ENERGY MODELLING INITIATIVE

MODELLING, POLICY AND THE ENERGY TRANSITION

Abstract
A summary of the western workshop held at UVic, 27 September, 2019

University of Victoria | Institute for Integrated Energy Systems

Contents

1. Background

The Energy Modelling Initiative (EMI) Western Regional Workshop was held at the University of Victoria on September 27th, 2019. Hosted by the Institute for Integrated Energy Systems (IESVic), approximately 40 participants representing academia, government, utilities, and energy actors were in attendance. The workshop consisted of panel discussions and roundtable sessions aimed at understanding the current state of energy system modeling for decarbonisation, and identifying ways that energy modeling activities for policy-making can be strengthened.

This report provides a summary of the workshop, including the agenda, case study topics, a synthesis of discussion, and finally, attributes identified as desirable for future energy modeling activity.

2. The Workshop

Objectives

In accordance with the overarching goals of the EMI initiative, the objectives of the western workshop were to:

1. Foster discussions between regional stakeholders;
2. Produce a regional perspective on electricity and energy modelling for policy;
3. Highlight the value, potential, and limits of modelling in the regional context;
4. Articulate regional insights that could contribute to a final synthesis report;
5. Facilitate the crafting of a work-plan to enhance modelling for policy, including:
    a. Mutual expectations facilitating interactions of the policy and modelling community
    b. Essential ingredients of a unified national community

Workshop participants who identified themselves as part of the modeling community were asked to provide details on modelling approaches and tools. This information was collected as part of an effort to create an inventory of researchers and models. A preliminary inventory can be found in Appendix IV.

Workshop Agenda

The day was divided into a morning session framed around two moderated panels, and an afternoon case study consisting of round-table discussions. The panels were used to frame some of the key tools and considerations facing policy makers and modellers in their respective roles. The afternoon case-study provoked discussion as to how electricity and energy modelling can be better integrated with policy making processes.

The complete agenda for the workshop can be found in Appendix I. The abstracts for the policy and modelling panels are provided in Appendices II and III, respectively.

Panel Format

The workshop began with two moderated panel discussions. The first panel was comprised of participants working on policy and regulatory issues, and provided an overview of issues related to electrification, decarbonisation, and policy-making. The second panel was made up of model developers and users. The modelling panel described the types of tools used for energy and electricity system planning and operations and, broadly, their strengths and weaknesses. Subsequent discussions reflected perceived barriers limiting the connections between policy and modelling communities.

Roundtable Format

Roundtable discussions were used to identify gaps in modeling and policy, and to propose potential solutions. To help frame the thinking of participants, a positioning statement was created around the Western Canadian context of energy, carbon policy and the economy. Three linked roundtable topics were then defined to provoke and guide discussion. The roundtable positioning statements were as follows:

> *Roundtable 1* - Electrification spans a breadth of decision-making jurisdictions (municipal, provincial, federal, international) and systems (gas, electricity, water). Individuals operating devices behind the meter, provincial planners developing load forecasts and infrastructure expansions, and federal negotiators making climate commitments all have different needs and information requirements. Representing these requirements in energy system modelling calls for a range of models with different frameworks, spatial-temporal scales, objectives, and so on. *How can modelling be applied to explore pathways that reach our decarbonization objectives*?

> *Roundtable 2* - There is a natural fit between modellers and policy-makers: modellers often develop insights that could be useful to policy-makers; policy-makers often seek evidence to support decisions and policy. However, despite this natural fit, we are here today in part because we don't always witness or partake in projects where this natural fit manifests. *How can we increase synergies between modelling and policy-making?*

> *Roundtable 3* - Ultimately, the policy and modelling community need to move from a paradigm where policy recommendations appear in the concluding remarks of our academic papers or reports to a more effective process. *What resources, frameworks, tools, institutions, support, etc. would be helpful for creating an effective national modelling platform to serve policy-making?*

Each roundtable had a moderator and a note-taker. The complete case study description and roundtable discussion questions are provided in Appendix V.

