Natural Sciences and Engineering Research Council of Canada

Conseil de recherches en sciences naturelles et en génie du Canada

NSERC CRSNG

Investing in people, discovery and innovation

Report on Plans and Priorities

2003-2004
Estimates

Allan Rock
Minister of Industry

Canada

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List of Abbreviations

AP	Action Plan
CA	Capacity Assessment
CFI	Canada Foundation for Innovation
CPI	Consumer Price Index
CIHR	Canadian Institutes of Health Research
CFCAS	Canadian Foundation for Climate and Atmospheric Sciences
FTE	Full-Time Equivalent
HQP	Highly Qualified People
ICT	Information and Communication Technology
IRC	Industrial Research Chairs
NCE	Networks of Centres of Excellence
NSE	Natural Sciences and Engineering
NSERC	Natural Sciences and Engineering Research Council of Canada
OECD	Organisation for Economic Co-operation and Development
PRAS	Planning, Reporting and Accountability Structure
PWGSC	Public Works and Government Services Canada
R&D	Research and Development
RPP	Report on Plans and Priorities
SPARK	Students Promoting Awareness of Research Knowledge
S&T	Science and Technology
SSHRC	Social Sciences and Humanities Research Council of Canada
TBS	Treasury Board Secretariat
USRA	Undergraduate Student Research Award

1. Messages

1.1 Minister's Portfolio Message

I am proud to report on the measures being taken by the Industry Portfolio to help realize the government's goal of moving Canada into the ranks of the most innovative countries in the world by the year 2010. In today's global economy, innovation is the key to success. Thanks to innovation, we are finding new ways of thinking and better ways of working.

As the Minister responsible for the Industry Portfolio, I was pleased to be part of creating *Canada's Innovation Strategy*, which was launched in February 2002. Throughout the year, Industry Canada and its partners held 34 regional innovation summits and took part in many expert round tables and sectoral meetings. In all, the views of more than 10,000 Canadians were heard. That exciting and productive process culminated at the National Summit on Innovation and Learning, which brought together more than 500 business, government and academic leaders, as well as representatives from non-governmental organizations.

Industry Portfolio:

Atlantic Canada Opportunities Agency
Business Development Bank of Canada*
Canada Economic Development for Quebec Regions
Canadian Space Agency
Canadian Tourism Commission*
Competition Tribunal
Copyright Board Canada
Enterprise Cape Breton Corporation*
Industry Canada
Infrastructure Canada
National Research Council Canada
Natural Sciences and Engineering Research Council of Canada
Social Sciences and Humanities Research Council of Canada
Standards Council of Canada*
Statistics Canada
Western Economic Diversification Canada

** Not required to submit a Report on Plans and*

The Government of Canada is listening to Canadians. During the engagement process many excellent ideas were brought forward and, at the National Summit, were ranked in order of priority. Eighteen items were identified for action over the short term. I want to emphasize, however, that the process being discussed will be fully implemented over a 10-year period and must involve not only the Government of Canada, but all of its partners. Still, we have forged a very good beginning, and I am very encouraged by the positive response of the business and academic communities to the measures taken to date.

The Industry Portfolio's 16 member organizations work in partnership to ensure that Canadians have the support they need to meet the challenges of a rapidly evolving world economy. The cornerstone of all our future activities will be innovation.

It is my great pleasure to present the *Report on Plans and Priorities* for the Natural Sciences and Engineering Research Council of Canada (NSERC), which describes their expected achievements and results over the next three years.

NSERC invests in Canada's capability in science and technology to provide Canadians with a highly qualified workforce, new knowledge, and the creative and productive use of that knowledge to fuel innovation in our knowledge-based economy. NSERC does this by supporting university-based basic and project research, awarding scholarships and fellowships to young researchers, and facilitating links between the universities, colleges, governments and the private sector. Each of NSERC's three kinds of investments (in people, discovery and innovation) contributes to the development of the highly qualified people, whom both *Canada's Innovation Strategy* and Budget 2003 recognize as fundamental to making our country one of the five most innovative in the world by 2010.

We have made great strides forward in working with Canadians through the engagement process for *Canada's Innovation Strategy*. We connected with businesspeople, academics and private citizens in every region of the country. I am confident that this renewed partnership will flourish over the coming year and that the results of our efforts will mean more and better jobs, a stronger and more dynamic economy, and a better quality of life for all Canadians.

The Honourable Allan Rock

1.2 Message from the Secretary of State (Science, Research and Development)

It is an exciting time for Canadian science and technology. Investments in research and development, and in innovation infrastructure are paying dividends. New ideas are turning into new opportunities, benefiting Canadians in every economic sector across the country. Indeed, Canada can count itself among the leaders in the global race toward excellence.

Increasing Canada's capacity to innovate and creating a culture of innovation and creativity is at the heart of *Canada's Innovation Strategy*. The Strategy is a far-reaching microeconomic blueprint, encompassing not only science and technology, but also education, legal frameworks, taxation and skills development for all Canadians.

Canada's Innovation Strategy is a 10-year plan, bringing together the public, private and non-profit sectors to establish Canada as the global hub for investment and opportunity. Our emphasis on long-term innovation and knowledge creation across all sectors will translate into important benefits for business processes, health care, sustainable development and the protection of our natural environment. The Canadian science research and development community will play a major part in this vital initiative.

Knowledge is one of Canada's strategic national assets. As we build our science and research capacity, we will ensure that knowledge contributes to building the progressive and successful economy that will lay the foundation for future generations of Canadians.

As such, I am pleased to present the *2003-04 Report on Plans and Priorities* for the Natural Sciences and Engineering Research Council (NSERC), outlining where our nation is headed, how we intend to get there and what we expect our achievements to be.

Hon. Dr. Rey D. Pagtakhan
Minister of Veterans Affairs and Secretary of State (Science, Research and Development)

1.3 Management Representation Statement

MANAGEMENT REPRESENTATION STATEMENT

I submit, for tabling in Parliament, the 2003-2004 Report on Plans and Priorities (RPP) for the Natural Sciences and Engineering Research Council of Canada (NSERC).

This document has been prepared based on the reporting principles and disclosure requirements contained in the *Guide to the Preparation of the 2003-2004 Report on Plans and Priorities*.

- It accurately portrays the organization'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.
- It is comprehensive and accurate.
- It 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.

_____
Thomas A. Brzustowski, President

_____
Date

2. Raison d'être

NSERC invests in people, discovery, and innovation to build a strong Canadian economy and to improve the quality of life of all Canadians.

