

Top Reliability Challenges

To

Canada's Energy System

Canadian Energy Reliability Council

DRAFT - CONFIDENTIAL

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1 Introduction

The Canadian Energy Reliability Council (CERC) was formed in 2024. Its goal is to focus on energy reliability as Canada navigates the ever-changing domestic and global energy marketplace and policy landscape. It will do so by facilitating collaboration between its members, stakeholders and government.

CERC is composed of energy providers (gas, electric and liquid), their customers, and other interested participants in Canada's energy system.

This article outlines the key energy reliability threats facing Canada's energy system. It is difficult to rank these threats; any ranking it may be possible to make can change abruptly. Further these threats are often coupled together for various reasons.

Threats originate from a number of different sources, including the physical environment and changes in economic and trade patterns. However, a major driver of reliability risk arises from government and public policy, particularly with respect to net-zero.

As this article was being finalized a timely example of the risk of public policy emerged as a smoldering trade war between the US and Canada broke out. It is impossible to predict the implications of this on energy reliability, on both sides of the border, but is nevertheless important to understand what they may be.

2 What is Energy Reliability?

For most of the past 150 or so years the energy system we enjoy in Canada has provided reliable energy to Canadians. But what is reliability and what do people mean by that term?

Most people have an intuitive sense of energy reliability: Can I find somewhere reasonably close to refuel my car. and is that facility open when I need it? When I come home and turn on the switch, does the light go on? And when winter comes and the temperature drops, does the heating system in my home provide me with the warmth I need?

A reliable energy system answers yes to all these questions. Perhaps not every time - it is difficult for any system to deliver anything 24 by 7 for 365 days of the year, each and every year. However, as long as the times when energy isn't available are brief and infrequent most people are satisfied

Resilience is closely related to reliability and the intuitive sense of energy reliability people have also includes the notion of resiliency. Resilience relates to reliability and includes how people perceive energy reliability. Reliability refers to normal operations, while resilience is

about adapting to disruptions. Both terms are often used interchangeably in contexts like power grids and pipelines.

3 Canada's Energy System

Canada's energy system differs from province to province, with different mixes of energy types, fuels and delivery systems. The diagram below illustrates the interdependencies between segments of Canada's energy system. It isn't intended to be an accurate representation of the energy system in any province or territory, but an approximation of Canada as a whole.

