

Powering performance
improvement
Facing future challenges



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Powering performance improvement

Chief executive officers of large power generation companies are today being faced with numerous challenges including climate change, financing new build projects, and navigating the myriad number of regulatory policies in places where they operate. In many cases, these challenges are long-term and strategic. Based on Deloitte member firm experience in the global power and utilities market, many generation company CEOs are faced with finding answers to three basic but complex tactical questions:

- How much money did the company make yesterday?
- How much money could the company have made?
- What did the company learn today that will help it to be smarter tomorrow?

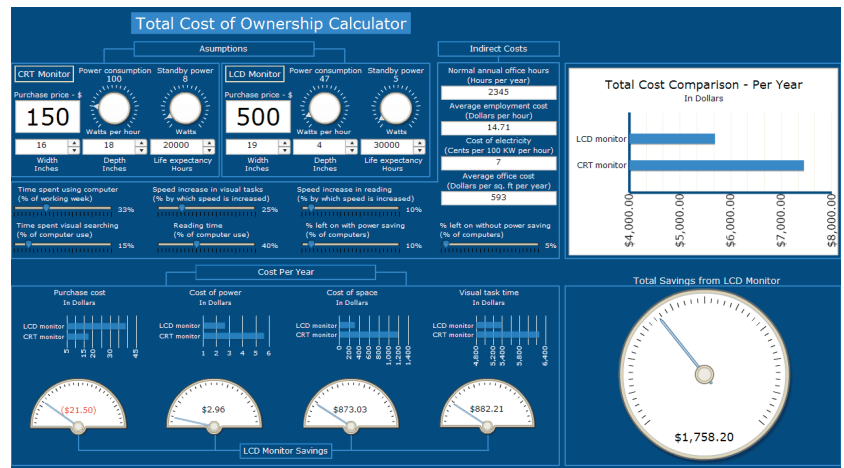
Can the company get answers to those questions, and if so, how long does that take? The first question might be answered the same day; the second one within a few days, and the last might take a few weeks to answer with confidence. Answers to these questions will help to support rapid and effective analysis and decision making, improve asset performance, and optimize commercial results.

Consider answers to those three questions on an executive's desktop every morning, supported by a set of relevant indicators about the health of the business – not just snapshot numbers, but information that has been processed to be presented with some intelligence – to anticipate the next set of questions – where are we, what is the trend – are we getting better or worse – who owns the problems – and what are they doing to deal with them?

The power of this information, and its visibility to management, is that it has been designated and presented to provide a window on the key business performance indicators and risks – operational, technical and financial – and behind a “dashboard,” those key performance indicators (KPIs) that have been cascaded down to the decision makers and knowledge workers within the business so their success is also the company's success.

Quality of engineering, operational and commercial operations is the goal, whether investor owned or regulated generator, system operator or wholesaler.

Example executive dashboard



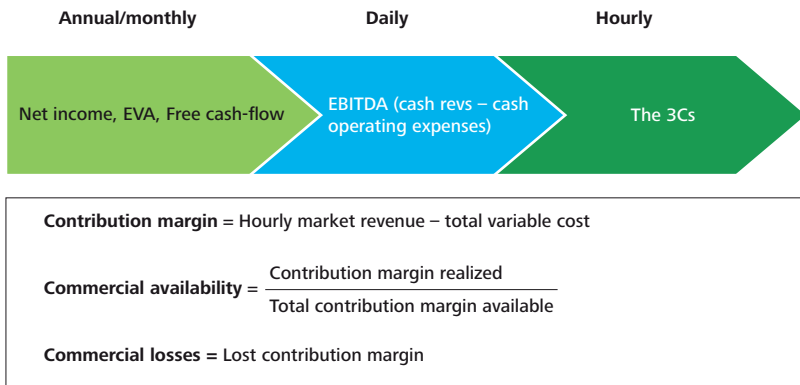
Everyone wins. Build timely, quality information and knowledge, find and automate best practice. But electric utilities operate in a unique and dynamic market – so how do companies get started?

