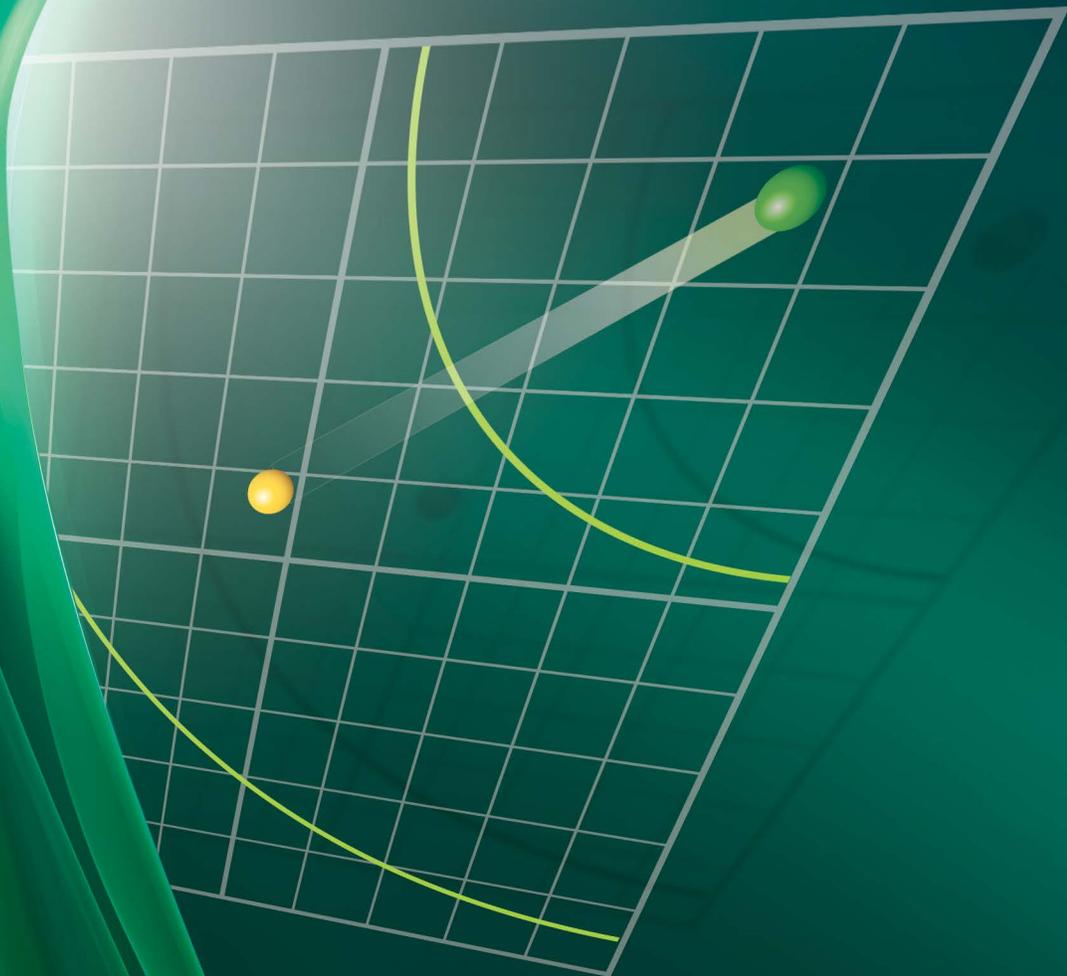


CANADA:

Making the Case for Nation-Building Projects



A project undertaken by:



**The Bowman Centre
For Sustainable Energy**

CANADA:

Making the Case for Nation-Building Projects

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The mission of the Bowman Centre for Sustainable Energy is to catalyze big energy projects which drive Canada's energy strategy and generate economically and environmentally sustainable wealth and jobs.

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As Marshall Kern states in the Executive Summary of this book, Canada seems to have lost its way when it comes to advancing major projects on a nation-building scale, a theme that the late and dearly missed Jim Prentice and I explore in significant detail in our 2017 *Globe & Mail* bestselling book titled *Triple Crown: Winning Canada's Energy Future*.

Canada is a top-five global producer of all forms of energy: we are third in the world in producing hydroelectricity, fourth in crude oil, and fifth in natural gas. Yet Canadian firms are still only able to export to one single customer, namely the United States, due to a lack of infrastructure capacity to reach international markets for oil and gas. Despite decades of official federal government policy aimed at diversifying Canadian export markets and the fact that many Canadian provinces have long-established international networks of commercial and 'para-diplomatic' representation offices abroad, exports of our most valuable commodity – energy – have not diversified beyond our single customer. This situation has become even more puzzling in recent years as Canada has signed free trade agreements with the European Union as well as several countries in the Asia-Pacific Rim, most of which are lacking in natural resources and energy endowments, where our valuable natural gas and crude oil are not part of any of those agreements.

It is clear that there is no national effort or plan to align national infrastructure priorities to our trade and export ambitions. There was no concerted efforts for example, when negotiating with Japan as part of the Trans-Pacific Partnership trade agreement, to align an energy infrastructure buildout on the West Coast to achieve a long-term supply agreement for liquefied natural gas (LNG), which Japan required after the Fukushima Daiichi nuclear disaster in 2011.

This alarming lack of major infrastructure development is due to several factors. In our book *Triple Crown: Winning Canada's Energy Future*, we discuss the constitutional factors that hamper efforts to achieve a national consensus on developing major projects, especially in the energy sector. One factor is that the Constitution Act puts natural resource development under provincial jurisdiction, which limits federal involvement in coordinating any national policies. Another factor is the policy division over environmental policy, so coordination in that sphere is also difficult. Thirdly, our difficult historical relationship with First Nations and Indigenous Peoples also mitigates any quick fix to building national infrastructure projects, as Canada has never fully resolved its constitutional and fiduciary responsibilities in this regard, resulting in legal uncertainty and costly delays.

Among the factors we do not examine in any great detail in *Triple Crown*, mostly due to space and subject matter limitations, are the societal changes that make major projects more difficult to achieve due to relatively new, and shifting goal posts that some call "social licence" – although to be frank I personally do not like that term. In my view, industrialization in the past century and perhaps more significantly the rapid urbanization of our society since around World War II has created a gap in citizens' understanding of how natural resources contribute to our economy. Canada has a large segment of the population that is now divorced from the process of wealth creation via the responsible development of our plentiful natural resources – both renewable and non-renewable – which account directly for over 15% of our Gross Domestic Product.

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Jim Prentice's co-author of the
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(Toronto: HarperCollins, 2017)

Whereas our grandparents might have left the farm to find work in forestry, mining or oil & gas, their descendants have grown up in suburbs and taken jobs in offices or in the service industries. We as a society have less direct experience these days in generating wealth by digging something out of the ground and selling it. One of my favorite anecdotes in Triple Crown is when Jim recounts his seven summers working ‘under the bins’ as a coal miner in Crowsnest Pass, Alberta, to pay for his university education in the 1970s. He recalled, “[e]very man under the bins knew that we were at the bottom of Canada’s industrial economy, but every one of us took pride in our work. The coal that we were mining was Canada’s best metallurgical coal. We knew it was being exported to Japanese steel producers who were paying premium prices for it, and we were proud of that fact.”

Because citizens are divorced from the realities of wealth creation and sometimes uninformed about the process of getting resources out of the ground, transforming them into something of value, and their transport to markets, it becomes easy to oppose major resource projects. In this context, “NIMBYism” (Not In My Back Yard) is easy to form. In the policy choices we face between protecting the environment and making use of natural resources, a sense balance has been lost and has swung resolutely to the former. It is hard to support an issue one is disconnected from, and easy to oppose something one knows little about because people incur a personal cost in building support (time, effort, and stigma) and little cost in opposing something far away.

Therefore, any book that explains how our economy works and discusses efforts to promote sustainability and improve our global position in responsibly developing our natural resources, building our infrastructure to transform and transport them to international markets is a positive step. Jim Prentice and I acknowledge that in a few decades, hydrocarbons as a source of energy will be replaced by something else. Until then, Canada can be a responsible and sustainable producer and exporter: the choice is not binary. And by being careful and purposeful we can sustain our natural resource economy and lay the foundation for generations of successful, employed Canadians and with the full participation of Indigenous Peoples as project proponents, equity partners, operators and partners because the economic growth and broader revenue opportunities that these nation-building projects will enable must benefit all Canadians.

Let’s get started!

Canada seems to have lost its way when it comes to advancing projects on a nation-building scale. Once a united and mighty nation capable of accomplishing Big Projects, Canada now sits stagnant in its own inability to internally consult, collaborate and come to a consensus to move forward towards a sustainable energy future.

Canada needs a *'vision of the possible.'* A clear plan, driven by visionary and courageous leaders to implement Big Nation-Building Projects with far-reaching benefits. We need Big Projects in the same nation-building scale as the Canadian Pacific Railway, the St. Lawrence Seaway, or the Trans-Canada Highway.

The Bowman Centre for Sustainable Energy understands that the urgency to get started on Big Projects is immediate and certain. We know that Canada has the natural resources that can deliver wealth now so we can build for a sustainable future. We also know that the history of Big Projects in Canada depends on people willing to cooperate, build together, and actively support the vision of a sustainable future. We need to launch Big Projects that set Canada on an unstoppable, irreversible and positive trajectory for a sustainable energy future.

Canada's energy wealth is well documented. However, the current energy infrastructure is the culmination of several centuries of progress. Authority to govern energy resources is divided between the territorial, provincial, and federal governments. The system favours silos of regionally important generation capacity without fully integrating these resources into an effective, optimized whole. We lack a collective vision for Canada's future and because of it, we've missed opportunities to export our expertise and example; choosing instead to export crude oil and bulk electricity.

This book has something new to offer, something spectacularly new. We present ideas that combine and build on the realities of First Nations reconciliation, nation-building, and technology. The pace and timing of the transition to a sustainable energy future will be the result of a new kind of leadership, coupled with innovations in technology and a systems approach to decision-making. Canadians need to use all the measurement tools, efficiencies, and human capacity available to properly manage energy innovation and develop our natural energy resources to provide wealth and prosperity to all.

Canada's business and political leaders know that climate change is a major driver of beliefs, attitudes, and consumer behaviour. Without a unifying vision of a sustainable energy future for Canada, a multitude of small groups of like-minded and single-focused people cannot begin to engage in the essential conversations to overcome differences, change attitudes and behaviours, and bring us together for the betterment of our nation.

Canada needs visionary leadership to overcome discontent and divergence. The ongoing process of building trust must be demonstrated by our leaders in truth, understanding, and reconciliation. Through consultation, collaboration, and consensus, First Nations leaders will help us to recognize the spiritual and cultural value of our land. These three C's must become the cornerstone to inform and shape the decisions we take to build infrastructure for our sustainable energy future.

This is the story of the new Canada. We need economic strength to provide the lifestyle that we have become accustomed to, and we need to continue to present Canada as a world leader in environmental performance.

With all these points in mind, the Bowman Centre for Sustainable Energy directs its attention to Big Projects that meet two key overarching objectives; Economic Performance that will enable Canada to extend its desired social programs, and Environmental Performance that will enable Canada to continue to lead the world in this key global task.¹ The life and career experiences of our Associates enable us to apply a Canadian-developed evaluation methodology that will drive Canada's energy strategy and generate economically and environmentally sustainable jobs and wealth.

Previous generations have built the shipping, transportation, and communication infrastructure that earned both praise and envy from other nations. There is an urgency to continue what has already been started. A Big Nation-Building Project to build a new energy infrastructure will set Canada up as a world leader in sustainable energy.

Big Projects surpass the capacity of a single company and exceed the term of a single government. Big Projects are nation-building tools, and Big Projects change the trajectory of Canada's growth, economy and culture.

It is time we got started.

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Canada's Energy System

Chapter Overview

This chapter provides an overview of the Bowman Centre for Sustainable Energy's (BCSE) vision for Canada's Energy System. It provides a wide-angle lens of what a new energy system looks like, the different components to the plan and what is needed to move forward to expand Canada's hydroelectrical potential.

Introduction

Canada's two hundred-year trajectory of nation-building projects is a gift that keeps giving. The wealth generated from our national infrastructure and almost unlimited energy resources has enabled Canada to create a country across six time zones interconnected through leading-edge microwave and satellite technology, with well-respected societal support programs.

However, will this trajectory continue?

Contrarily, this nation cannot even create a free trade zone within its own provincial boundaries, cannot build the pipelines needed to capture the potential of its resources, has no common goal or commitment regarding a global threat such as climate change, and suffers the consequences of a single dominating customer. The list goes on and on.

After being extraordinarily successful in nation-building projects with a seaway and transcontinental railroad that provided access to the whole country, a recent analysis realistically reports that nation-building in Canada is *stalled*.¹

Should we, as citizens, question whether Canada's future is in jeopardy? Could an observer who seriously analyzes the many forces that affect the capacity of our society to reach its potential, conclude that *many factors are misaligned*? Coupled with global economic and political pressures, would they also conclude that, *yes, our nation is in jeopardy!*

Prior Research

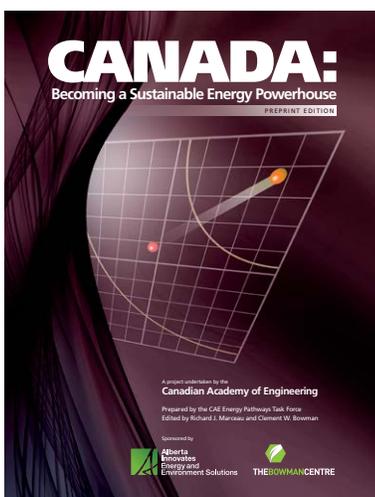
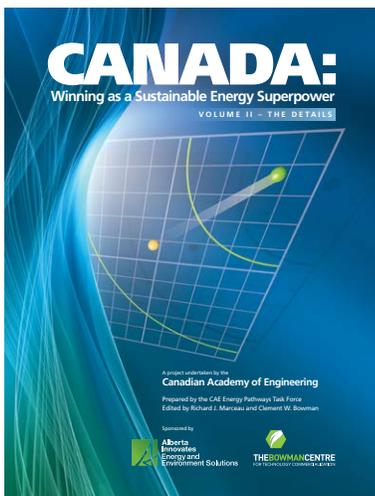
Two previous investigations by the BCSE have provided background on Canada's energy system.

Canada: Winning as a Sustainable Energy Superpower

This project was undertaken as a follow-up to the 2006 G8 Summit, where Prime Minister Stephen Harper presented his vision of Canada as an emerging energy superpower. The investigation concluded that yes, we could win, but raised the question *how?*

Canada: Becoming a Sustainable Energy Powerhouse

This follow-up investigation highlighted three petroleum-based and four electricity-based pathways. This project then raised the next questions *which?* and projects led by *whom?*



This current book, *Canada: Making the Case for Nation-Building Projects*, presents a compelling argument in favour of Big Projects and provides expert guidance on the path to making them a reality.

To move forward, a major new initiative is proposed, *Canada: Delivering on Our Nation-Building Potential*. It is designed to examine nation-building opportunities, and seek solutions to the issues standing in the way of progress.

The new initiative will move beyond any generic discussion of various energy sources and processing options to the actual *analysis of site-specific projects*. This will include projects with identified proponents, preliminary plans, locations and/or designated routes. Those, who will be participating in these multi-tiered and extensive set of analyses, will act, not as supporters, but as independent investigators. They will identify the strengths and weaknesses and help Canadians to understand the benefits and risks of each project.

Research Conclusions

From these investigations, the authors at the BCSE posit there are two possible futures for Canada.

Future 1:

Canada continues as a *captive supplier* of discounted resources to the United States.

Future 2:

Expansion of Canada's huge hydroelectric potential to provide North America with *low carbon renewable* electricity, while establishing a competitive advantage for its resources via access to the Atlantic and Asia Pacific Basins.

To move forward with our vision of Future 2, we posit that certain specific issues first need to be addressed. They are:

- Liquefied Natural Gas (LNG) projects to capture international markets are stalled
- Access to both the Pacific and Atlantic oceans to increase oil trade is completely inadequate
- No plan exists to augment our facilities for marketing value-added bitumen assets
- The potential to increase Canada's hydroelectric capacity as a pathway to lower North American greenhouse gases (GHG) emissions is not recognized
- No policies or plan exist to build a national power grid, which would facilitate expansion of clean, renewable energy

To successfully move nation-building forward, Canada requires:

- Visionary leadership at the national level and a dramatic improvement in interprovincial collaboration
- Leadership by Indigenous people

To support enhanced nation-building leadership, Canada requires:

- An effective regulatory process and aggregate system for project approval
- A mechanism to achieve consensus among Canadian citizens
- A financial system for multi-generational projects beyond the time-lines of individual shareholders

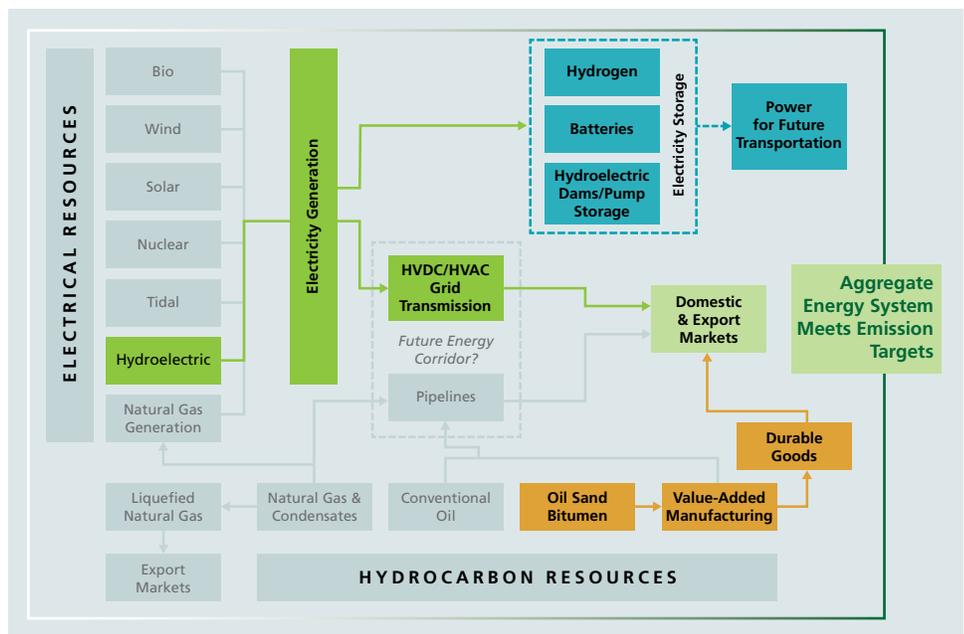
Canada's New Energy System

In their 2006 Natural Resources Canada report, *Powerful Connections*,² ten of Canada's energy leaders urged the federal government to use a systems approach to effectively manage energy innovation. What did they mean by systems approach? It is clear they did not mean energy silos, yet Canada's energy projects, including how we use energy, continue to operate in silos with minimal effort to define an energy system that would capture synergies among its components.

Canada's energy system should be envisioned as an integrated system. Components of this energy system should be selected for priority development over this next half-century, providing economic wealth and jobs, while meeting environmental and greenhouse gas emission targets. In its July 2015 Canadian Energy Strategy,³ the Council of the Federation urged Canada to develop and enhance a modern, reliable, environmentally safe and efficient series of transmission and transportation networks which include electrical grids and hydrocarbon pipelines.

As **Figure 1** shows, three system chains have been highlighted and should now receive increased attention. They are (1) new hydro and a national grid, (2) value-added bitumen manufacturing, and (3) the future energy system of electricity and hydrogen.

Figure 1
Energy Linkages: Three Important 'System Chains'



New Hydro and a National Grid

Canada has only developed part of its huge hydroelectric potential. This represents a major opportunity for 21st century Big Nation-Building Projects.

When properly designed and built, large hydro projects offer the lowest energy cost, including transmission and maintenance. That is why the lowest electricity rate jurisdictions in North America are in British Columbia, Manitoba, and Quebec, where current large hydro projects already exist. The lifespan of a large hydro project exceeds 100 years. After the initial installation is amortized, typically over 50 years, production costs in the following 50 years become negligible. For this reason, old hydro plants are not shut down. They just keep on going.

The development of Quebec's hydro resources has opened large export sales to the U.S. This could be achieved in Canada's west by integrating the resources of B.C., Alberta and the Northwest Territories. High Voltage Direct Current (HVDC) technology makes long-distance transmission of electricity feasible and competitive. Systematically integrating the efforts of B.C.,

Alberta and the Northwest Territories would facilitate development of vast hydro resources in our Northwest. As in Quebec, excess available low-carbon energy could be sold to the U.S. where electricity rates can be two to three times higher than those in B.C.

By developing Canada's huge hydroelectric potential through Big Nation-Building Projects, the following benefits can be realized:

Benefits of Big Energy Projects

- Lower energy costs
 - Energy storage
 - Integration of energy options
 - Provide peak energy periods
- Maintain lower energy costs while converting to a low-carbon future
 - Provide energy storage to allow better integration of intermittent energy options (wind/solar) in the electrical supply
 - Provide peak energy during periods of high demand in Canada and the U.S. through an expanded transmission network, an incremental step towards a possible North American HVDC/HVAC power grid

New Value-Added Bitumen Manufacturing

The oil sands industry began in the 1980s by mining bitumen and upgrading it to a range of value-added fuel and petrochemical products. However, since that time, the major focus has been on pipelining raw bitumen to the U.S. for processing, essentially sending jobs and wealth down the pipeline. The latest example is the Keystone XL Pipeline, which surfaced as a major political issue in the U.S.

Chemists have long known that bitumen is not a 'dirty oil.' It is, in fact, a natural treasure of complex naphthenic ring structures that could be precursors for high-value chemical and non-fuel products. As an early priority, it is recommended that facilities be constructed to process bitumen from the Alberta oil sands into other value-added, not intended for combustion, products.

For example, bitumen could be manufactured into non-fuel products such as carbon fibres, graphenes, premium asphalts, coatings, adhesives and other non-combusted products. This would break the paradigm that processing bitumen must lead to increased greenhouse gas emissions.

A 21st century facility designed to produce durable goods would divert almost half the carbon in raw bitumen from the fuel supply to durables not destined for combustion. The Sarnia-Lambton petroleum refining and petrochemical complex is one of several Canadian regions where value-added processing could be undertaken, while still meeting rigorous environmental criteria. The final step will be to find a contemporary visionary leader to complete the journey, by moving the bitumen east-west a few thousand kilometers to our ocean ports.

Canada's Long-Term Energy Future

We can also peer deeply into Canada's energy future to see new possibilities. Together, hydrogen and electricity have the potential to be the ultimate energy system. It will have the ability to match energy load demand on a daily basis.

Canada's hydrogen guru, Dr. David Sanborn Scott, has proposed that the only plausible final energy state for society will be built around these two interchangeable energy currencies, hydrogen and electricity. He refers to this as the 'hydricity' economy.⁴

The potential for batteries to deliver off-peak electrical power to electric cars is now being actively considered. However, long range battery-supplied electric passenger aircraft may not be practical or affordable. However, hydrogen is. It is the staple fuel of space flight and we have

The Way of the Future is

HYDROGEN + ELECTRICITY =
HYDRICITY

gained much practical experience in its safe manufacture and use. Indeed, without its use, we would not have reached the moon back in 1969.

An Example of a Successful Provincial-led Nation-Building Project

Successful nation-building projects all start with a person of vision. When faced with the decline of investments from multi-national oil companies, who were pursuing what they believed to be more attractive investment opportunities elsewhere, Alberta Premier Peter Lougheed found a solution.

Lougheed established the Alberta Oil Sands Technology and Research Authority (AOSTRA), a major investment fund worth over \$1 billion in today's dollars. This funded the development of commercial processes to recover bitumen from previously inaccessible deeply-buried Alberta oil sands. The task was to raise the bitumen approximately one kilometer to ground surface.

AOSTRA was administered by an independent Board of Directors. This organization led to the development of a new Canadian industry. Significantly, most field projects supported by AOSTRA involved joint funding by the public and private sector.⁵

In 2015, an article in the Globe and Mail noted that AOSTRA was Canada's best example of 'mission-oriented' economic development⁶. Similarly, the United Nations concluded that, in an era of uncertainty and therefore risk, development proceeded beyond expectations. This was the face of challenging federal and provincial structures and relations, volatile oil prices, primitive technologies, and the massive investment needed to bring oil sands production to markets.⁷ Clearly, Peter Lougheed's vision was achieved.

Does this scenario appear to be familiar with today's challenges?

New Evaluation Methodology

Premier Peter Lougheed faced many of the same challenges that we currently face. One of the outcomes of the AOSTRA experience was the development of a project evaluation methodology, which has been evaluated by the Canadian Academy of Engineering.⁸ The advanced methodology is used for evaluating nation-building projects, to establish the overarching *economic and environmental* objectives as well as a *Canadian Achievability* objective. The latter is designed to measure the level of national/provincial leadership and the degree of broad-based citizen support. Today's reality requires that all those who have an ownership in Canada reaching its desired potential be included.

Canada's New Energy System

Canada is in a unique position to lead the world in a transition to a '*hydricity*' economy. In order to do this, we, as a nation must overcome the barriers and obstacles that stand in our way. We must make room for new visionary leadership, including those from our First Nations. We need a dramatic improvement in interprovincial collaboration, consensus among Canadian citizens and both a regulatory process and financial system that can fulfill and maintain multi-generational Nation-Building Big Projects.

Can we do this? Yes, we can! Yes, we must!

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Chapter Overview

Before moving forward with Big Projects, it's worth the time to look behind and around us to assess what has contributed to our current situation, and what holds us back. This chapter will look at some of the reasons why Canada has been unable to build a pipeline, including the current trend to electric vehicles, the subsequent loss of financial investment in oil, as well as the impact that communication, social media and fake news have. Finally, several possible solutions are introduced, some of which will be further explored in later chapters.

Introduction

Canada's inability to move forward has been plagued by both obstacles that stand in our way and opportunities we haven't acted on. Past decisions for processing and distribution expansion have been stalled due to insufficient approvals and opposition from activists and First Nation communities. Instead of cashing in on the current market trend towards electrical over internal combustion engines, the rapidly changing transportation sector has made long term investors nervous. Finally, we must also address the false information, misinformation and incomplete information flooding our news and social media feeds that negatively affect our decision-making ability and fracture our trust in government.

However, there is hope. This book will focus on the ways in which we can overcome these obstacles and discuss what is required to move Canada forward in its transition to becoming a sustainable energy Superpower.

Past Production Decisions Contributing to Today's Oversupply

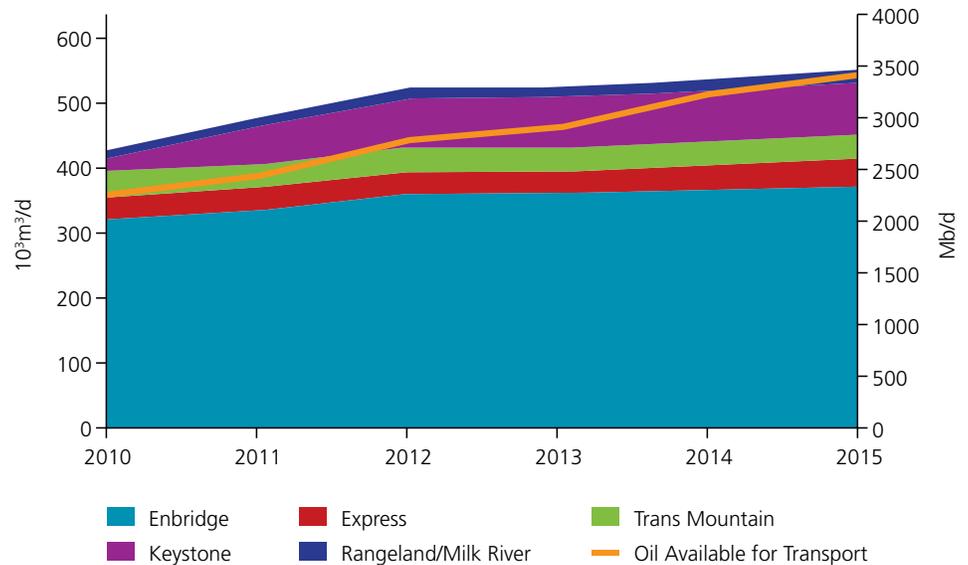
The evidence shows that the only new interprovincial or international energy transportation system built in the last decade is the 'Maritime Link' project between Newfoundland and Nova Scotia. This includes high voltage direct current transmission lines, natural gas or oil pipelines. The two main contributing factors have been the lack of support between the federal and provincial governments for implementing these Big Projects and delayed or abandoned expansion due to opposition from activists and protesters. This has resulted in an inadequate delivery system to export the surplus supply.

