

Real Options: Creating and Capturing the Option Value in Regulated Assets

The fundamental insight is recognizing that faced with uncertainty, flexibility has value.

Do any of the following questions sound familiar?

- Do your competitors bid higher for assets that you thought you had fairly valued?
- Conversely, have you ever won a bid for an asset and thought in hindsight that you won because you bid too much?
- Why are the recent prices paid for generation assets typically higher than a standard NPV analysis would suggest?
- When considering asset sales, do you say “it’s worth more than that” when you see the results of traditional evaluations?
- Do you own assets which may not meet EVA-type goals but you are reluctant to sell because you think they might be valuable in the future if you hold onto them?

If any of these do sound familiar, you may be systematically ignoring part of the value imbedded in your assets – the option value.

The “Option Value”

As utility deregulation and unbundling continues, and utilities reorganize business units and transfer assets, options valuation becomes more important. This massive industry transition is the most important time for managers to recognize, create and capture option value. Option valuation techniques can provide the analytical rigor to determine premiums for “strategic value” and model how these premiums can be increased. As asset auctions become more prevalent, options valuation techniques help guard against both the undervaluing of assets as well as paying too much.

Over-paying is likely to be prevalent. Consider that average premiums paid are just that: averages. If the average premium paid is 25%, even if this premium is “fair”, half the buyers paid too much and half got great deals. Wouldn’t it be nice to know where the line between too little and too much was before you had to bid?

A New Way Of Thinking

Option valuation techniques are not just black-box mathematics but represent a new collection of strategic insights.

- The fundamental insight of options thinking is to recognize that, faced with uncertainty, flexibility has value.
- Although potentially counter-intuitive, options thinking demonstrates that when you have flexibility, uncertainty can increase value.
- One can actually build future options into the strategies that are being considered today.

Suppose you are faced with a decision to refurbish a plant, which will reduce ramping time. If you can come on-line in a few hours instead of a few days, or shut down more quickly, you will have increased flexibility and at the same time reduced risk. This raises the value of your asset.

Similarly, suppose the refurbished plant will use natural gas instead of coal; under options valuation, volatility of gas prices vs. long-term coal contracts may actually increase your asset value-especially with the newly increased flexibility.

The Role of Uncertainty

Standard finance theory tells us that an asset’s value today is equal to the total of all the cash flows it produces for each period in the future, discounted at an appropriate opportunity cost of capital. And today, most assets are valued using standard discounted cash flow/net present value techniques that reflect the theory.

NPV starts to break down as a model when dealing with higher degrees of uncertainty. Faced with uncertainty, analysts might use spreadsheets to create scenarios to deal with assumptions about critical variables, for example, the revenues from energy output, that are highly variable. Typically, the analyst would make a “best case”, “worst case”, and “most likely case”.

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Static scenarios, however, fail to correctly assess option value. The middle of the road “most likely case” may be what we’d expect “on average”, but it ignores the fact that managers do not just sit idly on the sidelines and take averages as they come; they can respond to events. Thus, the average over all possible cases is not the true “expected” outcome. Often, specific decisions can be made opportunistically by managers as the circumstances of the moment reveal themselves. For an option to exist, the manager must be able to take action that will mitigate the downside, or expand the upside. Such flexibility has value that is therefore not captured with discounted cash flow models.

Example: Peaking Unit Strategy

Peaking units, we know are only used when demand and prices are high. The rest of the time, it is more profitable to let a peaker lay idle than to burn gas, since you can’t sell the energy produced for more than the cost to produce it. While you can say that “on average”, the peaker will be used for X number of hours next year, and the output will be sold for Y dollars per megawatt hour, options valuation takes into account the fact that prices and demand have a measurable chance of going even higher than the average, creating additional value. If electricity prices are less than the fuel prices converted to \$/MWh, it is not profitable to run. The minimum value of having the plant on line is zero in any hour—the plant never runs if the electricity price is less than variable cost. Even if you have firm contracts for fuel such as natural gas, there is often the option to resell the gas; this is what creates the so-called “spark-spread” options for gas turbines.

As opposed to DCF, options models do not try to predict the future: options models take historical volatility measures and come up with a value that we should be willing to pay today for an asset that has some probability of being profitable in the future. This is only applicable if management has flexibility to respond to market conditions, (i.e. the ability to wait, shut down, produce more, or switch uses depending on market conditions). This is the situation managers of electric generating asset portfolios face. Electricity, especially in newly created competitive markets, and fuel prices can be extremely volatile. At the same time, each electric plant has significant marginal costs, particularly fossil fuel plants. For example, two plants might have similar marginal costs, but one plant might be more cheaply converted from

oil to natural gas. The convertibility has value. How much value is the subject of real options valuation.

Where’s the Option Value?

Option values are imbedded in many parts of your business. One test to identify option value: What decisions can you make to mitigate losses when faced with the downside of the volatile market? If you own an asset that has volatile cash flows and you can adjust to limit losses when market conditions are unfavorable, or expand on the upside, there is option value in the asset. Might owning that asset allow you increase your involvement with a customer in new ways in the future? Does it allow you to gain expertise in that asset class, giving you the option to expand into other areas or similar assets? These are expansion options. Did you consider the value of the option to sell the asset when you bought it, and what would be needed to create this option (put option). Again, you can structure options into your strategies and increase their values.

