INTELLECTUAL PROPERTY MANAGEMENT

POLICIES AND PRACTICES USED BY CANADA'S SCIENCE-BASED DEPARTMENTS AND AGENCIES:

DO THEY SUPPORT OR HINDER TECHNOLOGY TRANSFER AND S&T COLLABORATION?

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1. INTRODUCTION

> **Intellectual Property (IP)** is created when something new or useful, and transferable has been conceived or developed, or when unusual, unexpected or non-obvious results obtained with an existing invention can be practiced for some useful purpose.

In the context of this paper, technology transfer is defined to be the managed process of transferring knowledge, expertise or hardware from an originator to an adopter in an organization that can maximize its value to the ultimate end-user.

S&T collaboration is simply a very effective technology transfer mechanism by which technology, expertise or know-how is transferred, in both directions, between partners working on an R&D project of common interest.

Technology transfer, that can take the form of licenses, learned publications or reports, personnel exchanges, IP assignments, information sharing during collaborative R&D, formal or informal communications between scientists, etc., from government laboratories to industry is seen as an important element in a country's technological innovation infrastructure. This does not mean, however, that all the scientific or technical work conducted in a government laboratory is or should be destined to result in new commercializable products or services. The government laboratories have an equal, if not more important role to conduct research that results in "public good" outputs which must also be transferred out of the lab for the benefit of Canadians, as a whole.

1.1 "Public Good" Technology Transfer

The measurable "public good" outputs that have been suggested by Canadian government scientists who were attending a technology transfer workshop in 2002 sponsored by Stargate Consultants Limited (SCL, Module One, 2002) include:

effective regulations that demonstrably improve the quality of air, water and food supplies (e.g., improved standard of living);

degree of impact on, or acceptance of the transferred knowledge by the public;

meeting the public's expectations for timely scientific advice and information;

cost savings to other government departments on service delivery;

cost savings to industry through avoidance of scientific deadends, or provision of less costly laboratory tests;

development of "greener" technologies;

creating a new awareness among the public on environmental/health factors (e.g., UV ratings, warnings about food-borne illnesses, etc.).

Given the greater difficulty of measuring the impact of these "public good" technology transfers, there is a temptation, when discussing technology transfer issues, to consider only technology transfers that involve measurable commercial outputs such as licenses and royalty payments. This, however, is a mistake. Many authors (Carr, 1992; Roessner, 1993; Bozeman and Papadakis, 1995) argue that measuring the impact of government laboratories on industry only in terms of licenses and royalties is too limited and will substantially underestimate the full value of government laboratories to industry.

1.2 Role of Government Laboratories

Government laboratories are being asked to be more diligent in transferring their intellectual property, both for "public good" and "commercial" purposes to organizations (industrial and academic) in their countries. In meeting this objective, government laboratories should not abandon their basic research agendas. Bozeman and Coker (1992) warn, “the whole idea of increasing the commercial consciousness of the government laboratories must be treated with some caution, as there is potential that the new enterprising, entrepreneurial laboratories may lose their edge in basic research, or pre-commercial applied research”. Thus technology transfer activities are not a substitute for strategic basic research but to complement that research to ensure the maximum utilization of results both in the private and public sectors. Baker (1999) in his review of U.K. public sector research establishments (PSRE) states that the first priority of each PSRE is the advancement of knowledge in pursuit of government objectives, with commercialization of research outputs a secondary priority. In Australia, the Queensland Government's "Public Sector IP Principles" states "commercialisation of IP should be no more that an ancillary part of an agency's operational activities and should not become part of an agency's core business (2003).

Canada , by most measures of R&D expenditures, under invests in technological innovation relative to its major competitors. Thus it is very important that technology, knowledge or know-how generated in government laboratories that supports Canada's technological infrastructure be transferred efficiently to either the Canadian private sector, or academia with the objective of gaining the maximum benefit possible for Canada . (This point was also made in the 2004 Discussion Paper produced by Interdepartmental Working Group on Commercialization, p.17.)

2. SCOPE

This review examines existing literature on Canadian federal intellectual property policies and practices to determine whether they support and do not hinder technology transfer and S&T collaboration among federal science-based departments and agencies (SBDAs) and Canadian industry and/or academia.

In addition, the authors analyze and compare Canadian policies and practices with studies of similar policies/practices conducted in selected countries.

The authors did not find any literature that specifically addressed the issue of how the variations in interpretation of government IP Acts or policies by Canadian SBDAs affected their technology transfer or S&T collaborative performance. The audits and evaluations of IP management in Agriculture and Agri-Food Canada (1999 & 2005) and Environment Canada (2006), and the audit of collaborative arrangements in Natural Resources Canada (2006), all found serious shortcomings in their processes and procedures, but did not assess whether what these SBDAs were doing, or not doing, was resulting in enhanced technology transfer or S&T collaboration. They focussed on whether processes were being followed, not on output or performance.

3. REVIEW OF EXISTING LITERATURE ON THE IMPACT OF IP MANAGEMENT POLICIES AND PRACTICES ON TECHNOLOGY TRANSFER PERFORMANCE

> Unless technology transfer objectives are explicitly stated, performance measures put in place and adequate rewards provided, a supporting organizational culture will not develop and technology transfer activities will not be optimized - N.R.C. Report, May, 1995

Unfortunately, there is a dearth of articles dealing with, and quantifying, the direct impact of a particular IP policy or practice on the success of technology transfer or S&T collaborative activities. It is also very difficult to track down articles that describe the various policies and practices used in many countries, with the exception of the U.S. This exception results from the Americans using legislation to govern IP in their government laboratories that is readily available

to the public. In addition, under U.S. rules, each government agency must publish their particular approach to IP management in some detail.

Many authors however have noted that there was an increase in technology transfer activities from U.S. government laboratories following the passage of the *Federal Technology Transfer Act of 1986 [Public Law 99-502]*. Among other things, this Act made technology transfer an intrinsic part of the duties of every federal scientist and engineer, and established a compulsory royalty sharing award system not only for inventors, but also for innovators. Canada has no such mandatory provision in its policies. Jaffe and Lerner (2001) note that "the (U.S.) policy changes of the 1980s appear to have had a substantial (positive) impact on the patenting activities by the national laboratories". They also noted that the ability to offer exclusive licenses accelerated the rate of commercialization.

Over the years, the U.S. Government has updated its public laws as a result of shortcomings in preceding legislation. For example, the *National Technology Transfer and Advancement Act of 1995 [Public Law 104-113]* enabled the government agencies to guarantee the granting of exclusive, field-of-use licenses to Cooperative Research and Development Agreement (CRADA) partners. It is presumed this change was made because the inability to grant exclusive licenses was interfering with the establishment of CRADAs. Again, Canada has no similar mandatory policy.

3.1 Intellectual Property and Technology Transfer Best Practices

In recent years, the internet has exploded with information on "best practices" on intellectual property management and technology transfer. A few examples are the "IP Handbook of Best Practices" at http://www.iphandbook.org/handbook , the model IP contracts available from the Association of University Technology Managers (AUTM) in its "Technology Transfer Practice Manual", http://www.autm.net/about/dsp.publications.cfm , the five Lambert Collaborative Research Agreements at http://www.innovation.gov.uk/ lambertagreements/ and the "Sponsored Research Interaction Process Model" which has been developed to assist universities and companies work through the complexities of IP contract negotiations at http://hpl.hp.com/open_innovation/images/srip.pdf In addition, lists of articles concerned with technology transfer, collaborations and the management of intellectual property can be found in the "S&T Management Bibliography 1954-2010" at http://www.tomeclarke.ca . Access to these and many other sites can enable SBDA technology transfer or IP officers to compare their practices against external benchmarks.

The following short list of "best practices" is drawn from an extensive review of the literature on technology transfer from government labs to industry. One may assume that the experience of the technology transfer practitioners have led them to report that these practices result in better technology transfer outcomes. Only those items concerned directly or indirectly with IP management are listed (Clarke (b), 1996):

- ·existence of a royalty based incentive system within the government department or agency;
- ·having an inventor-friendly disclosure and patent system;
- ·networks of bench level scientists/engineers are set up to assist their colleagues in the technology transfer activity (e.g., identifying commercializable IP) and to advise the central technology transfer unit of commercial opportunities as they occur;
- ·checklists are used to ensure that all the important issues concerning the technology and the transfer process have been considered;
- ·potential adopters are advised early of the government's intentions regarding ownership/licensing of IP rights;
- ·adopters are assigned exclusive proprietary rights to the IP in order to encourage additional investment in the technology's development;
- ·aggressively enforce patent positions when licensing to small firms to scare off predator companies who might otherwise challenge the patent;
- ·bench level scientists and engineers are trained so that they can identify potentially valuable IP;
- ·up-front fees or royalties are deferred, especially for small adopting firms; and
- ·the industrial adopter of the IP is involved very early in the development of the IP, ideally in a collaborative arrangement.

This literature review also identified some "poor practices" that reduced the effectiveness of the technology transfer process (Dorf and Worthington, 1990; Carr, 1992; Spann, Adams and Souder, 1993; Gover, 1995). Only those practices concerned with the management of IP are presented [items marked with an * were also mentioned by Canadian government respondents during this review]:

- ·lack of knowledge about what technologies are available from government labs;
- ·lack of appropriate incentives for the laboratory and laboratory staff to engage in technology transfer activities *;
- ·lack of assigning exclusive or sole rights to the IP to the adopting firm*; and

- ·lack of significant financial rewards to the innovation team *.

In a 1996 study to determine the principles and practices adopted by Canadian SBDAs to facilitate technology transfer to the private sector, government personnel considered the following as important IP management practices that facilitated the technology transfer process (Clarke, 1996):

- having an inventor-friendly IP disclosure process;
- charging minimal license fees to small firms;
- willingness to wait for a royalty stream to be generated (no large upfront IP charges);
- providing the licensee with a "money back guarantee" if the technology did not perform as promised;
- willingness to assign a sole license for a niche technology (which required a world market to exploit);
- use of IP management software to keep track of licenses, revenues and maintenance fees;
- use of blanket non-disclosure agreements to speed up discussions; and
- provision of guidelines to assist firms in acquiring a license.

It has also been argued that the culture in the government laboratory should be supportive of technology transfer activities. Erlich and Gutterman (2003) state that to help establish such a culture, the criteria for evaluating and promoting scientists should take into account their technology transfer activities. They also say that the provision of training in technology transfer is a critical element in promoting technology transfer. The provision of training is incorporated in the public sector IP principles promulgated by the Queensland government in Australia . It is also one of the factors mentioned by Canadian government scientists to improve the technology transfer process in SBDAs (See 7.1).

The key question here is to what degree do the SBDAs employ these IP best practices? No documentation was found, or provided that indicated whether these best practices are being routinely adhered to by many or any SBDAs today.