Collaboration, consensus and cooperation are required between all levels of government when moving forward with Big Projects. As it is currently, the Federal government has authority over interprovincial and international trade and therefore the delivery systems to move provincial resources to market. The provinces have jurisdiction within their boundaries and can intervene in Federal decisions. Since approvals are required by both the Provincial and Federal Government, one could argue that the following projects should not have been approved without pipeline capacity already in place.

The last export pipeline approved was TransCanada Keystone¹ pipeline (not Keystone XL). Phases 1 and 2 came on stream in 2009, stretching from Hardisty, AB to near Emerson, MB to Steele City, Nebraska to Cushing, OK, moving 590,000 BPD (barrels per day). Phase 3 came on stream in 2014. The only approved export pipeline project in this decade is the Enbridge Line 3 replacement in late 2019, adding 370,000 BPD to the capturing US market. That is, if the project survives protests expected to occur in Minnesota when construction begins in the spring of 2019.

Meanwhile, oil production projects were approved, built and started producing, without an adequate pipeline capacity aimed at the only available market, the USA. The pipelines filled up by 2016 and producers were faced with the choice of cutting back production, or shipping by rail. **Figure 1**² shows takeaway pipelines at capacity in 2016.

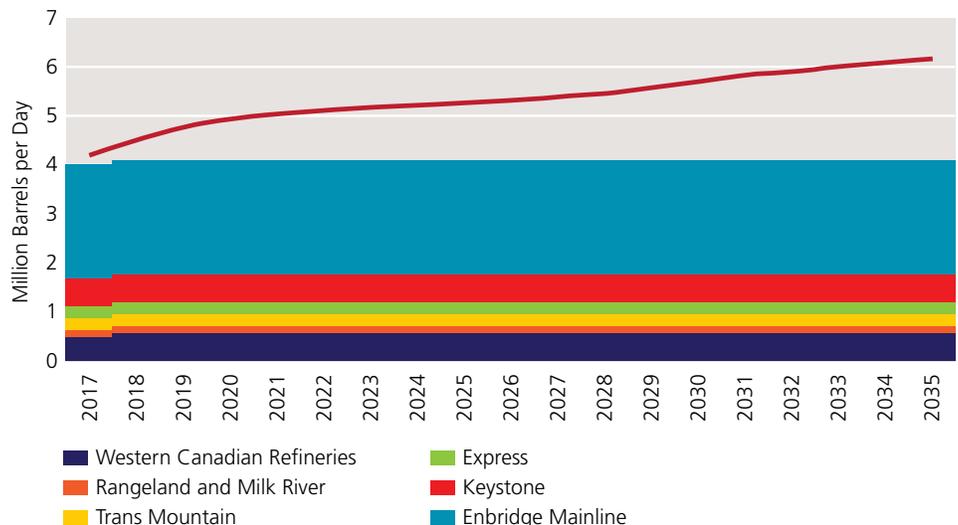
Figure 1
WCSB Pipeline Takeaway Capacity vs Supply Available for Export



Source: NEB

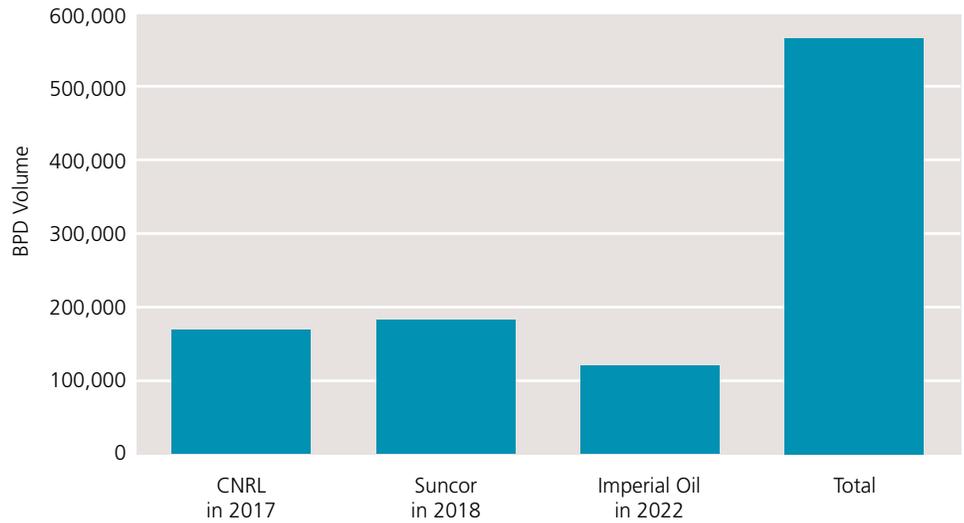
Also see **Figure 2**,³ the Canadian Association of Petroleum producers' projections of production through 2035, showing new capacity needed in 2016. In the first quarter of 2019, there is rail loading capacity in Alberta and Saskatchewan of over 700,000 BPD of petroleum.

Figure 2
The Views of the Canadian Association of Petroleum Producers



Meanwhile, **Figure 3⁴** shows the overall production increases in BPD. Suncor Fort Hills mine added 194,000 Barrels Per Day (BPD) in 2018, Canadian Natural Resources Limited (CNRL) Horizon added 180,000 BPD in 2017, and Exxon Mobil/Imperial Oil are proceeding with their Aspen 162,000 BPD project for 2022.

Figure 3
Production Volume Increases
in BPD



There are also several smaller projects coming on stream as step out additions to existing infrastructure. This will certainly keep the supply ahead of the take-away capacity, driving the Western Canadian Select price to below the West Texas Intermediate (less rail freight, and less quality differentials). Producers will benefit from lower royalties based on these prices. US refiners will benefit from the low-cost supplies. However, this is at the expense of the Canadian resource owners!

Alberta bitumen did not have enough pipeline capacity to take it away. The only substantial direct pipeline accessible market is to the USA. On November 22nd, 2018, Hardisty Western Canadian Select price was \$15 per barrel, less than the cost of the diluent in the barrel.

One could argue that these projects should not have been approved without pipeline capacity already in place. That would be like approving a new and remote hydro-electric dam without the prior approval and construction of transmission corridors ready for start-up of the dam. By granting approvals for these projects without considering the takeaway capacity, the Province and the Federal Government have jeopardized the profitability of previously approved projects.

Examples such as these, scream for unifying national action! Currently, Canada can't support its own needs, let alone aspirations for a decarbonized economy when these types of situations exist.

Additional Current Problems

The survival of Big Projects in Canada requires not only government and First Nations co-operation, but also agreement and consensus with the citizens. The loss of truth through false information, misinformation and incomplete information affects our ability to make sound decisions and fractures our trust in government. Unfortunately, the ability to distinguish truth from untruth has led to the rise of activism through miscommunication. As part of a four-month investigation, The Financial Post identified, "as many as 35 projects, worth \$129 billion,

“35 projects worth \$129 billion have been stalled or cancelled due to opposition.”

that have been stalled or cancelled due to opposition from various environmental, First Nations or community groups.”⁵

Consensus Difficult with New Communication Practices



We live in a different world now than we did 10 years ago. The public communication sector is where the most change has happened. Thanks to technology, we now see the prolific and pervasive use of the internet and smart phones. Biased news sources, fake news and social media have all contributed to a widespread proliferation of alternative realities; not the truth, but what others want us to believe.

Message sources on social media are not identified. Blind, sometimes malicious false messaging proliferates. Photos and videos are immediately available and can be modified, allowing the truth to be skewed even further.⁶ Public figures are reported to have done and said things they never did. People can easily become anonymous sources where there is no accountability for their message; they can say and do things that they would never do face-to-face.

This destroys truth. Lack of truth destroys trust, and the result is that it changes how people interact. Trust is fundamental to the operation of an effective democratic society and to all business interactions. Without trust, how can we move forward?

We are now at the end of the second decade of the 21st-century. We know history is real. We are presented with an array of forecasts, and our challenge is to sort out what is real from what isn't, and what is likely from what is not. Our world is defined by what is perceived by the public, politicians, and investors. It's not about what we think we know. It's about what actions these groups are motivated to take and how they present their perspective.

With the internet and social media at the tips of everyone's fingers, anyone can influence the opinions and actions of others. According to Fasken, over 2,000 companies specialized in big data analysis, have determined how easily fake news can spread over social media platforms such as Facebook, Snapchat, Twitter, and even Google.⁷

There are many examples of how this misinformation can influence and persuade people's judgement and opinion. Fake information is easily spread to the right people who will believe it to be true because it confirms their biases. For example, with the help of elaborate algorithms and artificial intelligence (AI),

“Given its billion or so users, YouTube may be one of the most powerful radicalizing instruments of the 21st century.”

YouTube can now recommend videos to you that are ever increasingly more and more extreme in supporting your opinion and position. “Given its billion or so users, YouTube may be one of the most powerful radicalizing instruments of the 21st century.”⁸

This kind of messaging creates what is called the Echo Chamber Effect. This is when parties talk past each other with limited or no engagement. There is no forum for reasoned discussion or exchange of views or facts. It creates a dynamic of ‘It’s my group against your group. My group is right, and your group is wrong.’ This division is not decided based on the facts or the merits of the position, but simply from whose group it came from.

Artificial intelligence has also created a new kind of warfare. Cyber-warfare is disinformation campaigns used to persuade and redirect public opinion. In September 2018, Jane Mayer from The New Yorker stated that a “meticulous analysis of online activity during the 2016 campaign makes a powerful case that targeted cyberattacks by hackers and trolls were decisive.”⁹

The Canadian Minister of Defence, Harjit Sajjan noted “One thing Russian bots do is amplify views that have already been voiced by domestic voters. So, in addition to falsifying entire narratives, they primarily amplified existing ones, presumably with the intention of leading droves of dimwitted voters astray.”¹⁰

As you can imagine, all this disinformation and radicalization through fake news has contributed to a decline of trust in government. According to the 2018 Edelman Trust Barometer, an 18-year study of 28 countries showed that trust in government plummeted last year. In the United States, trust in government saw its single largest drop in the history of their research.¹¹

We are now faced with Brandolini’s Law,¹² *the amount of energy necessary to refute bullshit is an order of magnitude bigger than to produce it.* Misinformation travels at the speed of light, while the truth limps slowly after it. But really, it’s more than just about the speed of dissemination of misinformation. It is inherently more difficult to refute misinformation after it’s out.¹³

The lack of truth and trust could be the biggest hinderances to moving forward with any Big Nation-Building Projects. The amount of effort it takes to ensure everyone has the correct information and gain a consensus, even amongst politicians, let alone the general public is overwhelming. Luckily, there are some current trends that despite the false information, are pushing us forward to an energy sustainable country.

BRANDOLINI’S LAW

“The amount of energy necessary to refute bullshit is an order of magnitude bigger than to produce it.”

Electrification is the Wave of the Future

Over the last several years, transportation fuels are beginning to transition from hydrocarbon to renewable electricity sources. There has been a substantial switch from internal combustion engines (ICE) to electrical motors. Two reasons are provided here.

First, environmental legislation. The push to go green comes from both the government and the consumer. For example, European countries are mandating up to 50% electric vehicles by 2030 and banning internal combustion engines. In China, electric vehicles are being mandated. British Columbia has announced a policy initiative to expand the use of electricity to replace hydrocarbons.¹⁴

According to KPMG’s April 2018 report, *New Drivers of Renewable Energy Transition*,¹⁵ “consumers themselves are looking for ways to become 100% renewable in the energy they use and are considering the use of alternative technologies and solutions to address the low carbon challenge.”

Second, electric cars are becoming more desirable to consumers, due to price, performance, low maintenance and of course they are environmentally friendly. Due to the nature of electric motors, electric cars are fast, fun to drive and, thanks to Elon Musk, sexy. All major car producers are already producing or will soon be offering high end performance and luxury cars.

Jaguar, Porsche, Audi, Rimak, Mercedes, BMW and of course Tesla, all have electric cars on the market today that readily compete with their high end conventional internal combustion engine (ICE) rivals.

The upfront price of electric cars has become affordable primarily due to the dramatic drop in battery prices, as well as the increase in production scales (economies of scale). The cost to operate an electric vehicle is much lower than the conventional ICE vehicle. They run much more efficiently and are less expensive to fuel. Maintenance costs remain low due to the simplicity of the motor design. Although the upfront cost of electric cars for conventional use continue to be more expensive than their counterpart ICE vehicle, this is expected to change as battery prices and advances in technology continue.¹⁶

The question is, what will the impact of world demand and price be, by how much and when? It is easy to speculate that volume production of electric vehicles will result in much lower costs, leaving the cost performance envelope of the battery system, and the availability of low-cost renewable electricity as the primary question marks. Because of the simplicity, in terms of moving parts, the design of the powertrain in an electric motor is much cheaper to maintain than an ICE. An internal combustion engine car has around 20,000 parts. An electric car has about 2000 parts. Because of the torque characteristics of an electric motor, there is no need for a complex and elaborate transmission to deliver torque to the wheels. This results in less annual maintenance costs, as well as the operational life of an electric drive train is much longer than an ICE drive train.¹⁷



**400HP+, the Jurassic way
200+ parts, 35% efficient power**



**400HP+, the 2013 (Tesla Model S) way
no oil, 1 moving part, 88% efficient power**

For these reasons, it is easy to see why industry uses electric motors to drive their processes rather than gasoline or diesel engines. Truck fleets, at least intra-city, are also moving to electric drives as their life cycle costs are much lower compared to internal combustion engine (ICE) units.

Autonomous driven vehicles are also under test. Mobility as a service is being tested as reported by KPMG in their *Fueling the Future* report.¹⁸ Interesting comparisons are drawn between private use and fleet use. They observed that both geography and population density have an impact. They see major advantages for electric vehicles for high population density commuting. Hydrogen fuel cell usage will be for low density population usage, long distance driving, and cold climates. What is still left unknown is how long it will take for the transition to make a major reduction in oil demand.

The popularity of electric vehicles is also driven by declining renewable electricity production costs. The *Bloomberg New Energy Finance 2018 Benchmark Report*¹⁹ forecast wind availability at 5 cents per kW-hr and solar at seven cents per kW-hr. Xcel Energy in Colorado received wind bids at 1.8 cents per kW-hr, wind with storage at 2.1 cents per kW-hr, and Solar PV at 2.95 cents per kW-hr. Starting in 2022, Xcel Energy will be replacing coal fired power plants with renewable power.²⁰ Utility scale battery storage costs dropped between 75-80% in the past five years. In

Alberta, bids were received at an average of 3.7 cents per kW-hr in Canadian funds for 600 MW of capacity²¹ and contracting is underway. Where solar and wind are readily available at medium to high load factors, renewable generation near demand is price competitive.

Loss of Investment in Oil

In what some are calling ‘the flight of major international oil companies out of Alberta,’ many of the global energy companies have sold their oil sands positions in Alberta. Statoil oil left in the mid-decade. Total Energy sold their position in the Fort Hills mine to Suncor and Marathon sold their position in the Alberta Oil Sands Project in 2006. CNRL purchased 60% of Shell Global’s position of the Alberta Oil Sands Project in 2017, which includes a mine north of Fort McMurray, the Shell operated bitumen upgrader, and the Quest carbon capture project northeast of Edmonton. Cenovus Energy purchased Conoco Phillips interest in the Oil Sands in 2017.²²

Shell Global Energy Transition Report

Shell Global has been very public with their energy transition. In April 2018, they released their Shell Global Transition Report.²³ The following outlines their Sky scenario:

Electricity

- Currently accounts for 18% of the total global energy consumption
- By 2030 projected to be 26%
- By 2060 rising to 50%

Fuel

- In 2010, 100% of cars have ICE
- By 2030, drops to 70%
- By 2050, it will be impossible to buy a new internal combustion engine passenger car

Industry

- Will be electrified where possible; displacing natural gas and oil as energy sources
- By 2020, Carbon Capture & Storage (CCS) will be in 50 large plants
- By 2070, 10,000 large plants will be needed.

Hydrogen

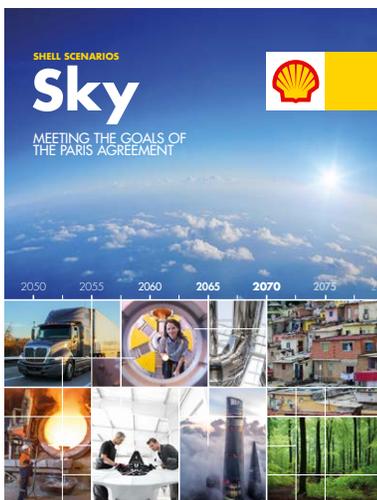
- Accounts for less than 1% of total global energy consumption in 2040
- By 2070, increases to approximately 7%
- It will be produced by an electrolysis of water from mainly renewable power

In preparation for this transition, in 2017, Shell acquired Netherlands based NewMotion, a company with one of Europe’s biggest networks of electric vehicle charging points.

Difficulties in Obtaining Capital and Quick ROI Times

Significant transitions to clean energy can also be seen in the corporate sector. In 2017, 5.4 GW of clean energy was committed by 43 corporations. Over 60% of Fortune 100 and 50% of Fortune 500 have set clean energy targets. It is estimated that 100% renewable power generation will require an investment of \$1 trillion per year to meet the goal.²⁴ This projection has investors scrambling.

The 2017 Task Force on Climate Related Financial Disclosures,²⁵ led by Bloomberg and Carney now forces energy companies to disclose their exposure to climate change in detail. In turn, this is



greatly influencing major investors' choices. To understand the enormity of the costs involved in oil production, a breakdown has been provided.²⁶

Oil Median Breakeven Production Costs Us \$/Barrel (\$/B)

- North American light oil \$38/B, mostly from fracking shale oil:
 - From financing commitments to first production is 6 - 9 months
 - Typical well cost \$5-6 million
 - Selling prices are locked in by hedging before the well is drilled
 - Time from financing commitment to capital recovery, plus return, is 18 - 24 months
- OPEC (Oil Producer Exporting Countries) onshore conventional \$40/B
- Non-OPEC onshore conventional \$70/B
- Bitumen \$70/B
- Offshore \$90/B

In their 2018 Sky Scenario report, Shell Global also stated, “as of December 31, 2017, we estimate that around 80% of our current proved oil and gas reserves will be produced by 2030, and only around 20% after that time. Production that is already on stream will continue as long as we cover our marginal costs.” In other words, the market will lead to these assets being stranded. By 2030, about 80% of proven reserves will be left in the ground!

Financing long lead time projects is increasingly difficult for the hydro-electric, nuclear, pipelines, and to a lesser degree thermally produced oil Steam-Assisted Gravity Drainage (SAGD) projects. There is a long lead time to capital recovery. The perceived risk of investing in oil resources is driven by renewable distributed power generation competitiveness.

Coupled with the broken approvals process, many major infrastructure projects have been delayed to the end of their financing patience. Enbridge with Northern Gateway, TransCanada Pipelines with Energy East, and Kinder Morgan with the TransMountain Expansion have all suffered this fate. Energy investors are now much more focused on early capital recovery and are forcing repayment for expenditures to be within the cash flow capability of the company.

What is Needed Now?

Create New Market for Bitumen

Bitumen Beyond Combustion (BBC) and Hydrocarbons Beyond Combustion (HBC) are on the horizon.

The Bowman Centre for Sustainable Energy developed a BBC concept in January 2016. Alberta Innovates then adopted it and sponsored the BBC 1 Report, authored by Axel Meissen in January 2017. Alberta Innovates gained funding from the Bowman Centre, five industry companies, and Natural Resources Canada to fund half of the BBC 2 Report²⁷ and funding the remaining balance themselves. With our participation and support, Stantec was retained and produced the BBC 2 report. In mid 2018, Alberta Innovates moved forward with a \$2 million ‘Open Call’ to fund research into alternative uses for bitumen.

It was reported that the alternative materials that could be made from bitumen are asphalt, carbon fiber precursors, vanadium for flow batteries for utility storage, and raw materials for polymers. These materials were identified as having the potential to drive substantial bitumen production. Materials that might be made from the mesophase pitch from bitumen are needle coke, battery carbon, and graphenes.

Alternative materials made from bitumen have potential to drive substantial bitumen production.

The production of low-cost natural gas liquids, a by-product from producing natural gas by horizontal drilling and hydraulic fracturing (fracking), now dominates North American petrochemical production because of its low cost. Switching to natural gas liquids from crude oil sources leaves an aromatics gap in the petrochemical chain. Bitumen is rich in aromatics and asphaltenes. Several projects are under development in Alberta to make propylene and propylene derivatives by dehydrogenating propane to make the raw material. Alberta has abundant propane and natural gas.

Open Global Markets

Currently, Canada already has more bitumen production capacity than pipeline take away capacity, and the production capacity is growing. We also know that in the accessible market in the USA, their production capacity is rising rapidly, and this production is light, low sulphur oil. This has driven the obtainable price of bitumen to a small fraction of its real value.

To be able to obtain its full worth, we need efficient, safe, low-cost access to other world markets. This means we need the combination of a dramatic increase in the domestic processing of bitumen and additional pipelines to tidewater ports to gain access to world markets where a much higher value can be captured. Pipeline access to world markets is essential!

Good Leadership

Most of the global governments who committed to the Paris environmental agreement, have failed to follow-up with effective actions. The time benchmarks for actionable results is beyond the political horizon of the leadership. In Ontario alone, carbon tax and cap and trade initiatives have been made and abandoned. The result of this inaction is no value creation and no Interprovincial or International projects completed, even where the federal government owns a pipeline.

In Canada, we see the evidence, and the lack of political will, to use existing tools to enable critical energy movement across provincial borders. The National Energy Board had executive rights by legislation. These rights were emasculated by new legislation, new criteria, and obscured by the establishment of new bodies. There has been no commitment to action by the Federal Government, other than the purchase of the Kinder Morgan pipeline. It remains to be determined if the Federal Government is committed to making the expansion a reality.

If we adopt the reasoning of Vivian Krause,²⁸ who has traced the funding of activist groups back to US energy billionaires, some say that we should be thinking and acting like Texans. Really? Shouldn't we be thinking and acting like Canadians? Like Major General Currie at Vimy Ridge? Like CD Howe, the Canadian politician, who between 1935-1957 drove both the development of the St. Lawrence Seaway system and the first TransCanada natural gas pipeline to be an all-Canadian Nation-Building Project? Like Premier Lougheed, who, by extracting more value from Alberta resources, stimulated the Alberta Oil Sands Technology Research Authority (AOSTRA) to develop the SAGD process for bitumen production?

We must be prepared for the future. Rapid disruptive changes threaten many areas. Technology and socially driven changes quickly change the playing field. We need to be cautious and adopt a 'show me' approach, but we also need to be bold. Canada has overcome insurmountable obstacles in the past and can do so again.

By taking a pro-active approach to the obstacles that currently plague Canada, we can change the trajectory of our country. The remainder of this book explores ways in which Canada can overcome the current obstacles. By calculating our current, transitioning and future energy needs, a long-term plan can be implemented. With the help of a new regulatory and approval

Call To ACTION

organization that operates outside of political influence, Big Projects like those discussed in the last chapter will come to fruition.

New visionary leadership will be required to navigate forward. We must have bold leadership to facilitate access to global markets to ensure we leverage the full value of our energy resources. We must have credible leadership and communication systems to gain back the trust from our nation, and we need compassionate leaders who will seek new ways of collaborating and consulting with our First Nations to first reconcile our past mistakes. Together, we must ensure that everyone benefits from Canada's transition to a sustainable energy Superpower.

So, who will step up?

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Chapter Overview

This chapter identifies some important factors that contribute to Canada's inability to move forward with Big Nation-Building Projects. It requires the reader to examine our current political system, with its complex communication networks and silo-style approach to projects. It also asks the reader to consider what their own personal role is as a citizen of Canada, and how it affects decision-making at every level. It places emphasis on the need for Canadians to perceive themselves as members of a national team.



Introduction

Forces at play in its social network and its localized spheres of influence have put Canada on a path to a future fraught with conflicting and potentially ominous outcomes. These forces are comprised of human behaviour, organizational structures, political motivations, economic considerations and other group-oriented factors. They are presented here as a way to open the discussion about the possibility of a bleaker future evolving from what currently exists and is being enjoyed in the present day. These forces gravely need our assessment and understanding in order for our current circumstances to lead to a favourable alteration of these adverse, evolving trajectories. The positive paths that will allow Canada to reach its inherent potential are discussed in this chapter.

Canada needs to have a new collective vision which captures all its potential resources, both human and natural, to overcome the inherent forces and obstacles and move forward with Big Projects. In order to do so, our nation needs to first understand the three greatest factors that are holding us back. Each citizen must understand (1) their own personal role, (2) the complex

mechanisms of decision-making in large groups, and (3) how the income disparity negatively impacts nation-building projects.

Canada has a two hundred year history of nation-building projects that has resulted in an infrastructure that supports the wealth created from our almost unlimited energy resources. This has resulted in our nation existing across six time zones interconnected through networks of roads, rail, airways, and microwave and satellite technologies. The generated wealth supports the societal institutions that make Canada the envy of many.

Should we truly believe that this cornucopia of plenty will continue?

Adversely, our nation cannot create a free trade zone within its own boundaries. It cannot build a pipeline needed to exploit our resource potential, tolerates essentially a single market for its prime resource, and has no nationally accepted and committed goal on climate change. With respect to such issues, our nation is neutered and must seek a new approach to achieve its full potential of a sustainable future.

Canada must have a vision that encompasses the two human resource capabilities – the private and public sectors of Canada’s economy that should share a common goal for the benefit of Canada’s citizens. Without tangible and dedicated cooperation and collaboration between these two sectors who employ the human resources capable of executing nation-building projects and programs, Canada’s future is in jeopardy.

Figure 1 demonstrates an example of a *single* Big Project that meets the challenge of harnessing the nation’s economy as it transitions from being fossil-based to a low carbon future. The marriage of projects between high environmental impact (oil sands development) and low impact ones (hydro and nuclear) must be consummated into ONE Big Project while the electrical network is designed and expanded to meet the needs of future generations. This is not just a provincial issue, it is a national one. It is the foundation of social well-being and its performance affects every citizen.

Figure 1
Canada’s Challenge in Navigating
to a Lower Carbon Future



One Big Project is Canada’s Future

As this chapter explores a path forward and deals with some of the factors that affect outcomes, the reader must imagine the state of circumstances that dictate current societal practices and personal interactions between individuals. What are the societal needs, motivations and status of the individual?

At the macro-level, where decisions affecting the nation’s future are made, cooperation and collaboration will only exist if the nation’s organizational structures and individual citizens alter the way the nation is managed. The best way to proceed in achieving shared results that positively contribute to a favourable future requires examination, understanding and acceptance. The vast majority of the population must set the standard of ethical behaviour and personal contribution for the nation to achieve success in warranting a positive future for the coming generations! The individual contribution towards this common goal is the responsibility of each citizen.

