Market Price Scenarios: Further Description & Considerations

PURPOSE

To provide further clarity regarding the makeup of the market price scenarios, whether these scenarios are missing any key combinations of variables, and how these will be used in the portfolio analysis.

OVERVIEW

Some members of the Integrated Resource Plan (IRP) Technical Advisory Committee (TAC) have asked for further consideration of the market price scenarios presented during the second TAC meeting. This summary brief will try to address the following TAC requests:

- Find a better, simpler way to sum up the scenarios.
- Explore which scenarios were excluded from the five chosen, and what might the result be of ignoring these other scenarios.
- Explain how will these scenarios be used going forward.

Describing The Five Market Price Scenarios

There are many moving parts within the uncertainty analysis, and so finding a simple way to describe and summarize the five market price scenarios is inherently difficult. The IRP project team has used:

- 3x3 tables with descriptive text;
- Influence diagrams;
- Table with text and up/down arrows to show change over time; and
- Qualitative descriptions.

Internal discussions have repeatedly returned to the schematic used in the Black & Veatch Greenhouse Gas (GHG) Price Forecast report, and so this will form the basis of this section. Note that this view emphasizes two of the many uncertainty drivers: long-term global growth trends and scope of government action. Splitting these into hi/mid/low levels gives a 3x3 matrix which Table 1 uses to present more detailed qualitative descriptions of the five chosen scenarios.

Table 1: Description Of Five Market Scenarios

Global Economic Growth Trend	Government Action on GHG Emissions: None / Low	Regional / National	National
Hi	**Scenario D** - Delayed high economic growth and lower international cooperation stifles national action, leaving the regions to regulate GHG emissions.		**Scenario A** - High Global economic growth leads to high commodity demand and broad environmental regulation.
Mid		**Scenario B** - Slow but steady global economic growth sees regional leaders paving the way for national GHG markets	
Low	**Scenario E** - Low economic growth and activity lead to lower GHG emissions and the absence of market prices	**Scenario C** - Low economic growth delays national GHG market development.	

As a reference for further IRP TAC discussions, Table 2 fills in some of the more pertinent variables that are included in these five market price scenarios.

Table 2: Detailed Description Of Market Price Scenarios

Global Economic Growth	Government Action on GHG Emissions: None / Low	Regional / National	National
Hi	**Scenario D** Mid Natural Gas/Electricity prices, High GHG Prices, Low REC prices		**Scenario A** High Natural Gas/electricity prices, Mid GHG prices, Low Rec Prices
Mid		**Scenario B** Mid Natural Gas/Electricity Prices, Mid GHG Offset costs, Mid REC prices	
Low	**Scenario E** - Low economic growth and activity lead to lower GHG emissions and the absence of market prices	**Scenario C** Low Natural Gas/Electricity Prices, Low GHG prices, High REC prices	

Since these scenarios vary along a number of dimensions at the same time, there is no obvious and easily memorable way of naming these. It is likely the case that knowledge of the individual scenarios will not be needed to understand the subsequent analysis. However, for those interested in keeping track of which scenarios contain which combinations, it is recommended that Table 2 be kept readily at hand.

Excluded Market Scenarios – What Are We Missing?

The goal of creating market price scenarios was to find a reasonable way to use the limited computing and modelling resources within the IRP, cover a broad range of how the world of market prices might unfold, and also create a reasonably broad range for the price variables of interest.

Early in the process, an internal discussion suggested that increasing the number of market price scenarios from three (the approach used in the Long-Term Acquisition Plan) to five would be just barely achievable given time constraints and modelling resources. Through meetings #2 and #3, the concern has arisen that some market price scenarios were not modelled. This section will and consider whether these non-modelled combinations were more probable than the five considered and were likely to stress the price variables of interest in a new and different way.

Table 2 suggests several combinations that were not tried. Table 3 lists these and suggests why these were not part of the final five market price scenarios.

Table 3: What Scenarios Were Excluded, And Why

Global Economic Growth	Government Action on GHG Emissions: None / Low	Regional / National	National
Hi	Scenario D	Likely to produce an intermediate result between scenarios D and A	Scenario A
Mid	Likely to produce an intermediate results between Sencarios D and E.	Scenario B	Not seen to add much information that could not be gleaned from Scenarios A and B.
Low	Scenario E	Scenario C	An extreme combination of how events might unfold, but seen as so unlikely that it would not be of interest when stress testing policy options.

