

Never in the black



Three Cummins diesel generator sets provide 'black-start' power for one of Australia's largest gas-fired power stations, recently commissioned on the NSW central coast.

The new 667 MW Colongra power station can be started with the click of a computer mouse.

That's an indication of the technology involved in the \$500 million Colongra plant which is located on the NSW central coast and remotely controlled from Delta Electricity's corporate office in Sydney, 120 km away.

Delta is a state-owned corporation and the largest electricity generator in Australia with an installed capacity of more than 5000 MW.

Designed around four gas turbines, the Colongra power station is a peaking plant, providing electricity to both NSW and the national grid during times of peak demand.

The gas-fired plant is critical to reduced greenhouse gas emissions. In fact, Colongra produces 40% less emissions than an equivalent size coal-fired plant, and 85% less NOx emissions per MWh of electricity generated.

The technical features of the power station, including the black-start capability provided by three Cummins diesel generator sets, will allow Delta to improve regional and state-wide grid restoration in the unlikely event of a system-wide shutdown, and also maintain reliability of supply at a time when peak electricity demands are increasing.

"The feature of this power station is its very fast start-up," says Jens Schulz, commissioning manager for Alstom, which designed and installed the plant.

"All four turbines can be up on maximum load in less than 30 minutes. The plant also has a super-fast start-up capability of 13 minutes, but this places higher thermal stress on the turbines."

By comparison, an equivalent size coal-fired plant can take up to 24 hours to reach full load, starting from cold conditions.

Black-start was considered a key requirement for Colongra to improve emergency response capability and the stability of its power supply in general. (The term

'black-start' refers to the process of restoring a power station to operation following failure of the power grid.)

Under normal conditions, the gas turbines at Colongra are started by power from the grid. In the event of grid failure, the three Cummins diesel generator sets provide the black-start power for one of the turbines.

While the Cummins gensets — C2500 units powered by 60-litre Cummins QSK60 engines — are rated to provide a total 6 MW, black-starting the one turbine requires around 4 MW.

On receiving a black-start signal, all three gensets are on-line within 10 seconds. The start-up process is then completed within 20 minutes, with the one turbine running at idle at 3000 rpm, ready to supply power to the grid.

A Cummins DMC300 digital master controller, located in the power station's main control building, synchronises the 11 kV Cummins gensets with any one of the four turbines selected for black-start and also controls synchronised re-transfer once the turbine is up to speed.

The DMC300 interfaces with the site distribution control system to provide black-start system status, control and alarm information. Delta staff can also control and monitor the black-start system via the DMC300 touchscreen.

In addition, the DMC300 and Cummins gensets provide emergency back-up power for the site facilities in the event of loss of mains supply to the power station. Each generator can also be load tested on the grid via the DMC300.

The turbines are actually dual fuel units, able to run on both gas and diesel. Gas is the primary fuel and is supplied to the plant via a 9 km offshoot from the Sydney-Newcastle pipeline.

The pipeline, the largest diameter high-pressure pipeline constructed in Australia, is designed to provide up to five hours storage of gas at full capacity of the power station.

"Due to the complex nature of the project, it was vital that the Cummins team worked closely with Alstom throughout all phases of the project," says Cummins' Colongra project manager David Van Brussel.

Cummins account manager Michael Hickling and application engineer Dennis Lo developed the design and technical aspects of the black-start system with Alstom's engineering group, while both Lo and Cummins service technician Pat Hickey were instrumental in installing, testing and commissioning with the Alstom team. ■



The three Cummins diesel generator sets provide the black-start power for one of the turbines in the event of grid failure.

MAIN There's an interesting story behind the red flood lighting on the exhaust stack. It's a tradition that the turbines be named after the wives or daughters of the commissioning engineers. The last turbine to be commissioned at Colongra was named after Jens Schulz's daughter Elin. Jens went to the trouble of illuminating the stack and also projecting a photo of Elin on the stack silencer wall.



Cummins' Colongra project manager David Van Brussel (right) with Alstom commissioning manager Jens Schulz (centre) and Delta Electricity's Colongra asset manager Peter Holley.



The power station can be started with the click of a computer mouse and remotely controlled from Delta Electricity's corporate office in Sydney, 120 km away.



With each gas turbine weighing over 340 tonnes, moving them to site was a huge logistical task.