JOINT CLEAN CLIMATE TRANSPORT RESEARCH PARTNERSHIP

JCCTRP Policy Brief on Transport and Climate Policy in Ontario

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Modeling practices and decision-making in transport, energy and climate in Ontario

Findings from the Phase 1a Workshop of the Joint Clean Climate Transport Research Partnership (JCCTRP)

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INTRODUCTION

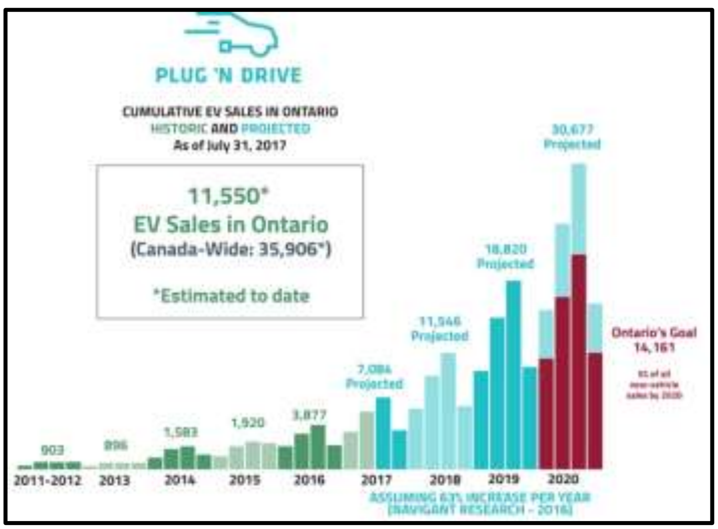
Climate change is one of the defining challenges of our time, requiring an unprecedented level of global cooperation to avoid dangerous levels of greenhouse gas (GHG) emissions.[1] Despite the recent diplomatic success of the Paris Agreement, climate change politics continues to be characterized by gridlock at the international level.[2] In light of such challenges, coordinated action at the sub-national level has increasingly been seen as a hopeful spur to greater climate action through more "bottom-up" political processes.[3] In North America, Quebec, California and, most recently, Ontario have taken an important leadership role in climate policy through a linked GHG emissions trading system operating under the auspices of the Western Climate Initiative (WCI)—a voluntary cooperative agreement between partner jurisdictions.[4]

In 2015, the WCI was significantly expanded to include transportation-induced emissions, which constitutes the largest source of GHG emissions in all three jurisdictions—34% in Ontario, 38% in California and 42% in Quebec.[5] In this context, it is important that jurisdictions be able to anticipate the effects of various GHG emissions reduction measures on emissions trading with WCI partners, notably the effects of measures in the transportation sector. Energy systems modeling allows these issues to be explored by beginning to attempt the quantification of energy and technology pathways. Equally important is to understand the role that modeling plays in policy decision-making.

In order to face this challenge, academics and practitioners from across these three jurisdictions as well as the state of Vermont have come together to develop the Joint Clean Climate Transport Research Partnership (JCCTRP).[6] In this policy brief, we report on a Phase 1a meeting of the JCCTRP held in early November 2017 in Montreal. The JCCTRP aims to build a network of experts tasked with identifying best practices, clarifying links between modeling and decision-making, and formulating concrete propositions to strengthen modeling capacities across partner jurisdictions.

In this policy brief we report on findings specific to Ontario. In 2014, the province met its target of 6% below 1990 levels, notably by closing all its coal-fired electricity-generating stations.[7] The Ontarian legislature has since adopted several GHG emissions reduction targets relative to 1990 levels: a 15% reduction by 2020, a 37% reduction by 2030 and a 80% reduction by 2050.[8] To achieve these goals, Ontario is required to develop and revise every 5 years a Climate Change Action Plan (CCAP) under the 2016 Climate Change Mitigation and Low-carbon Economy Act. The CCAP targets the largest contributors of fuels-related GHG emissions in the province: the transport, industrial and residential sectors. The primary measures of the 2016-2020 CCAP include an economy-wide cap-and-trade program, a province-wide electric and hydrogen passenger vehicle sales target of 5% by 2020 and multiple additional measures to reduce emissions from transport and buildings[9]. Below we present some of the key modeling tools and policies that Ontario is using in the province's attempt to reach these ambitious goals. Low-carbon vehicle sales are projected to be in excess of 5% of total sales by 2020 (Figure 1), but specific challenges must be addressed to reach the projected potential.

Figure 1: Low-Carbon Vehicle Sales in Ontario, Historic and Projected, 2011-2020



Source : Plug 'N Drive (2017) Driving Our Clean Energy Future, November 2017, JCCTRP Workshop.