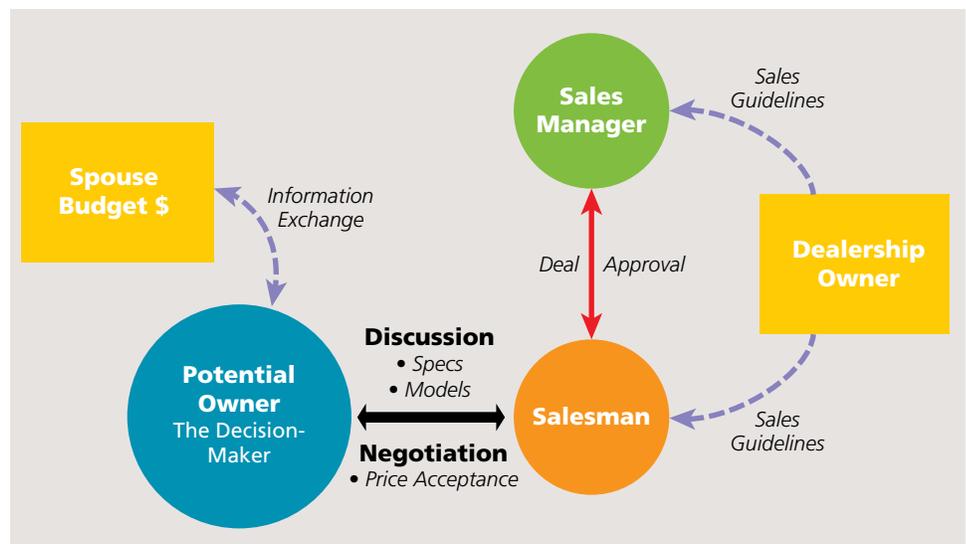
Is the citizen and nation up to the task? The key factors contributing to a notion that Canada is a nation threatened by its own citizens, decision-making systems, social structures, historical residuals, political organization, and laws are not necessarily obvious. One needs to assess the roots of our beginning as well as the established, longer term trends to properly judge whether there are threats to current economic, social and personal well-being of our aggregated population.

Consensus appears to be an elusive national target on almost any economic, mega-project that would enhance the probability of significantly improving the social benefits to which our citizens of all ages and social strata have come to expect or seek to expand. Admittedly, some large regional projects such as 5G networks, Site C hydroelectric generation and nuclear upgrades, have been progressing.

A **CONSENSUS** (noun) is a general agreement, the judgment arrived at by most of those concerned.¹

To have a common understanding of the elements that allow for a consensus, one needs to appreciate the complexity of a communication network comprised of nodes (people inhabited) and interchanges (of communication content). Such a macro perspective puts into stark contrast the difference between obtaining consensus in a small and simple network of humans compared to one that is very large and complex. **Figure 2** provides an example of a simple communication network comprised of five nodes. The example deals with reaching a satisfactory conclusion when someone endeavours to purchase a family transportation vehicle.

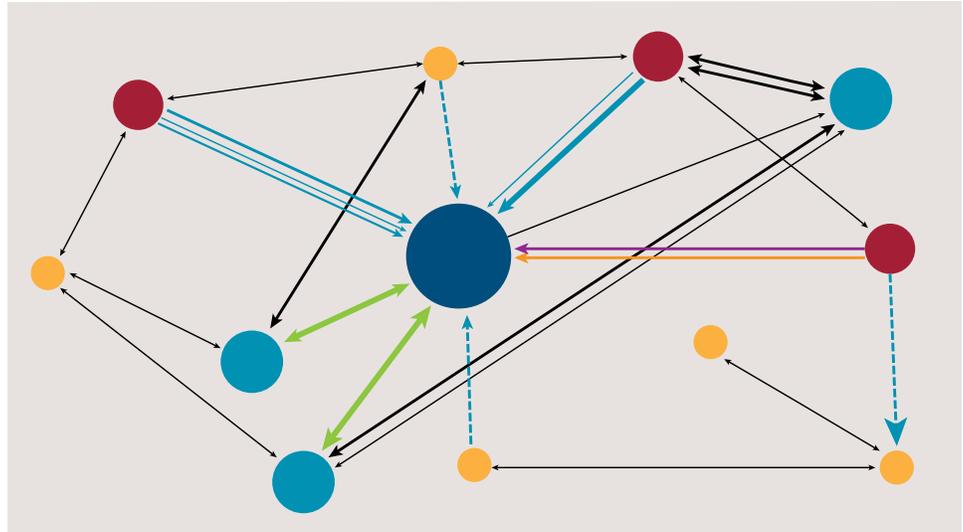
Figure 2
Five-Node COMMUNICATION NETWORK



The goal of the 'project' is to purchase a vehicle. The five nodes are self-explanatory as they represent the individuals who have an immediate impact on reaching an actual sale. Each individual has a personal goal which is not necessarily shared with the others. In each individual case, I leave it to the reader to define what these may be. The arrows connecting the nodes represent the many elements of the one or more communications that would take place during the purchasing project. The size of the nodes represent the approximate *importance* of each individual's contribution in reaching a decision. The prime negotiation takes place between the potential owner and the salesman but it is obvious that they do not act without other influences impacting their thinking and therefore their personal conduct.

Figure 3 displays an expanded network where communication, comprised of verbal, written, opinion, fact, false or erroneous inputs, local content, distant sources, etc. is exchanged.

Figure 3
Twelve-Node Complex
COMMUNICATION NETWORK



Here the nodes represent not only individuals, but possibly a group of like-minded members with an agreed upon and accepted self-interest. The ultimate decision-maker within a project of interest to all the nodes is the largest one at the center of the diagram. This node is subject to the inputs and communication exchanges as displayed. Some exchanges have a narrow scope while others are larger in content, volume, frequency and significance. Exchanges can have content based on opinion, data, social discourse, factual information or false information.

For such a network, the notion of achieving a consensus would be a challenge if not an illusion.

In order to understand and appreciate the challenges of obtaining a consensus with any group of citizens, it is necessary to delineate the various forces that are present in such an aggregation of personal opinions, wants, desires, goals and expected outcomes.

In their book, *Making Social Change*, Flynn and Hay² assess such networks in detail. Their analysis is based on 'chaos theory' which explains that a very small change may make the system behave completely differently. *Order* represents a stable system and *Chaos* represents an unstable system. Between these two states is *Complexity*, which represents change. Based on this theory, we can relate this to our discussion of nodes and the difficulty of decision-making within complex systems.

Instability in the system happens when certain nodes don't feel that they have a voice and are not represented in the decision-making. When this happens, both individuals and groups, represented as nodes start to disengage and withdraw, resulting in no decisions or wrong decisions. This has a two-part effect. First, when they withdraw from the discussion, they take their content with them, and they ignore the larger dialogue within the node. Second, they become outliers who may become proactively disruptive, starting with protests and possibly evolving towards graver actions. As can be seen by the increase in recent protest activity around Big Projects, more and more nodes are disengaging from the main conversation, shifting the system towards chaos.

Another example of a very complex system is the expansiveness created by modern technology. The current digital revolution which has introduced the opportunity for billions to exchange personal perspectives on smart phones and over the internet, has expanded the complexity of society's communication networks. This is especially the situation when one considers that the contributing individual cannot see all the links and hidden listeners, viewers or hackers. These exchanges can be supportive or unsupportive of any given theme in discourse.

In order to stabilize this quickly destabilizing environment, we must focus on becoming a team and re-engage the outliers to once again join the conversation. To get to the root of such an aggregate of nodal interests, Bruce Tuckman's Team Development Model,³ offers a four-step model to help understand the stages of team development. It demonstrates how people evolve from individual self-gratification to become a member of a unified team all sharing in the satisfaction and achievement of the group.

Nationhood is a team game.

The “forming–storming–norming–performing” model, as visualized in **Figure 4**, shows the four development stages of forming a team. Group behaviour changes as it passes through the sequence of evolutionary interactions and communication exchanges. This model offers a process of understanding group behaviour as it initially faces challenges, achieves an acceptable working relationship with active problem-solving that converges into a solution and finally executes a work plan to achieve its aggregated goals.

This model applies very well to a group of less than a dozen people but is challenged as the numbers increase. In the twelve-node example, one can appreciate the different personalities that exist with their own content and exchanges reflected in their contribution.

Figure 4
Evolving from a **GROUP** to
Becoming a **TEAM**



The Challenge for Canada?

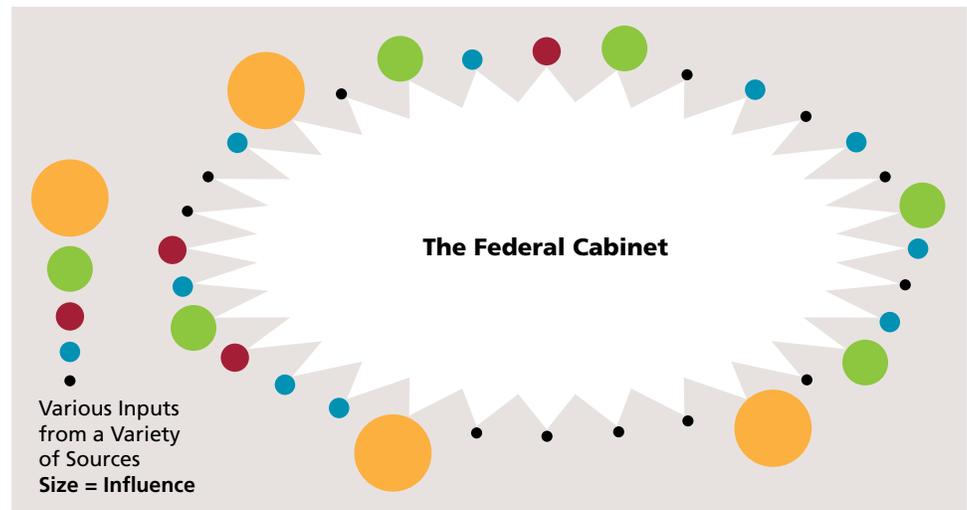
Canada's citizens who reflect many historical, regional and systemic organizational factors, are indeed a group, a very large group! However, this group does not behave as a team! The concept of adversarial approaches as the means to convince any opposition to achieve one's goals, works against the convergence towards a common and acceptable solution for any topic of common interest. Challenges of the first order are encountered when considering a nation of 37 million individuals existing across an immense and diverse geographical area while endeavouring to move forward in a common cause. A team environment and the acceptance of a common goal is more than a challenge, it is a necessary prerequisite to obtain a satisfactory and lasting result! An environment where the 'needs of the few are subordinated to the needs of the many' is at the very core of a *team*.

'We and us' matter, 'I and me' not so much. Nationhood is a team game.

This reality offers a glimmer of the complexity that a large population faces when seeking a 'so-called consensus' on an issue affecting the majority. The key factors at play include diverse sub-sets of individuals (often referred to as 'special interest' groups) who have found a localized common bond which may or may not relate to the needs of the many.

Commensurate with the size of Canada's population, now visualize a network of millions of nodes which represent individuals or communities of like-minded individuals, similar to that of **Figure 5**.

Figure 5
Visual Depiction of Varying Inputs
and their Influences on a Federal
Cabinet Decision



Pursuit of any consensus or approach to a single, lofty goal requires an understanding of this larger network of communication nodes. The many inputs, opinions, facts and data to the body seeking a convergence must be considered before an eventual conclusion to a legislative law, governmental policy or a nation-building project can be made.

All these nodes, in some way or another, influence the larger decision-making body. These individuals or communities of like-minded people want their voices heard. They want to make their own agreed upon recommendations that impact policies affecting Canada's future. Some examples include:

- First Nations Indigenous communities with a long list of injustices related to land, health, poverty and infrastructure⁴
- Climate change and environmental groups
- Anti-climate change and environmental groups
- Small and large businesses motivated by employment, cost and profit
- Regional groups where cooperation is driven by local factors
- Bodies representing national economic and political interests
- People affected by laws, rules and legal trade agreements
- External global forces
- Each individual citizen

This very large and complex set of nodes challenges any generating body sponsoring a proposal, project, investment opportunity, or policy. The challenge to the decision-making body is to amicably access such an array of network nodes, gain from the contributions, make appropriate alterations to the original definition and gravitate to a conclusion that is acceptable, *for the most part*, to the benefit of Canada's population.

Many of those inhabiting this nation have adopted a 'victim mentality' mindset. These are the people who recognize the problems within our society, especially those effecting themselves, yet fail to act on it. They feel powerless to effect change, so they disengage and complain about how it's someone else's fault. They fail to understand the processes that successfully evoke change and cannot see their own role, or their own potential in that process.

However, many citizens who do not have a *victim mentality* have taken a stance on subjects such as environment, oil sands, climate change, etc., as a way to gain some form of advantage in the discourse. Exaggerations, false claims, lack of facts and corroborating data, inside of highly charged expressions have no place in respectful discourse on such emotional topics. From a practical viewpoint, it should be recognized that all nodes cannot be accessed and the desired information necessarily exchanged in more than a cursory way with some of them. The volume and number of exchanges must have constraints.

'We and us' matter
'I and me' not so much

For significant project proposals, obtaining universal satisfaction from each and every contributing node will be an extraordinarily rare occurrence, if even achievable. Not all nodes will be satisfied, nor will their particular inputs be reflected in the ultimate conclusion and result. The complexity and scope of a large project essentially guarantees such an outcome.

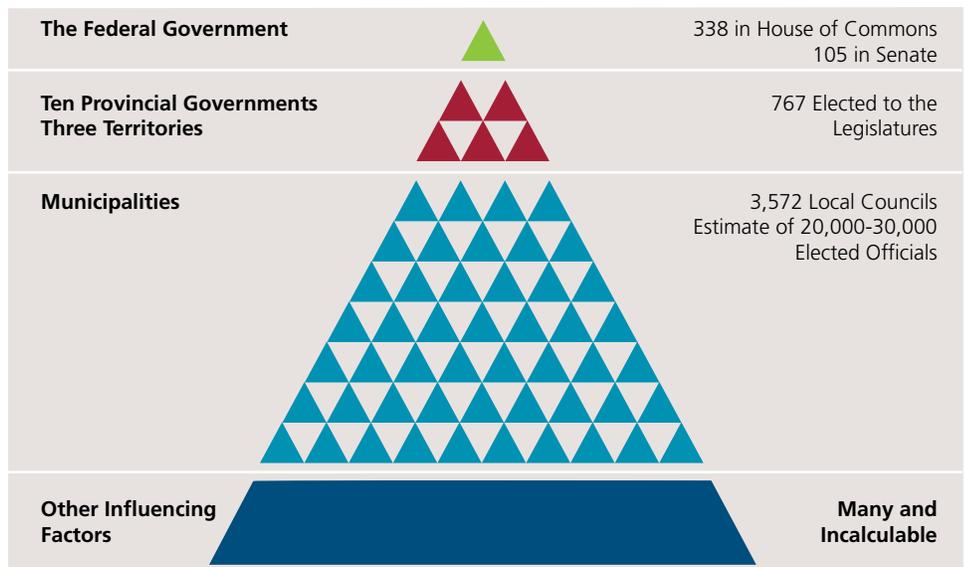
Acceptance by the general population of such a negotiated and compromised result is the essence of democracy!

DEMOCRACY (noun) is a political or social unit governed ultimately by all its members.⁵

We, of course, vest our rights in elected representatives to carry out our wishes. Since each representative's role is subject to their own personal interpretation, the actual governing of the nation's citizens could be defined as a group seeking to be a team.

Figure 6 depicts a representation of Canada's pyramid of elected officials.⁶ The diagram computes about 20-30,000 nodes in its communication network, thereby demonstrating the complexity of a nodal network for decision-making on a national scale. Keep this picture in mind as you read this material. Then add and assess the many outside forces of organized groups and individual citizens who endeavor to influence the decision-making of any significant issue being proposed or debated at the national level.

Figure 6
Decision-making Pyramid of Elected Representatives



With this image in mind, consider whether democracy, in practice, can survive indefinitely? That is, survival without some radical alterations to the processes and protocols currently in place?

A democratic government has three structured entities that provide required checks and balances among the branches; judicial, executive, and legislative. Laws emanate from approvals by the latter organizations. The judiciary is independent to interpret them. Election processes warrant the governance structure. Satisfaction by the electorate is tested by elections on a

frequent and timely basis. If one is dissatisfied with current decisions then one alters the vote to reflect dissatisfaction by seeking another representative at the next election.

To make this picture even more complex, within the elected structure resides an administrative structure designed to carry out the directives of the elected representatives. At all three levels of government, these ministries are staffed by professionals who operate within a basic, hierarchical organization to carry out the defined goals and mandates set by the elected representatives.

Accepting that all of these considerations are in place, the communication network for any topic or project proposal placed before the decision-making legislative group, is inevitably very large and complex. The nature, scope, and intent of the detailed content in the information interchanges between and amongst those comprising each node have variety, may have validity, and could be factual or fiction. Recognizing that many influencing factors are hidden from view, participants in this process must accept that competing influences will neutralize themselves in some manner as the process of convergence to a final decision or conclusion progresses.

A Structural Barrier

Already existing Big Projects limit Canada's capacity to implement new Big Projects on a scale that will invigorate Canada's economy to serve the current and future well-being of its citizens. Active projects command the attention of decision-makers.⁷ For example, the current federal government has set overarching goals regarding three such program areas: the environment, gender equality, and indigenous-reconciliation. These are Big Projects! Each province allocates resources to enhance regional profiles on these priorities. Though control of the projects is influenced by fiscal considerations, these goals solicit a commensurate commitment for that most precious and irreplaceable commodity, people's time.

Big Nation-Building Projects such as pipelines, new nuclear plants, and world-class mining projects have commanded only cursory consideration when viewed in competition for the key available resources, personal and organizational time. This reaches to the highest positions in the hierarchy of decision making. The allocation of priorities and human resources will only be re-distributed when a perturbation of significant impact occurs.

With a continental trade negotiation commanding short-term priority and a China-Canada relationship viewed as a pressing issue, potential problem analyses appear to have been ignoring the potential for such significant perturbation elsewhere. Disruptions in the oil and gas industry (pipelines) and the notable threat of the diminution of the manufacturing sector (Oshawa plant closure) seem to have flown under the radar. Priorities in the aforementioned areas have been of a knee-jerk and reactive nature rather than that of a strategic and long-term one.

However, as the saying goes, *'chickens come home to roost.'* Witness the recent bargain price that Canada's oil has commanded in the market place. The lack of a strategic vision at the national level for the development of the oil sector as a driving force in the Canadian economy has become imminently obvious as revenues decrease and far reaching impacts are realized. Because of the magnitude of the revenues involved, these results have threatening consequences to the well-being of all Canadians.

The crisis that is not as obvious, is the continuing diminution of the manufacturing sector as exemplified most recently by the challenges faced in the aerospace and automobile sub-sectors. When a crisis occurs, knee-jerk reactions in response to the threat, lead to short-term solutions; a patchwork of vote-saving actions become top priority. Do cash outlays really offer a long-term resolution to the challenge? These are not well researched and thought-out nation-building initiatives!

Without an effective coordination and harmonization of its implementation, project costs inevitably escalate and milestones are missed, with commensurate adverse consequences felt by all stake-holder communities and future generations. Processes to foster team building are a means to minimize this possibility but will not occur in such knee-jerk responses to crises.

To be strategic, the project implementation processes must be formally designed and then managed by the hierarchy during the execution phase. Time and resource management are the key control levers. A small but representative governance body, composed of qualified and apolitical individuals (to the extent that is reasonably possible) who oversee the implementation in a reasonable time window for execution, is a prerequisite.

Examples of Failure in Policies and Actions

In recent times, Canada's failure to implement policies to deliver on Big Nation-Building Projects can be contrasted to our historical capacity to do so. Examples of successful implementation on very large scale projects include the Rideau Canal, the Canadian Pacific Railway, the Interprovincial Pipeline, the TransCanada natural gas pipeline, the TransCanada Highway, the St. Lawrence Seaway, the Candu Nuclear Technology, a National airline, a TransCanada microwave network, and others. These were nation-building efforts! They were the foundation supporting Canada's economy and thereby the social well-being of its citizens.

Robert Bott, a Communications Consultant specializing in energy, forestry, and the environment explains, "Megaprojects can only thrive in an atmosphere of certainty. Ten-year, 20-year or even 50-year commitments involving billions of dollars and thousands of man-years can only be undertaken with assured finances, good product demand, a supportive political environment and fail-safe technology."⁸

The key reference is "a supportive political environment" with which we arrive at one of today's dilemmas – Canada's inability to build a pipeline!

Recent energy-based projects are visible examples of complex node networks. They include Canada's oil pipeline scene where a set of proposals and plans go unfulfilled: Keystone XL, Energy East, Gateway, and Kinder-Morgan pipelines. The lack of implementation of such megaprojects despite trends regarding a national acceptance of such fundamental infrastructure are ominous occurrences, foreshadowing a significant, negative impact on the fiscal well-being of Canada. Not to mention, catalyzing controversy and conversations of division!

Figure 7
The Federal Government
Purchase of Kinder-Morgan
Pipeline

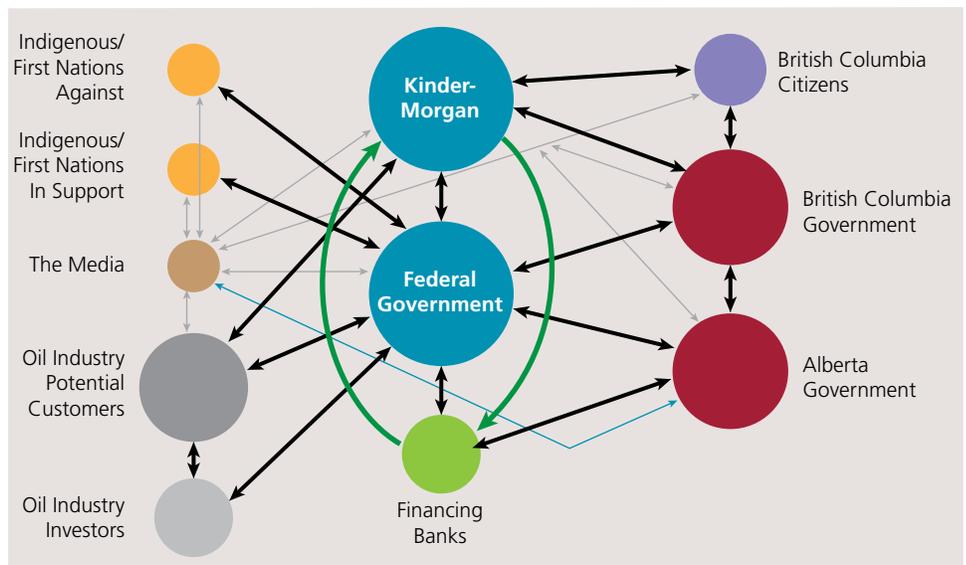


Figure 7 is a visual representation of a hypothetical network that estimates the process of converging to a conclusion by the Government of Canada regarding the purchase of the Kinder-Morgan Pipeline. Rationally, this would be deemed a knee-jerk reaction since it did not appear in any earlier planning documents nor was it advertised as a strategic direction for the federal body in the run-up to the last election.

A Hypothetical Version of the Communication Network

The complexity of this network of eleven nodes is an indication of the challenges that must occur before all the key considerations required by the two principle negotiators are satisfactorily answered.

However, the complexity of arriving at a decision to purchase Kinder-Morgan Pipeline must have involved an even more complex set of inputs as depicted in **Figure 5**. Other factors, not shown, include pressures from international environmental groups, crude oil competitors, and from those who benefit from the status quo such as foreign-owned refiners.

Another example of the dysfunctionality of project management led by the self-serving actions of a few instead of collectively as one Big National Project is captured in the following quote. Nicholas Martin, a policy analyst at the Canada West Foundation said, “*The most effective way to [decarbonize the electricity system] is to develop a lot of good wind resources in the Prairies and have a lot more interprovincial transmission capacity to send it where it needs to go and back it up with hydro from Manitoba and B.C.*”⁹ While such comments are consistent with the general consensus of an electrical grid as the best way to optimize the reduction of greenhouse gases, the piecemeal style of managing it as many individualized self-serving smaller projects falls short.

Intuitively, such a system, *treated as a whole*, begs to be recognized, accepted and to have its potential embraced by the Prime Minister and Provincial Premiers, rather than just the leaders who have localized, political self-interest. An *integrated energy network* that crosses provincial boundaries from coast to coast, can drive Canada to meet its global commitments of reaching a low-carbon future – but only if it is **treated as ONE system**. When managed and implemented as one Big Project, only then will it benefit all citizens across our vast geography. This is a failure in collective decision-making and policy development at the most senior levels of federal and provincial governance.

In his book *Triple Crown*, Jim Prentice captures the essence of a fundamental problem in co-operating and collaborating to get Big Projects, such as the Energy East pipeline accepted and implemented in a timely manner. “*British Columbia, Ontario and Quebec, as well as many municipalities, oppose pipelines because they face 80 percent of the risks (such as spills) but receive little or no benefits... Another model has to be created – one that also benefits First Nations.*”¹⁰

Every person inhabiting the geography that is Canada, benefits (some more, some less), but benefits absolutely, from residing here. The emphasis when considering any policy or project should definitely be on those who benefit less in the whole of our society. This encompasses employment, wage levels, housing, health, and many other considerations within each defined geographical body. The economic benefits inherent in having an energy industry are a means to provide social benefits such as universal health care, old age pensions, as well as jobs and other favourable outcomes. Everyone should be vested in the positive progress towards achievement of these national goals! The distribution of such benefits is a next step in realizing the ultimate potential that is possible.

It is not the intent of this chapter to offer quick and easy solutions to this conundrum, for there are none. What is required is the realization that individuals must seek compromises through

new organizational processes and a change in people's attitudes if Canada is to alter recent and historical behaviour to reach the nation's obvious potential. Doing less would be a mediocre response. There are a vast array of opportunities for Canada to fulfill the expectations of the many who desire that the nation obtain more significant value from applying the human and inherent natural resources with which we are blessed. Here the examples have been 'bitumen exploitation and the oil sands' and 'the electrical grid.'

Other Barriers

Placing the strategic nature of Big Projects aside, the posit goes farther stating ...

Decision-making networks are the bases for democracy to either thrive or fail!

An example of the structured barriers to achieving Canada's potential include political fragmentation from the national, provincial and municipal strata which manage the rules by which our society operates. One of the most egregious examples since confederation is the nation's inability to implement a free trade zone within its own boundaries. Both the individual and political entities have their own objectives and goals which aren't necessarily harmonized with or reflect the needs of the nation as a whole (read: its citizens). These examples of organizational structures are nodes in an expansive network that reflect the nation's historical evolution and geographical realities.

The group interests at each node in this established, and defined structure are exemplified by the aggregation of each elected member's personal perspective. Recognizing that some elected officials who inhabit each node and contribute communication content may not be there as a team member. Their decisions may reflect the ambitions of their personal careers instead of the priority of a team role to achieve a successful project with national impact.

Anecdotally, with observations of recent decades, the basis of serving the best interests of those who vote has gravitated to a back seat with priority being placed on an incumbent getting re-elected. This has become visible earlier and earlier in a given elected term.

To compound this myopic approach to managing a nation, the civil service, who are the ones that actually carry out the decision-maker's directives and conduct the nation's business operate in silo-oriented organizations. A melding of common goals to tackle those projects which demand specialized knowledge, cross-fertilization, and significant cooperation are challenges to the management and staff carrying out the implementations.

The hierarchical structures of these organizations force a top-down approach. The task for the day is carrying out the needs of the citizens, with political considerations dominating the priority in the conduct of routine business. This does not allow for the most efficient or effective mechanism of achieving a result let alone an optimum one. It is a cultural weakness requiring a new approach to harness the individual creativity and innovative abilities of the eventual contributors to an accepted goal. Existing institutions appear to be hobbled in their ability to reach a common and acceptable conclusion.

However, it is not the institutions that are at fault. There are many in Canada's existing network with jurisdictions to get at least a portion of the job done. It is the *individual behaving in personal self-interest* without due consideration to the needs of the many, who makes the fundamental contribution to failure or to less than optimum result. This observation holds true for a janitor, a technical specialist, a supervisor, a manager or more senior executive, all making a contribution as a group participant.

