

POSITIVE ENERGY

TRUST IN TRANSITION

Discussion Paper for Positive Energy's

Trust in Transition workshop

23-24 January 2018, University of Ottawa

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Introduction

Positive Energy seeks to strengthen public confidence in Canadian energy policy, regulation and decision-making through research and analysis, engagement and recommendations for action. As the first three-year phase of *Positive Energy* draws to a close, planning is underway for the next phase of research, which turns attention to low-carbon energy transition. Transitioning Canada's energy systems to lower carbon configurations will entail, in the relatively brief span of 30 years, a transformation of a nature and scale approximating that last seen at the beginning of the twentieth century, when power grids and petroleum-based transportation came to dominate energy systems.

Public confidence and trust in energy transition decision-making will be an essential driver of the speed and effectiveness with which Canada can transform its energy systems. To that end, *Positive Energy's Trust in Transition* project will provide sustained research and engagement on challenges and opportunities to strengthen public confidence in transition decision-making.

This discussion paper provides a "straw dog" for discussions at the planning workshop "Trust in Transition" held January 23 and 24, 2018 at the University of Ottawa. The paper has three broad goals. First, to outline the scope of the low-carbon energy transition. Second, to propose four topic areas that affect public confidence and trust in energy transition decision-making: expanded roles for municipal and Indigenous authorities; the role of conventional resource sectors (oil, gas, nuclear) in energy transition; social acceptance of energy technologies; and the information base for long-term evidence-based policymaking and regulation. Third, to outline proposed next steps for the *Positive Energy: Trust in Transition* project.

1. Low-carbon energy transition and decision-making

1.1 Type and extent of changes

The Government of Canada has committed to reducing GHGs by 30% from 2005 levels by 2030, with a planned further decrease of 80% from 2005 levels by 2050. Energy and greenhouse gas emissions are tightly linked, as almost 80% of GHG emissions are tied in some way to energy consuming activities such as transportation, heating and cooling of buildings, production of goods, and of course, the production of energy and electricity (NRCan 2018). Canada's oil and gas sector and electricity sectors account for 26% and 11% of GHG emissions respectively (ECCC 2018).

Major changes to Canada's energy system will be required to meet climate targets. The nature of these changes will be influenced by carbon pricing but also regulation. Current examples on the regulatory side include federal government rules to limit methane emissions from upstream oil and gas activities (ECCC 2017), an upcoming clean fuel standard establishing carbon intensity requirements for fuels used in transportation, industry and buildings (Canada Gazette 2017); and promises to phase out coal-fired electricity generation by 2030. Provincial government policy and regulation are also highly important given the constitutional division of authority over energy in Canada. For example, Alberta has committed to capping oil sands emissions at 100 MT¹, carbon pricing, reducing methane emission by 45% and ending coal-fired electricity generation by 2030 (Alberta 2018). The federal government estimates that existing policies and Pan-Canadian Framework commitments will reduce GHGs by 24% from 2005 levels with the remaining reductions to come from infrastructure changes and carbon sequestration (ECCC 2018b).

1.2 Focussing on projections and extent of changes for low-carbon energy systems

As projections and targets extend to 2050, the scenarios for lowering the carbon intensity of Canada's energy system become more far-reaching. To give a sense of some the changes that could be involved, this paper draws on projections from three sources: the National Energy Board's Energy Supply and Demand Projections to 2040 (NEB 2017), the Government of Canada's mid-century long-term greenhouse gas development strategy (ECCC 2016) and the Trottier Energy Futures Report (Trottier 2016). The purpose of Table 1 below is to provide a snapshot of some of the changes to help inform discussion at the "Trust in Transition" workshop. Note that the reports featured in table 1 analyse multiple scenarios. We chose the scenarios to capture a range of projections. For example, the one highlighted below from the Trottier Report is the most far-reaching in terms of impacts on the oil and gas sector and is based on a premise that reduced projected use of fossil fuels in Canada to reach an 80% GHG reduction target will coincide with reduced fossil fuels in the rest of the world and thus reduced export of fossil fuels. The NEB scenario on the other hand does not model a specific GHG reduction target or reduced global demand for fossil fuels, rather it models only the impact of carbon price and technology improvements.

¹ 100 MT equates to 14% of current (2015) national emissions and 19% of 2030 national emission target.