3.2 Concerns of Canadian Government Scientists

More recently, Canadian government researchers voiced their concerns about some of the difficulties they have in dealing with IP issues under the present Canadian government IP Acts and policies (SCL TT Workshop Module Three, 2002):

- lack of consistency in dealing with IP issues across a department;
- having adequate resources to obtain patent protection;
- lack of recognition of IP activities in promotion decisions;
- lack of knowledge on the part of researchers to consider the IP process;
- that the costs of managing IP are matched by revenues and do not detract from the budgets that support public good R&D;
- that efforts to commercialize IP do not in fact, slow down the adoption of technology that protects the environment;
- the additional administrative workload involved in managing IP;
- inventor being involved in determining the IP ownership question in contracts;
- inventor being involved in the definition of the "innovation team" when royalty sharing is being decided;
- having scientists consider patenting implications when preparing a publication;
- lack of proper monitoring/managing of licensees with the result that fees are not collected and the inventor doesn't get any royalty payments;
- inhibiting effect on the free exchange of scientific information; and
- managing awards to inventors.

Clearly if these difficulties are still perceived to exist, they would be major demotivators to the bench level scientists taking an active and positive approach to IP management. A symptom of this malaise might be declining invention disclosures, which recent Statistics Canada reports suggest is occurring (Statistics Canada, 2006).

In the case of S&T collaboration, Canadian scientists participating in Stargate's technology transfer workshops considered the following as major IP difficulties they had experienced when trying to establish a collaborative alliance with a company or client:

private sector partner fearing working with government due to past disagreements over IP ownership or having to deal with bureaucratic red-tape (i.e., government cannot operate in a business-like manner);

- disagreements over the ownership of any resulting IP;
- agreeing on confidentiality issues; and
- minimal incentives for government personnel to be involved in collaborative agreements.

These concerns would reduce the enthusiasm of both the non-government partner and government scientists from getting involved with S&T collaborations. Data on whether the number of S&T collaborations is going up, is stable, or is declining was not found.

4. GOVERNMENT ACTIONS TO PROMOTE TECHNOLOGY TRANSFER

> "The Congress finds that - the technology transfer process must be made "industry friendly" for companies to be willing to invest the significant time and resources needed to develop new products, processes, and jobs using federally funded inventions" - Sec. 2 Findings, Public Law 106-404, 106thCongress, (Technology Transfer Commercialization Act of 2000)

In some countries, the management of IP in government laboratories has been governed by legislation, in most others by government policy or guidelines. In the US , for example, legislative measures have been, and continue to be taken to encourage the effective transfer of technology from government laboratories to US industry. These include the establishment of a royalty based reward system for government inventors and the promulgation, since 1980, of various laws, legislative amendments, and transfer mechanisms (e.g., CRADAs) that direct government agencies to take technology transfer seriously, especially with small and medium sized enterprises (SMEs). For a list of some of these measures see Appendix Three. Germany appears to have only one piece of legislation (Employees' Inventions Act of 2002) that requires employers, public or private, to allocate a certain percentage of invention royalties to the inventor.

In the U.K. , many of their "government laboratories" have been privatized, for example, the former Laboratory of the Government Chemist is now LGC Ltd, and the research arm of the Ministry of Defence (MOD), formerly Defence Evaluation and Research Agency was split up in July, 2001, with 75% of the research activities going to form a new privately traded company QinetiQ Group plc. and the remainder with Defence Science and Technology Laboratories (dstl) which is s a trading fund under the control of the MOD. They are not as forthcoming as the Americans in putting information about their IP policies on the web.

In Australia , some of the individual states are very active in developing their own IP policies that govern public sector IP management. There does not appear to be any national IP policies that govern government to industry technology transfer. Unlike Canada , Australian government departments and universities make greater use of private sector commercialization organizations. For example, the Australian Institute for Commercialisation, established in 2002, provides IP and commercialization services to over 15 government organizations, as well as to universities. Request to the Commonwealth Scientific and Industrial Research Organisation (CSIRO) [N.R.C.'s equivalent] for information about their internal IP policies went unanswered. In 2001, CSIRO did not share IP royalties with their inventors, and this policy was to be re-examined in 2002; we were unable to find out its status today.

In a review of intellectual property management by the U.S. General Accounting Office in 2002, they reported that:

- the organization of the technology transfer process varied with some agencies having centralized programs, some decentralized and other components of both;
- agencies differ on what they will patent and the types of licensing arrangements they will enter; and
- most agencies did not fully comply with the reporting arrangement required by the *Technology Transfer Act of 2000 [PL 106-404]*, in their 2003 budgets.

Thus, even in the U.S. with its legislative approach to managing government IP, there is still much room for improvement at the front-end of the IP management process.

Unlike the U.S. , Canada has relied much less on legislation and more on government policies and statements to promote technology transfer. Even where there is legislation, departments and agencies can opt out and not adhere to the spirit of the legislation (e.g., awards to inventors and innovators). Canadian government efforts to promote technology transfer have been more inclined to make the process “government- or bureaucrat-friendly, rather than business-friendly” as the U.S. government tries to do.

4.1 Canadian Government Initiatives to Promote Technology Transfer

The main initiatives to promote the transfer or management of intellectual property in SBDAs in Canada are:

- Public Servants Inventions Act (PSIA), and Regulations of 1973;
- Retention of Royalties and Fees from the Licensing of Crown-owned Intellectual Property [1993];
- Award Plan for Inventors and Innovators [1993]; **(now rescinded)**
- Statements in the 1996 "Science and Technology for the New Century";
- Section 18 of the *Access to Information Act* [1985];
- Guiding Principles for the Management of IP Issues [Draft, 1998];
- Title to Intellectual Property Arising Under Crown Procurement Contracts [October, 2000; [Revised and replaced the earlier 1991 policy]; and
- Agriculture and Agri-Food Canada Inventions and Innovations Awards [April, 2007].

An overview of these Acts and policies can be found in Appendix Two, and the guiding principles for the management of IP issues in Appendix Four. In addition, various sections of the Financial Administration Act also have an impact on IP management or S&T collaborations (e.g., disposal of Crown-owned IP), as well as the Patent Act, the Copyright Act and the Plant Breeder's Rights Act.

4.1.1 Science and Technology for the New Century

In 1996, the federal government produced a series of reports, under the general title, "Science and Technology for the New Century", that outlined the government's plan to "allow Canada to take advantage of the worldwide economic shift to knowledge-based industries" (Government of Canada, 1996, p. 1). Among other things, the plan called for improved management of science and technology (S&T) activities within federal SBDAs. One aspect of this call for improvement was to encourage better management and commercial exploitation of intellectual property developed within the SBDAs.

The section of the Summary entitled, "Annex: Commitments to Action", states, among other things:

5. The transfer of knowledge and technology is an explicit objective of federal S&T, and departments and agencies will be closely evaluated on their efforts in meeting it.

6. All science-based departments and agencies will develop strategies for promoting partnerships and collaborative S&T arrangements with industry, the provinces, universities, and other stake holders.

9. Federal departments and agencies will take measures to improve access to their facilities and encourage an open-door approach to others engaged in scientific research.

16. The transfer of knowledge and the sharing of scientific information and data with Canadian researchers, schools, universities, libraries and industry will be a key function of all federal departments and agencies.

It is not clear that any of these "commitments to action" have been carried out to any great degree by the SBDAs since 1996.

Concern about IP management by the SBDAs still exists as the present-day government has committed to "review its own intellectual property policies to ensure they do not impede S&T collaboration and technology transfer, … (A Framework to Mobilize Science and Technology to Canada's Advantage, Gov. of Canada, 2007, p. 72)

4.2 Canadian Federal IP Policies and Practices and their Potential Impact on the Technology Transfer Process in SBDAs

In this section, the *PSIA* and Treasury Board (TB) policies are analysed to determine their impact on the technology transfer process.

4.2.1 *Public Servants Inventions Act (PSIA) and Regulations of 1973*

This piece of legislation was designed to encourage public servants to disclose their inventions by sharing royalties received from the licensing of Crown-owned IP, or from a cash award if the invention was used internally by the Crown. The public servants could also receive cash awards on filing for, and issuance of a patent based on their work. It wasn't until 1986 that the U.S. government had similar legislation to promote technology transfer. Unfortunately, this has been the only instance where Canada took the lead in encouraging technology transfer from government laboratories to industry. Even in 1999, U.K. departmental scientists were not allowed to share in royalty schemes, unlike their colleagues in other U.K. government funded research

institutions. Today, however, U.K. departmental scientists can take an equity stake in companies which exploit their research, something which Canadian government scientists cannot.

The positive aspects of the *PSIA* in promoting technology transfer and effective IP management by encouraging the involvement of government scientific staff are:

- made awards to government inventors possible in order to encourage invention disclosure and a more positive attitude by public servants towards the commercialization of their work;

- recognized that the Crown may be the sole beneficiary of the invention and allowed for a cash payment award;

- made IP disclosure by public servants mandatory; and

- allowed for cash payments to the inventor on patent filing and patent issue; an action which recognizes that there can be considerable time delay between invention and patenting, and the flow of royalties back to the SBDA.

The systemic problems associated with this Act are mainly due to the fact that it has not been kept up-to-date. In particular, the Act only authorizes payments to "inventors" and makes no mention of "software developers" or "innovators.

Another disincentive of the Act is that it does not provide for awards for Crown-use of an invention that reflect the level of benefit received by the Crown. It is a flat, one time award.

More will be said about the impacts of these shortcomings in the analysis of the Treasury Board Awards to Inventors and Innovators policy.

4.2.2 *Retention of Royalties and Fees from the Licensing of Crown-Owned IP [1993]*

When the intellectual property management agency of the Canadian government, Canadian Patents and Development Limited (CPDL) was disbanded in 1991, all of the intellectual property that they had previous managed (licensed and marketed) was returned to the originating government department or agency to manage, along with their royalty streams.

This additional source of funds for departments and agencies was to compensate for the additional expenditures faced by departments having to take on the licensing and patenting activities formerly undertaken by CPDL. The policy does not mention use of any surplus funds to support a

department's R&D activities or to set up awards for public servants not engaged in technology transfer.

Unfortunately the drafters of this policy, by referring to "Crown-owned" intellectual property rather than "Crown-developed" intellectual property, put this policy in direct conflict with the intent of the earlier 1991 version of the Treasury Board policy on IP ownership from procurement contracts. With the ongoing reductions in funding of government laboratories, this policy put great pressure on the SBDA laboratories to retain as much IP as possible, especially any that had commercial potential Schillo (2003) also commented on this inherent conflict. She states, "the necessity of attracting funding for research may lead to situations in which the laboratories might feel they have to commercialise a technology, rather than contribute the knowledge to the public domain, even if this latter option were to have greater impact in the long term (p. 17)".

The positive aspects of this policy in support of technology transfer are:

- ·IP revenues are to be used to offset the costs of operating a technology transfer operation; and
- ·provides a source of new funds for the recognition of technology transfer activities.