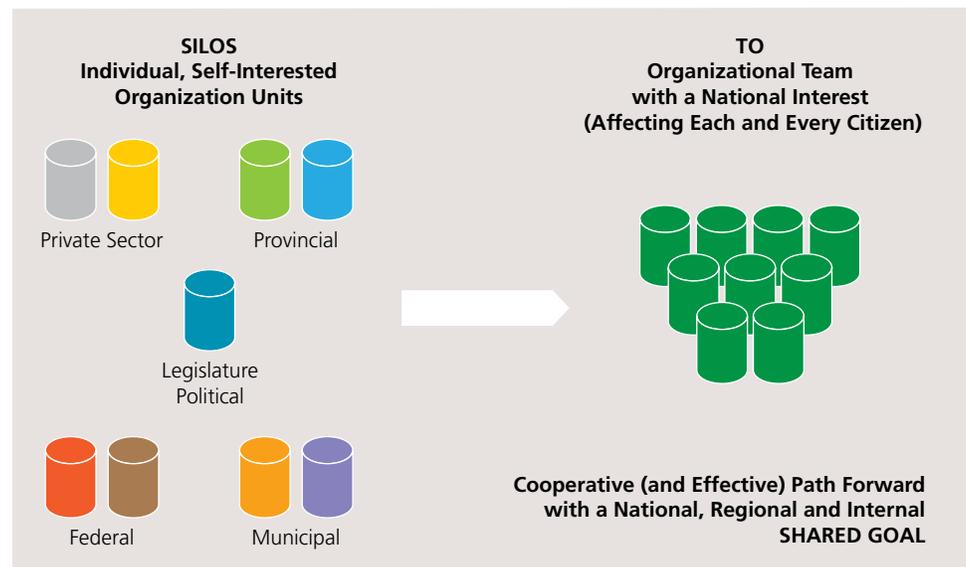
It is the individual who is the most significant barrier to Canada achieving its potential.

It's You, it's Me, and it's All of Our Neighbours!

Figure 8 provides a depiction of how individual silo organizations must gravitate to a common view of priorities and goals to achieve an effective execution of directives from the decision-making body. Of course, this cohesiveness does not only affect those dedicated to the project, it also involves the behaviour of each and every contributor to the decision-making. Support for such a freedom of expression and individual conduct must come from the organizational hierarchy: the supervisory, managerial, and executive strata.

At these organizational strata, the basic driving force in any decision or contribution to a decision must be a personal selflessness that places the needs of the many ahead of *any* particular self-interest that may be working against an identifiable team goal. The roots of self-interest exhibited by participation in a group operating via silo-type organizational structures are evolutionary and evolved by trial and error, as a survival of the fittest. This is as much derived *from the system* as from those currently *inhabiting the system*. The environment in which each and every one of us exists, fashions such an outcome. The individual is a 'survivor.' Personal behaviour will generally place personal survival at the top of priorities. This is where change in human behaviour is a *must* not a *want*.

Figure 8
Prerequisite for a Successful
Implementation of a Shared Goal
on a National Scale



The Untapped Skills in Human Resources

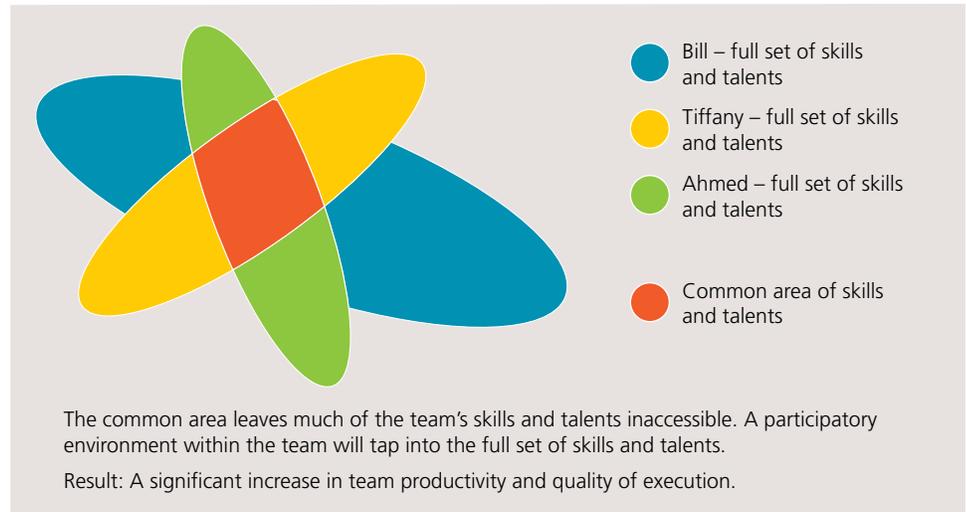
However, organizational structures that encourage this approach, work against the achievement of even the simplest of projects let alone Big Projects or policy considerations that involve thousands of individuals. To be able to harness the creative and committed energies of those comprising such an aggregate, a new form of thinking and project execution is required. Such an initiative starts at the top of these hierarchic organizational structures.

CEO, Michael Medline offers insight into the thinking that is required to be successful at the top as a leader. He was hired to turnaround the grocery chain *Sobeys*, an organization challenged in its capacity to maximize the contributions of its employees towards a common goal. Quotes from his interview include key phrases such as "I put away the script and spoke from my heart ... You need a little humility... I've learned it takes a team of great people," and finally, "I like to be strategic."¹¹ These philosophical guidelines are fundamental to the strategic leadership of transforming a group into behaving as a team.

Figure 9 depicts the conundrum of having untapped skills and talents residing in any group. The challenge for any team leader/supervisor/manager/executive is how to obtain contributions from these areas of a person's capabilities that are not common to any of the other members. This applies to any stratum of the pyramidal and established organizational structures in government or the private sector.

A participatory and open managerial style opens the opportunity for each contributing member of a potential team to use the full spectrum of their potential.

Figure 9
Tapping into the Full Set of Skills and Talents of a Team



Rather than operating in the common area where skills and talents overlap, the full areas of personal capabilities are available for concepts, new ideas, and contributions to the team goal. Thereby, individual members get satisfaction from the opportunity to contribute unique content not necessarily obtainable from any of the others on the team.

The leaders of the human resources who manage any program leading to expansive policies or physical projects affecting the nation as a whole, would benefit greatly from individuals working in such a participatory and open environment.

Participative Management sets the tone for the group to evolve into a team. A team is realized when each participating individual offers inputs that reflect personal capabilities and knowledge. Such contributions become reflected and visible in the team's decision-making. The more diverse and expansive the skills and talents within the group, the more potential content to be accessed by the team. Inevitably, the personal motivation of each team member is enhanced by the concepts, ideas, practicality inputs and ancillary improvements offered that contribute to the process as it converges to a conclusion and result.

This is the basis of innovation. The rumination of such inputs catalyzes the bonding of the members where the team's goal becomes more important than the individual's self-interest.

As a consequence of where it does not, the team will inevitably purge that member without interference from higher authorities. Individual members must accept and support the concept that the effectiveness of the team is far greater than the sum of individuals behaving within a group. The team being more important than the individual is a conclusion evolving from such a participatory environment. This applies to any existing group: be it the Prime Minister's office, a public sector organization, a private sector CEO's decision-making group and staff, or a voluntary not-for-profit organization.

What is the Role of a Citizen?

A citizen is a group member within our nation which, in turn, is a node in the United Nations' global network encompassing 193 nations.

A **CITIZEN** (noun) is a native or naturalized person who owes allegiance to a government and is entitled to protection from it.¹²

It is not possible for each citizen to be knowledgeable about all the discourse, communication, and decision-making taking place globally. Canada exists in an extraordinarily complex and sometimes miasma of interconnections and forces that comprise our global communication network. It is therefore incumbent upon us, as individuals, to be knowledgeable at a basic level and be aware of those forces that significantly affect us.

The citizen's voice is exercised in his/her vote, which is an inherent democratic right of expression, and thereby results in impacting the decision-making within our nation. The particularly low participation rates in elections across all levels of government do not speak well of our acknowledgement of personal responsibilities as contributors to the conduct of the nation's business. Non-voters who don't exercise their right to vote offer the opportunity for others to have an inordinate share of influence on the final outcome of the election.

It is this element of behaviour that enhances the thought of our nation being in jeopardy. As members of a national group, how are we to become a national team? A team where we truly have a common narrative and accept a common goal.

Leadership

It all starts at the top! It is recognized that leadership is an art. It begins with a vision!

LEADERSHIP (noun) is the ability to motivate a group of people to act towards achieving a common goal.¹³

A leadership role is challenging because it requires subsuming one's ego in a constrained manner and exercising humility, qualities rarely found in those who reach for the top of organizations, whether they be of a public or private nature. However, that is where the tone of any organization is defined. The tone set at the top cascades down through the hierarchy and penetrates to the lowest rung of this ladder. To obtain the maximum contribution from each strata of an organization (or a nation), the personal characteristic of such a leader must encompass honesty, truthfulness, morality, ethical behaviour, and courage. There must be respect for the contributions of those comprising the group for a leader to gain the necessary trust. In the case of a nation, acceptance of conclusions in policy or actions will only be forthcoming if the leader commands a favourable standing with respect to these characteristics. This is the Canadian way!

These qualities should be the prerequisite criteria for choosing a leader in the first place. If Canada is to alter the trajectory of the past, change is inevitable. New methods must be sought and implemented. This applies to the Prime Minister's and Premiers' offices, the most senior administrative management, and the elected representatives of our federal, provincial and municipal governments. Such change must apply to the respective staff, reaching all the way to the person sweeping the floor in a municipal office.

An open and transparent management style is not for those who lack self-confidence in their capabilities. They cannot be reluctant to create an environment that maximizes the pride and self-respect of those on their team.

When a citizen's primary characteristics are embodied by descriptors such as egoistic and self-centered with little to no consideration for having personal characteristics consistent with altruism and unselfishness, the nation is in jeopardy. We exist together and must recognize that our well-being is inextricably tied into being a member of the larger group that constitutes the whole population. A prerequisite to reaching our nation's elusive potential is for each person to consider themselves as a part of our 'national team.' Everyone must recognize that they not only contribute to their own personal needs but also collectively to every individual across our nation's vast geography.

If the stance one takes on any debated topic has elements being driven by only self-gain and greed, then the potential for chaos is dramatically heightened as those who 'have' continue to amass more of the economic pie than those who can be described as the 'have-nots.' The policies and rules by which we conduct our affairs have caused fiscal benefits to gravitate preferentially to those with significant surplus incomes. This system, although providing an incentive to improve one's standing in the spectrum of social status, is biased in favour of those who have already bridged the chasm that separates the extremities of wealth distribution. Any long term widening of this gap can only lead to rancor and dissatisfaction by those who are being left behind.

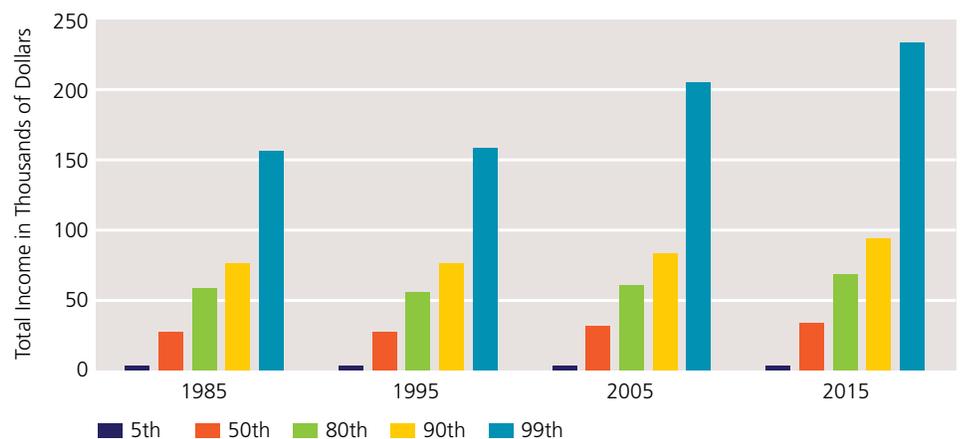
One may ask, how are these data related to the issue of Big Projects?

Figure 10 is a visual summary of the challenge facing our society's significant decision-makers. Big Projects are the fundamental foundations for the wealth required to support the social benefits, such as old age pensions, universal health care, affordable education, paved roads, bridges to cross expanses of water, and to provide a safe environment, manage equality before the law, and the list goes on. However, without the existing infrastructures that our past Big Projects have provided, Canada would not be a nation and would not be in the position to offer these social benefits that we have come to take for granted. Independent of their status in the earning spectrum, each and every citizen benefits from the foundation for wealth that Big Projects provide.

The policies and processes inherent in our current national and regional decision-making systems require the support of a significant majority if the nation is to evolve from this economic base and continue to improve the social well-being of each and every citizen in need of these services.

The seeds of discontent are sown and grow.

Figure 10
Personal Income by Percentile¹⁴



The 50th percentile averages about \$34,000 annually and has remained relatively stagnant in income growth over the past thirty years while those in the 99th percentile have grown from \$158,000 to \$234,000. A growth of almost 50% in income. Is it realistic to believe that a nation can tolerate such inequity, forever? I think not!

The seeds of discontent are sown and grow.

Those at the bottom of the income spectrum depend on the social services that are funded from the wealth that past Big Projects have created. Inherently, this is the result of our past capacity to put policies into place, take action and build facilities that have enabled the structures that we have in place today. If this nation is not capable of implementing new Big Projects of a national or large regional scale then inevitably the services will be fiscally threatened and diminish.

Surplus incomes increase significantly faster at the top than at the bottom of Canada's income distribution. As discussed earlier, discontent manifests itself in a disengagement from established societal norms resulting in like-minded individuals aggregating to disrupt the normal conduct of the nation's business. This fiscal chasm is a fundamental contributor to why our population behaves as a group rather than like a team!

For a stable nation endeavouring to reach its potential, it is imperative that the contributions of each and every citizen are channeled in a common direction to achieve the common goals that benefit all Canadians. Observation of recent unrest globally suggests that the frequency of visible activism is increasing and election results reflect the uneasiness of the relevant populations. Canada is not immune to global happenings and when established governmental policies continue to favour the few at the expense of the many, the same results can be expected here. It is only a matter of when!

Team Membership and Responsibility

A personal standard of behaviour is expected in any large and complex group where individuals share diverse thoughts and ideas. This standard encompasses a tolerance for cultural norms, some of which may be in violation of personal past experiences. Not every member is like-minded nor do they support or adhere to all the topics discussed within the group. The individual is unique in sentient interpretation of personal environment and the world in his/her proximity.

Acceptance that others have views and are prepared to offer content that may differ from personal perspectives is to be expected. Listening becomes a very important trait. Civil and respectful negotiation is a fundamental team exercise to come to a consensus on any topic. Once a significant majority of the team has convergence to a final stance on the given topic, it is the responsibility of the individual to accept the team's conclusion.

Recently there have been expressions of activist protesting that have violated the laws of the nation. Examples are particularly frequent where large project implementations are being pursued. These protestors, operating under the banner of '*environmental protection*,' appear to believe that their cause is '*saving the planet*' and thereby do not accept the approvals that have taken place via lawful avenues. Even an elected representative, by supporting such an activity and being arrested, obviously views such demonstrations as worthy of pursuit through such extreme expression. On a national scale, this is group behaviour, not that of a team. Gaining visibility via the media has become a tool for establishing one's '*brand*' and identification with a specific group or against a specific legal action.

Since there are legitimate, established avenues and processes to vet written submissions, hearings, input seeking forums, opportunities to hear views and share perspectives, these demonstrations challenge the democratic order. Each citizen must have a tolerance and acceptance that personal desires may be *wants* as compared to *must-haves* with respect to a debated topic. Utilizing data, facts, science, and rules of order to convey the essence of one's support or argument is the foundation of a democratic society. Everyone's input may not be

reflected in a team's final conclusion, but normally, if there are respectful exchanges, there will be some reflection of the content.

Canada's Potential

A vision of what is possible is required to fully appreciate the possibility of this nation being in jeopardy. For centuries the consumption of energy has been directly related to the economic and social well-being of nation-states and their citizens.

Figure 1 captured a vision of the challenge facing Canada's decision-makers for the nation to reach its potential. The graphic addressed the scale of a vision to ensure that there is adequate economic activity to support the demands of meeting its citizens' expectations of social benefits well into the future. To successfully bring together the private and public sectors in a cooperative and collaborative manner involves thousands upon thousands of individuals in a very complex communication network. The concept of a shared goal to continue managing the oil-based resources while evolving to an electrically-based economy is a fundamental necessity to meet climate change challenges. Everyone must accept that the oil-based resources (with high environmental impact) will still be required for decades to come while building the new electric infrastructure, navigating the economy to its new state with low environmental impact as the over-arching goal. Not only do the leaders who navigate our economy need to recognize and accept this circumstance but also each citizen must appreciate that one is invariably tied to the other.

Protesting and offering a cacophony of mixed messages arguing to the contrary is disruptive and futile. Achieving the ultimate goal of Canada reaching its potential starts with *a vision of the possible*. Managing the communication network with all its inputs, exchanges and influence-seeking is Canada's way going forward. It challenges the Prime Minister, the provincial Premiers, and Indigenous community leaders to recognize this nation-building set of projects as being inextricably welded into one BIG PROJECT!

Only then, will the citizens of Canada benefit, rather than a selective few dealing with self-interest as their motivation. The last reference here being to those who place careers and personal enrichment ahead of the needs of the many! Canada's citizenry needs to coalesce into a team, pulling together, supporting each other and their elected leaders in order to attract the financial capital required and properly allocate the available human resources to actually make this happen. The path is traversable if each citizen accepts being a *team member*.

Closing

Go for the GOLD!

When presenting an argument that challenges whether Canada is indeed in jeopardy, one must ask, *am I alone in such thinking?* As stipulated at the beginning of this chapter, there needs to be a national discussion as to whether this is actually the case. The idea that Canadians are tolerant of each other and willing to test the bounds of each citizen's positive contribution to the needs of the whole population is hopefully supported by the largest of majorities. There is no guarantee that this is the case. The discussion must question whether a *team behaviour* among all the members of our society is even possible?

We, as a nation, must behave like our Olympic Gold Medal winning hockey teams. I choose this metaphor to convey – *if each citizen strives to emulate such stellar cooperation and performance while utilizing his/her available skills and talents, Canada can reach its potential*. The cup is more than half full, not half empty.

Let's fill it and go for the GOLD!

If our form of democracy is to reinvigorate itself and prosper, it must start with us as individuals. In his book, *The Rational Optimist*, Matt Ridley¹⁴ argues that despite all the gloom and doom to which our society is exposed, there is much room for optimism. When assessed over centuries, and even recent decades, the world has seen significant social improvements through the exchange of thoughts, ideas, innovations and cooperation among people.

Hopefully Canada's significant decision-makers among our political, corporate, and Indigenous leaders can utilize the skills and talents of our population to generate new policies and organizational structures to take full advantage of our priceless resources. Through a collective consensus, Canada *can* move forward. Each person in this nation has something to offer in helping Canada reach its full potential.

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Introduction

In Canada, First Nations and the Crown have a *special relationship*. For that relationship to grow in a way which allows all of us to flourish, we need respectful processes which are mutually beneficial. These processes must balance pre-existing Indigenous rights over land and resources with the needs of the Canadian governments, industry, and the public. Although these respectful processes have been sorely lacking, the courts now recognize that our land and rights are essential to our identities. They understand the significance of our concerns about development on our land that may affect our Indigenous title and treaty rights. Through the laws outlining the legal Duty to Consult and Accommodate, the courts have demonstrated that an honourable relationship between the Crown and Indigenous peoples means good faith recognition and accommodation of Indigenous interests.

In this chapter, I will share with you the Walpole Island First Nation's experience with how we address the interests of developers within our homelands. I draw from my experience as former Chief of Walpole Island First Nation (WIFN), past Executive Director of the Walpole Island Heritage Centre, and my current position as Walpole Island's Consultation Manager. Through years of experience working together with Shell Canada, we have developed our own **Consultation and Accommodation Protocol** that steers the process. While the Shell project ultimately was never built, it did serve to build our capacity to engage in other larger projects and became the template for our consultation and accommodation process. Here, I will outline the four-step process, how it was developed, and the challenges involved.

I will also identify the inherent collateral opportunities and benefits for both corporations and First Nations. It *can be* a win-win agreement.

Truth and Reconciliation

What is Nation-Building? For many thousands of years, Indigenous people have lived together in the place we now call Canada. As an Indigenous word, it means the villages and communities on the many lakes and rivers on these lands and waters. The Oxford English Dictionary defines a nation as “a large body of people united by common descent, history, culture, or language, inhabiting a particular state or territory.” It also defines nation as “a North American Indian people or confederation of peoples.”¹ These definitions are different but not mutually exclusive. The common element, as it has been for hundreds of years, is the lands and waters of the place we call Canada. Since the first encounters, we have been joined together as nations by the process of Nation-Building in the form of Treaties.

In 2019, we must strive as Canadians to find out the Truth of these Treaties. In 2017, Senator and former Mr. Justice Murray Sinclair stated that we need to know and to speak the Truth before Reconciliation is possible. The truth is that our public schools continue to teach, through textbooks, misrepresentative stories and histories of Indigenous people, their communities, and Nations. The truth about Indigenous people, their communities and Nation must be told before reconciliation is possible. As Senator Mr. Justice Sinclair said, “education got us into this mess and education will help us get out of it.”²

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Indigenous leadership in partnership with non-indigenous governments and proponents is an integral part of the development and nation-building of Canada. The latter two need to alter their perspectives on consulting and accommodating Indigenous peoples. Rather than thinking of the Duty to Consult and Accommodate as a cost with no benefits, it must be viewed as a tool that can benefit all parties involved, both Indigenous peoples and proponents alike.

Without Truth and Reconciliation, nation-building as a process cannot be achieved. Indigenous leadership must be central to this nation-building.

The Duty to Consult and Accommodate First Nations: Indigenous Law in Canada

First, I will briefly explain what the Duty to Consult is, how it affects businesses and why corporations should *want* to consult with us regardless of the law. This information is pertinent to understanding how and why our Walpole Island First Nation Protocol was developed.

Corporations benefit from proper consultation and accommodation

- Limits negative environmental impacts
- Avoids delays and cancellations
- Avoids financial losses
- Long-lasting relationships

The Duty to Consult us is much more expansive than just checking in to gauge our concerns and treating us like mere stakeholders; members of the public who may or may not be affected by the actions of governments and corporations. Unlike other members of the public, we have Indigenous and treaty rights that are constitutionally protected. Therefore, the Duty to Consult is more than just the opportunity to have a nice chat across the table. It is about structuring and defining how the Crown and Indigenous peoples make decisions when development may affect Indigenous lands, rights or interests. When properly carried out, the Duty to Consult and Accommodate ensures that Indigenous peoples have a meaningful role and voice in making decisions that potentially impact the fate of our communities and the generations that follow.

The consultation obligation spans the lifetime of a project and is an ongoing duty that lasts for however long an Indigenous right is affected. The duty does not vanish with the conclusion of a treaty or modern-day lands claim agreement. The right of Indigenous communities to be consulted is both a procedural and a substantive right. Therefore, the Indigenous people have the right to a just process of consultation, and the process must accommodate Indigenous concerns about the impact on our rights such as hunting and fishing.

Indigenous peoples are entitled to a consultation process that fully identifies and adequately addresses our concerns over how proposed development or legislative changes will affect our specific concerns, environment and rights. We are entitled to a distinct process where there are no existing processes, and the Crown must provide guidance and be transparent about the proposed process and what current stage it believes to be at. There must be adequate time for the Indigenous group to raise concerns about the proposed process. Consultation and accommodation must be both significant and proportionate to the potential adverse effects on the Indigenous rights. Simply adopting industry guidelines or statutory minimums may not sufficiently satisfy the Duty to Accommodate.

United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP)

A few words should be said about the standard of free, prior and informed consent set out in the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). In *Clyde River*,³ the SCC did not apply UNDRIP explicitly, but implicitly affirmed that many of its underlying principles such as freedom from force, proper resourcing, information exchange, and a demonstrated understanding of the impact of a project on a First Nation's rights are already enshrined in Canadian law. In 2018, the Government of Canada announced that it already has a Working Group reviewing federal laws in order to harmonize them with UNDRIP so it can be implemented into domestic law.

Consultation and Accommodation are Good Business

Walpole Island First Nation (WIFN) considers consultation and accommodation as integral to the process of reaching a fair agreement whenever our Indigenous rights (including Indigenous title) or treaty rights may be affected by a development. Consultation and accommodation are good business. According to the Supreme Court, “The controlling question in all situations is what is required to maintain the honour of the Crown and to effect reconciliation between the Crown and Indigenous peoples with respect to the interests at stake.”⁴ The Supreme Court’s statement reflects Walpole Island’s perspective. WIFN is committed to finding the honourable means to reconcile and balance the needs of the Crown and industry with our special responsibility to care for the lands and resources entrusted to us by the Creator for future generations.

Companies often approach Walpole Island First Nation to inquire about our processes and expectations regarding consultation. For many years, we have worked with companies who deal with us in good faith to find the appropriate processes and types of accommodation. The Duty to Consult encourages governments and industry to get consent and develop working relationships and agreements with First Nations to avoid risk of declined authorizations, project cancellations and claims for damages. We strive to address our First Nation’s needs while giving industry benefits, including the certainty needed to proceed with projects.

Do Corporations Have a Duty to Consult and Accommodate?

The Supreme Court addressed the question of companies’ legal obligations to consult us in the *Haida* and *Taku River Tlingit* cases (SCC).⁵ These cases established that there is no legal duty on the part of third parties, such as corporations, to consult where Indigenous rights or title could be affected. However, the Supreme Court also stated that when the Crown delegates some of the procedural aspects to corporations, such as environmental assessments or regulatory processes, then the corporations would in fact have the delegated Duty to Consult. Nevertheless, the Crown cannot delegate the duty away, it is still ultimately the Crown’s responsibility for ensuring that the Duty to Consult is met.

Corporations benefit from proper consultation and accommodation. This process enhances the success of a company’s project by limiting its negative environmental impacts, avoiding delays and financial losses, all while being a good corporate neighbour to the community.

Why Corporations Should WANT to Consult

It is important to consider why corporations should *want* to consult with First Nations beyond their delegated procedural duties. Corporations that try to disentangle themselves from the Crown’s consultation process risk that the Crown will be found to be in breach of its legal Duties to Consult and Accommodate. Yet corporations have more reasons to consult with First Nations beyond merely assessing legal risks. Consultation and accommodation are simply good business.

As the former Chief and present Consultation Manager of the Walpole Island First Nation, I have been involved in a wide variety of consultations with corporations and different levels of government. The types of external projects that our First Nation has been engaged in have included pipelines, marinas, hazardous waste landfills, dredging disposal facilities, dredging of contaminated sediments, power generation projects, highway developments, international bridges and industrial wastewater treatment operations. My experience includes formal

hearings, community meetings, external reviews, providing input on permit applications, establishment of on-going environmental liaison committees, and the negotiation of memoranda of understanding with project proponents.

Many companies have already realized that consulting with First Nations, in whose territories they plan to operate, is good business. Industry plays an important and practical role in the consultation process. They recognize the real and substantive interest that their companies have in the outcome of the consultation process.

Avoid Delays

In the 2017 *Clyde River* case, the Supreme Court said, “No one benefits - not project proponents, not indigenous peoples, and not non-Indigenous members of affected communities - when projects are prematurely approved only to be subjected to litigation.”⁶

When the Duty to Consult is not met, there is a risk that the proponent’s project will be delayed, causing significant financial losses. Litigation is costly and time-consuming. It is a path that most corporations and First Nations want to avoid. For example, in the *Saugeen First Nation v. Ontario* (MNRF), 2017 ONSC 3456 case,⁷ the Court decided that the Ministry of Natural Resources and Forestry failed to meet that duty in respect to a proposed limestone quarry in the First Nations’ traditional territory. The proponent declined to take an active role and deal directly with the First Nations to advance consultations. Although not required to do so, the consequence of refusing that role was to further delay consultations. The simplest and most effective way for government and industry to avoid this uncertainty and risk is to obtain the consent of First Nations before using and developing our lands.

Avoid Cancellation of Projects, Permits or Licences

In the case of failure to adequately consult an Indigenous community, a land tenure, permit, or licence may be overturned. In a 1997 ruling, the Supreme Court warned that if the Crown or company begins a project without adequate consultation and consent before Indigenous title is established, they may be required to reassess prior consultation, if or when that title is confirmed. The project could be delayed or cancelled if continuation of the project would unjustifiably infringe Indigenous title. This could result in significant financial losses to the company and put them on the line for potential claims for damages.

Corporations Understand How to Best Accommodate

In my experience, I believe that the Crown cannot successfully carry out their own duty without corporations becoming integrally engaged in the consultation process. I would even venture to say in some cases, that the only way the Crown can be successful is to require the corporation and the First Nation to reach a bilateral agreement that outlines the terms of mitigating any potential impacts on First Nations’ rights. For some projects, trilateral agreements which involve the Crown may be more preferable.