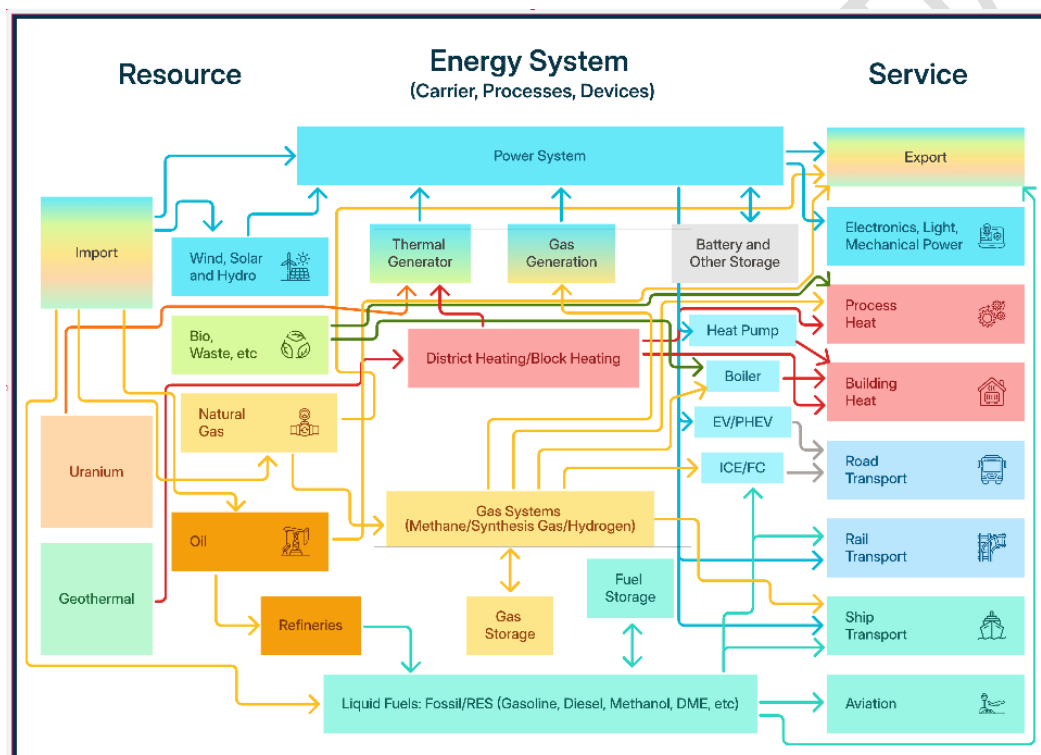


Figure 1 Simulated Energy Flow in Denmark 2035 (source: Energinet)

Canada's energy system is often talked about in terms of different segments – the gas sector, the electricity sector, fuels, pipelines, etc. While in some cases, an individual company may operate in more than one segment, it is generally the case that the segments operate quite independently. However, as the diagram demonstrates, there are many touchpoints between segments of this system.

It is fair to say that Canada has one of the most reliable energy systems in the world. It has contributed substantially to the wellbeing of Canadians and the growth of one of the most successful economies in the world. Producers and providers of energy, whether regulated

or not, take steps to ensure they can deliver energy to their customers -motivated both by competitive forces and/or a regulatory regime.

If we were to draw the same diagram for, say, 2050, it may look quite different. Pathways that evolved relatively slowly over the past hundred years or so are now being redrawn. How will these changes impact the reliability of the energy system?" Understanding these dependencies are important when planning any change.s We will talk a bit about these changes, particularly those driven by energy policy, later in this article.

4 Can Energy Reliability be Measured?

Most people don't use a measure for reliability, in the same way, for example, they measure how much energy they use or track how much it costs. However, the industries that produce, supply and sell energy do measure and track the reliability of their systems.

Canada's energy system consists of an economically regulated component (delivery of electricity and natural gas) and all the rest.¹ In the portions of the energy system that are subject to economic regulation, the bedrock of economic regulation is a "regulatory compact" that attempts to balance the provision of "safe and reliable service" at rates that are "just and reasonable" and that provide the utility the opportunity to earn a "fair return". In the portion of the energy system that is market-based, competition works to set prices that are acceptable and ensure providers are incented to continue producing and delivering reliable energy.

The companies that deliver our electricity and natural gas and the bodies that regulate them use various metrics to measure and track reliability. These include System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI).

In a future article we will look more closely at reliability measures.

5 How do we make our energy system reliable?

Organizations like the Institute of Electrical and Electronics Engineers, the American Society of Mechanical Engineers, and the Canadian Standards Association develop standards to support the design, manufacture, deployment and testing of safe and reliable components of our energy infrastructure. These standards are followed by engineers, technicians and managers that build and maintain our energy system.

¹ In the Atlantic provinces and Nunavut, gasoline and diesel prices are set, either at the wholesale or retail level. In Quebec the Regie de l'Energie establishes a minimum price under which retailers cannot sell.

However, energy reliability is “more than just a technical matter. It is also dependent upon the organizational structure that enables and constrains entities in their management of operations”.² management structures are very important and must be in place to ensure that infrastructure continues to be reliable throughout its operating life and that the necessary elements are in place to ensure operation as designed.

An example of a body that supports a systemic approach to reliability is the North American Electricity Reliability Corporation (NERC). NERC provides cooperative oversight of the high voltage grid in three countries: the US, Canada and Mexico.

It was constituted in its present form in response to a wide-spread loss of electricity in 2003, in the eastern US and Ontario, caused by a tree falling on a powerline. This event caused an unexpected cascade of equipment tripping off, thereby illustrating the vulnerability of an important component of energy infrastructure upon which people depend – not only for their livelihood, but to support human life.

Currently NERC imposes more than 100 reliability standards in areas of resource and demand balancing, critical infrastructure protection, communications, emergency operations, facilities design and maintenance, interconnection reliability operations, modeling, data and analysis, personnel performance, training and certification, and transmission operations.

