



## David F. Shipley

### Senior Consultant

#### Experience Overview

David Shipley has over 25 years of experience as an energy engineer. His areas of expertise include: stock-and-flow models for energy efficient buildings and technologies, load forecasting, CDM potential estimates, building energy modelling, building commissioning, building energy systems, energy efficiency, renewable energy, energy and environmental systems modelling, and demand-side management. Mr. Shipley recently served on the expert panel for the 2019 Ontario Achievable Potential Study, as a recognized national expert on these studies.

In recent years, Mr. Shipley has coordinated the residential sector analysis for conservation potential studies for electric and gas utilities in six provinces, and has developed modeling tools used for analysis by the commercial and industrial teams in these studies. This has led to the development of Posterity Group's Navigator™ suite of energy and emissions simulation tools. He has also conducted market studies on building commissioning, HVAC and lighting technologies for commercial buildings, and efficient equipment for industry. Before joining Posterity Group, Mr. Shipley was a Senior Consultant in energy efficiency with ICF/Marbek, and Project Manager with the Energy Center of Wisconsin.

#### Select Project Experience

##### *Conservation Potential and High Efficiency Buildings*

Conservation Potential Study: Pacific Northern Gas (August 2021-November 2021). Posterity Group is developing a Conservation Potential Review study for Pacific Northern Gas. This analysis will build on resource planning and conservation potential work Posterity Group has recently completed in BC, including FortisBC's 2021 CPR. It will support adjustments to PNG's current portfolio of DSM programs and PNG's 2023 DSM Plan and Resource Plan filing. Dave is acting as Technical Lead and Residential Advisor.

2021 Conservation Potential Review: FortisBC Energy Inc. (January 2020-September 2021). FortisBC's 2021 Conservation Potential Review Study (CPR) will support two of FortisBC's major regulatory filings in 2022: the long-term gas resource plan (LTGRP) and the demand side management plan. Posterity Group will estimate BC's technical, economic and market potential savings over a 20-year period for natural gas using its Navigator Energy and Emissions Simulations Suite™, which enables complex, multi-variable modelling, detailed scenario exploration and solution optimization. The CPR is an important guiding document for ongoing conservation and energy management program development and support at FortisBC. Posterity Group has proposed a transparent, well-documented approach to develop the CPR and will facilitate the engagement of internal and external stakeholders. Posterity Group will complete end-use modelling and scenario development for FortisBC's 2022 Long Term Gas Resource Plan (LTGRP) in parallel with the CPR, which will ensure technical consistency across the projects. Dave is acting as Technical Director and Residential Sector Lead.

2022 Long Term Gas Resource Plan Demand Forecast and Resource Planning: FortisBC Energy Inc. (February 2020-July 2021). Following a successful engagement in 2017, FortisBC again engaged Posterity Group to generate a natural gas end-use forecast in support of their 2022 Long Term Gas Resource Plan





(LTGRP) filing. The analysis uses baseline end-use energy intensities for over 40 customer segments across 5 provincial regions developed by Posterity Group through the 2021 Conservation Potential Review. Forecasting analysis incorporates multiple data sources including customer end-use surveys, customer energy use data, and price and commodity forecasts. In addition to the reference case forecast, Posterity Group will conduct scenario analysis that estimates the impact on gas demand from a number of policy drivers including anticipated federal, provincial and municipal codes and standards, carbon pricing, efficiency activity, natural gas transportation, liquefied natural gas production, renewable natural gas production, and availability of district energy. Dave is acting as Technical Director.

Integrated Resource Planning and Achievable Potential Study Support: Enbridge (2019-Present).

Technical lead on modeling and analysis to support Enbridge Gas in their planning and DSM activities. Building on the results of the provincial Achievable Potential Study (APS), used the Navigator™ Energy and Emissions Simulation Suite to construct a model of Enbridge's service territory to estimate DSM potential and peak demand impacts. The detailed model will permit the client-consultant team to better understand the outputs from the 2019 APS, identify limitations in the underlying dataset, and integrate additional data to estimate program potential and budgets. The Navigator™ Energy and Emissions Simulation Suite enables complex, multi-variable modelling, detailed scenario exploration and solution optimization. It also has an 8760 peak analysis module, which we are using to develop full annual load shape profiles for the gas end uses relevant to Enbridge's service territory.

Greenhouse Energy Profile Study: Ontario IESO (2018-2019). Technical lead on modeling and analysis of economic and achievable potential for energy conservation in covered agricultural facilities in Ontario, including greenhouses and indoor agriculture. Developed the stock-and-flow model for three different scenarios of sector expansion, for technical, economic, and achievable energy savings potential, and for peak demand reduction. Provided full 8760-hour profiles of demand before and after the application of energy and demand reduction measures.

