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Optimizing Your Strategy to Make 'Smart' Investments

After visiting numerous utility-focused conferences over the past 18 months, one topic that appeared to dominate many agendas was a focus on "smart" solutions – smart meters, smart grids, smart customers, and smart generation. While these are all different functional areas, reading between the lines of the presentations suggested that all where wrestling with elements of the same question. "How do you select the most valuable smart investment initiatives to undertake?" In response, UMS Group re-defined its existing Investment Optimization service offering to make it "Smart"er. This whitepaper describes how we did it.

(by Jan Schipper, Managing Director UMS Group Europe, February 2011)

Utilities have lots of promising initiatives but not enough financing is available for all of them.

Recently I spoke with a colleague who is the portfolio manager at a large multi-utility. He told me:

"*The problem is that all business cases for individual investments pass our tests! However the amount available in the budget is insufficient to fund them all. I need to quickly decide which investments to fund to meet my stakeholders' demands, but how do I evaluate all these investments in different parts of the business? I can't compare apples to oranges.*"

As the portfolio manager, he is responsible for promoting only the best investments to his board. Yet, on his desk he had about fifty good individual investment proposals. While each business case met all of the company criteria for investment, the overall investment potential was constrained due to the existing budget.

Figure 1: How to optimize investment alternatives?

I told him the good news is that he is not alone, many of his colleagues are struggling with the same, difficult problem. I also told him the better news is that there exists a structured framework for comparing and evaluating various options within complex investment portfolios to optimize the investment strategy. Here's how it can be done.

Step 1: Understand the Value Chain

The first step in developing a framework for optimizing a "smart" investment strategy is to identify and understand the dependencies within the value chain for each investment. All smart investments are part of the utility value chain, which at the basic level consists of systems providing supply, logistics (transport), and demand. Therefore, each investment must be linked to others. In addition, each part of the value chain is driven by a multitude of factors, so understanding the key business drivers of each investment is also important.

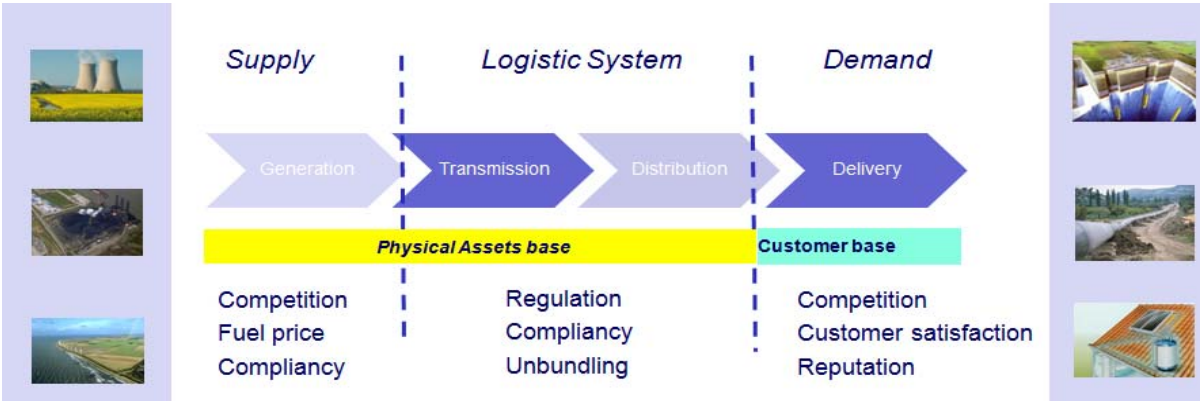

Figure 2: Value chain; how it is linked and what are the drivers?

In many markets, the power generation side of the value chain (supply) operates in a competitive manner with fuel price a key business driver and an increasing number of regulatory/legislative and environmental constraints on operation. The energy delivery side of the value chain (demand) is also competitive in a number of markets with customer satisfaction and company reputation as key business drivers. Similarly, it is facing an increasing number of regulatory/legislative constraints. In between these two links in the chain sits transmission and distribution (the logistics) where the capacity requirements are dependent on both supply and demand. The logistics system provides the linkage for one to balance the other, but is still regulated, with the key business driver being service level / reliability.

