

# WHAT IS "DECISION ANALYSIS"?

The Municipalization Exploration Project used a decision analysis process to determine how a local electric utility could perform, compared to Xcel Energy, under a variety of conditions.



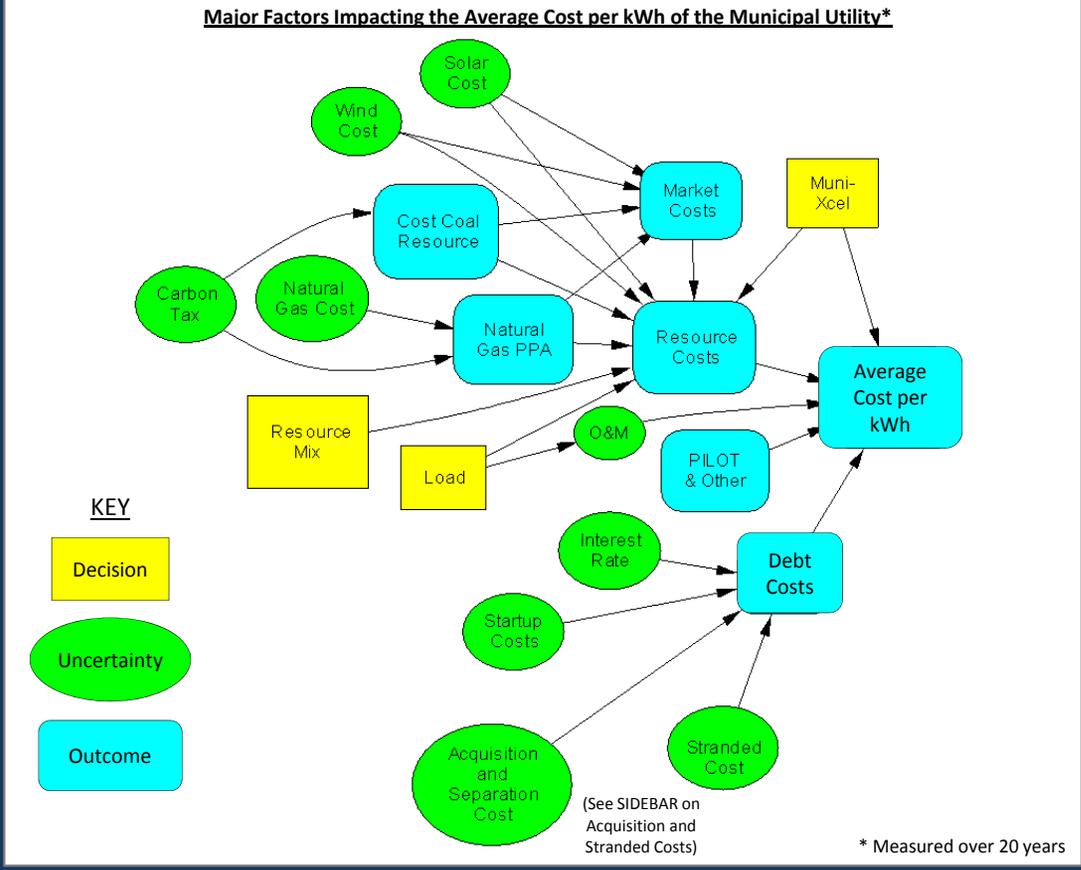
**DECISION ANALYSIS**, a formalized method of decision-making, added two types of value to the modeling:

1. It allowed staff to identify potential risks by incorporating wide ranges of costs for certain key variables. This means that even if a few less influential variables don't go the way we're anticipating, they wouldn't strongly impact the modeling results.
2. It allowed staff to perform many model runs under different conditions, to get a sense of the overall picture of how a local electric utility might perform once the likelihood of best-case (i.e., low cost) or worst-case (high cost) outcomes are included.

This page references information described in [Attachments D and H](#) of the Feb. 26, 2013 memo to City Council.

## 1 What factors could create risks or opportunities for a local electric utility in the next few decades?

An influence diagram was created to identify those main factors, called "uncertainties" (the full list of uncertainties is [here](#)). The uncertainties shown in the diagram below are a portion of those that were built into the load, financial, and resource models, using the best available data provided by consultants and the working groups. This diagram shows the uncertainties and the outcomes they influence.



