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Contribution of Canada

to the CSTD 2017-18 priority theme on 'The role of science, technology and innovation to increase substantially the share of renewable energy by 2030'

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Priority Theme 1: The role of science, technology and innovation to increase substantially the share of renewable energy by 2030

What are the policies (renewable energy strategies, regulations, standards, fiscal measures, financial incentives, etc.) in place in your country/region that encourage renewable energy projects or aim at increasing the share of renewable energy in your country's energy mix? Who are the main actors in the renewable energy sector and what are the linkages between them? Do you have any documentation, references, web addresses or reports on the cited policy measures?

The Government of Canada, and its provincial, territorial, indigenous and municipal government counterparts, recognise that a clean environment and a strong economy go hand in hand. On March 3, 2016, Canada's First Ministers signed the Vancouver Declaration on Clean Growth and Climate Change, and established four Working Groups to develop options to support the development of a **Pan-Canadian Framework on Clean Growth and Climate Change**.

The Working Group on Clean Technology, Innovation and Jobs developed 34 options on how to stimulate economic growth, create jobs, and drive innovation across all sectors to transition to a low-carbon economy, leveraging regional strengths. The Working Group considered policy tools required to bring new and emerging technology and innovations to market, as well as to sustain a competitive economy, reduce greenhouse gas (GHG) emissions, encourage growth and investment, and increase exports of clean technologies, services and expertise.

The efforts led by the Working Group built the foundation of the clean technology, innovation and jobs pillar of the Pan-Canadian Framework on Clean Growth and Climate Change that was adopted by First Ministers on December 9, 2016. The Pan-Canadian Framework clean technology actions are spread across four core themes based on the 34 options presented in the Working Group Report: building early-stage innovation, accelerating growth and commercialization, fostering adoption, and strengthening collaboration and metrics.

The 34 actions on clean technology presented in the Working Group Report and supported in the Pan-Canadian Framework on Clean Growth and Climate Change form Canada's clean technology strategy. The strategy was bolstered by significant investments of more than $2.3 billion in clean technology announced in the Government of Canada's budget 2017. These investments support the development, commercialisation and use of clean technology in Canada, the growth of Canadian clean technology firms, as well as large-scale support for economy-wide innovation.

Government of Canada programming supporting early-stage innovation includes **Sustainable Development Technology Canada**, a fund that supports the development and demonstration of pre-commercial clean technologies**; Impact Canada Clean Technology Stream**, which provides innovative funding methods to solving Canada's biggest challenges with clean technologies; the **Clean Growth in Natural Resources Program**, supporting R&D, demos and adoption in the natural resources sectors; and the **Energy Innovation Program**, which funds clean energy R&D for climate change mitigation, including R&D by national laboratories and small demonstration projects with external participants.

The **International Business Development Strategy for Clean Technology** and **Innovative Solutions Canada** are both helping to boost market pull for Canadian companies, helping them to become world leaders in clean tech. Funding through the **BDC/EDC**, of $1.4 billion, will help

improve clean tech firms' access to capital. The Government of Canada is working to improve data on clean technology in Canada through the **Clean Technology Data Strategy**, with new and expanded surveys, analysis, and ongoing data publication.

The **Clean Growth Hub** is the Government of Canada's whole-of-government focal point for clean technology program coordination and stakeholder engagement. The Hub provides a "no wrong window" service to clients and a centralised forum for stakeholder engagement. The Hub will have an open-access "store front" at its Ottawa office, a regional presence, as well as a website connecting departments, when fully implemented. A key focus of the Hub will be coordinating the more than $2.3 billion invested in clean technology through the federal 2017 budget, including linking clean technology producers to export supports and related initiatives in provinces and territories.

The Hub is being created as part of Innovation Canada, a coordinating organisation established to streamline innovation activities across economic sectors. The Hub advances the Clean Technology and Innovation pillar of the Pan-Canadian Framework on Clean Growth and Climate Change. The Hub is also providing technical and policy support to the administrators of the Invest in Canada Hub, helping to enhance efforts to attract clean technology foreign direct investment.

Information on all of these programs can be found by visiting the Government of Canada's webpage, www.canada.ca.

Furthermore, Canada is playing a leadership role in the global initiative **Mission Innovation** as a member of the Steering Committee. Canada is also co-leading work to identify the most critical areas for collaborative clean energy innovation, the Analysis and Joint Research Sub-group, under which seven Innovation Challenges are being advanced. Additionally, Canada is co-leading work to assist member countries in collaboratively engaging the private sector through the Business and Investor Engagement Sub-group.

