dunsky
Energy + Climate

# The Next 20 in Energy

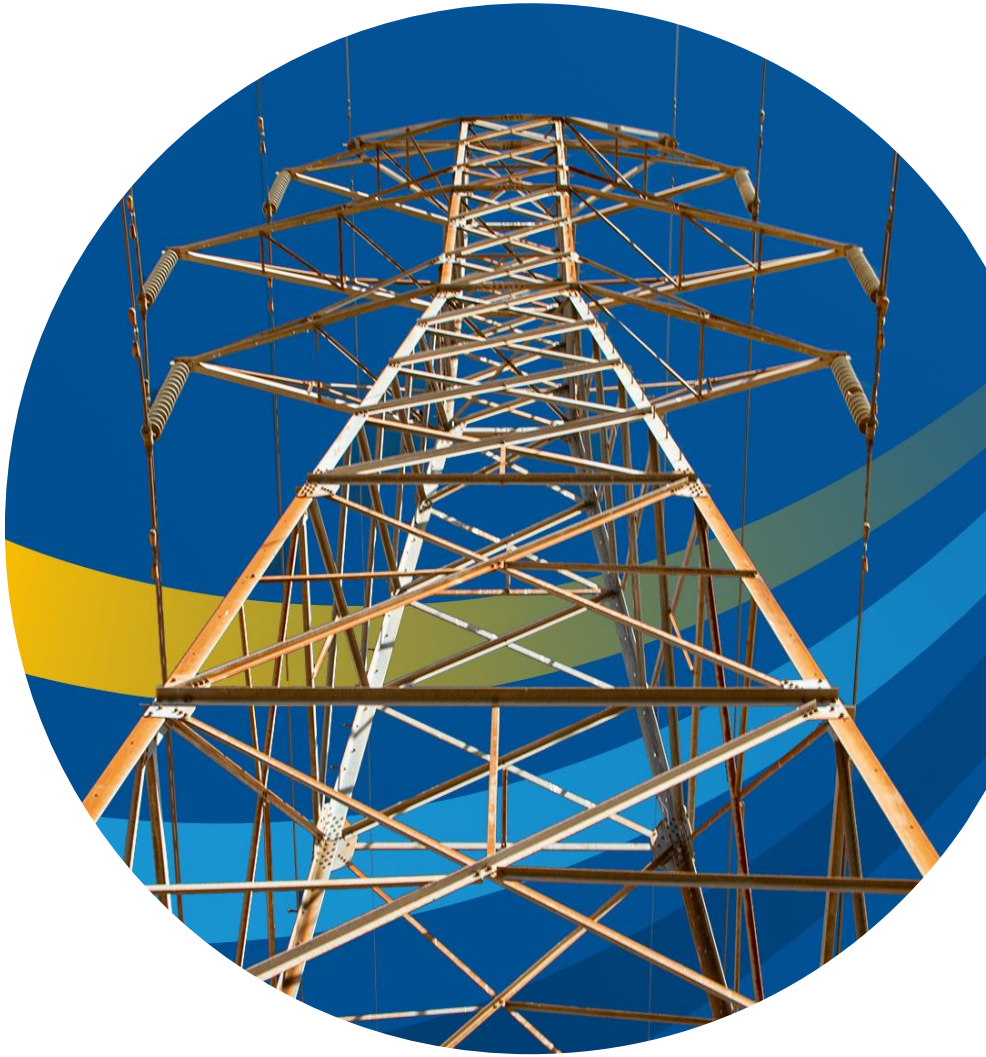
## Navigating Growth, Reliability, and Reform in the Electricity System

February 27, 2025

# Housekeeping

## Webinar Participation

- Due to the great turnout, **the chat has been disabled.**
- **Submit questions using the Q/A function** (*les questions en français sont les bienvenues !*)
- Turn on **closed captioning** by clicking the icon that says “cc” then more > show sub-titles



# Agenda

1. **Opening Remarks**
   *Philippe Dunsky*
2. **The Next 20 Years in Energy**
   *Amara Slaymaker, Anirudh Kshemendranath and Ben Kujala*
3. **Discussion**
   *Hydro-Québec*
4. **Audience Q&A**