Power market dynamics

The power market has interesting dynamics. There's no shortage of data and no shortage of knowledge. Unfortunately, converting data into knowledge has mostly been the realm of many of the organization's people and that is where the knowledge sits. Take the average power plant. They are, on average, between 20 and 45 years old, historically underinvested because of the regulatory background, with up to a thousand staff and costing up to \$1 billion or more to replace. The highly trained and skilled engineers and managers do their best to maximise performance, but need help to transition from engineers to businessmen so they can be even more effective in the new markets at maximising commercial performance, as they were at keeping lights on in the old utility world. They need to know what the measures of success are. They need to change their indicators from technical to commercial, and use technology to help them optimise performance decisions while “tuning” the plant to the market – so when they reduce cost and “get in the money,” they do not leave that money on the table and maximise quality performance at every opportunity they get.

The 3Cs

Let's return to the three questions that were asked at the outset and slightly rephrase them. How much money did the power plant make – or what was the *contribution margin*? How much could have been made – measure and attribute losses, both from minimum costs and from maximum revenue – *commercial losses*? And what can be learned – has data been turned into knowledge to learn to be smarter tomorrow? The answer is in understanding *commercial availability*. These KPI metrics are the 3Cs.



Commercial availability as a term has been around for many years, but with the help of a near real-time IT infrastructure, can mean much more. Success in maximising the financial contribution from power generation energy sales, such as \$/kwh, in a competitive market is influenced by both minimising the cost of production and maximising the sales revenue. To make this indicator more meaningful and dimensionless, the two ratios can be written as follows:

- *Actual thermal efficiency/design thermal efficiency* provides a quality indicator of the conversion of fuel to electricity, or minimising the cost of production.
- *Actual units sold in the period/units instructed or contracted to sell* provides a quality indicator for maximising available revenue when in the money and contracted to sell.

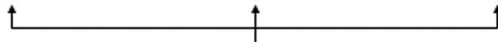
Multiplying the two provides an indicator that is both minimising controllable cost and maximising controllable revenue – and therefore margin. Although technical problems and limitations can limit how much actual influence the plant operators have in real time, ultimately they are both a function of good investment and maintenance and operation of the plant. This leads to the concept of market-based maintenance.

Market-based maintenance

Market-based maintenance (MBM) is a concept that refers to the prioritising of maintenance and investments based on their impact on limiting loss of revenue earning capability, whether planned or unplanned. It also biases attention towards minimising controllable costs and deviations from design heat rate. The IT infrastructure provides the real time dashboard showing the operator controllable costs and actual production against what was required. Algorithms monitor these variables and trigger “events” when the deviation reaches a threshold value and starts a train of information and log that records not only the event, but a set of data and information which provide an online report of the day’s events. These so-called commercial event logs – and their impact on performance (commercial availability), can be used by the maintenance planners and schedulers to prioritise activities.

Remember the three questions – how much did the power plant make; how much could have been made; and what can be learned to be smarter tomorrow? This new information and associated processes provides ways of answering the third CEO question. MBM can be used to direct resources, when appropriate and feasible, to minimise controllable losses, and use the information to judge how effective maintenance or investments in plant performance have really been. Investments can be made more wisely and maximise market performance at minimum cost.

Plant across the fleet...



... connect via network ...



... to a central monitoring, trading and portfolio optimization group...



