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National Research Council Canada    Conseil national de recherches Canada

# **NRC · CNRC**

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## *Report on Plans and Priorities*

National Research Council Canada

2004-2005  
Estimates

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David L. Emerson  
Minister of Industry

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Canada



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# Guide to Acronyms and Abbreviations

## Acronyms and Abbreviations

ACOA	Atlantic Canada Opportunities Agency
ALMA	Atacama Large Millimeter Array
AMTC	Aerospace Manufacturing Technology Centre
ATC	Aluminium Technology Centre
CBRN	Chemical, Biological, Radiation and Nuclear
CED	Canada Economic Development for Quebec Regions
CIHR	Canadian Institutes of Health Research
CIMI	Crossroads for Industrial Materials Innovation
CIPM	Comité international de poids et mesures
CLS	Canadian Light Source
CPFC	Canadian Photonics Fabrication Centre
CSIR	Centre for Sustainable Infrastructure Research
CTN	Canadian Technology Network
DND	Department of National Defence
DRDC	Defence Research and Development for Canada
FAC	Foreign Affairs Canada
GHI	Genomics and Health Initiative
GTERC	Gas Turbine Environmental Research Centre
HR	Human Resources
IP	Intellectual Property
IPF	Industry Partnership Facility
ISO	International Standards Organization
ITA	Industrial Technology Advisor
LHC	Large Hadron Collider
LRP	Long Range Plan for Astronomy and Astrophysics
NMI	National Metrology Institute
NMR	Nuclear Magnetic Resonance
NPMR	Neutron Program for Materials Research
NRC	National Research Council
NRC-BRI	Biotechnology Research Institute
NRC-CHC	Canadian Hydraulics Centre
NRC-CISTI	Canada Institute for Scientific and Technical Information
NRC-CSTT	Centre for Surface Transportation Technology
NRC-HIA	Herzberg Institute of Astrophysics
NRC-IAR	Institute for Aerospace Research
NRC-IBD	Institute for Biodiagnostics
NRC-IBS	Institute for Biological Sciences
NRC-ICPET	Institute for Chemical Process and Environmental Technology
NRC-IFCI	Institute for Fuel Cell Innovation
NRC-IIT	Institute for Information Technology
NRC-IMB	Institute for Marine Biosciences

NRC-IMI	Industrial Materials Institute
NRC-IMS	Institute for Microstructural Sciences
NRC-IMTI	Integrated Manufacturing Technologies Institute
NRC-INMS	Institute for National Measurement Standards
NRC-INH	Institute for Nutrisciences and Health
NRC-IOT	Institute for Ocean Technology
NRC-IRAP	Industrial Research Assistance Program
NRC-IRC	Institute for Research in Construction
NRC-NINT	National Institute for Nanotechnology
NRC-PBI	Plant Biotechnology Institute
NRC-SIMS	Steacie Institute for Molecular Sciences
NSERC	Natural Sciences and Engineering Research Council of Canada
OECD	Organisation for Economic Co-operation and Development
OGD	Other Government Departments
PEM	Proton Exchange Membrane
R&D	Research and Development
S&T	Science and Technology
SBDA	Science-based Department or Agency
SMEs	Small and Medium-sized Enterprises
SOFC	Solid Oxide Fuel Cells
STM	Scientific, Technical and Medical
TBS	Treasury Board of Canada Secretariat
TPC	Technology Partnerships Canada
TRIUMF	Tri-University Meson Facility
UPEI	University of Prince Edward Island

# Section 1 Messages

## Minister's Portfolio Message

As Minister of Industry, I am proud to report on Industry Portfolio initiatives to foster the creation and growth of a thriving, innovative economy. Through the programs of the National Research Council Canada (NRC) and the other federal departments and agencies that make up the Industry Portfolio, we have encouraged progress on a number of priorities for Canadians, including improving Canada's business environment, continuing investment in the creation and commercialization of knowledge, building a skilled workforce, strengthening our communities, increasing health research and advancing sustainable development.

Canada is gaining recognition as a world leader in the knowledge economy. This is due in part to our significant investments in advanced research and ground breaking developments by Canadians in new technologies. By increasing our focus on research and development and working in partnership with Canadian firms, post-secondary institutions and not-for-profit organizations, we have stimulated innovation and have improved the productivity and competitiveness of Canadian businesses.

In the coming years we must make a concerted effort to improve Canada's performance even further by achieving greater successes in the industries that have brought Canada to where it is today. We must make it a priority for our businesses, large and small, to be leaders in developing the enabling, transformative technologies of tomorrow. As part of our commitment to building a thriving 21st century economy, we will foster the creation and growth of innovative Canadian companies by strengthening our focus on science and technology, increasing the commercialization of university research, and improving access to early-stage financing.

We are committed to supporting small business access to markets, promoting leading-edge technologies with emphasis on the health and environmental sectors, and information and communications technologies (ICTs) sectors, and promoting the development of value-added industries, particularly those related to the resource sectors. We will make our expertise available to the small businesses that drive the social economy, and we will collaborate with key stakeholders to widen the scope of programs currently available to small and medium-sized enterprises to include social enterprises.

These initiatives will build upon the excellent work that has been achieved to date by the Department and its Portfolio partners. Their work will continue to drive Canada's economic growth in the future and allow us to seize opportunities that present themselves, enabling us to leverage and showcase Canadian creativity and expertise in the global marketplace.

It is my pleasure to present the *Report on Plans and Priorities* for NRC. This report describes the Agency's anticipated achievements and results over the next three years as we embark on building an economy for the 21st century. Some of the highlights of NRC's plans and priorities include:

- **Ensuring Excellence and Leadership in Research and Development** through increased horizontal R&D programs particularly in nanotechnology, nutrisciences and health, oceans technologies and alternative energy technologies;
- **Building Technology Clusters** across Canada and complete an assessment of progress on NRC's Atlantic Innovation Partnership technology clusters activities in the Atlantic Provinces;
- **Creating Value for Canada** through improved Intellectual Property management systems, the creation of new technology-based companies and the strengthening of the Industrial Research Assistance Program's (NRC-IRAP) support for NRC's regional innovation and commercialization strategies;
- **Enhancing Canada's Global Reach in Science and Technology** through enhanced strategic bi-lateral alliances with key innovation partners in Europe, Asia and Latin America, and the US and implementation of astronomy and astrophysics Long Range Plan; and
- **Developing Outstanding People Becoming an Outstanding Employer** through recruitment of outstanding people, development of leadership at all levels, and aligning compensation and reward practices.

We are on our way to ensuring that Canada remains a nation with unique strengths that supports a growing economy and values social enterprise, a country where we can continue to build a better standard of living with quality jobs and competitive wages. We must create opportunities and overcome the economic and social challenges that will arise. In short, we must commit ourselves to the pursuit of excellence, leveraging the ingenuity and creativity of our people.

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David L. Emerson  
Minister of Industry



## Management Representation Statement

### MANAGEMENT REPRESENTATION REPORT ON PLANS AND PRIORITIES 2004-2005

I submit, for tabling in Parliament, the 2004-2005 Report on Plans and Priorities (RPP) for the National Research Council Canada.

This document has been prepared based on the reporting principles and disclosure requirements contained in the *Guide to the preparation of the 2004-2005 Report on Plans and Priorities*.

- It accurately portrays the agency's plans and priorities.
- The planned spending information in this document is consistent with the directions provided in the Minister of Finance's Budget and by TBS.
- Is comprehensive and accurate.
- Is based on sound underlying departmental information and management systems.

The reporting structure on which this document is based has been approved by Treasury Board Ministers and is the basis for accountability for the results achieved with the resources and authorities provided.

Name: \_\_\_\_\_

Date: \_\_\_\_\_



## Vision 2006: Science at Work for Canada

The Vision of the National Research Council (NRC) Canada is about value-creation through science, technology and innovation. It is a source of pride and motivation for NRC employees and it guides their Research and Development (R&D) activities. It is fully endorsed by NRC's governing council and is well grounded by NRC's mandate.

### *NRC's Vision 2006*

*Recognized globally for research and innovation, NRC is a leader in the development of an innovative, knowledge-based economy for Canada through science and technology.*

This Vision is founded on five strategic pillars:

- **EXCELLENCE AND LEADERSHIP IN R&D:** integration of public and private strengths to create new opportunities and meet national challenges for Canada;
- **TECHNOLOGY CLUSTERS:** development of the innovative capacity and socio-economic potential of Canada's communities;
- **VALUE FOR CANADA:** commitment to the creation of new technology-based enterprises, technology transfer and knowledge dissemination to industry;
- **GLOBAL REACH:** access to global research & information networks and science facilities, stimulation of enhanced international opportunities for Canadian firms and technologies; and
- **OUTSTANDING PEOPLE – OUTSTANDING EMPLOYER:** recognition as a leading research organization distinguished by the excellence and creativity of its employees.

## Creating Value for Canada through Science, Technology and Innovation

NRC creates value for Canada through its core strength: over 4,000 talented and dedicated people in 19 research institutes, 2 technology centres, the NRC Industrial Research Assistance Program (NRC-IRAP), and the NRC Canada Institute for Scientific and Technical Information (NRC-CISTI). As an integral element of Canada's scientific and technological (S&T) community, NRC plays a national role in advancing Canada's Innovation Strategy.

NRC works with partners from all sectors to build and improve the Canadian innovation system by nurturing national and international networks and collaborations and by fostering the growth of community-based technology clusters. Mindful of the future needs of knowledge-based industries, NRC generates and disseminates new knowledge, and develops new technologies and technology-based enterprises to help create wealth for Canada.

### NRC creates value for Canada through:

- Advances in scientific knowledge
- National & international networks, linkages and partnerships
- Commercialization and technology transfer
- R&D assistance to Canadian companies
- Creation of new companies and highly skilled jobs
- New and improved technologies
- Community-based technology cluster and innovation initiatives
- Provision of scientific, technical & medical information
- Incubator facilities for young companies
- Standards, codes and measurement activities

Over the past six years, NRC has spun new research-based enterprises out of its laboratories and created 58 firms. To assist the growth of Canadian Small and Medium-sized Enterprises (SMEs), NRC offers supportive trial environments, known as Industry Partnership Facilities (IPF), to fledgling firms. During 2002-2003 a total of 95 firms were incubating at NRC. In addition to these endeavours, NRC has participated in thousands of collaborations, improved its dissemination of technical information and advice and issued hundreds of licenses to commercialize discoveries. The activities represent the creation of mutually profitable alliances, valuable intellectual property and useful technologies. The end result is substantial revenues and economic growth for Canada.

The activities undertaken by NRC and its partners spark opportunities for national economic growth but also provide benefits to the lives of many Canadians on a personal level. NRC encourages co-op students to gain practical experience in its laboratories and offers opportunities for Canadian researchers in exciting new industries. NRC's research portfolio spans the gamut of scientific fields and its applications include, to name only a few, better health advice and medical treatments, a better understanding of our environment and sustainable practices, and improved productivity in transportation, manufacturing and information technologies. Ultimately, NRC's collaborative R&D, technology transfer and commercialization support services help make the lives of Canadians healthier, more productive and more prosperous.

# Section 3

## Plans and Priorities

### The Road Ahead for NRC

NRC recognizes that today's research creates tomorrow's opportunities, and that sustained research efforts will bring social and economic benefits to Canada as well as advance the frontiers of knowledge. With a unique national R&D infrastructure, NRC is well positioned to improve Canada's innovation capacity in existing and emerging fields of research, build networks for researchers and entrepreneurs, train highly qualified personnel, create new technology-based companies and jobs and transfer knowledge and technology.

Moving towards 2006 implies...

- expanding NRC's presence with new facilities across the country, from St. John's to Vancouver;
- pushing the frontiers of knowledge in new domains of research (nanotechnology, fuel cells, photonics and genomics);
- further developing and strengthening technology clusters in St. John's, PEI, Halifax, New Brunswick, Saguenay, Montréal, Gatineau, Ottawa, Winnipeg, Regina, Saskatoon, Edmonton and Vancouver;
- creating new technology-based companies that employ highly skilled workers;
- offering technological and financial assistance to SMEs;
- supporting Canadian industry needs through collaborative research, technical and calibration services;
- strengthening existing international alliances and developing new ones to support Canadian companies; and
- providing access to large-scale international S&T facilities.

### The Context of NRC's Planning

#### The Economic, Business and Social Environment: Building Canada's Niche in the 21<sup>st</sup> Century Economy

The relatively strong economic performance of Canada, despite major disruptions over the past year, including SARS, Mad Cow Disease, power outages in Ontario and major climate-related events, such as forest fires in B.C. and Hurricane Juan in Nova Scotia, bodes well for economic growth in the coming year. The events themselves, however, underline scientific, technological and innovation-related issues that Canada must address if it is to ensure the continued health and safety of its citizens, lessen environmental harm, improve its productivity and remain globally competitive. The ability for Canadians to maintain or improve their enviable standard of living in the future will depend increasingly on our ability to innovate and commercialize new technologies and knowledge in global markets. Over the coming year, the following industrial, social and environmental trends will continue to influence NRC's external operating environment:

*Commercialization:* Canada's Innovation Strategy lays out an ambitious agenda for Canada; the aim is to become one of the most innovative nations in the world. In considering this goal, stakeholders have

identified the commercialization of new technologies in global markets as a prominent concern. NRC will therefore strive to improve Canada's ability to commercialize new knowledge.

*Risk Financing and Technology Ventures:* NRC's impact on the Canadian economy depends on the success of new technology ventures in fast developing fields such as life sciences and biotechnologies, alternative energy technologies, information technologies and photonics. As identified by many stakeholders in the past year, the overall dynamism and health of the Venture Capital and seed-stage investment markets for the growth of NRC-IRAP supported SMEs or start-up firms, spinning out of NRC or incubating in NRC Industrial Partnership Facilities, will be an important planning factor. Financing challenges will be particularly acute in the areas of life sciences and biotechnologies, where the gestation times for technology commercialization are long, and in the photonics sector, where capital costs are high. It will be important to the Canadian economy that firms operating in these sectors can grow and stay in Canada.

*Climate Change and the Environment:* North American economies are among the most energy-intensive in the world as they depend on oil, natural gas and coal. Given the declining reserves and increasing costs of these conventional fossil fuels, our continued prosperity will rely on accelerating the development of alternative energy supply and infrastructure. The environmental damage caused by the burning of fossil fuels is another incentive to develop alternative energy resources. NRC intends to reinforce its research efforts in alternative energy for both reasons.

*Relations with the United States:* The United States is our most important trading partner. With them, we share cultural, economic and scientific ties, and our security interests are inextricably linked. NRC has numerous linkages with US partners in all of our R&D activities. NRC will continue to work with other departments and agencies in the Canadian Federal government in its efforts to improve our S&T relations in areas such as border security and to expand our trade and technology presence.

*Transitional Economies:* The challenges facing developing and many transitional economy countries are extensive in their nature and scope, including chronic under-nourishment, poverty, infectious diseases and environmental stress. Underlying the gaps between the developed and developing worlds are inequities in knowledge and innovative capacity. Developed countries such as Canada have not fully marshalled their science and technology capacities to address international development challenges in partnership with developing or transitional economy countries.

### **The Machinery of Government and Expenditure Review**

On December 12, 2003, the new Prime Minister announced the membership of his Cabinet and began a series of changes within government and Parliament. Two developments will have a particular impact on NRC: the appointment of a National Science Advisor to the Prime Minister (effective April 1, 2004) and the appointment of a Parliamentary Secretary for Science and Small Business.

The National Science Advisor will provide advice on issues related to research and the impact of science considerations on public policy. The Advisor will work with the Advisory Council on Science and Technology (ACST) in developing S&T priorities and directions.

The Parliamentary Secretary is a member of the Queen's Privy Council. Reporting directly to the Prime Minister, the secretary will work with the National Science Advisor in fostering a government-wide

emphasis on science. In particular, the Parliamentary Secretary will examine ways in which small business can leverage science and research and development by increasing its access to expertise and knowledge transfer. Assisting small- and medium-sized businesses with technological, commercialization and other support is a core role for NRC, and any recommendations brought forward by the Parliamentary Secretary will also likely have an impact on NRC.

The government has also set up a new Expenditure Review Committee, chaired by the President of the Treasury Board, to review all programs and expenditures. The Committee will submit its first set of recommendations to the Prime Minister in the fall of 2004. Again, this may affect NRC's planning, as will the December 16, 2003 announcement of immediate measures to control costs for fiscal year 2003-04.

The release of the Auditor General's Value for Money audit of NRC in March 2004 will also strongly influence the organization's program and research management processes over the planning period as NRC responds to and implements the recommendations to be outlined in the report.