dunsky
Energy + Climate

# Opening remarks

**Philippe Dunsky**

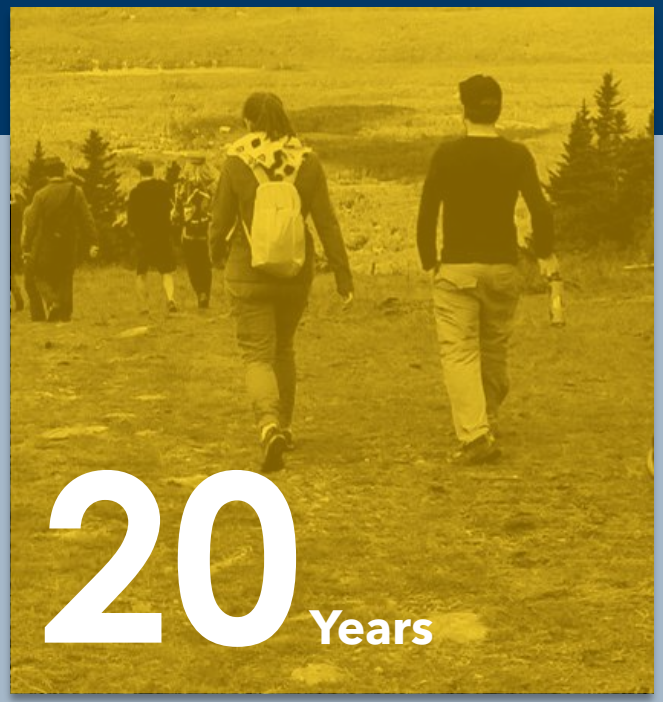
**PRESIDENT & FOUNDER**

dunsky
Energy + Climate

*ACCELERATING THE CLEAN ENERGY TRANSITION*

**ANALYSIS + STRATEGY**

**BUILDINGS** **MOBILITY** **INDUSTRY** **ENERGY**





dunsky
Energy + Climate

*ACCELERATING THE CLEAN ENERGY TRANSITION*

**ANALYSIS + STRATEGY**

**BUILDINGS** | **MOBILITY** | **INDUSTRY** | **ENERGY**


GOVERNMENTS | UTILITIES | CORPORATE + NON-PROFIT

dunsky
Energy + Climate

*ACCELERATING THE CLEAN ENERGY TRANSITION*

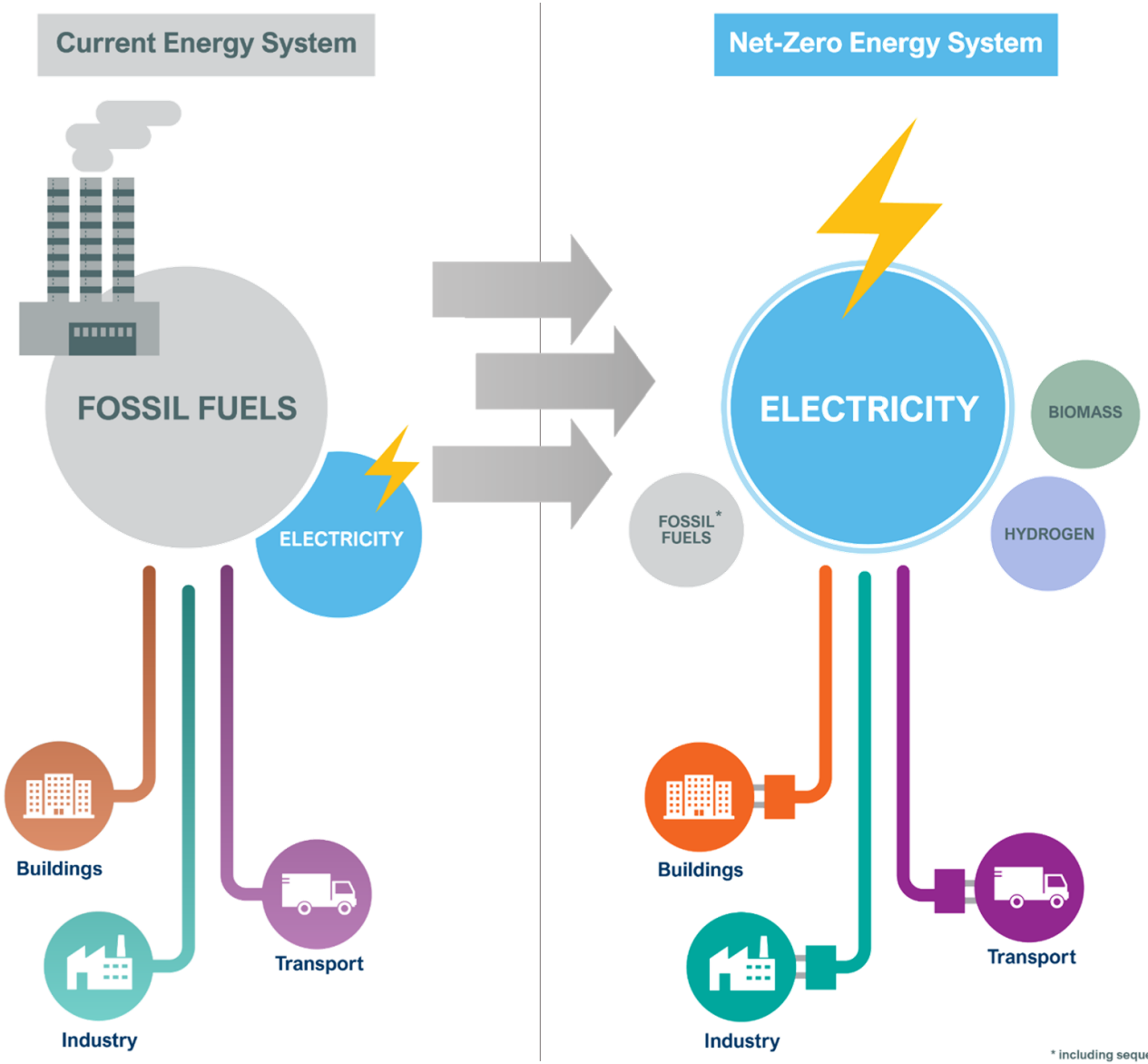
**ANALYSIS + STRATEGY**


- ✓ Technology assessments
- ✓ Load forecasting
- ✓ Resource planning
- ✓ Pathway studies
- ✓ Market assessments
- ✓ Feasibility studies
- ✓ Policy and regulatory support
- ✓ Grid modernization strategy

*… and much more…*

GOVERNMENTS | UTILITIES | CORPORATE + NON-PROFIT

How do we **unlock the role of clean power**, **affordably and reliably**, while also harnessing clean fuels where appropriate?




