



Innovation Clusters on Shale Resource Development and Distributed Power Generation: A Progress Report to Ministers

Energy and Mines Ministers' Conference

Winnipeg, Manitoba
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Introduction

At the 2014 Energy and Mines Ministers' Conference (EMMC), federal, provincial, and territorial (FPT) ministers emphasized the need to address environmental performance in Canada's natural resource industries through the advancement of research, technology, and innovation. In response, the EMMC Energy Technology Working Group (ETWG) launched a multijurisdictional and multi-year effort to advance collaboration on innovation through science and technology.

In previous years, the ETWG has produced analytical reports on smart grid technologies (2012), shale resource development (2013), and efforts by Canadian governments to spur energy innovation within their respective jurisdictions (2014).

Building upon these efforts to create a common knowledge base, the ETWG shifted its focus in 2015 to seek out concrete ways to increase collaboration across FPT governments. The result of this approach was the creation of a new mechanism to enhance FPT collaboration. "**Energy innovation clusters**" were formed of FPT experts to drive collaboration in priority technology areas through the establishment of multi-jurisdictional action plans.

Amongst jurisdictions, a number of technology areas were reviewed as potential areas of focus for a cluster. Based on consultation within the ETWG, two innovation clusters were established in the lead up to EMMC 2015:

1. Cluster on **Improving Environmental Performance in Shale Resource Development**

Participants: Federal government, B.C., Alta., Sask., N.B., N.L., N.W.T., Y.T.

2. Cluster on **Distributed Power Generation**

Participants: Federal government, B.C., Man., Ont., Que., N.S., N.B., N.L., P.E.I., N.W.T., NU

The resulting action plans, published for EMMC under the title, *Taking Action: Moving Forward Together on Energy Research, Technology and Innovation*, included a set of nine collaborative actions that were proposed by clusters, to be undertaken over the following year. It was also established that the ETWG would report back to the ministers at EMMC 2016 on progress made on these collaborative actions.

The following report provides a summary of progress made for each of the nine collaborative actions that were launched through the ETWG's Energy Innovation Clusters in 2015.

Shale Resources Cluster			Distributed Power Generation Cluster		
Action		Status	Action		Status
1	Wellbore integrity roadmap	In progress	1	Showcasing Canadian technology internationally	In progress
2	Geoscience and geo-engineering R&D gaps	Completed	2	Remote communities database	In progress
3	Environmental baseline data	Completed	3	District Energy Economic Model	Completed
4	Flaring and venting regulators forum	Completed	4	Energy storage information sharing	Completed
			5	Renewables in Remote Microgrids conference	Completed

Shale Resources Cluster

Action #1 – Technology Roadmap on Wellbore Integrity

PARTICIPANTS:
Natural Resources Canada / British Columbia / Alberta / Saskatchewan / Newfoundland and Labrador / Northwest Territories
MEASURE DESCRIPTION:
<p>Based on an initial workshop related to wellbore integrity in March 2015, co-hosted by Natural Resources Canada (NRCan) and Alberta Innovates, this project sought to develop a collaborative technology roadmap for addressing research and technology gaps related to wellbore integrity, with the ultimate goal of improving environmental performance.</p> <p>Topics and issues that were addressed in the initial workshop, such as the magnitude and frequency of gas leakage into the shallow subsurface, methods to improve initial completion of wells, and maximizing the success of remediation efforts, contributed to the development of this technology roadmap.</p>
RESULTS:
<p>NRCan has partnered with the Canadian Society for Gas Migration to convene a steering committee for this project and is working toward contracting a series of reports by industry experts that will guide and inform the development of the technology roadmap. These reports will be presented at workshops in summer 2016. During the workshops, stakeholders from industry, academia, and provincial/territorial governments will meet, discuss, and provide feedback on the reports.</p> <p>The creation of a wellbore integrity roadmap will result in an overall improvement in shale resource development across jurisdictions. Collaboration among industry, academia, and government enhances the capacity of participating jurisdictions to address technology gaps.</p> <p>The final technology roadmap is expected to be completed by March 2017.</p>

