

Generation Strategic Planning in an Increasingly Uncertain World

INTRODUCTION »

With more and more countries around the world seeking to reduce emissions from generating facilities, combined with the rise of renewable generation alternatives, energy companies are facing key strategic issues regarding how to manage their current fleet of generating assets. How, when, and at what level should renewable generating assets be added to generation fleets? When, and how many of the current generating units should or could be shutdown? And, how can these types of capital intensive decisions be made in a world of uncertainty.

Navigant Consulting, Inc. recently completed a project that dealt with these very issues. Working hand in hand with our client, we navigated through these uncertainties to identify a manageable set of strategic alternatives that the Board of Directors could review and make key strategic decisions in a timely fashion to provide the best economic alternative understanding the related level of risk for each alternative.

The project itself had four main objectives:

1. Integrate the Navigant team with a broad-based client team to create a cohesive working group
2. Define and evaluate numerous alternative planning scenarios to determine the top three to four capacity expansion options based on a combination of economic benefit and risk
3. Prepare a comprehensive report detailing the methodology, key assumptions, current situation the company was facing, analytic results from the scenario planning and modeling, recommendations regarding the most likely scenarios to focus on and the preparation of an executive summary of the results and associated recommendations
4. Document the process used in determining the best course of action to support any rate case or other proceedings related to the decisions made

The overall effort took place over a six month time frame and resulted in a report to senior management and the board in late September of 2010.

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BACKGROUND »

Most utilities in the world are or will likely face increasingly stringent regulations and laws related to power plant emissions. Utilities in the United States are currently facing a complex landscape of regulations and laws as well as uncertainty in the timing, depth and breadth of these regulations. Chief among these are the U.S. Environmental Protection Agency's Regional Haze Regulations requiring Best Available Retrofit Technology requirements, potential enhanced regulation of criteria and non-criteria pollutants, potential Green House Gas (GHG) regulation, and renewable generation and demand-side management requirements. Additionally, it has become increasingly probable for most utilities that new requirements will be adopted in the near future that specifically target power plant emissions, and/or otherwise indirectly impact operation of such facilities; particularly coal-fired facilities. These ever increasing requirements have led many companies to modify how they determine:

- » Which, if any, facilities they will invest in through new environmental equipment additions
- » Which new generation (size, location, technology, etc.) additions they should consider
- » Which units to consider for shutdown
- » What is the role of demand side management
- » Under what time frame will these decisions be required

New developments in natural gas exploration and extraction technologies have greatly increased expectations for U.S. domestic supply and lowered price expectations. As a result, many utilities in the U.S. have already declared shutdown of some coal fired units and are evaluating the potential retirement of other coal units to reduce their total GHG emissions.

Often times a company's integrated resource plan (IRP) will focus on the least cost alternative necessary to meet their needs given a defined set of assumptions regarding regulation, pricing, load growth etc. However, in a world of uncertainty regarding potential new regulations

that can significantly impact an entire industry, it is necessary to apply differing techniques regarding the likelihood and breadth of these more stringent regulations, impacts from new renewable technologies, etc. These new levels of risk must be accounted for since the final results from an economic stand point can significantly alter overall results for the ratepayer and for the company.

In short, processes in place for developing IRPs may not be sufficiently robust to develop a clear path forward when faced with so many different areas of uncertainty. While an economic alternative can be developed, the unanswered question remains, what is the risk that a decision made today will have negative impacts on consumer rates and/or on shareholder returns in the future?

Additionally, companies may find it necessary to evaluate differing scenarios outside of the IRP process that will be used internally to determine the best strategy going forward to meet defined corporate goals.

This paper will identify the methodology used by Navigant in its work with a client facing these challenging issues, a high level summary of the results and a review of lessons learned during the project. This paper will detail the following:

1. Value added from a risk based scenario planning approach
2. An overview of the methodology used for this approach
3. Sense of the magnitude of variance from a risk based approach versus a "standard" approach
4. Lessons learned from actual project work
5. Potential end users for results of this type of risk based analysis

PROJECT SETUP »

The project team was established as a joint effort of a broad based set of client members and key members of Navigant with skills in strategy, planning, modeling, and risk analysis. The client team members were vital in providing current state assessments of their generating fleet,

recently filed resource plans, state, regional and federal regulatory requirements specific to their company and the ability to provide a key interface with the company's Senior Leadership Team. As shown in Figure 1 the client team members represented 13 departments within the company.