Source: Dunsky Energy + Climate Advisors, for Electrifying Canada Task Force, 2022.

dunsky Energy + Climate

# Electricity Demand:

## Where is load going?

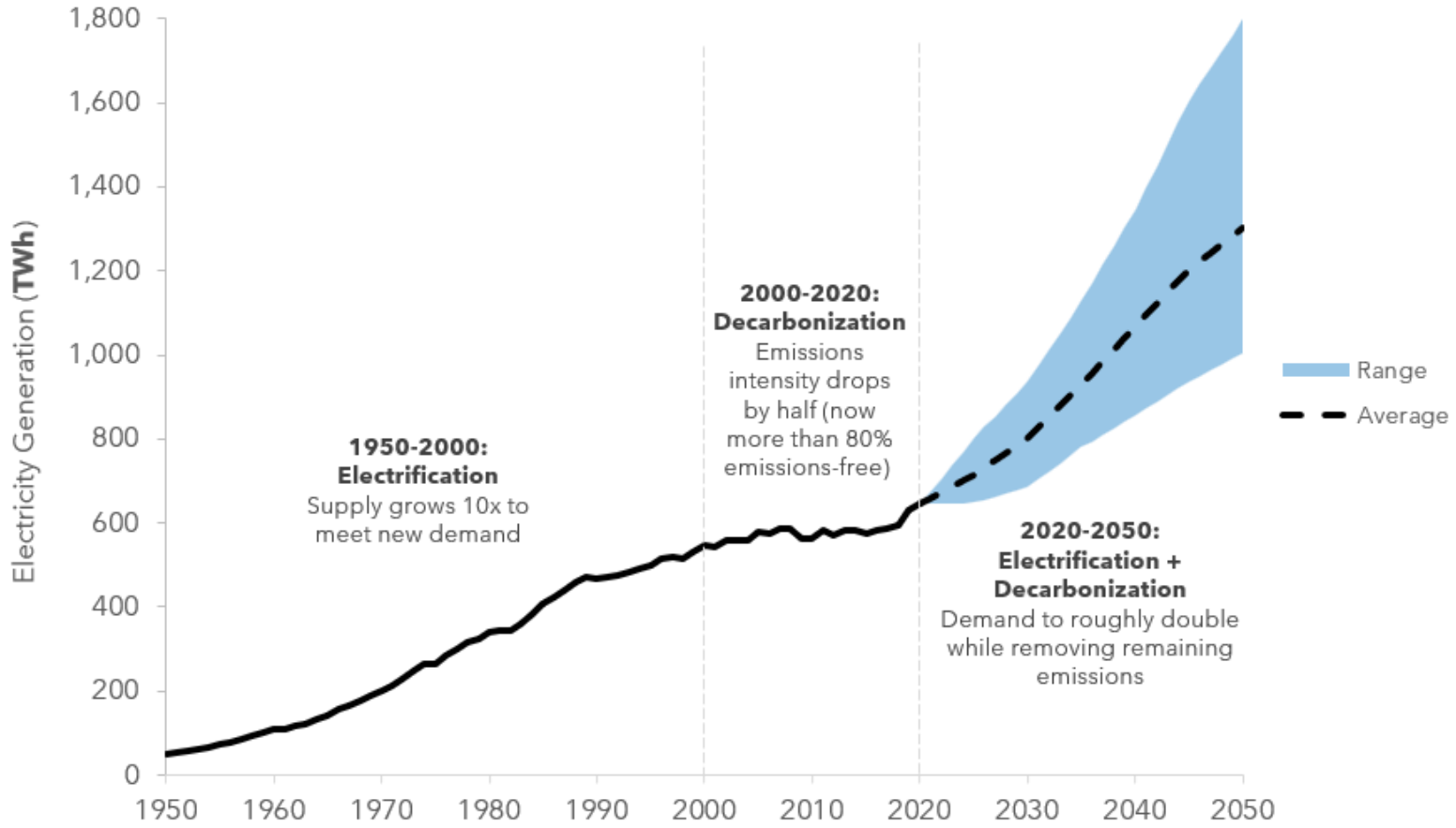
**Amara Slaymaker**
CONSULTANT

Electricity Demand

# Our Challenge

1. Continue to **decarbonize existing supply**
2. **Grow supply** by 2%-7% per year on average
3. Maintain system **affordability and reliability**

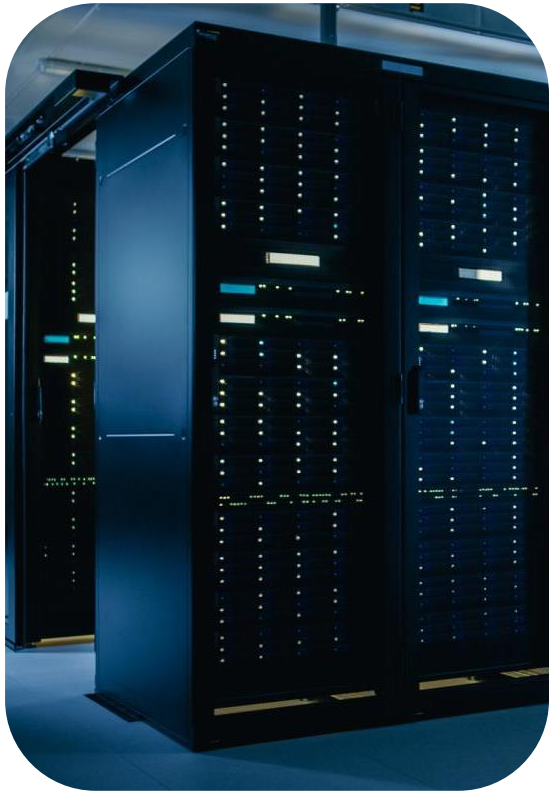
## Historical and Projected Electricity Generation in Canada (1950-2050)



