

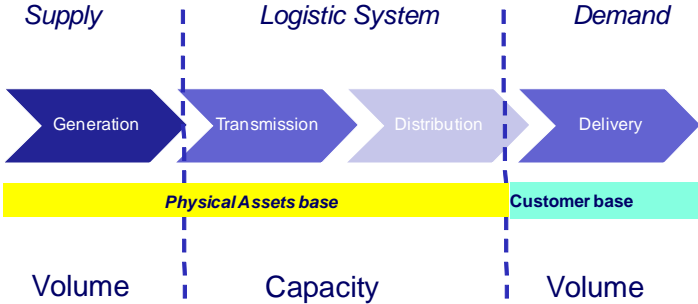
Strategically Optimizing Investment Risks In Powering 2020

This paper is a follow up of the conference “Powering Towards 2020” held in London in November 2009. UMS Group presented key views on anticipated developments in the electricity markets and facilitated an interactive session with 67 opinion leaders at the conference. This paper presents the views of these opinion leaders on the range of issues discussed. Local government (16%) and suppliers and certification institutes (40%) represented more than half of this group.

(By J. Schipper, Managing Director UMS Group Europe)

Introduction – Electricity supply chain model

The conference opened with the introduction of a simple supply and demand model which would be used to project future electricity market developments and scenarios. One can look at the energy value chain in terms of supply and demand, where we recognize downstream end users who consume electricity, and upstream suppliers – the power generating companies. Since electricity can't be stored (yet), the system of demand and supply must always remain balanced. In between the supply and demand players lie the Transmission and Distribution grids as the transport / logistics system which must always have sufficient capacity to support the energy flow between supply and demand. In opening the conference, we postulated that discussing “Powering 2020” cannot be done solely from the supply side, nor the demand side, nor even from the ‘smart grid’ perspective. All elements of the system are connected, however the forces and constraints on each element are different. Understanding these forces and constraints and defining their impact on the different but linked parts is a critical piece of finding the way forward towards powering 2020.

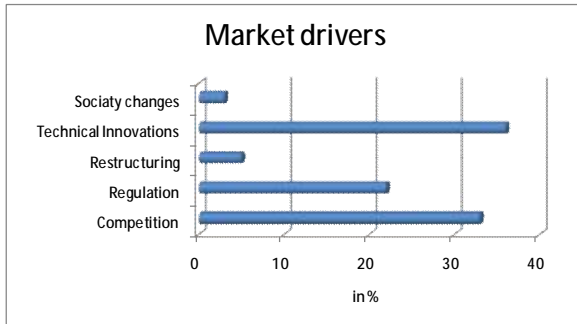


“Holistic understanding of the all future forces, developments and constraints are needed to define the best powering strategy towards 2020”



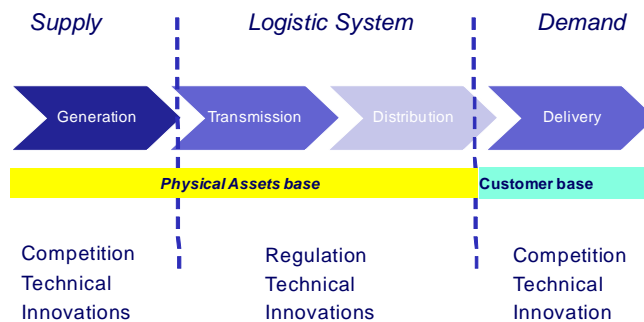
Market drivers projected on the demand/supply model

The session explored the forces working on the electricity demand/supply chain system. We asked our group of opinion leaders what were their views regarding the most important market drivers today. Their response was clear that the most important market drivers are expected to be *technical innovation, market competition and regulation*.



We probed in more detail their views on specific areas of the full value chain. They believed that Market competition will be the key driver for both ends of the chain - Demand and Supply, while regulation will be the most relevant driver for changes in the Delivery or Logistics System.