The systemic problems of this policy on technology transfer are:

- ·assumes that IP revenues will be sufficient to support an effective technology transfer/IP management process, which has never occurred, even when CPDL existed;
- ·does not allow for excess funds beyond those needed for the technology transfer process to be used for further technology development; or for providing awards to others who may not, for reasons beyond their control, be able to directly develop licensable technology (a practice in many U.S. organizations); and
- ·put public servants in a conflict of interest situation regarding IP revenues and contractor ownership, a situation that still exists today.

4.2.3 Award Plan for Inventors and Innovators [1993]

This TB policy, in general, vastly improved the level of awards that could be given to public servants for the commercialization of their inventions.

Unfortunately, it was rescinded in 2011, and the maximum IP award was once again 15%. It would have been wiser to amend the Public Servants Inventions Act to make the 35% award legal.

Besides increasing the amounts of the awards, the policy was intended to expand the class of recipient to include the people who develop the invention into a more commercializable form and assist in marketing the technology to an adopter. These people are referred to in the title as "innovators". Thus it is the intent of this policy to reward the whole innovation team, not just the inventors.

However "innovators" are not defined or even mentioned in the body of the policy. They are also not mentioned or defined in the Public Servants Inventions Act from which this policy draws its authority to make cash payments. Hence there appears to be no legal authority to pay the downstream developers and other people who contribute significantly to the commercialization of the government developed technology, despite this being a good management practice followed by many U.S. (e.g., the NIH) and foreign government laboratories. Payments to software developers, where the software is not patented, may also be illegal. Several departments are turning a "blind-eye" to this legal question and are awarding 20% of the allowable 35% to the key contributors or innovators with the traditional 15% continuing to go to the inventors. The National Research Council, for example, includes their marketing/business development people in their award scheme.

The only positive aspects of this policy in support of technology transfer are:

- increased the amount of the reward to inventors, from 15% to a max of 35%; and
- attempted to include the whole innovation team in the award scheme.

This policy was poorly drafted and resulted in the following systemic problems that hinder technology transfer:

- as it did not define "innovators', it left the interpretation to the SBDAs, which has led to major inconsistencies within the single government employer, the Treasury Board;
- it did not make payments to inventors/innovators mandatory, thus leaving open the possibility that an SBDA could decide not to make any payments;
- it did not set up an award scheme to recognize the fact that most technology transfer activities of government involve "public good" IP, that either would not generate IP royalties, or is to be "given" to the public free-of-charge;
- it did not modify the PSI Act or pass other legislation making the payments to innovators, both legal and mandatory, leaving SBDAs that view such payments as a good management

practice in a "catch-22" situation, if audited by the Office of the Auditor General of Canada (OAG);

- it allowed the IP revenue payments to the inventors to lapse upon their death (unlike the practice in other countries, and in Canadian universities);

- it capped the award to inventors at an arbitrary sum, that does not reflect the total value of the revenue stream;

- it did away with the patent filing and issue awards which are more timely in supporting IP disclosure behaviour;

- did not provide for any form of recognition for IP disclosures by themselves, independent of whether they moved forward to being a patent application;

- it did not address the situation of a company buying out the IP in one payment for a large amount, but the inventor can only get one payment capped at the RES 2 salary scale maximum, which may not reflect what he/she would receive if there was a royalty stream over several years;

- it continued the practice of capping the award for Crown use of an invention at the old arbitrary value of $5,000. which as noted before, may not reflect the value to the Crown; and

- it did not set in place any mechanism for tracking the use by the Crown of public servant developed inventions which might result in a government inventor not being rewarded financially for its use [especially in the case where the inventor is in one department, and the user is in a different department].

This awards policy is the most important tool the SBDAs have to encourage government scientists to take IP into consideration when either planning an R&D project, or during the course of a project. It is the only incentive that might have a scientist think about commercialization opportunities, and not just publication opportunities.

4.2.4 Title to Intellectual Property Arising Under Crown Procurement Contracts [2000]

As noted in Appendix Two, the purpose of this policy is to provide private sector or other contractors with an incentive to invest in and commercialize IP that they have developed as a result of working on a government procurement contract by vesting the ownership of the IP with them. This approach is not unique to Canada and is employed in the U.S. and the U.K. (Ministry of Defence as outlined in their intellectual property statement (Policy # 1).

This 2000 policy is a revision to an earlier 1991 policy that removed the presumption of Crown ownership of any IP developed under a procurement contract. The revision resulted from an evaluation in 1995 of the degree of compliance of Canadian government SBDAs to the policy that found that most were, in effect, ignoring the policy by using one of the many exceptions to retain Crown ownership (Clarke and Reavley, 1995). The major reason given for retaining ownership was to protect sources of income (IP royalties and license fees) in the chronically under-funded Canadian government laboratories.

This lack of compliance with the previous 1991 Treasury Board policy was a source of major concern and confusion to many private sector contractors, especially those dealing in computer hardware or software.

Whether this new policy with its reporting requirements has resulted in greater compliance with the concept of contractor ownership may be in question. This pessimism about the effectiveness of the 2000 policy to encourage the assignment of IP ownership to a contractor was prompted by a comment made by a senior government manager who stated that he was satisfied with the new version because the exceptions were so large, "he could drive a truck through them". Presumably this means that his department can continue its policy of "Crown pays, Crown owns" without any interference from outsiders.

In the U.S. , with the exception of national security issues, the contractor, not the public servant, makes the decision on whether or not to elect to retain IP ownership. If the contractor elects to retain the ownership, they must undertake to exploit the technology in a timely fashion and must provide the U.S. government with a royalty-free, fully paid-up license in perpetuity, to practice and make use of the transferred technology in a non-commercial manner.

The positive aspects of this Title to IP policy in support of technology transfer are:

- ·continues the effort to leave the ownership of Foreground IP in the hands of the contractor, who presumably is interested in, and able to, commercialize it; and
- ·allows the Crown to use IP assigned to the Contractor for its own internal use.

The systemic problems of this policy that may hinder technology transfer are:

·a public servant still decides whether the Crown will own the IP, and there are many exceptions that can be employed to circumvent the policy;

- there is no appeal process that a prospective contractor can use to question a decision by a public servant to claim Crown ownership, without the danger of being considered non-compliant with a Request for Proposal;

- the new reporting requirements of IP disposition statistics do not make a distinction between IP with commercial potential, and IP that has no commercial potential, thus data will not show whether the Crown is still taking an ownership position with the “valuable” IP, and letting the contractor keep the dregs; and

- the policy does not deal with the issue of non-performance by the contractor in exploiting IP they have been assigned, thus leaving the decision to take action to the discretion of an SBDA (i.e., no policy regarding "march-in" rights similar to those found in U.S. legislation).

4.2.5 *Access to Information Act [1985]*

While the impact of this Act on the management of IP is not direct, it is important in that it allows public servants to keep secret either confidential information provided to them by commercial partners, or information or knowledge developed within the government laboratory that has commercial potential. Without this protection, companies or universities would be loath to share information or partner with government organizations. This protection of confidential information is also allowed under U.S legislation governing CRADAs in their Technology Transfer Commercialization Act of 2000.

The positive aspects of this Act in support of technology transfer are:

- allows the government to maintain control of its commercial IP for the financial benefit of the laboratories;

- provides assurance to prospective S&T collaborators that their commercial secrets will be protected, and that any resulting commercializable IP cannot be freely accessed by competitors; and

- allows the government to obtain the maximum overall benefit to Canada over the dissemination of the IP.

There does not appear to be any major negative aspects of this Act to the technology transfer process.

4.2.6 *Agriculture and Agri-Food Canada Inventions and Innovations Awards [2007]*

As noted in Appendix Two, the purpose of this award plan is to recognize the contributions of AAFC scientists regardless of whether their inventions result in a royalty stream.

The inclusion of inventors who produce patentable IP that is in the category of "public good" rather than the narrower and less frequent commercial type of IP is strong recognition that most IP produced by government laboratories is of the "public good" variety, and should be rewarded and recognized.

The positive aspects of this awards plan in promoting technology transfer are:

- it provides for cash awards to inventors of "public good" inventions, which covers off a major deficiency in Treasury Board's 1993 Awards Plan.

The systemic problems of this plan that might hinder technology transfer are:

- it has substantially removed the potentially larger awards to inventors who do invent a royalty generating invention;
- sends the message that industry relevant R&D projects are of lesser importance now;
- it does not make any mandatory awards to inventors;
- it does not make any obvious provision for Crown-use of an invention;
- it does not apply to innovators whose involvement may make the invention actually useful;
- the nomination process is highly bureaucratic with six approval levels (i.e., possibility of discrimination against a particular scientist is high); and
- the selection criteria are very subjective.

It can be safely predicted that those scientists who have an orientation to industrial technology transfer type R&D projects will be very displeased about the decision to abandon the Treasury Board policy on awards. They may question why they should bother to make any disclosures because the odds of receiving an award are low because of the bureaucratic nature of the nomination process (i.e. odds are worse than with the TB policy).

It is not obvious why AAFC could not have added the key elements of their awards plan onto the Treasury Board plan. Had it done so, everyone would be highly motivated to take part in technology transfer.

5. ANALYSIS OF THE IMPACT OF PRESENT ACTS, POLICIES AND PRACTICES ON TECHNOLOGY TRANSFER AND S&T COLLABORATION

5.1 S&T Collaborations

5.1.1 *IP Ownership Issues*

The most effective way for scientists in the "inventing" organization to work with scientists in the "adopting" organization is for them to work together to develop the technology in the first place. In their study of the Canadian laboratory system, Niosi and Manseau (1994) found the second most effective technology transfer mechanism after person-to-person contact, was cooperative The sale of patents, licenses, etc. was way down their list of effective technology transfer mechanisms Adams, Chiang and Jensen (2003) commented that "CRADAs may be more beneficial to firms than other interactions with federal (U.S.) laboratories, because of the mutual effort that they demand from both parties". Erlich and Gutterman (2003) state that one way to encourage a close working relationship between inventor and adopter is to develop a CRADA in conjunction with the patent licensing agreement.

Despite being one of the most effective technology transfer mechanisms, it is fraught with IP management headaches. For example, Parker (2007) notes that complaints about the loss of background IP rights, cross licensing and the ownership of the resulting foreground IP can be problematic. Burnside and Witkin (2008) in their study of university-industry collaboration noted that conflicts over IP issues was undermining the support that such collaborations have for the U.S. innovation system. Clarke and Reavley (1995) also found that fear of the loss of background IP rights made some companies nervous about dealing with government laboratories. Indemnification issues can also be a barrier to technology transfer and collaboration.

The Canadian government still has no consistent overarching approach or agreed upon policies to govern the ownership of IP in S&T collaborations across all of the SBDAs. Each SBDA has developed its own approach. Some departments want to own the IP while others decide ownership on a case-by-case basis. For example, the Communications Research Centre policy calls for the creator of the foreground IP to own the IP, but if the IP is jointly developed, the IP will be jointly owned. This approach is similar to the one dictated by the rules governing U.S. CRADAs.

