

ENGINEERING
TOMORROW

Danfoss

Case study | VACON® NXP Grid Converter

Unique heat recovery for geothermal power using **VACON® drives**

Annual savings of
**AUD
100,000**

In arid outback Australia the borewater pumped up from underground is so hot, it needs cooling before you can drink it. The town of Winton in Queensland has turned this to its advantage by converting heat from the bore water to electricity. A new geothermal power station recovers energy during the borewater cooling process then uses it to generate power for the local community.

Recovering heat with advanced technology

Winton cools the town's borewater by dumping heat into large cooling ponds. To make use of this heat instead of losing it to the atmosphere, they have installed a geothermal power station, designed and delivered from greenfield site by the green thermal energy

company gTET. The installation cools the town's bore water supply from 86 °C to 53 °C. The power station recovers heat then uses it to generate power using two of gTET's leading-edge ORC generators.

Exceeding efficiency predictions

The overall performance of the power station has exceeded modelling predictions by up to 10%, and here the efficiency of the drive is a significant contributor - the VACON® drive being an integral component in the power generation system.

The design models for the Winton geothermal plant predicted 100 kW net power generation, for measured inputs of

- bore water at 85.1 °C temperature flowing at 30 liters per second, and
- cooling water at 19 °C temperature, flowing at 128 liters per second

With gross power generation capacity of more than 300 kW, the actual output has proven to be as high as 110 kW.

Paul Keen, Managing Director of gTET explains::

"The VACON® drive solution provides the functionality needed to effectively control gTET's turbines with minimal energy losses. And as such, the integrated drive solution is a critical component in gTET's ORC generators."



The two gTET directors, Simon St Hill (left) and Paul Keen (right)

VACON® drive is integral to ORC generator

The VACON® drive from Danfoss is an integral component in gTET's ORC generator, which cools borewater and generates power using recovered energy.

gTET uses the VACON® drive primarily for its high-speed regenerative capability needed to control the micro turbo-alternators used in the ORC generators. The VACON® drive was also the most economically viable solution found during the selection process.

The two ORC generators each contain an integrated VACON® drive comprising

- VACON® NXP Grid Converter
- VACON® NXI Inverters
- LCL filter

The site also runs a separate VACON® NXP Grid Converter with micro grid application, connected to 75 kW of battery storage.

Certification opens up new opportunities

The most challenging aspect of the project was to obtain the AS4777:2015 accreditation for the VACON® NXP Grid Converter - a mandatory requirement for the power distributor's connection agreement. Danfoss Australia and Danfoss Drives in Finland regularly supported gTET, solving technical queries throughout the certification process.

This certification was received in November 2019 and overcame a significant obstacle for gTET to obtain connection approval for any of its Australian ORC generator installations. Despite the slow process of AS4777 certification, the result is very satisfying. Now the certification is in place, it will be smooth sailing for similar projects in the future.





Annual savings of AUD 100,000

The geothermal power station is the only site of its kind in Australia, and so the unique project has also delivered significant promotional, marketing and tourism opportunities for the town of Winton.

The geothermal power station delivers savings of approximately \$100,000 annually, made up of power savings and credits. Furthermore, it also reduces the energy required to cool the town water supply via the cooling ponds.

It's no wonder that the Winton Council is very pleased and excited by the completed project, and is heavily promoting the site with state and federal governments and the public.

About gTET

A private Australian-owned technology-based business, gTET specializes in developing and implementing thermal energy management solutions for business that are optimized for performance and economics.

gTET's thermodynamics specialists have experience and capabilities in technologies that include refrigeration, waste heat recovery, ORC power generation, cogen/trigen and heat transfer with product and services across a wide range of clients and industries.