Estimating the Uncertainty Around Demand-Side Management (DSM) Savings

PURPOSE

BC Hydro has created five different DSM options for consideration in its IRP. There is uncertainty regarding the volume of electricity savings that will result from each option. Moreover, as some of the tactics used to achieve these savings are new and untested, estimating the level of uncertainty around the forecast savings is an important issue and will have important implications in the integrated resource planning process.

OVERVIEW

What is the Risk Framework?

The Risk Framework is the construct that guides how BC Hydro incorporates uncertainty into the Integrated Resource Planning (IRP) portfolio analysis and which assists in making portfolio comparisons within the IRP.

The goal of the Risk Framework is to identify the key sources of uncertainty and, by using quantitative methods wherever possible, characterize these uncertainties in a way that separates out probability judgments and impacts from value judgments.

METHOD

How was the Risk Framework Applied to DSM Savings Uncertainty?

The DSM options are portfolios of activities largely organized around three main DSM tools: Programs, Codes and Standards, and Rates. Underneath each of these lay a large number of activities designed to achieve energy conservation, numbering over eighty in total.

For each of these line items, managers of the various initiatives developed forecasts of annual energy savings over the next twenty years. Once these were complete, these forecasts were then revisited and, through a structured set of conversations, managers were asked to develop upper and lower ranges of how the estimated savings might vary, and what the likelihood of seeing those more extreme outcomes might be.

These subjectively assessed uncertainties were then rolled up to give a probability distribution of outcomes, by tool, for each of the five DSM options. When aggregating these individual line items, care was taken to capture the possible inter-relationships (correlations) across line items within each tool. This influences the spread of uncertainty around forecast savings.

The steps outlined above can be described as a “bottom-up” approach to estimating uncertainty associated with the DSM savings estimates, with separate consideration of each of up to approximately 80 line items within each DSM option. A second step was to supplement this with a “top-down” review of the total DSM savings from each option by a separate group of people comprising upper management and two outside experts: an external decision analysis practitioner and an external consultant familiar with attempts to aggregate DSM tools in the face of uncertainty.

The results of the DSM uncertainty assessment capture, at the current time, BC Hydro’s professional judgment regarding the range of uncertainty for each of the DSM options.

Comparison to the 2008 LTAP

The approach taken for this IRP builds on the work done in assessing DSM uncertainty in the 2008 LTAP.

Some key areas of improvement are:

Enhanced methods for eliciting probability judgments – calibration training was undertaken with managers to increase their ability to match their probability statements against their actual performance. As well, the use of subjective probability judgments was extended to a "top down" assessment of the overall DSM portfolios, allowing BC Hydro management to bring their professional judgment into a quantified statement of uncertainty.

More deliberate creation of portfolios – the creation of five portfolios allowed a more fulsome picture to be painted of what the "low hanging fruit" were and what were the more speculative (and perhaps more productive) DSM activities.

An enhanced jurisdictional review – BCH is in the process of looking across jurisdictions to see how conservation plans have matched up with actual performance and how other jurisdictions approach their verification methods. This will better inform the level of uncertainty around DSM savings. As well, this survey is looking for how other utilities measure and integrate uncertainty into their DSM and energy planning processes.

However, estimating DSM savings over the long term is not a simple task, and some gaps identified in the 2008 LTAP remain:

Model uncertainty – it is still not clear whether it is appropriate to simply add up the over 80 line items of DSM actions, or whether more complex, interdependent models are appropriate.

Interdependency among tools – it is clear that the performance of each of the DSM tools relies on the success of the other tools. However, BC Hydro does not have enough information at this time to sort through competing hypotheses about what these interdependencies might look like.

Link between load growth and DSM savings – while some progress was made untangling overlaps and/or gaps between load growth estimates and DSM savings, the current approach of subtracting off DSM from load growth is still missing key interdependencies.

Results and Discussion

The estimated savings for each of the five DSM options, and the spread of uncertainty around these, is contained in the DSM component of the IRP TAC Meeting #2 presentation. However, some high level conclusions can be raised here.

Conclusion 1 – compared to the 2020 goal of Option A from the 2008 LTAP, BC Hydro has not developed any key breakthroughs in DSM savings that leave us confident we can substantially exceed (e.g. surpass 10,000 GWh by 2020) the 2008 LTAP targets.

Conclusion 2 – there are some speculative, new approaches which, if they work, have a small chance to substantially increase DSM savings in the coming decades. However, the chance of achieving these savings is not large.

Conclusion 3 – Moving the DSM portfolio of actions to these more speculative actions in order to chase potentially much larger savings has a downside potential in that, if they don't work, DSM savings may fall below current (expected) targets.

NEXT STEPS

The forecast level of DSM savings and the level of uncertainty around it is a key input into determining the size of the gap between supply and demand that needs to be filled with resources over time. As outlined in the 2008 LTAP, the best balance between DSM and supply side resources will be determined through portfolio analysis over the 20-year planning horizon and through the qualitative assessment of other factors and considerations that have not been included in the quantitative portfolio analysis.