



## Cutting the Cost of Flexible Operation in a Competitive Power Market

### Overview

Country or Region: Swindon, UK

Industry: Power Generation

### Customer Profile

RWE npower, is part of the RWE Group. The company operates and manages a portfolio of flexible, low-cost coal, oil and gas fired power stations and are also developing innovative energy related technologies.

### Business Situation

Through a combination of overcapacity and competitive pressure in the UK power market the company needed to operate its plant and carry out start-ups more efficiently, to deliver power to the grid on time, reduce damage to expensive equipment, and be more attractive to the market.

### Solution

The OSIsoft PI System offered a flexible, enabling Platform that employees could easily add value to the company by configuring applications for better analysis, decision-making, and optimization.

### Benefits

- Start up costs were reduced by 1/3
- Standardization of best practices and empowerment of people
- Cost savings achieved for expensive equipment
- Provided substantial competitive edge

“There are probably less expensive solutions if you just want to store and manipulate data. But if you want to change your business—improve your business—OSIsoft’s solution is almost certainly the best. For us, start up costs have been reduced by about 30% and peak savings for one generating unit making 250 start-ups per annum were €120,000 in energy costs alone. And that does not include the money we save in minimizing damage to expensive equipment.”

Paul Ireland, Manager of Information Engineering, RWE npower Technology Services

Starting a power generating unit involves bringing a plant from shutdown condition to synchronization between the electrical generator and the transmission network, or grid. Optimizing this process requires a careful balance which minimizes startup energy costs and limits plant damage. Traditionally, the startup of a coal fired unit is performed manually by highly skilled operators. For RWE npower, however, an analysis of the startup methodology using the PI System from OSIsoft® revealed significant variation in the company’s techniques. Having identified the reasons for the variations, RWE npower then standardized and optimized the procedures to ensure that best practices were achieved for every startup.

OSIsoft has afforded more visibility into the process for greater performance management. The applications and techniques developed by RWE npower with the PI System have given the company the agility and flexibility to meet the challenges of a deregulated market by determining best practices, improving processes, and optimizing start-ups with minimum damage to expensive equipment; thus reducing costs.



RWE npower ranks among the leading integrated energy utilities in the United Kingdom and supplies over six million customers with electricity and gas.

Prior to 1990, the company was part of the state-owned and regulated Central Electricity Generating Board. In 1990, the UK government deregulated and privatized the power industry; the company became National Power and for the next ten years, expanded internationally by building and managing power companies all over the world. In 2000, National Power split into two companies: International Power, which today continues to own and operate power stations internationally, and Innogy, which focused on power generation in the UK. In 2002, RWE acquired Innogy and renamed the business RWE npower.

RWE npower's core businesses are energy production, retailing, operations, and engineering. The company owns and operates a flexible portfolio of power stations capable of generating around 10,000MW, earning the leading position in cogeneration and renewable energy production in the UK market.

### PI System Becomes the Corporate Standard for Operational Improvement

RWE npower first implemented the PI System in 1990, to build a new Operational Information System (OIS). A pilot implementation of the PI System was installed at two power stations from October to December 1991, and the implementation was then rolled-out to ten remaining stations in 1992-1993.

Following this company-wide implementation, npower conducted a cost/benefit analysis proving that the PI System was a strategic product with quantifiable return on investment (ROI) for the business. Since then, OSIsoft products have been implemented as the de facto standard on all 'new builds' and acquisitions. Typical 'pay-back' times range from nine months to two years. The PI System has also been implemented at a number of Combined Heat and Power (CHP) plants and will be used with the company's Renewable Energy sites to collect and analyse data from wind turbines and hydro units.

As a long-term investment, the PI System provides strategic integration of systems, standardization of best practices, and empowerment of people.

"RWE npower currently has 275 client licenses of the OSIsoft combination ProcessBook/DataLink packs," says Paul Ireland, Manager of Information Engineering for npower Technology Services. "We were also delighted to learn that OSIsoft had integrated their portal product within Microsoft's architecture since we were already using SharePoint as our Platform for knowledge management."