Balancing these disparate forces will make the risk evaluations and investment decision processes challenging. It can be further expected that technical innovation will repeatedly upset the current equilibrium through the emergence of new solutions to today's constraints. However the nature and the impact of such technical innovations on each element of the chain will differ, creating a continual shifting of competitive advantage and with it opportunities and threats to incumbents.

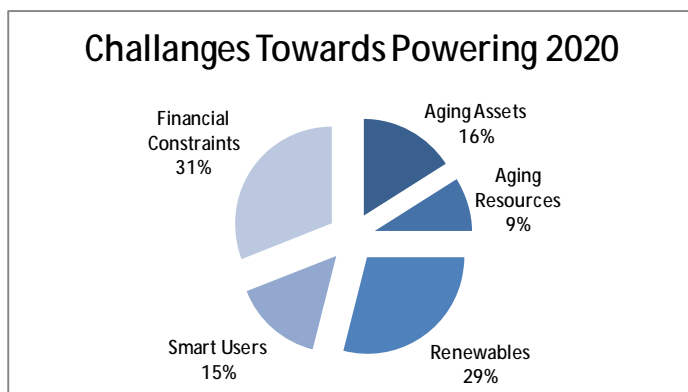


"Generation and delivery are mainly driven by forces of market competition, while the Logistic Transmission and Distribution Systems are driven by regulation!"



Challenges in perspective of powering towards 2020

Besides the market drivers that will force changes, the group identified five (5) major challenges



which must be considered by competitors, investors and policy makers when looking towards 2020. We asked these opinion leaders what they saw as the most substantial of these challenges. Their response suggested that *financial constraints* will be the greatest challenge! Each of these changes is multidimensional with significant

interdependencies. Further, most of these challenges have to be met while we navigate the current massive shift toward more renewable generation.

UMS Group research and analysis suggests somewhat different order in the magnitude of these challenges. We project that over the coming three years, generators, as well as grid companies, will first have to define their strategies for dealing with the aging of physical assets. This, however, will depend on the direction which generators and end users will choose.

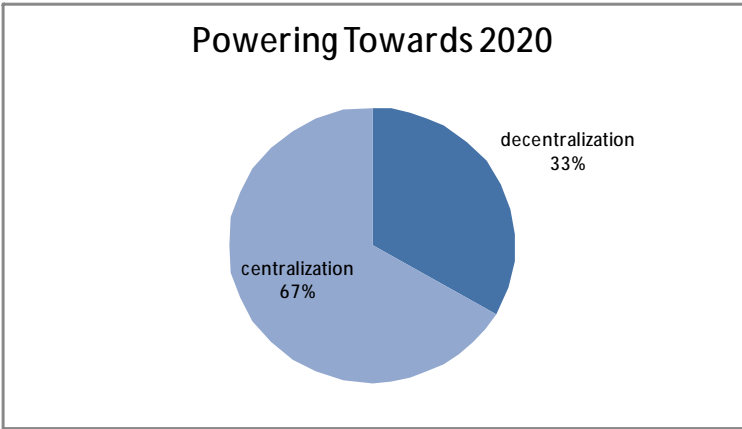
Technical innovation on the demand front is expected to drive changes to End User behaviors and lead to the emergence of completely new consumption profiles. Expected patterns include consumer optimization of energy consumption (via “smart homes”) and the rise of the ‘energy-neutral’ end user who, during peak consumption periods, is a net energy user, but in other periods feeds energy back into the system.

The current economic crisis seems to produce a bit of paradigm shift on the energy supply side. In the past, during economic prosperity, the general public would agree that Renewables were good for society and commitment to them was a sound public policy. But during economic recessions, Renewables tended to be viewed as expensive and less relevant. Now however, the greenhouse gas debate has driven a major shift in public sentiment and political will to strengthen the Renewables commitment. But because the areas where renewable generation can be built differ from both where the load is, and from the locations of current power plants, our grids are rapidly becoming suboptimal. Furthermore, they are not designed to readily adapt to these changes.

The group examined different future scenarios for each element of the value chain, starting at the supply side.