Outcomes

The topics and content described in the rest of this report are based on the views and opinions expressed during panel and roundtable discussions. The nexus of *energy, policy*, and *modeling* is one that touches on numerous considerations and resulted in wide-ranging discussion. The conversations are synthesized and described in the following two sections. The first section (*landscape*) focuses on ideas that reflect the current situation with regards to policy and modeling. The final section (*recommendations*) summarizes some of the over-arching concepts as to how to improve, structure, and sustain a community of energy modellers and policy-makers.

3. The Policy and Modelling Landscape

The following sub-sections summarize views regarding modeling value and need. Regionally specific priorities where modeling can play a role are highlighted. Expectations for ways in which interactions of modeling and policy communities can be improved are described.

Priorities

The policy landscape in Canada is diverse with municipal and provincial objectives sometimes varying considerably amongst themselves and with federal goals. In British Columbia, the government's 2019 budget presented a comprehensive array of actions in its "CleanBC" plan to accelerate reductions in provincial carbon emissions. Some of the priority areas include natural gas systems, LNG, hydrogen, electric vehicles, and efficiency improvements in the built environment. Targets for electrification and renewable fuel production in BC are particularly ambitious, with electrification set to play a crucial role in meeting emissions targets. Approximately half of the CleanBC budget is contingency funding to be allocated for initiatives still in development.

Western Canadian regions are seeing renewable projects offering electrical energy at low-cost. The need for market mechanisms or regulations to ensure firm capacity and reliability is a question growing in importance for utilities and balancing authorities. Support mechanisms for hydrogen, renewable gas, and low carbon fuels are areas where energy modeling can play a role. In general, uncertainty in regard to short and long-term regulation and policy are impeding decision making. The integrated aspects of production, transmission, and delivery of energy services makes quantitative modeling and analysis a key tool for policy formation.

Infrastructure

An important theme identified by policy and modeling communities is clean electricity systems and electrification. The ability to use Canadian resources to generate clean electricity and substitute for fossil fuels is a near term objective. The interconnections between Canadian provinces and the United States provides access to markets and shared capacity thereby reducing costs and ensuring reliability. The value of stronger inter-provincial linkages for electricity, energy, and material transfer is a techno-economic problem with acute political impact. The need to identify value and incent investments is seen as a practical issue straddling the policy-modeling space. Here, objective and robust modeling tools have a role to play in informing stakeholders at all levels.

Decision Support

Federal and provincial governments often need and call on external agencies to provide modelling results quantifying the merit and impact of policy measures and infrastructure projects. Both levels of government highlight the need for strong, evidence-based analysis to support the design and implementation of policy measures. Questions related to building new infrastructure are topical- what kind of infrastructure needs to be built in the coming decades, and when? Modellers must account for provincial and regional differences, and achieve an appropriate balance of breadth versus depth.

The tension between short-term and long-term objectives is one that policy makers struggle with. Modeling activities can help test and guide sequential actions aimed at giving short-term signals that meet long-term objectives. A typical challenge facing both modellers and policy makers is the uncertainty around future costs, technology performance, and demand. Robust methods for considering and comparing impacts of uncertainty are essential to providing defendable decisions.

Interaction

Effective communication between modellers and policy-makers is a challenge that causes frustration on both sides. Policy makers are in need of modellers that can anticipate their needs, produce results that are clear and transparent, and incorporate the policy and market conditions of the day. Conversely, modellers find it challenging to distill complex simulations into language that is appropriate for policy-makers. Often, modellers may focus on sophisticated technical representations, but lack behavioral, regional or economic details of importance to implementing policy. In contrast, important nuances with regards to system behaviour may be lost when model outcomes are separated from context and detail. The lack of opportunity for consistent, sustained interaction is a common theme. Both parties see a need for some platform or forum that provides the opportunity for regular dialogue and exchange of ideas.

Capability

Despite the broad range of capabilities available in existing energy systems models, improvements in terms of usability, problem complexity, and resolution are needed. Examples of considerations that are absent or under-developed in existing modelling platforms include the value of technologies from a market perspective, accounting for human behaviour, and the specific requirements of remote communities. There is a need for models capable of tailoring solutions to the unique circumstances of Canada's diverse communities.