This lack of consistency was noted in a 2003 study of S&T linkages involving SBDAs when it reported, "the application of federal government IP policy, particularly in the context of complex, multi-party research initiatives, seems not to be generally well understood. There appear to be different views as how IP rights should be assigned in cases of collaboration; some departments adhere rigorously to the principle that IP rights should be retained by the Crown" (Sussex Circle , 2003).

Another major problem for a prospective S&T partner is whether they will obtain a license to foreground technology developed and owned by the Crown as a result of the partnership. There is no clear TB policy direction, where in the case where the Crown retains the IP ownership, the non-government "partner" will obtain a license to the foreground technology. The government is free to provide a license to a third party, possibly a competitor. In the U.S. , however, CRADA agreements guarantee the partner exclusive field-of-use licenses to any foreground technology.

In the study of multi-institutional IP agreements presently being conducted by Price WaterhouseCoopers LLP for Agriculture and Agri-Food Canada, it is noted that "challenges and delays in negotiating multi-institutional agreements in Canada are common" and that "the US and Australia have legislation and policies in place that define IP ownership rights" that simplifies agreements and negotiations (AAFC, 2008).

This lack of guarantee to a license in a collaborative R&D project was also found to be a deterrent to S&T collaborations (Clarke and Reavley, 1995).

Clearly, a prospective R&D partner will be reluctant to enter into a collaborative arrangement with an SBDA and spend a lot of money, if they do not have at least the right of first refusal to any resulting foreground IP. At present, there is no guarantee that an R&D partner will obtain a strong enough license (sole, or sole to a particular application or region) to recoup their R&D expenditures and make a profit.

Thus Canada's lack of the equivalent of the U.S. *Public Law 104-113* (*National Technology Transfer Act*) that governs the IP ownership positions of parties to an S&T collaboration agreement (CRADA) can be considered to be a serious impediment to the promotion of S&T collaborations in Canada.

5.1.2 *Easy Access to SBDA IP Policies and Practices Governing Collaboration*

A major source of frustration to people wishing to get involved in an S&T collaboration with the SBDAs is the difficulty of finding out what their IP policies and practices are. Unlike when dealing with most universities, a potential S&T collaborator must expend considerable time and effort to track down the internet location of the technology transfer offices of most Canadian SBDAs, and to determine their IP and collaboration policies, if in fact they are up on the web. One of the recommendations of the Interdepartmental Working Group on Commercialization (2004) was to "require all federal laboratories to formalize their IP policies and share these in a user-friendly format to firms". It is not clear that this recommendation has been followed.

On the Environment Canada website, for example, on a page entitled "Science & Technology Operating Practices", found by conducting a search on "Intellectual Property" are listed various policies on collaboration, data ownership, commercialization, IP and their awards policy, **but** the links to the actual policies are broken. Typing "technology transfer" in the search box on EC's and

NRCan's website does not take you to their technology transfer offices. This only occurred on the website of Agriculture and Agri-Food Canada .

It appears that the Intellectual Property Framework of Natural Resources Canada is no longer available online to the public.

Both Defence R&D Canada and N.R.C. had direct links to "doing business" but not to their technology transfer offices. The N.R.C. site did provide the names of business development officers across Canada , however the "contact us" button only sent enquirers to the N.R.C. general communications office, not to the IP/technology transfer office.

None of the Canadian government sites provides anywhere near the wealth of information provided by U.S. government sites (and some U.K. sites, e.g, Ministry of Defence). On the websites of a few of the U.S. government agencies examined, typing "technology transfer" took one directly to websites of their offices of technology transfer or development, which contained information on policies and rules that govern their technology transfer and CRADA activities. On the home page of the U.S. Agricultural Research Service, for example, is a "partnering' button that take the viewer to a page listing not only information on technology transfer policies and procedures, but also to their many technology transfer offices and to licensing information, which in turn leads to the names of their technology transfer coordinators and patent advisors across the U.S. The website also provides information to prospective licensees on how to apply for a government patent, and provides a blank license application form that can be downloaded. The website of the National Institutes of Health's,

National Institute of Allergy and Infectious Diseases, provides similar information in a user-friendly manner.

In a review of SBDA websites, McKenzie (2006) made the observation, “Why is it that universities make their IP policy readily available on their web site to astute potential collaborators wishing to do their homework and SBDAs do not?" To this question can be added, if the U.S. government can provide easily accessible information why can't the Canadian government?

There is no excuse for the SBDAs not providing user-friendly access to both their technology transfer/business development offices and to their transfer/IP policies. Such access should not be more than one “click” away from the SBDA home page.

5.2 Invention Disclosures

Recent studies/evaluations of invention disclosures in the SBDAs appear to indicate that the number of disclosures per year is going down. In a 2006 evaluation of Environment Canada’s intellectual property management process, the authors noted “the extremely low number of invention disclosures” and postulated that not all possible commercializable inventions are being reported (EC, 2006). They also noted that this decline is not unique to Environment Canada (p. 15). In telephone

conversations by the authors with technology transfer officers in March, 2008, most confirmed that the number of disclosures were either low, or declining.

In an earlier report on knowledge transfer and commercialization in Canada 's federal laboratories, Schillo (2003) commented that, "the perception among IP management and business development staff persists that transferable research outputs are declining" (p. 6). She also notes that "compliance with disclosure policies are not consistent across laboratories and over time".

5.2.1 *Compensating for the Extra Work Required for Technology Transfer*

One reason invention disclosures are declining might be that the rewards to inventors/innovators are not considered to be adequate or fair to compensate for the extra administrative work required to ensure successful technology transfer by the research scientists, especially when dealing with IP. The EC evaluation (2006) noted that there was a need to motivate researchers to work with the IP management process. One EC researcher stated, "it takes a lot of work to go through the patenting process" (p. 16). One way to avoid this "extra" work could be to ignore patentable technology and the disclosure process.

The Audit and Evaluation Team of Agriculture and Agri-food Canada (2005), noted the importance of an award program in encouraging scientists to identify, protect and commercialize IP through the submission of Invention Disclosures (p. 16). Ironically, as discussed earlier, the AAFC have opted out of the Treasury Board policy on awards to inventors, and have substituted a highly bureaucratic and subjective award process, which may in fact discourage AAFC scientists to disclose and commercialize IP.

The present Treasury Board awards plan does not provide timely awards to reinforce disclosure (i.e., no patent filing or patent issues awards), the royalty awards are still not mandatory and there is an arbitrary limit to the amount of money one can receive. The lack of awards to those inventors and innovators whose inventions are destined for non-government use, but do not, or are not allowed to, generate royalties is a major shortcoming of the TB 1993 awards policy.

Several senior science managers believe that a major reason for present decline in IP disclosures was the scientists dissatisfaction in having to deal with the extra administrative work involved in the IP disclosure and patenting process (Telephone conversations, March, 2008). It distracted them from what they like to do, which is science. Another senior science manager admitted, during a telephone conversation, that he discouraged his people from IP disclosure for this very reason (July, 2008). Complaints about paper work were also noted during an SCL technology transfer workshop in 2002.

Adding to the lack of incentive to disclose IP might be the SBDA annual performance appraisal process for scientists. If it is weighted in favour of publications and does not adequately take into account IP activities that may considerably delay publications, then from the scientists perspective, there is no advantage in disclosing IP. A technology transfer official in C.R.C. in his review of an earlier version of this report stated that, "this was the root cause of most research scientists' lack of interest in developing patentable IP. The promotion system is heavily weighted toward publication".

5.2.2 *Costs of Patenting Are Taken From Laboratory Research Budgets*

Another factor in the decline of IP disclosures may be the costs of patenting and the patent maintenance fees. In principle, the costs of patenting should come from the royalty and licensing stream generated by an SBDAs intellectual property. In practice, many studies of the Canadian SBDAs have noted that underfunding of the technology transfer offices is quite common. Statistics Canada surveys on barriers to IP management (1998 and 1999) consistently show lack of adequate funding to be a major problem in effective IP management.

Some departments such as Environment Canada and Health Canada , therefore, require the laboratories to fund the cost of patenting out of their research budgets. Natural Resources Canada's limited technology transfer budget to cover patenting costs results in their laboratories having to pay for IP protection on occasion. Agriculture and Agri-Food Canada 's Office of Intellectual Property also has a limited budget for patenting costs, but budget reductions may be putting that in jeopardy.

Having patenting costs come from the laboratories' R&D budget was identified as a major barrier to researchers becoming involved in the commercialization of IP (Clarke, 2002). In the U.S, the National Institutes of Health (NIH), Department of Energy (DOE) and the U.S. Department of Agriculture cover most of the patent protection costs out of a technology transfer budget. An NIH official stated, “we never pull patent expenses from the laboratory budget. That would be a disincentive”. An official in the Office of Technology Development of the National Institute of Allergy and Infectious Diseases (NIAID), confirmed that the NIH does not finance patenting costs from laboratory budgets (Telephone conversation , March, 2008).

An official in the Office of Technology Transfer of the U.S. Agricultural Research Service said that their office obtains half of its budget from headquarter's appropriations and the other half from IP revenues The Office does not charge the research laboratories anything for its services [ARS has 300 licenses, of which 100 are generating $3.5 million per year; median license revenue is approx. $5k] (Telephone conversation, March, 2008).

In a review of knowledge transfer and commercialization in federal laboratories, Schillo (2003) notes that “on the whole, the costs of transfer and commercialization as conducted currently are being financed at the expense of research activities" (p. 16). The EC (2004) evaluation noted that, “expenses for patent or similar protection are generally incurred by the science and operational

groups. Many of these groups work within tight budgets, and these additional potential costs may be a deterrent to effective and appropriate IP management" (p. 20). The Conference Board of Canada in their review of Canada 's IP system (2002), noted that the costs of IP protection poses a significant financial burden to government laboratories. This study also noted, "According to focus group participants, in government labs, the limited availability of funds for IP protection often necessitates using the research money to protect IP". In other words, in order to avoid the extra costs, scientists may be ignoring the IP disclosure process.

This funding situation presents the scientists with a difficult dilemma. If they disclose IP they could lose financial support for their current research, but in the long term they could have personal financial gains (possibly only modest gains). If they do not disclose IP, they could publish results of their work ahead of competitors in the field and add to their professional stature in the scientific community (a powerful motivator for scientists).

5.2.3 *Centralized vs. Decentralized Organization of the IP Disclosure Process*

The way in which an organization structures its IP management operations can have a considerable effect on IP disclosures. Where an organization has geographically separated research sites the most effective model is to have a central technology transfer office with smaller technology transfer offices or specially trained IP personnel at each of the laboratory locations (e.g., CSIRO in Australia, Institut Pasteur in France, the NIH in the U.S. (Clarke, 2002). An NIH official stated that, "it is very important that your technology transfer office should not be too separate from the labs". Another stated that, "you cannot just have a central office located a thousand miles away and expect to get the same attention" (i.e., same number of IP disclosures). The USDA reported in 2001 that

their patenting staff visited their assigned laboratories on a regular basis to meet with their scientists (Clarke, (a), 2001). This appears to still be the case today.

