

Approaches for Understanding the Impact of RD&D Programs

Lessons learned from a pilot impact assessment by
Natural Resources Canada's Office of Energy Research and Development

*Prepared for the IEA Committee on Energy Research and Technology,
Experts' Group on R&D Priority Setting and Evaluation*

Oct. 29, 2021

Background

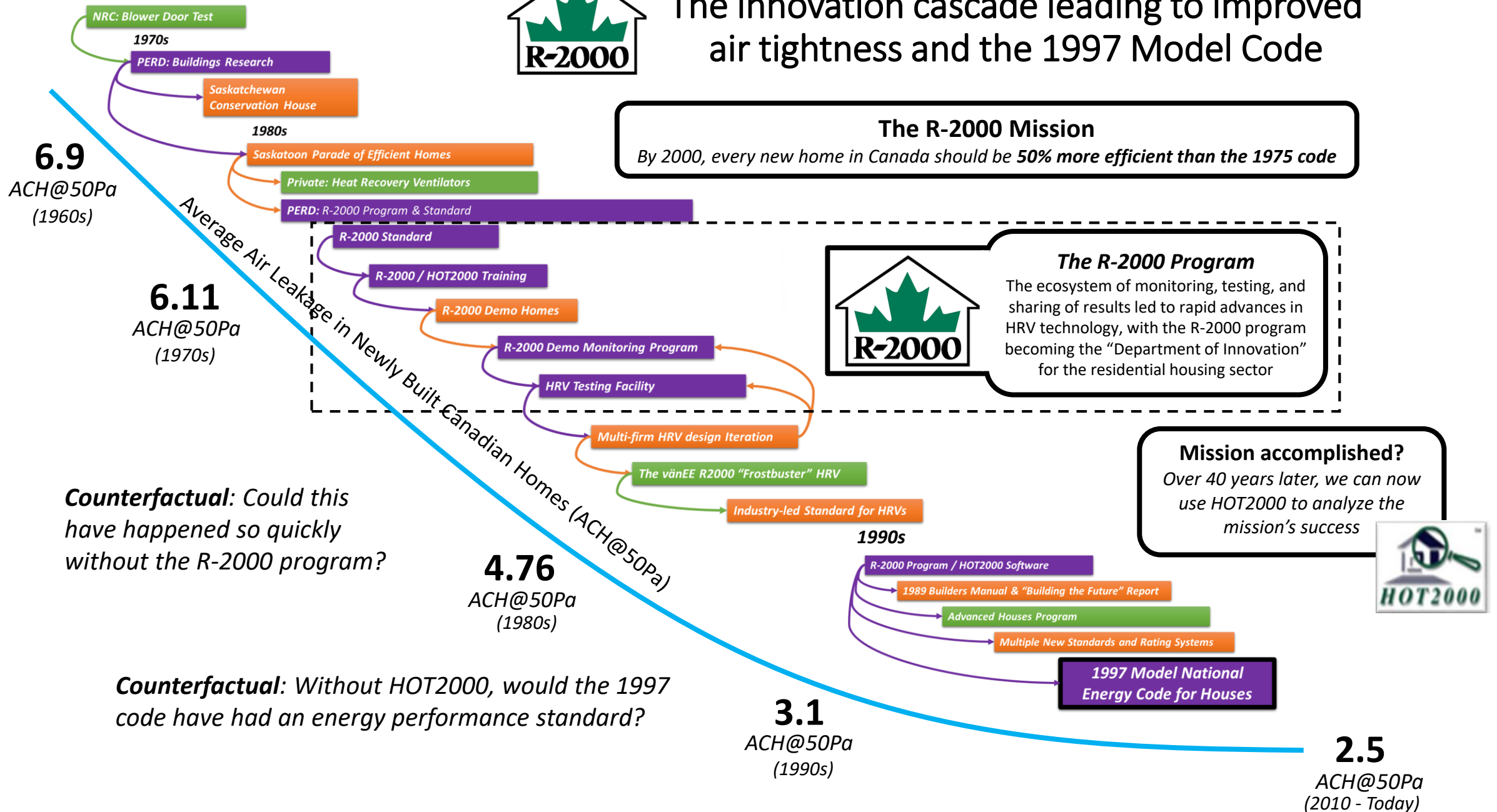
- ▶ Objectives of pilot impact assessment approach:
 - ▶ To identify and test **methods, tools, frameworks** to capture the impact of programs and activities over time
 - ▶ Experiment with new approaches for **telling the performance story**
 - ▶ **Understand impact in two key RD&D areas** beyond the scope of time-limited program evaluations and corporate reporting (1-5 year cycles), focussing on multi-decadal time horizons
- ▶ Worked with OERD directors and S&T Advisors to identify research areas:
 - ▶ **Residential New Construction** 
 - ▶ **Carbon Capture, Utilisation, and Storage** 