MODELING CAPACITY IN CANADA AND ONTARIO

Ontario's transport and climate policy are bound to be influenced by the federal government's modeling efforts. Canada has developed respectable capacities in energy-systems modeling, distributed across three federal entities, a number of Canadian universities and a few consulting firms. The National Energy Board (NEB), Environment and Climate Change Canada (ECCC), and Natural Resources Canada (NRCan) have also developed models to forecast energy markets and GHG emissions.

However, a number of challenges present themselves. First, very few federal planning and modeling initiatives have been documented in the transportation sector.[10] One notable exception is the *Plug-in Electric Vehicle – Charge Impact Model* (PEV-CIM), developed by NRCan to estimate the impact of electric-vehicle market uptake on power demand and GHG emissions in Canada.[11] Second, another important challenge is that climate and transport policy is a shared jurisdiction of federal, provincial and municipal governments, meaning that many of the modeling efforts of the Canadian federal government might find it difficult to gain traction in provincial-level policy discussions.[12]

Some Canadian universities and associated consulting firms have developed advanced modeling capacities. Most efforts target energy systems and as such transportation sector analysis is often provided only by indirect modeling, as a component of the energy system.[13] However, there are some modeling efforts specific to transportation. The Canadian Energy Research Institute (CERI) developed a model of personal vehicle fleet turnover.[14] Simon Fraser University in British Columbia hosts the Sustainable Transportation Action Research Team, which is responsible for the development and use of a transit demand simulation model, the REspondent-based Preference and Constraint (REPAC) model.[15] REPAC uses data drawing from a wide range of disciplines including economics, engineering, public opinion, marketing and psychology. It allows to compare the costs and benefits of policies aiming to incentivize zero emission transit, by tapping into an individual-level understanding of transit demand.

While it is likely that JCCTRP only identified the tip of the iceberg regarding energy and transport modeling in Ontario, from deliberations of the November 2017 JCCTRP workshop the province is characterized by the strength of modeling capacity at the regional or municipal scales, in contrasts with the situation in Quebec and California. The University of Toronto Transport Research Institute (UTTRI), for example, provides a solid foundation in transportation modeling, with an emphasis on regional models and integration with land-use planning.[16] Toronto, Mississauga, Brampton and Durham have used the GTAModel developed by UTTRI to plan regional transit. The Data Management Group (DMG) affiliated to UTTRI provides data collection, management, and analysis services to provincial and municipal transport planning agencies in the region of Toronto-Hamilton.[17] DMG manages two important databases, namely the TTS and the regional Cordon Count. The Travel Demand Modeling Group (TDMG) affiliated to UTTRI brings together research activities related to sustainable transit planning, transit demand modeling, and transit behavior-oriented survey methodology.[18] Outside academia, considerable modeling capacity appears to be retained by Metrolinx, an agency of the government of Ontario created in 2006 to improve transport coordination and integration in the Greater Toronto Area.[19]

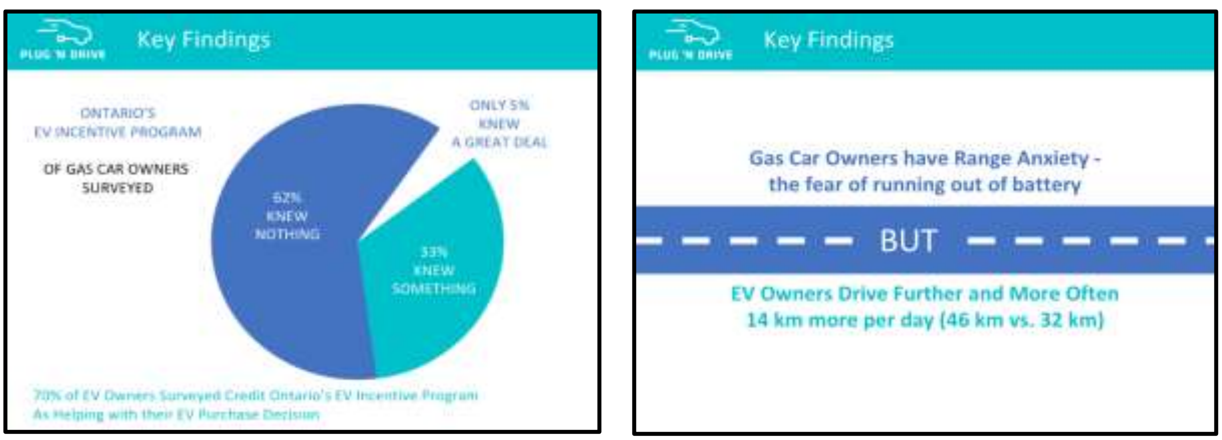
However, large-scale modeling capacity has also been developed, though appears to be located amongst private consulting firms in Ontario. The Canadian Energy Systems Simulator (CanESS) has been developed by whatIf? Technologies in Ottawa and the Canadian Energy Systems Analysis Research at the University of Calgary.[20] CanESS is an integrated, multi-fuel, multi-sector, provincially-disaggregated energy systems model for Canada that enables bottom-up accounting for energy supply and demand. The EnviroEconomics consulting group, also based in Ottawa, has used the CIMS model[21] in tandem with Regional General Equilibrium Energy Model (R-GEEM) in a recent analysis for Ontario climate policy.[22] The concentration of large-scale modeling capacity in Ottawa is likely related to needs of the federal government.

