Robust decisions for uncertain energy futures

Energy prices are going up. But by how much will they rise? And over what time frame? We explore some issues and solutions

netbalance
tomorrow's agenda

Robust decisions for uncertain energy futures

"The global financial crisis and ensuing recession have had a dramatic impact on the outlook for energy markets, particularly in the next few years."

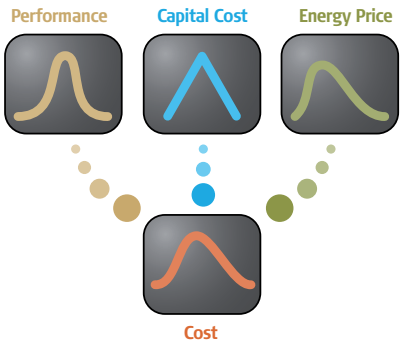
International Energy Agency,
World Energy Outlook 2009

Case Study

We assisted a water authority review its planned energy supply and greenhouse gas abatement options. As a result, the authority cancelled an option that we identified as high risk.

We also identified three areas where uncertainty about investment outcomes could be cost-effectively reduced.

Monte Carlo analysis



Energy prices are going up. But by how much will they rise? And over what time frame? The answers are uncertain, making decisions on energy supply options and investment in energy efficiency very difficult. What we do know is that the wrong decisions can strongly impact profitability.

There are three principal reasons for uncertainty about both energy costs and supply security: the likely introduction of a price on carbon in some form, the need for substantial investment in network infrastructure and continuing deregulation. These uncertainties highlight some of the shortcomings of traditional investment decision-making tools like NPV, IRR and payback period.

Many energy investments can look profitable under some future scenarios – and unprofitable under others. But the investment decisions have to be made before it is clear which scenario was right.

However, even where there are uncertainties, some things are more certain than others. And an investment decision that may not be optimal for any one future energy scenario can be the best one overall because it hedges against a wide range of uncertainties.

Net Balance offers a suite of tools to help our clients work through the uncertainties and find robust solutions.

The tools we offer are adapted from those used by financial analysts to find robust solutions including Value at Risk (VaR) and Conditional Value at Risk (CVaR), also known as expected shortfall or expected tail loss. The failings of VaR exposed by the Global Financial Crisis have been addressed in CVaR. These tools allow such investments to be modelled as portfolio risk management problems, providing business case solutions that translate energy engineering analysis into financial language meaningful to CFOs and financial managers.

Energy budgets at risk

TOOLS WE USE

Energy budgets at risk analysis takes Value at Risk (VaR) tools and applies them to energy investments. It was developed by US energy economist Jerry Jackson from Texas A&M University.

Uncertainty in key variables in the investment analysis like technology performance, capital costs, operations and maintenance costs, future fuel prices, future electricity prices, energy use and peak loads, and weather is modelled using Monte Carlo analysis. This method of incorporating uncertainty gives a probability distribution of investment outcomes.

Energy budgets at risk analysis works best when the relationships between energy supply, energy efficiency and greenhouse gas emissions reduction options are clear.

for more information go to
netbalance.com/energyfutures.html

For some businesses, the required level of investment in each of these areas depends on the investment choices made for the others. Some investments combine well, some do not. If one investment is chosen, the opportunities available in others may change. For example, improved heat exchange can lead to a decrease in available excess heat for other purposes.

Here Net Balance offers a robust optimisation process that draws together multiple options. We begin by identifying energy supply or efficiency opportunities. Then we define the impact of combining opportunities and any constraints, and gather all input data. We build an optimisation model designed to maximise financial benefits or minimise greenhouse gas emissions under uncertainty.

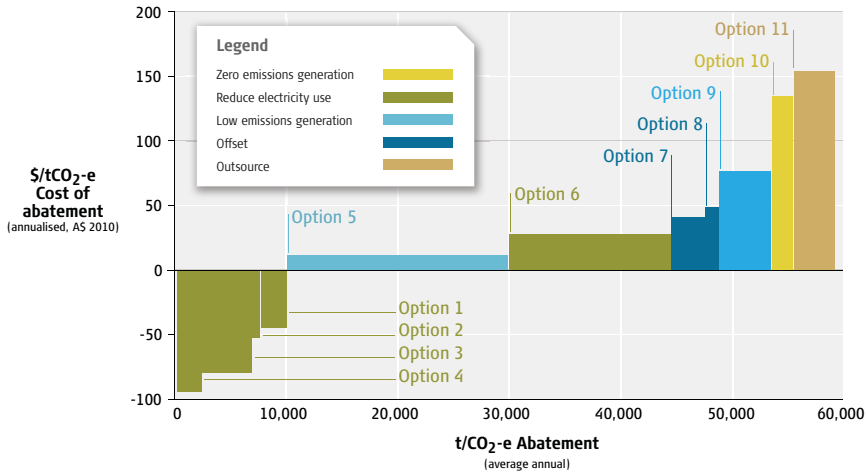
Abatement cost curves

TOOLS WE USE

An abatement cost curve is a common tool for comparing the estimated cost of abatement for multiple projects. It represents the effectiveness of abatement options relative to their costs.

Abatement cost curves are often provided with no transparent accounting for uncertainty in the data they are based on. Net Balance combines abatement cost curve modelling with Monte Carlo analysis to provide a clear representation of uncertainty for each abatement option.

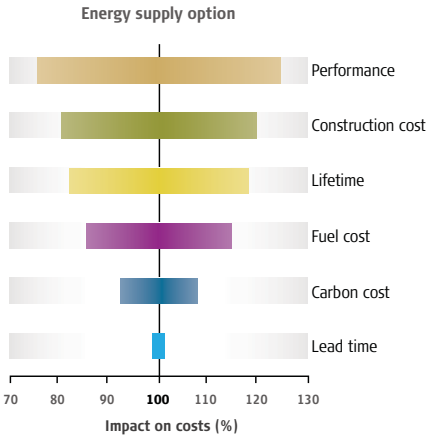
We use statistical techniques including rank correlation and step-wise regression to identify the most significant uncertainties. This assists decision-makers understand where uncertainty impacts final results and to identify action that will reduce uncertainty.



Robust optimisation

1. Identify investment options (energy supply, GHG reductions, energy efficiency)
2. Define impact of combining options and any constraints
3. Collect input data
4. Build scenario model
5. Solve model and analyse results

Representing the impact of uncertainty



Net Balance offers robust solutions that will support investment decisions designed to respond to the full range of energy market uncertainties.

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ABOUT NET BALANCE

We help clients develop and deliver strategies to underpin their long-term sustainability.
It is difficult to plan for long-term sustainability when it is not clear what tomorrow will bring. Much of our work is therefore about managing uncertainty and building capability to respond to whatever tomorrow looks like. It is what we mean by Tomorrow's Agenda.

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