

# **National Research Council Canada**

**2010-11**

**Departmental Performance Report**

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The Honourable Christian Paradis  
Minister of Industry and Minister of State (Agriculture)



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## Minister's Message

Last year, the Industry Portfolio played a key role in advancing the government's agenda in Year 2 of Canada's Economic Action Plan.

Specific stimulus measures taken by the Industry Portfolio under Canada's Economic Action Plan were aimed at boosting economic development, supporting small and medium-sized enterprises, improving Canada's research and development capacity and strengthening communities. The Portfolio's stimulus measures targeted communities through the Marquee Tourism Events Program and the Broadband Canada: Connecting Rural Canadians program. Further investments in the Industrial Research Assistance Program, the Industrial Research and Development Internship Program, the Canada Graduate Scholarships Program and the Knowledge Infrastructure Program expanded Canada's research and development capacity. Investing in the Canadian space industry maintained Canadian expertise and leadership in space robotics. Through these and other stimulus initiatives, we helped create jobs, build communities and nurture the roots of economic recovery.



In 2010-11, the Government of Canada completed its two-year investment of \$200 million to temporarily expand the National Research Council of Canada's Industrial Research Assistance Program's initiatives for small and medium-sized businesses. This investment helped 2,422 Canadian firms enhance their innovative capacity and enabled the placement of 1,567 post-secondary graduates in Canadian companies. The Council also updated the Model National Energy Code of Canada for Houses, which allows designers and contractors to make energy-wise decisions during the planning and construction of new houses. The Council saw an increase in its licensing and product and process transfer to industry by some 17 percent and 14 percent respectively compared to the 2009-10 levels. These revenues are expected to increase in the coming years as the Council continues to transition to a world-leading research and technology organization focused on strengthening Canadian productivity and competitiveness – areas of key priority for the government.

Cultivating an environment for job creation, growth and competitiveness, both domestically and internationally, remains a priority for the Industry Portfolio. We will work to improve cost-effectiveness and efficiency and will contribute to the Government of Canada's priority of balancing the budget and achieving real results for all Canadians.

It is my pleasure to present the National Research Council of Canada's Departmental Performance Report for 2010-11.

Christian Paradis  
Minister of Industry and Minister of State (Agriculture)

## President's Message

I am proud to submit for tabling in Parliament the 2010-11 Departmental Performance Report for the National Research Council of Canada. NRC's plans and priorities are well aligned with the Government of Canada's science and technology strategy, *Mobilizing Science and Technology to Canada's Advantage*, and as such, strongly contribute to advancements in innovative technologies and to increased innovation capacity in targeted industries and other national priority areas.

2010-11 marked the beginning of a transition period for NRC as we began a critical renewal exercise to further strengthen our role as a research and technology organization (RTO) focused on Canadian productivity and competitiveness. In fact, NRC's vision is to become the best RTO in the world.

Our performance over the last year reflects this change in direction. In 2010-11, NRC led or participated in almost 1,500 collaborative research agreements to develop and advance new technologies – an increase of 18% over the previous year – with over 1,700 industrial and research collaborators. This includes over 380 international collaborations. As a direct result, NRC delivered or co-delivered 97 unique innovations (a 14% increase) and issued 158 licenses (a 17% increase) to Canadian industries to significantly improve their products, services, technologies and/or processes.

A major socio-economic study was conducted in 2010-11 by NRC, in connection with Statistics Canada, to investigate the impact of our assistance, research and technical services on clients' sales and innovation capacity. That impact was found to be strong. For every dollar of NRC science and technology (S&T) activity, over nine dollars in client sales were shown to be generated. NRC's direct contributions to business expenditures in research and development (BERD) were also shown to have generated between \$1.50 and \$2.00 of additional research and development (R&D) for each dollar invested.

Canada's future depends on a strong record in innovation and technology. NRC has a critical role to play in building that record through research and collaborations with industry and other partners, developing and cultivating new opportunities for Canada.



Mr. John McDougall,  
President

## Section I: Organizational Overview

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### Raison d'être

The National Research Council (NRC) aims to become one of the world's leading research and technology organizations (RTO), helping Canada keep pace with the changing innovation landscape, with a focus on generating socio-economic benefits for Canadians. With a presence in every province, NRC has a strong national foundation along with international linkages to help Canada remain competitive in the transitioning global economy. NRC's expertise and unique contributions strive to develop and deploy technologies to the marketplace by: undertaking research and development (R&D) in areas critical to Canada's future; fostering industrial and community innovation and growth through technology and industry support; and providing, maintaining and advancing national infrastructure and information for the scientific and industrial community to help push innovation forward and keep Canada at the cutting-edge. NRC's approach is directly aligned to the [\[1-0\] Government of Canada's science and technology \(S&T\) strategy, \*Mobilizing Science and Technology to Canada's Advantage\*](#) and its four key principles: promoting world class excellence in research; focusing on priorities for the short and long term; encouraging strong partnerships and enhancing accountability.

### Responsibilities

Under the [\[2-0\] \*National Research Council Act\*](#), 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, 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 Accountability Framework*

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 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 within the guidance of the NRC Council. Each of six Vice Presidents is responsible for a portfolio of Program Activities composed of research institutes, initiatives, centres and/or a corporate branch. Supporting senior management, 24 Directors General, two General Managers and various committees are responsible for executing plans and priorities and ensuring successful achievement of objectives.

## Strategic Outcomes and Program Activity Architecture (PAA)

NRC's aim is to create a sustainable advantage for Canadians through S&T leadership, which contributes to improved economic competitiveness and social betterment for our nation. Through strategic relationships with industry, government and academia, NRC works to align the strengths and critical mass required to achieve four of [3-6] Canada's Strategic Outcomes (SOs): strong economic growth; healthy Canadians; a clean and healthy environment; and an innovative and knowledge-based economy. NRC's Program Activities (PAs) directly support the delivery of NRC's Strategic Outcomes, which are aligned to deliver against these federal commitments. The approved 2010-11 NRC PAA structure, shown below, represents how activities are organized to achieve these desired results.

SO1: ADVANCEMENTS IN INNOVATIVE TECHNOLOGIES AND INCREASED INNOVATION CAPACITY IN TARGETED CANADIAN INDUSTRIES AND NATIONAL PRIORITY AREAS					SO2: CANADIANS HAVE ACCESS TO RESEARCH AND DEVELOPMENT INFORMATION AND INFRASTRUCTURE		
PA1.1 Manufacturing Technologies	PA1.2 Information and Communications Technologies and Emerging Technologies	PA1.3 Industrial Research Assistance	PA1.4 Health and Life Science Technologies	PA1.5 Energy and Environmental Technologies	PA2.1 National Science and Technology Infrastructure	PA2.2 Scientific, Technical and Medical Information	PA3 Internal Services
SA 1.1.1	SA 1.2.1		SA 1.4.1	SA 1.5.1	SA 2.1.1		SA 3.1
SA 1.1.2	SA 1.2.2		SA 1.4.2	SA 1.5.2	SA 2.1.2		SA 3.2
SA 1.1.3	SA 1.2.3		SA 1.4.3	SA 1.5.3	SA 2.1.3		SA 3.3
SA 1.1.4	SA 1.2.4		SA 1.4.4	SA 1.5.4	SA 2.1.4		
			SA 1.4.5				
			SA 1.4.6				

**Legend** SO – Strategic Outcome PA – Program Activity SA – Sub-Activity

SA 1.1.1 – Aerospace Research  
SA 1.1.2 – Construction Research and Support  
SA 1.1.3 – Manufacturing and Materials Research  
SA 1.1.4 – Surface Transportation Technology

SA 1.2.1 – Semiconductor-Based Technology Research  
SA 1.2.2 – Information Technology Research  
SA 1.2.3 – Nanotechnology Research  
SA 1.2.4 – Molecular Sciences Research

SA 1.4.1 – Health and Environmental Biotechnology Research  
SA 1.4.2 – Age-Related and Infectious Disease Research  
SA 1.4.3 – Medical Diagnostic Technology Research  
SA 1.4.4 – Marine Biosciences and Nutrisciences Research  
SA 1.4.5 – Plant Biotechnology Research  
SA 1.4.6 – Genomics and Health Technology

SA 1.5.1 – Ocean Technology Research  
SA 1.5.2 – Sustainable Energy Technologies and Environmental  
Monitoring Research  
SA 1.5.3 – Fuel Cells Technology Research  
SA 1.5.4 – Hydraulics Technology Research

SA 2.1.1 – National Measurement Standards  
SA 2.1.2 – Canadian Astronomical Observatories  
SA 2.1.3 – Facility for Sub-Atomic Research TRIUMF  
SA 2.1.4 – Canadian Neutron Beam Centre

SA 3.1 – Governance and Management Support  
SA 3.2 – Resource Management Services  
SA 3.3 – Asset Management Services



## Organizational Priorities

### Performance/Priority Status Legend

**Exceeded:** More than 100 per cent of the expected level of performance (as evidenced by the indicator and target or planned activities and outputs) for the expected result or priority identified in the corresponding Report on Plans and Priorities (RPP) was achieved during the fiscal year.

**Met All:** 100 per cent of the expected level of performance (as evidenced by the indicator and target or planned activities and expected outputs) for the expected result or priority identified in the corresponding RPP was achieved during the fiscal year.

**Mostly Met:** 80 to 99 per cent of the expected level of performance (as evidenced by the indicator and target or planned activities and expected outputs) for the expected result or priority identified in the corresponding RPP was achieved during the fiscal year.

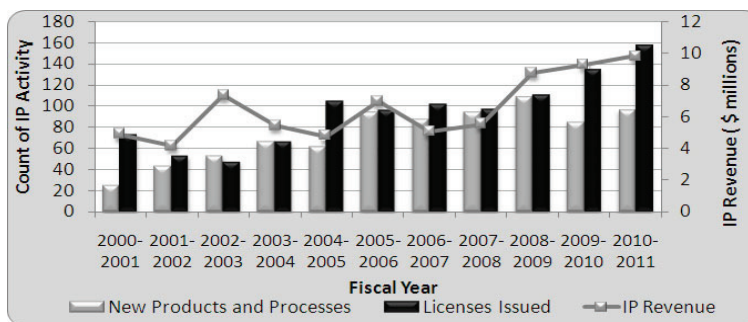
**Somewhat Met:** 60 to 79 per cent of the expected level of performance (as evidenced by the indicator and target or planned activities and expected outputs) for the expected result or priority identified in the corresponding RPP was achieved during the fiscal year.

**Not Met:** Less than 60 per cent of the expected level of performance (as evidenced by the indicator and target or planned activities and expected outputs) for the expected result or priority identified in the corresponding RPP was achieved during the fiscal year.