Each of these links in the value chain is facing challenges that threaten to upset the balance that currently exists between them. For example, the supply side is facing an asset base that is aging, leading to investment decisions regarding the repair, replacement or life extension of assets. Furthermore, stakeholders are demanding increased investment in renewable energy and energy efficiency. Finally, it is becoming more and more difficult to site new plants.

Similarly, on the demand side, the challenges include customers that want “clean” energy solutions such as smarts meters, combined heat and power (CHP), solar water heaters, and small-scale distributed generation. Along with concepts such as “zero”-energy buildings, these new technologies

Figure 3: Business challenges are adding more complexity

have the potential to significantly impact electricity demand. Given the changes in both these parts of the supply chain, the question is 'Will supply be adequate to meet demand, yet not have a significant level of overcapacity'. A further complication is that in order to accommodate theses changes, the logistics system must also change. However, the aging grid and existing capacity constraints present a challenge in this area, as does the increasing resistance to overhead distribution and difficulties in siting new transmission lines.

In addition to the individual issues that they face, all three links in the value chain also face a common issue in terms of carbon emission constraints. The follow-up to the Kyoto Protocol, the Copenhagen Accord, continues the trend towards government constraints on the amount of carbon that can be emitted by the electric industry. However, specifics on long-term reductions and acceptable offsets are lacking, and the uncertainty created by the start and stop nature of the political process increases the risk in making investment decisions.

Once the challenges to the supply chain have been defined and bounded, we can use them as a guide to identifying a consistent framework for optimizing investments.

Step 2: Develop Potential Scenarios for the Future

Beginning with the supply side of the value chain, the major questions for generators as we look out a decade is whether decentralized (distributed) generation will provide significant capacity and how fast the transition from gray (fossil-based) power to green power will occur.

Globally, policy makers have been unable to provide a clear answer to these questions, which creates business risk for those utilities looking to make major investments in power generation for the future. Investing in all four quadrants shown in Figure 4 will lead to sub-optimal decisions, so generators need to pick a development path that minimizes the risk of an incorrect decision (e.g., starting with centralized gray power, using energy efficiency to avoid new capacity until end of life, and replacing with decentralized, green power).

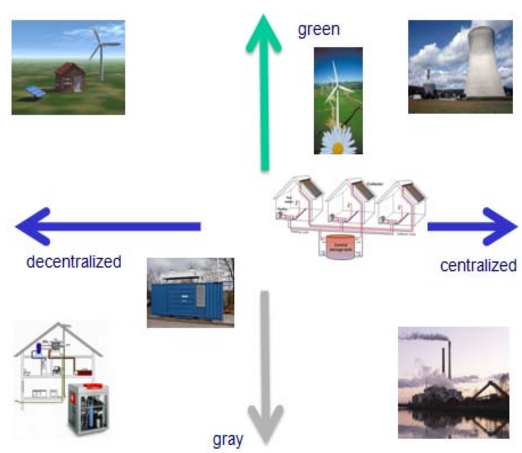

Figure 4: Which direction is the way towards 2020?

Just as the supply side of the value chain faces questions that impact planning for the coming decade, so does the demand side. A vast number of online, intelligent, sophisticated energy management systems are being introduced experimentally in homes and offices. At some point, it is likely that these experimental systems will become mainstream and have a major impact on demand (or at least in the growth of demand). In addition, there is also significant potential for the development of zero net energy consumption buildings where on-site, distributed generation (such as micro CHP) fully meets energy demand without requiring any electricity from the utility.

