047</b>	<b>1,332,387,047</b>	<b>1,209,517,453</b>	<b>1,193,299,954</b>	<b>1,773,220,811</b>	<b>1,214,601,865</b>	<b>1,648,655,313</b>	<b>1,436,309,314</b>

Actual spending of \$1,436.3M in 2021–22 in comparison to planned spending of \$1,332.4M represents an overall increase of \$103.9M (7.8 percent). The variance from 2020–21 planned spending is due to additional grants and contributions funding received for NRC IRAP, and capital funding received for the Canadian Photonics Fabrication Centre and the BMC, including the reprofiling of BMC construction costs from 2020–21 to 2021–22.

The following table summarizes 2021–22 spending and year-over-year variances.

In millions of dollars	2021–22 Spending	Variance from 2020–21	Variance from 2019–20
NRC IRAP – Firms and Organizations	394.9	77.0	74.6
International Astronomical Observatories Program	27.5	2.0	-1.5
TRIUMF	62.2	2.8	7.1
Collaborative Science, Technology and Innovation	31.9	4.0	17.8
NRC IRAP - Youth Employment and Skills Strategy	63.4	44.2	48.3
NRC IRAP – Innovation Assistance Program	-	-375.4	-
Grants under Innovative Solutions Canada Program	9.7	-0.3	9.4
NRC IRAP Vaccines & Therapeutics	-	-3.3	-
Other	1.2	-0.1	-
<b>Grants and Contributions</b>	<b>590.8</b>	<b>-249.2</b>	<b>155.6</b>
COVID-19 funding - BMC and the Clinical Trial Material Facility	56.3	0.3	56.2
All other	54.0	-0.6	3.0
<b>Capital</b>	<b>110.3</b>	<b>-0.3</b>	<b>59.2</b>
Operating	506.2	12.2	40.7
Statutory Revenue	65.8	-0.1	2.2
Contributions to Employee Benefit Plans (EBP)	163.2	25.1	-36.0
<b>Operating/Revenue/EBP</b>	<b>735.2</b>	<b>37.1</b>	<b>6.9</b>
<b>Total Expenditures</b>	<b>1,436.3</b>	<b>-212.3</b>	<b>221.7</b>

## Human resources

The “Human resources summary for core responsibility and internal services” table presents the full-time equivalents (FTEs) allocated to the NRC’s core responsibility and to internal services.

### Human resources summary for core responsibility and internal services

Core responsibility and internal services	2019–20 actual full-time equivalents	2020–21 actual full-time equivalents	2021–22 planned full-time equivalents	2021–22 actual full-time equivalents	2022–23 planned full-time equivalents	2023–24 planned full-time equivalents
Science and Innovation	3,115.5	3,270.3	3,251.3	3,307.7	3,251.3	3,251.3
Internal services	993.9	991.0	984.1	978.2	984.1	984.1
<b>Total</b>	<b>4,109.4</b>	<b>4,261.3</b>	<b>4,235.4</b>	<b>4,285.9</b>	<b>4,235.4</b>	<b>4,235.4</b>

The NRC’s actual 2021–22 FTEs (4,285.9) has increased by 24.6 FTEs (0.6 percent) when compared to the 2020–21 FTE level (4,261.3). The increase is mostly attributable to increased FTEs within Science and Innovation, primarily due to ramping up of operational capacity in 2021–22 for the BMC.

Description	2021–22 FTEs	Variance from 2020–21	Variance from 2019–20
R&D FTEs	2,636.1	37.6	158.9
NRC IRAP FTEs	452.4	4.9	28.2
Internal Services and Enabling Services FTEs	1,197.4	-17.9	-10.6
<b>Total NRC FTEs</b>	<b>4,285.9</b>	<b>24.6</b>	<b>176.5</b>

## Expenditures by vote

For information on the NRC’s organizational voted and statutory expenditures, consult the [Public Accounts of Canada 2021](#).<sup>xxxviii</sup>

## Government of Canada spending and activities

Information on the alignment of the NRC’s spending with Government of Canada’s spending and activities is available in [GC InfoBase](#).<sup>xxxvii</sup>

## Financial statements and financial statements highlights

### Financial statements

The NRC's financial statements (audited) for the year ended March 31, 2022, are available on the [departmental website](#).<sup>xxxix</sup>

### Financial statement highlights

#### Condensed Statement of Operations (audited) for the year ended March 31, 2022 (dollars)

Financial information	2021–22 planned results	2021–22 actual results	2020–21 actual results	Difference (2021–22 actual results minus 2021–22 planned results)	Difference (2021–22 actual results minus 2020–21 actual results)
Total expenses	1,364,752,000	1,402,442,000	1,627,272,000	37,690,000	(224,830,000)
Total revenues	188,423,000	168,417,000	155,691,000	(20,006,000)	12,726,000
Net cost of operations before government funding and transfers	1,176,329,000	1,234,025,000	1,471,581,000	57,696,000	(237,556,000)

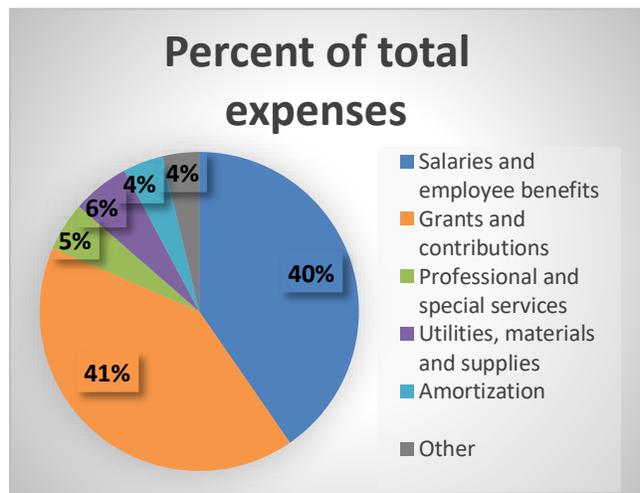
The NRC's consolidated financial statements include both the NRC and its portion of the accounts of the Canada-France-Hawaii Telescope Corporation (CFHT) and TMT International Observatory LLC (TIO). The NRC relationship with CFHT and TIO meets the definition of a government partnership under Canadian public sector accounting standards, which requires that its results be proportionally consolidated within those of the NRC. All inter-organizational balances and transactions are eliminated as part of the consolidation process. CHFT and TIO statements as at December 31, 2021 have been proportionally consolidated with the NRC's March 31, 2022 accounts.

The NRC's consolidated total expenses of \$1,402M in 2021–22 represent a decrease from \$1,627M in 2020–21. The NRC's major expense components are salaries and employee benefits (\$566M) and grants and contributions (\$576M), representing 81 percent of total expenses. The \$225M decrease is primarily due to a decrease in grants and contributions of \$245M, an increase in salary and employee benefits of \$12M, and an increase of \$8M in other operating expenses. The variance in grants and contributions is mainly due to a \$375M decrease in the Innovation Assistance Program which ended in 2020–21, a \$71M increase in NRC IRAP contribution to firms, and a \$53M increase in the Youth Employment and Skills Strategy. The salary increase is

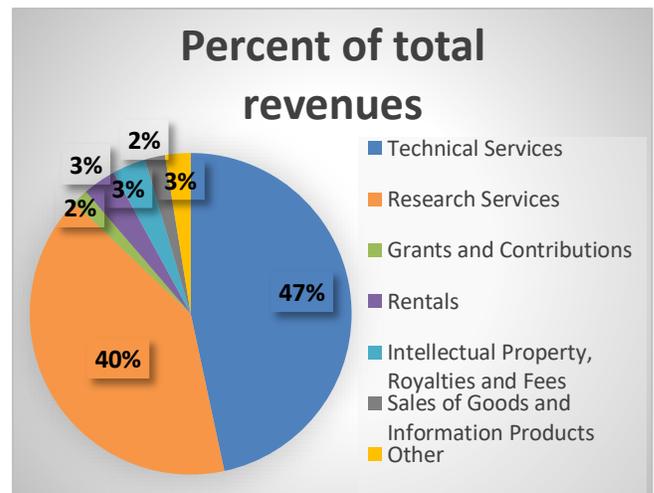
mainly due to renewed collective agreements, an increase in term/casual employees, and an increase in Phoenix compensation claims. The planned expenses, as reported in the NRC’s Consolidated Future Oriented Financial Statements in the 2021–22 Departmental Plan were \$1,365M. The variance between planned and actual results of \$37M is primarily due to increases in grants and contributions.

The NRC generates revenue which can be reinvested in operations. The NRC’s consolidated total revenues of \$168M in 2021–22 represent an increase from \$156M in 2020–21. The NRC’s major revenue components were research services (\$68M) and technical services (\$79M), representing 87 percent of revenues. The planned revenue, as reported in the NRC’s Consolidated Future Oriented Financial Statements in the 2021–22 Departmental Plan was \$188M. The total variance of \$20M is largely attributed to technical service (\$19M lower than the planned results).

**Expenses by Type (2021–22)**



**Revenues by Type (2021–22)**



**Condensed Statement of Financial Position (audited) as of March 31, 2022 (dollars)**

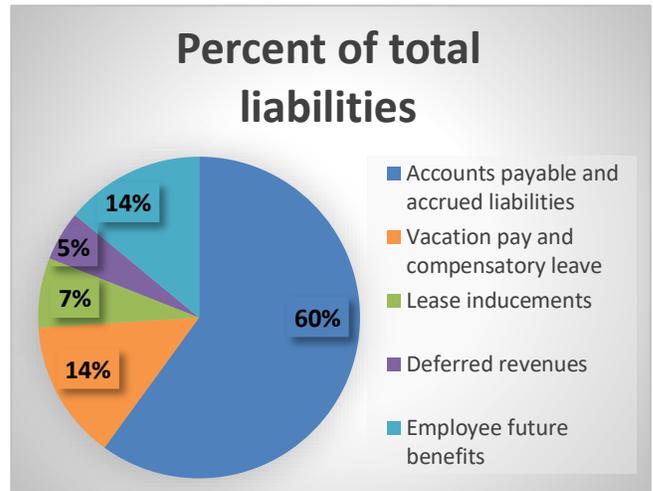
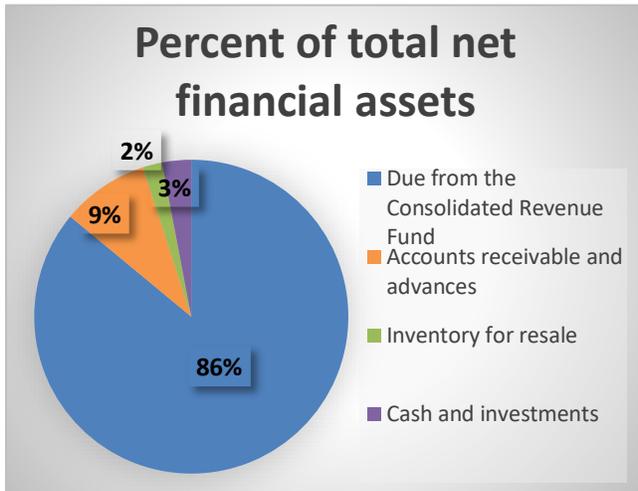
Financial information	2021–22	2020–21	Difference (2021–22 minus 2020–21)
Total net financial assets	326,495,000	321,409,000	5,086,000
Total net liabilities	297,980,000	291,571,000	6,409,000
Departmental net financial assets	28,515,000	29,838,000	(1,323,000)
Total non-financial assets	875,113,000	794,526,000	80,587,000
Departmental net financial position	903,628,000	824,364,000	79,264,000

The NRC’s consolidated net financial assets totaled \$326M as at March 31, 2022, an increase of \$5M from the March 31, 2021 balance of \$321M. The balance is made up of the Due from the Consolidated Revenue Fund (CRF), accounts receivable, inventory for resale and cash and investments. The increase is primarily due to a \$10M increase of the Due from the CRF.

The NRC’s consolidated liabilities consist of accounts payable and accrued liabilities, vacation and compensatory leave, lease inducements, deferred revenues, and employee future benefits. The balance as at March 31, 2022 of \$298M represents a \$6M increase from the March 31, 2021 balance of \$292M. The increase is primarily due to a \$6M increase in deferred revenues.

**Net Financial Assets as at March 31, 2022**

**Liabilities as at March 31, 2022**



The 2021–22 planned results information is provided in the [NRC’s Future-Oriented Statement of Operations and Notes 2021–22](#).<sup>x1</sup>

## Corporate information

### Organizational profile

**Appropriate minister:** The Honourable François-Philippe Champagne, P.C., M.P., Minister of Innovation, Science and Industry

**Institutional head:** Iain Stewart, President

**Ministerial portfolio:** Innovation, Science and Economic Development

**Enabling instrument[s]:** *National Research Council Act*,<sup>xli</sup> R.S.C. 1985, c. N-15

**Year of incorporation / commencement:** 1916

**Other:** The NRC is a departmental corporation of the Government of Canada, reporting to Parliament through the Minister of Innovation, Science and Industry. The NRC works in partnership with members of the Innovation, Science and Economic Development Portfolio to leverage complementary resources to promote science and research and integrated innovation, to exploit synergies in key areas of science and technology, to promote the growth of small and medium-sized enterprises and to contribute to Canadian economic growth. The NRC's Council provides independent strategic advice to the NRC President and it reviews organizational performance. The President provides leadership and strategic management and is responsible for the achievement of the NRC's long-range goals and plans in alignment with government priorities as reflected in his mandate letter. Each of the NRC's Vice-Presidents is responsible for a number of areas composed of programs and research initiatives, centres, the Industrial Research Assistance Program, and/or a corporate branch. Vice-Presidents and NRC managers are responsible for executing plans and priorities to ensure successful achievement of objectives.

### Raison d'être, mandate and role: who we are and what we do

“Raison d'être, mandate and role: who we are and what we do” is available on the [NRC website corporate page](#).<sup>xlii</sup>

For more information on the department's organizational mandate letter commitments, see the [Minister's mandate letter](#).<sup>i</sup>

### Operating context

Information on the operating context is available on the [NRC website financial and performance reporting page](#).<sup>xliii</sup>

## Reporting framework

The NRC’s Departmental Results Framework and Program Inventory of record for 2021–22 are shown below.

Core Responsibility: Science and Innovation		
Departmental Results Framework	Departmental Result: Scientific and technological knowledge advances	I1. Citation score of NRC-generated publications relative to the world average I2. Number of peer-reviewed publications generated by the NRC I3. Number of patents issued to the NRC I4. Number of licence agreements I5. Ratio of the NRC’s workforce made up of underrepresented groups relative to Canadian average labour market availability in Science, Technology, Engineering and Mathematics (STEM)
	Departmental Result: Innovative businesses grow	I6. Percentage of R&D clients who report positive benefits of working with the NRC I7. Percentage revenue growth of firms engaged with the NRC (IRAP-engaged firms) I8. Percentage growth in Canada’s science and technology related jobs through NRC supported firms (IRAP-engaged firms) I9. Revenue earned from clients and collaborators
	Departmental Result: Evidence-based solutions inform decisions in Government priority areas	I10. Revenue earned from other federal government departments I11. Number of NRC peer-reviewed publications co-authored with other federal government departments
	Program Inventory	Advanced Electronics and Photonics
		Aerospace
		Aquatic and Crop Resource Development
		Automotive and Surface Transportation
		Business Management Support (Enabling)
		Collaborative Science, Technology and Innovation Program
		Construction
		Design & Fabrication Services (Enabling)
Digital Technologies		
Energy, Mining and Environment		
Genomics Research & Development Initiative Shared Priority Projects		
Herzberg Astronomy & Astrophysics		
Human Health Therapeutics		
Industrial Research Assistance Program		
International Affiliations		
Medical Devices		
Metrology		
Nanotechnology		
National Science Library		
Ocean, Coastal and River Engineering		
Research Information Technology Platforms (Enabling)		
Security and Disruptive Technologies		
Special Purpose Real Property (Enabling)		
TRIUMF		

Internal Services

## Supporting information on the program inventory

Financial, human resources and performance information for the NRC's Program Inventory is available in [GC InfoBase](#).<sup>xxxvii</sup>

## Supplementary information tables

The following supplementary information tables are available on the [NRC website's Financial and Performance Reporting page](#):<sup>xliii</sup>

- ▶ Details on transfer payment programs
- ▶ Gender-based analysis plus
- ▶ Response to parliamentary committees and external audits

## Federal tax expenditures

The tax system can be used to achieve public policy objectives through the application of special measures such as low tax rates, exemptions, deductions, deferrals and credits. The Department of Finance Canada publishes cost estimates and projections for these measures each year in the [Report on Federal Tax Expenditures](#).<sup>xliv</sup> This report also provides detailed background information on tax expenditures, including descriptions, objectives, historical information and references to related federal spending programs as well as evaluations and GBA Plus of tax expenditures.

## Organizational contact information

**Mailing address:** National Research Council Canada

1200 Montreal Road, Bldg. M-58

Ottawa, Ontario, Canada K1A 0R6

**Telephone:** 613-993-9101 or toll-free 1-877-NRC-CNRC (1-877-672-2672)

**TTY:** 613-949-3042

**Fax:** 613-991-9096

**Email:** [info@nrc-cnrc.gc.ca](mailto:info@nrc-cnrc.gc.ca)

**Website(s):** <https://nrc.canada.ca/en/><sup>xxxix</sup>

## **Appendix: definitions**

### **appropriation** (*crédit*)

Any authority of Parliament to pay money out of the Consolidated Revenue Fund.

### **budgetary expenditures** (*dépenses budgétaires*)

Operating and capital expenditures; transfer payments to other levels of government, organizations or individuals; and payments to Crown corporations.

### **core responsibility** (*responsabilité essentielle*)

An enduring function or role performed by a department. The intentions of the department with respect to a core responsibility are reflected in one or more related departmental results that the department seeks to contribute to or influence.

### **Departmental Plan** (*plan ministériel*)

A report on the plans and expected performance of an appropriated department over a 3-year period. Departmental Plans are usually tabled in Parliament each spring.

### **departmental priority** (*priorité*)

A plan or project that a department has chosen to focus and report on during the planning period. Priorities represent the things that are most important or what must be done first to support the achievement of the desired departmental results.

### **departmental result** (*résultat ministériel*)

A consequence or outcome that a department seeks to achieve. A departmental result is often outside departments' immediate control, but it should be influenced by program-level outcomes.

### **departmental result indicator** (*indicateur de résultat ministériel*)

A quantitative measure of progress on a departmental result.