The devil really is in the details since the design, construction, and operation of a project, program, or policy will depend on discussing the details in order to meet the Duty to Consult and Accommodate. In many cases, only the corporations will fully know and understand the details of the project and are often the only ones able to provide some economic benefits to the First Nations to offset some of the negative impacts of the development. Moreover, when the corporation develops a relationship with the host First Nations, they will be in a better position to understand the ways in which accommodation can be achieved through modifying the project’s design, implementation, or operations.

Gain Traditional Ecological Knowledge

The benefits of a second set of eyes should not be underestimated, especially considering that First Nations have unique insights into the territory that cannot be found anywhere else. The process of consultation allows for the incorporation of traditional ecological knowledge in baseline environment studies and environmental monitoring protocols. For example, we can direct the location of the studies to properly target valuable habitat or set the parameters to be monitored and identify appropriate locations where the monitoring should take place. Mitigation measures are also enhanced when we are included in the fundamental planning to adapt the routing of pipelines, roads, and other corridor-type developments to avoid valued habitat.

The Shell Project

Note: The Shell Project story in this paper is also described in lesser detail in a forthcoming UBC Press volume.

In Walpole Island First Nation's case, we have had to use a variety of methods to urge the corporations to agree to first consult with us and second, to consult with us in a meaningful way. Our First Nation has adopted a **Consultation and Accommodation Protocol**, which we distribute to our proponents. In this protocol, we urge corporations to voluntarily consult with us, and where appropriate, to enter into a *hosting agreement* with our First Nation. This type of agreement is appropriately named, as the First Nation is consenting to 'host' the development on our traditional territory. A hosting agreement covers a variety of topics, which can be found in the Appendix. Taken into consideration in this agreement is that Indigenous peoples' concerns yield benefits, not only for themselves, but for corporations and the environment that we must all share and protect.

In March 2007, Shell Oil Canada, a subsidiary of Royal Dutch Shell announced plans to construct the first new oil refinery in Canada in approximately 30 years. The proposed \$15 billion crude oil refinery along the St. Clair River was about 20 kms south of Sarnia, Ontario and falls within the traditional territory of WIFN. The proposed new refinery was designed to process heavy crude oil from Alberta. It would have been integrated into the existing Shell refinery, with the overall project to include a dock on the St. Clair River, electricity generation, storage of crude oil in brine caverns, and new pipeline and transportation infrastructure improvements.

That spring, Shell began to prepare the Terms of Reference (TOR) for the project, which are required by the Minister of the Environment for the province. As part of the TOR process, Shell began consultation with stakeholders, including local First Nations. The initial consultation meeting at WIFN was held in April 2007 with 54 community members in attendance. The TOR was approved by the Ministry of the Environment on June 27, 2007. The TOR set out the framework and work plan for how the Environmental Assessment (EA) would be conducted. Included within the TOR framework was a detailed listing of the key reports to be included in the EA. As a response to the ongoing history of human and environmental impact from industry in our territory, WIFN Council implemented a community consultation process. The primary purpose of the consultation process was to keep the community informed and engaged in all potential developments and impacts from the Shell Project and future development projects.

During this process, which became known as *The Shell Project*, WIFN became the first First Nation in Canada to successfully negotiate a seat on the Government Review Team for the Environmental Assessment process that followed. The victory was not an over-night success,

it was the result of years of community efforts to ensure that we had a say in any development project that took place within our territory. The results were positive for the community and offer a perspective on best practices in the ecosystem health assessment process. This part of the chapter aims to outline potential directions for future Indigenous, Crown, and industry consultations on development to ensure the health of Indigenous and non-Indigenous populations in Canada.

The Consultation and Accommodation Protocol

WIFN defined the new standards of consultation, and even more significantly, continues to refine the consultation process itself. The new process was required because there had never been a joint Ontario and Federal Environmental Assessment (EA) completed within one project. The process was created to ensure that WIFN had a meaningful seat at the table for the EA process. That is now the expectation the community has for every proponent who comes in with new projects. Often the response is, 'Wow, we're not the Shell project.' However, the protocol is customized for each project according to its scale and model. WIFN elevated the consultation because the rulings on the Duty to Consult refers to a spectrum of Indigenous land rights.

History of Land Rights Relevant to WIFN

There have been many new developments surrounding the Duty to Consult as a result of recent court decisions by the Supreme Court of Canada.⁸ I highlight only a few below.

The Sparrow Case

Starting with the *Sparrow case* (1990),⁹ there has been a long string of cases from the Supreme Court of Canada that recognize that Indigenous peoples must be consulted when our Indigenous rights, treaty rights or title are affected. This case established that the government must engage in a *justification process* to prove they are legally entitled to interfere with the above rights. The Crown must also take steps to minimize the negative impacts and ensure that proper compensation is provided. The *Sparrow* decision made it clear that proven Indigenous rights trigger the Duty to Accommodate those rights, although the court did not use the word 'accommodate' until later decisions. The court also noted that the Duty to Consult can even include obtaining full Indigenous consent after the accommodations have been provided to our satisfaction.

The *Sparrow* decision was upheld and added to by subsequent Supreme Court of Canada (SCC) decisions in the *Delgamuukw* and *Tsilhqot'in* cases in 1997. In the *Haida* and *Taku River Tlingit* cases,¹⁰ the Supreme Court confirmed that the Duty to Consult and Accommodate exists even where Indigenous rights and title are not yet proven. The Supreme Court further elaborated on these principles in 2010 in *Rio Tinto A/can v Carrier Sekani Tribal Council*,¹¹ *Beckman v Little Salmon/Carmacks First Nation*,¹² and most recently in *Chippewas of the Thames First Nation v Enbridge Pipelines Inc.*¹³ and *Clyde River v Petroleum Geo-Services Inc.*¹⁴ In all of these decisions, the Supreme Court confirmed the scope of the Crown's obligation and laid out important principles and guidelines regarding the Duty to Consult and Accommodate Indigenous peoples in the context of unproven rights.

WIFN Consultation and Accommodation Protocol

As noted above, WIFN has developed a 4-step Consultation and Accommodation Protocol which provides an adjustable framework to follow for each new project proposed. The four steps include:

1. Initial Contact
2. Determination of Consultation and Accommodation Needs and Appointment of WIFN Representative if Applicable
3. Preparation of Workplan and Budget
4. Follow Workplan and Revise When Necessary

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For Initial Contact, WIFN Council mandated the WIFN Heritage Centre (or *Nin.Da.Waab. Jig* which means ‘those who seek to find’) to establish a Response Team to monitor progress on the project. This team included technical, legal, and reporting units to review reports in the EA process, advice on legal matters and report back to both the Council and the community on all aspects of the project.

For Step Two, the Response Team determines whether consultation and accommodation are required. If it is required, a WIFN Representative is appointed to be the contact person and will inform them of the decision, as well as whether it will require a minor, medium or major level of consultation and accommodation.

Step Three is the creation of a workplan that outlines all the steps required within the Consultation and Accommodation Process. The workplan determines what other information is required, sets a budget and establishes target dates. This step identifies what expert analysis or input is required from environment experts, archeologists, or anthropologists, as well as any legal analysis from a lawyer. The collection of information, work to be completed and consultation meetings are planned.

An important part of this step worth noting is the budget. WIFN recognizes the importance of internal community consultation and wants to ensure that all members have access to the information. To ensure meaningful access and understanding of the information provided by the proponent and other experts, the budget includes provisions for the collection, dissemination of information, expert and legal fees incurred, and any associated costs at the community consultation level. This is discussed further in the next step.

In the case of the Shell Project, the Response Team undertook a Traditional Ecological Knowledge (TEK) Study. TEK is generally understood to be information about the relationship between humans and the land and resources, passed on from one generation to the next, and is preserved in oral tradition. The study was designed to capture the knowledge that community members have traditionally acquired through verbal lessons from skilled teachers about the use of the land and resources.

Step Four involves following through with the workplan and making revisions when necessary. Consultations take many different forms. WIFN often makes decisions with the participation of its members, therefore it is important to ensure that all information is accessible to everyone and participants are fully informed in a meaningful and understandable way that allows them to actively participate in the decision-making.

The goal of consultation is ‘*mutual understanding on the core issues*’ which includes the potential impact on the Indigenous or treaty rights and possible accommodations. Each member of WIFN should be able to make submissions, and formally participate in any hearings that might take place before any decisions are made regarding the proposed project. It is important to recognize that an Indigenous group may have resource constraints that need to be addressed,

including time, money and people. Simply dumping data on an Indigenous group is not appropriate, as it will often not be accessible. Consultation requires taking all steps to ensure all information is accessible. Accommodations to accessibility would include taking measures such as translating the information into an Indigenous group's language if required or if the community is remote with limited internet access, proponents should ensure that the documents are downloadable or that substantial copies can be made available in the community.

Once a decision is made, the final phase consists of negotiating a Memorandum of Agreement or an Impacts Benefits Agreement stating that the project may proceed.

The Protocol and Shell

Within this framework, once the Shell Oil TOR was approved, the Ministry of the Environment began conducting consultation and accommodation meetings with local First Nations. WIFN Council became very active in the consultations. We were involved in structuring and defining how the Crown and the First Nation would make decisions, as well as assessing the impacts and benefits of the development. In the consultation process, two important questions were considered: (1) What are the potential effects of the proposed project on the WIFN? (2) What consultation and engagement processes can be put in place to ensure that the Duty to Consult and Accommodate has been met?

Shell Oil Canada contracted Jacques Whitford Consulting Company to complete the Environmental Assessment Process under the Ontario Environmental Assessment Act. To review the potential outcome effects of the proposed project, the following studies were undertaken:

- Natural environment (water, air, land, species, and habitats)
- Social (community)
- Economic (training, employment, and business opportunities)
- Cultural (traditional, archaeological)
- Health (association between environmental degradation and health)

Health Assessment

As part of the EA, we directed our attention to the association between environmental degradation and health, as it is well documented across many different disciplines. However, specific to WIFN is our relationship with *Chemical Valley*, a term used to refer to the more than 40 chemical and petroleum plants located upriver from the community. Research conducted by the WIFN in partnership with the Western University Ecosystem Health Research Team confirmed that the health effects in the community extend beyond uptake of elevated levels of mercury and arsenic in the air, water and soil.

Henley et. al.¹⁵ confirmed statistically higher levels of stress, as measured by hair cortisol within the community. Chronic stress is associated with the development of obesity, glucose intolerance, and metabolic syndrome. In addition, increased stress is known to affect a dysfunction of the hypothalamic-pituitary-adrenal (HPA) axis which is associated with increased incidence of mood disorders. Within WIFN, individuals who self-reported Type 2 Diabetes also had elevated levels of hair cortisol. None of these health outcomes are what we might consider Traditional burdens of illness, to use an inappropriate term. Stress is known to increase the risk of diabetes and diabetes is known to increase the risk of depression. In this case, stress is associated with the increased presence of pollutants associated with Chemical Valley as our neighbour.

Local is More Than the Island

In order to understand why an Environmental Assessment makes up such a significant part of our Protocol, an explanation of WIFN's historical connection to the land is provided. We have a long-recognized right to our unceded territory on and around Walpole Island. We have never surrendered our Indigenous title to the beds of the Great Lakes in our area, and as a result, we have a strong 'land claim' in the eyes of the law. In fact, it is Canada who claims to own territory that we never surrendered. We are legally asserting our rights to these parts of our traditional territories which we never surrendered. They include the Canadian portions of Lake St. Clair, the St. Clair River, the Detroit River, the western part of Lake Erie, the southern part of Lake Huron, various islands and parts of the mainland in southwestern Ontario, and some lands in the U.S. Even if only a small geographic area of our claimed lands is impacted by a proposed development, we believe (and the Supreme Court agreed in the *Mikisew Cree* case) that the size of the affected area is only one issue among many. What is important is whether and how those lands are significant to our First Nation. We consider the entire traditional territory to be significant.

The Bkejwanong First Nation Territory

The Bkejwanong First Nation Territory and its corresponding Indigenous title and rights still exist and remain intact. Our citizens are and remain sovereign within our Territory based on various Indigenous laws. Canadian Research Chair in Indigenous Law and Governance at the University of Victoria Professor John Borrows observes how Indigenous laws are part and parcel of Canada's Constitution as a legal framework under Section 35(1) of the Constitution Act, 1982. He clearly states that, "Indigenous legal traditions continue to exist ... [and have] not been widely extinguished." Thus, "Indigenous legal traditions are inextricably intertwined with the present-day Aboriginal customs, practices, and traditions" under Canada's Constitution, therefore they are also a part of Canadian law.¹⁶

These Indigenous legal traditions are reflected in treaties into which our nation has entered. These are examples of *sacred law* that come 'from the Creator, creation stories or revered ancient teachings that have withstood the test of time.' Legal traditions based on spiritual principles form an important part of every culture's legal inheritance and are often given the highest respect. We must be guided by the sacred law of Indigenous Thought and Knowledge from the Creation Stories. Providing leadership in the development of Indigenous and Canadian laws, John Borrows explains, "The laws surrounding Canada's formation in many treaty territories are profound because they are meant to encourage the spiritual, moral and legal capacities of all the people who would come to live here. The sacred nature of the treaties is one reason why many First Nations would not consider abandoning them despite generations of government neglect. It would be a violation of the Creator's law, sacred law, to turn away from their promises to him and others in maintaining peace and order throughout the lands on which they lived."¹⁷

Locating Ourselves Through Our Connection to the Land

In his 1974 book, *Culture and Experience*, A. Irving Hallowell noted that,

Schematic perception, involving the meaningful aspects of experience, can hardly be understood without reference to an articulated world of objects whose relations and attributes become meaningful for the individual, not simply through the innate psychological potentialities he brings to experience but, above all, through the significance for experience that the development, patterning, transmission, and accumulation of past experience, in the form of a cultural heritage, have come to imply.¹⁸

Over the years, we have moved away from the singular male focus in Hallowell's words toward an understanding of the central importance of place and locating ourselves within it. We also expand on his reference to objects to include other relations with the many Beings who reside or move through a territory.

To intentionally avoid the place-space debate common in social science discourse, we instead focus on location, as it allows us to situate ourselves spatiotemporally within relationships. It allows us to work within Anishinaabek tradition by understanding that the 'development, patterning, transmission, and accumulation of past-experience' represents past and future generations who occupy Walpole Island territory. It allows us to consider all the Beings, past, present, and future, who engage with land and water. It ensures that in our discussions we consider the land an ongoing dialogue rather than a series of unrelated stories.

The localized standards exist in a scale. Starting with the larger section of the scale, WIFN is located at the intersection of two continental flyways; both the Mississippi and Atlantic flyways meet at WIFN bringing birds from across the continent to the region. The birds are a significant resource for the community. Historically, the flyways provided the food that the community's ancestors needed and within the context of the continental ecology, the local community formed. The flyways continue to provide in the contemporary economy in the form of hunting, recreation, and tourism.

Scaling down a little situates WIFN in the middle of the Great Lakes basin. Relative to the community, Lakes Superior, Michigan and Huron form the upper lakes of the basin. Lakes St. Clair, Erie and Ontario are the lower lakes in the basin. The nishnaabemwin word *bkejwanong* means 'where the waters divide' and serves to situate the community within the basin. The community is not set apart from the lakes, instead the lakes and every life within it are in relationship with WIFN. The basin is the traditional Anishinaabek territory for the Three Fires Confederacy of the Ojibwe, Pottawatomi and Odawa Nations. Historical factors have contributed to the movement of these Nations, who make up parts of the population at WIFN.

The final scale to consider is the unique local ecosystem within which WIFN is situated. The community sits on six islands that are approximately 58,000 acres in size. Prior to the Caldwell First Nation receiving a major land claim in 2010, WIFN was the most southern First Nation in Canada. The community has a responsibility to maintain five ecosystems that are present on the islands: coastal waters, wetlands, tall grass prairie, oak savanna, and forest. Wetlands on the island account for approximately 17,000 acres, which makes them significant for the health of the community, the Great Lakes and the birds travelling along the flyways. The tall grass prairies are the largest remnants in Ontario and the Oak Savanna is the last of its kind in Ontario.

In the 1980s the International Joint Commission on the Great Lakes listed Walpole Island as one of 42 areas of concern. The community is home to over 70 species at risk, including: wild orchids that are found nowhere else in Canada, Small White Lady's slippers, Southern Flying Squirrels, Northern Bobwhite Quail, King Rails, Round Hickory nuts, Kidney Shell Mussels, and Northern Madtom. The islands that now form the community emerged out of the glacial waters approximately 5,000 years ago. Archeological evidence supports the local knowledge that occupation of the islands started at about that same time. Within the scales of perception that make up the concept of community, continental, Great Lakes and local ecology, is woven a time scale where the community has developed local knowledge systems. These ways of knowing are embedded in what it means to be from WIFN. They also form the governance system of the community. The shared development, patterning, transmission, and an accumulation of past-experience constitute the contemporary and future WIFN community within the larger and smaller ecological contexts.

Nation to Nation Relationships

Reciprocal Obligation

WIFN, like all First Nations, is both a nation and a government. The first position we maintain is that the consultation is about respect and reconciliation and that First Nations also have a reciprocal obligation within the structure of Duty to Consult and Accommodate to share the knowledge that the community has developed from being from a place. First Nations do not often discuss our obligations. The community has an obligation to share our story with proponents if we are hosting them in our traditional territory so that they can know who the community is. Knowledge can bring benefits to all parties in a project and should be shared reciprocally.

Delegated Responsibility

The second position we maintain is that members of the community's consultation teams work within a mandate of *delegated responsibility* rather than *delegated authority*. Our understanding of *delegated authority* comes from Stephen Gardiner who wrote, "citizens delegate their own responsibilities and power to [the government]. The basic idea is that political authorities act in the name of the citizens in order to solve problems that either cannot be addressed, or else would be poorly handled at the individual level."¹⁹ With the exception of the election cycle and regional recall legislation, delegated authority tends to be unidirectional in nature.

Alternatively, we define *delegated responsibility* as the acceptance of a mandate for individuals or teams to be given temporary responsibility to represent the wishes of the community. This is more than a fiduciary responsibility as we believe that the community is capable to act in its own interests. This relationship is bidirectional. WIFN's Consultation Team is accountable to the community during all phases of the negotiations. To highlight this process, we draw on the experience of WIFN during the Shell Project.

An early lesson learned by community members at WIFN was the importance of being involved in the drafting of the TOR, which ensured that WIFN secured a prominent position in the overall process. A new Protocol was necessary because of the high turnover of representatives from Shell Canada, the Province of Ontario and the Federal Government. Eventually the community responded by coordinating an engagement process. In it, the community defined our expectation on many aspects of the consultations, including how information was disseminated at open houses. Normally a proponent would bring an information board and the community can ask them questions. Under the *delegated responsibility* model, the open house room was divided into four groups: Shell Canada, the Province, the Federal Crown, and the WIFN Consultation Team. This allowed community members to travel around the room and hold court at each corner. When partnered with formal presentations, the new process ensured that all actors in the process were responding to the community's wishes.

TEK Studies and Evidence-based Partnerships

As part of the consultation process for the Shell Project, WIFN negotiated funding for a Traditional Ecological Knowledge (TEK) study. Previously, the community has been successful in our negotiations for smaller TEK studies for the TransCanada Pipeline and Westcoast Energy in the Millennium Pipeline projects. Because of the TEK, the Millennium Pipeline project was eventually aborted.

The purpose of the TEK studies is to look at how the proposed activities will impact contemporary life, the community, the community's relationships with others, as well as the

impact it will have on future generations. The TEK studies represent an important part of the assessment for First Nations. Instead of simply providing a list of impacts that may become an exclusive and final list, we believe that each TEK contributes to the whole. The community also took the position that impacts need to include positive outcomes through the process of capacity building. Each TEK study is stitched together with previous studies and have much more collective value after the consultation than simply as a repository or a tool that helps a project obtain approval. During each process, the team works the proposed project into a larger community strategy based on the collective TEK studies.

The Challenges Involved with TEK Studies

Three Challenges with TEK Studies

1. Ensure that TEK is properly considered
2. Achieve meaningful consultation
3. Create equitable negotiation outcomes despite power and cultural differences between parties

TEK studies have become the standard for First Nations contributions to many Environmental Assessment (EA) processes. However, Clint Westman, an environmental studies and cultural anthropologist warns that the collection of traditional land use and environmental knowledge does not always respect or comprehend the sacred and contextual nature of the information. As such, the communities represented in the TEK studies too often become little more than ‘public relations tools’ for the proponents of development.²⁰

Additionally, Dylan, Smallboy, and Lightman²¹ outline three challenges for ensuring proper consultation with Indigenous peoples as it relates to the EA process: (1) ensure that TEK is properly considered, (2) achieve meaningful consultation, and (3) create equitable negotiation outcomes despite power and cultural differences between parties. WIFN has a simple policy to ensure that TEK studies benefit the community; we own the studies and continue to use them to advance our own aims. The data contained in the studies includes information on hunting, fishing, harvesting, and spiritual places. The community has completed three rigorous TEK studies that are independent of any set proponent objectives.

On behalf of the community, the WIFN Consultation Team is going beyond simple TEK studies. Our strategy is to have a voice in all aspects of the development and restoration that takes place in our traditional territories in Southwestern Ontario. We are combining TEK studies and historical ecology studies to be used as base line data. Exploring how the study of historic ecology can benefit the restoration of the species and habitat at risk can add to our further understanding and standards of health in the community. This community research is based on its historic occupation of these lands and waters over thousands of years. In addition, this element adds capacity for future partnerships with other governments and proponents. Cultural identity is an association of relationships between the community, and the land and waters, or environment. Professor Deborah McGregor, now the Canadian Research Chair at York University, refers to their connection providing a ‘conceptual framework’ for Indigenous understandings of their relationships with Creation.²²

Collateral Opportunities

What We Learned from Shell

Benefits are more than just jobs. I like to tell a story about jobs from the Shell Project. We questioned Shell representatives about their past promises to provide jobs and do good things for WIFN. We acknowledged that their refinery had been in Sarnia for 55 years and then asked them how many First Nations people from Walpole Island or another First Nation had been hired to work for them in the last 55 years? Of course, they replied that they didn’t know, they would have to go find out and report back. Shell came back and said they found three. That is equivalent to hiring a First Nation person every other decade.

All these broken promises of employment and opportunities has made it important for us to have a strong strategy to measure success. As a result, other employment opportunities were found and defined as ‘*collateral opportunities*’; benefits that extend beyond the regular and expected benefits from economic development. If oil spills into the river are considered as ‘*negative externalities*’ in economic terms, *collateral opportunities* are best thought of as tangible and intangible opportunities that benefit the community. They include immediate benefits such as procurement options and opportunities to partner a younger, growing population with aging, shrinking labour unions. WIFN used our experiences from the Shell Project to negotiate a First Nation’s procurement program during the development of the Herb Gray Parkway in Windsor, Ontario.

WIFN is focused on developing benefit agreement rather than impact benefit agreements

From this process, WIFN is focused on developing benefit agreements rather than impact benefit agreements. The reason is simple, we do not want impacts. WIFN wants ‘good development.’ We want good projects. If the project meets the criteria for a good project, then it will be elevated and WIFN will ensure we are involved and included in the benefits. Our focus is on opportunity for the community, which includes the geographic scales mentioned above.

Examples of Collateral Opportunities

Collateral opportunities include the opportunity to form new partnerships such as the joint Ecosystem Health Research Team between WIFN and Western University. The origin of the relationship was the community’s first memorandum of understanding with Western University, laying out how the community wanted to interact with the university. It was an important step because it ensured that WIFN was in partnership with the research that was taking place in our community. The partnership allowed us to direct where the research was going in terms of practical application for the community. It also included future benefits and the development of a community master plan where TEK studies are woven together from past projects to strengthen the community’s future consultation position. We use the term *master plan* here as a shared community vision, not as a fixed document, this is where delegated responsibility returns to the conversation.

Another example of the collateral benefits we share is the archeological fieldwork that must be completed as part of the EA process. During the Shell Project, Shell Canada had to do an archeological survey on 10,000 acres of land covering close to 200 archeological sites, many of them First Nations. Each new survey is stitched into or partnered with the original WIFN archeological master plan that was completed 15 years ago. Rather than site by site reports, the new survey becomes a part of the existing master plan for our traditional territories. This new information was also shared with the municipality who did not have an archeological master plan.

In this example the benefits were extended to the municipality and the Provincial Crown’s Ministry of Tourism, Culture and Sports. The relationship with the Crown extended further to include a reciprocal opportunity to provide cultural awareness training to Crown employees. At first, the reaction from many employees was less than enthusiastic. They worried about losing a day and a half of work while they were at WIFN. However, the same people that were worried approached me after the training and said, ‘we didn’t know all this. This was the best day I’ve ever had... I’ve learned so much.’

Employment Opportunities

Other collateral opportunities include the creation of jobs and employment on the project for qualified employees from the First Nation membership. Employers that contribute resources for training will enjoy the long-term benefits of having employees who reside close to a development, and who have a personal interest in seeing the project operate well with limited environmental impacts. As well, there will be opportunities for Indigenous businesses to supply

goods and services to a proponent's project. Employers are often surprised by both the quality and quantity of the WIFN labour pool.

Improved Communication

This process will also be able to establish clear mechanisms for informing the affected Indigenous community about developments and potential impacts in the affected area. If community members are given adequate financial resources to participate at this level, then the Indigenous members on a joint committee will be able to communicate with members of the community we live in about what is really happening. There will also be provision of clear avenues for First Nations to communicate plans for community developments to corporations, so that we can work together in partnership with the corporation. For example, if a First Nation was considering building a facility requiring specialized equipment, an arrangement could be negotiated for the purchase of a corporation's surplus or used equipment.

WIFN Continues to Benefit

WIFN was successful in setting a standard of consultation by becoming the first First Nation to receive a seat on the Government Review Team (GRT) for the joint Ontario EA. That meant that we presented our TEK study to all the Ministries and proponents at the table. Being part of the GRT allowed for real time assessment, involvement and consultation. Rather than waiting for the GRT to sign off on all the reports and send them to the community for review, we were able to short-cut the process by being a part of it. However, this process placed a great burden on the community's capacity which must be a consideration for other First Nations.

WIFN continues to benefit from our involvement in the Shell Project. We are taking a proactive role in moving projects forward that respect our values. We are now part of the decision-making steering committee instead of simply on a special ad-hoc First Nations advisory committee. We have embraced the development of renewable energy within the territory. We have been active with opportunities in wind and solar development. WIFN also utilized procurement incentives that were included in Ontario's Feed-in Tariff program for renewable energy. These incentives are a way for the Crown to encourage economic partnerships which can be thought of as a de facto revenue sharing model for first Nations.

WIFN is now active with wind and solar development

Our focus is on building capacity to further build wealth and health in our community. WIFN and Aamjiwnaang First Nation partnered with Northland Power on a 20-year contract for a 100- megawatt wind farm. The project is now completed and in commercial operation. This was followed with two more wind partnerships bringing WIFN's total renewable portfolio to 300 MW which provides much needed revenue to sustain the community. WIFN takes credit as a community for re-inventing the three R's. It's not reduce, reuse, and recycle. It's all about Relationships, Reconciliation, and Respect.

Closing

We are still here. Our stories derive from our spirit memory. We are international. We continue to be successful. As citizens of Canada, we are also citizens of our own Nation. We are here in Canada as a Place. Indomitably, again, we are becoming free and independent and sovereign.

The success and lessons learned during the Shell Project and other negotiations involving Walpole Island First Nation offer a perspective on how consultation between Indigenous populations, the Crown and industry might look. What the community wants is to have a say in every development and every restoration. The community is determined to maintain

our presence in the sensitive, layered, ecosystem that we have occupied for thousands of years. And we expect to have the capacity to go into future partnerships with other governments and proponents in a way that effectively decreases the negative impacts and increases collateral opportunities.

Together with a new form of leadership, consensus across the provinces, First Nations, and country, and a new regulatory approval system for big energy projects, we are ready, willing and able to work with our non-Indigenous neighbours, proponents, and government to move forward with Big Projects. Nation-Building through Big Projects is achievable if we all work together.

