

## **Standing Senate Committee on Energy, the Environment and Natural Resources**

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Presented by

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## **Introduction**

The Carbon Management Canada-Network of Centres of Excellence (CMC-NCE) was established in 2009 to develop the people, technologies and insights that will enable the fossil energy sector and other large stationary emitters to radically reduce carbon dioxide emissions. Its focus is on innovation, which by definition only occurs when research results are put into actual practice. Therefore CMC-NCE also concentrates on creating the means that will lead to links between academics and practitioners in industry, government and NGOs and specifically aims to increase the innovation practice at Canadian universities.

The company is supported by the federal and Alberta governments and seven fossil energy companies. CMC-NCE currently has over 150 investigators across 26 universities and colleges in Canada. It has administered two rounds of funding which have resulted in 36 research projects committing \$18 million of funding directly with substantial attracted funding from industry and government sources.

In November 2011, CMC-NCE issued a third call for proposals. In previous calls the emphasis was on the fossil energy sector with a few projects in generic emissions reduction technologies such as accelerated rock weathering and mineralization of CO<sub>2</sub>, direct air capture and other areas. In this call CMC-NCE is also seeking projects relating to reducing emissions associated with mining, metallurgical processes and cement production.

## **Research**

CMC-NCE funds research with ambitious objectives aimed at game-changing technical developments and social policy change, rather than incremental developments of current approaches. The network also encourages multi-disciplinary, multi-institutional, cross-sectoral and international participation in projects in order to facilitate breakthrough thinking and challenge Canadian researchers to engage at a global level.

Research is funded in four areas but it should be noted that these are loose groupings and that one project can span several themes. **Theme A, Recovery, Processing and Capture**, focuses on technologies to capture or reduce CO<sub>2</sub> emissions and improve carbon utilization efficiency in operations such as power generation, bitumen upgrading, mining, metallurgical processing and cement production. **Theme B, Enabling and Emerging Technologies**, focuses on incorporating understandings from revolutions in biology, nanotechnology and chemical, and engineering practice to enable novel low emission energy recovery processes and routes to large-scale emissions reduction. **Theme C, Secure Carbon Storage**, focuses on carbon storage issues including the currently envisaged geological storage processes and other newer alternatives. **Theme D, Accelerating Appropriate Deployment of Low Carbon Emission Technologies**, focuses on developing routes to improved links between technological innovation (Themes A, B and C) and the enabling social, economic and policy dimensions. It includes policy, regulation, business practices, economics, life cycle analysis, risk assessment and communication, media impacts, and public engagement practices.

### **International Research Initiatives**

Carbon management is a rapidly developing field of global interest with substantial activity and investment. The network supports Canadian researchers who participate in EU and other international research initiatives. It also has collaborative working relationships with other world-class research groups in Australia and the United States, and is working to develop links into Asia.

### **HQP Development Activities**

Part of CMC-NCE's mandate is to help fulfill the growing demand for highly qualified professionals in the new green energy field. To work toward this end it established a national Highly Qualified Personnel Development Committee to pull industry, government and academic institutions together to guide development of pragmatic

HQP programs that seek to enable our young researchers to move beyond research to innovation.

Additionally, it has been clearly identified that if declared national pledges for carbon emission reductions are to be achieved, a large number of people with specialized skill sets will be required over the coming five to twenty-five years. Many of these will be specializations of various technical and professional fields that are foreseen to undergo dramatic shortages over the next decade or more due to demographic shifts.

### **Barriers to Success**

Of course, having the right people trained up and in place will only work if the solutions that are presently in hand, and those that are under development, are implemented beyond a handful of demonstration projects. One of the primary barriers to pushing research forward, attracting new people into the various required fields, and transferring research results to practice is the lack of a clear economic incentive to reduce carbon emissions. For many, there is no clear return on investment in carbon management technologies, especially carbon capture and storage which requires a large investment of funds. Instead, many in industry seek a focus on technologies that will reduce carbon emissions incrementally with existing technology offering an immediate return and at low cost. There is a lack of market pull for game-changing technologies.

