Inter-Sectoral Partnerships for Non-Regulatory Federal Laboratories

A Report to the
President of the Treasury Board of Canada
by the
Independent Panel of Experts

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Table of Contents

Executive Summary

In 2006-07, approximately 25,000 people were engaged in science and technology (S&T) activities in federal laboratories located in all regions of Canada. These laboratories play a crucial role in the Canadian science and innovation enterprise, and account for more than $4 billion in annual investment by the Government of Canada. The scientific activities they conduct support two essential functions: meeting the government's statutory regulatory responsibilities and providing the scientific underpinning for achievement of broader national scientific, social and economic objectives.

Budget 2007 signalled the government's intention to create an independent panel of experts to consider the "transfer" of non-regulatory federal laboratories to universities and the private sector. Subsequently, Canada's science and technology strategy document, Mobilizing Science and Technology to Canada's Advantage, released in May 2007, stated that the government "would focus its activities in areas where government is best able to deliver results, and consider alternative management arrangements for non-regulatory federal laboratories." Pursuant to the Budget 2007 announcement, and consistent with the federal government's strategy for science and technology, the President of the Treasury Board appointed an Independent Panel of Experts (the Panel) in mid-August 2007 to undertake three main tasks:

1. explore opportunities for achieving greater synergy among the major sectors undertaking science and technology activities through transfer of non-regulatory federal laboratories to universities and/or the private sector[1];
2. identify up to five non-regulatory federal laboratories as "early candidates" for transfer; and,
3. develop a framework for evaluating opportunities for transfer of non-regulatory federal laboratories.

These tasks were to be undertaken in the context of the federal government's objectives with respect to inter-sectoral S&T integration (ISTI), namely:

- increased value/efficiency of federal investments in S&T;
- enhanced quality of scientific activities through fostering research excellence;
- expanded opportunities for learning and knowledge transfer; and,
- improved Canadian economic competitiveness.

1. The Panel was advised that the term "universities" should be interpreted broadly as including colleges and not-for-profit institutions affiliated with universities and colleges. Accordingly, in the remainder of this report, this sector is referred to as "academia". The term "private sector" is interpreted as referring to for-profit enterprises.

The Panel's work entailed analysis of:

- case studies involving inter-sectoral S&T collaboration in Canada and abroad;
- input received during consultations undertaken by Panellists with knowledgeable individuals from government, academia and the private-sector;
- a series of regional inter-sectoral roundtable discussions sponsored by the Panel;
- commentaries received from stakeholders in response to a general invitation for input; and,
- submissions to the Panel proposing specific S&T integration initiatives.

To facilitate its consultations and analysis, the Panel developed working definitions of key terms.[2]

Alternative Arrangements for Managing Federal S&T Activities

The vast majority of federal S&T activities are conducted in laboratories under the sole management and control of the federal government. The current interactions between scientists in federal laboratories and their counterparts in academic institutions and the private sector are mainly informal and ad hoc collaborative arrangements. There are, however, instances in which the collaboration takes place under a formal agreement, and others in which management of federal laboratories or specific programs conducted in federal laboratories have been transferred to other entities.

Other developed countries also have a diversity of arrangements governing the interactions of national government laboratories with academia and the private sector. The varying patterns of such arrangements reflect differences in: governance structures and accountabilities; the nature of the jurisdictional relationship between the national government and regional governments; the financing and governance of academic institutions, and the industrial structure. Some governments have embarked on major programs of privatization of government laboratories

2. **Non-regulatory federal laboratory:** an identifiable organization or capacity within the federal government (i.e., directorate, branch, program, institute, centre, division, survey, bureau, or parts thereof respectively) for performing scientific activities, involving basic research, applied research, and experimental development, for the purpose of expanding scientific knowledge and understanding, promoting innovation and enabling economic and social development.

   Alternative management arrangement: an arrangement for managing non-regulatory federal laboratories or parts thereof other than through sole ownership and management by the federal government. An alternative management arrangement may include a continuing role for government (e.g., in a partnership or consortium) or may not (in cases of divestiture - sometimes referred to as "full transfer")

   Transfer: the conveying, in whole or in part, of a non-regulatory federal laboratory to an existing entity in academia or industry, or to a new entity such as a partnership or consortium involving government, academia and/or the private sector. Without limitation, transfer may include one or more of: transfer of ownership of assets (e.g., building, equipment, personnel, and intellectual property); transfer of management of assets; and transfer of S&T program management.

(both regulatory and non-regulatory), while others have created new agencies within government with special authority to establish new management models.

The experience in Canada and abroad indicates that there are several alternatives to exclusive government ownership and control of federal non-regulatory laboratories. The characteristics of such arrangements can be organized under an array of typologies based on, for example: the sectors and types of organizations involved; governance mechanisms; financing arrangements; and, the extent of ongoing involvement of the federal government.

In Canada, the most common models of alternative arrangements involve informal not-for-profit cooperative arrangements, operating in single locations for indefinite terms; and, without changes in ownership of assets or in the employment status of personnel. These commonly employed models do not, in the Panel's view, result in an optimal level of S&T integration. While they may represent examples of useful collaboration and networking, they do not result in the level of complementarity and synergy that can be achieved through models based on close integration of the work of scientists from the three sectors in a program of R&D under a single management structure. This integration can be achieved in two main ways:

- Full transfer to a non-governmental entity involving academic and/or private sector organizations (divestiture)
- Transfer to an entity jointly sponsored and managed by government, academic and/or private sector organizations (partnering).

Opportunities for Inter-Sectoral Integration of Non-regulatory S&T

The Panel received a large number of submissions identifying particular opportunities for inter-sectoral integration of S&T activities. The Panel also received statements from organizations expressing a strong interest in identifying such opportunities in the future.

General Observations

In submitting proposed ISTI initiatives, proponents and partners were encouraged to consider alternative management arrangements that cover a range of options – from full transfer to an existing or new non-governmental organization – to transfer to a new entity involving government, academia and the private sector in joint governance and management of assets and/or S&T programs. Simple co-location or establishment of a network of existing programs without a unified management structure was not deemed to constitute a "transfer."

Submissions came from organizations in all regions of the country, and included identification of a wide variety of other organizations in the federal government, academia and the private sector as potential partners in new management arrangements. In several cases, provincial government laboratories were also identified as potential partners.

The types of alternative arrangements contemplated in the submissions included:

- Establishing a new entity involving joint sponsorship and management of S&T activities by the federal government, an academic institution, and/or the private sector. In some cases, the entity would be a not-for-profit corporation. In most, the proposed entity would operate under what has been termed a "co-operative research and development agreement." Several proposals included participation by more than one organization;
- Co-location of scientific personnel, involving existing proximities or through new co-location initiatives. Nearly all locations designated are on or near university campuses, in research parks or in other cluster arrangements. In a few instances, the arrangements would involve seconding university S&T personnel to government laboratories; and,
- Full transfer of ownership, governance and/or management from government to non-governmental entities.

Several submissions indicated that the models of ISTI being proposed were seen as the initial arrangement in an evolving relationship that could result in, for example, a move from a joint sponsorship arrangement involving government (partnering) to one in which the federal government is no longer involved in ownership, governance or management.

Selection of Early Candidates for Transfer

The Panel reviewed and rated the submissions on the basis of probability of success in achieving primary objectives, impact, feasibility, governance and management considerations, and timeliness (see Section 5.2.4). The following five (5) laboratories (listed alphabetically by department or agency in which the laboratories are located) were identified for recommendation as early candidates for establishing alternative management arrangements. They represent excellent opportunities for S&T integration, cover a range of fields and federal departments and identify initiatives in which the new arrangements could be implemented within a 12-month period.[3] In the implementation of these initiatives, concerted attention should be given to

3. The degree of implementation to be expected within 12 months would include: completion of the necessary legal agreements to effect the new governance and management arrangements; the identification of the administrative and scientific leadership of the new entity, and the formulation of an integrated research program and detailed business plan that take into account the relevant elements of the proposed ISTI framework described in Section 5.2. It is understood that full programmatic implementation may require additional time – especially where significant infrastructure development is required.

governance and accountability, delineation of an integrated research program and designation of strong managerial and scientific leadership.

- Agriculture and Agri-food Canada – Cereal Research Centre
- Environment Canada – Wastewater Technology Centre
- Health Canada – Safe Environments Laboratories
- National Research Council – Aerospace Manufacturing Technology Centre
- Natural Resources Canada – Geoscience Laboratories

Nearly all of the proposals received are potential candidates for future consideration in the implementation of a longer-term federal strategy for inter-sectoral S&T integration.

A Framework for Inter-Sectoral S&T Integration (ISTI)

The Panel developed a framework for guiding the development and evaluation of opportunities for alternative management arrangements for non-regulatory federal laboratories. Such a framework will be useful to the government, should it choose to undertake a systematic move in the direction of a broader ISTI strategy. In the Panel's consultations, such a potential move received wide support, provided the strategy was conceived more broadly than may be inferred from use of the phrase "transfer of non-regulatory federal laboratories." The Panel has therefore formulated its proposed framework as applying to "inter-sectoral S&T integration" involving federal laboratories. The key elements of the proposed framework are grouped under the following headings:

- An overarching goal (broad purpose)
- A general strategy for achieving the goal
- Specific strategies
- Desired outcomes
- Scope of application
- Articulation of federal governance and accountability requirements with respect to ISTI initiatives
- Criteria for evaluating proposed ISTI initiatives
- Implementation
- Performance evaluation

Concluding Observations

The timeliness and importance of the Panel's mandate emerged both through the analysis of the state of S&T investment strategies worldwide and in the expressed stakeholder interest in ISTI as a key component in advancing Canada's science and innovation system.

Seizing the opportunity to integrate the resources and efforts of the various partners in the science and innovation system can enhance federal S&T activities through effective use of combined resources to pursue research agendas that are aligned with core objectives.

There is strong support among stakeholders and knowledgeable individuals for implementing an ongoing systematic process to identify and implement promising ISTI initiatives as an important part of a national S&T strategy. ISTI is seen as a key component of a holistic approach to meeting the science and innovation challenges facing the nation, now and in the future.

Government, academia and the private sector have distinctive but interdependent roles to play in the Canadian science and innovation system. ISTI can contribute to the strength of all three sectors and can be pursued in ways that do not weaken the ability of each sector to perform its distinctive role.

The Panel identified several of the proposals received as involving major strategic and transformative initiatives worthy of future development and consideration. Early adoption of the ISTI framework proposed by the Panel would be helpful in assessing these and other proposals, whether they are initiated by federal departments and agencies or emerge in response to a general call for proposals issued under the aegis of an appropriate central authority.

Section 1 – Introduction

Federal laboratories play a crucial role in the Canadian science and innovation enterprise, and account for more than $4 billion in annual investment by the Government of Canada. They conduct scientific activities related not only to the government's statutory regulatory responsibilities but are also linked to achieving broader scientific, social and economic objectives essential to the national interest.

As part of the national strategy for science and technology (S&T), the President of the Treasury Board, on behalf of the Government of Canada, appointed an Independent Panel of Experts (the Panel) to explore opportunities for achieving greater synergy among the government, academia and private sectors through the potential creation of new management structures for federal S&T activities in non-regulatory areas.

1.1 The Panel's Mandate

The Panel's mandate is addressed in two Government of Canada documents. In the March 2007 Budget, the government announced its intention to "launch an independent expert panel that will consider options for transferring federal laboratories to universities or the private sector. The panel will report to the President of the Treasury Board in the fall of 2007 on the type of non-regulatory science that should be transferred, which partners should be involved and an appropriate governance framework. The panel will also be asked to identify up to five laboratories that could be early candidates for transfer." (Aspire Canada, Page 202).

This intention was echoed in Mobilizing Science and Technology to Canada's Advantage, released in May 2007. In this document, the government stated that it "would focus its activities in areas where government is best able to deliver results, and consider alternative management arrangements for non-regulatory federal laboratories." The document also signalled the government's intention to "break down the barriers that stand in the way of more strategic S&T collaborations among federal departments and agencies and between the federal S&T community and universities, industry, and the non-profit sector" and "to explore and develop innovative new models for S&T collaboration between federal departments and agencies and other sectors."

