MITSUBISHI POWER

CASE STUDY:

PARTIAL-LOAD HEAT RATE IMPROVEMENT REDUCES FUEL COSTS AND DELIVERS POSITIVE CASH FLOWS

TOMONI®
Performance Improvement and Flexible Operation

Turbine Cooling Air Optimization

PLANT DETAILS

- Genesis Energy Huntly Power Station Unit 5 commissioned in June 2007
- 385 MW CCGT, originally base loaded
- Huntly, Waikato, New Zealand

EQUIPMENT NOTES

- Mitsubishi Power Turnkey Plant Supply
- M701F Gas Turbine and Steam Turbine
- DIASYS Netmation® Control Platform
- TOMONI Solutions Installed: 2021

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MOVE THE WORLD FORWARD MITSUBISHI HEAVY INDUSTRIES GROUP

CHALLENGE

The 385 MW CCGT unit #5 at Genesis Energy's Huntly Power Station has been in service since June 2007, mainly in base-load operation. Due to the increase of renewable energy in the New Zealand market, operation of Huntly is shifting toward more partial-load operation. Huntly needed to find ways to improve efficiency during partial-load and load-following operation. For units such as Huntly intended for base-load operation, turbine cooling air (TCA) fans operate at a fixed speed, and rotor cooling air (RCA) temperature is set for the highest ambient temperature at base load to ensure safe operation. This results in a TCA outlet temperature below the target temperature when the unit is at partial load or the ambient temperature is low, creating an opportunity to improve plant efficiency.

SOLUTION

Digital solutions can improve operational flexibility and efficiency for partial-load operation in several areas, and one particularly beneficial application for Huntly was upgrading the control of the TCA fans that manage rotor cooling air temperature. The original control method provides enough cooling function to cover the various operational conditions from the point of view of reliability of turbine parts. However, excessive cooling sometimes induces plant performance loss. The TOMONI Turbine Cooling Air Optimization solution provides more precise control of the TCA fans to optimize RCA temperature through control logic modifications and power electronic inverters. This improves efficiency at all loads by maintaining an optimum RCA temperature based on real-time operating circumstances.

Another important solution for the plant was the payment method called "pay-as-you-go," which was applied for the initial capital investments for the upgrade of the TCA fans and control system. In this investment model, there is cost only when the digital solution is used, avoiding initial investment and maintaining positive cash flows.

RESULT

The solution achieved a partial-load combined-cycle heat rate improvement of up to 0.6%, which was consistent with the forecast for this project and significantly reduces fuel cost and emissions. Fuel cost savings from 0.6% partial load heat rate improvement vary, but can be in the range of 200,000-800,000 USD per year depending on fuel cost and unit dispatch. In addition, as the operating load range changes during normal operation, the TOMONI Turbine Cooling Air Optimization solution automatically comes in and out of service to maximize the economic benefit. Genesis only uses the solution when they feel it is beneficial, based on the plant operational mode and estimated heat rate improvement. They have seen the benefits and have continued to use the TOMONI solution.

TOMONI Turbine Cooling Air Optimization is one of many solutions available from Mitsubishi Power to optimize O&M of the entire plant. Other TOMONI solutions deployed at Huntly include KPI Analyst data visualization, Pre-ACT anomaly detection and Post-ACT alarm guidance.

"All thermal generation throughout the world needs to respond to the significant growth in renewable generation, by effectively and efficiently filling the gaps which renewable generation can leave due to variable climatic conditions, and to cover peak demands. TOMONI TCA Optimization is an innovative solution provided by Mitsubishi Power for partial load heat-rate improvement. This has both reduced our fuel cost and reduced the environmental emissions without any major up-front capital investment and only minimal expenses for on-site enabling work such as cabling and installation support."

Rob Schinkel
LTSA Manager, Huntly, Genesis Energy

TOMONI® is a suite of intelligent solutions that accelerates decarbonization with power plant design, O&M and system knowledge, together with strong customer and partner collaborations. TOMONI leverages advanced controls, artificial intelligence and machine learning with multi-layered cybersecurity to make energy systems smarter, more profitable and ultimately more autonomous on the road to a sustainable future.

TOMONI®

- **Data Foundation & Enablers**
- **O&M Optimization**
- **Performance Improvement**
- **Flexible Operations**