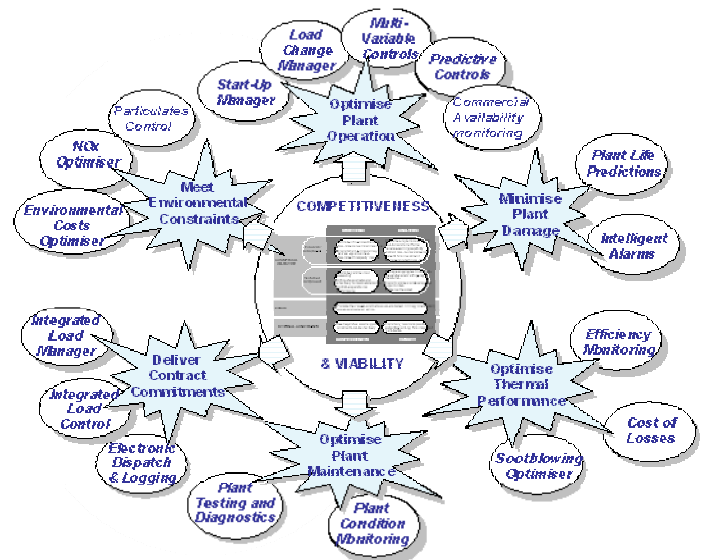
### Added Value Applications Improve the Business

According to Paul Ireland, "The PI System is an enabling Platform, but it's the applications you create with the Platform that are the key to making the most of this technology. "There are probably less expensive solutions if you just want to store and manipulate data, but if you want to change your business—improve your business—OSIsoft's solution is almost certainly the best."

*Added Value Applications* describes the applications the company has built internally using the OSIsoft PI System. Each application adds value to the company's business and increases the rate of return on investment in the PI System. RWE npower's suite of *Added Value Applications* focus on cost reduction, revenue enhancement, and process optimization.

"PI is a great tool for integrating disparate systems and bringing data together," says Paul Ireland. "But if you put in a PI System and do nothing with it, it will just sit there and collect data. It's important that you have a strategy to develop and support those applications that will improve your business."

"The strategy we have adopted with our *Added Value Applications* includes training and empowering employees and getting them involved in application development and use," says Paul Ireland. "These applications are tools that every employee can use to improve the business" and because they have added value to our business we have also been successful in marketing them to other power companies.



RWE npower's Added Value Applications (outer circles) enable the company to reach its operational objectives (in blue) and stay competitive in the energy market.

### Added Value Application in Focus: Start up Analysis and Optimization

The introduction of new, more efficient, and lower cost power generating plants into the market has also driven the need to improve operations. These plants are mostly gas fired operations that can run continuously at full-load (base load). Older, less efficient plants are now forced to operate closer to the demand margin. When operating at the margin, flexibility is the key. The strategy is to stop and start the plant during low / high market price periods to extend its viable commercial life. With fierce competition in this market, a plant's very operation can depend upon reduced start up times and reduced costs. RWE npower's startANALYSIS application and other Start up optimization applications provide critical analysis and optimization of start-ups to ensure generating units are reliable and cost efficient. Since the UK market rules have changed, startup costs are no longer directly paid to the power generator and even though coal fired generating units are carrying out fewer starts, keeping costs down is still a major priority. With the introduction of Carbon Trading, the start up cost must also take into account the cost of CO<sub>2</sub>.

### startANALYSIS in focus: Getting Base-Load Power to the Grid on Time

In the UK market, the generating unit must be synchronized within a +/- five-minute window when delivering power to the grid. If late, the grid operator may not accept the power at all, regardless of the fuel and production costs already incurred by the plant. The goal is to get power to the grid on time without causing too much damage to expensive plant components.

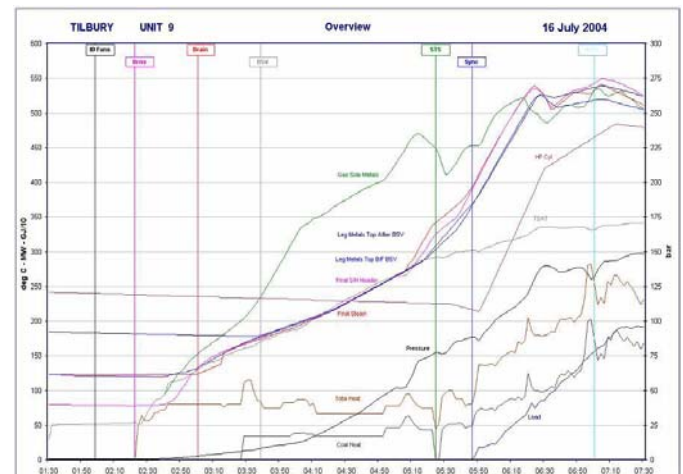
Many of the older plants were not designed to run with this sort of flexibility and must be pushed outside the original design conditions. Best practices must be defined to operate at these outer limits in a safe, reliable, and cost effective manner.

