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NATIONAL RESEARCH COUNCIL CANADA

ARCHIVED – Departmental Performance Report 2013-2014

National Research Council Canada

2013–14

Departmental Performance Report

The Honourable James Moore, P.C., M.P.
Minister of Industry

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Foreword

Departmental Performance Reports are part of the Estimates family of documents. Estimates documents support appropriation acts, which specify the amounts and broad purposes for which funds can be spent by the government. The Estimates document family has three parts.

Part I (Government Expenditure Plan) provides an overview of federal spending.

Part II (Main Estimates) lists the financial resources required by individual departments, agencies and Crown corporations for the upcoming fiscal year.

Part III (Departmental Expenditure Plans) consists of two documents. Reports on Plans and Priorities (RPPs) are expenditure plans for each appropriated department and agency (excluding Crown corporations). They describe departmental priorities, strategic outcomes, programs, expected results and associated resource requirements, covering a three-year period beginning with the year indicated in the title of the report. Departmental Performance Reports (DPRs) are individual department and agency accounts of actual performance, for the most recently completed fiscal year, against the plans, priorities and expected results set out in their respective RPPs. DPRs inform parliamentarians and Canadians of the results achieved by government organizations for Canadians.

Additionally, Supplementary Estimates documents present information on spending requirements that were either not sufficiently developed in time for inclusion in the Main Estimates or were subsequently refined to account for developments in particular programs and services.

The financial information in DPRs is drawn directly from authorities presented in the Main Estimates and the planned spending information in RPPs. The financial information in DPRs is also consistent with information in the Public Accounts of Canada. The Public Accounts of Canada include the Government of Canada Consolidated Statement of Financial Position, the Consolidated Statement of Operations and Accumulated Deficit, the Consolidated Statement of Change in Net Debt, and the Consolidated Statement of Cash Flow, as well as details of financial operations segregated by ministerial portfolio for a given fiscal year. For the DPR, two types of financial information are drawn from the Public Accounts of Canada: authorities available for use by an appropriated organization for the fiscal year, and authorities used for that same fiscal year. The latter corresponds to actual spending as presented in the DPR.

The Treasury Board *Policy on Management, Resources and Results Structures* further strengthens the alignment of the performance information presented in DPRs, other Estimates documents and the Public Accounts of Canada. The policy establishes the Program Alignment Architecture of appropriated organizations as the structure against which financial and non-financial performance information is provided for Estimates and parliamentary reporting. The same reporting structure applies irrespective of whether the organization is reporting in the Main Estimates, the RPP, the DPR or the Public Accounts of Canada.

A number of changes have been made to DPRs for 2013−14 to better support decisions on appropriations. Where applicable, DPRs now provide financial, human resources and performance information in Section II at the lowest level of the organization's Program Alignment Architecture.

In addition, the DPR's format and terminology have been revised to provide greater clarity, consistency and a strengthened emphasis on Estimates and Public Accounts information. As well, departmental reporting on the Federal Sustainable Development Strategy has been consolidated into a new supplementary information table posted on departmental websites. This new table brings together all of the components of the Departmental Sustainable Development Strategy formerly presented in DPRs and on departmental websites, including reporting on the Greening of Government Operations and Strategic Environmental Assessments. Section III of the report provides a link to the new table on the organization's website. Finally, definitions of terminology are now provided in an appendix.

Minister's Message

Canada has a long and proud history of excellence in research and discovery. As our country becomes more and more integrated into the globally competitive economy, harnessing the power of science, technology and innovation is key to the success of Canadian entrepreneurs and to the creation of jobs and prosperity for Canadians.

Industry Canada's portfolio partners continue to play central roles in promoting innovation, improving Canada's marketplace policies, and efficiently managing programs and services. From supporting experts in the field to youth in the classroom, the partners have maintained their commitment to fostering strong working partnerships and forging groundbreaking relationships.

In 2013–14, our government supported the National Research Council of Canada (NRC) by helping transform the agency into one of the world's most effective research organizations. As a result, the NRC is in a position to deliver effective innovation support to Canadian businesses across the country.

Investing in science creates jobs and improves the quality of life of all Canadians. That is why our government has invested more than $11 billion in science, technology and innovation. Canada is ranked first among the G7 countries for research and development support in our colleges, universities and other research institutions. Moving forward, our government will continue to make record investments in science and support the important work being undertaken by the NRC.

As Industry Canada revises the federal science, technology and innovation strategy, it will work in partnership with the NRC to help shape Canada's international competitiveness by promoting our world-class research and discovery.

It is my pleasure to present the 2013–14 Departmental Performance Report for the National Research Council of Canada.

James Moore
Minister of Industry

Minister of State's Message

A strong focus on science, technology and innovation has never been more important than in today's globally competitive environment. As Minister of State for Science and Technology, I am proud to be part of a government that has committed record investments in these disciplines to push the boundaries of knowledge and to create jobs and opportunities while improving the quality of life of Canadians.

By developing strong partnerships with Canadian businesses while leveraging public-private investments, the National Research Council Canada (NRC) has distinguished itself as one of Canada's main drivers of innovation and scientific advancement.

This year, our government charted out a course to transform the NRC into the most effective research and technology organization, which is committed to increasing the competitiveness, productivity and prosperity of Canada's research and development–intensive businesses while continuing to pursue innovation at the frontiers of scientific discovery. The NRC implemented a new organizational structure with highly trained and market-savvy Client Relationship Leaders who are building new business relationships and continually monitoring, understanding and anticipating client needs and market demand. Toward this end, the NRC accomplished several important milestones including launching the Concierge Service to better connect clients to existing federal business support programs and delivering the Business Innovation Access Program to encourage greater commercialization and innovation by Canada's small and medium-sized businesses. This report shows how these transformative measures have gained traction with businesses and are achieving successes.

Moving forward, we hope to build on these measures and further align the objectives of the Industry Portfolio with the Government's overarching goals of creating jobs and opportunities for Canadians. Together, we can create lasting partnerships to build a prosperous future for Canada.

It is my pleasure to join my colleague, the Honourable James Moore, Minister of Industry, in presenting the 2013–14 Departmental Performance Report for the NRC.

Ed Holder
Minister of State (Science and Technology)

President's Message


John McDougall, P.Eng., President

I am pleased to submit for tabling in Parliament, the 2013-14 Departmental Performance Report for the National Research Council of Canada. Last year, we introduced the new NRC to the world. At that time, we made a public commitment to measuring our success based on the success of our clients – primarily, R&D intensive Canadian companies.

In support of our goal to help innovative Canadian companies become more successful, in 2013-14 we introduced a suite of industry-driven R&D initiatives that respond to areas of greatest market pull. Leading the way are four high-value flagship initiatives designed to 1) prove the commercial viability of algal carbon-conversion technologies, 2) open new industrial markets for renewable biomaterials, 3) improve the profitability of Canadian wheat, and 4) create lucrative "high tech" product lines for the Canadian printing industry.

To ensure small and medium-sized Canadian companies have access to the business and technical services that they require in their own economy, the Government of Canada recently launched the Business Innovation Access Program (BIAP), delivered through NRC's Industrial Research Assistance Program (IRAP). BIAP helps Canadian SMEs expedite their ability to commercialize by accessing business and technical services from Canadian universities, colleges and non-profit research institutions. Economic Action Plan 2014 further strengthened this commitment to SMEs through the announcement of the Canada Accelerator and Incubator Program (CAIP), also being delivered through IRAP. The CAIP program will help entrepreneurs create new companies and realize the potential of their ideas by delivering intensive mentoring and other resources required to develop their businesses.

Through these investments, NRC is now optimally positioned to help Canadian companies innovate more and invest more in R&D – key factors to Canada's continued economic growth and long term prosperity.

Section I: Organizational Expenditure Overview

Organizational Profile

Appropriate Minister: James Moore, Minister of Industry

Institutional Head: John McDougall, President

Ministerial Portfolio: Industry

Enabling Instrument(s): *National Research Council Act* [i], R.S.C. 1985, c. N-15

Year of Incorporation / Commencement: 1916

Other: NRC is a departmental corporation of the Government of Canada, reporting to Parliament through the Minister of Industry. NRC works in partnership with members of the Industry Portfolio to leverage complementary resources to promote the innovation of firms, to exploit synergies in key areas of S&T, to promote the growth of small and medium-sized firms (SMEs) and to contribute to Canadian economic growth. NRC's Council provides independent strategic direction and advice to the NRC President and reviews organizational performance. The President provides leadership and strategic management and is responsible for the achievement of NRC's long-range goals and plans. Each of NRC's seven Vice Presidents is responsible for a number of areas composed of research sub-programs, 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.

Organizational Context

Raison d'être

The National Research Council Canada (NRC) bridges the innovation gap between early stage research and development (R&D) and commercialization, focusing on socio-economic benefits for Canada and increasing national performance in business-led R&D and innovation. A federal leader in technology development, NRC supports Canadian industry to enhance their innovation capabilities and capacity and become more productive in the development and deployment of innovative products, processes and services for markets of national priority and importance. With a presence in every province, NRC combines its strong national foundation with international linkages to help Canada grow in productivity and remain globally competitive. NRC works in collaboration with industry, governments and academia to maximize Canada's overall R&D investment.

Responsibilities

Under the *National Research Council Act* [i], NRC is responsible for:

- Undertaking, assisting or promoting scientific and industrial research in fields of importance to Canada;
- Providing vital scientific and technological services to the research and industrial communities;
- Investigating standards and methods of measurement;
- Working on the standardization and certification of scientific and technical apparatus and instruments and materials used or usable by Canadian industry;
- Operating and administering any astronomical observatories established or maintained by the Government of Canada;
- Establishing, operating and maintaining a national science library; and
- Publishing and selling or otherwise distributing such scientific and technical information as the Council deems necessary.

NRC VISION

To be the most effective research and technology organization (RTO) in the world, stimulating sustainable domestic prosperity.

NRC MISSION

Working with clients and partners, we provide innovation support, strategic research, scientific and technical services to develop and deploy solutions to meet Canada's current and future industrial and societal needs.

Strategic Outcomes and Program Alignment Architecture

During 2013-14, NRC completed a major update of its PAA to reflect NRC's new industry-focus. It is approved for reporting in 2014-15. It is aligned with Government of Canada's Strategic Outcomes and federal priorities and to NRC's business processes that were in full operation during 2013-14. NRC's performance reporting for 2013-14 is aligned accordingly.

