Funding Clean Technology Development (Presentation)

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Abstract

As the world's population grows, so does the demand for energy. All estimates indicate that the bulk of energy needs will be met through fossil fuels for decades to come. Increasing fossil fuel production to meet rising demand means that, globally, greenhouse gas emissions will likely continue to increase. The need for innovative clean technology that will reduce greenhouse gas emissions is imperative. The Climate Change and Emissions Management (CCEMC) Corporation provides one policy model that is effectively bridging the innovation gap to spur investment in clean technology and help foster a lower carbon economy.

Keywords: lower carbon economy, clean technology, policy

Résumé

Au fur et à mesure que la population mondiale augmente, la demande en énergie s'accroît. Toutes les estimations montrent que les combustibles fossiles vont combler l'essentiel des besoins en énergie durant les prochaines décennies. La croissance de la demande en énergie entraînant une augmentation de la production de combustibles fossiles, il est probable que les émissions de gaz à effet de serre continueront d'augmenter à l'échelle planétaire. Une technologie novatrice pour réduire les émissions de gaz à effet de serre devient donc essentielle. La Climate Change and Emissions Management Corporation (CCEMC) propose un modèle de politique qui comble efficacement le déficit d'innovation, stimule les investissements dans des technologies propres et favorise une économie à plus faible empreinte carbone.

Mots-clés : économie à plus faible empreinte carbone, technologie propre, politique

1. Introduction

Canada is blessed with abundant energy resources, both renewable and non-renewable. The country is one of the world's top five energy producers [1].

Canada also produces about two per cent of the world's greenhouse gas emissions. The country is committed to greenhouse gas (GHG) reductions, but faces a challenge. As corporations increase energy production to meet rising demand, absolute GHG emissions are also increasing. There is a need to continue to increase energy production in Canada while at the same time, reducing the absolute level of GHG emissions.

The solution rests with the development of new technology that can support cleaner energy production. The Climate Change and Emissions Management (CCEMC) Corporation provides one policy model that is effectively bridging the innovation gap to spur investment in clean technology and help foster a lower carbon economy.

2. The need for clean technology to support growing demand for energy

According to the International Energy Agency, global demand for energy is growing, primarily due to increased demand by countries like China and India [2]. Even with the continued development of renewables and energy efficiency efforts, primary energy demand is projected to increase by about 36 per cent worldwide between 2008 and 2035 [3] and according to the 2012 World Energy Outlook fossil fuels will remain the principal sources of energy, even as renewables continue to grow. By 2035, oil, gas and coal will still meet 75% of the world's demand for energy [4].

Canada can play a significant role in addressing this growing global demand. The country is the only non-OPEC country among the top five countries with large proven oil reserves. In 2011, Alberta's total proven oil reserves, proven meaning that they can be recovered using current technology and under current economic conditions, were 170.2 billion barrels, 11% of total reserves. Canada also has significant natural gas reserves and vast coal beds that are largely untapped.

Growing global energy demand, large proven energy reserves, strong regulation and a stable political environment combine to make Canada an increasingly important supplier in a world that is hungry for energy. However, the country has been under some international scrutiny linked to environmental impacts associated with oil sands development.

Today, the United States, China, Russia, India, Japan and Europe all have higher total GHG emissions from fuel combustion than Canada [5]. While the oil sands, one of Canada's most significant energy resources, are sometimes criticized as a major source of global GHG emissions, they actually account for less than 0.15% of total global emissions [6].

While the emissions intensity has declined, increasing production from the oil sands to meet energy demands means that absolute emissions will grow. Canada needs to continue to increase energy production from fossil fuels while at the same time, reducing the absolute level of GHG emissions.

It is in Canada's self-interest to continue to manage its energy resources prudently and to continue to improve practices, reduce emissions, and reduce the impact resource development has on the environment. Technology development is the key to reducing greenhouse gas emissions from fossil fuels. With demand for fossil fuels and ongoing concerns about the impacts of greenhouse gas emissions, Canada must develop clean technology that will enable it to continue to develop fossil fuel resources and provide secure and responsible energy.

3. The CCEMC model

Canada has a number of government programs and incentives that support the development of clean technology. For example, the federal government funds an organization called Sustainable Development Technology Canada, or SDTC. SDTC operates two clean tech funds. A $590 million SD Tech Fund™ and a $500 million NextGen Biofuels Fund.

Some provinces have programs to support clean technology as well. One way Alberta is fostering the development of clean technology is through the Climate Change and Emissions Management (CCEMC) Corporation. Alberta, home to Canada's largest oil resource, took early action to reduce GHG emissions. The province produced the first Climate Change Action Plan in Canada in 2002. It was the first jurisdiction in North America to legislate mandatory greenhouse gas emission reductions across all industrial sectors in 2007. It was the first province in Canada to set a price on carbon ($15/tonne) for large emitters.

The CCEMC model is unique. It operates independently of industry and at arms-length from government. It is a not-for-profit corporation that provides ongoing, dedicated funds to support the discovery, development and deployment of transformative technology.