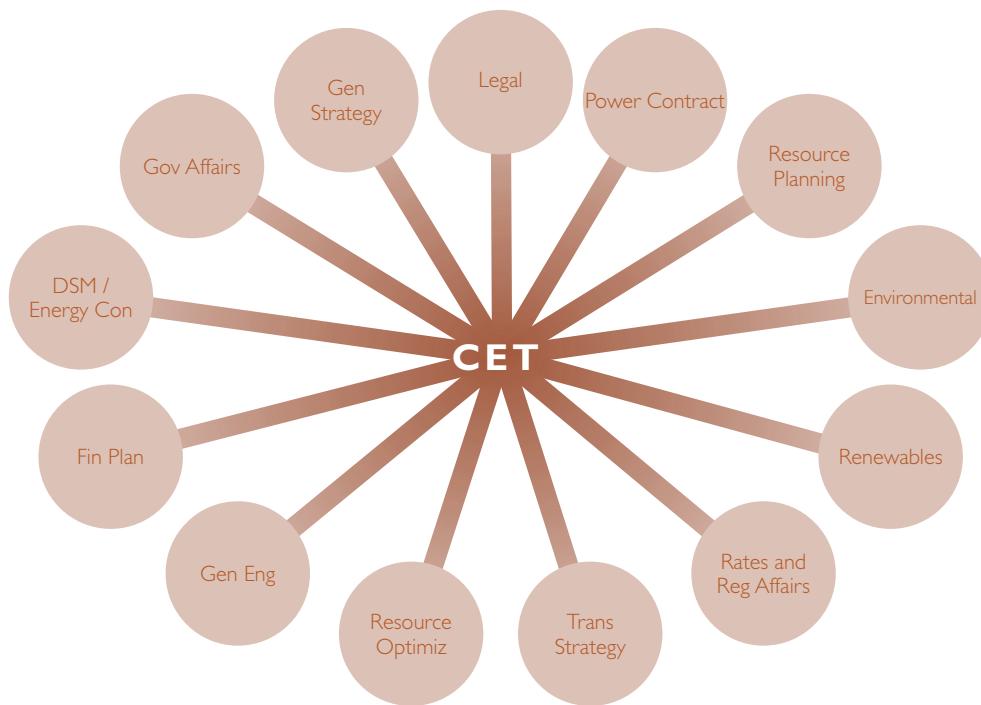


Figure 1: Corporate Evaluation Team (CET) Representatives

The identification of the team also served as a commitment from all parties to focus on this effort and the deadlines to meet the company's needs. Once the project team was assembled it was necessary to make several decisions to prevent the project from devolving into an esoteric discussion that would have delayed the project completion.

These decisions included:

- » Selection of the modeling tool to use for the project
- » Identification of broad scenarios to be modeled
- » Determination of key risks to be applied to the modeling results
- » Outline of the final report and presentations
- » Project schedule and critical path deadlines
- » Establishing lines of communications amongst the team members

Selection of the modeling tool included determining which available product would not only properly evaluate various alternative generation plans but would also allow the use of a risk based adjustment to key modeling results to better understand the impact of the associated potential risks.

Next the team selected six basic scenarios that they felt would cover the most likely conditions in which decisions would be made. The scenarios included variables such as fuel price, carbon price, the level of regulatory impact, load, technology cost, and technology improvements.

The team further determined the areas of risk to apply to the modeling results. These areas included likelihood of certain regulations, external market prices, range of fuel and carbon pricing, etc.

Since there was an identified time in which the analysis was required to be completed a project schedule was established with weekly updates provided to insure the project remained focused on the established deadline. Weekly meetings were also held to insure a constant flow of ideas and communication necessary for a successful outcome. Multiple conversations between team members were held outside the weekly meeting as well to deal with detail modeling issues.