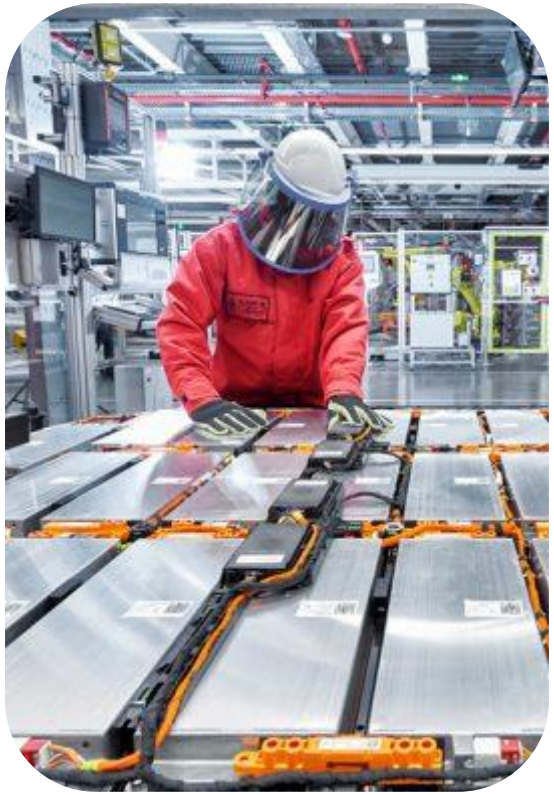
Electricity Demand

# Emerging Drivers of Load Growth

**Transportation, Buildings and Industry Electrification**



**AI and Data Centers**

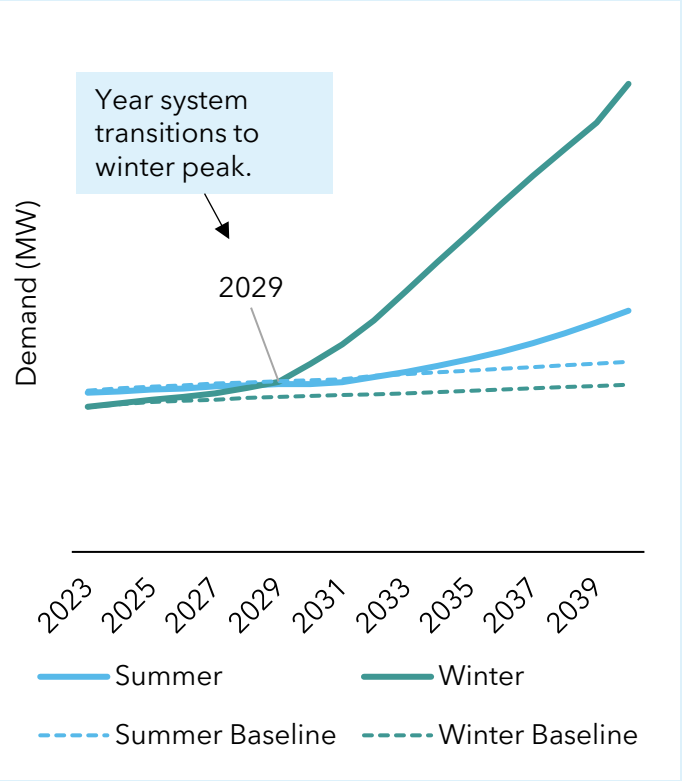


**New Economic Opportunities and Industries**


**Clean Fuel Production**

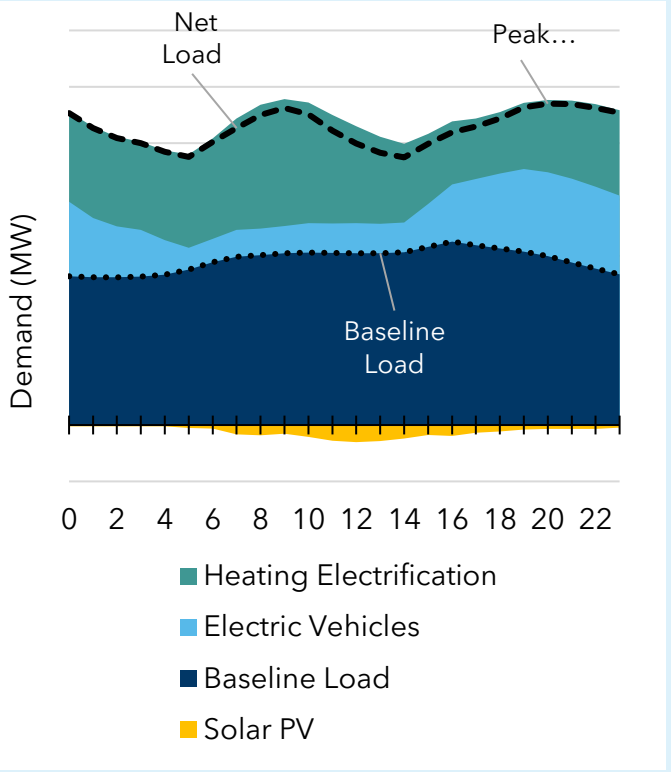
# What does this mean for our systems?