It was also pointed out during JCCTRP deliberations that there are insufficient agent-based models in use, which are better designed to estimate technology uptake. But such models are only as good as the survey data they are built on. Plug 'N Drive, a Toronto-based non-profit organization that promotes electric vehicles for their environmental and economic benefits, has fielded a number of surveys in the recent years to understand the factors driving electric vehicle uptake. Amongst interesting findings, they have shown that most internal combustion engine car owners are not aware of the existence of Ontario's Electric Vehicle Incentive Program, which subsidies electric vehicle acquisition by up to $14,000 CAD[23]—which is substantially more than the $8,000 CAD offered in Quebec.[24] It has also shown that despite the range anxiety invoked by internal combustion engine car owners as a reason not to switch to an electric vehicle, electric vehicle owners drive 44% further and drive more often (Figure 2). Most internal combustion engine car owners are also unware of the fact that the electric vehicle' higher upfront costs can be offset not only through government incentives, but also through savings on fuel and maintenance. Electric vehicle owners save approximately $1,900 per year on operational costs relative to internal combustion engine cars.[25]

Figure 2: Driving EV Uptake in the Greater Toronto-Hamilton Area, 2016

(a) Awareness of Ontario's Electric Vehicle Incentive Program Amongst Internal Combustion Engine Car Drivers

(b) Average Mileage, Internal Combustion Engine Vehicle and Electric Vehicles



Source : Plug 'N Drive (2017) Driving Our Clean Energy Future, November 2017, JCCTRP Workshop ; Plug 'N Drive (2017) Driving EV Uptake in the Greater Toronto-Hamilton Area. How Driver Perceptions Shape Electric Vehicle Ownership in the GTHA. Report.

MODELING AND DECISION-MAKING IN ONTARIO

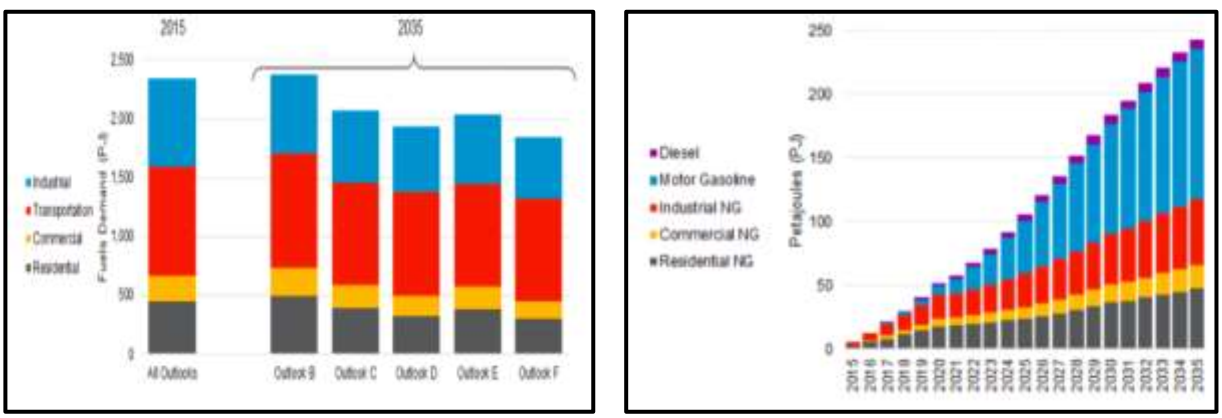
In the context of energy transitions, the systematic use of modeling is expected to have several advantages. Ideally, modeling will allow for the identification of policies most likely to achieve complex and inter-related policy goals such as emissions reduction, public revenue generation, social welfare growth and economic efficiency. It is also thought that modeling efforts will generate results that generate public awareness and cultivate more nuanced discussion of the breadth, nature, and distribution of expected costs and benefits climate and transport efforts. A number of examples arose during deliberations of the JCCTRP of how modeling is used in the policy decision-making process.