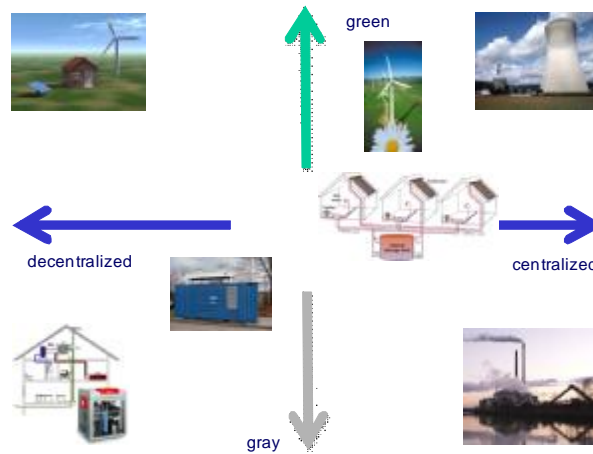
Future scenarios towards powering 2020

Again our opinion leaders were asked for their thoughts. The question put to them was “What are you expecting in the short to medium term regarding relative centralization of power generation?” Their expectations were that centralized plants will continue to be built and would retain the majority share all supply, but would be steadily losing share to share to Renewables into the future.



Forecasting the future rarely adds much value. But interviewing experts about the range of possible future scenarios can elicit interesting new perspectives. We explored two primary lines of thinking with our panel. These two dimensions of uncertainty included the relative priority of decentralized

versus centralized generation and the future predominance of fossil (gray) supply sources versus renewable (green) sources. Interestingly, these experts expected that efficiency improvements in our current “gray” landscape will dominate, offering far better results in relation to reduction of carbon emissions, for example.

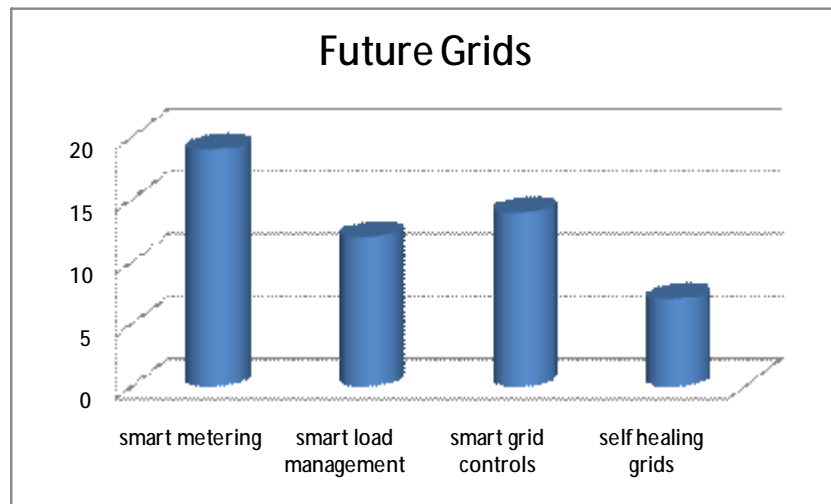


Which direction is the most likely scenario?

It is impossible to predict which scenario will come to pass. In theory, good scenarios are all equally likely to occur. The value of any scenario is primarily in what it reveals to you about future possibilities and the implications for how ready we might (or might not) be for that eventuality. In the current market we see elements of all four different world views developing. This ambiguity is largely due to uncertainty regarding technology evolution and the lack of any clear direction from government policy makers at the local, national and even global scale.