Table 1 – Selected energy system projections for low-carbon energy transition

Report	Energy Supply and Demand Projections to 2040 (NEB, 2017) (Technology Case)	Mid-century long-term greenhouse gas development strategy (ECCC, 2016) (review of different models)	Energy Futures Report (Trottier, 2016) (scenario 8R60a)
Author	National Energy Board	Govt of Canada	Trottier Foundation, Canadian Academy of Engineering and David Suzuki Foundation
GHG target	none	80% from 2005 levels by 2050	80% from 1990 levels by 2050
Major assumptions	Carbon price rises 5\$/tonne after 2022 to \$140/tonne (nominal terms, \$88/tonne in 2016\$); technology assumptions that costs for renewables decline and modest penetration of battery storage	Reviews 4 models (Deep Decarbonization Pathways – Bataille et al 2015; Trottier Energy Futures Report and two Environment Canada models) (p 22)	Reduced fossil fuel exports; 60% reduction targets for combustion GHG; new high voltage interconnections; CCS; 2 nd generation biofuels; new nuclear power; new large scale hydro in BC (table 55, p 129)
Electricity infrastructure	40% more capacity than 2015 by 2040 to approximately 200 GW from approximately 135 GW (Stats Can, 2017a) (p 76)	Production increases between 113% - 295% (~150 GW – 400 GW) (p 23) mostly hydropower	Reaches approximately 320 GW by 2050 (fig 151, p 255)
Oil and gas production	Total domestic fossil fuel use declines 7.4% compared to 2015 levels (p 78) Total oil production increases from ~ 3.9 mmBd to ~5.5 mmBd by 2040 (figure 4.12)		Oil and natural gas exports are ~5000 PJ by 2050 (fig 138, p 247), an approximately 50% decline from 2013 exports of 9470 PJ (CESAR 2018)
Degree of electrification of transportation fleet	34% EV penetration of passenger vehicles by 2040 (p 65)	21% - 56% by 2050 (p 38)	Not directly reported for scenario 8R60 but similar scenarios feature virtually 100% EV for smaller passenger vehicles and 95% hydrogen fueled heavy freight vehicles by 2050 (p 176)
Other		Total energy consumption declines from 10,950 PJ (2014) to potentially 7971 PJ	

While the models above outline potential scenarios for a drastically decarbonized Canadian energy system, some have pointed to “basic realities” (Smil 2016: 194) that limit the pace of energy transitions. Smil (2016) notes, for example, that fossil fuels supply 80% of the world’s primary energy supply and the global energy transition has been, so far, a shift in electricity generation that has only had a small effect on the

decarbonisation of the overall primary energy supply. Replacing fossil carbon used in production of cement, iron and plastics, for example, is a major barrier to large-scale decarbonisation.

When one considers the Canadian energy system as a whole in terms of flows of the total energy produced in Canada from primary energy to end use including exports as is done in the Sankey Diagram below in Figure 1 (CESAR, 2018) a few other “realities” are apparent. First, the importance of energy efficiency. About half of the energy that flows into the domestic end use space ends up as losses. Second, the choice to pursue electrification for all end uses is a large undertaking as today electricity accounts for about one-fifth of energy end use. Third, the relatively small contribution of new renewables wind and solar to total energy flows. While it is important to note that the diagram includes data only up to 2013, and that wind and solar production have increased significantly since then (to approximately 80 PJ annually according to latest Stats Can electricity generation figures from October 2017 (Stats Can 2017b)), the contribution is growing but still relatively small.

