

# Submission to Expert Panel on R&D

By  
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## Qualifications of Submitter

Ken Putt, after a distinguished executive career with Imperial Oil Limited, including assignments with Exxon Research and Engineering, established his consulting practice in management of new technology development. Ken's contributions and involvement with technical societies have been extensive. He was President of the Engineering Institute of Canada (EIC), the Canadian Society for Engineering Management, and the Canadian Society for Senior Engineers (CSSE). Ken Putt has been duly honoured throughout his career with several awards. He is a Fellow of the Canadian Academy of Engineering, the EIC and the CSSE. Ken has received the EIC's Canadian Pacific Railway Engineering Medal and John B Sirling Medal. Ken Putt served on the Senate of the University of Calgary, and is on the Innovation Strategy Advisory Committee of the University of Victoria. He served on many committees of the Natural Sciences and Engineering Research Council of Canada as well as the Tri-Council Selection Committee for National Centres of Excellence.

## Major Actionable Recommendations

**1) Modify the Income Tax Act of Canada to permit flow through shares for Canadian Corporations (CCPC's and Public Companies) conducting Research, Development and Innovation (RDI) in Canada applicable for tax credits conveyed by issuance of new shares to individual investors.**

Small and Medium-sized Enterprises (SME's) have difficulty raising capital to finance their RDI/BERD activities. Moreover, many are in a non-taxable position and do not need to deduct their RDI expenses. The Flow Through Share (FTS) mechanism allows the issuer corporation to transfer the RDI expenses to the investor. An SME, in particular, benefits greatly from FTS financing. The FTS program provides tax incentives to investors who acquire FTS's by allowing: deductions for RTI expenses renounced by eligible corporations; and SR&ED tax credits for individuals (excluding trusts) on RDI expenses in all industrial sectors that qualify as flow-through RDI expenditures. The Canada Revenue Agency (CRA) would review all FTS arrangements and Audit them.

**2) Recognize not-for-profit 4<sup>th</sup> pillar (Government, University, Business, Independent Not-for Profit) research facilitation organizations, such as the Petroleum Technology Alliance Canada (PTAC), with Independent Boards of Directors and high levels of Corporate Governance who's membership includes all key stakeholders, as authorized approval agents to administer Government RDI funding of importance to that industrial sector, much as is done by SDTC.** Canada Revenue Agency (CRA) would review RDI funding arrangements after completion and Audit them.

## Consultation questions

1. In addition to the R&D activity defined by the OECD, should government be funding other business activities related to the commercialization of R&D? If so, what and why?

**Response:**

***1A Industrial applied research practices in the Natural Resources Sector are virtually all ineligible for SR&ED tax credits. This occurs because the majority of breakthroughs in the petroleum and natural gas sector, for one, occur in prospecting and exploring (as a consequence of applying new in-situ resource concepts, geological theories and new geophysical tools and seismic interpretation algorithms, etc.) and in production through new recovery concepts and downhole tests during and following drilling which, if successful in demonstrating a new tool or technique in the wellbore are disallowed for SR&ED credit. At the same time, despite not being applicable for SR&ED tax credits, if the new recovery mechanism or wellbore completion technique test is unsuccessful, the multi-million dollar investment in the well may be destroyed by the RDI test.***

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**1B Market research and or human factor engineering for a new product and/or service that qualifies for SR&ED should also qualify for SR&ED tax credits as those elements are necessary for innovation to occur (innovation is successful reduction of a new idea to commercial or social practice or use). This relies on social science and perhaps humanities research.**

2. Does Figure 2, the model of business innovation presented above, capture the key structural factors and inputs to innovation? If not, what is missing?

**2A Two factors influencing businesses to choose innovation as a competitive strategy are missing.**

**2A1 The first missing is the ownership structure of the firm. Foreign firms with branch plants in Canada are less likely to conduct R&D in Canada. Foreign firms usually do research close to their head offices and control structures where they can better manage the R&D agenda and Intellectual Property (I.P.).**

**2A2 The second missing is the inclination of the Board of Directors and company Management. What's often missing is Leadership by Boards and Senior Management in many Canadian firms. The Board of Directors must approve the corporate strategy and plays a large role in formulating company strategy. If either the Board or Management does not have an R&D or Technology Strategy as a fundamental means of competing, then innovation is not likely to happen, regardless of the factors cited.**

3. Regarding capital, is there an adequate supply of risk capital for Canadian firms at each stage of their growth (start-up, small, medium, large)? If not, why not? Where returns on investments are low, what are the reasons and potential solutions?