Once the best practice procedure is defined and agreed upon, the challenge is to ensure exact repetition. Starting up the generating unit is an intensive period for operating personnel. With PI, operators can focus attention on those improvements which deliver the greatest benefit and use tools intuitively to ease the overall burden.

Depending on the temperature of the boiler and turbine, start up times can vary from one hour to several hours. A sequence of operations are performed when starting up a generating unit to bring auxiliary plant items into service and to warm the boiler along a profile that matches the thermal constraints of construction materials.

RWE npower's startANALYSIS application provides guidance to reduce variation in start up times and ensure the correct sequence of key activities. To be on-load and synchronize with the grid each phase must proceed through the start at specific times.

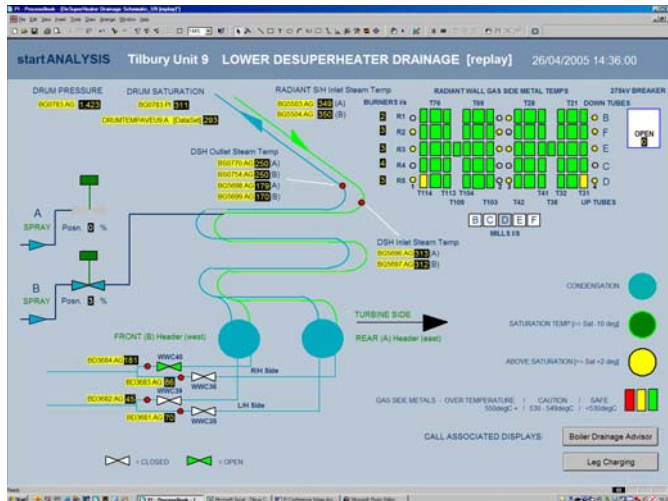
"We've got a great tool to get our employees on board with best practices," says Paul Ireland. "It's all about getting the operator involved because that is the person who is going to optimize the process and save the plant money at the end of the day. With PI, employees can clearly see which practices are working and which ones are not, and take ownership in making the right changes to stay on course."



The startANALYSIS application enables the analysis of key plant signals during start up. The vertical bars are phases, also called milestones, overlaid onto the trend display. Each trend is a key phase which occurs at every start up. The diagonal band is the best practice target temperature, which the operator must maintain in order to synchronize with the grid and minimize damage to equipment. Heat trends are also displayed so that oil quantities can be tracked and controlled against less expensive amounts of coal. Rates of rise in temperature and pressure can also be analyzed to determine and control the amount of damage that is done to very expensive equipment.

The startANALYSIS Application enabled RWE npower to see operational inefficiencies such as:

- Unreliable operation of key plant items, particularly after extended shutdown periods
- Significant inconsistency in the operation of boiler drains
- Poor timing of pressurization of main steam pipes, which can lead to plant damage



Displays are dynamic with status colors changing in real-time depending on the temperature, rate of rise, steam production and condensation released during the start up. Green color is ideal start up status; amber is caution; red is unsatisfactory. Operators can monitor and take action in real time to keep the process aligned with best practice.

## An Enabling Platform Enhances Profitability

Aside from enabling change and empowering people, operations can be clearly visualized at every phase and analyzed against best practices. By adopting a culture of real time performance management and giving employees the tools to take the right actions, RWE npower has realized the following ROI:

- Start up costs were reduced by approximately one third
- Peak savings of €120,000 in energy costs alone for one generating unit that makes 250 start-ups per annum
- Cost savings through minimizing damage and extending the life of expensive equipment

RWE npower is now able to adapt to changes more quickly.

- The new UK market rules meant that units were no longer paid for start-ups. When the unit achieves on-load capacity and provides timely power to the grid these costs can be recovered. Being able to start and synchronize the generating unit reliably avoids market penalties and makes the unit more attractive.
- Following the introduction of Carbon trading, the cost of CO<sub>2</sub> can also be taken into account for start up costs.

“Using technology like the PI System ensures our business remains competitive,” says Paul Ireland. “We are able to continually assess the condition and performance of the plant, make changes to the way we operate and maintain equipment, and quickly evaluate the impact and benefit of those changes. With PI, we have better information to aid our decision making. Being agile is critical when markets change, legislation changes and new technology offers new opportunities. As systems are upgraded and new systems are introduced, integration remains our biggest exploitation opportunity.”