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# Canadian Energy Outlook

— 2018 —

*horizon 2050*

**IET** INSTITUT  
DE L'ÉNERGIE  
TROTIER

**e3Hub** | Expertise in Energy  
and Environment  
HEC MONTRÉAL

Modelling

**ESMIA**  
Energy Super Modelers  
and International Analysts

Financial support

FONDATION FAMILIALE  
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# Energy Outlook Scenario

- Scenario : neither a prediction of the future, nor a forecast, but an **image** of a possible future.
- A scenario is based on a **coherent set of assumptions**.
- A scenario can be **descriptive** (plausible evolution of the energy sector given the assumptions made) or **normative** (the evolution considered meets a societal ideal).
- We develop **normative scenarios** of the energy sector evolution, using mathematical formalism (model of the MARKAL / **TIMES** family).

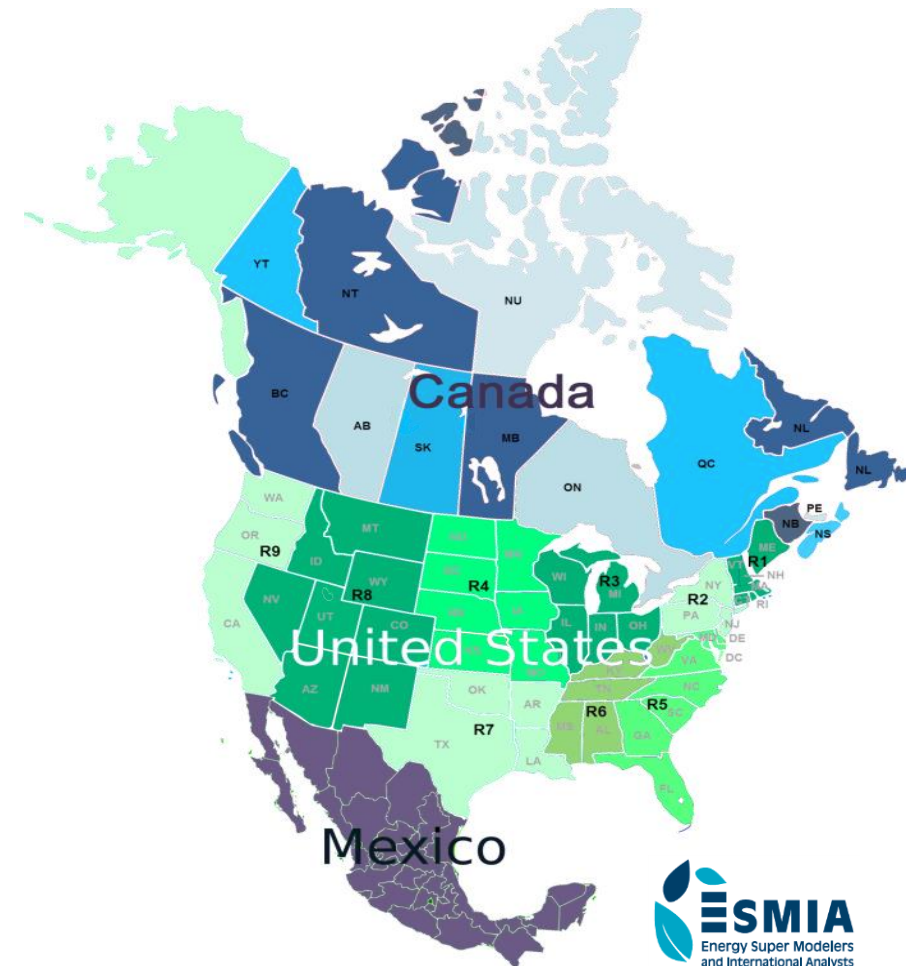
# MARKAL / TIMES Models

- Developed by the **Energy Technology Systems Analysis Programme (ETSAP)** of the **International Energy Agency** since 1978.
- Long history of methodological developments and applications in nearly **70 countries** around the world.
- Provide a common platform to examine the possible evolution of their energy systems in response to **technological developments** and **energy or climate policies**.
- **Users** : governments, industries, universities and consulting firms
- **ESMIA** developed **NATEM**