**Response:**

**3A1 Since many Canadian Companies do not feature an explicit R&D Strategy, New Technology Road Map, or Innovation Strategy as part of their Corporate Strategy, R&D funding and Innovation expenditures are going to be woefully low. Canadian industry's investment in Information Technology (ITC) as well as other productivity capital investments significantly lags that of U.S. firms, for example.**

**3A2 Most large companies, particularly Canadian subsidiaries of foreign firms, and often the foreign controlling companies themselves, no longer have Corporate Research Departments. There is no Board strategic, long term view of basic foundational research needed to support the firm in the longer term. Most R&D funding decisions are now made by Operating Departments and are short term operational targets to meet stewardship deliverables. Capital is not a problem for large firms; it is the corporate management processes and RDI strategy development and funding authorities being located within operations management rather than strategic management or the Board that's problematic. Where Canadian leading edge strategic RTI occurs, the Foreign Investment Review Act review limits that are high and don't reflect investment or market value don't protect against sale of strategic technology.**

**3A3 SME's on the other hand have a chronic shortage of capital. Since the Dot-com bust of 2000 Canada's remaining Venture Capital firms have shrunk and their available capital and actual investments have declined substantially, more so than the U.S. Corporations' (e.g. Inco, Nortel, etc.) and Canadian Bank's venture arms have all disappeared. Currently, Canadian Venture Capital investors are risk-averse with onerous terms for SME's. They only want to invest in sure things after the risk of failure is low, yet they still want to control the SME Boards of companies they invest in and take their money out or force a "liquidity event" as soon as they have met their high return on capital invested target.**

4. Regarding ideas and knowledge, do you believe it is important for Canadian firms to perform their own R&D and, if so, what do you believe are the key factors that have been limiting business R&D activity in Canada?

**4A It is important for firms to perform their own R&D or jointly, cooperatively/collaboratively with others in order to develop in-house expertise and HQP in the firm's areas of core competency.**

**4B If the firm doesn't conduct R&D directly or with others it will lack "receptor capacity" to recognize (and implement or transfer in to the firm) third party technology and/or productivity enhancements.**

5. Regarding networks, collaborations and linkages, what are the main impediments to successful business-university or business-college partnerships? Does the postsecondary education system have the right capacity, approaches, and policies for effective partnerships with business?

**5A Research has shown that technology is most often transferred within a short geographical distance from the research provider to the firm. That underlies the importance of industrial and R&D 'clusters' with industries' offices near research providers to enable on-going dialogue, networking and personal contact amongst science and engineering professions and receptor firm Management.**

**5B I draw your attention to recent European Research on Innovation and Technology Transfer from Sweden, which demonstrates that one 'best practice' model that works for industries in the so-called analytical sectors (knowledge is abstract, codified and universal e.g. Pharmaceutical, ICT) doesn't work well for industries in sectors that rely more on a synthetic or symbolic base (knowledge is experience based and applied e.g. natural resources, processing, food) (See Appendix 4.)  
I don't believe these industrial/sectoral differences are taken into account by Canadian policy.**

6. Regarding the creation of demand for business innovation, what role, if any, do you believe that government should play in being a "first customer" for R&D investments in Canada?

**6A I believe the government should commit a significant portion of Public Works & Government Services capital/services funding to Canadian Innovation alpha test sites, beta test sites and as early adopters.**

7. Regarding talent, is Canada producing sufficient numbers of graduates with the right skills to drive business innovation and productivity growth? If not, what changes are needed? Where demand for advanced skills is low, what are the reasons and what changes, if any, are needed?