See Figure 12 on page 29 for a graphic representation of NSERC's vision and mission.

3. Planning Overview

NSERC is the primary federal agency investing in university research and training in the natural sciences and engineering (NSE). In 2003-2004, NSERC will invest its net planned spending of $770.6 million in support of three core priorities – people, discovery and innovation – at Canadian universities and colleges (including administration costs to deliver these investments and fulfil NSERC's mandate). NSERC investments support university-based basic and project research, they support the education of young people in that research and they encourage and facilitate links between the universities, colleges, governments and the private sector. These investments build Canada's capabilities in science and technology and support innovation that drives the economy and improves the quality of life of all Canadians.

The Government of Canada has set a new goal – moving Canada to among the top five OECD countries in R&D investment per capita by 2010. This ambitious benchmark underscores the government's Innovation Strategy, of which NSERC is an integral part. To reach its goal, Canada will require many more Highly Qualified People (HQP) trained at Canadian universities and colleges. In order for Canada to realize its goal of ranking among the world's top five R&D performers, NSERC estimates that approximately 100,000 new R&D employees will be required at various levels of qualification across all fields. NSERC investments in the training of HQP are key to meeting this challenge and unlocking Canada's R&D potential.

Canada’s innovation system benefits directly from NSERC's support for the creation of new knowledge through basic university research. Our innovation system also benefits from the dissemination and commercialization of this new knowledge in Canada through NSERC-supported partnerships among universities, colleges, governments and the private sector.

Each of NSERC's priorities – people, discovery and innovation – makes a distinct contribution to help satisfy Canada's demand for HQP. For example, on average, thirty-three per cent of the grant money awarded to professors through Discovery Grants is spent on the training of HQP. Furthermore, through its university-industry partnerships programs, NSERC exposes students to the opportunities available in Canadian industry and provides industry with direct access to talented research students coming out of our universities. These programs help train talented youth in areas of science and engineering that are relevant to Canadian industry and therefore they help to retain HQP in Canada after graduation.

4. Plans and Priorities by Strategic Outcome

4.1 Summary

All NSERC plans and priorities relate to one strategic outcome:

Strategic Outcome	Priorities
To provide Canadians with economic and social benefits arising from the provision of a highly skilled workforce, knowledge transfer of Canadian discoveries in the natural sciences and engineering from universities and colleges to other sectors, and informed access to research results from around the world.	1. Investing in people. 2. Funding the discovery process. 3. Helping Canada innovate.

NSERC achieves this long-term outcome by awarding scholarships and research grants through peer-reviewed competition, and by building research partnerships among universities, colleges, governments and the private sector.

4.2 Details on NSERC Priorities

Investing in People
Canadians, equipped with the skills and knowledge required to create value, will enable Canada to be competitive in the global knowledge economy. Canada's future capabilities in science and technology depend on today's graduate students and new faculty. Students and postdoctoral fellows trained with NSERC funding have the skills required to pursue rewarding careers across all sectors of the economy. In 2001-2002, NSERC created an additional 200 NSERC Postgraduate Scholarships and 300 Undergraduate Student Research Awards (USRA). NSERC offers direct support to nearly 7,000 students and postdoctoral fellows every year.

Budget 2003 provided $270 million over four years to the three federal research granting agencies to support an additional 2,000 master's and 2,000 doctoral students each year across all disciplines, at Canadian universities. The Canada Graduate Scholarships program is a new initiative of the Government of Canada. Funding for the program will be allocated among the three federal research granting agencies in proportion to the distribution of the graduate student community (30 per cent to NSERC).

NSERC promotes science by helping to identify the NSE disciplines as good career choices for youth. PromoScience, a program of grants to not-for-profit organizations that help Canadian youth learn about opportunities in the NSE, received additional funding in 2001-2002. Through PromoScience, NSERC aims to recruit the next generation of scientists and engineers.

NSERC and the other granting agencies, the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institutes of Health Research (CIHR), manage the investments of the Canada Research Chairs program. The key objective of this program is to enable Canadian universities, together with their affiliated research institutes and hospitals, to achieve the highest levels of research excellence to become world-class research centres in the global, knowledge-based economy. To reach this objective, the program aims to attract and retain excellent researchers in Canadian universities.

NSERC also supports Industrial Research Chairs to help universities achieve the critical mass required for a major research endeavour of interest to industry. Industrial Research Chairs can also enhance the ability of universities to recruit senior-level researchers and research managers from industry or other sectors.

See Figure 1 on page 10 for planned results, activities and resources.

Funding the Discovery Process

NSERC investments give Canadian professors the opportunity to contribute to and to access the latest international research in order to extend the boundaries of our knowledge in all areas of the NSE. Basic research driven by a professor's interests often generates innovation. NSERC-funded research has led directly or indirectly to the creation of new value-added products, processes, businesses and industries in Canada. *Research Means Business*, an NSERC publication now in its third edition, presents 134 first-generation start-up companies that were spun out of NSERC-funded university research (this publication can be obtained by contacting distribution@nserc.ca). Investments in knowledge creation also help determine policy, standards and regulations, for example, in the area of environmental protection.

With NSERC funding, Canadian professors strengthen their capability in all areas of the NSE and, armed with this knowledge, and working increasingly in partnership with industry, they help fuel Canada's innovation system. Canadian scientists and engineers are respected throughout the world for the high calibre of their research and their leading-edge discoveries and projects. Annually, more than 9,200 professors are funded through NSERC Discovery Grants and other research grants.

Through NSERC, the Government of Canada is contributing to the Perimeter Institute for Theoretical Physics with a $25 million grant to be disbursed at the rate of $5 million per year, for five years from 2002-2003 to 2006-2007. Breakthroughs in theoretical physics have been demonstrated to have the potential to result in widespread benefits across the whole of society. The application of these breakthroughs could have broad impact across Canadian industry and could entirely transform some industry segments. Through its private sector leadership, its involvement with universities across Canada and its various outreach activities, the Perimeter Institute is creating an environment that will maximize the potential for beneficial and widespread application of the knowledge it will generate. In such an environment, breakthroughs in theoretical physics could lead to significant economic benefits to Canada.

See Figure 2 on page 11 for planned results, activities and resources.