1. Strategic Outcome (SO1): Canadian businesses prosper from innovative technologies
- **1.1 Program:** Technology Development and Advancement (TD&A)
  - **1.1.1 Sub-Program:** Aerospace
  - **1.1.2 Sub-Program:** Automotive and Surface Transportation (AST)
  - **1.1.3 Sub-Program:** Ocean, Coastal and River Engineering (OCRE)
  - **1.1.4 Sub-Program:** Energy, Mining and Environment (EME)
  - **1.1.5 Sub-Program:** Construction
  - **1.1.6 Sub-Program:** Aquatic and Crop Resource Development (ACRD)
  - **1.1.7 Sub-Program:** Medical Devices (MD)
  - **1.1.8 Sub-Program:** Human Health Therapeutics (HHT)
  - **1.1.9 Sub-Program:** Information and Communications Technologies (ICT)
  - **1.1.10 Sub-Program:** Security and Disruptive Technologies (SDT)
- **1.2 Program:** Industrial Research Assistance Program (IRAP)

2. Strategic Outcome (SO2): R&D Infrastructure for an innovative and knowledge-based economy
- **2.1 Program:** Science Infrastructure and Measurement (SI&M)
  - **2.1.1 Sub-Program:** National Science Infrastructure (NSI)
  - **2.1.2 Sub-Program:** Measurement Science and Standards (MSS)

Internal Services

Past program results are related to the new PAA through the following crosswalk.

2014–15 Programs **2013–14 Programs**	Technology Development and Advancement (TD&A)	Industrial Research Assistance Program (IRAP)	Science Infrastructure and Measurement (SI&M)	Internal Services
Manufacturing Technologies	√			
ICT and Emerging Technologies	√			
Industrial Research Assistance (IRAP)		√		
Health and Life Science Technologies	√			
Energy and Environmental Technologies	√			
National S&T Infrastructure			√	
Scientific, Technical and Medical (STM) Information				√
Internal Services				√

Note: In 2014-15, Internal Services includes the mandated activities of the National Science Library that were included in 2013–14 as STM Information.

Organizational Priorities

Priority 1	Type[1]	Strategic Outcome
Cultivate business innovation to increase the productivity of Canada's industrial sectors in support of economic growth and development in Canada, including efforts to open up international markets for Canadian firms	Ongoing	SO1: Canadian businesses prosper from innovative technologies

Summary of Progress

- Drawing on discussions with industry and analyses of market and technology trends, as well as economic and innovation factors, NRC implemented a roster of industry-focused sub-programs in areas of importance to Canadian industry prosperity in alignment with *Canada's Science and Technology Strategy.* They were integrated into a single Program adopting consistent performance metrics to monitor progress allowing for timely course correction.
- The present report is rich with examples of alliances with innovation players to leverage resources and to accelerate technology development thus demonstrating NRC's values of actively collaborating to generate better solutions. The recently-launched Printable Electronics (PE) Consortium, which brings together public and private stakeholders to strengthen Canadian technical capacity and industry involvement in PE, has already yielded results through numerous new industry-industry relationships.
- NRC focussed on strategic international alliances and international networks (including EUREKA[ii] and the Canadian Networking Aeronautics Programme for Europe). These alliances and networks helped NRC enable more efficient technology development (acquire/develop/deploy) to increase productivity and competitiveness of Canadian businesses and ease access to new, larger markets. For example, EUREKA has been proven as a tool for firms, especially SMEs, to overcome the risks and complexities associated with entering R&D partnerships abroad. This has enabled faster access to foreign markets and global value chains.
- NRC-IRAP deployed new funding[iii] to increase its support for Canadian SMEs. The increased budget also enabled NRC-IRAP to develop and launch several new initiatives that facilitate Canadian SME access to innovation resources and services in Canada.

[1] Type is defined as follows: previously committed to—committed to in the first or second fiscal year prior to the subject year of the report; ongoing—committed to at least three fiscal years prior to the subject year of the report; and new—newly committed to in the reporting year of the RPP or DPR.

Priority 2	Type	Strategic Outcome
Enhance the generation and commercialization of knowledge in Canada by providing integrated scientific support and infrastructure	Ongoing	SO2: R&D infrastructure for an innovative and knowledge-based economy

Summary of Progress

- NRC continued to work with Canadian data centres to encourage the registration of data with DataCite Canada[iv] in order to make research data easier to access, reuse and verify. Five new DataCite agreements were signed.
- NRC facilitated public access to federal science library collections through a partnership with Infotrieve Canada[v]. Canadian clients received more than 20,500 documents from these collections in 2013-14.
- NRC delivered technical library services to eight federal science-based departments and agencies through eleven agreements.
- The continued relevance and demand for astronomy infrastructure was highlighted by the more than 440 users who accessed leading edge facilities (such as GEMINI and Atacama Large Millimeter/submillimeter Array observatories) and the more than 920,036 terabytes of data (22.4 million files) delivered to roughly 6100 professional astronomers by NRC's Canadian Astronomy Data Centre. Furthermore, NRC was chosen to lead the Central Signal Processing international consortium, which includes industry, which will design the advanced data systems needed by the Square Kilometre Array (SKA) telescope that is expected to become the world's largest and most sensitive radio telescope while having a direct impact in advancing Canada's digital economy.
- As Canada's national metrology institute, NRC provided the measurement standards underlying domestic and international trade. In 2013-14, these services and expertise were accessed by over 850 clients from industry and government.

Priority 3	Type	Strategic Outcome
Strengthen NRC's business model to deliver on expected results.	Ongoing	SO1: Canadian businesses prosper from innovative technologies.

Summary of Progress

- NRC continued to operate its business model with strong centralized management to ensure that resources, investments and opportunities are managed holistically with an eye to balancing risk. NRC approved a full suite of R&D initiatives under this model. These initiatives underwent several stage-gate reviews that ensured critical mass and "industry pull" to successfully address current and anticipated industry needs. Market assessment and positioning in the value chain, risk management and plans for performance measurement frameworks were key considerations by NRC executives when approving R&D initiatives. Other approval considerations included a review of detailed plans for the effective management of physical and human resources, expenditures, and revenues.
- NRC introduced a holistic account management approach and a corporate client relationship management system to offer clients enhanced service levels and a consistent experience across the organisation. A new team of market-savvy Client Relationship Leaders was deployed to build new business relationships and to continually monitor, understand and anticipate client needs and market demand. As part of NRC's enhanced client-focused culture, a client satisfaction survey was introduced into NRC's framework of core performance metrics. Client feedback was used to inform managers on opportunities for improvement and to highlight best practices within the organisation. NRC's Intellectual Property and Contracting guidelines have been updated to reflect a more flexible business approach. And, a group of specialized technical business analysts continue to offer in-depth market analysis services to ensure that program delivery managers and client-facing employees fully comprehend and appreciate the needs of the Canadian market.

Priority 4	Type	Strategic Outcome
Ensure effective and efficient resource management for a sustainable organization (including efforts in streamlining internal services).	Ongoing	SO1: Canadian businesses prosper from innovative technologies.
Summary of Progress		
• NRC improved human resource (HR) practices to attract, develop and engage talent and to build management capacity. Initiatives included a more flexible hiring policy; a new talent acquisition strategy; an improved onboarding initiative to foster early engagement and contributions of recruits; "supervisor essentials" training; and a revitalized rewards and recognition initiative to foster a culture of recognition and to enhance employee engagement, motivation and performance. • NRC standardized its procurement practices and adopted a commodity-based delivery model to improve service. This model enables a better understanding of the client's requirements, supports the continuous development of internal competencies and contributes to streamlining the acquisition process. In addition, NRC began reviewing its Procure-to-Pay process to bridge gaps, to enhance internal control and reporting capabilities, and to better integrate workflow between clients, procurement, and finance functions. • An improved service delivery model was established for managing buildings. It features a regional management structure, a building operations costing model, and a common approach to all facets of building management through NRC's business system. Work commenced to establish standard service levels across all building operations. • NRC consolidated its Information Technology (IT) infrastructure with that of Shared Services Canada (SSC) and NRC put in place plans to accelerate the integration and improved security of its information technology systems. • NRC undertook facility security assessments, resulting in the implementation of a common system for card access control across the regions, complete with monitoring and alarm systems. This improved NRC's security while reducing costs.		

Risk Analysis

NRC, its clients and partners, experienced an operating environment characterized by uneven global economic recovery. RTOs abroad were expanding their international reach and strengthening cross-disciplinary capabilities while building critical mass for such reasons as: improving ability to address complex societal and economic challenges; responding to increasingly sophisticated industrial client needs; maintaining relevancy, and enhancing visibility. Opportunities for technology and innovation solutions were seen to arise out of global risks related to water crises, climate change and adaptation, food crises, and other issues. These were considerations in NRC's selection of its new R&D initiatives.

As Canada's global competitiveness rank[2] remained unchanged at 14, several initiatives were announced in Budget 2013[iii] to help address the innovation and wealth creation barriers identified in the Study on State of Industrial R&D in Canada. These included: operationalizing the re-focused NRC and enhancing research and business development services for SMEs through IRAP. Examples of progress and success in operationalizing the re-focused NRC are seen

[2] World Economic Forum , The Global Competitiveness Report 2013-14

throughout the present report and in the table below, which shows NRC's top externally-oriented risks from the corporate risk profile for 2013-14:

Key Risks

Risk	Risk Response Strategy	Link to PAA
1. Sourcing of technical and business expertise: Risk that NRC will not be able to source the necessary expertise (externally or through staff development) for successful design and delivery of its R&D activities.	**Plan:** Profile NRC's competency base and gaps; develop succession management plans for key positions; implement sourcing strategies for specific skillsets; enhance employee capabilities through training and more proactive career planning. **Progress**: Competency profiling initiated across NRC; priority recruitments expedited; began design of a branding initiative to attract top talent; began developing an internal NRC marketplace to better match capability needs and availabilities.	SO1 and SO2
2. Preparedness for incident and crisis management: Risk that NRC is not adequately prepared to manage a crisis or emergency incident that could result in significant damage and losses.	**Plan:** Implement key actions associated with enhancing organizational preparedness for incident and crisis management; implement fully coordinated internal policy for emergency management, business continuity planning and risk management; build a stronger occupational safety and health culture (OSH) within management ranks. **Progress**: Began implementing a recently-approved Strategic Emergency Preparedness Plan, including a Crisis Communications Plan and Business Continuity Planning Program, advised by a dedicated working group and steering committee; and ongoing OSH progress was made through audit responses, performance management, training and awareness building, and onboarding activities.	SO1 and SO2
3. Management of NRC awareness and brand: Risk that NRC will not manage its reputation and public awareness to ensure an effective view of NRC, which could affect client and stakeholder relationships and hinder NRC growth and impact opportunities.	**Plan:** Implement initiatives to engage clients and stakeholders nationally and internationally; provide leading-edge sales tools for client relationship teams; support effective two-way communications with staff; put aggressive effort on re-branding infrastructure. **Progress**: Communications initiatives (internal and external) undertaken to announce NRC's Strategy[vi]; launched a communications campaign for building employee engagement; enhanced use of business social media; resources were approved for greater awareness building, talent recruitment and R&D support.	SO1 and SO2

