Climate Adaptation Practices among Power Generation and Natural Gas Companies in Alberta

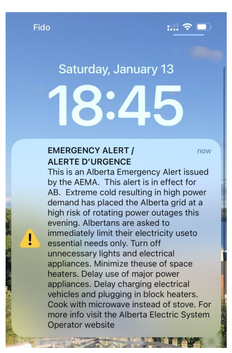
by Bose Dele-Ijagbulu

Supervised by Dr. Conny Davidsen[1], Claire Hosford[2] and Emily Hunter[2]

[1]University of Calgary; [2]ATCO Frontec

INTRODUCTION

- Extreme weather events are increasing in intensity and frequency partly due to climate change.[3]
- Alberta has experienced increased climate change related risks such as wildfires, droughts, flood and changing weather patterns.
- Extreme weather events increase electricity demand, while also increasing the risk of supply and delivery failures. [4]
- For instance, Alberta's electric system was impacted by a week-long period of extreme cold weather starting January 11, 2024.
- Risks posed to electricity utilities by the effects of climate change therefore need to be managed through climate adaptation practices. [5]



RESEARCH QUESTIONS AND IMPORTANCE

1. What are the climate adaptation practices of power generation and natural gas companies in Alberta?
2. How aligned are their adaptation practices with industry-based recommendations?
3. What coordinated adaptation strategies are being considered to reduce the risk of outages to end users?
4. What policies exist or could help to support adaptation planning?

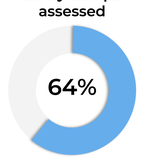
Studies on utilities' climate adaptation practices are **largely absent** at the **provincial** and **territorial** level in Canada.[6] This research contributes towards closing this gap.

METHODOLOGY

Data Sources

1. Interview and Surveys
2. Document Analysis:
   a. Review of 2023 sustainability and integrated annual reports
   b. Review of Industry based climate adaptation recommendations by:
      - The Canadian Electricity Association (2020)
      - the North American Electric Reliability Corporation (NERC), the Federal Energy Regulatory Commission (FERC), following winter storms Uri in 2021 and Elliott in 2022
      - The Pacific Northwest National Laboratory (2023) report to the United States Department of Energy
   c. Review of reports issued by the Alberta Electric System Operator (AESO) and the Market Surveillance Administrator (MSA)

Proportion of Alberta's Generation capacity* owned by companies assessed



- 9,841 MW out of 15,425 MW*
- 68% gas, 21% wind, 3% solar and 8% hydro

* excludes co-generation

Companies Assessed

1. ATCO Limited
2. TransAlta Corporation
3. Capital Power Corporation
4. Enmax Corporation
5. TC Energy Corporation
6. Enbridge Inc.

Climate Risk Reporting Standards

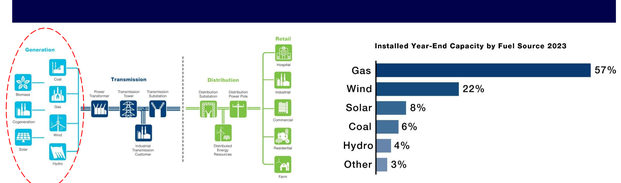
	TCFD	CDP	IFRS S2
% of companies assessed	100%	50%	17%

TCFD: Task Force on Climate-Related Disclosures
CDP: Climate Disclosure Project
IFRS S2: The International Financial Reporting Standards Climate-related Disclosures

Analytical Approach

1. Qualitative Approach
   a. Contextualization and extraction of relevant information
   b. Identification of key themes and trends in the climate change related risks and adaptation practices
   c. Comparison of companies' adaptation approach with industry-based recommendations
2. Quantitative Approach
   a. Determination of the highest recurring risks and adaptation themes and their distribution by generation technology

RESEARCH SCOPE[7]



- Limited to natural gas supply for power generation only
- Co-generation power plant facilities excluded