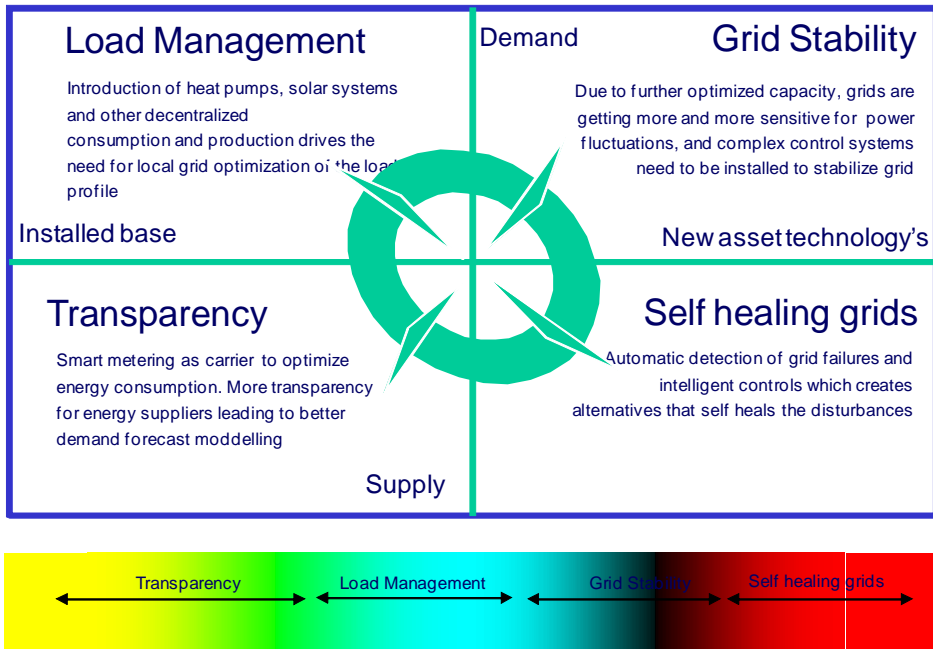
Future scenarios towards ‘smart grids’

When studying the development in the electric delivery network / logistics system, we also find interesting scenarios. Again our opinion leaders were asked to share their views. The question asked was if they would expect a trend towards smart meters leading to better understanding of End Users profiles which would lead to better use of current grids. Or smarter users having own decentralized generation which would lead to changing profile of end users. This would cause changes in the load management forecast and some changes in control systems of the current grid. Or more and more decentralized generation feeding into the grid at locations where the grid is not designed for the flows, which could lead to severe grid instabilities. This would implicate major changes in the current grid control systems. Or a last option - implementation of very advanced grid controls that can measure and predict grid stability problems and initiate control action to self heal?



As can be seen, self healing grids are viewed as more science fiction than near term reality. In our internal analysis, UMS sees a kind of a maturity scale in the steps described above. We expect that the first development will be the introduction of smart meters. This will be driven more by public policy and regulatory pressure on Distribution utilities than by End User demand. The risk is that this may enable better demand/supply forecasting, but is also likely to lead to unmet customer expectations. Reliability of the core grid will not change simply with the addition of such meters, although customers are likely to expect 21st century levels reliability once a “Smart” meter is installed on their home. This in turn may increase regulatory pressure on the utility as customer complaints rise.

Therefore, initially this first step in the roll out of the smart grid concept may not lead to high investments in transmission and distribution grids. But without dramatic increases in utility investment and corresponding rises in electricity rates (very unlikely to receive regulatory support), grid companies will need to find more sophisticated ways to manage their aging network problem - with their own “*Smart*” replacement program. However, even following that course, when End Users begin implementing new technologies on a larger scale (e.g. solar cells, micro turbines, heat pumps and energy optimization systems), then major changes in the energy profile of end users could lead to growing power quality problems. In that event, the current design of the installed base grids will come under further pressure and eventual upgrades to grid control systems will be necessary, and costly.