Actual Expenditures

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	Difference[3] (actual minus planned)
820,009,430	820,009,430	1,071,269,378	894,418,206	74,408,776

Human Resources (Full-Time Equivalents [FTEs])

2013–14 Planned	2013–14 Actual	2013–14 Difference[3] (actual minus planned)
3,392	3,539	147

Budgetary Performance Summary for Strategic Outcomes and Programs (dollars)

Strategic Outcomes, Programs and Internal Services	2013–14 Main Estimates	2013–14 Planned Spending	2014–15 Planned Spending	2015–16 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2012–13 Actual Spending (authorities used)	2011–12 Actual Spending (authorities used)
Strategic Outcome 1: Canadian Businesses Prosper from Innovative Technologies								
TD&A	269,191,955	269,191,955	339,266,474	299,502,297	446,000,872	317,721,198	261,874,311	313,814,269
IRAP	279,860,916	279,860,916	270,670,144	270,670,144	296,269,192	278,130,653	244,628,683	146,311,268
Subtotal	549,052,871	549,052,871	609,936,618	570,172,441	742,270,064	595,851,851	506,502,994	460,125,537
Strategic Outcome 2: R&D Infrastructure for an Innovative and Knowledge-Based Economy								
SI&M	94,342,113	94,342,113	101,777,277	77,521,584	111,131,916	99,678,744	94,893,647	96,359,502
Subtotal	94,342,113	94,342,113	101,777,277	77,521,584	111,131,916	99,678,744	94,893,647	96,359,502
Internal Services Subtotal	176,614,446	176,614,446	206,591,964	206,053,800	217,867,398	198,887,611	203,408,271	142,018,543
Total	820,009,430	820,009,430	918,305,859	853,747,825	1,071,269,378	894,418,206	804,804,912	698,503,582
The difference in 2013-14 actual spending compared to the previous fiscal year reflects additional investments announced in Budget 2013								

[3] The difference is mainly caused by NRC's transformation funding announced in Budget 2013.

Alignment of Spending With the Whole-of-Government Framework

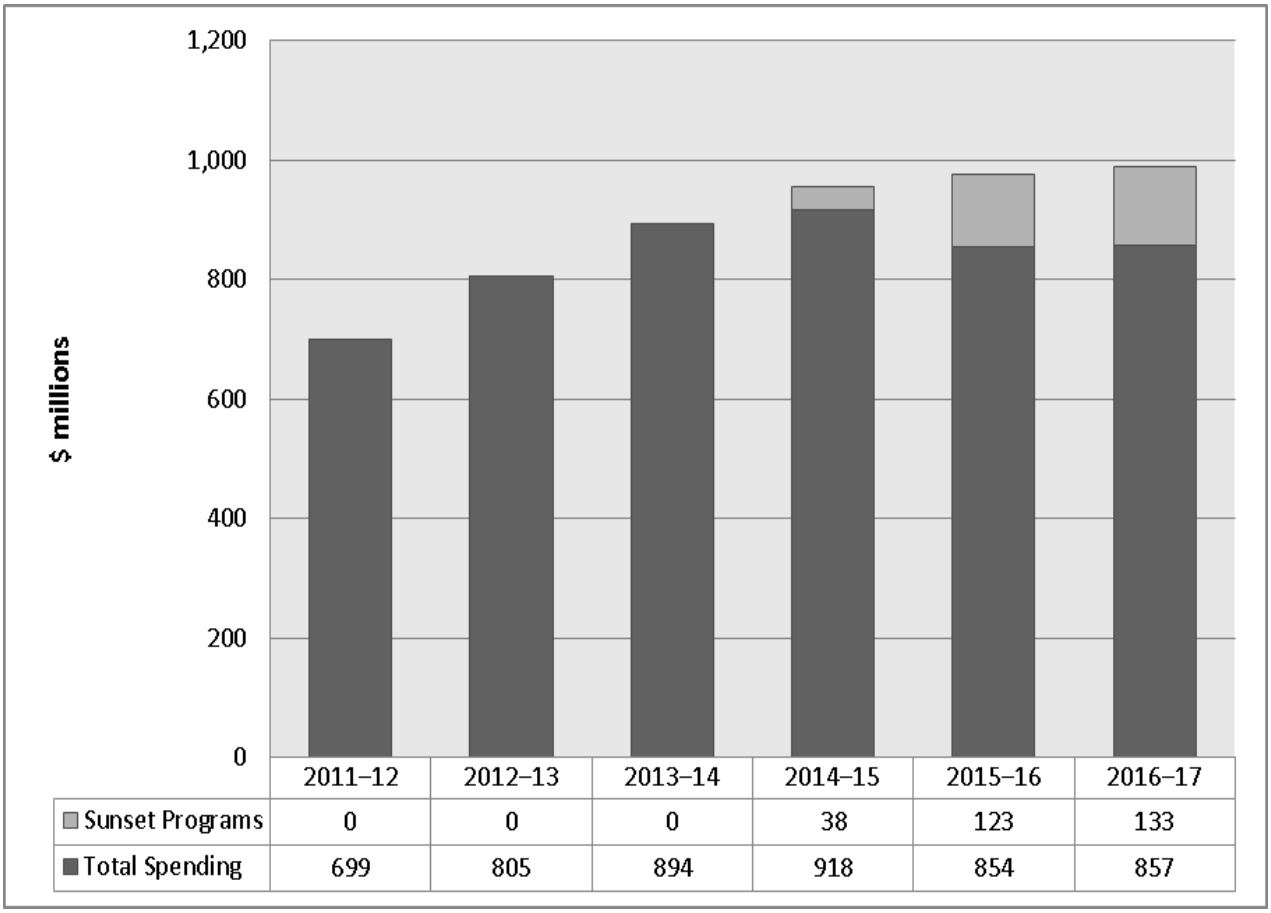
Alignment of 2013–14 Actual Spending With the Whole-of-Government Framework[vii] (dollars)

Strategic Outcome	Program	Spending Area	Government of Canada Outcome	2013–14 Actual Spending
Canadian Businesses Prosper from Innovative Technologies	Technology Development and Advancement	Economic Affairs	Strong Economic Growth	317,721,198
Canadian Businesses Prosper from Innovative Technologies	IRAP	Economic Affairs	Strong Economic Growth	278,130,653
R&D Infrastructure for an Innovative and Knowledge-Based Economy	Science Infrastructure and Measurement	Economic Affairs	An Innovative and Knowledge-based Economy	99,678,744

Total Spending by Spending Area (dollars)

Spending Area	Total Planned Spending	Total Actual Spending
Economic Affairs	820,009,430	894,418,206
Social Affairs	0	0
International Affairs	0	0
Government Affairs	0	0

Departmental Spending Trend



	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17
Sunset Programs	0	0	0	38	123	133
Total Spending	699	805	894	918	854	857

NRC’s spending trend increased due to the implementation of various initiatives in Budget 2011, Budget 2012, and Budget 2013 related to contribution funding. These include the permanent doubling of funding for IRAP, CAIP, BIAP, and the Youth Employment Program. Another factor contributing to the rise in spending relates with the amount of growth planned in Statutory Revenue spending due to NRC's realignment to industry-focused research. NRC's 2013-14 funding profile includes sunsetting programs, including research and development funding for a realigned NRC as well as contributions to the TRIUMF sub-atomic research facility. Additional investments for TRIUMF announced in Budget 2014 are not reflected in this graph. Planned spending does not reflect future budget decisions.

Estimates by Vote

For information on NRC’s organizational Votes and statutory expenditures, consult the *Public Accounts of Canada 2014* on the Public Works and Government Services Canada website[viii].

Section II: Analysis of Program by Strategic Outcome

Strategic Outcome 1: Canadian businesses prosper from innovative technologies

Program 1.1: Technology Development and Advancement

This program develops and advances technologies to enhance the prosperity of Canadian industries in support of federal priorities such as the federal Science and Technology Strategy. This includes national-scale flagship technology-development initiatives having sufficient critical mass to contribute demonstrably to national prosperity. To bring new and innovative products and processes to the marketplace, companies must advance the emerging and maturing technologies embodied in applied developments and prototypes to a level where the risk is sufficiently reduced to be accepted from the business, investment, and regulatory perspectives. The program bridges this critical technology gap through mission-oriented research and development services, and specialized technical services such as custom design and fabrication, testing, prototyping, up-scaling, and demonstration in specialized facilities.

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2013–14 Difference[4] (actual minus planned)
269,191,955	269,191,955	446,000,872	317,721,198	48,529,243

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference[4] (actual minus planned)
1,856.0	2,009.4	153.4

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Canadian industries commercialize advanced technologies	Client/stakeholder deployment of technology	14	At least 4 clients announced intentions in 2013-14 to exploit technologies already developed with or by the Program
	Client/stakeholder feedback on benefits: jobs, sales, R&D	80%	72% of surveyed clients reported positive benefits attributed to the Program.

[4] The difference is mainly caused by NRC's transformation funding announced in Budget 2013.

[5] All Actual Results in this report pertain to 2013-14, while all Targets relate to expected results in 2014-15.

Performance Analysis and Lessons Learned

The Program launched a roster of 10 integrated sub-programs in areas of strategic national importance that will deliver on crucial industry needs through collaborative strategic R&D and technical services, contributing to improve Canada's innovation performance. During 2013-14, the sub-programs continued to contribute to their respective technology areas while exploring and building industry engagement and support to launch new targeted initiatives for advancing technologies. Already, 35 fixed-duration initiatives have been implemented with planned outcomes to be achieved over the next 5 to 8 years. NRC's service offerings include technical and advisory services through which clients' shorter term technical problems associated with the transfer, adoption and diffusion of technology are addressed, as well as collaborative research to aid in accelerating development and deployment timelines. To protect commercial interests, there may be constraints on disclosure of the work.

Although impacts in technology development commonly take years to manifest, signs are already apparent of success in advancing technologies to the point of industry readiness to exploit them commercially. For example, Ontario's Artemis Technologies Inc. committed to full-scale deployment of a novel vaccine, via a production process developed by NRC, to control wildlife rabies.

Overall, 51 (72%) of 71 surveyed clients stated that the Program impacted their organization positively. Specific impacts were: increased knowledge and innovation capacity (55%), closer to market faster (43%), improved products and services (41%), increased sales (20%), and job creation (14%). On a scale of 1 to 10, with 10 being most important, 64% of clients rated the importance of the impact as 7 or above to the future of their business.

These results are supported by recent evaluations[ix]. For example, interviewed construction industry associations commonly recognized NRC impacts in terms of increased market access for products and growth in the industry while clients from the automotive and surface transportation sectors typically reported on improved operations and reduced costs.