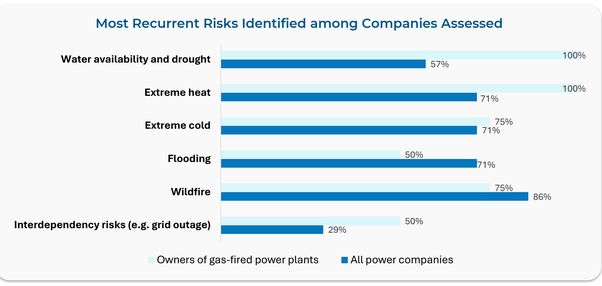
INTERDISCIPLINARY ASPECTS[8]

1. Energy
2. The Environment
3. Policy

FINDINGS AND ANALYSIS

Power Generation Companies

Most Recurrent Risks Identified among Companies Assessed



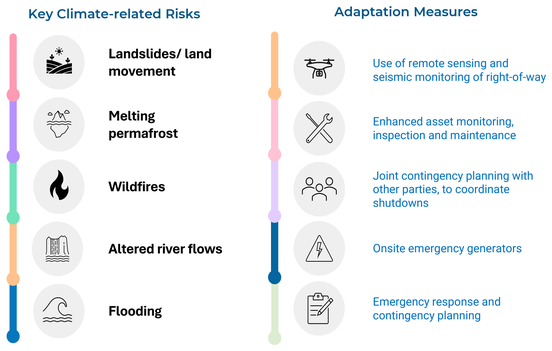
Adaptation Measures

- Asset strengthening/ hardening
- Communication and collaboration with external parties (e.g. government, research institutes and industry for interdependent risks)
- Emergency response and contingency planning
- Due diligence, design modification and technology optimization (especially for new projects and acquisitions)
- Use of historical climate data or models for long-term planning and mitigating chronic risks

For gas-fired facilities:

- Development and implementation of a **water management strategy**
- Contracting for **firm natural gas supply and delivery** to ensure priority access
- **Portfolio diversification** by geography and by technology

Natural Gas Companies

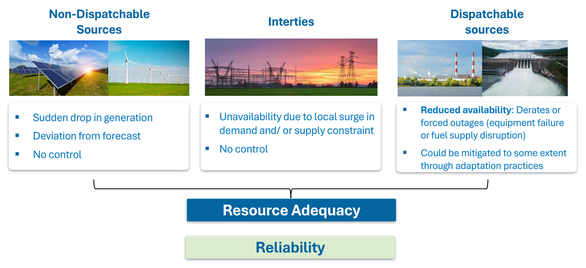


Respondents' Views on the Need for Gas Supplier Reliability Standards (for gas-electric climate-related risk mitigation)

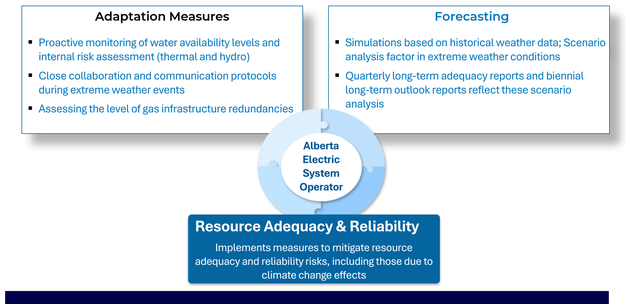
Unanimously of the view that reliability standards proposed by the NERC and FERC may not be needed in Alberta for the following reasons:

- Climate Resilient Gas Infrastructure in Alberta
- The level of redundancy already built into Alberta's gas supply system

Key Climate Risks to the Grid (by Supply Source)[9]



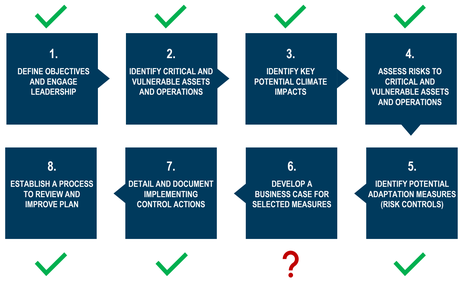
Adaptation Coordination Approach[10]



Highlights of January 13, 2024 Events[11]

