

# HEAT

# EX

# CHANGE

How today's policies  
will drive or delay Canada's  
transition to clean, reliable  
**heat for buildings**

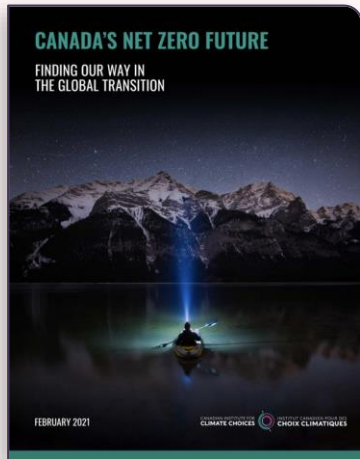
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June 2024

# Related work to date

## Canada's Net Zero Future

February 2021



Electricity is **central** for net zero

## The Big Switch

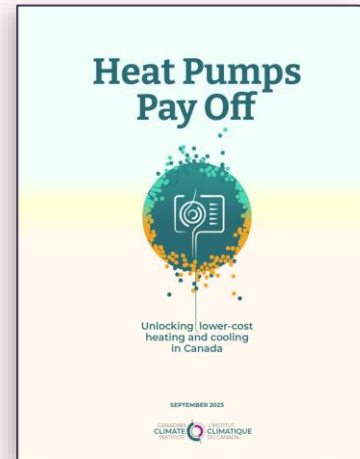
May 2022



Building heat is **crucial to understanding** our electricity future

## Heat Pumps Pay Off

September 2023



Under existing policy, heat pumps are **already cost-effective** for many consumers

## Heat Exchange

June 2024



But what is most cost-effective **from a system perspective?**



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# Why the focus on building heat from a system perspective?

**Lack of progress**

**Complexity**

**High stakes**

**... despite all challenges, progress is possible**



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# Research questions



What are the **least-cost pathway(s)** to net zero in Canada and what are their implications for building heat?



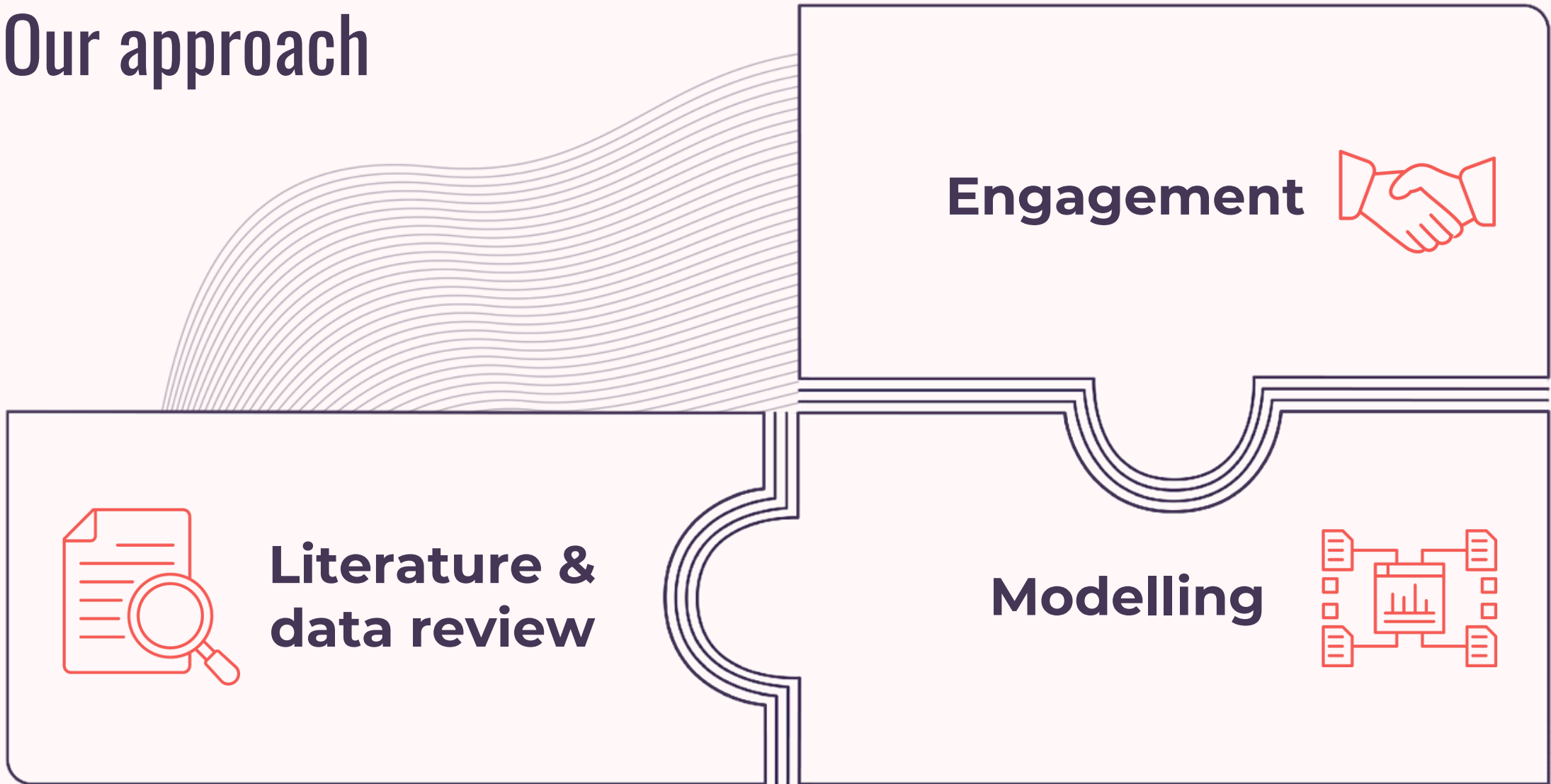
What is **driving system inertia** and how can it be addressed?



What **policies can help align** building space heating and electricity and gas networks with net zero goals?



# Our approach



# Findings

What does a cost-optimal pathway to net zero mean for building heat?