Performance targets for this new Program were under development during 2013-14. Performance results at the program and sub-program level are therefore reported as interim progress against annual targets[6] established for 2014-15. Some sub-program targets were significantly exceeded in 2013-14, indicating greater than expected momentum in building industry engagement.

[6] Targets for 2014-15 were established during 2013 while R&D initiatives were in various stages of planning and approval. Future targets will be adjusted as historical trends emerge.

Sub-Program 1.1.1: Aerospace

This sub-program advances product and process technologies to enhance the prosperity of the aerospace industry sector in Canada that is striving to remain competitive in the face of razor-thin margins and increasing regulatory demands. The sector is important to the Canadian economy as a major contributor to manufacturing trade and for hundreds of thousands of skilled jobs at all levels of the supply chain. It is also important for its impacts on the transportation costs of materials and products that drive the economy. Results are achieved through multi-disciplinary collaborative research and development services in addition to specialized technical services in specialized facilities, such as testing and prototyping, for transferring or advancing technologies into deployed solutions and improved practices for the marketplace.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[7]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	51,810,595	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[7]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	313.7	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancements of aerospace process and product technologies	Client/stakeholder financial investment in technology development, $ millions	$37.0M	$34.84M
	Licensing and royalty revenue from NRC clients, $ millions	$0.05M	$0.06M

[7] With the completion of a major PAA update, NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Six R&D initiatives were launched to develop and advance technologies that will:

- reduce costs of developing and operating aircraft while reducing their environmental footprint;
- improve passenger and aircrew comfort, and safety;
- prove the commercial value of unmanned aircraft;
- reduce the cost of icing certification and help Canadian companies meet emerging regulatory requirements in icing;
- accelerate the certification process for new aerospace products; and
- facilitate the transfer of innovative technologies from defence to civilian applications.

Client and stakeholder engagement is evidenced by a total of $34.84M in financial investments during 2013-14 towards the advancement of technologies ($24.90M technical services, $9.89M collaborative research, $0.06M licensing and royalties).

Highlights from 2013-14 include the following.

- Announcement of a 5-year R&D collaboration agreement with Aerolia, a European company now establishing a Canadian headquarter office and a manufacturing facility in Montreal.
- Developed and validated advanced intelligence, surveillance and reconnaissance technology that will greatly facilitate Arctic and Maritime aerial surveillance.
- Announcement of a collaboration agreement with Ontario's Brican Flight Systems to advance civilian unmanned aircraft technologies.
- Provided on-going aerodynamic expertise leading to the maiden flight in 2013 of Bombardier's C-Series jet, which is poised to expand Canada's global market share of this class of jet.
- Successfully flight-tested a novel NRC-developed sensor that reduces icing risks in flight.
- Announcement by Thunder Bay's Aerovate Inc. that technical services provided in the sub-program have increased the market-readiness of the firm's novel variable pitch propeller that is poised to increase the firm's share of the global unmanned aircraft market.
- Forged a 2-year agreement with the Japan Aerospace Exploration Agency to study structural fatigue of aging aircraft.
- International outreach extended to flight alongside aircrafts from the National Aeronautics and Space Administration (NASA) and the German Aerospace Center in studying the performance of bio-fueled aircraft. Results will accelerate qualification and acceptance of biofuels in aviation while opening the door to future collaborations and, ultimately, cleaner air travel in addition to new end-uses and markets for agricultural crops that thrive in Canadian climates.

Additional information is available on the sub-program's website[x].

Sub-Program 1.1.2: Automotive and Surface Transportation

This sub-program provides technical knowledge and it advances product and process technologies for producing more fuel-efficient, affordable, and environmentally-responsible ground vehicles and for delivering engineering solutions to complex technology challenges facing surface transport industries including heavy vehicle and rail. This is important for reducing transportation infrastructure and costs and for enhancing Canada's share of ground vehicle supply chains and for enhancing the prosperity of the ground vehicle industry sector in Canada as it is faced with growing environmental concerns, competitive pressures, and stringent regulations. The Canadian economy relies on ground vehicle industries as major economic drivers, accounting for a significant portion of manufacturing trade, and therefore must remain competitive. Results are achieved through multi-disciplinary collaborative research and development services in addition to specialized technical services, such as testing, prototyping and system integration, for transferring or advancing technologies into deployed solutions and improved practices for the marketplace.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[8]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	38,759,791	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[8]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	246.8	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancements in ground vehicle process and product technologies	Client/stakeholder financial investment in technology development, $ millions	$27.0M	$24.52M
	Licensing and royalty revenue from NRC clients, $ millions	$0.45M	$0.87M

[8] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Six R&D initiatives were launched to develop and advance technologies that will:

- facilitate commercialization of new products based on novel and renewable biomaterials for the automotive and other industry sectors;
- accelerate the introduction of innovative lightweight components based on advanced aluminium and multi-materials technologies in the automotive and rail industry;
- support Canadian companies to deliver advanced propulsion technologies for petroleum-fueled and electric vehicles aimed at increasing average fuel economy;
- reduce the design and manufacturing costs of Canadian automotive components;
- reduce the maintenance and operational costs of Canadian automotive, rail and heavy ground vehicle fleets; and
- improve the operational efficiency and effectiveness of track inspection for the Canadian railway sector.

Client and stakeholder engagement is evidenced by a total of $24.52M in financial investments during 2013-14 towards the advancement of technologies ($18.05M technical services, $5.60M collaborative research, $0.87M licensing and royalties).

Examples of accomplishments during 2013-14 include the following.

- Forged a collaboration agreement with Ontario auto-parts giant Magna Inc. to develop superior “greener” plastics that are reinforced with biomaterials.
- Entered in a multi-partner agreement with Bombardier Transportation, their suppliers and natural fibres convertors in Quebec to develop technologies needed to manufacture biocomposite-based parts for mass transit.
- Developed automotive-grade plastics using carbon recovered from industrial waste.
- Entered into a 5-year $3.2M agreement with mining innovator Rio Tinto Alcan to co-develop advanced fabrication techniques for lighter aluminium components for vehicles.
- Renewed an agreement with Rio Tinto QMP to jointly develop iron and steel powder formulations for coating automotive powertrain components.
- Received patents for two separate innovations that improve the quality and reduce the cost of moulded automotive parts.
- Delivered 91 technical service projects for improving the operational effectiveness of public fleets while contributing to new and strengthened relationships with major defence and automotive suppliers in Canada.

Additional information is available on the sub-program’s website[xi].

Sub-Program 1.1.3: Ocean, Coastal, and River Engineering

This sub-program develops and advances technologies and standards for safe and effective operations in Canada's vast ocean, coastal and river environments, including the Arctic. This is important for lowering barriers for natural resource development and for enhancing the prosperity of the Canadian marine transportation and water resource sectors facing costly challenges of harsh environments (ice, wind, waves, currents), extreme weather events (floods, "100 year wave"), and coastal erosion. Results are achieved by working with Canadian industry through multi-disciplinary collaborative research and development services in addition to specialized technical services, such as testing, prototyping, numerical modeling, and system integration in specialized facilities, for transferring or advancing technologies into deployed solutions and improved practices for the marketplace.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[9]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	13,201,696	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[9]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	82.0	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancements of process and product technologies for ocean, coastal and inland water engineering	Client/stakeholder financial investment in technology development, $ millions	$12.0M	$9.08M
	Licensing and royalty revenue from NRC clients, $ millions	$0.05M	$0.09M

[9] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Three R&D initiatives were launched to develop and advance technologies that will collectively:

- reduce design cost and fuel consumption of ships;
- enable safe offshore exploration in conditions of severe ice;
- support sustainable and low impact development of the Arctic;
- improve the design and stewardship of freshwater resources and management systems across Canada; and
- accelerate commercialization of Canadian marine renewable energy technologies.

Client and stakeholder engagement is evidenced by a total of $9.08M in financial investments during 2013-14 towards the advancement of technologies ($6.98M technical services, $2.01M collaborative research, $0.09M licensing and royalties).

Highlights from 2013-14 include the following.

- Announcement by Montreal's Sonitec-Vortisand Inc. that intensive collaborative research with OCRE has ultimately led to the market-readiness of a significantly faster municipal water filtration system that is expected to increase the firm's global market share.
- Announcement by British Columbia's AXYS Technologies that its remote ocean-monitoring technology developed with OCRE is now marketed in over 30 countries and is propelling the commercial success of the company.
- Collaborated with TransAlta in developing techniques to better manage dam operations while increasing revenues and decreasing flood risk.
- Entered into collaboration with several exploration companies to develop a comprehensive database of ocean, ice, and seabed information critical to enabling exploration in the Beaufort Sea.
- Successfully evaluated the designs and propulsion systems for Canada's new Polar Icebreaker, the Arctic Offshore Patrol Ship and the Joint Support Ship, which will further operations in Canada's North.
- Advanced an engineered solution to improve navigation safety at the Shippigan Gully tidal inlet in New Brunswick.
- Developed and licensed numerical models for reliable ice management operations in the Grand Banks and for managing the risks of iceberg drift on offshore oil and gas operations.
- Collaborated with a major offshore oil and gas operator plus an industry association towards improving lifeboat safety standards, thermal protection, and operability in harsh conditions including severe ice where regulations are lacking.

Additional information is available on the sub-program's website[xii].

Sub-Program 1.1.4: Energy, Mining and Environment

This sub-program develops and advances technologies and techniques for enhancing the innovation capacity and growth of Canada's natural resources and utility sectors. These sectors are important contributors to Canada's GDP that are challenged by volatile global markets and growing environmental pressures. To remain sustainable, industries in these sectors require technologies to reduce production costs. Results are achieved through multi-disciplinary collaborative research and development services in addition to specialized advisory and technical services for transferring or advancing technologies into industrial solutions for the marketplace.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[10]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	24,733,572	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[10]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	166.0	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancements of process and product technologies for the natural resources and utility sectors	Client/stakeholder financial investment in technology development, $ millions	$10.0M	$7.49M
	Licensing and royalty revenue from NRC clients, $ millions	$0.06M	$0.25M

[10] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Three R&D initiatives were launched to develop and advance technologies that will:

- make bioenergy economically viable;
- reduce the cost of energy storage for modernizing the electrical grid; and
- increase extraction efficiency from lower grade ores while reducing equipment costs for the Canadian mining industry.

Client and stakeholder engagement is evidenced by a total of $7.49M in financial investments during 2013-14 towards the advancement of technologies ($4.09M technical services, $3.15M collaborative research, and $0.25M licensing and royalties).

Highlights from 2013-14 include the following.