An array of modeling tools and methods exist. Electricity system planning and operations spans time-scales of seconds to decades. Likewise, spatial resolution, network topology, and the physical behaviour of transmission and distribution range from community scale to continental. Economics, behaviour, material balances, markets, regulation, and policy forces are considerations for utilities.

Among existing modelling platforms there is a lack of capability suited to the perspective of investors. Modellers can better account for the considerations of investors by accounting for business economics and long-term, life-cycle assessments of investment decisions. To ensure results are relevant to policy makers, models should consider the implications to multiple sectors: social, technological, environmental, and economic.

Capacity

Modellers identified lack of consistent funding as a barrier to a strong modelling community. With sustained funding and capacity, a national forum for the exchange of ideas, data, and feedback on research activities would benefit both policy and modelling communities. Such a forum would also help to identify evolving needs, shape the types of questions being considered, and ensure the modelling community is aware of evolving policy agendas.

Organization

The need for some degree of standardization in the modelling-policy space is a recurring theme of discussion. A standardized approach to data availability, sharing, and formatting has the potential to both simplify communication with policy-makers and increase collaboration between modellers. Creating a standardized data repository could serve as a complement to this initiative.

Policy-makers and modellers both stand to benefit from some form of documentation of methodologies to promote and develop a common knowledge base. While academics maintain the importance of model diversity, a set of "Canadian baseline energy system models" could serve as a valuable tool for academics, industry and policy-makers to compare results.

Process

The processes in place to start, guide, re-direct, and report on modeling activities are often not defined or considered. These types of regular interactions can help prevent good models delivery poor results. As an example, an important consideration in creating relevant modeling results is to ensure data, assumptions, and type of model reflect a problem. Existing regional policies and those that are imminent should be incorporated in modeling scenarios. Outcome reporting should be tailored to the key questions and audiences. To help ensure modeling activities are going to have broad value, engagement between stakeholders and researchers must occur early in defining the research questions and developing scenarios. While work is underway, frequent and regular interactions should be maintained.

There are a number of ways to interact besides formal meetings. Web-meetings, news feeds, and electronic forums where subject-relevant updates can be shared by stakeholders can be helpful. While face-to-face meetings are useful, there are those who feel a formal structure can actually impede their usefulness. Smaller, frequent, and "low stakes" discussions can be fruitful in the early and mid-stages of modeling so that learning, idea exchange, and questioning are encouraged. There is an opportunity to strengthen the energy modeling and policy connections through new process paradigms.

4. Summary and Recommendations

The previous section focused on the needs, weaknesses, and gaps in the existing modeling and policy community. This section summarizes suggestions for improving and strengthening activities. Finally, high-level considerations for key elements of a more organized community are provided in bold.

Process

Improving communication between modellers and policy-makers is critical for more productive relationships. Modellers need more opportunities to interact with users of information at the early stages of the decision process, allowing them to produce results that clearly respond to key policy questions.

Energy literacy is a problem in all communities. Technical practitioners lack knowledge on regulation, markets and finance, while policy-makers have less depth on technical systems. Interactions that promote two-way communications, more dialogue, and low-risk opportunities to ask questions are valuable. In future, **it is recommended that the energy-policy modeling community develop a series of regular national forums for disseminating activities, sharing best practices, and identifying needs.**

There is a general sense that the best coupling between energy system modelling and policy-making is through trusted partners, not black-box models. However, some level of standardization for documentation within the modelling community may be necessary to achieve greater transparency and ease of communication with policy-makers. **It is recommended that those participating in a formalized modeling network provide a basic level of documentation for bespoke models.**

Modelling Platforms

Spatial, temporal, and sectoral resolution are key characteristics that define an energy system model. These attributes are of practical importance for model developers as they are often connected to computational resources. In terms of usability, these characteristics also determine the type and granularity of data. No single computational environment, model, or modeller is best suited to working across the full spectrum of system to be considered. For these reasons, **a diverse community of models and researchers is needed.**

While there is expected to be greater strength in diversity of methods, there is also a need for open tools that can be easily shared and integrated. To increase value and potential for collaboration, **it is recommended that code for a baseline model be explicitly connected to documentation describing the modeling tool.** A simplified model to test in conjunction with documentation is a common way to share tools and educate the community.