**7A In order to remain competitive in the G20, Canada needs to graduate more science, math and engineering graduates and provide more focus in business schools on entrepreneurship and joint innovation-focused inter-disciplinary programs.**

**7B Canada's production of post-graduate masters and Ph.D. students in the sciences, math and engineering and advanced business skills lags the U.S. Canadian firm's have a lower proportion of degree and post-graduate degree holding executives.**

8. Can you describe whether and how your firm employs students currently enrolled in community colleges, polytechnics and universities, and what government measures could make it easier to work with students during their academic programs and to recruit them after their graduation?

**8A When I was in Executive management with a major multi-national firm, I tried to hire at least 50% of new professional and technical hires who had previously been co-op or engineering internship students.**

**8B The NSERC Industrial Internship and Industrial Post Doctoral Internship numbers and funding should be dramatically increased for two reasons; 1) Give firm's a better appreciation of the higher value-add of new employees with the latest advanced knowledge and capabilities, and 2) Give post-grad students and post doc's enhanced work experience and a better appreciation of how their university research might be applied in the Canadian economy.**

**8C The NRC/IRAP Industry Development Grants that support science or engineering student's employment in R&D in SME's are particularly important and should be expanded for post grad's.**

9. With which federal programs supporting business or commercially oriented R&D in Canada do you have direct experience and knowledge? In your view: a. Which of these programs are working, and why? b. Which programs are not working, and why not?

**9A I have direct experience with all of the NSERC Collaborative (with Industry) Programs as well as their Strategic Grants Program, Industrial and Post Doc Internships, Strategic Networks, Ideas to Innovation, Collaborative R&D (CRD), Industrial Research Chairs (IRC), Collaborative Research Policy, mostly on selection and advisory committees and with SSHRC on NSERC/SSHRC (expired) Management of Technological Change Chairs selection. Additionally, I have been on the CHIR/NSERC/SSHRC Networks of Centres of Excellence (NCE) Selection Committee and involved with their peer review processes. Also, I have consulted as an NRC/ IRAP Industrial Technology Advisor. While these are effective, there is too much bureaucracy burden and paperwork which limits the Advisor's time with business or RDI clients.**

10. If you have direct experience and knowledge of the SR&ED tax credit, what are your views in relation to the following: a. Does the current structure of the SR&ED tax credit encourage incremental investment in R&D? Does it free up capital to invest in other aspects of innovation activities in the firm? Does this vary by size, ownership, sector or nationality of firm? b. What are the strengths and weaknesses of the refundable portion of the SR&ED tax credit for Canadian-controlled private corporations and to what extent does it encourage the growth and commercial success of SME's? c. Bearing in mind the improvements being made by the Canada Revenue Agency, are there additional opportunities for change to simplify the administration of the SR&ED tax credit and facilitate the applications process?

**10 I have direct experience with and knowledge of SR&ED's**

**10 a. The current structure of the SR&ED tax credit is problematic as it is bureaucratic, the criteria applied varies from firm to firm and from Province to Province and the paperwork is onerous with too long a lag time to grant acceptance and no provision for pre-approval. Because of no prompt pre-approval and extensive time lag until payout, it doesn't free up capital in a timely way or support credit.**

**10 b. Cash refunds to SME's are critical for cash-strapped SME's doing pre-commercial R&D with no income. In the case of under-capitalized early stage SME's (most of them) with a high R&D expenditure 'burn rate', pre-approval and cash advances based on completion progress should be considered.**

**10 c. A provision should be made for 3<sup>rd</sup> party collaborative R&D not-for-profit organizations with independent Boards of Directors (Fourth Pillar Organizations) to approve field and pilot plant trials RDI that would fit a defined process to pre-qualify for SR&ED treatment, much like Sustainable Technology Development Canada (STDC) does in funding aligned research. The Petroleum Technology Alliance Canada (PTAC) fits this model and the independent PTAC Board of Director currently approves aligned RDI funding under Alberta DOE Guidelines from a substantial pool of Alberta DOE funds held in trust.**

11. How could the Government of Canada lighten the administration requirements of its programs on recipients and improve outreach to business?