## Peak Demand Forecast



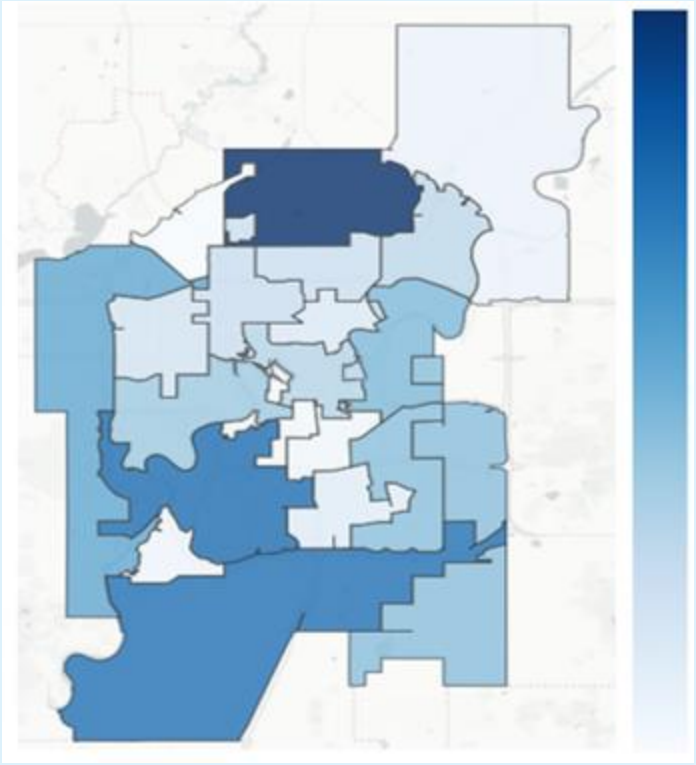

**Shifts in peak season**

## Typical Peak Winter Day (2040)




**Evolving peak window and system load shape**

## Substation-level Load Impacts



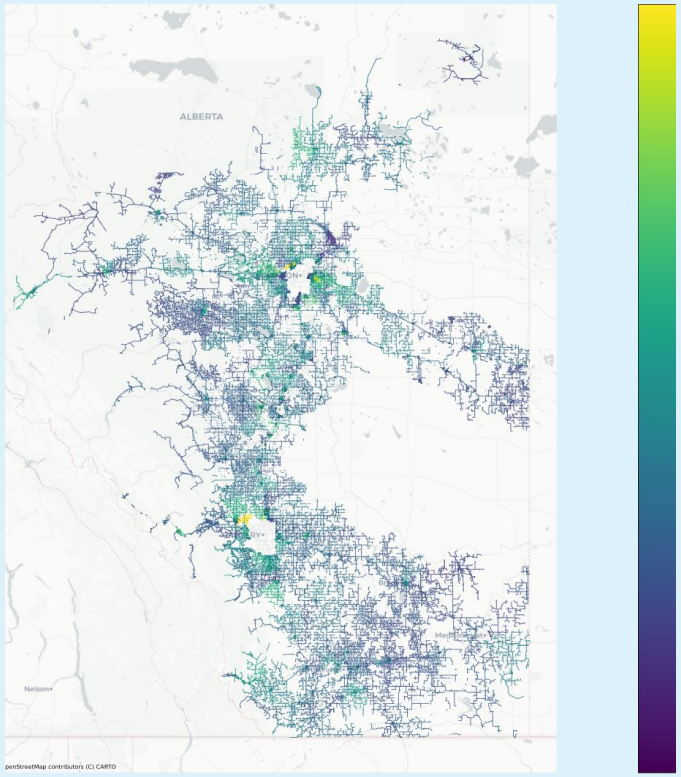
**Non-homogeneous distribution of impacts**

