CanESS: Canadian Energy Systems Simulator

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INTRODUCTION

CanESS is an integrated, multi-fuel, multi-sector model with detailed accounting for the sources and uses of energy and the GHG emissions across Canada. It is a dynamic tool for scenario analysis with a long-term horizon, and therefore a platform for exploring energy system transformations.

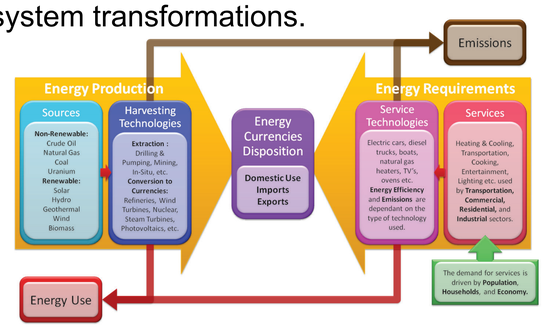


Fig. 1. The energy system underlying the design of CanESS.

MODEL BASICS

Space: Disaggregated by province and accounts for energy production, use and trade for all fuels and feedstocks.

Time: Calibrated with observed historical data from 1978 to the present, and enables projection of scenarios forward in one-year time steps to 2050 and beyond.

Technology: Present-day and future harvest, conversion and service technologies are explicitly represented.

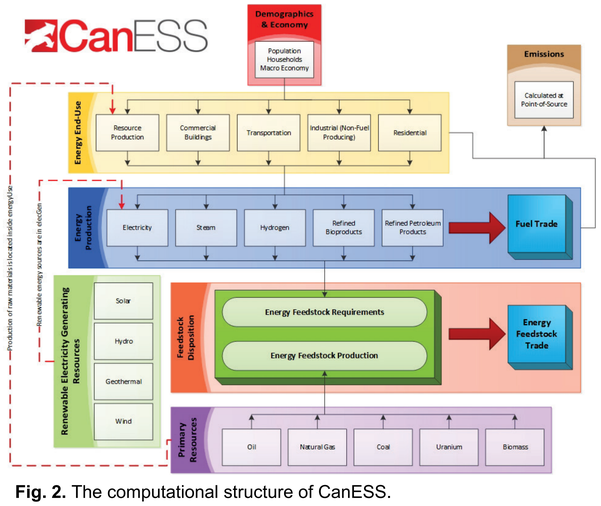


Fig. 2. The computational structure of CanESS.

MODEL QUALITIES

PHYSICAL & BEHAVIOURAL

The model design emphasizes a clear separation between physically coherent systems simulation and alternative models of institutional behaviour.

HISTORICALLY CALIBRATED

Our team assembles and processes energy data to produce a complete and coherent historical time-series energy database for Canada.

SCENARIOS & TRANSPARENCY

Built on the whatIf? Modelling Platform, CanESS offers transparency, flexibility, data visualization and scenario management.

BUILT WITH OPEN DATA

Data sources used for calibration and the reference projected scenario are public so the model may serve as a platform for open discussion and analysis.

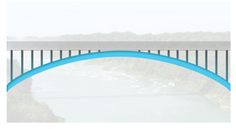
MODEL CAPABILITIES

STRATEGY DEVELOPMENT

Where do you want to go? Work towards goals and chart various energy system trajectories in so doing. Strategic themes may include low-carbon futures and energy independence.

ENERGY SYSTEMS LITERACY

Simulation models are powerful tools for understanding complex systems. CanESS - currently used to support several energy systems literacy initiatives - is available as an educational tool.



POLICY DEVELOPMENT

How do you want to get there? Examine existing or proposed policies and project their likely impacts and implications. Policy themes may include energy efficiency standards, technology assessment and fuel switching.

HISTORICAL DATABASE

The product of our rigorous calibration process is a complete and coherent time-series database back to 1978 which describes the evolution of Canada's energy system.

CANESS IN ACTION

TROTTIER ENERGY FUTURES PROJECT

To determine how Canada can dramatically reduce its greenhouse gas emissions, CanESS is one of the key tools for analysis in this research and modelling effort.

BEHIND THE SWITCH

To examine how scaling back Ontario's plans to develop renewable energy would affect electricity prices, The Pembina Institute used CanESS to compare two main scenarios.

YOUR ENERGY STORY

Have you ever wondered how all the energy you consume gets used - or where it comes from? This energy literacy website uses CanESS data to answer these questions.

CITY OF CALGARY ELECTRIC VEHICLE DEPLOYMENT STRATEGY

EV scenario models were compared with a reference scenario and used to calculate changes in emissions of greenhouse gases, criteria air contaminants and demand for oil.

ACKNOWLEDGEMENTS

The CanESS model has been developed over the past 20+ years with the input, data resources and advice of dozens of individuals who have been interested in what this model can do to inform policy and investment decisions. Thank you!