<b>Priority:</b> To contribute to the global competitiveness of key industrial sectors and to support the economic growth and development of communities across Canada.	<b>Type<sup>1</sup>:</b> Ongoing	<b>Linkages to [~] Strategic Outcome 1</b>
<p><b>Status:</b> Met all (100%)</p> <ul style="list-style-type: none"> <li>NRC provided targeted support and services to specific high-impact and emerging industry sectors. These sectors are technology intensive and depend on innovation for their growth and competitiveness, thus benefiting from the resources and knowledge that NRC provides. NRC worked with private and public partners to address immediate and future needs and opportunities through strategic research and services such as assembly and integration of devices and access to incubator space. As an example, NRC provided research support to the Canadian information and communications technology (ICT) sector, working with SMEs and developing systems and hardware for next generation technologies and applications to enhance the global competitiveness of firms contributing to Canada's Digital Economy.</li> <li>Licensing statistics are indicative of industry confidence in the commercial value of NRC innovations. During 2010-11, NRC increased the flow of technologies into high-impact and emerging sectors of the economy by introducing 97 unique product and process innovations to industry.</li> <li>NRC worked with university, industry and government to stimulate the growth of community-based clusters of firms specializing in priority technology areas. These innovation hubs accelerated the commercialization of new technologies, products, processes and services, and built S&amp;T capacity in specific industries and regions across the country.</li> <li>NRC assisted SMEs to develop technologies and successfully commercialize them in a global marketplace by providing technical and business advisory services, financial assistance, and networking and linkage opportunities. In 2010-11, the NRC Industrial Research Assistance (NRC-IRAP) Program Activity provided \$232.8M to 3,098 firms and 190 organizations for 4,400 innovation projects that supported 12,821 jobs, including 1,442 for recent graduates.</li> </ul>		

<sup>1</sup> Type is defined as follows: **Previously committed to** – committed to in the first or second fiscal year before the subject year of the report; **Ongoing** – committed to at least three fiscal years before the subject year of the report; and **New** – newly committed to in the reporting year of the DPR.

In 2010-11 NRC licensing activity continued on an upward trend, one NRC has generally witnessed over the past decade. Revenue from Intellectual Property (IP) increased to a high of \$9.8M.



<b>Priority:</b> To support and conduct R&D in areas of national importance such as healthy Canadians, sustainable energy and a clean environment.	<b>Type:</b> Ongoing	<b>Linkages to [Strategic Outcome 1]</b>
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**Status:** Met all (100%)

- NRC collaborated with academic, government and private sector players to conduct R&D and develop applications and market solutions in such areas as general health and wellness, age-related and infectious diseases, and the prevention, early diagnosis and improved treatment of diseases such as cancer.
- Working with key industrial and government collaborators, NRC contributed to energy efficiency for industrial processes and transportation, renewable energy sources, bioenergy, fuel cells and oil sand development.
- NRC focused on developing sustainable energy as part of an industrial oils consortium to replace petrochemical-based products with renewable sources. This consortium comprises technology suppliers, producer groups and biodiesel manufacturers to validate performance of the oilseed crops and form partnerships for commercialization of a biofuels crop in Canada.
- Contaminated effluents treatment, waste management, and eco-efficiency all present challenges where innovative, cutting-edge technology solutions are critical for Canada. NRC developed environmental technologies to contribute to solutions such as monitoring air quality, preventing pollution and cleaning up contaminated sites.

<b>Priority:</b> To provide integrated support that engages key players across government, academia, and industry.	<b>Type:</b> Ongoing	<b>Linkages to [Strategic Outcome 2]</b>
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**Status:** Met all (100%)

- NRC provided integrated S&T infrastructure to support Canadian excellence in R&D. NRC worked with university, industry and government in Canadian communities to ensure that Canada's national S&T facilities are up-to-date and accessible to Canadians in accordance with its federally legislated and assigned mandate and evolving national needs.
- In response to funding allocated in Budget 2009, NRC upgraded existing facilities, by addressing deferred maintenance issues, modernizing NRC facilities supporting research in areas of national importance, and assessing or remediating contaminated areas. This strengthened federal capacity by enhancing researchers' ability to work alongside firms in updated facilities. Initiatives funded under Modernizing Federal Laboratories and the Accelerated Federal Contaminated Site Action Plan were completed in March 2011.
- NRC provided Canada's innovation community with information tools and services for accelerated knowledge discovery, innovation and commercialization in its mandated role as Canada's national science library.

<b>Priority:</b> To ensure effective program management for a sustainable organization.	<b>Type:</b> Ongoing	<b>Linkages to [Strategic Outcome 1 and Strategic Outcome 2]</b>
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**Status:** Met all (100%)

- NRC implemented its new integrated planning and performance management process, tools and structures to ensure alignment with priorities, and improved performance reporting of financial and non-financial information.
- NRC implemented a new integrated investment planning process and associated governance structure to ensure compliance with the Treasury Board *Policy on Management of Projects* and the *Policy on Investment Planning: Assets and Acquired Services*. This new approach ranks and approves investment projects on an NRC-wide basis and more clearly integrates investments with the Government's and NRC's strategic priorities.
- NRC focused on human resource (HR) initiatives to engage talent and build organizational capability such as: initiating a new program for enabling and recognizing performance; developing leadership capability across the organization; and implementing a new HR organizational design.
- NRC strengthened its financial management and control practices with its implementation of the *Policy of Internal Control over Financial Reporting*, a more rigorous performance and sustainable planning cycle, and the continued development of its business intelligence reporting tool to support planning, operations, decision making, accountability and transparency.

## Risk Analysis

In 2010-11, Canada approached the end of stimulus spending for economic recovery through Canada's Economic Action Plan with future budget reductions now anticipated, aimed at reducing the deficit in the near term. Continued attention was given to the innovation and productivity lag in Canada through studies, such as the federal government's R&D Review, in which NRC participated. With recognition of the growing strength of emerging economies such as India and China, Canada needs to focus its R&D resources where it can have the greatest impact to enhance industry competitiveness, and leverage international S&T through collaborations and capital/resources. NRC plays an important role as a research and technology organization in this regard.

Changes in NRC's senior executive members and a new President put in motion a renewal exercise on the organization's strategy, direction and culture. A new vision and mission for the organization were adopted, and NRC is examining its activities to ensure that they are in the right direction and delivered with a clear value proposition for Canada.

NRC's risk management priorities in 2010-11 focused on addressing the highest risks identified in the Corporate Risk Profile, including:

**Strategic leadership/governance:** *The risk of ineffective decision-making around critical strategic issues with increased senior executive time dedicated to addressing operational issues, and a broad focus on research and development at a time of financial pressures.* Potential consequences include NRC not delivering its full value and impact, and the potential inability to generate future organizational sustainability.

- The risk management strategy focused on **Strategic Leadership:** *Strengthening decision-making and priority-setting mechanisms and structures, adjusting to changes resulting from the economic downturn, and ensuring alignment of investments with objectives through the business planning process.* Progress was made to lay the foundation for new strategic directions and focus. This included the development of new program-based selection and planning processes to begin transitioning NRC from an institute-based to a program-based management structure for greater focus and critical mass. Progress also included implementation of the new investment planning and project management process.

**Promotion, image and understanding of NRC:** *The risk of lack of awareness and understanding of the organization due to: low visibility of its role and contributions to Canada; lack of a clearly defined unique, differentiated position for itself that is understood and strongly supported; and weak coordination and communications of NRC's successes and value-added.* Potential consequences include the inability to attract collaborators and technical expertise and generate a sufficient level of external sources of funding to fulfill NRC's role.

- The risk management strategy focused on **Stakeholder Relationships:** *Developing and implementing an effective communications, marketing and stakeholder relations strategy that will result in coordinated action across NRC at multiple levels.* Aligned with NRC's new strategic orientation, progress has been made to enhance stakeholder relations and client management through increased dialogue with current and future potential public and private sector collaborators in Canada and abroad, as well as new initiatives to raise awareness of NRC offerings, such as NRC branding. Such initiatives will continue to take shape as NRC's new strategy unfolds.

**Funding and financial pressures:** *The risk of a reduction in NRC's ability to carry out its activities and deliver on its expected outcomes due to financial constraints arising from such issues as growing operations and maintenance costs, sunseting funds, and the inability to address shortfalls without increased external sources of funding.* Potential consequences include NRC not delivering its full value and impact, and the potential inability to attract and retain high quality scientific and technical personnel and generate future organizational sustainability.

- The risk management strategy focused on **Financial Sustainability:** *Establishing sustainability through various short and longer term strategies focused on reducing and streamlining activities, achieving greater efficiencies and enhancing revenue.* Several initiatives were undertaken to address financial sustainability, including a review of corporate overhead efficiencies, the development of revenue generation plans with higher revenue targets, and new financial reporting practices. As part of NRC's strategy, further work is being done on funding models for financial sustainability and creating greater focus and critical mass by moving towards a program-based management model.

From a positive risk perspective, NRC has benefited from opportunities associated with greater visibility from media coverage and outreach activities, and enhanced communications with other government groups. This has allowed for a better understanding of how and where NRC contributes to Canada, and provides future opportunities to better link to collaborators and service clients.

## Summary of Performance

### 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities*	Actual Spending**
749.0	963.6	903.3

\* The Total Authorities includes Planned Spending, amounts from Budget 2010, amounts from Supplementary Estimates, and other statutory authorities.

\*\* Except where noted otherwise, all financial results are reported on a cash accounting basis for historical comparability.

The Planned Spending amount is the best estimate of spending, is prepared prior to the budget and prior to the start of the fiscal year. The Total Authorities includes the Planned Spending plus all items approved subsequent to the Planned Spending number being prepared and reflects authorities available at the end of the fiscal year. There is a \$214.6M difference between the two numbers and this amount is from items approved over the course of the fiscal year. The major items that made up this increase were \$68.4M for the Clusters Initiative, \$45.0M transferred from the Federal Economic Development Agency for Southern Ontario, \$45.8M in other statutory authorities, \$30.2M for personnel costs, \$25.7M for TRIUMF, \$3.6M for the Youth Employment Strategy and a combined reduction of \$4.5M for several smaller items. There is \$60.3M less in Actual Spending when compared to Total Authorities. Of this amount, \$48.0M is statutory revenues that are carried forward to the next fiscal year, \$7.9M is frozen and to be used for employee benefit plan costs and other items, and the balance is unspent and returned.

### 2010-11 Human Resources (Full Time Equivalent (FTEs))

Planned	Actual	Difference
3,675	4,365	690*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. FTE utilization is roughly estimated using a calculation based upon salary appropriation divided by

an average salary. This methodology involves several assumptions including constant average salary throughout the year. NRC has learned that these assumptions do not hold for 2010-11. This renders planned FTE values incomparable to the actual values determined by actual usage. To correct the situation, NRC invested in developing its existing systems to include future year forecasting functionality and expects to have it available for the 2012-13 reporting cycle.