Shale Resources Cluster

Action #2 – Identifying Geoscience and Geo-engineering R&D Gaps

PARTICIPANTS:
Natural Resources Canada / British Columbia / Alberta / Saskatchewan / Manitoba / Ontario / Quebec / New Brunswick / Nova Scotia / Newfoundland and Labrador / Yukon / Northwest Territories / Nunavut
MEASURE DESCRIPTION:
<p>This initiative convened a series of workshops of science and policy experts across the country to discuss challenges faced by Canada's shale industry. Specifically, the workshops sought to identify research and development (R&D) gaps related to the geoscience and geo-engineering aspects of shale resource development.</p> <p>In February–March 2015, NRCan held a series of regional workshops comprised of provincial/territorial governments, industry, and academia representatives in Halifax, Québec, Calgary, Vancouver, and Winnipeg. Close to 200 representatives attended the workshops, and broad topics discussed included:</p> <ul style="list-style-type: none"> • Common barriers to innovation (e.g. lack of access to industry/government data); • Geological and aquifer mapping; • Fugitive greenhouse gas emissions, wellbore leakage and induced seismicity; • Enhanced oil recovery; • Improved secondary/tertiary recovery techniques; and • Rock formation characterization.
RESULTS:
<p>A summary report of these workshops is available online at the following address: nrcan.gc.ca/energy/sources/shale-tight-resources/17687.</p> <p>The regional workshops culminated in a national roundtable, co-hosted by Canada's Public Policy Forum, in Ottawa on March 26, 2015. A final summary report from the national roundtable, titled <i>Canada's next energy frontier: Shale oil and gas</i>, was published in January 2016 and is available online at the following address: ppforum.ca/publications.</p> <p>This initiative helped to inform policy makers and industry on how R&D can help improve the economic and environmental performance of shale resource development in Canada.</p>

Shale Resources Cluster

Action #3 – Information Sharing on Environmental Baseline Data Collection

PARTICIPANTS:
Natural Resources Canada / British Columbia / Alberta / Saskatchewan / Newfoundland and Labrador / Yukon / Northwest Territories
MEASURE DESCRIPTION:
<p>Baseline environmental data related to shale resource development is collected across the country in a variety of areas (e.g. air quality and emissions, surface and groundwater quality and mapping, seismicity). This information plays a vital role in assessing and monitoring potential environmental risks associated with shale resource development. Jurisdictions within the EMMC Shale Resources Cluster agreed that sharing information on the types of data being collected across jurisdictions would help facilitate further opportunities for enhanced collaboration.</p> <p>NRCan hosted a teleconference meeting in March 2016 with representatives from NRCan's Office of Energy Research & Development, CanmetENERGY Laboratory, the Geological Survey of Canada, British Columbia, Alberta, Yukon, and the Northwest Territories and provided an opportunity for representatives to report on the collection of environmental baseline data in their jurisdictions.</p>
RESULTS:
<p>The information-sharing session provided participants with a broader understanding of the shale projects and methodologies being used across Canada and helped to connect governments on related files. Improving environmental data collection plays a key role in shale resource development across jurisdictions. This initiative supported enhanced collaboration among the FPT governments, ultimately improving Canada's capacity in environmental baseline data collection.</p>

Shale Resources Cluster

Action #4 – Participation in a Venting and Flaring Forum

PARTICIPANTS:
Natural Resources Canada / Yukon
MEASURE DESCRIPTION:
<p>The purpose of this initiative was to raise awareness of the Canadian Flaring and Venting Regulators Forum within the Shale Resources Cluster and promote additional participation. The Forum discusses topics related to the regulation of venting and flaring associated with tight oil and gas operations, and promoting the advancement of regulations and related technologies with an aim to improve the environmental performance of oil and gas operations.</p> <p>Prior to this initiative being raised within the Shale Resources Cluster, the Yukon government had not participated in the Forum.</p>
RESULTS:
<p>As a result of introductions made through the Shale Resources Cluster, the Yukon government joined the Canadian Venting and Flaring Regulator's Forum and hosted the annual general meeting in Whitehorse in June 2015. Further meetings were also convened with officials from NRCan, the Alberta Energy Regulator, the Yukon government, the Arctic Institute, and the Yukon Research Centre Cold Climate Innovation to exchange information and discuss topics of shared interest.</p>