Many promising technologies are being produced already through the first rounds of CMC-NCE's funding, and through other funding processes. What is needed for these results to represent true "innovation" is the hard work of transfer to practice. Moving from bench scale to pilot, demonstration and full commercial implementation requires a commitment of time and effort as well as substantial funding on the part of research, industry and regulatory communities. However without economic signals the results of even the most promising research will stop at publications as much good research has done so before. This is the Canadian

dilemma. We are in the A league for basic research but well down the B leagues for innovation and technology deployment.

### **Opportunities**

Despite this, there are two strong paths that could lead to opportunities. One is to develop relationships with EU and Asian technology companies to maximize commercialization through those channels where risk-taking is greater and piloting a more accepted route. While much less of the economic benefit of the research efforts will accrue to Canadians in this path, at least the technologies will be commercially available for Canadian industry to purchase if and when economic conditions create demand.

The second is to establish a broad, transparent and easy to understand national carbon pricing structure. Although many say this carries a huge economic penalty, this is an assumption that needs to be checked. According to the Conference Board of Canada<sup>i</sup>, Canadian energy intensity dropped by 34% between 1971 and 2008. Often the oil price shock of the 1970s is used as support for the direct linkage between energy price and economic impact, but the link is weakening. Further, as the investments and innovations fueled by these incentives are implemented, that link will weaken at an accelerating pace.

### **Conclusions**

The Canadian research community has tremendous research capacity to solve crucial challenges relating to industrial carbon emissions but our universities and industry have not been successful in converting this invention through to innovation. We regularly hear that industry is willing to convert the results of research into practice – which is the only way to achieve real innovation – but only within the context of a secure regulatory environment and economic incentives. Many in industry speak of having plans “in the drawer” but are frustrated because they can’t justify implementation until they see the requisite signals. Many others

would willingly support more pilot or demonstration projects, but the uncertainty of economic signals and timing makes it appear a risky bet.

The current global economic downturn has hit many countries hard and they have been forced to temporarily downgrade their attention to this crucial area. Canada, however, is in a strong position to capitalize on its relative wealth, stability and abundance of fossil resources to take a lead in the area of carbon emissions innovation. This will require clear, transparent and broadly applied price signals to do so.

Complex regulatory signals are difficult for entrepreneurs, researchers and investors to interpret. Regulations that are ambiguous or open to divergent interpretations can increase the perception of risk. They also slow technology investment and development because it takes longer to understand and respond to the requirements.

Simple, broad, clear price signals can be accurately converted to economic return on investment calculations even by small to medium enterprises who do not have access to fleets of economists and lawyers. Concise, clear signals make investment decisions more rapidly assessable by investors and make research and commercialization priorities easier to access and implement. They also reduce the likelihood of unintended or perverse incentives.

Research funding by government is, of course, important. However, effective price signals will result in appropriately targeted private sector support and will attract more highly qualified researchers, entrepreneurs and innovators into the field.

If Canada commits to taking a lead in valuing carbon emissions, we will build a springboard for our future global industries. We will launch the success of coming generations by embracing the challenge, and the responsibility, that comes with our fossil energy wealth.

At the same time the U.S. and many other countries in the world are stepping away from carbon pricing due to the exigencies of the deep economic crisis, which is hitting them more deeply than Canada. That differential is due in large part to the strength of the fossil energy sector in Canada. This brings us full circle. The world's attention will inevitably come back to concerns with global change due to greenhouse gas emissions. By moving now, Canada can leverage its position to be a supplier of technology to the world's fossil energy producers. Canada is in a strong position to understand and develop the next generations of technologies to address the carbon emission challenges associated with fossil energy production and processing.

Where the object is to foster and accelerate growth of an ecosystem of innovation, the signals need to be clear and visible to researchers; to SMEs, angel investors, venture capitalists and bankers; to technology vendors, project developers and integrators, and services companies; and to the colleges and universities planning their curricula. A clear, broad, predictable and transparent pricing scheme, whether it is mandated or set through market mechanisms, tells Canadians and the world that Canada recognizes that resource wealth brings both benefits and responsibilities and that we embrace those responsibilities. Canada is not a free-rider on the global environmental commons.

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<sup>i</sup> Conference Board of Canada Website – page dated October, 2008.  
<http://www.conferenceboard.ca/hcp/Details/Environment/energy-intensity.aspx>