**Strategic Outcome 1: Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas**

Performance Indicators	Targets	2010-11 Performance <sup>2</sup>
Average incremental number of new and improved client products as a result of NRC's R&D activities compared to non-clients	0.6 by March 2012	Total attributable private sector client sales, as a result of NRC's activities, were estimated to have increased from \$2.53B in 2006-07 to \$3.45B in 2010-11. <sup>3</sup>
Average incremental client R&D expenditures as a result of NRC's R&D activities compared to non-clients	\$75,000 by March 2012	Based on study results, it is estimated that total attributable private sector client R&D expenditures increased from \$285M in 2006-07 to \$430M in 2010-11. <sup>4</sup>
Average incremental client R&D full-time equivalents employed as a result of NRC's R&D activities compared to non-clients	1.2 by March 2012	Based on study results, it is estimated that total attributable private sector client R&D employment increased from 2,325 in 2006-07 to 3,735 in 2010-11. <sup>5</sup>

Program Activity	Actual Spending 2009-10 (\$ millions)	2010-11 <sup>6</sup> (\$ millions)				Alignment to Government of Canada Outcome
		Main Estimates	Planned Spending	Total Authorities	Actual Spending	
Manufacturing Technologies	144.6	115.0	115.0	146.5	128.6	Strong Economic Growth
Information and Communications Technologies and Emerging Technologies	83.7	44.8	44.8	76.8	77.2	Strong Economic Growth
Industrial Research Assistance	285.7	237.6	237.6	293.3	286.2	Strong Economic Growth
Health and Life Science Technologies	122.4	102.3	102.3	104.1	115.1	Healthy Canadians
Energy and Environmental Technologies	48.7	28.2	28.2	41.5	36.5	A Clean and Healthy Environment
<b>Total</b>	<b>685.1</b>	<b>527.9</b>	<b>527.9</b>	<b>662.2</b>	<b>643.6*</b>	

\* NRC spent less than total voted Parliamentary authorities. The majority of the unspent balance relates to revenues carried forward to FY 2011-12. Note that at the program activity level, actual spending may be higher than Total Authorities as spending priorities shifted to meet program needs.

Note: Due to rounding, figures may not add to total shown.

<sup>2</sup> NRC's *S&T Economic Impacts and Return on Investment Study*. NRC Strategy and Development Branch, 2011. Note that the results and methodology of the Study have undergone a review and validation process, including a validation of results by Statistics Canada. A formal international peer review of the methodology and results is now in process.

<sup>3</sup> *Ibid.* The study did not allow for the collection of data on the number of products for clients and non-clients.

<sup>4</sup> *Ibid.* The study did not allow for measurement of average incremental R&D expenditures of clients versus non-clients.

<sup>5</sup> *Ibid.* The study did not allow for measurement of average incremental R&D employment of clients versus non-clients.

<sup>6</sup> Commencing in the 2009-10 Estimates cycle, the resources for Program Activity: Internal Services are displayed separately from other program activities; they are no longer distributed among the remaining program activities, as was the case in previous Main Estimates. This has affected the comparability of spending and FTE information by program activity between fiscal years.

**Strategic Outcome 2:** Canadians have access to research and development information and infrastructure

Performance Indicator	Target	2010-11 Performance
Proportion of surveyed S&T infrastructure users who report positively on the value of the NRC infrastructure used	85% by March 2012	93%

Program Activity	Actual Spending 2009-10 (\$ millions)	2010-11 (\$ millions)				Alignment to Government of Canada Outcome
		Main Estimates	Planned Spending	Total Authorities	Actual Spending	
National Science and Technology Infrastructure	100.6	49.7	49.7	98.8	98.6	An Innovative and Knowledge-based Economy
Scientific, Technical and Medical Information	27.7	39.0	39.0	48.6	33.6	An Innovative and Knowledge-based Economy
<b>Total</b>	<b>128.3</b>	<b>88.7</b>	<b>88.7</b>	<b>147.4</b>	<b>132.2*</b>	

\* NRC did not spend its full Authorities, most of which relates to revenues carried forward to FY 2011-12.

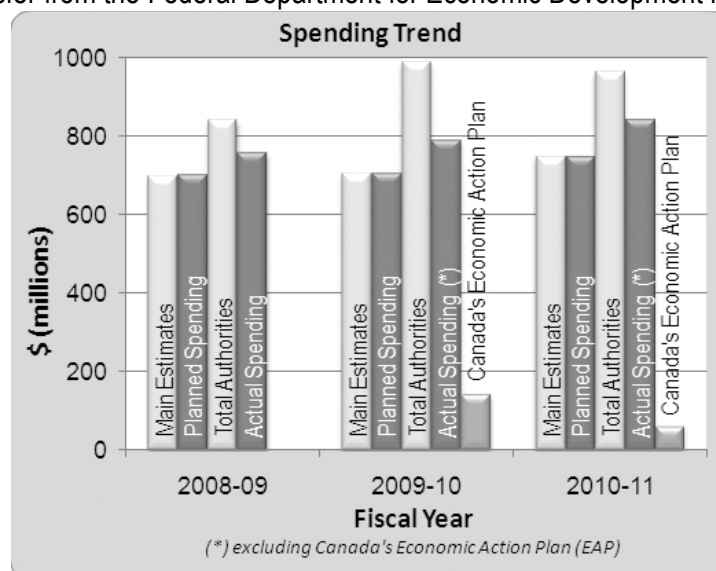
Note: Due to rounding, figures may not add to total shown.

Program Activity	Actual Spending 2009-10 (\$ millions)	2010-11 (\$ millions)			
		Main Estimates	Planned Spending	Total Authorities	Actual Spending
Internal Services	117.7	132.3	132.3	153.9	127.6

## Expenditure Profile

### Departmental Spending Trend

NRC's actual spending for 2010-11 was \$903.3M. Over the past three years (FY 2008-09 to FY 2010-11), actual spending averaged \$864.1M. The average spending increased by \$44.0M (or 5.4%) when compared to last year's average. The increase is due primarily to additional TRIUMF funding and a transfer from the Federal Department for Economic Development in Southern Ontario.



### **Estimates by Vote**

For information on NRC's organizational Votes and/or statutory expenditures, please see the 2010-11 Public Accounts of Canada (Volume II) publication. An electronic version of the Public Accounts is available on the [4~0] [Public Works and Government Services Canada \(PWGSC\) web site](#).

## Section II: Analysis of Program Activities by Strategic Outcome

### Strategic Outcome 1

#### Advancements in innovative technologies and increased innovation capacity in targeted Canadian industries and national priority areas

The federal S&T Strategy commits to translating discovery into innovative, technology-driven products and services in national priority areas as well as improving the innovation capacity of industry. NRC delivered on these commitments by developing technological solutions to national challenges in health and wellness, sustainable energy and the environment. NRC also helped SMEs increase their innovation capacity and compete more effectively in world markets, and strengthened Canada's innovation system by increasing technology transfer and commercialization.

NRC's study, [5-6] *NRC's S&T Economic Impacts and Return on Investments*, sheds light on the extent to which NRC programs, projects and expenditures impact its clients and the Canadian economy at large. The study looked at the benefits and impacts of NRC's annual expenditures on its clients' performance, and those generated through knowledge spillovers to the economy. It estimated the total value of NRC's economic impact at between \$4.0B and \$5.5B annually and that the average annual economic return on investment (EROI) to taxpayers is between 6.5 and 7.5 times NRC's total expenditures. The study also addressed specific issues about NRC's role in new wealth creation through private sector innovation as well as building innovation capacity. NRC was found to have a positive and statistically significant impact on private sector client sales and productivity. For every \$1 spent by NRC on private sector client-related activities, some \$9 of new wealth creation, measured in terms of total client sales, was induced.

**NRC: A Valued Research Partner** – The value and relevance of NRC's research and supporting activities is evidenced by partner investments in collaborative projects. In 2010-11, NRC had a total of 1,469 active collaborative research agreements (an increase from 1,245 in the previous year) with 1,088 Canadian and 381 international collaborators from industries, universities, and governments. NRC's portfolio of active collaborative agreements remained high at \$812M in 2010-11. Although this represents a 2% decrease in value from the previous year, it is almost double the value of \$415M in 2001-02 from which stems a general trend of growth.

**Impact of NRC Licensing** – Licensing statistics are indicators of NRC's successes in attracting industry to bring NRC innovations to market. They point to industry's confidence in the commercial value of NRC innovations. NRC increased the flow of technologies into high-impact and emerging sectors of the economy by introducing 97 unique product and process innovations to industry, an increase from 85 in 2009-10. NRC filed 194 patent applications, and 79 patents were issued. 158 licenses were issued, an increase of 17% from 2009-10.

#### Program Activity 1.1: Manufacturing Technologies

**Program Activity Description:** *This program performs multi-disciplinary research and development in consultation with industry, universities, government departments and other key innovation players to improve the global competitiveness of Canadian industry by transforming knowledge and innovation into real economic value and by transferring technologies into industrial solutions for the marketplace. Companies have coordinated access to NRC's multidisciplinary research expertise and state-of-the art facilities to ensure they are at the leading edge of innovation. This includes a facility that transforms concepts into custom precision mechanical prototypes for research applications.*



## 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities	Actual Spending
115.0	146.5	128.6

## 2010-11 Human Resources (FTEs)

Planned	Actual	Difference
852	1,081	229*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. This will be corrected in the 2012-13 reporting cycle.

Expected Result	Performance Indicators	Targets	Performance Status
Manufacturing industries in Canada have coordinated access to NRC's multidisciplinary research expertise and state-of-the art facilities to ensure they are at the leading edge of innovation	Percentage of surveyed clients who report that NRC's manufacturing technologies research and facilities helped advance their innovation capacity	75% by March 2012	73%

## Performance Summary and Analysis of Program Activity

NRC consulted a sample of clients<sup>7</sup> to determine the extent to which NRC's manufacturing technologies research and facilities helped advance their innovation capacity. The aggregate of all responses where respondents agreed that NRC helped advance their innovation capacity was 73%, indicating progress toward the achievement of the 75% target by March 2012. Eighty-one percent (81%) of those consulted in the sample client survey reported that NRC's products and services increased their overall innovation capacity; 91% reported that NRC helped develop or significantly improve one or more products and/or technologies (i.e., product innovations); and 71% reported that NRC helped develop or significantly improved one or more methods of manufacturing or producing goods or services (i.e., process innovations).

[6-6] **Lightweight car parts ready to roll** –The auto industry is working to reduce vehicle weights for environmental reasons, as lighter cars need less energy to move. In April 2010, NRC signed a commercialization licence with STAS, a Canadian company, to promote a "game-changing" semi-solid aluminium die-casting system. The system, which took seven years and \$12M to develop, will make brake and suspension components made of aluminium far more common in inexpensive mass-produced vehicles – a major benefit for Canada's aluminium industry, the global auto industry and the environment. STAS promoted the technology globally in collaboration with ALCAN and NRC which led to discussions and negotiations with ten prospective industrial partners for automotive, military, and electronics and telecommunication applications.

The Manufacturing Technologies Program Activity provided targeted support and services to high-impact industry sectors such as automotive, aerospace, and construction.

Over the last few years, Canada's automotive sector has faced severe economic challenges. Working through the federal "Automotive Partnership Canada" initiative, which supports Canadian auto and parts makers in addressing their R&D needs, NRC undertook 34 projects with automotive industrial partners, worth a total value of \$32.8M including industrial, university/other government departments/international and NRC contributions of \$9.1M, \$3.5M and \$20.2M respectively. NRC's [7-6] automotive sector research collaborations, focused on developing innovative technologies to

<sup>7</sup> There were 22 respondents, representative of clients with whom NRC has had a sustained relationship over the past three years, within this Program Activity.

create lightweight vehicles, alternative propulsion and cognitive cars, helped SMEs understand the technology demands of automakers and assisted them in developing the solutions to meet these needs.