Helping Canada Innovate
To improve their competitive positions, our industries need to take full advantage of Canada's capacity for science-based innovation. NSERC's Research Partnerships Programs facilitate the development and exchange of knowledge, technology and people across all sectors to help build an innovative economy. Through NSERC investments, university professors connect with those who can use new knowledge productively and enhance Canada's capacity for innovation: this in turn contributes to wealth creation that benefits all Canadians.

NSERC offers a flexible mix of programs in support of innovation. These cover a broad spectrum of activities that includes: targeted research, research networks, joint university-industry projects, technology transfer, industrial research chairs and capacity building for the management of intellectual property, including the training of intellectual property management professionals.

Through the Strategic Project Grants program, NSERC directs funding to accelerate research and training in target research areas. The program invites research proposals that address emerging areas of national importance with a potential impact on Canada's economy, society and/or environment. The program supports early-stage research projects that have the potential to lead to breakthrough discoveries. In 2001, the following target research areas were introduced for a five-year cycle:

- Biosciences
- Environment and Sustainable Development
- Information and Communications Technologies
- Value-Added Products and Processes
- New Directions

A New Media target area was added in 2002 in collaboration with the Canada Council for the Arts.

To further expand opportunities for innovation in strategic areas of national importance, NSERC partners with other organizations to establish special target research initiatives on a cost-shared basis. NSERC and Natural Resources Canada have partnered to stimulate research in greenhouse gas mitigation technologies. NSERC also supports the carbon-cycle research of the Fluxnet-Canada Research Network. The network is jointly funded by: NSERC; the Canadian Foundation for Climate and Atmospheric Sciences (CFCAS); and the BIOCAP Foundation. Another special research initiative involves a partnership between NSERC and the Office of Critical Infrastructure Protection and Emergency Preparedness (OCIPEP).

For every dollar NSERC invests in its university-industry partnerships programs, another $1.84 is co-invested by active partners. Current activity supported by NSERC's Research Partnerships Programs involves 689 ongoing projects with 817 industry and government partners.

The Networks of Centres of Excellence (NCE) is a unique federal partnership program administered jointly through NSERC, CIHR and SSHRC in partnership with Industry Canada.

The networks are innovative research partnerships among universities, the private sector and governments that address complex problems of critical importance to Canadians.
In a typical year, the 22 existing networks will involve 5,000 participants, create 17 first-generation start-up companies, and assist 1,500 university graduates to obtain employment in industry.

The following three figures describe NSERC's major planned results, key activities and resources for the next three years. Information is grouped according to NSERC's three core priorities: people (Figure 1), discovery (Figure 2) and innovation (Figure 3).

Figure 1 – Investing in People

Planned Results	Key Related Activities	Resources[1] (millions of dollars)		
		2003-04	2004-05	2005-06
Highly qualified people (HQP), expert in research in the natural sciences and engineering (NSE), able to pursue various knowledge-intensive careers within industry, government and other sectors of the economy.	Provide research training support to undergraduate, master's and doctoral students, and postdoctoral fellows. This is done by:			
	• Providing direct support: awarding scholarships and fellowships, some in partnership with industry, to selected individuals through national competitions;	89.9	89.9	89.9
	• Providing indirect support: a professor may hire a student or postdoctoral fellow using an NSERC grant.	*(Indirect support resources estimated at:* *125.4*	*125.4*	*125.4* *are counted in figures 2 & 3.)*
Enhanced ability to recruit the next generation of scientists and engineers among today's youth.	Provide targeted support to address the under-representation of women and Aboriginal peoples in faculty positions in the NSE.	4.8	5.0	5.0
	Recognize significant work in encouraging Canadians to learn more about science and engineering and promote these disciplines as career choices through three programs: the Michael Smith Awards for Science Promotion; PromoScience; and the NSERC SPARK program (Students Promoting Awareness of Research Knowledge).	2.1	2.1	2.1
Canadian universities achieve high levels of research excellence and become world-class research centres in the knowledge-based economy.	Manage the investments of the Canada Research Chairs program along with the other federal granting agencies (SSHRC and CIHR).[2]	106.2[3]	135.0[3]	135.0[3]
	Support research chairs to enhance Canada's capacity to carry out research in the North.	1.3	1.3	1.3
	Support Industrial Research Chairs to build critical mass for major research endeavours of interest to industry.	16.6	16.6	16.6

1. Other resources include approximately $33 million per year for the administration of the organization as a whole.
2. More information on the Canada Research Chairs program can be found in the SSHRC Report on Plans and Priorities.
3. Funding to the Canada Research Chairs program that flows through NSERC.

Figure 2 – Funding the Discovery Process

Planned Results	Key Related Activities	Resources (millions of dollars)		
		2003-04	2004-05	2005-06
High-quality research capability maintained across all areas of the natural sciences and engineering (NSE). New knowledge that is the source of new ideas for innovation.	Invest in research activities of individuals and groups working in leading-edge science and engineering, as well as in the tools, instruments and facilities necessary for this work.	295.9	296.6	297.4
		(Approximately 40% is used to pay salaries for students and postdoctoral fellows, as indicated under indirect support in Figure 1.)		
Enhanced ability to access leading-edge knowledge from around the world.	Manage programs that enhance Canadian researchers' access to international knowledge networks.[1]	7.1	7.1	7.1
	Honour excellence with prestigious prizes including a $1 million research prize, The Gerhard Herzberg Canada Gold Medal for Science and Engineering.	1.9	2.1	2.1
	Administer, on behalf of the Government of Canada, its contribution to the goal of the Perimeter Institute for Theoretical Physics to establish itself as a premier international centre for research in foundational physics.	5.0	5.0	5.0
	Implement the results of the 2002 Reallocations Exercise to adjust spending priorities within the Discovery Grants program.	*(Resources reallocated within the Discovery Grants program.[2])*		

1. For more information, visit NSERC's Web site at www.nserc.gc.ca/intnew.htm .
2. For more information, visit NSERC's Web site at www.nserc.gc.ca/programs/real2000-e.htm .