### **departmental results framework** (*cadre ministériel des résultats*)

A framework that connects the department's core responsibilities to its departmental results and departmental result indicators.

### **Departmental Results Report** (*rapport sur les résultats ministériels*)

A report on a department's actual accomplishments against the plans, priorities and expected results set out in the corresponding Departmental Plan.

### **experimentation** (*expérimentation*)

The conducting of activities that seek to first explore, then test and compare the effects and impacts of policies and interventions in order to inform evidence-based decision-making, and improve outcomes for Canadians, by learning what works, for whom and in what circumstances. Experimentation is related to, but distinct from innovation (the trying of new things), because it involves a rigorous comparison of results. For example, using a new website to communicate with Canadians can be an innovation; systematically testing the new website against existing outreach tools or an old website to see which one leads to more engagement, is experimentation.

**full-time equivalent** (*équivalent temps plein*)

A measure of the extent to which an employee represents a full person-year charge against a departmental budget. For a particular position, the full-time equivalent figure is the ratio of number of hours the person actually works divided by the standard number of hours set out in the person's collective agreement.

**gender-based analysis plus (GBA Plus)** (*analyse comparative entre les sexes plus [ACS Plus]*)

An analytical tool used to support the development of responsive and inclusive policies, programs and other initiatives; and understand how factors such as sex, race, national and ethnic origin, Indigenous origin or identity, age, sexual orientation, socio-economic conditions, geography, culture and disability, impact experiences and outcomes, and can affect access to and experience of government programs.

**government-wide priorities** (*priorités pangouvernementales*)

For the purpose of the 2021–22 Departmental Results Report, government-wide priorities refers to those high-level themes outlining the government's agenda in the 2020 Speech from the Throne, namely: Protecting Canadians from COVID-19; Helping Canadians through the pandemic; Building back better – a resiliency agenda for the middle class; The Canada we're fighting for.

**horizontal initiative** (*initiative horizontale*)

An initiative where two or more federal organizations are given funding to pursue a shared outcome, often linked to a government priority.

**non-budgetary expenditures** (*dépenses non budgétaires*)

Net outlays and receipts related to loans, investments and advances, which change the composition of the financial assets of the Government of Canada.

**performance** (*rendement*)

What an organization did with its resources to achieve its results, how well those results compare to what the organization intended to achieve, and how well lessons learned have been identified.

**performance indicator** (*indicateur de rendement*)

A qualitative or quantitative means of measuring an output or outcome, with the intention of gauging the performance of an organization, program, policy or initiative respecting expected results.

**performance reporting** (*production de rapports sur le rendement*)

The process of communicating evidence-based performance information. Performance reporting supports decision making, accountability and transparency.

**plan** (*plan*)

The articulation of strategic choices, which provides information on how an organization intends to achieve its priorities and associated results. Generally, a plan will explain the logic behind the strategies chosen and tend to focus on actions that lead to the expected result.

**planned spending** (*dépenses prévues*)

For Departmental Plans and Departmental Results Reports, planned spending refers to those amounts presented in Main Estimates.

A department is expected to be aware of the authorities that it has sought and received. The determination of planned spending is a departmental responsibility, and departments must be able to defend the expenditure and accrual numbers presented in their Departmental Plans and Departmental Results Reports.

**program** (*programme*)

Individual or groups of services, activities or combinations thereof that are managed together within the department and focus on a specific set of outputs, outcomes or service levels.

**program inventory** (*répertoire des programmes*)

Identifies all the department's programs and describes how resources are organized to contribute to the department's core responsibilities and results.

**result** (*résultat*)

A consequence attributed, in part, to an organization, policy, program or initiative. Results are not within the control of a single organization, policy, program or initiative; instead they are within the area of the organization's influence.

**statutory expenditures** (*dépenses législatives*)

Expenditures that Parliament has approved through legislation other than appropriation acts. The legislation sets out the purpose of the expenditures and the terms and conditions under which they may be made.

**target** (*cible*)

A measurable performance or success level that an organization, program or initiative plans to achieve within a specified time period. Targets can be either quantitative or qualitative.

**voted expenditures** (*dépenses votées*)

Expenditures that Parliament approves annually through an appropriation act. The vote wording becomes the governing conditions under which these expenditures may be made.



## Endnotes

- i. Minister of Innovation, Science and Industry Mandate Letter, <https://pm.gc.ca/en/mandate-letters/2021/12/16/minister-innovation-science-and-industry-mandate-letter>
- ii. Mandate Letter for the NRC President, <https://nrc.canada.ca/en/corporate/about-nrc/mandate-letter-mr-iaian-stewart-september-6-2018>
- iii. Clean and Energy Efficient Transportation program, <https://nrc.canada.ca/en/research-development/research-collaboration/clean-energy-efficient-transportation-program>
- iv. Resilient Ground Transportation program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/resilient-ground-transportation-program>
- v. RC's Low-emission Aviation Program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/low-emission-aviation-program>
- vi. Case Study on COVID-19 Hate Speech, <https://caiac.pubpub.org/pub/vd3v9vby/release/1>
- vii. Indigenous languages technology project, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/canadian-indigenous-languages-technology-project>
- viii. Publication: The Virgo Environment Traced In CO Survey, <https://arxiv.org/abs/2111.00937>
- ix. NRC Ideation Fund, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/ideation-fund-where-breakthroughs-begin>
- x. Publication: Reinforcement of Polymer-Based Nanocomposites by Thermally Conductive and Electrically Insulating Boron Nitride Nanotubes, <https://pubs.acs.org/doi/10.1021/acsanm.9b02010>
- xi. NRC Collaboration centres, <https://nrc.canada.ca/en/research-development/research-collaboration/collaboration-centres>
- xii. Publication: Neural evolution structure generation: high entropy alloys, <https://nrc-publications.canada.ca/eng/view/object/?id=3b30e425-0723-4c7a-bc47-d313eaa92ca7>
- xiii. Accelerated Growth Service, <https://www.canada.ca/en/atlantic-canada-opportunities/atlanticgrowth/results/acceleratedgrowth.html>
- xiv. Innovative Solutions Canada, <https://www.ic.gc.ca/eic/site/101.nsf/eng/home>
- xv. ExploreIP marketplace, <https://ised-isde.canada.ca/ipm-mcpi/organisation/national-research-council-canada/1000?lang=en>
- xvi. 2021 ITEA Aware of Excellence Recipients, <https://itea4.org/news/congratulations-to-our-2021-itea-award-of-excellence-winners.html>
- xvii. Disruptive Technology Solutions for Cell and Gene Therapy Challenge program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/disruptive-technology-solutions-cell-gene-therapy-challenge-program>
- xviii. Materials for Clean Fuels Challenge program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/materials-clean-fuels-challenge-program>
- xix. High-Throughput and Secure Networks Challenge program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/high-throughput-secure-networks-challenge-program>
- xx. Artificial Intelligence for Design Challenge program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/artificial-intelligence-design-challenge-program>
- xxi. Pandemic Response Challenge Program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/pandemic-response-challenge-program>
- xxii. Aging in Place Challenge Program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/aging-place-challenge-program>
- xxiii. Internet of Things: Quantum Sensors, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/internet-things-quantum-sensors-challenge-program>
- xxiv. Sustainable Protein Production program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/sustainable-protein-production-program>
- xxv. Ocean program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/ocean-program>
- xxvi. AI for Logistics program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/artificial-intelligence-logistics-supercluster-support-program>
- xxvii. Digital Health and Geospatial Analytics, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/digital-health-geospatial-analytics>
- xxviii. Advanced Manufacturing program, <https://nrc.canada.ca/en/research-development/research-collaboration/programs/advanced-manufacturing-program>
- xxix. TorchDrug, <https://torchdrug.ai/>
- xxx. NRC's Departmental Sustainable Development Strategy, <https://nrc.canada.ca/en/corporate/planning-reporting/departmental-sustainable-development-strategy-2020-2023>
- xxxi. Federal Sustainable Development Strategy, <https://www.fds-sfdd.ca/index.html#/en/goals/>
- xxxii. Sustainable Development Goal 7, <https://www.un.org/sustainabledevelopment/energy/>
- xxxiii. Sustainable Development Goal 9, <https://www.un.org/sustainabledevelopment/infrastructure-industrialization/>
- xxxiv. Sustainable Development Goal 11, <https://www.un.org/sustainabledevelopment/cities/>
- xxxv. Sustainable Development Goal 12, <https://www.un.org/sustainabledevelopment/sustainable-consumption-production/>
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- xxxvii. GC InfoBase, <https://www.tbs-sct.gc.ca/ems-sgd/edb-bdd/index-eng.html#start>
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- xxxix. NRC website, <https://nrc.canada.ca/en/>
- xl. NRC's Future-Oriented Statement of Operations and Notes 2021-22, <https://nrc.canada.ca/en/corporate/planning-reporting/consolidated-future-oriented-statement-operations-year-ending-march-31-2022>
- xli. National Research Council Act, <https://laws-lois.justice.gc.ca/eng/acts/N-15/index.html>
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- xliii. NRC website financial and performance reporting page, <https://nrc.canada.ca/en/corporate/planning-reporting/financial-performance-reporting>
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## Operating context: conditions affecting our work

In 2021–22, most countries around the world faced economic challenges as a result of the ongoing pandemic and Russian invasion of Ukraine, including rising inflation, supply chain disruptions, cyber-attacks and a growing labour shortage. The uneven economic recovery from the pandemic has deepened national and international divisions at a time when threats – including climate change – are increasingly global in scale.

The pandemic highlighted Canada’s dependency on foreign imports for critical health care supplies and the limitations of domestic production capabilities. Science and technology played a key role in helping to slow the virus, secure a longer-term resolution for the pandemic and improve access to healthcare for vulnerable populations. The NRC made numerous contributions to this cause, including supporting the development of life-saving vaccines, increasing Canada’s biomanufacturing capacity, testing the effectiveness of personal protective equipment, and leveraging nanotechnology to enable swift diagnosis of illness. At the same time, non-pandemic-focused research and development continued. In a world where innovation is the new arms race, emerging technologies are redefining the ways in which Canada and other countries do business.

The NRC continues to focus on key challenges facing Canada and the world, including an aging population, cybercrime and climate change. With industries undergoing digital transformations at an accelerated rate, the need for enhanced cyber security capabilities has become increasingly prominent. The impacts of climate change in Canada are also becoming more pronounced, with extreme heat, wildfires, floods, and severe storms increasing in frequency and intensity. Canada has demonstrated its commitment to doing its part in the global effort to combat climate change, which includes the NRC’s continued delivery of initiatives targeting clean technologies and sustainable alternatives.

Immigration accounts for almost 100 percent of Canada’s labour force growth. In 2021, Canada rebounded from restrictions and delays of the COVID-19 pandemic by admitting the most immigrants in a single year in its history. Equity, diversity and inclusion (EDI) in the workplace remains an opportunity for Canada to increase productivity and fill skills gaps, but hiring and retention rates remain low for underrepresented groups. The NRC has taken steps to address this by developing a new EDI strategy designed to remove barriers for new applicants and enable successful career progression.

The NRC shifted the majority of its employees to work remotely at the onset of the global pandemic and limited onsite capacity in response to public health measures to protect the health and safety of employees; however, unlike many federal organizations, NRC technical and scientific staff returned to laboratories rapidly under strict health and safety protocols to be able to continue important research for clients and collaborators. While this shift presented a risk to the NRC’s ability to deliver on its research objectives, it also presented an opportunity to rethink the future of the workplace and prompted the development of NRC’s modernized Telework Policy. New flexible work arrangements could have a significant role to play in the NRC’s ability to attract and retain a highly skilled workforce, especially in an increasingly tight labour market.

Traditional research practices, along with the methods by which results are produced and delivered are shifting. Canada is among the leaders in making government data open to the public, and the volume and impact of its scientific research output is strong. However, Canada’s comparatively low investment in R&D and lacklustre innovation performance will need to be addressed if it hopes to grow domestic companies into global champions and remain at the forefront of world-leading research and development. For the NRC, there is an opportunity to leverage its strengths and collaborate with both domestic and international innovators to help Canada address current and future global challenges, including NRC IRAP support to Canadian businesses seeking revenue-generating IP and subsidized R&D funding.

**Supplementary Information Tables:  
2021–22 Departmental Results Report**

## Table of Contents

Details on transfer payment programs .....	1
Assessed Contribution to the Bureau International des Poids et Mesures (BIPM) .....	3
Collaborative Science, Technology and Innovation Program (CSTIP) .....	5
Industrial Research Assistance Program (IRAP) .....	7
Innovative Solutions Canada .....	9
International Affiliations Program .....	11
International Astronomical Observatories Program.....	13
TRIUMF .....	16
Response to parliamentary committees and external audits .....	20
Gender-based analysis plus.....	21

## Details on transfer payment programs

### Assessed Contribution to the Bureau International des Poids et Mesures (BIPM)

<b>Start date</b>	Canada signed the Metre Convention and became a member state of BIPM in 1907
<b>End date</b>	Ongoing
<b>Type of transfer payment</b>	Contribution
<b>Type of appropriation</b>	Estimates
<b>Fiscal year for terms and conditions</b>	2018–19
<b>Link to departmental results</b>	<p>Scientific and technological knowledge advances</p> <p>Innovative businesses grow</p> <p>Evidence-based solutions inform decisions in Government priority areas</p>
<b>Link to the department’s Program Inventory</b>	<p>Core Responsibility: Science and Innovation</p> <p>Program: Metrology</p>
<b>Purpose and objectives of transfer payment program</b>	<p>The assessed contribution to the BIPM is an obligation accepted by Canada as a signatory to the international treaty known as the Metre Convention. By representing Canada on the international metrology stage through its affiliation with the BIPM and associated regional metrology organization Sistema Interamericana de Metrologia (SIM), the NRC can more effectively and efficiently respond to its mandated responsibility for maintenance of national measurement standards, as articulated in the <i>NRC Act</i> and the <i>Weights and Measures Act</i>.</p>
<b>Results achieved</b>	<ul style="list-style-type: none"> <li>• By maintaining international recognition in measurement science through its interactions with the BIPM and SIM, the NRC continues to provide metrology research and services that help transform ideas into market-ready technologies that benefit Canadian society, the economy, and the environment.</li> <li>• In 2021–22, this included the SIM Quality System Task Force (QSTF) approval of the NRC Quality Management System (QMS) transition to ISO/IEC 17025:2017 before the June 2021 deadline. Additionally the NRC QMS for Electrical Standards was presented to SIM regional task group and gained continued acceptance supporting its internationally recognized Calibration and Measurement Capabilities. The peer review for Photometry and Radiometry was successfully completed and submitted to SIM for April review and approval.</li> </ul>
<b>Findings of audits completed in 2021–22</b>	N/A

<p><b>Findings of evaluations completed in 2021–22</b></p>	<p>The <a href="#">2021–22 evaluation of the NRC's Metrology Program</a> found that it demonstrates scientific excellence, contributes to government policy solutions, and supports business innovation. The Metrology Program is engaging with national and international stakeholders and has the expertise to meet stakeholder needs and shift focus as required to address changing needs and priorities; it has also been integral to Canada's response to the COVID-19 pandemic. Opportunities identified to strengthen the Metrology Program's position were in the areas of tracking performance measurement, strategic client engagement, and increasing partnerships in order to access needed competencies, equipment and facilities.</p>
<p><b>Engagement of applicants and recipients in 2021–22</b></p>	<ul style="list-style-type: none"> <li>• The NRC participates in the activities and meetings relative to the Bureau international des poids et mesures and associated regional metrology organization Sistema Interamericana de Metrologia (SIM)</li> <li>• In 2021–22 engagement included attending virtual meetings of all the Consultative Committees and associated working groups, leading regional level workshops, leading pilot studies and key comparisons involving other international NMIs (National Metrology Institutes), as well as producing 153 peer-reviewed publications in Chemical and Physical Metrology.</li> </ul>

**Financial information (dollars)**

Type of transfer payment	2019–20 Actual spending	2020–21 Actual spending	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	Variance (2021–22 actual minus 2021–22 planned)
<b>Total grants</b>	-	-	-	-	-	-
<b>Total contributions</b>	612,603	650,198	659,000	608,795	608,795	(50,205)
<b>Total program</b>	<b>612,603</b>	<b>650,198</b>	<b>659,000</b>	<b>608,795</b>	<b>608,795</b>	<b>(50,205)</b>
<b>Explanation of variances</b>	N/A					

## Collaborative Science, Technology and Innovation Program (CSTIP)

<b>Start date</b>	April 1, 2018
<b>End date</b>	Ongoing
<b>Type of transfer payment</b>	Grants & Contributions
<b>Type of appropriation</b>	Estimates
<b>Fiscal year for terms and conditions</b>	2018–19
<b>Link to departmental results</b>	Scientific and technological knowledge advances Innovative businesses grow Evidence-based solutions inform decisions in Government priority areas
<b>Link to the department's Program Inventory</b>	Core Responsibility: Science and Innovation Program: Collaborative Science, Technology and Innovation Program
<b>Purpose and objectives of transfer payment program</b>	Provides grant and contribution funding for external collaborators with complementary capabilities [e.g. small and medium-sized enterprises (SMEs), post-secondary institutions and non-profit research organizations]. The program comprises: <ol style="list-style-type: none"> <li>1. NRC Collaborative Research &amp; Development (R&amp;D) initiatives: funding external collaborators working with NRC researchers on projects that make up a series of large-scale collaborative R&amp;D programs in priority areas;</li> <li>2. Ideation Fund: funding external collaborators working with NRC personnel to encourage, test and validate transformative self-directed, exploratory research ideas; and</li> <li>3. Outreach Initiative: funding to support conferences, workshops, symposia or other outreach initiatives, in order to promote engagement of Canadians, particularly those in under-represented groups, interested in Science, Technology, Engineering and Mathematics (STEM).</li> </ol>
<b>Results achieved</b>	<ul style="list-style-type: none"> <li>• Conducted significant stakeholder engagement to inform the development of the Applied Quantum Computing Challenge program announced through Budget 2021.</li> <li>• Formally launched 3 new Challenge programs: Aging in Place, Internet of Things: Quantum Sensors and Arctic and Northern.</li> <li>• Established strategic partnerships with the Canadian Institute of Health Research (CIHR), UK Research and Innovation (UKRI), Fonds de recherche du Québec (FRQ), Polar Knowledge Canada, Parks Canada, and Inuit Tapiriit Kanatami (ITK). These enabled coordinated calls for proposals with national and international partners, including a joint CINUK (Canada-Inuit Nunangat-United Kingdom Arctic Research Programme) call with UKRI.</li> <li>• Continued to advance research into secure telecommunications through collaborative R&amp;D in optical and quantum communications, while working closely with the Optical Satellite Consortium and the Canadian Space Agency.</li> </ul>

	<ul style="list-style-type: none"> <li>The Quantum Sensors Challenge program (QSP) is highly engaged with the National Quantum Strategy and is working on quantum technologies across the TRL scale with emphasis on commercialization. To date, the QSP program has signed collaborative research agreements with five Canadian SMEs providing \$3.8 million in CSTIP funding for projects with a total value of \$7.6 million.</li> </ul>
Findings of audits completed in 2021–22	N/A
Findings of evaluations completed in 2021–22	First evaluation scheduled for 2022–23 (five-year cycle).
Engagement of applicants and recipients in 2021–22	<p>The NRC continues to partner with private and public sector, academic and other research organizations in Canada and internationally through seven active Challenge programs and five active Cluster support programs (formerly named Supercluster support programs).</p> <p>The NRC held direct consultations with over 40 external stakeholders in addition to public communications and social media outreach in the development on the Applied Quantum Computing Challenge program, which provided a better understanding of the challenges and opportunities facing stakeholders in the quantum sector.</p> <p>There were six open calls for proposals issued in 2021–22 across Challenge programs and Cluster support programs.</p> <p>To date, the NRC has supported 356 projects and over \$114 million in funding through its Challenge programs and Cluster support programs with 93 unique collaborators.</p> <p>Two Small Teams projects were selected for funding through an open call within the NRC to work with external research collaborators.</p>

### Financial information (dollars)

Type of transfer payment	2019–20 Actual spending	2020–21 Actual spending	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	Variance (2021–22 actual minus 2021–22 planned)
<b>Total grants</b>	6,997,744	18,359,497	24,000,000	27,060,242	24,159,401	159,401
<b>Total contributions</b>	7,115,625	9,542,593	7,655,610	7,731,419	7,731,419	75,809
<b>Total program</b>	<b>14,113,369</b>	<b>27,902,090</b>	<b>31,655,610</b>	<b>34,791,661</b>	<b>31,890,820</b>	<b>235,210</b>
Explanation of variances	Variance is immaterial.					