... supported by integrated information platforms

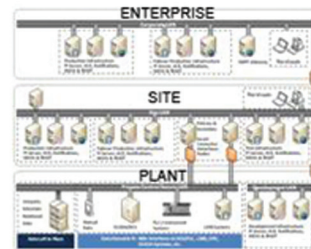
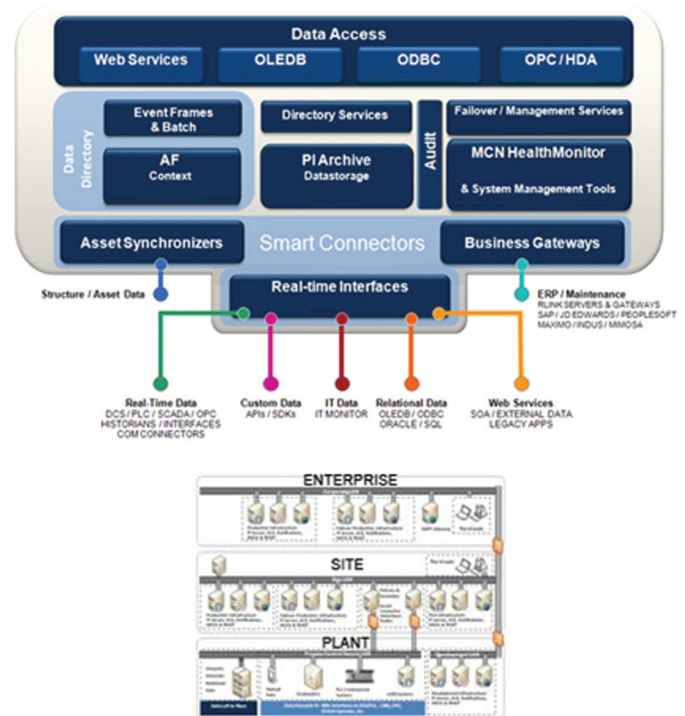


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Experience shows that “tuning” plant performance to maximise market capabilities can improve revenue from all three sources – potential sales of energy, which cover variable costs; potential payments for capacity, which cover fixed costs; and payments from ancillary services, which are usually very profitable as they have no fuel cost. Investing in and maintaining the plant in this way focuses on measuring and evaluating them from true market performance. Traders and risk managers can use this approach as it will improve asset optionality, allowing more flexible, quality operations, better performance, cost visibility, and certainty of actually moving the plant as the available margin incentivises it.

The “window” on performance and the process of using event logs for plant tuning, has enabled operators to produce better margins and better plant performance, while improving reliability and avoiding those expensive unplanned losses of performance. They can use the information to find and automate best practice at minimum cost, such as load changes, start-up and shut down sequencing, and other dynamic performance characteristics – and to run the plant harder but cheaper and break it less often. In fact, one operator of a large plant re-tuned base load assets to make them flexible and more reliable at lower cost. The result has allowed the operators to “get the plants in the money more” while extending their life and value. Plant operators could run the plant less and make it more profitable after trimming costs.

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System operators use compliance monitoring of their market participants and impose penalties for under-performance in order to minimise their use of more expensively bid power to make up for poor operation. The same infrastructure used to monitor the 3Cs and provide commercial event logs provides the plant operators their own view of compliance monitoring, so that they cannot only avoid penalties in most cases, but maximise revenue within market rules.

From engineers to businessmen

Ask the plant operators about becoming businessmen and they usually relish the challenge, provided they have the tools and decision support techniques to simplify all this complexity. They will say that they have always understood the commercial impact of their decisions to run their plant every minute. They may go so far as to say their asset maintenance and optimisation colleagues also need access to this translation of technical to business information, so they can support the operator in their mission to extract every cent of margin while still maintaining plant integrity. In fact, team work is often refocused, so that the overall measure of maintenance and operator success, their KPI, is commercial availability – how much was made and how much could have been made – and can the plant be even more effective tomorrow?

Concluding thoughts

Examples of investments in IT, KPIs, process, and human factors necessary to make this work have shown rapid paybacks, less than a year in some cases. Good or best practice has been brought about by changes in market structure where regulators are mandated to find ways to introduce competition, improve cost and performance transparency, and lower prices. The approaches discussed can enable these changes not only to be implemented, but to be implemented alongside strategies that enable owners of assets to reduce fixed and variable costs faster than the fall in available market prices, while still improving performance and so helping protect margins.

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