In his study of Japanese companies, Grandstrand (2000) noted that they promoted a patent culture in their organizations by, among other actions, having patent liaison personnel distributed throughout their organization. Having IP management support close to the R&D laboratory scientists as promoting the patent culture in government laboratories was also noted in studies by Ransley and Gaffney (1997) and Franza and Grant (2006).

In Australia , the CSIRO has central technology transfer office in Melbourne and each of the major research sites has its own technology transfer operation (Clarke, 2001).

In Canada , N.R.C. and AAFC are examples of SBDAs which have both a centralized IP office along with regional officers who assist with IP management locally.

Besides assisting in the identification of potentially commercializable IP, a local agent can help in reducing the paperwork burden that the scientists dislike.

5.3 Distribution of IP Revenues

There is no consistency across Canadian SBDAs in the distribution of revenues from the commercialization of intellectual property either to the government inventors, innovators, or for further research.

Health Canada for example, only awards 15% of IP revenues, Communications Research Centre (C.R.C.), awards up to 25% of IP revenues to their inventors, while most other SBDAs go up to the allowable maximum of 35%.

The balance of the IP revenues are generally assigned back to the originating laboratory. EC's policy is to return monies (50%) back to the laboratory to support further R&D, and Defence R&D Canada's Intellectual Property Instruction (IPI-01, January, 2000) also calls for funds to be returned to the originating laboratory to support further scientific research. While a strong argument can be made that this is a "good management practice", it is not in line with the TB 1993 policy on retention of IP revenues by SBDAs. In N.R.C., 15% is returned to the R&D group, and the remaining 50% to the Director General to cover technology transfer costs.

The 1993 Awards Policy **(which has now been rescinded)** states that the recipients of IP royalties should include not only the inventor, but also innovators. In general, many SBDAs are not following this policy. Only N.R.C., NRCan and Defence R&D Canada include the innovators in the award. Environment Canada has only once given an award to an innovator. Ironically, even though including the innovators in the award process is a "good technology transfer management practice", followed by many foreign government laboratories (e.g., U.S. under CRADA legislation), it may be illegal in Canada , as noted earlier.

A major departure from the awards plan used by all other government departments is the decision of Agriculture and Agri-Food Canada to "discontinue the use of Treasury Board Award Plan for Inventors and Innovators, effective April, 2007 (in Appendix Two). The one major positive element in this awards plan is that the awards do not require that royalty revenues be generated. This recognizes the fact that most IP transferred from government laboratories, while very valuable for the public good, does not generate royalties. The major negative factor is that awards based on the generation of royalties has, for all intents and purposes, been scrapped; a major de-motivator for scientists to be involved in commercial IP activities. This new policy does not recognize the contributions of "innovators" and the nomination for awards process is highly subjective and bureaucratic with six levels of approval. Another major discincentive to AAFC scientists is that revenue from patents, etc. are not returned to the originating research centre; they must be applied for and their is a limitation of how much is returned (Telephone conversation, December, 2010).

A former IP official with the U.K. Department of Environment, Food and Rural Affairs stated (Clarke, (a), 2001): "You must motivate everyone in the IP chain [including the marketing people] otherwise you will not be successful. Only to reward the inventors is not enough".

A major difference in IP management practices between Canadian SBDAs and other countries' national laboratories is that royalty revenues to an inventor do not cease with the death of the inventor, but continue to accrue to their estates (e.g., U.S. , Switzerland {CERN}) (Clarke, 2001). In Canada royalty revenue awards cease with the death of the inventor.

In many scientific areas, especially in biotechnology, the time between invention and patenting, and the generation of IP revenues might be many years. Give the ageing scientific population in the Canadian government laboratories, the scientists might be dead before their invention is commercialized and IP revenues start to flow; so there is little incentive to disclose.

In the U.S. , under *Public Law 104-113*, excess funds beyond that needed for awards can be allocated to the originating laboratory to conduct further research. The lack of an equivalent to the U.S.*Public Law 104-113* provides ample room for inconsistencies among the Canadian SBDAs in the distribution of royalty payments.

If Canadian government scientists are not satisfied with the awards plan, they will have little interest in taking an active role in either technology transfer to a commercial entity, or in S&T collaborations. The C.R.C. reviewer, who was mentioned earlier, commented that, "financial incentive is the single most important tool in spurring industrially relevant innovation in federal labs".

5.4 "Prior User Rights"

Canada , unlike Europe , which also operates under a "first-to-file" patent filing regime, does not have "Prior User Rights" IP legislation. A "prior user right" can be defined as the non-transferable right of a prior inventor to use an invention that is subsequently patented by another person, but had not been put in the public domain by the earlier inventor before that patent was applied for. Prior user rights thereby act as a defence against the patentee's rights and do not invalidate the patent in and of themselves (Piper et al, 2007) In other words, this policy allows an organization to continue using an invention or trade secret for which it has not sought IP protection, even if someone else files a patent on it. The patent holder cannot force the organization to stop using the technology. The organization, however, cannot transfer the technology to a third party except by it being included in the sale of the organization to a third party.

In its audit of the AAFC IP management structure, the OAG report states that the most urgent IP issue facing AAFC is "that its freedom to pursue its mandate is being challenged by its use of IP developed elsewhere (OAG, 1999). The authors of the EC evaluation noted that one of the reasons EC protects IP is "to ensure EC's continued rights to use its data and technologies" (EC, 2006).

If Canada had "Prior User Rights" protection, this might reduce some of the concerns voiced by the OAG, and the need for some "protectionist" patenting activity and thereby allow the technology transfer offices to direct their limited funding to more commercial patenting activities.

6. IP CHALLENGES TO STRENGTHEN TECHNOLOGY TRANSFER AND S&T COLLABORATION

6.1 Create a Central IP Management Group

The fundamental problem with the management of IP, technology transfer and S&T collaboration in the Canadian government is the lack of a centralized management group with the authority and mandate to make changes to IP acts and policies, as necessary, collect statistics on the annual performance of the technology transfer offices, develop frameworks or guidelines to assist SBDAs in determining what and when to patent, and to monitor and enforce the technology transfer policies and good technology transfer practices that have been identified.

Canada 's piecemeal approach to IP management is the result of a lack of an up-to-date set of acts or policies that draw upon the best practices that have been identified in studies and reports over the years. If an IP management group with the authority to act cannot be established or agreed upon, then the only alternative route for the government is to embed technology transfer and IP best practices in legislation that must be followed; in other words, the American approach.

6.2 Provide Adequate Funds for the Technology Transfer Process

Many past studies of Canadian SBDAs, have identified funding of the technology transfer process as being inadequate to ensure effective and efficient operations. To demand that the laboratories that disclose an invention cover the costs of the IP protection process is a sure way of killing off IP disclosures and scientists' enthusiasm for the technology transfer process.

Baker (1999), in his study of U.K. laboratories noted that, "government must recognise that effective knowledge transfer costs money. Even the proactive management of IP, a prerequisite to commercialisation, is expensive". It is not obvious that the Canadian government has accepted this fact, and provided for it. Baker goes on to say in the context of the U.K. , "government should consider earmarking some funds to meet the costs of knowledge transfer in the Public Service Research Establishments." The Conference Board of Canada (2002) echoed this call by stating, "If we wish to commercialize public research results, we must allocate sufficient funds for IP protection and technology transfer at universities and government labs". This would be especially important for IP that is not revenue generating but is important to transfer out of the government laboratories (e.g., public good IP).

During an OAG audit of the research activities of Agriculture and Agri-Food Canada , researchers stated, "they could each probably come up with one or two patentable ideas every year if they had adequate support (OAG, 1999).

Proper funding would also permit the setting up of an IP assistance network so that there is a local scientist or other person trained to both recognize commercializable IP and to help the inventor with the paperwork.

If the Canadian government is serious about supporting and encouraging technology transfer and S&T collaboration, it should, as is done in the U.S. , allocate a dedicated percentage of funds to cover the IP protection costs, and the operations of the technology transfer offices.

6.3 Develop a Government-wide Policy or Legislation Dealing with Ownership of IP Generated Under an S&T Collaborative Agreement

To make the sometimes considerable financial investment required to commercialize an invention, S&T partners will require some certainty of decisions by their SBDA partners, such as a Canadian equivalent to U.S.*Public Law 104-113*.

The lack of consistency in the "rules" about who owns the IP developed during an S&T collaboration can be a major deterrent to some prospective partners. The lack of "rules" about the ownership of background IP and cross-licensing can also cause potential partners to shy away from collaborative R&D projects with the SBDAs. In a review of the impact of Canada 's public sector technology transfer system on the growth of the biotechnology industry (Clarke, (b), 2001), it was reported that "the reluctance of some government departments to award exclusive licenses to firms was considered to be an impediment to the commercialization of technology".

Therefore, the government should consider the development of a specific policy for the governance of IP ownership, background and foreground IP, and licensing for S&T collaborative arrangement, that applies to all SBDAs. Items that could be incorporated in the policy/legislation include:

- ownership of foreground IP resulting from a collaborative S&T collaboration should be determined by the level of resources put in by the partners, (or some other mutually agreed upon formula);

- IP developed solely by one of the partners, is owned by the developer, but the other partners should have a royalty-free license to use the IP in their own operations; and

- where ownership of IP developed during an S&T collaboration is retained by the Crown, a sole license to the partner(s) for a particular use, or particular time period, should be assured;

6.4 Improve Access to IP Policies and S&T Collaboration Rules on Websites

There is no legitimate excuse for the SBDAs not to have full disclosure of the IP policies and rules for governing S&T collaborations and technology transfer on their websites, in easily accessible locations. Providing the names of contact persons in the technology transfer or business development offices listed on the websites would facilitate communication between potential licensees or S&T collaborators and the appropriate contact person.

6.5 Revise the Awards Plan for Inventors and Innovators

At present, the policy does not clearly lay out the distribution of awards to inventors, software developers, or innovators, nor does it update the 1973 Public Servants Inventions Act. The decline in invention disclosures indicates that the status quo with regard to awards is not an option. Misguided changes to providing awards to government inventors that take away benefits previously provided should also not be an option. **Unfortunately, Treasury Board thought otherwise in 2011.**

6.5.1 *Mandatory Awards to the Inventor*

At present, payments to inventors/innovators are discretionary and the amount of the award is subject to departmental or managerial interpretation. [In the U.S. , awards to inventors are compulsory, subject only to IP revenues being received] This has resulted in SBDAs refusing to make awards, especially to the innovators, despite earning IP revenues and despite the 1993 TB policy stating that awards should go to both inventors and innovators. This has also allowed Agriculture and Agri-Food Canada to bring in its own version of an awards policy that may prove to be disastrous to the government's specific intention to support the technological infrastructure of Canada . The discretionary nature of the awards and the highly bureaucratic nature of the awards nomination system in AAFC may also be a deterrent to invention disclosure. Revisions of the 1993 Awards policy for consideration are:

- legislate unequivocally that if license/royalty revenues are earned by the Crown, appropriate payments to the inventor must be made**,** with no cap on the amount;

- state that appropriate multi-year monetary payments must be made to the inventor if the Crown, through internal use, saves money or otherwise benefits from the use of his/her invention, and that these payments should be based on a percentage of the identifiable savings or benefits, for as long as such benefits accrue to the Crown (i.e., no cap);

- awards to inventors do not cease upon their death, but go to their estates, subject to revenues being received by the Crown;

- maintain the practice of paying IP rewards even if the inventor leaves the employ of the Crown, and include the innovators in this practice;

- re-establish the awards for patent filing and issue for the inventor(s) and establish an award for the original innovators, when the patent is licensed, in amounts that reflect 2008 monetary values. These amounts should be revised annually; and

- develop an additional awards category that provides for monetary awards to those inventors or knowledge creators, whose IP, while valuable as a "public good", does not generate royalty revenues.