## Industrial Research Assistance Program (IRAP)

<b>Start date</b>	September 1, 2018 (terms & conditions renewal date; original start date: April 1, 1965)
<b>End date</b>	Ongoing
<b>Type of transfer payment</b>	Contribution
<b>Type of appropriation</b>	Estimates
<b>Fiscal year for terms and conditions</b>	2018–19
<b>Link to departmental results</b>	Scientific and technological knowledge advances Innovative businesses grow Evidence-based solutions inform decisions in Government priority areas
<b>Link to the department's Program Inventory</b>	Core Responsibility: Science and Innovation Program: NRC Industrial Research Assistance Program (NRC IRAP)
<b>Purpose and objectives of transfer payment program</b>	<p>The program contributes to the growth and prosperity of Canadian SMEs by stimulating innovation, adoption and/or commercialization of technology-based products, services, or processes in Canada. This is done through: 1) technical and related business advice and networking facilitated by a cross-Canada network of field professional staff; 2) cost-shared merit-based contributions; and 3) contributions supporting employment of post-secondary graduates.</p> <p>This program has the following streams: Contributions to Firms; Contributions to Organizations; and Youth Employment Program. NRC IRAP supports the placement of graduates in SMEs through its participation in the delivery of the Youth Employment Program sponsored by Employment and Social Development Canada's Youth Employment and Skills Strategy.</p> <p>With the onset of the COVID-19 pandemic, NRC IRAP established a suite of ten temporary Subject Expert Teams to coordinate and accelerate support to Canadian SMEs who presented viable solutions to detect, prevent and treat COVID-19. NRC IRAP supported projects to further technology development, capacity building and manufacturing scale-up in response to COVID-19.</p> <p>Recipients are not required to repay funds obtained under this transfer payment program.</p>
<b>Results achieved</b>	<ul style="list-style-type: none"> <li>• Stimulation of innovation in SMEs in Canada.</li> <li>• Growth of innovative SMEs</li> <li>• Creation of wealth for Canada.</li> </ul> <p>See the Main portion of the NRC's Departmental Results Report for additional results pertaining to NRC IRAP.</p>
<b>Findings of audits completed in 2021–22</b>	N/A

<b>Findings of evaluations completed in 2021–22</b>	Next evaluation scheduled for 2022–23 (five-year cycle).
<b>Engagement of applicants and recipients in 2021–22</b>	<p>NRC IRAP is a national program managed on a regional basis with over 260 Industrial Technology Advisors (ITAs) located in 106 points of service across the country, who provide customized advice to growth oriented technologically innovative SMEs. ITAs engage with firms over a period of time, creating a plan to work with the firm to support their plans for innovation and growth. Support may be in the form of advisory services and/or financial support for innovative projects.</p> <p>At the end of their funded project, recipients are required to complete an online Post-Project Report. This assessment captures information on the recipient's experience with NRC IRAP and, along with published service standards, is used by the program to develop continuous program improvements.</p> <p>NRC IRAP has an Advisory Board composed of 10 to 12 members from the industry sector and industry associations. This Board provides advice to NRC IRAP management and brings an external perspective on the strategic direction and management of the program.</p> <p>NRC IRAP is actively engaged with the Treasury Board Secretariat (TBS) Grants and Contributions Reform. Participation in workshops and constant alignment with recent TBS policy and guidelines has enabled the program to steadily move toward principles such as a Recipient Engagement Strategy and Policy on Service and Digital.</p>

### Financial information (dollars)

Type of transfer payment	2019–20 Actual spending	2020–21 Actual spending	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	Variance (2021–22 actual minus 2021–22 planned)
<b>Total grants</b>	-	-	-	-	-	-
<b>Total contributions</b>	335,412,426	715,902,634	379,514,000	582,575,435	458,281,744	78,767,744
<b>Total program</b>	<b>335,412,426</b>	<b>715,902,634</b>	<b>379,514,000</b>	<b>582,575,435</b>	<b>458,281,744</b>	<b>78,767,744</b>
<b>Explanation of variances</b>	The significant variance between planned spending and actual spending is primarily due to the additional funding received for Medical Countermeasures. As a result, the NRC has reprofiled funds of \$50.4 million of its 2021–22 funding to future years.					

## Innovative Solutions Canada

<b>Start date</b>	2017–18 The first NRC challenge was posted in December 2017, to coincide with the program launch.
<b>End date</b>	2021–22
<b>Type of transfer payment</b>	Grant and Procurement
<b>Type of appropriation</b>	Estimates
<b>Fiscal year for terms and conditions</b>	The NRC received authority for the Innovation, Science and Economic Development (ISED)-led terms & conditions for Innovative Solutions Canada (ISC) grants in 2017–18 (January 2018).
<b>Link to departmental results</b>	ISC is an ISED-led program, with the NRC as one of 20 federal departments mandated to participate. Program results will be reported by ISED.
<b>Link to the department's Program Inventory</b>	Within the NRC, this ISED-led program is administered by NRC IRAP.
<b>Purpose and objectives of transfer payment program</b>	ISC is a grant and procurement program that enables participating departments and agencies to support the scale-up of Canadian small and medium-sized businesses through early-stage, pre-commercial R&D. The program allocates a portion of departmental funding to: <ul style="list-style-type: none"> <li>• Fuel the development and adoption of technological innovation in Canada.</li> <li>• Grow Canadian companies through direct funding to support early stage, pre-commercial R&amp;D, late stage prototypes, and to accelerate commercialization.</li> <li>• Encourage procurement from companies led by under-represented groups, such as women, Indigenous Peoples, youth, disabled individuals, 2SLGBTQ+ and others.</li> <li>• Foster greater industry-research collaboration through the release of challenges for solutions that address key Government of Canada priorities.</li> <li>• Provide federal departments and agencies with opportunities to develop new capabilities to meet their R&amp;D needs and thereby advance government priorities.</li> </ul>
<b>Results achieved</b>	NRC IRAP provided financial support for near-to-market solutions through ISED's ISC Challenge Program, investing \$12.6 million in 2021–22, to support 40 projects with 38 Canadian SMEs. The NRC continues to be the leading ISC department in the number of challenges posted, including the number of challenges issued in collaboration with other departments and awarded funded projects.
<b>Findings of audits completed in 2021–22</b>	N/A
<b>Findings of evaluations completed in 2021–22</b>	N/A – this is an ISED-led program
<b>Engagement of applicants and recipients in 2021–22</b>	Results included above

### Financial information (dollars)

Type of transfer payment	2019–20 Actual spending	2020–21 Actual spending	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	Variance (2021–22 actual minus 2021–22 planned)
<b>Total grants</b>	291,000	10,024,930	14,600,000	16,200,000	9,697,295	(4,902,705)
<b>Total contributions</b>	-	-	-	-	-	-
<b>Total program</b>	<b>291,000</b>	<b>10,024,930</b>	<b>14,600,000</b>	<b>16,200,000</b>	<b>9,697,295</b>	<b>(4,902,705)</b>
<b>Explanation of variances</b>	The significant variance between planned spending and actual spending is primarily due to the additional funding received for Medical Countermeasures. As a result, the NRC has reprofiled \$6.5 million of its 2021–22 funding to future years.					

## International Affiliations Program

<b>Start date</b>	1958
<b>End date</b>	Ongoing
<b>Type of transfer payment</b>	Grant
<b>Type of appropriation</b>	Estimates
<b>Fiscal year for terms and conditions</b>	2011–12
<b>Link to departmental results</b>	Scientific and technological knowledge advances
<b>Link to the department's Program Inventory</b>	Core Responsibility: Science and Innovation Program: International Affiliations
<b>Purpose and objectives of transfer payment program</b>	Canada's membership in international science and technology (S&T) organizations promotes international research and innovation, networking, advocacy, leadership opportunities as well as access to benchmarking possibilities, enabling Canadian science, technology, and industry to remain competitive.
<b>Results achieved</b>	<ul style="list-style-type: none"> <li>• Enhanced the NRC's international visibility and Canada's reputation as a global leader in science, technology and innovation (STI), noting in particular that the International Science Council (ISC) awarded Dr. Sherilee Harper (Canada Research Chair in Climate Change and Health and an Associate Professor in the School of Public Health at the University of Alberta) the prestigious Early Career Scientist Award for North America.</li> <li>• Enhanced Canadian influence in solidifying interdisciplinary science-based global policy making – including the election of Dr. Francoise Bayliss (Research Professor, Department of Philosophy and Special Advisor to the Vice-President Research and Innovation at Dalhousie University) to the ISC Board.</li> <li>• Contributed to Canadian STI leader development via ISC opportunities for leadership development and leadership opportunities implementing equity, diversity and inclusion (EDI) approaches.</li> <li>• Increased market-oriented innovation opportunities to Canadian SMEs and export growth via global value chains to ensure Canadian excellence and competitiveness. Canada was invited to be one of the first countries outside the European area to join the Eureka network for international co-innovation as a full-member, providing greater future opportunities for Canadian companies to access international networks and expertise to accelerate their innovative products and services to the market.</li> </ul>
<b>Findings of audits completed in 2021–22</b>	N/A
<b>Findings of evaluations completed in 2021–22</b>	Next evaluation scheduled for 2025–26.

<b>Engagement of applicants and recipients in 2021–22</b>	<ul style="list-style-type: none"> <li>• Ongoing in-depth engagement with representatives of each Canadian National Committee (CNC) that has assessed evolving priorities, most valued benefits of the program to participants and perceived needs of each international affiliation's CNC was continued.</li> <li>• Dialogue continues with existing CNCs to gauge their desired level of international participation as well as with other potential applicants.</li> <li>• An advisory committee for the program has now met through three full fiscal years, drawing on cross government science departments and agencies and deploying expertise to leverage Canadian international science objectives. Regular, frequent interaction ensures continuous engagement and coordination. The ISC was introduced to the committee and noted that processes for engagement across government as well as with CNCs were exemplary.</li> <li>• Engagement with international affiliations management has intensified and will continue to better gauge impact and plans. This will inform the Canadian STI management community of the science diplomacy needs of Canadian practitioners in light of track records of international affiliations and of associated level of required support.</li> <li>• Moreover, a regular engagement will continue to take place including completion of a reporting questionnaire.</li> </ul>
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### Financial information (dollars)

Type of transfer payment	2019–20 Actual spending	2020–21 Actual spending	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	Variance (2021–22 actual minus 2021–22 planned)
<b>Total grants</b>	588,917	608,896	560,000	565,368	564,958	4,958
<b>Total contributions</b>	-	-	-	-	-	-
<b>Total program</b>	<b>588,917</b>	<b>608,896</b>	<b>560,000</b>	<b>565,368</b>	<b>564,958</b>	<b>4,958</b>
<b>Explanation of variances</b>	Variance is immaterial.					

## International Astronomical Observatories Program

<b>Start date</b>	1978
<b>End date</b>	Ongoing
<b>Type of transfer payment</b>	Contribution
<b>Type of appropriation</b>	Estimates
<b>Fiscal year for terms and conditions</b>	2015–16
<b>Link to departmental results</b>	<p>Scientific and technological knowledge advances</p> <p>Innovative businesses grow</p> <p>Evidence-based solutions inform decisions in Government priority areas</p>
<b>Link to the department's Program Inventory</b>	<p>Core Responsibility: Science and Innovation</p> <p>Program: Herzberg Astronomy &amp; Astrophysics</p>
<b>Purpose and objectives of transfer payment program</b>	<p>Astronomy is a global science. The increasing cost of leading-edge observatories and the scarcity of ideal observation sites have led to a greater focus on international collaboration for large-scale astronomy projects which lead to advances in our knowledge and understanding of the universe.</p> <p>The NRC, in collaboration with other international bodies, provides financial contributions to support the management and operations of offshore ground-based observatories and their related facilities, including the Canada-France-Hawaii Telescope (CFHT), the twin telescopes of the Gemini Observatory and the Atacama Large Millimetre-submillimetre Array (ALMA). The NRC participates in the oversight and direction of these facilities and their research capabilities. The NRC also represented Canada in the Square Kilometre Array (SKA) consortium for the pre-construction phase of the telescope and signed a cooperation agreement in November 2021 to continue Canada's participation in the Square Kilometer Array Observatory (SKAO). In 2015, Canada joined the international partnership to participate in the Thirty Meter Telescope (TMT).</p> <p>International agreements governing these observatories are long-term commitments that specify contributions to support preconstruction design and development, construction, operation and maintenance, capital improvements (e.g., development of new astronomical instruments and other facility upgrades) and decommissioning the international ground-based observatories and their related facilities. These agreements also include commitments to support the university-based user communities to ensure a fair and progressive use of these observatories. The NRC participates in the governance of these international facilities on behalf of the Canadian astronomy research community and provides appropriate support, including sophisticated data management services and instrumentation. Through the NRC's financial and in-kind contributions, the Canadian astronomy community is assured merit-based access to these facilities with appropriate support.</p> <p>Recipients are not required to repay funds obtained under this transfer payment program.</p>

<p><b>Results achieved</b></p>	<p>Demand by Canadian astronomers for international observatories continued to exceed time available, an indicator of the relevance of the observatories and their instrumentation. 230 scientific papers were published by Canadian astronomy users enabled by the NRC based on data obtained using the CFHT, 244 based on data from the Gemini Observatory, and 483 based on data from ALMA.</p> <p>With construction of two of the world's largest radio telescopes underway, the NRC signed a 2-year cooperation agreement with the international SKAO in November 2021, to allow Canada's scientific and engineering communities to continue their participation in the project while Canada considers its future role in the construction phase. Canada has been involved in the SKA project from its earliest stages. Canadian data processing technology, developed by the NRC and industry partner MDA Ltd., is behind the extraordinary effort to identify and measure the weak signals from space in the large data stream coming from the SKA telescope in South Africa. The NRC's Canadian Astronomy Data Centre (CADC) implemented streamlined access to high-performance computing resources via a web browser. There has been significant uptake by the Canadian astronomical community. CADC's application of machine learning has increased significantly. The same machine learning methods were also applied in other fields, such as finding the most important parameters in some cancer cases.</p> <p>As an example of the widespread implementation of machine learning in astronomy, NRC researcher Hossen Teimoorinia used a random forest-based approach to reassess the metallicities of galaxies, i.e., the amounts of elements heavier than helium within them. These results were used in a recent benchmark determination of the expansion rate of the universe where the uncertainties in the measured value were dramatically reduced.</p> <p>The Canadian Hydrogen Intensity Mapping Experiment (CHIME), located at the NRC's Dominion Radio Astrophysical Observatory (DRAO) site, continued to characterize the mysterious Fast Radio Burst (FRB) sources it now discovers routinely. A notable paper, which included NRC postdoctoral fellow Jane Kaczmarek, provided fresh insight into the character of the FRBs that repeat, as their signals were found to be longer in duration and narrower in bandwidth than those that do not, helping to constrain their possible origins.</p>
<p><b>Findings of audits completed in 2021–22</b></p>	<p>N/A</p>
<p><b>Findings of evaluations completed in 2021–22</b></p>	<p>The NRC completed a formal <a href="#">2021–22 evaluation of its Herzberg Astronomy and Astrophysics (HAA) Program</a>, covering 2016–17 to 2020–21. Key findings included that HAA is an internationally recognized leader in scientific excellence, is aligned with both the strategic objectives of the federal government and the needs of the Canadian astronomy community, and has a strong record of research publication and impact. HAA's activities and strategic priorities are closely aligned with the needs of the Canadian astronomy community. A survey found that 84 percent of respondents engaged in ground based observational research considered the telescopes supported by Canada to be critical to their research. The international</p>

	<p>telescopes supported by Canada are critical to users, however the value of annual grants and contributions for Canadian access to international observatories have remained static since 2011, which could reduce the amount of time designated to Canadian astronomers in the future. HAA's facilities are unique in Canada, however some are in need of maintenance or upgrading. Finally, HAA is highly capable in managing both national facilities and Canada's participation in international facilities.</p>
<p><b>Engagement of applicants and recipients in 2021–22</b></p>	<p>The NRC manages observatories established or maintained by the Government of Canada for the benefit of the Canadian astronomy research community, aligning its contributions to the priorities of the community's Long Range Plan for Astronomy and Astrophysics. The NRC participates on the Boards which oversee the observatories to ensure that the science directions and programs of the facilities reflect Canadian strengths and interests. In addition, the NRC ensures that these activities increase opportunities for Canadian researchers and firms to develop relevant instrumentation for the observatories.</p> <p>To carry out its roles effectively, the NRC provides current information about each observatory to research community-based committees of scientists, which provide expert advice on observatory operations and development. The NRC provides extensive support to the user community through numerous services extending from administering the time allocation process for Canadian researchers, to delivery of science-ready data (through the CADDC).</p>

### Financial information (dollars)

Type of transfer payment	2019–20 Actual spending	2020–21 Actual spending	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	Variance (2021–22 actual minus 2021–22 planned)
<b>Total grants</b>	-	-	-	-	-	-
<b>Total contributions</b>	29,044,279	25,495,440	53,126,691	57,998,565	27,537,242	(25,589,449)
<b>Total program</b>	<b>29,044,279</b>	<b>25,495,440</b>	<b>53,126,691</b>	<b>57,998,565</b>	<b>27,537,242</b>	<b>(25,589,449)</b>
<b>Explanation of variances</b>	The significant variance between planned spending and actual spending is primarily due to project delays associated with Canada's participation in the construction of the TMT that are outside the NRC's control. As a result, the NRC has reprofiled \$20 million of its 2021–22 funding for Canada's contribution to the TMT to future years.					