NRC's [9-0] Aerospace Research focused on improving the design, manufacture, performance and safety of aerospace vehicles, while reducing environmental impacts. In 2010-11, NRC developed a new helicopter control system that allows pilots to operate their aircraft to their maximum capabilities more safely, representing a major breakthrough in the development of advanced aircraft control systems. NRC also advanced alternative fuels testing with successful qualification testing of semi-synthetic jet fuel. NRC completed a successful Department of National Defence-funded collaborative project to understand the physics of helicopter ice accretion and shedding, and another phase of a \$40M collaboration with partners Bombardier, Bell Helicopter and Canadian SME Composites Atlantic, conducting an elevated-temperature full-scale fatigue and residual strength test to certify Canada's first all-composite helicopter tail boom. NRC's total number of aerospace sector partners/collaborators/clients in 2010-11 was 293, with a total of \$32.6M in revenue. NRC had 50 Canadian lower-tier partners/collaborators/clients in 2010-11, with a total of \$5.6M in revenue.

[8-0] **NRC Aerospace Research supplies the icing system for the \$42M GLACIER icing testing and research facility in northern Canada** – In October 2010, NRC officially opened the Global Aerospace Centre for Icing and Environmental Research (GLACIER) with partners Pratt & Whitney and Rolls-Royce in Thompson, Manitoba. GLACIER will be used for icing certification of the world's largest aircraft turbines. NRC Aerospace developed and will maintain and update the icing system, using the facility to advance aircraft engine icing research as well. This role builds on NRC's long-standing worldwide leadership in the development of icing simulation technology aimed at engines and wings, as well as ice detection equipment and atmospheric measurement of icing conditions.

As Canada's largest employer, the construction industry sector accounts for 12% of Canada's Gross Domestic Product (GDP), with annual investments of more than \$146B in capital expenditures.<sup>8</sup> The substantive challenge for this industry is to transition into the knowledge-based economy. To enable this transition and advance sector competitiveness and value creation, [10-0] NRC Construction Research and Support developed the knowledge and technologies needed to create a quality and cost-effective built environment; provided integrated, decision-making tools that enable the construction sector to respond to changing performance expectations; and developed construction process technologies critical to improved productivity. In 2010-11, NRC worked on the performance

**Stimulating export sales** – To help the Canadian wood industry prosper from the growing need in China for competitive and quality housing, NRC researchers investigated construction techniques suitable for wood frame buildings in China. The key challenge was to develop proven moisture management strategies for exterior walls and roofs in the country's hot, humid and mixed climates. During the past five years, NRC delivered research results that were incorporated into a good practice guide, regional training programs, and the Shanghai local code on wood-frame construction. During 2010, Canada exported 1.6B board feet of construction-grade softwood lumber to China. This represents a doubling of exports every year since 2007. (Data source: Statistics Canada)

assessment of building envelope systems focusing on energy and moisture management; innovative sensors and sensor networks linked to decision-support tools to manage indoor air quality and increase energy efficiency; and prefabrication, modularization and preassembly of building systems and components to increase construction productivity and efficiency.

More information on Manufacturing Technologies can be found on [11-0] the supplementary information page for NRC's DPR 2010-11.

<sup>8</sup> Statistics Canada

## Lessons Learned

In 2010-11, an evaluation of NRC Aerospace noted NRC's alignment with the needs of the aerospace sector and NRC's unique expertise and facilities. The evaluation provided insight into opportunities to strengthen the program. It identified the need to increase strategic research to support ongoing development and to further develop the capacity of lower-tier suppliers to connect to global supply chains. It also resulted in information allowing NRC to reflect on its role in the area of data flight recording. As a result, NRC management committed to examining the alignment of these activities.

In addition, NRC learned the importance of promoting the existence and benefits of research framework agreements that have been put in place with leading aerospace companies over the past several years. In several instances, individual collaborators/clients were not aware of these agreements, and therefore did not take full advantage of their time- and cost-saving potential at the project definition and contract negotiation stages. NRC has resolved to work with its strategic partners to address these communication issues through the launch of a new client management approach and Key Account Management System at NRC. These efforts are expected to result in streamlined negotiations with key clients and an increased ability to identify collaborative research opportunities between NRC and the private sector.

## Program Activity 1.2: Information and Communications Technologies (ICT) and Emerging Technologies

**Program Activity Description:** *In support of the federal S&T Strategy, this program mobilizes and partners with key university, government and private sector players and forms major research collaborations to develop integrated research solutions in the areas of information and communications technologies and emerging technologies for the economic benefit of industrial sectors and Canadians generally. Areas of research focus include photonics, molecular science, information technology and enabling sustainable development.*

### 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities	Actual Spending
44.8	76.8	77.2*

\* Actual spending may exceed 'Total Authorities' at the PA level due to changes to the individual PA main estimates amounts. However Parliamentary Authorities at the NRC level cannot be exceeded.

### 2010-11 Human Resources (FTEs)

Planned	Actual	Difference
363	488	125*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. This will be corrected in the 2012-13 reporting cycle.

Expected Result	Performance Indicators	Targets	Performance Status
Advancements in innovative technology solutions in emerging and ICT sectors	Revenue from service contracts and successful Intellectual Property (IP) transferred to emerging industry sectors	\$1.5M by March 2011	Exceeded – \$6.1M
	Percentage of clients reporting positively on the impact of NRC R&D on client growth	85% by March 2012	88%

## Performance Summary and Analysis of Program Activity

The relevance of this program activity is demonstrated by a 26% increase in revenue from service contracts and successful intellectual property transferred to industries. NRC exceeded its \$1.5M target by \$4.6M.

NRC consulted clients to assess the impact of NRC's ICT and emerging technologies research and facilities in their organizations. Of the industrial respondents<sup>9</sup> spoken to, all (100%) reported that NRC's products and services increased their competitive advantage. They additionally reported: increased product sales (87.5%); increased number of employees (78%); the development of or significant improvement to one or more products and/or technologies (92%); and the development of or significant improvement to one or more processes or methods of producing goods or services (80%). The aggregate of all responses who reported positive growth due to NRC R&D was 88%.

The ICT and Emerging Technologies Program Activity worked to strengthen Canadian leadership in ICT, molecular and nanotechnology enablers that are pervasive in today's society, underpinning everything from research applications to "smart" consumer products.

NRC nanotechnology research is carried out in 13 research institutes across Canada, including the National Institute for Nanotechnology (NINT), which spearheads efforts in this emerging area. NRC focused its efforts in ICT, the environment and metrology to enable the manufacturing of nano-based products. NRC partnered with the Natural Sciences and Engineering Research Council (NSERC) and the Business Development Bank of Canada (BDC) to foster early results in biosensors, photovoltaics, polymer nanocomposites and quantum computing. The NRC-NSERC-BDC program funded six projects, each of which had NRC, university and industry participation. Overall, the program led to the hiring and training of 145 students, over 200 refereed publications, 360 conference presentations, nine patents and one licence.

[12~6] **Breaking through the quantum memory speed limit** – The standing quantum speed barrier for photon memories has been broken by an international team of researchers from Oxford University, the University of Delaware, and NRC. Experts agree that quantum information processing will usher in the next wave of computing and communication technologies. An essential component of these new technologies will be quantum memories, capable of precisely storing and releasing quantum information bits. Following this technology breakthrough, NRC will develop quantum information processors, positioning Canada to fabricate the next-generation of communications technologies.

[13~6] **Text Mining of Medical Records** – A free text analyzer developed by NRC is the base of the Influenza-Like Illness (ILI) Watch tracking system developed as part of the Advanced Syndromic Surveillance and Emergency Triage (ASSET) project. ASSET was led by the University of Ottawa Heart Institute, NRC and Ottawa Public Health with key partners, which included all of the Ottawa area hospitals. The program was initially developed to help Ottawa Public Health manage the 2009 H1N1 outbreak by classifying and tracking Influenza-Like Illness (ILI). ILI-Watch has now been extended to other kinds of outbreaks (e.g. gastrointestinal, other respiratory illnesses). ILI-Watch helps public health epidemiologists detect and manage pandemics by processing the health care information in Emergency Room records in real time and in a format amenable to statistical analysis. NRC and its partners in ILI-Watch were honoured with the *Health Innovation Award* at the Annual OCRI awards in Ottawa.

NRC's IT & e-Business Cluster in Fredericton and Moncton focused on ICT solutions in health and advanced learning technologies. This past year, NRC's collaboration with Red Ball Internet on the TRAX software system won the KIRA Award (Knowledge Industry Recognition and Achievement).

<sup>9</sup> There were 12 respondents, representative of clients with whom NRC has had a sustained relationship over the past 3 years, within this Program Activity.

TRAX is a powerful tool designed to help municipalities manage large fleets of vehicles in real time, including snow removal vehicles, heavy equipment and city buses.

The NRC Canadian Photonics Fabrication Centre (NRC-CPFC), a partnership among NRC, the Province of Ontario and Carleton University, provided commercial grade photonic device prototypes to industrial and university clients. A member of the Ottawa photonics cluster, NRC-CPFC provides design, foundry and pilot production services to help clients close the gap between innovation and commercialization of optical devices in silicon and III-V semiconductors. In 2010-11, NRC-CPFC expanded its suite of fabrication services and added new-generation fabrication tools to keep its clients at the leading edge of nanofabrication. NRC-CPFC also provided training for highly qualified personnel in the latest processes. NRC-CPFC doubled its shift to keep up with client demand, as it saw its number of clients increase by 40% since 2008 to reach 25 unique clients who often engage in multiple transactions.

Research conducted by NRC in the area of semiconductor nanostructures advanced the process of bringing clean solar energy to an affordable level for Canadian homes. The Semiconductors Using Nanostructures for Record Increases in Solar Cell Efficiency (SUNRISE) project saw the installation of a solar tracker at the Canadian Centre for Housing Technology in Ottawa. The solar tracker uses a new class of solar cells that can generate over two kilowatts of electricity, representing a large fraction of the electricity needed to power a typical home.

More information on ICT and Emerging Technologies can be found on [\[14-0\] the supplementary information page for NRC's DPR 2010-11.](#)

### **Lessons Learned**

A series of technology demonstrations to industry and other government departments (OGDs) during the course of an ICT project provided excellent feedback on research orientations as well as created collaborative opportunities. For example, a demonstration to OGDs initiated ongoing discussions with the Royal Canadian Mounted Police (RCMP) on sensors for building security and resulted in a \$273K collaboration between NRC and Natural Resources Canada (NRCan) on Smart Buildings. This approach of periodic demonstration workshops will be carried forth to future projects.