6.5.2 *Legalize Royalty Payments to Innovators and Software Developers*

To encourage all SBDAs to include innovators and software developers in the TB IP reward plan, amend the PSI Act and the TB Award Plan for Inventors and Innovators to include the following changes:

- legislate unequivocally that if license/royalty revenues are earned by the Crown, appropriate payments to the innovation team must be made;

- state that appropriate multi-year monetary payments must be made to the innovation team, if the Crown, through internal use, saves money or otherwise benefits from the use of their invention, and that these payments should be based on a percentage of the identifiable savings or benefits, for as long as such benefits accrue to the Crown (i.e., no cap);

- define what is meant by the “original innovator”, or the “original key contributor”; and the "downstream innovator/contributor" who improves the technology later on in the technology development cycle, and declare that they should be part of the reward scheme;

- explicitly include original and downstream software developers in the reward scheme;

- maintain the 15% of IP revenues for the inventor(s) and mandate that the remaining 20% be divided up among the original and downstream innovators (key contributors) in consultation with the whole innovation team;

- establish a process by which the proportion of reward to the original innovators can be modified, as others, who were not part of the original innovation team, add value to the original intellectual property through later improvements, and thus should share in the 20% of any ongoing IP revenues as a result of their improvements;

- state that IP rewards to the original or downstream innovators or key contributors would not be extinguished by the death of the inventor(s);

- do not establish a financial cap on the total amount that can be rewarded for a single invention;

- state that IP rewards to software developers and innovators continue to their estate upon their death, subject to revenues being received by the Crown; and

- develop an additional awards category that provides for monetary awards to innovation teams whose assistance to an inventor or knowledge creator, made the IP useful as a "public good" , but does not generate royalty revenues.

6.5.3 Legalize the Use of Excess Royalty Revenues to Further Research by the Laboratory of Origin

At present, there is no guarantee that IP revenues earned by an R&D laboratory will be returned to that laboratory. Without these funds, technology transfer activities will be a net drain on the operational resources of the laboratory. There is also no authority for the laboratory to use any excess IP funds for future R&D. This can cause colleagues who have no opportunity be part of an innovation team to be jealous of any awards a successful team receives. It is important that the benefits of a successful patent or license be shared among immediate colleagues to avoid conflicts and lack of cooperation.

The revised legislation/policy should mandate that a considerable percentage of the funds earned from IP licenses, fees, etc. be returned to the originating laboratory to provide awards or resources to other researchers. This should also encourage others to disclose their inventions.

7. FOLLOW-UP AREAS OF ENQUIRY

7.1 Satisfaction with Present Internal IP Practices

Stargate Consultants Limited has for many years, been presenting a workshop on “Technology Transfer from Government Labs to Industry” in Canada . The following are some of the suggestions made by the many scientists who attended the workshop for improving the technology transfer process:

- provision of adequate resources to conduct marketing studies;

- reduction in the paper burden associated with technology transfer (i.e., stifling red-tape);

- hire additional, dedicated technology transfer staff so that inventors can focus on the R&D side, and leave the legal side to people with more expertise;
- provision of training for government scientists and engineers in technology transfer;
- development of more effective mechanisms to identify appropriate licensees or R&D partners;
- modify the REM/RES promotion criteria to give more weight to technology transfer activities;
- encourage conference attendees to be on the look-out for potential licensees or R&D partners;
- increase and improve the monitoring of licenses and follow-up action;
- stop penalizing research units for being successful in bringing in new money, by reducing their A-base by a similar amount;
- provide specific funds for patenting and patent maintenance; and
- have the guts to defend patents once filed, issued and licensed.

These suggestions for improvement imply quite strongly that there is some level of dissatisfaction by bench level scientists and their immediate supervisors with the technology transfer process. No literature was found, or presented to the authors that would indicate that any SBDAs have conducted any surveys of their scientists to determine their level of satisfaction with the IP management and more general technology transfer practices of their organization.

Recommendation:

A survey be conducted in the SBDAs to:

- determine the level of satisfaction of their scientific staff with their present IP/technology transfer procedures and processes;
- identify particular practices or process that greatly dissatisfy the scientists, and;
- identify possible solutions to any barriers.

7.2 Satisfaction of Industrial Collaborators with Government IP Practices

Except for a few comments made by industrial collaborators noted in the 1995 study of the compliance of SBDAs with IP ownership issues concerned with contracts (Clarke and Reavley, 1995) (i.e., unhappiness about not having a guarantee of "exclusive" access to foreground IP that results from a collaborative project), no recent study has been brought to our attention that identifies the degree of satisfaction companies' have with how government laboratories manage collaboratively developed IP.

Recommendation

A survey of companies who have been involved in collaborative R&D projects with an SBDA in the past five years be undertaken to determine their degree of satisfaction with the way in which the SBDA has handled IP issues, and to determine the degree of consistency across SBDAs in their handling of IP issues. If possible, companies that avoid collaborative R&D projects with SBDAs should be identified and approached, to determine their reasons for not wanting to collaborate with SBDAs.

7.3 Adequacy of Present Level of Technology Transfer/S&T Collaboration Training for Bench Level Scientific Staff

In the Environment Canada audit referred to earlier, scientists were asked whether they had had any training in IP management or technology transfer. The replies were negative. The fact is that they had had training from several sources, including this author. So, did the authors of the audit just happen to talk to those people who were not on IP/collaboration workshops or had they forgotten. In a recent telephone conversation with a technology transfer official in an SBDA, he mentioned that many of their new scientists come from other cultures where there was little emphasis on IP management practices, with the result that inadvertent IP disclosures were being made.

Recommendation

Investigate the amount and the frequency of technology transfer and S&T collaborative training that is being provided to government scientists in the SBDAs to determine its adequacy, and determine how the impact of such training can be improved.

In order to successfully conduct these three recommended studies, the full cooperation of the SBDAs will be required.

8. CONCLUSION

Given the lack of a central authority to effectively manage or improve the management of IP, the out-of-date acts, the poorly drafted IP policies and the discretionary nature of the application of the policies, it must be concluded that the present approach to IP, and the present IP policies do not support effective technology transfer or S&T collaboration.

Thus government technology transfer officers are carrying out successful technology transfer and collaboration activities despite the policies, not because of them.

9. Authors' Note

Many of the barriers to effective S&T collaboration and technology transfer have nothing at all to do with the management of IP. In their study of barriers to effective IP management, Statistics Canada in their 1998 and 1999 surveys found that lack of funding to be a major issue. Lack of appropriate funding, not only for the IP protection activities of a technology transfer office, but for the funding of the "commercialization gap" between laboratory proven concepts and commercialization scale operations of technology is a major barrier. The clumsy financial mechanisms of government are not flexible enough when dealing with private sector partners. Lack of funding also affects how much marketing a government technology transfer office can do to search out "good" licensees or collaborators. The government must decide that technology transfer and S&T collaboration is not just "window dressing" but sufficiently important to both the Canadian economy and the welfare of Canadians and "put its money where its mouth is". The Statistic Canada survey also found that "poor understanding of policies" and the lack of an adequate level of training in IP to be significant barriers.

Thus the track record of SBDAs in S&T collaborations and technology transfer cannot be improved by addressing the IP issue alone, or by one department. It must be a multi-departmental approach involving not only the SBDAs, but also Industry Canada , Treasury Board and the Department of Finance.

Many of the problems or shortcomings of the government's IP acts and policies, and it's financial acts and policies, have been known for many years, and yet no action, by anybody except for more and more studies, has been undertaken to correct them. A question that the IP Working Group should ask itself, is “WHY NOT?”.

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For a more complete list of articles concerned with technology transfer and R&D collaboration and alliances in general, please refer to Chapters 14 and 19 of the Science and Technology Management Bibliography 1954-2011 located at http://www.tomeclarke.ca

APPENDIX ONE

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APPENDIX TWO

Canadian Government IP Acts and Policies

Public Servants Inventions Act, and Regulations[1973]

In 1973, the Federal Government enacted the Public Servants Inventions Act (PSIA) and Regulations to encourage the disclosure of inventions made by public servants.

Under this Act, awards to a public servant inventor can be made, but they are subject to Ministerial approval. Section 10 states: "Subject to the regulations, the appropriate minister **may** authorize the payment of an award to a public servant who makes an invention that is vested in Her Majesty by this Act, in such amount as the appropriate minister and the public servant may agree on or as the appropriate minister determines".

The accompanying Public Servants Inventions Regulations elaborated on the awards that could be made. Section 13 "Awards to Inventors" states:

(1) In addition to any other award that may be paid under this section in respect of an invention vested in Her Majesty, an award may be paid by the appropriate Minister to each inventor of the invention:

(a) upon the filing by Her Majesty of the first application for a patent for the invention in the patent office of the first country in which an application for a patent for the invention is filed by Her Majesty, in the amount of:

(i) $50. if there is only one inventor, or

(ii) $95. divided by the number of inventors, if there is more than one inventor; and

(b) upon the issuance of the first patent in respect of the invention that is issued by the first country that issues a patent in respect of the invention, in the amount of

(i) $50. if there is only one inventor, or

(ii) $95. divided by the number of inventors, if there is more than one inventor.

(2) Where any money is received by Her Majesty upon the sale, license or other disposal of an invention vested in Her Majesty by the Act, an award or awards may be paid to the inventor, based on the total amount from time to time so received, but such award or awards shall not in the aggregate exceed 15% of the amount so received.

(3) Where Her Majesty has made use of an invention vested in Her Majesty by the Act, an award or awards may from time to time be paid to the inventor, but such award or awards shall not in the aggregate exceed the sum of $5,000. except with the approval of Treasury Board.

Subsection (5) allows for the payments under both subsections (2) and (3), where an invention is used both internally by the Crown, and also results in revenues to the Crown. Subsection (6) allows for the $5000. payment to an inventor for an invention with potential value to the Crown in some manner, for example, the trading of some Crown-owned IP for someone else's IP where no actual funds exchange hands.

From the wording of this Act, it is clear that payments are to be made only to the inventor(s), who for the purposes of award, is the person(s) named in the patent application.