**11A A provision should be made for 3<sup>rd</sup> party collaborative RDI not-for-profit organizations with independent Boards of Directors to approve field and pilot plant trials that would fit a defined process / criteria to pre-qualify for SR&ED treatment, much like Sustainable Technology Development Canada (STDC) does in funding aligned research. The Petroleum Technology Alliance Canada (PTAC) fits this model and the independent PTAC Board of Director currently approves aligned R&D funding under Alberta DOE Guidelines from a pre-committed pool of Alberta government funds. Other Industry-funded collaborative R&D organizations such as Paprican and FPIInnovations/Forintek, Canadian Construction Research Board(CCRB)etc. might also be examined to determine if they fit a PTAC model. Reporting requirements on IRAP ITA's are too onerous. Reports should be results-based on completion.**

12. How could the Government of Canada be more innovative and responsive to meet new needs or opportunities, and try alternative service delivery-approaches in its programs?

**12 A The Government of Canada should, sector by sector, bring together the industrial collaborative not-for-profit, appropriately- governed R&D organization (e.g. RxD, PTAC, etc.) to sit down with the respective Ministries conducting direct relevant federal research(e.g. NRCan for PTAC) to align research programs, focus on R&D addressing the sectors' largest opportunities or problems and better align R&D initiatives to avoid duplication, enhance R&D focus and improve productivity, technology transfer and innovation. The three research granting councils (CIHR, NSERC, and SSHRC) and IRAP should participate to enhance alignment of Networks of Centres of Excellence, Strategic Networks, Ideas to Innovation, and Collaborative Research, as all three Agencies have incredible University funding/granting leverage.**

13. Are there any gaps in the Government of Canada's support to business and commercially-oriented R&D? Do firms performing R&D in other countries have an advantage over Canadian firms because of access to programs that are not available in Canada? What would be the principal features of new programming to fill these gaps?

**13 A The Government of Canada should seek to close the productivity gap that has arisen through inadequate corporate investment in RDI and ICT for productivity improvement and competitiveness. In the IRAP program, for example, funding of new technology development should be enhanced if it is linked with complementary productivity improvement investments to holistically improve the firm's fitness to compete and thrive. Place more postgraduate HQP in firms receiving IRAP funds or in partnership grants with NSERC and other granting councils and the Networks of Centres of Excellence.**

14. What lessons and best practices can be taken from provincial business and commercially oriented R&D programs, and how should the two orders of government align their programming?

**14 A Canada should invite the government Ministries conducting R&D, the Three Research Granting Councils, Provincial Ministries of Science & Innovation funding R&D and Innovation provincially, Science Councils, Provincial Research Agencies, the industry sector collaborative R&D conductors and facilitators to recommend programs that could benefit from 1/3 Federal, 1/3 Provincial, 1/3 industrial RDI funding.**

15. Is there a difference between R&D and innovation? If yes, how are they different? Should government focus on R&D or Innovation? What should the balance be?

**15A All Governments should recognize that R&D does not equate to Innovation. Innovation only occurs when a new idea or new knowledge arising from creative thinking or R&D is converted to commercial practice or societal use. SR&ED only recognizes (and counts) a small subsector of RDI actually conducted in Canada, as most of the in situ tests and field trials, pilot plants, and variations tried in the natural resource and process industries extending experiential knowledge is not categorized by CRA as R&D, but it most certainly is Innovation! 'Line of sight' to commercial or societal application of R&D should be a major factor in funding all but basic and theoretical research.**

**15 B The Government of Canada should be the primary funder of basic research conducted primarily through universities and to a lesser extent through NRC and Provincial Research Organizations (ARC & SRC, etc.). Applied R&D with a line of sight to Innovation should be funded 1/3; 1/3; 1/3 between the two senior levels governments and industry. RDI for SME's should be funded primarily through IRAP and industrial sector focused innovation funded 2/3 by government funds allocated through Industry-led, independently governed, research not-for-profit organizations, such as PTAC, Paprican, FPIInnovations, RxD, etc. administering direction of government funding to research provider proposals approved by their respective Boards of Directors, much like SDTC does now for alternative energy funding.**

## REVIEW OF FEDERAL SUPPORT TO R & D Appendices

### Appendix 1: OECD Definition Innovation

The *Oslo Manual* (2005) is the basis for the OECD definition of innovation: “the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations“

### Appendix 2: Scientific Research & Experimental Development (SR&ED) Rules (Canada CRA)

To qualify for the SR&ED program, work must advance the understanding of scientific relations or technologies, address scientific or technological uncertainty, and incorporate a systematic investigation by qualified personnel.