## **Linking NRC Plans and Priorities to Government Objectives**

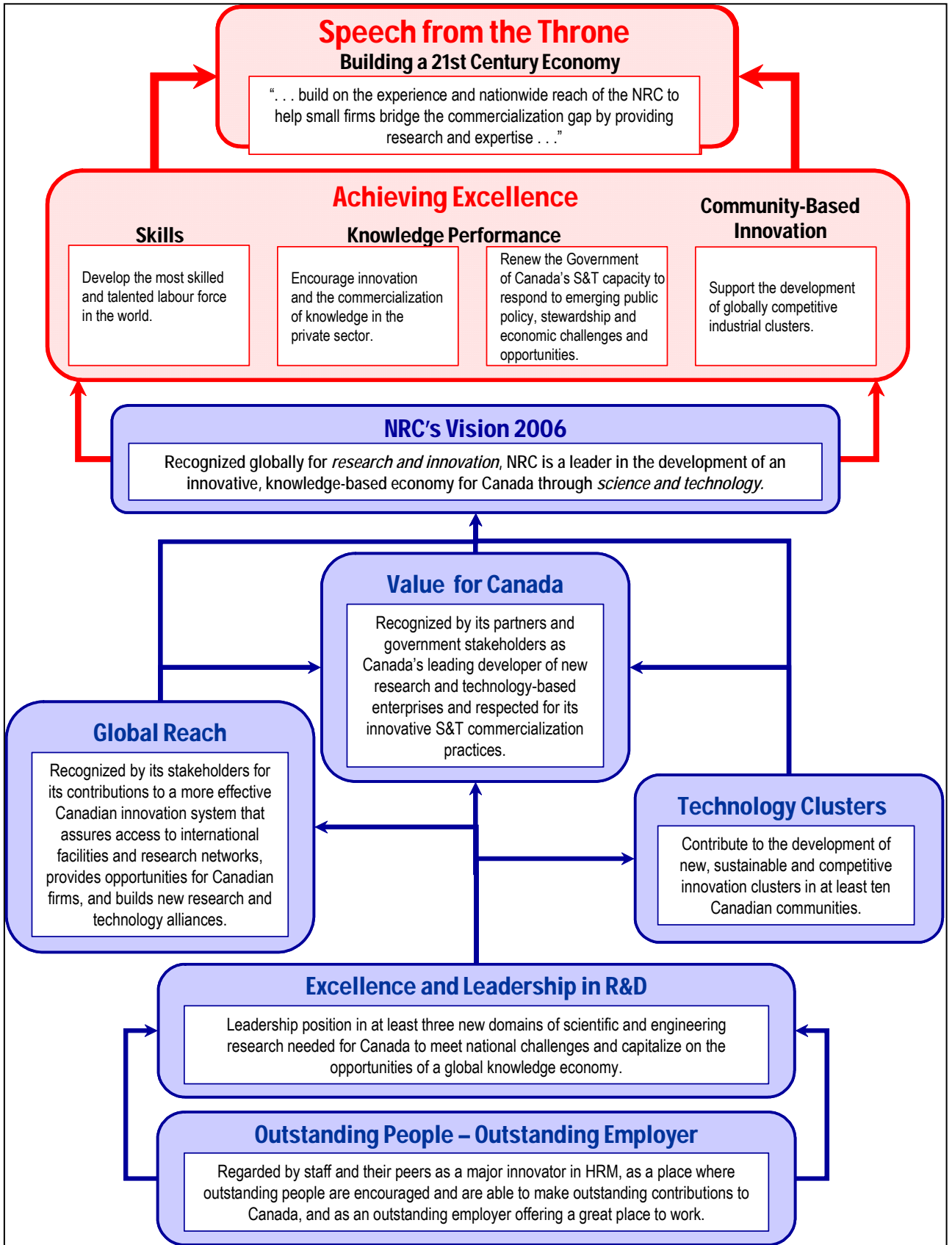
NRC has developed a results-based performance management framework against the goals and strategic outcomes of its vision. The following pages include a graphical outline that demonstrates consistency between NRC's *Vision 2006* and Canada's innovation priorities as expressed in the 2004 Speech from the Throne (*Figure 1*) and a list of plans and priorities, and key planned results that NRC's Senior Executive Committee has decided on for the planning period (*Table 1*).

Appendix D gives an overview of the linkages between NRC's Vision 2006 and the President of the Treasury Board's annual report to parliament, *Canada's Performance*.<sup>1</sup>

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<sup>1</sup> Please see *Canada's Performance* on-line at [http://www.tbs-sct.gc.ca/report/govrev/03/cp-rc\\_e.html](http://www.tbs-sct.gc.ca/report/govrev/03/cp-rc_e.html).

Figure 1: Ties between NRC's Vision Statement and the Government's Speech from the Throne 2004





**Table 1: Summary of NRC's Plans, Priorities and Key Result Commitments (2004-2005)**

STRATEGIC OUTCOMES	PROPOSED PLANS AND PRIORITIES	KEY PLANNED RESULTS
<i>Excellence and Leadership in R&amp;D</i>	<ul style="list-style-type: none"> <li>▪ Increase horizontal R&amp;D programs particularly in emerging areas of S&amp;T</li> <li>▪ Develop and enhance research programs in nanotechnology, nutrisciences and health, oceans technologies and alternative energy technologies</li> <li>▪ Renewal of Genomics and Health Initiative funding</li> </ul>	<ul style="list-style-type: none"> <li>▪ Leadership position in at least three new domains of research of importance to Canada</li> <li>▪ Build Canada's technology capacity, improve its R&amp;D performance and support the needs of Canadian industry in emerging R&amp;D areas;</li> <li>▪ Develop knowledge of key importance for health, safety, the environment and economic development</li> </ul>
<i>Technology Clusters</i>	<ul style="list-style-type: none"> <li>▪ Continue activities to build technology clusters across Canada.</li> <li>▪ Complete assessment of progress on NRC's Atlantic Innovation Partnership technology clusters activities in the Atlantic Provinces</li> <li>▪ Complete and open Industrial Partnership Facilities (IPF) in Halifax, Winnipeg and continue building new R&amp;D and IPF facilities in Charlottetown, Montréal, Ottawa, Regina, and Edmonton.</li> </ul>	<ul style="list-style-type: none"> <li>▪ New, sustainable and competitive technology clusters in at least ten Canadian communities</li> <li>▪ Prepare case to government for continued funding of the Atlantic Cluster Program</li> <li>▪ An integrated national network of industrial partnership facilities offering incubation services for high tech startup enterprises</li> </ul>
<i>Value for Canada</i>	<ul style="list-style-type: none"> <li>▪ Create new technology-based companies</li> <li>▪ Improvement of Intellectual Property Management systems</li> <li>▪ Increase the IPF occupancy and graduation rates for Canadian start-ups</li> <li>▪ Transfer NRC technologies to Canadian companies through licensing agreements and collaborative research</li> <li>▪ Implementation of IRAP strategic plan with the emphasis on the needs of medium-sized businesses and on helping more businesses grow from small to medium size</li> <li>▪ Ensure Canadians have ready access to scientific, technical and medical information to support research and innovation</li> <li>▪ Improved building, construction and urban infrastructure codes system in Canada</li> </ul>	<ul style="list-style-type: none"> <li>▪ New technology-based companies providing highly-qualified jobs to Canadians and stimulating new foreign investment in Canada</li> <li>▪ Enhanced innovation capacity of companies and socio-economic growth through the diffusion of NRC technologies</li> <li>▪ Enhanced innovation capacity of Canadian SMEs through technological advice and project financing</li> <li>▪ Integrated national and international network of scientific, technical and medical information resources readily available to Canadians</li> <li>▪ Publication of objective-based codes and guides to support the construction industry and promote innovation in this sector</li> </ul>

STRATEGIC OUTCOMES	PROPOSED PLANS AND PRIORITIES	KEY PLANNED RESULTS
<i>Global Reach</i>	<ul style="list-style-type: none"> <li>▪ Development and enhancement of strategic bi-lateral alliances with key innovation partners in Europe, Asia, Latin America and the US</li> <li>▪ ISO/IEC 17025 accreditation for the Institute for National Measurement Standards (NRC-INMS)</li> <li>▪ Prepare case of funding of new five year plan for Tri-University Meson Facility (TRIUMF)</li> <li>▪ Continued implementation of astronomy and astrophysics Long Range Plan (LRP)</li> </ul>	<ul style="list-style-type: none"> <li>▪ Raise the profile of Canada as an S&amp;T country, through new relationships and access and disseminate the knowledge from abroad to Canadians</li> <li>▪ Enhanced innovation capacity of Canadians SMEs through international ventures and partnerships</li> <li>▪ Harmonize international measurements standards to support international trade</li> <li>▪ Canadian participation in leading-edge international science activities and development of large-scale S&amp;T infrastructure of importance for the Canadian scientific and engineering community</li> </ul>
<i>Outstanding People – Outstanding Employer</i>	<ul style="list-style-type: none"> <li>▪ Recruit outstanding people</li> <li>▪ Develop leadership at all levels</li> <li>▪ Build cross functional and cross cultural capability</li> <li>▪ Align compensation and reward practices</li> </ul>	<ul style="list-style-type: none"> <li>▪ Modernization of NRC's recruiting and hiring practices</li> <li>▪ Revitalized leadership and Management Development Programs</li> <li>▪ More effective management of horizontal initiatives</li> <li>▪ Modernization of pension reform</li> </ul>

## Excellence and Leadership in R&D

**Outcome:** By 2006, NRC will assume a leadership position in at least three new vital domains of scientific and engineering research needed for Canada to meet national challenges and capitalize on the opportunities of a global knowledge economy.

### Strategies and Goals:

- Leadership in new and emerging research domains
- Excellence in R&D and innovation
- Stewardship of large-scale S&T infrastructure
- Contribution to federal strategies and initiatives
- Research that benefits Canadians

### Performance Indicators:

- Publications in refereed journals/proceedings & technical reports
- Citations comparison
- External grants
- Leadership and contribution to Federal horizontal initiatives
- Multi-researcher networks and centres of excellence

Canada faces major challenges in areas such as industrial competitiveness and productivity, sustainable development and the environment, health care, and security. As a dynamic national R&D organization, NRC helps address these challenges by conducting strategically focused collaborative research in emerging fields of science and engineering with industry, academia and government, to build the technology capacity that Canada will need to succeed in the years ahead.

## Plans and Priorities:

PROPOSED PLANS AND PRIORITIES	KEY PLANNED RESULTS
<ul style="list-style-type: none"> <li>▪ Increase horizontal R&amp;D programs particularly in emerging areas of S&amp;T</li> <li>▪ Develop and enhance research programs in nanotechnology, nutrisciences and health, oceans technologies and alternative energy technologies</li> <li>▪ Obtain renewal of Genomics and Health Initiative funding</li> </ul>	<ul style="list-style-type: none"> <li>▪ Attain a leadership position in at least three new domains of research of importance to Canada</li> <li>▪ Build Canada's technology capacity, improve its R&amp;D performance and support the needs of Canadian industry in emerging R&amp;D areas</li> <li>▪ Develop knowledge of key importance for health, safety, the environment and economic development</li> </ul>

### *Leadership in Emerging Research through Increased Horizontal and Multidisciplinary R&D*

Research leadership is at the core of NRC's mission and mandate. The coming years will see the emergence of totally new technologies resulting from research that cuts across traditional disciplines in biology, physics, chemistry, information technology, materials science and manufacturing.

Over the coming year, NRC will emphasize multidisciplinary R&D initiatives, within NRC and with other leading research institutions in Canada and internationally, that will help leverage resources

towards fields with the greatest potential long-term benefits for Canada. Key areas of focus will be in the following:

### **Nanotechnology**

Nanotechnology has emerged over the past decade as a scientific and technological priority among virtually all of the leading industrialized countries within the Organization for Economic Co-operation and Development (OECD). To help position Canada internationally in this exciting new field, the NRC National Institute for Nanotechnology (NRC-NINT) has engaged in a partnership with the province of Alberta and the University of Alberta. Focused and strategic research programs for nanotechnology will be devised through this partnership.

NRC-NINT takes a systems-level view of nanotechnology while studying the assembly of nanoparticles, atoms, molecules, or macromolecules, defined by critical length scales between 1 and 100 nanometres. NRC's research efforts in this field can result in the development of new materials, devices and processes. The long-term goal of NRC-NINT, however, is to achieve a successful combination of synthetic and biological materials in devices that are "smart"—meaning that they are self-assembled, powered by their chemical surroundings, can be programmed for specific functions and are able to sense and respond to changes in their physical environments.

NRC-NINT will also be the catalyst for the development of horizontal research programs across NRC. Over the coming year, NRC plans to deliver on the following commitments to achieve its goals in nanotechnology:

- Initiate multi-disciplinary research between NRC institutes bridging nanotechnology, biotechnology, medicine and new materials;
- Develop new knowledge and potential applications in the field of nano-electronics and quantum information technology through NRC's Institute for Microstructural Sciences;
- Complete a strategic plan that positions NRC-NINT's nanotechnology research within the context of the NRC - University of Alberta collaboration and the development of the Edmonton nanotechnology cluster;
- Develop partnerships with leading national and international nanotechnology research institutions;
- With partners across the federal government, establish a stewardship framework that addresses the implications of nanotechnology from a regulatory, societal and ethical perspective; and
- Establish alliances and networks with key nanotechnology stakeholders in industry, academia, and government, both in Canada and internationally.<sup>2</sup>

### **Life Sciences, Genomics and Health research**

As a major player in the Canadian Biotechnology Strategy, NRC's Biotechnology Group launched the Genomics and Health Initiative (GHI) in 1999 to bring the benefits of revolutionary advances in genomics, proteomics and health research to a variety of Canadian industrial sectors and regions. With this initiative, NRC, in collaboration with other federal agencies, industries and universities, is making key contributions to national efforts in the areas of genomics and health research.

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<sup>2</sup> For more information on NRC-NINT and nanotechnology at NRC please see: <http://nint-innt.nrc-cnrc.gc.ca/>.

GHI represents an investment of more than \$75 million from 2002 to 2005, most of which is invested in research programs involving partnerships between two or more NRC institutes. Approximately \$43 million of the total investment in this initiative is funding that NRC has reallocated from the base budgets of its Biotechnology institutes in order to match federal contributions of \$33 million. Over the three-year period of this program, NRC has more than tripled its internal expenditures in genomics research.

NRC organized a genomics workshop with its federal research partners to develop a shared vision on the future of genomics at NRC for the 2005-2008 third phase of GHI and is now launching the selection process. NRC has taken stock of lessons learned from the first two phases of the GHI and remains committed to the use of modern research management in this initiative, including external peer review and assessment of proposals by an Expert Panel that includes industry representation. NRC anticipates that this consultative process will lead to exciting new ideas and promising strategies for NRC's Genomics and Health Initiative; these might involve more frequent collaboration with partners outside NRC, new programs that enable greater horizontal integration across the institutes, and stronger management at the level of individual programs.<sup>3</sup>

NRC and the Canadian Institutes of Health Research (CIHR) have worked together to provide funding, in the form of peer-reviewed grants, for health-related research and development. The NRC-CIHR Science and Technology Convergence for Health Innovation Program has already received several project proposals. It is anticipated that three projects will be funded in 2004-2005. The competition, in this case, called for joint proposals that involved an innovative, multi-disciplinary approach to a health research question in any of the following three areas:

- nanomaterials and nanorobotics in the area of health and regenerative medicine;
- biophotonics applied to health; and
- diagnostic imaging.

In October 2003, NRC's governing Council approved the strategic plan for NRC's Institute for Biological Sciences (NRC-IBS). Over the next five years NRC-IBS will focus on infectious diseases and age-related neurological disorders through genomics and proteomics research in glycobiology.

The sequencing of the human and other genomes has resulted in a tremendous upsurge of activity to understand the function of genes and their protein products, and this comprehensive understanding of biological processes promises to enhance our ability to diagnose and treat diseases more specifically and more effectively. Genomics and proteomics are also the keys to understanding further translation of molecular messages in cells, tissues and organs. The role of carbohydrates may be particularly important in these processes.

Glycobiology is the study of carbohydrate biology. Its application to drug discovery and development is increasingly interesting to the research and industrial communities. NRC-IBS is already uniquely positioned in Canada in the area of prokaryotic glycobiology and can build on its strength to develop expertise in eukaryotic glycobiology to address both infectious and neurological diseases. The main initiatives will focus on establishing a lead role for the Institute in the Canadian and international

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<sup>3</sup> For more information on NRC's Genomics and Health Initiative, please see: <http://ghi-igs.nrc-cnrc.gc.ca/>.

glycobiology community and taking a leadership position in neurogenomics, neuroproteomics and neuroglycomics in the Ottawa region, in Canada and in the international arena.

In addition, the institute recognized that it was strongly positioned to work with other NRC institutes and external partners to integrate complementary technologies such as nanotechnology, materials science, photonics, and information technology into its research programs. These "convergence technologies" have the potential to become a driver of both discovery and innovation in areas of disease diagnosis, drug delivery and restorative / regenerative medicine.

### Hydrogen and Fuel Cells

The Government of Canada announced the National Fuel Cells Initiative in 1999 and designated \$20 million over five years for the initiative in 2001. NRC has reallocated between \$3 million and \$4-million annually towards fuel cell research and technology development in parallel support to this initiative. More recently, in October 2003, the Federal Ministers of Industry and Natural Resources announced funding in support of the Hydrogen Economy and to stimulate hydrogen R&D and demonstration projects. A total of \$7 million over five years has been allocated to NRC and will be applied to its Horizontal Fuel Cell and Hydrogen Program. NRC has committed to reallocating a further \$15 million of existing resources towards hydrogen research over the five years as a matching contribution. These significant investments in fuel cell research are likely to pay dividends, as there will be a projected \$46 billion world market for fuel cells by 2011.

The lead institute for fuel cell R&D at NRC is the new Institute for Fuel Cell Innovation (NRC-IFCI) - formerly Innovation Centre - in Vancouver. NRC's Governing Council approved the institute's first strategic plan in June 2003. NRC-IFCI will implement this plan through collaborations and consortia with universities, leading fuel cell developers, and parts and components suppliers. The plan is fundamentally geared towards the development of core competencies relevant to the long-term technology needs of the Canadian industry.

Canada currently leads in three main fuel cell technology thrusts: Proton Exchange Membranes (PEM), Solid Oxide Fuel Cells (SOFC) and Direct Methanol Fuel Cells. PEM and SOFC technologies, in particular, are widely expected to dominate the booming fuel cell market of the future. NRC-IFCI will focus, therefore, on filling any research gaps in PEM and SOFC for the next generation of fuel cell research. NRC-IFCI will also provide facilities and expertise in fuel cell testing and evaluation; a \$1.5 million environmental test chamber is scheduled to begin operation in March 2004.

Furthermore, NRC-IFCI will be responsible for the NRC-wide, externally peer-reviewed Horizontal Fuel Cell and Hydrogen Program. Over the planning period, NRC will be implementing the enhanced Horizontal Fuel Cell and Hydrogen Program using modern research management practices for horizontal initiatives, modelled after NRC's Genomics and Health Initiative (GHI).<sup>4</sup> The program will mobilize fuel cell expertise and research strength from a network of NRC research institutes across Canada through a coordinated national program that will help build a strong Canadian fuel cell industry.

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<sup>4</sup> For more information on NRC's Fuel Cell Program, please see: <http://ifci-iipc.nrc-cnrc.gc.ca/>.

## *Contributing to Federal Strategies through Leading-Edge Research*

The Government of Canada is committed to leveraging our scientific and research expertise to address national, social and economic challenges. NRC, as an integral part of the Federal government's research infrastructure, continues to make important contributions to these efforts. Over the planning period, in addition to the implementation of Canada's Biotechnology Strategy, NRC will be an active and value-adding participant in a number of other government initiatives, with particular emphasis on two key areas: Climate Change and Marine and Oceans research. *Appendix B* provides an overview of NRC's contributions to other government-wide initiatives.