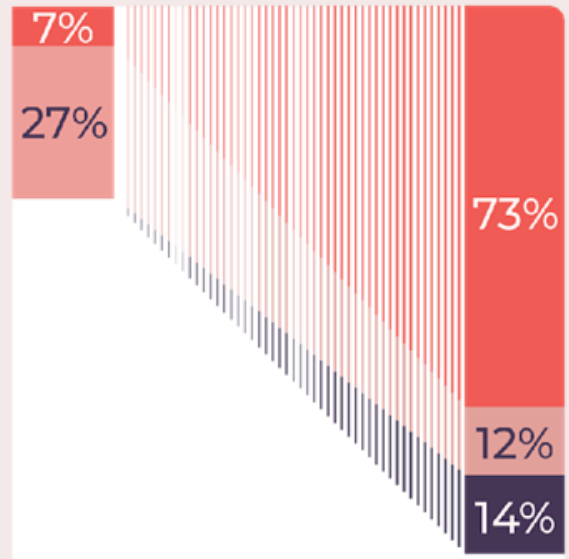


# Electricity powers most space heating under net zero

Primary space heating mix in the **residential sector**, % market share by technology

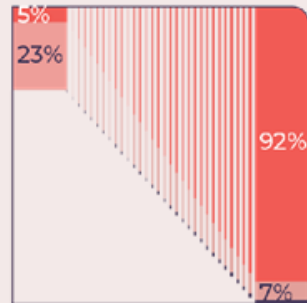
■ Heat pump ■ Electric baseboards ■ Hybrid (electric heat pump with gas backup)