## TRIUMF

<b>Start date</b>	April 1, 1977
<b>End date</b>	Ongoing
<b>Type of transfer payment</b>	Contribution
<b>Type of appropriation</b>	Estimates
<b>Fiscal year for terms and conditions</b>	2020–21
<b>Link to departmental results</b>	Scientific and technological knowledge advances Innovative businesses grow Evidence-based solutions inform decisions in Government priority areas
<b>Link to the department's Program Inventory</b>	Core Responsibility: Science and Innovation Program: TRIUMF
<b>Purpose and objectives of transfer payment program</b>	<p>TRIUMF is Canada's particle accelerator centre. The laboratory is one of Canada's key investments in large-scale research infrastructure. It provides world-class facilities for research in sub-atomic physics, accelerator science, life sciences, and materials science. An incorporated non-profit with charitable status, TRIUMF is owned and operated by a consortium of Canadian universities, with its core operations funded through five-year contribution agreements. The NRC plays an important oversight and stewardship role for TRIUMF on behalf of the Government of Canada.</p> <p>Recipients are not required to repay funds obtained under this transfer payment program.</p>
<b>Results achieved</b>	<ul style="list-style-type: none"> <li>• TRIUMF contributed to 285 scientific publications in scientific journals, and hosted 187 scientific visitors and users, 90 of which came from international institutions.</li> <li>• The TRIUMF Life Sciences team produced, purified, and delivered its largest batch ever of actinium-225 from the spallation of thorium-232, and shipped the material to a radiopharmaceutical provider for further testing.</li> <li>• TRIUMF commissioned the unique station for FLASH irradiation at the ARIEL superconducting electron linear accelerator. This new type of radiotherapy being explored for cancer treatment is using a unique electron convertor target developed for ARIEL.</li> <li>• TRIUMF's DRAGON facility performed the first direct measurement of an astrophysical reaction using a radioactive beam of isomeric nuclei. The reaction rate is important for the interpretation of astronomical observations that provide direct evidence for ongoing nucleosynthesis in our galaxy – findings were published in Physical Review Letters.</li> <li>• TRIUMF implemented policies and procedures intended to safeguard the health and safety of staff and visitors, including limiting site-access at times, implementing vaccination requirements, and promoting remote engagement where possible – all measures to lessen the impact of COVID-19 while still supporting active research programs across the lab.</li> <li>• TRIUMF reached a very important milestone in the ARIEL project with the completion of the Target Ion Source Acceptance (TISA) test stand. Thermal and mechanical testing was started and the prototype of an important</li> </ul>

	<p>component of the ARIEL target stations, the High Voltage Feedthrough, was prepared for high voltage operation at the test stand.</p> <ul style="list-style-type: none"><li>• For Canada's contribution to the High Luminosity LHC (HL-LHC) upgrade at CERN (European Organization for Nuclear Research), the TRIUMF Superconducting Radiofrequency (SRF) group completed the preparation of the test infrastructure required for the 2 Kelvin operation of the dressed crab cavities that will be provided by Fermilab.</li><li>• TRIUMF scientists with the ATLAS collaboration delivered new detector components to CERN. The New Small Wheels (NSW) constitute a major upgrade of the ATLAS detector to prepare for the increased luminosity and will enable continued work on the Higgs and new physics programs at ATLAS. TRIUMF, in a consortium with five Canadian universities (Carleton, McGill, Montreal, Simon Fraser, and Victoria) have contributed to the NSW detector.</li><li>• TRIUMF trained more than 300 highly qualified personnel, including undergraduate and graduate students, and post-doctoral researchers.</li><li>• For the first time since the beginning of the pandemic, TRIUMF and its Japanese counterpart, KEK, relaunched the Exchange Program for Early Career Researchers – a bilateral program to support the sharing of young talent between Canada and Japan.</li><li>• TRIUMF filed for patent protection for a new chelator patent, expanding its portfolio of chelators available for licensing to three. These chelators are being out-licensed on a non-exclusive basis to Canadian and global drug development partners.</li><li>• TRIUMF spinoff, Ideon, is leading a \$13.5 million Digital Supercluster Project, "Earth X-ray for Low-Impact Mining" in partnership with Simon Fraser University, Dias Geophysical, Microsoft, Fireweed Zinc, and Mitacs. The project will enable mining exploration companies to identify density and magnetic anomalies with greater resolution and certainty up to 1 kilometre beneath the Earth's surface.</li><li>• TRIUMF spinoff, ARTMS (Alternative Radioisotope Technologies for Medical Science), filed with Health Canada to produce gallium-68, a critical medical isotope of significant clinical importance in nuclear medicine diagnostic procedures utilizing PET imaging. On the basis of the filing, ARTMS entered into partnership with POINT Biopharma and the Canadian Molecular Imaging Probe Consortium (CanProbe), a joint venture between the Centre for Probe Development and Commercialization (CPDC) and the University Health Network (UHN), for the development and clinical use of innovative radiopharmaceuticals in Canada.</li><li>• TRIUMF, in collaboration with international partners and key Canadian research collaborators, leveraged its expertise in the gas exchange systems used in experimental physics to develop a novel ventilator in response to the early COVID-19 shortages. The Mechanical Ventilator Milano (MVM) ventilator received Interim Order approval from Health Canada and was produced and delivered by an industry partner, Vexos.</li><li>• On June 1, 2021, TRIUMF incorporated as a federal not-for-profit entity with registered charitable status. This provides TRIUMF the ability to efficiently manage legal and financial matters related to the organisation. It has also allowed the implementation of a skills-based Board of Governors, while a Members' Council overseeing the interests of TRIUMF's university stakeholders. The skills-based board has improved the connection between laboratory management and TRIUMF's governance structures.</li><li>• To ensure strong performance across key regulatory areas, many management system procedures were augmented and rewritten to streamline and improve processes associated with work planning and</li></ul>
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	<p>execution. In addition, TRIUMF’s organizational structure was also reconfigured to more clearly align with contemporary governance and oversight requirements. This includes clear configuration around science, infrastructure and support divisions, and streamlining and consolidating the leadership structure.</p>
Findings of audits completed in 2021–22	N/A
Findings of evaluations completed in 2021–22	Next evaluation scheduled for 2022–23.
Engagement of applicants and recipients in 2021–22	<p>The NRC chairs the Agency Committee on TRIUMF (ACT), which includes the federal agencies that fund and oversee activities at TRIUMF, providing TRIUMF management the opportunity to present progress and discuss future directions for the facility.</p> <p>The NRC also manages the Advisory Committee on TRIUMF (ACOT), composed of international experts within disciplines that span the research and technology activities of TRIUMF. ACOT reports its findings to the NRC and TRIUMF senior management twice annually, making recommendations on programs and management as well as reporting on the scientific and technological achievements of TRIUMF programs and facilities. Observer representatives from the National Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation, the Canadian Institute of Nuclear Physics, the Canadian Institute of Particle Physics, the materials science community and TRIUMF's user community ensure that TRIUMF's directions are well aligned with the research community's needs and that TRIUMF is working with all its constituencies across Canada. The Committee considers all aspects of the TRIUMF program, with a particular emphasis on science and technological issues to ensure the relevance, impact, and world-class standing of TRIUMF's activities. Through NRC activities in ACT and ACOT, the NRC maintains a close relationship with TRIUMF. Dialogue ensures that investments are optimal, the NRC meets the needs of its recipient, and provides a vehicle for feedback on the transfer payment management process.</p> <p>TRIUMF has approximately 410 staff and students supported via the NRC's contribution agreement, with roughly 140 additional positions supported through other sources for specific designated purposes, including temporary funds to operate new capital infrastructure. Annually, TRIUMF provides training for more than 200 undergraduates, graduate students, and postdoctoral fellows. TRIUMF has numerous programs aimed at young people, students, teachers, and the general public to ensure that as many as possible share the wonder of discovery and experience the excitement generated by one of Canada's premier laboratories. In addition, TRIUMF offers a suite of programs to aide in the growth and development of professional skills for its graduate students and postdocs.</p>

**Financial information (dollars)**

Type of transfer payment	2019–20 Actual spending	2020–21 Actual spending	2021–22 Planned spending	2021–22 Total authorities available for use	2021–22 Actual spending (authorities used)	Variance (2021–22 actual minus 2021–22 planned)
<b>Total grants</b>	-	-	-	-	-	-
<b>Total contributions</b>	55,162,800	59,443,659	60,748,372	62,225,000	62,225,000	1,476,628
<b>Total program</b>	<b>55,162,800</b>	<b>59,443,659</b>	<b>60,748,372</b>	<b>62,225,000</b>	<b>62,225,000</b>	<b>1,476,628</b>
<b>Explanation of variances</b>	The significant variance between planned spending and actual spending is primarily due to changes to the annual funding in the contribution agreement signed with TRIUMF, however the NRC is cash managing the variances over the five year period of the agreement.					

## Response to parliamentary committees and external audits

### **Response to parliamentary committees**

There were no parliamentary committee reports requiring a response in 2021–22.

### **Response to audits conducted by the Office of the Auditor General of Canada (including audits conducted by the Commissioner of the Environment and Sustainable Development)**

There were no audits in 2021–22 requiring a response.

### **Response to audits conducted by the Public Service Commission of Canada or the Office of the Commissioner of Official Languages**

There were no audits in 2021–22 requiring a response.

## Gender-based analysis plus

### Section 1: Institutional GBA Plus Capacity

As one of Canada's leading research and development organizations, the NRC partners with Canadian industry to take research impacts from the lab to the marketplace, where people can experience the benefits. This approach delivers innovation faster, enhances people's lives and addresses some of the world's most pressing problems. It also fits with the NRC's mission to have an impact by advancing knowledge, applying leading-edge technologies, and working with other innovators to find creative, relevant and sustainable solutions to Canada's current and future economic, social and environmental challenges.

The NRC's research benefits all Canadians, including multiple gender and demographic groups with intersecting characteristics. The NRC is using a GBA Plus lens to make its research more inclusive of equity deserving groups and to improve how the NRC's research helps the lives of all Canadians.

<p><b>NRC's GBA Plus Framework</b></p>	<p>The goal of the NRC's GBA Plus Framework is to build GBA Plus organizational capacity and sustain the practice of GBA Plus at the NRC in 3 areas: the NRC workplace, NRC research, and funding for innovative small- and medium-sized businesses (SMEs) through the NRC's Industrial Research Assistance Program (NRC IRAP).</p> <p><u>The NRC workplace</u></p> <p>The NRC is committed to employing a diverse and representative workforce and to fostering an open, accessible, inclusive, and anti-racist work environment and culture. This commitment extends to the creation of a more inclusive Canadian innovation system, recognizing that diversity fuels innovation.</p> <p>The NRC has integrated GBA Plus into its workplace to build and expand diverse Canadian Science, Technology, Engineering and Mathematics (STEM) capacity in its areas of research and development. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce and the broader Canadian STEM community.</p> <p>For a number of years, the NRC has monitored the representation of groups designated under the <i>Employment Equity Act</i> relative to the available workforce in Canada. As of March 31, 2022, the representation for women in the NRC's overall workforce surpassed labour market availability, while steady progress in addressing representation gaps was noted for the remaining designated groups (Indigenous Peoples, racialized persons, and persons with disabilities).</p> <p>In the hiring of new resources, the NRC has adopted measures with a GBA Plus lens to build and expand diverse Canadian STEM capacity, including:</p> <ul style="list-style-type: none"> <li>• Focus hiring activities on the NRC's representative groups, including identifying targeted post-secondary institutions and associations with</li> </ul>
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	<p>whom the NRC may establish long term relationships to build a diverse talent pipeline;</p> <ul style="list-style-type: none"> <li>• Implement targeted actions to include more diversity in the next generation of STEM talent, including students;</li> <li>• Consider representation gaps when developing talent (via workforce planning and leadership development programs).</li> </ul> <p>In 2020–21, the NRC conducted a thorough review of its hiring, promotion and retention practices using principles in line with GBA Plus with a view to identify systemic barriers faced by equity deserving groups, in addition to an accessibility assessment to determine readiness for the implementation of the <i>Accessible Canada Act</i> requirements. The results of these reviews informed the development of the NRC Workforce and Workplace Equity, Diversity and Inclusion (EDI) Strategy 2021-2024. Through a suite of initiatives, this strategy aims to build a diverse and representative NRC workforce, and foster an open, accessible, inclusive, and anti-racist work environment and culture across NRC workplaces. The strategy provides an enabling framework to integrate GBA Plus into the NRC workplace with the expectation that all employees must be engaged in a shared responsibility for bringing the strategy to life, adopting practices that promotes inclusion, and helping to influence positive change.</p> <p>The NRC's Five-Year Strategic Plan, launched in 2019, includes employment equity targets for all research centres and NRC IRAP. These targets require each business unit to achieve at least labour market availability for each of the equity deserving groups (women, Indigenous Peoples, racialized persons, and persons with disabilities) by 2024. This, in turn, facilitates the adoption of GBA Plus principles to make NRC's research more inclusive of equity deserving groups.</p> <p><u>NRC research</u></p> <p>The NRC incorporates GBA Plus into research initiatives at all stages of the process from ideation to evaluation, including budget proposals, memoranda to Cabinet (MCs), and Treasury Board (TB) submissions; research centre planning; program design; and evaluation. To measure progress and impact, the NRC monitors and tracks statistics on equity deserving groups and women in STEM, and collects success stories on research that impacts diverse populations.</p> <p>The NRC is making further efforts at the program level to encourage EDI in the formulation of collaborative research programs. The NRC considers language in calls for proposals to promote different and varied partnerships, and recognizes diverse attributes in teams when reviewing projects. Researchers developing projects under these programs are encouraged to use GBA Plus tools to increase the impact of research on diverse groups and are provided workshops on integrating EDI and GBA Plus into proposals within NRC.</p> <p><u>NRC funding for innovative SMEs</u></p> <p>NRC IRAP uses an Inclusivity, Diversity, Equity and Accessibility lens to review policies and programs, in order to remove barriers to growth for firms</p>
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	<p>led by equity deserving groups by providing focused support through its Contribution to Organization (CTO) funding mechanism and developing tools to support SMEs in assessing, developing and operationalizing a plan to foster the progression of their EDI maturity journey.</p> <p>NRC IRAP also amplifies recruitment activities to attract, retain and advance a more diverse workforce, leveraging modern recruiting tools and recruitment marketing techniques. This is done while refining organizational design to meet evolving program delivery requirements to further efforts to support an empowered world-class workforce.</p>
<p><b>GBA Plus Governance structure and engagement</b></p>	<p>The responsible centre for GBA Plus at the NRC has been established in the Secretary General's division, with the NRC's Secretary General fulfilling the role of GBA Plus champion for the organization. The Secretary General division represents the NRC on the Government of Canada's Interdepartmental Working Group for GBA Plus and the GBA Plus Focal Point Network. The division also develops and provides guidance to enable GBA Plus integration into program design and delivery.</p> <p>The NRC has established an intra-departmental network dedicated to EDI, called the EDI Community of Practice. This group brings together staff from across the NRC that are involved in EDI-related work to discuss initiatives, events, and progress made to advance EDI efforts within the department, including GBA Plus work. Members include the NRC's EDI Advisor, GBA Plus Focal Point, and an extensive network of NRC employees involved in human resources, planning, real property and accessibility, communications, NRC IRAP, and research.</p> <p>Building a diverse and representative workforce, removing barriers, and fostering an inclusive culture continue to be key priorities for the NRC. Engagement is an important tool in making progress in these areas, and the NRC actively works to engage on GBA Plus with its employees, in its research, and with its innovative SME clients.</p> <p><u>The NRC workplace</u></p> <p>The NRC recently developed a strategic framework to guide its work in supporting research advancements within Indigenous communities. Aligned with the Truth and Reconciliation Commission Calls to Action, this framework includes 4 pillars: research partnerships (build research and development partnerships with Indigenous partners); Indigenous business innovation (support Indigenous businesses through NRC IRAP); Indigenous STEM workforce (increase outreach, recruitment and retention of Indigenous talent); and intercultural competency (raise awareness, knowledge and recognition of the diversity of First Nations, Métis and Inuit cultures and issues). An NRC Indigenous Engagement Network was established to support this framework with activities tailored to the 4 pillars, using an engagement lens and an overarching focus on culture.</p> <p>In 2021–22, the NRC began preparatory work to inform the development of a new NRC Talent Attraction Strategy. The NRC employer value proposition included consultations with the NRC Committee on Equity, Diversity and</p>