Through Mission Innovation, Canada is also supporting Innovation Challenges designed to accelerate global clean energy innovation. Examples include:

- ***Sustainable Biofuels Innovation Challenge***: Canada is co-leading 16 countries to make progress toward affordable, advanced biofuels for transportation and industrial applications;
- ***Smart Grids Innovation Challenge***: Encouraging research to advance the technology needed to bring cleaner, renewable energy onto a smarter electricity grid;
- ***Off-Grid Access to Electricity Innovation Challenge***: Encouraging research and policy developments aimed at advancing clean energy solutions for rural and remote communities; and,
- ***Carbon Capture Innovation Challenge***: Encouraging research in technologies to capture carbon, building on Canada's leading carbon capture and storage expertise.

2. Can you share success stories of renewable energy projects in your country or region? How do you ensure the sustainability of the project, and scale or replicate it? In your answer please include information on the following: location, time period of implementation/starting date, main actors, beneficiaries, funding, technology and innovation used, issues addressed, stage of implementation, sustainability, etc. Do you have any documentation, references, web addresses or reports on the specific examples cited?

The following are six innovative energy technology projects by Canadian partners.

1. ***Oxy-Pressurized Fluidized Bed Combustion***: this new pilot test facility will be the host site for Canada-US collaboration on leading-edge carbon capture technologies for applications in industry or in power generation.
2. ***Flaring & Venting***: CanmetENERGY led a project at a refinery in Mexico, in which it identified ways to reduce GHGs by 1.3 MT annually/yr worth US$100M of saleable products.
3. ***Advanced Refrigeration Technology****:* CoolSolution® technologies are in use in hundreds of arenas and supermarkets in Canada, reducing energy consumption by as much as 60%.
4. ***RETScreen International***: By 2022, over 1M users expected worldwide; $20B in direct user cost savings, $100B in clean energy project investments, and over 50 MT/yr of GHG emission reductions.
5. ***Drake Landing Solar Community – Seasonal Thermal Storage***: Developed a community in Alberta that heats 52 homes with solar energy. The project was the first of its kind in North America, fulfilling 98% of its space heating requirements, setting a world record.
6. ***Oil Sands Bitumen Froth Treatment***: In collaboration with Shell Canada, the development of an improved froth treatment process led to a 10% reduction of energy use and water consumption which is now an industry standard.

Information on all of these programs can be found by visiting the Government of Canada's Mission Innovation webpage, https://www.nrcan.gc.ca/energy/resources/mission-innovation/18612.

Priority Theme 2: Building digital competencies to benefit from existing and emerging technologies, with special focus on gender and youth dimensions

1. Can you give examples of digital competencies projects/policies in your country and how they have contributed to benefit from existing and emerging technologies? What are the main challenges confronted while trying to implement these projects/policies in your country or region?

More and more aspects of Canadians' lives are touched by digital technology on a daily basis. Digital skills are increasingly relevant—in school, at home and in the workplace. Digital skills, like coding and understanding how new technologies can be used to solve real world problems, have become increasingly vital across all sectors of the global economy. For example, learning to code at a young age helps develop analytical thinking and fosters problem-solving techniques - skills important for further study in STEM fields and that are becoming increasingly in-demand for the job market. However, according to the Information and Communications Technology Council, fewer than 50% of Canadian high school students graduate with senior courses in STEM at a time when 70% of Canada's top jobs require an education in those fields.

To ensure that Canadians have the digital skills they need to succeed, the Government of Canada has announced investments in developing and supporting the digital skills of all Canadians. The 2017 federal budget introduced **Canada's Innovation and Skills Plan**, an ambitious effort to make Canada a world-leading centre for innovation, to help create more well-paying jobs, and help strengthen and grow the middle class. This includes equipping Canadians with the tools, skills and experience they need to succeed in the workforce, now and into the future.

Digital skills widen Canadians' access to a world of possibilities. **The Digital Literacy Exchange** program supports non-profit organizations to implement initiatives that teach basic digital skills, including how to use the Internet safely and effectively, at pre-existing facilities such as public libraries, refugee housing complexes and seniors' homes. The program will focus on vulnerable groups such as low-income individuals and families, and seniors.