PROJECT METHODOLOGY »

The overall project was conducted in three major work steps which are described below.

Work Step 1: Current State Assessment

The effort in Work Step 1 included Navigant's review of previously completed studies and reports in the area of resource planning, regulatory requirements, current generation capabilities and performance, current and potential environmental constraints and current forecasts for fuel and carbon pricing. Navigant provided updates and augmentation as needed, including assessing the company's existing assets and resource plan, determining opportunities and gaps and key areas of risk. Some of the information required came from previous work done by Navigant for the client and helped to better manage costs and work effort.

Work Step 2: Future Scenario Analysis

Work Step 2 entailed constructing a set of coherent and plausible scenarios of the future, reflecting combinations of fuel prices, carbon prices, capital costs, and other parameters. Each of the scenarios included the potential impact of the scenario factors on revenue requirements, rate impacts, and shareholder returns. The project team identified the likely renewable, conventional supply side, energy efficiency, demand response, and other potential resources that will be available over the next ten years. This part of the project required the most significant effort and discussion amongst the team members. With a broad range of views from the team a significant amount of time and effort was necessary for the team to reach a reasonable consensus on the best scenarios that would be evaluated from a risk based approach

The modeling output identified the least cost plans in each scenario using a utility planning model. The model used enumerates all feasible combinations of resources, subject to user constraints such as number of units, time available, reserve margin requirements, renewable energy requirements, and mutually exclusive combinations. Utilizing the modeling results the team determined multiple potential plans that would be further reviewed under the risk assessment effort.

Work Step 3: Risk Assessment

As was noted earlier, the least cost plan may be very fiscally attractive but may also carry with it a high level of risk based on potential future market and regulatory conditions beyond the control of the company. The overall goal of Work Step 3 was to identify these risks and maintain the greatest amount of flexibility for the company in making decisions that are associated with significant investment. A graphical depiction of how risk was evaluated is shown in Figure 2.

This work step examined the likely risks associated with the low cost plan in each scenario and highlighted the best plan for risk mitigation while balancing the economics for the customers and shareholders.