Appendix: Towards a Hosting Agreement

1. Recognition of Walpole Island First Nation's (WIFN) outstanding claims against the Crown, and its interest in self-government.
2. Definition of an on-going role for the community in jointly implementing, managing, and monitoring the project, including the creation of a liaison committee.
3. Definition of the make-up of a liaison committee, which would include representatives from the First Nation, the company, and possibly one or more consultants retained by the First Nation.
4. Preparation of a schedule of meetings for the committee and other proponent/First Nation meetings.
5. Agreement on the combination of environmental standards that will be used in the monitoring of the project.
6. Definition of the direct advisory role that WIFN would provide in the design, implementation, and evaluation of monitoring studies.
7. Description of what effective compliance monitoring, and environmental effects monitoring, would consist of for the project, as well as what forms and records would be used to document the monitoring system.
8. Development of monitoring threshold levels that would trigger action and a description of appropriate notification protocols.
9. Establishment of an annual schedule for the reporting and interpretation of monitoring results to the committee, the community, and other interested Indigenous communities in the local area.
10. Development of notification protocols for the First Nation for specific project construction or operation activities.
11. Establishment of annual budgets and disbursement mechanisms for on-going project related activities (e.g., monitoring and database management activities), and for other environmental programs addressing broader regional objectives for which mutual benefit could be established.
12. Identification of all the potential costs and benefits for the community in the project, including environmental, social, and economic impacts. This may mean identifying opportunities to develop business partnerships and defining specific First Nation employment and training.
13. Identification of Community opportunities. This may also apply to opportunities for the provision of any additional services to the community that the project could potentially provide.
14. Development of an Indigenous relations policy by the project proponent if there is none in place.
15. Agreement on joint positions that may be required in any regulatory processes. For example, it may be possible to jointly submit draft Environmental Compliance Approvals after effective consultation has taken place. These submissions may include such issues as contingency plans, financial assurances, monitoring programs, or emergency response planning. The submissions could also include statements on meeting federal, provincial, and other legal requirements for timely Indigenous consultation and statements on the thoroughness of evaluating potential Indigenous impacts.
16. Payments in lieu of tax payments.
17. Technical and financial support for enhancing research, monitoring, and training capacities in all areas of environmental protection within the traditional territory. This may include the sharing of information concerning environmental protection as it affects the traditional territory.
18. Agreement to participate in circles that bring together governments, organizations, individuals, and private business to promote integrated local perspectives on environmental and development issues in the watersheds of our traditional territory.

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Joules in a Decarbonized Economy

Chapter Overview

Chapter 5 provides an overview of the changes in how we develop, transport and use energy. This chapter arms the reader with a basic knowledge of energy so they can better understand the issues, identify biased or misinformation and reach an informed opinion related to energy issues. It provides clear, concise information on how to measure and convert energy content from different sources in order to evaluate our 21st century energy options.

Introduction

Popular media is replete with discussions about energy, clean energy, dirty energy, fossil energy, energy conservation, energy of the future and on, and on, and on. When it comes to energy, where are we headed as a country, as part of a global market, and as a society?

Our political and corporate leaders are charged with making multi-billion-dollar decisions today that will affect generations to come. Corporate leaders must do so with current quarterly dividends in mind while political leaders must be cognizant of corporate donors as well as public sentiment. But the latter two are not always in harmony, leading to confusion and misinformation around energy. Compounding these conflicting pressures is a growing environmental awareness, economic concerns, rapid advances in technology, and a perceived negative change in lifestyle; all leading to a high potential for disruptive changes in the energy sector.

Despite these conflicting pressures, decisions affecting the future of Canada's sustainable energy must still be made. Transitioning away from fossil fuels to hydroelectricity is not a straightforward mathematical conversion. We must keep this complicated conversion in mind when discussing what energy resources are required today, throughout the transition and towards our future needs as a clean energy country.

Lifestyle and Energy

Our prolific use of fossil fuels has led to a standard of living and life expectancy in Canada unheard of, or even imaginable, to our grandparents. Access to almost unlimited energy, specifically fossil fuels, has created huge benefits. However, we are only just beginning to understand and address that this has also come at a huge cost.

One of the challenges, or perhaps opportunities, underpinning the disruptive changes before us is our lifestyle expectations. Those of us in the developed world want to maintain and even improve our quality of life and life expectancy and to help bring similar benefits to those living in the developing nations.

Technological Disruption

Transporting people and goods over land used animal power, mainly horses, for millennia. And few if any imagined, never mind predicted, a change. However, over the course of a decade at the beginning of the 20th century horses were rendered obsolete except for racing and pleasure riding. Automobiles disrupted transportation.

More recently, the smartphone, hardly imaginable a decade or so ago, has now disrupted how we communicate.

The video below provides insight into rapid changes in several energy sectors forming disruptive change on a scale mimicking the emergence of the automobile, computers and cell phones.

Video 1 Clean Disruption of Energy & Transportation



This dichotomy reminds us of Charles Dickens' famous words that seem appropriate today, "It was the best of times, it was the worst of times, it was the age of wisdom, it was the age of foolishness, it was the epoch of belief, it was the epoch of incredulity..."¹

Which side a leader takes depends on that leader's vision of the future. Visionary political and corporate leaders are seeing changes on multiple fronts as described in the following paragraphs. There are signs that the net positive benefits of decarbonization are already underway and likely **unstoppable**.

Is a Revolution Involving Energy Imminent?

Is the way we think of energy extraction, transportation and conversion, and how we actually use energy, undergoing a fundamental change?

Canada, aligned with the rest of the world, is on a path to decarbonize our economy. Initially the goal was to address climate change, but research into renewable energy sources and energy storage has driven costs down dramatically, adding an economic driver to the transition process. A decarbonized economy requires game changing advances in energy efficiency and conservation, as well as energy system innovation, production, distribution and end use. Such disruption will inevitably lead to a steep decline in the use of fossil fuels as our primary energy source. **Video 1**² makes us question if we are seeing signs of this happening already and asks how can we ensure that we do not damage our economy or negatively impact our lifestyle?

In the last decade, coal combustion has gone from being one of the cheapest sources of electricity generation to being completely undermined by the price of natural gas. Utility scale wind and solar have become the norm with prices approaching grid parity in some regions making it competitive with natural gas. We see the emergence of affordable long-range electric vehicles, and Energy Star™ certification incorporated into residential building codes, and many other examples.

Yet, to a casual observer, it's confusing that oil companies are still looking to expand production while the market is trending towards greener energy. Some pundits talk of a rapid move to clean renewable sources of energy while others still assume that oil consumption will increase further until the end of this century. Oil companies are still spending billions searching for new reserves and building pipelines, while environmentalists and the current market are pushing society towards a zero-carbon world, potentially by mid-century.

Are we approaching, or perhaps past, a tipping point? Public views of climate change are evolving. The Financial Post reports that, "80% of investors are concerned about climate change."³ Coincidentally or not, energy economics is rapidly moving toward favoring low carbon sources coupled with localized control (distributed generation). These shifts may lead to uncertainty about the future of fossil fuels and fossil fuel projects. Chatham House, a world-leading policy institute from the UK reports that the "World Bank is no longer financing upstream oil & gas."⁴ Are these factors threatening the viability of new, world-scale fossil fuel projects?

If these electrification trends are real, Canada will need new energy generation sources. New sources such as big hydro-electric, large scale deployment of solar, wind, nuclear, geothermal, and tidal will all require an upgraded transmission and distribution networks, including smart-grids, and storage projects. These new energy system components will be needed to displace the gargantuan energy content currently being supplied by fossil fuels. Similar amounts of total energy will still be needed in a growing and decarbonized economy, even after considering

some decoupling of the Gross Domestic Product (GDP) and growth from energy use (efficiency and conservation).ⁱ

Fortunately, Canada has a wide assortment of energy resources and options to draw upon. Evaluating the options proves difficult as we must first decide which energy resource to exploit, how to convert 'packages' of energy from one form to another, and how to move it from the resource to the user. The difficulty lies in the conversion as energy is measured in different 'packages' according to what it is and the ways in which we use that energy.

Measuring 'Packets' of Energy

For example, we buy and sell crude oil denominated in barrels, we buy gasoline in litres, and electricity in kW-hrs. Natural gas is sold into the market in \$/GJ but purchased by the consumer in standard cubic meters. Propane is purchased in kilograms, coal in tonnes, and nuclear fuel in kilograms, and this is only a sample. Challenges related to energy packet measurements is compounded by differences in how efficiently we use that energy.

To turn a car's wheels, a typical fossil fueled automobile uses less than 30% of the energy content in a litre of gasoline,⁵ while an electric vehicle uses about 80% of the kW-hours stored in its battery. A typical residential furnace converts about 85% of the energy contained in natural gas, denominated in cubic metres, into useful heat, while electricity, is better at essentially 100% but measured in kW-hours.

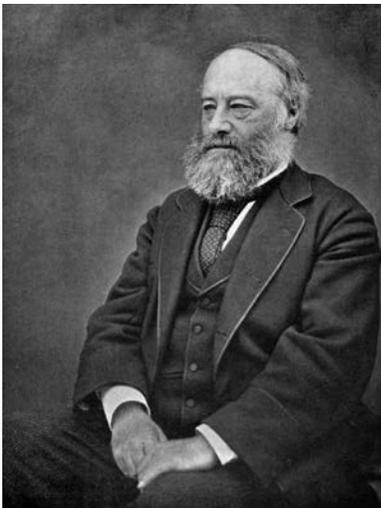
These examples demonstrate the need for a common basis that allows comparison of energy options. Fortunately, such a basis is already in place. All the examples of energy packages mentioned above can be converted relatively easily into a common dimension, known as the Joule,ⁱⁱ named after James Prescott Joule (**Figure 1**). This greatly simplifies the comparison of packages of energy and the power derived from spending that energy.

The difference between the term *power* and *energy* is also confusing. *Power* is the result of using *energy* over a given amount of time, or, the rate at which energy is used. The most common terms used to describe power are horsepowerⁱⁱⁱ for mechanical devices and Watts for electrical equipment.

Similar to energy dimensions, power dimensions are also interchangeable. A one horsepower (HP) lightbulb is the same as a 746-Watt lightbulb. A 400 HP car engine is also a 300,000-Watt engine. A typical grid connected natural gas fired power plant might have a nominal output rating of 300,000,000 Watts, or 400,000 HP. In real world application, energy and power measurements readily span many orders of magnitude, or multiples of 10.

Looking at **Table 1**, this inconvenience is readily addressed by using abbreviations for multiples of 1,000, similar to the metric system. For example, our 300,000-Watt automobile motor may be described as a 300-kW motor. Our 300,000,000-Watt natural gas fired power plant is the same as a 300 MW plant.

Figure 1
James Prescott Joule



- i Joules, a unit of energy, contained in fossil fuels would need to be supplied by Joules in the form of electricity leading to the same total Joules used today after considering efficiency. Economic growth would add to that total and would need to come from electricity.
- ii The Joule is named after James Prescott Joule. Among many other achievements, Joule discovered relationships between heat and mechanical work leading to the foundation for the theory of conservation of energy.
- iii Horsepower (HP) is defined as 550 foot-pounds per second (ft-lb/s). To convert HP to Watts multiply HP by 746.

Table 1
Order of Magnitude Convention

Multiplier	Short Form	Magnitude	Applied to Watts
Base Unit	–	1 Base Unit	1 W
kilo	1 k	1 Thousand	1 kW
mega	1 M	1 Million	1 MW
giga	1 G	1 Billion	1GW
tera	1 T	1 Trillion	1 TW
peta	1 P	1 Quadrillion	1 PW

Converting Energy Packets to Joules^{iv}

Now the questions become, how do we convert HP to kW's and how many Joules are in a litre of gasoline?

Crude oil sells for about \$60 USD per barrel. The price of coal used in power plants sells for about \$100/tonne, gasoline retails for about \$1 /litre and electricity costs about 10 cents/kW-hr.

Now, recall that the common reason we purchase these products is for their energy content to heat our house or fuel our car, etc. There is no sentimental value to be considered. From a simple glance at these prices, we have little insight into which one has the lowest price. To compare prices, we need to determine the energy content in each 'package.'

Table 2: Typical Energy Packet Measures Converted to Joules, provides a list of how common energy carriers are packaged, notional Canadian prices for each energy packet, factors to convert to Mega-Joules contained in each energy packet and the price^v for each energy product in \$ per Mega-Joule (MJ) as well as in \$ per Giga-Joule (GJ).^{vi}

Table 2
Typical Energy Packet Measures
Converted to Joules

Energy Form	Typical Measurement	~Price ^{vii}	Mega Joules/ measurement	~Price \$/MJ	Price \$/GJ
Natural Gas	Cubic Meter (m ³)	\$0.12/m ³	0.024 MJ/m ³	0.003	\$3
Natural Gas	GJ	\$3/GJ	1,000 MJ/GJ	0.003	\$3
Thermal Coal	Tonne	\$100/Tonne	20,000 MJ/Tonne	0.005	\$5
Crude Oil	Barrel	\$60/Barrel	7,000 MJ/Barrel	0.009	\$9
Electricity	kW-Hr	\$0.1/kW-hr	3.6 MJ/kW-Hr	0.028	\$28
Gasoline	Litre	\$1/Litre	32 MJ/L	0.031	\$31
Diesel Fuel	Litre	\$1.2/L	39 MJ/L	0.031	\$31
Propane (LPG)	Litre	\$0.9/Litre	25 MJ/Litre	0.036	\$36
Ethanol	Litre	\$1.2/L	20 MJ/L	0.06	\$60
Hydrogen	Kg	\$15/kg ⁸	120 MJ/kg	0.042	\$120

From **Table 2**, comparison of energy prices in their common packaging measures is very difficult. However, once converted to Joules, mega-Joules (MJ) or giga-Joules (GJ), the price comparison becomes straightforward.

We can see that hydrogen, although a potent fuel in the context of energy content, is more expensive than most other fuels. On a Joules basis, gasoline, as one might expect, is about the

iv Prices used in this discussion reflect notionally reflect consumer prices at time of writing. Cost of extraction and generation will be lower.

v Notional prices are in 2019 Canadian dollars

vi From Figure 2, a mega-Joule, or MJ is equal to one million Joules and a giga Joule is one billion Joules

vii Prices shown are representative of those in place at the time of writing but are subject to change over time.

same price as diesel fuel. Could this be because the market unwittingly values the capability to do work and finds that, on an energy basis, both fuels get the job done in about the same way? Natural gas energy is less expensive than coal on a \$/GJ basis.

However, there is more to comparing energy price as delivered to the consumer than price per Joule. Using the comparison between coal and natural gas, we see that on an energy basis, both fuels are about the same price. However, due to the complexity of the cost of construction, operation and maintenance of a coal fired plant, economics would dictate that when a plant is approaching retirement, it will be replaced with a new simple and more efficient natural gas fired plant or another form of electricity generation.

Table 2 helps explain the massive movement away from coal. Although there is concern about greenhouse gases (GHG) and conventional air contaminant emissions resulting from burning coal, the transition to natural gas is economically driven, and much less so on a socially and politically driven 'war on coal.'

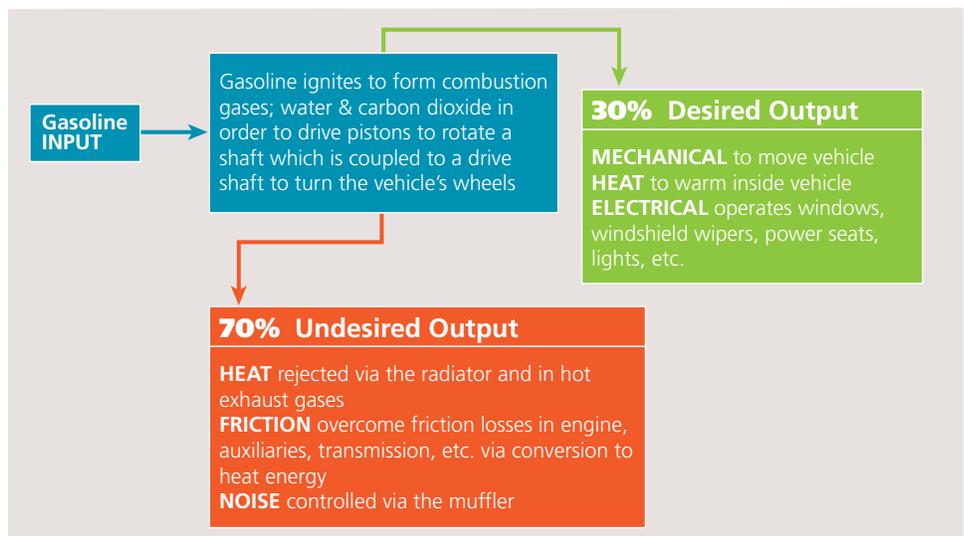
Knowing how to convert various packets of energy to one common denominator, the Joule, is only half the equation to understanding our energy options. The other critical piece is to understand the energy efficiency of the different options and this is where it becomes a bit more difficult. Efficiency can vary significantly depending on its use, even for the same fuel type. For example, oil used to heat a home has a different efficiency than oil used to fuel a vehicle.

Energy Efficiency and Implications

Although **Table 2** contains a list of energy sources and energy prices defined in different ways, it does not provide information on efficiency, the nature of the energy,⁶ or any external costs associated with its use. Before discussing energy efficiency, we need to expand on the term *energy*, specifically how we use energy. When we talk about using energy we often talk about energy 'consumption.' Energy consumption is an erroneous term and leads to major misconceptions, as energy is NEVER consumed.

Instead, energy is converted into one or more alternative forms of energy, some desirable, some not. **Figure 2** illustrates gasoline energy conversion in a car. Less than 30% of the chemical energy in the gasoline is converted into moving the car, or kinetic energy, the desired conversion. Included in that 30%, is heat energy to control cabin temperature and electrical energy to power windows, air conditioning, windshield wipers, power seats etc. Finally, a tiny amount is converted into light energy.

Figure 2
Vehicle Energy Balance⁷



The remaining 70% of the energy contained in a litre of gas is wasted as heat and noise energy. These energy transfers (from chemical energy in gas) are conversions into other forms of energy, all of which are described as Joules. Further, energy and power are related and are measurable in Joules and Joules per second respectively.

When a car slows down by applying the brakes, the speed of the car (its kinetic energy) is converted into heat, which is why there are cooling fins on the brake disks. In a car, this excess heat is not the desired outcome, however when heating a home, it is. In a natural gas furnace, most of the chemical energy in the gas is converted to heat energy and transferred into your home, raising the temperature. Only a small amount of energy produces undesired effects such as releasing some of the heat along with the contaminants through the exhaust system to the outside air.

Dividing the number of Joules transferred from the natural gas into raising inside air temperature by the total chemical energy released through burning the natural gas is energy efficiency, usually expressed in a percentage. Depending on the quality of the furnace, this might be in the range of 80 to 90+%.

Similar to energy packaging units, energy efficiency is often not measured in consistent units. While furnace efficiency is measured in percentages, fuel economy for vehicles is measured in litres/100 km, or miles/gallon. More confusing, we often say that a device has an energy consumption rating.

A typical incandescent light bulb might be rated at 60 Watts, but only about 5% of the electricity flowing through the light bulb is converted into light! The rest is released as heat which is why light bulbs get hot. The 60-Watt light bulb is only delivering about 3W to the desired conversion of light energy. LED light packaging often claims, '*equivalent to a 60W bulb but only using 9W*'. This is a very confusing way to say that the LED light bulb is about 33% efficient while the incandescent counterpart is only 5% efficient in delivering the desired conversion to light energy. To be more energy efficient, we could replace our incandescent bulbs with LEDs.

Energy Conservation vs. Energy Efficiency

Although they are often used interchangeably, the terms energy conservation and energy efficiency are not the same and this can be confusing. As discussed in the previous section, energy efficiency is connected to converting energy from one form to a desired alternative form, such as moving a car. A car requiring less fuel to move the same distance as another car, all other factors being equal, is said to be more fuel efficient than the other car. However, not taking the trip at all, or driving slower, or packing more people into the car (one vehicle instead of two), is energy conservation.

The topic of energy conservation is important as it ultimately comes back to lifestyle. Using less energy can be the result of using more efficient devices or it can result from doing less. The latter is often equated to sacrifice. As in, '*am I supposed to stop driving my car and take the bus, or ride a bicycle, or worse, walk?*'

Energy efficiency does not necessarily mean sacrifice, and neither does energy conservation. The purchase of a high efficiency furnace will result in less energy purchased. However, energy conservation comes from using a programmable thermostat to reduce energy use while no one is home. Neither option involves a sacrifice in lifestyle, and both will expand your spending power for better uses.

If there are significant improvements to the energy efficiency of devices and the way desired energy is converted and conserved, then we have the ingredients for disruptive change in our society. Are such changes occurring and if so, are they occurring at a rate that can be described as an energy revolution?

Evidence Suggesting that an Energy Revolution is Underway

Average vehicle fuel efficiency has increased every year since 2012, with new vehicle fleet average fuel economy on track to be less than about 4.4 L/100 KM (~55 miles/ US gallon) by 2025. As mentioned earlier, conventional internal combustion engine (ICE) vehicles waste most of the energy contained in the fuel while electric motors approach 90% efficiency.

Figure 3
Electric Commuter Aircraft



Affordable fully electric cars are now available that can travel in the range of 400 km or more on a single charge. The Economist⁷ stated that, “2018 is set to be the year the world fully embraces the electric car.”¹⁰ Short and medium range electrified commercial trucks are now on the market with several vendors planning to market long-range trucks before the end of this decade. Short to medium range electric air travel (**Figure 3**) is being developed by world class¹¹ aircraft manufacturers. Deployment of commercial medium range, all electric passenger aircraft is planned for the next decade, less than 10 years away. Changes in other sectors are also underway.

In addition to Provincial initiatives, the Federal government, via Natural Resources Canada, offers a wide suite of support for all sectors of our economy to improve energy efficiency and reduce GHG emissions by consumers. Some programs are voluntary while others are mandatory such as changes to building codes that now require all new construction to be Energy Star™ certified. Proponents argue that taking these steps makes economic sense because cost savings will recover the cost of the improvements.

Energy consumption patterns and usage are changing; however our premise is that total energy usage will remain somewhat static while maintaining our lifestyle and quality of life. Therefore, a significant part of an energy revolution will involve how and where we generate energy. If Joules derived from fossil fuels are to be displaced by Joules from alternatives then a revolution in electricity generation, transmission and distribution will be needed. That will require projects to be assessed, approved and constructed in time to meet our Paris international treaty commitments.

Energy Pricing

Government policy alone is not likely enough to drive such a pace. Pricing will need to be a key factor. In recent years, solar and wind power prices have dropped dramatically. New wind power generation costs are now at grid parity in some parts of Canada and solar is within reach.¹² According to Forbes magazine, “Renewable energy will be consistently cheaper than fossil fuels by 2020.”¹³

Figure 4
Wind and Solar Power Prices

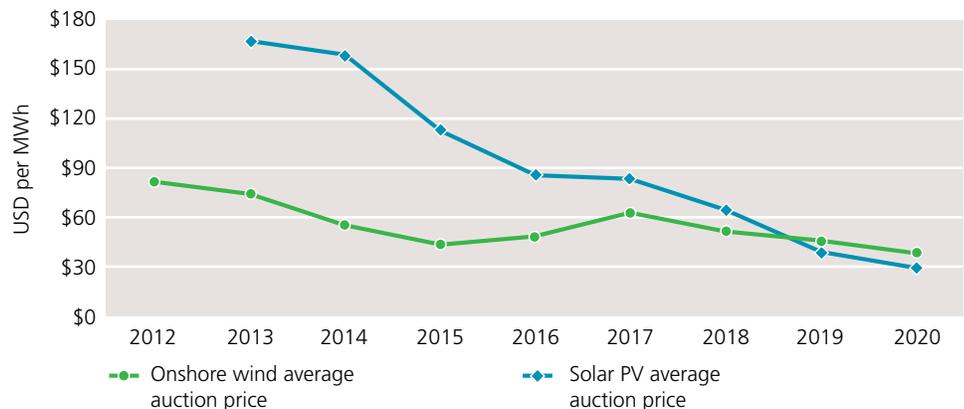


Figure 4¹⁴ shows global average pricing trends for wind and solar power. These global average prices suggest that new wind and solar, after correcting for capacity factor, are at or are approaching grid parity - without subsidies. Going beyond visionary government policies,

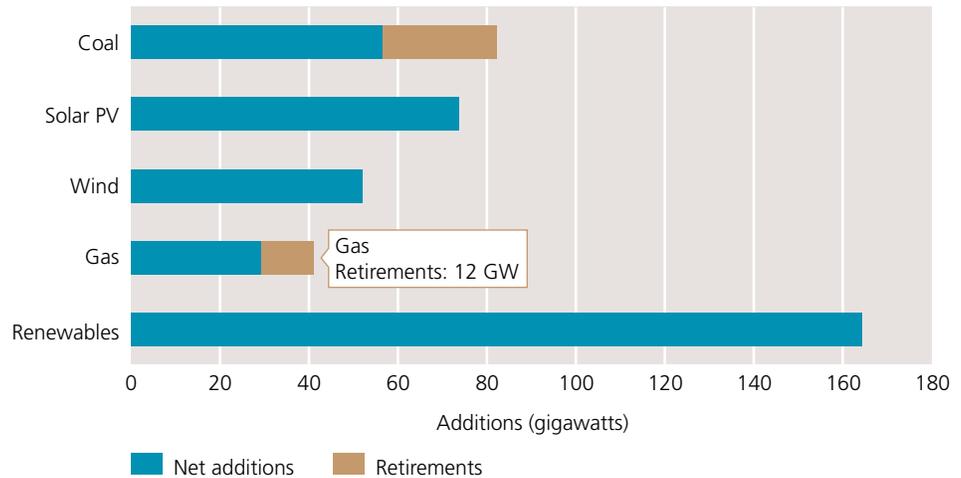
Video 2
Is the Electric Vehicle Revolution Real?



Figure 5
New Electricity Capacity

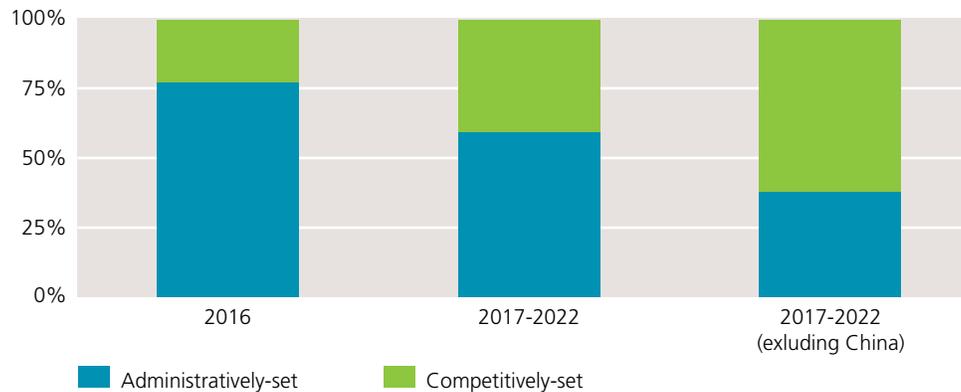
these average prices are what is really behind the massive expansion of wind and solar capacity around the world.

Figure 5, from the IEA, reported that in 2016, new electricity generation capacity from wind and solar exceeded new coal and natural gas capacity, combined. As can be seen in **Figure 6**, although government policy was influential in these energy transition initiatives,¹⁵ these trends have accelerated into an energy revolution primarily due to rapidly declining costs giving rise to opportunities to make money. **Video 2** is a presentation to investors about the advantages of investing in renewable energy and why the market is shifting away from high carbon energy sources such as coal.¹⁶



The key to enabling unbridled growth and deployment of these intermittent sources involves energy storage. Grid scale energy storage is now in various developmental phases and is being actively deployed in many Canadian cities. Grid scale storage is being implemented at municipal levels via chemical batteries, flywheels, compressed air storage, etc. Inter-regional and even international scale energy storage in the form of pumped storage is being used to optimize large hydroelectric facilities.

