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Climate Change Adaptation: An Electricity Sector Perspective

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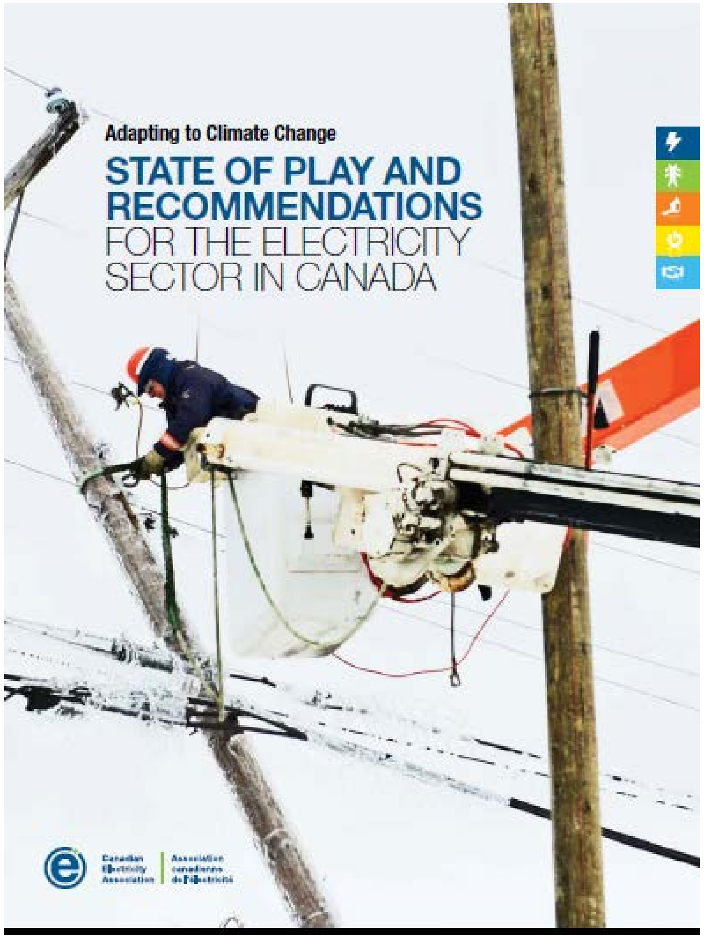
CEA Climate Adaptation Report



The report aims to demonstrate the value of climate change adaptation for the electricity sector and supporting stakeholders:

- **Chapter 1** – Introduction
- **Chapter 2** – Climate Science and Canada's Future
- **Chapter 3** – Climate Risks and Opportunities for the Electricity Sector
- **Chapter 4** – Sector Perspectives and Practices on Adaptation
- **Chapter 5** – Recommendations

Major climate risks

- Electricity demand
  - Summer increase / winter decrease
  - Sharper peaks during heat waves
- Electricity supply
  - Hydro: Potential changes in hydro availability as a result of changes in precipitation, temperature and runoff.
  - Transmission: Reduced transmission efficiency at higher temperatures.
  - Thermal generation: Reduced output from thermal power
  - Wind: Changes in wind patterns (turbulence, velocity).
- Infrastructure
  - Damage to overhead equipment from ice loading, high winds, tree contacts
  - Flooding of underground equipment
  - Changing soil conditions for transmission towers (e.g. permafrost/ice melt)

Electricity Utility Actions

1. Address data requirements
2. Develop adaptation management plans
3. Understand climate risks from multiple perspectives
4. Exchange best practices in the incorporation of climate models
5. Review electricity system standards
6. Pilot and deploy technology solutions (leverage public funds where available), including demand response, energy storage and system management tools

Data Requirements

- Good national seasonal projections re: average temperatures, average precipitation, average runoff.
  - Useful for resource availability and energy demand projections.
- Short term reliability impacts require a different data set:
  - Max temperatures; duration of heat waves; scope of precipitation extremes; max wind speeds; ice loading

CEA Adaptation Management Plan Template

- Supports the creation of effective climate change adaptation management plans, and aims to ensure a consistent approach across the electricity sector.
- Outlines a strategic risk-based framework that can be readily incorporated into existing enterprise risk management (ERM) processes.
- In the absence of ERM processes, it supports the creation of an adaptation management process.

Legal Risk Analysis

- As climate hazards become more common, it is conceivable that electrical utilities will be expected to act diligently and exercise reasonable care in preparing for, and responding to hazards, to ensure that their statutory duties are met.
- Rate cases are likely to consider climate change impacts over the coming years.
- Investors are increasingly demanding disclosure on companies' exposure to climate risks, to support more informed investment decisions.