- Successfully engaged over 30 key stakeholders across the energy storage supply chain, including raw material providers, manufacturers, integrators and end users. Co-investment projects in energy storage were launched in such areas as Techno-Economic Assessments, Technology Road mapping, Technology Demonstration, System Integration, Component Validation, Manufacturability, Material Improvements and Accelerated Testing.
- A research initiative in high efficiency mining was launched late in 2013-14, yet has already engaged industry and industry associations across Canada and has identified industry-driven opportunities to mitigate the high risk of mining cyclical recessions.
- Completed earlier NRC contract commitments including: developing a novel method for assessing ecological health of environments; reporting on catalysts for producing cleaner, low-carbon fuels; discovering a means of accelerating biodegradation of diesel spills in the Arctic, thus helping remediate a risk of Northern mining; developing a sensor to accelerate the smelting of copper and nickel ores; improving fuel cell performance at medium temperatures; developing an improved means of fabricating ion-exchange membranes for fuel cells; and developing higher capacity Lithium-ion batteries for residential energy storage.

Additional information is available on the sub-program's website[xiii].

Sub-Program 1.1.5: Construction

This sub-program provides technical knowledge and it advances product and process technologies to enhance the prosperity of the Canadian construction industry sector as it faces critical challenges in responding to expectations for better performing and more affordable buildings and infrastructure while striving to remain competitive in the global marketplace. The success of this sector is critical as a major contributor to Canada's GDP, employing millions of individuals, and managing assets valued in the trillions of dollars. Results are achieved through multi-disciplinary collaborative research and development and standardization services in addition to specialized technical services -- such as testing, product and process validation, prototyping, and system integration in field and in specialized facilities -- for transferring or advancing technologies into deployed solutions and improved practices for the marketplace.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[11]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	24,448,768	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[11]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	164.6	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancements of process and product technologies for the construction industry sector	Client/stakeholder financial investment in technology development, $ millions	$12.0M	$12.49M
	Licensing and royalty revenue from NRC clients, $ millions	$0.64M	$1.58M

[11] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Three R&D initiatives were launched to develop and advance technologies that will:

- make mid-rise wood buildings commercially viable;
- enable large buildings to economically generate more energy than they consume; and
- improve service life and costs of Canadian highway bridges.

In addition, the sub-program assumed responsibility for expert review of model building regulations and for providing technical evaluation services that facilitate commercialization of innovative building products.

Client and stakeholder engagement is evidenced by a total of $12.49M in financial investments during 2013-14 towards the advancement of technologies ($3.25M technical services, $4.59M collaborative research, $3.04M for sale of model code products, $0.04M leasing of technical facilities, $1.58M licensing of model code products and royalties.

Highlights from 2013-14 include the following.

- Quebec's Fireflex Technologies reported that its innovative foam fire suppressant technology, which it licensed from the sub-program, is contributing to the global market success of the company.
- Delivered technology advancements in innovative building components leading to net zero-energy structures; e.g., next-generation high performance thermal insulation, vacuum insulation panels, and vegetative roofs.
- Simulated and validated new technologies for monitoring civil infrastructure and for building energy conservation; e.g., pioneered a novel remote-satellite approach to monitoring bridge structures, and demonstrated innovative high-resolution lighting controls that conserve up to 25% in energy.
- Developed tools for forecasting building energy needs and the real-time performance of concrete bridges and related structures. This includes an innovative blast (extreme event) simulation and evaluation technology that tests the real-time performance of critical structures subjected to blast loads, at a fraction of the cost of existing technologies.
- Successfully demonstrated and deployed NRC's RF-shielding concrete technology to protect a new high-security facility.
- NRC's National Energy Code, which outlines requirements for responsible energy use in buildings, was formerly adopted for regulation in British Columbia with several other provinces in the process of following suit.
- Released the results of a study showing a positive relationship between "green" buildings and indoor air quality.
- Received a grant from Alberta Innovates for a 3-year study on suitability of "green" structural insulation panels.

Additional information is available on the sub-program's website[xiv].

Sub-Program 1.1.6: Aquatic and Crop Resource Development

In collaboration with industry, this sub-program develops improved varieties of crops and develops technologies for maximizing crop value and converting biomass to enhance the prosperity and global market share of the Canadian agriculture, bio-product, and natural health product industry sectors. This includes development and validation of value-added goods – from natural ingredients and health products through to chemicals and industrial oils and other products – for leveraging Canada's abundance of aquatic and crop resources. Results are achieved through multi-disciplinary collaborative research and development services in addition to specialized technical services for transferring or advancing technologies into deployed solutions and improved practices for the marketplace.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[12]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	32,982,659	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[12]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	212.6	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancements in agricultural crops and related value-added products	Client/stakeholder financial investment in technology development, $ millions	$5.5M	$4.23M
	Licensing and royalty revenue from NRC clients, $ millions	$0.32M	$0.25M

[12] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Three R&D initiatives were launched to develop and advance technologies that will:

- prove the commercial viability of algal carbon-conversion technologies;
- accelerate the development of natural health products in Canada; and
- improve the profitability of Canadian wheat.

Client and stakeholder engagement is evidenced by a total of $4.23M in financial investments during 2013-14 towards the advancement of technologies ($1.81M technical services, $1.69M collaborative research, $0.49M grants, $0.25M licensing and royalties).

Highlights from 2013-14 include the following.

- Teamed up with Markham's Pond Biofuels Inc. and oil-sand energy company Canadian Natural Resources Ltd. to build and validate a "game changer" algal bio-refinery pilot facility to efficiently convert industrial emissions into algal biomass for transformation into useful products such as biofuel, fertilizer and livestock feed. Construction of the pilot facility was delayed to further analyze cost and energy inputs prior to deployment. A critical experimental photobioreactor unit was manufactured and pre-deployment testing commenced. A suite of 16 industry-driven R&D sub-projects were launched to support future commercialization of algal carbon conversion technologies.
- Provided pre-clinical development and testing support to help firms accelerate bringing innovative natural health products to market; e.g., developed methods that supported Saskatoon's Bioriginal and POS Biosciences in delivering new high-value specialty oil products for the nutritional market, and worked with Ontario's Sevita International to develop a lab-scale process to isolate protein and fibre from soybean waste streams. Additional services also enabled Charlottown's Island Abbey Foods Ltd to expand its market for Honibe® Honey Lozenges™ now sold in major retail locations. Exploiting NRC's enzyme technology for processing flax and hemp fibres, Victoria's Crailar Technologies entered into a major exclusive long-term agreement to supply several natural domestic textile products to IKEA.
- Together with Agriculture and Agri-Food Canada, the University of Saskatchewan, and the province of Saskatchewan, and with support from the Genomics R&D Initiative[xv], the sub-program developed a strategy to engage the private sector in co-developing improved wheat varieties. For example, negotiations began with several companies to develop a large-scale collaborative project to enhance doubled haploid technology to accelerate wheat breeding. Four additional R&D sub-projects, supported by $2.3M in provincial funding, were launched.

Additional information is available on the sub-program's website[xvi].

Sub-Program 1.1.7: Medical Devices

This sub-program applies expertise in biochips, nano-materials, micro-devices, in vitro diagnostics, imaging, optical bio-photonics, medical simulation, and radio-frequency engineering and electronics to develop and advance technologies for enhancing the prosperity of the medical device industry as it strives to respond to increasing demands for equipment and supplies that are faster, more accurate, more informative, more affordable and less invasive. The industry is important for its growing contribution to Canada's GDP and its contribution to effective and efficient health care. Results are achieved through provision of industry-driven technical services and multi-disciplinary collaborative research.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[13]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	9,592,261	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[13]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	65.6	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancements in medical devices for the marketplace	Client/stakeholder financial investment in technology development, $ millions	$3.5M	$3.47M
	Licensing and royalty revenue from NRC clients, $ millions	$0.06M	$0.16M

[13] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

This sub-program consulted the Canadian medical device value chain to determine areas of greatest industry need and market potential in preparation for announcing formal R&D initiatives in 2014-15. Meanwhile, client engagement is evidenced by a total of $3.47M in financial investments during 2013-14 towards earlier NRC contractual commitments ($0.52M from technical services; $2.79M from collaborative research, $0.16M from licensing and royalties).

Highlights from 2013-14 include the following.

- Developed a virtual reality simulator for endoscopic surgery.
- Assessed technologies for delivering stem cells to failed hearts.
- Co-developed and successfully tested, along with Health Canada and the Canadian Food Inspection Agency under the Genomics R&D Initiative[xv], affordable, portable, automated, industry-scalable devices that rapidly diagnose genomic-based pathogens in applications of food and water safety, as well as clinical diagnostics. When tested in microbiological food inspection applications, this novel technology delivered reliable results in as little as 30 minutes compared to the lag of several hours or days of conventional technologies. Collaboration agreements were initiated with two Canadian companies with an aim of further developing and advancing the technology to market.
- Upgraded a cardiovascular simulator for a major industrial client, enabling it to generate future business with its client, and have entered into negotiations to deliver additional specialized technical services.
- Patents were granted for:
  - a device that images the cardiovascular system in real-time during surgery;
  - a device that assesses cognitive awareness of unresponsive patients; and
  - an artificial prostate that facilitates surgical training.
- Continued developing a porous titanium implant in collaboration with a venture capital investment firm, Amorchem L.P., and McGill University Health Centre for fixation of a common wrist fracture of the scaphoid bone, which often does not heal properly using conventional techniques involving solid screws.
- Signed several technical service contracts with a Canadian SME developing a novel diagnostic instrument for use in laboratory settings, using NRC's expertise in microfluidics and polymer substrate-based diagnostic chips, and allowing the company to develop new applications and validate several design approaches in developing its products.

Additional information is available on the sub-program's website[xvii].

Sub-Program 1.1.8: Human Health Therapeutics

In collaboration with industry, this sub-program develops vaccines and biologics for enhancing the prosperity of the Canadian bio-therapeutics industry, and to provide more effective treatments to Canadians. Activities include developing biologic materials for treating and preventing infectious and chronic diseases, and technologies to deliver therapeutics from circulation in the blood to the central nervous system. Results are achieved through multi-disciplinary collaborative research and development services in addition to specialized technical services for transferring or advancing technologies into deployed solutions and improved practices for the marketplace.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[14]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	44,105,603	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[14]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	278.6	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Improved and more affordable vaccines and biologics for the marketplace	Client/stakeholder financial investment in technology development, $ millions	$11.3M	$17.18M
	Licensing and royalty revenue from NRC clients, $ millions	$1.60M	$4.86M

[14] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Three R&D initiatives were launched to develop and advance technologies that will further contribute to the Canadian biologics and vaccine industries, and enhance the effectiveness of biological treatments of central nervous system diseases.

Client and stakeholder engagement is evidenced by a total of $17.18M in financial investments during 2013-14 towards the advancement of technologies ($0.03M technical services, $12.25M collaborative research, $4.86M licensing and royalties, $0.04M other revenue.) Highlights from 2013-14 include the following.