Figure 3 – Helping Canada Innovate

Planned Results	Key Related Activities	Resources[1] (millions of dollars)		
		2003-04	2004-05	2005-06
Productive use of knowledge in support of new products, processes, and services, leading to new jobs and businesses. Accelerate research in target areas of national importance. Knowledge base for developing policies, standards and regulations, and making decisions, for government and industry.	Lever investments by forging research partnerships with the private sector, as well as with other sectors, including government departments and agencies.	64.7	64.2	63.4
	Provide funding for university-based project research in target areas of national importance and in emerging areas that are of potential significance to Canada.	36.0	35.5	35.5
	Support the commercialization of research results at Canadian universities and the capacity building of intellectual property management professionals.	3.0	3.0	3.0
		(Approximately 29% of above is used to pay salaries for students and postdoctoral fellows, as indicated under indirect support in Figure 1.)		
	Continue to implement a communications strategy specifically aimed at industrial clients to enhance the private sector's awareness of NSERC programs that foster university-industry research collaboration and training.	*(Resources within the administration budget.[1])*		
	Partner with other organizations through flexible mechanisms that provide leadership, planning and focus to accelerate research in areas that present a high potential for Canada to become a leader in science and technology.	2.0	2.0	2.0
	Manage and administer the Networks of Centres of Excellence program (along with the two other granting agencies and Industry Canada).	38.2[2]	38.2[2]	38.2[2]

1. Other resources include approximately $33 million per year for the administration of the organization as a whole, across NSERC's three priorities.
2. Funding to the Networks of Centres of Excellence that flows through NSERC.

4.3 What's New at NSERC

In February 2002, the Ministers of Industry and Human Resources Development launched the Government of Canada's Innovation Strategy. NSERC investments in university research and training in the NSE are vital to the success of the Innovation Strategy and the government's long-term goals for Canadian prosperity and high quality of life. To maximize the added value of investments Canadians make through NSERC, the Council will be flexible, dynamic, innovative, and forward-looking. The initiatives described below reflect this approach.

Budget 2003

Through Budget 2003 the Government of Canada is demonstrating its commitment to delivering on its innovation agenda. Toward that end, the Government has increased the annual budget of NSERC by ten per cent, resulting in an increase of $55 million per year. This increase will help ensure that, as universities renew their faculty, new researchers have access to the support they need to pursue their work and realize their career aspirations within Canada. The Budget recognizes the need for highly qualified people who will help to power Canada's effort to be one of the most innovative countries in the world by the year 2010. A new initiative, the Canada Graduate Scholarships, will help renew the faculty at Canadian universities and will complement the 2,000 Canada Research Chairs. The Budget also responds to a call in Canada's Innovation Strategy to provide ongoing support for the indirect costs associated with federally sponsored research at Canadian universities. This funding will help universities and research hospitals to strengthen the effectiveness of Canada's research system and translate discoveries into commercial and social benefit for Canadians.

Workshops on Highly Qualified People (HQP)

In the context of the Innovation Strategy, NSERC sponsored a series of consultations in the spring of 2002 with some three hundred stakeholders including students, university and college professors and administrators, industry leaders and public servants from provincial and federal departments and agencies. A consistent message that NSERC heard was that Canada will require significant increases in the numbers of HQP in the NSE if we are to achieve the goals of the Innovation Strategy. Throughout the consultations, participants offered a number of concrete suggestions about steps NSERC could take to help increase the numbers of NSE HQP. Some of their suggestions focused on areas where NSERC could take direct action, adjusting its programs, policies and funding levels to attract and retain greater numbers of NSE HQP. There were repeated calls to increase the Undergraduate Student Research Awards (USRA), and the number and value of Postgraduate Scholarships, and to provide more internationally competitive research funding so that professors could support more graduate students paid from grants. Other suggestions focused on areas where NSERC could play an indirect role by influencing or helping to coordinate the actions of others. For example, expanding current science promotion efforts and finding ways to influence K-12 education and improve the quality of science and math education in Canada.

The majority of workshop participants agreed that the future demand for HQP is a critical challenge for Canada and stressed the need for a co-ordinated effort by all stakeholders to address this challenge. The final report from these workshops can be found at www.nserc.gc.ca/about/hqp.htm .

The findings and proposals collected through the workshops are a starting point from which to develop a strategy and action plan to address the HQP challenge associated with Canada's Innovation Strategy.

Adjusting our Spending Priorities

NSERC will reallocate $27 million to invest in 50 initiatives and priorities proposed by the Canadian university research community. This decision follows an extensive peer review process to ensure that the Council's funding supports the most important new developments in university research in science and engineering. As part of this Reallocations Exercise, each discipline that NSERC funds had its annual base budget reduced by ten per cent to create a $27 million reallocation pool. Each discipline community was then asked to identify its priorities and present its case for new initiatives and needs that would be important to Canada. A selection Committee was faced with the extremely difficult task of recommending which of the 90 proposals, representing an overall request of more than $120 million, should be funded from the $27 million pool. The details of the 50 new initiatives and priorities that were funded, as well as the full text of all the discipline community submissions and the Council's Report, are available at www.nserc.gc.ca/programs/real2000-e.htm .

Intellectual Property Management

In 2001-2002, NSERC's Intellectual Property Management program was expanded to include a Networked Training initiative, in collaboration with CIHR and SSHRC. This initiative aims to help train more technology transfer and commercialization practitioners as they are in short supply. In the coming years, we must increase the pool of trained technology transfer personnel with hands-on experience available to Canadian universities and hospitals if these institutions are to succeed in maximizing the benefits to Canada of our publicly funded research.

Changes to Industrial Research Chairs

NSERC has made significant changes to the Industrial Research Chairs (IRC) program in order to broaden the program's accessibility and flexibility. For example, a new type of chair, "Executive Research Chairs," provides five-year term appointments for highly qualified candidates with non-academic research backgrounds, such as candidates from industry (or other sectors) who have not acquired the teaching experience or publication track record normally expected of tenured professors, but who are otherwise qualified. These chairs can also help universities address any shortfall in senior faculty in areas of important industrial need.
The Executive Chair-holders conduct research, mentor new faculty, train students and broaden the universities' understanding of the needs of the industrial sector. The changes to the program will provide universities with greater opportunities to solidify and expand their research base.

Expanded Technology Partnerships Program

Another important development to foster innovation and commercialization has been the expansion of NSERC's Technology Partnerships Program (TPP) to include the proof-of-concept stage of the R&D process. Given the higher degree of uncertainty associated with the proof-of-concept stage of technology development, financing for this stage of R&D is often a challenge. The Technology Partnerships Program supports partnerships between postsecondary institutions and small and medium-sized Canadian companies. A TPP grant is a one-time award for a specific project to advance a university invention to the point where the company can commercialize it.

Perimeter Institute

Through NSERC, the Government of Canada is supporting the Perimeter Institute for Theoretical Physics with a $25 million grant to be disbursed at the rate of $5 million per year, for five years from 2002-2003 to 2006-2007 (See also section 4.2, Funding the Discovery Process, on page 7).