### **Program Activity 1.3: Industrial Research Assistance**

**Program Activity Description:** *This program provides a range of technical and business-oriented advisory services, as well as financial support for small and medium-sized (SME) Canadian businesses engaged in research and development of technological innovations. The program is important for enabling enterprises to generate significant economic activity for Canadian industry by augmenting the capacity and capability of enterprises to innovate and commercialize. Financial support is provided through a transfer payment program delivered by a cross-Canada network of more than 250 professionals, including over 230 Industrial Technology Advisors (ITAs), and located in approximately 100 communities. The field staff of professionals, recognized for their scientific, technical, engineering, business expertise, and knowledge of SMEs, provides clients with customized value-added advice, information, referrals and financial assistance. They work with clients at all stages of the innovation – commercialization continuum, including: project development; access to technical assistance, financial, business, marketing or management advice; access to competitive technical information; patent searches; and access to local, regional, national or international linkages. NRC-IRAP Innovation Network Advisors (INAs) represent and promote NRC-IRAP in the*

community innovation system and build effective regional innovation system relationships for the benefit of SMEs. This includes working with organizations that receive NRC-IRAP contributions as well as with other organizations to facilitate the implementation of multi-sector, multi-partner initiatives that are relevant to SMEs regionally and nationally. As well, the program supports the placement of graduates in SMEs through its participation in the delivery of Human Resources and Social Development Canada's Youth Employment Strategy (YES).

### 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities	Actual Spending
137.6	150.6	145.9

### 2010-11 Human Resources (FTEs)

Planned	Actual	Difference
467	388	79*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. This will be corrected in the 2012-13 reporting cycle.

Expected Result	Performance Indicators	Targets	Performance Status
SMEs in Canada have merit-based access to effective and efficient innovation support resulting in increased wealth	Return on investment to the Canadian economy (X:1) as a measure of NRC's effectiveness and efficiency	7:1 by March 2013	9:1
	Number of firms assisted	510 by March 2011	Exceeded – 1,192
	Number of graduates placed	166 by March 2011	Exceeded – 363

NRC-IRAP also received funding from the Community Adjustment Fund and from the new Federal Economic Development Agency for Southern Ontario (FedDev Ontario). With these resources, in 2010-11, NRC-IRAP funded 666 innovation projects that supported 2,624 jobs in 560 firms and 34 organizations.

NRC-IRAP (FedDev Ontario) Spending (\$ millions)		
2010-11 Planned	2010-11 Actual	2011-12 Planned
42.8	42.2	0.0

Note: The values shown reflect grants and contributions to SMEs. The 2010-11 planned value includes \$26.6M from the Community Adjustment Fund (CAF) that has been added to NRC's reference levels under FedDev Ontario.

### Performance Summary and Analysis of Program Activity

Based on the NRC's S&T Economic Impacts and Return on Investment Study, which used Statistics Canada General Business Panel Survey (GBPS) data<sup>10</sup>, NRC-IRAP's economic return on investment was estimated to be 9:1, for a total of \$1.1B. The study also found that NRC-IRAP has had a positive and statistically significant impact on private sector client performance in a number of areas including firm productivity, sales, employment, exports as well as R&D expenditures and R&D employment. It is estimated that for every \$1 the program spends there is an overall increase in private sector sales of over \$11, with approximately 20% of that exported, as well as between \$1.5 and \$2 of private sector R&D being conducted.

<sup>10</sup> GBPS data, which is data included from 6 separate databases including LEAP, RDCI, Business Registry as well as Export and Import Registries. Reported in *NRC's S&T Economic Impacts and Return on Investment Study*, NRC Strategy and Development Branch, 2011.

With over 60 years of experience, NRC customized its offerings to meet the immediate and emerging needs of SMEs in 2010-11 and help them prepare for the future:

- NRC improved SME access to needed services and built effective regional/community relationships and services that benefited all SMEs. For example, in 2010-11, NRC-IRAP sector teams contributed to increased linkages with industry players in the formation of a new bioproducts community and facilitated a nascent aerospace industry to access markets. In collaboration with industry players, NRC defined industry needs and developed new integrated approaches to improve SME innovation in priority areas.
- NRC collaborated with industry to reduce or manage the risk in developing new products and processes by providing firms with access to highly-skilled personnel and tailored market intelligence before they embarked on the adoption, adaptation or development of new technologies or processes. To increase SME access to needed expertise, 190 unique organizations that provided additional support to SMEs were funded in 2010-11. Of these 190, 28 were community-based cluster organizations, 19 were funded through the Community Adjustment Fund (CAF) and 14 were funded through FedDev Ontario's Southern Ontario Development Program.
- As a result of the additional \$200M of contributions allocated in Budget 2009, NRC was able to financially support 2,422 more clients over the two years of this temporary funding.

**Welding Together an Entire Industry** – The productivity in Canada's manufacturing and metal fabrication sector has an alarmingly low ranking, requiring significant improvements in order to compete at a global level. NRC collaborated with industry stakeholders on the collective creation of a new Lean Welding methodology. NRC-IRAP funding (\$107K) was leveraged with provincial funding (\$97K) to deploy this methodology with manufacturers in Québec, Ontario, Newfoundland and Alberta. Audits of 32 companies have revealed a minimum of \$15K annual savings for each company with almost no cost associated with implementation. "The Sector Team networking approach is helping expand opportunities exponentially" says Craig Martin, Vice President of Operations at the Canadian Welding Bureau.

More information on Industrial Research Assistance can be found on [\[15-0\] the supplementary information page for NRC's DPR 2010-11.](#)

### Lessons Learned

With the greatly increased reporting required to track stimulus funding, as well as an increasing need to report on the impact of NRC-IRAP, it was determined that components of the program's performance management system could be enhanced. Through dialogue with stakeholders and its management team, NRC learned that consistency in the collection of output and early impact information could be furthered across regions. As a result, a new Performance Management System was created, designed to support the collection, analysis and reporting of program impacts. The new system, which will collect information directly from clients, will help NRC-IRAP understand and assess the program's relevance and impact, provide input to decisions and provide the organization with information that could assist with overall program performance.

### Program Activity 1.4: Health and Life Science Technologies

**Program Activity Description:** *In support of the federal S&T Strategy, this program mobilizes and partners with key university, government and private sector players, and forms major research collaborations to develop integrated research solutions for complex health and related life science issues for the benefit of Canadians. Areas of research focus include age-related and infectious*

diseases, human health and wellness, and the prevention, early diagnosis and improved treatment of diseases such as cancer.

## 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities	Actual Spending
102.3	104.1	115.1*

\* Actual spending may exceed 'Total Authorities' at the PA level due to changes to the individual PA main estimates amounts. However Parliamentary Authorities at the NRC level cannot be exceeded.

## 2010-11 Human Resources (FTEs)

Planned	Actual	Difference
675	946	271*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. This will be corrected in the 2012-13 reporting cycle.

Expected Result	Performance Indicators	Targets	Performance Status
Canadian health and life science industries have greater access to effective and innovative technology solutions	Revenue from successful IP transferred to health and life science industries	\$5M by March 2012	\$6.4M
	Percentage of respondents from the health and life science industrial collaborators who respond positively on value of NRC innovative contributions	85% by March 2012	91%

## Performance Summary and Analysis of Program Activity

The relevance of the Program Activity is indicated by a 14% increase in revenue from IP transferred to industries. NRC exceeded its target IP revenue of \$5M by \$1.4M. This increase was dominated by advances in immunology.

An assessment of the extent to which NRC's health and life science research and facilities provided value to its clients was conducted by NRC. Of industrial respondents<sup>11</sup> consulted, 96% indicated that NRC's products and services increased their understanding of complex scientific problems related to the fields of health and life sciences; 90% said that NRC contributed to the development or significant improvement of one or more products and/or technologies related to health and life sciences; and 87% confirmed that development of or significant improvement to one or more methods or processes (e.g., diagnosis, etc.) related to health and life sciences resulted from NRC products and services. The aggregate of all responses where clients responded positively on the value of NRC innovative contributions was 91%.

[16-0] **Identifying biomarkers** – NRC and Dalhousie University are profiling samples from 3000 volunteers to identify biomarkers of cancer, cardiovascular and other chronic diseases. These will be compared with personal and geographical information which may influence health. The study will help identify potential risk factors and susceptibility for such diseases.

Increased emphasis was placed in 2010-11 on the development of integrated technological solutions for medical conditions facing Canada's aging population. NRC developed a technology to address a key challenge for aging people – getting therapeutics to cross the blood-brain barrier – and licensed it to MedImmune / Astra, a major pharmaceutical company, for development into novel products.

<sup>11</sup> There were 29 respondents, representative of clients with whom NRC has had a sustained relationship over the past three years, within this Program Activity.



Working with the Canada Food Inspection Agency, NRC developed a new method (liquid chromatographic post-column oxidation) that provides an earlier warning (i.e., earlier than the standard methods currently used) of Paralytic Shellfish Poisoning contamination, thus improving the safety of shellfish for human consumption.

NRC worked on a virtual reality system for surgical oncology to develop a training process to help physicians prepare for complex surgeries and tumour resection. There are now 23 Canadian teaching hospitals engaged in the research activity, and seven of these hospitals taking in prototypes. The *NeuroTouch* technology was demonstrated at the Montreal Neurological Institute's (MNI) [18~] Neurosurgical Simulation Centre, to coincide with the opening of this new MNI-NRC lab.

Commenting on the NeuroTouch system, Dr. A. Porter, the CEO of the McGill University Hospital Centre said, "Clinical adoption of NRC's virtual-reality simulation will not only revolutionize how the next generation of neurosurgeons is trained, but will also accelerate the adoption of innovative surgical techniques and reduce brain surgery risks...".

[17~] **New insights into brain injuries** – Using an advanced MRI system built with NRC technology, NRC studied the brain of Captain Trevor Greene, a Canadian soldier nearly killed after receiving an axe blow to the head in Afghanistan five years ago, to learn how Greene has been able to make his remarkable recovery from having damaged primary motor function to regaining the use of his limbs. Greene's case challenges conventional wisdom that there is a narrow window of time for the brain to recover from severe injury, and could have implications for other victims of strokes or other types of brain injuries.

NRC developed new instrumental techniques and associated software for minimally invasive medical diagnosis. Some examples include: the NRC-developed phased array coil design software Musaik™, licensed to Schmid & Partner Engineering AG (Switzerland) and incorporated into its existing electromagnetic field simulations software; an engineering technique (Cartesian Feedback) developed by NRC to address the issue of shadows in ultra-high magnetic field MRI imaging; and an NRC patented point-of-care lipid analyser undergoing clinical trial by Cardiogenic, a Canadian SME.

In Halifax, NRC partnered with other technology clusters in translational neuroscience to develop R&D collaborations and attract medical device companies to the area. As a direct result of its collaboration with NRC and other members of the Halifax cluster, Elekta (Sweden), a multinational company specializing in innovations and clinical solutions for treating cancer and brain disorders, officially launched "Elekta AtlanTIC: Translational Imaging Centre" in Halifax, which will serve as its R&D arm in Canada.

