## 2. Presentations

### 2.1 Speaker 1: Deep Decarbonization and Electrification in Canada

The first speaker was Dr. Steven Wong, Research Advisor, Renewable Energy Integration, CanmetENERGY, Natural Resources Canada. He spoke on the topic of deep decarbonization and electrification in Canada. Dr. Wong highlighted key needs and solutions required for the Energy Modelling Initiative. He spoke to four federal government departments that provide modelling support, data and analytics:

- Natural Resources Canada (NRCan);
- Environmental and Climate Change Canada (E3C);
- Statistics Canada; and
- Canada Energy Regulator.

Points addressed by Dr. Wong included the following:

- Canada has targeted to reduce greenhouse gas (GHG) emissions 30% by 2030 as per the 2015 Paris Accord. The execution of the Accord led to creation of a framework under the pan-Canadian association to meet the set goals.
- There is a need for decision making to meet the goals within the Paris Accord. The *Green Initiative Program* contains targets for green energy development through energy efficiency and renewable programs. The above federal bodies are determined to cooperate among themselves to achieve the targets of the summit.
- The Energy Modelling Initiative is intended to lead to steps to reduce GHG emissions and modelling to achieve the set goals. For the successful implementation of this initiative, it is important to communicate the policies and government rules and regulations regarding CO2 emissions. The rules and policies set by the federal bodies need to be justified based on proper case studies. This justification must be prepared based on scientific data and experiments analyzed by the researchers. Furthermore, the data must be collected, analyzed and evaluated by specially trained personnel.
- A wide variety of generated resources are available in Canada due to the geographic position and landscape. The province of New Brunswick has its electricity generated from a pool of mixed energy resources. Whereas Quebec is producing its entire electricity from hydro and Alberta is mostly generating power from natural gas. The demand characteristic between the regulators is widely different due to the different provincial structures.

<u>Problems Identified</u>

- Need for better science-based modelling and policy integration.
- Need to build and improve Canadian modelling capacity.

<u>Proposed Solutions/Options</u>

- Consideration should be given to building an open data and modelling platform: It can be achieved through contributions from each stakeholder, bridging gaps between models, and regular model maintenance.

- Establishing a common data source: The solution should bring transparency in the modelling process, to speed up studies and interactions between parties. It should help integrate resources, information, and human skills needed in energy system modelling and policy. It should also provide parties with a common language, i.e. modellers, policy-makers, users, and researchers. This common data source should speed up the process of new modelling initiatives and increase credibility in the models. Everyone involved should have access to the same data.
- EMI actions to date have involved creation of an inventory of models and generation of insights from energy modellers. The goal is to identify electricity infrastructure projects and proposals for an end-use opportunity for decarbonization. Next steps may also involve identifying distributed energy resources and support techno-economic integration.

**Question from the Participants**

**Who can access the stored data?**
This is a challenge since the utility providers cannot in some circumstances make their data public. Planning needs to be done to decide the type of data that will be open to the public and others with restricted access.

**What is the difference between deep decarbonization and regular decarbonization?**
Deep decarbonization involves going beyond the reduction of GHG emissions in the electricity sector. It includes all sectors in transportation, processing, commercial and industries.

**How safe is the open-access system to prevent a breach of privacy or cyber-attack?**
This will require advice from cybersecurity experts. There will be need to be an authentication system for users to access the portal, which will prevent the cyberattack.

### 2.2 Speaker 2: The Energy Modelling Initiative

EMI Coordinator Dr. Moe Esfahlani and Louis Beaumier, Executive Director of Institut de l'énergie Trottier (IET) provided an overview of The Energy Modelling Initiative.

The following objectives were highlighted by the speaker:

- To seek people in Canada who have relevant data to contribute to our goal.
- To establish a modelling inventory of Canadian modelling expertise.
- To convene the modelling community in order to expedite collaboration in model development. This involves bringing people together, organizing more workshops and initiating more exchanges of information.

- To organize energy hubs to access data and policy recommendations such as the Canadian Centre of Energy Information and the Canadian Institute of Climate Choices.
- To design modelling applications.
- To develop a business case for long-term projects
- To identify the data needed and terms for sharing and access by energy modellers.
- To plan for sustainable policy and modelling initiative over the next 10 years.

The speaker emphasized the importance of identifying groups in the Atlantic region who have completed related studies and to acquire relevant data to contribute to the modelling process. Canada is in the early stages of creating the required models based on the forecast. The goal is to find a permanent and effective solution to reduce GHGs emissions.

## 3. Panels

### 3.1 Panel 1: Meeting Climate Action Goals: The View from Policy Makers

The questions are in bold and responses from the panelists follow. For information on panelists please see the workshop agenda in the appendices.