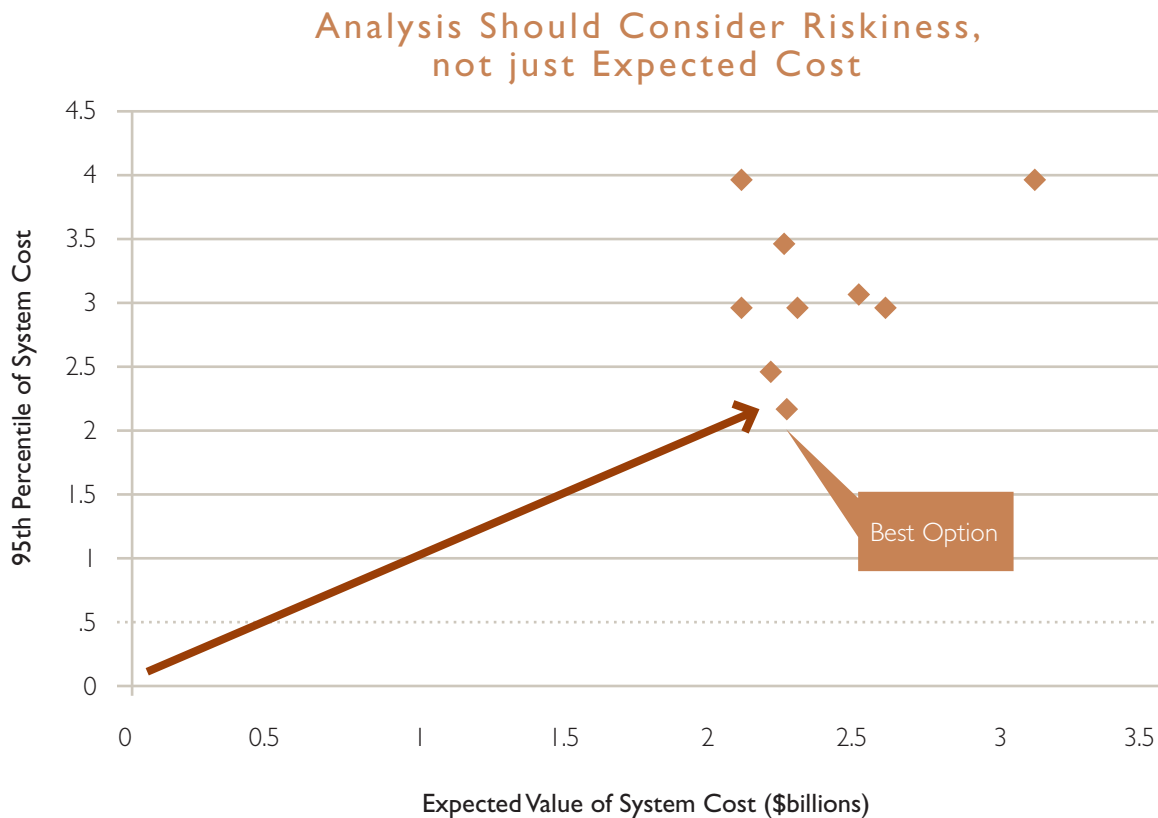


Figure 2: Risk Assessment Framework

PROJECT EXECUTION »

As can be expected, for the project the planning modeling analysis consumed the bulk of the time. The effort required close coordination with utility staff to make sure that both the existing resources and candidate resources were being appropriately characterized. The project team determined that to provide a more comprehensive evalua-

tion the potential options would be increased from 6 to 14. In all there were seven alternatives evaluated in each of two regulatory cases:

1. Regional Haze – Best Available Control Technology – current regulation
2. Enhanced Regulation – more expensive compliance required

These seven scenario options are shown in Table I below.

Forecast Combination	Fuel Price Forecast	Carbon Price Forecast	Load Growth Forecast
Current trends	Company base	mid	Company base
Green world	Company high fuel	high	Company low
Robust growth	Company high fuel	low	Company high
Technology Improvement	Company base	mid	Company base
Escalating costs	Company high	mid	Company base
Low growth	Company low	low	Company low
\$0 carbon	Company base	No carbon	Company base

Table I: Summary of Forecast Combinations

Coupled with iterative run times of approximately 24 to 36 hours, this required substantial computing capability and intensive analyst focus. During this effort the Navigant team continued to hold weekly meetings with the client team to discuss project and review interim results, adjust any parameters and generally insure continued coordination throughout the process. These meetings typically lasted at least 90 minutes.

During the course of the project it also became clear that given current conditions, likely regulatory actions and technological issues, consideration of lead time for new resources was an important consideration. Research showed that permitting times have increased significantly in the U.S. in recent years, in part due to budget constraints at

state agencies. This has lengthened development and construction periods to six years for combustion turbines and seven years for combined cycles. Renewables are likely to be permitted in shorter periods of 2.5 years. This led to significant reliance on the market and renewables in early years, with concomitant risk.

The relative risk analysis identifies portfolio financial risks at extremes. Optimally, the best portfolio will have the lowest cost in a most likely case as well as the extreme value (i.e., “upper tail”) financial risk. Navigant ran each of the 14 plans selected as optimal in two worlds: Current Trends (viewed as most likely) and Extreme Costs (high construction, fuel, and market prices and load).

PROJECT RESULTS »

The results of the evaluation process showed that build plans and decision points differ by scenario. Figure 3 shows key commonalities and differences across the various scenarios, forming a divergent tree of options that define the decision points in a build plan. The paths

are merged to best optimize costs while minimizing risk under the assumed constraints. Of key importance was the effort to provide maximum flexibility in direction and timing for the decisions required by the client.