Electricity Demand

# Emerging best practices for modernizing load forecasting

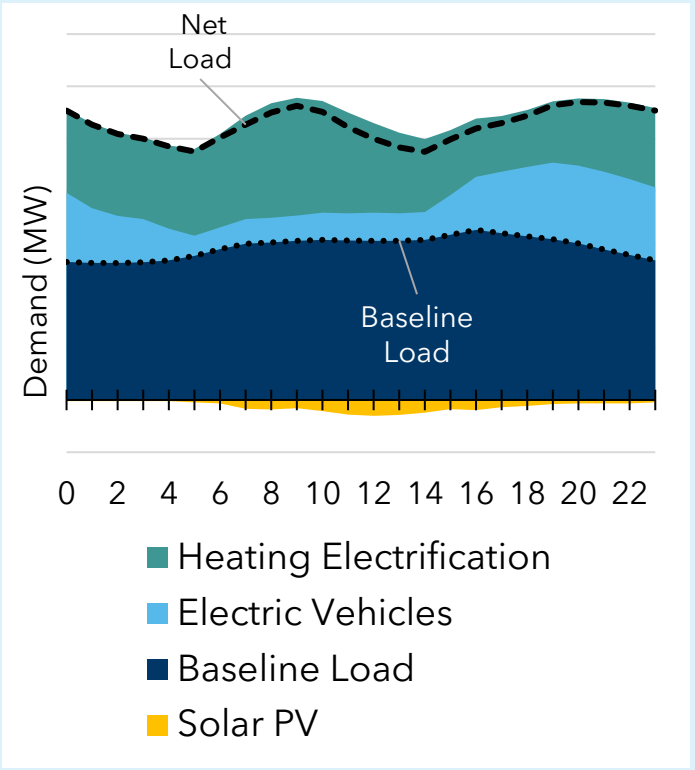
dunsky

## Feeder-Level Load Impacts



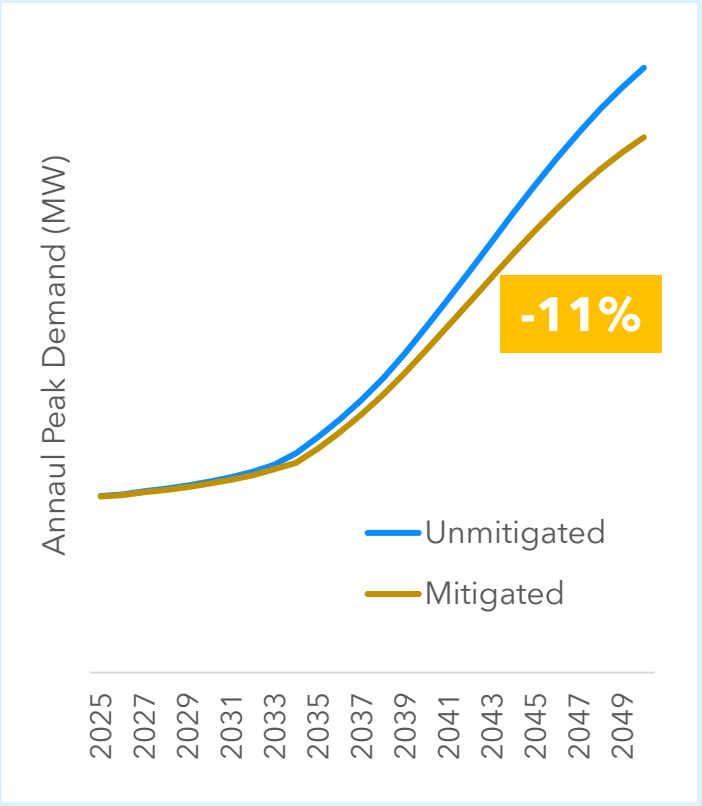

**Right-sized temporal and spatial granularity**

## Typical Peak Winter Day (2040)




**Holistic – covers all emerging areas of load growth**

## Peak Demand Forecast




**Evaluates both unmitigated and mitigated trajectories**

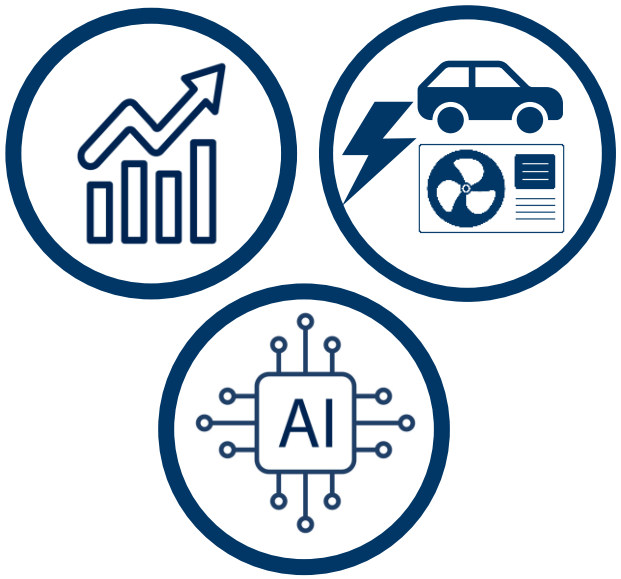
# Emerging Resources:

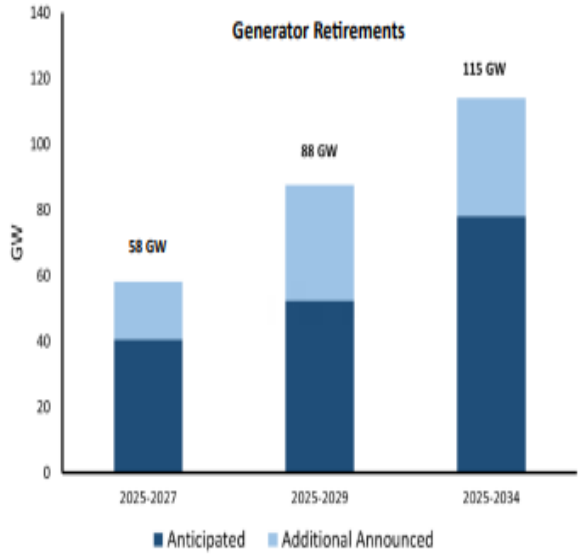
## How will we meet this growth?

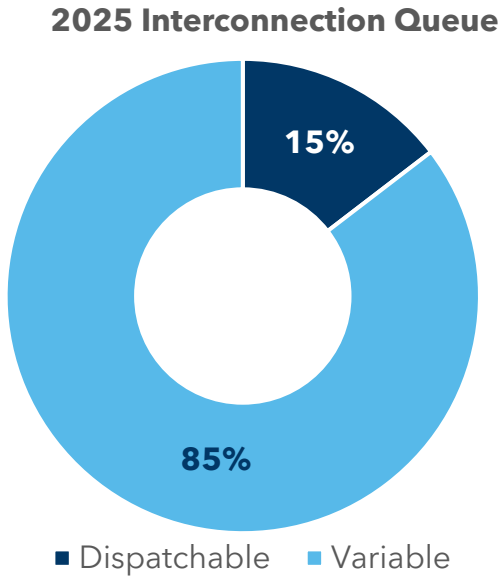
**Anirudh Kshemendranath**
SENIOR CONSULTANT

# The Road Ahead…

## Navigate Headwinds to get to a Reliable, Affordable, and Clean Grid




**Escalating**
Demand Growth

**Accelerating**
Retirements

**Declining**
Dispatchability

dunsky

**Distributed Energy Resources**

**Long Duration Energy Storage**


**Clean Fuels**

# Distributed Energy Resources

## A **solution** for emerging needs

1. **Meet Emerging System Needs:** Mitigate peak impacts, defer infrastructure upgrades (NWAs) and balance the grid.