## National

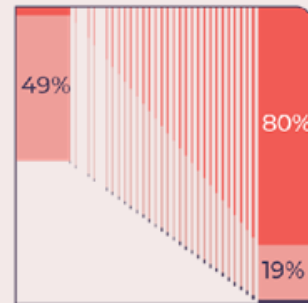


2020 → 2050

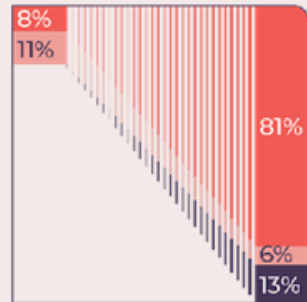
## Nova Scotia



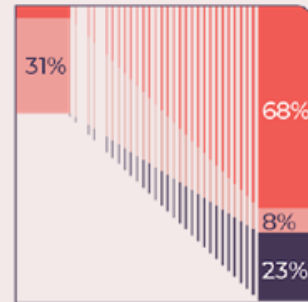
## New Brunswick



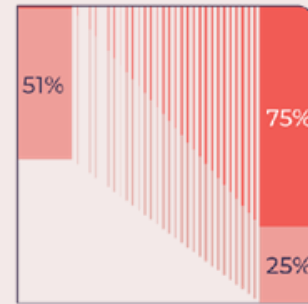
## Ontario



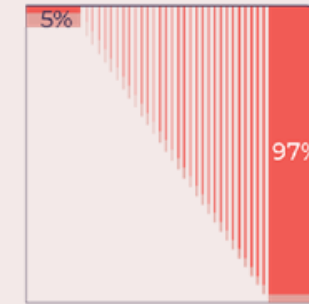
## British Columbia



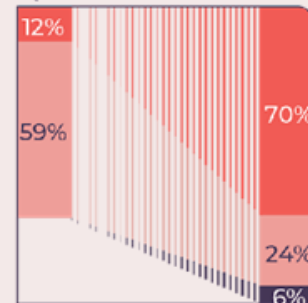
## Newfoundland and Labrador



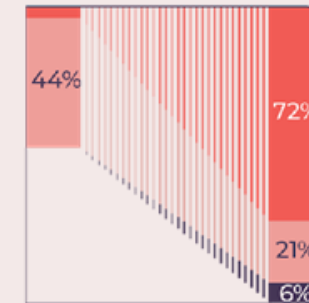
## Prince Edward Island



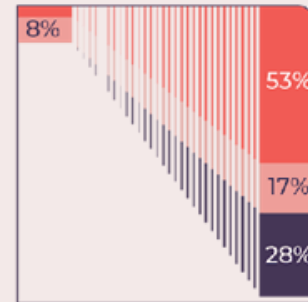
## Quebec



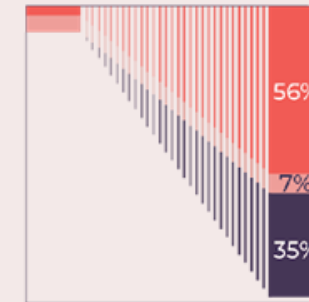
## Manitoba



## Saskatchewan

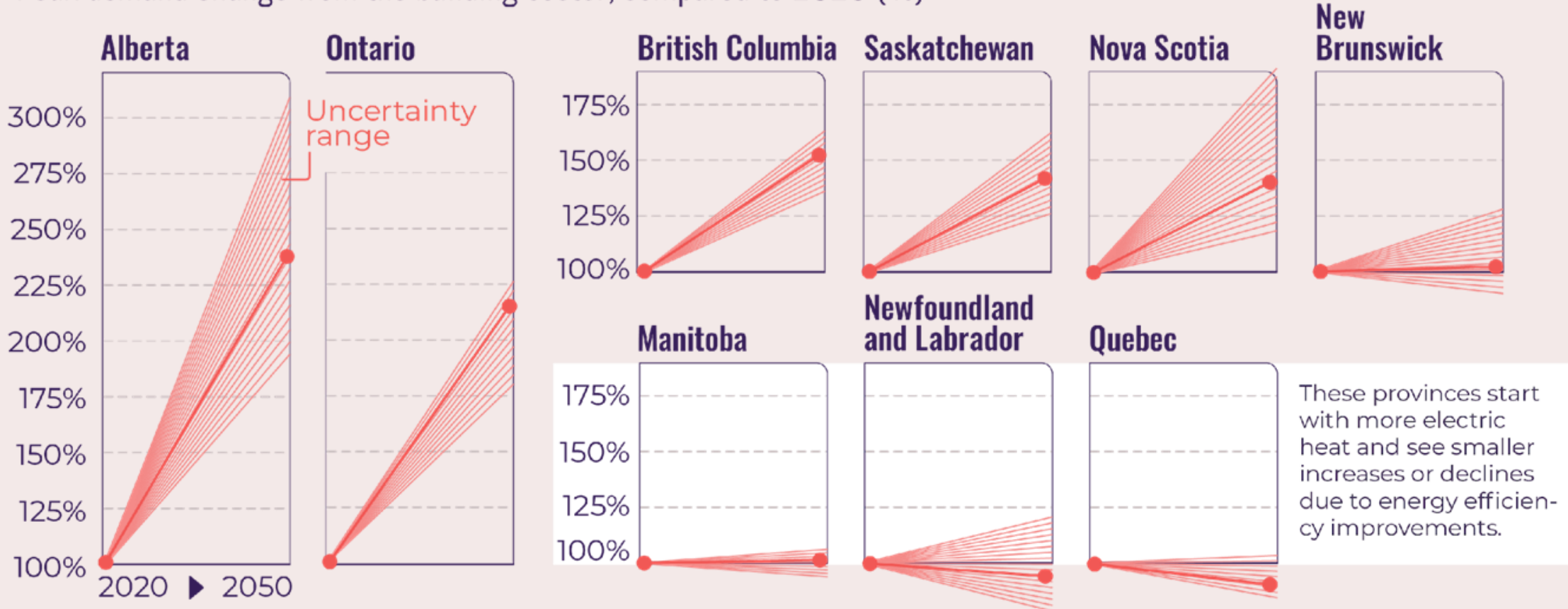


## Alberta



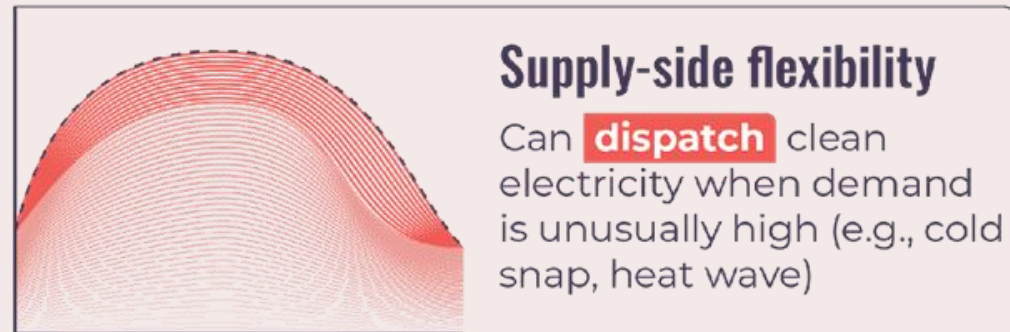
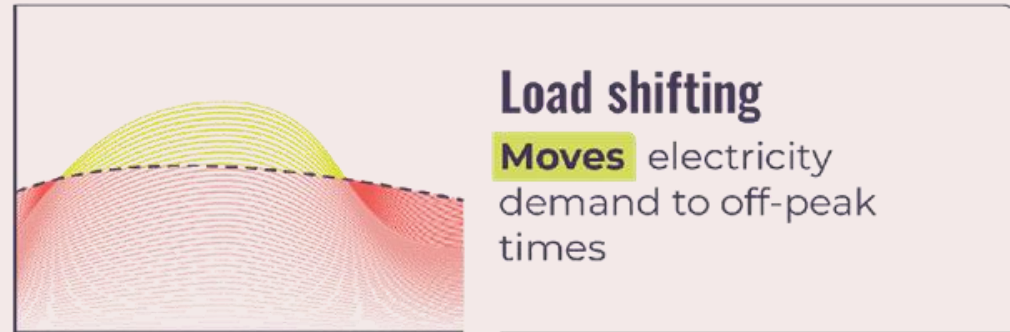
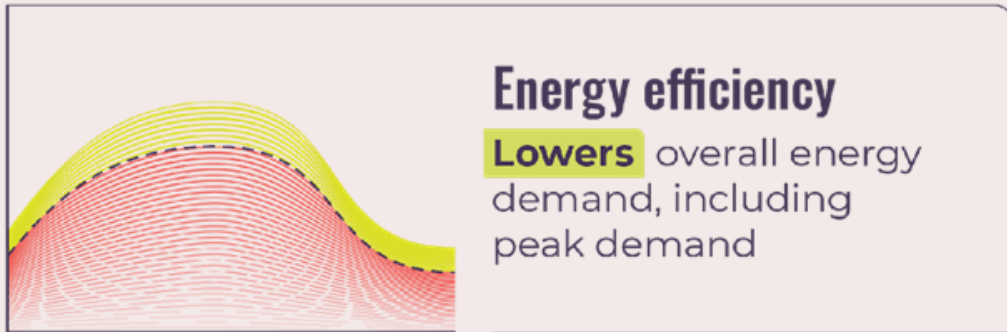
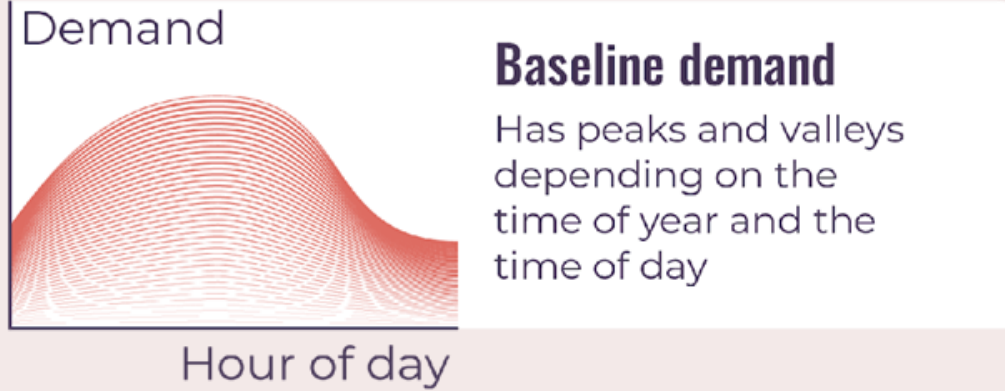
# Impact on peak demand varies by province