As will be noted later, the Governor in Council, in 1993, authorized the revocation of Section 13 to allow for the removal of the awards scheme from the regulatory environment to a policy format in order to make substantial changes to the awards scheme.

In addition to the awards schedule, the PSIA states that public servants are duty-bound to disclose any intellectual property they develop. Under the conditions of the Act, an invention made by a public servant:

- while acting within the scope of his/her duties or employment, or
- with facilities, equipment or financial aid provided by or on behalf of Her Majesty; or
- that resulted from or is directly connected with his/her duties or employment;

is owned by the Crown.

"**Retention of Royalties and Fees from the Licensing of Crown-Owned Intellectual Property**" [1993]

On June 2, 1993, the Treasury Board approved a submission from the Minister of Industry, Science and Technology (now Industry Canada) and the Minister of Science which allowed departments and agencies to retain all revenues arising from the licensing of Crown-owned intellectual property. These revenues "***are intended to be used toward the costs associated with incentives awards for technology transfer and other technology transfer activities undertaken by the department or agency***".

A Treasury Board memorandum of July 19, 1993 on the subject of *Retention of Royalties and Fees from the Licensing of Crown-Owned Intellectual Property* states that "Departments and agencies are now authorized to receive, through Supplementary Estimates, an annual appropriation equal to all revenues arising from the licensing of Crown-owned intellectual property which the department or agency remitted to the Consolidated Revenue Fund in the previous fiscal year". These funds are to be in addition to their normal A-base departmental allocation.

"**Award Plan for Inventors and Innovators**" [1993] **(Rescinded in 2012)**

This Treasury Board policy, effective June 8, 1993, revised the payment schedule as set out in the Public Servants Inventions Act and is designed to further encourage government inventors to pursue, through the transfer of technology, the commercialization of their inventions and to promote within the government laboratories, the practice of collaborating with Canadian industry.

The authority to make awards under this revised plan is still the Public Servants Inventions Act:

In accordance with Section 10 of the Public Servants Inventions Act, "the appropriate Minister may authorize the payment of an award to a public servant who makes an invention that is vested in Her Majesty". Payments to the inventor may be made for the life of the inventor but must cease at the inventor's death.

The amount of an award for inventions used by the Crown remains at a maximum of $5,000. unless permission is received from Treasury Board to exceed this amount.

The major change was in the amount of the awards made from royalty or license fees which are considered to be **ex gratia awards** and subject to reconsideration at any time.

Under the new formula, the amounts to be awarded for each invention should be based on the revenues from the invention (i.e., royalties, license fees, etc.) and should be:

1.not less than 15% of revenues, and

2.not more than:

100 % of revenues where revenues are $1,000. or less, or

the greater of $1,000. or 35% of revenues where revenues are greater than $1,000.

If there is more than one inventor for any one invention; the award should be divided among the eligible inventors.

Awards are to be made annually based on revenues received, but no individual is to receive an annual award or awards derived from a single invention that exceeds the highest salary current at the time of payment of the SE-RES 2 classification (approx. $85,607. in 2008). [In the U.S. , awards to government inventors are capped at $150k per person, per year regardless of the number of revenue generating patents a person has. Two inventors on one patent can each receive up to the maximum]

"**Title to Intellectual Property Arising Under Crown Procurement Contracts**", [2000]

The purpose behind this policy is to put intellectual property firmly in the hands of those who are best equipped to commercialize it, namely the private sector. This policy also puts Canadian companies on the same footing as their U.S. counterparts in their dealings with their government Contractor ownership of IP is also the default position of the Australia 's Queensland Government, but not the Victoria Government (at least in 2003).

This Treasury Board policy applies to intellectual property arising from research and development carried out in the course of work done under contracts issued for the procurement of goods and services by the private sector, academic researchers or consultants. This is a revision to an earlier TB policy established in 1991.

This revised policy continues the elimination of the presumption of Crown ownership of new intellectual property (called Foreground IP) arising from procurement contracts (i.e., when preparing a request for proposal, a department is to start with the presumption that the contractor will take title to any resulting intellectual property). The policy is only to be applied to those procurement contracts, of any monetary value, that will result in the creation of new intellectual property (e.g., a new instrument, a new drug, new software, a written report, etc.). Thus when preparing a Request for Proposal, a determination of whether any new IP will be developed must be made. If no new IP will be developed, then the policy is not to be applied. If new IP will be developed, the position of the Crown on who is to own the resulting IP must be provided in the Request for Proposal.

Like its 1991 predecessor, this new version of the policy provides for Crown ownership of any resulting IP under specific circumstances or conditions.

Under a Crown Procurement Contract, the Crown may own the Foreground IP for the following reasons (Section 6 of "Title to Intellectual Property Arising Under Crown Contracts"):

1. National Security (6.1)

for example, wanting to control the further development and distribution of a new virulent biological warfare agent

2. Where statutes, regulations, or prior obligations of the Crown to a third party or parties preclude Contractor ownership of the Foreground (6.2)

for example, provincial and federal governments are funding a project and the prior agreement is for the Crown to own the Foreground IP

3. When the Contractor declares in writing that he/she is not interested in owning the Foreground (6.3)

for example, the contractor is an R&D establishment only and has no interest in or capability to commercialize any resulting Foreground IP

4. Where the main purpose of the Crown Procurement Contract, or of the deliverables contracted for is, (6.4):

4.1 to generate knowledge and information for public dissemination (6.4.1)

4.2 to augment an existing body of Crown Background IP as a prerequisite to the transfer of the augmented Background IP to the private sector, through licensing or assignment of ownership (not necessarily to the original Contractor), for the purposes of commercial exploitation (6.4.2)

4.3 to deliver a component or subsystem that will be incorporated into a complete system at a later date (not necessarily by the original Contractor) as a prerequisite to the planned transfer of the complete system to the private sector (not necessarily to the original Contractor), through licensing or assignment of ownership, for the purposes of commercial exploitation (6.4.3)

5. Where the Foreground IP consists of material subject to copyright, with the exception of computer software and all documentation pertaining to that software (6.5)

There is also a sixth general exception called the "Treasury Board Exception". The Crown may take ownership of any Foreground IP in circumstances where it is justified but not provided for in Section 6 of the Policy, and the Responsible Department has sought and obtained Treasury Board approval for such an exception. Use of this exception must be obtained through a Treasury Board Submission.

The exceptions are only to be applied (i.e., Crown retains IP ownership) if obtaining a license from the Contractor is not adequate for the Crown to fulfil its objectives. If an exception is going to be invoked, this information must be included in the Request for Proposal and state which exception is being used.

A major difference between the earlier 1991 version and the new 2000 policy is that if exceptions 6.4.2 or 6.4.3 ("fragmentation exceptions") are invoked, any licenses to the retained intellectual property must be royalty-free, to anyone. The Crown may, however, charge a license fee for the complete technological package.

Another difference is that SBDAs are to prepare an annual report to Treasury Board on the disposition of contractor developed IP.

Intellectual property developed in the course of a collaborative R&D agreement falls outside of this IP ownership policy and ownership is to be decided on a case-by-case basis. IP developed under a grant is the property of the grant recipient or their employer.

Access to Information Act [1985]

While much of government developed information is, or should be, accessible to the public, there are exceptions when dealing with government-private sector commercial arrangements and government developed technology or expertise.

For example, the general public does not have the right under Section 20 of the Act to obtain commercial or scientific confidential information that has been provided to the government by a company, in confidence. Nor, under Section 18 of the Access to Information Act, does the public have the right to obtain information relating to "economic interests of Canada " such as scientific or technical information that has commercial potential, at least not free-of-charge.

Agriculture and Agri-Food Canada (AAFC) Inventions and Innovations Awards [2007]

In April of 2007, discontinued use of the Treasury Board Policy on Awards to Inventors and Innovators and adopted an awards plan of its own making.

It is AAFC policy to treat, on an equitable basis all significant contributions by AAFC employees to the conception and development of an invention whether or not such contributions have generated royalty revenues.

This plan applies only to employees of AAFC. Employees who participate in performance pay plans are not eligible for the cash portion of awards and incentives.

Employees are nominated for awards and incentives to the ADM Research who passes them on to a Selection Committee which in turn makes recommendations to the AAFC Executive Council who in turn makes recommendation to the Deputy Ministry, who makes the final decision. The awards consist of:

Individual Award

a certificate and a symbolic memento;

$10,000. net cash payment for individuals, and

access to Non-Pay Operating (NPO) funding up to $75k for eligible recipient(s) who are currently employed with AAFC to undertake a research initiative of their choice [retired guest workers are not eligible].

Group or Team Award

a certificate and a symbolic memento;

$20,000. net cash payment for groups or teams, to be divided by the number of individuals in the group or team and paid directly to each individual; and

access to NPO funding up to $150k for eligible recipient(s) who are currently employed with AAFC to undertake a research initiative of their choice.

As noted above, one of the purposes of this awards plan is to recognize the contributions of inventors, whose invention while important, does not generate revenues, as well as those which do. Another unique feature is the access to more research funding. A complete description of the policy can only be found on AAFCs intranet site.

APPENDIX THREE

U.S. Government IP Legislation/Policies to Support Technology Transfer

Since 1980, the U.S. government has passed various forms of legislation to enhance and encourage technology transfer from publicly funded research organizations to the private sector. Material in this section is drawn from "Why Canada Needs a Technology Transfer Act", Stargate Consultants Limited, February, 2000 and NASA's Technology Commercialization Handbook. Among the key pieces of legislation and their key impacts are:

Bayh-Dole Act of 1980 [Patent and Trademarks Law Amendment, *PL 96-517*]

Designed to promote the commercialization of IP from federally funded R&D in non-government organizations, it:

- allowed small business and non-profit organizations (e.g., universities) to retain title to federally funded inventions;
- authorized federal agencies to withhold information on inventions from public disclosure and from disclosure under the Freedom of Information Act;
- required the contractor or grantee to disclose to the appropriate federal agency any invention created with federal funds within 2 months of the inventor disclosing the invention to the contractor or grantee;
- required the contractor or grantee to apply for a patent on the invention within one year of either electing to retain title or from time of disclosure, whichever is earliest; and
- required the issuing of an irrevocable, nontransferable, paid-up license to the government to use the invention for government purposes only.

Stevenson-Wydler Technology Innovation Act of 1980 [PL 96-480]

To promote technological innovation for US economic, environmental and social goals, this Act directed at the operations of U.S. government agencies:

- required large federal laboratories to establish an Office of Research and Technology Application (ORTA) to facilitate technology transfer, and for agencies to set aside 0.5% of their R&D budgets to support technology transfer activities;

- established the Center for the Utilization of Federal Technology to coordinate the ORTAs; and

- made technology transfer a mission of the national laboratories.

Presidential Memorandum on Government Patent Policy [1983]

This allowed all contractors to claim rights to technologies developed under a federally funded grant, contract or cooperative R&D agreement. It extended to all contractors, the rights previously given to small business and and non-profit contractors in the Bayh-Dole Act.