4.4 Challenges

Moving Canada to Among the Top Five

The goals set out in the Government's Innovation Strategy paper, *Achieving Excellence: Investing in People, Knowledge and Opportunity*, and those implied in the Prime Minister's commitment to ensure that our research and development effort per capita places Canada amongst the top five countries in the world, represent a significant challenge on many fronts. To make Canada one of the most innovative countries in the world will require, first of all, an enormous increase in the amount of R&D carried out by the private sector. Key issues related to this challenge are described below.

Sustaining a Pool of R&D Personnel for the Future
NSERC estimates that, to meet Canada's goal, industry will need approximately 100,000 additional R&D employees at various levels of qualification in all fields of science and engineering by the end of the decade. This is not a large number when compared to our current work force of slightly more than 15 million, but a very large number when compared with Canada's annual output of highly qualified people in science and engineering. Increasing the pool of R&D personnel in industry by 100,000 becomes a greater challenge still in the light of current demographics: about 7,000 Ph.D.'s are needed to replace retiring professors, several thousand more are needed to replace retiring government scientists, and a comparable or larger number to replace retiring industry personnel.

Doubling Graduation Rates
To move Canada into the world's top five countries in terms of R&D intensity per capita also implies a very significant increase in the number of highly qualified people available to conduct the increased volume of R&D.

Canadian universities annually award about 2,000 Ph.D.'s, 5,000 Master's, and 27,000 Bachelor's degrees in engineering, mathematics, and science, as well as an additional fraction of those numbers in the other areas that NSERC supports. Even after allowing for increases in other sources of HQP – immigration, repatriation and retraining – the graduation rate of HQP from Canadian universities at the Master's and Ph.D. levels in the NSERC disciplines will have to at least double to satisfy an increased demand in time to meet Canada's new goal. Graduation rates depend on both the numbers of graduate students enrolled and the time that it takes to complete a degree. Some estimates suggest completion times have been getting longer for decades, and the time from the Bachelor's degree to the Ph.D. has reached eight years in some disciplines. Should this trend continue it will complicate the goal of increasing the numbers of HQP.

Appropriate Skills
It is anticipated that a very large proportion of new graduates with advanced degrees will be hired into industry. Consequently, their graduate education will have to ensure they acquire skills that are important for work in the private sector. These include the capacities for team work, for finding and using knowledge from outside of their own field, for project management, for entrepreneurship, for developing a business plan, etc. Teaching such skills is not new; the novelty lies in the need to routinely integrate such skills into graduate education in the NSE.

Increased Hiring of Professors into Canada's Universities
NSERC is seeing a sustained increase in qualified first-time applicants for Discovery Grants who are establishing their research careers as faculty in Canada's universities. Among the 2,987 applicants for 2003, 897 (30 per cent) are first-time applicants. Against that growth, only 266 currently funded researchers are retiring. This is the largest growth in new applicants that NSERC has yet experienced. Based on a recent survey of faculty hiring plans conducted by NSERC, this growth trend is expected to continue. These newly appointed professors, who are expected to be active in research, are critical to Canada's future capabilities in S&T; they generate knowledge and innovations and also train HQP. Supporting them is NSERC's first priority. Last year, NSERC directed $27.5 million toward new applicants out of a $36.5 million increase to the Council's budget. In 2003, an even larger investment will be required in light of the unprecedented numbers of new applicants noted above. The new investment of $55 million a year to NSERC, announced in the 2003 federal budget, will help to ease the pressure associated with meeting this increased demand.

Maximizing the Return on Federal Investments in Research
The Government has pursued an ambitious agenda to improve its support for advanced research in Canada. In order for Canada to fully benefit from these federal investments, it remains a challenge to support the efficient and intensive operation of the research facilities that have been provided through the investments of the Canada Foundation for Innovation (CFI) and its funding partners. Similarly, to continue to attract and retain the best researchers and create a stimulating research environment in which they can work, NSERC Discovery Grants, at internationally competitive levels, must also be provided to the Canada Research Chairs recipients, and to professors collaborating in their research.

Facilitating the Commercialization of University Research

It has been well documented that universities play a strategic role in strengthening Canada's innovative capacity and productivity performance. Canada's comparative advantage in innovation lies in university research because our country largely lacks the corporate labs and not-for-profit private labs that connect research with the market in countries that we compete with. Universities train HQP who create, build and attract knowledge-based firms. Universities are a major source of ideas for new products and processes that add value in Canada for success in the global market. However, the expertise and experience of Canadian universities in the commercialization of research results is generally under-developed. It is critical that we exploit the discoveries of Canada's research universities and NSERC's Intellectual Property Management program (IPM) is just one step in that direction. Moreover, Budget 2003 has provided $225 million per year to support universities for a portion of the indirect costs associated with federally supported research. Included in the indirect costs that underpin a university's research activities are the services to support the commercialization of university research.

Fostering Greater University-Industry Collaboration

NSERC helps to increase Canada's private sector R&D investment and performance, and to foster the growth of receptor capacity in industry for new knowledge. NSERC programs bridge the gap between the university research enterprise and the knowledge users. Through cost-shared initiatives, they also foster increased investments by the private sector in R&D. The private sector is forming partnerships with universities at an increasing rate as universities offer access both to new knowledge and to the HQP who will be able to use that knowledge productively. There has been strong growth in the number of companies that have contributed to NSERC's collaborative university-industry research programs (see Figure 6 on page 19). However, much remains to be done to broaden NSERC's industry partnership base.

4.5 Clients and Partners

NSERC does not conduct any research in-house, nor does it have any training facilities. Thus, the universities, colleges, companies, government agencies, and other institutions with which NSERC collaborates are all key co-delivery partners. Most Canadian universities benefit from NSERC programs, as do a growing number of industries and government departments.

Figure 4 presents the details of NSERC's client support. Also included are estimates of the share of the population funded or participating, for eligible individuals and organizations.

