RESEARCH, TRAINING, AND INNOVATION FOR A COMPETITIVE 21ST CENTURY ECONOMY

A Submission to the Standing Committee on Finance from Science and Engineering Research Canada (NSERC)

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SUMMARY

NSERC is an important tool of the federal government for supporting research and innovation for the economic and social benefit of Canadians, and NSERC's existing programs support many of the objectives of Canada's productivity agenda. These programs support the production and diffusion of new scientific knowledge, the training of highly qualified people, and collaborations between university, industry, and government to increase the rate of new innovations flowing into the Canadian economy. However, more needs to be done to improve Canada's ability to compete globally given the aggressive expansion of other countries' research activities. NSERC must continue to increase support for its core programs while targeting additional funds to address three important opportunities:

1) Support the development of highly qualified people with the professional skills necessary to transfer new discoveries to industry;
2) Fund research in emerging areas of strategic interest to position Canada to become a recognized leader in R&D activities and to excel in the knowledge economy; and
3) Enable Canadian researchers to fully participate in international S&T projects, access world-class labs and facilities abroad, and engage in researcher and student exchanges with foreign counterparts.

With incremental funding of $110 million each year for the next three years ($110 million in 2006-07, $220 million in 2007-08, and $330 million in 2008-09), NSERC will be able to mobilize Canada's existing human and capital resources for the social and economic benefit of all Canadians.

INTRODUCTION

NSERC is the primary federal agency investing in postsecondary research and training in the natural sciences and engineering (NSE), and is an integral part of the Government of Canada's strategy to further develop a highly competitive, knowledge-based Canadian economy. With a current budget of $865 million,[1] NSERC's grants and scholarships programs:

- Fund over 10,000 principal investigators who are professors at Canadian universities, and whose discoveries form the foundation of technology development by industry as well as improvements in environmental quality and public safety. By most metrics of research performance, such as papers published in prestigious journals and citations by other researchers, our professors perform very well in international comparisons, based on available funding;

[1] This includes a base budget of $675 million and an additional $190 million that flows through NSERC for programs such as Canada Research Chairs, Canada Graduate Scholarships, and the Networks of Centres of Excellence.

- Support more than 20,000 undergraduate and graduate students and fellows. These highly qualified people, educated in advanced research techniques, form the human capital necessary to transfer new ideas and techniques to industry for the economic benefit of Canada. In addition, many of these researchers will be employed by government research organizations and universities, whose demographics require an unprecedented renewal of research staff.

- Support university-industry research partnerships and industrial training with more than 1,000 Canadian companies. Through such collaborations, industry is able to develop discoveries into new products and processes and hire staff with the most modern skills and knowledge, both of which result in greater productivity. University researchers in turn address issues of interest to industry, and are often able to use these experiences to develop more relevant curricula for the benefit of future students. Students and fellows involved in these programs also develop important professional skills, and are often hired by the supporting company once the project is completed.

The sustained federal investments in university research and training made since 1997 have led to a remarkable turnaround in Canada's S&T capacity. World-class researchers are being recruited to Canadian universities, new research equipment and infrastructure is being installed, and many important new research projects have been launched. In this context, NSERC's challenge is to maintain the momentum created by these important investments and ensure the competitiveness of Canada's research efforts.

Dramatic economic changes are occurring throughout the world. Emerging competitors are assuming the lead in important industrial sectors: China in steel production and manufacturing, Taiwan in semiconductors, and India in specialty chemicals, software, and information technology. The increase in highly qualified people in Asia means that global outsourcing now includes services and research and development (R&D) functions in addition to the "traditional" outsourcing of manufacturing. Beyond our traditional competitors among the G8, smaller economies such as Finland, Ireland, Israel, and Sweden have surpassed Canada in research intensity.

To enhance Canadian competitiveness in this global context, NSERC's approach is to promote innovation to maximize the value of public investments in research for the benefit of Canadians.

In order to ensure that the growing community of Canadian researchers in the NSE can successfully compete with their counterparts worldwide, NSERC must: continue to increase support for programs of basic research, including operating funding for the many new national science facilities created through the Canada Foundation for Innovation; increase funds to its scholarships and fellowships programs to support the development of more talented young researchers; and increase the funds available for programs that support university-industry partnerships. NSERC's current programs have been successful in achieving these objectives, but without increased investments, Canada will fall behind the many other countries that are aggressively expanding their S&T activities.

Even more must be done to fully realize Canada's potential, and NSERC is ideally positioned to address three issues that are crucial to Canada's productivity agenda:

1) In today's competitive environment, students and fellows must learn not only the skills to be excellent researchers, but also the appropriate professional skills to effectively transfer new discoveries to relevant industries.

2) Canada must be able to identify and rapidly expand research, training, and innovation in emerging areas where Canada has the potential to become a recognized world leader.

3) Canadian researchers must have the resources necessary to fully participate in important international S&T projects, access world-class facilities abroad, and participate in exchanges of researchers and students with other countries.

NSERC will require additional funds in 2006-07 to ensure the growing community of researchers in the NSE are effectively mobilized for the benefit of Canada, as well as to begin to address these important issues. **With strategic investments of incremental funding of $110 million each year for at least the next three years ($110 million in 2006-07, $220 million in 2007-08, and $330 million in 2008-09), NSERC will have the means to address these priorities.**

1) TRAINING NEW RESEARCHERS FOR THE 21ST CENTURY ECONOMY

One of the key early findings of the Expert Panel on Commercialization is the importance of human capital to Canada's innovation performance, and universities are central to the process of training new and talented young researchers and innovators. With NSERC funding, university professors help train students and fellows in advanced research techniques, often in collaboration with industry. NSERC also provides direct assistance in the form of scholarships and fellowships to outstanding students and fellows, and delivers several programs that provide students and fellows with the opportunity to further develop their skills in an industrial setting. Industry-based programs also stimulate increased research capacity in the private sector, and students supported by these programs are frequently employed by the sponsor company after the award is completed.