Figure 6
Renewable Capacity Growth



Other opportunities for energy storage are being identified, researched and engineered around the world and involve technologies ranging from nuclear power augmenting hydro, hydrogen generation and storage, compressed air and liquid air storage. These opportunities are not only being explored; they are being implemented. In the US, cumulative grid scale energy storage exceeded 1,000 MW-hrs in 2017¹⁷ and according to GTM Research, annual deployments will exceed 1,000 MWh in 2018. The growth in global energy storage deployments currently underway is remarkable.

When only considering internalized costs for each fuel, natural gas now offers a clear price advantage over coal-based electricity generation. Government policy tends to try and level the field to consider externalities such as land use and water impacts, GHG, and conventional pollutant emissions etc. Even without taking economic credit for its significant externalized cost advantage, natural gas still wins over coal and oil.

Spurred by government policies, wind and solar coupled with storage are closing in on fossil fuel electricity costs and are at par or lower in many regions of Canada. This means that solar and wind electricity generation costs will drive down the consumer price for electricity and tend to push electricity up on **Table 2**.

Video 3



Today's wind energy is now the lowest-cost source of new electricity in Canada.

In 2018, the Alberta Government announced plans to deploy 5,000 MWs of wind power by 2030.¹⁸ The first 600 MWs contracts were signed at an average price of 3.7 cents/kW-hr. (**Video 3**)¹⁹ This price is at or below grid parity anywhere in Canada!

Primarily driven by market forces, this disruptive energy revolution that will lead to at least a partial decarbonization of our economy seems to be already underway. If this is true, or at least likely, then Canadians need to understand how much new electricity supply we will need.

Failing to make that supply available and affordable could result in a 21st century Canada being fueled by energy sources popular in the 19th and 20th centuries. Those sources were appropriate for their time but not for today. In parallel, there is a growing global population with people in the developing world aspiring to use as much energy as those of us in the developed world and opting for renewable energy sources. That demand has contributed to falling prices for alternatives based on technology that was unavailable in the last century. Therefore, it is time for Canadians to re-evaluate our 21st century energy options and select a path forward to meet the needs of current and future generations.

How Big? How Much? And When?

Canada has all the ingredients to be a leader in a decarbonizing, and ultimately a decarbonized world. These ingredients include technology, natural resources, and a talented, diverse and educated workforce, coupled with world leading project development and management experience. The latter has been proven by successful mega project executions in energy, transportation and communication.²⁰ Armed with our new-found expertise on energy we can now take stock of how we use energy and where our future opportunities lie.

In 2016, Canada used approximately 635 TW-hrs of electricity, approximately 80% of which came from no or low carbon sources (hydro-electric, nuclear, wind and solar). Going into a future decarbonized economy, we will need the same amount of electricity plus a little more to account for economic growth and population increases to meet a 'business as usual' energy demand scenario. Significantly more new electricity generation and distribution capacity will be needed to make up for the Joules currently being sourced from fossil fuels used to power our transportation, electricity, domestic and industrial sectors. The first step to enable this transition is to better understand how many fossil Joules are being delivered and the transition time frame.

Coal

In 2016, Canada generated about 9% of its electricity from coal, consuming about 35 mega tonnes^{viii} of coal to produce about 58 TWh of electricity.²¹ Almost 80% of Canada's coal fired generating capacity of 8,000 MW is currently located in Alberta and Saskatchewan and all

viii Although about 35 mega-Tonnes of coal was used in Canada to generate electricity, Canada's coal production was 61 mega tonnes in 2017. The difference is due to metallurgical coal production and coal exports.

scheduled to be off-line by 2030. That capacity could be displaced by about 10 large hydro-electric plants or nuclear-powered units (750 MW each), OR 15 natural gas fired power plants, OR about 7,500 industrial (2.5 MW) size^{ix} wind turbines OR about 5.5 million 10kW rooftop solar arrays, assuming that sufficient energy storage is available to align renewable generation with energy demand.²² At first glance, this appears to be a daunting task, but it is possible. Ontario successfully displaced its coal electricity generation over the last decade and that Province's total coal fired electricity capacity was around 6,500 MW.

Alberta, Saskatchewan, Manitoba, New Brunswick and PEI presently use coal to generate electricity. A key difference between these jurisdictions and the Ontario experience is that Ontario has a large base of nuclear power. The remaining coal-using provinces depend on coal for their base load proportionally more than Ontario did. However, Alberta and Saskatchewan both have abundant renewable resources and large natural gas deposits.

These political commitments to move away from coal to generate electricity assume that we maintain, as a minimum, our standard of living and lifestyle, as well as remain competitively priced. Therefore, new low carbon sources of electricity are required. Natural gas, wind, solar, hydroelectric, nuclear, improved efficiency and conservation are the main candidates to displace coal for electricity generation.

Petroleum

Fuel products derived from petroleum are used primarily in the road transportation sector and secondarily in marine and aviation. Small amounts of diesel are also used to generate electricity, mainly in remote communities to supply electricity during extreme peak demand periods. Petroleum derived products used as a feed stock for chemicals represent about 5%²³ of crude petroleum production. Relative to the volumes used for transportation, volumes used for chemicals and electricity production are so small that they will not be addressed here.

During 2016,²⁴ Canadians burned about 44 billion litres of gasoline and 17 billion litres of diesel fuel. Using factors in **Table 2**, this translates into over 2 trillion MJ's (2PJ's) per year for transportation needs. That amount of energy translates into about 70 large conventional power plants.^x

However, this is where technology comes to our aid. Remember, all this gasoline and diesel is less than 30% efficient. By comparison, electric vehicles are approximately 90% efficient, which means only about one third as much electrical energy is needed to drive the same distances. Therefore, instead of needing the equivalent of 70 new power plants, the need could be met with about 25 new power plants or their equivalent from renewable sources.

Natural Gas

Natural gas is currently used to generate about 13% (~67,000 GW-hrs) of Canada's electricity needs. It is also widely used for space and water heating. Although natural gas is also used as feedstock for producing industrial and agricultural chemicals, that use will not be addressed here.

ix 2.5 MW turbines were used in this discussion as that is a common capacity at time of writing. Note, that GE currently offers 5.3 MW onshore and up to 12 MW offshore units.

x Assumes ~1,000 MW plants with the number of units rounded up to reflect requirements to meet peak demand periods and to cover generating plants unavailable due to maintenance requirements. Wind estimate is based on 2.5 MW wind turbines with a 33% capacity factor. This factor could be higher if energy storage is used.

Table 3 summarizes the consumption of natural gas use by sector, according to Natural Resources Canada, in 2015. In addition to the magnitude of Joules sourced from natural gas with non-carbon sources of energy we have the additional issue of dealing with the financial implications.

Table 3
Natural Gas Use by Sector

Sector	PJ/Year	%	Giga-Watts
Transportation	4	0.1	0.1
Agriculture	39	1.4	1
Commercial	513	19	16
Residential	690	25	22
Industry	1,508	55	48
Total	2,754	100	87

Where replacing gasoline or diesel with electricity is rapidly approaching economical parity for transportation, natural gas is easily the cheapest source of thermal energy and significantly more so than the electricity.

Natural gas sells in bulk for about \$3/GJ. From **Table 2**, this compares to electricity at about \$28/GJ. Natural gas for heating, even

after considering efficiency losses, is significantly less expensive than electricity assuming ten cents per kW-hr as a reasonable approximation for an electricity price. This means natural gas, on a Joule basis, has about a 10:1 price advantage over electricity. We can readily see why the market prefers natural gas for heating rather than electricity.

This overstates the simple economic advantage natural gas enjoys over electricity for heating because emissions-related costs are externalized. Electric appliances and heating equipment are simpler and a little more efficient than their counterpart natural gas units, making electric equipment less expensive. However, this equipment related price advantage does not come close to overcoming the energy pricing advantage natural gas enjoys over electricity. That differential could be further reduced by pricing emissions, but of course the extent such a policy change would have on the energy price differential would depend on the price assigned to the emissions.

The economic advantage currently offered by natural gas for heating is being threatened by the steep decline in renewable energy prices. The videos introduced earlier project that renewable energy prices will decline in the near future to a point where natural gas (even for heating applications) could be disrupted. Displacing natural gas, as seen from **Table 3**, would require massive new demand for electricity derived Joules. Such a transition would be more disruptive than displacing transportation fuels with electricity because heating demands do not offer the significant efficiency advantages available in the transportation sector. From **Table 3**, after recognizing that some natural gas is used to manufacture chemicals, we would need almost 90 GWs of electricity generation and distribution capacity to displace natural gas.

Logistics of Transition from Fossil Derived Joules to Low Carbon Joules

Developing new sources of low carbon power supplies is only part of the challenge, or opportunity, before us. Those supplies must be delivered in a useable form to the end user and at an affordable price.

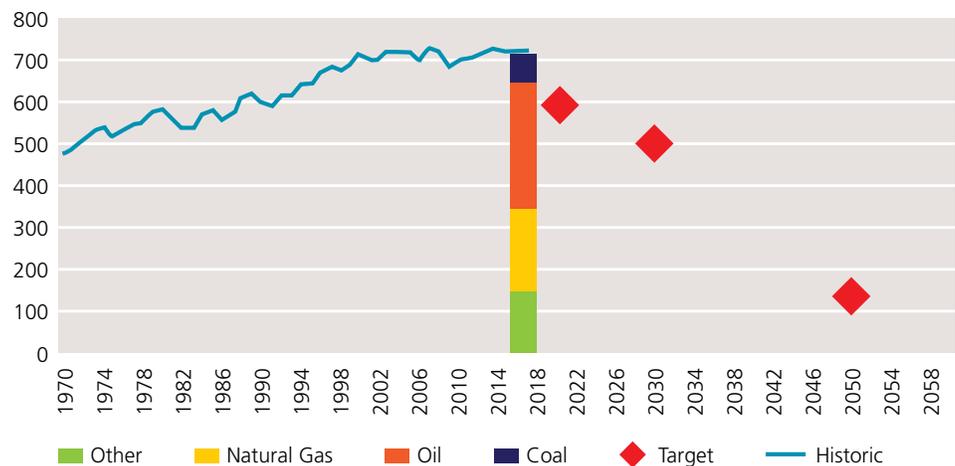
The required distribution of power generation capacity depends on how the power is generated. If large centralized units are built, then long-distance transmission infrastructure is required. Without it, the power plant location would need to be close to the demand. However, if small scale distributed units are used, such as wind and solar, then the supply would need to be closer to the demand, likely as clusters of micro-grids deployed close to demand centres or having access to longer distance transmission infrastructure. Perhaps the near optimum delivery system will involve both options.

Timing

The pace and timing of a transition to a decarbonized economy will be the result of political decisions coupled with advances in technology. The response by market forces to those factors is outside our scope, but we can provide qualitative commentary on some of them.

Political will, even if driven by public support, is not likely to drive this energy transition alone. Although visionary government policies by many countries and jurisdictions over the past few years were a key factor, they weren't the only factor underpinning the rapidly changing economic landscape we are now observing. Cost, as well as climate will play an increasing role in setting the pace. Cost refers to not only equipment purchase prices, installation, maintenance and operating fees, but also costs imposed by policies such as carbon prices and even liability costs. So, what does the pace of Joules being sourced from low emitting sources need to be to match Canada's 2015 Paris Agreement commitment? The scale of the challenge can be seen from **Figure 7**, which identifies the amount of emissions from each fossil fuel source and from 'Other' which are non-fossil sources of greenhouse gases (e.g. emissions from agriculture, cement manufacturing, etc.).

Figure 7
Canada's Historical GHG Emissions



Canada has committed to a 17% reduction in greenhouse gas emissions from 2005 to 2020, 30% by 2030 and 80% by 2050.^{xi} Clearly, Canada will not meet its 2020 commitment so the next target that Canada has committed to is 30% by 2030. However, the targets set by nations in the Paris Agreement will not be sufficient to meet the overall goal of keeping the rise in global temperatures below two degrees Celsius. Two degrees is a level beyond which scientists think the risk of catastrophic consequences becomes unacceptable. The Paris Agreement clearly identifies the need for faster reductions. Sourcing Joules from low or zero emitting sources to displace fossil fuel derived Joules could put Canada on a path to meet its 2030 targets and to develop technology that could be sold to other countries.

xi These targets were originally set by the Conservatives under Stephen Harper and later adopted by the Liberal party under Justin Trudeau. The percentage reductions are comparable to other jurisdictions; Canada's commitments are relative to 2005 while other jurisdictions choose 2000 and some other countries use 1990. Using 2005 as a base year makes Canada's commitments less challenging than our peers. In addition, it is worth noting that even if all parties achieved their Paris targets, we would still condemn future generations to a temperature increase of approximately 3 deg C. by 2100. The Paris agreement requires the parties to meet every 5 years to discuss progress, share technology and to set new targets as required to meet the "well below two deg C. long term target.

Some political decisions already announced will hasten the transition to low carbon sources of energy:

- The mandated phase-out of coal firing for electricity generation by 2030²⁵ will potentially eliminate the approximately 65Mt per year of CO₂ emissions from coal-fired generation
- The replacement of diesel-fueled electricity in remote communities with local renewable sources OR a connection to the provincial transmission system²⁶
- The escalating price on carbon. Every \$10/tonne fee on the price of CO₂ emissions will add approximately \$0.50/GJ to the cost of burning natural gas, \$0.70/GJ to the cost of burning oil and \$0.90/GJ to the cost of burning coal
- Improved California Combined Average Fuel Efficiency (CAFE) standards for transportation vehicles will continue to drive vehicle fuel efficiency through to 2025

In addition, governments are looking at other measures such as:

- Strengthening inter-provincial electrical transmission lines to better utilize surplus and undeveloped renewable resources
- Creating additional hydropower generating capacity
- Improvement of building and appliance efficiency standards
- Funding for building energy conservation retrofits

Technological advances will also change the last column of **Table 2**, the Price \$/GJ. More productive and efficient renewable sources for electricity are inevitable. The slope of the two curves on **Figure 4** have not bottomed out, suggesting further price reductions are likely; extrapolating the lines suggests much of this could happen early in the next decade. Couple the CAFE policy with rapidly dropping electric vehicle prices with improved performance suggests that meeting the required standard by the midpoint of the next decade is a reasonable bet.

We will need to significantly reduce our dependence on fossil fuels if we plan to meet our international commitments in the time frames Canada agreed to. We have shown that market forces coupled with a very rapid pace in technology development is already driving changes in energy efficiency and use profiles faster than government policy.

If we want to enjoy the same quality of life, including avoidance of the worst possible impacts of global warming, we need to seriously consider our energy choices and consider the long-term implications of our actions.



Summary and Conclusions

This chapter was an opportunity to review our understanding of energy, tools to make energy system comparisons and to impress upon you the full scale of the opportunity before us. This understanding enables us to evaluate the options and move Canada forward to not only participate in the revolution, but to lead and profit from the changes already underway.

What holds us back is the fear of loss in economic activity coupled with our natural resistance to change, which creates a negative mindset. We need to change our mindset. Although this issue has often been presented as a problem, it is really an opportunity to create hundreds of thousands of jobs, advance Canadian technology, sustainably develop Canada's abundant human and natural resources and provide wealth and prosperity to all regions of the Country.

As discussed earlier, this transition is global in scale, disruptive in nature and, we suggest, is already well underway. Continued progress toward decarbonization will be driven by visionary leadership, consumer demand for electric vehicles, equipment efficiency and conservation. Other factors to consider are price advantages for low carbon emitting supplies to meet the new demand, as well as the replacement of existing high carbon supplies when equipment is retired.

Substituting fossil fuels with low emitting energy sources does not require selecting solar, *OR* nuclear, *OR* wind, *OR* hydro-electric, etc. There is likely an optimum mix of energy sources that best accounts for provincial natural resource strengths, labour force characteristics, demand profiles and a suite of other factors. Assessment of these factors will need a systematic approach to selecting an optimal energy mix for our current and future generations of Canadians. (See Chapter 6)

We will need an informed public, decisive, courageous and visionary leaders, plus corporate, political, Indigenous, and national engagement to make it happen.

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Chapter Overview

This chapter explores the current problem of delayed or rescinded project approvals and presents the idea of creating an independent national organization as a potential solution. The organization will evaluate projects across the three dimensions of economic performance, readiness, and environmental performance using multi-dimensional, verifiable, and scientifically sound information and processes. The organization will operate outside of the government to identify, assess, and screen viable energy system infrastructure projects for further development.

Introduction

Canada seems to have lost its way when it comes to advancing projects on a nation-building scale. Compounded by the notion that we may not have grasped the pace and full scale of this global energy revolution, our ability to envision national scale projects has been impaired. We are already well entrenched in this revolution that is likely to disrupt our very notions of energy and energy use (See Chapter 5).

Regardless of the positive attributes of an idea or proposal, a single dimensional negative view perpetuated by the misuse of social media and the echo chambers created in mainstream media can often fuel fierce opposition that is oversimplified by single statements on a protestor's placard. Among other disabling factors, all this has led to the mistrust of our institutions and crippled our nation's ability to get stuff done.

Project Approvals in the 21st Century

What is needed is a fresh idea. An idea that asks, what will it take to make this work? An idea that generates solutions and tangible outcomes. An idea that recognizes and enables restoration of trust.

Earning and retaining trust is a foundation for having the will, resolve, courage and ingenuity to lead. Having garnered trust, government, industrial, institutional, Indigenous, and community leaders will be empowered to decide which proposals, among the wealth of ideas offered by Canadians, should be developed in order to use our resources in a near optimal and sustainable manner.

In order to do this, three additional dimensions are required: (1) Economic Performance, (2) Readiness, and (3) Environmental Performance.

Economic Performance is critical to long term financial performance and sustainability of our economy for future generations. **Readiness** is key to the 'will' needed by leaders to advance and overcome the obstacles to executing a worthy proposal. **Environmental Performance**, especially for large scale projects with potential for long term or even permanent impacts, is an overarching dimension intimately tied to Economic Performance and Readiness.

Big Projects must demonstrate

- Economic performance
- Readiness
- Environmental performance

As can be seen in **Table 1**, within each of these dimensions are performance sub-headings that must be considered. An evaluation of a project proposal across the three dimensions, as well as a comparison to other proposals will lead to an objective score and an indication of the probability of success. The best proposals will then be advanced to the next stage of development.

No matter how comprehensive in evaluation, no tool can overcome the problem of there being no impartial body tasked with these evaluations. There needs to be an impartial body that has access to funds and authority to advance proposals and acquire timely and durable regulatory approvals.

A New Regulatory Approval Organization

This proposed new body, called the Canadian Interprovincial Technology and Resource Authority (CITRA) will promote trust, cooperation and consensus-building by recognizing the constitutional and traditional roles played by the different parties in Canadian nation-building efforts.

Table 1
Proposal Evaluation Matrix

Economic Performance	Readiness	Environmental Performance
National & Regional Impacts	Fit to National Vision	National Environmental Targets
Breadth of Impacts	Fit to Provincial Goals	Local/Regional Impacts
System Synergies	Societal Readiness	Net Societal Benefits

CITRA, working at arms length from **both** proponents and governments, will have funds to enable further development of proposals toward 'project' status. That funding will be deployed as seed funding designed to:

- a. Conduct fully independent, impartial and integrated impact assessments on behalf of Canadians. Assessments will include stakeholder engagement and consultation with Indigenous peoples. The assessment output will include recommended mitigation steps to reduce residual risk to acceptable levels associated with the inevitable impacts. This assessment will alleviate proponents, public and private sector, from needing to conduct their own assessments.
- b. Provide 'gap' funding for projects identified as offering a national strategic benefit but lacking the financial attractiveness needed to secure 100% private sector funding. This gap funding will enable both public and private sector proposals to proceed to the next stage of project development. Gap funding will apply to the projects that were selected using the evaluation tool (**Table 1**), which underwent a rigorous and independent impact assessment with proponents agreeing to the mitigation steps identified in the assessment.

This 'new idea' will enhance the existing Federal regulatory approval system and will augment the new system¹ enacted by passage of Bill C-69.¹

In Canada, the current systems to approve energy infrastructure take a silo approach to energy developed in the last century. Twentieth century processes are inadequate for the 21st century. We seem to have great difficulty gaining timely and reliable approvals for large energy projects, especially if the proposed projects have interprovincial implications. This is especially important when nation-building scale energy infrastructure is required at an accelerated pace to displace fossil fuel energy with low emitting energy sources.

i Bill C-69 enacts a new Impact Assessment Act and forms a new Canadian Energy Regulator Act along with changes to other related Federal Acts.

CITRA Assessments will be

- Fully independent
- Impartial
- Integrated
- Consultation with Indigenous communities
- Meaningful stakeholder engagement
- Provide gap funding for projects that do not quite meet traditional economic tests
- Make recommendations

To be clear, we are not talking about new or more energy (Joules). As discussed in Chapter 5, we are talking about substituting Joules provided through combustion of fossil fuels with Joules supplied from low or near zero emitting sources. Implementing alternatives to fossil fuels in a time scale consistent with Canada's Nationally Determined Contributions (NDCs) to the 2015 Paris Agreement while meeting a 'no negative impact on lifestyle' premise will need extensive new infrastructure investments across the country. Consequently, if this energy revolution is already underway, then a timely approval process is required so that projects can be identified, approved and built in time to meet our international commitments and our duty to Canadians.

A 21st century Canada needs a mechanism to identify and screen viable energy system infrastructure projects and select the most promising of those candidates for further evaluation and detailed assessment. Following an assessment of the candidate proposals, decisions need to be taken to select the best projects and gain socially acceptable and robust regulatory approvals for the best projects.

The Bowman Centre for Sustainable Energy (BCSE) believes that Canada has both the required hard and soft assets to lead the world in this arena, including leadership. What is needed is a new 21st century organization. This new organization will build on previous successful Canadian programs² with the added authority to develop a Canadian pathway to affordable low greenhouse gas emitting energy infrastructure. Goals include minimizing the economic disparity in all regions and deliver prosperity to Canadians across the country, making Canada a leading 21st century energy powerhouse. The wealth created from this powerhouse will fund many of the gaps needed to meet international climate change commitments.

How CITRA Will Work

This new organization, CITRA, will advance a policy of treating energy and the environment as part of a cohesive and integrated nationwide system. The organization will assess project opportunities and identify an optimal mix of energy system infrastructure investments across jurisdictions. These investments will be designed around a vision to optimize a national integrated sustainable energy system rather than the various ad hoc energy facilities operating in provincial silos.

These investments will;

- Recognize constitutional and traditional roles played by parties in Canadian *nation-building* efforts
- Advance a policy of treating energy, societal needs and the environment as part of a cohesive and integrated *system*
- Assess opportunities to identify a near *optimal mix* of energy system components to maximize benefits and minimize impacts
- Gain broad *social acceptance* for 21st century energy system projects by evaluating the tangible as well as intangible characteristics of each proposal
- Enable the *transition* to a clean and decarbonized economy

It is pertinent that CITRA is viewed as an organization that has been committed to and is supported by The Council of the Federation and has been *given the proper authority* to proceed in the nation's best interest. The key to success lies here.

Both proponents and Canadians NEED to be able to get projects approved, and once approved, proponents need a high degree of assurance that a future government won't rescind the approval. The Canadian Interprovincial Technology and Resource Authority will accomplish these goals by conducting reviews and assessments that are technically rigorous, impartial, timely and transparent. A key driver will be gaining broad based support and credibility, which will give leaders the will to authorize proposals.

CITRA will have the authority to authorize a project to the next phase of development.

CITRA's Authority

The word **Authority** is included in the acronym as CITRA will have the power to authorize a project to continue to the next phase of development. As a foundation for regulatory approval, CITRA will have the authority to execute technically solid assessments and garner broad social acceptance for a proposal. We recognize there will never be 100% support for anything. As described earlier, social media can and is used by opponents to amplify a minority view to degrade trust and often do so with simple and one-dimensional slogans. After gaining trust and credibility, CITRA can help counteract the negative press by providing politicians a rationale for decisions taken by staff and specialists acting on recommendations offered by CITRA. Having projects authorized by a credible and trusted organization will provide proponents and investors a solid foundation upon which they can advance their ideas.

Project proponents in Canada currently assume all costs and economic risks for regulatory approvals including stakeholder engagement and consultation costs. They also assume all costs associated with the attendant Socio-economic, Human health and Environmental Assessments (SHEA) for their proposal. This process draws criticism due to what may appear as biased or tainted outcomes leading to lack of trust. That historical approach could still be continued at the discretion of the proponent even with CITRA organization in place.

But proponents will have optional access to the CITRA organization and process.

The CITRA Process

As currently envisioned, CITRA will hold an arms length relationship with a Federal Ministry, Agency, OR preferably, the Council of the Federation. As an *arms length* entity, CITRA will have the money and authority to move projects forward as follows:

- Receive project proposals from proponents who choose to follow the CITRA option
 - Submit proposals to a peer review process for input into a screening exercise
 - Screening process will evaluate proposals within the context of an interconnected system using the criteria of economic performance, readiness, and environmental performance
 - Screening process will use software to analyze the results of peer reviews
 - Output from the software will be used to understand variances in the reviewer's evaluations and to select from the most promising project proposals
- Proceed to rigorous Consolidated and Cumulative impact & benefit assessments funded by CITRA, not the proponent(s)
 - This demonstrable independence will add credibility to the process
 - Assessment terms of reference and scope will meet requirements of affected provinces and territories and the new Canadian Impact Assessment Agency (Bill C-69)
- As part of the assessment, CITRA will fund stakeholder engagement, Indigenous Peoples Consultation and economically challenged groups with 'standing'
 - Provide staff to monitor social media sites, dialogue with users and offer fact-based information including prompt countering and rebutting disinformation campaigns related to the proposal
- Help fund 'good' projects that are challenged using conventional economic assessment tools (e.g. very long term or economy disrupting projects judged to be in the national interest)
- Proponent demonstrates commitment by funding all engineering, procurement land acquisition and other project development costs unrelated to the regulatory approval process

The historical project development process with the CITRA option is illustrated in **Figure 1**.

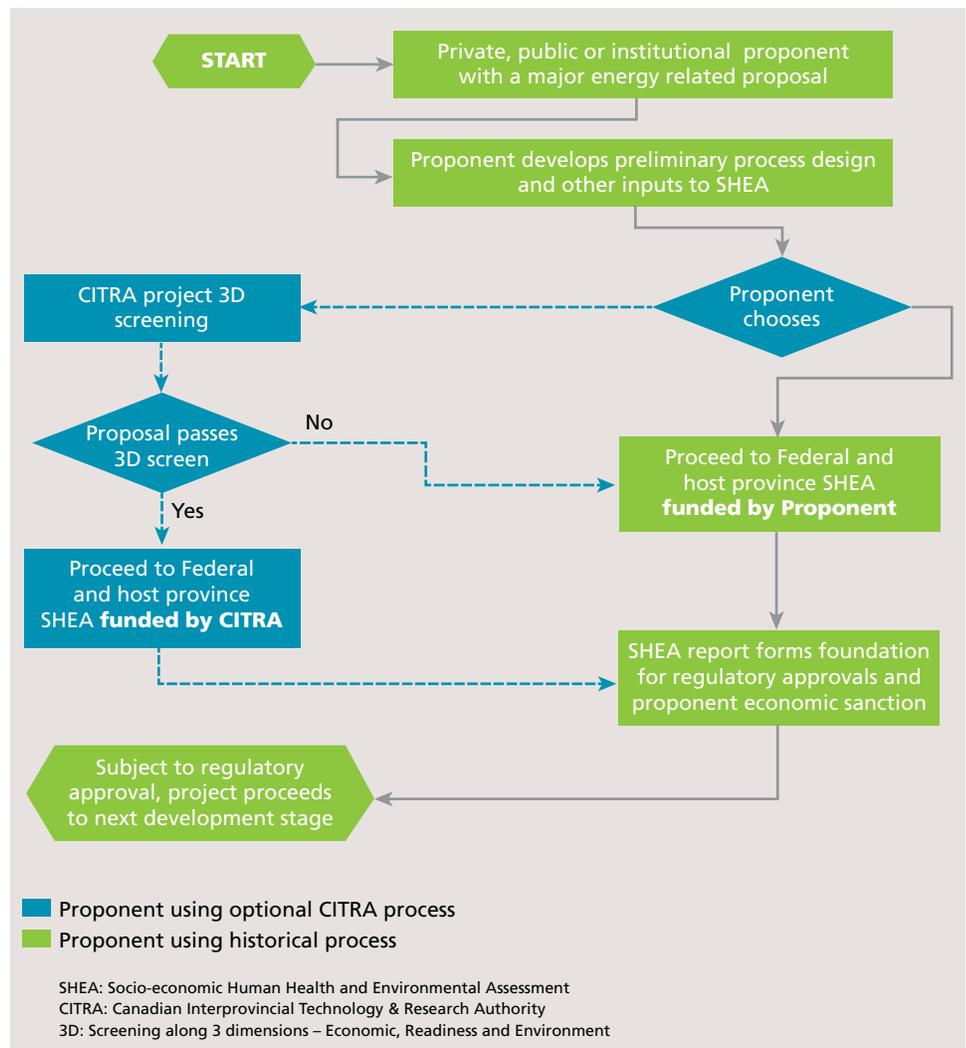
The intent of these activities is to actively provide independent, multi-dimensional, verifiable and scientifically sound information. Through early transparency and dialogue, trust will be built in the CITRA organization and systems. To the extent practical, CITRA will be a bottom up process rather than top down from government and/or the proponent(s). In other words, input into what is important to a project proceeding will come from the communities who are impacted by a proposal rather than from proponents or the government.