6 What are Canada's Current Energy Reliability Challenges?

Threats to reliability challenge almost every step in the energy production and delivery process. These threats include environmental (e.g., fire, wind, flood, earthquakes), aging infrastructure, supply chain issues, cyber and physical threats, and electricity resource adequacy. Most of us are aware of these threats – and some of us may have experienced the reliability impacts of them first-hand.

Reliability challenges often defy strict categorization. For example, upgrading infrastructure can make it more resilient to some of the environmental threats described below. Aging or improperly maintained infrastructure can be more vulnerable to environmental threats.

Further, as we discuss later in this article, our energy system has many interdependencies – for example, natural gas is critical for some electricity generation; without electricity, oil

² Keeping an Eye on Reliability: The Organizational Requirements of Future Renewable Energy Systems, Daniel Scholten, Academic Publishers (June 29, 2012)

and gas flow in pipelines could be impacted. It is important to understand the interdependencies and their impact on reliable energy delivery.

6.1 Environmental Threats

Environmental threats include wind, extreme heat and cold, wildfires, flooding, drought, tsunamis and earthquakes, amongst others. Because exposed energy infrastructure is particularly vulnerable to these threats, the electricity system is often the first and most visibly impacted. However, pipeline, road and rail infrastructure are not immune, especially to flooding and earthquakes. Wildfires and tsunamis can impact access to all energy infrastructure. Hydroelectric generation is particularly vulnerable to drought.

We have seen many such incidents in Canada. Notable examples are the wildfires in Fort McMurray that impacted extraction operations in Northern Alberta and floods in the Fraser Valley that exposed portions of the main north-south natural gas transportation pipeline.

Hardening infrastructure will require capital investment. Investment decisions in the regulated sector – which includes pipelines and electricity transmission and distribution lines and other related infrastructure – typically requires regulatory approval for such investments. Do regulators understand the need? Regulators are usually very conservative in their approach to spending approvals. They need to see a direct line between the need and the spend. Can they approve these investments, which could be characterized as “speculative” in that they may not be needed if an event doesn’t happen or isn’t reasonably expected to happen.

A better understanding of the threats themselves would help both regulators and utility companies. Earthquakes are difficult to predict, but a probabilistic assessment is possible and from that a risk analysis can provide the necessary evidentiary basis for a decision. Weather data upon which we rely for forecasting demand for energy and for driving codes and standards for construction of infrastructure only goes back, at best, a few hundred years – which is clearly proving to be too short a time-series for what we need. The same is true for sea, lake and river level data. Better data and a more effective approach to that data would help greatly.

Better data and ways to view the data we have can also be helpful for actors in other areas of the energy system that do not have to make a case to an economic regulator.

We will be looking more closely at these issues around environmental reliability threats in future articles.

6.1.1 Increased demand during heat and cold waves:

Extreme heat and extreme cold events cause a sharp spike in electricity and natural gas usage due to increased heating and air conditioning needs. While electricity and natural gas utilities typically design their systems to meet these peak days, the latter can still exceed available capacity for any number of reasons, including unexpected unavailability of supply of gas or electricity due to damage to infrastructure that is often related to the cause of the extreme heat/cold event.

There is evidence that the frequency and duration of extreme weather events may be increasing. However, there appears to be no consensus on whether both are increasing and by how much they may be increasing. The recent fires in the Los Angeles area potentially point to another development: extreme weather occurring outside its expected season.³

6.1.2 Physical damage to infrastructure

Ice storms and strong winds can damage power lines, transformers, and poles, causing widespread disruptions to electricity supply.

Since extreme weather impacts reliability both through the potential to damage infrastructure and through the increase in demand described above, it is important to understand the quantitative aspects of any changes to weather-related parameters that are used to forecast load and to design infrastructure. We will examine this further in a future article.

6.1.3 Rural and Remote Communities

Rural and particularly remote communities can be more vulnerable to many environmental threats. In addition, they are often off-grid and served by less reliable energy systems. Maintenance personnel may not be on site and therefore response times to interruption can be longer. Access to replacement parts can be more challenging than in less remote areas.