**There is a perception that there is a disconnect between public policy and modelling communities, for instance in the sharing of information. And this perception is one of reasons we have assembled here today. Is there a disconnect, and if there is, how could the public policy and modelling communities change the ways they interact with each other?**

- There is a gap in communication between researchers and modellers. The big challenge for researchers is to come up with a package of information in a way that is useful for policymakers.
- There are disconnections between database modellers and users. Therefore, there is a need to create a modelling inventory platform for all parties to share results on transition solutions and to achieve climate goals that will boost synergy among all stakeholders.
- There is a dependency on Statistics Canada (StatCan) data. They have been effective in providing a substantial amount of useful data for modellers as well as researchers.
- There is no specific reason for the disconnection between researchers and policymakers. A forum is needed with participation from a variety of experts.
- An example of where significant challenges exist for policy development and modelling, in a carbon constrained future is electric vehicles (EV). Where the road tax is paid for by gasoline tax revenues, new taxation policies need to be developed, e.g. tires could be taxed higher, or vehicle registrations fees could increase. So more broadly the multi-disciplinary nature of new policies will lead to more complexities.

**What new problems and challenges should energy system modellers address in contributing to policy making for climate action?**

- There are challenges with data. Federally collected data for New Brunswick did not capture the interconnections of NB with New England, Maine, Nova Scotia, PEI, Hydro Quebec. The electrification models NRCan uses in New Brunswick are old and the results do not come out with the right projections. The reason could be that New Brunswick power transmission and distribution system have the highest number of interconnections with other provinces. To overcome this problem, we need more co-operation from the utility companies for data sharing.
- It's important to know what the strengths and limitations are for a given model. In other words, what comes out of that model, what do the results mean, and what should and shouldn't the results be used for.
- Regarding steps and approaches, it's rational to approach it from a variety of ways, through an iterative process. Recognizing that you will have to define some criteria for any given model to function, but that defined criteria should be flexible and allowed to change depending on the outcomes.
- It's equally important to leave room for different approaches as time goes on, and that we not get too committed to a particular set of results. When setting near term goals and targets, the challenge is setting ambitious enough targets to achieve meaningful emissions reductions, but recognizing that there is a limit as to what the rate payer and tax payer can afford to pay.
- New policies are multi-disciplinary in nature. Cost of stable and reliable energy will increase for consumers as a result of increasing stringency of emissions targets. This will likely drive a need for enhanced social policy and programming to offset increased costs for those that cannot afford to pay more.
- Modelling tools for policy development are important, but at the end of the day, the modelling involves uncertainties. And where there exists uncertainty there's the potential for unintended consequences. Models are useful to give a view to the future of a potential outcome based on a set of assumptions. Making policy based of the output of a single model, with a single set of assumptions would lead to a limited view of the potential future, and greater risk of unintended consequences.
- Sticky policy would be policy that involves changes to multiple pieces of legislation, and regulations. The policy would have to be flexible enough to allow for unintended consequences to be addressed in a timely fashion. For instance, if the build out of large wind generation were to require new builds of natural gas generation, and/or due to locations of new generation sites put protected species at risk.

**In the pre-call to this panel we talked about how we have existing energy modelling tools and we want to get the most of our them in our new modelling challenges. What are some of the ways in which models are useful in the policy making or regulatory process? How can we get the most of our existing modelling tools?**

- In integrated resource planning, electric power utilities are modelled based on their lifecycle expectations and the least cost method of attaining those goals. The electricity sector has more flexibility in meeting carbon reduction goals than any other sector. Thus, it is easier to set a target and plan strategies to reach those goals on a cost-benefit basis in this sector.

**It seems that the federal government sees the need for transformation of the economy and industrial base to meet Canada's climate goals. One of the questions in modelling changes to energy systems in this transformation is about the process or sequence of steps. What should be done first? For instance, thinking of the case we will discuss after lunch, in achieving a 40% reduction of GHGs by 2030 and 80% reduction by 2050 in a provincial territory, is the first step to articulate specific GHG emission reduction targets for each sector of the economy? Or do you begin with modelling interprovincial energy storage options with jurisdictions like Quebec and Newfoundland that have significant hydro-electric capacity. There are presumably many other starting points. From either a public policy perspective or an energy system modelling perspective, what is the sequence of steps or process to begin modelling this transition within Canada?**

- Policymakers need to know the goals for GHG reduction and financing available for the system transformation. But policy makers should not impose too many details.
- Policy makers should set the target and let modellers design the models.
- Policymakers shouldn't pick one solution. Approval in more than one solution can provide more options for applicability and give the researchers as well as policymakers more options to think. Policymakers and researchers are aiming for the same objective: Reduction of carbon emission. The ideal solution should be for policymakers to set the goals and modellers to choose the way to get there.