Peak demand change from the building sector, compared to 2020 (%)



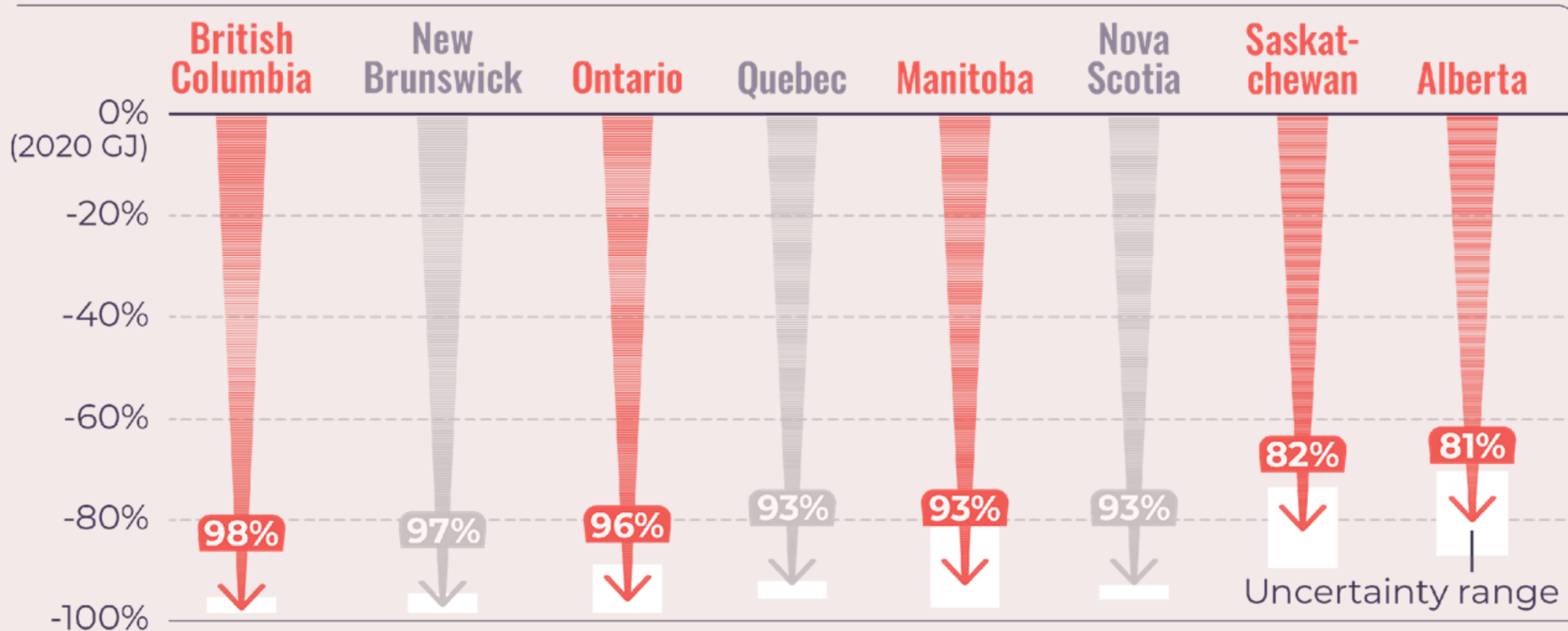


# Tools to manage peak can help mitigate costs



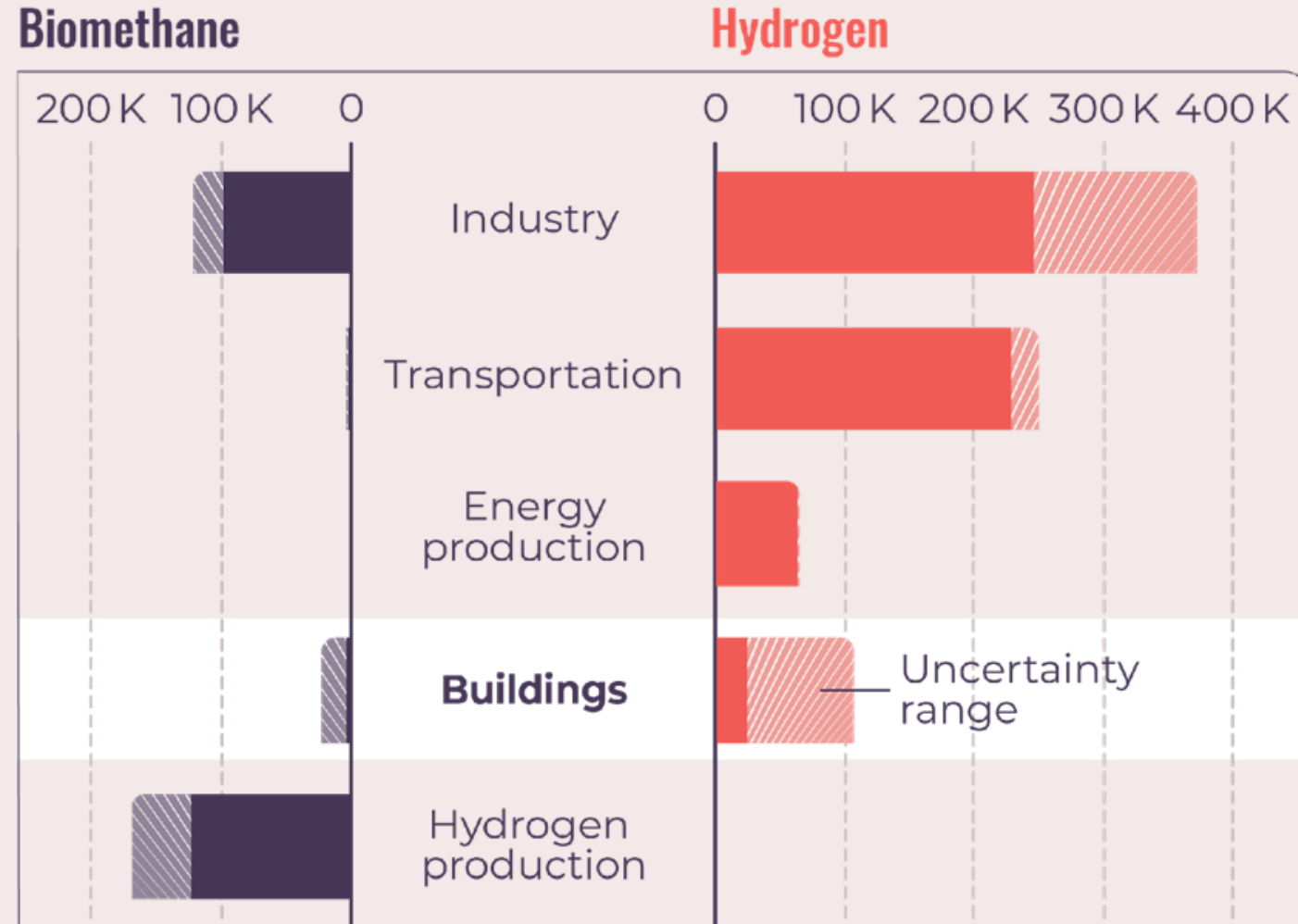
# Gas use in buildings declines in all provinces