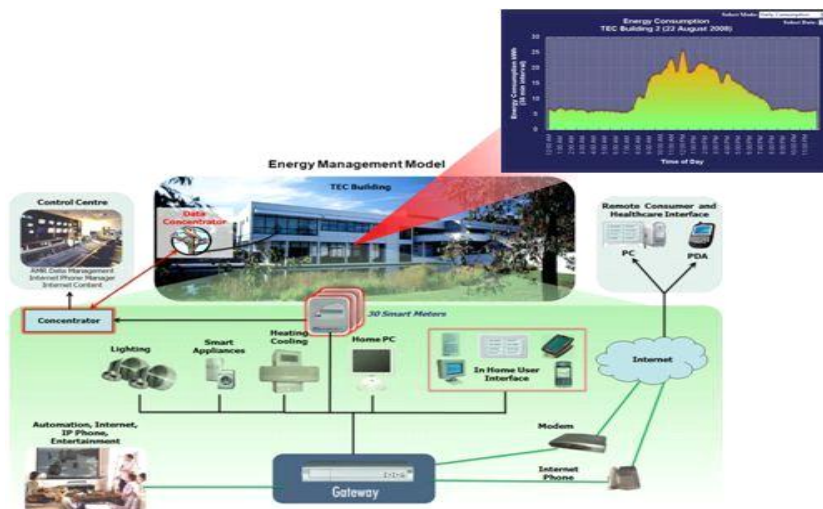


As these developments unfold, current grid design will not meet the new demand/supply needs and grids are likely to suffer from instability. Major design changes will be needed in parallel with major waves of utility investment. The end state of such changes will finally be innovative technologies that create the capability of grid systems detecting problems and having smart controls to solve these problems in real time (the self-healing grid).

However, when this end state is reached, we foresee that other forces will have created a completely new market landscape and the cycle of technology, regulatory and customer changes will likely start again.

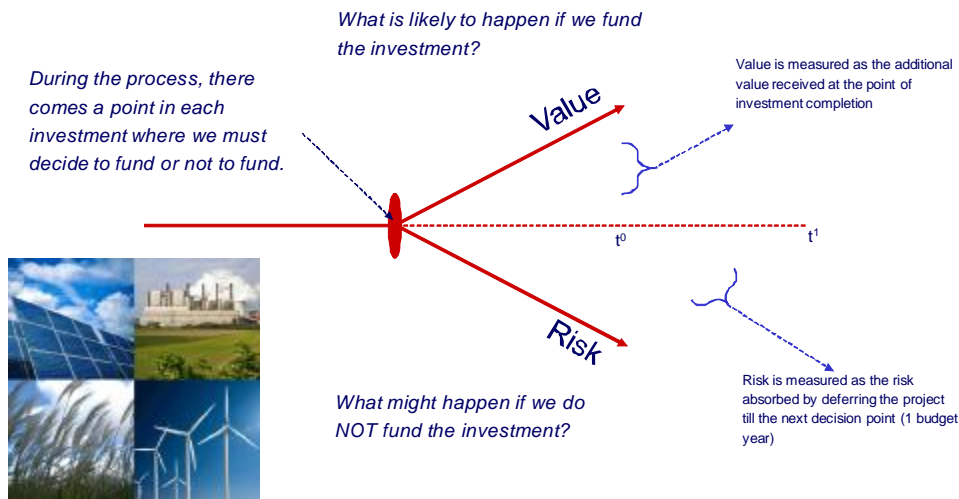
Future scenarios towards 'smart users'

Looking at the future scenarios regarding the end users, our group of opinion leaders were of a single mind. Their uniform expectation was that end users will increasingly focus on optimization of their energy consumption ("Smart Houses").