2019 Ontario Achievable Potential Study Technical Advisory Panel: IESO (2018-2019). Acted as an Expert Panel Member to the Independent Electricity System Operator (IESO) and the Ontario Energy Board (OEB) for the 2019 Ontario Achievable Potential Study (APS). Provided advice on the integrated electricity and natural gas APS, which will seek to identify and quantify energy savings, GHG emission reductions, and associated costs from demand side resources for 2019-2038. Helped the IESO and OEB ensure that the APS is conducted using industry best practices. Reviewed and provided guidance on all aspects of the APS including the methodology and workplan, base case and reference forecast, energy efficiency and conservation measures, technical and economic potential analysis, achievable potential analysis, and final report.

Conservation Potential Study: Ontario Energy Board (2015-2016). Technical lead on modeling and analysis of economic and achievable potential for energy conservation in Ontario, covering the service territories of both natural gas companies. Led the residential analysis and was principal model developer, including development of stock-and-flow models, economic screening models, and achievable adoption models.

Conservation and Demand Management Study: Newfoundland Power and Newfoundland Labrador Hydro (2014-2015). Technical lead on modeling and analysis of economic and achievable potential for conservation and demand management in Newfoundland and Labrador. Led the residential analysis and was principal model developer.

Tailored Achievable Potential Studies for Ontario LDCs: Hydro One Networks, NPEI, Powerstream, Horizon Utilities, Thunder Bay Hydro, Waterloo North Hydro, Entegrus, Canadian Niagara Power, Algoma





Power, Brantford Power, Milton Hydro, Oakville Hydro, Oshawa PUC, Haldimand County Power, Halton Hills Hydro, Burlington Hydro, Brant County Power (2014-2015). Developed tailored versions of the OPA achievable potential model (see the project immediately below), to provide detailed conservation potential estimates for the service territories of several Ontario LDCs.

Achievable Potential Study: Ontario Power Authority (2013). Led the analysis of conservation potential for all sectors, deriving much of the economic potential from outputs of OPA's End Use Forecaster model, but applying data from ICF Marbek's internal databases to estimate achievable potential. After a market characterization phase targeting the application of measures in Ontario, produced a fine-tuned estimate of achievable potential.

Conservation Potential Study for Yukon Government: YEC, and YECL (2011-2012). Led residential analysis of conservation potential, including developing detailed end-use baseline profiles calibrated to utility data, deriving economic potential for cost-effective actions in the residential sector, and forecasting 20-year economic and achievable savings.

Conservation Potential Study: SaskPower (2010-2011). Led residential analysis of conservation potential, including developing detailed end-use baseline profiles calibrated to utility data, deriving economic potential for cost-effective actions in the residential sector, and forecasting 20-year economic and achievable savings.

Conservation Potential Study: Terasen Gas (2010-2011). Led residential analysis of conservation potential, including developing detailed end-use baseline profiles calibrated to utility data, deriving economic potential for cost-effective actions in the residential sector, and forecasting 20-year economic and achievable savings.

DSM Potential Study: Enbridge Gas (2008). Led residential analysis of conservation potential, as part of a major update to the DSM study Marbek did in 2004. Developed detailed end-use baseline profiles calibrated to utility data, derived economic potential for cost-effective actions in the residential sector, and forecast 10-year economic and achievable savings.

DSM Potential Study: Enbridge Gas Inc. (formerly Union Gas) (2008). Led residential analysis of conservation potential for Union Gas, as part of a project similar to Enbridge project above.

CPR 2007: BC Hydro (2007). Led analysis of residential savings potential for BC Hydro, as part of a project to estimate potential for all sectors. Derived detailed end-use baseline profiles calibrated to utility data, derived economic potential for cost-effective actions in the residential sector, and forecast 20-year savings. This was an update to an earlier CPR Marbek performed for BC Hydro in 2002.

CPR: Newfoundland Power and Newfoundland and Labrador Hydro (2007). Led analysis of residential savings potential for Newfoundland and Labrador, as part of a project to estimate potential for all sectors. Project included same elements as the BC Hydro study.

Fuel Switching Potential: Ontario Power Authority (2006). Developed the residential fuel switching potential estimate as part of a full fuel switching potential study for Ontario.

DSM Potential Study: Terasen Gas (2005). Developed the residential energy savings and fuel switching potential estimate as part of a full DSM potential study for the Terasen service territory. Conducted part of the commercial energy savings and fuel switching potential analysis.

DSM Potential Study: Enbridge Gas (2004). Developed the residential energy savings potential estimate as part of a full DSM potential study for the Enbridge service territory.





DSM Study: Manitoba Hydro (2003). Led residential analysis for DSM study.

Statewide Technical and Economic Potential: Consortium of Wisconsin Utilities (1993). While at Energy Center of Wisconsin, managed the completion phase of the estimate of conservation, fuel switching and load management potential, as part of IRP filing.