**Industrial oilseed issues** – Metabolix Oilseeds Inc, a company focused on providing sustainable plant-based solutions of plastics, chemicals and energy was attracted to the Saskatoon cluster because of NRC's expertise in oilseed biotechnology, service platforms and laboratory infrastructure. The company has joined a consortium of local companies working on science and regulatory issues related to development of industrial oilseed crops – a direct result of its collaboration with NRC to develop camelina as an industrial crop production system.

NRC, the Crop Development Centre at the University of Saskatchewan, and Saskatchewan Pulse Growers entered into a [19~] partnership, valued at \$3.8M over three years, to improve commercial pulse yield through genomics research that will contribute to decreased production costs, reduced risks, increased crop value, and enhanced processing quality. Pulse represents the fastest growing Canadian crop sector with exports of \$1.92B in 2008.

**Industrial oilseed crops** – NRC partnered with Agrisoma Biosciences in developing camelina as an industrial oilseed crop. In collaboration with others, this project was recently awarded \$4.5M over three years to develop industrial oilseed crops. The "Prairie Gold" project illustrates the impact of public and private focus of resources on a research area of common interest.

NRC helped five of the six companies currently incubating at its industry partnership facility in Charlottetown to move from complex R&D towards commercialization. Chemaphor, Nautilus Biosciences Canada, Neurodyn, Phytterra Bio and Phytterra Yeast have sold two new products in Canada and internationally, created two subsidiary companies and acquired another, filed one additional patent, entered into five licensing agreements, received a Michael J. Fox Foundation award to assess progranulin as an agent against neurological disease, and created 18 more Canadian jobs.

More information on Health and Life Science Technologies can be found on [20-06] [the supplementary information page for NRC's DPR 2010-11.](#)

### Lessons Learned

In the past, NRC Plant Biotechnology Institute maintained a large and costly IP portfolio, often filing too early and without an industrial partner to guide the commercial opportunity. It has now implemented a team approach to critically evaluate technology market relevance and commercial potential before filing. This process has led to a decrease in IP costs (a decrease of approximately \$100K in the last few years) and an increase in royalty revenue. This type of approach, and increasing consideration of the commercial applicability of IP, are leading to new IP management practices across NRC program activities.

### Program Activity 1.5: Energy and Environmental Technologies

**Program Activity Description:** *This program is carried out in partnership with other government departments, universities and industry and brings together the knowledge and expertise needed to make an impact on areas of critical importance to Canada in environmental and sustainable energy. The challenge is to reduce energy consumption while developing clean, sustainable energy alternatives. NRC is working to help alleviate the environmental impacts of activity in the energy, resources, transportation, construction and agri-food industry sectors. NRC performs R&D to develop processes and technologies for environmentally responsible manufacturing.*

#### 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities	Actual Spending
28.2	41.5	36.5

#### 2010-11 Human Resources (FTEs)

Planned	Actual	Difference
216	361	145*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. This will be corrected in the 2012-13 reporting cycle.

Expected Result	Performance Indicators	Targets	Performance Status
Collaborative contributions on improving sustainability of Canada's natural resources and protection of Canada's environment through innovation	Percentage of responding collaborators who respond positively on the value of NRC contributions to natural research sustainability and environmental protection innovations	85% by March 2012	88%

## Performance Summary and Analysis of Program Activity

To measure the extent that research collaboration with NRC's energy and environmental technologies helped advance sustainability and environmental protection innovations, NRC consulted a sample of its clients<sup>12</sup>. With regard to benefits attributable to collaborations with NRC, 91% of industrial clients consulted reported an increase to their competitive advantage; 94% reported the development or significant improvement of one or more products and/or technologies; and 88% reported on development or significant improvement to one or more methods of producing goods or services. The aggregate of all responses where clients agreed that NRC collaborations advanced sustainability and environmental protection innovations was 86%, reaching the desired performance target a year sooner than planned.

The Energy and Environmental Technologies Program Activity focused on advancing technologies that address clean air and water, healthy soil and oceans, sustainable energy and environmentally friendly technologies. These activities support the pursuit of solutions for preventing pollution, water use strategies and testing of groundwater, a major source of drinking water for Canadians. For example, together with Environment Canada and Health Canada in support of the federal Clean Air Agenda, NRC developed and validated a protocol that enables industry to reliably assess the performance of commercial air duct cleaning. Also, NRC completed the intervention phase of a collaborative project with the Québec National Public Health Institute focused on indoor air quality and its effects on asthmatic children.

NRC collaborated with Agriculture and Agri-Food Canada (AAFC), Natural Resources Canada (NRCan) and others in delivering the National Bioproducts Program (NBP), which develops environmentally friendly products for the automotive, aerospace, construction, and plastics industries. As an example, the NBP was able to replace up to 20% of petroleum-based polyols with lingo-polyols in insulating panels for the construction industry. This should translate into 13,600 tons of lignin, or 50,000 tons of wood biomass for the spray foam market in North America. To produce biofuels from marine algae, NRC established an algal cultivation pilot facility that produced approximately 30 kg of high quality biomass per month. This established NRC as a world leader in the controlled cultivation of photosynthetic microalgae for the production of algal-based biofuels.

NRC led the Hydrogen and Fuel Cells national initiative to improve cost and performance of fuel cells, to open new markets, and to integrate fuel cells into clean energy systems. During 2010-11, NRC increased fuel cell performance threefold and durability by 20% to 3,000 hours. The latter brings NRC closer to its target of 5,000 hour durability needed for general market adoption. To help

[21-06] **Nanocrystalline cellulose, a miracle fibre** – Using a processing method licensed from NRC, Nova Scotia biotech firm Bio Vision Technology Inc. is now supplying a high-grade nanocrystalline cellulose (NCC) to research institutions and companies that are exploring high-value applications for this miracle fibre: a biodegradable polymer that is stronger than steel, lightweight yet durable, and whose production poses no serious environmental risks. It can be used as a performance enhancer in everything from automotive panels and aircraft parts to paint, adhesives and resins – even medical products such as adhesive bandages and gauze.

**Nanoaerosols** – NRC collaborated with University of British Columbia, University of Alberta, University of Waterloo, Concordia, University College of Alberta and six firms to develop instrumentation for real-time chemical and physical characterization of nanoaerosols. The technologies can also be applied to measuring and monitoring other environmental contaminants. The project has provided training to 17 students and led to over 70 publications and conference presentations.

<sup>12</sup> There were 33 respondents, representative of clients with whom NRC has had a sustained relationship over the past three years, within this Program Activity.

promote the adoption of fuel cells, NRC demonstrated the technology to 2,238 visitors, representing 75% of the target of 3,000 visitors. NRC also demonstrated, with the firm Boeing, how fuel cells can improve efficiency and decrease aircraft emissions.

More information on Energy and Environmental Technologies can be found on <sup>[22~0]</sup> [the supplementary information page for NRC's DPR 2010-11.](#)

### **Lessons Learned**

The resource constraints of SMEs posed a challenge to the revenue generation goals and industry leverage ratios of the Fuel Cells Technology Research. Several corrective measures were taken to address this challenge, including improved billing practices and margins, and a broadened market focus to other government departments (OGDs), original equipment manufacturers (OEMs) and system integrators. These lessons are being applied across the Program Activity as there is now increased focus on ensuring target markets for research activities and a strong value proposition for the activities being undertaken.

## Strategic Outcome 2

### Canadians have access to research and development information and infrastructure

Through NRC, Canadian firms accessed national facilities and information infrastructure to help them conduct fundamental research and take new products and technology innovations to market. This infrastructure includes the TRIUMF sub-atomic research facility, a suite of neutron-scattering spectrometers at Chalk River Laboratories, and, as mandated by the [23~0] National Research Council Act, a national science library together with astronomical observatories, in addition to a system of measurement standards that facilitate domestic and international trade.

Progress made toward Strategic Outcome 2 is measured through the performance indicator: proportion of surveyed S&T infrastructure users who report positively on the value of the NRC infrastructure used. In 2010-11, 93% of S&T infrastructure users surveyed, reported positively on the value of the NRC infrastructure used, exceeding the target by 11%. This speaks well to the services and facilities offered by NRC. Users of astronomical observatories are not included here but will be surveyed separately in an evaluation slated for completion in FY 2011-12.

#### Program Activity 2.1: National Science and Technology Infrastructure

**Program Activity Description:** *This program manages national science and engineering facilities for Canadian scientific and technological communities. Facilities include astronomical observatories, the laboratory for national measurement standards, the TRIUMF sub-atomic research facility, and a suite of neutron-scattering spectrometers at Chalk River Laboratories.*

#### 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities	Actual Spending
49.7	98.8	98.6

#### 2010-11 Human Resources (FTEs)

Planned	Actual	Difference
277	291	14*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. This will be corrected in the 2012-13 reporting cycle.

Expected Result	Performance Indicators	Targets	Performance Status
Canada's national science and technology facilities are up-to-date and accessible to Canadians in accordance with federally legislated and assigned mandate and/or evolving national needs	Percentage of surveyed clients reporting positively on their perceived value of NRC R&D infrastructure used	85% by March 2012	93%
	Number of Canadian users of major NRC science infrastructure	1,200 by March 2012 cumulative over 2 years	517

#### Performance Summary and Analysis of Program Activity

In a consultation with a sample of NRC clients<sup>13</sup>, 93% reported positively (either "Agree" or "Strongly Agree") when asked about the perceived value of NRC R&D information and infrastructure used. This exceeds the target by 8% and speaks positively to the services and facilities offered by NRC. In

<sup>13</sup> Those consulted were limited to clients of SA 2.1.4 (Canadian Neutron Beam Centre). Users of astronomical observatories will be surveyed separately in an evaluation to be completed in 2011-12. Note that NRC does not count users of TRIUMF facilities.

addition, 100% of those consulted reported that the infrastructure meets the needs of their organization.

During 2010-11, NRC achieved 86% of the target 600 paying users for the year. Multiple users from the same company or organization are counted as one. The number of paying users of NRC science infrastructure fell by 5.8% during 2010-11 from 549 to 517. This can be explained by the shutdown of the National Research Universal (NRU) Reactor at Chalk River for over a year, until August 2010.

Fulfilling NRC's mandate "to operate and administer any astronomical observatories established or maintained by the Government of Canada", NRC's Canadian Astronomical Observatories program provided 484 Canadian scientists with access to primary international state-of-the-art telescopes. As well, NRC attracted an estimated 2,000 users of NRC astronomical data who downloaded 170 terabytes (TB) of information. This represents an increase of 50 TB over last year's count.

In support of Canada's Long Range Plan (LRP) for Astronomy of 2000, NRC participated in the full deployment of the new Atacama Large Millimetre Array (ALMA) telescope. NRC oversaw the production of receiver cartridges for the telescope, developed in collaboration with Canadian industrial partners. Two Canadian firms also gained expertise through their involvement in building parts for the Gemini Planet Imager, the main component of which was designed and assembled by NRC and shipped for integration in the Gemini Observatory in December 2010.