**How do we optimize the use of energy resources in different regions in Canada for interchangeable benefits between regions?**

- There should be an increase in trans-regional (east-west line) transmission capacity.

**Do modellers consider social and behavioural changes with other modelling parameters?**

- Modellers need to put into consideration social factors to have a holistic view and to get the best optimal outcomes.

**What level of historical load data is available to researchers?**

- NB power provides periodical data. They don't have access to every 5 minutes because of the lack of a database for storage. Recently, the regulatory body asked access to these hourly data, which are now available on their website.

**Are researchers working on how to bring transmission lines to remote places?**

- Yes, research has been done in this field. But it depends more on the utility providers in the province. Policymakers are the moderators to decide whether they want integration between provinces.

### 3.2 Panel 2: An Overview of Energy Models

The questions are in bold and responses from the panelists follow. For information on panelists please see the workshop agenda on the appendices.

**What energy modelling tools are available? What type of energy models have been created so far and what is the experience in the field?**

- Examples of modelling tools include:
  **PSSC:** It allows engineers to simulate reliability in energy dispatch.
  **STRATEGIST:** It models load dispatch.
  **GENUPS**: It models up to 7 days of economic dispatch.
  **PLEXOS**: It is a tool for modelling long-term through short-term across electric power, water and gas systems.
- The models simulate different scenarios and interpret the grid response to a certain level of changes or disturbances.
- On the academic side, one challenge is to adapt academic modelling to the practical system either in industry or utilities.
- In utilities modelling is done using a variety of software to simulate load flow, load demand, methods to meet energy targets, economic and financial dispatch.
- The tools are advantageous, but the ones that depend on forecast are not accurate. The weather and load behaviour can have unexpected data results. Dealing with such data is chaotic. For 2-3 years of forecast, an average is used. It might not be accurate.
- Economic dispatch models have been created using software such as PROMOD, Plexos and Zenus. Modelling is done on a different time frames for different regions. Zenus has a cascaded hydro model that deals with a changes in waterflow. These models are not perfect, but they are consistent.

**Do modellers engage with policymakers?**

- When policy maker makes a change, they focus on the financial and social aspect of the implications.
- A good cross-border contract between policymakers and modellers will be beneficial for everyone.
- Researchers typically do not make recommendations on policy implementation. Instead, they typically provide solutions and advice when being asked by the policymakers.
- Policymakers are the architects and the modellers build the interface.
- Economic studies often accompany technical modelling.
- Policymakers dictate the constraint in their system to energy modellers. Modellers request from policymakers what the model interface and architecture need to look like.
- There is a need for modellers to include the impact of carbon in some of the tools used.
- Capital costs are most times ignored during modelling, which affects the results.

**How can we have models without knowing the load/client behaviour?**

- Modelling and data availability will differ by province.
- Consumers wouldn’t want to have their own usage data accessed by everyone.
- Certain data requires privacy and needs protection against cyberattacks. Improvements and investment in cybersecurity will be valuable to protect data.
- The contribution of technology with smart meters will help the process of gathering more precise data. Smart meters will elevate the value of information.

- Other observations from this session include the need for modellers to add the impact of carbon in some of the tools used. Capital costs are often ignored in modelling.

### 3.3 Panel 3: New Policy Needs and Models

**How should modellers and policy makers work together?**

- There is not a single process. Relationships are most important. Policymakers and modellers need to build trust and relationships, work together from the beginning to end of the modelling and policy making processes.

**Was there engagement with policymakers in the past regional workshops?**

- The Central Workshop that took place in Ottawa and was attended by more government representatives and the Victoria workshop had more academic representatives. Most modellers use their own frameworks for modelling, with little reference to policy in the modelling assumptions. The EMI initiative has a responsibility to map out landscaping in energy modelling. The initiative will allow people to converge and communicate inside-out. The initiative creates a standard protocol to store data and connect to other concerned initiatives in order to mobilize the network to solve policy problems.

**How do you connect policy effects into modelling? How do you measure the implications of policy in the model? Is EMI considering this?**

- It is necessary to evaluate the policy effects in a model and to know the areas of improvement in it. An open data source can help users to know the type of data used to build these models.
- In electric power utilities, the demand side management (DSM) program has a measurement and verification strategy to check & balance the models for continuous improvements. Non-intuitive results are difficult to explain. Therefore, utility modellers can generate accurate results with this approach.

**What's the balance between policy simplicity and technical complexity in the communication aspect?**

- To achieve climate goals the steps to adopt renewables or carbon captures processes is not main objective. Rather, the main objective is to achieve carbon reduction goals. It’s the duty of the modeller to choose the right model to achieve those objectives.

**What determines what to prioritize in policy goals?**

- It depends on the objectives to be achieved but building an early relationship between modellers and policymakers is very essential in other to make good priorities.