Appendix 2 - Workshop Case Study

Energy Modelling Initiative - Initiative de modélisation énergétique
Bringing the Tools to Support Canada's Energy Transition - Outiller le Canada pour réussir la transition

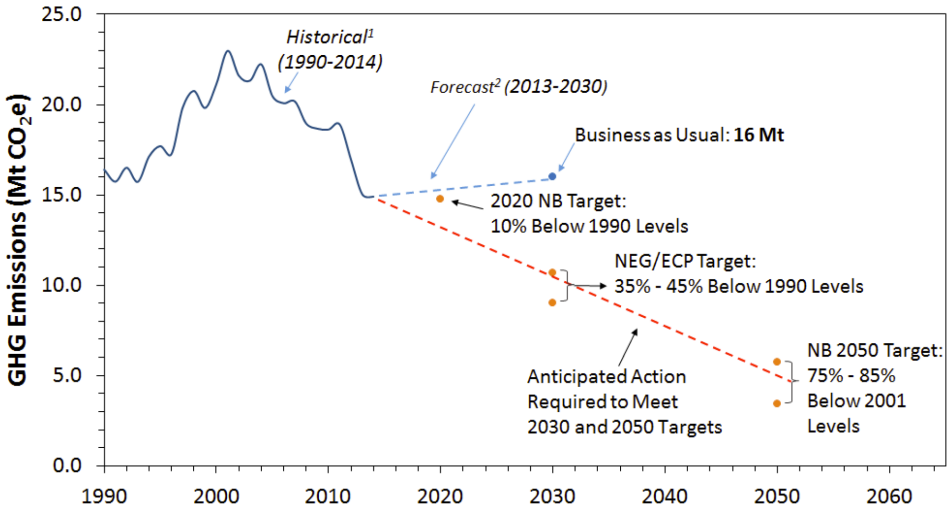
Atlantic Region Energy Modelling Case Study
"Electrification and Decarbonization in New Brunswick"
November 12, 2019

Introduction

In this case study you are asked to identify modelling tasks, gaps and issues in a New Brunswick electrification and decarbonization scenario. You are not obligated to use information outside of this case, but you are permitted to do. The case study questions are presented on the following page.

Background

New Brunswick's plan is to achieve greenhouse gas (GHG) reduction targets of 10 per cent below 1990 levels by 2020, and 75 to 85 per cent below 2001 levels by 2050, equal to about 5 million tonnes. The plan is illustrated in Figure 1. According to data from Canada's Energy Regulator[1], New Brunswick's GHG emissions in 2016 were 15.3 megatonnes (MT) of carbon dioxide equivalent (CO2e). This amounts to 20 tonnes CO2e per capita, just above the Canadian per capita average of 19.4 tonnes.



The largest GHG generating sectors in the province are electricity generation at 32% of emissions (4.9 MT), transportation at 28%, and oil and gas at 17% (primarily petroleum refining at 2.5 MT, with 0.1 MT attributable to production, processing, and transmission).

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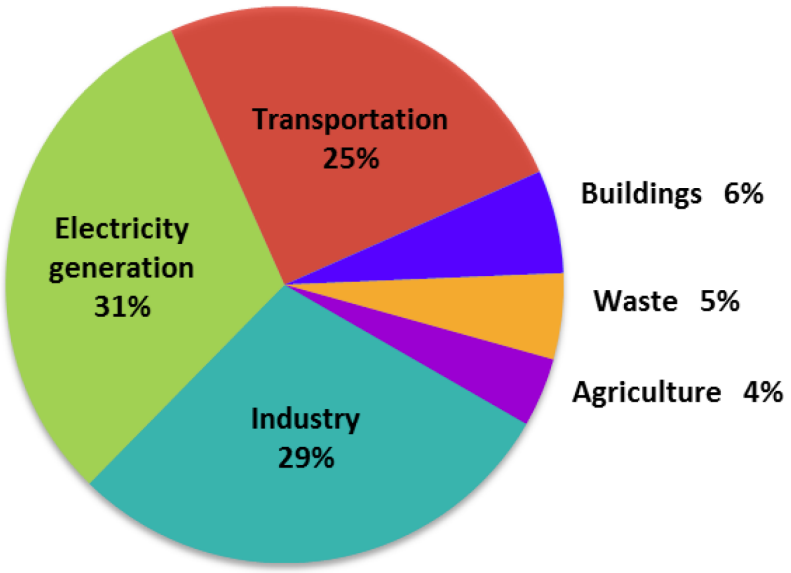
1 Link: https://www.cer-rec.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/nb-eng.html?=undefined&wbdisable=true

Figure 1: GHG emission trend for New Brunswick[2]

According to NB Power's 2017 Integrated Resource Plan, NB Power's projections for GHG emissions are relatively flat at about 4 million tonnes per year during the period from 2017 to 2039, and then decrease to below 2 million tonnes per year by 2041 as Belledune (coal fired) and Coleson Cove (oil fired) generation stations are retired and new natural gas combined cycle turns are commissioned. NB Power's forecast of future provincial electricity requirements to 2042 are also relatively flat, remaining at just under 15,000 GWh with an Energy Smart NB Program, and rising to about 17,000 GHh without the Energy Smart NB Program.

New Brunswick's greenhouse and gas (GHG) emissions by sector in 2014 are presented in Figure 2. For the modelling exercise, presume New Brunswick has GHG emission reduction **objectives** of:



- 40% zero-emission personal automobile usage by 2040 and 80% by 2050;
- 80% net-zero energy buildings by 2050;
- 40% reduction in GHG emissions in waste, agricultural and industry sectors by 2030 and 80% reduction by 2050; and
- 80% reduction of GHG emissions in electricity generation by 2050.

Figure 2: 2014 New Brunswick GHG emissions[3]

Case Study Questions

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

2 Link to *Final Report of the Select Committee on Climate Change*: https://www1.gnb.ca/legis/committees/archive/58/climate-e.asp

3 Link to *Final Report of the Select Committee on Climate Change*: https://www1.gnb.ca/legis/committees/archive/58/climate-e.asp

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.

Your task is to identify modelling tasks, gaps and issues in the above New Brunswick electrification and decarbonization scenario. Questions to consider include the following.

1. How can modelling be applied to reach our decarbonization objectives?
   (a) 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?
   (b) 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?
   (c) 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?
   (d) What additional capabilities would have to be developed/applied to address the gaps?
   (e) What new data is required the modelling activities?

6. In pursuit of those **objectives**, what **impacts** need to be considered in policy development, in addition to rates and GHG emissions?
   (a) What impacts on energy system infrastructure should be modelled?
   (f) How can we model changes in consumption in gas and electricity?
   (g) How can we model increases in self generation and prosumers?
   (h) How should we consider a decrease in capacity to pay of lower income consumers?
   (i) What are the impacts for federal-provincial cooperation in energy system electrification and decarbonization?

7. How can multiple **objectives** be addressed simultaneously? How can they be integrated with a higher, systemic objective?
   (a) How can municipal, provincial, federal, international models cooperate?
   (j) How may new modelling problems be identified for research and development within academia?
   (k) What organization will model gas, electricity, transportation systems simultaneously? What organizations will support this modelling work?

8. What are the prospects of **new modelling approaches** for political decision making?
   (a) How should the results of modelling be presented for political decision making? By whom? How often?
   (l) How should the results of modelling be presented for public presentation?
   (m) What processes of consultation should modellers undertake to prepare reports for political decision making?

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.

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