### Climate Change and the Environment

NRC will continue to build upon and enhance existing programs that contribute to Canada's commitment to reduce greenhouse gas emissions and improve the environment. In addition to on-going efforts in fuel cells, manufacturing processes, construction, aerospace and bioprocesses, priorities over the planning period will include the implementation of the strategic plans developed by NRC's Institute for Chemical Process and Environmental Technology (NRC- ICPET) and NRC's Institute for Research in Construction (NRC-IRC), which were approved by NRC's governing Council in October 2003.<sup>5</sup>

NRC-ICPET will now focus on two major research thrusts: energy-oriented processes and solution-driven materials, concentrating on the environmental and economic aspects of three primary areas of industry applications:

- *Fuel cells*: in collaboration with NRC-IFCI and other partners to support the emergence of a hydrogen economy in Canada;
- *Oil sands efficiency*: contribute to efficient exploitation of this important resource, while ensuring integration of NRC-ICPET's research activities with those of provincial and federal stakeholders; and
- *Bioproducts*: focus on climate change and expanded markets for the agricultural and bioresource sector, where renewable resources are seen as an alternative to fossil fuel based feedstocks, in concert with provincial-level organizations and the recently created Bioproducts Canada Inc.

The institute will engage the chemistry-intensive industry in the definition and adoption of total solutions where chemical process technologies, materials, and modeling and simulation can have the greatest impacts. This strategy will result in the development of new technologies to improve the sustainability of industry operations, especially through greenhouse gas reduction.

NRC-IRC will also be implementing its strategic plan over the planning period to respond to the new strategic directions of the Canadian construction sector and the imperatives of climate change. The Canadian built environment continues to evolve as the construction industry adapts to changes in societal needs. As the Canadian industry strives for increased productivity to gain competitive advantage in a global market place, changing societal expectations demand new technology and solutions in areas such as health, security, and sustainability. Through its new five-year strategic

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<sup>5</sup> For more information on NRC-ICPET and NRC-IRC, please see: <http://icpet-itpce.nrc-cnrc.gc.ca/> and <http://irc.nrc-cnrc.gc.ca/>.



plan, NRC-IRC will pursue several new initiatives in collaboration with national and international partners to respond to the evolving needs of Canada's construction sector, including:

- aligning activities with government priorities on sustainable urban infrastructure and climate change mitigation and adaptation;
- creating a cross-program IRC initiative in sustainable built environments, including a new regional component on sustainable northern communities;
- creating a cross-program initiative on the effect of the indoor environment on the health of occupants; and
- developing construction process technologies to improve the productivity of the construction industry.

### National Marine and Ocean Industry Roadmap

The NRC-led Marine and Ocean Industry Roadmap<sup>6</sup>, released in the spring of 2003, involved the whole of the ocean industry, including nationally over 250 firms from the shipbuilding, offshore oil and gas, marine operations, fishing and aquaculture, and ocean technology industries. It also involved participants from several government departments, including: Industry Canada, Fisheries and Oceans Canada, Natural Resources Canada, Environment Canada, Transport Canada, The Canadian Space Agency and a number of provincial government agencies, as well as Canadian universities, unions and non-government research organizations.

The development of an Oceans Action Agenda is being considered by the Parliamentary Secretary to the Minister of Fisheries and Oceans, who has been charged with the implementation of the roadmap. Over the coming year, NRC will assist in this process through, among others, the NRC Ocean Technology Institute (NRC-IOT), the IRAP Network of Ocean Technology Industrial Technology Advisors and implementation of four Technology Demonstration Projects, which are high on the list of opportunities identified through the roadmap process. Some preliminary work has been accomplished on the projects. These particular projects were chosen for their policy relevance and geographical distribution. The projects include:

- a traffic pattern and security and defence project on the lower St. Lawrence River Valley and its Gulf Region;
- a marine safety project (including ship to ship, ship to small vessel and ship to marine life interactions) on Placentia Bay, Newfoundland;
- an ice movement, ice management, ice monitoring project in the Arctic Archipelago that would involve climate change and northern science; and
- an oil and gas exploration, development and use of ocean space project (including environmental, recreational and aboriginal uses) in the Hecate Strait/Dixon Entrance/Gulf of Georgia Region.

All of the projects will use ocean-mapping technologies. Horizontal cooperation and integrated management of the four projects will require the involvement of the following partners: federal and provincial governments, university and college research interests, various industry segments, and other important stakeholders in civil society and the First Nations.

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<sup>6</sup> For more information on the Marine and Ocean Industry Roadmap please see: <http://route.nrc-cnrc.gc.ca/ocean>.



## Technology Clusters

**Outcome:** By 2006, NRC will contribute to the development of new, sustainable and competitive innovation clusters in at least ten Canadian communities.

**Strategies and Goals:**

- Competitive research and development base for cluster development
- Community involvement in technology cluster – local leadership and strategies
- Impacts of technology cluster activities

**Performance Indicators:**

- Community participation
- Incubating firms and co-locating firms
- Investment to the cluster
- Venture capital to the cluster
- New companies to the cluster

NRC is committed to catalyzing the growth of locally based technology clusters across Canada. NRC’s technology cluster strategy builds on existing local strengths by developing and transferring NRC R&D capabilities to industry, pulling together community strengths and supporting SMEs through NRC-IRAP. The

“The Research Institutes of the National Research Council Canada form the nuclei of technology clusters in areas such as biotechnology, aerospace, fuel cells and nanotechnology across Canada.”

*Achieving Excellence 2002*

ultimate benefit for Canadians of NRC’s strategy is the emergence of globally competitive, community-based technology clusters leading to higher productivity, new jobs and expanded trade. NRC proactively engages local stakeholders to foster networking, leadership and knowledge sharing. Over the past four years, NRC has been provided resources to implement its national Technology Cluster Strategy. This includes \$110 million over five years in June 2000 to develop clusters as part of the Atlantic Initiative and \$230 million over six years in the Budget of 2001 to expand cluster initiatives across Canada. The Budget of 2003 announced two new regional innovation initiatives in Charlottetown (Prince Edward Island), and in Regina (Saskatchewan). The allocation of new funding for the implementation of NRC’s Cluster Strategy is outlined in *Table 2*.

Location	Focus	Timeframe	Resources
St. John’s (NF)	Ocean and marine technology	2000-01 – 2004-05	\$ 25 million
Halifax (NS)	Aquaculture and genomics	2000-01 – 2004-05	\$ 30 million
Fredericton (NB), Sydney (NS)	e-Business and wireless	2000-01 – 2004-05	\$ 40 million
Charlottetown (PEI)	Nutrisciences and Health	2003-04 – 2007-08	\$ 20 million
Saguenay-Lac-Saint-Jean (QC)	Aluminium	2002-03 – 2006-07	\$ 30 million

Location	Focus	Timeframe	Resources
Montréal (QC)	Biopharmaceuticals Aerospace	2002-03 – 2006-07	\$ 5 million \$ 20 million
Gatineau (QC)	Language technologies	2003-04 – 2007-08	\$10 million
Ottawa (ON)	Photonics Aerospace	2002-03 – 2006-07	\$ 30 million \$ 20 million
Winnipeg (MB)	Medical diagnostics	2002-03 – 2006-07	\$ 10 million
Saskatoon (SK)	Plant biotechnology	2002-03 – 2006-07	\$ 10 million
Regina (SK)	Sustainable urban infrastructure	2003-04 – 2004-05	\$ 10 million
Edmonton (AB)	Nanotechnology	2002-03 – 2006-07	\$ 60 million
Vancouver (BC)	Fuel Cells	2002-03 – 2006-07	\$ 20 million

### Plans and Priorities:

PROPOSED PLANS AND PRIORITIES	KEY PLANNED RESULTS
<ul style="list-style-type: none"> <li>▪ Continue activities to build technology clusters across Canada</li> <li>▪ Complete assessment of progress on NRC's Atlantic Innovation Partnership technology clusters activities in the Atlantic Provinces</li> <li>▪ Complete and open Industrial Partnership Facilities (IPF) in Halifax, Winnipeg and continue building new R&amp;D and IPF facilities in Charlottetown, Ottawa, Montréal, Regina and Edmonton.</li> </ul>	<ul style="list-style-type: none"> <li>▪ New, sustainable and competitive technology clusters in at least ten Canadian communities</li> <li>▪ Prepare case to government for continued funding of the Atlantic Cluster Program</li> <li>▪ An integrated national network of industrial partnership facilities offering incubation services for high tech startup enterprises</li> </ul>

### *Helping to Build Technology Clusters across Canada*

#### Newfoundland – Ocean and Marine Technologies

The NRC Institute for Ocean Technology's (NRC-IOT) (formerly Institute for Marine Dynamics) Industrial Partnership Facility (IPF) was opened on schedule in October 2003.<sup>7</sup> The IPF has the potential to become an anchor to the cluster by helping companies working in fields related to ocean and marine technology development. NRC-IOT will continue to reach out for collaboration opportunities with Memorial University, the province and locally based industry partners such as Oceans Advance, a working group for the St. John's community cluster, based on the findings of the Marine and Ocean Industry Roadmap, completed in 2003.<sup>8</sup>

<sup>7</sup> For more information on Industry Partnership Facilities, please see section entitled "Strategy for Industry Partnership Facilities", on page 26 of this document.

<sup>8</sup> For more information please see: <http://iot-ito.nrc-cnrc.gc.ca/>.

## Prince Edward Island – Nutrisciences and Health

The Government of Canada, through the Atlantic Canada Opportunities Agency (ACOA) and NRC will invest a total of \$28 million over the next five years to help construct a new facility and to establish the NRC Institute for Nutrisciences and Health (NRC-INH) at the University of Prince Edward Island (UPEI) in Charlottetown. The Province of Prince Edward Island is contributing \$3.5 million to the project.

Construction of the facility will begin in the summer of 2004 with completion anticipated by early 2006. Approximately \$13.5 million is allocated for the construction of the 50,000 sq. ft. facility, which will house NRC research officers, UPEI faculty, administrative staff, and an industrial partnership facility. Research and technical officers are currently being recruited. It is estimated that approximately 10 – 12 research officers as well as supporting researchers, including technical officers, research assistants, post-doctoral fellows, graduate students and visiting scientists will work at NRC-INH. Primary research on dietary constituents, nutraceuticals, bioactives and bioresources will be linked to health outcomes primarily through the study of *in vitro* and *in vivo* model systems. Areas of interest include neuroscience, infection and immunity, obesity-related disorders, as well as bioactives development. These resources and the vision for the NRC-INH will form the cornerstone of a PEI technology cluster.

## Nova Scotia – Marine Biosciences

The NRC Institute for Marine Biosciences (NRC-IMB) is committed to playing a leadership role in the development of a thriving life sciences cluster in the Atlantic region through activities such as working with Genome Atlantic to manage a state of the art high throughput DNA sequencing platform for the community and the Canadian Bioinformatics Resource for life science applications. The NRC Institute for Biodiagnostics (NRC-IBD) is operating the *Brain Repair Centre* in Halifax. Over the course of the past three years, NRC has reallocated \$5 million of internal funding in support of these two initiatives (\$4.8M and \$1.2M respectively). Within the coming year, NRC will complete the construction of a new IPF and is targeting 75% occupancy by 2005. As co-chair, NRC is working closely with the Halifax-based Life Sciences Development Association to achieve the local clustering goals.<sup>9</sup>

## New Brunswick and Cape Breton (Nova Scotia) – e-Business and Wireless Technologies

NRC's Institute for Information Technology (NRC-IIT) is managing a recent addition to New Brunswick's e-Business cluster. NRC's *e-Business Centre* in Fredericton was officially opened in March 2003. Twenty-four key researchers now staff New Brunswick's three e-Business labs. These recruits hail from countries all over the world and they have brought both diverse expertise and important networks of contacts to the province. Future hiring will aim at expanding the scope of the research team even further, which reflects the multidisciplinary nature of research in e-Business.

Having ramped up so successfully and quickly, the focus in the year ahead will be consolidation and sustainability, i.e., delivery on the promises made to stakeholders. The NRC strategy will continue to focus on building an e-Business cluster in New Brunswick involving all types of Internet transactions,

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<sup>9</sup> For more information on the NRC Institute for Nutrisciences and Health and the Halifax Life Sciences cluster please see: <http://imb-ibm.nrc-cnrc.gc.ca/>.

including patient-to-doctor (e-Health, Saint John), teacher-to-student (e-Learning, Moncton), and citizen-to-government (e-Government, Fredericton). To date NRC has reallocated \$2.5 million of internal funding in support of the New Brunswick e-Business cluster. The execution of the strategy will rely on the building of linkages such as:

- promotion and use of the completed broadband link and construction of labs to provide infrastructure missing from a regional landscape of SMEs;
- participation on the boards of influential organizations such as CANARIE and eNB.ca, the Province of New Brunswick's strategic partnership to advance the digital economy;
- active involvement in Atlantic Innovation Fund projects with private-sector, public-sector, and academic partners;
- continued participation in national multi-partner projects such as eduSource;
- alignment with agendas of provincial, federal and industry partners (such as the NB Innovation Foundation);
- partnership in the development of a national Privacy, Security, and Trust network (PSTnet); and
- continued cultivation of a strong relationship with the University of New Brunswick and other academic institutions.<sup>10</sup>

#### Quebec – Aerospace Manufacturing, Biopharmaceuticals, Aluminium and Materials Technologies, and Language Technologies

The NRC *Aerospace Manufacturing Technology Centre (AMTC)*, being built on the campus of Université de Montréal, will be completed in 2004. NRC's Institute for Aerospace Research will be responsible for the centre. NRC has been successful in strengthening its links with key stakeholders in Montréal's aerospace manufacturing sector contributing to its objective to foster a globally competitive cluster. Since the announcement of the Government of Canada's commitment to the aerospace cluster in Montréal through the creation of AMTC, NRC has reallocated approximately \$6 million of internal resources in support of this initiative and the related *Gas Turbine Environmental Research Centre (GTERC)* in Ottawa. Over the coming year, AMTC will begin in-house and collaborative research programs. It is expected that the centre's staff will double before it officially begins operations in the new building in the spring of 2004. The AMTC research program will focus on:

- automation, robotics and intelligent manufacturing systems;
- forming and joining of metallic structures;
- fabrication and joining of composite structures;
- material removal; and
- functional materials and sensors.<sup>11</sup>

The NRC Biotechnology Research Institute (NRC-BRI) is strongly positioned within the biopharmaceutical and environment clusters at regional, national and

#### NRC Contributes to World Health through ProMetic Partnership

In October 2003, one of NRC BRI's partners, the Montreal-based ProMetic Life Sciences, announced that it would set-up a company in Tunisia to manufacture and commercialize affordable drugs designed to combat cancer and hepatitis to a potential market of 500 million people in Africa, the Middle East, and parts of Europe. Scheduled for completion by 2006, the market opportunity is estimated at over \$2 billion CDN.

<sup>10</sup> For more information on the NRC activities in support of the New Brunswick and Cape Breton e-business and wireless clusters as well as for the Language Technology Centre in Gatineau, Québec, please see: <http://iit-iti.nrc-cnrc.gc.ca/>.

<sup>11</sup> For more information on the NRC activities in support of the aerospace cluster in Montréal please see: [http://iar-ira.nrc-cnrc.gc.ca/manuf\\_main.html](http://iar-ira.nrc-cnrc.gc.ca/manuf_main.html).

international levels. Last year, NRC-BRI was involved in the attraction of a major biopharmaceutical investment to the region. The \$300 million investment by DSM Biologics, for a large-scale biopharmaceuticals plant adjacent to the NRC-BRI site in Montréal, was formalized in May 2003. This new multi-product facility will provide the infrastructure for the production of monoclonal antibodies and recombinant proteins based on mammalian cell culture technology. This is a new generation of drugs representing the most promising and strongly growing segment of the pharmaceutical industry. With the completion of this project, Montréal will be a world-leading manufacturing centre of biopharmaceuticals.

Last year, NRC-BRI was involved in 62 Canadian and international R&D collaborations with companies and other partners. Many of these multi-year partnerships, valued at \$50 million, will continue in 2004-2005. Examples include:

- the NRC/Biophage Pharma Inc. project for the development of biosensors that rapidly identify both human and animal diseases; and
- the NRC/ProMetic Life Sciences Inc. project for the production and biopurification of therapeutic proteins.

The NRC *Aluminium Technology Centre (ATC)*, for which NRC's Industrial Material Institute (NRC-IMI) will be responsible, is currently being established. ATC will be located on the campus of the University of Québec in Chicoutimi with a planned critical mass of 60 NRC employees. It will provide industry with the technical support and expertise required to develop value-added aluminium-based products and services and support SME access to emerging technologies. Aiming to strengthen the national R&D infrastructure with academia and other laboratories, NRC will continue to work with regional stakeholders to catalyze the development of an aluminium technology cluster in the Saguenay region. The opening of the centre is scheduled for fall 2004.

On October 27, 2003, The Honourable Claude Drouin, Secretary of State for Canada Economic Development (CED) inaugurated the Crossroads for Industrial Materials Innovation (CIMI) a technological incubator in Longueuil, Québec. This initiative is a partnership between CED (\$6M), NRC (\$5.3M) and Valotech. Over the next five years, CIMI should yield such benefits as the establishment and development of some 20 firms in the industrial materials and manufacturing sector and the creation of more than 150 new jobs by emerging enterprises.<sup>12</sup>

On March 12, 2003, the federal government announced new funding of \$10M over five years to NRC to create a *Language Technology Research Centre (LTRC)* in Gatineau, QC. As part of the Government's Action Plan on official languages, the centre will conduct R&D activities in multilingual processing technologies in collaboration with government, industry and university partners, including the Université du Québec en Outaouais and the Translation Bureau. Subsequent to the announcement, the funding for the *Language Technology Research Centre (LTRC)* was made continuous. Over the coming year, NRC and its partners will decide on the centre's research priorities, participate in the Technology Road Map and staff the initial NRC research group.

#### Ontario – Photonics and Aerospace

NRC, in partnership with Carleton University, and with \$43 million in new funding from the Governments of Canada and Ontario is establishing the *Canadian Photonics Fabrication Centre*

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<sup>12</sup> For more information on the NRC Aluminium Technology Centre and CIMI please see: <http://www.imi.nrc-cnrc.gc.ca/>.

(CPFC). The CPFC will be the cornerstone of NRC's contribution to the photonics cluster in Ottawa and will support new research and technology development with significant benefits to Canadian firms in this emerging industry.