Work that qualifies for SR&ED tax credits includes:

- **experimental development** to achieve technological advancement to create new materials, devices, products, or processes, or improve existing ones;
- **applied research** to advance scientific knowledge with a specific practical application in view;
- **basic research** to advance scientific knowledge without a specific practical application in view; and
- **support work** in engineering, design, operations research, mathematical analysis, computer programming, data collection, testing, or psychological research, but only if the work is commensurate with, and directly supports, the eligible experimental development, or applied or basic research.

The following activities are **not** eligible for benefits under the program:

- social science and humanities research;
- commercial production of a new or improved material, device, or product, or the commercial use of a new or improved process;
- style changes;
- market research or sales promotion;
- quality control or routine testing of materials, devices, products, or processes;
- routine data collection;
- prospecting, exploring, or drilling for or producing minerals, petroleum, or natural gas; and
- development based solely on design or routine engineering practice.

### Appendix 3: Key Elements of Discussion Paper Figure 2 (that could not be cut and pasted here) *These factors influence businesses to choose innovation as a competitive strategy*

Structural Characteristics; Competitive intensity; Climate for new ventures; Public policies; Business ambition.  
*Federal support for business R&D helps businesses develop or access these inputs, which are used in their innovation activities*

**THE FIRM PERFORMING R&D IN SUPPORT OF INNOVATION AND INVESTING IN THE FOLLOWING INPUTS**  
Ideas and Knowledge + Talented, educated, entrepreneurial People + Networks, collaboration & linkages + Capital & financing  
**INNOVATION AND INVESTING IN THE Above INPUTS (Results in)**  
= INCREASED PRODUCTIVITY  
= INCREASED LIVING STANDARD

These are considered by Government the **Factors influencing business strategies for innovation**

#### **Appendix 4: “Regional Innovation Policy beyond ‘Best Practice’: Lessons from Sweden”**

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##### **Abstract:**

This paper deals with policy measures in the regional innovation system of Scania, Southern Sweden. Focus is dedicated to requirements on innovation policy from actors representing different industries. Previous studies have identified profound differences with regard to the organization of knowledge sourcing between firms and other actors in industries drawing on different knowledge bases. In correspondence with these findings, industries differ also with regard to how policy measures aiming to support innovation are perceived and acquired. Despite this, there is a tendency among regional policy programs to base their strategies on one ‘best practice’-model, inspired by successful (or sometimes less successful) cases in other parts of the world. The paper presents an in-depth analysis of such policy support targeting three industries located in one region, and ends with a suggestion to how those should be adapted to render influence on the institutional framework of the regional innovation system.

Keywords: innovation policy, regional innovation systems, knowledge bases,

##### **Sweden**

...In correspondence with these findings, different industries are expected to differ also with regard to how policy measures aiming to support innovation are perceived and acquired. Summarizing the differences as regards modes of innovation it can be said that knowledge sourcing and inter-organizational collaboration in geographical proximity is especially important for industries that rely on a synthetic or symbolic knowledge base, since the interpretation of the knowledge they deal with tend to differ substantially between places. This is less the case for industries drawing on analytical knowledge, since such knowledge is codified, abstract and universal. Knowledge sources related to scientific knowledge and principles are particularly important for analytical industries, whereas synthetic industries rely more on experience-based learning and applied R&D, and symbolic industries on creativity and non-scientific knowledge (Asheim and Coenen, 2005).

Martin et al argue that regional innovation policies should take these differences seriously into account in order to provide appropriate support, shaping good conditions for innovation to take place. However, there is a tendency among regional policy programs to base their strategies on one ‘best practice’-model, neglecting such industry-specific needs and preconditions (Hansen and Winther, 2010).

##### **And,**

...Despite these differences, however, the policy support programs targeting these different types of industries appear as very similar in scope, providing more or less generic support in line with best practice models for innovation support which have had a strong impact on the predominant policies defining the Swedish and European research and innovation policy agendas the past decades. Typical activities defining those are regional industry-university network promotion, technology transfer support through incubation, human capital development through higher education, and regional branding in attempts at attracting venture capital and nationally and internationally governed funds for R&D.