In announcing the appointment of the Panel in mid-August 2007, the President of the Treasury Board stated that "the Government of Canada is committed to strengthening the effectiveness of its investments in S&T to ensure Canadians benefit from scientific innovation and that Canada continues to have a competitive advantage."

In short, the Panel's work was to be guided by the overarching goal of more effective exploitation of the scientific capacity of government, academia and industry for the benefit of

Canadians; and, by the government's desire to ensure that alternative management arrangements are aimed at achieving one or more of the following objectives:

- increased value/efficiency of federal investments in S&T;
- enhanced quality of scientific activities through fostering research excellence;
- expanded opportunities for learning and knowledge transfer; and,
- improved Canadian economic competitiveness.

In accordance with the Budget 2007 announcement, and consistent with the federal government's strategy for science and technology, the Panel organized its work around three main tasks:

- explore opportunities for achieving greater synergy among the major sectors undertaking science and technology activities through transfer of non-regulatory federal laboratories to universities and/or the private sector[4];
- identify up to five non-regulatory federal laboratories as "early candidates" for transfer; and,
- develop a framework for evaluating opportunities for transfer of non-regulatory federal laboratories.

1.2 Methodology

1.2.1 Definitions of Key Terms

The Panel adopted the following definitions of key terms to facilitate its deliberations and consultations:

Non-regulatory federal laboratory: an identifiable organization or capacity within the federal government (i.e., directorate, branch, program, institute, centre, division, survey, bureau, or parts thereof respectively) for performing scientific activities, involving basic research, applied research, and experimental development, for the purpose of expanding scientific knowledge and understanding, promoting innovation and enabling economic and social development.

Research: creation of new knowledge or revision of existing knowledge through systematic investigation and inquiry using the scientific method.

4. The Panel was advised that the term "universities" should be interpreted broadly as including colleges and not-for-profit institutions affiliated with universities and colleges. Accordingly, in the remainder of this report, this sector is referred to as "academia". The term "private sector" is interpreted as referring to for-profit enterprises.

Experimental development: experimental work applied to new knowledge gained from research to establish the feasibility of using that knowledge to build prototypes of products and processes with the potential to be introduced into the marketplace; and, the systematic refinement of research methods to solve scientific problems.

Alternative management arrangement: an arrangement for managing non-regulatory federal laboratories or parts thereof other than through sole ownership and management by the federal government. An alternative management arrangement may include a continuing role for government (e.g., in a partnership or consortium) or may not (in cases of divestiture—some times referred to as "full transfer").

Transfer: the conveying, in whole or in part, of a non-regulatory federal laboratory to an existing entity in academia or industry, or to a new entity such as a partnership or consortium involving government, academia and/or the private sector. Without limitation, transfer may include one or more of: transfer of ownership of assets (e.g., building, equipment, personnel, and intellectual property); transfer of management of assets; and transfer of S&T program management.

1.2.2 Topics of Study and Analysis

The Panel focused its study and analysis on:

- current patterns of non-regulatory S&T activities in the federal government;
- current patterns of interaction between government S&T activities and those in academic institutions and the private sector in Canada, and those in other countries;
- alternatives, involving participation by academia and the private sector, to sole ownership and/or management of S&T assets and activities by the federal government;
- specific opportunities for greater synergy among the federal government, academia and the private sector in the conduct of S&T activities; and,
- desirable features of a federal policy framework for inter-sectoral S&T collaboration.

1.2.3 Work Plan

The Panel's work plan included:

- Intensive review of background information and research developed or commissioned on the Panel's behalf by the Treasury Board Secretariat, including:
    - an inventory of non-regulatory S&T laboratories and their geographic distribution;

- case studies of transfer of government laboratories or activities to alternative arrangements involving academic institutions and/or the private sector in Canada and abroad; and,
- briefing documents on various policies and procedures related to S&T in, or sponsored by, the federal government.

- A series of six roundtables across Canada (Calgary, Winnipeg, Toronto, Ottawa, Montreal and Halifax) to hear from key stakeholders in government, academia and industry;
- Inviting stakeholders to offer comments directly to the Panel (more than 60 submissions were received);
- Inviting proposal submissions using a template developed by the Panel, (56 proposals were submitted); and,
- Bilateral meetings or teleconferences of Panel members with a broad variety of stakeholders and other interested parties (more than 150 such interactions took place in the period mid-August to mid-December 2007).

The submissions and consultations provided valuable input to the Panel's extensive deliberations.

Section 2 – Current Patterns of Federal Science Activities

2.1 The Role and Nature of Federal S&T Activity

In 2006-07 the federal government invested $9.31 billion in science activities. Of this amount, $4.91 billion was spent on science activities performed by federal departments and agencies. Of this, $2.1 billion was spent on research and experimental development and $2.81 billion on other types of scientific activity.[5]

Through the S&T activities it conducts, the federal government contributes directly to:

- public health;
- safety;
- environmental protection;
- security and national defence;
- evidence-based decision making;
- policy development;
- formulation of standards and regulations;
- development and advancement of Canadian business and commercial enterprises;
- economic and social advancement of knowledge; and,
- development and management of standards.

Federal scientists conduct not only scientific activities related to the government's statutory regulatory responsibilities, but also activities linked to achieving broader scientific, social and economic objectives essential to the national interest.

Through these activities, the federal government plays a key role in the Canadian science and innovation system. Federal laboratory scientists interact with counterparts in other sectors and organizations, domestically and internationally, to enhance the benefits federal S&T investments bring to Canadians.

The Panel's mandate focuses on those aspects of federal S&T that are not specifically and directly required to meet the regulatory obligations of the federal government and more particularly on those S&T activities involved in research and experimental development (R&D).

5. Statistics Canada, *Federal Scientific Activities 2006/2007,* April 2007

2.2 Scale and Distribution of Federal S&T Activity

2.2.1 Personnel and Expenditures

In 2006-07, 24,890 federal employees were engaged in S&T activities.[6]

The largest employers in the federal S&T community were:

- Statistics Canada (6,242);
- National Research Council (4,033);
- Environment Canada (3,469);
- Natural Resources Canada (3,008);
- Health Canada (2,900);
- Agriculture and Agri-Food Canada (2,352); and,
- Atomic Energy of Canada Limited (1,550).

Federal government departments and agencies with the largest expenditures on intramural S&T were:

- Statistics Canada ($794 million);
- National Research Council ($660 million);
- Environment Canada ($529 million);
- Natural Resources Canada ($421 million); and,
- Agriculture and Agri-Food Canada ($336 million).

These five agencies accounted for $2.74 billion, or almost 56 per cent, of the federal government's expenditure on intramural S&T.

2.2.2 Geographical Distribution

Based on an informal survey of federal departments and agencies, some 198 laboratories and science facilities have been identified across Canada.[7] The number of laboratories by province or territory is:

- Ontario, 84 (including the concentration of laboratories in the National Capital Region);
- Quebec, 32;

6. Statistics Canada, *Federal Scientific Activities 2006/2007,* April 2007.
7. Based on information submitted to the Treasury Board Secretariat by Science Based Departments and Agencies

- British Columbia, 18;
- Alberta, 13;
- Manitoba, 13;
- Nova Scotia, 10;
- Saskatchewan, 10;
- New Brunswick, 7;
- Newfoundland and Labrador, 3;
- Prince Edward Island, 3;
- Northwest Territories, 1; and,
- Yukon Territory, 1.

Most federal laboratories are located in or near metropolitan areas, with very few in small towns or rural regions.

2.2.3 Distribution by Department and Agency

The following table indicates the number of laboratories in specific federal departments and agencies.

Dept/Agency	No.	Dept/Agency	No.	Dept/Agency	No.	Dept/Agency	No.
HC	37	CFIA	13	RCMP	6	CBSA	1
NRC	32	DFO	12	IC	3	CGC	1
AAFC	22	DND	10	AECL	2	INAC	1
NRCan	21	PCH	7	CSA	2	STC	1
EC	18	PCA	6	PHAC	2	TC	1

2.2.4 Overview of Current and Future Demographic Profiles of Federal S&T Personnel

According to a recent study from the Public Service Human Resources Management Agency of Canada, the number of retirements from the federal S&T community doubled in the five-year period from fiscal 2000 to fiscal 2005. [8] The study also found that 27 per cent of members will reach retirement eligibility by 2010.

The average age of employees in the federal S&T community in 2005 was 45.9 years, and the number of new recruits into the federal S&T community fell sharply from a peak in 2002-03.

The implications of the demographic data are clear. Since academic institutions in Canada and other countries will also be faced with having to recruit a large number of scientists to fill vacancies created by a wave of imminent retirements, there is likely to be intense competition for the relatively small pool of highly qualified candidates available in Canada and abroad. Inter-sectoral S&T integration may help to improve Canada's overall competitive position through pooling of available resources.

8. Public Service and Human Resource Management Agency of Canada Report: *Towards an Identification of the Current and Future Needs in the Science and Technology Community: Key Findings, Analysis and Demographic Projections* Research and Analysis Directorate, Human Resource Planning, Accountability and Diversity Branch, October 2005.

Section 3 – S&T Linkages Involving Federal Laboratories, Academia and the Private Sector

S&T linkages among the government, academic and private sectors in Canada and abroad take a variety of forms; including: inter-sectoral transfer of ownership and control; contracting-out of services; partnerships and consortia; and, informal collaboration. In some cases regional and municipal governments may be involved in addition to the national government.

3.1 Linkages with Academia

Many linkages between federal research facilities and academic institutions have been developed over the years. The Association of Universities and Colleges of Canada (AUCC) identified nearly 80 federal or joint federal-academic research facilities located on or near 33 university campuses where research collaboration is taking place. It is estimated that about 3,400 federal employees are involved in these collaborations. Moreover, several hundred government researchers are teaching or supervising university students as adjunct professors across Canada.

There are clear mutual benefits to strengthening government-academic institution research linkages, including: increased access to, and consolidation of, human and financial resources; increased research and training opportunities for students; and enhanced national and regional economic development through the establishment of strong clusters involving participation of the private sector.

Examples

Agriculture and Agri-Food Canada and its provincial counterparts have been active in building linkages with academic institutions for decades. For example, the Ontario government transferred most of its in-house agricultural research to the University of Guelph (Guelph). Ministry staff members were transferred to Guelph and became university employees. Under the funding agreement, Guelph manages the research and education programs and related facilities (e.g., diagnostic testing laboratories) previously managed by the ministry. The contract also provides Guelph with funds to deliver diploma agri-food education programs at Guelph's Ontario Agricultural College and the University's Colleges at Alfred, Kemptville and Ridgetown. Guelph operates an agri-food laboratory and an animal health laboratory providing diagnostic support to the ministry, the food industry and the province's livestock (e.g., BSE testing) and poultry producers (e.g., West Nile virus testing).

In 2005, the University of Manitoba, Agriculture and Agri-Food Canada (AAFC) and the St. Boniface General Hospital entered into an agreement to jointly manage an integrated research program in the Canadian Centre for Agri-food Research in Medicine. In June 2006, the NRC, the

University of Prince Edward Island and AAFC signed a cooperative research and development agreement (CRADA) to support the creation of the Centre for Bio-Resources and Health (CBH).

The agreements governing these two recent developments establish clearly how the parties will integrate their research, education and commercialization resources and capacities and how the occupation of space, use of equipment, intellectual property, technology transfer, commercialization activities and confidentiality will be managed.

The recently established National Institute for Nanotechnology (NINT) represents another type of alternative management arrangement. NINT operates as a partnership between the National Research Council, the Province of Alberta and the University of Alberta, and is jointly funded by the three partners. The partnership owns major facilities housing multi-disciplinary research activities related to nanotechnology and involving researchers in physics, chemistry, engineering, biology, informatics, pharmacy and medicine.

3.2 Linkages with the Private Sector

Although collaborative linkages between government and private sector research efforts are fairly common across many federal laboratories, formal long-standing relationships are relatively infrequent and restricted to a few industrial sectors. Such linkages are far less common in Canada than in other developed countries.

Examples

Privatization of federal research facilities – the transfer of full ownership and control to a for-profit entity – has occurred relatively infrequently in Canada but can be illustrated by the creation of the for-profit BC Research Corporation from the BC Research Council. Part of the corporation was spun off as Vizon Scitec and acquired by CANTEST, which performs testing services for Health Canada, the Canadian Food Inspection Agency, and Fisheries and Oceans Canada.