2050 gas consumption compared to 2020 gas consumption level (%) | Major gas consumers today



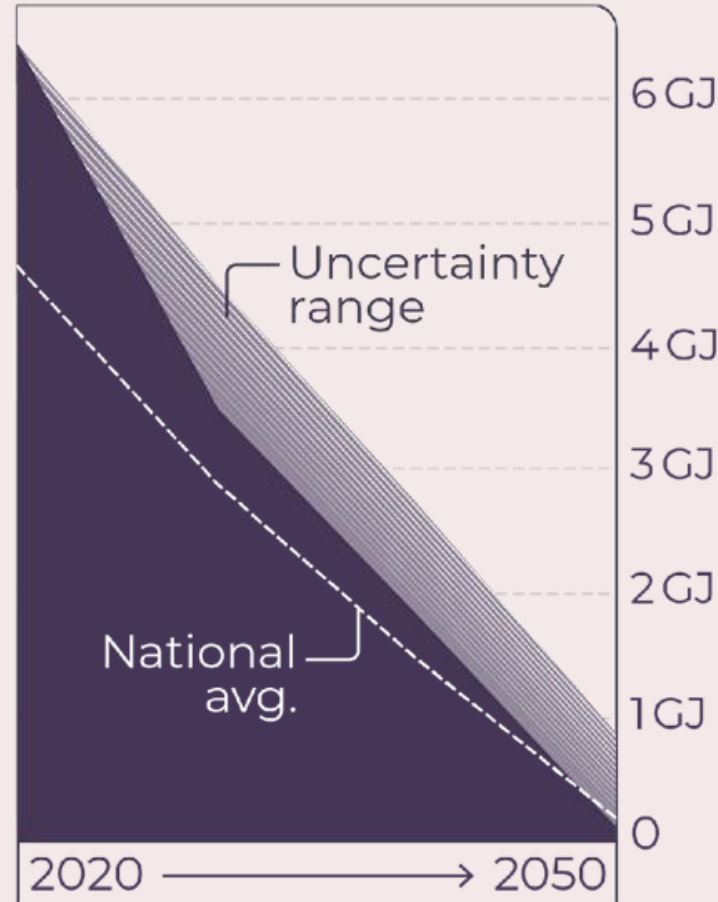
# Building heat is not a cost-effective use of biomethane and hydrogen

Low-emission gas use by sector in 2050 (TJ)

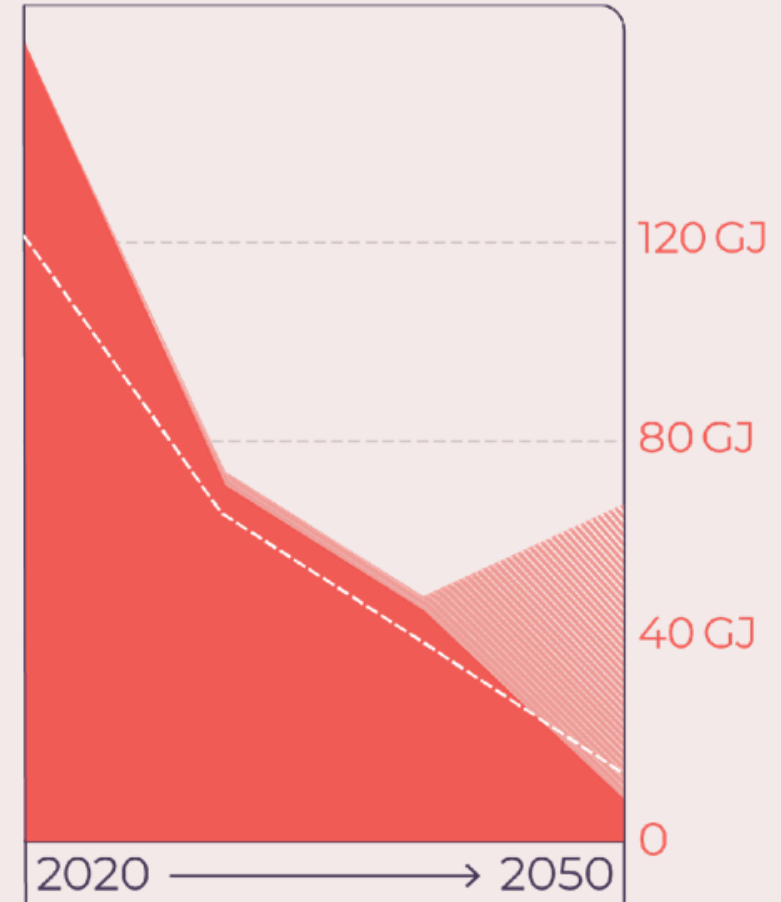


# Hybrid systems play a role in some contexts, but use very little gas by 2050

**ALBERTA | Residential**  
Gas consumption (GJ)/building/month



**ALBERTA | Commercial**  
Gas consumption (GJ)/building/month



Uncertainty in the extent of gas use in the commercial sector widens between 2040 and 2050, but the particular shape of the distribution between 2040 and 2050 is a function of the model's mechanics. GHG reduction requirements in the model tighten over time and the model works in five-year timesteps. In one of the sensitivity analyses, 2040 is the point when cost assumptions result in a shift to more gas use.