6.2 Aging and Under Capacity Infrastructure

Aging equipment and facilities directly threaten reliability. In some cases, they can also be a safety risk. Energy infrastructure requires long term “patient” capital investment. The ongoing energy system evolution and the desire to transform or abandon existing energy infrastructure is creating increased regulatory uncertainty. This impacts investors’

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https://www.wsj.com/articles/natural-disasters-cost-417-billion-worldwide-in-2024-1bf513f3?utm_source=chatgpt.com

willingness and ability to fund capital expenditure on existing energy infrastructure and maintain aging infrastructure - with serious implications for energy reliability.

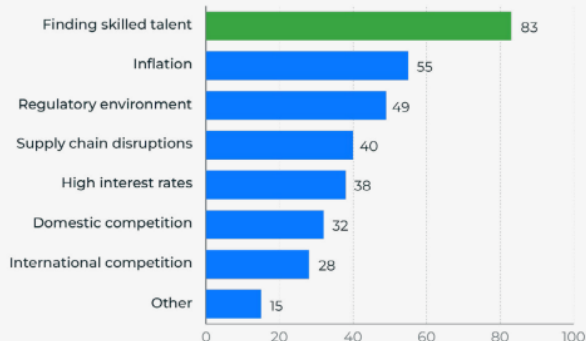
Additionally, as the need to build more infrastructure increases, the approval and permitting process has become more complex. This is a well documented phenomena and it has serious implications for energy reliability going forward. Investment in energy projects in Canada may be perceived as riskier than in other jurisdictions leading to higher costs and difficulty financing projects.

6.3 Supply chain issues including skilled labour

The transition to low or zero-GHG emission electricity generation sources, the introduction of renewable natural gas (RNG) and hydrogen into the fuel mix, new technologies such as Capture Carbon, Utilization and Storage (CCUS) and electric vehicles – all such developments create new supply chain needs and changes in the skills required by workforces.

A new report projects Canada's energy industry could add up to 116,000 jobs by 2035.⁴ Approximately 28,000 of those jobs are expected to be in the electricity sector by 2028⁵ Clearly this weighs heavily on the mind of management in the electricity sector as this recent survey indicates:⁶

Figure 41. Most pressing issues constraining your outlook over the next 5 years (% of employers), 2023



Source: EHRC Employer Survey, 2023.

Note: Figures do not sum to 100 as respondents could provide more than one answer.

⁴ Canada's Energy Workforce National Labour Market Outlook to 2035, Careers in Energy.
https://careersinenergy.ca/wp-content/uploads/2024/03/FINAL_CIE-National-Outlook_Mar-19.pdf

⁵ Electricity in Demand, Labour Market Insights, 2023 – 2028, Electricity Human Resources Council.
<https://ehrc.ca/wp-content/uploads/2024/05/Electricity-in-Demand-Labour-Market-Insights.pdf>

⁶ Electricity in Demand, Labour Market Insights, 2023 – 2028, p.88. Electricity Human Resources Council.
<https://ehrc.ca/wp-content/uploads/2024/05/Electricity-in-Demand-Labour-Market-Insights.pdf>

Is the pace and scale of the changes to our energy system achievable without risking shortages in any area that is essential to energy reliability? Importantly, we need to look beyond any part of that system. Constraints on skills and materials may also be felt by end users whether residential retrofits or repowering an industrial plant to use electricity or hydrogen.

6.4 Cyber and Physical Threats

Canada's energy system faces significant cyber and physical security threats that can disrupt operations, endanger public safety, and undermine economic and national security. These threats are increasing – and becoming increasingly sophisticated – as operators adopt digital technologies and artificial intelligence for management and control of their systems and infrastructure becomes more interconnected.

Suncor Energy, a leading company in the oil sands industry, experienced a significant cybersecurity incident in mid-2023. This attack, reportedly carried out by a sophisticated hacker group, led to a temporary halt in Suncor's operations, costing the company not only millions of dollars but also a blow to its reputation.

The attackers targeted Suncor's operational technology (OT) network, which controls physical processes and devices within the company's industrial systems. The attackers successfully infiltrated Suncor's corporate network and then moved laterally into the OT network, exploiting the interconnections between them. Once there, they deployed a ransomware attack, which locked up critical systems and demanded a ransom to restore access.