2. **Cost-effective, quick-to-deploy and right-sized:** Scalable to the required pace while minimizing overbuild risks and ratepayer impacts

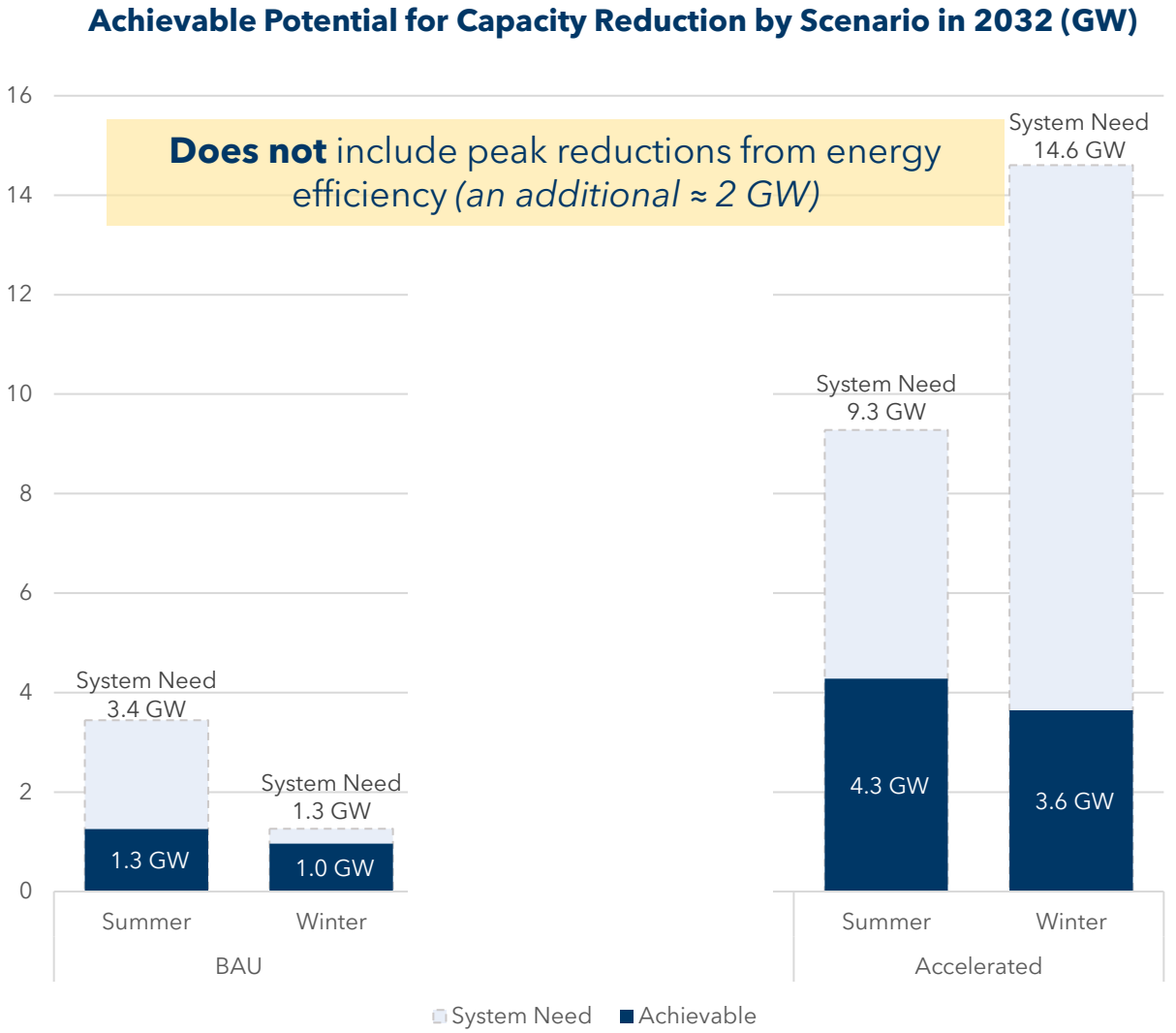
3. **Customer-empowering/buy-in:** Transform consumers into active participants in energy management

# Case Study: How can DERs meet Ontario's needs?

## DERs could reduce system peak demand by 5% to 15% (1 to 4 GW) over the next decade.

## To unlock that potential:

- **Plan** for DERs as a resource (not a load-modifier)
- **Enable** DER participation through programs, rates, and markets
- **Integrate** through grid modernization efforts



# Long Duration Energy Storage (LDES)

- **Enhances** grid reliability by making renewable energy both reliable and dispatchable.
- **Provides** a cost-effective solution for addressing reliability challenges.
- **Supports** a diversified portfolio to hedge against planning, supply, and deployment risks.

## So why do LDES not show up in most resource plans?

**Gaps in Planning Models** –Often excluded from planning frameworks or not modeled with sufficient granularity to capture their full value.

**Misaligned Market & Regulatory Structures -** Current frameworks do not always compensate LDES adequately for the full value they bring to the system.

**Diverse Technology Landscape** – This adds complexity to modeling and comprehensive assessments of technology and cost risks.

# Long Duration Energy Storage (LDES)

## Despite these barriers, LDES resources are gaining momentum

- **California** targets 2 GW LDES by 2037
- **Australia** (New South Wales) has revised their targets from 16 GWh to 28 GWh by 2034.
- **Ontario** has launched a long-term RFP to procure up to 1 GW of LDES by 2035.

### Case study: Long Duration Energy Storage (LDES) Opportunity Assessment

**6 GW**

**of 10-hr LDES**

could be cost effective in Ontario by 2032.

# Clean Fuels

## An emerging tool for supporting system reliability:

- The use of clean fuels for power generation as dispatchable resources.
- Alleviating some burden on electricity systems (e.g. dual-fuel heating, heavy-duty transportation)

## ...however, some challenges may limit the potential

- Limited supply of clean fuels available for power applications and competing demand from hard-to-electrify sectors
- Fuel production could increase electricity demand and infrastructure needs. (e.g. hydrogen electrolysis)

**Integrated planning** is needed to assess the role, potential, and constraints of clean fuels in decarbonizing both the electric grid and the broader economy.