In 1979, a not-for-profit entity was established when the Eastern and Western Wood Products laboratories of the Canadian Forest Service became Forintek Canada, an independent, not-for-profit corporation. Forintek is a unique partnership involving the federal government, six provincial governments, and 150 private companies. It has also benefited from on-going financial support from the federal government.

The new Canadian Wood Fibre Centre (CWFC) brings together forest sector researchers to develop solutions for the Canadian forest sector’s wood fibre related industries in an environmentally responsible manner. The Canadian Forest Service (CFS), a sector of NRCan, is

a key contributor to the CWFC which is staffed by CFS employees housed in CFS research centres across Canada. This Centre is an integral part of the newly created FPInnovations that amalgamates three existing not-for-profit forest research institutes – FERIC, Forintek, and Paprican – into a national private-public sector partnership. The research program of FPInnovations integrates a wide array of forest research activities, from the genomics of wood formation to the development of diverse new processes, products, and markets for Canadian wood fibre. The CWFC is to be compliant with the strategic direction and the policies of its two parent organizations, CFS and FPInnovations. Its research direction and orientation are determined by the Board of FPInnovations through its President and Chief Executive Officer.

Canada also has several examples of government-owned/contractor-operated (GOCO) entities with testing and evaluation activities that could be classified as "regulatory." Since 1953, the Weir Group PLC (formerly Peacock Inc.) has operated National Defence's Naval Engineering Test Establishment (NETE), in Montréal, as a GOCO. NETE provides a broad range of multi-disciplinary engineering test and evaluation services, directed at naval equipment, combat and control systems, as well as information and communication systems. The facilities and services of NETE are also available to the private sector on a contractual basis. A similar example of this model is the Motor Vehicle Test Centre (MVTC) in Blainville, Québec - a Transport Canada facility operated as a GOCO since 1996. In addition to supporting Transport Canada's responsibilities in compliance enforcement and regulatory development, the operator also provides testing services to external clients.

3.3 Inter-Sectoral Linkage Arrangements in Other Countries

Several other member countries in the Organization for Economic Co-operation and Development (OECD) are fostering collaborative approaches to S&T among government, academic and private sector organizations. They have introduced structural reforms, changed S&T strategies and implemented new policies. These initiatives have been broadly aimed at changing the role played by government in supporting research through a greater focus on strategic planning and oversight and on enabling research-performing institutions to function more efficiently and competitively by according them enhanced autonomy.

A notable feature of the foregoing developments has been a drive to maximize benefits from linking science and innovation by expanding the use of public-private R&D partnerships as a means of breaking down traditional "silos" and promoting inter-sectoral integration. In a number of instances, realignment of S&T activities between public and private sectors has involved partial or full commercialization of some S&T establishments and, in others, it has involved a move to contract-based competitive supply. Enhanced commercialization of S&T per se is being pursued both through major programs of privatization of both regulatory and non-regulatory

laboratories and/or through creation of new government agencies that have special authority to pursue private-sector-like activities.

To illustrate the diversity of inter-sectoral S&T integration, developments in six countries are described in Appendix II. This diversity in patterns of inter-sectoral S&T management arrangements among industrialized countries reflects differences in governance structures and accountabilities, the nature of the jurisdictional relationship between the national government and regional governments, the financing and governance of academic institutions, and the industrial structure. Some features of these approaches are of potential relevance to Canada. However, there is no particular approach that can serve as a generally applicable model in the current Canadian science and innovation system.

3.4 Typologies of Alternative Management Arrangements[9]

The key variables involved in the wide range of alternative management arrangements reviewed by the Panel are:

- The types of organization involved in governing or managing the alternative arrangements
- The nature of the transformations involved in creating the alternative arrangement
- Governance relationships
- The time horizon
- The ongoing role of the federal government in relation to alternative arrangements
- Financing channels
- Location

The typologies commonly associated with these variables are provided in Appendix III. The list of relevant typologies can vary depending, for example, on whether the development under consideration is a new S&T endeavour or involves alternative management arrangements to be applied to an existing non-regulatory laboratory.

Given the number of potential characteristics associated with each typology, it is obvious that the number of potential models (i.e., particular combinations of characteristics) is very large. Based on the information reviewed by the Panel, the most common models currently used in Canada have the following characteristics:

9. ***Typology:*** a classification of things according to their characteristics e.g., a typology of organizations; a typology of governance.

- not-for-profit, cooperative arrangements without a formal joint governance agreement to cover integration of S&T;
- operating in single locations (i.e., not networked);
- not involving changes in employment status of personnel;
- operating for indefinite terms; and,
- no change in ownership of assets or sources of funding.

These commonly employed models do not, in the Panel's view, result in an optimal level of S&T integration. While they may represent examples of useful collaboration and networking, they do not result in the level of complementarity and synergy that can be achieved through models based on close integration of the work of scientists from different sectors.

Given the qualitative and quantitative diversity of federal non-regulatory S&T activities, there is likely no "one-size-fits-all" model of close integration. The Panel has concluded that there is, however, a feature of models of close integration that is required, in the current Canadian context, to achieve the full scope of the four core objectives of the Government's transfer strategy; namely, joint sponsorship and management, by the federal government, academia and/or the private sector, of unified programs of R&D. Unified programs of R&D may also be a feature of models involving full transfer to non-governmental entities; but these programs are likely to address a narrower range of objectives. In either case, close and effective integration does not require the partners/participants to have identical purposes in mind (although they may) – only that the purposes are complementary and the integrated scientific activities will serve those purposes.

Examples of joint sponsorship and management of S&T already exist and the building blocks for establishing new ones (e.g., existing proximity of scientists from different sectors to each other) are already in place. It should be noted, however, that while co-location may be a necessary requirement for some types of S&T collaboration, that is not always the case. For example, there are opportunities for extending the integration initiative beyond individual nodes of S&T integration to include "networks of centres of S&T integration" involving more than one federal lab with more than one academic institution and/or private sector counterpart operating in more than one location or region and perhaps internationally.

Section 4 – Identification of Early Candidates for New Management Arrangements

As part of its mandate, the Panel was tasked to identify and recommend five “early candidates” for potential transfer to alternative management arrangements. The Panel invited submission of proposals for transfer initiatives and developed a template for identifying the topics proponents were to address in formulating proposals (Appendix IV).

Given the nature of the Panel's mandate and the time available, the template focused on key qualitative characteristics of the proposed transfer, including: identification of the federal laboratories to be involved, the proponents of the transfer initiative and the main potential partners; and a description of essential components of the governance and management arrangements and the roles of the partners. Proponents were asked to indicate how the proposed initiative would improve on the status quo and to describe the anticipated benefits and impacts of the initiative - in particular how the initiative would contribute to the achievement of the four core objectives of the transfer strategy. They were also asked to identify milestone and timelines for, and any challenges and risks associated with, implementing the proposed initiative. They were neither expected to, nor in general could they in the time available, undertake the in-depth consultations necessary to develop and submit full business plans and estimates of implementation costs associated with proposed initiatives.

In the course of its discussions with stakeholders, the Panel encouraged potential proponents of transfer initiatives to consider the full range of alternative management arrangements – from full divestiture by government to various forms of partnering of government with academic and private sector organizations in joint governance and management of assets and/or S&T programs.

4.1 General Observations

In response to the Panel’s solicitation of proposals, 56 submissions were received. They varied somewhat in how far advanced the proposals were in, for example, the extent of interaction between proponent organizations and potential partners in the course of preparing proposals. Several organizations indicated a strong interest in developing proposals in the future but stated they were not in a position to undertake the necessary consultations and explorations for preparing specific proposals for the current round of submissions.

The Panel regards the level of response and the outcome of its consultations with stakeholders as indicating a highly significant level of support for ISTI as a strategic objective of the federal government, extending beyond any follow-on actions that may be taken in respect of the Panel's identification of early candidates for transfer.

The proposals came from organizations in all regions of the country and covered a wide range of fields.[10] Not surprisingly, a majority of the proponent organizations were from, or included, academic institutions and federal laboratories engaged in, or with significant past experience in, inter-sectoral S&T collaboration. In a few cases, this experience has included actual S&T integration.

Submissions from the proponent organizations identified a variety of other organizations in government, universities and the private sector as potential partners in the sponsorship and management of new entities formed in implementing the proposed initiative. In aggregate, some 300 potential collaborations, involving organizations or laboratories and S&T programs within organizations, were cited in the proposals received.

Some provinces have indicated strong interest in, and support for, the concept of partnering in ISTI, and this interest has been reflected in provincial entities being identified as collaborators and potential partners in several of the proposals submitted to the Panel.

The types of alternative arrangements contemplated in the submissions included:

- Establishing a new entity involving joint sponsorship and management of S&T activities by the federal government, an academic institution, and/or the private sector. In some cases, the entity would be a not-for-profit corporation. In most, the proposed entity would operate under what has been termed a "co-operative research and development agreement." Several proposals included participation by more than one organization;
- Co-location of scientific personnel, involving existing proximities or through new co-location initiatives. Nearly all locations designated are on or near university campuses, in research parks or in other cluster arrangements. In a few instances, the arrangements would involve seconding university S&T personnel to government laboratories; and,
- In some instances, a proposed divestiture by government of physical assets, human resources or intellectual property (e.g., data resources) or personnel, by transfer to non-governmental entities.

10. The fields covered by the proposals included: agriculture; agri-food; horticulture; viticulture; fisheries and aquaculture; environment and ecosystems; ocean systems; health and biological sciences; medical devices; geosciences; space and earth observation; mining; nanotechnology; photonics; forestry; water systems.

Several submissions indicated that the models of ISTI being proposed were seen as the initial arrangement in an evolving relationship that could result in, for example, a move from a joint sponsorship arrangement involving government to one in which the federal government is no longer involved in ownership, governance or management.

Most of the transfer arrangements proposed were "new" in the sense they involved an alternative to sole ownership and management of assets, personnel and programs by the federal government. None of the arrangements constituted an entirely novel model. The Panel did identify, however, the potential for Canada to build on it leadership in developing research networks by fostering the formation of networks of centres of S&T integration in fields of major strategic importance.

Some proposals involved full divestiture by the federal government; but, for the most part, divestiture was not seen as optimizing the achievement of the core objectives of the transfer strategy to the same extent as a partnership model. The central feature of the partnership model is a jointly agreed upon research agenda the implementation of which is facilitated by bringing together the resources of the partners and by sharing costs related to research operations and to the development and maintenance of physical facilities. Non-federal parties are generally unwilling to undertake ownership of federal laboratories without long-term funding to defray the cost of operating and maintaining the facilities. Moreover, the opportunities for full transfer are limited by the fact that some federal laboratories undertake science activities that do not fit with the interests and capabilities of academia or the private sector.

4.2 Selection of Early Candidates

The Panel first reviewed all submissions thoroughly to identify possible "early" candidates. The Panel identified 24 proposals that:

- included one or more federal laboratories as proponents of a transfer arrangement or in respect of which one or more federal laboratories had been consulted and indicated significant interest;
- identified new governance/management arrangements; and,
- addressed the relevance of the proposal to the achievement of the objectives of the ISTI strategy.

The 24 proposals were then rated by each Panellist independently on each of five criteria using a predetermined numerical rating system. The criteria were: probability of success in achieving primary objectives, impact, feasibility, governance and management considerations, and timeliness (See Section 5.2.4). The resulting ratings were reviewed by the Panel as a whole.

The following five laboratories (listed alphabetically by department or agency in which the laboratories are located) were identified unanimously for recommendation as early candidates for transfer. They represent excellent opportunities for S&T integration; can be implemented within a 12-month period; and, represent a range of fields and departments.[11] It is critical that initial stages of implementation of the five early candidate proposals focus intensively on governance and accountability, more detailed delineation of an integrated research program, and identification of effective managerial and scientific leadership.

1. Agriculture And Agri-Food Canada – Cereal Research Centre

The partners in the proposed Centre of Excellence in Grain Crops are the Cereal Research Centre of Agriculture and Agri-Food Canada, the University of Manitoba, some components of the Grain Research Laboratory of the Canadian Grain Commission, the Canadian International Grains Institute, the Canadian Malting Barley Technical Centre, the Province of Manitoba and the Canadian Wheat Board.