## 2 Which of the uncertainties strongly impact a local electric utility's ability to save money and purchase renewable energy, compared to Xcel Energy?

Forecasting the future means recognizing that not everything will go according to plan. To capture the possibility that we could under- or over-estimate costs, we narrowed down the uncertainties to a few key factors that really impacted the model outputs. We used publicly available, locally relevant data—including what Xcel Energy forecasted in its 2011 Electric Resource Plan. The full list and ranges of costs are in Attachment H of the Feb. 26, 2013 memo.

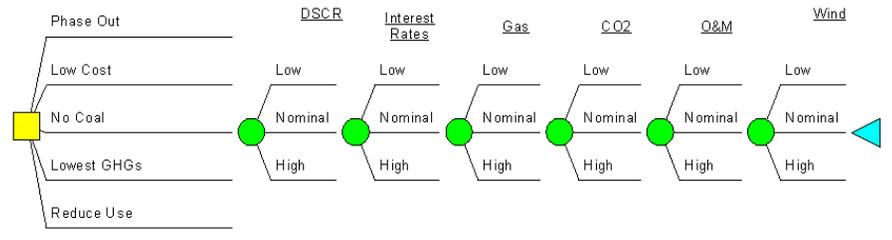
## 3 How did staff run the decision analysis model?

It sounds more complicated than it is. Six of the highest-impact uncertainties were identified:

- NATURAL GAS PRICE** • **WIND PRICE** • **INTEREST RATES ON DEBT** • **OPERATIONS & MAINTENANCE COSTS** • **CARBON PRICE** • **DEBT SERVICE COVERAGE**

Each of the 6 uncertainties was modeled with 3 prices: a high, a low, and a median (these ranges are laid out in Attachment H). The median price is the one where 50% of the sample population comes in lower and 50% is higher. With this many variations, 3<sup>6</sup> model runs (729) were required for each municipalization option that was modeled.

A software program called DPL was used to perform this task. DPL links to cells in the financial model and changes the values in them in a particular order. Each time it programs a particular run, it collects the results—such as total costs or carbon intensity (the results the [City Charter](#) requires be measured). DPL populates the financial model with different uncertainties using a decision tree like this one:



**What about stranded and acquisition costs?**  
The acquisition costs, and stranded costs if any, that the city may have to pay Xcel will not be known until the parties agree on the amounts or all litigation is completed. From our research the city does not believe that state or federal courts would find the city owed anywhere near the maximum amount modeled (\$405 million in stranded and acquisition costs, based on numbers provided by Xcel Energy). Because DPL assigns probabilities to cost ranges, acquisition and stranded costs could not be modeled the same way as the other uncertainties, so fixed amounts using Xcel's ceiling were used.

**What about the risk of staying with Xcel Energy?**  
Xcel hasn't provided detailed enough data to apply the same decision analysis process, so fewer variables could be treated as uncertainties with wide ranges of costs. Xcel's risks were approximated by varying their natural gas, wind, and carbon prices, and interest rates, to compare with municipalization. Uncertainties like coal prices were not varied at this time.

## 4 What do the results mean?

The reports provided to City Council include expected values and whisker charts.

1. **Expected values are weighted averages.** For each of the 6 uncertainties shown above, the high and low prices were each 30% likely to occur and the median price was 40% likely to occur. This is based on an accepted statistical probability theory. These underlying likelihoods were used to weight the overall likelihood of a particular model outcome occurring. The results of all 729 model runs were combined, weighted according to likelihood, and then averaged—producing "expected value" results for cost per kWh, carbon intensity, and other metrics.
2. **Whisker charts, like the one to the right, show the likelihood of any single run being within a certain range.** All 729 runs are plotted on a distribution curve. The blue dot at the center is the median run, where half of the 729 runs produce higher outcomes and half produce lower outcomes. The dots on either end show where 10% and 90% of the runs fall below. This was used to show an 80% range for where cost savings could fall when the municipalization options were compared against Xcel.