Suncor successfully thwarted the attack and, for the most part, experienced no disruptions in the supply and delivery of fuels, although parts of its payment system at gas stations and convenience stores was affected. However, this incident raises important questions about how such events can be prevented.⁷

6.5 Electricity Resource Adequacy

After many years of almost stagnant growth in electricity demand, forecasters now predict significant increases in the need for electricity. For example, BC Hydro recently stated that in BC, electricity demand is expected to increase by 15% between now and 2030. For example, the Ontario IESO predicts increases of approximately 24% by 2030, 37% by 2035 and 75% by 2050.

What is driving this increase in demand? There are a number of causes. One of the biggest reasons for stagnant demand in recent years is demand side measures taken by utilities to

⁷ <https://teckpath.com/a-deep-dive-into-the-suncor-cybersecurity-incident/>

increase electricity efficiencies. These demand-side savings compensated for the increase in electricity demand driven by population and GDP growth. However, with such measures as the replacement of incandescent light bulbs with LEDs and significantly improved building insulation a lot of that low hanging fruit has been picked. Coupled with this, population growth rate is on an upward trajectory. The substantial increase of almost 3% in 2023 marks the highest annual population growth rate in recent history.⁸

The increase in the number of data centers, particularly to fuel an AI boom also significantly drives electricity demand. Data centers represent 13% of new electricity demand and 4% of total anticipated Ontario demand in 2035.⁹¹⁰ Very recent developments in AI research and development may result in significantly lower power consumption, although AI is only one component of data centre demand growth. As a result, it is unclear what the impact of this on data centre demand growth will be.

Forecast increased load for electric vehicles, electric heat pumps to replace natural gas furnaces and electric compression for LNG export facilities also contribute to increased electric load.

Is supply keeping up with this surge in demand? According to NERC, not everywhere:¹¹

Capacity and Energy Risk Assessment Area Summary			
Area	Risk Level	Years	Risk Summary
Midcontinent Independent System Operator (MISO)	High	2025	Resource additions are not keeping up with generator retirements and demand growth. Reserve margins fall below Reference Margin Levels (RML) in winter and summer.
Manitoba	Elevated	2028	Potential resource shortfalls in low-hydro conditions, driven by rising demand.
SaskPower	Elevated	2026	Risk of insufficient generation during fall and spring when more generators are off-line for maintenance.
Southwest Power Pool (SPP)	Elevated	2025	Potential energy shortfalls during peak summer and winter conditions arise from low wind conditions and natural gas fuel risk.
New England	Elevated	2026	Strong demand growth and persistent winter natural gas infrastructure limitations pose risks of supply shortfalls in extreme winter conditions.

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⁹ 2025 Annual Planning Outlook_ Demand Forecast Information Session

¹⁰ At the time this article was being finalized, recent development suggest that AI electricity use may be significantly lower than at first expected.

¹¹NERC's 2024 Capacity and Energy Risk Assessment Area Summary.

Ontario	Elevated	2027	Reserve margins fall below RMLs as nuclear units undergo refurbishment and some current resource contracts expire. Demand growth is also adding to resource procurement needs.
PJM	Elevated	2026	Resource additions are not keeping up with generator retirements and demand growth. Winter seasons replace summer as the higher-risk periods due to generator performance and fuel supply issues.
SERC East	Elevated	2028	Demand growth and planned generator retirements contribute to growing energy risks. Load is at risk in extreme winter conditions that cause demand to soar while supplies are threatened by generator performance, fuel issues, and inability to obtain emergency transfers.
Electricity Reliability Council of Texas (ERCOT)	Elevated	2026	Surging load growth is driving resource adequacy concerns as the share of dispatchable resources in the mix struggles to keep pace. Extreme winter weather has the potential to cause the most severe load-loss events.
California-Mexico	Elevated	2028	Demand growth and planned generator retirements can result in supply shortfalls during wide-area heat events that limit the supply of energy available for import.
British Columbia	Elevated	2027	Drought and extreme cold temperatures in winter can result in periods of insufficient operating reserves when neighboring areas are unable to provide excess energy.