Source: *Understanding Canadian Electricity Generation and Transmission Sectors' Action and Awareness on Climate Change and the Need to Adapt*, ZizzoAllan, 2014.

Overhead System Design Standard – C22.3

Table 30
Deterministic weather loads*†
(See Clauses 7.2, 7.3.1, 7.3.5, 7.5.1, 7.6.2.1, and A.7.3.)

Loading conditions	Loading area‡			
			Medium	
	Severe	Heavy	A	B
Radial thickness of ice, mm	19	12.5	6.5	12.5
Horizontal wind loading, N/m²	400	400	400	300
Temperature	–20 °C	–20 °C	–20 °C	–20 °C

* *When large conductors are used in locations where high winds are prevalent, the loading on bare conductors should be assessed, as high winds can produce a transverse loading in excess of the wind and ice combinations.*
† *On small conductors, the ice effect is more significant than on large conductors, as it constitutes a greater percentage of the total mass.*
‡ *See Clause 7.2 and Annex C.*

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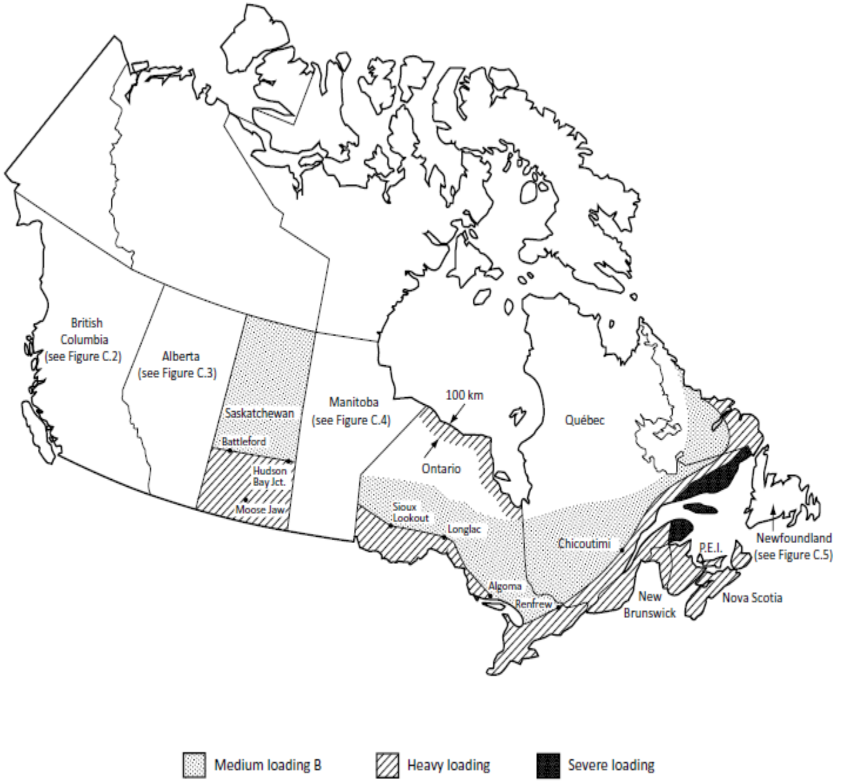
Overhead System Design Standard – C22.3

- The loading maps in Annex C are based on Environment Canada data and the experience of utilities across Canada. Designers are cautioned that these maps should be treated only as a guide and that local areas can have higher icing and/or wind forces.
- Designers unfamiliar with local weather conditions should acquaint themselves with the terrain and obtain local information from weather records and regional meteorologists. Where weather data are unavailable, local residents can be consulted.

Figure C.1
Loading map of Canada
(See Clause 7.2 and Table 30.)



Federal Infrastructure Funding

Investment (Billions)	2016/17	2017/18	2018/19	2019/20
Public Transit	$1.675	$1.675	$1.150	$1.150
Social Infrastructure	$1.675	$1.675	$1.150	$1.150
Green Infrastructure	$1.675	$1.675	$1.150	$1.150
Totals	**$5.025**	**$5.025**	**$3.450**	**$3.450**

Recommendations for Gov't

Federal Government

1. Develop a national adaptation strategy
2. Support scientific research and event-driven climate data development
3. Improve national understanding of climate change impacts
4. Enable cross-border coordination and risk management
5. Improve flood plain mapping and building codes
6. Export the Adaptation Platform model

Provincial and Territorial Governments

1. Require municipalities to develop adaptation plans to operationalize provincial objectives
2. Establish policies recognizing the economics of addressing climate risks in electricity
3. Work with legislators and regulators to define appropriate investment mechanisms. Potential options include:
   a) Rate setting
   b) Dedicated cost recovery or allocation mechanisms
   c) Performance-based regulation

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