NRC delivered 7,998 calibration and measurement services to companies needing reliable measurement references to enable international trade of their goods. To verify the reliability of its measurements, NRC participated in five <sup>[24-26]</sup> Key Comparisons in 2010-11. All results were consistent with NRC published uncertainties. In the last four years, NRC has successfully participated in 60 "round robin" intercomparisons of its measurement capabilities with those other national

**Measurement Canada relies on NRC for Current Transformer approval data** – A new breed of current transformers (CTs) is being used in revenue metering systems to measure power/energy at the service entrance of large apartment and commercial buildings. As required by the Electricity and Gas Inspection Act, these new milliamp CTs must be subjected to type-approval testing by Measurement Canada (MC). NRC assisted Measurement Canada in developing a suitable calibration system to meet this requirement, by developing and building a special multi-ratio reference transformer that could be used with MC's existing calibration system while also minimizing costs.

measurement systems around the world. This provides international confidence in the reliability of Canada's system of measurement for meeting evolving national and global trade interests.

In 2010-11, NRC progressed in establishing measurement standards for emerging technologies such as nanotechnology. A total of 12 ISO standards were published; several in the area of carbon nanotubes. A further 28 are under development. These have had an impact on the OECD coordination of nano standards as well as on the regulation of nanotechnologies.

NRC took new research directions in the areas of water and energy use efficiency, joining forces with NRCan to update the *Model National Energy Code for Buildings* (MNECB). The MNECB has been used, among other things, to establish a baseline for new energy-efficient building design. Programs that have benefited include Power Smart of BC Hydro and Manitoba Hydro, the Design Assistance Program of Enbridge, Ontario, MIEUX CONSOMMER of Hydro-Québec and Leadership in Energy and Environmental Design of LEED-Canada.

The *Model National Energy Code for Houses* was also updated, providing for the design of housing that minimizes energy use in relation to overall building costs. The Canadian Commission on Building and Fire Codes approved the content of the National Energy Codes for Buildings 2011 (NECB), which included both technical provisions and a sub-objective addressing energy efficiency.

The NRC Canadian Neutron Beam Centre (NRC-CNBC) provided neutron beams to researchers seeking to obtain new understandings of materials, improve products and strengthen their businesses. Each year over 200 scientists, engineers, and students from universities, government laboratories, and industry participated in research depending on access to NRC's six neutron beam lines. NRC-CNBC enables industrial research in sectors such as nuclear energy, aerospace, automotive, oil and gas, defence, and primary metal production. During 2010-11, 92% of the available beam time was occupied by clients. There were 229 <sup>[25-6]</sup> research participants in 2010 (compared with 235 in 2009 and 258 in 2008). These research participants included 87 users who were granted access to the beamlines in 2010 after the Chalk River reactor was restarted in August. This compares with 161 and 88% in 2008 respectively, when the reactor operated for a full year.

More information on National Science and Technology Infrastructure can be found on <sup>[26-6]</sup> the supplementary information page for NRC's DPR 2010-11.

### Lessons Learned

NRC's science facilities are used to deliver services to clients and, in the context of certain programs, are accessed by collaborators from industry, academia and other government departments. Like other departments, NRC has experienced challenges in updating aging equipment and laboratories that require upgrading in order to provide optimal service. Infrastructure funding for the modernization of federal labs was used in order to enhance the NRC building holding the Watt Balance Instrument. The funding was also used to build two new labs with very stable and independent climate control to house the atomic clocks for the Canadian Time Standard. All principal mechanical systems and motor control centres in an adjacent building were also replaced and now offer improved temperature and humidity control. These upgrades ensure both the highest standard of service offering and the health and safety of employees.

### Program Activity 2.2: Scientific, Technical and Medical Information

**Program Activity Description:** *This program operates and maintains the national science library, specifically holding the national collection of Scientific, Technical and Medical (STM) information. The program provides Canada's research and innovation communities with access to global STM information, to facilitate knowledge discovery, cross discipline research, innovation and commercialization.*

#### 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities	Actual Spending
39.0	48.6	33.6

#### 2010-11 Human Resources (FTEs)

Planned	Actual	Difference
114	134	20*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. This will be corrected in the 2012-13 reporting cycle.

Expected Result	Performance Indicators	Targets	Performance Status
High value information that advances research and innovation in the areas of science, technology and health/medicine	Percent access to information services via alternative service delivery mechanisms where feasible	100% by March 2011	Met all – 100%

## Performance Summary and Analysis of Program Activity

In response to the 2008 Strategic Review, this Program Activity underwent significant changes in 2010-11, including the introduction of the following three major alternate service delivery mechanisms that enabled NRC to experience cost savings in 2010-11, and are expected to reach an estimated \$11M per year starting in 2011-12.

- NRC completed the privatization of the NRC Research Press publication activities to [27~0] Canadian Science Publishing, a not-for-profit corporation.
- Access to the national STM collection was made available through an agreement with [28~0] Infotrieve Canada, a private content delivery provider ([29~0] NRC-CISTI/Infotrieve Service). In the first year of operations, over 53,000 documents were supplied from the collection to the Canadian research and innovation community. Access to global STM information was also improved since the arrangement allows Canadians to use the extensive document delivery infrastructure world-wide. The agreement was extended to the Canadian Agriculture Library, allowing its collection to be easily accessed by all Canadians.
- Cataloguing activities were outsourced to [30~0] OCLC for an estimated savings of \$350K per year. This service has also been extended to Health Canada under a shared library services agreement.

NRC undertook a number of partnership initiatives this year. The STM information infrastructure and services were extended to two other government departments, with six shared library services being implemented with Health Canada and one with the Public Health Agency of Canada<sup>14</sup>. NRC also negotiated access to content from Canadian Science Publishing and the American Chemical Society on behalf of the Federal Science eLibrary (FSeL) consortium. Joint licensing resulted in more value for content expenditures and a streamlined process that ensured uninterrupted access to content for NRC and other federal workers.

The [31~0] PubMed Central Canada (PMC Canada) archive of published health and life sciences research, launched in partnership with the Canadian Institutes of Health Research (CIHR), completed its first year of operations. In 2010-11, over 750 manuscripts resulting from research funded by CIHR were submitted and over one million items were downloaded. Through PMC Canada, Canadian researchers can now contribute to a growing, searchable digital archive of published Canadian health research.

NRC also made progress on the national research data initiative by establishing [32~0] DataCite Canada, and becoming the digital object identifier (DOI) allocation agent for Canadian research data sets. This first step in implementing the broader initiative provides the Canadian research community with a mechanism for registering data sets to make them more accessible for others to build upon.

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<sup>14</sup> Health Canada uses the following shared library services: Acquisitions and Licensing, Cataloguing, Catalogue Integration, Web Site Hosting, Information Delivery, Help. The Public Health Agency of Canada uses the Acquisitions and Licensing service.



**NRC-CISTI takes the first step to become the data registration agency for Canada** – Research data are an important part of Canada’s scientific record. Currently, however, huge amounts of data are inaccessible or at risk of being lost altogether. NRC-CISTI has taken a step forward in making it easier for researchers to manage and share their data by becoming the central registration agency for Canadian research data sets. The mechanism to register data sets has been implemented, and a basic web site, [DataCite Canada](#) is now available. The first data sets to be registered will include those created by over 50 Canadian research projects for the International Polar Year (IPY) 2007-08, thus making these data accessible by other researchers for knowledge transfer and re-use.

More information on STM Information can be found on <sup>[33-6]</sup> [the supplementary information page for NRC's DPR 2010-11.](#)

## Lessons Learned

The implementation of the alternate service delivery mechanisms, requiring collaborations with other organizations, presented several challenges. At times, collaborators lacked clear objectives and a full understanding of the benefits of the collaboration. Open discussion of issues as they arose, and flexibility in adapting to the capabilities and needs of the partner organizations resolved many of these problems. Attention to these issues will be more rigorously applied to future collaborations whether within government or with industry. As well, evaluations of successful initiatives such as the pathfinder for shared library services will be performed, to discover success and issue areas which can positively impact how other shared services agreements are implemented in the future.

## Internal Services

**Description:** *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 Travel 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.*

### 2010-11 Financial Resources (\$ millions)

Planned Spending	Total Authorities	Actual Spending
132.3	153.9	127.6

Note: Figures includes EAP resources (Modernizing Federal Laboratories (MFL) and Accelerated Federal Contaminated Site Action Plan (FCSAP)).

### 2010-11 Human Resources (FTEs)

Planned	Actual	Difference
711	677	34*

\* The current methodology for planning Full Time Equivalent (FTE) utilization does not necessarily permit comparison with actual utilization. This will be corrected in the 2012-13 reporting cycle.

## Performance Summary and Analysis of Program Activity

### Governance and Management Support

**Integrated Business and Client Services:** With the objective of further strengthening its business and client management practices, NRC launched an innovative online business training and orientation program with 15 seminars, bi-weekly business information sharing sessions, and a three-day training course to orient new NRC business practitioners.

Integrated Communications, Marketing, and Branding: To increase awareness of NRC with key industry and business sectors, NRC strengthened its focus on traditional and social media, which increased and enhanced Canadians' ability to connect with NRC. Furthermore, NRC raised awareness of its products and services among potential business partners and increased brand recognition by developing an external advertising campaign with the intent of positioning NRC as the 'go-to' place for customized, complex R&D solutions and support from dedicated technical specialists.

Integrated Planning and Performance Management: NRC revised its new integrated planning, performance management and reporting process to accommodate its new 2010-11 PAA. Through NRC's automated Business Intelligence (BI) information management system, both financial and performance data were collected and reported using a common data structure that linked resources to results.

#### Resource Management Services

Integrated Human Resource Management: In 2010-11, NRC Human Resources Branch (NRC-HRB) completed a comprehensive review and renewal of its organizational design. This included examination of NRC-HRB's structure, services, policies, processes, and skills required to increase NRC-HRB's capacity to deliver and effectively support the strategic direction of NRC, and to ensure the branch is best positioned to deal with emerging HR challenges. Following this review, a new organizational design was implemented, effective November 1, 2010, which achieved budgetary targets and resulted in more cost-effective delivery of HR services while attending to the development of NRC-HRB's capacity to respond to emerging requirements.

In order to enable NRC's workforce to respond effectively to NRC's new strategic directions, NRC-HRB developed the Commitment to Excellence (CTE) program for launch, effective April 1, 2011, replacing the Performance Planning and Review (PPR) process. The CTE program was designed to enable and recognize superior performance and support the achievement of individual and organizational excellence. Following from the 2009-10 Executive Talent Review, which resulted in the *Report on Executive Bench Strength*, the annual Talent Review activities were placed on hold for 2010-11 to allow for review and modification of the process in order to align fully with CTE.

Financial Management: NRC enhanced its Business Intelligence financial reports, including a real-time financial dashboard, to support a more rigorous performance and sustainable planning cycle, as well as strategic decision making, accountability and transparency.

Investment Planning: NRC's first five-year Investment Plan and Organization Project Management Capacity (OPMCA) Class 2 "Tactical" was approved by Treasury Board in March 2011. Accordingly, NRC's governance and supporting planning processes associated with identifying and prioritizing investments in support of the Federal S&T and innovation goals have also been approved.