Under the proposal, the Centre will integrate the management of personnel, physical infrastructure, and intellectual property to foster innovation and competitiveness along the full value chain of grain crops, from basic discovery of traits and cultivars to international marketing efforts.

Researchers, producers, processors and marketers will come together to focus on increasing productivity and scientific excellence through integration, acceleration and enhancement of research and development activities of researchers, and through the outreach and commercialization efforts of the Centre's partners. Increased efficiency and value to funders and to industry will be achieved through combined, targeted activity facilitated by common access to leading-edge equipment and infrastructure, through enhanced training opportunities and through the early dissemination and implementation of research findings.

The proposed Centre will involve a shift from independent research planning and implementation by each organization to a fully integrated research planning and implementation model involving joint appointments of research scientists and coordinated management of infrastructure and support services.

2. Environment Canada – Wastewater Technology Centre

The partners in the proposed Water-Health Collaborative Network are Environment Canada's Wastewater Technology Centre (WTC), other Environment Canada laboratory capacities, McMaster University, the University of Guelph, the University of Waterloo, the University of Ontario Institute of Technology, and the United Nations University – International Network on Water, Environment and Health located in Hamilton. The proposed network will pursue three core research themes: Urban and Rural Water, Water and Health, and Energy and Water.

11. The degree of implementation to be expected within 12 months would include: completion of the necessary legal agreements to effect the new governance and management arrangements; the identification of the administrative and scientific leadership of the new entity, and the formulation of an integrated research program and detailed business plan that take into account the relevant elements of the proposed ISTI framework described in Section 5.2. It is understood that full programmatic implementation may require additional time – especially where significant infrastructure development is required.

The Network will focus on integrating complementary research conducted in the universities with the technical expertise of the Wastewater Technology Centre in order to increase the efficiency and quality of the research programs and to promote knowledge transfer in an area of national and international importance.

The Network will form the basis of a planned transformation into an independent entity governed by a Management Board withhttp://www.dti.gov.uk/files/file14578.pdfhttp://www.dti.gov.uk/files/file14578.pdfh representatives from the partner organizations; i.e. federal government, academia and the private sector.

3. Health Canada – Safe Environments Laboratories

This proposed Canadian Laboratory for Environmental Health will bring together the scientists of the Safe Environments Program of the Healthy Environments and Consumer Safety Branch of Health Canada with a broad range of colleagues in health and environmental research at the University of Ottawa. The new laboratory will be built at the Smyth Road Campus of the University of Ottawa – the site of health and medical faculties, major research hospitals and the Ottawa Health Research Institute.

Joint research planning and operations will foster synergy in scientific creativity and outputs, and will enhance the amount, quality and timeliness of research and its contribution to innovation. Research results will be available to inform policy and regulations. Private-sector involvement will be facilitated to help guide access to, and interest in, commercially-viable technologies. Subsequent developments could see a national network of health and environmental scientists. The Laboratory will increase knowledge transfer by attracting and retaining young scientists and students to build Canadian capacity in an important area of national interest.

Under the proposed governance model, the director will be responsible to a joint Research Management Committee and report jointly to the Deputy Minister of Health (or designate) and the Vice-President Research of the University of Ottawa. The Committee will oversee the operations of the laboratory and the setting of a common research agenda. A Scientific Advisory Board will assist the director in elaborating laboratory programs of research, training, commercialization and external linkages.

4. National Research Council – Aerospace Manufacturing Technology Centre

This proposal will establish the foundations of a broad collaborative Network in Aerospace Research built around the Aerospace Manufacturing Technology Centre of NRC's Institute for Aerospace Research, l'École Polytechnique de Montréal, and other Quebec-based universities. The network will link to the existing Consortium for Research and Innovation in Aerospace in Quebec, which in itself links some 30 private sector firms that constitute a major portion of Canada's aerospace industry. The initiative will involve a number of College Centres for Technology Transfer and other organizations focused on the commercialization of technology.

Once it is formally established as a not-for-profit corporate entity, the consortium intends to expand to include the Canadian aerospace industry sector. The initiative will build from Quebec's recognized leadership in this industry sector to become national in scope, and will link the remaining federal research capacity in aerospace innovation, most notably NRC's Institute for Aerospace Research, located in Ottawa, with the efforts of both academic and private sector partners.

5. Natural Resources Canada – Geoscience Laboratories

This proposal calls for the establishment of the Central Canada Institute of Environmental Geosciences and Natural Resources as a joint effort of the research and teaching facilities of the Department of Earth Sciences and Environmental Studies of the University of Ottawa and the scientific team of the Geological Survey of Canada (GSC) of Natural Resources Canada.

The initiative will group over 150 scientists and technicians from the Central and Northern Divisions of the GSC (Booth Street Complex) with 80 full-time and adjunct professors at the Universities of Ottawa and Carleton. The initiative reflects the urgent need for infrastructure renewal at the GSC and proposes the eventual development of new facilities by the University of Ottawa in which federal and academic researchers will be co-located.

Under the proposed governance structure of the institute, the director will report to a management board comprising representatives from government, academia and industry. The proposal calls for immediate close linkages to the new Canadian Shield Research Institute, as well to the shared facilities of the Ottawa-Carleton Geoscience Centre.

4.3 Overall Assessment of Proposals

The Panel was impressed by the quality, scope and potential impact of the proposals submitted. In aggregate they involve some 70 laboratories or major research programs within the federal government and links to over 150 non-federal entities including Canadian universities, independent research organizations, and individual firms or industry associations. The following table provides a breakdown of the number of laboratories and proposals arranged by Ministerial portfolio.

Portfolio	Number of laboratories potentially involved	Number of proposals involving department
Agriculture and Agri-Food	21	14
Environment	4	7
Fisheries and Oceans	5	7
Health	7	5
Industry	20	21
National Defence	1	2
Natural Resources	11	11
Public Safety	1	1
Total*	70	68

* some of the 56 proposals referenced more than one federal laboratory or department

Nearly all of the proposals received were viewed as being potential candidates for future consideration in the implementation of a longer-term federal strategy for inter-sectoral S&T integration. In addition to the five Recommended Proposals, the Panel identified a number of other highly ranked proposals that were at a relatively advanced stage of development and took special note of a number of other proposals that, while less developed, had considerable potential in areas of national strategic importance.

Section 5 – A Framework for Inter-Sectoral S&T Integration (ISTI) Involving Federal Laboratories

5.1 Input from Roundtable Discussions and Stakeholder Consultations

The Panel's consultations with a wide variety of stakeholders in government, academia and the private sector indicated a high level of interest in ISTI as a means to improve Canada's science and innovation system and its economic competitiveness, and as an important element in the Canada's overall S&T strategy. During the consultation process, a full range of possibilities were entertained, ranging from divestiture to various forms of alternative arrangement involving public-private partnerships.

The input also indicated strong support for an ongoing process of identifying opportunities for ISTI. However, there was virtual unanimity in the view that the phrase "transfer of federal non-regulatory laboratories" is problematic and that terminology should be adopted to reflect the broad scope of opportunities for inter-sectoral collaboration.

A large majority of stakeholder commentators concurred with the conclusions that:

- current patterns of inter-sectoral collaboration were, in the main, insufficient to achieve optimum synergy and complementarity;
- alternative management arrangements were needed to reach that goal; and,
- although such arrangements would need to be customized to reflect diverse patterns of S&T, the central feature of the arrangement should be an integrated program of research and experimental development that meets the needs and expectations of all partners involved and includes strong governance and accountability mechanisms.

A variety of useful suggestions were made with respect to the criteria for identifying and selecting promising opportunities for ISTI involving federal laboratories. The input validated the Panel's preliminary identification of the key elements of a possible framework for ISTI and identified desirable refinements and additional features. Among the factors viewed as critical to the success of ISTI initiatives, commentators placed special emphasis on the need for a shared vision of purpose and desired outcomes, strong and sustained commitment of partners, effective leadership and clarity of roles and accountabilities. In general, the various detailed suggestions received centred around three pillars of success: strong shared commitment; sound governance, and excellent leadership.

It was recognized that while all partners in alternative management arrangements operate within certain constraints, it is possible, through careful design of management and accountability mechanisms, to work within them successfully. It was also recognized that it would be desirable to remove or modify constraints that are no longer necessary in substance or form, respectively.

Some provincial officials expressed strong interest in, and support for, the concept of partnering in ISTI, and stakeholders recognized the important role provincial governments can play in integration initiatives.

A fuller summary of stakeholder input is provided in Appendix V – Summary of Input to the Panel on Inter-Sectoral S&T Integration. A detailed compilation report prepared by the facilitator of the regional roundtable discussions has been sent to participants.

5.2 A Framework for Assessing Opportunities for ISTI

A systematic approach is needed to guide government officials in dealing with proposed ISTI initiatives involving federal departments and agencies. The development and implementation of a federal policy framework for S&T integration can provide such guidance.

The key elements of the framework proposed by the Panel are outlined below. The applicability of the particular elements of the framework will depend on whether the initiative under consideration involves full transfer to a non-governmental entity (divestiture); or, transfer to an entity jointly sponsored and managed by government, academic and/or private sector organizations (partnering).

5.2.1 Goal, Strategies, Outcomes

The Panel's study and analysis was conducted on the basis of the goals, objectives and strategy as described by or imputed from its mandate. The Panel recommends the goal, objectives and strategy articulated be reviewed in the light of our findings. We offer the following formulation for consideration:

Overarching goal: enhanced realization of the potential of the scientific and technological capacities of government, academia and the private sector for the benefit of Canadians.

General strategy for achieving the goal: realign appropriate scientific activities of government laboratories with those of academia and the private sector so as to benefit from the potential synergies and complementarities realignment can bring.

Specific Strategy: inter-sectoral S&T integration (ISTI), through governance and management arrangements for eligible federal S&T activities that include participation of academia and/or the private sector.

Desired Outcomes:

- increased value/efficiency of federal investments in S&T;
- enhanced quality of scientific activities through fostering research excellence;
- expanded opportunities for learning and knowledge transfer; and,
- improved Canadian economic competitiveness.

5.2.2 Scope of Application: Definition of Federal S&T Activities Eligible for ISTI

The Panel developed working definitions of the terms used in describing its mandate to assist in organizing and focusing its discussions and consultations. On the basis of those discussions and consultations, the Panel recommends reconsideration of the use of certain terms.

First, the term "transfer" lends itself to the inference that the Government is intent on wholesale divestment of its non-regulatory laboratories – an inference that was not conducive to constructive dialogue with some stakeholders. However, when the topic was framed as "inter-sectoral S&T integration" and "alternatives to sole government ownership and control" the tone of the discussion was constructive and even enthusiastic. Accordingly, the Panel suggests that the phrase "inter-sectoral S&T integration" be used instead of "transfer" in describing a move to alternative management arrangements for S&T.

Second, the Panel suggests that whether federal laboratories are regulatory or non-regulatory is not the best basis of determining their eligibility for possible integration with other sectors. Instead, the Panel proposes that the federal S&T activities eligible for ISTI should be those activities in respect of which the federal government does not require exclusive ownership and operational control. On this basis, not all activities coming under the Statistics Canada definition of regulatory S&T would necessarily be excluded from ISTI; and, not all activities defined as non-regulatory would necessarily be eligible for ISTI.[12]

Third, the premise that government is best able to perform regulatory science while the other sectors are best able to perform non-regulatory science is too broad a generalization. There are

12. Regulatory and non-regulatory activities may be linked, either because individual federal scientists perform both types of activities or because the non-regulatory activity (e.g. R&D) provides critical input to regulatory functions. Moreover, the definition of non-regulatory as being virtually synonymous with R&D poses some difficulty because there are a variety of activities other than R&D that serve non-regulatory purposes.

areas of vital public interest where research of a non-regulatory nature is required that non-governmental sectors are unable, unwilling or unlikely to carry out. Such areas would not lend themselves to full transfer to academia or the private sector. However, in some of these areas the government's requirements could be met through its participation in joint sponsorship, governance and management of an inter-sectoral research program.

5.2.3 Articulation of Federal Governance and Accountability Requirements with Respect to ISTI Initiatives

The level of the government's continuing interest in, requirement for and commitment to the scientific activity under consideration for ISTI is the most important consideration in determining its position in negotiating the form and substance of alternative arrangements for governing and managing that activity.