CITRA Funding

As currently envisioned, one of the key features imbedded in the CITRA concept is that impact assessments will be disentangled from both the proponent and the government. The intent of this feature is to minimize any lack of credibility due to funding or influence by the proponent, government or special interest groups. To achieve this objective, CITRA will fund the impact assessments for projects that pass the CITRA screening process.

This means that CITRA will need to be funded by an untainted source of money. The amount needed will be determined by the number of projects to be approved by the CITRA process. To obtain a notional budget, let's assume that 20 very large projects will be approved over a 10-year time frame. Each project will require a technically rigorous impact assessment, effective stakeholder engagement and consultation with Aboriginal communities. These activities will not only address the project under review but also how each project proposal will fit with other projects that have passed the screening process.

Figure 1
Project Development with
CITRA Option



For budget purposes, we might assume that such an assessment program will cost approximately \$25 million per project, or about 0.25% of the cost for a \$10 billion proposal. In total, \$500 million over ten years to improve the credibility, and ultimately the approvability and reliability of regulatory approvals for 20 large Canadian projects.

This funding can come from a variety of sources, all of which will be controversial. Rather than wade into that discussion now, we think the CITRA concept should be further refined before discussing funding. If the concept can be developed to the point that it has public support along with political backing, then discussions about funding sources will be appropriate.

When the CITRA process has been fully developed and adopted by the public, Indigenous communities and governments, then funding sources can be identified. A key point to remember is that regardless of where the funding is found, that money and its sources must not be viewed as detracting from the credibility of the assessment work to be carried out on proposals that pass the screening test.

Summary

We recognize that it has become near to impossible to get regulatory and societal approval for major energy projects in Canada, particularly projects that have implications across provincial boundaries. Further, even when approvals are granted, they may not be durable in the long run. For example, gas fired power generation plants were previously approved and then cancelled in Ontario. We have also witnessed a myriad of arguments before the Site C hydro-electric dam in Northern BC was given a renewed 'go ahead' after it had been approved and spent a couple of billion dollars on construction. Wind energy projects in Ontario were approved and under construction, then the approvals rescinded, and the projects cancelled by a new provincial government.

A new idea is needed to prevent leaders from having to make such decisions. Our idea revolves around a new decision-making organization, CITRA.

In its essence, CITRA will evaluate projects at the proponent's option. Based on that evaluation, if the proposal appears to be in the national and affected province or territories' best interest, CITRA will authorize, initiate, fund and conduct a technically rigorous and fully transparent impact and benefit assessment. The CITRA led assessment will be independent of the proponent and the regulator. This will greatly reduce perceived biases held by disparate groups and organizations. Stakeholder engagement managed by CITRA independent of the proponent and regulator will be a critical part of the process. Consultation with Indigenous Peoples will be an early priority and in full recognition of all Constitutional and Treaty obligations. The proponent will be involved in the process, but at an arm's length. The deliverable will be a credible impact assessment report containing impact mitigation and community accommodation recommendations.

Finally, Federal and Provincial regulators will decide on whether to grant a final and robust regulatory approval after considering the SHEA report and its recommendations. Economic sanction will continue to be the purview of the proponent(s) although 'gap' funding may be provided by CITRA for projects determined to be of strategic interest for Canada.

Note that the details of how CITRA will function is a work in progress and is still in its early development stages. There is ample opportunity for you to deliberate and contribute to this effort. Further, the mechanisms described above are preliminary. Nothing has been formally adopted.

We feel that the creation of the Canadian Interprovincial Technology and Resource Authority is a viable and realistic solution to help Canada find its way back to advancing Big Projects on a nation-building scale. The energy revolution is upon us and Canada needs to move forward to make the transition to a clean energy nation. Big Projects such as the multi-energy corridor and the Canada-wide transmission network discussed in the next chapter will be key to our success. However, without a regulatory organization in place, Big Nation-Building Projects such as these are at risk of never getting off the ground. Canada has the capacity to be a Sustainable Energy Superpower, and it's time to do everything in our power to make that happen.

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What are Big Projects and Why does Canada Need Them?

Marshall Kern

Chapter Overview

This final chapter focuses on the actual Big Projects themselves. Historical Big Project success stories are shared, showing the enormous long-lasting positive impact they have had to our country's success. The criteria involved in defining a project as a Big Project are outlined. Finally, the Canada-wide Transmission Network and the Eagle Spirit corridor are introduced as two examples of current Big Projects that are gaining momentum in transforming Canada to an energy-sustainable future.

Introduction

It is a profitable truism in the project management industry that a project is a combination of people and resources, along with a timeline, who are brought together to deliver something. Sometimes it seems that everything is being managed as a project, from the smallest community fundraiser through to landing a science probe on Mars.

Our research at the Bowman Centre for Sustainable Energy adds specific aspects to the concept of a project so that we can, and do, focus on Big Projects. What is required to undertake these Big Projects has been outlined in prior chapters. First, we must start with a new kind of bold and courageous leadership, including those from our First Nations. Our leaders must have an awareness of the obstacles that must be overcome and the courage to make important decisions. As well, a comprehensive knowledge and understanding of energy conversion and a strong regulatory authority are all required to ensure the future of Canada's big energy projects.

The Bowman Centre directs its attention to projects that are specific to Canada. We focus on projects that can be nation-building, and we explore projects that can contribute to the national wealth of Canada. Both the life and career experiences of our Associates convince us that we want to catalyze big energy and resource projects which drive Canada's energy strategy and generate economically and environmentally sustainable wealth and jobs.

To have a focus on Canada is to tap into the acknowledged energy and resource wealth of Canada. Many reports explain and quantify the energy wealth from both realized and untapped hydropower, tidal energy, wind, solar, geothermal, nuclear, as well as hydrocarbon resources. Canada's history is such that when we develop the technology and expertise to enjoy our energy resources here, we share that expertise around the world.

Definition of a Big Project

A big project is one which is nation-building. It has the capacity to provide benefits across the span of Canada. A big project generates wealth and jobs. It produces positive economic benefits from the early stages of development right through to the expected end-of-life of the project. It must be sustainable and drive Canada's energy strategy on an irreversible trajectory to an environmentally sustainable energy future.

Big Project Definition

- Nation-building
- Sustainable
- Generates wealth
- Creates jobs
- Has positive economic benefits
- Drives Canada's energy strategy
- Spans years or decades in length
- Require visionary leadership

Big Projects tend to exceed the capacity of a single proponent or company and tend to take longer to execute than the term of a single provincial or federal government. Most importantly, Big Projects require visionary leadership.

A History of Big Projects

Canada has many nation-building projects we can use as examples. In earlier books, the Bowman Centre for Sustainable Energy has published the stories of the Rideau Canal, the Canadian Pacific Railway, the St. Lawrence Seaway, the Trans-Canada Pipeline, and other Big Projects. In our examples, we show that the original driver was some comparatively short-term need and that the additional benefits surpass the initial expectations. The Rideau Canal for example, was built for national security reasons. Canada needed to move military personnel and material east-and-west without being exposed to American armed forces along the St. Lawrence River. It also provided a main travel route for immigration to western Canada and a conduit for timber, minerals, and grain from the productive west to the markets of Lower Canada and the world. Even now it provides economic benefit through tourism and an enviable quality of life along its route.

Likewise, the Canadian Pacific Railway was built to fulfill a commitment to link the four eastern provinces to Quebec and Ontario, and then to bring British Columbia into the Confederation. It has enabled the growth of western Canada with immigrants bringing their skills and knowledge to grow communities along the ribbon of steel. It has delivered wealth to Canadians as the products of a young nation were shipped to national and international markets. Despite being troubled by political scandal, significant engineering challenges, delays, cost overruns and financial difficulties, it was successfully completed. It was a remarkable accomplishment of both engineering and political will for a young country with a small population, limited means, and a difficult geography.

The *Great Canadian Pipeline Debate* began in 1954, with the goal to ship natural gas from west to east 'through Canada and only in Canada.' Opposition came on many fronts: those supporting north-south links to the United States, those against participation by US companies in a Canadian resource, and those who simply saw the project as financially unsound. At the time, the pipeline debate in the House of Commons was considered by some to be one of the lowest points in the history of Canadian politics. The pipeline was built, the company continues to operate in the energy sector, and the political cost included the Louis St. Laurent government falling to John Diefenbaker at the polls.

What Constitutes a Big Project?

Canada also has Big Projects that develop our human capital. A defining attribute of being Canadian is our health care system. Another is our education system. Though both are frequently attacked, we cannot think of Canada without them. However, there are major differences between big energy and infrastructure projects on one hand and health care or education on the other. Big energy and infrastructure projects contribute directly to Canada's national wealth as they are being built and throughout their operational life. Health care and education are costs that must be paid for by wealth created in other economic sectors.

There are challenges to finding and completing Big Projects. Fundamentally they have deliverables beyond the capacity of a single company. Therefore, there is a need for some form of joint-venture or consortium, or involvement of public as well as private resources. During World War Two there was an urgent need to produce synthetic rubber. The Canadian government persuaded six companies to deliver the technology and raw materials. The Polymer Corporation of Canada quickly built a production facility that produced 95,000 tons of rubber by the end of the war. This operation in Sarnia, Ontario, helped launch the development of a petrochemical complex for Canada.

Big Projects also have deliverables beyond the usual short-term timeframe for determining success. The timeframe may be longer than the career of a business leader, or the mandate of a government. Construction on the Trans-Canada Highway was started in 1950, with the federal government making significant contributions to the costs, which were shared with the provincial governments. Major construction was completed over 20 years later, in 1971. Clearly this was beyond the career of the politicians who started it, and those who marked the completion. Parts of the highway have become embedded in our culture. Year after year, there are Canadians who walk, run, bicycle, or drive the length of the highway across the breadth of our nation. We will always remember the stretch of road now called the *Highway of Heroes*. We cannot forget the images of Terry Fox on the highway for his *Marathon of Hope*.

Given this short review of Big Projects that built Canada as a nation, we can now consider some current Canadian projects. Natural Resources Canada maintains an inventory of natural resource projects underway or planned for the next decade. The inventory is used to produce a report of 'major projects' across Canada that is shared at the annual conference of Energy and Mines Ministers. The capital cost of each project is used to determine if it meets the threshold of being included in the inventory. Energy and mining projects with capital costs greater than \$50 million are considered 'major projects.' For electricity and forestry projects the capital cost threshold is \$20 million. The threshold for clean energy and clean technology projects is \$10 million in capital cost.¹

The report, *Natural Resources: Major Projects Planned or Under Construction — 2018 to 2028*,² released in August 2018, shows a four-year trend of decline in both the number of projects (487 in 2015 compared to 418 in 2018) and in the total capital cost of the projects (\$711 billion in 2015 down to \$585 billion in 2018). The report notes that cancellation and suspension of 'major projects' were concentrated in the energy sector. Fortunately, all sectors (energy, mining, electricity, forestry, clean energy and clean technology) saw an increase in the number of 'major projects' completed, subsequently removing them from the inventory. As completed projects, they will benefit Canadians over their operational lifetime with contributions to the employment of Canadians and to government revenues.

However, it is still concerning that the number of projects is down over just four years. Where are the new projects that are 'shovel-ready' and so beloved by politicians? Where is the evidence of innovation? Where is the demonstration of infrastructure projects that will receive funding from the new Canada Infrastructure Bank? These are the questions that we should be asking.

With the focus on a single metric of 'capital cost' above an arbitrary threshold, we cannot easily determine from the inventory which projects will be nation-building and contribute to a sustainable future. We cannot allow ourselves to look at the classification of 'major projects' and conclude that all the projects in the inventory are the same as Big Projects.

Collective Choices

Nor can we look at the collective contribution to Canada's sustainable energy future from the individual efforts of 37 million Canadians as being Big Projects. As much as we may want to 'think global and act local' by insulating our homes, sealing drafts, using energy efficient lighting and appliances, and taking public transit, we need to recognize how many decision-makers need to be influenced and for how many separate actions.

From the 2016 census, Statistics Canada tells us that there are 14.1 million households in Canada.³ Further, in 2015, 88% of households were already using at least one type of energy-saving light at home. That percentage has been fairly stable for a decade.⁴ There are also 34.3 million vehicles registered in Canada and only about 1.4% of them are electric vehicles.⁵ Comparing the reported high level of personal responsibility for choosing energy efficiency lighting at home to the decision to drive a vehicle with an internal-combustion engine may

Statistics Canada reports:

- 14.1 million households in Canada
- 88% of households use energy-saving lights
- 34.3 million vehicles registered in Canada
- 1.4% of vehicles are electric vehicles

seem incongruous. From this comparison of selected evidence, we might conclude that Canadians are making personal decisions that maintain their quality of life when it is within their means to do so. However, major expenditures such as a vehicle are also significant decisions about personal lifestyle and indebtedness and a commitment to move away from conventional vehicles is not something that most Canadians are willing to do yet. It is reasonable to conclude that Canadian households are not yet on an irreversible trajectory to a sustainable energy future.

The Future of Big Projects

What might be considered a Big Project now? We can look at two projects and ask if they are truly Big Projects that will contribute to Canada's wealth. Will they be both environmentally and economically sustainable for the future?

Eagle Spirit

Eagle Spirit is the first Big Project to come to mind. It is a First Nations-led proposal for a sustainable, multi-pipeline, multi-energy corridor in Canada's Northwest. The corridor will convey oil, natural gas and LPG (Liquified Petroleum Gas) pipelines, as well as HVDC (High-Voltage Direct Current) power lines and fibre-optic cables in a single utility corridor from Alberta's oil sands to tide-water at Prince Rupert B.C. It runs from the heart of Alberta's Industrial Heartland upgrading and refining area through the Peace Region low-carbon hydro-electric developments and potentially hydro-powered shale gas and oil developments in northeast Alberta. It continues through northwest B.C. to hydro-powered coastal LNG (Liquified Natural Gas) plants until it ends at the marine terminals in Prince Rupert, which is considered the safest area on Canada's west coast for oil ports. Among other advantages, this establishes the northwest leg of an eventual cross-Canada coast-to-coast-to-coast energy and utility corridor. Currently, the status of the Eagle Spirit Energy proposal is unclear as it is still in consultation before a formal proposal can be brought to regulators for approval.

Canada-wide Transmission Network

A *Canada-wide transmission network* is another Big Project worthy of discussion. The establishment of this network must be considered a pre-requisite for moving ahead with new major hydroelectric projects. Hydroelectric development in Canada has continued unabated since 1881. However, since 1990, progress in the efficient use of electricity has reduced the pace of development in new hydropower. Given its untapped potential, alongside the slower pace of the nuclear industry development, it is quite possible that Canada is at the dawn of a new rush for this 'white gold.'

There are three important objectives that the transmission network will need to meet: (1) link new hydroelectric projects to areas of consumption, (2) interconnect existing provincial networks, and (3) replace aging thermal power plants to reduce Canada's greenhouse gas footprint.

Canada now has 73,000 MW of hydroelectric power in service, and another 163,000 MW could be developed, for a total capacity of 236,000 MW. With an improved Canada-wide transmission network, both large centralized hydroelectric projects and smaller clusters of micro-grids would have access to a network providing reliable connections between points of generation and areas of consumption.

The high variability in the price of electricity across Canada could also be corrected with improved interprovincial connections. Currently, there are more transmission links between provincial networks and the United States than internally between the provinces of Canada, resulting in more electrical energy being sold to the United States than between provinces.

For example, 75% of the electrical energy sold by Hydro-Quebec to out-of-province buyers is exported to the United States.

Environmental issues received extensive attention in hydroelectric projects initiated during the 1970s. There is an extensive body of knowledge regarding best practices in the form of preferred interventions, development measures, audits, corrective works, and analyses. These time-tested procedures for safeguarding the environment will guide us to safely harness the hydroelectric potential of new hydraulic sites while reducing Canada's greenhouse gas footprint.

Big Projects Change Lives

Big Projects will have a positive and enduring impact in Canadian productivity. There will be the immediate contribution to the GDP from the direct investment costs of the project. This includes the capital cost, as noted by the inventory of major projects maintained by Natural Resources Canada. It also includes the other costs of construction of the Big Project such as wages, as well as the cost of expendable and ancillary items.

Classic economic theory shows there can be a reduction in fundamental cost structure and expenditures for years due to the longevity of Big Projects. From prior examples in Canada, we know that the St. Lawrence Seaway reduced the cost of shipping for Canadian agricultural and resource commodities. It has also reduced the cost of imports for bulk goods, and some large specialty items such as large industrial components. A key point to note here is that there has been a permanent change in cost structure for these products because nobody is willing to return to the shipping patterns before the Seaway opened.

Another example is the cost of telecommunications after the completion of the cross-Canada microwave system, and then again after the launch of Canadian telecommunication satellites. These changes in cost structure were sustained for as long as the technology delivered an edge. The satellite system became a disruptor, and again changed the cost structure for telecommunications.

Big Projects change the barriers to entry for innovators. While the Rideau Canal was built because of the need for a transportation corridor to be used for military purposes, it rapidly became an important route for commerce. It opened-up new manufacturing locations with access via the canal to distant Canadian markets. Today the Rideau Canal provides significant quality-of-life and tourism contributions to the regional economy. Another example is the Victoria Bridge in Montreal, which was built to speed up the movement of rail freight between the major centres of Montreal and New York. The quick growth of passenger traffic on the rail line added to its value and economic contribution.

Maintaining the Positive Impact of Big Projects

Big Projects will have measurable and achievable environmental performance. Big Nation-Building Canadian Projects will not only allow Canada to meet its environmental targets, they will show the rest of the world the path to meeting theirs. Through Big Projects, Canada will be recognized by the global community as a major contributor to reduce environmental impacts. Yes, there will always be some negative impact from any Big Project's infrastructure. Big Projects should have impacts that can be mitigated at the regional level, or planned to become positive impacts over the life of the project.

It must be noted that with every Big Project, indeed with any infrastructure project, there is a need for ongoing investment to prevent service failure. Each winter, the St. Lawrence Seaway is closed to allow essential maintenance on the lock system, as well as to avoid damage caused by the ice formation in the connecting waterways of the Great Lakes, that makes shipping difficult during these months.

In 2017, the rail line to Churchill, Manitoba was washed-out by high waters during the spring melt. The loss of this rail line created significant hardship for both residents and businesses that depend on it for transportation of goods and people. The required financing for repairs was eventually arranged after some legal proceedings, which involved a change in ownership to a consortium of local stakeholders and several governments. These examples show the need for ongoing expenditures to maintain the positive impact that infrastructure projects have on Canadian productivity.

Finding New Big Projects

How do we find new Big Projects? We need to find opportunities that fundamentally set Canada on a permanent trajectory to a low-carbon, sustainable future. To secure our green future, we must find profitable Big Projects now. Our history shows us that we can be successful with both transportation and energy projects. Our history also shows us that we need strong leadership to bring in investors from both industry and government, who are willing to accept and share the financial risk.

The economic performance characteristics of a Big Project will be:

1. A transformative economic impact affecting all of Canada
2. A major positive and sustainable economic impact across many sectors of the Canadian economy and will significantly support Canada's international trade and relationships
3. Encouragement for the launch of similar projects (or integrated industrial and commercial activity) that attract further continued investments into the sustainability of Canada's transportation, natural resource, and energy sectors

Is Canada Ready for Big Projects?

Is Canada ready for more Big Projects? We think so. We know that Big Projects will have to be aligned to the environmental and economic goals outlined in the '*Canadian Energy Strategy*'

(released July 2015),⁶ and the '*Pan-Canadian Framework on Clean Growth and Climate Change*' (released in December 2016).⁷ Such aligned and implemented Big Projects will be recognized internationally and provide the technology, engineering and construction knowhow, project management expertise, and other intellectual and intangible properties that can be leveraged to Canada's benefit.

Big Projects also need to be aligned to the priorities of the Provinces, Territories and First Nations. Each area's unique regional strengths and aspirations will contribute to lowering the internal trade barriers and continue the trajectory of sustainable nation building within the Canadian confederation.

Most of all, Big Projects need to get off the drawing boards of think tanks and visionaries! Finding leaders who are capable of bringing proponents together with partners from indigenous communities, civil society, various levels of government, and industry is paramount. Through consensus and collaboration, we can overcome the many obstacles and opponents of infrastructure projects and support those responsible for the approval and delivery of the projects.

The Bowman Centre for Sustainable Energy understands that the urgency to get started on Big Projects is immediate and certain. We know that Canada has the natural resources that can deliver wealth now so we can build for a sustainable future. We also know that the history of Big Projects in Canada depends on people willing to cooperate, build together, and actively support the vision of a sustainable future. We need to launch Big Projects that set Canada on an unstoppable trajectory for a sustainable energy future.

The next step for the Bowman Centre for Sustainable Energy is to work with proponents of site-specific energy projects in Canada. Together we can collaborate through the dimensions of decision-making that will identify the strengths of projects that will move Canada to a sustainable future. Together we will make the case for nation-building projects.

That is our goal for the next step. Join us!

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Glossary

Accommodation	Accommodation is a process to recognize that Indigenous rights are being infringed in a justifiable manner and are being resolved by efforts to mitigate the infringement and provide proper compensation when necessary
Asphaltenes	From the study of chemistry: hydrocarbons that are very large, interconnected, molecules. They are commonly recognized as the binder for aggregate in the construction of asphalt roadways.
Big Project	A Big Project is one which is nation-building, surpasses the capacity of a single company, and exceeds the term of a single government.
Bitumen	Naturally-occurring bitumen, as present in the oil sands areas of Alberta, is a hydrocarbon that does not flow freely. It must be heated or diluted with a solvent (such as dil-bit) to flow. It is comprised of a higher proportion of asphaltenes than conventional crude oil.
Bitumen Beyond Combustion	A program under the auspices of Alberta Innovates. This seeks to find alternative and high-value opportunities to use bitumen instead of converting it to fuels.
Brandolini's Law	The idea that it can be many times harder to disprove erroneous or false information than to promote correct information.
BPD or bpd	Barrels Per Day; a measure of the volume of hydrocarbons being transported in a pipeline, or processed in a refinery. A barrel is 159 litres.
Conventional Oil	Conventional oil is extracted from underground deposits by drilling and pumping the oil to storage or pipelines. The first example of drilling to find and extract oil was in the 1860s in the Ontario town of Petrolia. Conventional oil is a liquid under normal conditions which allows it to be pumped through pipelines and stored in vessels.
Duty to Consult	The duty to consult is about structuring and defining how the Crown and Indigenous people make decisions when development may affect Indigenous land, rights, or interests. Consultation obligations span the life of the project.
Energy Conservation	Energy is conserved when demand is reduced. A homeowner can reduce energy demand by lifestyle choices such as taking public transport over driving a personal car.
Energy Efficiency	Energy efficiency is achieving the same desired outcome with less energy input. A homeowner can choose energy efficient lighting and appliances that allows the same activities to be done with less electricity.
Energy System	An energy system is the combination of sources of generation of energy (wind farms, solar farms, tidal sites, hydropower dams, thermal-power plants, nuclear plants, etc.) their transmission, storage, and delivery to users.
Externalized Costs	Taken from the study of economics; externalized costs are those paid by others, and not the provider of a good or service. This means the costs of disposal of a product are paid by the purchaser, not the producer. Or the cost to the environment of emissions are paid for by taxpayers, not the emitter.
Fracking	A process in oil and gas production when fluid under high pressure in a drilled hole causes fracturing of the surrounding rock strata. Oil and gas hydrocarbons seep along the fractures to the drilled hole for extraction.
Gigawatt (GW)	A gigawatt is a billion watts, or 1000 megawatts. This is a unit of measure commonly used to describe large generation sources or the capacity of power grids.
Grid Parity	An energy generation site is at 'grid parity' when the cost of non-subsidized cost of energy produced is on par with the cost of energy in the transmission grid.
HVDC	High Voltage Direct Current. A classification of electrical transmission lines that conduct large amounts of electricity over long distances.
Internalized Costs	Taken from the study of economics; an entity internalizes costs when it accounts for full life-cycle costs. This includes costs of disposal of products, and costs to the environment of emissions.
Joule	The basic unit for measuring energy. It is named in honour of British physicist James P. Joule. One joule is the amount of work needed to produce one watt of power for one second. Statistics Canada reports that in 2016 primary energy production in Canada was 19,709 petajoules, and energy consumption was 7,953 petajoules.
Kilowatt (KW)	A watt is a unit for measuring energy, typically electrical energy. A kilowatt is 1000 watts.
Kilowatt hour (KWh)	1000 watts being consumed in one hour. Kilowatt hours, and larger units of megawatt hours (MWh) or gigawatt hours (GWh) are used to measure the amount of electricity generated over a day, month, or year; or the amount consumed by industry or in homes or buildings
LNG	Liquified Natural Gas. Natural gas, or methane, is compressed and cooled to become a liquid which can be stored, or transported by pipeline or ship.
Load Factors	Load factor is a measure of the efficient use of electricity by comparing peak demand to average demand over a period of time. A high load factor means that electrical use is fairly constant. A low load factor means there are peaks of demand, which may require additional generation capacity to be added to the electrical grid.

Major Project	Within Canada a major project is a natural resource project with a capital cost of more than \$50 million. Major projects that increase, extend, or improve natural resource production are tracked by provincial governments, with data collected by Statistics Canada and reported annually through the Council of the Federation.
Mega Project	Mega Projects is the term used to describe a number of development and construction projects with very high capital cost estimates. It was popularized in the 1970s. Many of the proposed projects were not built because of economic conditions in Canada in the 1980s. Successful mega projects of that era include: the James Bay Hydro Electric Development, the Confederation Bridge between Prince Edward Island and New Brunswick, the Hibernia off-shore oil development, and the twinning of the Canadian Pacific Railway tracks through the Rocky Mountains.
Nation Building	The ongoing process of bring people together for a shared vision, that delivers sustainable social and economic benefits to all.
NDC	Nationally Determined Contributions to the international 2005 Paris Agreement. These describe the goals for reducing greenhouse gas emissions for a nation.
ProGrid	ProGrid is a trademarked framework for decision-making and managing intangible aspects of an activity. The intangible aspects are typically framed in several dimensions as overarching concerns that will define the success of the endeavour.
SAGD	Steam-Assisted Gravity Drainage. A process in recovering hydrocarbons from oils sands in-situ, or without disturbing the land by excavating the deposit containing the hydrocarbons. Two horizontal drill holes run close together, with one a short distance above the other. The upper drill hole receives injections of steam or hot liquid to warm the surrounding oil sands. When warmed, the bitumen drains by gravity to the lower drill hole where it is extracted.
Shale Oil	Oil hydrocarbons recovered from shale rock or strata; usually by fracking the strata. This is considered 'tight oil' or 'non-conventional oil'.
Tar Sands Campaign	An international effort by some non-governmental organizations to embarrass Canada, deter investment, and stigmatize Alberta oil.
Utility-scale	A source of energy generation is considered 'utility-scale' when the quantity and quality of the energy produced can be accepted into the energy transmission grid.
WCS	Western Canadian Select. This is the benchmark for pricing oil in Western Canada. It compares in importance to 'West Texas Intermediate' (WTI) or 'Brent' which is a benchmark for pricing oil in Europe.



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