	<p>Inclusion (CEDI) and the NRC Women in STEM Committee. Input was collected from Indigenous employees and the NRC Black Employee Resource Community (BERC) in the preliminary phases of the development of an NRC sponsorship program for diverse employees, to be piloted in 2022–23. The preparatory work included GBA Plus analysis of the process to implement improvements to the onboarding process with the aim of reducing barriers to participation of equity deserving groups.</p> <p><u>NRC research</u></p> <p>To gather views from a broad range of stakeholders, NRC research centres have an advisory board made up of a broad range of stakeholders that provides strategic and independent advice to NRC senior management on overall strategic direction and priorities, while helping to ensure alignment with the NRC’s objectives of supporting business innovation and advancing scientific knowledge. The NRC has worked extensively to ensure that these groups are as balanced as possible and representative of the Canadian population.</p> <p><u>NRC funding for innovative SMEs</u></p> <p>In terms of engagement with the broader innovation ecosystem, NRC IRAP participates in the Women's Entrepreneurship Strategy Assistant Deputy Minister Committee and Working Group collaborating on strategies in support of women entrepreneurs. NRC IRAP is also represented on TAFTI E-The European Network of Innovation Agencies Diversity and Inclusivity reviewing best practices in this space. NRC IRAP collaborates with UK Research and Innovation to support government initiatives including EDI.</p> <p>In addition, NRC IRAP supports the 50-30 Challenge and has taken action to improve equity and increase the diversity within the organization and its collaborators.</p>
<p><b>GBA Plus integration into program design and delivery</b></p>	<p>The NRC has integrated GBA Plus into many areas of its operations to assess the potential impacts of its policies, programs, and initiatives on diverse groups from ideation through to outcome measurement. This approach includes the application of GBA Plus on proposed initiatives, organizational planning, and program evaluation. These efforts fall into 2 areas most commonly associated with program delivery: NRC research and NRC IRAP.</p> <p>In each of these areas, the NRC meets its obligations to conduct GBA Plus analysis on Cabinet documents (e.g. MCs, TB submissions and Budget 2-pagers), as well as during program design (including NRC’s collaborative challenge programs) and in the evaluation of initiatives. The NRC also monitors and tracks statistics on equity deserving groups, as well as women in STEM, supported by a streamlined set of EDI standards and performance indicators, and has established a regular routine for reporting on EDI progress.</p> <p>As part of yearly operational planning, the NRC asks its research centres, branches and NRC IRAP to consider GBA Plus. Considerations include specific initiatives or projects to benefit equity deserving groups, which</p>

	<p>groups in Canadian society benefit from NRC activities, which groups benefit indirectly, barriers to participation, potential negative impacts, and mitigation measures.</p> <p>The NRC has worked with Treasury Board Secretariat (TBS) to make changes to the terms and conditions of its Collaborative Science, Technology and Innovation Programs (CSTIP) to further enable flexibilities for Indigenous recipients and remove barriers to collaboration. Examples include enabling capacity-building grants and allowing for the costs of Indigenous ceremonies and honoraria for elders to be eligible under the program. The NRC has also initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand the performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition of enterprises.</p>
<p><b>Advancing NRC's GBA Plus capacity and awareness</b></p>	<p>The NRC continues to build capacity and expand awareness of GBA Plus across the organization. The NRC is also increasing efforts to promote an environment where all individuals can achieve their full potential, and foster communities, networks and mentoring that support a diverse organization.</p> <p>In 2021-22, the GBA Plus Focal Point developed and advanced a plan to improve and expand the application of GBA Plus at the NRC. Under the direction of the NRC's GBA Plus Champion, the branch responsible for GBA Plus at the NRC inventoried the NRC's GBA Plus resources and current practices; consulted other government departments on their use of GBA Plus and best practices; compiled GBA Plus resources and approaches; and developed a 2-year action plan to increase engagement, understanding and application of GBA Plus throughout the organization.</p> <p>To engage employees in applying GBA Plus, the NRC currently offers GBA Plus training on demand, and completed a refresher course to engage NRC planners in using GBA Plus as a tool in their yearly planning cycle.</p> <p>Within the organization, the NRC's EDI Strategy serves as a tool to increase diversity and inclusiveness in the NRC workforce and NRC engagements as a partner/collaborator. As part of this strategy, the NRC has developed 2 mandatory online courses for all staff in areas related to EDI, including a fundamentals course and unconscious bias training. A mandatory course on managing bias in hiring was created for all supervisors and moving forward, plans are in development for training in targeted areas of the organization.</p> <p>For internal communication, the NRC has established an internal portal for EDI information, tools and resources to assist employees in applying GBA Plus in their work (e.g. checklists, guides, templates). The NRC Committee on Recruitment and Retention of Women in STEM organizes quarterly meet-ups to explore the broad range of experiences, challenges and</p>

	<p>opportunities facing women in STEM which raises awareness about the importance of integrating GBA Plus into program design and delivery. The NRC has also made progress in ensuring that diversity and inclusive language are reflected in NRC images, posters and materials; adopting inclusive practices such as land acknowledgements in formal gatherings; and supporting the formation and promotion of grassroots networks and communities of federal public service employees.</p> <p>Building on the roll-out of a grassroots speaker series and antiracism training for senior leaders and all staff, moving forward the NRC will analyze the organization's needs/approach to address anti-racism/discrimination, including providing additional training and awareness to address racism, and leveraging work underway in the federal public service. This type of training helps reduce bias, which in turn prepares employees to better adopt a GBA Plus lens in NRC programming.</p>
<p><b>Overview of major initiatives</b></p>	<p>The group(s) receiving direct benefits from NRC programs are generally the science and technology research/academia sector and/or small- and medium-size enterprises (SMEs). In general, these groups are predominantly male and Caucasian and have acknowledged gaps in the representation of women, gender-diverse people, Black people, other racialized groups, Indigenous Peoples and persons with disabilities. In the Canadian SME community, which makes up the vast majority of Canadian businesses, Statistics Canada's 2020 <i>Survey on Financing and Growth of SMEs</i> shows that 16.8% of businesses are owned by women, 9.3% by racialized persons and SMEs equally owned by females and males represented 14.3% of businesses. While women-owned firms are fewer, they are more innovative. A 2018 study by ISED shows that these firms are slightly more likely to engage in innovation activities.</p> <p>The NRC currently has several research initiatives that benefit equity deserving groups. These initiatives are often implemented by multiple research centres and elaborated below. Specific initiatives implemented by research centres are included in Section 2.</p> <ul style="list-style-type: none"> <li>• In collaboration with Indigenous communities and language experts, the Canadian Indigenous Languages Technology (ILT) project continues to support the revitalization of Indigenous languages. The project has adopted an empowerment based approach, where collaboration with communities and fulfillment of their goals is central. Since many of the technologies developed were in response to community needs, the project has a collection of diverse subprojects including new speech- and text-based resources for Indigenous language students, educators, translators, transcribers and other language professionals, and work to increase the accessibility of audio and video recordings. The project has also actively recruited for a diverse, representative project team by building trust, over several years, with respected Indigenous educators. A key element of building trust was assuring Indigenous collaborators that the NRC would not own the data or the software developed collaboratively with communities, and that the software could actually be useful. Once</li> </ul>

	<p>Indigenous educators were comfortable with the approach taken, the project attracted several talented Indigenous recruits.</p> <ul style="list-style-type: none"><li>• The AI for Logistics (AI4L) Cluster Support program has made efforts to address challenges faced by Indigenous communities in remote areas. The clearest example that is currently ongoing is an AI4L project led by NRC-Aerospace AI-enabled navigation of unmanned aircraft systems in remote northern areas which focuses on enabling beyond visual line of sight navigation of cargo drones to deliver medical supplies to remote communities. As access to medical supplies are increased, the project will contribute to improved health outcomes for vulnerable populations, including Indigenous communities. Partners include Toronto Metropolitan University (funded), a drone company and the St. Theresa Point Nursing Station (in coordination with the Oji-Cree First Nation St. Theresa Point community).</li><li>• Through the AI for Design (AI4D) Challenge program, the NRC sponsored the Canadian Council of Academies Leaps and Boundaries report. This report explores the opportunities, challenges, and implications of deploying AI technologies to enable scientific and engineering research design and discovery in Canada and includes a detailed overview of the legal, ethical, social and policy implications of deploying AI for science. The report will be utilized to strengthen AI4D's approach to GBA Plus analysis in the program, and broad dissemination of the report will allow others (including collaborators and partners) to consider its important findings and recommendations.</li><li>• In 2021-22, the NRC developed an interactive web-enabled digital atlas of tidal energy resources in northern Canada, which is now being used by communities in the north. The NRC's work could lead to future development of tidal energy resources to supply the energy needs of remote northern communities.</li><li>• In 2021-22, the NRC commissioned the study of "Intersectional Gender Based Analysis, and EDI in the NRC Quantum Sensors Challenge program (QSP)". GBA Plus was integrated as part of the evaluation of project proposals and was taken into account in the formation of various committees. The implementation of the recommendations from the study is underway and will be included in the monitoring of project progress. GBA Plus issues have been part of the engagement by QSP management with the public and quantum sensing ecosystem.</li><li>• Efforts continued in 2021-22 to ensure the clinical development of the Haemophilus influenzae type a (Hia) vaccine. Hia can cause severe and debilitating disease in children and is emerging as a pathogen of concern, especially to Indigenous populations in northern Canada and Alaska. The clinical trial material was prepared at InventVacc Biologicals GMP (Good Manufacturing Practices) facility in Seattle, and GMP toxicology studies in Ontario have been initiated, to comply with Health Canada requirements.</li><li>• Since 2021-2022, the NRC's Engineering Division is conducting an Indigenous student recruitment pilot project, which identified and is implementing strategies to improve engagement with Indigenous offices and outreach to Indigenous students in targeted Canadian</li></ul>
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	<p>post-secondary institutions, as well as exploring ways to offer more meaningful short term work opportunities to Indigenous students.</p>
<p><b>Program links to Gender Results Framework (GRF)</b></p>	<p>In general, NRC activities contribute to either Education and Skills Development or Economic Participation and Prosperity.</p>

## Section 2: Gender and Diversity Impacts, by Program

### **Core Responsibility: Science and Innovation**

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#### **Program Name: Advanced Electronics and Photonics**

##### **Target Population:**

All Canadians / Sectors: manufacturing, telecommunications photonics industry, science & technology industry

##### **Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

##### **Key Program impacts on Gender and Diversity:**

The NRC's Advanced Electronics and Photonics (AEP) program has integrated GBA Plus into many aspects of its program activities, including the design and delivery of a challenge program to improve telecommunications in rural and remote areas, efforts to build, expand and diversify Canadian STEM capacity in the fields and sectors it supports, and representation of diverse views on its research advisory board.

Through its High-throughput and Secure Networks (HTSN) Challenge program, AEP and other NRC programs are partnering with external collaborators to develop disruptive technologies and technologies that improve the cost and performance of delivering secure, affordable, and high-speed internet services in rural and remote communities across Canada. The program aims to move beyond the Canadian Radio-television and Telecommunications Commission's universal service objective of 50 Mbps download and 10 Mbps upload with unlimited data, and to develop technology that can enable service providers to offer affordable 1 Gbps or better connectivity to users in all rural and remote communities in Canada. This would benefit Indigenous communities in remote areas significantly, providing increased access to economic development, employment, health care, education, cultural exchanges, and safety and security. New Canadians are being incentivized to settle in rural and remote areas, and connectivity will be a key driver in support of this goal. Affordable, high speed internet can also lead to improved outcomes for vulnerable populations through better access to education, jobs and health services through distance education, virtual jobs and telehealth. GBA Plus has been integrated into the governance of the HTSN program through external committees involved in design, implementation and, strategic guidance. The members of these committees were selected from across Canada for their areas of expertise with a view to providing broad technical and geographical representation. The program is working towards ensuring that the composition of these committees are consistent with the representation of the 4 employment Equity (EE) groups. In addition, for all research proposals, HTSN requires teams to articulate at least 1 concrete practice to eliminate systemic barriers in addressing team composition and recruitment, training and development opportunities, or inclusion, as well as to describe measures taken to integrate GBA Plus into their research proposal. For approved projects, collaborators are asked to provide updates on EDI and GBA Plus progress.

The AEP program has also integrated GBA Plus into its operations through the training of students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. An observed result for the AEP program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 1.30 in 2021-22. An action plan was developed in 2021-22 to support the attraction and retention of highly qualified personnel from equity deserving groups. The action plan lays out a set of best practices, including: organizing succession planning sessions focused on women; increasing representation of women on hiring boards; ensuring panels are diverse; adopting long-term strategies to increase the number of applicants from equity deserving groups by participating in career fairs targeting equity deserving groups and sending job opening notifications to specific groups to target equity deserving groups (Women in STEM, Indigenous student groups, Women of Color LinkedIn group); and providing awareness training to help foster an inclusive and respectful work environment.

Finally, the AEP program has an advisory board, made up of a group of industry representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

#### **GBA Plus Data Collection Plan:**

The AEP program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, AEP is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

AEP's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific

action for GBA Plus data collection, the AEP program is collecting data on a monthly and quarterly basis on the proportion of new hires that are women and racialized persons and plans to include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the AEP program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the AEP program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the AEP program. This specific action to collect GBA Plus data will enable the AEP program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

Future evaluation of the work undertaken will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

## **Program Name: Aerospace**

### **Target Population:**

All Canadians / Sectors: aviation, aerospace sector, manufacturing, transportation, science & technology industry

### **Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

### **Key Program impacts on Gender and Diversity:**

The NRC's Aerospace program has integrated GBA Plus into its research activities and operational planning, including the use of specialized facilities, work to support Cluster advances, efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

Using its Centre for Air Travel Research, the Aerospace program investigates opportunities to improve the safety, comfort and productivity for passengers and crew throughout the air travel experience, including Canadians with diverse physical attributes. An example is an ongoing study under the New Beginnings Initiative which supports small-scale exploratory research projects led by individual NRC employees working with external collaborators. The research team is studying the air travel experience of those living with obesity with the aim of designing systems, technologies and processes to address the issues identified. The research is being undertaken with collaborators from Carleton University, University of Alberta and Obesity Canada.

Under the AI for Logistics (AI4L) Cluster Support program, the Aerospace program is working on a project to address challenges faced by Indigenous communities in remote areas. The Aerospace program's AI-enabled navigation of unmanned aircraft systems in remote northern areas focuses on enabling beyond visual line of sight navigation of cargo drones to deliver medical supplies to remote communities. As access to medical supplies are increased, the program will contribute to improved health outcomes for vulnerable populations, including Indigenous communities. Partners include Toronto Metropolitan University (funded), a drone company and the St. Theresa Point Nursing Station (in coordination with the Oji-Cree First Nation St. Theresa Point community).

The Aerospace program has also integrated GBA Plus into this operations to build and expand diverse Canadian STEM capacity in its scientific field and the industry sectors it supports. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. An observed result for the Aerospace program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 1.19 in 2021-22.

Finally, the Aerospace program has an advisory board, made up of a group of industry representatives that provides strategic and independent advice on the overall strategic direction and priorities of the Aerospace program, while helping to ensure alignment with the NRC's objectives of supporting business innovation and advancing scientific knowledge. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

**GBA Plus Data Collection Plan:**

The Aerospace program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, the Aerospace program is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

The Aerospace program's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the Aerospace program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the Aerospace program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the Aerospace program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program, Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked

to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the Aerospace program. This specific action to collect GBA Plus data will enable the Aerospace program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

The Aerospace program is working on studying the air travel experience of those living with obesity that will enable the program to determine the tangible benefits that can be realized by this marginalized group through improved systems, technologies and processes. In addition, the evaluation of the Aerospace program has been tentatively scheduled to be initiated in 2024-25. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

## **Program Name: Aquatic and Crop Resource Development**

### **Target Population:**

All Canadians / Sectors: agricultural, marine, science & technology industry

### **Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

### **Key Program impacts on Gender and Diversity:**

The NRC's Aquatic and Crop Resource Development (ACRD) program has integrated GBA Plus principles into its research activities and operational planning, including work to support food security, develop sustainable technologies and combat climate change, which can affect diverse groups disproportionately. The ACRD program has also integrated GBA Plus into its operational and research planning with efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

ACRD's activities contribute to improving the lives of all Canadians, regardless of gender, race, socio-economic status, Indigenous identity, geographic location, language, education level, socio-economic or marital status, culture, or religion. However, the program activities naturally gravitate towards diverse groups based on the priority sectors and technologies aligned with ACRD's spheres of influence. For example, efforts supporting northern food production require meaningful engagement with Indigenous organizations, and projects carried out in collaboration with Indigenous communities allow for cross-fertilization of Indigenous and modern agricultural knowledge. Similarly, food insecurity is disproportionately felt by equity deserving groups and these sectors benefit from ACRD activities.

In isolated communities or remote locations, it can be difficult to access fresh fruits and vegetables. Working with the Arctic Research Foundation, the Canadian Space Agency, Agriculture and Agri-Food Canada, and the community of Gjoa Haven (in Nunavut), the ACRD program is leading the Sustainable Food System (SFS) initiative. The SFS initiative aims to develop a local food production system in the Arctic which would enable year-round production of fresh fruit and vegetables using renewable energy and controlled environment technologies. Through community input, methods for growing Indigenous plant species in the controlled environmental units will also be developed. Through the Arctic Research Foundation, members of the Gjoa Haven community have been hired and trained to help maintain the research pod. While this first collaboration is working on a food production system, the project will also help inform how growth technologies and infrastructure can be delivered in a number of harsh and isolated locations.

The ACRD program has integrated GBA Plus into its operations to build and expand diverse Canadian STEM capacity in its field and sector. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training

opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. An observed result for the ACRD program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 1.64 in 2021-22. ACRD continues efforts to develop equity in workforce representation, particularly when hiring new employees, and will continue to track the composition of its workforce with regard to the 4 EE groups. Efforts are directed at 3 levels: (i) program participation (internal teams and external collaborations), ii) priority setting of research projects and activities (impact on various groups), and iii) the social, cultural, and economic environment in which the program's outputs are intended to achieve impact.

Finally, the ACRD program has an advisory board, made up of a group of industry representatives that provides strategic and independent advice on the overall strategic direction and priorities of the ACRD program, while helping to ensure alignment with the NRC's objectives of supporting business innovation and advancing scientific knowledge. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

#### **GBA Plus Data Collection Plan:**

The ACRD program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, ACRD is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

ACRD's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the ACRD program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4

designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the ACRD program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the ACRD program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the ACRD program. This specific action to collect GBA Plus data will enable the ACRD program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

The ACRD program's Performance Information Profile identifies key indicators against which data will be collected. A recent evaluation of the ACRD program in 2021-22 concluded that the program has contributed to food security by developing different crop varieties and platforms, and is currently working on a project aimed at meeting the dietary needs of environmentally-challenged and remote populations. The next evaluation of the ACRD program has been tentatively scheduled to be initiated in 2026-27. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Automotive and Surface Transportation**

**Target Population:**

All Canadians / Sectors: manufacturing, transportation, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The Automotive and Surface Transportation (AST) program has integrated GBA Plus into many aspects of its program activities, including in its research facilities, efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

The AST program leads the new Advanced Manufacturing Research Facility in Winnipeg, Manitoba. An Indigenous working group was engaged to ensure Indigenous representation in staff and student hiring, and within the scientific and research agenda, and interior of the facility.

The AST program has also integrated GBA Plus into its operations in order to build and expand diverse Canadian STEM capacity in its scientific field and the industry sectors it supports. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. An observed result for the AST program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 1.00 in 2021-22.