### *End-Use Energy Efficiency and GHG Mitigation Modelling & Load Forecasting*

Renewable Gas Program Review – Cost Recovery: FortisBC Energy Inc. (July 2021-October 2021). FortisBC Energy Inc (FEI) is reassessing the pricing scheme of their voluntary renewable gas (RG) program, including how to recover supply costs from customers who did not volunteer to pay a premium for RNG. Posterity Group (PG) is focusing on assessing how non-participants may respond to changes in their annual gas bill from RG-related costs. Posterity Group is estimating impacts to annual demand and customer defection from price signals. The results of this project will help inform FEI's proposed design of the RG program to minimize impact on customers. Dave is acting as Advisor.

DSM Planning Support: Enbridge Gas Inc. (January 2021-January 2022). In 2019 and 2020, Posterity Group worked with EGI to develop a Navigator end-use energy model to support DSM planning. The model aligns closely to the Ontario Energy Board's 2019 Achievable Potential Study but includes adjustments that better reflect Enbridge's input and experience, and to correct for identified limitations. Model outputs are housed within Power BI to provide an interactive means to support future EGI planning efforts. In 2021, Posterity Group is working with EGI to update and enhance the end-use model dataset to support its next multi-year DSM plan submission. Priorities include: Developing evidence to position the APS in a context that more accurately reflects EGI's knowledge and experience; Make further adjustments to the APS dataset to address deficiencies and enable sensitivity analysis; and Interrogatory and Witness Support. Dave is acting as Technical Director and Lead Analyst.

Load Forecasts for the Southwest Ontario Greenhouse Sector: IESO (February 2021-August 2021). Greenhouse energy demand continues to expand in the Windsor-Essex and Chatham-Kent regions. To support planning efforts in these regions, the IESO developed three load forecast scenarios (a low growth, reference case, and high growth scenario) for greenhouse non-coincident winter-peak load. Posterity Group was hired to review the information and assumptions used by the IESO and provide additional information to validate the IESO's forecast scenarios or identify possible areas for adjustment. The main activities included in this project were data collection, review and analysis, scenario development, modelling, and a comparison of the data and model results to the IESO's assumptions and models. Dave is acting as Expert Advisor.

Energy Transition Scenario Analysis: Enbridge (July 2020-March 2021). Posterity Group is supporting Enbridge's Energy Transition Planning team to conduct scenario analysis of the consider the financial and operational impacts of the range of climate policy related impacts Enbridge could face over the next 30 years. Posterity Group will model future load at the granular level of energy end uses, different building types, rate classes, and regions, and undertaking scenario analysis to explore several possible economic and policy scenarios under which Enbridge may operate in the future. The goal of the project is for Posterity Group to provide Enbridge with a comprehensive end-use level dataset that reflects several possible futures and a user-interface tool that allows decision makers to explore this dataset and distill quantitative impacts (e.g., how gas use and GHG emissions will change) under different forecast scenarios. Dave is acting as Technical Director and Residential Sector Lead.

Energy Management Best Practices for Cannabis Greenhouses and Warehouses: CEATI International Inc. (November 2019-May 2020). Posterity Group, in partnership with Cultivate Energy Optimization and D+R





International, will assess and document best practices of energy management for cannabis production in both greenhouse and warehouse facilities. The study will develop a five-year forecast of energy use in three regions (Ontario, British Columbia and the Pacific Northwest) for the sector and assess energy saving opportunities. The outcome of this work will form an important base of industry knowledge and bridge the gap to provide current and comprehensive information regarding energy use in cannabis facilities, from which future conservation activities might be developed. Dave acted as Senior Analyst.

Long Term Resource Plan Model Enhancement: FortisBC Gas (November 2018-ongoing). Posterity Group is adding several new features to the Long Term Resource Plan model used to support FortisBC's regulatory filings. New features include the ability to output avoided cost and customer cost of energy, ability to vary short-term and long-term elasticity of energy demand based on the latest research, and the ability to run hundreds of stochastically-generated scenarios with inputs varying probabilistically.

Long Term Resource Plan Regulatory Support: FortisBC Gas (March 2018-November 2018). Posterity Group supported FortisBC in responding to BC Utilities Commission and intervenor Information Requests (IRs) regarding its 2017 Long Term Gas Resource Plan (LTGRP). Posterity Group provided FortisBC with information and analysis in support of such inquiries related to the load forecast and subsequent scenario analysis conducted by Posterity Group for inclusion in FortisBC's LTGRP.

Analysis of Fenestration Products in Support of Canadian Market Transformation Activities: NRCan (July 2017-June 2018). Posterity Group provided analysis of the current market for low-rise residential fenestration products, including windows, doors, and skylights and developed estimates of the energy savings potential from changing performance levels in ENERGY STAR or introducing national performance standards. Dave was the technical lead on this project. To produce the estimate, he developed a detailed model of HVAC consumption in different types and vintages of low-rise housing in 22 regions, and modeled the application of several different fenestration energy performance improvements. Developed from publicly available data, this model can be applied for other future projects.