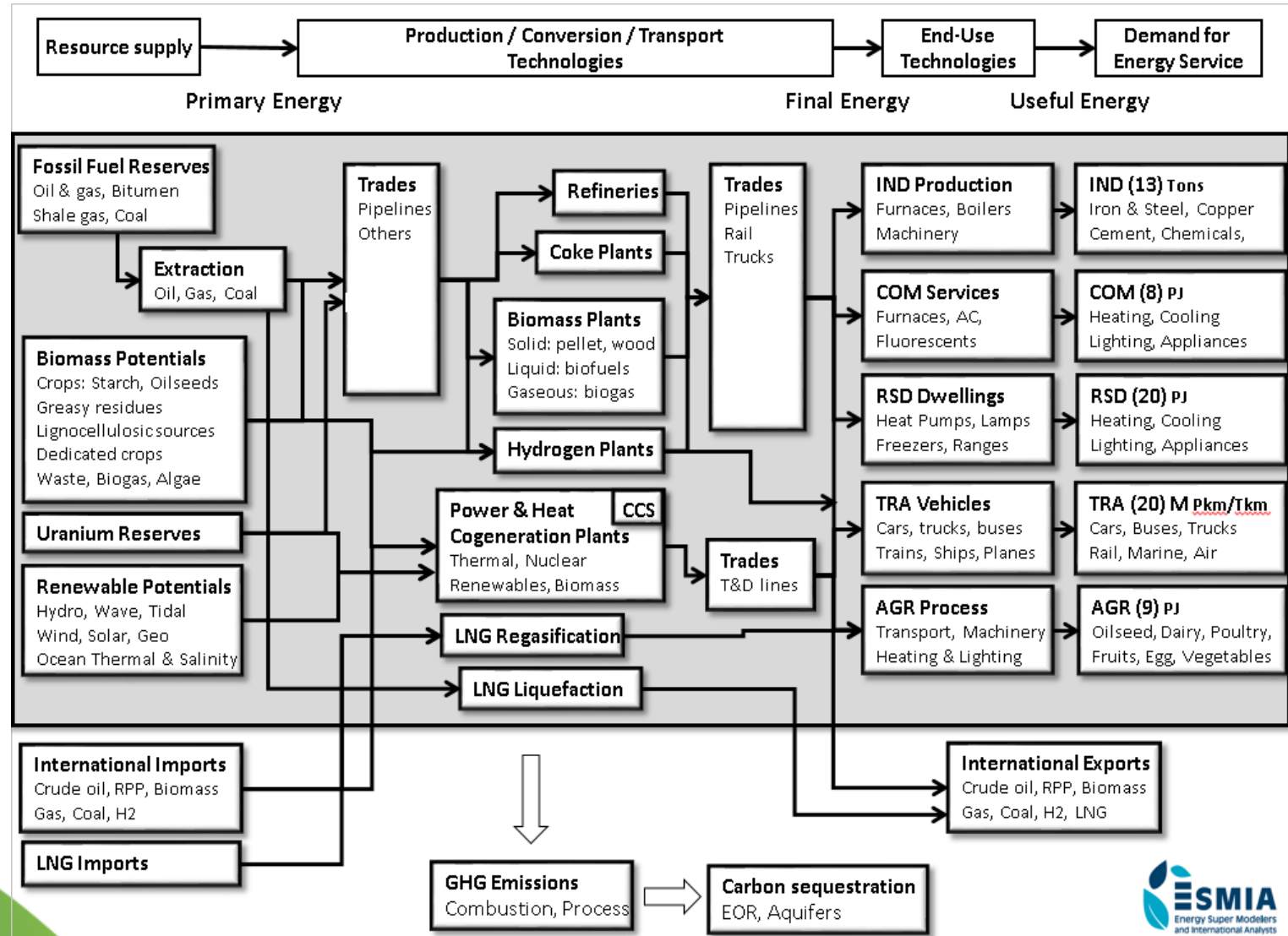


# NATEM

- **NATEM** : *North American TIMES Energy Model*
  - **optimization** model: the model minimizes costs to meet energy service demands
  - follows a **techno-economic** approach: contains more than 4500 technologies characterized by technical and economic parameters
- **NATEM-Canada** :
  - projection to horizon **2050**
  - details the energy system of Canada's 13 provinces and territories



# NATEM-Canada



# Scenarios in this Outlook

- **BAU** : Business-As-Usual or reference scenario
  - Does not use GHG reduction targets and only incorporates current constraints
  - Corresponds to the baseline scenario used in the NEB's "Canada's Energy Future 2017"
- **PRO** : Provincial scenario
  - This reduction scenario imposes individual provincial targets for emissions – when they exist.
- **FED** : Federal scenario
  - Uses federal government's stated 2030 and 2050 targets (30% and 80% reduction with respect to 2005)
  - All reductions must be achieved domestically.
- **FIM** : Federal scenario with International carbon Market purchases
  - Same as FED
  - 25 % of these reductions come from international carbon market purchases, in line with Canada's recent 7th National Communication and 3rd Biennial Report submitted to the United Nations Framework Convention on Climate Change.
- **80P** : 80 Percent scenario
  - 80% reduction by 2050, but this time from 1990 levels, (83% reduction with respect to 2005)