The AST program has an advisory board, made up of a group of industry representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

**GBA Plus Data Collection Plan:**

The AST program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA

Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, AST is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

AST's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the AST program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the AST program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the AST program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the AST program. This specific action to collect GBA Plus data will enable the AST program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

An evaluation of the AST program has been tentatively scheduled to be initiated in 2025-26. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

## **Program Name: Construction**

### **Target Population:**

All Canadians / Sectors: construction, infrastructure, science & technology industry

### **Distribution of Benefits:**

By gender (1 to 5) – Predominantly men (e.g. 80 % or more men)

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

### **Key Program impacts on Gender and Diversity:**

The Construction program's work benefits 3 primary target client groups: the science and technology research workforce within the research centre that has acknowledged gaps in the representation of Indigenous Peoples and people with disabilities; the construction sector, which employs men at a higher rate than women and other equity deserving groups; and small- and medium-size enterprises (SMEs), which also employ men at a higher rate than women and other equity deserving groups.

It was observed that women made up 13.36% of those employed in the Canadian construction industry in 2021, compared to 13.28% the year before. Though modest, the increase in representation during a challenging year continues a slow, years-long shift toward more women in both on- and off-site roles. Between 2020 and 2029, around 131,000 workers in the residential construction industry are expected to retire, but only about 105,000 new workers are expected to enter the industry. This gap may force the industry to look for construction labour among women, Indigenous Peoples, and new Canadians.

The Construction program will continue efforts in reaching equity deserving groups, especially Indigenous Peoples, and people with disabilities. The benefits of the Construction program's work include an increase in research and innovation to bring more resilience and sustainability to communities experiencing disproportionate and differential impacts of climate change, including coastal areas prone to flooding and northern communities experiencing warming at a greater rate than the rest of Canada. This resilience and sustainability may also benefit marginalized low-income communities with more safe, secure housing, which would also address associated economic, social and health vulnerabilities.

Accessibility for persons with disabilities is 1 of the 5 stated objectives of the National Building Code of Canada. Through Codes Canada (which includes the National Building Code, National Fire Code, National Plumbing Code and National Energy Code), the Construction program continues to improve accessibility for all Canadians. The external committees involved in developing the Building Codes are selected from across Canada for their interests and expertise. The program is working towards ensuring that the composition of these committees are consistent with the representation of the 4 EE groups in the overall construction industry.

The Construction program has integrated GBA Plus into its governance structure through external committees involved in design and implementation. While encouraging a seismic shift in the construction industry toward decarbonisation and climate resilience, the program is working to encourage increased EDI in the construction industry along with sustainable supply chains, innovative Canadian businesses, job creation and lower GHG emissions. An important

lever in this process is the Construction program's advisory board, a group of industry representatives that provides strategic and independent advice to NRC senior management on the overall strategic direction and priorities of the program, while helping to ensure alignment with the NRC's objectives of supporting business innovation and advancing scientific knowledge. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

Skills development and job opportunities that are provided to equity deserving groups can provide positive, lasting impacts on individuals and the overall Canadian economy. Through the NRC's Environmental Research Strategy, Construction researchers have been equipped with GBA Plus tools to inform the design of their environmental projects so as to increase the impact of their research on diverse groups. The Construction program has also integrated GBA Plus into this operations to build and expand diverse Canadian STEM capacity in its field and sector. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. An observed result for the Construction program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 0.77 in 2021-22.

#### **GBA Plus Data Collection Plan:**

The Construction program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, the Construction program is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

The Construction program's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the Construction

program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the Construction program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the Construction program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the Construction program. This specific action to collect GBA Plus data will enable the Construction program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

An evaluation of the Construction program has been tentatively scheduled to be initiated in 2024-25. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Digital Technologies**

**Target Population:**

All Canadians / academia, OGDs, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The NRC's Digital Technologies (DT) program has integrated GBA Plus into many aspects of its program activities, including the design and delivery of research projects, a challenge and Cluster Support program, efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

The DT program has adopted key GBA Plus principles to serve the needs of Indigenous Peoples. An observed result was that in collaboration with Indigenous communities and language experts, the DT program's Indigenous Languages Technology (ILT) project continued to support the revitalization of Indigenous languages. The project has adopted an empowerment based approach, where collaboration with communities and fulfillment of their goals is central. Since many of the technologies developed were in response to community needs, the project has a collection of diverse subprojects including new speech- and text based resources for Indigenous language students, educators, translators, transcribers and other language professionals, and work to increase the accessibility of audio and video recordings. The DT program has also actively recruited for a diverse, representative project team by building trust, over several years, with respected Indigenous educators. A key element of building trust was assuring Indigenous collaborators that the NRC would not own the data or the software developed collaboratively with communities, and that the software could actually be useful. Once Indigenous educators were comfortable with the approach taken, the project attracted several talented Indigenous recruits.

The DT program has also integrated GBA Plus into its operations in order to build and expand diverse Canadian STEM capacity in its scientific field and the industry sectors it supports. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. The DT program is committed to increasing diversity in its workforce. An observed result for the DT program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 3.36 in 2021-22.

Finally, the DT program has an advisory board, made up of a group of industry representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure

that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

### **GBA Plus Data Collection Plan:**

The DT program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through key indicators in its research project and challenge program and a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, the DT program is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

The DT program's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the DT program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the DT program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the DT program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the DT program. This specific

action to collect GBA Plus data will enable the DT program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

The DT program's Indigenous Languages Technology (ILT) project is actively working with its Indigenous collaborators to monitor and ensure that the benefits of the project are in line with community goals. The revitalization of Indigenous languages have wide ranging impacts on Indigenous Peoples and represent broader community goals of self-determination.

Under the Artificial Intelligence for Design Challenge program led by DT, the NRC sponsored the Canadian Council of Academies Leaps and Boundaries report. This report explores the opportunities, challenges, and implications of deploying AI technologies to enable scientific and engineering research design and discovery in Canada and includes a detailed overview of the legal, ethical, social and policy implications of deploying AI for science. The report will be utilized in 2022-23 to strengthen AI for Design's approach to GBA Plus in the program and broad dissemination of the report will allow others (including collaborators and partners) to consider its important findings and recommendations. In addition, as part of its performance measurement framework, the Artificial Intelligence for Logistics (AI4L) Cluster Support program, also led by DT, will measure the number of discrete novel capabilities or capacity improvements in and for the Canadian North to demonstrate that Innovative AI tools are used to optimize and improve logistics operations in Canada, with data collection planned closer to the targeted dates in 2026-27 and 2027-28.

An evaluation of the DT program has been tentatively scheduled to be initiated in 2023-24. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Energy, Mining and Environment**

**Target Population:**

All Canadians / Sectors: energy and utilities, mining, oil & gas exploration, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The NRC's Energy, Mining and Environment (EME) program has integrated GBA Plus into many aspects of its program activities, including the design and delivery of a challenge program to create a cleaner, more sustainable Canadian energy and chemical industry through materials innovation, efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

EME leads on the Materials for Clean Fuels (MCF) Challenge program, which has far-reaching impacts aimed at improving the lives of all Canadians, regardless of gender, race, socio-economic status, Indigenous identity, geographic location, language, education level, socio-economic or marital status, culture, or religion. EME is coordinating a national effort to collaborate with leaders in academia and industry from a diverse range of backgrounds to catalyze the discovery and development of materials for early-stage exploratory technologies to decarbonize Canada's oil and gas and petrochemical sectors. A case can be made that demographics that would experience first-hand impacts could be those that currently work in the oil and gas industry and the groups that value environmental stewardship. The program development process adopted a GBA Plus lens to determine that no major issues with respect to discrimination in the scientific directions have been identified.

Skills development and job opportunities that are provided to equity deserving groups can provide positive, lasting impacts on individuals and the overall Canadian economy. Through the NRC's Environmental Research Strategy, EME researchers have been equipped with GBA Plus tools to inform the design of their environmental projects so as to increase the impact of their research on diverse groups. The EME program has also integrated GBA Plus into its operations to build and expand diverse Canadian STEM capacity in its field and sector. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. EME participated in NRC's Indigenous Student recruitment pilot project, resulting in new student hires from equity deserving groups.

The EME program has an advisory board, made up of a group of industry representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that

they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

**GBA Plus Data Collection Plan:**

The EME program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, EME is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

EME's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the EME program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the EME program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the EME program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the EME program. This specific action to collect GBA Plus data will enable the EME program to understand how certain equity

deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

An evaluation of the EME program has been tentatively scheduled to be initiated in 2023-24. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Herzberg Astronomy & Astrophysics**

**Target Population:**

All Canadians / students, researchers, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The Herzberg Astronomy and Astrophysics (HAA) program has integrated GBA Plus into many aspects of its program activities, including in its leadership role in the [Canadian astronomical community](#), efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

The HAA program primarily benefits individuals in the astronomy and astrophysics sector such as researchers in astrophysics and astronomy, and individuals with higher education. HAA also benefits Canadian industry through transfer of know-how and technology in support of facility and instrument development, and indirectly benefits all Canadians with enhanced understanding of the universe. , Canada's participation in leading international observatories like the Square Kilometre Array (SKA) provides employment opportunities for students and post-doctoral fellows. However, under-representation and marginalization of women and minorities are a major concern in the astronomy field and the researchers who benefit from HAA are still predominantly male. Other challenges in the field include a lack of equity in compensation, funding, access to telescope time, and sociological issues associated with dependent caregiving. Linguistic identity is an additional equity issue in Canada because English is the international language of astronomy and Francophones are often required to work in a language that is not their native tongue.

The NRC is committed to listening to and learning from local Indigenous communities, to better understand how the organization can support Indigeneity at both domestic and international observatories, and in the research conducted. As recommended in the Canadian Astronomy Long Range Plan 2020-2030, through its HAA program, the NRC is working with the Canadian astronomical community and Indigenous partners to develop a set of guiding principles for the astronomy facilities and infrastructure in which Canada participates.

To ensure equitable allocation of the available observing time, fully anonymous processes for assessment of observing proposals are now in use for all the international observatories supported by the NRC. This includes the Gemini Observatory where in 2021–22, in the first round of observing time allocation using full, dual-anonymous review procedures, HAA observed that women-led proposals were 39% more likely to be approved than proposals led by men. This was the first time the acceptance rate was higher for women-led proposals since this rate has been monitored (over the last 6 years). At the Canada-France-Hawaii Telescope (CFHT) and the Atacama Large Millimeter/submillimeter Array (ALMA), women-led proposals were successful in the application cycles in 2021–22 at or above the rates expected (based on their proportion of the total number of applications).

A recent evaluation of the HAA program in 2021-22 recommended that HAA develop and implement a strategic EDI plan that focusses on research excellence, student engagement, reducing barriers for women to become future leaders, as well as those for minority group populations, and moving from consultation to empowerment for local Indigenous communities.

The HAA program has also integrated GBA Plus into its operations in order to build and expand diverse Canadian STEM capacity in its scientific field and the industry sectors it supports. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve workforce representation within traditionally under-represented fields. An example of efforts to increase representation was the mentoring of early-career female astronomers by 2 HAA researchers through the Women at NRC mentorship program. An observed result for the HAA program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 0.79 in 2021–22.

Finally, the HAA program has an advisory board, made up of a group of industry and academic representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

#### **GBA Plus Data Collection Plan:**

The HAA program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 through key indicators to track proposals for observing time at the international observatories supported by the HAA program. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, HAA is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

HAA's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address

EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the HAA program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the HAA program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the HAA program's research efforts.

Anonymous processes for assessment of observing proposals have been adopted for all the international observatories supported by the NRC through its HAA program. As part of the specific actions taken for GBA Plus data collection for 2022-23, the HAA program will continue its annual tracking and over a several year period the proportion of women-led proposals that are approved to better understand the gender bias in the process and adopt strategies to mitigate this.

An evaluation of the HAA program has been tentatively scheduled to be initiated in 2025-26. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

## **Program Name: Human Health Therapeutics**

### **Target Population:**

All Canadians / Sectors: manufacturing, health care, social assistance, science & technology industry

### **Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

### **Key Program impacts on Gender and Diversity:**

The Human Health Therapeutics (HHT) program has integrated GBA Plus into many aspects of its program activities, including the design and delivery of a challenge program, efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

Through the Disruptive Technology Solutions for Cell and Gene Therapy (CGT) Challenge program, HHT will design and develop disruptive technology solutions for precision-engineered cell and gene therapies for the treatment and potential cure of chronic diseases and rare genetic disorders affecting Canadians, including diverse Canadians who are disproportionately impacted by these diseases and disorders. The extent to which diverse populations, gender and ethnicity play a role in cell therapy and characteristics and therapies for broad use may not have similar impacts on all individuals. While there are gender biases in science that could carry over into the technologies developed in the program and translated into later therapeutic use, the research projects comprising the CGT Challenge program are generally not expected to have a negative GBA Plus impact. The platform and multi-purpose nature of the outputs of the program are broadly applicable in a variety of disease settings, and should be independent of the social or cultural context in which the eventual products are applied. However, one platform technology, development of a universal cell product which could be the basis for generating cell therapy products for broad use, could conceivably be derived from one individual, or universal donor. With this in mind, the gender and ethnicity of that donor may have a poorly understood influence on the characteristics of the cell, so understanding the impact of gender or diverse ethnicity in designing a universal cell product will have to be considered and studied. A positive intended outcome of the program is an automated biodevice for the production and remote analysis of cell therapies for clinical use, which is deployable to remote locations. Such a device would be a tremendous benefit to deliver costly designer cell therapies to remote and northern communities.

The 2020–21 evaluation of HHT piloted a GBA Plus Lens for Evaluation, by using it in a case study for the NRC's *Haemophilus influenzae* type a (Hia) vaccine, focusing on its impact on Indigenous communities. Efforts have been ongoing to develop the Hia glycoconjugate vaccine. Hia can cause severe and debilitating disease in children and is emerging as a pathogen of concern, especially to Indigenous populations in northern Canada and Alaska. The clinical trial material was recently prepared at InventVacc Biologicals GMP facility in Seattle, and GMP toxicology studies in Ontario have been initiated, to comply with Health Canada requirements.

The HHT program has also integrated GBA Plus into its operations in order to build and expand diverse Canadian STEM capacity in its scientific field and the industry sectors it supports. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. An observed result for the HHT program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 0.85 in 2021-22.

The HHT program has an advisory board, made up of a group of industry representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

#### **GBA Plus Data Collection Plan:**

The HHT program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through key indicators in its challenge program and a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, HHT is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

HHT's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the HHT program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the HHT program also compiles qualitative evidence of its

research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the HHT program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the HHT program. This specific action to collect GBA Plus data will enable the HHT program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

The CGT Challenge program will collect data on identity factors across internal research teams within NRC, within collaborator teams applying for funding for contributions to the program, and in the management framework providing governance and oversight of the Challenge program. Consultation will be conducted with the stakeholder community to ensure that the program structure, governance model, and collaborative process is accessible and conducive to equal participation from diverse participants. As part of the specific actions taken for GBA Plus data collection for 2022-23, the HHT program is monitoring participant data to uncover equity deserving groups will be conducted over the life of the program, and on a regular frequency, to identify opportunities and strategies to enhance participation more broadly as needed. These monitoring and gap assessment activities will be extended to include highly qualified personnel (students, postdoctoral fellows) working within the NRC, within collaborating centres, or granted funding awards through the program's grants and contributions mechanism.

An evaluation of the HHT program has been tentatively scheduled to be initiated in 2023-24. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Medical Devices**

**Target Population:**

All Canadians / Sectors: manufacturing, health care, social assistance, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The NRC's Medical Devices (MD) program has integrated GBA Plus into a range of its program activities, including its research projects to improve healthcare access to equity deserving groups, efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research centre advisory board.

A number of the projects led by MD within the Pandemic Response Challenge Program (PRCP) Pillar 3 (Digital Care and Analytics) have the goal of improving access to healthcare through contactless diagnostics, mental health tools, and development of standards for accessibility. Guidelines developed in collaboration with Health Canada for virtual care are online for public domain and industry use, including Enhancing Equitable Access to Virtual Care in Canada: Principle-based Recommendations for Equity. PRCP projects are also expected to have positive results for vulnerable populations and women significantly impacted by SARS-CoV-2.

The 2020-21 MD program evaluation made a number of observations on how the program impacts certain equity deserving groups. MD's work on latent tuberculosis has the potential to address an important need within the Indigenous community. Tuberculosis has a disproportionate burden in Indigenous communities, compared to the general population. Likewise, MD's work on Point of Care solutions and interactive remote care can provide benefits to Indigenous populations and/or vulnerable people living in remote areas. MD's work on forefoot deformity orthopedics has implications for people with disabilities. Molecular diagnostics and point-of-care testing done by MD in the In Vitro Diagnostic thrust has implications for the effective and convenient diagnosis of old age diseases. Similarly, MD's work on cognitive care and remediation may have implications for the elderly (e.g., managed care implications and triage).

The MD program has also integrated GBA Plus into its operations in order to build and expand diverse Canadian STEM capacity in its scientific field and the industry sectors it supports. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. The observed results for the MD program in 2021-22 was 1.54 for the ratio of women new hires and 1.57 for the ratio of racialized persons new hires relative to the Canadian average labour market availability.

Finally, the MD program has an advisory board, made up of a group of industry representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

### **GBA Plus Data Collection Plan:**

The MD program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, the MD program is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

The MD program's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the MD program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the MD program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the MD program's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the

business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the MD program. This specific action to collect GBA Plus data will enable the MD program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

An evaluation of the MD program has been tentatively scheduled to be initiated in 2024-25. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Metrology**

**Target Population:**

All Canadians / SMEs, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The Metrology program has integrated GBA Plus into its program activities, including conducting targeted GBA Plus analysis in the design and delivery of its research projects, efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

Based on Metrology's expanding footprint in quantum-related technologies as an example, a GBA Plus analysis made the observation that the immediate and short-term benefits from the deployment of new quantum technologies are initially susceptible to have links between gender and socio-economic factors such as wealth, education, occupation and decision-making power. In developing Metrology projects, it is recognized that various aspects of emerging quantum technologies such as areas of application, distribution channels, as well as the above mentioned socio-economic factors will all have an impact on benefits realization. However, similar to the development of the transistor, medium- and longer-term benefits realization is expected to be improved through economies of scale as quantum technologies become more mainstream and more affordable. In response, projects are being designed with the understanding that as network quantum sensing becomes more pervasive (i.e., from demonstration to a scalable quantum technology), similar to the transistor, this potentially revolutionary technology should contribute to the reduction of current major structural inequities in potential end-user communities and in society.