Distributed Power Generation Cluster

Action #1 – Showcasing Canadian Technology Successes Internationally

PARTICIPANTS:
Natural Resources Canada / British Columbia / Ontario / Quebec / Newfoundland and Labrador / New Brunswick / Nova Scotia / Northwest Territories / Nunavut
MEASURE DESCRIPTION:
<p>This initiative sought to establish a collaborative side event to the International Conference on Integration of Renewable and Distributed Energy Resources (IRED), being co-hosted in Niagara Falls, Ontario, by NRCan and the Ontario Ministry of Energy (Ontario Energy) on October 25 to 27, 2016.</p> <p>Ontario Energy is serving as the conference's policy session-chair and co-hosting a Smart Grid Showcase with Japan's New Energy and Industrial Technology Development Organization (NEDO). This showcase will raise awareness of successful Canadian innovation related to the development of smart grid technologies. One hundred and fifty industry and government delegates from around the world are expected to attend the conference.</p> <p>As a result of Distributed Power Generation Cluster discussions, it was determined that an opportunity existed to broaden participation of this side event to include other Canadian jurisdictions in order to provide a more comprehensive look at Canadian energy technology innovation in this area. The Smart Grid Showcase is expected to take place on Monday, October 24, 2016, with Japan and Ontario Energy each hosting half of the day. Ontario's portion intends to highlight the establishment of smart grid labs in Ontario and the development of successful partnerships between industry and academia that translate R&D strengths into a growing smart grid sector.</p>
RESULTS:
<p>Provinces and territories have been invited to attend the conference and were encouraged to contact Ontario with any recommendations regarding smart grid-focused labs or partnerships that could be highlighted within the Smart Grid Showcase event.</p> <p>By showcasing Canadian innovation in smart grid technologies to international industry and government delegates, this event is anticipated to bolster Canada's reputation as a global leader in these technologies. Increased collaboration among Canadian jurisdictions ensures a comprehensive picture of Canada's strengths in smart grid technologies is presented on the international stage. Additionally, the conference provides an opportunity for enhanced international collaboration on the development of smart grid technologies.</p>

Distributed Power Generation Cluster

Action #2 – Pan-Canadian Database on Energy Usage in Remote Communities

PARTICIPANTS:
Natural Resources Canada / Quebec / British Columbia / Nunavut / Northwest Territories
MEASURE DESCRIPTION:
<p>NRCan's database on energy production and usage in remote communities provides quality controlled and easily accessible data for Canada's 294 remote, off-grid communities in areas such as energy production and use and costs of electricity on a site-by-site basis.</p> <p>The goal of this project was to enhance the utility of the database through the creation of a FPT steering committee, while updating the information within the database with the help of committee representatives.</p> <p>On October 14, 2015, NRCan officials provided a presentation to the Canadian Remote Microgrid Network, raising awareness of the database and presenting the idea of establishing a Federal, Provincial and Territorial Steering Committee for the project. The anticipated role of the Steering Committee includes:</p> <ul style="list-style-type: none"> • Quality control for the database; • Determining improvements in both quality and functionality; and • Helping raise awareness of the tool to those working in this area.
RESULTS:
<p>NRCan is currently upgrading the database, and a new version will be available in summer 2016. As a result, NRCan has delayed setting up the advisory steering committee until the new database is ready so that members can review it and provide guidance. NRCan is also trying to secure additional funding for the next five years to support work on the database.</p> <p>A first meeting of the steering committee was held in May 2016.</p> <p>Work and collaboration on this database will provide important energy data to remote communities that can assist them in transitioning away from fossil fuel dependence.</p>

Distributed Power Generation Cluster

Action #3 – District Energy Economic Model

PARTICIPANTS:
Natural Resources Canada / British Columbia / Nova Scotia / Newfoundland and Labrador / Nunavut
MEASURE DESCRIPTION:
<p>This project aimed to enhance the utility of an economic model, developed by NRCan, that provides governments, municipalities, and project proponents with an estimation of the broader socio-economic benefits (e.g. jobs created, economic activity) of district energy system projects.</p> <p>Currently, the only data available for use in the model is collected federally by Statistics Canada and is aggregated at the provincial/territorial level. As a result, the outputs of the model are limited to providing the average benefits of a project to an entire province or territory and not at the community level. This limits the utility of the model as the jobs and economic activity created by a project would differ substantially between an urban, economic centre (e.g. downtown Toronto) and a more rural community.</p> <p>The participants of this action agreed to meet and discuss potential avenues to circumvent this particular challenge. An initial meeting was held in August 2015 in order to explain the project in greater detail to participating jurisdictions and discuss the potential availability of additional data for the model.</p>
RESULTS:
<p>The meeting confirmed that provincial and territorial governments rely on Statistics Canada data and do not generally collect additional data on industrial activity at the community level. NRCan initiated a series of meetings with Statistics Canada to determine whether they could provide assistance in the collection of additional industry data.</p> <p>Unfortunately, it was determined that neither Statistics Canada nor provincial and territorial governments collect the industry data necessary to improve the model at this time. NRCan continues to work with Statistics Canada to provide advice on its evaluation of future government data needs.</p> <p>This initiative developed a new area of collaboration among Canadian jurisdictions, federal agencies, and industry with the intended future goal of carrying out data collection at the municipal level to enhance the utility of the District Energy Economic Model.</p>