NSERC's challenge is to continue to provide opportunities for talented young scientists to further their research and training, and to stimulate university-industry research collaborations and exchanges. It is crucial to ensure that new and talented researchers acquire the appropriate professional skills – such as project management, marketing, intellectual property rights, and financing – to translate new discoveries from around the world into economic and social benefits for Canadians. NSERC's university-industry partnerships and industry-based scholarships and fellowships give students and fellows practical experience in these important areas.

Additional funding will enable NSERC to expand training through its highly successful industry-based scholarships and fellowships and university-industry partnerships

programs. The skills and experience of new graduates will be enhanced through their increased interaction with the private sector, and private sector demand for such highly trained people will be stimulated. Many Canadian companies that have not yet participated in such programs will have the opportunity to expand their research capacity and access highly trained people. NSERC will also continue to work with universities, industry, and government to help further identify the professional skills students and fellows need to utilize new knowledge for the economic benefit of Canadians.

2) IDENTIFYING AND FUNDING STRATEGIC S&T PRIORITIES

NSERC will continue to support research activities in a wide range of disciplines, such as chemistry, earth and ocean sciences, mathematics, biology, astronomy, physics, engineering, and information and communications technologies. Maintaining research capacity and expertise in all these fields is essential for any country that wishes to excel in the modern knowledge economy. The rapid pace of new scientific breakthroughs in these and other areas offers opportunities for Canadians to become pioneers in new research domains, with all the economic and social advantages that being first often brings. However, Canada must compete with many other countries who similarly wish to develop a world-class research base in these areas of strategic interest.

NSERC's challenge is to be able to respond to new areas of opportunity for research at an early stage, and to be able to invest significant funds in identified areas of interest so that Canada may position itself as a key player and source of knowledge in these emerging disciplines and play a major role in consequent innovation. It is recognized that the Government of Canada cannot adequately fund every potential opportunity, and so investments must be focused to ensure sufficient resources are mobilized to allow Canadian researchers to thrive in these highly competitive areas of emerging research that often span several traditional disciplinary boundaries.

NSERC has an important role to play in seizing the opportunities offered by such emerging areas. In consultation with universities, industry, and other government organizations, NSERC is well-positioned to identify and prioritize strategic investments in emerging areas such as quantum computing, nanotechnology, and proteomics. With additional funding, NSERC will have the means to react to new strategic priorities in a timely manner, which will ensure that Canada will develop a strong base in disciplines in which we can become a world-leader, and in which such investment would have significant benefits for the Canadian economy.

3) INCREASING CANADIAN PRESENCE AND PARTICIPATION IN INTERNATIONAL S&T

NSERC was encouraged to note that the International Policy Statement released in April 2005 embedded S&T as an essential driver of trade, investment, development, and diplomacy. To further the objectives of the International Policy Statement, NSERC is considering a number of options to increase Canadian presence and participation in international S&T activities. The significant federal investments in university research

and training since 1997 have been very successful in re-establishing Canada's reputation as a key player in research and innovation. While Canadians already collaborate on a number of high-profile international projects, NSERC sees a golden opportunity to build on this success so that Canadian researchers and students may fully participate in international research projects and have the means to access world-class foreign research facilities. NSERC is currently developing an International Strategy that will include mechanisms to increase collaborations with scientists in emerging economies and developing countries. There is also an urgent need to support international collaborations that involve both academic and industrial researchers.

More needs to be done to increase Canada's S&T presence internationally. Canadian researchers are often unable to fully participate in important international S&T projects because of a lack of dedicated funding for international activities. Canadian students and fellows also do not have the same opportunities as their counterparts in other countries with regards to accessing funds to support travel to a foreign lab or facility. The benefit of supporting international travel and exchanges for large numbers of Canadian students is threefold: first, students gain valuable research experience at world-class research organizations and learn novel research techniques; second, by collaborating with international counterparts, Canadian professors and students are able to develop a network of potential future collaborators and are able to access the new discoveries and knowledge created by researchers outside Canada; finally, some students who travel abroad to work and study at world-class facilities can become effective marketers for Canadian innovations around the world.

CONCLUSION

NSERC provides vital support for generating and using new knowledge, and thereby contributes to the overall productivity agenda of the Government of Canada. NSERC continues to face strong budget pressures due to the massive renewal of science and engineering faculty at universities and the need to fund the operating expenses of facilities developed through the Canada Foundation for Innovation, and requires sufficient funding to fully realize the benefits of Canada's existing human and capital resources. It is not enough to buy a fleet of great cars: they must be supported with fuel to do what is expected of them. The momentum created since the Government began to reinvest in university research and training in 1997 must be maintained in order to fully realize the benefits of such support. Although additional resources for many of NSERC's existing research and training programs are necessary, NSERC is also well positioned to seize key opportunities in strategic target areas of national importance such as increasing training opportunities for students and fellows (particularly in an industrial setting); identifying and funding emerging S&T disciplines in which Canada can become a recognized world leader in R&D and innovation; and increasing Canadian presence and participation in international S&T ventures. All of these issues address Canada's competitiveness agenda, and will be important factors in improving the social and economic benefits to Canadians derived from public support of research, training, and innovation.

With incremental funding of $110 million each year for the next three years ($110 million in 2006-07, $220 million in 2007-08, and $330 million in 2008-09), NSERC will have the means to define urgent priorities and seize opportunities as they become apparent, and will help Canada to be more competitive in today's globalized, knowledge economy.