This includes:

- the determination of the ongoing role the government wishes to play in influencing the scientific agenda to be pursued under any new arrangement;
- the nature of the "deliverables" it expects;
- the continuing roles, responsibilities and accountabilities, if any, of federal scientists in relation to their respective departments and agencies, beyond those associated with participation in the proposed ISTI initiative; and,
- the temporal term of the alternative arrangement.

Analogous considerations will no doubt be important in determining the position of potential academic or private sector "partners" in negotiating alternative arrangements.

5.2.4 Criteria for Evaluating Proposed ISTI Initiatives

The criteria proposed for evaluating ISTI initiatives reflect the relevance of the initiatives to the goals and objectives of the ISTI strategy as a whole and the extent to which the initiatives contain the elements that are critical for successful implementation.

Probability of success in achieving primary objectives

- Likelihood of achieving agreement on new management arrangements that benefit all partners involved.
- Likelihood that one or more of the four key objectives of the ISTI strategy (i.e. value/efficiency, quality/results, learning/knowledge transfer, and competitive advantage) will be achieved through the new management arrangement.

Strength of commitment of parties to the ISTI initiative

- Demonstrated commitment by potential partners to the long term success of the partnership.
- Clear articulation by partners of their expectations.
- A demonstrated history of successful inter-sectoral cooperation/collaboration among the parties.

Quality of the proposed management and accountability arrangements and business plan

- Governance mechanisms and management arrangements that clearly address the expectations and collateral accountability requirements of the partners.
- Policies and procedures that deal effectively with issues such as conflicts of interest, dispute resolution, management of intellectual property interests, risk management; and mechanisms for discontinuing the initiative when circumstances require it.
- Comprehensive, forward-looking business and operating plans that take into account legal, regulatory and other conditions precedent.
- Performance evaluation principles and processes that are clearly linked to goals and objectives.

Managerial and Scientific Leadership

- Strong management and scientific leadership resources are in place to implement the initiative, including designation of managerial and scientific leaders capable of guiding complex collaborative S&T programs.

Feasibility

- **Separability:** Proposed ISTI initiative can be implemented without undermining the mandate of the department or agency; and, any interdependencies are understood and capable of being managed.
- **Logistics:** Any logistic challenges to be overcome in effecting the initiative (e.g., relocation of personnel) and means to deal with them are identified.
- **Sustainability:** The proposed initiative is financially sustainable over a period sufficient to achieve its objectives.
- **Legal considerations:** The proposed initiative can be implemented in the context of the legislative responsibilities of the federal department or agency concerned, and of any other legal constraints (e.g., land claims, international agreements, or third party interests).

- **Other Constraints:** Any constraints arising from federal policies and procedures on the operations of a proposed ISTI initiative can be accommodated or managed.
- **Risk Assessment:** No unacceptable short term or long term risks inherent in the proposed initiative, or associated with it, have been identified. Risks of not proceeding with the initiative are greater than risks of proceeding.

Impact

- The ISTI initiative is substantial enough in terms of size, scope and anticipated benefits to justify the time and effort and any additional investment required to create the conditions for successful implementation.
- The initiative addresses an area of strategic importance from an economic, social, scientific or technological viewpoint.
- Cost/benefit analysis produces a significantly positive result.
- The initiative will contribute to the achievement of other key policy priorities or to the functioning of other programs.
- The initiative will maintain or enhance the fulfillment of the national mandate of the federal laboratory involved.

Timeliness

- The proposed initiative can be implemented, and its associated benefits realized, in a reasonable time frame.
- The initiative is coincident with other events (opening up of a window of opportunity) or emergence of new policy directions or priorities to which the proposed initiative may be particularly relevant.

Implementation

A central locus of authority and responsibility is required for managing the horizontal application of the framework. The central agency's role could include:

- monitoring the requirement for compliance with policies and procedures that may flow from adoption of the framework;
- establishing processes for independent adjudication of proposed ISTI initiatives and for performance evaluation;
- facilitating the elimination of unnecessary constraints on pursuing ISTI initiatives; and,

- providing guidance to departments on the development of effective inter-sectoral partnering, including guidance on governance and management approaches to successfully accommodate the accountability requirements of the participants (see Appendix VI).

Performance evaluation

A general plan is required for evaluating the performance of the entities created as part of ISTI initiatives. The plan should include:

- identification of key performance indicators and metrics related to the objectives of the ISTI strategy in general and guidelines for establishing indicators of relevance to specific initiatives;
- a focus on outputs and outcomes, as well as process measures;
- a description of the evaluation process, including how, by whom and when the evaluations will take place; and,
- guidance on the critical data requirements for effective assessment, including pre-launch data on key indicators, as a baseline for assessing the impact of the initiatives.

Section 6 – Concluding Observations

The Panel was given an important mandate. The completion of its work within the short time frame available is due in significant part to the excellent support it received from the Treasury Board Secretariat and from the constructive input from officials and scientists in government and other sectors. In addition, the fact that inter-sectoral mechanisms for enhancing S&T and its links to innovation have become an increasingly prominent topic of discussion and element of national policy in Canada and abroad has given the Panel's work a sense of timeliness.

The timeliness of the government's initiatives related to inter-sectoral S&T collaboration was reinforced by the increasingly positive interest and optimism that developed among stakeholders in the course of the Panel's work. The Government of Canada's commitment to realizing the benefits of collaborative approaches was welcomed as recognition of the importance of science and technology and of the need for a holistic approach to meeting the science and innovation challenges facing the nation, now and in the future. The strong, positive response to the call for proposals demonstrated a considerable interest in, and generally felt need for, a significant advance in integration activities among government, academia and the private sector and for a broader ongoing government thrust in promoting ISTI.

Individuals working in and managing federal laboratories are keenly aware of the competitive threat they face in key areas of recruitment, including access to complementary expertise, and quality of facilities and equipment. They see forming partnerships with other sectors as an opportunity to create an enriched environment for attracting new employees.

There is strong and widespread respect for government laboratories and their personnel within the Canadian S&T community. Business representatives, particularly those from SMEs, emphasized the importance of maintaining and enhancing the access to, and positive interaction they experience with, government laboratories. Clearly all three sectors have distinctive and important roles to play in the Canadian science and innovation system. ISTI can and should be pursued in ways that contribute to the strength of all sectors without weakening the ability of each to perform its distinctive role.

The independence of the Panel, and the consultative process it used, were identified by stakeholders as important contributors to their willingness to actively participate in the discussions. This suggests that similar characteristics may be useful in any mechanisms established by the government to evaluate ISTI initiatives in the future.

The Panel has concluded that adoption of its suggested framework for ISTI could proceed expeditiously as a general guide for evaluating future ISTI proposals involving federal laboratories – whether these are initiated by federal departments and agencies or emerge in

response to a general call for proposals. The Panel believes the framework is robust enough, and the proof of concept sufficiently well established, for the government to proceed with considering proposals beyond the five “early candidates” recommended in this report. Moreover, the Panel is aware that consideration of certain ISTI initiatives, other than those proposed to the Panel, was well advanced at the time the Panel was announced. It is likely that some of these initiatives can be aligned with the proposed framework without significant delay. As experience grows in the operation of these new entities, one can anticipate that, in some instances, partnering arrangements, initially involving the federal government, may evolve to become wholly non-governmental enterprises.

Appendices

Appendix I – Panel Membership and Terms of Reference

Dr. Arnold Naimark (Chair) – President Emeritus and Dean of Medicine Emeritus, University of Manitoba. Currently Director of the Centre for the Advancement of Medicine, Chair of Health Canada's Ministerial Science Advisory Board and Chairman of Genome Prairie. Founding Chair of the Canadian Biotechnology Advisory Committee and of the Canadian Health Services Research Foundation.

Dr. Kevin Keough – Former President and CEO, Alberta Heritage Foundation for Medical Research and a founder of NovaLipids Incorporated. Former Vice President of Research and International Relations at Memorial University of Newfoundland and former Chief Scientist of Health Canada.

Dr. Kelvin Ogilvie – Past President and Vice-Chancellor of Acadia University. First Chair of the Premier's Council for Innovation (Nova Scotia), member of the Board of Genome Canada, the Advisory Boards for the Atlantic Innovation Fund and Terragon Environmental Technologies Inc., and Chair of the Advisory Board for the NRC-IMB.

Dr. Clive Willis – Former Vice President of the National Research Council; Past Director General, NanoQuébec; currently a consultant in the area of innovation and economic development.

Terms of Reference

Background

Federal laboratories undertake a broad range of scientific activities, including science focused on regulatory functions critical to federal responsibilities in areas such as the environment, health, safety, and public security. They also undertake non-regulatory scientific activities to address broader social and economic objectives, including: earth and planetary science, energy technologies, agriculture and environmental science. Federal science is undertaken for public policy reasons such as supporting regulatory activities, the advancement of knowledge and economic and social development.

Government science and technology (S&T) is one of the three major sectors within the national innovation system, the other two being the private and the academic sectors. Government S&T plays a key role in the innovation system and federal labs and researchers interact with other sectors and organizations, domestically and internationally, to bring the benefits of federal S&T

investments to Canadians. Strengthening the effectiveness of the government's investments in S&T to generate wealth and public good benefits is a key element of government policy.

Following a reference in the Economic and Fiscal Update, Advantage Canada, Budget 2007 signalled the Government's desire to explore alternative management arrangements for federal laboratories. Specifically, it stated that "the Government will launch an independent expert panel that will consider options for transferring federal laboratories to universities or the private sector. The panel will report to the President of the Treasury Board in the fall of 2007 on the type of non-regulatory science that should be transferred, which partners should be involved and an appropriate governance framework. The panel will also be asked to identify up to five laboratories that could be early candidates for transfer."

This intention was echoed in Mobilizing Science and Technology to Canada's Advantage, released in May 2007, which stated that the government would focus its activities in areas where government is best able to deliver results, and consider alternative management arrangements for non-regulatory federal laboratories. It also identified the key objectives that will act as drivers for considering alternative management arrangements for federal laboratories:

- **Value / Efficiency** – increasing the impact of federal investments;
- **Quality / Results** – fostering research excellence;
- **Learning / Knowledge Transfer** – creating better learning opportunities for students and the development of knowledge; and,
- **Competitive Advantage** – levering university and private-sector strengths.

Scope

In the context of these drivers, the Panel is encouraged to consider scientific activities undertaken by federal departments and agencies. Taking into account the diversity of federal science activities, the Panel will consider a broad range of alternative management arrangements including, but not limited to, transfer. Accordingly, the Panel should become familiar with the range of alternative arrangements already used by federal departments and agencies in the management of laboratories, and explore models beyond what is currently in place.

Several principles should guide the work of the Panel in considering alternative management arrangements for non-regulatory activities of federal laboratories:

- **Practical Results** – advice and supporting analysis from the Panel should result in workable approaches and proposals that have a high probability of implementation success;
- **Benefits for Canada** – outcomes support the achievement of tangible benefits for Canadians, and reflect linkages to the Canadian innovation system; and,

- **Strong Accountability** – due consideration should be given to the imperative of providing for strong accountability that demonstrates results for Canadians.

The Panel will engage key stakeholders in accordance with its mandate and mindful of the need to deliver its report to the President in the fall of 2007.

Mandate

The Independent Expert Panel will report to the President of the Treasury Board, in the fall of 2007, providing advice and options on alternative management arrangements, including transfer, for federal non-regulatory laboratories.

Budget

The Panel will operate within a budget of $1 million, including costs of a secretariat to be located within the TBS.

Deliverables

In fulfilling its mandate the Panel will prepare a report that provides a framework for considering alternative management arrangements and increasing the impact of federal investments. This report will include the following:

- Criteria that can be used to identify laboratories conducting non-regulatory science that could be suitable for alternative management by universities and/or the private sector;
- Identification and examination of a range of relevant management and governance and financial models;
- Identification of partners that need to be involved and under which circumstances and models;
- Success factors for implementation, including barriers that need to be addressed, such as financial, human capital and infrastructure implications and performance evaluation considerations; and,
- Identification of up to 5 federal laboratories as early candidates for new management arrangements.

Appendix II – International Case Studies

Introduction

Many members of the Organization for Economic Co-operation and Development (OECD) are, like Canada, working towards more collaborative approaches to S&T among government, academic and private sector organizations. Several OECD countries have implemented changes to their S&T systems ranging from incremental adjustments to comprehensive structural reforms and changes, whether incremental or more comprehensive. The changes have been generally aimed at modifying the role played by government, fostering strategic planning and developing governance and management structures within which research-performing institutions function more efficiently and competitively.