RH BART Build Plans

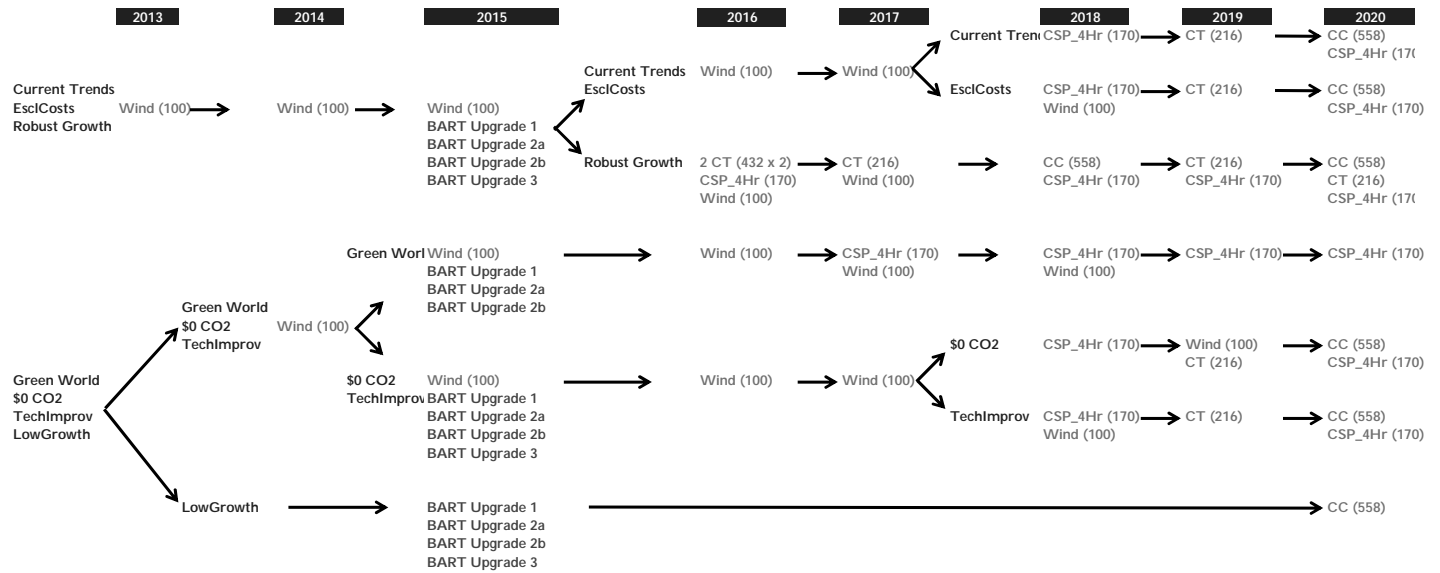


Figure 3: Decision Tree Results

The results of the relative risk analysis of **Current Trends World** show that the **Green World Plan** appears lower cost than the **Current Trends Plan**, as shown in Figure 4. This result may initially appear surprising. However, the **Green World Plan** does not meet the reserve margin in this case, which entails significant risks for the utility. Navigant quantified the risks through a capacity charge for the short-

fall in the plan relative to the reserve margin. Even with the capacity charge, the **Green World Plan** is still the least cost, implying the utility should consider increased reliance on the market, although this does carry with it some increased risk.