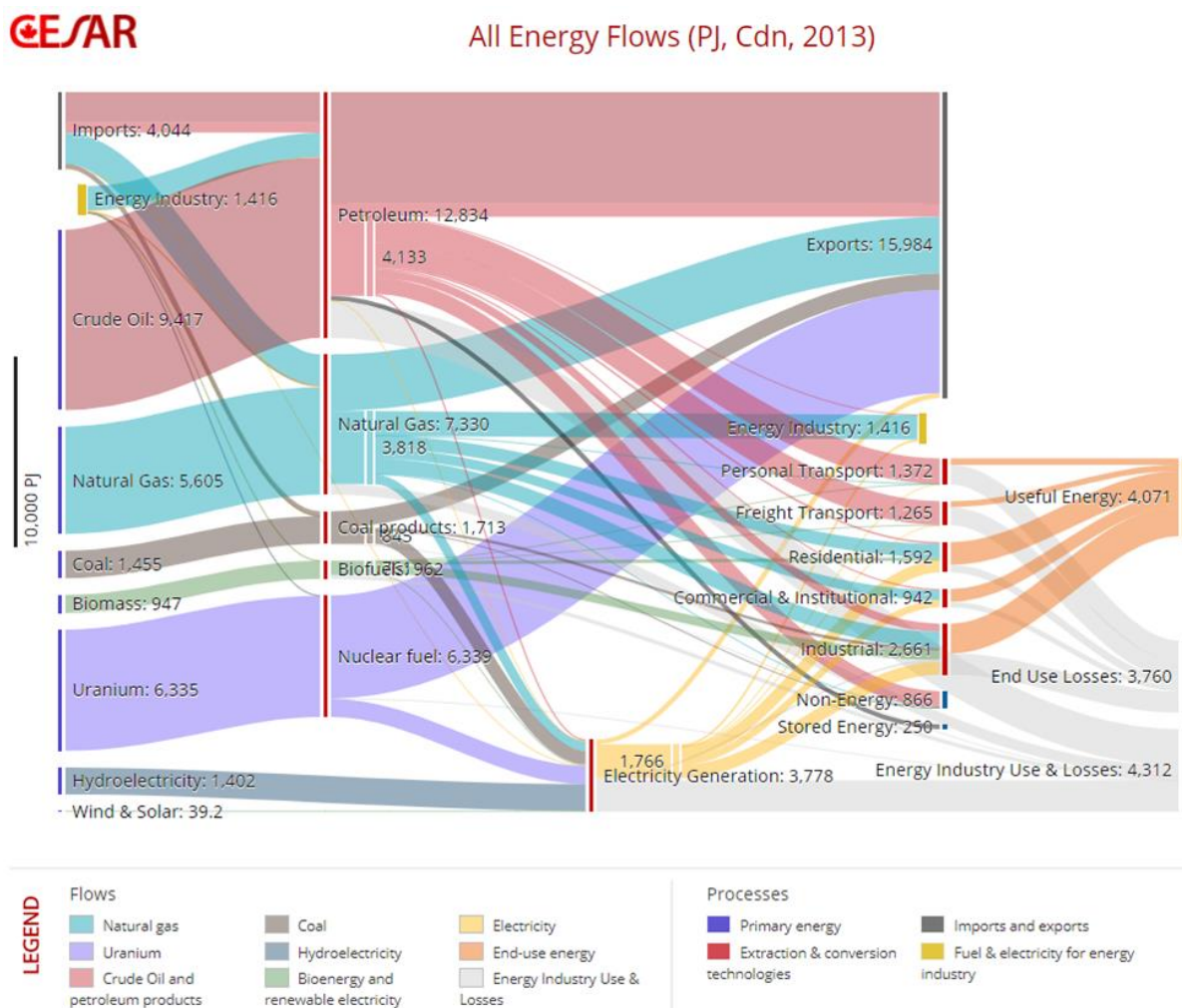


Figure 1 – Sankey Diagram of Canadian energy flows

2. Four potential challenge areas for public trust in energy transition decision-making

The notion of directing a major change in the energy system touches on fundamental questions about society's ability to steer and govern change. From a public policy and administration perspective, that ability is not straightforward. New Public Management (Lane, 2000; Doern and Gattinger 2003), characterized by a reduction in the size and scope of government, and leaving more issues to the market and nongovernment actors to resolve, raises questions about the capacity of the 'system' to respond effectively to the demands for a managed energy transition.

Further complicating efforts is that levels of trust in government, industry and experts have declined across western industrialized democracies in the postwar period (Giddens 1990). In an era of "fake news" and social media echo chambers, the 2017 Edelman Trust Barometer declared "trust is in crisis around the world" (Edelman 2017). The implications of low trust levels for energy transition are generally understudied (Greenberg 2015). Sovocool's (2015) influential review of social science research in the energy field highlights the important role of trust in decisions about energy technology as a priority area for research. To date, *Positive Energy* (www.uottawa.ca/positive-energy) has undertaken comparative case studies of factors affecting trust in energy decision-making authorities (Cleland et al 2016, Cleland and Gattinger 2017, see also community case studies by Bird 2016, Fast 2016, Sajid 2016a, 2016b, 2016c and Simard 2016). This research emphasizes that in addition to lack of trust relating to individual energy project decision-making processes, distrust is exacerbated by lack of adequate policy movement on issues well beyond individual energy projects, notably climate change, reconciliation with Indigenous Peoples and cumulative effects management.

Against this backdrop and based on Positive Energy's extensive research and engagement project to date, we propose that the *Trust in Transition* research program focus on four core challenges that affect public confidence and trust in energy transition decision-making.

Challenge 1: Role for municipalities and Indigenous communities

Municipalities (municipal governments and all the private entities – e.g., households, businesses - within their jurisdiction) account for 60% of energy used in Canada and over 50% of greenhouse gas emissions (Council of Energy Ministers, 2009). Despite their importance in the energy system, there is an ongoing debate over the role of municipal governments in the energy decision-making system (Potvin et al 2017).