An OECD report suggested that "changes in the balance between institutional and project-based modes of funding of the public research sector need to be considered in the context of a broader strategy to improve the efficiency, performance and adaptability of public research organizations and the linkages between them. A shift to more competitive, project-based modes of funding linked to performance assessment can help improve the responsiveness of public research to socio-economic needs and improve research quality. To be effective, such a shift often needs to be accompanied by more fundamental structural reforms aiming at redefining the respective roles of universities and other public research institutions."[13]

Foreign policy makers have sought to establish public-private R&D linkages as a means of maximizing benefits from the innovation system, breaking down traditional silos and promoting horizontal S&T. In a number of OECD countries, the strengthening of linkages between the public and private sectors has been effected through changes in management arrangements for public sector S&T.

The patterns of S&T governance and management models in particular countries are influenced by the national context including: the nature of the economy, historical circumstances, the respective roles of national and regional governments, and, the relative S&T strengths of industry, academia and government. In this section, an overview of developments pertaining to inter-sectoral initiatives in S&T in the US, UK, Germany, Finland, New Zealand and Australia is provided to illustrate the diversity of approaches being taken to implementing new governance and management arrangements for government S&T.

13. ECD (2003), *Governance in Public Research – Toward Better Practices*, p. 35.

United States

The U.S. spends over $300 billion annually on R&D, including expenditures to maintain over 720 laboratories.[14] [15] Although most laboratories are government owned and operated, the US has extensive experience with contracting out the management of federally-funded laboratories.

Private sector and academic R&D were mobilized for defence and security purposes during World War II.[16] In the ensuing decades the U.S. the mobilization of non-federal resources to meet new pressures (e.g., on nuclear arms, space, health and energy programs) resulted in the development of 36 Federally Funded Research and Development Centers (FFRDCs).

Through the FFRDCs, the government contracts out the management of a facility to post secondary institutions (e.g., California Institute of Technology, Carnegie Mellon University, Massachusetts Institute of Technology), not-for-profit corporations (e.g., Battelle Memorial Institute, RAND Corporation), or for-profit firms (e.g., Westinghouse Savannah River Co., Lockheed Martin Corp.). Sponsoring federal departments and agencies provide 70 per cent or more of a Center's financial support and remain responsible for monitoring the Center's R&D performance. In 2002, FFRDCs accounted for about $7 billion in federally funded R&D, the majority of which was performed by Centers administered by colleges and universities.

Although some of these facilities have a single organization tasked with their management, others are operated by consortia. For example, the National Optical Astronomy Observatory is operated by the Association of Universities for Research in Astronomy (AURA), a consortium of 33 U.S. educational and non-profit institutions and 7 international affiliates. Similarly, the National Center for Atmospheric Research (NCAR) is managed by the University Corporation for Atmospheric Research (UCAR), a not-for-profit organization comprising 70 member universities, 17 U.S. affiliates and 46 international affiliates.

The FFRDCs are seen as having distinct merits. For example, the Department of Energy's contractor-operated National Laboratories are viewed as providing a strong public interest focus arising from the long term, strategic partnerships with sponsoring departments, assurance of

14. Council on Competitiveness (November 2006), Competitiveness Index: Where America Stands, p. 60.
15. National Academy of Engineering (US), Technology Transfer Systems in the United States and Germany: Lessons and Perspectives (1997), p. 124.
16. Brown, Marilyn. U.S. National Laboratory Perspective on Energy Technology Innovation and Performance Assessment. Presentation to International Conference on Innovation in Energy Technologies, Washington, DC, Sept 29-30, 2002, p.2. http://www.oecd.org/dataoecd/3/35/15935294.pdf

relevance through mandatory reviews to determine the appropriateness of the work program, as well as enhanced flexibility to recruit and manage a highly skilled technical workforce.[17]

The overall role of government-owned, contractor operated (GOCO) National Laboratories in industrial partnering and technology commercialization is reviewed periodically. These reviews provided an opportunity to identify issues that influence performance including maintaining focus, protecting scientific autonomy, establishing efficient procurement practices, managing intellectual property effectively and reconciling cultural differences.

Cooperative Research and Development Agreements (CRADAs) are vehicles for conducting cost-shared research involving government research laboratories and the private sector. Evidence is emerging that such agreements can extend the influence of federal laboratory R&D on industrial research. A 2003 study concluded that industry laboratories with a CRADA produce more patents, spend more on company-financed R&D, and devote more resources to their federal counterparts, than those without such an agreement.[18]

Both FFRDCs and CRADAs are expected to remain key features of the US laboratory system, and ongoing contributors to public-private sector collaboration.

United Kingdom

British Public Sector Research Establishments (PSREs) represent a broad range of intramural research organisations funded by the UK government. PSREs fall into two categories: 1) those that are part of, or directly funded by, Government departments and hence conduct research as a subsidiary activity to support the sponsoring departments' core objectives; and 2) those that are sponsored by the Research Councils. The Research Council Institutes (RCIs) have a different role; they are predominantly curiosity/science driven institutes and invest in knowledge creation for the public good rather than for specific departmental needs.

In the 1980's and early 1990's, the UK experienced a wave of public sector reform focusing on cost-cutting, efficiency and effectiveness, the devolution of executive functions to various agencies and a commercial orientation to both policy making and management. The UK policy for the advancement of science began to put emphasis on the economic benefits of S&T, including a systematic approach to the commercialization of research conducted in public

17. Testimony of John P. McTague, Energy Subcommittee of the Committee on Science, U.S. House of Representatives Hearing on Competition for DOE Laboratory Contracts: What is the Impact on Science? July 10, 2003.
18. Adams, James, Chiang, Eric and Jensen, Jeffrey. The Influence of Federal Laboratory R&D on Industrial Research, in The Review of Economics and Statistics, Nov 2003. 85(4).

research establishments. The focus was on developing a closer partnership between the government and its scientific and engineering communities, and industry. Many of the UK's largest national government laboratories were privatised on a case by case basis. There are now three main categories of privatization in the UK context:

1. **Trade sales or full privatization:** ownership of the research laboratory or establishment is transferred to a private company (e.g., the National Engineering Laboratory; and the Laboratory of the Government Chemist.)

2. **Transfers of establishments to companies limited by guarantee:** laboratories are transferred to private organisations but with certain constraints on functioning to safeguard a research activity of public interest (e.g., the Transport Research Laboratory).

3. **Government – owned / company - operated (GOCO):** government retains ownership of the facility but enters into a contract for a fixed period of time with a private sector company for the full or partial operation of the facility (e.g., the National Physical Laboratory).

Most of the departmental laboratories that were not privatized or devolved under contract were turned into Executive Agencies (e.g., the Defence Evaluation and Research Agency) in an attempt to enhance efficiency by exposing the government science to quasi-commercial governance and management mechanisms. Executive Agencies are responsible for performance of the executive functions of that department. They are independently accountable within their departments, but have more autonomy and can pursue efficiency gains by means commonly employed in the private sector.

Overall, the foregoing changes had more profound effects than a simple change of ownership or governance would imply. The creation of executive agencies provided more autonomy for the management of the labs and a simultaneous increase in accountability and control mechanisms. Privatization produced changes in both attitude and behaviour in respect of partnering, development of a clear mission, customer orientation, cost control and efficiency.

Since privatisation, many of the laboratories have expanded and acquired an international reputation. The LGC, (formerly the Laboratory of the Government Chemist), has expanded from 250 scientists at the time of privatisation to more than 1000 in 2006 as a result of acquisitions. The Transport Research Laboratory (TRL) is now an independent world recognized organization providing research, consulting advice and testing for all aspects of transport.

Existing PSREs, including RCIs, are facing pressures as a result of a combination of factors, including ageing scientific staff, complex lines of strategic responsibility, inadequate investment

and low cost recovery.[19] The UK government plans to reinvigorate the PSREs through additional capital funding, a strategic approach to capacity planning and re-location and integration of RCIs with the university sector.

Germany

In Germany there are four large research institutes (the Max Planck Gesellschaft, the Helmholtz-Gemeinschaft Deutscher Forschungszentren, the Wissenschaftsgemeinschaft Wilhelm-Gottfried-Leibniz, and the Fraunhofer Gesellschaft) that are jointly funded by federal and state governments, as well as some private sector funding. While these institutes work closely with the government and receive a significant portion of their funding from government sources, they are formally separate from the government. There are also mission focused federal (and state) research institutes called "Bundesanstalten". These research organizations are closely affiliated with a specific ministry and not only carry out research but also perform regulatory functions. A management organization called Projekttraeger is licensed by government departments to manage sector-based research.

Recently, there has been an effort to bridge the separation between fundamental research and applied research which has long characterized the German system. The effort is aimed at achieving greater efficiency and cost effectiveness, flexibility and greater institutional competition in the management of public sector science, enhanced internal networking, commercialization, flexible funding mechanisms and S&T cluster formation involving government, academia and the private sector.[20]

Clusters are defined by the OECD as 'networks of interdependent firms, knowledge-producing institutions, bridging institutions and customers, linked in a production chain which creates added value'.[21] In Germany, the development of clusters in certain fields (e.g., in medicine and biotechnology in Munich) between universities, public research institutes and business, with the support of private foundations such as Stifterverband, has contributed to new forms of cooperation amongst the country's four main research organizations.

19. See UK Office of Science Technology (2006), *PSREs and the Science Base: a Policy for Sustainable Trading and Joint Strategic Investment in PSRE Infrastructure.* http://www.dti.gov.uk/files/file14578.pdf.
20. *OECD, Steering and Funding of Research Institutions, Country Report: Germany* (Paris: 2003) pp. 7. See also National Academy of Engineering (US, 1997), *Technology Transfer Systems in the United States and Germany: Lessons and Perspectives*, p. 321.
21. Ibid, p.12.

Germany has no stated intent to alter long-standing structures in its research system, except to enhance their internal networking, efficiency and performance. To achieve these goals, Germany is creating bridges between institutions of basic and applied science; developing indirect mechanisms to encourage competitive-based allocation of funding and performance criteria for research activities within its four main public research network. Contrary to other OECD countries, Germany has decreased the proportion of funding allocated to projects and increased base funding of institutions in order to achieve "greater responsiveness, flexibility, improved competitiveness, and greater integration across institutional boundaries."[22]

Finland

As part of the Finland's on-going commitment to enhancing network-based cooperation, they have developed two types of collaborative initiatives of interest: the Strategic Centres of Excellence (SCE) and the Centres of Expertise Programme (CEP).

SCEs are designed to foster long-term R&D cooperation between leading companies, universities and government laboratories in targeted areas: energy and the environment; metal products and mechanical engineering; forestry; health and well-being; the information and communications industry and services. They are established as non-profit limited companies funded by the shareholders, including both private and public organizations. The first Strategic Centre of Excellence was created in spring 2006 when Forest Cluster Ltd. (KCL) was established with shareholders from the forestry sector and others (e.g., chemical companies), amongst others. The government funds projects and programs included in the research agendas of these non-profit companies on a competitive basis.

The second example of Finnish S&T collaboration is the Centres of Expertise Programme which is designed to pool local, regional and national resources. These resources focus on fields requiring high levels of expertise, bringing together regional strengths and specialisation from the research sector, educational institutions, and businesses and industry. The present program is based on 13 thematic clusters which are selected on competitive basis and each of which must include CEPs from at least two regions. The Programme has been effective in supporting specialisation and cooperation between regions and increasing regional competitiveness.

22. National Academy of Engineering (US, 1997), *Technology Transfer Systems in the United States and Germany: Lessons and Perspectives*, p. 321.

A systematic promotion of cooperation between companies and between different organizations as well as regular evaluation and feedback has been the cornerstone of development in Finland's science system.[23] According to the Finnish Science and Technology Policy Council 2006 report on Science, Technology, Innovation, there appears to be no further significant reform planned for Finland's S&T structure. The government intends to maintain and reinforce its strong tradition of network-based cooperation through the creation of academic and private sector clusters and centres of excellence.

New Zealand

New Zealand's nine Crown Research Institutes (CRIs) and eight universities form a significant part of New Zealand science and innovation system. The CRIs, launched in 1992, are government owned but are required to operate on a commercial basis.