Trademark Clarification Act of 1984 [PL 98-620]

This amendment to the Bayh-Dole Act allowed non-profit (including university) operated GOCO facilities (excluding those involved in naval nuclear propulsion or weapons-related research) to retain title rights to technologies they developed, and license the technology without having to go through the funding agency (i.e., allowed university GOCOs to enter into cooperative R&D agreements and receive patent royalties)

Federal Technology Transfer Act of 1986 [PL 99-502]

This amendment to the Stevenson-Wydler Act is to encourage federal laboratories to engage in cooperative R&D arrangements with state and local governments, industrial organizations, industrial development organizations, and non-profit organizations, including universities, and licensees of federal inventions (i.e., it established the formal Cooperative Research and Development Agreement (CRADA) mechanism). This Act:

- assured that public servants share in the royalties from the licensing of government technology (15%), set up a reward system for other innovators, and makes each science and engineering professional employed by the US Government responsible for transferring technology;

- allowed federal laboratories to grant patent licenses or assignment rights to companies;
- allowed federal laboratories to retain the balance of royalties from the licensing of inventions after the inventors are paid their share;
- established the Federal Laboratory Consortium for Technology Transfer (FLC) to facilitate technology transfer activities in federal agencies and improve access of SMEs to federal technology; and
- requires that laboratory directors give preference to small business in choosing CRADA partners and in licensing patents.

A key difference between the Canadian system of rewards to government inventors and the U.S. system is that in the U.S. , the royalty revenues to the inventor do not end with his or her death, but continue on to their estate. Another difference is that the lower Canadian cap on the amount the government inventor can receive (approx. $87k per year) applies per invention. This allows a Canadian government inventor to exceed the cap if multiple revenue generating inventions are involved. The U.S. has an absolute annual cap regardless of the number of revenue generating inventions.

Executive Order 12591 Facilitating Access to Science and Technology of 1987

This Order directed federal agencies with government operated laboratories to delegate authority to the laboratories to license, assign or waive IP rights developed under cooperative agreements (i.e., to encourage large businesses to obtain title to inventions that resulted from joint research). It also required that technology access and IP protection be considered when negotiating R&D agreements with foreign individuals and governments.

Omnibus Trade and Competitiveness Act of 1988 [PL – 100-418]

Established the National Institute of Standards and Technology and their Advanced Technology Program that assists industry in the commercial application of generic research results and the refinement of manufacturing technologies.

National Competitiveness Technology Transfer Act of 1989 [PL 101-189]

This Act promoted technology transfer from GOCOs to the private sector, and enhanced

collaboration between universities, the private sector and GOCO laboratories. In particular the Act:

- authorized the Department of Energy's GOCO laboratories to enter into CRADAs on the same basis as its government-owned, government operated laboratories (GOGOs) (i.e., for-profit contractors could enter into CRADAs);

- allows directors of national laboratories to obtain title to and license IP developed under collaborative agreements; and

- allows the laboratory to protect trade secrets, privileged or confidential commercial and financial information, as well as data developed under joint R&D agreements, for five years (i.e., exceptions from the Freedom of Information Act).

National Technology Transfer and Advancement Act of 1995 [PL 104-113]

This Act made important changes to the legislation governing the operation of CRADAs. In particular, this Act allowed public servants to receive up to $150,000 in royalties from their inventions per year (up from $100k), and authorized that any surplus funds after payment to individuals could be used to support further research. It also authorized that royalty or other license revenues be paid to the originating laboratory and such revenues to be disbursed according to the following formula:

- the first $2000. to the inventor(s), and thereafter at least 15% of revenues;

- provision of financial incentives to those people (not the inventors) who substantially increase the technical value of such inventions (i.e., the downstream innovators);

- provision of awards to scientific, engineering and technical employees of the laboratory, including developers of sensitive or classified technology, regardless of whether the technology has commercial applications;

- to further scientific exchange among the laboratories in the agency;

- for education and training, or other activities that increase the potential for technology transfer;

- for payment of expenses incidental to the administration and licensing of IP by the agency or laboratory; and

- for scientific research and development consistent with the R&D mission of the laboratory.

The Act also guarantees the CRADA partner, at a minimum, the option of an exclusive field-of-use license for inventions created solely or jointly with government employees. In addition the Act assures that privileged and confidential information will be protected from public disclosure when a CRADA invention is used by the Government.

According to an Environmental Protection Agency (EPA) official, most government agencies have a customized awards policy that reflect the intent of the 15% of royalty revenue awards, while not strictly adhering to the award being based on 15%. For example, in the EPA, once an inventor has received $8,500. in royalties (based on 15%), the percentage applied jumps to 35% until the $150,000. cap is reached. This official also stated that there is still "on the books" a government-wide award plan to provide small financial awards for the filing and issuing of a patent. Some agencies give out small awards under this plan (e.g., $200 – 500.) to inventors while others ignore it totally.

Technology Transfer Commercialization Act of 2000 [PL 106-404]

The purpose of the latest amendments to the Bayh-Dole and Stevenson-Wydler Acts are to promote partnerships with federal laboratories through the commercialization of government-owned inventions by making the process more "industry friendly".

In particular these amendments:

- allow federal laboratories to grant a license to a pre-existing federally-owned invention as part of a CRADA, as long as the invention is directly related to the work covered by the CRADA;

- reduce the time required to notify the public of a request for an exclusive or partially exclusive license to 15 days from 60, but does not confine such notification to publication in the Federal Register, but encourages the use of the Internet;

- allow basic business plans provided by prospective licensees to be exempt from the Freedom of Information Act requirements;

- allow the government to consolidate rights in an invention of which they are a co-developer by either licensing or assigning the government's rights to the non-federal partner or by acquiring rights in the invention from the non-federal partner in return for a share of the royalties (i.e. allows the government to license rather than just assign their rights to an invention, and to "in-license" rights to related inventions in order to bundle them with a government owned invention and be licensed together in a more commercializable package);

- require that the rights of the inventor must be assigned to the federal government in order for the inventor(s) to share royalties and that the federal agency can retain income for two

succeeding fiscal years before having to transfer unspent funds to the Treasury;

- requires government agencies to file with the Office of Management and Budget, an explanation of the agencies technology transfer program for the preceding year their plans for the coming year; information should include number of patent applications filed, the number of patents received, the number of fully-executed licenses which received royalty income in the preceding fiscal year, the total earned royalty income, the disposition of that royalty income and the number of licenses terminated for cause.

- call for the appointment of a "Technology Partnerships Ombudsman" in each of the national laboratories of the Department of Energy to hear and resolve complaints from outside organizations regarding the policies and actions of each laboratory or facility with respect to CRADAs, patents and technology licensing.

Federal Laboratory Consortium for Technology Transfer (FLC)

The FLC was organized in 1974 and formally chartered by the Federal Technology Transfer Act of 1986 to promote and to strengthen technology transfer from federal government laboratories [www.federallabs.org]. To date, 712 major federal laboratories and centers and their parent departments and agencies are FLC members. This is the American equivalent of the Canadian Federal Partners in Technology Transfer.

Most of the services offered by the FLC are free. It maintains a database on technologies, patents and licenses available from federal laboratories. Among its services are:

- helps laboratories identify new partners, industry and markets for the use of their technologies (i.e., helps to identify "dual-use" applications);

- assistance through providing various channels (e.g., meetings, publications, web-site) for federal laboratory personnel to locate peers and potential collaborators in other federal labs;

- provision of easy-to-use outlets (e.g., newsletter, web-site, trade show program, etc.) for the marketing of technologies, and facilities;

- its Laboratory Locator which directs requests from industry, academia, and state and local governments to the appropriate ORTA at a particular laboratory.

In addition, the FLC offers a variety of training opportunities (e.g., courses and publications) to improve the technology transfer skills of government personnel.

APPENDIX FOUR

FPTT Guiding Principles for the Management of IP Issues (Draft)

(This organization has been disbanded)

The Federal Partners in Technology Transfer (FPTT) have outlined some non-binding guiding principles for the management of intellectual property within the Canadian Federal Government. One of the major concerns of the FPTT is balancing the need for consistency of management of IP throughout the government with having practices that respect individual departmental and agency mandates.

The purpose of the draft guidelines is to ensure that intellectual property will be managed in a way that will maximize the socio-economic benefits for the country. If commercial exploitation of the IP is possible, this will be best achieved by the transfer of the property to the private sector.

The guiding principles prepared by FPTT are:

- IP must be managed as a tool to help departments fulfil their mandates. This is its primary function. No other consideration can equal or surpass the obligation to support the departmental mandate.

- When government transfers IP to the private sector for commercialization, the objective is to maximize socio-economic benefits for Canadians.

- When split ownership of IP occurs, contractual arrangements must be managed so as to maximize possibilities for commercial exploitation. This will generally translate into efforts to focus control of the IP into the hands of a single player for a given application of the IP.

- To facilitate technology and IP transfer to the private sector, government will use generally accepted industrial standards and norms whenever possible.

- IP developed in collaborative R&D with industry generally stands the best chance of being effectively transferred to the private sector and commercialized. This mode of technology transfer should be favoured in the management of IP. In instances where government R&D laboratories do not have a mandate to collaborate directly with firms, licensing of IP should be the favoured option.

- For departments and agencies that have an industrial development or support mandate, project selection should involve careful consideration of the market potential and value of the IP being targeted. Managers of IP should be involved in this assessment.

- IP may be embodied in various forms, including patents, copyrights, "know-how", trade secrets, etc. All forms of IP must be properly managed and respected.

- IP management is an integral part of the R&D process. It helps define the optimum research strategy. Managers of IP should be part of R&D teams during the entire course of project development

- Human resource training is an essential component of IP management. It leads to improved R&D strategy and reduces the risk of premature disclosure. Departments must provide such training for scientists and their managers.

- The importance of contributions to the creation, management and exploitation of IP must be properly reflected in job descriptions and performance evaluations of employees.

- Government-created or -sponsored IP is an asset to the Crown. As such it must be treated with the same care and respect due to physical Crown assets. In particular, care must be taken to recognize the value of IP at the early stages of its development.

- To maintain employment equity, rewards to inventors and innovators in government employment must be made according to uniform principles established by the Treasury Board. Appropriate rewards should be given to the employees directly responsible for the development of an IP and to members of the support team that contributed to the work even if they were only indirectly involved in the discovery.

- The management of IP involves flexible business skills such as deal-making that are not readily translated into rules and guidelines. Given the complexity and diversity of IP issues, sharing of knowledge and experience across departments through mentoring and information exchange is considered to be an essential means for training and for management improvement.

- When it awards an exclusive licence thereby providing a monopoly to a firm, government should reserve the right to continue to use the invention in question for its own internal non-commercial purposes.

- The continuance of licenses should be conditional upon the licensee achieving predetermined performance milestones so that government can recover its property if the licensee fails to properly develop and exploit the IP.

- Licensees should be prohibited from assigning licenses to third parties without the consent of government since such an action may conflict with the obligation to maximize the use of the IP for the socio-economic well-being of Canadians.