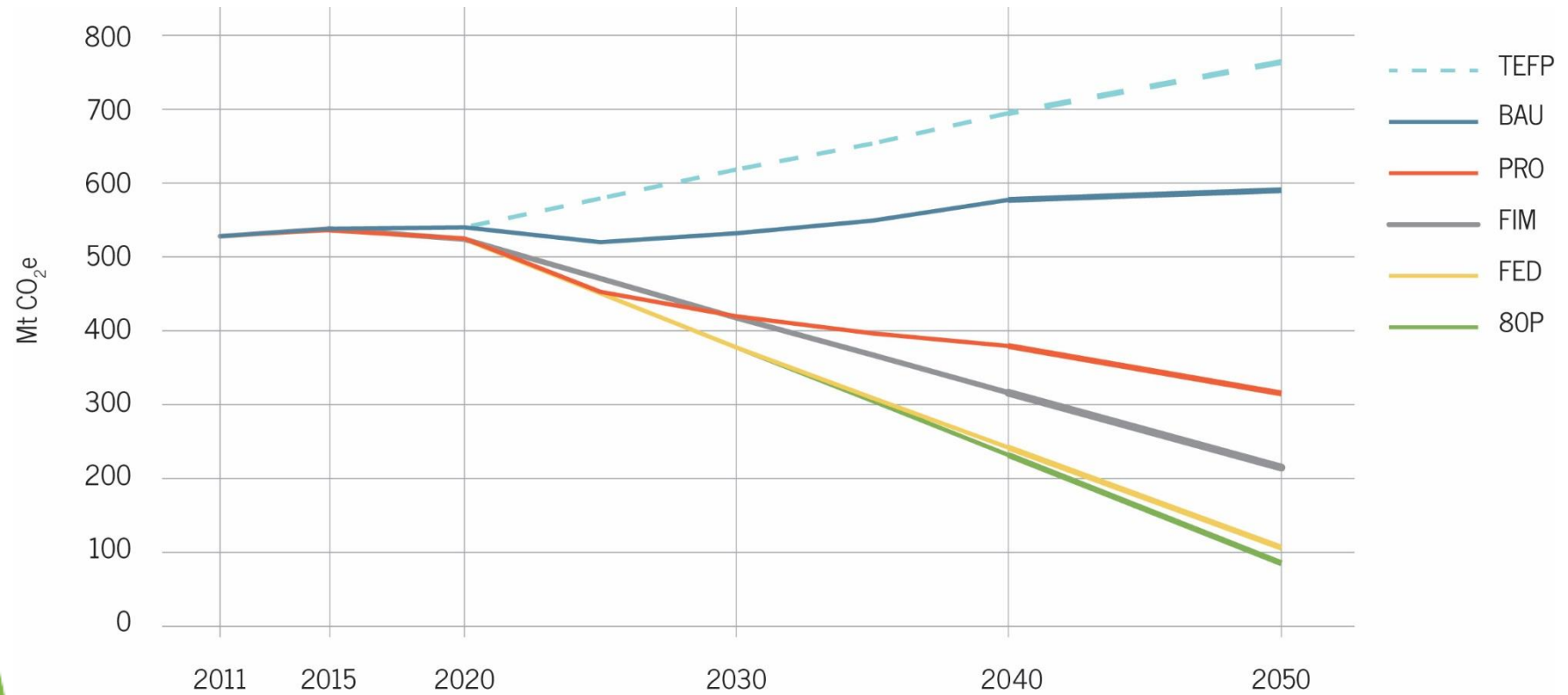
# Modelling Results

Canada can achieve the ambitious goal of -80% GHGs in 2050 without affecting the satisfaction of energy services.

This goal, like the intermediate GHG targets, will be missed by a lot unless there is a significant turnaround.