Construction of the CPFC facility is scheduled for completion in May 2004; however, it is expected that the facility will begin offering a limited number of services in early 2004. Equipment acquisitions are well underway. By taking advantage of the adjustments in the industry, NRC has acquired more equipment than initially considered possible. This will allow the CPFC to start operations with a greater capability than originally anticipated.<sup>13</sup>

The NRC Institute for Aerospace Research (NRC-IAR) *Gas Turbine Environmental Research Centre (GTERC)* will be completed in 2004. The development of the GTERC has included the negotiation and signing of major long-term (20-year duration) agreements with Pratt and Whitney Canada, which are indicative of the value that our partner places on the long-term viability and value of this collaboration.

#### Manitoba – Medical Devices Technologies

NRC's Institute for Bidiagnostics (NRC-IBD) will make expansion of the Winnipeg-based biomedical cluster a priority in the coming years focusing on the development of diagnostic and imaging devices. This will include hardware, software, new uses and methodologies and device components. NRC's efforts will be linked with the Infectious Disease Program, which will further foster relationships with other departments including Health Canada and the Department of National Defence. The Centre for the Commercialization of Biomedical Technology, currently in the design phase, will catalyze cluster development resulting in new company formation and high tech spin-offs in the coming years.

#### Saskatchewan – Plant Biotechnology and Sustainable Infrastructure Research

The Industry Partnership Facility in Saskatoon, a \$15.4 million expansion to NRC's Plant Biotechnology Institute (NRC-PBI), was completed in March 2003. It will house incubation and research equipment for start-up plant-science companies and provide access to analytical services and controlled environmental growth rooms. The Western Economic Partnership Agreement (WEPA) funded \$4.9 million of the cost while the Canada Saskatchewan Agri-Food Innovation Fund provided an additional \$1.5 million. NRC provided the remaining \$9 million. This facility will offer local innovators and start-up companies in the plant biotechnology and nutraceuticals sectors a unique environment for the development and commercialization of new technologies that will reinforce the city's position as the North American centre for plant biotechnology and nutraceuticals R&D.

The initiative to create the NRC *Centre for Sustainable Infrastructure Research (CSIR)* was announced in the Budget 2003. NRC was allocated \$10 million over five years to be applied to leading-edge technologies and to expand NRC's regional innovation and technology cluster initiative in Regina. The CSIR will serve as a catalyst for the growth of a technology cluster in the region, focusing on sustainable infrastructure and the environment, and building on local industry and the research and development capacity of the University. Partners include the City of Regina, The University of Regina, and Western Economic Diversification.

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<sup>13</sup> For more information on the Canadian Photonics Fabrication Centre please see: <http://cpfc-cfdp.nrc-cnrc.gc.ca/>.



The initiative will help Regina meet its infrastructure challenges and become a national centre of research, expertise and real-life testing. This research nucleus will be part of NRC's Institute for Research in Construction (IRC) and closely linked to regional and national research facilities along with NRC-IRAP Industrial Technology Advisors of the Prairie Region. Priorities over the planning period are to:

- establish NRC-CSIR on The University of Regina campus;
- hire 10 researchers; and
- develop joint research projects, exchanges of scientific and technical personnel and dissemination of scientific and technical information and other forms of collaboration to be determined through consultation.

### **Alberta – Nanotechnology**

The groundbreaking on October 4, 2003, marked the beginning of the building phase for the permanent home of NRC-NINT. The new building will be one of the world's most technologically advanced research facilities and will house the latest generation of scientific equipment. The completion of the facility will enable NRC and the University of Alberta to expand their collaborations in nanotechnology research, including the synthesis of new materials and the integration of nanotechnology with other microtechnologies to make practical nano-scale systems. The construction of the building will be completed in 2005.

### **British Columbia – Fuel Cells**

In March 2002, the Minister of Industry announced \$20 million over five years in new funding to NRC in support of the emerging fuel cell technologies cluster. NRC will use these funds to leverage its investments, increase its research staff, strengthen its fuel cell testing and demonstration program, expand its contributions to training people for the fuel cell sector and enhance its role as a showcase for innovative Canadian technologies and companies. In June 2003, NRC's governing Council approved the Strategic Plan for NRC-IFCI, which will be a key element in the delivery of the objectives articulated in Canada's Fuel Cell Commercialization Roadmap released in the spring of 2003. For the coming year, NRC has three priorities for the Vancouver fuel cell cluster.

- continue to build on the growing interest at the BC provincial level in fuel cells and sustainable energy, and develop support for the cluster;
- cultivate and grow the relationships that have been established with the three local universities – The University of British Columbia, Simon Fraser University and the University of Victoria to help train Highly Qualified Personnel for local industry, as well as enhance research programs; and
- continue involvement in the "BC Hydrogen Highway" initiative between Whistler and Vancouver with Fuel Cells Canada and local companies in preparation for the 2010 Winter Olympics.

### ***Building on Success and Lessons Learned: Formative Assessment and Case for Continued Funding of NRC's Atlantic Clustering Initiative***

With the Government of Canada's announcement of the Atlantic Initiative in June 2000, NRC was asked to play an important and unique role in enabling the development of new technology clusters in Halifax and PEI (life and nutrisciences), New Brunswick and Cape Breton (e-usiness and wireless technologies), and St. John's (marine and oceans technologies). Building on an already well-established regional presence through its IRAP Network in Atlantic Canada and research institutes in

St. John's and Halifax, NRC, in collaboration with local industry, academia and all levels of government, has made considerable progress in supporting local cluster development in the region.

New technology cluster development is a long-term process that offers unique challenges in smaller urban settings. NRC will nonetheless pursue a formative assessment of its efforts to support cluster development in Atlantic Canada in light of the goals NRC established in 2000. This assessment will be an overriding corporate priority for NRC in 2004-2005 and will provide valuable information and insight into best practices, lessons learned and key opportunities and challenges. It will serve both as a reference point for further development of NRC's technology clustering strategy in Atlantic Canada and elsewhere across the country, and as an important resource for all local stakeholders in technology clustering in Canada. Over the course of the coming year, NRC will proceed to make a case to the Government of Canada for renewed funding for the Atlantic Initiative based on the evidence provided in this assessment and support from local industry, academia and government partners.

### ***Strategy for Industry Partnership Facilities***

In support of its cluster development activities, NRC will develop, build and operate Industry Partnership Facilities (IPFs) across Canada (*See Table 3.*) These unique facilities will be workplaces for collaborative research, for the incubation of new firms and NRC spin-offs and will serve as community resources for access to mentoring, innovation financing and competitive technical intelligence for new enterprises. The NRC-IMI Crossroads for Industrial Materials Innovation (CIMI) and the NRC-IOT Industrial Partnership Facilities were completed and officially opened in the fall of 2003. NRC's network of existing facilities and those scheduled for opening in 2004-2005 will become the focal point for industry, university and government partnerships for the incubation of new ventures and enterprises and a centre for collaborations in research and technology transfer.



Table 3: NRC's Industry Partnership Facilities – Current and Planned			
Location	Area (m <sup>2</sup> )	Status	Completion
Institute for Ocean Technologies (St John's, NF)	600	Completed	2004-2005
Institute for Marine Biosciences (Halifax, NS)	2,787	Construction	2003-2004
Institute for Information Technology, (Fredericton, NB)	766	Completed	2002-2003
Aluminium Technology Centre, (Chicoutimi, QC)	1,000	Construction	2003-2004
Biotechnology Research Institute (Montréal, QC)	9,800	In operation	1998-1999
Crossroads for Materials Innovation (Longueuil, QC)	1,277	Completed	2003-2004
NRC Industry Partnership Facility (Ottawa, ON)	1,604	In operation	1998-1999
Steacie Institute for Molecular Sciences (Ottawa, ON)	743	In operation	2002-2003
Institute for Biodiagnostics (Winnipeg, MB)	4,645	In operation	2003-2004
Plant Biotechnology Institute (Saskatoon, SK)	6,941	In operation	2002-2003
National Institute for Nanotechnology (Edmonton, AB)	2,600	Construction	2004-2005
Institute for Fuel Cell Innovation (Vancouver, BC )	520	In operation	1999-2000
Herzberg Institute of Astrophysics (BC) Penticton and Victoria Facilities	315	In operation	2001-2002
<b>Total</b>	<b>33,571</b>		

## Value for Canada

**Outcome:** By 2006, NRC will be recognized by its partners and government stakeholders as Canada's leading developer of new research and technology-based enterprises, and respected for its innovative S&T commercialization practices.

### Strategies and Goals:

- Creation of new technology-based companies
- Enhanced innovation capacity of firms
- Improved dissemination of knowledge
- Supporting the Canadian industry

### Performance Indicators:

- Technology transfer
- Knowledge dissemination
- Highly qualified personnel to Canada
- Client success
- Spin-offs/spin-ins
- Economic, social and environmental impact

NRC creates value for Canada and its industry sectors through research and commercialization. It continues to seek to accelerate technology transfer, knowledge dissemination, and the development of new research-based technology enterprises and jobs for Canadians. NRC started several new programs in 2002-2003 to help accelerate the scope and pace of its new company creation. The NRC Business Case Challenge will help identify new business opportunities based on NRC technologies and attract interest from outside investors. NRC's new Entrepreneurs-in-Residence Program will nurture better linkages between outside entrepreneurs and NRC researchers interested in commercializing their technologies. NRC-IRAP continues to increase the innovation capacity of Canadian SMEs, helping small firms grow to medium size.

### Plans and Priorities:

PROPOSED PLANS AND PRIORITIES	KEY PLANNED RESULTS
<ul style="list-style-type: none"> <li>▪ Create new technology-based companies</li> <li>▪ Improvement of Intellectual Property Management systems</li> <li>▪ Increase the IPF occupancy and graduation rates for Canadian start-ups</li> <li>▪ Transfer NRC technologies to Canadian companies through licensing agreements and collaborative research</li> <li>▪ Implementation of IRAP strategic plan with the emphasis on the needs of medium-sized businesses and on helping more businesses grow from small to medium size</li> <li>▪ Ensure Canadians have ready access to scientific, technical and medical information to support research and innovation</li> <li>▪ Improved building, construction and urban infrastructure codes system in Canada</li> </ul>	<ul style="list-style-type: none"> <li>▪ New technology-based companies providing highly-qualified jobs to Canadians and stimulating new foreign investment in Canada</li> <li>▪ Enhanced innovation capacity of companies and socio-economic growth through the diffusion of NRC technologies</li> <li>▪ Enhanced innovation capacity of Canadian SMEs through technological advice and project financing</li> <li>▪ Integrated national and international network of scientific, technical and medical information resources readily available to Canadians</li> <li>▪ Publication of objective-based codes and guides to support the construction industry and promote innovation in this sector</li> </ul>

### ***Creating Value: Growing the Firms for the 21<sup>st</sup> Century Economy***

Despite the slowdown in venture financing for technology start-ups over the past two years NRC remains committed to creating new technology-based companies as a way to commercialize NRC technologies. On average, NRC has created seven new companies per year between 1995 and 2002. To sustain long-term success for new ventures resulting either from spin-offs or licensing of new technologies to existing firms, NRC will focus on the following three core priorities over the coming year.

#### **Implementing NRC's Intellectual Property Management and Commercialization Initiative**

Based on a 2003 benchmarking study of best practices in Intellectual Property (IP) management across NRC and with other leading Research-based organizations in Canada and abroad, NRC will implement the first stage of the recommendations of the final report. Specific activities will include:

- increased focus on high-value IP and improved market opportunity assessments;
- improved marketing and communications of technology transfer opportunities to attract new business partners;
- enhanced management and decision-making support tools;
- adoption of world standard best practices and evaluation tools; and
- integration of IP management strategies in institute strategic plans and a balanced portfolio of technology transfer activities.

#### **Increasing Capacity and Improving Innovation Support Services for NRC's National Network of Industry Partnership Facilities (IPFs)**

Approximately 90 technology companies, of which some 30% are spin-off firms from NRC and 58% are based on NRC developed technologies, have been co-located in an NRC Institute or at an NRC IPF. Over 70% of these companies had linkages to NRC-IRAP. NRC has recognized the critical importance of services and linkages these facilities provide to the emergence and growth of new technology-based firms. With the completion of the IPFs in Halifax, Chicoutimi, Winnipeg, and Edmonton over the coming year (see table 3 in previous section), NRC will have a national network that will contribute to achieving NRC's goals of increasing the commercialization of new technologies and enhancing technology clusters across Canada. During the planning period, NRC will concentrate on improving the provision of and access to commercialization, technical, financing and business support services needed by firms to succeed. The success of this strategy will be measured not only by the continued full occupancy rate of incubating firms and satisfaction with services provided but also by the successful graduation from IPFs and growth of start-up companies into viable globally competitive enterprises.

#### **Supporting Small and Medium-Sized Enterprises**

NRC's Industrial Research Assistance Program (NRC-IRAP) is the main instrument of the Government of Canada for innovation and technology assistance for SMEs. During the planning period, NRC-IRAP will continue the implementation of its strategic plan approved by NRC's governing Council in 2002. The plan set two new strategic objectives: to increase the innovative capacity of SMEs and to become the national enabler of technological innovation for Canadian SMEs.

Over the planning period, NRC-IRAP will increase its support and services for high-risk R&D activities and early-stage development opportunities via targeted innovation assistance on a regional, national and international basis – with additional emphasis on the needs of medium-sized businesses and on providing small firms with assistance to grow to medium size. Priority activities to support this strategy will be as follows:

- provide technology expertise combined with financial assistance to effectively commercialize new knowledge or technologies new to the firm;
- help more Canadian-based enterprises move from the small-firm stage to medium-sized wealth and employment generators;
- identify stakeholders for new target areas (mid-size and rapid growth high-tech firms in emerging industries) for multi-client, large collaborative projects.

#### Primary Targets for SME Success

- NRC-IRAP supported small firms will develop their innovation capabilities and grow into medium-sized firms with international involvement and participation (target client profile: 35% of firms with 50+ employees).
- Firms will leverage up to twice the amount of R&D investments from other sources.
- Firms will generate \$20 in new sales for every dollar invested by NRC-IRAP in new competencies, products and processes.
- Innovative, risk-taking start-up firms supported by NRC-IRAP will have a 20% higher survival rate beyond three years than similar non-supported firms.
- 25% of NRC-IRAP clients will be ready to pursue international technology opportunities and alliances.

#### *Improved Dissemination of Knowledge; a Key Contributor to Innovation*

As Canada's national science library and the largest Canadian publisher of scientific and technical information, NRC's Canada Institute for Scientific and Technical Information (NRC-CISTI) plays a crucial role in assuring that Canadians continue to have ready access to the world's Scientific, Technical and Medical (STM) information required to support their research and innovation activities.

To ensure this access, NRC-CISTI emphasizes the role of partnerships and collaboration. Currently, there is a key opportunity to develop a Federal Science eLibrary that would provide efficient, cost-effective desktop access to STM information for federal researchers across the country. The eLibrary would serve as a model for a national digital library network where STM information and value-added services could be delivered electronically and seamlessly to Canadians.

NRC-CISTI is an important component of NRC's technology cluster strategy. NRC-CISTI will ensure maximum benefits to Canadian SMEs by enhancing its current activities and developing new products and services offered through its NRC Information Centres located across the country. Plans for the next three years include:

- opening new NRC Information Centres in Prince Edward Island and Alberta and providing services to other new regional clusters as they develop; and
- offering a comprehensive competitive technical intelligence program to SMEs in partnership with NRC-IRAP. The outcomes of a pilot project underway in the Maritimes will shape this program.

NRC-CISTI also contributes to the publication and dissemination of the discoveries of researchers in Canada and around the world through the NRC Research Press. To improve the digital publishing environment, the institute will develop publishing tools, including an online peer-review management

system and an electronic manuscript tracking system. Through its publishing services, NRC-CISTI will leverage these new tools and its expertise to support the publishing activities of Canadian scientific societies.

### ***Supporting Canadian Industry through Codes, Standards and New Technologies***

#### **Construction Codes and Standards**

The NRC Institute for Research in Construction (NRC-IRC) continues its leadership role in developing a national transition to objective-based building regulation. In partnership with the provinces and territories, NRC-IRC will introduce model codes aimed at facilitating the use of innovative solutions that promise to reduce the cost of construction, while also meeting societal expectations for health, safety and accessibility in buildings.

Extensive public consultations about objective-based building regulation have greatly reassured the code-using community. The new approach is now widely accepted by all sectors of the community. A Global Policy Summit on performance-based building regulations, organized in part by NRC-IRC, revealed that the Canadian objective-based approach avoids difficulties encountered in other countries.

Enhanced participation by the provinces and territories in the code development process is expected to lead to the release of the new model objective-based codes in mid-2005, with adoption shortly thereafter. This will result in an unprecedented level of uniformity throughout the building regulatory system in Canada. In support of the objective-based approach to construction, NRC-IRC will:

- prepare commentaries and guidelines to assist code users implement objective-based code requirements;
- develop guides for the technical assessment of innovative construction products to demonstrate compliance with the code requirements; and
- respond to industry needs with R&D projects aimed at developing new decision-making tools for design and operation of built assets.

In a related national thrust, NRC-IRC will collaborate with the Federation of Canadian Municipalities to prepare and publish new Best Practices under Phase II of the National Guide to Sustainable Municipal Infrastructure (InfraGuide).

#### **Surface Transportation Technology:**

NRC's *Centre for Surface Transportation Technology (NRC-CSTT)* operates major facilities and delivers services in heavy vehicle research, development, and testing on a cost-recovery basis at full commercial rates. It fosters innovation in Canada's railway, heavy truck, and military sectors.

Expected results in 2004-2005 are the successful completion of projects that:

- enhance the communications and electronic warfare capability of military vehicles;
- increase knowledge of the rollover characteristics of commercial tanker trucks to support the development of regulations by Transport Canada;
- evaluate the performance of heating, ventilating, and air-conditioning systems in Canadian-made rail passenger cars to support their sale in foreign markets;

- increase knowledge of railway track geometry defects and their influence on freight car derailments to support the revision of safety standards by Transport Canada;
- increase knowledge, with US government research funding, in the fundamentals of wheel/rail interaction of high-speed passenger rail systems; and
- improve railway bogie designs using internally-developed IP to reach new performance standards that will lower operating costs for Canadian railways.