Clearly these five scenarios do not cover off all interesting combinations of their constituent variables. BC Hydro recognizes that the limited modelling capacity and time constraints have left some combinations of interest that will not be modelled. At best, these need to be considered in a qualitative sense when examining modelling results and drawing conclusions and recommendations from the policy comparisons.

How Will These Scenarios Be Used Within IRP Modelling?

The five market price scenarios and the three gap scenarios can be combined through a probability tree to create fifteen price/gap combinations. Since relative likelihoods can be assigned to each of these, then the relative likelihood of each of these scenarios can also be calculated. The considerations and results for the market price scenarios were done by an external energy consultant assisting BC Hydro. The final results and report are being prepared at this time. However the draft results are shown below in Figure 1.

BC Hydro has highlighted five key policy questions that need to be addressed within this IRP. Each of these policy questions may have within it several policy choices. The fifteen branch probability tree gives a way to “stress test” each policy option to see how it performs against different ways in which the energy planning world might unfold. Figure 2 shows how, if time permits, two options might be compared using this tree (data are illustrative, not actual modelling outputs). What is important to note in Figure 2 is that that data can be looked at in a disaggregated sense, it can be looked at as a weighted average, and it can also be used to generate a measure of extreme cost to show, perhaps, how cost and cost risk might be a trade-off when comparing Option 1 to Option 2.

Given the range of opinion around the market price scenarios, if time permits some sensitivity analysis can be carried to see whether policy recommendations are sensitive to changes to the likelihoods used and the way in which they are combined in the probability tree. This is just to emphasize that these numbers should not be seen as exact measures of what will happen in the future. Rather, they are a rough attempt at trying to capture uncertainty and bring it into the process of understanding policy comparisons.

Figure 1: Fifteen Branch Probability Tree

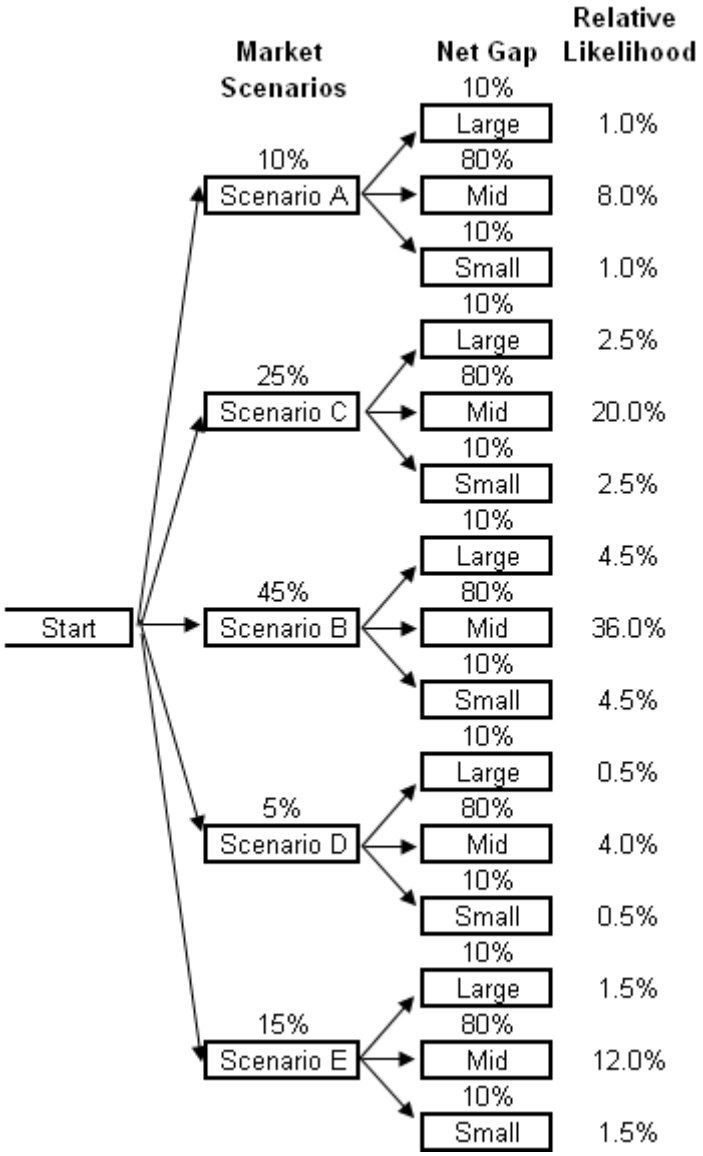

Figure 2: Using Probability Tree To Generate Cost Ranges, Weighted Average (Expected) Cost, And Cost Risk