Each CRI was established around a productive sector of the economy, a grouping of natural resources or a particular public-good task, enabling each to have a clearly defined purpose and customer base. The CRIs undertake both basic and applied research for industry and government as end-users, with most efforts focused on the application of research results over the medium to long-term.[24]

Public funding of CRIs is primarily provided for under the Public Good Science Fund on a contestable basis. The CRIs compete against universities, private firms and research associations for funding. It is generally recognized that this competitive approach to funding is fostering research excellence. CRIs also receive funding from a non-contestable public source of funds, to build and maintain the research capability required for the provision of public good science. Notwithstanding the revenue generation of the CRIs, government funding ensures that much of the research undertaken by CRIs is strongly aligned with the government's economic, environmental and social S&T priorities.

23. National Academy of Science (USA, 1998): *National Science and Technology Strategies in a Global Context: Report of an International Symposium*, p.28

24. New Zealand Ministry of Research, Science and Technology, *New Zealand Research Agenda – A Government Strategy for New Zealand Research, Science and Technology* , Oct .07, p.34.

It is generally believed that CRIs have had a positive impact on New Zealand's economy. However, as part of its current S&T review (2007)[25], the New Zealand Ministry of Research, Science and Technology observed that:

i) the current system of purchasing research can create excessive competition within New Zealand's small scientific community, thereby limiting opportunities to build collaborative research effort in nationally important areas;

ii) there is a need for greater clarity about the role of CRIs and their management policies and procedures pertaining to, for example, ownership of assets, purchasing rules, intellectual property and audit.

iii) effective mechanisms are needed marshal resources so that universities, CRIs and the private sector work together to meet the strategic research requirements of government and industry;

iv) the need for quality 'public good' research in areas such as health, social services and the environment is more adequately met; and,

v) the devolution of government S&T to private laboratories has increased the gulf between the users of science in government and the performers of science.

Australia

Publicly funded research is conducted through various institutions and organizational structures, most of which are collaborative endeavours. Australia's Cooperative Research Centres and National Flagships program offer two examples of highly successful collaborative efforts.

The Cooperative Research Centres (CRCs) were established in 1990 to link top university, government and industry researchers into a network allowing for "integrated collaborative research teams."[26] CRCs seek to create linkages that facilitate the turning of Australia's scientific innovations into commercial successes. CRCs are established by a competitive process and must have at least one Australian university and one private sector organization as participants; undertake some research in the natural sciences or engineering; and involve undertaking commercialization/utilization activities, and education and training activities. Once a CRC is formed, it is incorporated and enters into a formal agreement with the Australian

25. *Ibid*, p.35
26. Council of Science and Technology Advisors (April 1999), *An International Perspective.* http://www.csta-cest.ca/index.php?ID=312&Lang=En

government for up to seven years. The government agrees to provide a certain level of funding and the CRC agrees to undertake specific research activities as well as identify in-kind contributions they will make.

A 2006 economic assessment of the CRC program concluded that the CRC program is delivering net economic benefits to Australia.[27] The same study also concluded that CRCs focused on developing new industries have more difficulty delivering economic benefit than those that produce incremental improvement within existing sectors.

The National Research Flagships program is Australia's newest research initiative. National Research Flagships link Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) with organizations across country to conduct research in specific areas of national interest. Individual Research Flagships are not physical structures or laboratories, but rather a collaborative goal-oriented research effort managed by a small staff and performed by the partner organizations. Collaboration within multi-disciplinary teams is a key feature of the Flagship initiatives.

A recent review of the Flagships program recommended the continuation of the program and concluded that it was a powerful mechanism for optimizing the application of science for the benefit of Australia.[28] The review also urged the articulation of clearly defined goals, the formulation of IP policies that maximize national impact, and the adoption of communication strategies focused on end-users and the community at large.

27. Insight Economics (2006), Economic Impact Study of the CRC Program. https://www.crc.gov.au/HTMLDocuments/Documents/PDF/CRC_Economic_Impact_Study_Final_121006.pdf
28. Australian Government (Accessed Dec. 2007). Review of the National Research Flagships- an initiative of CSIRO. http://www.csiro.au/resources/pflq.html

Appendix III – Typologies of Alternative Management Arrangements

Organizations involved in governing or managing the alternative arrangement:

- Private sector
- Academia
- Federal departments or agencies
- Departments/agencies of other levels of government

Nature of the transformations involved in the alternative arrangement:

- Change in ownership of assets (physical plant, equipment, IP)
- Change in management of assets (physical plant, equipment, personnel, programs)
- Change in orientation (to for-profit enterprise)
- Change in employer-employee status of personnel
- Governance relationship:
- Partnership (bilateral, multilateral)
- Consortium
- Corporation
- Contractual (Lease arrangement; facilities access and use)
- Contractual (government owned-contractor operated)
- Joint management agreement

The time horizon:

- Indeterminate
- Fixed term
- Renewable terms

The role of the federal government in relation to alternative arrangements:

- Active role on management board
- Active role on management board and participant at science level
- No ongoing role (i.e., complete transfer)

Financing:

- Ongoing base funding by sponsors
- Endowment
- Revenues from service contracts
- Proceeds from IP
- Research grants
- In-kind contributions

Location:

- Single site
- Multiple sites
- Existing Facilities
- New or refurbished facilities

Appendix IV – Proposal Submission Template

Summary of Proposal:

- Briefly describe the proposal and which organizations/labs it includes.

Proposal Proponent:

- Provide the name and contact information for the key proponent(s) of this proposal.

Key Partners:

- Who are the key partners who need to be involved?

Proposal Description:

- Describe what is being proposed? How is it different from the existing arrangements?
- What are the essential components?
- Describe the role of the partners? What contribution would each make?
- What is the overall rationale for the proposal? In what ways will it improve upon the status quo?
- Describe the operational model/governance structure that is being contemplated?

Status of Discussions with Partners:

- How far advanced is the proposal?
- How extensive have discussions been with those affected, and what are the major issues?

Next Steps / Timelines:

- What are the milestones and timelines for the proposal?

Anticipated Benefits and Impacts:

- Describe the expected benefits?
- How does each partner benefit?

Contribution to the Four Objectives:

1. Value / Efficiency:
   - Describe how this proposal will increase the impact of investments in S&T?
2. Quality / Results:
   - Describe how this proposal will foster excellence and productivity in research and deliver better results for Canadians?
3. Learning / Knowledge Transfer:
   - Describe how this proposal will create better science learning opportunities and facilitate knowledge sharing with other partners in the innovation system.
4. Competitive Advantage:
   - Describe how this proposal will enhance the social and economic benefits of Canada's investment in S&T?

Challenges and Risks

- What are the main challenges to be met in implementing the proposed new arrangement?
- Are there any significant risks associated with the proposed new arrangement? If so, how might they be avoided or mitigated?

Appendix V – Summary of Input on Inter-Sectoral S&T Integration

Input to the Panel on the issue of transfer of non-regulatory federal laboratories to alternative management arrangements for non-regulatory federal laboratories was obtained in three ways: by informal consultations undertaken by Panellists with a variety of knowledgeable individuals; through a series of invitational roundtable discussions was held in six regions to elicit the views of participants about the structure and content of a framework to evaluate opportunities for transfer of non-regulatory laboratories to new management arrangements and through responses to solicitation of input from a wide variety of stakeholders in government, academia and the private sector.

Part 1 of this appendix summarizes input from the roundtable discussions on the matter of a framework for ISTI. Part 2 summarizes the input received from all three sources (informal consultations, roundtables, and stakeholder solicitation) on the various strategic and tactical issues related to laboratory transfers.

1. On a Framework for ISTI

Roundtable participants were provided a background document describing the Panel's mandate, its working definitions of key terms, an overview of federal S&T, a general typology of transfer arrangements in Canada and abroad, and a preliminary draft of an evaluation framework.

Goals, Objectives and Definitions of Key Terms

Participants were supportive of the goals and objectives of the laboratory transfer initiative and observed that an ISTI strategy should be seen as one element in an overall national S&T strategy. Participants viewed this element as one linked to the full spectrum of activities supporting innovation and its major role in Canadian economic competitiveness.

There was considerable agreement among the three sectors (government, academia and the private sector) on the potential benefits of inter-sectoral S&T integration. The key benefits identified included:

- greater synergy, harmonization and collaboration between sectors;
- increased capacity to tackle major R&D projects by achieving critical mass;
- improved knowledge transfer between sectors;
- revitalization and sustainability of existing laboratories;
- potential to accelerate innovation;
- increased alignment with national priorities; and,

- better base for contributing to harmonizing the national science and economic agendas.

Participants noted that significant opportunities exist for better integration of S&T amongst government, academia and private sectors at the institutional as well as operational levels, and that the number of discreet opportunities for inter-sectoral integration of S&T could far exceed the 5 "early" candidates to be identified by the Panel. Those involved emphasized that implementation of early transfers should include performance measurement to identify and apply lessons learned to the evaluation of later transfer initiatives.

Participants supported the Panel's continuing analysis of existing models of S&T integration in Canada and abroad. Indeed, many participants expressed an interest in this process becoming an ongoing dialogue looking at S&T integration among the government, academic and private sectors to ensure other models, and other opportunities, are presented and discussed in the future.

The roundtable discussions reinforced the Panel's emphasis on careful definitions of terms. It was noted that the use of the term "transfer" in public announcements, without clarification, had created considerable concern about the government's motivation and intentions, in particular when interpreted as the federal government divesting itself of laboratory assets. The working definition of "transfer" developed by the Panel was regarded as clear and useful when seen in the context of the goals and objectives of the lab transfer initiative.

It was further suggested that "development" in the phrase "research and development" should be replaced by "experimental development" and that the term "conveyance" in the definition of transfer should be replaced by a word that does not have the same specific meaning in law as conveyance. It was also suggested that the words "interest in" in the phrase "articulation of the government's interest in" be explained as including the government's ongoing commitment to particular S&T activities.

Criteria for Identifying and Assessing Opportunities

Roundtable participants were asked to comment on the criteria for evaluating opportunities for transfer as proposed by the Panel in the background discussion document. Their comments validated the Panel's draft criteria and included valuable suggestions about the detailed considerations needed to develop a fuller description of the criteria. They also suggested that the mode of application or relevance of the criteria might vary from case to case depending on the nature and scale of a proposed transfer. For example, the "timeliness criterion" might apply differently in selecting candidates for early transfer than it would in evaluating large scale or complex transfers designed to meet long term, strategic objectives.

There was considerable emphasis on including, in the evaluation criteria, elements pertaining to:

- complementarity, synergy and net value gain;
- rigorous accountability and quality assurance mechanisms;
- articulation of a compelling business case and operating plan;
- evidence of significant growth potential;
- readiness and capacity of the partners; and,
- potential to contribute to national and regional priorities.

These suggestions were taken into account by the Panel in revising the draft criteria.

Models of Arrangements for Managing Inter-Sectoral S&T Integration

Roundtable participants considered various examples of management arrangements involving inter-sectoral S&T transfer and integration from Canada and abroad as described in the background discussion document. They highlighted a number of existing models that offered experiences (both positive and negative) that could be applied in the laboratory transfer initiative and in developing new management arrangements for inter-sectoral S&T integration. They also identified, from their own experience and knowledge, other examples of such management arrangements.

They discussed the most salient features of the various operating and management models and agreed on two key points:

- a fundamental feature of models of integration that are most likely to meet the objectives of the transfer strategy would be the development and implementation of a research program that is shared among, and meets the needs and expectations, of all partners, and
- the arrangements for governing and managing the joint research program would need to be tailored to fit particular circumstances, i.e. there is no “one-size-fits-all” model.

They also noted the importance of stable and sustainable resources; HR policies that addressed different cultures, practices, incentives and expertise development; and the need to adapt new arrangements as they mature, lessons are learned, and the environment changes.

The Panel’s background discussion document contained a table categorizing the characteristics of various management models. Participants made a variety of useful suggestions for clarifying and enhancing the table, and these have been taken into account by the Panel in revising the table.