The Metrology program has also integrated GBA Plus into its operations in order to build and expand diverse Canadian STEM capacity in its scientific field and the industry sectors it supports. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. An observed result for the Metrology program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 0.32 in 2021-22. To support the removal of obstacles to women, racialized persons and other equity deserving groups, the Metrology program promotes shared project leadership, particularly for competitive funding opportunities (internally and externally). Recognizing that equity deserving groups may experience barriers to access in these competitions and to build capabilities, Metrology provided the support of a project manager experienced in designing and executing competitive research and development programs to accompany project teams. In support of gender equality, the program actively monitors its activities to ensure opportunities to lead projects and attend

conferences and other activities that support career progression are equitably assigned. Metrology also encourages and supports the participation of 2 female research fellows at the NRC-uOttawa Joint Centre for Extreme Photonics.

The Metrology program has integrated GBA Plus into its governance structure through its advisory board, made up of a group of industry representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

### **GBA Plus Data Collection Plan:**

The Metrology program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. GBA Plus data on longer term impacts on gender and diversity will be collected through identifying potential benefits from its research projects through GBA Plus analysis and a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, the Metrology program is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated Employment Equity (EE) groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

Metrology's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the Metrology program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the Metrology program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the Metrology program's research efforts.

As part of the specific actions taken for GBA Plus data collection for 2022-23, the Metrology program will build on the GBA Plus analysis of Metrology's work in quantum-related

technologies to gather more data and draw conclusions about immediate and short-term benefits from its deployment. This information will enable the Metrology program to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

An evaluation of the Metrology program has been tentatively scheduled to be initiated in 2026-27. The evaluation will include an examination of EDI populations within the research centre/program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Nanotechnology**

**Target Population:**

All Canadians / Sectors: mining, oil & gas exploration, transportation, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The NRC's Nanotechnology program has integrated GBA Plus into many aspects of its program activities, including efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

The Nanotechnology program has engaged in the University of Alberta's iSTEAM pathways program and one of the results observed was that at least 1 Indigenous undergraduate student from the University of Manitoba worked with the NRC on environmental science-based projects and gained valuable research experience. In addition, a Nanotechnology supervisor undertook the iSTEAM training program, which is tailored to provide tools for supervising and mentoring Indigenous students. The program also promotes, educates and monitors EDI best practices with respect to hiring and seeking out experts, including a Advisory board and seminar speakers which facilitates an understanding of barriers to access faced by equity deserving groups.

The Nanotechnology program has integrated GBA Plus into its operations in order to build and expand diverse Canadian STEM capacity in its scientific field and the industry sectors it supports. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. An observed result for the Nanotechnology program last year was the ratio of women new hires relative to the Canadian average labour market availability, which was 1.11 in 2021-22.

The Nanotechnology program has an advisory board, made up of a group of industry representatives that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

**GBA Plus Data Collection Plan:**

The Nanotechnology program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its

different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, the Nanotechnology program is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated Employment Equity (EE) groups as well as specific EE I occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

The Nanotechnology program's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As a specific action for GBA Plus data collection, the Nanotechnology program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the Nanotechnology program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the Nanotechnology program's research efforts.

Future evaluation of the work undertaken will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Ocean, Coastal and River Engineering**

**Target Population:**

All Canadians / academia / Sectors: marine transportation, marine & coastal infrastructure, manufacturing, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The Ocean, Coastal and River Engineering (OCRE) program's work benefits 3 primary target client groups: the science and technology research workforce within the research centre that has acknowledged gaps in the representation of women, gender-diverse people, Indigenous Peoples, Black people, other racialized groups and people with disabilities; the marine sector (marine transportation, oil and gas, renewable energy) and the resilient infrastructure development sector, which employs men at a higher rate than women and other equity deserving groups; and small and medium-sized enterprises (SMEs), which also employ men at a higher rate than women and other equity deserving groups.

The OCRE program's work is expected to benefit all Canadians by contributing to economic growth and prosperity in industry sectors implicated in lowering carbon emissions – i.e., increased innovation and resilience in marine operations (including marine transport and renewable energy) and in resilient infrastructure development. There are benefits to overall population health by researching fate and transport of microplastics and other pollutants in the marine/aquatic environment. Other benefits to all Canadians include contributing to safe and efficient marine transport of people and goods, and Canadian sovereignty in the North.

OCRE specifically benefits populations in coastal and inland flood-land areas, all across Canada. A particular focus of the program is the emphasis on harsh environments characterized by ice, waves and wind (i.e., Canadian north) which will benefit northern Canadian communities. As a result of the work done by OCRE in 2021-22 to benefit these communities, an interactive web-enabled digital atlas of tidal energy resources in northern Canada is now being used by communities in the North. The NRC's work could lead to future development of tidal energy resources to supply the energy needs of remote northern communities, which would also address associated economic, social and health vulnerabilities.

While working to encourage the shift towards decarbonisation and climate-resilience in the marine and coastal sectors, the NRC will also be working to reduce barriers for participation of equity deserving groups in the ocean and freshwater sectors. An important lever in this process is OCRE's advisory board, a group of representatives from industry, government and academia that provide strategic and independent advice on its overall strategic direction and priorities. When forming the advisory boards for all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning. This was similarly the case for a recent evaluation of the OCRE program (2021–22) in which a Peer Review Committee of

independent national and international experts providing diverse perspectives were engaged in the process.

Gender parity, inclusion of minority groups, and the meaningful participation of Indigenous groups are priorities for the Ocean program, which is led by OCRE. Indigenous representation is particularly important for coastal communities, where fishing and aquaculture are important means of livelihood. Training on GBA Plus principles is planned for the program team. GBA Plus has been integrated into the governance of the Ocean program through external committees (including the Program advisory board) involved in the design and implementation. Additionally, efforts are being made to link Indigenous traditional knowledge to the NRC's research capacity. A key objective of the NRC Ocean Program is to develop environmental technologies that have economic appeal, and it is believed that Canada's First Nations, Métis and Inuit have the most wisdom to offer.

OCRE's research project on Indigenous clothing ensemble investigated how Indigenous clothing could be part of harsh weather personal protective equipment (PPE), leading to increased personal safety and security in Arctic environments. This project brought together Indigenous knowledge and western science in order to identify the components of traditional clothing ensembles that are most suitable for operational activities in cold climates. Women have been the driving force behind the fabrication of northern harsh weather garments. Indigenous garments have been developed with natural items, through observations that the component materials have properties that promote water resistance, wicking, and heat retention, all properties required for northern survival.

Skills development and job opportunities that are provided to equity deserving groups can provide positive, lasting impacts on individuals and the overall Canadian economy. Through the NRC's Environmental Research Strategy, OCRE researchers have been equipped with GBA Plus tools to inform the design of their environmental projects so as to increase the impact of their research on diverse groups. The OCRE program has also integrated GBA Plus into its operations to build and expand diverse Canadian STEM capacity in its field and sector. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. The observed results for the OCRE program in 2021-22 was 0.71 for the ratio of women new hires and 0.92 for the ratio of racialized persons new hires relative to the Canadian average labour market availability. These efforts are being guided by OCRE's HR and operational plans which identify strategies to increase recruitment of equity deserving individuals such as the Indigenous Internship Program, EDI pre-screening/checklist for all hiring actions etc. Furthermore, the HR Plan identifies strategies to create an inclusive environment to retain this talent. OCRE is near its overall target for representation of women, and in 2021-22 an observed result was that it exceeded sub-targets for management, administrative, and senior clerical roles. With respect to overall program development and execution of specific initiatives, OCRE is focusing on its engagement with Indigenous Peoples and rights holders, which is formalized in the program's communications and engagement strategy. The program has addressed the barrier of exclusively virtual engagement (COVID-imposed travel restrictions are not culturally appropriate) through training (Virtual Blanket ceremony) and will be remediated with focused travel in 2022-23.

**GBA Plus Data Collection Plan:**

The OCRE program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. The program plans to collect GBA Plus data in 2022-23 about the business ownership and workforce composition of enterprises it supports. GBA Plus data on longer term impacts on gender and diversity will be collected through key indicators in its Ocean program and a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, OCRE is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

OCRE's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the OCRE program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, OCRE also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of OCRE's research efforts.

The NRC has initiated discussions with TBS to leverage their collaborative statistical program on Business Innovation and Growth Support (BIGS) with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. The NRC will be part of TBS' ongoing research project of "Understanding BIGS beneficiaries". The project will allow NRC access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by the OCRE program. This specific action to collect GBA Plus data will enable OCRE to understand how certain equity deserving groups based on gender, age and immigrant status may be disproportionately impacted, and to determine strategies to mitigate these impacts.

Over its 7-year timeframe, the Ocean program led by OCRE will compile available data on identity factors across internal research teams within the NRC, within collaborator teams applying for funding for contributions to the program, and in the management framework providing governance and oversight of the program. Consultation will be conducted with the stakeholder community to ensure that the program structure, governance model, and collaborative process is accessible and conducive to equal participation from diverse participants. As part of specific actions taken for GBA Plus data collection for 2022-23, the OCRE program is monitoring participant data to uncover equity deserving groups will be conducted over the life of the program, and on a regular frequency, to identify opportunities and strategies to enhance participation more broadly as needed. These monitoring and gap assessment activities will be extended to include highly qualified personnel (students, postdoctoral fellows) working within the NRC, within collaborating centres, and recipients of grant funding awards through the Ocean program's grants and contributions mechanism.

An evaluation of the OCRE program has been tentatively scheduled to be initiated in 2027-28. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

## **Program Name: Security and Disruptive Technologies**

### **Target Population:**

All Canadians / academia / Sectors: manufacturing science & technology industry

### **Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

### **Key Program impacts on Gender and Diversity:**

The NRC's Security and Disruptive Technologies (SDT) program has integrated GBA Plus into many aspects of its program activities, including the design and delivery of a challenge program, efforts to build and expand diverse Canadian STEM capacity in its field and sector, and representation of diverse views on its research advisory board.

The SDT program is leading the implementation of the Quantum Sensors (QSP) Challenge program to enable the development of revolutionary sensors that harness the extreme sensitivity of quantum systems to provide enhanced precision, sensitivity, rates, and range of measurable phenomena. The SDT program commissioned a GBA Plus assessment for the QSP program which highlighted some of the representation gaps in the field of physics. An observation made in this assessment was that women and black, Indigenous Peoples, and people of colour (BIPOC) researchers are under-represented in physics. As men have historically comprised the majority of physics researchers and academicians, physics departments and research labs may be implicitly designed with their interests in mind. Intersectional gender inequality in STEM fields is a persistent issue as women's rates of representation remain low. Within the physical sciences, computer science, engineering, and mathematics (PCEM) more broadly in Canada, women represent 15% of all faculty. At the high school level in Canada, young women represent 38% of those enrolled in advanced placement physics courses. These insights have helped the SDT program to develop strategies to address these disproportionate impacts on equity deserving groups.

The SDT program has also integrated GBA Plus into its operations to build and expand diverse Canadian STEM capacity in its field and sector. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields. The observed results for the SDT program in 2021-22 was 0.76 for the ratio of women new hires and 1.00 for the ratio of racialized persons new hires relative to the Canadian average labour market availability.

Finally, the SDT program has an advisory board, made up of a group of industry representatives that provides strategic and independent advice on the overall strategic direction and priorities of the SDT program, while helping to ensure alignment with the NRC's objectives of supporting business innovation and advancing scientific knowledge. When forming the advisory boards for

all NRC programs, the NRC worked extensively to ensure that they were as balanced and representative of the Canadian population as possible to ensure that diverse views were considered in research planning.

### **GBA Plus Data Collection Plan:**

The SDT program's efforts to integrate GBA Plus are significant steps given the challenges to measure and report observed impacts on gender and diversity as the program provides indirect support to final beneficiaries, through research and technical services to clients and collaborators supporting science and innovation in Canada. The program is making efforts to overcome these challenges by adopting different strategies to collect GBA Plus data from its different streams of work. In 2021-22, the program collected GBA Plus data on hiring and career advancement of STEM professionals from equity deserving groups who receive practical training opportunities at the NRC. The program also collects GBA Plus data on the gender representation of members appointed to its advisory board in a confidential manner to facilitate efforts to achieve equal representation of women. GBA Plus data on longer term impacts on gender and diversity will be collected through a planned program evaluation. Finally, in 2022-23, the NRC plans to engage other science based departments and agencies to exchange information on the challenges to collect GBA Plus data and strategies to overcome them.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, SDT is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. Data is collected on the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

SDT's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members. As another specific action for GBA Plus data collection, the SDT program is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates. As part of the operational planning process, the SDT program also compiles qualitative evidence of its research accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of the SDT program's research efforts.

An evaluation of the SDT program has been initiated in 2022-23. The evaluation will include an examination of EDI populations within the research centre/ program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

**Program Name: Genomics Research & Development Initiative Shared Priority Projects**

**Target Population:**

All Canadians / OGDs

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The Genomics Research and Development Initiative (GRDI) is a funding program that carries out vital genomics research. Participating federal government departments include the NRC and Agriculture and Agri-Food Canada, the Canadian Food Inspection Agency, Environment and Climate Change Canada, Fisheries and Oceans Canada, Health Canada, Natural Resources Canada, and the Public Health Agency of Canada. GRDI collaborates with universities and the private sector, creating economic, environmental and social benefits for Canadians. Research areas include agriculture, environment, fisheries, forestry and health (including developing treatments for diseases such as cancer). The NRC's role in the GRDI is to provide the coordination function, through program coordination, communication, networking and outreach support. In this role, the NRC aims to promote analysis of the potential benefits of the GRDI on various stakeholders including equity deserving groups.

An evaluation of the GRDI in 2019/20 identified the primary users and potential benefits that can be experienced by them. One of the observations made was that the end-users for GRDI-funded projects include both internal and external end-users. Internal end-users are the most common type for GRDI-funded projects and include people working inside the federal government, such as laboratory scientists, field inspectors, border agents, trade negotiators and resource managers. External end-users are outside the federal government, and may include industry using a patented technology or revising their processes due to a policy change, and international regulatory agencies using and/or adopting the technology.

**GBA Plus Data Collection Plan:**

The NRC's role in the GRDI includes the responsibility to conduct studies and analyses to serve as input in the determination of GRDI-wide research priorities, and providing management and administration support, as well as support for performance management, reporting, evaluation, and communications. In this capacity, the NRC has tentative plans to coordinate a review of the annual performance report template for GRDI-funded Shared Priority Projects in 2022-23 to facilitate knowledge transfer, which could include GBA Plus data considerations. The NRC also aims to integrate GBA Plus considerations in future evaluations and analysis of the program. The next evaluation of the GRDI program is tentatively scheduled to be initiated in 2024-25 and will provide insights and data on GBA Plus.

**Program Name: Collaborative Science, Technology and Innovation Program**

**Target Population:**

All Canadians / academia, SMEs, science & technology industry

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

Under the Collaborative Science, Technology and Innovation Program (CSTIP), the NRC continues to integrate GBA Plus in its activities to partner with private and public sector, academic and other research organization in Canada and internationally through 7 active Challenge programs and 5 active Cluster Support programs. CSTIP provides grant and contribution funding for external collaborators with complementary capabilities (e.g. SMEs, post-secondary institutions and non-profit research organizations). The program has 3 main components: NRC Collaborative Research & Development (R&D) initiatives, the Ideation Fund and the Outreach Initiative.

The research community and targeted challenge program sectors in Canada benefit from CSTIP funding, in particular highly qualified personnel in specific fields and sectors. Secondary beneficiaries are the academics and SMEs that benefit from the intellectual property created through funded projects. The impact on diverse groups depends on the demographic make-up of post-secondary students and their chosen fields of study. In Canada, some demographic groups show lower rates of participation in post-secondary education, including Indigenous youth, youth from low-income backgrounds, and youth from rural areas. Moreover, due to the demographic composition of the pipeline for STEM fields, it is likely that there will be more male participants.

The Outreach initiative, which provides funding to support conferences, workshops, symposia or other outreach initiatives in order to promote engagement of Canadians, specifically targets equity deserving groups in an effort to promote more participation in STEM. The Challenge and Cluster Support programs support the Government of Canada goals and the intent it is to positively benefit Canada and the Canadian population. The Challenge and Cluster Support programs and Ideation Fund projects have significant flexibility in their terms and conditions, which allows for targeting the participation of equity deserving groups. For example, the Artic and Northern Challenge Program targets northern Indigenous populations and the Small Teams Indigenous Languages project seeks to digitalize endangered Indigenous languages.

The main barriers to participation in the program's activities are associated with the need to be trained and employed in the STEM research and development ecosystem, which CSTIP programs leverage to advance science and technology to solve pressing issues for Canadians. CSTIP aims to identify these barriers to participation faced by equity deserving groups and find solutions to remove them. As a result of the barriers identified by the NRC to collaboration with Indigenous recipients, CSTIP sought changes to its terms and conditions which were officially approved by the Minister of Innovation, Science and Industry in December 2021. In addition, special attention was paid in the calls for proposals launched in 2022-23 targeting Indigenous

participation. Specific activities include ensuring that the timing of the call launch respects time on the land and making templates short and clear to remove application barriers. A result highlighted in the call for proposals launched in 2022-23, was that for the first time, the external peer review included an entirely Inuit peer review panel (who were compensated for their time) paired with a non-Inuit panel that enabled scientific review and a distinctions-based approach with regional priorities to be factored into final selection.

In addition, each CSTIP program develops a GBA Plus framework, commits to providing equal opportunities and strives to hire 50% of equity deserving groups. Some notable examples include:

- The Aging in Place Challenge (AiP) program aims to support a sustainable model for long-term care by shifting the focus toward preventive home and community-based care. The program's objectives focus on improving the quality of life of older adults and their personal caregivers through technology and innovation that will support safe and healthy aging. The aim is to enable nursing homes to concentrate on older adults with the highest needs while reducing costs to the Canadian health care system. The ultimate goal of the program is to increase the proportion of older Canadians who are living in homes and communities of their choice by 20% in the next decade through technologies that support safe, healthy and socially connected living.
- AiP allocates resources to support the ethical participation of "Experts by Experience" (older adults and their caregivers) at the program, project and community levels and ensuring representation from across Canada, including racialized persons, official language groups, indigenous communities, 2SLGBTQ+ and persons with disabilities.
- The Arctic and Northern Challenge program has been working on several projects addressing various areas of importance to Indigenous communities in Canada's north, including making shipping operations safer in ice-covered waters, reinforcing ice roads for a longer operational lifespan, detecting and cleaning up oil spills in the Arctic, reducing permafrost degradation, and developing new techniques for sewage treatment in challenging Arctic conditions. By providing both research funding and scientific expertise, the program aims to support strong and sustainable northern communities through applied technology and innovation to solve pressing issues confronting Northerners, specifically in the areas of housing, health, food, and water. The program is also committed to prioritizing northern-led research projects that have a strong focus on northern capacity building.