In some regions, the integration of large amounts of intermittent renewable energy sources, particularly wind and solar, into the electricity grid poses challenges primarily due to their variability and unpredictability. These sources depend on weather conditions—solar power generates energy only during daylight hours and is affected by cloud cover, while wind energy depends on wind speeds, which can fluctuate.

This intermittency can lead to mismatches between energy supply and demand, particularly during peak usage periods when renewable generation may be insufficient. Without adequate energy storage solutions or backup generation, the grid risks instability and/or blackouts. We will look a bit further at this in the following sub-section. Addressing these challenges requires investments in grid infrastructure, large-scale energy storage, demand-response technologies, and diversified energy sources to ensure a stable and reliable electricity supply.

The need for reliable back-up generation is increasingly being met by natural gas. However, as, generally speaking, natural gas generation uses a just in time delivery system for its fuel, this raises issues around the reliability of the gas supply and its impact on the reliability of the electric system. NERC is taking an active role in this area and has published a number of analyses on this issue.¹²

Other reliability issues related to the deployment of intermittent renewables include:

- Inverter based resources – Solar and wind generate DC current and require power electronic devices to convert that to AC current. The maturity of this technology presents challenges to maintaining grid reliability, stability, and operational efficiency.
- Increasing amounts of generation on a distribution system that doesn't have the same level of reliability oversight as the high voltage grid. This also poses a challenge to high voltage grid operations as there is limited "visibility" into these generation resources.

6.5.1 Intermittent Renewables

Around the world and in Canada, increasingly more electricity is generated by intermittent renewables. California leads the US in the amount of electricity generated by wind and solar. According to the Solar Industries Association, the end of 2023 California had a total of 46,874 MW which provided for 28% of the state's electricity generation. Wind accounted for 6.9% as of 2022.

How does the electricity grid handle one third of its electricity generated by intermittent sources? One method is "rotating outages" According to the CAISO, California's Independent System Operator, one way is "rotating outages, or controlled load sheds, are relatively short power disruptions that alternate throughout communities to reduce demand to match supply and maintain grid reliability. Planned outages help stretch available energy when supplies are short and ensure the grid doesn't collapse into uncontrolled and unplanned power failures, while limiting outages to the smallest group of customers in a more contained area for shorter periods of time."¹³

Not all rotating outages are caused by a shortage of electricity from intermittent sources, As the CAISO points out, in addition to "cloud cover and a lack of wind reduce solar and wind generation, affecting available supplies", adequate energy supply can also be impacted in several ways, primarily by high temperatures which causes increased air conditioning use and drives up electricity demand and unexpected power plant or

¹² For example:

https://www.nerc.com/comm/RSTC_Reliability_Guidelines/Fuel_Assurance_and_Fuel-Related_Reliability_Risk_Analysis_for_the_Bulk_Power_System.pdf

¹³ CAISO Fact Sheet – Rotating Outages, 2023.

transmission line outages caused by mechanical failure, wildfire, or constraint on transmission lines.

The CAISO initiated rotating outages on Aug. 14 and Aug. 15, 2020. Before that, it had been almost two decades since outages were imposed due to energy shortages. What triggered this rotating outage? According to the Root Cause Analysis ordered by the Governor after that event, the three causes were:

- An extreme heat wave across the western United States resulting in demand for electricity exceeding existing electricity resource adequacy and planning targets,
- The rotating outages occurred late afternoon, when solar generation declines at a faster rate than demand decreases.
- Some practices in the day-ahead energy market exacerbated the supply challenges.

Across all of Canada, penetrations of intermittent renewables are much lower, at 6.6%:

- Wind Energy: Increased from 1.5% in 2013 to 5.8% in 2022.
- Solar Energy: Grew from 0.1% in 2013 to 0.8% in 2022.

However, solar and wind generation isn't uniformly distributed across the country. PEI leads the provincial pack with 99% of its electricity generated by wind. Next are Alberta with 20% wind, 6% solar and Ontario with 10% wind 2.5 % solar.