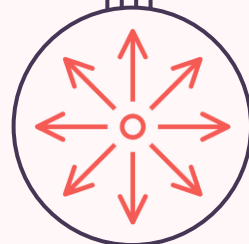


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# A cost-effective clean energy transition for building heat requires overcoming inertia in the energy system



Electricity systems must **grow faster** to meet demand



Gas networks **must stop expanding** in order to cost-effectively reach net zero



Utility regulation **must evolve** to protect consumers through the transition

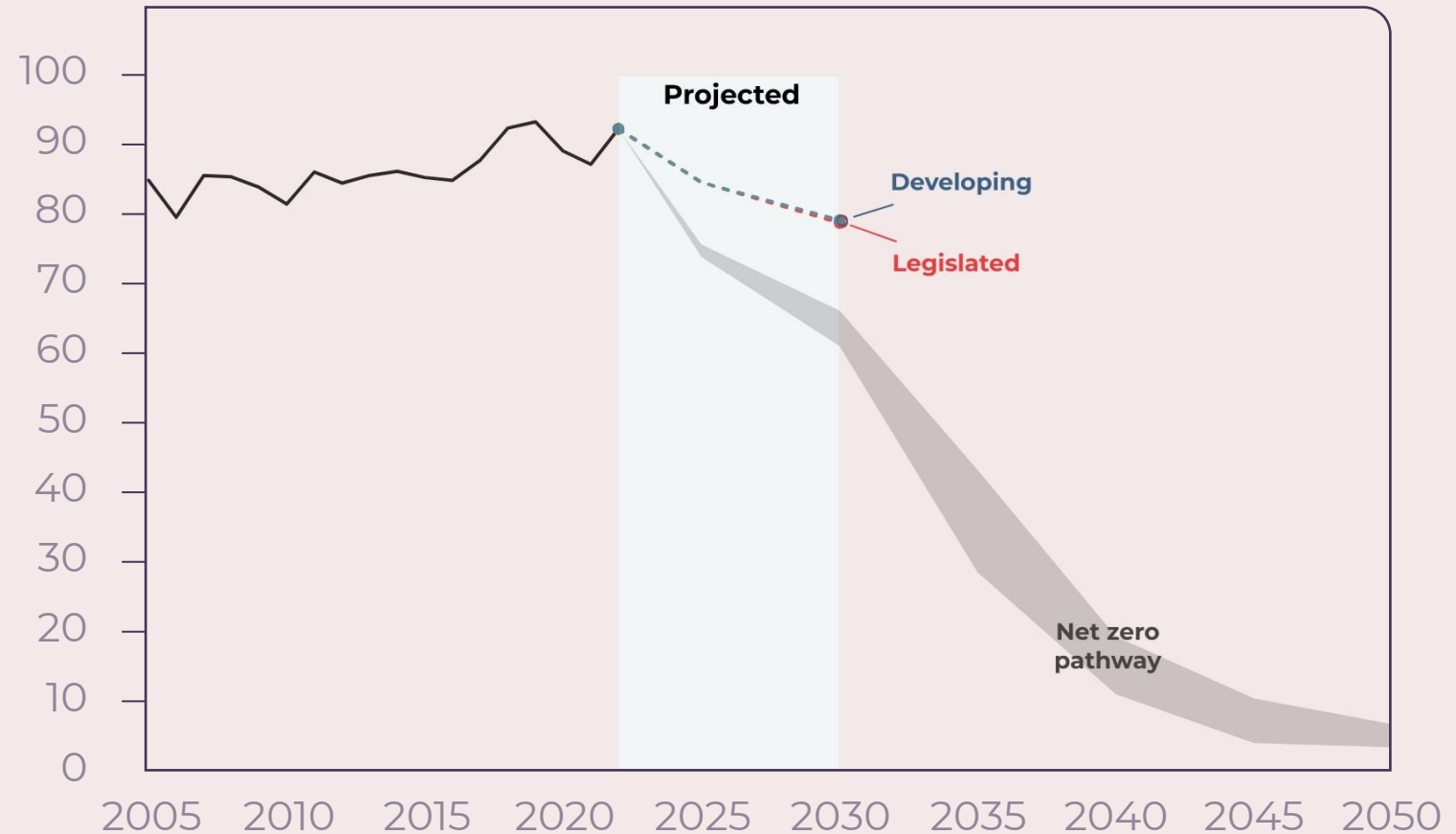
# Policy implications

What path is Canada on now, and what does that mean for policy makers?