Indigenous governments and communities are also highly important energy governance actors. Energy development on Indigenous reserve lands or lands subject to Aboriginal claim occurs in a unique legal, political and historical context. In this context, the typical situation of provincial jurisdiction over natural resource development is upended for three reasons: first, reserve lands fall under federal jurisdiction; second, Aboriginal and treaty rights are constitutionally protected; and, third, the Crown has a duty to consult with Aboriginal peoples (Wright and White 2012). This constitutional context has led to innovative co-management arrangements, but it has also generated considerable uncertainty about the respective roles, responsibilities and capacities of Indigenous governments, Indigenous community actors, policymakers and regulators at the federal and provincial levels, and industry proponents.

The workshop will focus on identifying key areas for *Trust in Transition* research over the next three years by examining practical examples of municipal and Indigenous authorities in energy decision-making along with the constitutional arrangements that challenge coordination. Henderson will share survey findings from more than 150 medium-to-large scale solar, wind, hydro and bio-energy projects across the country with Indigenous participation (ICE, 2017). Leach will focus on the movement for Smart Energy Communities (i.e., those that emphasize energy efficiency, integration of energy networks, local generation opportunities, land use planning) (QUEST, 2016). Deschênes-Philion will explore the roles of municipal authorities in energy decision-making.

Challenge 2: Limited attention to the role and contribution of Canada's oil, gas and nuclear sectors in the country's path to transition

Low carbon transition will reduce the utilization of fossil fuel resources. However, comprehensive energy system-wide integration research shows these resources will continue to play a valuable role in the future, yet will be providing different energy system services. Oil and gas resources are likely to continue to play a role in Canada's energy system in the coming decades. Renewable resources may come to dominate the generation of electricity, but not all renewables sources are able to provide quick ramping, contingency reserves, and this has major implications for regulatory frameworks required to maintain grid reliability. In this context, the role of nuclear and natural gas in Canada's electricity system going forward is an important question. Furthermore, electricity currently accounts for only about a quarter of total Canadian energy primary energy supply, meaning there are significant questions about the feasible pace of change and what low carbon transition means for the (current) majority of Canada's energy system.

Workshop panelists Torrie (global/domestic supply/demand), Farmer (lower carbon electricity generation and regulation) and Abdullah (nuclear) will speak to these issues, with an emphasis on key areas for further investigation and engagement in the *Trust in Transition* project.

Challenge 3: Social acceptance of evolving technologies and transition

Social acceptance of technologies propelling energy transition will be a key driver of the pace and extent of transition. And yet, lack of social acceptance of low-carbon technologies (e.g., wind farms, smart meters) was largely unexpected (Fast, Mabee et al 2016, Peters et al 2017). What lessons can be drawn from these experiences? How can we better anticipate and address public confidence in new and emerging technologies underpinning transition? How might social acceptance of energy technologies (or lack thereof) affect the validity of assumptions of "prosumer" (individual households that both consume and produce energy) behaviour in smart grids? For example, the involvement of new actors in grid operation and the growth of microgrids generates questions about coordination and the need for clear rules or regulations to manage competing interests (Bird and Hotaling, forthcoming 2017). In addition, new energy technologies face the "pacing problem": the lag in time between the development of new technologies and the development of regulation, mechanisms and institutions to oversee their use (Wallach 2015; Bird 2017). How can we proactively address this issue? Further, energy transitions call for new politics, investment, cultural norms, and landscapes (Parkins et al 2015). What are the social acceptance dimensions of these issues?

Scholars Bird, Millar, Parkins and Simard (policy learning) will address speak to these challenges, and identify key research gaps and priority research and engagement areas for the *Trust in Transition* project.

Challenge 4: How to integrate questions of public trust into techno-economic modelling and other energy futures research methods

Data and information on cost, reliability, the investment and innovation climate, and environmental performance are essential for public and private investment and decisions in a low-carbon energy transition. This relies heavily on economic modelling, forecasts for technical change and advances in engineering and technology. Economic evaluations of features such as the employment impacts of different transition scenarios (e.g., Rivers, 2013) and the impact of carbon pricing on energy transition (e.g., Dolter and Rivers, 2017) inform public policy. Yet, economic analyses of low-carbon energy transitions often disregard questions related to public confidence and social acceptability of the relevant policies and programs. These studies typically apply energy economic models to simulate optimal pathways to a low-carbon energy system, where the pathways are constrained only by technical feasibility and economic cost-effectiveness—not by public confidence (Strachan et al. 2009, Bataille et al. 2015, Dolter and Rivers 2017). Accounting for behavioural aspects is mostly limited to consumers' or firms' choices about energy technologies and energy use (Horne et al. 2005, Rivers and Jaccard 2005).