Information Management and Information Technology (IM/IT): NRC developed an enterprise information security architecture to comply with TBS policies on the management of IT. In addition, NRC began to consolidate physical and IT security to improve efficiency and effectiveness. As well, a videoconferencing service was deployed to over 60 sites. This is part of NRC's effort towards the greening of government operations, by offering staff a practical substitute to travel.

#### Asset Management Services

Real Property: NRC expanded its capacity to monitor and manage its real property portfolio through continued investment in property management software, which was deployed throughout its facilities

in the National Capital Region. This enabled NRC to manage, monitor and report on this real property portfolio in an accurate, consistent and timely manner.

Acquisition and Materiel Management: NRC implemented a Contract Review Committee and updated its Procurement and Material Management Policy Manual and its Material Management Manual. Targets were set for [34-0] Green Procurement. In addition, procurement planning was entrenched in NRC's enterprise investment planning process to ensure that capital projects meet established targets.

More information on Internal Services can be found on [35-0] the supplementary information page for NRC's DPR 2010-11.

### Lessons Learned

NRC's non-financial performance measurement data is generally accumulated manually from the diverse information management systems maintained by different institutes across NRC. This inefficient process does not meet NRC's needs for dynamic performance management. Towards remedying the problem, NRC conducted a review of its information systems to identify opportunities for making better use of existing and new systems. For information on publishing, NRC's automated business intelligence information management system captured data from the [36-0] NRC Publications Archive, NRC's online data archive, improving reporting efficiency. Plans were also made for accessing other existing and emerging common information systems including one that will improve the ability to report on NRC engagement with clients and to respond to queries on NRC performance.

## Canada's Economic Action Plan (EAP)

### **Program Activity: Industrial Research Assistance**

This was the second and final year of the \$200M allocated in Budget 2009, Canada's Economic Action Plan, to NRC-IRAP to increase assistance provided to Canadian SMEs. This more than doubled NRC-IRAP's contribution funding to firms in each year and helped companies expand their R&D activities by stimulating their innovation capacity, increasing the commercialization of technology-based products, services and processes, and hiring post-secondary graduates. This included \$170M to double the Program's contribution to firms, and \$30M to help companies hire new post-secondary graduates under its Youth Employment Program. For 2010-11, this amounted to \$78.6M in contributions to firms and \$19.4M for youth projects.

NRC-IRAP Canada's Economic Action Plan Spending (\$ millions)		
2010-11 Planned	2010-11 Actual	2011-12 Planned
100.0	98.1	0.0
NRC-IRAP Expected Result through Canada's Economic Action Plan: SMEs in Canada have merit-based access to effective and efficient innovation support resulting in increased wealth.		
Performance Indicators	Targets*	Performance Summary**
Number of firms assisted	1,360 firms by March 2011	Exceeded – 2,422
Number of graduates placed	1,000 graduates by March 2011	Exceeded – 1,567

\* These targets are the totals for 2009-10 and 2010-11.

\*\* These performance figures are the totals for 2009-10 and 2010-11.

### *Canada's Economic Action Plan Risk Management*

For NRC, the major risk to achieving expected results was the capacity of the field delivery staff to

ensure effective and efficient movement of the stimulus funding, which doubled NRC-IRAP's national budget and quadrupled NRC-IRAP Ontario's budget. NRC-IRAP was able to deliver by readjusting resources to expand staff capacity, implementing program delivery improvements, and reducing the amount of advisory services provided.

**Program Activity: Internal Services**

NRC also received infrastructure stimulus under the Modernizing Federal Laboratories initiative (\$19.07M) to address deferred maintenance issues and to modernize facilities that support research in areas of national importance. Finally, under the Accelerated Federal Contaminated Sites Action Plan, NRC received \$4.84M to remediate contaminated areas in an effort to rehabilitate the environment and improve safety.

**Modernizing Federal Laboratories (MFL)** – Under this initiative, NRC received a total of \$19.07M (\$8.7M in 2009-10 and \$10.36M in 2010-11) to address deferred maintenance issues and modernize NRC facilities across Canada that support research in areas of national importance such as health and wellness, sustainable energy, manufacturing, and metrology. For example, heating and ventilation systems were renovated to improve the climate-sensitive stability of the atomic clocks used for [37] Canada's Time Standard. Additional renovations were carried out to accommodate a novel [38] “Watt Balance” instrument that has established NRC as a world leader in accurate mass measurement upon which innovation and international trade depend.

MFL Canada's Economic Action Plan Spending (\$ millions)		
2010-11 Planned	2010-11 Actual	2011-12 Planned
10.4	10.1*	No anticipated expenditures. MFL EAP spending was completed in 2010-11.

\* The shortfall in 2010-11 spending is due to a failed tender call because of a contractual (insurance) issue with the successful vendor that could not be resolved.

Performance Indicators	Targets	Performance Status
Program completion by 2010-11	80 projects by March 2011	Exceeded – 103 projects completed by March 2011; 54 in 2009-10, 49 in 2010-11
Number of jobs created	145,000 hours of labour by March 2011	Exceeded – 144,000 hours of labour invested by March 2011; 67,000 hours in 2009-10, 77,000 hours in 2010-11

**Accelerated Federal Contaminated Site Action Plan (FCSAP)** – Under this initiative, NRC received \$4.8M of infrastructure stimulus funding over the past two years to assess and/or remediate contaminated areas in an effort to remove risk to human health and/or the environment while reducing contaminated site liability. The majority of this funding was allocated to soil remediation projects at sites in Montréal, Penticton and Ottawa. The balance of the funds were used along with \$0.3M of operational resources to conduct contaminated site assessments and risk management work at the site in Montréal, five sites in Ottawa, and at sites in Penticton, Victoria, St. John's and Boucherville.

Accelerated Federal Contaminated Site Action Plan (FCSAP) Spending (\$ millions)		
2010-11 Planned	2010-11 Actual	2011-12 Planned
2.5	2.5*	No anticipated expenditures. Accelerated FCSAP Program was completed in 2010-11.

\* Actual FCSAP expenditures exceeded planned expenditures because NRC secured additional FCSAP funding by means of an interdepartmental transfer of FCSAP funds with the RCMP in 2010-11.

Performance Indicators	Targets	Performance Status
Program completion for 2010-11	13 projects (assessment, remediation, risk management) by March 2011	Met all – Successful completion of 13 projects over two years

Number of jobs created	15,000 hours of labour	Met all – 11,327 hours labour generated in the private sector and 4,500 hours labour generated in the public sector over two years
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*Canada's Economic Action Plan Risk Management*

A comprehensive risk mitigation strategy was developed for this two-year program in May 2009, and updated on a regular basis. A major risk identified was the capacity to manage the additional workload. This risk was successfully mitigated with the use of in-house resources, supplemented by private sector resources from the consulting engineering/environmental community when required.

## Section III: Supplementary Information

### Financial Highlights

#### Condensed Statement of Financial Position

As at March 31, 2011 (\$ thousands)

	% Change	2010-11	2009-10
Total Assets	0.42	820,379	816,923
Total Liabilities	-6.92	312,905	336,152
Equity of Canada	5.55	507,474	480,771
<b>TOTAL</b>	<b>0.42</b>	<b>820,379</b>	<b>816,923</b>

#### Condensed Statement of Operations

For the year ended March 31, 2011 (\$ thousands)

	% Change	2010-11	2009-10
Total Expenses from Continuing Operations	-2.04	1,000,631	1,021,439
Total Revenues from Continuing Operations	7.13	169,785	158,482
Net Cost of Continuing Operations	-3.72	830,846	862,957
Net Cost from Discontinued Operations	963.24	723	68
<b>NET COST OF OPERATIONS</b>	<b>-3.65</b>	<b>831,569</b>	<b>863,025</b>

### Financial Statements

This general overview of NRC's financial position and operations are presented on an accrual basis for comparability with the complete financial statements published on [\[39-6\] the supplementary information page for NRC's DPR 2010-11](#).

### List of Supplementary Information Tables

All electronic supplementary information tables found in the *2010-11 Departmental Performance Report* can be found on the [\[40-6\] Treasury Board of Canada Secretariat's web site](#):

- Details on Transfer Payment Programs (TPP)
- Green Procurement
- Horizontal Initiatives
- Internal Audits and Evaluations
- Response to Parliamentary Committees and External Audits
- Sources of Respendable and Non-Respendable Revenue
- User Fees Reporting

## Section IV: Other Items of Interest

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### Organizational Contact Information

Questions and requests for information may be directed to:

National Research Council of Canada  
NRC Communications & Corporate Relations  
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](mailto:info@nrc-cnrc.gc.ca)

### Additional Information

#### NRC Council

NRC's Council provides strategic direction and advice to the President and monitors progress against strategic plans. The Minister of Industry may also consult the NRC Council for advice on matters that affect NRC and that are of importance to science and technology in Canada. The Council usually meets three times a year and has three standing committees: the Executive Committee, the Human Resources Committee and the Finance Committee. The Council is chaired by the President of NRC and the other members are appointed by the Government of Canada for three-year terms. Current members are as follows. An updated list is maintained on <sup>[41-6]</sup> [NRC's web site](#) along with biographies of the members.

**John R. McDougall** - President (and Chair of Council), National Research Council, Ottawa, Ontario

**Jacques Beauvais** - Vice Provost of Research, Université de Sherbrooke, Sherbrooke, Québec

**Paul Clark** - Former Vice-President, Research and Technology, NOVA Chemicals Corporation, Calgary, Alberta

**Peter Frise** - Scientific Director and CEO, Auto 21, Windsor, Ontario

**Alexandre Jodoin** - Materials and Structures Engineer, BMT Fleet Technology Limited, Manotick, Ontario

**Jay Josefo** - Lawyer, Toronto, Ontario

**Raymond Leduc** - Director and Senior Location Executive, IBM Bromont, Bromont, Québec

**Margaret Lefebvre** - Director, The Couchiching Institute on Public Affairs, Canadian Association of Income Funds, Montréal, Québec

**Cecil H. Rorabeck** - Professor, Orthopaedic Surgery (Emeritus), University of Western Ontario, London, Ontario

**Leo Steven** - Chairman of the Board, PEI Health, Cardigan, Prince Edward Island

**Iain Stewart** - (Leave of absence - 14 October 2010 to 13 October 2011), Assistant Vice-President, Research, Dalhousie University, Halifax, Nova Scotia

**Robert Warren** - Executive Director - Stu Clark Centre for Entrepreneurship, University of Manitoba, Winnipeg, Manitoba

**David Wood** - Head of Finance and Corporate Development, Secretary and Treasurer, Celator Pharmaceuticals Inc., Vancouver, British Columbia

## Online References

- [\*] This symbol denotes a reference to another section within this document.
- [1] [http://www.ic.gc.ca/eic/site/ic1.nsf/eng/h\\_00231.html](http://www.ic.gc.ca/eic/site/ic1.nsf/eng/h_00231.html)
  - [2] <http://laws-lois.justice.gc.ca/eng/acts/N-15/index.html>
  - [3] <http://www.tbs-sct.gc.ca/ppg-cpr/frame-cadre-eng.aspx>
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