Funding for the CCEMC is collected from industry. Since 2007, Alberta companies that annually produce more than 100,000 tonnes of GHG emissions are legally required to reduce their emissions intensity by 12 per cent below a baseline based on 2003-2005 emissions production.

New facilities, or those facilities that began operation on or after January 1, 2000, and that have completed less than eight years of commercial operation, are required to reduce their emissions intensity by two per cent per year starting in their fourth year of commercial operations. New facilities are required to establish a baseline emissions intensity based on their third through fifth full years of commercial operation. The reduction obligation for new facilities ramps up by two per cent per year until the ninth year of commercial operations when a 12 per cent target is reached.

Companies have three options to meet their compliance reduction target:

- improve the efficiency of their operations,
- buy carbon credits in the Alberta-based offset system or
- pay $15 dollars into the Climate Change and Emissions Management Fund for every tonne they emit over the reduction limit.

The money in the fund is collected by the government and segregated from public accounts. That means that these funds are not affected by the government's normal budgeting process as they can only be spent on reducing greenhouse gas emissions. Funding is also sustainable, because industry must renew their compliance and meet their targets annually. The CCEMC administrative costs are maintained at less than five percent of the total funds under management.

The CCEMC receives money from the government in the form of a grant and the organization is charged with investing money from the fund into projects that will provide emissions reductions.

Clean technology projects are selected through a request for proposal process and funded through grants that are managed through a contribution agreement that pays out based on performance.

4. CCEMC performance

The CCEMC began funding projects in 2010 and by the end of February 2013, had committed over $181.5 million in funding to 48 clean tech projects. The projects have a combined value of nearly $1 billion. CCEMC funds are typically leveraged on a 4 to 1 basis. For every dollar CCEMC invests in clean technology, on average, another four dollars are also invested.

The organization's portfolio is diverse. It includes energy efficiency, carbon capture and storage, biological projects, renewables, and projects intended to reduce greenhouse gas emissions from fossil fuel recovery and processing.

There are several examples of the effectiveness of the CCEMC model:

4.1 CCEMC achieves real reductions in greenhouse gas emissions

First, the CCEMC is achieving its mandate by enabling and delivering real reductions in greenhouse gas emissions through the projects it supports. The organization estimates that the projects committed to by the end of February 2013 will combine to reduce emissions by about 7 megatonnes over 10 years. The estimate of 7 megatonnes is conservative and does not include the potential of additional GHG reductions as new technology is broadly adopted and deployed into the marketplace.

For example, in June 2012 the CCEMC announced funding for six clean technology projects and estimated they would combine to reduce emissions by less than 200,000 tonnes over 10 years. While it is beyond the scope of work the CCEMC is directly funding, the potential emissions reductions that could be realized through build out and commercialization of the technologies is estimated at roughly 5 megatonnes by 2021.

4.2 CCEMC has the potential to identify game changing technology

In addition to reducing greenhouse gas emissions, the CCEMC has the potential to identify game-changing technology – technology that has the capacity to significantly change the way an industry or sector operates.

Many of the CCEMC projects would make little economic sense to investors. They're risky, costly and most wouldn't be viable without financial support from the CCEMC. The CCEMC provides patient capital – with no requirement for a return on investment, other than expected reductions in greenhouse gas emissions.

One example of a project that has the potential to produce game changing technology is tied a project by the ESEIEH Consortium (Harris Corporation of Florida, Nexen Inc., Suncor Energy Inc. and Laricina Energy Ltd.). They have field-tested a new extraction method in the oil sands that draws on electromagnetic heat, rather than steam, to extract bitumen. It applies Harris Corporation's antenna technology to heat the oilsands electrically with radio waves. If it works, it should have a significant impact on water use and significantly reduce the greenhouse gas emissions while reducing extraction costs. While additional work remains before the commercial viability of the process can be determined, a test conducted last year confirms the ability to successfully generate, propagate and distribute electromagnetic heat in an oil sands formation.

Another example of a project that may produce technology advancement in the oil sands industry is the MEG Energy HI-Q process. If successful, the MEG project has the potential to reduce greenhouse gas emissions, increase the capacity of existing pipeline infrastructure, and reduce water consumption. The MEG project uses a low pressure, relatively rapid conversion process with lower energy requirements to convert bitumen into a pipeline ready product oil (HI-Q) which does not require transport diluent. The combination of mild thermal cracking coupled with advanced solvent separation convert bitumen more effectively than conventional upgrading, resulting in comparably lower GHG emissions for the high yields of product oil produced. By eliminating the need for light hydrocarbon diluent, the Hi-Q process also

effectively increases the product volume that can be transported through existing pipeline infrastructure. The project has been successfully piloted at a smaller scale.

Cenovus is drawing on the CCEMC funding to develop the world's first and largest field pilot that uses chemical looping combustion technology to generate steam in the oil sands. The 10 MW pilot is expected to demonstrate that the technology is energy efficient, carbon capture ready, and lower cost than conventional steam generators.