Approach

- ▶ Methods employed include:
 - ▶ Review of historical documentation on past investments (including metrics and KPI data that was available*)
 - ▶ Key informant interviews, heavily respondent-driven
 - ▶ Longitudinal narrative assessment
 - ▶ Patent citation analysis
- ▶ Broad initial scope, narrowed based on result of initial interviews
- ▶ Reports and analysis (quantitative and qualitative) by professional evaluators
- ▶ Identification and communication of key results by internal experts



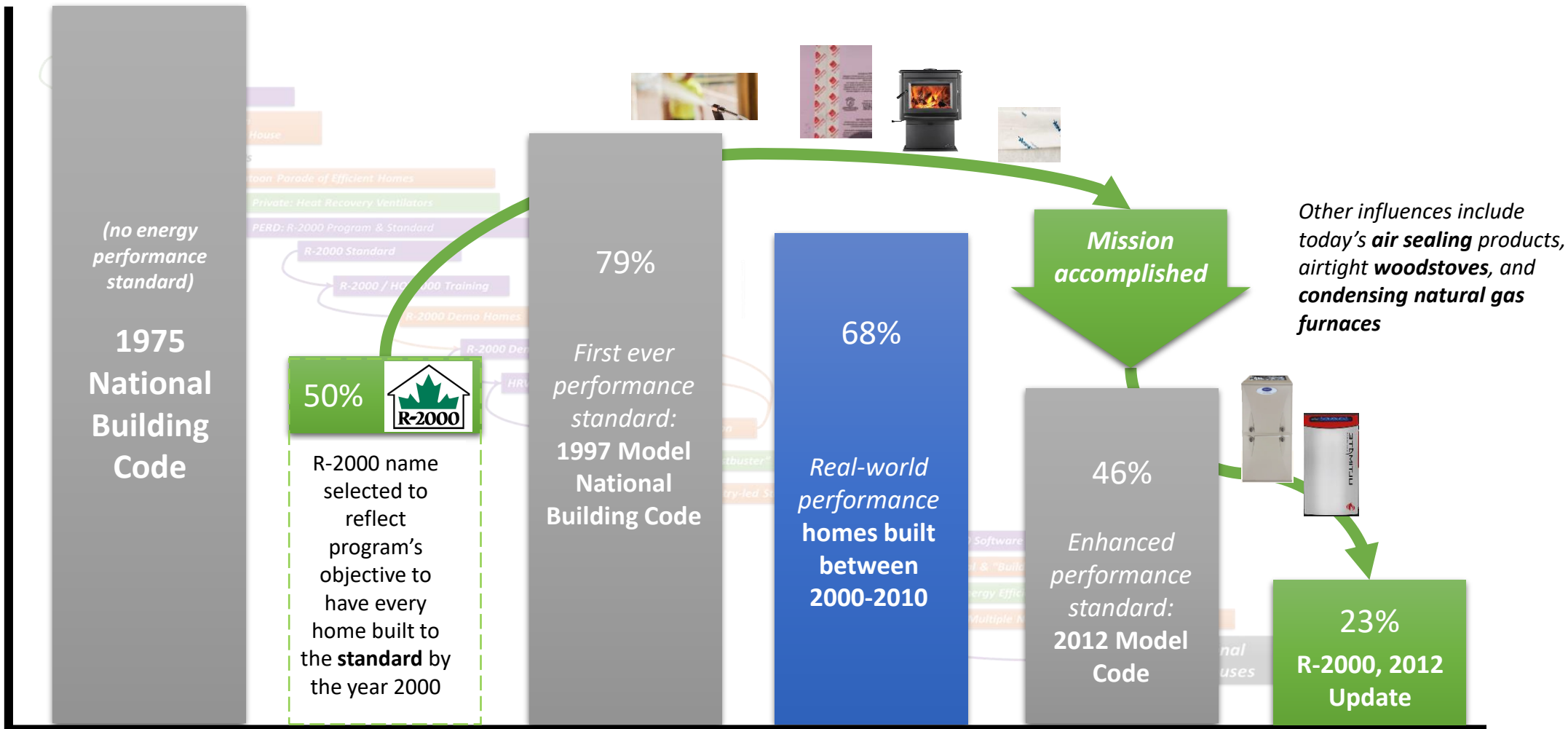
The innovation cascade leading to improved air tightness and the 1997 Model Code