#### Hydraulics Technologies for Coastal, Cold Regions and the Environment:

NRC's *Canadian Hydraulics Centre (NRC-CHC)* provides services to Canadian consulting firms specializing in the fields of coastal engineering, environmental hydraulics and cold regions technology. One of the centre's goals is to establish itself as the centre of excellence for hydraulic studies relevant to the operational and regulatory requirements of Other Government Departments (OGDs) in Canada. NRC-CHC will work with OGDs and Canadian consulting firms in addressing major topics of national importance such as climate change impacts, reduction of greenhouse gas emissions, renewable energy, water resources and quality, coastal environment, impacts of floods and environmental impact assessment. Over the planning period, the priority is therefore to work with these stakeholders to develop new solutions, technologies and decision support systems to address the priorities mentioned above.

## Global Reach

**Outcome:** By 2006, NRC will be recognized by its stakeholders for its contributions to a more effective Canadian innovation system that assures access to international facilities and research networks, provides opportunities for Canadian firms, and builds new research and technology alliances.

**Strategies and Goals:**

- Integration and facilitation of international research
- Harmonization of international standards
- New international S&T alliances
- Access to international research facilities
- Stimulation of new foreign investments in Canada

**Performance Indicators:**

- Number and value of international collaborative agreements
- International advisory board/committee participation
- International technology missions and impacts
- Joint authorship publications with international partners
- Foreign investment

For Canada, international technology development and business and investment opportunities have risen significantly since 1995 and are projected to grow further by 2006. In the words of the Prime Minister's Advisory Council on S&T, "Canada will become a country that, within the limits of our resources, takes maximum possible advantage of international opportunities in support of advancing scientific research, industrial innovation and improvements in the quality of life for Canadians."<sup>14</sup>

Today almost half of NRC's publications in refereed scientific journals are co-authored with non-Canadian researchers, more than doubling NRC's international reach over the past decade. NRC's international research collaborations enhance Canada's reputation as a vital participant in the international scientific community. The connections, knowledge and expertise gained through these collaborations benefit Canadian firms, universities and other government departments and leverage new innovation opportunities for Canadian industry internationally. NRC also takes the lead on international technology missions and facilitates vital connections to centres of advanced technology around the world.

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<sup>14</sup> "Reaching Out: Canada, International Science and Technology, and the Knowledge-based Economy" (May 1999).



## Plans and Priorities:

PROPOSED PLANS AND PRIORITIES	KEY PLANNED RESULTS
<ul style="list-style-type: none"> <li>▪ Development and enhancement of strategic bi-lateral alliances with key innovation partners in Europe, Asia Latin America and the US</li> <li>▪ ISO/IEC 17025 accreditation for the Institute for National Measurement Standards (NRC-INMS)</li> <li>▪ Prepare case of funding of new five-year plan for TRIUMF</li> <li>▪ Continued implementation of astronomy and astrophysics LRP</li> </ul>	<ul style="list-style-type: none"> <li>▪ Raise the profile of Canada as an S&amp;T country, through new relationships and access and disseminate the knowledge from abroad to Canadians</li> <li>▪ Enhanced innovation capacity of Canadians SMEs through international ventures and partnerships</li> <li>▪ Harmonize international measurements standards to support international trade</li> <li>▪ Canadian participation in leading-edge international science activities and development of large-scale S&amp;T infrastructure of importance for the Canadian scientific and engineering community</li> </ul>

### *Development and Enhancement of Strategic Bi-lateral Alliances with Key Innovation Partners in Europe, Asia, Latin America and the US*

In the coming year, NRC will continue to build networks, collaborations and strategic alliances around the world for Canada through bilateral and multi-level agreements, technology and research alliances, as well as through over 70 bi-lateral formal agreements with 26 nations. NRC conducts numerous targeted technology missions to countries around the globe. Follow-up from two missions to Taiwan has led to new opportunities for collaboration in nanotechnology and aerospace.

More than any other agency or Department of the Federal government, NRC has realigned its priorities and reallocated its budget to develop strong partnerships around the world. These international collaborations have required a reallocation and investment of \$4.5 million in internal resources annually. In 2004-2005 NRC plans to sign and implement a new R&D and SME program with Spain, continue international collaborative research partnership programs with France, Germany, Singapore, Taiwan and the Czech Republic and pursue new opportunities with Japan.

Over the years, NRC has developed extensive linkages and collaborative research arrangements with the U.S. In 2004-2005, NRC will work closely with other departments and agencies in a number of separate initiatives that will strengthen Canada's S&T relationships with U.S. counterparts. A priority will be placed on the Federal Government's Enhanced Representation Initiative launched in 2003 whereby Canada will pro-actively explore S&T partnerships with U.S. government agencies, research institutions and industry in a number of targeted domains, most notably, photonics, hydrogen and fuel cells, and security and defence. An overview of the initiative is provided in Appendix B.

### *Supporting Canadian SMEs*

Under its new strategic plan, NRC-IRAP will extend Canada's innovation system internationally, and facilitate SME access to foreign technology, alliances and markets via visits/missions, joint ventures and partnerships, collaborative R&D projects and relevant international organizations. The planned results by 2006 will be:

- increased SME participation in international relationships, technology collaborations and joint ventures resulting in increased access through technology to domestic and international markets;



- increased SME access to competitive technology intelligence and international funding opportunities;
- increased exploitation of international technologies by SMEs; and
- Increased readiness (through collaborations) of NRC-IRAP clients to pursue international technology opportunities and alliances.

The priority actions undertaken by NRC-IRAP over the coming year will be:

- extend Canada's Innovation System internationally by identifying target countries and technologies of strategic focus and setting resource priorities; and
- create a National Competitive Technology Intelligence Capacity, through the identification of areas of strategic focus for SMEs.

### *Harmonization of International Measurement Standards*

Canada's goal to rank among the top five industrialized countries in R&D by the year 2010 will require an estimated \$250 billion increase of technology-based trade.<sup>15</sup> The NRC Institute for National Measurement Standards (NRC-INMS), as Canada's national metrology institute (NMI), must ensure that international recognition and acceptance of Canada's national measurement system remains solidly in place, and that our capabilities grow to serve emerging industry sectors that will fuel this trade. The NRC-INMS Strategic Plan, approved by NRC's governing Council in June 2002, lays out five core strategies to address these challenges:

- lead R&D activities to meet current and future Canadian needs for primary measurement standards, methods and calibration capabilities;
- ensure adequate dissemination of calibration and measurement services, including improved and expanded services, and calibration services arising from R&D;
- maintain a recognized leadership role in supporting Canada's national and global trade interests through strengthened participation in international metrology activities;
- provide leadership for the creation of a national coordinating body for the Canadian national measurement system; and
- lead the dissemination of measurement-related knowledge and technologies to all sectors of Canada through adequate outreach and training.

In 1999, NRC signed the CIPM (Comité international des poids et mesures) Mutual Recognition Arrangement (MRA), which is intended to facilitate global mutual recognition and acceptance of calibration and measurement certificates issued by NMIs. Participation in measurement comparisons that demonstrate equivalence is a requirement of this agreement and NRC-INMS participates in a number of such comparisons annually. Another condition is that the NMI should have a quality system that meets the requirements of ISO/IEC 17025, the quality standard for calibration and testing laboratories that assesses on an on-going basis the technical competency of laboratories. Although not all trade related measurements are made by NRC-INMS, Canadian testing labs that make routine measurements must demonstrate that their results are traceable to an NMI that meets the ISO/IEC requirements. Last year, NRC-INMS began the process of acquiring ISO/IEC 17025 accreditation,

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<sup>15</sup> Based on calculations of Industry Canada's Policy Sector, which estimates the amount of R&D required to get Canada in the top five of the most industrialized countries in R&D.

which is expected to be complete in 2006. This will ensure that Canadian measurement standards and testing services maintain their international standing and acceptance, a major condition for continued access to global markets and the reduction of non-tariff barriers to trade.

### *Access to International Research Facilities*

NRC provides stewardship over Canada's investments in large-scale S&T infrastructure of critical importance to the research community and ensures Canada's reciprocal participation in leading-edge international science activities around the world. NRC's involvement is essential in initiating, planning and developing such facilities. Large-scale research facilities include:

#### **Canada's Long Range Plan for Astronomy and Astrophysics**

NRC's Herzberg Institute for Astrophysics (NRC-HIA) plays a unique role in the implementation of Canada's Long Range Plan for Astronomy and Astrophysics (LRP), a role that is highly complementary to that of Canadian universities. It is NRC's charter responsibility to manage national astronomy observatories and to facilitate Canadian academic participation in its flagship international facilities: the Canada-France-Hawaii Telescope, the James Clerk Maxwell Telescope and the Gemini Telescopes.

University astronomers depend on the institute for instrumentation development and project management, while NRC-HIA depends on the universities for student training and for the broader base of research expertise available in the larger university community.

In the coming year, NRC priorities will focus on the Atacama Large Millimetre Array (ALMA). In February 2003 the Federal Government announced extended new research funding for ALMA, the 64-radio antenna to be built in northern Chile. The array will operate as a single telescope to study millimetre and sub-millimetre - wavelength light, keys to understanding processes such as planet and star formation. It is believed that ALMA will be able to look back to when the universe was a tenth of its present age of about 15 billion years.

In June 2003, NRC announced the signing of the North American Program in Radio Astronomy, which will give Canadian scientists and their American colleagues equal access to facilities such as ALMA. In return, Canada will develop a \$10 million digital correlator system for the upgrading of the Very Large Array (VLA) in Socorro, New Mexico.

#### **TRIUMF (Tri-University Meson Facility)**

TRIUMF, Canada's national particle and nuclear physics laboratory, provides world-class facilities for research in sub-atomic physics, nuclear physics, nuclear astrophysics, life sciences and condensed matter and encourages the transfer of technology developed at the laboratory to the commercial sector. It also provides a platform for Canadian scientists to participate in experiments outside Canada, notably at CERN (Switzerland). NRC provides funding for the facility on behalf of the government of Canada and the Canadian scientific community via a contribution agreement. TRIUMF is currently in its third year of its Five-Year Plan, and has submitted a new Five-Year Plan that will potentially take effect April 1, 2005. The funding requirement associated with this proposal is for \$277 million over the five years, up from the current \$200 million. The change is partly to enable the completion of the ISAC II radioactive beam accelerator. TRIUMF is ready to exploit the unique new science opportunities afforded by the ISAC facility.

Canada's particle physics offshore program at CERN will be completed in 2007 with the opening of the Large Hadron Collider (LHC). TRIUMF will be the data hub for processing and analysis of data coming from the LHC's ATLAS detector. Canada, through TRIUMF and on behalf of the Canadian community has made considerable investments in this current Five-Year period to this project. TRIUMF works closely with private sector partner NORDION to produce radiopharmaceutical isotopes for some 50,000 clinical procedures weekly in North America and receives about \$1 million annually in royalties.

## Outstanding People – Outstanding Employer

**Outcome:** By 2006, NRC will be regarded by staff and their peers as a major innovator in human resources management, as a place where outstanding people are encouraged and are able to make outstanding contributions to Canada, and as an outstanding employer offering a great place to work.

### Strategies and Goals:

- Highly qualified personnel
- External and internal awards
- Research facilities and equipment
- Activities promoting an outstanding work environment

### Performance Indicators:

- Top quality recruits
- External awards
- Investments in facilities and equipment
- Training as a percentage of salary
- Diversity (designated group representation of employees)
- Bilingualism (bilingual positions filled by qualified bilingual staff)
- Workplace safety (compensation cases)

Outstanding people are at the core of NRC and are its most valuable asset. NRC continues to face strong competition in finding and keeping premier research talent, and continues to meet other HR management challenges such as managing cross-functional, cross-cultural teams. Therefore, it is essential that NRC remains strongly committed to its employees through its *Employment Philosophy* and other HR management initiatives in order to maintain its long-standing international reputation for excellence and creativity in leading-edge research and innovation.

### *The NRC Employment Philosophy:*

- Recruit and retain outstanding people;
- Give them the opportunity to grow professionally, to utilize their strengths and to deliver to the maximum of their capabilities;
- Reward them based on their level of professional development and their level of productivity; and
- Create a respectful partnership with them based on trust and understanding.

### Plans and Priorities:

PROPOSED PLANS AND PRIORITIES	KEY PLANNED RESULTS
<ul style="list-style-type: none"> <li>▪ Recruit Outstanding People</li> <li>▪ Develop leadership at all levels</li> <li>▪ Build cross functional and cross cultural capability</li> <li>▪ Align compensation and reward practices</li> </ul>	<ul style="list-style-type: none"> <li>▪ Modernization of NRC's recruiting practices</li> <li>▪ Revitalized leadership and Management Development Programs</li> <li>▪ More effective management of horizontal initiatives</li> <li>▪ Modernization of pension reform</li> </ul>

## *Human Resources Management Plan*

Creativity and innovation is NRC's business and human capital is what drives its success. Implementing human resource management practices that enable NRC to be an outstanding employer of outstanding people is therefore a key pillar of our Vision to 2006. The twenty-first century brings with it many challenges (i.e. the increasing multi-disciplinary nature of science, fierce competition for resources and expanding global markets) that cannot be addressed by traditional human resource management practices. NRC needs new approaches that foster the development of a strategically focused, integrated and adaptable organization.

### *Recruit Outstanding People*

#### International front

NRC will build recruitment activities into planned S&T missions abroad. This will involve working with Canadian embassies to host presentations on NRC research activities and employment opportunities, linking up with universities abroad to build exchange

#### *Planned Recruitment Activities 2003-2006*

- Expand recruitment market to include international locations where untapped sources of talent are identified
- Develop and implement an approach to hiring and integrating foreign workers into Canada and NRC
- Build centre of expertise (with data, services and tools) to support hiring activities
- Measure impact of recruitment strategy and modernization of hiring processes on efficiency and effectiveness of recruitment
- Continued implementation of Modernization of Hiring Processes recommendations

programs, facilitating the entry of foreign workers into Canada and NRC. Researchers must be prepared to act as ambassadors for NRC abroad in order to capitalize on the opportunities created by their strong international presence.

#### National Front

NRC will tailor existing relationships with universities to focus on strategic alliances for recruitment. For example, as part of one institute's collaboration with one university, the institute will commit to hiring three of their undergraduate students each year and the university will commit to hosting two researchers for lectures. Each fiscal year, NRC will also develop a fixed calendar of recruitment activities that will include presence at career fairs, job fora on campus, marketing ads, etc. to ensure a coherent approach.

### *Develop Leadership at All Levels*

Recruiting and retaining top talent, creating a rewarding work environment and optimizing organizational performance hinge on an organization's ability to build leadership and management capacity. In 2004-2005, NRC will implement a revitalized leadership and management development

#### *Planned Leadership Development Activities 2003-2006*

- Establish a leadership profile and a management review committee
- Create a corporate registry of people on assignments
- Build a leadership/learning network
- Build monitoring and evaluation framework with emphasis on values and ethics
- Develop and implement measures to reinforce leadership

system to ensure that it has the depth and diversity of technical and leadership talent required for the

future. Recognizing that all employees contribute to organizational agility and performance, NRC will work to create a context that allows each employee to lead within his or her sphere of influence. Implementation of this integrated system will include articulating a leadership competency profile applicable to all employees within the organization, modifying NRC's existing management and supervisor competency profile, designing a management orientation program, providing additional support to self-directed learning for supervisors and managers, and implementing two new initiatives to identify and develop potential (the Accelerated Leadership & Management Development Program and the Executive Challenge).

### ***Build Cross-Functional and Cross-Cultural Capability***

The increasing multi-disciplinary nature of science requires flexible approaches. Horizontality across NRC institutes, and the federal S&T community in general, as well as integration across industry and academia are ways to extend and exchange knowledge and reduce unnecessary duplication of

#### ***Planned Activities to Build Cross-Functional and Cross-Cultural Capability 2003-2006***

- Investigate new structures, mechanisms and incentives to support horizontal initiatives
- Communicate best practices of existing horizontal initiatives at NRC
- Develop processes to facilitate forming, assessing and dissolving of teams
- Develop creative conflict framework
- Implement processes and creative conflict framework

efforts. In 2004-2005, NRC will begin the review and identification of human resource management practices that foster the development of cross-functional, cross-organizational and multi-disciplinary capability. Building on the findings of its *Modernization of Hiring* initiative, NRC will implement new measures to accelerate the creation and orientation of teams.

Recognizing that recent immigrants represented 70% of the labour force growth in the last decade and that this trend is likely to continue, NRC will also begin implementation of special initiatives that prepare individuals to work across cultures and capitalize on the benefits of workforce diversity.

### ***Align Compensation and Reward Practices***

NRC will explore a new and innovative compensation mechanism within the current legislative framework by learning from similar organizations in both the private and public sector. The intent is to move towards a total compensation strategy that includes more than salaries and risk pay. This activity will be supported through consultation with key parties such as Treasury Board Secretariat, the new Public Service Labour Relations Board, Finance

#### ***Planned Activities to Align Compensation and Rewards Practices 2003-2006***

- Classification – simplified rationales, audit and measurement tools
- Confirm impact of central agency decisions regarding alternative service delivery models for pay and benefits
- Develop compensation strategy for NRC and benchmark other comparable organizations
- Determine impact of modernization of pensions
- Explore alternatives for fostering and rewarding cross functional collaboration
- Review alternative compensation methodologies in context of legislative framework

Department, Foreign Affairs, Immigration, Canada Customs and Revenue Agency and NRC Bargaining Agents with the view of identifying barriers and potential opportunities.

## Making Choices and Managing Resources to Realize NRC's Vision

Under the guidance of NRC's Senior Executive Committee, a number of corporate-wide management initiatives were launched to ensure that strategic and operational decision-making across NRC was aligned with the goals and intended outcomes of the NRC Vision 2006. They include a strategic planning framework and guidelines for NRC Institute Programs and Branches, the development of a Performance Management Framework for the NRC Vision, the development and implementation of a Modern Management Practices Initiative as part of the Federal government's Modern Comptrollership Initiative, the development of risk-based criteria for Audit and Evaluation Planning in NRC and the creation of the NRC Planning Network.

### Institute, Program and Branch Strategic Planning within NRC

Over the past three years, NRC has implemented its Vision 2006, at the institute, program and branch levels, through a comprehensive and systematic process of strategic planning with the close involvement of NRC's Senior Executive Committee, NRC's governing Council, Institute and Program External Advisory Boards and key external stakeholders. All of NRC's strategic plans are approved by NRC's governing Council, which bases its decisions on the established guidelines for strategic planning at NRC.

Table 4 provides an overview of NRC Institute and Program Strategic Plans that have been approved and that are planned for the coming fiscal year.