Critical Success Factors

Participants discussed critical success factors from two perspectives: those that are particularly relevant to introducing or launching a transfer arrangement, and those that are particularly relevant to the ongoing operation and outcome of the integrated research program. Clearly, there are several factors that are germane to both perspectives. The factors identified by participants include:

- factors inherent in the Panel's criteria for opportunity leadership, e.g., sound governance and management processes and strong managerial and scientific leadership;
- building strong, transparent and trusting relationships between partners in any new arrangement;
- developing and maintaining a strong shared vision statement of purpose and desired outcomes among all parties involved;
- governance of new arrangements that includes effective dispute resolution mechanisms;
- scientific capacities and skills that are truly complementary and not merely duplicative;
- concerted ongoing efforts to build understanding and accommodation of the differing mandates and needs of partners from different sectors; as well as their distinctive cultures and practices;
- provision, by the sponsors of new arrangements, of sufficient funding (or services) to cover both the transaction costs of establishing partnerships and the costs of sustaining the joint research program. In cases where the new arrangements involve multi-site research networks, sufficient funding to cover inter-action costs may be critical;
- perseverance and patience over a development period that is long enough to allow partnerships to mature and allow benefits to be realized;
- building in flexibility to facilitate mid-course corrections to respond to changing circumstances;
- ensuring well-developed communication and outreach initiatives to explain the rationale and benefits to obtain "buy-in";
- equitable sharing of benefits and rewards; and,
- a research program management framework that reconciles differences in operating time frames among the sectoral partners.

2. On the Inter-Sectoral S&T Integration Strategy

Comments on the inter-sectoral S&T integration strategy were received from a wide range of stakeholders in the course of the roundtable discussions and during bilateral discussions between individual Panel members and individuals in government, academia, and in the private sector. Stakeholder submissions were also received from individuals associations and organizations.

In addition, the Panel members conferred with representatives of groups (e.g., the AUCC, the Professional Institute of Public Service of Canada, the federal granting councils and the CFI, university vice-presidents with portfolio responsibilities for research and/or industrial liaison and provincial officials).

On The Value of an ISTI Strategy

Virtually all commentators were in favour of enhanced inter-sectoral S&T collaboration.

Many commentators concurred in the view that: greater S&T integration is needed to fully realize the benefits of synergy and complementarity; current collaborative mechanisms are insufficient and new management arrangements are needed. For example it was noted that while co-location of S&T activities may be essential in particular cases, co-location alone is insufficient to ensure effective integration.

A few contended that current mechanisms for fostering collaboration were qualitatively sufficient and that the government's focus should be on increasing the extent of collaboration by greater investment in federal laboratories and removal of unnecessary barriers to collaboration both within government and with academia. Several cautioned against a false dichotomy between strengthening government laboratories and fostering integration since both are needed.

On Roles and Expectations

Several commentators emphasized the importance of recognizing critical differences in the roles and expectations of science in government, in academia and in the private sector. These differences are sometimes referred to as "cultural" but Panel members agreed most can be categorized as differences in accountability; academic freedom; motivation; degree and nature of mission orientation in determining the subjects of research; time horizon for completion of projects; responsiveness to public policy requirements; and the collateral roles of scientists (e.g., of academic scientists in education and training; of government scientists as confidential advisors to government and representatives of the federal government in international fora).

Recognition of the distinctive and important roles served by S&T in government, academia and the private sector was not seen as precluding greater S&T integration in particular circumstances,

but rather as a basis for not pursuing integration to the extent that it weakens the ability of any sector to fulfill its distinctive role. Thus, while industry commentators noted that it may not be helpful to transfer non-regulatory laboratories that currently pursue joint experimental development with industry, or that currently provide pilot scale or incubator facilities to small and medium-sized business, they did see clear opportunities for industry collectives to partner with government and academic institutions in pre-competitive applied research. Others noted that individual companies might wish to enter into contracts with an entity under joint sponsorship of the federal government and academia to undertake specific projects.

Caution was also urged in the interpretation of the term “non-regulatory”. Some involved in government laboratories regard the R&D they conduct as subserving regulatory purposes and that to characterize such R&D as “non-regulatory” is inappropriate. By the same token, it was noted that results of R&D of relevance to regulatory functions often originate in non-governmental laboratories.

There were several references to the need to look at the inter-sectoral integration strategy in the context of a national S&T strategy as a whole. In this regard, reference was made to the notion that government should focus on those aspects of S&T that government is “best able” to perform. The implicit premise that government is best able to perform “regulatory” science while others (academia, private sector) are best able to perform non-regulatory science was deemed to be highly questionable. It was noted repeatedly that there are several areas of vital public interest where research of a non-regulatory nature is required that non-government sectors are unable, unwilling or unlikely to carry out. These views were expressed primarily in relation to government divesting itself of involvement in non-regulatory R&D. It was acknowledged that, in selected areas, the government’s need for research that it is best able, willing, and likely to perform can be met through its participation in joint sponsorship, governance and management of an inter-sectoral research program.

There were several commentaries received from individuals and organizations in the private sector conveying the important and often critical roles government laboratories play in the support of business and industry – roles that they cannot fulfill on their own on economic grounds and that universities are unable to fill for economic, structural and functional reasons. They called for government to sustain and strengthen the capacities of federal laboratories, including their ability to provide access by the private sector to special facilities and data resources. It was also indicated that participation of federal laboratories in a joint venture with universities was seen as important incentive for industry to participate in, or contribute to, trilateral alternative arrangements. The NRC, in particular, was seen as offering major strength by virtue of its ability to marshal research and expertise that is oriented toward the needs of industry, both regionally and nationally.

Shared Interests and Desired Outcomes and Benefits

The roundtables provided a venue for the identification of shared interests and desired outcomes of an ISTI strategy. An integration strategy was seen as contributing, under appropriate circumstances, to:

- greater synergy and complementarity among sectors, resulting in more and better research and training, and increased knowledge transfer and commercialization opportunities;
- more sustainable scientific enterprises, new opportunities for existing laboratories, and a heightened level of entrepreneurship;
- building capacity (achieving critical mass) to enhance the scope of S&T and to create an environment that is conducive to recruiting new scientists and to providing greater opportunities for career advancement;
- an enhanced international role for Canadian science and technology; and,
- an enhanced ability to participate in innovation clusters.

Achieving the desired outcomes and benefits of integration were seen as depending on attention to the critical success factors described in section 1 above and most notably on a common vision, equality of interest, sustainability, leadership, sound governance and management processes, adaptability to changing circumstances and adequate resources.

General Effects of Launching Inter-Sectoral S&T Initiatives

Commentators from academia and research funding agencies noted that the laboratory transfer initiative may have significant potential impacts on the current agencies supporting extramural S&T and on academic administration. For example, if federal scientists relocated to universities became eligible to apply for operating, equipment and infrastructure grants from the granting councils and CFI, the resources of these agencies would have to be increased to prevent erosion of funding opportunities for existing academic scientists. Pressure on existing resources would also be increased on programs supporting graduate students, post-doctoral fellows and career development awards for scientists; and, on existing programs supporting inter-sectoral collaboration.

Some existing and proposed models of ISTI involve a finite duration (e.g., a 5-year term). While one may anticipate renewals or evolution into more permanent arrangements, the federal government and its co-sponsors should have contingency plans in place for dealing with initiatives that come to the end of their term or are discontinued for other reasons.

The enhanced collaboration resulting from new management arrangements can contribute significantly to achieving the goals and priorities of a national science and innovation strategy.

Appendix VI – A Note on Implementing New Management Arrangements

Implementation of new management arrangements to support inter-sectoral S&T integration involves the formation of new working relationships related to:

- a common purpose, objective, and scope;
- governance mechanisms, roles and responsibilities and accountability;
- management of human and financial resources;
- management of intellectual and real property;
- planning and reporting;
- norms, values, and ethics.

Forming successful new multi-sector working relationships involves recognition of the conditions under which each partner in the relationship must operate, and designing management and accountability arrangements that take these conditions into account.

The Government of Canada, because of its many statutory obligations, regulatory roles and public responsibilities, has a complex array of controls guiding its operations. Some of these apply to departments and agencies generally. Others are matters of departmental or agency policy and regulation. Indeed, even at the most fundamental level, the ability of Departments to engage in partnerships varies. While some federal departments have the legislative framework to rapidly implement such arrangements, others do not.

From an operational standpoint, departments vary with respect to the functional expertise and the practical capacity to support partnerships both within government and with external organizations. The following observations concern certain structural or formal constraints on partnering with external organizations.

Authority and Accountability

Departments and agencies are bound to operate their programs and activities within the scope of both their enabling legislation and mandate. Those involved in a collaborative arrangement will need to ensure that they have the proper legislative spending authorities to implement and maintain the arrangement effectively. Moreover, there will be a need for participating departments and agencies to commit to the collaborative arrangement over the long term. The annual budgetary cycle may pose a challenge to collaborative arrangements in that the authority for spending allocations for programs and activities, including transfer payments, are subject to

annual appropriations. A lack of on-going commitment may undermine the collaborative arrangement. There will be a need to address this at the outset of the new working relationship.

Moreover, there will be a need to define clear accountabilities for the new arrangements being contemplated. In many cases, collaborative arrangements may not always mesh with the established machinery of government and associated system of accountabilities, and the federal laboratory may be involved in a broader range of activities than is now the case. Newly defined accountabilities will need to be associated with the appropriate legislative and expenditure authorities.

Procurement Contracts

Government procurement rules have been identified as an issue that may come into play in certain forms of ISTI. To the extent that, during the course of a long term research program, partners in an ISTI initiative enter into contracts in which they obtain services from each other, the federal Government's Contracting Policy may apply. The Policy requires all professional service contracts must be competitively offered to the marketplace, with some exceptions (value under $25,000, security issues etc.). If this requirement were interpreted to mean that discrete phases of work being carried out by the parties in the ISTI initiative would have to be competitively offered to those outside the initiative, a significant disincentive would be created for Canadian companies to become involved in the collaboration. Other countries have policies and interpretations that better support these types of collaborations.

Although procurement policies and regulations (e.g., the *Financial Administration Act* or the Government Contracts Regulation) may act as a constraint in certain types of ISTI where outsourcing of technical or management services is involved, it is not necessary to follow a procurement approach when forming a partnership involving integration of R&D activities.

Grants and Contributions

Grants and Contributions are subject to the rules and regulations outlined in TBS’s Transfer Payment Policy (TPP). The TPP states that:

- A department should not benefit directly from the award of a transfer agreement;
- A core service that departmental staff are mandated to provide directly should not be funded through a transfer payment; and,
- An individual or an organization that receives a transfer payment does not act on the government's behalf.

Grants and Contributions are currently a source of funds to the non-federal parties who are considering joining in an alternative management arrangement. Government researchers, however, cannot compete for or receive funding from granting bodies such as NSERC, SSHRC, and Genome Canada. However, government scientists who hold adjunct professorships in universities may apply through university mechanisms for grants. A systematic approach to addressing this issue is both timely and necessary in view of the focus on inter-sectoral S&T integration.

Intellectual Property (IP)

Some cite IP issues as a constraint on partnering with the federal government because of a belief that the government requires exclusive rights over IP developed within federal laboratories. In fact, current legislation does not prevent the federal government from transferring or assigning IP rights to external entities. Ownership of intellectual property (IP) developed before, during and after the establishment of a partnership is an issue that requires negotiation by the parties and should be addressed in the terms of the partnership agreement, whether the federal government is involved in the partnership or not.

Appendix VII – List of Acronyms

AAFC	Agriculture and Agri-Food Canada
AECL	Atomic Energy of Canada Limited
AUCC	Association of Universities and Colleges of Canada
CBSA	Canada Border Services Agency
CFIA	Canadian Food Inspection Agency
CGC	Canadian Grain Commission
CSA	Canadian Space Agency
DFO	Fisheries and Oceans Canada
DND	National Defence Canada
EC	Environment Canada
GSC	Geological Survey of Canada
HC	Health Canada
IC	Industry Canada
INAC	Indian and Northern Affairs Canada
ISTI	Inter-sectoral S&T Integration
NCR	National Capital Region
NRC	National Research Council
NRCan	Natural Resources Canada
PCA	Parks Canada
PCH	Canadian Heritage
PHAC	Public Health Agency of Canada
R&D	Research and Development
RCMP	Royal Canadian Mounted Police
S&T	Science and Technology
STC	Statistics Canada
TC	Transport Canada
TBS	Treasury Board Secretariat
TPP	Transfer Payment Policy