Inventys is using their VeloxoTherm™ technology for a carbon capture pilot at Joffre that captures carbon dioxide in a steam boiler so it can be used for enhanced oil recovery. The novel technology may prove to be the lowest cost and most energy efficient technology for capturing carbon dioxide from industrial flue gas streams. It could also be applied to coal and natural gas power plants, steam generators and Steam Assisted Gravity Drainage operations in the oil sands.

These are just some examples of the innovative technologies the CCEMC has identified to date.

4.3 CCEMC is actively seeking the best and brightest ideas to support

The CCEMC is effective is that it is continuously seeking out innovative clean technology from around the world. The organization is committed to supporting the best ideas and, while technology must be applicable in Alberta, research can occur anywhere.

The CCEMC already supports projects led by companies in the U.S. and across Canada. As the CCEMC becomes more sophisticated in efforts to reach an international community submissions are beginning to come in from around the world – including the United Kingdom, Europe, India, Asia, Africa and the Middle East.

Typically CCEMC invites funding submissions for new projects twice a year. After initial proposals are received, they are vetted and shortlisted by a team of technical experts from Alberta Innovates – Energy and Environment Solutions. The technical team also assesses full project proposals and makes recommendations to the CCEMC board. The CCEMC board, which represents various industry sectors and the public at large, make all final funding decisions.

In addition to regular requests for proposals, the CCEMC launched an international Grand Challenge in February 2013. The open innovation competition will award up to $35 million in grants for technology that will create new carbon based products and markets. The five-year initiative is expected to identify multiple novel technologies that will also serve to reduce GHG emissions.

Today, there are very limited uses for captured carbon, such as Enhanced Oil Recovery. Other smaller, niche applications include mineralization and greenhouse applications – but these utilize only a fraction of the carbon produced and captured annually. The CCEMC Grand Challenge will expand on this technology by looking into a broad array of end uses for the captured carbon beyond storage.

If captured carbon is repurposed and becomes an enabling starting material instead of a waste stream, new markets will arise that could consume significant volumes of carbon and subsequently reduce GHGs through the development of a carbon-based economy.

The three-stage competition provides opportunities for funding at each stage. Through the unique structure of this Challenge, the diverse global community of technical solution providers will have an opportunity to network and collaborate together on novel solutions. The process also enables the CCEMC to support the development of multiple ideas that can progress simultaneously.

While this is a five-year initiative, in the first stage the CCEMC is offering up to $10 million through a maximum of 20 $500,000 grants. While the technology can be developed anywhere in the world, it must be capable of being commercialized in Alberta. (Full details are available online at ccemcgrandchallenge.com).

Over time, the CCEMC projects will add to a growing body of knowledge, and the organization will continue to seek out innovations that can be applied worldwide with the potential of game-changing outcomes.

4.4 The CCEMC is spurring investment in clean technology and producing economic impacts

Most importantly, the CCEMC is spurring investment in innovative technology and producing economic benefits. For every dollar the CCEMC invests in projects, another four dollars, on average, are also invested. These investments help diversify Canada's economy and bring new businesses and new jobs.

A 2010 report by the Conference Board of Canada called the *Economic and Employment Impacts of Climate Related Technology Investments* examined plans for government and matching private sector investments from 2010 through 2014. The report found the economic impacts were significant and broadly distributed. In Alberta, spending generated by technology funds was estimated to boost Alberta's real GDP by about $4.8 billion and create close to 50,500 person-years of employment. The projected benefits were also visible in Ontario where every $100 million in technology investments is estimated to result in $107 million in real gross domestic product. Other economic benefits included increased employment and higher tax revenues.

The *2013 Canadian Clean Tech Industry Report* indicates that clean technology is set to become a $26 billion dollar industry in Canada and surpass the size of the aerospace industry within five years. Based on data gathered for the report, the clean tech industry already employs more people than the aerospace industry. Further, it is expected to export 70 per cent of what it produces by 2015. By some estimates, Canada alone could eventually account for about 3 per cent of the estimated $1 trillion global market for clean technology [7].

5. Conclusion

The CCEMC is an organization supported by the Alberta government to provide funds to organizations to research or develop methods of reducing greenhouse gas emissions. No return on investment, other than reduced greenhouse gas emissions, is required. Thus, economically risky projects can be supported. International projects can be supported, provided the results can be applied in Alberta. Currently, the funds come from penalties levied on Alberta companies as one compliance mechanism for reductions in GHG emissions.

6. References

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7. Biography

Dr. Eric Newell, P.Eng. served as President, CEO and Chairman of Syncrude Canada Ltd. Under his leadership, Syncrude, the world's largest producer of crude oil from oil sand, became an increasingly significant source of energy supply. Eric was appointed an Officer of the Order of Canada in 2000. He serves on a number of boards, and as Board Chair for both the CCEMC and for Alberta Innovates – Energy and Environment Solutions.