Wider governance issues, including systematic public opposition and lack of trust in public authorities managing transition, are not commonly considered in model variables. At the same time, a number of empirical studies show that a favourable economic analysis of energy and climate policies does not guarantee their public support (Dresner et al. 2006, Zoellner et al. 2008, Beck et al. 2016). As a result of this disconnect, we lack understanding of both how economic analysis influences public confidence and how a lack of public confidence may in turn affect the economic costs and sociopolitical feasibility of energy transition policies.

In the absence of explicit consideration of public confidence in economic, techno-economic and other futures-oriented research (scenarios, horizon scanning, forecasting), government decision-makers may find themselves taking one step forward and two steps back if public opposition to economically or technically rational – but politically unpopular – decisions lead to policy reversals and instability. Not only can this reduce the speed and effectiveness of transition from a public support perspective, it also creates an unpredictable and uncertain investment climate for business and competitiveness. The workshop will help to identify key knowledge gaps through participation by modelling experts Dolter and Robertson. The workshop will also assess the extent to which foresight planning and scenarios work in government (participant Toor) consider questions of public confidence and where key research gaps and opportunities lie for the *Trust in Transition* project.

3. Proposed next steps for *Trust in Transition*

Short-term (next 6 months – until fall 2018): Problem-Framing

- **Begin to systematically map the energy transition decision-making system (ETDMS) with a view to identifying its key gaps or challenge areas:** *Trust in Transition* will take a systems approach to mapping the ETDMS. We anticipate the main component parts of the ETDMS system will be similar to the conventional energy decision-making system (Cleland and Gattinger, 2017), however, we expect there will be major differences in the respective roles, responsibilities and importance of key public sector players in the system (e.g., much greater role of policymakers and municipal governments), along with the nature of their interactions with one another. Moreover, we expect that questions of scale (extent of transformation required) and time (long term) will distinguish energy transition decision-making from conventional energy decision-making systems. Mapping the various component parts of energy transition decision-making, how they relate to each other, and how they interface with the physical and market energy systems, will be a pivotal first step of the *Trust in Transition* project. We expect to prepare a discussion paper on this topic that draws on systematic document reviews, interviews and validation through workshop or other means of exchange with energy leaders.
- **Undertake general and elite public opinion polling work to inform and validate problem framing.**
- **Kick-off conference:** We plan to officially launch the *Trust in Transition* project with a high profile inaugural conference in fall 2018.
- **Prepare policy primers:** Develop a policy primer(s) on priority topic areas informed by the January workshop discussion.
- **Fundraise:** fundraising through granting agencies (federal and provincial), industry, government and foundation sources.

Medium term (6-18 months – until fall 2019): Solution Seeking

- **Finalize mapping the ETDMS and key gaps/challenge areas:** Finalize mapping the ETDMS as the major foundation to research and engagement on the four challenge areas.
- **Launch research and engagement streams for each of the four challenge areas:** Research and engagement streams for each challenge area will be informed by the workshop discussion and follow-up activities (mapping paper, inaugural conference). These could include, for example, case studies and engagement with senior leaders to identify and address barriers to long term evidence-based decision-making, e.g., the ‘pacing problem.’ Given the quick pace of energy technology development and often ambitious public policy goals to facilitate widespread use and commercialization of low-carbon energy technologies, the pacing problem is particularly acute when it comes to energy transition. The research and engagement could focus on cases like the regulatory treatment of electric vehicle charging stations and challenges related to federal grants to municipalities to install charging stations and sell power to electric vehicle drivers.
- **Begin to provide recommendations to strengthen public confidence in energy transition across each of the four challenge areas.**

- Undertake general and elite public opinion polling work to inform and validate solution seeking.
- Throughout, regularly convene government, industry, NGO, Indigenous interests and academics; mobilize/disseminate research and engagement findings to decision-makers through various means (briefings, policy briefs, op-eds, etc.)

Long term (18-36 months – until summer 2021): Validating Solutions

- Continue to convene/engage/communicate/poll at regular intervals in the research process.
- Provide final recommendations to decision-makers on ways to address challenges to public trust and confidence in energy transition: this could include working directly with policymakers, regulators, municipalities, Indigenous governments or industry to pilot and validate recommendations.
- Final conference: fall 2021.

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