# Existing climate policies for buildings are not enough

Emissions in the buildings sector, megatonnes CO<sub>2</sub>e



Source: 440 Megatonnes Emissions Pathway Tracker

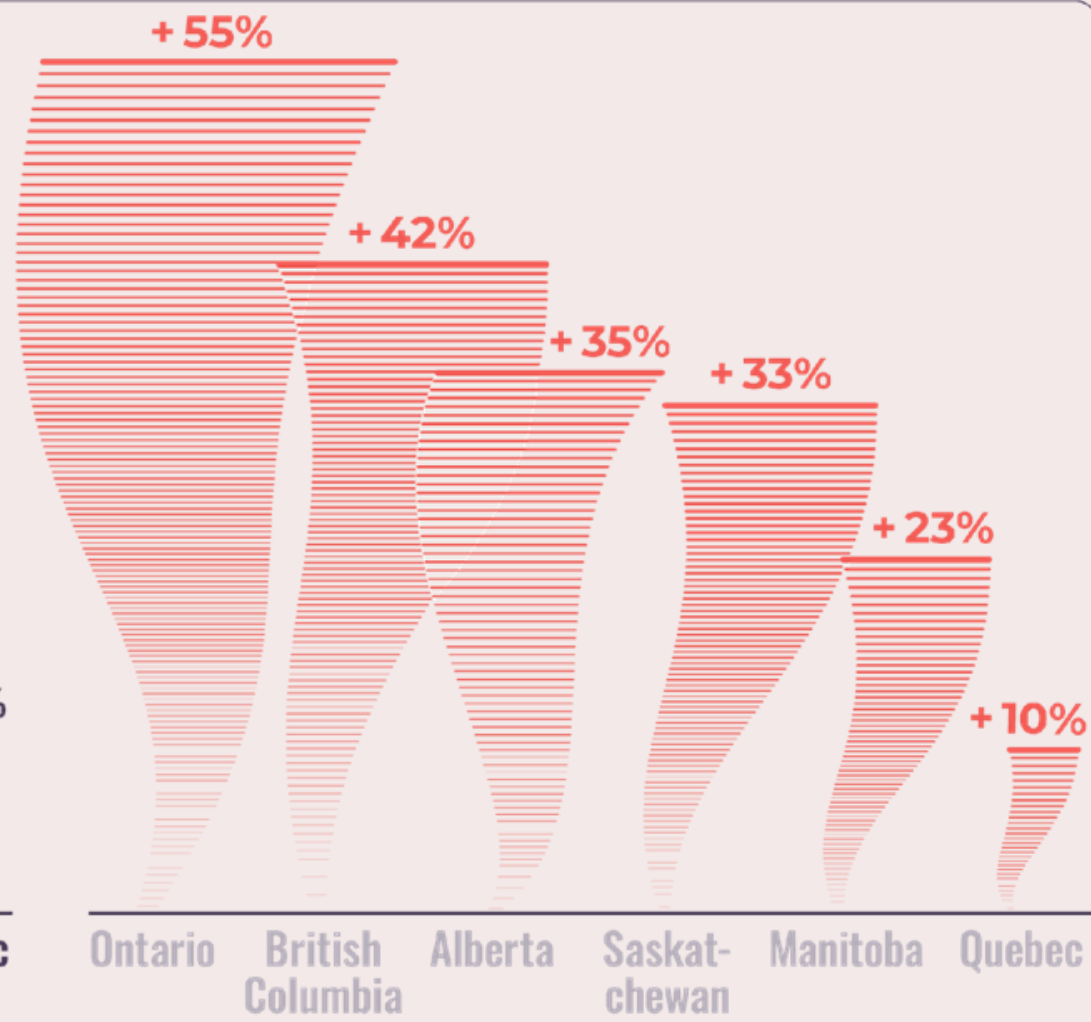
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POLICY  
IMPLICATIONS

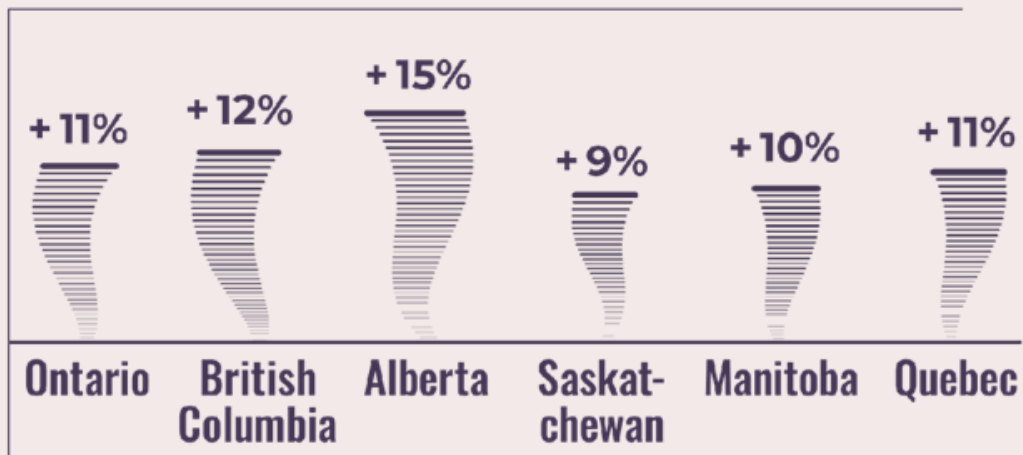


# Under status quo, gas networks are still expanding

Growth of the rate base (\$) from 2013 to 2022 (%)



Growth of customer numbers from 2013 to 2022 (%)





# Two interacting policy problems

**Existing climate policies**  
are insufficient to address  
rising building sector  
emissions

Regulators can't make  
assumptions about  
future policy, so  
are continuing to  
default to gas

MISSING PIECE

**Provincial  
policy  
action**

**Current utility regulation**  
is getting in the way  
of a cost-effective  
transition

Lock-in to gas  
heating is driven  
by this inertia in  
energy system  
development

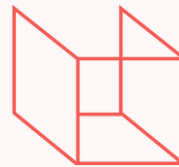


# Energy regulation today

Utility regulators exist **to protect the public interest** – safe and reliable energy, at just and reasonable rates



How climate goals fit in **can be ambiguous**, especially when they aren't sufficiently legislated provincially or translated to energy policy



Regulators **are being cautious** because they are not in a position to make assumptions about future policy



# Utility regulation meets the clean energy transition

This transition presents new challenges that regulators are **not equipped** to address