Table 4: NRC Institute and Program Strategic Plans	
Institute or Program	NRC Governing Council Approval
NRC Biotechnology Group Strategic Planning Framework	February 2002
NRC Biotechnology Research Institute	February 2002
NRC Institute for National Measurement Standards	June 2002
NRC Industrial Research Assistance Program	June 2002
NRC Plant Biotechnology Institute	October 2002
NRC Institute for Marine Biosciences	February 2003
NRC Institute for Fuel Cell Innovation	June 2003
NRC Institute for Chemical Process and Environmental Technology	October 2003
NRC Institute for Biological Sciences	October 2003
NRC Institute for Research in Construction	October 2003
TRIUMF	February 2004
NRC Institute for Information Technology	June 2004
NRC Institute for Biodiagnostics	June 2004
NRC Canada Institute for Scientific and Technical Information	October 2004
NRC Institute for Aerospace Research	October 2004



## Audit and Evaluation Plans

Using the supplementary resources available under Treasury Board Secretariat's Audit Policy and Evaluation Policy, NRC has completed work in the areas of internal audit and evaluation. For the planning period, evaluation personnel will conduct the following studies:

- Formative Evaluation of the NRC's Group I Cluster Initiatives (Atlantic); and
- Peer Review of the Steacie Institute for Molecular Sciences (SIMS).

In addition, a feasibility study of NRC-wide bibliometric and citation analysis is tentatively planned. A summative evaluation of NRC's Genomics and Health Initiative (GHI) and a formative evaluation of NRC's Group II Cluster Initiatives are also scheduled to take place, upon condition of approval by the Senior Executive Committee.

NRC's internal audits are an effective means for evaluating the soundness of management practices and providing the government of Canada with transparent information relating to the Council's activities.

NRC's recent audit titles include the following:

- Follow-Up Audit to the Auditor General's Chapter 10 (1994) - Science and Technology: Management of Departmental Science and Technology Activities (February 2002);
- Audit of Partnerships (October 2002); and
- Audit of Construction Contracting (October 2003); and
- Comprehensive internal audit of NRC's Facilities and Equipment (to be completed March 31st, 2004).<sup>16</sup>

In spring 2004, NRC will prepare a 3-year risk-based internal audit plan for approval by the NRC Senior Executive Committee.

### Response to the Auditor General

The overriding priority for NRC, with respect to management processes and the audit function, will be to work closely with the Auditor General of Canada to develop a response and implement an action plan based on the recommendations of the Auditor General's Value for Money audit of NRC, which was released publicly in March 2004.

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<sup>16</sup> Results of the previous audits and evaluations are now available on NRC's web site at [http://www.nrc-cnrc.gc.ca/aboutUs/audit\\_e.html](http://www.nrc-cnrc.gc.ca/aboutUs/audit_e.html).



# Section 4 Organization

## Overview of NRC

The National Research Council Canada (NRC) is the Government of Canada's largest science and technology agency, a premier vehicle for innovation and a leading resource for science, research and technology development. NRC is a national organization with approximately 4,000 employees and 1,200 guest workers. In addition, it is an integral part of the Industry Portfolio and the Canadian and international S&T community.

## Mandate

The *National Research Council Act* and the *Weights and Measures Act* set out the legislative framework that guides NRC.

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

- undertaking, assisting or promoting scientific and industrial research in different fields of importance to Canada;
- investigating standards and methods of measurement;
- working on the standardization and certification of scientific and technical apparatus and instruments and materials used or usable by Canadian industry;
- operating and administering any astronomical observatories established or maintained by the Government of Canada;
- administering NRC's research and development activities, including grants and contributions used to support a number of international activities;
- providing vital scientific and technological services to the research and industrial communities; and
- establishing, operating and maintaining a national science library and publishing, selling and otherwise distributing scientific and technical information.

Under the *Weights and Measures Act*, NRC has a specific mandate relating to “the investigation and determination of standards and methods of measurements including length, volume, weight, mass, capacity, time, heat, light, electricity, magnetism, and the investigation and determination of physical constants and the fundamental properties of matter.”

Please consult <http://lois.justice.gc.ca/en/> for more details about the NRC's legislative framework.

## Agency Organization

NRC's activities are divided into three business lines, which provide a balance between conducting research and development, offering technical and innovation support services to industry and the public, and supporting the organization with corporate services. The accountability structure, or organization chart, of NRC is presented on page 45.

## Crosswalk between NRC's Vision Pillars and Business Lines

Table 5: A Crosswalk between NRC's Strategic Outcomes and Business Lines					
Business Lines	Strategic Outcomes				
	Excellence and Leadership in R&D	Technology Clusters	Value for Canada	Global Reach	Outstanding People - Outstanding Employer
<b>Research and Technology Innovation</b>					
Research Institutes	√	√	√	√	√
<b>Support for Innovation and the National Science and Technology Infrastructure</b>					
Industrial Research Assistance Program		√	√	√	√
Scientific and Technical Information		√	√	√	√
Technology Centres	√		√	√	√
<b>Program Management</b>					
Corporate Branches		√	√	√	√
Executive Offices	√	√	√	√	√

### Business Line 1 – Research and Technology Innovation

#### Objective

To achieve sustained knowledge-based economic and social growth in Canada through research and development and innovation in key areas.

#### Description

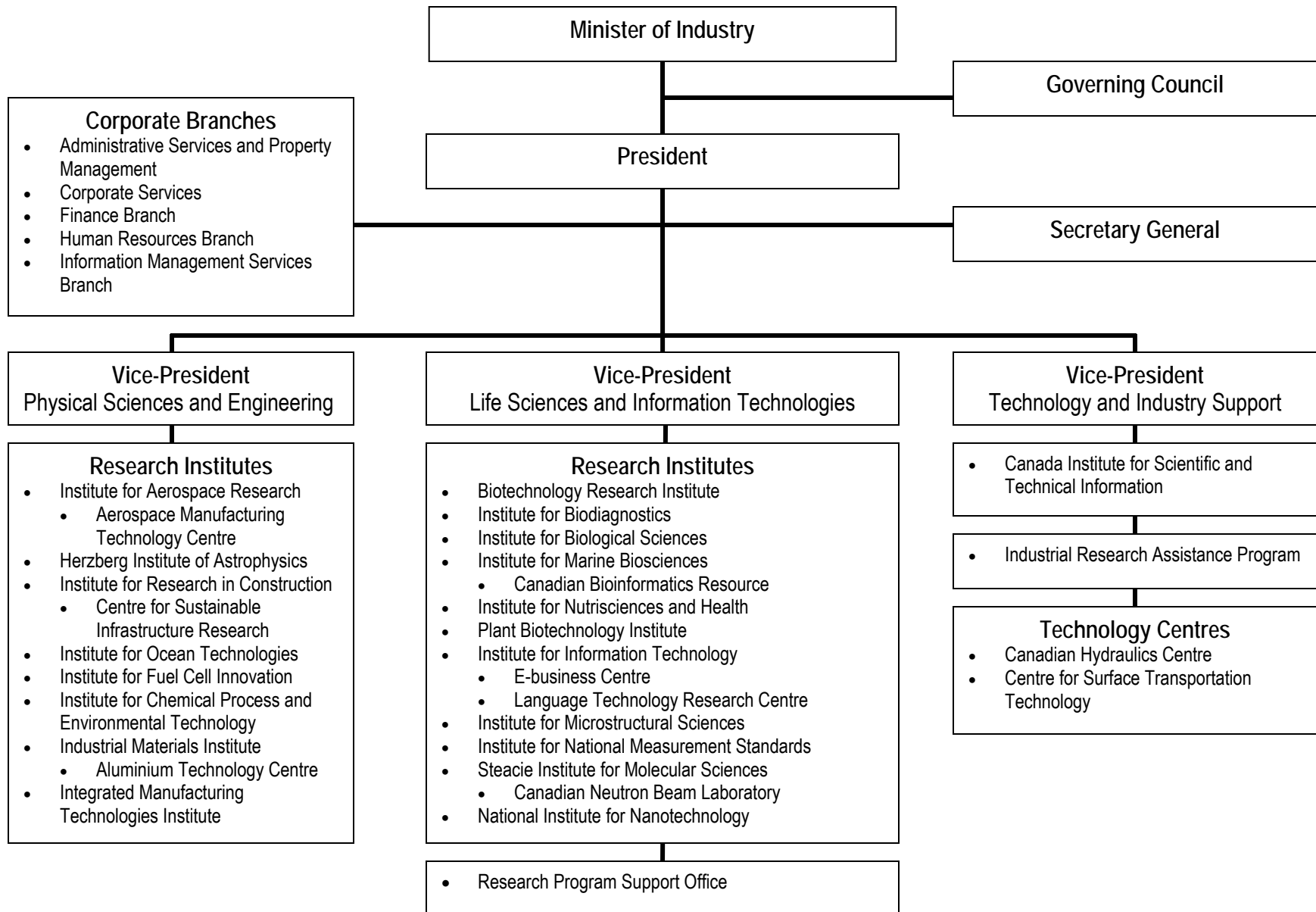
The business line includes the research programs, technology development initiatives and the management of national science and engineering facilities along with research and collaborations with firms, universities and public institutions. These efforts all focus on key technological and industrial areas of Canada's economy where NRC has specific roles and recognized competencies, and where it has the ability to have an impact.

#### Associated institutes

- Aerospace Technologies – Institute for Aerospace Research (Aerospace Manufacturing Technology Centre)
- Astronomy and Astrophysics – Herzberg Institute of Astrophysics
- Biotechnology – Biotechnology Research Institute, Institute for Biodiagnostics, Institute for Biological Sciences, Institute for Marine Biosciences, Institute for Nutrisciences and Health, Plant Biotechnology Institute
- Construction – Institute for Research in Construction (Centre for Sustainable Infrastructure Research)
- Information and Communications Technologies – Institute for Microstructural Sciences and Institute for Information Technology (e-business centre and Language Technology Research Centre)
- Manufacturing Technologies – Industrial Materials Institute (Aluminium Technology Centre), Institute for Chemical Process and Environmental Technology, Integrated Manufacturing Technologies Institute and the Institute for Fuel Cell Innovation
- Measurement Standards – Institute for National Measurement Standards
- Molecular Science – Steacie Institute for Molecular Sciences
- Nanotechnology – National Institute for Nanotechnology
- Ocean Engineering and Marine Industries – Ocean Technology Institute

(millions of dollars)	Forecast Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006	Planned Spending 2006-2007
<b>Research and Technology Innovation</b>				
Net Business Line Spending	410.6	428.0	375.3	367.8
Full Time Equivalents	2,508	2,561	2,561	2,561

## Organizational Chart of the National Research Council Canada



## Business Line 2 – Support for Innovation and the National Science and Technology Infrastructure

### Objective

- To improve the innovative capability of Canadian firms through the provision of integrated and co-ordinated technological and financial assistance, information and access to other relevant resources; and
- To stimulate wealth creation for Canada through technological assistance, information and access to other relevant resources.

### Description

The Support for Innovation and the National Science and Technology Infrastructure business line reinforces NRC's role as a major R&D participant within the larger Canadian science and technology infrastructure. This business line encompasses the dissemination of scientific, technical and medical information and the provision of innovation assistance to Canadian small and medium sized enterprises. NRC also maintains key engineering and technology-based facilities to support specific industrial sectors of the economy.

### Associated programs and centres

- Innovation Assistance to Firms – Industrial Research Assistance Program
- Scientific, Medical and Technical Information – Canada Institute for Scientific and Technical Information
- Technology Centres – Canadian Hydraulics Centre and Centre for Surface Transportation Technology

(millions of dollars)	Forecast Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006	Planned Spending 2006-2007
<b>Support for Innovation and the National S&amp;T Infrastructure</b>				
Net Business Line				
Spending	162.1	194.8	205.8	197.9
Full Time Equivalents	733	748	748	748

## Business Line 3 – Program Management

### Objective

To provide efficient, client-focused services, which enhance NRC's effectiveness as an integrated, dynamic science and technology organization.

### Description

The business line provides policy, program advice and executive support for the coordination and direction of NRC's operations and its governing Council. It also supports and enables effective and efficient management of NRC's resources through its specialization in finance, information management, human resources, administrative services and property management and corporate services.

### Associated corporate branches

- Administrative Services and Property Management
- Corporate Services
- Finance Branch
- Human Resources Branch
- Information Management Services Branch

(millions of dollars)	Forecast Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006	Planned Spending 2006-2007
<b>Program Management</b>				
Net Business Line Spending	73.1	72.6	67.6	67.8
Full Time Equivalents	597	610	610	610

## Agency Planned Spending

AGENCY PLANNED SPENDING (MILLIONS OF DOLLARS)				
	Forecast Spending 2003-2004 *	Planned Spending 2004-2005	Planned Spending 2005-2006	Planned Spending 2006-2007
Research and Technology Innovation Support for Innovation and the National Science and Technology Infrastructure Program Management	410.6	428.0	375.3	367.8
Budgetary Main Estimates (gross)	645.8	695.4	648.7	633.5
Non-Budgetary Main Estimates (gross)	0.0	0.0	0.0	0.0
<i>Less: Respendable Revenue</i>	0.0	0.0	0.0	0.0
<b>Total Main Estimates</b>	<b>645.8</b>	<b>695.4</b>	<b>648.7</b>	<b>633.5</b>
<i>Adjustments (Planned Spending not in Main Estimates)**:</i>				
Increased funding for Industrial Research Assistance Program	31.1			
Collective Bargaining	29.4	12.6	9.5	9.5
Innovation Centre move, Vancouver, BC		8.2	5.5	
Biotechnology (Genomics Research)			6.0	6.0
Increased funding for Industrial Research Assistance Program – Regional Innovation and Commercialization Strategy		5.0	5.0	5.0
2002-2003 Operating Budget Carry-Forward	4.8			
2002-2003 Capital Carry-Forward	3.5			
Technology Cluster Initiatives	3.1			
TB Vote 10 Modern Comptrollership – Innovations Fund	0.6			
Technology and Innovation Initiative – Climate Change Plan for Canada	0.6			
Changes to Revenue	6.0			
2003-2004 Capital Carry-Forward		2.9		
<i>Total Adjustments</i>	<b>79.1</b>	<b>28.7</b>	<b>26.0</b>	<b>20.5</b>
<b>Net Planned Spending</b>	<b>724.9</b>	<b>724.1</b>	<b>674.7</b>	<b>654.0</b>
Less: Spending of Revenues Pursuant to section 5.1 (e) of the <i>NRC Act</i> .	81.9	75.1	72.0	72.1
Plus: Cost of services received without charges	20.9	19.4	18.4	18.6
<b>Net Cost of the Department</b>	<b>663.9</b>	<b>668.4</b>	<b>621.2</b>	<b>600.5</b>
<b>Full Time Equivalents</b>	<b>3,838</b>	<b>3,919</b>	<b>3,919</b>	<b>3,919</b>

### Notes:

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

\* Reflects best forecast of total planned spending to the end of the fiscal year.

\*\* Adjustments are to accommodate approvals obtained since the Main Estimates and are to include Budget initiatives, Supplementary Estimates, etc.



# Appendix A

## Financial Information

### Summary of Financial Tables

Table 1 – Summary of Capital Spending by Business Lines

Table 2 – Details on Major Capital Projects Spending

Table 3 – Summary of Transfer Payments

Table 4 – Source of Respendable Revenue

Table 5 – Net Cost of Program for the Estimate Year

**Table 1 – Summary of Capital Spending by Business Lines**

CAPITAL SPENDING BY BUSINESS LINE (MILLIONS OF DOLLARS)				
Business Lines	Forecast Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006	Planned Spending 2006-2007
Research and Technology Innovation	63.7	69.6	43.7	37.0
Support for Innovation and the National Science and Technology Infrastructure	0.0	0.0	0.0	0.0
Program Management	7.6	6.4	5.8	5.4
<b>Total Capital Spending</b>	<b>71.3</b>	<b>76.0</b>	<b>49.5</b>	<b>42.4</b>



**Table 2 – Details on Major Capital Projects Spending**

CAPITAL PROJECTS BY BUSINESS LINE (MILLIONS OF DOLLARS)						
Business Lines	Current Estimated Total Cost	Forecast Spending to March 31, 2004	Planned Spending 2004-2005	Planned Spending 2005-2006	Planned Spending 2006-2007	Future Years' Requirement
<b>Research and Technology Innovation</b>						
<i>Nova Scotia</i>						
Construction of the Industry Partnership Facility at IMB, <u>Project Close-out Phase (DA)</u>	4.8	3.2	1.6			
Fourier-Transform Ion Cyclotron Resonance Mass Spectrometry Facility, <u>Project Close-out Phase (DA)</u>	1.3		1.3			
<i>Quebec</i>						
NRC Advanced Aerospace Manufacturing Technology Centre, <u>Project Close-out Phase (S-EPA)</u>	34.1	28.1	6.0			
NRC Aluminium Technology Centre, <u>Project Close-out Phase (S-EPA)</u>	34.4	25.5	8.9			
<i>Ontario</i>						
Construction of the Canadian Photonics Fabrication Centre, <u>Project Close-out Phase (S-EPA)</u>	19.0	15.7	3.3			
Scanning Transmission Electron Microscope, <u>Project Close-out Phase (DA)</u>	2.4	1.4	1.0			
New Avionics Requirements for FRL Aircraft – Updating Research Facilities, <u>Project Close-out Phase (DA)</u>			1.1			
High-Load Low Reynolds Number Testing Facility, <u>Project Close-out Phase (DA)</u>	1.1	0.5	0.5			
Expansion of M-54 to Accommodate a Regional Cluster in Neurogenomics, Neuroglycomics and Neurosystems, <u>Project Close-out Phase (DA)</u>	1.1	0.1	1.0			
<i>British Columbia</i>						
Move of the NRC Innovation Centre, <u>Project Implementation Phase (I-PPA)</u>	15.0	0.9	8.6	5.5		
<b>Program Management</b>						
<i>Ontario</i>						
Asbestos Removal – Building M-58, <u>Project Implementation Phase (DA)</u>	2.1	1.9		0.2		

**Table 3 – Summary of Transfer Payments**

TRANSFER PAYMENTS BY BUSINESS LINE (MILLIONS OF DOLLARS)				
Business Lines	Forecast Spending 2003-2004	Planned Spending 2004-2005	Planned Spending 2005-2006	Planned Spending 2006-2007
<b>GRANTS</b>				
Research and Technology Innovation	0.0	0.3	0.0	0.0
Program Management	1.0	1.0	1.0	1.0
<b>Total Grants</b>	<b>1.0</b>	<b>1.3</b>	<b>1.0</b>	<b>1.0</b>
<b>CONTRIBUTIONS</b>				
Research and Technology Innovation <sup>1</sup>	46.0	45.5	24.7	24.7
Support for Innovation and the National Science and Technology Infrastructure <sup>2</sup>	88.4	92.6	101.0	92.0
<b>Total Contributions</b>	<b>134.4</b>	<b>138.1</b>	<b>125.7</b>	<b>116.7</b>
<b>Total Transfer Payments</b>	<b>135.4</b>	<b>139.4</b>	<b>126.7</b>	<b>117.7</b>

Notes:

- (1) TRIUMF: Located on the campus of the University of British Columbia, it is Canada's national laboratory for research in particle and nuclear physics. It is managed as a joint venture by a consortium of universities (Universities of Alberta, British Columbia, Carleton, Simon Fraser and Victoria) and operated under a contribution from the Government of Canada administered by NRC. An Advisory Committee on TRIUMF (ACOT) monitors TRIUMF's overall scientific program and ensures that all program initiatives are of an appropriate scientific quality, while an Agency Committee on TRIUMF (ACT) oversees the federal investment, with a particular focus on financial and commercialization matters. A results-based management and accountability framework incorporating performance indicators and expected results and outcomes has been prepared for TRIUMF for the current 2000-2005 funding period. (Please visit NRC's 2002-2003 Departmental Performance Report on-line at [http://www.tbs-sct.gc.ca/rma/dpr/02-03/NRC-CNRC/NRC-CNRC03D\\_e.asp](http://www.tbs-sct.gc.ca/rma/dpr/02-03/NRC-CNRC/NRC-CNRC03D_e.asp) for more details on TRIUMF's performance).