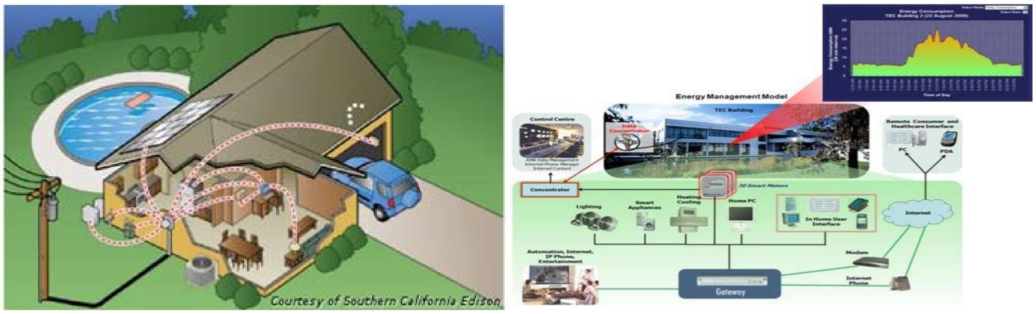

Figure 5: Future demand will be driven by innovative technology

While this looks like a future of falling demand, the impact of these changes may be countered by new sources of demand, such as Electric Vehicles (EVs). At first glance, the economic downturn would seem to undermine the conversion to a greener (and more electric) transportation system. Yet, the increasing price of oil and growing concern over the environment seem to be overriding concerns over the cost of electrifying transportation. While predictions of the rate of market penetration vary, at some point EVs appear poised to create a major new source of demand for electricity.

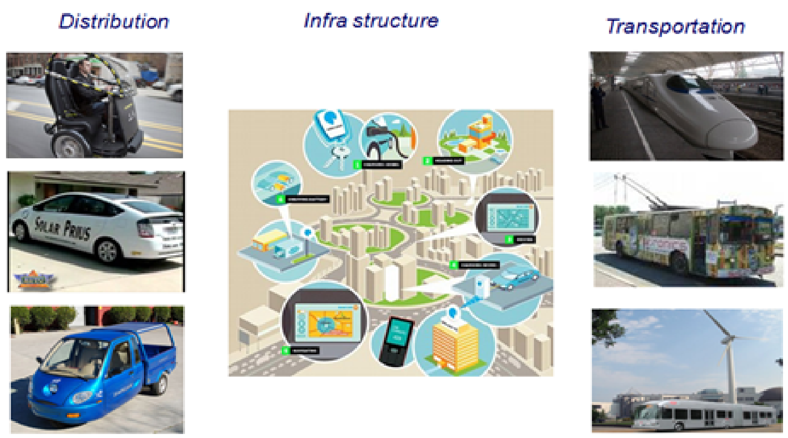

Figure 6: Use of electricity as a transportation fuel will impact the grid

Step 3: Consider the Impact of Grid Modernization (the "Smart Grid")

The "Smart Grid" is one of the key buzzwords being bandied about at industry conferences and in the press. However, at UMS Group, we prefer to use the term "grid modernization," which implies a change based on evolutionary steps, rather than a revolutionary, instant conversion. We believe a slow evolution is more likely, and we see it occurring in four stages which will eventually bring about the smart grid.

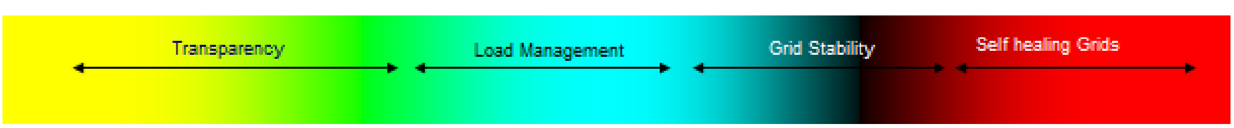

Figure 7: Stages of Grid Modernization

The first stage is the introduction of smart metering which will help optimize energy consumption by providing better transparency regarding usage to energy suppliers. In turn, this visibility will support better load forecasting and 'time of use' rates for electricity. While many see this as a major technology change for the grid, the real impact comes from the dramatic rise in the volume of data which will need to be processed. This volume will have a major effect on IT systems, but won't really require significant changes in today's grid.

The second stage will be the addition of CHP, solar power, distributed generation and remote load control technologies which will afford both customers and utilities the ability to reduce or shape load. These systems will create a need for local grid optimization requiring upgrades in system automation and security. Similar to the first stage, this second stage will require no major modifications to the existing grid.

However, as more and more decentralized generation is added to the grid and existing capacity needs to optimized even further, grid stability will become an issue. This is where the third stage of grid modernization will occur, and this stage will require major technology upgrades to meet the massive changes in demand/supply profiles. Significant investment will accompany this stage as complex control systems are needed and grid capacity is adjusted on a large scale.

The last stage is the development of the self-healing grid in which the grid is continuously monitoring and assessing its status and operations to identify problems, and where it uses intelligent controls to initiate corrective actions. This stage will take some time to come about, but will also require significant investment when it does.