Even at these lower penetrations, intermittent renewables can still be impactful if the wind doesn't blow, or the sun doesn't shine. For example, on April 5 the Alberta Electric System Operator (AESO) shed firm load for the first time since 2013. Although electricity demand was relatively low on April 5 as prevailing temperatures were close to 0°C across Alberta, there was a high amount of thermal generator outages and low wind generation, which reduced supply.¹⁴

Prior to the load-shed event, a period of exceptionally cold weather drove high demand, prompting the AESO to declared Emergency Energy Alerts events on four consecutive days, from January 12 through 15. EEAs indicate that the province's electricity grid is under stress and facing a potential supply shortfall and the need for grid stability measures. The AESO stated that "extreme cold resulting in high power demand has placed the Alberta grid at a high risk of rotating power outages. And asked Albertans to immediately limit their electricity use to essential needs only.

The report on the outages attributed the EEA to a combination of existing generator outages and very low wind generation throughout the day, noting that the wind forecast started to anticipate this around January 11.

¹⁴ Alberta electricity system events on January 13 and April 5, 2024_ MSA review and recommendations. August 6, 2024.

7 Does decarbonizing our energy system affect reliability risk?

Much of the changes are driven not principally by organic, bottom-up demand, but by top-down policy. This policy sets various targets and goals for 2030, 2035, 2040, and by 2050 a goal of net-zero GHG emissions economy wide.

What consideration does this policy give to energy reliability? Is the pace and scale of the proposed changes achievable without risking shortages in any area that is essential to energy reliability? Importantly, we also need to look beyond any particular part of the energy system. Some of the biggest reliability impacts may be felt by end users as the way they use energy changes, whether residential retrofits or repowering an industrial plant to use electricity or hydrogen.

Increasingly, energy policy is driving the replacement of liquid and gaseous fuels with electricity. However, as we discussed above, concerns about electricity resource adequacy are already emerging. Where will the electricity to power a net-zero policy that relies on electricity come from?

Already steps are being taken to accelerate the move to electricity - including municipal gas bans. A number of Canadian municipalities have prohibited or curtailed the use of natural gas in new building construction, including the Metropolitan Community of Montreal, City of Vancouver, City of Richmond BC, Nanaimo BC and Prévost, Quebec.

Additionally, two recent regulatory decisions found that demand for natural gas will significantly decline in the face of increased electrification and in one case, denied a capital project to upgrade a pipeline and in the other disallowed any amortization period for certain natural gas infrastructure investments.

These actions may be well intentioned, but do they consider whether there will be enough electricity in place at a price that is affordable to average Canadians to replace the natural gas needed to heat homes and businesses and power industry. And if not, where it will come from?

A recent ERQ article discussed these decisions at greater length.¹⁵ That article concluded that “for regulators to make informed decisions requires a holistic view of an energy transition that is not always amenable to such views. It also requires policy makers to provide clear policy direction when at all possible and when not possible to ensure that they

¹⁵ Energy Regulation Quarterly, Two Regulators Speak Out, December 2024.
<https://energyregulationquarterly.ca/articles/the-energy-transition-and-natural-gas-two-regulators-speak-out#sthash.7Y6fQb3y.dpbs>

encourage and support the regulator to take steps to consider all the aspects of the energy system when making decisions about the energy transition”.

While federal and provincial energy policy may increasingly lean more heavily towards electrification as ‘the’ pathway to achieve net-zero by 2050, there could be other viable pathways as well. Other option, such as:

- CCUS used in industrial processes and from fossil fuel use could enable net-zero operations without full electrification.
- Increased utilization of mini and micro energy grids, including district thermal systems using Combined Heat and Power (CHP)
- Green or low carbon hydrogen to replace fossil fuels in industries and transportation.
- Biofuels and synfuels to decarbonize aviation, shipping and other hard-to-decarbonize sectors.
- Biomass used for heating.
- Nuclear energy with advanced nuclear reactors and SMRs providing high-temperature heat for industry, reducing reliance on fossil fuels. This could be in conjunction with CHP district energy systems.
- Geothermal and renewable/waste heat can replace fossil-fuel based heating in buildings and industrial processes, including CHP systems.

It is important to look at these alternatives not only from a cost perspective, but to consider the reliability implications of adopting – or not adopting – these energy pathways.

We will be looking at the impact of energy policy, in particular the pace of it, on reliability in our next publication.