- Contributed to advancing two technologies beyond 'development for launch', indicating partner commitment to commercialisation. First, Calgary's Oncolytics Biotech Inc. began final testing prior to filing for regulatory approval of a new formulation of REOLYSIN® that was co-developed with HHT to selectively destroy cancer cells of the head and neck. Second, after achieving approval from the Canadian Food Inspection Agency to produce large-scale batches at NRC, Ontario's Artemis Technologies Inc. committed to full-scale deployment of a novel vaccine that was developed, with the assistance of NRC, to control wildlife rabies.
- Building on earlier successes in advancing biologic therapies with NRC and with support from the Genomics R&D Initiative[xv], in 2013-14 Vancouver's Zymeworks Inc. leveraged significant new capital, created 8 additional high-quality jobs, and forged a three-year multimillion dollar collaborative agreement with HHT to co-develop a series of innovative medicines against cancer, autoimmune and inflammatory diseases to improve the health of Canadians. This will open global opportunities for the company to pursue the biologics bi-specific markets and contribute to Canada's biologics' value chain including manufacturing.
- Forged a strategic partnership with Montreal's Alethia Biotherapeutics aimed at cancer therapies and other diseases as Alethia works to advance a pipeline of biologics - one of which originated from NRC - to improve patient response to chemotherapy and to inhibit cancer growth.
- Teamed up with the Atlantic Canada Molecular Oncology Centre to deliver a unique gene mutation test for lung cancer – the only such offering of the test in Canada.

Additional information is available on the sub-program's website[xviii].

Sub-Program 1.1.9: Information and Communication Technologies

In support of Canada's digital economy, this sub-program applies leading-edge expertise in software development, semiconducting materials and photonic device design and fabrication to design, validate, demonstrate and deliver both physical and software solutions that lead to new market opportunities for industries in Canada's information and communication technology (ICT) sector that seek to profit from an explosive growth of data and from escalating needs for greater connectivity and for revolutionary ways to use computers to make decisions, synthesize information, and discover new knowledge. This is important for increasing Canada's global share of the growing ICT market. Results are achieved through multi-disciplinary collaborative research and development services in addition to specialized technical services in state-of-the-art facilities for transferring or advancing technologies into deployed solutions and improved practices for the marketplace. This includes custom manufacturing of novel components for innovative photonic, electronic, and opto-electronic devices.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[15]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	37,364,536	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[15]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	187.6	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancements of process and product technologies for the information and communications technology sectors	Client/stakeholder financial investment in technology development, $ millions	$8.3M	$8.59M
	Licensing and royalty revenue from NRC clients, $ millions	$0.95M	$0.42M

[15] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Working with Canadian industry partners, five R&D initiatives were established to develop and advance technologies including:

- the innovative embedding of electronic circuits in printable materials (called printable electronics, PE);
- new semi-conductors and photonic based technologies to keep pace with increasing telecommunication demands;
- analytic solutions enabling access to large amounts of information with greater precision and speed; and
- learning and performance resource technologies to address the changing needs for dynamic and personalized learning solutions.

Client and stakeholder engagement is evidenced by a total of $8.59M in financial investments during 2013-14 towards the advancement of technologies ($4.78M technical services, $3.24M collaborative research, $0.15M grants, $0.42M licensing and royalties).

Highlights from 2013-14 include the following.

- NRC partnered with Canadian industry through the PE Consortium[xix] to strengthen Canadian technical capacity and industry involvement by developing technology capable of printing conductors for circuits, touch screen applications, and semi-conductor inks for information storage.
- NRC's initiative to develop predictive analytic tools to address governments' security needs already started to demonstrate results with the applications of natural language processing technologies to access critical information with greater speed, allowing for rapid scanning of potential security threats. The tools developed are also applicable to the needs of the health care and business intelligence communities.
- Together with industry and learning providers, NRC launched an initiative to develop a platform that will support learning, training and performance support systems. Exploratory efforts on constructing a learning and development platform were undertaken with a major end-user client and an education technology client.
- Supporting Canada's digital economy, NRC and Quebec's TeraXion Inc. established a strategic alliance to develop and fabricate next-generation high-speed optical communication technology. This includes working to demonstrate a platform suitable for coherent transmission systems at enhanced transmission speed to help companies meet evolving client needs.
- PORTAGE, NRC's statistical machine translation system, was licensed to Montreal's Terminotix Inc., which specializes in computer-aided translation.

> Raghu Das of IDTechEx Ltd., the leading market analysis firm in the sector stated: "*Less than 18 months ago, most involved in the printed electronics industry would not have thought of Canada as a territorial hotspot for the development of the technology. That has changed… Initiatives at the NRC, which include significant government investment, close collaboration with companies and universities within Canada, focus on technology development and commercialization, and -- critically – building relationships with companies and other centres around the world, have put Canada on the global printed electronics stage."*

Additional information is available on the sub-program's website[xx].

Sub-Program 1.1.10: Security and Disruptive Technologies

This sub-program builds and validates emerging technology platforms (such as nanotechnology, quantum technologies and the convergence of nano-, bio- and information technologies) that can be applied in a range of industries to sustain Canada's industrial competitiveness by opening new markets and value networks for Canadian industries in tomorrow's economy. Efforts focus on applications for addressing national security challenges because security and defence innovation players are amongst the earliest adopters of such technologies from which broader commercial adaptations ultimately evolve, replacing existing technologies. Results are achieved through multi-disciplinary collaborative research and development services in addition to specialized technical services in state-of-the-art facilities for ultimately introducing disruptive and transformational technology solutions into practice and the marketplace.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[16]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	23,966,960	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[16]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	170.4	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Advancement of process and product technologies in security and other industry sectors	Client/stakeholder financial investment in technology development, $ millions	$3.5M	$4.90M
	Licensing and royalty revenue from NRC clients, $ millions	$0.12M	$0.17M

[16] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

Three R&D initiatives were launched to develop and advance technologies that will:

- develop a Quantum Photonics technology platform, with a focus on cyber-security and quantum sensing, for translation into validated applications for the Canadian photonics industry;
- develop highly efficient, next generation nanomaterials and armour systems; and
- continue to accelerate the commercialization and responsible deployment of nanotechnologies in Canadian industries through the National Institute for Nanotechnology (NINT).

Client and stakeholder engagement is evidenced by a total of $4.90M in financial investments during 2013-14 towards the advancement of technologies ($1.38M technical services, $3.34M collaborative research, $0.17M licensing and royalties).

Highlights from 2013-14 include the following.

- Collaborated with an Edmonton-based company to provide them a solution to improve monitoring of oil well integrity, contributing to the acceleration of the company's commercialization goals.
- Worked with Engineered Power Service Inc. to provide energy storage solutions to the oil and gas industry. Conditions in down-hole environments make safety and performance of equipment in a wide range of temperatures critical. This ongoing relationship caters to industry needs, creating next generation solutions to be applied in drilling environments.
- NRC scale-up production capability of Boron Nitride Nanotubes (BNNT) provided Canadian companies a head-start in prototyping, manufacturing and commercializing products containing BNNT. Early applications are anticipated in Canada's defence and security sector, with integration of BNNTs into new advanced materials for such uses as lighter and transparent armour.

Additional information is available on the sub-program's website[xxi].

Program 1.2: Industrial Research Assistance Program (IRAP)

The program contributes to the growth and prosperity of Canadian small and medium sized enterprises (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. This program uses funding from the following transfer payments: IRAP Contributions to Firms; IRAP Contributions to Youth Employment Strategy; Contributions to Organizations; and Contributions for the Digital Technology Adoption Pilot Program (DTAPP).

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2013–14 Difference[17] (actual minus planned)
279,860,916	279,860,916	296,269,192	278,130,653	(1,730,263)

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
344.0	338.9	(5.1)

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Innovative businesses grow in Canada	SME jobs supported	9000	14,124 supported through contributions, including 477 jobs for recent graduates. In addition, 4939 jobs were supported through other initiatives.
	SMEs served (through funding)	2200	3304 SMEs funded through the *Contributions to Firms* transfer payment program.
	SME client feedback on growth: jobs, revenues, net operating profit	Not available	Have put in place processes to capture this information and will set targets and will report on results in 2014-15.

[17] The difference in spending arises mainly from due diligence in the management of contributions to clients.

Performance Analysis and Lessons Learned

IRAP generally exceeded its annual targets for 2013-14. A total of 3,304 firms were funded through Contributions, supporting 14,124 jobs including 477 for recent graduates. A total of 2,675 SMEs responded to post project survey questions. Key responses indicated that a large majority (75%) of the respondents agreed or strongly agreed that the funded project contributed to the firm's growth in technical capabilities and 88% of the firms agreed or strongly agreed that the professionalism of IRAP Industry Technology Advisors translated into useful and relevant information, ease of program access or appropriate advisory services. Through increased funding announced in Budget 2013[iii], NRC-IRAP launched several initiatives to increase its reach and impact for SMEs. They include:

- Business Innovation Access Program (BIAP), which provides credit notes to help access research technology and business development services in academic and non-profit research institutions,
- Canada Incubator and Accelerator Program (CAIP) that leverages critical venture capital funding to accelerate the advancement of innovations to market, and
- "Concierge" one-stop portal to innovation services across Canada.

Examples of impact during 2013-14 include:

- Newfoundland's Camouflage Software Inc. reported that it could not have brought its innovative cybersecurity software to market, and the firm would not have survived without support and advice from NRC-IRAP.
- Quebec's Imprimerie Maxime Inc. said that management software designed for the printing and graphic arts industries and introduced to the company through the Digital Technology Adoption Pilot Program (DTAPP) helped increase sales by 33 percent, productivity by 20 percent, and responsivity to proposal requests by 400 percent.
- Ontario's Laydon Composites Ltd. reported that its innovative truck fairings and windscoops, which were developed with NRC-IRAP support, are cutting fuel costs of truck fleets by up to 7%, and that the company has since grown by 300 percent with North American market share boosted from 2 to 15 percent.
- Saskatchewan's Agrisoma Biosciences Inc. announced that NRC-IRAP services have enabled it to successfully demonstrate viable commercial-scale cultivation and processing of carinata, a breakthrough oilseed crop suited to Canadian climate.
- Vancouver's QuickMobile Inc. reported growth exceeding 100% annually following the launch of software that was developed with NRC-IRAP advice and support, putting the company 18 to 24 months ahead of its competition.

Additional information is available on the program's website[xxii].