Figure 4: NSERC's Clients and Partners, 2001-2002

	Number Supported or Participating	Share of the Population[1]
Clients:		
University Professors	9,239	65% – 75%
Undergraduate Students	6,682	6%
Master's/Doctoral Students	7,418	35% – 40%
Postdoctoral Fellows	1,489	40% – 45%
University Technicians and Research Professionals	3,222	30% – 40%
Partner Organizations:		
Universities and Colleges[2]	65	75%
Companies Performing R&D[3]	687	10%
Federal Science Departments/Agencies[3]	15	75%
Provincial Science Departments/Agencies[3]	13	25% – 40%

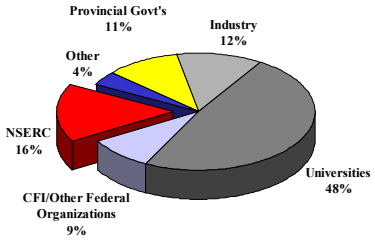
Source: NSERC

1. The percentage that NSERC supports of all individuals and organizations eligible for NSERC funding.
2. NSERC supports college researchers who collaborate with university professors. The Number Supported or Participating and the Share of the Population indicated here refer to universities only.
3. Organizations in partnership with NSERC (across all NSERC programs).

A brief summary of NSERC's partners is presented below.

Universities and Colleges

Figure 5: University R&D Funding in the Natural Sciences and Engineering, 2001



Total: $2.9 Billion

Source: Statistics Canada

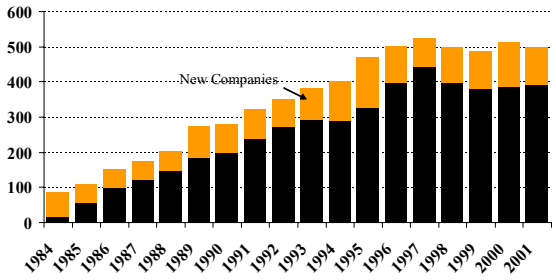
NSERC is one of the most important funders of research and development (R&D) in the natural sciences and engineering (NSE) in Canadian universities. In 2001, $2.9 billion in R&D was carried out by Canadian universities in the NSE. NSERC directly provided almost one-sixth of the total funding. Since much of the other funding from universities, industries and governments is leveraged by NSERC funding, a reasonable estimate makes the Council directly and indirectly responsible for slightly less than half of the funding. Figure 5 gives a breakdown of the total funding by direct source.

More than 9,200 university professors and more than 15,500 university students and postdoctoral fellows are supported by NSERC. The Council also supports a considerable number of university technicians and research associates.

NSERC has expanded its eligibility guidelines to include colleges. Researchers from colleges that are declared eligible by NSERC can participate in NSERC project research programs as co-applicants with university professors. As of December 2002, five colleges in Canada have been declared eligible. These are: the British Columbia Institute of Technology, the New Brunswick Community College at Bathurst, the Nova Scotia Community College - Annapolis Campus, Olds College in Calgary and Malaspina University-College in British Columbia.

Companies

Figure 6: Number of Companies Contributing to NSERC's University-Industry Programs



Source: NSERC

Strong growth has taken place in the number of companies that have contributed to NSERC's collaborative university-industry research programs (see Figure 6). Since the inception of the university-industry research programs, more than 1,500 firms have participated, rising from less than 50 companies in 1983 to 500 businesses in 2001. On average, 100 new firms are working with NSERC every year. NSERC is well known to companies heavily involved in R&D. In 2001, twenty-nine of the top 50 Canadian R&D companies (as ranked by Research Infosource, 2002) have funded university research jointly with NSERC.

Government Departments/Agencies

NSERC is also well known to most federal and provincial science-based departments and agencies. A list of federal and provincial departments and agencies that collaborated with NSERC in 2001-2002 is presented in Figure 7.

Figure 7: NSERC's Federal/Provincial Partners, 2001-02

Federal Departments/Agencies	*Provincial Departments/Agencies*
Agriculture and Agri-Food Canada	Alberta Energy
Canada Mortgage and Housing Corporation	Alberta Environment
Canadian Heritage	Alberta Oil Sands Technology and Research Authority
Canada Council for the Arts	Alberta Research Council
Canadian Institutes of Health Research	Alberta Transportation
Canadian Space Agency	Fonds québécois de la recherche sur la nature et les technologies
Cape Breton Development Corporation	Forest Renewal BC
Environment Canada	Manitoba Conservation
Fisheries and Oceans Canada	Ministry of the Environment (Québec)
Health Canada	Ministry of Natural Resources (Québec)
Indian and Northern Affairs Canada	Ministry of Transportation (Québec)
Industry Canada	Ontario Ministry of Agriculture
National Defence	Saskatchewan Energy and Mines
National Research Council Canada	
Natural Resources Canada	
Public Works and Government Services Canada	
Social Sciences and Humanities Research Council of Canada	

4.6 Monitoring of Results

NSERC measures its performance by evaluating its programs of research and training support, their impact, cost effectiveness and continuing relevance. When reviewing the performance of support for research and scholarship programs, it is important to remember that these investments take longer to bear fruit than most other government investments. Concrete data can be provided on advanced degrees granted, theses published, patents applied for and granted, papers published, etc., but the long-term socio-economic benefits of research emerge much more slowly. The impact of NSERC investments is detailed in the *Departmental Performance Report* for the period ending March 31, 2002, through a suite of indicators that range from bibliometrics, to patents and licences, to first-generation start-up companies, to new products and processes, as well as the career progression of NSERC-funded students and fellows.

Performance and Evaluation

NSERC continues to develop a multi-faceted performance measurement strategy that includes the collection of both qualitative and quantitative information on an ongoing basis, as well as periodic reviews and evaluations of major programs, policies or new initiatives.

In order to measure and report on the results of its programs, NSERC will integrate appropriate performance measurement systems into the operational cycle of its activities. NSERC is in the process of developing a Results-Based Management and Accountability Framework (RMAF) for the Council. The RMAF will include: key results to be achieved; indicators; a performance measurement strategy; a schedule for major evaluation work; and reporting provisions on the use of funds allocated to recipients of NSERC grants and scholarships.

Ongoing commitments to performance measurement and evaluation over the next three years include: data collection on a number of indicators, special studies and evaluations of programs, policies or new initiatives, and a number of management and monitoring initiatives to ensure the constant quality and relevance of NSERC activities.

Audit

NSERC is also addressing performance issues in its program and administration activity, including quality service initiatives. The goal of NSERC's administration activity is to support and underpin the Council's sole business line; performance issues therefore revolve around efficient and quality service to both Council's staff and clients (i.e., the research community).

NSERC has a formal internal audit function relative to its programs and administration and has developed a long-term audit plan (2003-2008). Flexibility will be maintained in these activities to enable NSERC to respond to any situation requiring immediate attention or to additional requirements as defined by central agencies or the Office of the Auditor General.

Monitoring of Client Institutions

With respect to the auditing function at institutions receiving NSERC funding, NSERC conducts monitoring activities to ensure that they have an appropriate control framework in place.