The older modeling paradigm of commercial code accessible via paywalls is being challenged. Models continue to evolve, but there are often common needs for data processing, scenario development, constructing a particular model, solving, and visualizing results. The current paradigm for modeling is open, shared, and portable. Cloud based repositories of code based on interpreted, high-level, general-purpose programming languages such as Python, R, Julia, and others are well-developed. Open tools for integrating code developed in different languages are becoming more common, making integration easier. Vast amounts of documentation, examples, and tutorials are available. When considering the need for transparency, portability, cost, and training, **a national energy-policy modeling platform should embrace the use of open-source tools.**

Data

Data should be open and held in a common repository with a standard format. While this is possibly outside the scope of a future EMI activity, there should be close coordination between groups. Ideally, data sets are accessible and referenced, use common formatting, and can be cited. These criteria may be best provided through a single, permanent host with a clear mandate. **A centralized data authority should work with regional centres to help collect, format, and anonymize sensitive local data.**

Structure

The gap between modeling and policy is to be expected given the complexity of both fields. Ideally, transparent and usable tools may mitigate the divide, but this challenge is probably best solved by educating practitioners and providing opportunity for ongoing communication. There are a number of possible structures that may facilitate the modelling-policy interaction, such as establishing an independent research institute, a permanent working group inside government, or a more distributed network model. All possibilities point toward **the need for some long-term, institutional structure to facilitate sustained dialogue in spite of a fast-changing political landscape**.

Appendix I: Workshop Agenda

Energy Modeling Initiative Western Workshop:
Modeling, Policy and the Energy Transition
Friday, September 27, 2019
University of Victoria
Engineering and Computer Science (ECS) Bldg., Rm 660

8:45	**WELCOME –** coffee and snacks

9:00-9:45 **Opening Remarks**

- The Energy Modeling Initiative, **Normand Mousseau**, University of Montreal
- Workshop Overview, **Andrew Rowe**, Director, Institute for Integrated Energy Systems (IESVic)
- Introductions**:** Participants

9:45-10:45 **PANEL *Meeting Climate Action Goals: The View from Policy Makers***

- **Brad Little**, Renewable and Electrical Energy Division, Natural Resources Canada
- **Amy Sopinka**, Director, Transmission and Interjurisdictional Branch, BC Ministry of Energy, Mines, Petroleum Resources (BC MEMPR)
- **Derek Olmstead**, Director, Markets, Alberta Market Surveillance Administrator
- **Guy Gensey**, Director, Energy and Industry Decarbonization, BC MEMPR

10:45-11:00 **Coffee Break**

11:00-12:00 **PANEL *An Overview of Energy Models***

- **Sean Broadbent,** BC Ministry of Environment
- **Hadi Dowlatabadi,** Professor, UBC
- **Cameron Wade,** PhD Student, IESVic
- **Madeleine McPherson,** Assistant Professor, IESVic
- **Curran Crawford,** Professor, IESVic
- **Ralph Evins,** Assistant Professor, IESVic

12:00	**LUNCH –** *Megawatts and Marbles* demonstration

1:00-1:10 ***Case Study: Identifying the Needs***
Introduction, **Normand Mousseau**, Director, Trottier Energy Institute, UMontréal.

1:10-1:40 Roundtable 1

- How can modelling be applied to reach our decarbonization objectives?

1:40-2:10 Roundtable 2

- How do we increase synergies between modeling for policy making?

2:10-2:30 **Coffee Break**

2:30-2:50 Report Back and Discussion

Next Steps

2:50-3:20 Roundtable 3

- What resources, frameworks, tools, institutions, support, etc. would be helpful for creating an effective national modeling platform to serve policy-making?

3:20-4:00 Building the Community

- What are the next steps to further develop national modeling capacity?