Strategic Outcome 2: R&D Infrastructure for an innovative and knowledge-based economy

Program 2.1: Science Infrastructure and Measurement

This program manages national science facilities and infrastructure critical to research, development and innovation by Canadian scientific and technological communities. This includes operating and administering Canada's astronomical observatories. It also fosters development and maintenance of Canada's metrological infrastructure system that provides industries and researchers access to reliable measurements that are traceable to recognized national standards maintained by the program. The program helps clients make the most of this infrastructure by facilitating access to a wide range of Canadian and international user communities and by participating in networks. In addition, the program provides stewardship of the TRIUMF sub-atomic research facility. This program uses funding from the following transfer payment: TRIUMF (Canada's National Laboratory for Particle and Nuclear Physics).

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2013–14 Difference (actual minus planned)
94,342,113	94,342,113	111,131,916	99,678,744	5,336,631
The increase in spending of $5,336,631 is mainly caused by increased contributions of $1,252,475 in Astronomy, an increase in Treasury Board funded payroll costs of $2,368,791, the cost of terminable allowances of $1,105,525 as well as the employee benefit plan cost increase of $592,440.				

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
257.0	259.2	2.2

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
National science infrastructure and measurement standards services are valued by user communities	Client/user satisfaction	85%	80% of surveyed clients reported that they were satisfied with the Program's services

Performance Analysis and Lessons Learned

NRC provided Canadians access to science infrastructure, including state-of-the-art international astronomical observatories while also collecting and distributing astronomical data through the Canadian Astronomy Data Centre. It also provided traceable measurements that define the national standard in line with international requirements. Through its two sub-programs, NRC sought to optimize the delivery of its mandated responsibilities as defined in the *National Research Council Act* and *The Weights and Measures Act*.

To support the continued access of Canadian researchers to neutron spectrometers for materials research, the operation and governance of the Canadian Neutron Beam Centre in Chalk River was transferred to Atomic Energy Canada Limited.

TRIUMF, which operates as a joint venture by a consortium of Canadian universities, functions as Canada's national laboratory for research in subatomic physics. It received federal funding via a Contribution agreement with NRC. In its stewardship role, NRC continued to support subatomics physics research at TRIUMF through this Contribution Agreement and by playing an oversight role on behalf of the Government of Canada. A formal evaluation of TRIUMF[ix] was completed in 2013-14, confirming that TRIUMF continues to be relevant. The facility was found to perform world-class research, delivering its services efficiently and effectively.

In 2013-14, NRC started implementing a new Client Satisfaction Survey process. During 2013-14, the roll-out of the survey to clients of the Measurement Science and Standards sub-program started, and initial results indicate that eight of the 10 respondents (80%) were satisfied with the Program's services. As the survey process matures and the number of respondents increases, more comprehensive results for the Program will become available. Nonetheless, these preliminary results indicate that progress is underway towards the target of 85% established for March 2015.

Given that this is a new program in its present form, its performance results and those of its sub-programs are reported only as interim progress against annual targets[6] established for 2014-15.

Sub-Program 2.1.1: National Science Infrastructure

This sub-program manages Canada's astronomical observatories as mandated in the National Research Council Act, and it compiles and disseminates astronomical data while leveraging access to international observatories for Canadian researchers in astrophysics. This sub-program uses funding from the following transfer payment: Contributions to the International Astronomical Observatories Program.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[18]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	31,543,807	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[18]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	115.2	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Canadian scientists have access to astronomical observatories and data	User access and downloads of astronomy data	4000	6100
	Scientific publications by telescope users	300	480

[18] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

The sub-program focused on the following complementary activities:

- operate and administer Canada's national astronomical observatories;
- leverage Canadian access to world-leading ground-based optical and radio- telescopes;
- develop innovative astronomy technology and instruments for existing and future telescopes to maintain observatories at internationally competitive levels; and
- operate the Canadian Astronomy Data Centre (CADC) providing access to Canada's "virtual observatory" of astronomical data and metadata from Canadian and international observatories.

During 2013, the CADC delivered over 22.4 million individual astronomy files to roughly 6,100 professional astronomers while over 480 scientific publications were contributed by users of astronomical data.

Notable success stories highlighting NSI's support to the astronomy community and collaboration with industry in developing innovative technologies in 2013-14 include the following.

- The Gemini Planet Imager (GPI), a multi-million dollar adaptive-optics instrument designed to see extra-solar planets, was deployed on Canada's Gemini South telescope. GPI, now the world's most advanced instrument for imaging and analyzing planets around other stars, garnered international acclaim for the revolutionary leap-forward in the technology that enables ultra-high-contrast imaging. Working with industry, NRC designed and built the robust optical bench that enables GPI performance and the complex systems-level software that operates it.
- NRC led the development of GRACES, an experimental 270 metre fiber-optics link between Gemini North and the adjacent CFHT located on Mauna Kea's summit. NRC worked with industry to advance the technology needed to construct the high-performance cable that allows starlight gathered by Gemini to be fed into an instrument at CFHT allowing users to learn more about the characteristics of objects in space. This breakthrough offers a new path toward integrating operations of telescopes while expanding the capabilities available to astronomers and industry.

Additional information is available on the sub-program's website[xxiii].

Sub-Program 2.1.2: Measurement Science and Standards

As mandated under the National Research Council Act and also the Weights and Measures Act, this sub-program investigates and determines standards and methods of measurement for Canada's national measurement system. This national metrological system is critical for underpinning trade and commerce in the global economy. The sub-program supports international metrological treaties and arrangements to establish and maintain foreign recognition and acceptance of Canada's standards and measures that are critical for participation in multi-lateral and free-trade agreements. The sub-program provides a wide variety of calibration and measurement services that underpin the accuracy of millions of measurements conducted annually in public and private sector testing and calibration laboratories. In addition, the sub-program provides expert assessments and formal recognition of the measurement capabilities of industrial calibration laboratories. This is important for providing Canada's trading partners confidence in the reliability of Canadian industries' measurements and test certifications of compliance to regulatory and product standards that govern trade. The sub-program also develops measurement standards for emerging technologies that open new global market opportunities for Canadian industries.

Budgetary Financial Resources (dollars)

2013–14 Planned Spending[19]	2013–14 Actual Spending	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	23,834,937	To be available in the 2014-15 DPR

Human Resources (FTEs)

2013–14 Planned[19]	2013–14 Actual	2013–14 Difference (actual minus planned)
To be available in the 2014-15 DPR	137.3	To be available in the 2014-15 DPR

Performance Results

Expected Results	Performance Indicators	Targets[5]	Actual Results[5]
Internationally-recognized national system of measurement that meets Canada's evolving needs.	Clients served	725	858
	International recognition of calibration and measurement capabilities	600	612 calibration and measurement capabilities recognized by formal international agreement
	Scientific and other publications in metrology	1500	1709

[19] NRC began reporting at the sub-program level in the 2014-15 RPP. All planned values will be reflected in the 2014-15 DPR, accordingly.

Performance Analysis and Lessons Learned

To support and build metrological infrastructure in Canada's knowledge-based economy, the sub-program focused on initiatives that will:

- enable vital Canadian sectors, where high precision and credible measurement have a significant impact on market success, to better compete, conform and connect globally;
- enable Canadian industry to capitalize on market opportunities involving emerging technologies dependent on measurement challenges; and
- deliver coherent scientific advice to improve and inform national decision-making for commerce, standards development, and regulation and trade agreements.

During 2013-14, MSS served 858 clients while 612 of its calibration and measurement capabilities were formally recognized internationally. NRC contributed 81 scientific papers to the metrology literature, 1619 calibration and other reports to clients, as well as 9 key strategic planning documents for committees of the CIPM (Comité International des Poids et Mesures).

MSS participated in the US-Canada Regulatory Cooperation Council initiative focussing on responsible introduction of new technologies with initial work examining principles for nanotechnologies including evidence-based standards and decision-making and highlighting the importance of metrology-related infrastructure.

MSS continued to achieve research success that is directly aimed at improving measurement precision for all metric system users – now and in the long term. For example, MSS successfully concluded new work on single-ion optical frequency standards, achieving a "breakthrough" measurement precision to a few parts in 10^{17} (or 100 million billions). This is expected to pave the way for international redefinition of the International System of Units (SI) second in terms of optical frequency, enabling more precise timing and geo-location applications.

Additional information is available on the sub-program's website[xxiv].

Internal Services

Internal Services are groups of related activities and resources that are administered to support the needs of programs and other corporate obligations of an organization. These groups are: Management and Oversight Services; Communications Services; Legal Services; Human Resources Management Services; Financial Management Services; Information Management Services; Information Technology Services; Real Property Services; Materiel Services; Acquisition Services; and Other Administrative Services. Internal Services include only those activities and resources that apply across an organization and not to those provided specifically to a program.

Budgetary Financial Resources (dollars)

2013–14 Main Estimates	2013–14 Planned Spending	2013–14 Total Authorities Available for Use	2013–14 Actual Spending (authorities used)	2013–14 Difference[20] (actual minus planned)
176,614,446	176,614,446	217,867,398	198,887,611	22,273,165

Human Resources (FTEs)

2013–14 Planned	2013–14 Actual	2013–14 Difference (actual minus planned)
935.0	931.6	(3.4)

Performance Analysis and Lessons Learned

Program and Project Management: All R&D initiatives were effectively managed using processes, tools and reporting systems supported by NRC's business system. Performance results against established targets were reviewed quarterly by NRC executives to support decision-making. Guidelines for the formal triennial review of R&D initiatives were prepared based on real-time market and competitive factors and pre-established performance criteria to inform decisions on continuation, change or termination. Training was provided to 615 employees to build related competencies.

Integrated Communications, Marketing and Branding: To build profile with key stakeholders and client groups, NRC held special events and news conferences launching the new NRC and its new R&D initiatives. These activities were reinforced with targeted promotional material based on a new, consistent visual identity. Media coverage was significant and media requests increased from 350 in 2012-13 to 415 in 2013-14 with commensurate increases in NRC's social media presence.

Integrated Business and Client Services: NRC restructured its Business Management Support function, providing a centralized, flexible approach that allows NRC to prioritize and channel

[20] The difference is mainly caused by NRC's transformation funding announced in Budget 2013.

resources and to grow in a strategic way. Improvements include new client-focused positions, additional business intelligence capabilities, enhanced and streamlined business practices, and focused positions and systems in contract, intellectual property and client relationship management.

International Relations: NRC forged international networks to ensure timely access of Canadian companies to emerging technology and markets. As a key result, 12 Canadian firms and one university entered into new technology partnering projects, valued at over $20M, with firms in EUREKA[iii] member states.

Integrated Planning and Performance Measurement: NRC implemented a new performance measurement framework with harmonized performance indicators permitting intercomparison between sub-programs while demonstrating progress towards higher level outcomes. These included measurements of sub-program efficiency, which were piloted in 2013-14.