5. Organization

5.1 Strategic Outcome and Business Line

NSERC's sole business line is:

Support of research and scholarship in the natural sciences and engineering.

The strategic outcome of this business line is:

To provide Canadians with economic and social benefits arising from the provision of a highly skilled workforce, knowledge transfer of Canadian discoveries in the natural sciences and engineering from universities and colleges to other sectors, and informed access to research results from around the world.

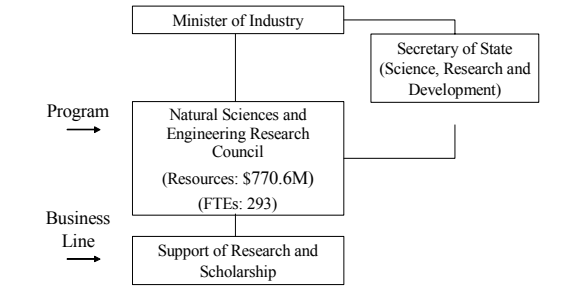
All of NSERC's net planned spending of $770.6 million for 2003-2004 is dedicated to NSERC's sole business line and its strategic outcome. This includes approximately $33 million for administration (5% of budget).

5.2 Roles and Responsibilities

NSERC is a separate employer of the Government of Canada, reporting to Parliament through the Minister of Industry. Figure 8 presents NSERC's organization structure.

NSERC is governed by a Council (a Board of Directors) whose members (up to 21) are drawn from universities as well as from the private and public sectors, and appointed by the Governor-in-Council. Members serve part-time, and receive no remuneration for their participation. The President serves full-time, and functions as the Chair of the Board and the Chief Executive Officer of the Council. Council is advised on policy and programming matters by several committees.

Figure 8: Organization Structure



5.3 NSERC Planned Spending

Table 1: NSERC Planned Spending

($ millions)	Forecast Spending 2002-2003[1]	**Planned Spending 2003-2004**	Planned Spending 2004-2005	Planned Spending 2005-2006
Budgetary Main Estimates (gross)	641.6	**708.1**	736.9	736.9
Non-Budgetary Main Estimates (gross)	—	—	—	—
Less: Respendable Revenue	—	—	—	—
Total Main Estimates	641.6	**708.1**	736.9	736.9
Adjustments[2]	42.9	62.5	71.5	80.5
Net Planned Spending	684.5	**770.6**	808.4	817.4
Less: Non-Respendable Revenue	0.6	**0.6**	0.6	0.6
Plus: Cost of Services Received Without Charge	4.4	**4.7**	4.7	4.7
Net Cost of Program	688.3	**774.7**	812.5	821.5
Full-Time Equivalents	280.0	**293.0**	293.0	293.0

1. Reflects the best forecast of total net planned spending to the end of the fiscal year.
2. Adjustments are to accommodate approvals obtained since the Main Estimates and include Budget 2003 initiatives, Supplementary Estimates, etc.

The Main Estimates for the Natural Sciences and Engineering Research Council of Canada are $708.1 million, a net increase of $66.5 million over 2002-2003.

The major spending trends are as follows:

i. An increase of $36.5 million per annum as a result of the December 2001 Budget;
ii. Starting in 2002-2003, an increase of $5.0 million per year for five years for the Perimeter Institute for Theoretical Physics;
iii. An annual increase of $25.2 million for the Canada Research Chairs program until 2004-2005. Beginning in 2004-05, the program's budget will remain stable.

Annex A - Financial Information

Tables 2, 3, and 4 present the required financial information for NSERC.

Table 2: Summary of Transfer Payments

($ millions)	Forecast Spending 2002-2003	**Planned Spending 2003-2004**	Planned Spending 2004-2005	Planned Spending 2005-2006
Grants				
Support of Research and Scholarship	644.6	**722.6**	751.4	751.4
Perimeter Institute	5.0	**5.0**	5.0	5.0
Canada Graduate Scholarships	—	**7.5**	16.5	25.5
Total Grants	649.6	**735.1**	772.9	781.9
Contributions	—	**—**	—	—
Other Transfer Payments	—	**—**	—	—
Total Grants, Contributions and Other Transfer Payments	649.6	**735.1**	772.9	781.9

Table 3: Source of Non-Respendable Revenue

($ millions)	Forecast Revenue 2002-2003	**Planned Revenue 2003-2004**	Planned Revenue 2004-2005	Planned Revenue 2005-2006
Support of Research and Scholarship	0.6	**0.6**	0.6	0.6
Total Non-Respendable Revenue	0.6	**0.6**	0.6	0.6

Table 4: Net Cost of Program for 2003–2004

($ millions)	**Total**
Planned Spending (Budgetary and Non-Budgetary Main Estimates Plus Adjustments)	**770.6**
Plus: Services Received Without Charge	
- Accommodation provided by Public Works and Government Services Canada (PWGSC)	**3.4**
- Contributions covering employer's share of employees' insurance premiums and expenditures paid by Treasury Board Secretariat	**1.3**
- Worker's compensation coverage provided by Human Resources Canada	—
- Salary and associated expenditures of legal services provided by Justice Canada	—
	4.7
Less: Non-Respendable Revenue	**0.6**
2003-2004 Net Cost of Program	**774.7**

Annex B - Key Government Themes and Management Initiatives

Figures 9, 10 and 11 describe three key government themes, the results NSERC expects to achieve and how NSERC plans to achieve them.

Figure 9 – Government On-Line	
Planned Results	**Key Related Activities**
Provide Canadians with the ability to interact with NSERC, to receive information and services, and to do business electronically. A robust internet portal that allows NSERC and its clients and partners to share information, collaborate, process applications and administer awards electronically.	Implement a project plan to migrate toward a portal-based approach to service delivery in relation to the Government On-Line initiative. Activities will include: • Enhance and refine a web-based, user-friendly, client-centric, electronic grant application process to facilitate on-line collaboration,[1] university approval and peer review; • Develop automatic data transfer of web application data to NSERC corporate databases; • Develop web-based bi-directional information-sharing tools and electronic services for peer reviewers and university administrators; • Facilitate electronic document management; • Develop web-based tools for awards management and progress monitoring; • Integrate the Canadian Common CurriculumVitae service for grant applications into the NSERC systems. Collaborate with the other federal granting agencies as well as various organizations involved in funding research to identify areas of mutual interest and opportunities to share products and services and to develop common service standards.