Assistive technologies such as screen readers, alternative keyboards and refreshable braille displays can make it easier for Canadians with disabilities to more fully participate in the digital economy. To expand the range of assistive technologies, and to give more Canadians better access to digital services, the Government established a new **Accessible Technology Development program**. This program would co-fund innovative projects led by private sector firms, non-profit organizations and research institutes, to develop new assistive devices and technologies.

Access to the Internet opens up a world of opportunities—from social connections with friends and family to new ways to learn and work. Most Canadians are already online, but many low-income families face financial barriers to access, such as the cost of purchasing a computer and the high cost of an Internet connection at home. The **Affordable Access program** will help service providers offer low cost home Internet packages to interested low-income families. As the cost of computer hardware is also a barrier for some families, a target of 50,000 computers refurbished through the existing **Computers for Schools program** will also be distributed to families, along with the low-cost Internet packages.

To identify challenges in digital technology use, and better understand how Canadians use digital technology, the 2017 federal budget has allocated $5 million over five years, starting in 2017–18, for Statistics Canada and private sector-led surveys on the impact of digital technology in Canada. Further Government of Canada-led consultations with consumer advocacy groups, other government departments, research institutions, the not-for-profit sector, the private sector, and end-users are currently underway.

Information on all of these programs can be found by visiting the Government of Canada's webpage, www.canada.ca.

2. Can you provide examples of digital policies/projects/initiatives to benefit from existing and emerging technologies specially focused on gender and youth? How have the policies benefited women and youth? What are the particular challenges confronted in implementing these projects?

Growing a diverse talent pool is critical to Canada's competitiveness in the global economy. As such, it is important to engage all available talent domestically -- including underrepresented groups such as youth, women, Indigenous peoples, and persons with disabilities -- as well as attracting foreign talent through immigration when there is a lack of sufficient skills in Canada.

Talent is the fuel of the Government of Canada's **Innovation and Skills Plan**. Domestically, there is a need to promote the value of science, technology and mathematics, (STEM) learning to Canadians, including youth and underrepresented groups, to better position Canada to readily adapt to the jobs of the future. New and emerging technologies are transforming the workforce and driving the demand for new skills. The Government of Canada is investing in digital skills development for school-age youth that will help them fully benefit from the economic and social opportunities offered by the digital world.

Investing in the development of digital skills for youth, including underrepresented groups like girls, indigenous and disabled youth, is particularly important to ensure they are equipped with what they need for the jobs of today and the future. Canada's success in the digital economy depends on leveraging our diverse talent and providing opportunity for all to participate—investing in digital skills will help to achieve this.

The **CanCode program** will invest $50 million over a two-year period from 2017-18, to support educational opportunities for coding and digital skills development to Canadian youth from kindergarten to grade 12 (K-12).Providing educational opportunities for digital skills development to Canadian girls and boys—from kindergarten to grade 12—will give them the head start they need to find and keep good, well-paying, in-demand jobs. The $50-million program also aims to encourage more young women, Indigenous Canadians and other under-represented groups to pursue careers in science, technology, engineering and math. In addition, it will equip 500 teachers across the country with the training and tools to teach digital skills and coding.

Mitacs is a national, not-for-profit Canadian organization that has designed and delivered research and training programs in Canada for 15 years. Working with 60 universities, thousands of companies, and both federal and provincial governments, the program builds partnerships that support industrial and social innovation in Canada. The federal 2017 budget provides more work-integrated learning placements for Canadian post-secondary students and graduates with innovative companies, with $221 million over five years, starting in 2017-18, to renew and expand federal funding for Mitacs.

Further support for work-integrated learning for students includes the Government of Canada's **Superclusters Initiative**. Budget 2017 allocates up to $950 million over five years to superclusters, which will build strong connections between diverse industries, researchers, intermediary and post-secondary institutions and support research and development linked to commercial outcomes with application in the knowledge-based economy.

The federal 2017 budget included significant investments to help Canadians pursue skills training or upgrade their credentials to remain competitive in the workforce, and in developing

and supporting the digital skills they need to succeed of younger and older Canadians and groups underrepresented in the digital economy. This includes $225 million over four years, starting in 2018-19, and $75 million per year thereafter to establish a new organization to support skills development and measurement in Canada.