Distributed Power Generation Cluster

Action #4 – Information-sharing Session on Energy Storage Technologies

PARTICIPANTS:
Natural Resources Canada / Northwest Territories / Ontario / Quebec / Nova Scotia
MEASURE DESCRIPTION:
<p>Energy storage is a shared technology priority area for jurisdictions, with the development of new technologies (e.g. hydrogen storage, flywheels, pumped-hydroelectric storage) occurring across the country.</p> <p>In order to gain a better understanding of Canada's capacity in energy storage and potentially align with jurisdictions with similar interests, an information-sharing session was scheduled for interested jurisdictions.</p> <p>NRCan hosted a teleconference on March 2, 2016, with representatives from participating provinces/territories, as well as the private sector, to discuss energy storage activities occurring in their province or territory. Participants provided progress updates on projects at the FPT levels, ranging from early-stage research to commercialization, many of which have included collaboration with utilities, academia, and the private sector.</p>
RESULTS:
<p>The information-sharing session provided valuable information to all participating jurisdictions on the range of energy storage technology activities occurring across the country and opportunities going forward. Participants agreed to share a list of resources amongst the group to provide further information on relevant projects of interest.</p> <p>Additionally, details for an upcoming energy storage conference organized by Ontario and the National Research Council in September 2016 were shared, with participants encouraged to attend and help raise awareness of the event within their respective jurisdictions.</p> <p>This project support enhanced collaboration among the FPT governments, ultimately improving Canada's capacity as a whole in the field of energy storage technologies.</p>

Distributed Power Generation Cluster

Action #5 – Increasing Government Engagement in the Renewables in Remote Microgrids Conference (Yellowknife, Northwest Territories, in September 2015)

PARTICIPANTS:
Natural Resources Canada / Northwest Territories / Nunavut / Yukon / Newfoundland and Labrador / Ontario / Alberta
MEASURE DESCRIPTION:
<p>The Renewables in Remote Microgrids Conference is a biennial event to promote the application of renewable energies (primarily wind and solar), coupled with smart grid technologies in remote and/or northern communities. The conference brings together community members, manufacturers, researchers, and governments from across North America to discuss and promote renewable energy and smart grid technologies to solve remote energy challenges. The 2015 conference, hosted by the Government of the Northwest Territories in September, attracted over 150 participants.</p> <p>Engaging primarily through the Canada Remote Microgrids Network, participants of this collaborative project sought to increase collaboration and government engagement to improve the conference agenda with the aim of more accurately reflecting jurisdictional priorities.</p>
RESULTS:
<p>At the conference, participants discussed experiences, lessons learned, and innovative policy solutions to energy challenges for remote communities to stabilize long-term costs, reduce pollution, and improve local energy security. These discussions resulted in a number of recommendations to support decision-making regarding remote community energy systems at the technology and project level, the community level, and the policy and regulatory level.</p> <p>Ultimately, increased collaboration and government engagement in the conference strengthened Canada's capacity to address energy challenges in remote communities. The collaborative nature of this initiative, including participation from community members and industry and government representatives, ensured appropriate stakeholder representation and participation from all parts of the community.</p> <p>In addition to the main conference proceedings, a project tour of a community solar project in Lutsel K'e was organized, as well as an NRCan-facilitated <i>Introduction to Design Thinking</i> workshop for participants.</p> <p>All conference presentations, along with solar and biomass community case studies, are available from the conference website: gogreen.bullfrogpower.com/microgrids2015-presentations.</p>

Conclusion

The ETWG has taken action to advance FPT collaboration on energy science, technology, and innovation.

The “energy innovation clusters” focusing on distributed power generation and shale resource development established at EMMC 2015 bring together FPT experts to drive collaboration in priority technology areas. The ETWG has completed or is on track to complete all cluster action items it committed to at EMMC 2015. To date, progress made within these clusters has articulated shared technology innovation priorities, established collaborative initiatives, and identified further opportunities for collaboration among jurisdictions going forward.

The importance of energy innovation through technology R&D is apparent. The knowledge and expertise shared throughout the year from the collaborative actions established in 2015 demonstrate the benefits and opportunities that arise from interjurisdictional collaboration. Canadian governments are well situated to take action and move forward together on energy research, technology and innovation.

Canadian governments have a clear role to play within the energy innovation system. Partnerships and various other collaborative initiatives that work toward solutions to common energy system challenges are vital to the success of new energy technologies. Increasing FPT collaboration will have substantial benefits going forward.

Innovation clusters have proven to be a successful model for enhancing FPT collaboration. Energy innovation clusters encourage different levels of governments and other stakeholders to come together and leverage each other’s expertise to accelerate energy technology and innovation. The successful completion and progress of activities in these innovation clusters suggest that this model could be considered as an option for further FPT collaboration in the context of the Clean Energy Strategy and as FPT governments go forward and implement the outcomes of the Pan-Canadian Framework on Clean Growth and Climate Change.