1. Bi-directional information exchange between grant applicants and their university and collaborating partners.

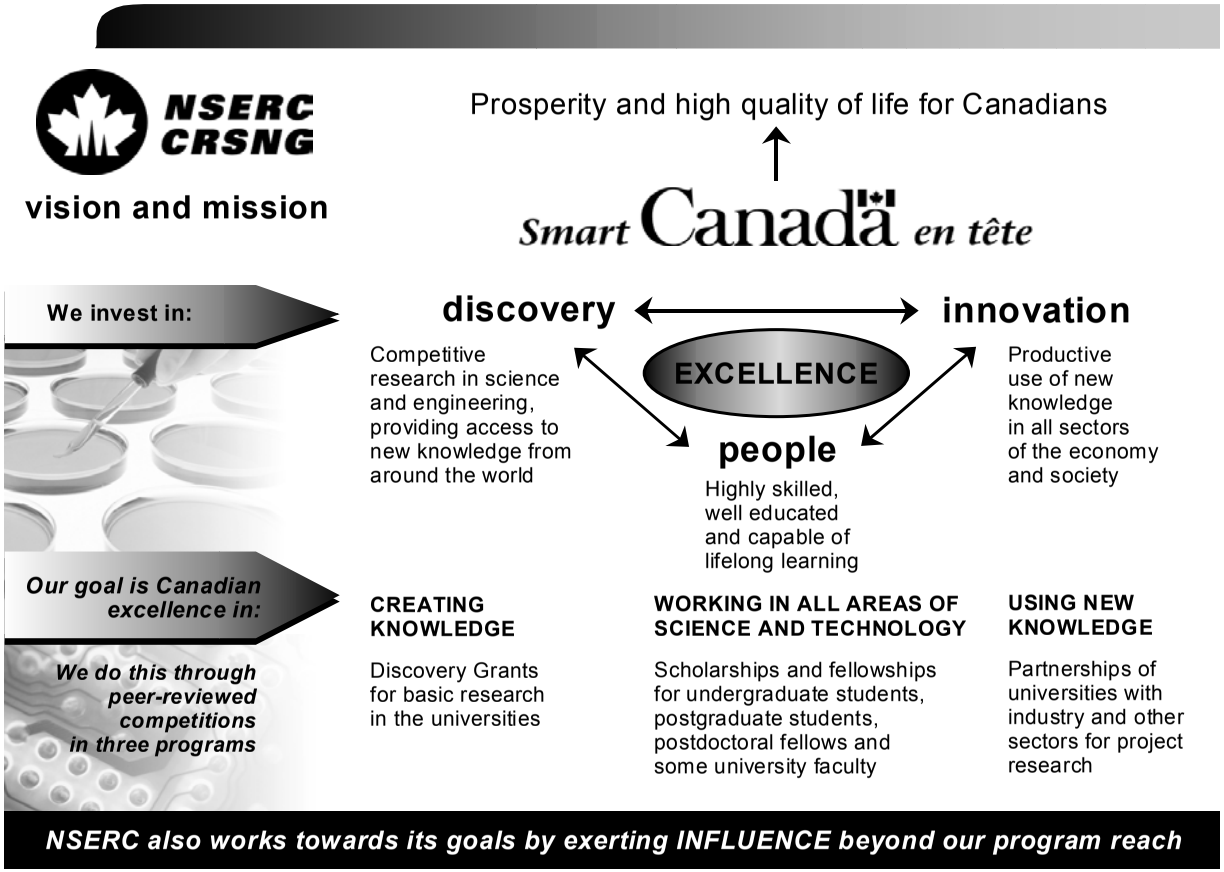
Key Government Themes and Management Initiatives (continued)

Figure 10 – Service Improvement	
Planned Results	**Key Related Activities**
Achieve a significant, quantifiable improvement in client satisfaction with NSERC services.	Establish a Service Improvement Plan, identify and report on service standards for key services, and establish client satisfaction baseline measures and targets. The follow-up on service improvement efforts will be integrated into the Action Plan of the Modern Comptrollership initiative (see Figure 11). Determine ways to reduce the workload on professors both in terms of applying for grants and peer reviewing the applications of others (focus of the Government On-Line initiative described in Figure 9). Continue to review the NSERC program structure to consolidate programs where appropriate and avoid any overlap in objectives, thus reducing the number of programs for which professors may need to prepare and peer review applications. Existing service improvement initiatives include: • Develop service standards and service-level agreements; • Harmonize policies and procedures with the other federal granting agencies; • Clarify and codify the respective roles and responsibilities of the federal granting agencies and of institutions administering grants under Phase 2 of an initiative involving Memoranda of Understanding among these parties; • Develop a mechanism to integrate various sources of feedback on client satisfaction.

Key Government Themes and Management Initiatives (continued)

Figure 11 – Modern Comptrollership	
Planned Results	**Key Related Activities**
A management framework that is integrated, assures sound management of resources and effective decision making and involves a shift in emphasis from controls and compliance to results and values. NSERC will operate under the banner of "Integrated Management Practices."	Jointly with SSHRC, a Project Management Office (PMO), dedicated to Modern Comptrollership (MC) and Integrated Management Practices (IMP), has been created and staffed. The economies of scale, integration and synergy already achieved through the granting agencies' shared Human Resources, Finance, Administration and Information Systems functions will thus be extended to the PMO and the IMP initiative. During the winter of 2003, managers will receive training on the seven themes of Modern Comptrollership and the Capacity Assessment (CA) will take place. A final report on the CA is expected to be approved by the Senior Management team in April, 2003. A detailed Action Plan (AP) to address areas for improvement identified in the CA will be developed during the spring and summer and will be presented to the NSERC Council in October 2003. It is anticipated that MC/IMP will be of benefit to several on-going priority initiatives related to issues such as: - client service/client satisfaction/client relationship management; - employer of choice/employee satisfaction; - performance indicators/external reporting; - audit. The first phase of implementation of the AP will take place from October 2003 to March 2004. Quarterly reports to the TBS are planned during 2003-2004. Following this, NSERC will continue to implement the AP and to progress toward fully integrated modern management practices.

Annex C - NSERC on a Page (Figure 12)



Annex D - Contact Information

Figure 13: Contact for Further Information and Web Site

Our Web site is located at: www.nserc.gc.ca.

A searchable Web database of grants and scholarships awarded by NSERC since 1991 is located at www.nserc.gc.ca/programs/result/database.htm.

For further information about this report, you can contact:

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