Human Resource Management Services: A new approach to talent attraction improved NRC's ability to hire required talent. To build leadership capability, NRC designed and initiated training of all supervisors, and it supported skill enhancement in key business areas. NRC implemented monthly HR performance reports to track progress. Weekly e-polls gathered employee views on organizational issues, helping inform decision making.

Financial Management Services: Managers were trained in planning, budgeting, managing and forecasting operations in a regime of accrual-based accounting. Standardized monthly financial reports – including an updated Statement of Operations - provided the basis for analysis, discussion, and financial accountability across all levels. NRC also developed a Financial Dashboard plus a Monthly Financial Reporting Guide. A new financial services delivery approach was implemented to better integrate and streamline processing of transactions and advisory financial services.

Information Management Services: NRC enhanced its expertise and capacity in delivering intelligence and decision support services. One strategic intelligence project was successfully completed, and two integrated foresight / competitive technical intelligence projects were launched. To increase efficiency in preserving all corporate information of value to Canadians, NRC invested in a three-year Electronic Working Environment project. NRC also launched a project to deploy a "Wiki" discussion forum for internal collaboration needs.

Information Technology Services: NRC implemented a tiered service delivery model that includes a new IT Service Centre, Frontline Support Services, and Client Support Standards. An employee Self-Service Portal plus a computer life-cycle management process were implemented to further improve efficiency and effectiveness. Regular meetings with SSC representatives helped identify operating issues and opportunities to align SSC services with NRC's business requirements.

Security Services: NRC implemented a comprehensive Threat and Risk Assessment covering all NRC facilities. Measures were consequently implemented to improve the security posture of

NRC. Security processes were scheduled for annual review to ensure that security policies and practices remain aligned with ever-changing security threats.

Occupational Safety and Health (OSH): NRC implemented an electronic reporting system to increase accountability in incident reporting; developed comprehensive monthly OSH performance reports for managers to identify improvement opportunities; and developed and implemented OSH incident investigation and reporting training modules in view of minimizing and preventing recurrence. Three OSH directives were developed and approved, and 7 internal site audits were completed.

Real Property and Materiel Services: NRC created a Client Services Group to provide a single service point of contact for real property requests in the National Capital Region while overseeing plant maintenance in regional operations in addition to real property capital investment plans and minor capital projects. NRC also created a Project Delivery Group with a project management structure to develop and execute capital investment plans. Responsibilities also include prioritization of building recapitalization projects in alignment with sub-program business plans.

Investment Planning: NRC integrated and aligned its capital investment projects with its planning and annual budget cycle. This ensured that business cases for investment projects were linked to R&D initiatives, making it possible to include investment decisions as part of the overall 2014-15 NRC budget process. NRC identified and implemented additional efficiencies and related changes to further streamline administrative and management processes. This included changes to strengthen the justification provided in all investment business cases. In addition, NRC’s five-year Investment Plan (2014-15 to 2018-19) was submitted to Treasury Board for approval (granted in May 2014).

Section III: Supplementary Information

Financial Statements Highlights

National Research Council Canada
Condensed Statement of Operations and Departmental Net Financial Position
(audited)
For the Year Ended March 31, 2014
(dollars)

	2013–14 Planned Results	2013–14 Actual	2012–13 Actual	Difference (2013–14 actual minus 2013–14 planned)	Difference (2013–14 actual minus 2012–13 actual)
Total expenses	978,284,000	933,517,000	913,123,000	(44,767,000)	20,394,000
Total revenues	189,410,000	156,349,000	155,272,000	(33,061,000)	1,077,000
Net cost of operations before government funding and transfers	788,874,000	777,168,000	757,851,000	(11,706,000)	19,317,000
Departmental net financial position	504,002,000	574,479,000	551,327,000	70,477,000	23,152,000

Expenses by Type (2013-14)

Type	Percent
Salaries and employee benefits	43
Grants and contributions	30
Utilities, materials, and supplies	8
Amortization	6
Professional and special services	6
Other	7

NRC incurred total expenses of $933.5M in 2013-14, an increase from the $913.1M spent in 2012-13. NRC's major expense components are salaries and employee benefits ($404.8M) and grants and contribution ($278.4M), representing 73.2% of total expenses. The planned expenses, as reported in NRC's Future Oriented Financial Statements in the *2013-14 Report on Plans and Priorities (RPP)*, were $978.3M. The variance between planned and actual results is primarily due to salaries and employee benefits expenses that were $41.9M lower than planned.

NRC generates revenue that can be reinvested in operations. NRC earned total revenues of $156.3M in 2013-14, a slight increase from $155.3M in 2012-13. NRC's major revenue components are Research Services ($50.1M) and Technical Services ($77.9M), representing 81.9% of revenues. The planned revenue, as reported in NRC's Future Oriented Financial Statements in the *2013-14 RPP* was $189.4M. The variance between planned and actual amounts is due to the refocusing of NRC research activities.

Revenue by Type (2013-14)

Type	Percent
Technical Services	50
Research Services	32
Intellectual property, royalties, and fees	6
Rentals	3
Sales of goods and information products	4
Other	5

National Research Council Canada
Condensed Statement of Financial Position (audited)
As at March 31, 2014
(dollars)

	2013–14	2012–13	Difference (2013–14 minus 2012–13)
Total net liabilities	272,569,000	321,019,000	(48,450,000)
Total net financial assets	307,097,000	326,872,000	(19,775,000)
Departmental net (financial assets) debt	(34,528,000)	(5,853,000)	(28,675,000)
Total non-financial assets	539,951,000	545,474,000	(5,523,000)
Departmental net financial position	574,479,000	551,327,000	23,152,000

NRC's consolidated liabilities consist of accounts payable and accrued liabilities, vacation pay and compensatory leave, lease inducements, deferred revenue and employee future benefits. The balance as at March 31, 2014 of $272.6M represents a $48.4M decrease from the March 31, 2013 balance of $321.0M. NRC's consolidated net financial assets totaled $307.1M as at March 31, 2014, a decrease of $19.8M from the March 31, 2013 balance of $326.9M. The balance is made up of Due from the Consolidated Revenue Fund (CRF), accounts receivable, inventory for resale, and cash and investments. The decrease in NRC's consolidated net financial assets is principally due to the decrease of the Due from the CRF which decreased by $19.1M. A $32.2M decrease in accounts

Consolidated Net Liabilities as at March 31, 2014

Type	Percent
Accounts payable and accrued liabilities	52
Employee future benefits	19
Lease inducements	15
Vacation pay and compensatory leave	11
Deferred revenue	3

payable-external parties offset by a $14.2M increase in revenues available for use in future years were the primary sources of the decrease.

The overall increase in consolidated net financial assets contributed to NRC having a departmental net surplus position as at March 31, 2014, a measure of the organization's ability to repay all debts. NRC's strong financial position is also reflected in its Departmental Net Financial Position at March 31, 2014, which was improved by $23.2M over the previous year to $574.5M.

Consolidated Net Financial Assets as at March 31, 2014

Type	Percent
Due from the Consolidated Revenue Fund	88
Accounts receivable and advances	10
Inventory for resale	1
Cash and investments	1

Financial Statements

NRC's complete financial statements are published on NRC's website[xxv].

Supplementary Information Tables

The supplementary information tables listed in the *2013-14 Departmental Performance Report* [xxvi] can be found on the NRC's website.

- Departmental Sustainable Development Strategy;
- Details on Transfer Payment Programs;
- Horizontal Initiatives;
- Internal Audits and Evaluations;
- Response to Parliamentary Committees and External Audits; and
- User Fees Reporting.

Tax Expenditures and Evaluations

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 annually in the *Tax Expenditures and Evaluations*[xxvii] publication. The tax measures presented in the *Tax Expenditures and Evaluations* publication are the sole responsibility of the Minister of Finance.

Section IV: Organizational Contact Information

Questions and requests for information may be directed to:

National Research Council of Canada
NRC Communications
1200 Montreal Road, Bldg. M-58
Ottawa, Ontario, Canada K1A 0R6
Phone: (613) 993-9101 or toll-free 1-877-NRC-CNRC (1-877-672-2672)
Fax: (613) 952-9907
TTY number: (613) 949-3042
E-mail: info@nrc-cnrc.gc.ca

Appendix: Definitions

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

budgetary expenditures: Include operating and capital expenditures; transfer payments to other levels of government, organizations or individuals; and payments to Crown corporations.

Departmental Performance Report: Reports on an appropriated organization's actual accomplishments against the plans, priorities and expected results set out in the corresponding Reports on Plans and Priorities. These reports are tabled in Parliament in the fall.

full-time equivalent: Is a measure of the extent to which an employee represents a full person-year charge against a departmental budget. Full-time equivalents are calculated as a ratio of assigned hours of work to scheduled hours of work. Scheduled hours of work are set out in collective agreements.

Government of Canada outcomes: A set of 16 high-level objectives defined for the government as a whole, grouped in four spending areas: economic affairs, social affairs, international affairs and government affairs.

Management, Resources and Results Structure: A comprehensive framework that consists of an organization's inventory of programs, resources, results, performance indicators and governance information. Programs and results are depicted in their hierarchical relationship to each other and to the Strategic Outcome(s) to which they contribute. The Management, Resources and Results Structure is developed from the Program Alignment Architecture.

non-budgetary expenditures: Include net outlays and receipts related to loans, investments and advances, which change the composition of the financial assets of the Government of Canada.

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

planned spending: For Reports on Plans and Priorities (RPPs) and Departmental Performance Reports (DPRs), planned spending refers to those amounts that receive Treasury Board approval by February 1. Therefore, planned spending may include amounts incremental to planned expenditures presented in the 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 RPPs and DPRs.

plans: 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 up to the expected result.

priorities: Plans or projects that an organization 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 Strategic Outcome(s).

program: A group of related resource inputs and activities that are managed to meet specific needs and to achieve intended results and that are treated as a budgetary unit.

results: An external 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.

Program Alignment Architecture: A structured inventory of an organization's programs depicting the hierarchical relationship between programs and the Strategic Outcome(s) to which they contribute.

Report on Plans and Priorities: Provides information on the plans and expected performance of appropriated organizations over a three-year period. These reports are tabled in Parliament each spring.

Strategic Outcome: A long-term and enduring benefit to Canadians that is linked to the organization's mandate, vision and core functions.

sunset program: A time-limited program that does not have an ongoing funding and policy authority. When the program is set to expire, a decision must be made whether to continue the program. In the case of a renewal, the decision specifies the scope, funding level and duration.

target: 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.

whole-of-government framework: Maps the financial contributions of federal organizations receiving appropriations by aligning their Programs to a set of 16 government-wide, high-level outcome areas, grouped under four spending areas.

Endnotes

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xxvii. *Tax Expenditures and Evaluations* publication, http://www.fin.gc.ca/purl/taxexp-eng.asp