- Emergency alert issued by the Alberta Emergency Management Agency due to extreme weather conditions affecting Alberta's electric system.
- **Demand:** ~10% surge in peak demand due to weather conditions.
- **Non-Dispatchable Supply Sources:**
  - Solar generation over-estimated by 200 MW.
  - Generation from wind resources was below 500 MW (compared to an installed capacity of about 4,500 MW) on January 13.
  - At the onset of the extreme conditions on January 11, the MSA reports that *"wind generation fell from approximately 1,350 MW to almost 0 MW"*.
- **Dispatchable Sources:**
  - At least 909 MW of expected thermal and hydroelectric generation capacity unavailable due to the extreme conditions.
  - Eight thermal generation plants and two hydroelectric power experienced forced outages or lower than expected available capacity.
- **Gas-Electric Interface:**
  - According to the MSA, "the supply of natural gas to thermal generation assets was not a cause of the supply shortfall on January 13".
- **Interties:** Emergency imports of up to 153 MW received via the Saskatchewan intertie and up to 260 MW via the British Columbia intertie.
- Unexpected shortfall caused AESO to declare a level 3 Energy Emergency Alert on January 13, 2024.
- Alerts also declared every day from January 12 to January 15, 2024.

Comparison of Adaptation Approach with the Canadian Electricity Association Guidelines[5]



- Incorporated into existing **Enterprise Risk Management** system: 100% of companies assessed
- Implemented via existing **Environmental Management System**: 67% (of which half reported alignment with ISO 140001 standards)

Policy Findings

Availability of Policies

- There **are no direct climate adaptation policies or regulatory requirements** in place for power and natural gas companies in Alberta.

Measures that *Indirectly Incentivize* Climate Adaptation Planning

- Emergency management program requirements
- Environmental Impact Assessment requirements
- Industry regulations, codes and guidelines
- Global standards for reporting of climate change related physical risks

Measures that *Indirectly Mitigate* the Effects of Climate Change Related Risks on the Supply Components of the Alberta Grid

- Supply Cushion Regulation
- Increased procurement of ancillary services for grid stabilization

RECOMMENDATIONS

1. Publishing of adaptation-focused lessons learnt from extreme weather events, and promotion of proactive adaptation practices.
2. Proactive adoption of IFRS S2 climate risk and adaptation reporting standards by power generation and natural gas companies.
3. Publication of generation capacity at-risk data by the AESO.
4. Continuous enhancement and improvement of gas-electric coordination protocol.
5. Extreme weather thresholds for natural gas contingencies should be defined and monitored by the AESO. E.g. loss of compressor stations, or pipeline infrastructure that can result in multiple generator losses.[12]
6. Enhancement of long-term forecasting via the use of forward-looking climate models and not just historical weather data.
7. Policy certainty and adequate levels of economic signalling to attract investors and incentivize adaptation measures.

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[5] Canadian Electricity Association. (2020). *Climate Change & Extreme Weather: A Guide to Adaptation Planning for Electricity Companies in Canada*.

[6] MacKay, M., Nciri, A., & Timmins, E. (2020). *Advancing Community Energy Resilience in Alberta*. https://questcanada.org/wp-content/uploads/2020/12/Advancing-Community-Energy-Resilience-in-Alberta-Primer-report.pdf

[7] Image Credits: https://www.aeso.ca/download/listedfiles/Electricity-in-Alberta-and-the-AESO.pdf; Understanding Electricity in Alberta » AESO

[8] Image credits: Sustainable Development Goals | Green European Foundation (gef.eu); https://commons.wikimedia.org/w/index.php?curid=122043798 ; https://commons.wikimedia.org/w/index.php?curid=122043804

[9] Image credits: Shutterstock

[10] Image credits: Alberta Electric System Operator (aeso.ca)

[11] Market Surveillance Administrator. (2024a). *Alberta Electricity System Events on January 13 and April 5, 2024: MSA Review and Recommendations*. (August 6, 2024). https://www.albertamsa.ca/assets/Documents/January-and-April-2024-Event-Report.pdf

[12] North American Electric Reliability Corporation (NERC). (2023, March 22). *Reliability Guideline: Natural Gas and Electrical Operational Coordination Considerations*.