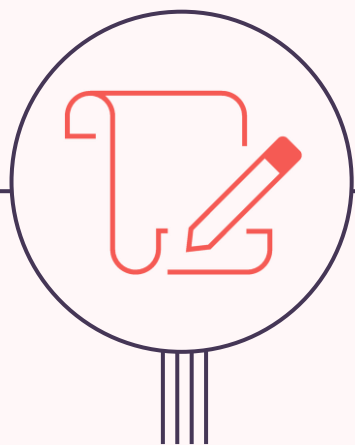


**Gas utilities** have an economic interest to expand the gas network - even if its long-term usage case is uncertain



**Electric utilities** are being cautious

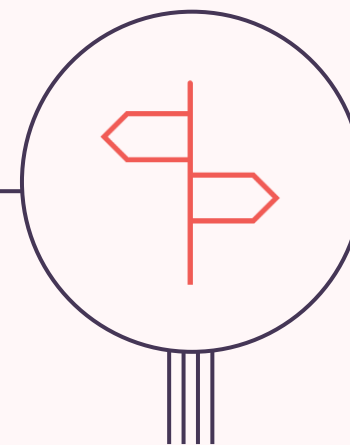
# Contending with energy system inertia



The **gaps in climate policy** are making it hard to protect ratepayers through the transition



Some regulators are beginning to **explore and weigh the risks** that the energy transition presents

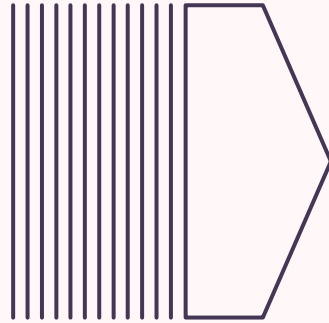


Regulators are up to the job, but need provincial **government direction and guidance**

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# Provincial policy action is the missing piece

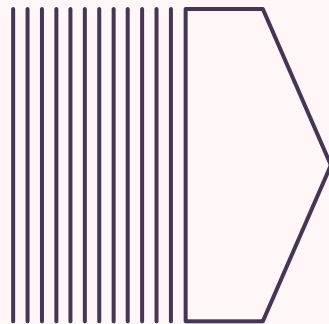
**Existing climate policies**  
are insufficient to  
address rising building  
sector emissions



Emissions from buildings  
**are not aligned** with  
climate goals

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**Current utility  
regulation** is getting  
in the way of a cost-  
effective transition



**Inertia** in energy  
systems is prevailing



# Summary of conclusions



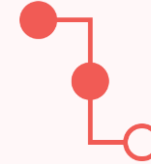
On a cost-effective path to net zero, **electricity** powers most space heating as Canada approaches net zero



Even with hybrid heat, biomethane, and hydrogen, a cost-optimal clean energy transition means **contracting gas networks** in Canada



A **business-as-usual** approach increases the risk of **higher costs**, jeopardizes Canada's climate goals, or both



**Provincial policy** is the missing piece for achieving climate goals while protecting reliability and affordability

# Recommendations

How could policies protect consumers while facilitating the energy transition in building heat?



# 01

## Provincial governments should equip regulators, system operators, and utilities to make decisions consistent with net zero

| *Legislate climate targets*

| *Conduct provincial analysis on paths forward for the energy system for net zero*

| *Publish energy roadmaps on how the jurisdiction will meet its energy needs out to 2050*





# 02

## Provincial governments should stop treating gas system expansion as the default option, and equip regulators to consider alternatives

*Compare new gas infrastructure against alternatives*

*Reform obligation-to-serve requirements*

*Consider mandating new builds to be fully electric (except where suitable net zero alternatives exist)*



# 03

Provincial governments should require gas utilities to provide maps of their networks to facilitate a managed transition that protects ratepayers

*Require information sharing (e.g. at a local level between relevant parties - gas and electric utilities, local municipality)*

*Include age/condition of gas lines (or timelines for pipeline replacement)*



# 04

## All orders of government should strengthen policies to support building electrification, peak management, and energy efficiency

*Standards (building codes, appliance standards)*

*Financial and implementation support (for retrofits and smart systems)*

*Price on greenhouse gas emissions*



# 05

All orders of government should centre equity in policy design and provide targeted support to the most affected

| *Determine who bears the remaining costs and how*

| *Anticipate equity impacts and design solutions to address them*



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# Summary of recommendations

**01** **Provide policy clarity** for regulators, system operators and utilities to drive decisions consistent with net zero

**02** **Stop defaulting** to gas system expansion

**03** **Require gas network mapping**

**04** **Strengthen policy support** for building electrification, peak management and energy efficiency

**05** **Prioritize equity** in policy design



# HEAT

# EX

# CHANGE

How today's policies  
will drive or delay Canada's  
transition to clean, reliable  
**heat for buildings**

Kate Harland, Research Lead  
Sachi Gibson, Research Director  
Jason Dion, Senior Research Director  
June 2024

# Annex



# Previous work on Building Heat

## Reports

## Case studies

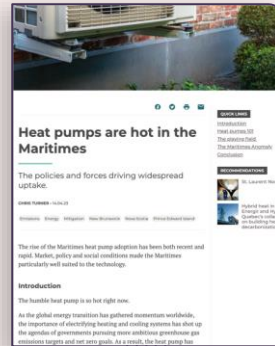
## Blog



Heat Pumps Pay Off



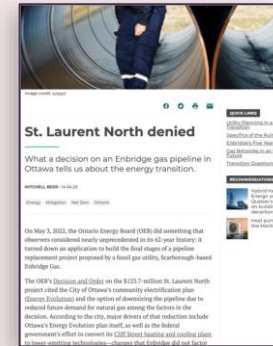
The Cool Way to Heat Homes



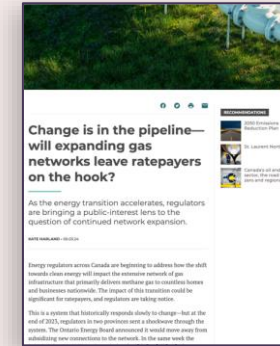
Heat pumps are hot in the Maritimes  
The policies and forces driving widespread uptake



Hybrid heat in Quebec  
Energir and Hydro-Quebec's collaboration on building heat decarbonization



St Laurent North Denied  
What a decision on an Enbridge Gas Pipeline in Ottawa tells us about the energy transition



Change is in the pipeline  
Will expanding gas networks leave ratepayers on the hook?