Low Carbon Heating Options for Ontario: Ontario Ministry of the Environment and Climate Change (November 2017-June 2018). Posterity Group estimated the GHG reduction impact potential of strategies targeting low carbon space, water and process heating technologies and fuels in Ontario's residential, commercial and industrial sectors. The project included four main activities: Development of energy and GHG Inventory and accompanying business as usual forecast for Ontario's thermal end-uses by fuel, sector/subsector, and end use; Development of a long list of fuels and technologies with abatement potential, and an evaluation matrix to build a short list of the 10 preferred, most promising technologies and fuels for detailed analysis; Detailed analysis of the short list of fuels and technologies to understand their current market structure, barriers, and applicability; and, development of illustrative deployment scenarios to estimate the potential impacts of the shortlisted fuels. Dave developed the inventory model and the illustrative deployment scenario models.

Natural Gas Demand Scenarios: FortisBC (July 2017-November 2017). Posterity Group provided demand scenario analysis to support FortisBC demand forecasting, with Dave acting as Technical Director and Residential sector lead. This work involved analysis of six scenarios that built on the core end-use forecast completed in June 2017. The project results helped FortisBC assess the impact of various policies, including the City of Vancouver zero emissions plan and the BC Step Code. As part of this work, Posterity Group added new features to the processing software at the heart of the forecasting model. These features allow users to dynamically select the municipalities that are expected to opt into new energy efficiency requirements.







Long Term Resource Plan Model and Forecast: FortisBC Gas (October 2016-June 2017). FortisBC turned to Posterity Group to develop a new end-use forecasting model to enhance their current end-use resource forecasting approach, and to generate a new 2017 forecast. The model provides value to the load forecasting, integrated resource planning, system planning, and conservation potential teams at FortisBC. Enhancements include: a full integration of energy efficiency impacts at the individual measure level, improved transparency of the model; features to allow casual users to vary parameters and review the effects on the results; outputs for every year in the forecast period (rather than milestone years); closer linkage between the annual demand and peak demand forecasting approaches; the ability to analyze the impact of changes such as municipal policy activity, ability to analyze the impact of liquefied natural gas and natural gas transportation initiatives. Dave was technical director and lead model developer.

End Use Load Forecast: FortisBC (2012-2014). Developed an end-use based load forecasting system for FortisBC, using detailed customer data and models built for an earlier conservation potential study. The model could forecast account growth and consumption of five fuels under five economic scenarios, over a twenty-year period, for three sectors, six regions, 33 rate classes, 36 building types, and 29 end uses. The model also estimated potential for conservation programs and reported on the sensitivity of the potential to different economic scenarios.

Integrated Resource Plan: NB Power (2009). Led residential analysis as part of a project to provide input data to NB Power's integrated resource planning process.

Conservation Potential Review and 20 Year Load Forecast: Ontario Power Authority (2009-2010). Led residential analysis of conservation potential for OPA, as part of project to develop a model combining forecasting and DSM potential.

Market Characterization of the Commercial/Institutional and Residential Sectors in Yukon: YEC and YECL (2012). Prepared initial program focus assessment documents, based on results from the Conservation Potential Study. Assisted in planning and preparing interview guides for market research, and conducted interviews. Provided input to program concept documents, which will lead to commercial and residential programs offered by the Yukon utilities.

Residential Market Segmentation Study: Enbridge Gas Inc. (formerly Union Gas) (2010). Led this analysis to assess the potential for DSM technologies in specific niche markets. In a mature market for DSM activities such as Union's service territory, many measures no longer pass the TRC test in a typical or average application, but often will pass in niche applications. We provided a strategic assessment of potential niche markets, to target DSM program activities.

## EDUCATION

M.Sc., Energy Studies, University of Sussex - Brighton, Sussex, United Kingdom, 1987

B.A.Sc., Mechanical Engineering, Minor: Management Science, University of Waterloo – Waterloo, Ontario, Canada, 1986

## CERTIFICATIONS

Licensed Professional Engineer (Ontario)

## PROFESSIONAL AFFILIATIONS

American Society of Heating, Refrigeration, and Air-conditioning Engineers





## EMPLOYMENT HISTORY

Posterity Group	Senior Consultant	2016-Present
ICF International	Senior Technical Specialist	2011-2016
Marbek Resource Consultants	Senior Consultant	2000-2010
Energy Center of Wisconsin	Project Manager	1993-2000
Resource Management Associates	Energy Engineer	1991-1993
University of Waterloo	WATSUN Engineer	1987-1991