For option value to exist we need:

1. Volatility in cash flows, such as fuel prices, energy prices, etc.,
2. Managerial flexibility, such as flexibility for a manager to decide to dispatch an asset and incur marginal cost.

Volatility of cash flows can take several forms. Prices of output are often the primary drivers of profit volatility. Fortunately, historical price and quantity data from competitive energy markets around the USA are obtainable, so probabilistic models of price movements that we would expect to see in the future can be built. Marginal costs can also have significant volatility. Things like fossil fuel input costs are major volatility drivers, but other stochastic factors such as unplanned maintenance or reduced output because of power grid congestion can change the cost and/or output of the plant.

Flexibility can be described in several ways. Managers can have the ability to:

- Sell a plant (shut down);
- Let a plant lay idle (wait),
- Switch uses (modify a plant to run at a different marginal cost);
- Produce more (expand) or less (shrink);
- Build or purchase a new plant (replicate);
- Add-on, new business (diversify).

The challenge for managers in the next decade is to systematically identify and adopt strategies that contain and enhance option value.

The matrix below organizes these options as calls and puts on the vertical axis and “preferential access” on the horizontal axis.

Preferential access is a term used to measure comparative ease and variability of execution for the owner of the option vs. external firms. If a firm has “preferential access” to an option, it has know-how, assets, processes or systems that others will find hard to replicate and are considered part of the price of maintaining the option. For example, if you own several nuclear plants, the variability or “access” to the option of buying an additional nuclear plant is better than that of a competitor that has never owned a nuclear. On the other hand, if you wanted to diversify into selling telecommunications services to your customer base, there would be high risk about the outcome, so we categorize that as preferential access being low.

2. Marginal cost of producing the energy must be calculated.
3. Any deterioration or reduction in a plant’s useful life must also be considered, especially if this cost is incurred even when the plant is idle.
4. Fixed costs, incurred whether the plant runs or not, need to be considered a part of the price of owning the option to produce in the future.

Using Options Thinking in The Future

As we can see from the example of the nuclear plant, standard spreadsheet driven NPV analysis just does not work in certain situations; specifically ones with assumptions that are highly variable and where managers can take action after uncertainty is reduced.

Real Options Matrix

	← Low Risk	—————→	Higher Risk →
High benefit/ expansionary (Calls)	Replicate/ Repeat	Expand: (Purchase/Build)	Add-On/Diversify
Lower cost/ minimize risk (Puts)	Switch	Wait	Sell/Exit

The challenge for managers in the next decade is to systematically structure strategic scenarios that build option value and act to increase the value of strategies that may contain embedded options. In the previous example of selling telecommunications services, we could envision several scenarios such as buying a small telecom service company or piloting the service in one market which would move one to the left in the matrix. In general, we think of options to the left of the matrix as being less risky, and of higher expected value.

Data needed to evaluate an option

When using options techniques to evaluate an asset, you will need four types of data:

1. Data on output prices can be collected from available industry sources such as the new ISOs or futures exchanges. [If market-based price data are not yet available, FERC Form 714 system load and lambda data can be used. Lambda, the system marginal cost is the price that would clear a perfectly competitive market.]

In fact, a nuclear facility is a pool of options resident in the plant, land and decommissioning fund. While options valuation certainly has its skeptics, recent utility asset sales suggest that there is additional value that others might be ignoring. Additionally, stock market research also suggests that investors intuitively reward option value as well, assigning premiums to companies with solid customer relationships and brands. Owning a connection to customers gives them the option to expand.

While options valuations are used as an analytical technique when facing uncertainty, the analysis is sometimes more easily performed than others. If there are good historical data available that give us insight into the behavior of key variables in the future, models can be created more easily and their outcomes can be used with greater confidence. If little historical data are available, assumptions must be made, limiting the precision and thus the usefulness of the options analysis. Fortunately, most often this is not the case when valuing utility assets; good data are often available.

Given the fact that industry restructuring and M&A activity is almost certain to intensify, a company should consider the option value of its assets before any major strategic action is taken. Companies also should not ignore the value of flexibility when evaluating new strategies, nor the ability to create options that will increase the value of your existing assets.

A Brief History of Real Options

Options give the right, but not the obligation, to own an asset and its cash flows in the future. Until 1973, when Nobel Prize winning financial economists Fisher Black and Myron Scholes discovered a method of pricing options, the market for options was not well developed, since pricing them was tricky. Today, a new financial industry segment has emerged in using new financial instruments both to hedge risk or to leverage investments on many types of derivative contracts.

After the groundbreaking work at University of Chicago, Stewart Meyers of MIT noticed that any capital budgeting decision was in fact a series of imbedded “real options” on additional investments. Researchers first applied “real options” to figure out why some companies systematically underbid for oil and gas exploration rights. Oil companies realized that owning the reserves had value, even if the costs of developing did not make sense given the costs and prices present at that time. Given the historic volatility of oil prices, owning the reserves in the ground had the distinct possibility of being “in the money” in the future. The techniques used to value those reserves were the starting point for real options analysis today.

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