**International Telescopes:** NRC, through the Herzberg Institute of Astrophysics (NRC-HIA), supports the construction and operation of international telescopes in order to ensure that Canadian researchers and students (spanning several professional disciplines) have access to sophisticated, cutting edge astronomical facilities. NRC currently supports the Canada-France-Hawaii Telescope (Hawaii), the James Clerk Maxwell Telescope (Hawaii) and the Gemini Telescopes (twin facilities in Hawaii and Chile).

- (2) **Industrial Research Assistance Program (NRC-IRAP):** Through expert advice and financial assistance, NRC-IRAP stimulates the innovative capacities of some 12,000 SMEs each year. It has been demonstrated that NRC-IRAP helps SMEs to (1) acquire new technical knowledge and skills, (2) enhance linkages with experts, (3) improve processes, and (4) increase innovation, sales and jobs. In 2002-2003, the total NRC-IRAP level of activity was \$147.18 million; including \$95.2 million in direct contributions to 2,741 SMEs for 2,919 innovation capacity building projects. Of this \$95.2 million, \$28.2 million was delivered through the IRAP-TPC program to assist in pre-commercialization projects.

**Table 4 – Source of Respendable Revenue**

SPENDING OF REVENUES PURSUANT TO THE <i>NRC ACT</i> (MILLIONS OF DOLLARS)				
Business Lines	Forecast Revenue 2003-2004	Planned Revenue 2004-2005	Planned Revenue 2005-2006	Planned Revenue 2006-2007
<b>Research and Technology Innovation</b>				
Fee-for-Service	32.1	26.6	22.8	22.6
Rentals	2.3	2.1	2.1	2.2
Royalties	7.2	7.3	7.7	8.3
Publications	2.4	1.7	3.8	2.8
Others	0.9	0.7	1.7	0.7
<b>Support for Innovation and the National Science and Technology Infrastructure</b>				
Fee-for-Service	5.9	5.0	5.5	5.8
Royalties	0.1	0.1	0.1	0.1
Publications	25.0	25.1	25.8	26.6
Others	0.2	0.2	0.2	0.2
<b>Program Management</b>				
Fee-for-Service	0.8	1.2	1.3	1.2
Rentals	0.4	0.1	0.1	0.1
Others	4.6	5.0	0.9	1.5
<b>Total Respendable Revenues</b>	<b>81.9</b>	<b>75.1</b>	<b>72.0</b>	<b>72.1</b>

Notes:

Due to rounding, figures may not add to totals shown.

**Table 5 – Net Cost of Program for the Estimate Year**

(MILLIONS OF DOLLARS)	
	Total
Planned Spending (Total Main Estimates plus Adjustments as per the Planned Spending table)	724.1
Plus:	
<i>Services Received without Charge</i>	
Employer's share of health and employment insurance premiums paid by the Treasury Board Secretariat (excluding revolving funds)	18.6
Employee compensation under <i>Workers' Compensation Act</i> paid by Human Resources Development Canada	0.3
Salary and associated expenditures of legal services provided by the Department of Justice Canada	0.3
Accommodations – Public Works and Government Services Canada	0.2
	19.4
Total Cost of Program	743.5
<i>Less:</i>	
<i>Spending of revenues pursuant to the NRC Act</i>	75.1
2004-2005 Net Cost of Program	668.4

# Appendix B

## Government-Wide and Horizontal Initiatives

### Government-Wide Initiatives

#### Canada's Innovation Strategy

With the release of the *Summary Proceedings of the National Summit on Innovation and Learning* in 2003, the Government of Canada articulated 18 priority recommendations developed by over 700 participants at the Summit. NRC was asked to take a lead role in following up on the first of those recommendations by identifying actions that will improve Canada's commercialization capacity. The results of the March 2003 Workshop on *Building Canada's Capacity for Commercialization* have been widely circulated to government, industry and academic stakeholders to help formulate new initiatives and measures in support of commercialization. A priority for NRC in the coming year will be to support and implement measures that will improve Canada's performance in commercializing new technologies in the market place. More information on Canada's Innovation Strategy can be found at <http://www.innovationstrategy.gc.ca>.

#### Sustainable Development

As a Schedule II (*Financial Administration Act*) departmental corporation, NRC is not subject to the 1995 amendments to the *Auditor General Act* requiring the preparation of a Sustainable Development Strategy (SDS). However, NRC has an Environmental Management Policy to ensure that its operations contribute to sustainable development. NRC fosters the integration of sustainable development strategies and practices across Canada and in the innovation processes of Canadian SMEs.

#### Modern Comptrollership (Modern Management Practices – MMP)

NRC's Modern Management Practices Capacity Assessment was completed in December 2002. An Action Plan, which integrated and built upon existing and planned management initiatives was developed and finalized in April 2003. Two special networking initiatives were also undertaken in 2003 with support from Treasury Board. These projects involved establishing networks among federal science-based and related departments and agencies to share information and expertise in the areas of risk management and performance management. The projects included efforts to develop generic Integrated Risk Management and Performance Management Frameworks related to the unique environment of federal S&T organizations.

### Collective Initiatives

#### Industry Portfolio

NRC reports directly to the Parliament of Canada through the Minister of Industry and is one of fourteen departments and agencies that make up the Industry Portfolio. Together these organizations

are uniquely positioned to advance the Government's agenda in building national innovative capacity and to help Canada become one of the top five industrialized nations in R&D.

Through partnerships and projects, NRC has worked closely with Industry Portfolio partners over the years to leverage complementary resources and exploit synergies. During 2001, the members of the Industry Portfolio agreed upon four priority areas of cooperation for the future:

- *Innovation* – stimulating the creation and use of knowledge to benefit all Canadians;
- *Business development* – supporting the creation and growth of businesses (primarily SMEs) and industries;
- *Sustainable communities* – promoting inclusive economic growth in rural, urban and remote communities across Canada; and
- *Marketplace* – ensuring fair, efficient and competitive rules, standards and ways of operating.

Over the planning period, NRC will collaborate with its Portfolio partners in developing strategies and approaches to advance these four priorities.

### **Federal Strategies and Initiatives**

Whether it is NRC's unique and multidisciplinary research portfolio or its technology cluster model, NRC is a welcome partner in many S&T horizontal and government-wide initiatives. *Table B-1* demonstrates NRC participation in Federal Strategies and Initiatives for which NRC and its partners have been granted funds.

**Table B-1: Federal Strategies and Initiatives – NRC Participation<sup>17</sup>**

COLLECTIVE INITIATIVES	STRATEGIC OUTCOME (KEY RESULT COMMITMENT)	LEAD DEPARTMENT	RESOURCES ALLOCATIONS (MILLIONS OF DOLLARS)	EXPECTED BENEFIT AND/OR RESULTS FOR CANADIANS
<i>Atlantic Investment Partnership</i>	Fostering technology clusters that develop the innovative capacity and socio-economic potential of Canada's communities.	ACOA	NRC was allocated \$110 million over five years, starting in 2000-2001, from the \$700 million Atlantic Investment Partnership for its Atlantic Canada Innovation Initiative.	<ul style="list-style-type: none"> <li>▪ Create a globally competitive research and technology base for cluster development at the community level;</li> <li>▪ Foster community leadership, champions and knowledge-based strategies;</li> <li>▪ Leverage funding and new investment in the cluster with stakeholders;</li> <li>▪ Stimulate the emergence of new firms, jobs, exports and investment growth.</li> </ul>
<i>Aerospace Technology Infrastructure Initiative</i>	Provide the technology infrastructure needed to ensure the long-term international competitiveness of the Canadian aerospace industry (including access to national facilities, and leadership and direction in technology transition).	CED	NRC was allocated \$43.4 million over the five-year period 2000-2001 to 2004-2005 for the development and construction of facilities and the establishment of new research programs in Montréal and Ottawa. CED is contributing \$25 million over the same period toward the capital costs associated with the construction AMTC in Montréal.	<ul style="list-style-type: none"> <li>▪ Industrial and economic development: increasing and leveraging investments in Canadian aerospace technology and increasing capacity of Canadian firms;</li> <li>▪ Regional development: developing and transferring technology within local communities;</li> <li>▪ Advancement of knowledge: development, transfer and growth of knowledge and highly qualified personnel;</li> <li>▪ Environmental and safety improvements: improve environmental, safety and quality performance of aerospace industry.</li> </ul>
<i>CBRN Research and Technology Initiative</i>	Strengthen Canada's preparedness for prevention of, and response to, a CBRN terrorist attack by fostering new investments in research and technology that will generate knowledge and technology, and support their application, while harnessing existing capabilities.	DND (DRDC)	Launched in May 2002, as a response to the events of 9/11, DND (DRDC) has been allocated \$170 million to help Canada respond to CBRN incidents through the CBRN Research and Technology Initiative (CRTI). NRC is the lead on one project and participates in three others.	<ul style="list-style-type: none"> <li>▪ Create clusters of federal labs as elements of a federal laboratory response network that will build S&amp;T capacity to address the highest risk terrorist attack scenarios;</li> <li>▪ Create a fund to build capability in critical areas, particularly those identified in the scenarios that address biological and radiological attack;</li> <li>▪ Accelerate technology into the hands of the first responders community and other operational authorities; and</li> <li>▪ Provide funds to those areas where national S&amp;T capacity is deficient owing to obsolete equipment, dated facilities and inadequate scientific teams.</li> </ul>

<sup>17</sup> Note : For more details on the horizontal initiatives listed in this table please see the Treasury Board Secretariat's Horizontal Results database at [http://www.tbs-sct.gc.ca/rma/eppi-ibdrp/hr-rh\\_e.asp](http://www.tbs-sct.gc.ca/rma/eppi-ibdrp/hr-rh_e.asp)

COLLECTIVE INITIATIVES	STRATEGIC OUTCOME (KEY RESULT COMMITMENT)	LEAD DEPARTMENT	RESOURCES ALLOCATIONS (MILLIONS OF DOLLARS)	EXPECTED BENEFIT AND/OR RESULTS FOR CANADIANS
<i>Public Security Technical Program</i>	To develop a bi-lateral working relationship with the U.S. through S&T collaboration in border security issues between the two countries.	DND (DRDC)	To be implemented within the framework of existing resources	<ul style="list-style-type: none"> <li>▪ To improve public and economic security of Canadians through improved surveillance on border issues associated with: <ul style="list-style-type: none"> <li>▪ Chemical, Biological, Radiological, Nuclear and Explosive (CBRNE) weapons</li> <li>▪ Systems Integration, Standards and Analysis (SISA)</li> <li>▪ Critical infrastructure protection</li> <li>▪ Detection and interdiction</li> </ul> </li> </ul>
<i>Enhanced Representation Initiative</i>	To complement on-going efforts to enhance the promotion of Canadian interests in the U.S. through pro-active participation in both the political and economic sectors at a regional level.	FAC	NRC has contributed \$.5 million to this initiative.	<ul style="list-style-type: none"> <li>▪ Increased trade with the U.S.</li> <li>▪ Enhanced innovation in the Canadian economy through S&amp;T, strategic alliances and investment</li> <li>▪ Improved access to the U.S. market through management of trade disputes, development of rules-based systems and advancement of a smart regulation agenda <ul style="list-style-type: none"> <li>▪ Implementation of the smart border accord</li> <li>▪ Enhanced security through co-operation on defence and security issues</li> <li>▪ Protection of the shared environment; and</li> <li>▪ Promotion of Canadian identity and values.</li> </ul> </li> </ul>
<i>Genomics Research Initiative</i>	Enhance the quality of life of Canadians in terms of health, safety, the environment and social and economic development by positioning Canada as a responsible world leader in biotechnology.	NRC <sup>17</sup>	<p>From 1999-2000 to 2001-2002, a \$55 million genomics research initiative was developed through the Canadian Biotechnology Strategy. In 2002-2003, \$59 million were allocated by the Treasury Board to pursue this initiative.</p> <p>NRC received \$17 million in 1999-2000 and \$18 million in 2002-2003.</p>	<ul style="list-style-type: none"> <li>▪ <i>Stewardship</i>: increased dissemination of genomics information; impact in terms of value-added and influence in technology identification, adoption, and development; establishment of critical mass and strengthening of national genomics program through excellence in federal research programs</li> <li>▪ <i>Economic benefits</i>: increased business development; improved management practices development; improved technical and economic performance of genomics clients and target population</li> <li>▪ <i>Citizenship engagement</i>: improved awareness and understanding of genomics research and its potential impacts, stakeholder and/or client community recognition and support of genomics organizations and their product and/or services.</li> </ul>



# Appendix C

## Management & Legislative Information

### Senior Management and Corporate Information

#### President (Acting)

Michael Raymont

(613) 993-2024

[michael.raymont@nrc-cnrc.gc.ca](mailto:michael.raymont@nrc-cnrc.gc.ca)

#### Secretary General

Pat Mortimer

(613) 993-3731

[pat.mortimer@nrc-cnrc.gc.ca](mailto:pat.mortimer@nrc-cnrc.gc.ca)

#### Vice-President, Research – Life Sciences and Information Technologies

Peter A. Hackett

(613) 993-9244

[peter.hackett@nrc-cnrc.gc.ca](mailto:peter.hackett@nrc-cnrc.gc.ca)

#### Vice-President, Technology and Industry Support

Michael Raymont

(613) 998-3664

[michael.raymont@nrc-cnrc.gc.ca](mailto:michael.raymont@nrc-cnrc.gc.ca)

#### Vice-President, Research – Physical Sciences and Engineering

Richard Normandin

(613) 993-4449

[richard.normandin@nrc-cnrc.gc.ca](mailto:richard.normandin@nrc-cnrc.gc.ca)

#### Corporate Headquarters

1200 Montreal Road

Montreal Rd. Campus

Ottawa, Ontario

K1A 0R6

#### General Inquiries:

1-877-672-2672 or (613) 993-9101

Internet: <http://www.nrc-cnrc.gc.ca/>

e-mail: [info@nrc-cnrc.gc.ca](mailto:info@nrc-cnrc.gc.ca)

#### Access to Information and Privacy:

(613) 990-6111

[huguelle.brunet@nrc-cnrc.gc.ca](mailto:huguelle.brunet@nrc-cnrc.gc.ca)

#### RPP Contact:

*Director, Corporate Policy and Strategy*

Rob James

(613) 990-7381

[rob.james@nrc-cnrc.gc.ca](mailto:rob.james@nrc-cnrc.gc.ca)

### NRC Legislation

The establishment, duties and powers of NRC are set out in the *National Research Council Act*, R.S.C. 1985, c. N-15

NRC has responsibilities and duties relating to the calibration and certification of standards of measurement under the *Weights and Measures Act*, R.S.C. 1985, c. W-6



# Appendix D

## NRC Strategic Outcomes - Linkages

### Linkages between NRC Strategic Outcomes and TBS' Canada's Performance

#### Economic Opportunities and Innovation in Canada Theme

As Canada's foremost multidisciplinary R&D agency, NRC falls under the *economic opportunities and innovation in Canada* theme of the Canada's Performance 2003 Annual Report to Parliament and the two societal indicators *innovation* and *educational attainment*. NRC is aligned with the innovation societal indicator with its 19 research institutes, two technology centres, the Industrial Research Assistance Program (NRC-IRAP) and the Canada Institute for Scientific and Technical Information (NRC-CISTI). NRC is also aligned with educational attainment as it helps to develop skilled workers through undergraduate, graduate and post-graduate training programs.

#### Societal Indicator: Innovation

With the Government of Canada's commitment in the *Speech from the Throne* (January 2001) for Canada to become one of the top five R&D performers in the world and the release of *Canada's Innovation Strategy*, NRC is now more committed than ever to pursuing its goals of fostering Canada's innovative capabilities through scientific research and technological development and innovation support programs. NRC's new five-year plan, *Vision 2006*, focuses on innovation; four of the five strategic pillars of *Vision 2006* are focused on innovation.

#### Related NRC's Strategic Outcomes:

- *Excellence and leadership in research and development* – By 2006, NRC will assume a leadership position in at least three new vital domains of scientific and engineering research needed for Canada to meet national challenges and capitalize on the opportunities of a global knowledge economy.
- *Technology clusters* – By 2006, NRC will contribute to the development of new, sustainable and competitive innovation clusters in at least ten Canadian communities.
- *Value for Canada* – By 2006, NRC will be recognized by its partners and government stakeholders as Canada's leading developer of new research and technology-based enterprises, and respected for its innovative S&T commercialization practices.
- *Global Reach* – By 2006, NRC will be recognized by its stakeholders for its contributions to a more effective Canadian innovation system that assures access to international facilities and research networks, provides opportunities for Canadian firms, and builds new research and technology alliances.