All challenge programs under CSTIP have integrated GBA Plus into their operations in order to build and expand diverse Canadian STEM capacity in the scientific field and the industry sectors they support. One of the ways this is accomplished is through training students and highly qualified personnel, in order to improve the quality of scientific and technical outputs produced by a diverse workforce. By hiring students and early career STEM professionals from equity deserving groups and providing them with practical training opportunities, the NRC is helping to strengthen the pipeline for Canadian industry, academia and other STEM employers and improve the workforce representation within traditionally under-represented fields.

#### **GBA Plus Data Collection Plan:**

In 2021-22, CSTIP incorporated GBA Plus data collection plans into several aspects of its planning and reporting activities. All CSTIP challenge programs are co-developed through significant stakeholder engagement with GBA Plus considerations factored into program design and the composition of the external peer review and advisory committees. Furthermore, as part of the specific actions taken for GBA Plus data collection for 2022-23, all CSTIP proposal

templates request information on GBA Plus considerations and recipients are asked to report back on their GBA Plus strategies. GBA Plus analyses are included in Ideation Fund proposals and this is an unscored element of the project selection process. Project-level data is collected and reported at the researcher level. GBA Plus data collection and analysis has been done on New Beginnings Initiative (a stream of CSTIP) for NRC applicants, with plans to extend this to other CSTIP programs from 2022-23 onwards.

An evaluation of CSTIP has been initiated in 2022-23. A specific indicator in the evaluation matrix will assess the integration of GBA Plus into program processes and tools at all stages of the program life cycle and the extent to which CSTIP encourages partners/collaborators to include GBA Plus considerations in their hiring, stakeholder engagement processes and the expected differential impact of the program on diverse groups of Canadians will also be assessed. The evaluation will also include an examination of EDI populations within the program workforce as well as distribution across the various employee subgroups (researcher, management, administrative) and levels. Further, to ensure the perspectives of diverse populations are heard, the evaluation project will also include diverse populations in key informant interviews, peer review committees, and surveys. GBA Plus success stories, if identified, could also be included as case studies.

Building on the NRC's objectives and targets laid out in the NRC Five-Year Strategic Plan, CSTIP is setting targets and collecting data on its work to build and expand diverse Canadian STEM capacity in its field and sector. The NRC's National Program Office collects EE representation data on applicants to the New Beginnings Initiative and will collect data on the breakdown of successful applications within the 4 designated EE groups.

Data collection on the representation of equity deserving groups is done internally on an annual basis to inform decision making. The 2023-24 operational planning process for the NRC branches, under which this program exists, will include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members in the branch. As another specific action for GBA Plus data collection, the branch under which this program exists is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates.

CSTIP also compiles qualitative evidence of its Challenge and Cluster Support programs' accomplishments and impacts on diverse groups in the form of success stories. These stories are used in NRC planning, reporting and communications activities as evidence of the success and impact of CSTIP's efforts.

## **Program Name: Industrial Research Assistance Program**

### **Target Population:**

All Canadians / SMEs, science & technology industry

### **Distribution of Benefits:**

By gender (1 to 5) – Second group: 60% - 79% men

By income level (1 to 5) – Fourth group: Somewhat benefits high income individuals (somewhat regressive)

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

### **Key Program impacts on Gender and Diversity:**

NRC IRAP has made efforts to diversify participation in its programs and build on work already underway to provide support to firms owned or led by women, Indigenous Peoples, racialized persons and persons living with disabilities through a number of agreements with not-for-profit organizations. NRC IRAP uses an EDI lens in its operations in building its programs and policies for clients. Since 2018, NRC IRAP has aligned its program activities with its EDI Strategy. Through outreach, advisory services, and funding, NRC IRAP has made efforts to:

- Increase the diversity of NRC IRAP's portfolio of clients;
- Increase service offerings to address and reduce barriers through Contributions to Organizations for SMEs owned or led by members of EE groups;
- Engage Indigenous Band Councils through the IRAP Indigenous Support Network (IISN), to discuss future project funding;
- Achieve gender parity in its Youth Employment and Skills Strategy (YESS) Program; and
- Support access to global value chain for SMEs owned or led by members of EE groups.

NRC IRAP has taken a number of actions to support these objectives. For example, NRC IRAP committed to ensure 50% of participants in the Youth Employment Program were women. In 2021-22, an observed result was that 53% of the participants in YESS were women.

NRC IRAP provided targeted support through the program's Contribution to Organization (CTO) funding mechanism. Based on the observed results, 4 CTOs targeting women, racialized persons and Indigenous entrepreneurs supported 140 firms in 2021-22 with a total contribution of \$1.1M. Clients are invited to share feedback through a Post Service Assessment (PSA) after engaging with NRC IRAP partners through these CTOs. PSA results indicate 93% of the 140 clients who were supported through these CTOs were satisfied with the services, 95% indicated the CTO had a positive impact on their business, and 88% indicated plans to implement the results within one month.

NRC IRAP has signed on to the 50-30 Challenge and has taken action to improve equity and increase the diversity within the organization and its collaborators.

In 2021-22, NRC IRAP completed a high level Accessibility Review of external facing documents and web presence to identify content and messaging that unintentionally reduces the participation of equity deserving groups in NRC IRAP programs and services. Equity deserving groups is defined as being in alignment with the defined EE groups for the purpose of

the assessment. A report was produced which includes findings and recommendations which will be turned into an action plan for future implementation.

NRC IRAP continues to use modern recruiting tools to attract, retain and develop a diverse workforce. Summary statistics of NRC IRAP hires between 2018 and 2021 was obtained and analyzed for new employees. Results indicate that between fiscal years 2018 and 2022, 42% of new NRC IRAP hires identified with 1 or more of the 4 EE groups, in most cases the EE group they self-identified with was “Women”. In the same timeframe, 58% of new managers hired at NRC IRAP self-identified with 1 of the 4 EE groups for the same time period.

NRC IRAP developed a proposal for a training program scheduled for 2022-23 which will increase field staff readiness to understand EDI as a business tool, to develop the skillset to communicate the benefits of EDI to IRAP clients and to engage with clients on their own EDI journey. Participants from internal and external facing roles, will complete scenario based micro-learning activities with topics that will be discussed in more detail in an expert speaker series. Participants will also be equipped with resources and toolkits to apply and reference in conversations with clients.

NRC IRAP continues to participate and be represented on the Women's Entrepreneurship Strategy Assistant Deputy Minister Committee and Working Group collaborating on strategies in support of women entrepreneurs. NRC IRAP is also represented on TAFTI E-The European Network of Innovation Agencies Diversity and Inclusivity reviewing best practices in this space. NRC IRAP collaborates with UK Research and Innovation to support government initiatives including EDI.

#### **GBA Plus Data Collection Plan:**

NRC IRAP served over 9000 clients in 2021-22 and has a voluntary data collection process for clients to self-declare Employment Equity information about their business ownership, leadership and board composition. In 2022-23, NRC IRAP will continue collecting and analyzing data to understand how equity deserving groups are experiencing unintended barriers to NRC IRAP support, and to develop mitigation strategies to address these barriers. Of the NRC IRAP clients who received funding in the last 5 years, 47% had provided a response about the EDI footprint of their ownership and leadership however some chose to respond with “I don't know” or “Choose not to answer”.

NRC IRAP continues to be part of TBS' ongoing research project of “Understanding Business Innovation and Growth Support (BIGS) beneficiaries” with Statistics Canada as a specific action for GBA Plus data collection. The BIGS database covers government support to enterprises linked to the Linkable File Environment (LFE) of Statistics Canada to better understand performance and conduct impact assessments for growth and innovation-related programs. BIGS project will allow NRC IRAP access to aggregate data in 2022-23 to improve the understanding of the business ownership and workforce composition (e.g. majority women-owned enterprises and proportion of female employees) of enterprises supported by NRC IRAP.

Building on the objectives and targets laid out in the NRC Five-Year Strategic Plan, NRC IRAP is collecting data against the Canadian Labour Market Availability (LMA) for each of the 4 designated EE groups as well as specific EE occupational groups (EEOGs). This data is drawn from corporate HR systems and Statistics Canada census information and collected through the annual operational planning process.

NRC IRAP's 2023-24 operational planning process will also include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help

address EE gaps and enable the advancement of equity deserving group members. NRC IRAP has a designated hiring team whose primary mandate is to source candidates from EE groups. As another specific action for GBA Plus data collection, data is collected and reported on a quarterly basis by corporate HR on the proportion of new NRC IRAP hires from EE groups.

**Program Name: International Affiliations**

**Target Population:**

All Canadians / researchers, international organizations or alliances

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

\*The Grants for International Affiliations (GIA) program funds flow not to individuals, but to organizations that are transparent and committed to equity. Therefore there are no benefits skewing to any particular group.

**Key Program impacts on Gender and Diversity:**

The Grants for International Affiliations (GIA) program has a target of 100% of funded organizations that have programs to support equity, diversity and inclusion. The GIA program funds a wide variety of scientific discipline based international unions or committees with varying equity, diversity and inclusion goals. It is notable that all organizations are now sensitized to these issues and moving from data tracking to actions that will address EDI issues. Each of the 28 funded organizations submits a mandatory annual performance review questionnaire and 26 of the 28 were interviewed as well in 2020-21. The GIA program funds organizations (scientific discipline based international unions or committees) that are committed to transparency and equity and it did not fund any individuals in 2020-21.

The International Affiliations program is responsible for Canada's membership in international science and technology (S&T) organizations which promotes international research and innovation, networking, advocacy, leadership opportunities as well as access to benchmarking possibilities, enabling Canadian science, technology, and industry to remain competitive. The program has integrated GBA Plus into many aspects of its activities including analyses of benefits to equity deserving groups from its initiatives and projects and representation of diverse views in its advisory committee and selection process.

The program engages with representatives of each Canadian National Committee (CNC) responsible for specific international affiliations to assess evolving priorities, most valued benefits of the program to participants and understand the needs of each CNC. GBA Plus has been integrated into the annual performance review process to track the initiatives and projects of the CNCs that benefit equity deserving groups. The 2020-21 program evaluation also gathered data on these benefits to provide the following observations on the program:

- International organizations receiving support have created opportunities and are building capacity for demographic groups traditionally excluded from STEM fields and for early career scientists, as well as working to include affected communities and developing and emerging country citizens as partners.
- In 2021, 100% of supported international organizations or their respective CNC had programs to support increased participation by early career scientists, women and other equity deserving groups (e.g., travel grants, dedicated awards, co-op placements, community consultations).

- CNCs also reported that their international organizations made supporting developing and emerging nations a priority as well (e.g., education and exchange programs).

In addition, the International Affiliations program has integrated GBA Plus into its governance structure. An advisory committee for the program has now met through 3 full fiscal years, drawing on cross government science departments and agencies and deploying diverse expertise to leverage Canadian international science objectives. In 2021, the program piloted an EDI Subcommittee to provide input for any nominations, awards or positions to support diversity and inclusion and address under-representation of certain groups, and the intention is to make this Subcommittee permanent.

#### **GBA Plus Data Collection Plan:**

The International Affiliations program has incorporated GBA Plus data collection in its planning and reporting activities to ensure participation of equity deserving groups and understand the benefits to diverse groups.

The program will continue to engage with the CNCs managing international affiliations to better gauge impacts and plans, and ensure continued recipient engagement in the program. This will inform the Canadian STI management community of the science diplomacy needs of Canadian practitioners in light of track records of international affiliations, and the associated level of required support. Moreover, as part of the GBA Plus data collection plan, regular engagement will continue to take place in 2023, including completion of a reporting questionnaire and short interviews to assess performance and program direction. Finally, the program's next evaluation scheduled for 2025–26 will provide further insights on the benefits experienced by equity deserving groups.

Data collection on the representation of equity deserving groups is done internally on an annual basis to inform decision making. The 2023-24 operational planning process for the NRC branches, under which this program exists, will include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members in the branch. As another specific action for GBA Plus data collection, the branch under which this program exists is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates.

**Program Name: TRIUMF**

**Target Population:** All Canadians / academia, students, researchers

**Distribution of Benefits:** N/A

**Key Program impacts on Gender and Diversity:**

N/A

A consortium of Canadian universities own TRIUMF Inc., which receives funding from several federal government organizations, including operational funding through a contribution agreement with the NRC. TRIUMF Inc. has its own governance and management team who operate and manage TRIUMF Inc. The NRC plays an important oversight and stewardship role for TRIUMF Inc. on behalf of the Government of Canada, but is not directly involved in designing and running the organization's operations. As part of this role, NRC serves on the governance committees of TRIUMF Inc. and provides advice on its implementation of GBA Plus data collection activities.

**GBA Plus Data Collection Plan:**

Through NRC's oversight and stewardship role in the governance structure of TRIUMF Inc., it was noted that the organization has implemented activities for GBA Plus data collection. While TRIUMF Inc. supports the requirements related to monitoring the advancement of equality across gender and other dimensions, its current systems do not allow for data collection in that regard on an ongoing basis. TRIUMF Inc. has put in place an ombudsperson, reporting to the executive director, whose mandate includes supporting students and postdoctoral fellows involved with TRIUMF Inc. In addition to campaigns to raise awareness about their activities among youth and equity deserving groups, TRIUMF Inc. also has put in place an undergraduate fellowship (Richard E. Azuma Summer Fellowships) which actively recruits members of equity deserving groups. Data collected on activities are reported within TRIUMF Inc. annual reports to its Board of Governors. Equity Diversity and Inclusion (EDI) has recently been reframed as a core value and a central theme in TRIUMF Inc. strategic planning. As part of NRC's regular evaluation of its TRIUMF program, tentatively scheduled to be initiated in 2027-28, the progress of TRIUMF Inc. on their strategic goals will be evaluated.

**Program Name: National Science Library**

**Target Population:** All Canadians / OGDs

**Distribution of Benefits:**

By gender (1 to 5) – Third group: Broadly gender-balanced

By income level (1 to 5) – Third group: No significant distributional impacts

By age group (1 to 3) – Second group: No significant inter-generational impacts or impacts between youth and seniors

**Key Program impacts on Gender and Diversity:**

The NRC National Science Library (NSL) offers a range of information-related services to the public and other libraries. Services include online access to digital content through NRC's publicly available repositories (NRC Publications Archive and the Digital Repository), a searchable catalogue and information discovery platform, and reference/interlibrary loan services with other libraries. The NSL is committed to open science and open government principles in making its research outputs accessible through its repositories. The NSL is a member of the Federal Science Libraries Network (FSLN), a partnership of 7 federal science libraries that have joined together to establish a one-stop, self-serve portal where you can access library services and search the print collections and repositories of all the libraries from a single place.

With the impact of COVID on in-person and telephone services, the NRC has been increasing digitization of its historical research products to reduce barriers in accessing federal research efforts and increasing accessibility to all Canadians, including those facing financial barriers. NRC historical records are scanned request and provided to clients, and high demand collections have been digitized to make them publically available online in the digital repository. The FSLN public site, the NRC Publications Archive, and the Digital Repository provide access to Government of Canada scientific information and research, with all sites meeting requirements under the Web Content Accessibility Guidelines. The NRC is also making improvements to NSL and FSLN services through the development and promotion of a service catalogue to increase access to services for internal clients and expanded access to global library collections through inter-library loans.

The NRC made efforts to increase anti-racism resources for NRC employees, and content specific to equity deserving groups such as women in STEM and Indigenous Peoples. The NRC purchased library resources related to anti-racist and Indigenous engagement practices, developed resource guides related to anti-racist and Indigenous engagement practices in research and the workplace, including books, reports, statistics and academic articles, and replaced library of Congress and Canadian subject headings in the FSLN catalog related to Indigenous Peoples with more current terminology to support reconciliation (e.g. replacing the term "Indians of North America" with Indigenous Peoples). The NRC also curated archival collections about NRC female scientists to support women in STEM and facilitated discovery by participating in the University of Ottawa's Canadian Archive of Women in STEM portal and supported national print preservation efforts to ensure access to federal STEM materials.

**GBA Plus Data Collection Plan:**

The NSL has a GBA Plus data collection plan to ensure participation of equity deserving groups and to understand the benefits to diverse groups. Data is collected on specific GBA Plus

initiatives in the form of qualitative evidence of NSL's accomplishments and impacts on diverse groups. This includes an initiative to digitize NRC's annual reports since 1917 to reduce barriers in accessing information on NRC's historical activities and increase accessibility to all Canadians. The program is collecting data on the number of reports that are converted to a digital format by the end of 2023-24. Data will also be collected in 2022-23 on the progress made under other initiatives such as the development and promotion of the service catalogue for NSL and FSLN and increasing library resources related to GBA Plus.

Data collection on the representation of equity deserving groups is done internally on an annual basis to inform decision making. The 2023-24 operational planning process for the NRC branches, under which this program exists, will include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members in the branch. As another specific action for GBA Plus data collection, the branch under which this program exists is collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates.

**Program Name: Four Enabling Programs:**

- (1) Business Management Support**
- (2) Design and Fabrication Services**
- (3) Research Information and Technology Platforms**
- (4) Special Purpose Real Property**

**Target Population:** NRC Employees (internal programs)

**Distribution of Benefits:** N/A

**Key Program impacts on Gender and Diversity:**

N/A

**GBA Plus Data Collection Plan:**

N/A

These are internal programs providing client engagement, technology transfer and commercialization support to NRC employees, enabling the delivery of other NRC programs.

Data collection on the representation of equity deserving groups is done internally on an annual basis to inform decision making. The 2023-24 operational planning process for the NRC branches under which these programs exist will include internal workforce planning which prioritizes the identification of high potential employees from designated groups to help address EE gaps and enable the advancement of equity deserving group members in the branch. As another specific action for GBA Plus data collection, the branches are collecting data on a quarterly basis on the proportion of new hires that are women and racialized persons and will include all EE hires from 2022-23 onwards. Also, hiring targets for EE groups were introduced in 2022-23 and will be used as the basis to collect data on the proportion of newly hired staff from the 4 designated EE groups from 2022-23 onwards. The postings for hiring explicitly invite people to self-identify as being members of EE groups as a preference will be given to these candidates.