# GHG Emissions

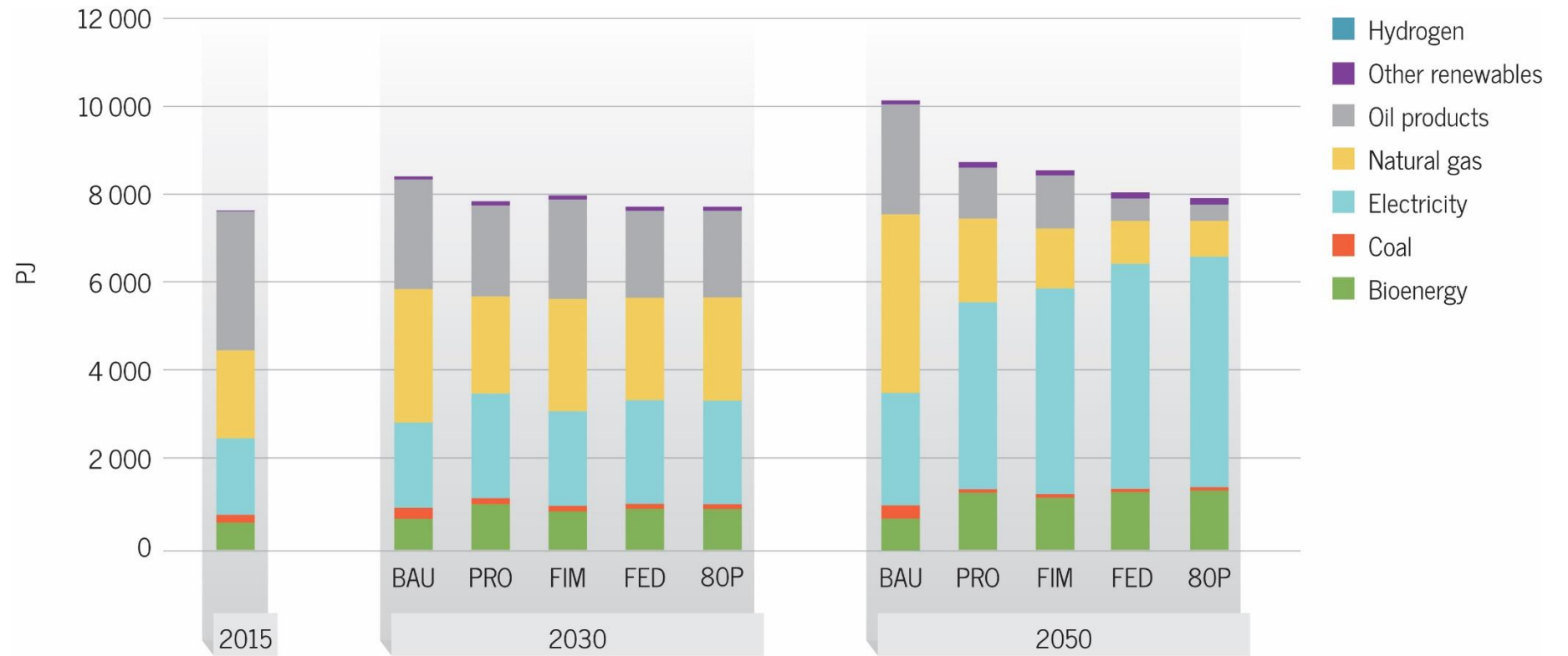
## Energy-related GHG emissions





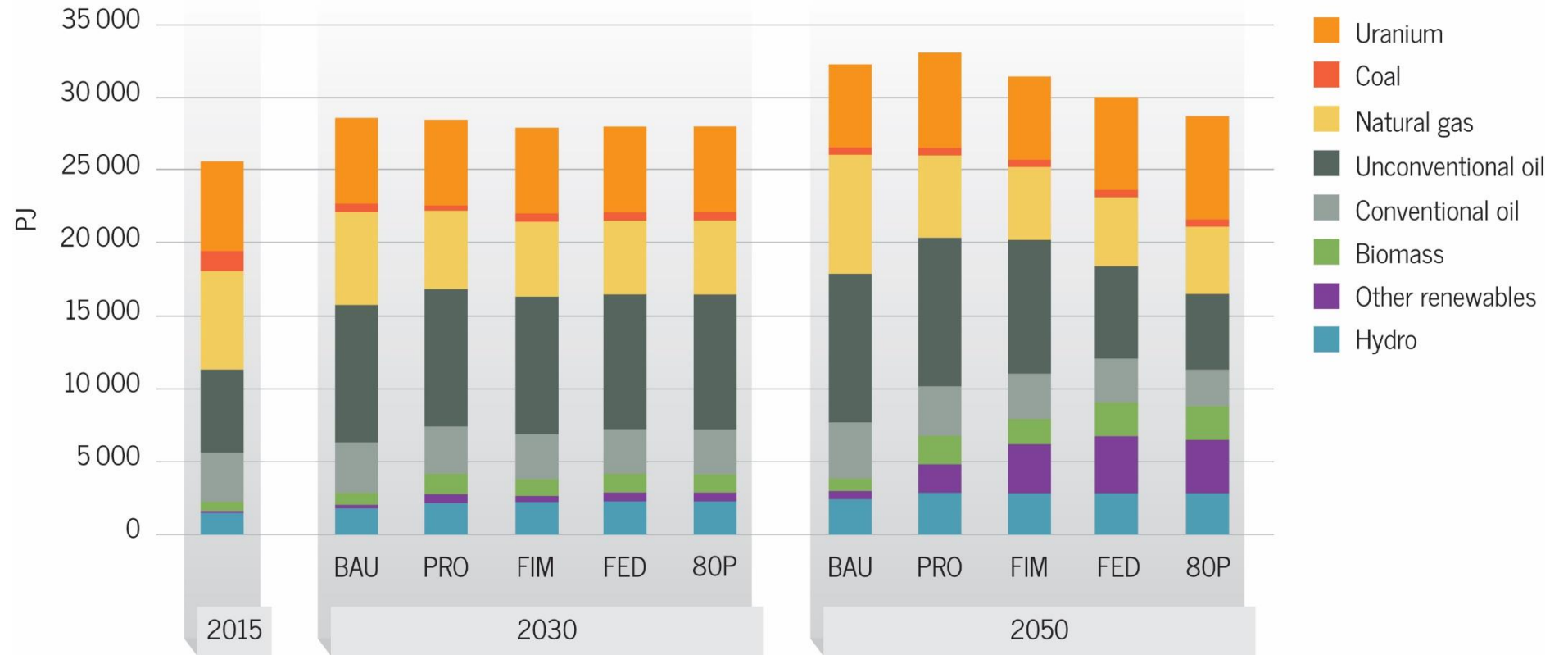
# Demand Evolution

Final energy consumption by source



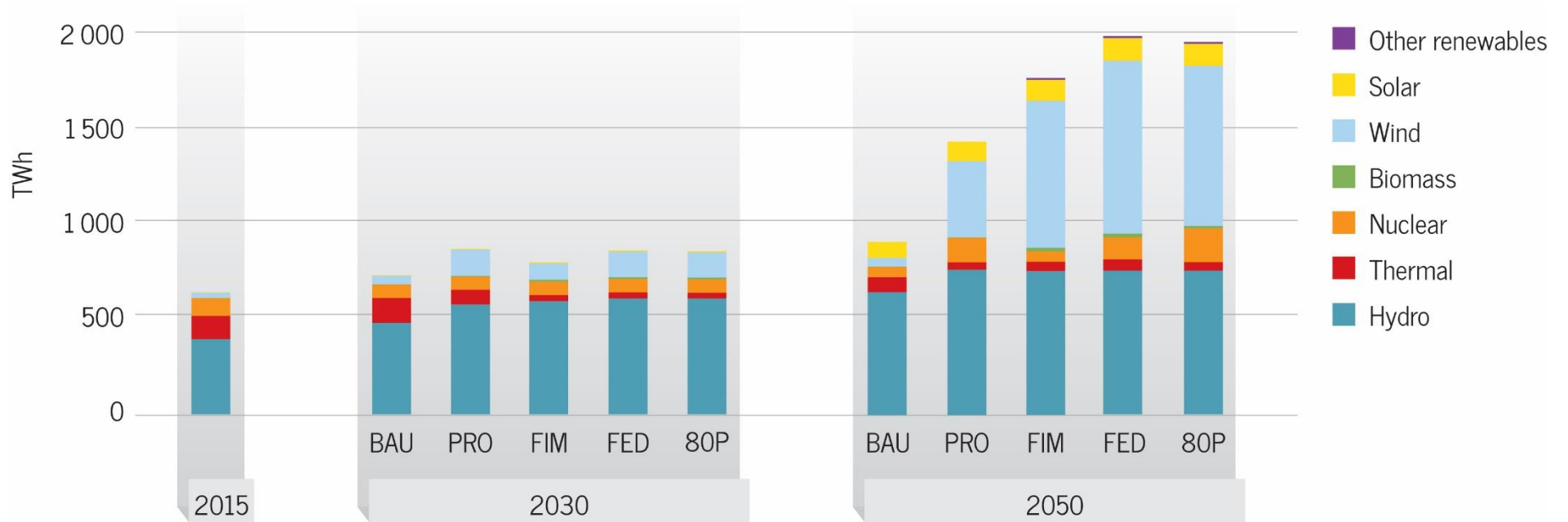
# Production and Trade

## Primary energy production



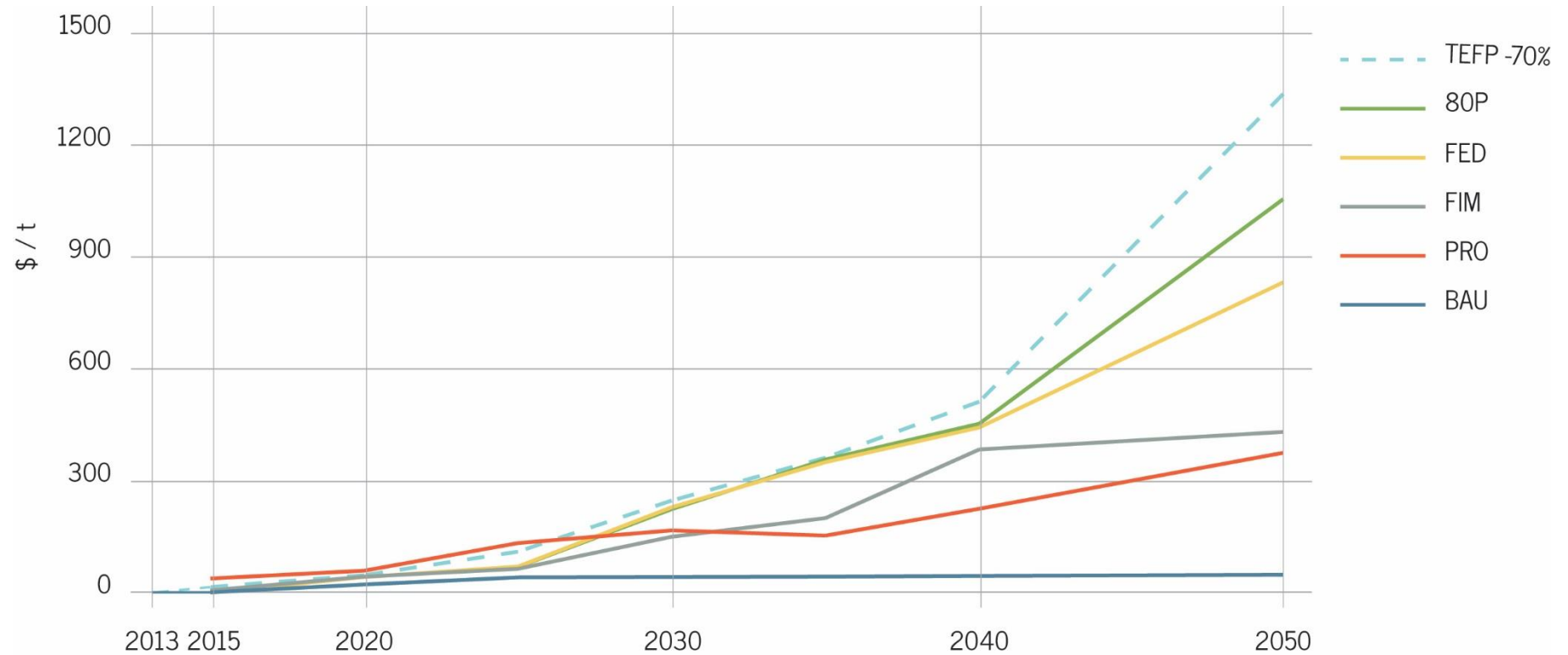