4:30 **RECEPTION** (cash bar) – Fireside Lounge, **University Club**

6:00 **DINNER** – Wild Rose Room, **University Club**

Appendix II: Policy-Maker Panel Abstract

Panel: *View from Policy Makers*

Moderator: Andrew Rowe, IESVic

Panel Members:

- **Amy Sopinka**, Director, Transmission and Interjurisdictional Branch, BC Ministry of Energy, Mines, Petroleum Resources (BC MEMPR)
- **Brad Little**, Renewable and Electrical Energy Division, Natural Resources Canada
- **Derek Olmstead**, Director, Markets, Alberta Market Surveillance Administrator
- **Guy Gensey, Director**, Energy and Industry Decarbonization, BC MEMPR

Context:
While there is considerable uncertainty regarding the future structure of regional energy systems, electrification and electrical system transformation are key strategies to support climate change mitigation. Besides direct use, clean electricity can play a role in sectors and services that are difficult to decarbonize, through indirect means such as hydrogen production. Unlike conventional secondary energy vectors, electricity requires an instantaneous coupling of supply and demand in addition to physical infrastructure providing connectivity. Electricity systems tend to be managed by provinces, but are physically coupled to other regions within Canada and the United States. These factors complicate planning and risk management in the use of clean electricity for energy system transformation.

Our panel members have expertise related to energy technology, economics, markets and policy. We will explore some of the challenges facing policy makers, important questions they face, and how models are used to develop policy.

Discussion: A broad range of issues are driving change in our energy systems:

1. What are your areas of responsibility? What are some of the challenges and uncertainties you see near-term and long-term?
2. What are some of the ways in which models have been useful in the policy making or regulatory process?
3. What should the modelling community be doing to help in policy making for climate action?
4. What are some of the problems you have seen with modellers who proposed policies?
5. What recommendations would you give to modellers when they are using models to inform policy?
6. How do we make "sticky"-policy i.e. resilient to changes in government?

Appendix III: Modeller Panel Abstract

Panel: *An Overview of Energy Models*

Panel Members:

- **Sean Broadbent,** BC Ministry of Environment
- **Hadi Dowlatabadi,** Professor, UBC
- **Cameron Wade,** PhD Student, IESVic
- **Madeleine McPherson,** Assistant Professor, IESVic
- **Curran Crawford,** Professor, IESVic
- **Ralph Evins,** Assistant Professor, IESVic

Context:

Following the *View from Policy Makers*, this panel will provide a complementary view from modelers, who will review six types of energy models that span scope, scale, and sector. The panelists will provide an introductory and high-level overview of each model category, explain the model capabilities, and discuss the model strengths and weaknesses particularly for informing electrification policy. While there are numerous energy models, this discussion will focus on energy-economy equilibrium, integrated assessment, capacity expansion, production cost, transport system, and building system models, due to the complementary insights that each of these types of models can provide policy-makers. Depending on the particulars of the policy application at hand, such as the indented energy sector, the jurisdiction in question, and whether it is marginal or structural/systemic in scope, one model type, or perhaps several in tandem, might be more applicable.

This overview will prepare participants for the subsequent case-study session, in which participants will discuss the applications of models to a specific policy question, as well as the closing session, which will focus on strengthening the role of models for policy needs and design.

Discussion: A broad range of models are available which can be used to develop insights in our energy systems. For each model category, our panellists will discuss:

1. The model's primary purpose (including key inputs and outputs) and scope
2. The model's spatial, temporal and sectoral focus
3. Some of the model's strengths and weaknesses
4. Some of the ways in which model has been useful in the policy-making or regulatory process
5. Some of the challenges we have seen with model applications attempting to inform policy
6. Recommendations for improving the modeller-policy maker collaboration