Through the **Innovation and Skills Plan**, the Government of Canada has announced a series of investments to ensure all Canadians are prepared for the jobs of the future; workers are equipped with the skills and training they need to succeed in a changing economy; and to encourage and foster inclusive innovation in Canada. This includes making Canada an advanced, digital environment, home to more “smart cities” and connected communities, where cutting-edge scientific research and technology drive business growth and create good, well-paying middle class jobs; delivering high-speed Internet access, so that all Canadians—urban and rural—can be part of the digital economy; and giving all Canadians a real opportunity to participate in the digital economy, especially those for whom evolving technology can deliver life-changing help but who may encounter barriers to accessing it, such as low-income Canadians, adult learners, and Canadians living with disabilities.

Information on all of these programs can be found by visiting the Government of Canada’s webpage, www.canada.ca.

3. How can the science, technology and innovation community contribute towards overcoming these challenges? Can you give any success stories in this regard from your country or region?

Gender and diversity remain an issue at all stages within science, technology, engineering and mathematics (STEM) education and careers. Even with hard evidence of gender and minority bias in STEM fields, studies have shown a relative reluctance among men, and especially faculty men within STEM, to accept evidence of biases in STEM. Unconscious biases can be especially insidious, and the Government of Canada is committed to promoting equity and equality for women, minorities and other underrepresented groups in all spheres of our society.

The Government of Canada believes in an inclusive approach to science promotion. To mark the International Day of Women and Girls in Science on 11 February 2017, Canada's Minister of Science, the Hon. Kirsty Duncan, announced the launch of a national social media campaign to encourage young women to enter STEM fields, Choose Science. When women, along with those who are otherwise under-represented in labs across the country, make the choice to join science, they bring a diversity of perspectives that enrich the research environment, and the overall research community will become a more inclusive and welcoming place to work.

The Government of Canada supports equity and diversity within the research community. Both the Canada Research Chairs (CRC) and the Canada Excellence Research Chairs (CERC) programs have taken steps to ensure access and opportunities to all qualified candidates. In fall 2016, Minister Duncan announced a new CERC competition in which the Government of Canada has strengthened the emphasis on equality and diversity, including a new requirement for a detailed equity plan from institutions. These equity plans will take into account an institution's track record in meeting CRC equity targets.

The Government of Canada Equity, Diversity and Inclusion Action Plan, released in May 2017, is another concrete step to upholding the principles of equity, diversity and inclusion. Canada recognises the value of an inclusive workforce that looks like Canada, better reflecting the full range of Canadian talent. Budget 2017 provides $25 million over five years for post-secondary scholarships from Indspire, with additional leveraging from the private sector of $15 million, which will support scholarships for over 12,000 Indigenous students; $27.5 million over five years, for a Targeted Employment Strategy for Newcomers; and $83.8 million over five years to the integration of traditional Indigenous knowledge to build a better understanding of climate change and guide adaptation measures for Canada and Canadians.

The Natural Sciences and Engineering Research Council's PromoScience Program received an additional $10.8 million over five years, starting in 2017-18, to encourage underrepresented groups to take an interest in STEM, and help create a more gender-balanced stream of talented individuals who are equipped to build – and benefit from – Canada's economic future.

Essential skills are critical for achieving results. The Government of Canada has identified nine essential skills which are used in nearly every job in Canada at different levels of proficiency. These skills are: reading; writing; document use; numeracy; thinking; oral communication; working with others; computer use/digital skills; and continuous learning. The capacity to acquire both technical skills and job-specific skills often depends on proficiency in some, or all, of the nine essential skills. The Government of Canada believes that skills training programs should be increasingly demand-driven, by engaging employers in their design and delivery, along with governments, education and training institutions and other stakeholders. This would enable these programs to better prepare workers to meet the needs of the economy.

4. Could you suggest some contact persons of the nodal agency responsible for digital competencies projects/policies, particularly those related to gender and youth, as well as any experts (from academia, private sector, civil society or government) dealing with projects in this area? We might contact them directly for further inputs or invite some of them as speakers for the CSTD inter-sessional panel and annual session.

Please contact Daniel Dufour, A/Senior Director, Science Policy Branch, Science and Research Sector, ISED. Email: Daniel.Dufour2@canada.ca.

5. Do you have any documentation, references, or reports on the specific examples on digital competencies to benefit from existing and emerging technologies in your country or region?

Information on all of these programs can be found by visiting the Government of Canada's webpage, www.canada.ca.