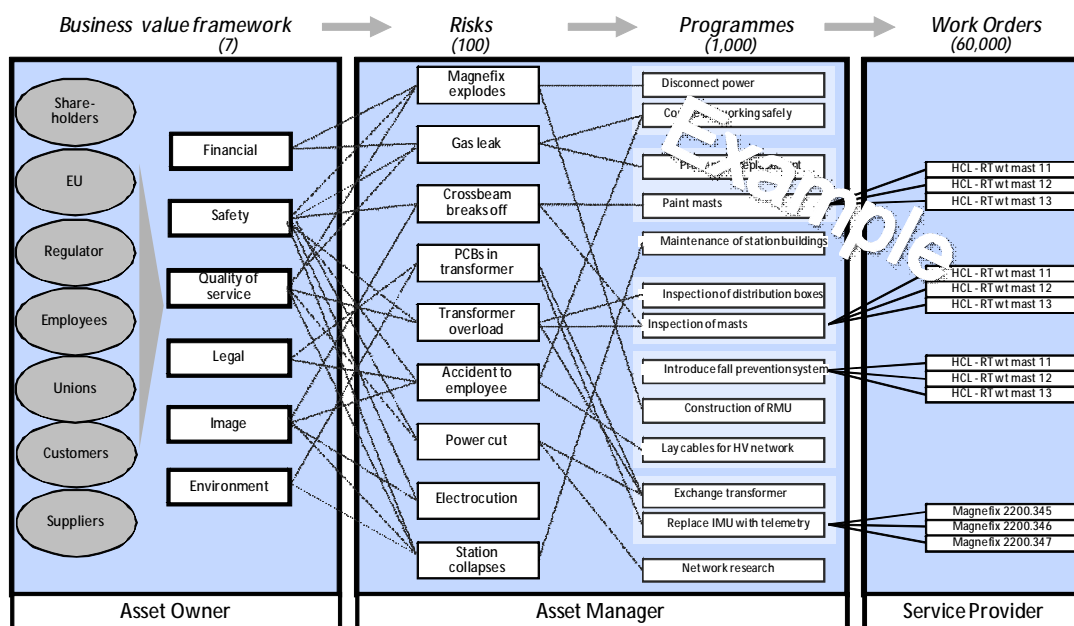
Investment decision approach

These insights brought the group to the point of asking ‘how can we determine what risks we are exposed to and what investments we need to make to be successful in the future?’ Our experience with thought leaders across the Electricity sector suggests that such decisions are fundamental and are typically based on a thorough evaluation of two dimensions. The key questions asked by such thought leaders are: “What value will be created by making the investment?” and “What risks will be mitigated?”

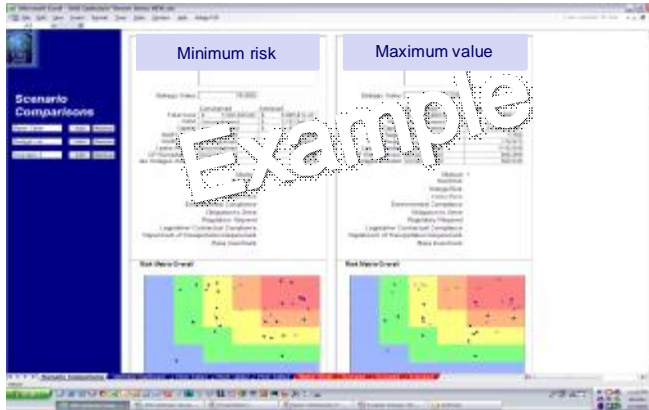


Of course, answering any question regarding *value creation* requires that you first ask - from whose perspective will you be defining “value”? Are you trying to maximize value for the owners of the business? Or should it be for your customers, for your Employees or Vendors, for your Regulators, or for some other stakeholder group? Industry leaders believe that value must be understood through the eyes of each such stakeholder interest. To be able to make such evaluations requires definition of a clear set of business values for each group.

Then, understanding of the risks to which business is exposed and how that will change as a function of each potential investment is critical.



Having evaluated each potential investment in terms of its impact on risk and value in the business, the overall portfolio of prospective projects must be assessed and optimized. Then full project list usually exceeds the financial means available for funding, and so the challenge is selection of those that together produce the best overall result. Two (2) sets of projects must be defined - the optimal combination in terms of producing minimal risk exposure to the business, and the optimal combination to produce the maximum value which can be created through investment.



In selecting the optimized set of investments, two scenario's should at least be understood. The scenario where risk is minimized and the scenario where value is maximized. The best selection of investments are those which you don't regret in any realistic scenario.

Only select No Regret Investments!

In our view, these two groupings represent the outer boundaries of the optimal solution, and the optimum mix of projects that should be selected for funding can always be found between these extremes. All projects which are contained in both the minimum risk scenario and the maximum value scenario are 'no brainers' and can immediately be funded. All projects which are deferred in both scenarios are also 'no brainers' - they can be deferred. All other investments, however, require further review.

Exactly how the future will look in 2020 none of us know. But a strategy for decision makers to fund only those projects which are No Regrets Investments will surely be a good start!