Appendix IV: Model Inventory

Model name	Model type	Model Type and purpose	Formulation	Spatial scale	Temporal scale	Sector	Key Inputs	Key Outputs	Code-base	Open-source or commercial	Developer	Publications/ studies using model	Ongoing/ current projects using model	Example uses / policy applications
SILVER	Production cost model: unit commitment, economic dispatch, optimal power flow	Optimization: Least-cost optimization of electricity system operation	Mixed integer linear programming (MILP)	User-defined Typically: provincial/ balancing area/ interconnected area	User-defined Typically 5 min - hourly	Electricity	Generator and transmission infrastructure configuration and parameters Demand profile Renewable resource characteristic	Least-cost dispatch of electricity system resources	Python	Not yet open-source (not commercial)	SESIT group, UVic	*Energy* 151: 332-346 *Energy* 145: 856-870 *Renewable Energy* 113: 1019-1032 *Energy* 138: 185-196	Clean Power Pathways project: 3-year project (2019-2022) exploring Canda's decarbonization pathways	Grid (renewables, EV, storage) integration studies Scenario analysis of alternative grid configurations
EV & thermostatic load transactive Control	Discrete time marching electricity market	5-min market simulation; V2G EV studies	Agent-based, retail double auction	Distribution grid	Typically 5 min	Electricity, transport, building heat	Generator & load price sensitivities/bidding strategies Generation & load profiles and/or responsive models	Demand-supply clearing price; asset dispatch behaviour	Matlab	In-lab	IESVic, SSDL/PICS Transport	HICSS-49, Applied Energy 210, Engineering 1(4)	N/A	Flexible responsive demand studies, EV/thermostatic/renewable generation integration
Cumulant-based probabilistic load flow	Load flow; intrusive probabilistic	Uncertainty quantification, rohbust design & control	Cumulant tensors, DC/AC load flow	Distribution to transmission scale	Min to seasonal depending on statistics	Electricity transport, building heat	Statistical description of generation & load over intra and inter time steps	PDF of line flows, bus power, etc.	Matlab	In-lab	IESVic, SSDL	IEEE Power Systems 28, 33	BC Hydro MITACS	Grid integration of variable renewables, EVs
Energy Hub / PyEHub	Energy hub: multi-stream energy balancing; sizing of converters and storages	Optimization: minimizing investment + operational costs and carbon emissions	Mixed integer linear programming (MILP)	User-defined. Typically single building to small district.	User defined. Typically hourly.	Electricity. Heat. Demands (Buildings, EVs...).	Demand profiles. Renewable profiles. Possible converter and storage options.	Optimal operation. Optimal capacities and network.	Python	Open-source	Energy in Cities group, UVic	*Energy* 73: 387-398. *Applied Energy* 171: 296-313.	BESOS platform (Building and Energy Simulation, Optimization and Surrogate-modelling)	Comparing microgrids with district heating Concept-stage options analysis for

Model name	Model type	Model Type and purpose	Formulation	Spatial scale	Temporal scale	Sector	Key Inputs	Key Outputs	Code-base	Open-source or commercial	Developer	Publications/ studies using model	Ongoing/ current projects using model	Example uses / policy applications
		(multiple objectives possible)		Network optimization possible.		Many others possible.						*Applied Energy* 191: 125–140.		building and district energy systems
ICAM 3	Demographics, economics, energy, GHG emissions, aerosols, carbon cycle, ecosystems, health, sea level rise, extreme events, … & policies for mitigation, adaptation & geoengineering	A simulation model with interacting adaptive agents representing different nations and specific interests	Dynamic programming	13 global regions	Century scale with 5 year timesteps	All forms of energy supply and demand	As endogenous as possible. With different structures for demographic transition, innovation, etc.	Future economy, energy, GHG, climate change, impacts, policy and its stability over time	Analytica	The software platform is commercial. My model is open source	me	*Many papers in the 1990s* *A book in 2020*	None	Climate and energy policy Support
OSeMOSYS	Capacity expansion model: generation and/or transmission planning	Optimization: User-defined, e.g. minimize discounted system cost (capital + o&m + CO2).	MILP	User-defined. Typical range: regional to continental.	User-defined. Typically multi-year, e.g. 2015 – 2040.	User-defined. Typically electricity, but can include other carriers, e.g. heat.	Costs (capital, o&m, etc…), discount rates, resource availabilities, load profiles, generator and network characteristics	Least-cost set of system investment & retirement decisions.	GNU MathProg (Python interface available).	Open-soruce	KTH	*Energy Policy* 39: 5850–5870. *Energy Strategy Reviews* 10: 40-52. *Energy 172:* 740-751	2060 Project, UNECE water-land-energy-food nexus project.	Impact of policy levers on system evolution and emissions. e.g. federal carbon tax, AB CLP.