# Modernizing Planning:

## how should planning evolve?

**Ben Kujala**

SENIOR RESEARCH LEAD

# Where Are We Today?

## Our research highlights an increased divergence between:

- Utility IRPs and system planning efforts used to inform short-term electricity investments; and
- Energy pathway studies used to inform long-term energy policy at the economy-wide level

1. **Inconsistent** scope, policy assumptions, timelines and scenario space
2. Average growth in electricity **demand in utility IRPs is roughly half** that of net-zero studies
3. Increased **uncertainty around the right mix of future resource** build-out to meet reliability standards

# The Future Requires Integrated, Robust, and Resilient Planning

## Leverage Clean and Abundant Energy

## Prioritize Reliability and Affordability

## Enable Growth and Opportunity

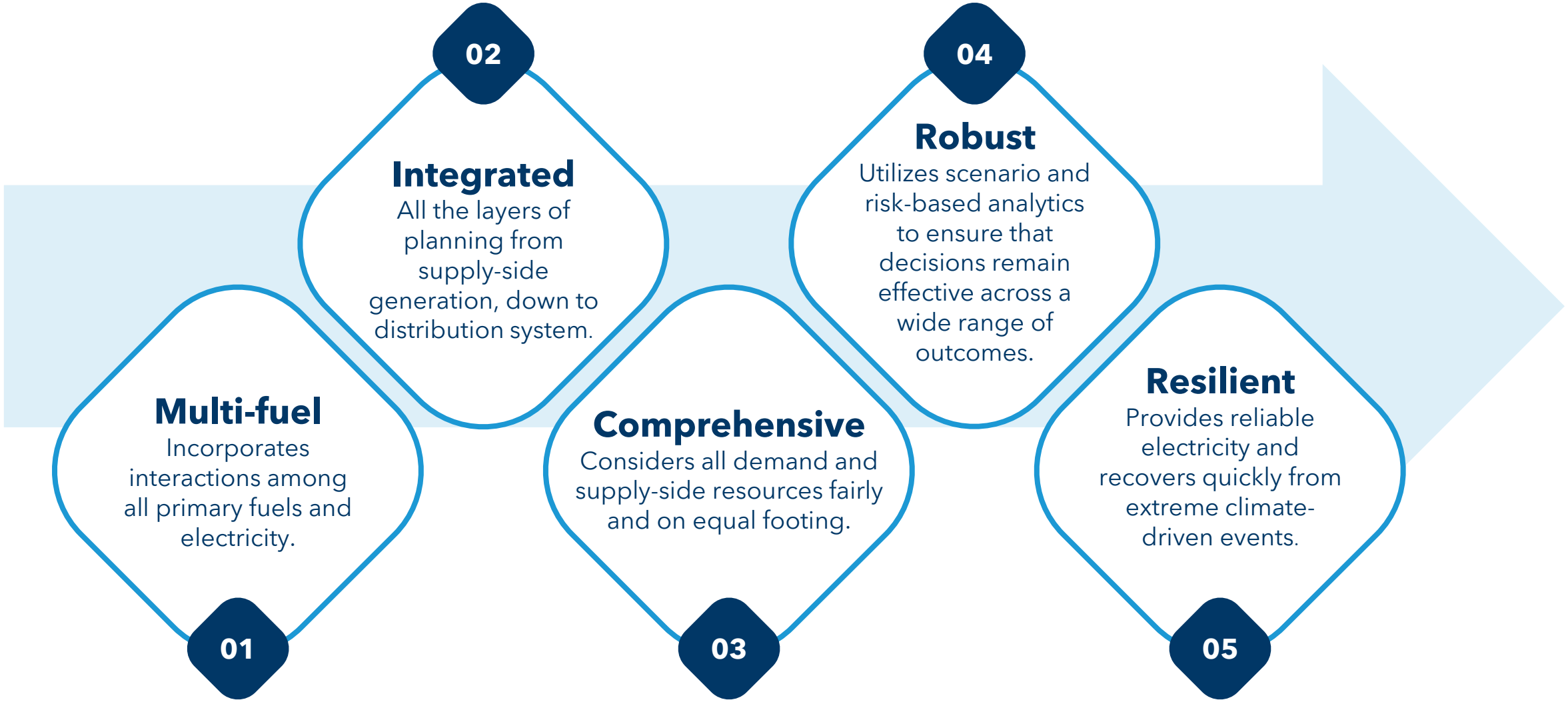
# Planning for the Future Grid

- **Prepare for Change.** Planning processes and approaches that were effective in the past must evolve to meet future challenges.

- **Manage Uncertainty.** Invest in options and flexibility. Plan for alleviating emerging system constraints.

- **Remove the Blinders.** Consider the entire energy portfolio rather than just electricity. Decarbonization opportunities need to be pursued for all fuels and in all sectors.

# Exemplary Planning for the Energy Transition



dunsky
Energy + Climate

# Guest Speaker

## Joël Thibert

**Vice President, Energy Planning & Strategy**

Hydro Québec

# Contact

**Ben Kujala**
Senior Research Lead
ben.kujala@dunsky.com
Tel: 514-504-9030 ext. 4235

**Anirudh Kshemendranath**
Senior Consultant
anirudh.kshemendranath@dunsky.com
Tel: 416-947-8599 ext. 4269

**Amara Slaymaker**
Consultant
amara.slaymaker@dunsky.com
Tel: 514-504-9030 ext. 4232