This large combined cycle gas fired power station (output around 1500MWe) wanted to reduce energy waste and cut down on losses in order to reduce costs.

The power station, located in the UK, uses gas piped directly from the gas field to generate electricity for supply to the National Grid. The power station’s operating regime has changed since construction, as the site now has to follow demand (i.e. turn on / off as required) but was designed to operate continuously, providing a base load of electricity to the Grid. Due to the change in operating conditions, as well as additional factors, overall generating efficiency had dropped.

After hearing of ABB’s world class reputation in energy efficiency, the client engaged ABB to investigate opportunities for energy savings.

**Solution**

ABB spent a week on site to identify the annual savings. Opportunities identified included savings of about £800,000 per year due to a natural gas let-down turbine. Natural gas is delivered to the site at high pressure, but when entering the gas turbines needs to be at a lower pressure. By reducing this pressure using a let-down turbine rather than a simple valve, this energy can be extracted and put to use.

The site was originally designed to operate constantly, but now operates following demand. Cooling water pumps operate constantly, delivering cooling water even when there is no demand for it. By fitting variable speed drives to these pumps, they could be turned off when not required, reducing electricity consumption by around £1M each year. In addition, flow control would be much improved.

Gas is delivered to the site at high pressure, and is then let down to a lower pressure via a valve mechanism. This pressure drop creates a drop in temperature, and as a result the gas entering the turbines is cold. By using waste heat to warm up the fuel, turbine efficiency could be increased, reducing fuel consumption and saving about £200,000 each year.
The gas turbines are lubricated using an oil system, and during operation the oil becomes hot. This heat could be recovered, and used (for example) to preheat steam condensate. This would reduce gas consumption by up to £40,000 per year.

The cooling tower fans operate constantly, even when the site is not generating electricity. By fitting variable speed drives to these fans, they would benefit from a soft start and stop, which would reduce maintenance requirements. They could also be turned off, or turned down when the generators are stopped, reducing electricity consumption.

Annual savings for this measure would be in the region of £450,000 to £700,000 for a cost of only £25,000.

Benefits
The study identified savings and opportunities throughout the site, in all aspects of site operations including:

- Total savings of £2.2M to £3.5M per year
- Equivalent to a reduction of parasitic load of 20 - 35%
- Savings equal to about 1% of total power station electricity output
- CO₂ emissions reduced by improving efficiency
- Improved start-up and shut down procedures leading to reduced machine wear and a reduction in maintenance requirements