Model name	Model type	Model Type and purpose	Formulation	Spatial scale	Temporal scale	Sector	Key Inputs	Key Outputs	Code-base	Open-source or commercial	Developer	Publications/ studies using model	Ongoing/ current projects using model	Example uses / policy applications
gTech	Energy-Economy Model	Computable general equilibrium model with technological explicitness, behavioural realism, and macroeconomic feedbacks	Mixed Complementarity Problem (gtech) and linear optimization programming (IESD)	Provincial, 10 other Canadian regions, and the United States	Model solves in 5-year increments	Macroeconomic (80 economic sectors), including, electricity, and oil, gas, and biofuels	Economic data, energy prices, key sector assumptions, technological information, among other inputs	GHGs, technological adoption, GDP, industry costs, electricity GHGs, electricity capacity (IESD), oil, gas production, and biofuels production and prices	GAMS	Commercial	Navius Research	N/A	CleanBC, Government of Alberta, CAPP, government of Manitoba, Government of Ontario, Government of Nova Scotia, Government of New Brunswick, NRCan, ICCT, others	Simulation of climate and energy policies

Appendix 5: Case Studies and Roundtable Discussions

Energy Modeling Initiative Western Workshop

Modeling, Policy and the Energy Transition

Case Study: *Identifying the Needs*

The economies of Western Canada are responsible for 60% of national GHG emissions and are strongly tied to the movement of goods, materials, and energy. Meeting decarbonization objectives while stimulating clean growth requires rapid transformation, innovation, and coordination.

Roundtable 1

Electrification spans a breadth of decision-making jurisdictions (municipal, provincial, federal, international) and systems (gas, electricity, water). Individuals operating devices behind the meter, provincial planners developing load forecasts and infrastructure expansions, and federal negotiators making climate commitments all have different needs and information requirements. Representing these requirements in energy system modelling calls for a range of models with different frameworks, spatial-temporal scales, objectives, and so on.

- How can modelling be applied to explore pathways that reach our decarbonization objectives?
    - The morning's modelling overview panel reviewed several model categories and their appropriateness in addressing different issues. Which of the models discussed in the panel session are appropriate and useful in the context of the case study topic?
    - Hypothetically, if a project applied the models discussed by the panel to address the case study topic, where would there still be gaps in the analysis?
    - Outside of the quality of the analysis, what other considerations are important? For example, is model transparency (i.e. open-source data and code) important for increasing public trust in good governance and appropriate policy?
    - What additional capabilities would have to be developed/applied to address the gaps?

Roundtable 2

There is a natural fit between modellers and policy-makers: modellers often develop insights that could be useful to policy-makers; policy-makers often seek evidence to support decisions and policy. However, despite this natural fit, we are here today in part because we don't always witness or partake in projects where this natural fit manifests.

0. How can we increase synergies between modelling and policy making?
    - Where can and should modellers be engaging in the policy-making process?
    - What do modellers need to know about a policy maker's job? What do policy makers need to know about a modeller's job?
    - Where have modellers, or projects that leverage modelling gone wrong such that modelling work hasn't been useful in the policy-making process?
    - What examples come to mind where this synergy has been particularly successful? Or unsuccessful? What made these examples successful or unsuccessful?
    - How can we ensure that the mandate and scope of work between different groups (academic modellers, government contractors, policy makers) align?

<u>Roundtable 3</u>

Ultimately, we – the policy and modelling community – need to move from a paradigm where policy recommendations appear in the concluding remarks of our academic papers or reports to a more effective process.

0. What resources, frameworks, tools, institutions, support, etc. would be helpful for creating an effective national modeling platform to serve policy-making?
    - In pursuit of these objectives, what realities, such as confidence and timeliness, need to be considered in a modeling-for-policy process? Do modellers need more training in qualitative methods used in the social sciences?
    - Are there other jurisdictions that successfully facilitate these relationships and synergies, for example through an institutional framework (such as the national lab systems)? Is there anything that we can learn from other jurisdictions that successfully navigate this?