Relative Risk – RH BART Plans

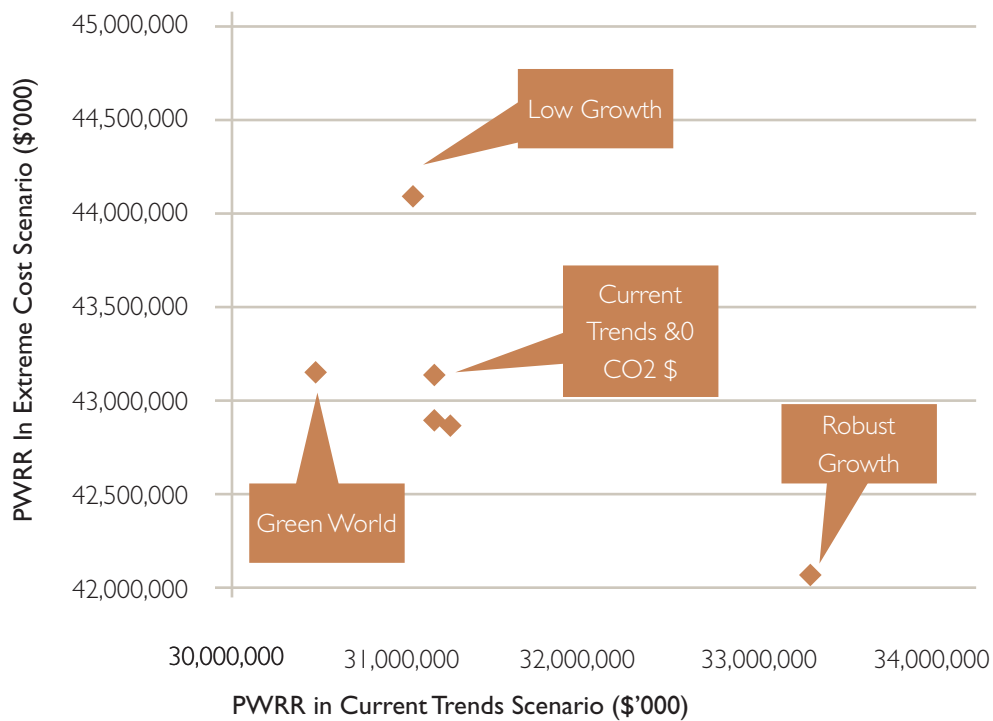


Figure 4: Relative Risk Analysis

LESSONS LEARNED »

In total the project was a key success and new step for the company toward better understanding the implications of meeting the demand for more renewable resources and the risk and cost of switching the generating fleet assets into a new mix of assets. This switch does carry with it significant costs and risks. To deal solely with the costs without understanding the potential risk of decisions could lead to the inability to recover costs associated with this change and or higher costs for the customer. Since the base effort of the project was to forecast what the future may hold it is also vital to protect the maximum flexibility in decision making as possible. Most assuredly the real future world will not exactly match any of the scenarios evaluated. However, evaluating several potential and realistic scenarios can provide a company with a glimpse of the options in a future world and allow them to make a better decision for their company and for their customers. During the course of the project several areas were identified as key areas that can impact the success or failure of a project like this.

Key areas which need to be well managed and which are lessons learned from the project are:

- » Managing expectations of time and deliverables is vital – experience continues to show that modeling typically takes longer than expected.
- » To insure a quality evaluation and thus a quality set of potential options, QA/QC must not be rushed. The costs associated with these types of decisions will always be made with imperfect information. Strong QA/QC can help minimize the negatives from this imperfect information.
- » Having redundant modeling staff to allow for backup when around-the-clock attention is needed. Since these projects can take multiple months to complete, it is likely that people will be out for various reasons and thus a back-up modeling person familiar with the project will help minimize delays in delivery.
- » Definition of the key uncertainties to consider. This will take some time to gain a consensus from the team on which uncertainties are most important.
- » Establish model performance benchmarks and validate as early as possible and include efforts to:
 - » Benchmark model results against historical data
 - » Benchmark model results against client model output (PROMOD or other)
 - » Benchmark model financial results with client IRP against actual IRP financials filed with the state
- » Constant and complete communication amongst team members is crucial. It is important to draw out the thoughts, concerns and opinions of all team members early to avoid a late project issue that could have been resolved earlier.
- » Define the form and format of final project deliverable(s) so you can begin to “fill in the blanks” as the project progresses. The final report will take time for all parties to read, review, comment on and return for inclusion. This is again another area that will take longer than many would think. The team should also expect that the project results will have multiple audiences which will require differing levels of depth and complexity. The final results will likely be presented to various levels of company management, company boards, regulatory bodies, internal planning teams etc. Each audience will likely need varying degrees of detail. Plan for multiple delivery points.

These types of strategy projects can be useful in evaluating an uncertain future and prepare a company for a range of potential outcomes. The decisions made for that part of the value chain associated with the generation portfolio may require significant capital investment which will shape the company's future for some time to come.

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