The main benefit of this four-stage model of grid modernization is that it provides recognizable decision points for considering investment. By understanding where a utility is in the process of grid modernization, the consequence of delaying an investment can be measured.

Step 4: Develop a "smart" investment strategy

This paper started with a question on how to choose between budget-constrained investments that all have positive business cases. You can't compare apples to oranges, so investments must be put into comparable terms. These comparable terms are value and risk (of investment deferral), which must be weighed against each other in comparing alternative investments. Taking into account the value and risk profile of each potential investment, the UMS Group framework focuses on selecting the optimal group of investments that maximize the strategic value of the company with an acceptable risk exposure and within budget constraints.

The ***strategic value*** of most investments can easily be calculated, incorporating the total impact projected for every potential investment on each dimension of the company's strategic scorecard. For example, how much benefit will a given project add to achieving the company's goals in safety, reliability, efficiency, cost, and financial returns? The sum of these impacts is the Value of the investment.

Calculating risk on the other hand has typically been the difficult part. This is due to the fact that there are three key dimensions of risk which must be considered in determining value – consequence, probability, and time frame. Consequence has often been the easiest to predict, while probability and time frame have been more difficult. Without standards for defining these three factors, comparison is useless.

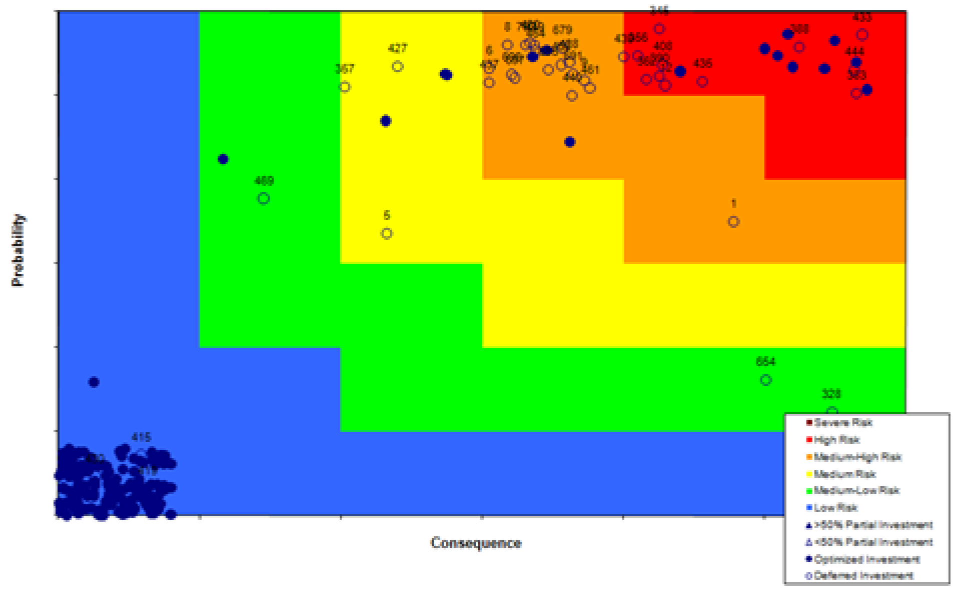

Figure 8: Risk must be considered on three dimensions

To set standards for such definition, one must first understand the possible future scenarios that will impact each investment. The steps discussed in this paper demonstrate how UMS Group considers the environment in which investments will be made, looking at the probability of changes that might occur in the value chain and the time frame in which they might occur. By consistently defining and applying company-specific standards for determining probability and consequence, quantitative values can be specified for each investment which can then be considered along with the value of the investment. Each company's business value framework (i.e., the risks they face and the weight they assign to them) will differ as each has different strategies and priorities, and operates in different regulatory and market environments. However, by providing a framework which identifies and grades risk, defines criteria scoring measures, and sets strategic priorities, a structured process is created for comparing different types of investments.

Executive managers must understand how much latitude they have for making decisions and what the consequences of a particular decision are. UMS Group has developed a structured framework for achieving this objective. By investing where risks are likely, timely, and significant, and waiting to invest in those that are less urgent, companies can make optimized, "smart" investment decisions.