# Electricity

Electricity generated by source



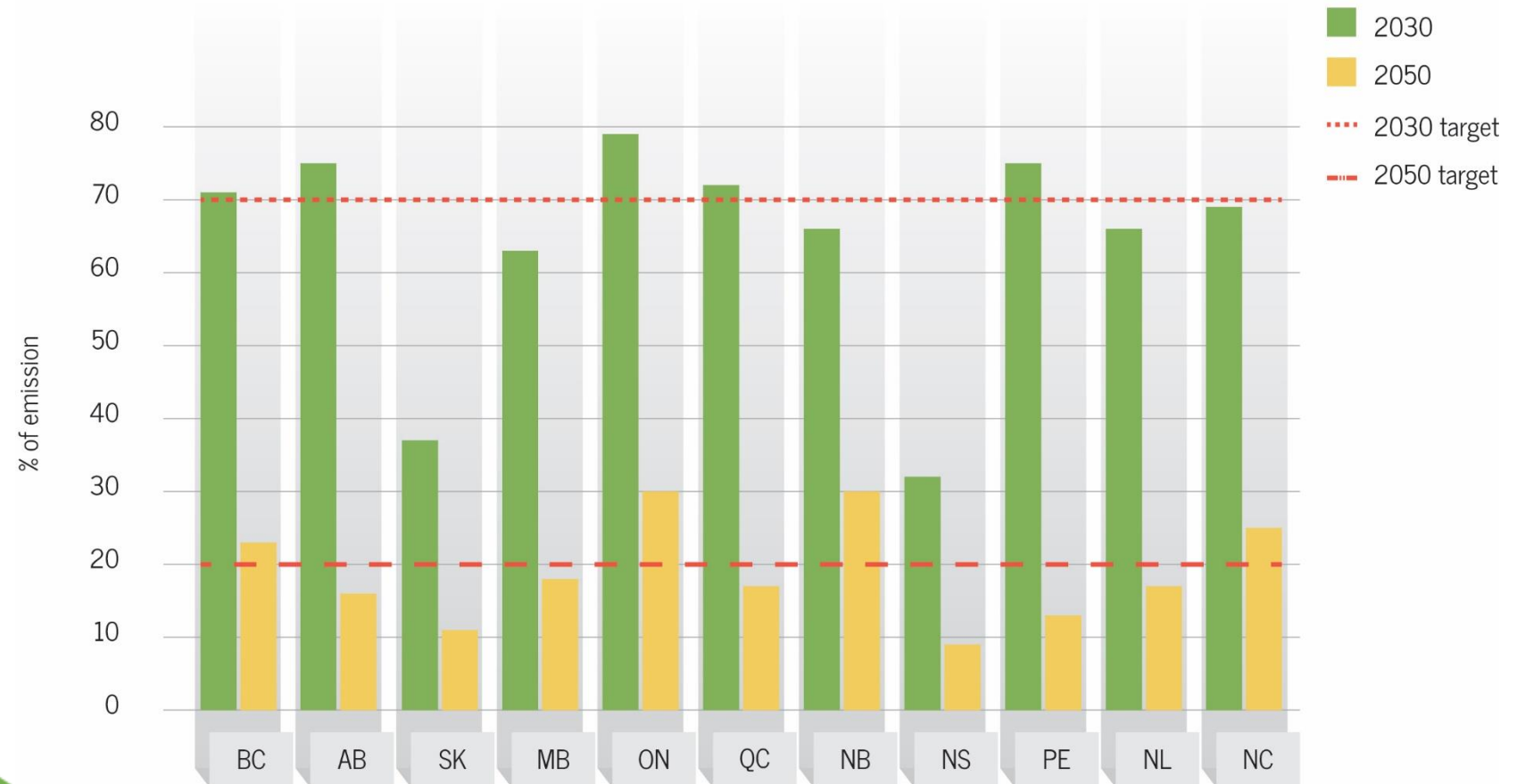
# Marginal Reduction Costs

Marginal reduction costs



# Provincial Reduction Efforts

Provincial percentages of emissions with respect to 2015 for the FED scenario



# Some Analysis Key Points

- General lack of detail on how to achieve the stated objectives.
- Even if current policies work as intended, Canada will still fall short of its 2030 GHG reduction target by 30%.
- As recent developments have shown, disagreements between the provinces and the federal government will add to the difficulty.
- This inconsistency creates a climate of uncertainty that prevents Canada from taking advantage of the economic opportunities of transition.
- Many promising avenues for the federal government to facilitate cooperation on challenges that cut across provinces.

# Conclusions

Unless Canada's energy pathway becomes clearer, it will remain difficult for investors to accurately evaluate the costs of the various options and to make the most cost-effective decisions from both short- and long-term perspectives.

A long-term vision from a public dialogue is needed to fill the gaps in current political efforts and realize the enormous potential of this transformation.

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