At the provincial level, the Ontario government has used modeling to inform its 2017 Long-Term Energy Plan (LTEP).[26] In September 2016, in preparation for the 2017 LTEP, the Ontario Ministry of Energy released the Fuels Technical Report. Prepared by Navigant Consulting, the Fuels Technical Report offers a comprehensive view of the current state of the fuel sector and provides a set of outlooks for the 2016-2035 period (Figure 3). This input is expected to inform future decarbonization strategies. Other modeling activities undertaken for the LTEP compare scenarios to take into consideration major uncertainties pertaining to technological innovation and deployment, as well as policy implementation.[27] At the regional level, Ontario's Minister of Transportation commissioned Metrolinx, referred to above, to undertake a transit system modeling analysis of the Toronto-Hamilton metropolitan area in order to inform its Regional Transportation Plan. Using a transit demand simulation model and infrastructure development scenarios, Metrolink generated transit network performance estimations.[28] In addition, Toronto, Mississauga, Brampton and Durham have used the GTAModel developed by UTTRI to plan regional transit management.

Figure 3: Fuels Technical Report, Outlook to 2035

(a) Sectoral Breakdown of Energy Demand to 2035, by Outlook

(b) Conservation Achievement to 2035, by Fuel Type – Outlook B.



Source : Navigant Consulting, Inc. (2016). Fuels Technical Report, prepared for The Ministry of Energy of Ontario, September 2016. Pages 66 & 71.

Nonetheless, during JCCTRP deliberations there was some skepticism of a direct link between modeling and decision-making. Indeed, in a 2007 study by UTTRI researchers, it was found that amongst transport policy practitioners in Ontario there was a general disbelief in the usefulness of models for decision-making, lack of resources for large-scale modelling exercises, and poor institutional integration among government departments.[29] Experts participating in the JCCTRP from Quebec had also pointed to a lack of coherence between their province's emission reduction targets and the measures to achieve them. In Ontario it would be important to clarify how regional and urban transport models are used by regional and municipal governments in their decision-making and the extent of their linkage to provincial-level decision-making.

Participants to the JCCTRP workshop have brought attention to several other issues that would need improvement in order for transport and energy modeling to play a more effective role in decision-making regarding the transport sector in Ontario. First of all, Canada does not currently have a program supporting the integrated modeling of transport and energy systems, in contrast with other jurisdictions.[30] Second, funding for modeling projects which can be obtained through federal research agencies typically only cover the development of new models, but not maintenance and updating of existing models. Third, the interplay between policy sectors can also generate important co-benefits if properly coordinated. A case in point, most of Ontario's hydropower is generated from run-of-the-river installations and, for this reason, Ontario's power system has relatively little storage capacity. As hydropower is generated continuously, there tends to be oversupply during the night. Charging electric vehicles overnight to absorb this power supply would benefit Ontario both environmentally and economically. Yet it is not known whether the co-benefits arising from EV uptake have been modelled and have informed policy-making.

Finally, when discussing the role of energy and transport system modeling in the decision-making process, it is also important to underline the uncertainty surrounding the scenario modeling and cost assumptions, especially of emerging technologies. The major part of energy systems modeling is undertaken in Canada and Ontario by consulting firms, notwithstanding the important contribution of academics. This state of affairs raises the question of lack of transparency as decisions concerning crucial parameters and hypotheses are often not made public, and thus are only known to specialists operating the models. Concerns about "optimism bias" and the "planning fallacy" suggest that opening up the modeling process would be beneficial.[31] Conveying findings along with uncertainties to decision-makers is also a key challenge. It is particularly at this level where the JCCTRP hopes contribute, by help decision-makers and the public understand what energy and transport system models can and can't tell us.

Conclusion

In comparison to California, which is a world leader for integrating modeling efforts with transport and climate policy-making,[32] the JCCTRP found room for improvement in Ontario. While regional and municipal government bodies seem to be taking advantage of models in order to improve transport systems, it would be important to clarify exactly how models are being used in policy-making at this level. However, more detailed understanding of how modeling is used in the policy decision-making process at the provincial level also requires attention. Nonetheless, expertise in regional and municipal modeling is a definite strength of transport modeling capacity in Ontario, particularly given that it more naturally fits with local-level policymaking where many important transport decisions are made. While the province is increasingly giving modeling greater attention and support, we must underscore that the links between energy, transport, and emission reductions are not analyzed in an integrated manner.[33] The JCCTRP will strive to clarify these issues by bringing together experts from inside and outside academia together to build capacity to address climate and transport issues together.

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