Measuring the Mission - an outcomes-based approach

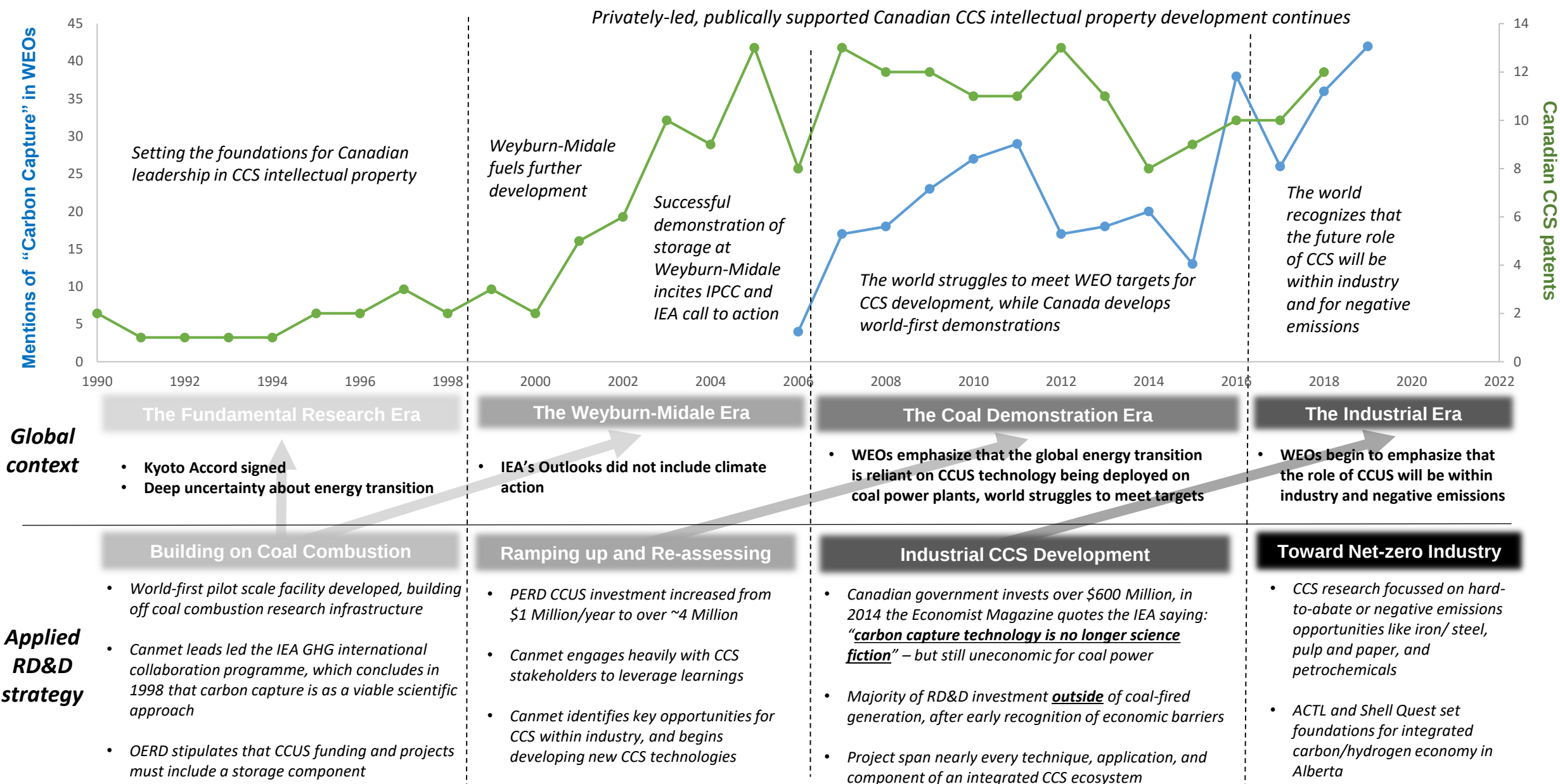
Average Energy Needs for New Homes in Canada



Results based on detailed, national-scale, building energy modelling using CanmetENERGY Ottawa's Housing/Building Technology Assessment Platform, itself based on the HOT2000 software



Canadian innovators have set the scientific context for each era of CCUS investment



Lessons Learned: There is no “magic” indicator

- ▶ Important to complement KPIs identified upfront (e.g. patents, publications) with developmental evaluation based on ongoing and consistent communication between evaluation analysts and researchers
 - ▶ It would have been impossible to pre-select the most important metrics (i.e. ACH@50Pa, energy performance baselines) resulting from building RD&D investment, as the metrics themselves were RD&D Outcomes
 - ▶ Reporting approaches can pursue discovery of these types of metrics and targets in process, and can link program outcomes more effectively with rigorous analysis (e.g. building simulation modelling)
- ▶ Linking both types of indicators with stories and visions puts investments in both current and potential future context
 - ▶ Ability to envision potential counterfactual scenarios (i.e. storytelling), including technical knowledge of energy system pathways, must be part to RD&D evaluation practice
 - ▶ Technology mapping can clearly elucidate how RD&D programs have influenced system level outcomes, including retrospectively mapping along cascades, and prospectively mapping against projected innovation pathways
- ▶ Important to acknowledge and discuss potential for failure and unexpected outcomes in planning RD&D programs and policies, and linkages with non-RD&D policies to create impact at the system level and acknowledge spillovers
 - ▶ This allows for a more nuanced perspective on program accountability - it is critical that programs demonstrate impact, but important to recognize that the potential impact identified upfront may be different than the final impact of the program
- ▶ Understanding past successful investments (like in residential new construction) can help understand the process of innovation in other program areas

CCUS can learn from R-2000: leveraging mature technologies to promote system-level innovation