#### Related NRC Programs and Initiatives:

- 19 research institutes, two technology centres (*See Appendix E for a complete list of NRC Research Institutes and Technology Centres.*);

- Special Interest Groups
- Entrepreneurship Program;
- Atlantic Innovation Partnership;
- Canada Institute for Scientific and Technical Information
- Industrial Research Assistance Program; and
- Canadian Technology Network.

### ***Societal Indicator: Educational attainment***

One of the goals set forth in *Canada's Innovation Strategy* is to develop the most skilled and talented labour force in the world. Since its inception, NRC has provided training opportunities to many of Canada's young scientists and engineers. Close to 900 students, each year, come to work with NRC research teams in our world-class facilities. Also many of NRC's scientists, researchers and engineers have received appointments as adjunct professors in Canadian universities.

#### **Related NRC's Strategic Outcomes:**

- *Outstanding People – Outstanding Employer* – By 2006, NRC will be regarded by staff and their peers as a major innovator in human resources management, as a place where outstanding people are encouraged and are able to make outstanding contributions to Canada, and as an outstanding employer offering a great place to work.
- *Excellence and leadership in research and development* – By 2006, NRC will assume a leadership position in at least three new vital domains of scientific and engineering research needed for Canada to meet national challenges and capitalize on the opportunities of a global knowledge economy.

#### **Related NRC Programs and Initiatives:**

- New Horizons – New Opportunities Program
- IRAP's Youth Internship Program;
- Research Associate Program;
- Women in Engineering and Science Program;
- Program to Enhance the Canadian Science and Technology Capacity (Supplement to Scholarships Recipients and Herzberg Memorial Prize and Fellowship); and
- NRC Post-doctoral Fellowship Program.

# Appendix E

## NRC Institutes, Branches and Centres

### Business Line: Research and Technology Innovation

#### Under the Direction of Vice-President Research – Physical Sciences and Engineering

##### Aerospace

Institute for Aerospace Research (NRC-IAR) - Ottawa, Ontario and Montréal, Quebec  
Director General: David Simpson

As Canada's national aerospace laboratory, the NRC Institute for Aerospace Research (NRC-IAR) undertakes and promotes R&D in support of the Canadian aerospace community, in matters affecting the design, manufacture, performance, use and safety of aerospace vehicles. NRC-IAR serves the industrial needs of airframe manufacturers, avionics manufacturers and aircraft operators. Aerospace manufacturing requires fundamental design assurances for its structural parts that encompass fail-safe and damage-tolerance concepts. NRC-IAR's research and testing helps clients to meet these standards, and satisfy airworthiness and certification requirements. It also is responsible for the *Aerospace Manufacturing Technology Centre* in Montréal, Québec.

General Inquiries: (613) 993-5738

<http://iar-ira.nrc-cnrc.gc.ca/>

##### Astrophysics

Herzberg Institute of Astrophysics (NRC-HIA) – Victoria and Penticton, British Columbia  
Director General: Gregory G. Fahlman

The NRC Herzberg Institute of Astrophysics (NRC-HIA) provides first-class research facilities in observational astronomy to the national research community. Most of its activities are conducted in the context of major international agreements and partnerships. NRC-HIA operates astronomical observatories of the Government of Canada in Victoria and Penticton (British Columbia), participates in four major international observatories in Hawaii and Chile (Canada-France-Hawaii Telescope, James Clerk Maxwell Telescope and the Gemini Telescopes); assigns observing time to any scientists in Canada and supports space astronomy missions.

General Inquiries: (250) 363-0001

<http://hia-aha.nrc-cnrc.gc.ca/>

##### Construction

Institute for Research in Construction (NRC-IRC) - Ottawa, Ontario and Regina Saskatchewan  
Director General: Sherif Barakat

The NRC Institute for Research in Construction (NRC-IRC) is Canada's foremost centre for construction technologies. NRC-IRC develops and maintains core competencies and the knowledge base critical to Canadian construction industry needs, supports the development, commercialization and implementation of leading technologies, and fosters the provision of a safe and sustainable built environment by developing building codes and standards. It also is responsible for the *Centre for Sustainable Infrastructure Research (CSIR)* in Regina Saskatchewan.

General Inquiries: (613) 993-2607

<http://irc.nrc-cnrc.gc.ca/>

## Ocean Engineering and Marine Industries

Institute for Ocean Technology (NRC-IOT) – St. John's, Newfoundland  
Director General: Mary Williams

The NRC Institute for Ocean Technology (NRC-IOT) provides innovative solutions and technical expertise in ocean engineering and ocean technology. NRC-IOT pursues research programs in ship technology and offshore engineering and works with industries and public sector agencies on projects relating to offshore oil and gas, ship design, marine operations and safety.

*General Inquiries:* (709) 772-6001

<http://iot-ito.nrc-cnrc.gc.ca/>

## Manufacturing Technologies

Institute for Fuel Cell Innovation (NRC-IFCI) - Vancouver, British Columbia  
Director General: Maja Veljkovic

The NRC Institute for Fuel Cell Innovation (NRC-IFCI) develops core competencies relevant to the long-term strategic technology needs of Canadian industry, with particular emphasis on integration with other players in the B.C. innovation community. The *Fuel Cell Technology Centre* (FCTC) acts as an R&D platform for the National Fuel Cell Initiative. The FCTC will support validation/testing of fuel cell component and sub-component projects conducted at other NRC institutes. It will also provide Canadian industries with the product development infrastructure required for business development and offer the means of demonstrating newly developed products and systems, training personnel and interacting with other international programs.

*General Inquiries:* (604) 221-3099

<http://ifci-iipac.nrc-cnrc.gc.ca/>

Institute for Chemical Process and Environmental Technology (NRC-ICPET) - Ottawa, Ontario  
Director General: Don Singleton

The NRC Institute for Chemical Process and Environmental Technology (NRC-ICPET) develops chemical process technologies and value-added materials to help Canadian industries improve the commercial viability of their products, reduce costs, manage environmental performance and increase the efficiency of process operations. NRC-ICPET works with Canadian industry to rapidly develop, transfer and commercialize innovative new technologies that enhance competitiveness and create sustainable economic growth.

*General Inquiries:* (613) 998-3692

<http://icpet-itpce.nrc-cnrc.gc.ca/>

Industrial Materials Institute (NRC-IMI) – Longueuil and Saguenay, Quebec  
Director General: Blaise Champagne

The NRC Industrial Materials Institute (NRC-IMI) is a R&D centre focused on materials, their formulation and forming, as well as the control of their processes. NRC-IMI works primarily in the metallurgy, polymer, aerospace, automotive and biomedical sectors. NRC-IMI helps Canadian companies meet the risks of the new economy by providing them competitive advantages and the required leverage to grasp opportunities. NRC-IMI is responsible for the *Aluminium Technology Centre* (ATC) in Saguenay.

*General Inquiries:* (450) 641-5000

<http://www.imi.nrc-cnrc.gc.ca/>

**Integrated Manufacturing Technologies Institute (NRC-IMTI) - London, Ontario**  
Director General: Georges Salloum

The NRC Integrated Manufacturing Technologies Institute (NRC-IMTI) conducts research in the engineering sciences, with an overall orientation towards integrated technologies. Working in collaboration with industry, universities and government partners, NRC-IMTI carries out strategic and commercially relevant research in systems simulation and control and in production technologies, pursues the development and application of virtual manufacturing and precision and freeform fabrication in support of manufacturing objectives and works with regional leaders in the development of innovation systems and clusters.

*General Inquiries:* (519) 430-7092

<http://imti-itfi.nrc-cnrc.gc.ca/>

## **Under the Direction of the Vice-President Research – Life Sciences and Information Technologies**

### **Biotechnology Group**

**Biotechnology Research Institute (NRC-BRI) - Montréal, Quebec**  
Director General: Michel Desrochers

The NRC Biotechnology Research Institute (NRC-BRI) promotes, assists and performs leading edge R&D in biochemical engineering, molecular biology and genomics, closely linked to the needs of industries in the health and environmental sectors. NRC-BRI is a critical locus of the biotechnology R&D cluster of enterprises in the Greater Montréal region. To support the industry, NRC-BRI offers an industry partnership wing of lab space, corporate offices and an environmental pilot plant to start-up and existing firms.

*General Inquiries:* (514) 496-6100

<http://www.bri-irb.nrc-cnrc.gc.ca/>

**Institute for Biodiagnostics (NRC-IBD) - Winnipeg, Manitoba**  
Director General: Ian Smith

The NRC Institute for Biodiagnostics (NRC-IBD) performs world-class research in non-invasive medical diagnostics and transfers this knowledge to the commercial sector. The results make a real difference to health, influencing diagnostics, treatment and prognosis.

*General Inquiries:* (204) 983-7692

<http://www.ibd.nrc-cnrc.gc.ca/>

**Institute for Biological Sciences (NRC-IBS) - Ottawa, Ontario**  
Director General: Gabrielle Adams

The NRC Institute for Biological Sciences (NRC-IBS) is a team of life sciences researchers dedicated to unearthing the next breakthrough discoveries and technologies in neurobiology and immunochemistry. NRC-IBS is focused on R&D associated with neurodegenerative diseases, infectious diseases, cancer vaccines, immunotherapeutics and bioproducts.

*General Inquiries:* (613) 993-5812

<http://ibs-isb.nrc-cnrc.gc.ca/>

**Institute for Marine Biosciences (NRC-IMB) - Halifax, Nova Scotia**  
Director General: George Iwama

The NRC Institute for Marine Biosciences (NRC-IMB) conducts research in the life sciences, with an overall orientation towards marine biotechnology. NRC-IMB expertise is in the four following areas: aquaculture biotechnology, marine chemistry, cell and molecular biology and genomic technology. NRC-IMB operates and manages the Canadian Bioinformatics Resource (CBR), a national facility providing access to biotechnology-related databases and bioinformatics software tools. NRC-IMB is also responsible for the Institute for Nutrisciences and Health (NRC-INH), an institute dedicated to research into naturally occurring compounds that have potential health benefits.

*General Inquiries:* (902) 426-8332

<http://imb-ibm.nrc-cnrc.gc.ca/>

**Plant Biotechnology Institute (NRC-PBI) - Saskatoon, Saskatchewan**  
Director General: Kutty Kartha

The NRC Plant Biotechnology Institute (NRC-PBI) performs, assists and promotes strategic research in plant biotechnology (strategic and enabling technologies, plant production modification and plant performance) to improve and diversify Canadian industry and strengthen Canada's competitive position in the global economy. NRC-PBI is a leader in the metabolic modification of oilseeds to increase oil content and to create specialty plant oils for new markets. Similar research is altering wheat starch for novel uses and to meet new international markets. Investigation of metabolic pathways has also led to a significant reduction in anti-nutritional compounds in common commercial crops. NRC-PBI also serves as a catalyst for economic growth and development and contributed to the emergence of Saskatoon's foremost agriculture biotechnology cluster.

*General Inquiries:* (306) 975-5248

<http://pbi-ibp.nrc-cnrc.gc.ca/>

## **Information and Communications Technologies**

**Institute for Information Technology (NRC-IIT) - Ottawa, Ontario and Fredericton, New Brunswick, Gatineau, Québec.**

Director General: Andrew Woodsworth

The NRC Institute for Information Technology (NRC-IIT) is dedicated to R&D in software and systems technologies. NRC-IIT is a key player in R&D collaborations and partnerships in information and communications technologies with business, universities and government agencies in Canada and around the world. In June 2000, NRC-IIT expended its activities in Atlantic Canada with the establishment of a new e-Business research program across New Brunswick and in Sydney (Nova Scotia). It is also responsible for the *Language Technology Research Centre* in Gatineau, Québec.

*General Inquiries:* (506) 444-6132

<http://iit-iti.nrc-cnrc.gc.ca/>

**Institute for Microstructural Sciences (NRC-IMS) - Ottawa, Ontario**  
Director General: Marie D'Iorio

The NRC Institute for Microstructural Sciences (NRC-IMS) provides leadership, in collaboration with Canadian industry and universities, in the development of the strategic base for information technology; that is, in the development of enabling technologies related to future hardware requirements for information processing, transmission acquisition and display.

*General Inquiries:* (613) 993-4583

<http://ims-ism.nrc-cnrc.gc.ca/>



## Measurement Standards

Institute for National Measurement Standards (NRC-INMS) - Ottawa, Ontario

Director General: Peter Hackett (acting)

The NRC Institute for National Measurement Standards (NRC-INMS) is Canada's national metrology institute. In accordance with the National Research Council Act, NRC-INMS is charged with the responsibility to investigate and determine standards and methods of measurement. NRC-INMS carries out a wide range of research and service activities to fulfill this responsibility and to support the Canadian innovation system.

*General Inquiries:* (613) 998-7018

<http://inms-ienm.nrc-cnrc.gc.ca/>

## Molecular Sciences

Stecie Institute for Molecular Sciences (NRC-SIMS) – Ottawa and Chalk River, Ontario

Director General: Danial Wayner

The NRC Steacie Institute for Molecular Sciences (NRC-SIMS) provides leadership in collaboration with the Canadian and international scientific communities in the development of a knowledge base in molecular sciences. NRC-SIMS undertakes fundamental interdisciplinary research programs in partnership with researchers inside and outside NRC to develop innovative technologies and is based on competencies that range from cell chemistry to attosecond science to nano-material. NRC-SIMS administers the Canadian Neutron Beam Laboratory in Chalk River (Ontario) through the Neutron Program for Material Research.

*General Inquiries:* (613) 991-5419

<http://steacie.nrc-cnrc.gc.ca/>

## Nanotechnology

National Institute for Nanotechnology (NRC-NINT) – Edmonton, Alberta

Director General: Janusz Lusztyk (acting)

The National Institute for Nanotechnology (NRC-NINT) is a joint venture between NRC, the Province of Alberta and the University of Alberta. NRC-NINT has a national mandate to conduct molecular and nano-scale technology research, development and commercialization focusing on the following major sectors: nanobiotechnology; energy and materials; information and communication technology, and nano-engineering. NRC-NINT will also work to establish Edmonton as an international centre for nanotechnology research and anchor a national nanotechnology R&D infrastructure available to researchers across the country.

*General Inquiries:* (780) 492-8888

[http://nint-innt.nrc-cnrc.gc.ca](http://nint-innt.nrc-cnrc.gc.ca/)

## **Business Line: Support for Innovation and the National Science and Technology Infrastructure**

### **Under the Direction of the Vice-President: Technology and Industry Support**

#### **Scientific Technical and Medical Information**

Canada Institute for Scientific and Technical Information (NRC-CISTI) - Ottawa, Ontario with offices across Canada

Director General: Bernard Dumouchel

The NRC Canada Institute for Scientific and Technical Information (NRC-CISTI) is one of the world's major sources for information in all areas of science, technology, engineering and medicine. NRC-CISTI provides easy-to-use electronic information tools that enable clients to stay on top of new developments in their fields. NRC-CISTI is home of the NRC Research Press – Canada's largest scientific publisher.

*General Inquiries:* 1-800-668-1222

<http://cisti-icist.nrc-cnrc.gc.ca/>

#### **Support for Small Business Research and Innovation**

Industrial Research Assistance Program (NRC-IRAP) - Ottawa, Ontario with offices across Canada

Director General: Margot Montgomery

The NRC Industrial Research Assistance Program (NRC-IRAP) stimulates wealth-creation for Canada through technological innovation. NRC-IRAP's objectives are to increase the innovative capabilities of SMEs and to become the national enabler of technological innovation for SMEs.

*General Inquiries:* 1-877-994-4727

<http://irap-pari.nrc-cnrc.gc.ca/>

#### **Technology Centres**

Canadian Hydraulics Centre (NRC-CHC) - Ottawa, Ontario

Director: Etienne Mansard

The NRC Canadian Hydraulics Centre (NRC-CHC) develops and provides technologies for studying maritime structures, coastal processes, environmental hydraulics and cold regions engineering. NRC-CHC continues to establish itself as a centre of excellence for hydraulic studies that are relevant to Canada and U.S. partners. NRC-CHC is poised to address topics of climate change, energy efficiency, environmental impact assessment, water resources and quality, sustainable development and coastal environments.

*General Inquiries:* (613) 993-9381

<http://chc.nrc-cnrc.gc.ca/>

Centre for Surface Transportation Technology (NRC-CSTT) - Ottawa, Ontario and Vancouver, British Columbia

Director: John Coleman

The NRC Centre for Surface Transportation Technology (NRC-CSTT) enhances international opportunities for the Canadian transportation industry by providing vehicle engineering and testing expertise and facilities, particularly in the railway sector and increasingly in the defence sector, by offering an array of services including projects critical to the deployment of Canadian Forces units in peacekeeping missions. As NRC-CSTT continues to build on its world leadership in wheel / rail

interaction, a similar level of global recognition for the institute is developing in railway freight car structures and dynamic performance.

*General Inquiries:* (613) 998-9639

<http://csst-ctts.nrc-cnrc.gc.ca/>

## **Corporate Branches and Offices:**

### **Reporting to the President**

#### **Administrative Services and Property Management (NRC-ASPM)**

Director General: Subash Vohra

General Inquiries: (613) 993-2440

[subash.vohra@nrc-cnrc.gc.ca](mailto:subash.vohra@nrc-cnrc.gc.ca)

#### **Corporate Services (NRC-CS)**

Director General: Don Di Salle

General Inquiries: (613) 993-0361

[don.di\\_salle@nrc-cnrc.gc.ca](mailto:don.di_salle@nrc-cnrc.gc.ca)

#### **Executive Offices and Secretary General**

Secretary General: Pat Mortimer

General Inquiries: (613) 993-4752

[pat.mortimer@nrc-cnrc.gc.ca](mailto:pat.mortimer@nrc-cnrc.gc.ca)

#### **Finance Branch (NRC-FB)**

Director General: Daniel Gosselin

General Inquiries: (613) 990-7471

[daniel.gosselin@nrc-cnrc.gc.ca](mailto:daniel.gosselin@nrc-cnrc.gc.ca)

#### **Human Resources Branch (NRC-HRB)**

Director General: Mary McLaren

General Inquiries: (613) 993-9391

[mary.mclaren@nrc-cnrc.gc.ca](mailto:mary.mclaren@nrc-cnrc.gc.ca)

#### **Information Management Services Branch (NRC-IMSB)**

Director General: Andy Savary

General Inquiries: (613) 991-3773

[andy.savary@nrc-cnrc.gc.ca](mailto:andy.savary@nrc-cnrc.gc.ca)

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