



Hybrid Solutions

SUSTAINABLE HYBRID SYSTEM ENSURES COST-EFFECTIVE SUPPLY IN AUSTRALIA'S NORTHERN TERRITORY

Many aboriginal communities in the Northern Territory of Australia power their homes by electricity generated from diesel power plants. With the aim of reducing the dependence on diesel fuel and acquire the advantages of using renewable energy, Power and Water Corporation started a project located in small community of Daly River. The project expanded the power plant by implementing solar modules and a battery storage unit from the Rolls-Royce solution brand, *mtu* (former Qinous). The hybrid system project achieved a reliable 24/7 energy operation and currently reduces fuel consumption by 50 percent.

Who Power and Water Corporation
What Hybrid power supply system consisting of diesel gensets, solar cells and battery storage system
(Previous model of today's *mtu* EnergyPack QL)
Where Daly River (also known as Nauiyu), Australia

With a population of around 250,000, the Northern Territory in Australia is sparsely populated. The majority of the population lives in the small towns of Darwin, Palmerston and Alice Springs. About 20 percent of the population live in small and remote communities. The energy supply of these places is mainly generated by diesel generators. The utilization of renewable energy at the Northern Territory is below the national average.

This project was jointly funded by the Australian Government via ARENA and the Northern Territory Government, both parties aim to reduce diesel consumption and promote the usage of renewable energy. Daly River, with its 500 inhabitants, was the first community that implemented a battery storage to their energy system. Additionally, Titjikala, a small town in Central Australia, has also been selected as the next location for a hybrid project where Daly River's acquired knowledge is essential for the new success.

"With an average of 12 hours of sunshine a day, Daly River has the best conditions to use solar energy and reduce fuel consumption. In addition, the location is easy to reach all year round due to road accessibility - an important decision-making factor for technical service access even during rainy season," explains former Power and Water project manager Dow Airen. The government-owned corporation is responsible for the transmission and distribution of electricity, and also handles water supply and sanitation in the Northern Territory.

The hybrid system ensures reliable and sustainable power supply

Daly River is about 220 kilometers south of the coastal city of Darwin. The favorable weather conditions and dazzling views to the river make the village a popular destination for anglers and weekend tourists. Freshwater and saltwater crocodiles live in the picturesque tidal river. During April and May, sport fishermen come to fish Barramundi, predatory fish from the giant bass family.



Model project for Power and Water

To reduce dependence on diesel fuel and promote the use of renewable energy, Power and Water Corporation launched a model project in the small community of Daly River. It expanded the existing diesel power plant to include solar modules and a battery storage unit from Rolls-Royce's *mtu*.

Place of residence and weekend destination

The 500 inhabitant town of Daly River, located about 220 kilometers south of Darwin on the river of the same name, is a popular destination for anglers and weekend tourists.



With a decentralized hybrid power supply system, the small community has been characterized by another special feature since 2015. "The system combines regenerative and fossil energy sources and stores the electricity in a battery storage as needed. This mix ensures the power supply for the community and the surrounding settlements - reliable, efficient and sustainable," explains Dow Airen.

Before the program commenced, the original power plant consisted of three powerful diesel generators for regular and backup operation depending on the load profile. Power and Water integrated into the existing power plant a photovoltaic system with a megawatt output and an *mtu* battery storage unit with an output of 800 kW and a capacity of 1.9 MWh.

"This mix ensures a reliable, efficient and sustainable power supply for the community and surrounding settlements."

Dow Airen

Former Project Manager from Power and Water

Battery Storage: Previous model of today's *mtu* EnergyPack QL compensates for varying energy requirements

"The battery storage system serves as an important buffer if the energy generated does not match the actual load profile of the municipality. It stores the excess energy from the photovoltaic system at peak times and thus ensures the optimal usability of the solar energy produced," explains Steffen Heinrich from Rolls-Royce Solutions Berlin (formerly Qinous).

The battery storage system was prefabricated and delivered to Daly River in a factory tested condition. It could be put into operation quickly and smoothly. It is ideally suited for the extreme weather conditions in the dry and rainy seasons in Daly River. The closed



Battery storage

The battery storage was prefabricated, factory tested and shipped to Daly River. The closed housing protects all components against temperature changes, dust, humidity and insects. A constant air exchange with the environment is prevented by the inverter concept.

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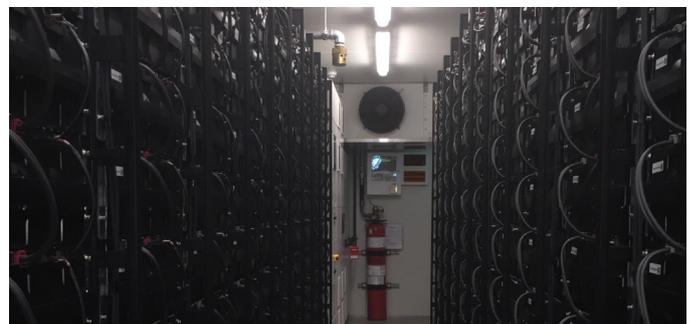
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The inverter concept prevents constant air exchange with the surroundings. The water-cooled inverter with a nominal output of 1.5 MVA is thermally designed for continuous charging or discharging operation of 800 kW. At ambient temperatures below 45 °C, an output of up to 1 MW is possible. The combination of higher kilowatt and kilowatt hour expandability is expected to ensure that the reliable battery storage device will last at least 10 years.

The battery storage design has additional space that can be used in the Daly River project if required. "There are currently 12 racks, i.e. battery racks, in use. The number can be expanded to 14, which enables an additional capacity of 17 percent. This option and the additional land available for the expansion of the photovoltaic system make it possible to expand the hybrid system with increasing energy requirements over the life of the battery storage system", says Steffen Heinrich from Rolls-Royce Solutions Berlin.



Possible extension

The battery storage design provides additional space in the battery room for further project extensions i.e. For the Daly River project, 12 battery racks, are in use. The number can be expanded to 14, providing an additional 17 percent capacity.



Less fuel consumption, more solar energy

With the expansion of the existing plant to a hybrid power supply system, Power and Water was able to achieve its project goals. “The share of renewable energy sources used in Daly River has been more than the designed target of 50 percent since the transition to regular operation. The diesel generators are completely switched off on average for 10 hours a day,” summarizes Dow Airen from Power and Water. Fuel consumption was reduced by 50 percent. This makes the community significantly less dependent on diesel fuel, which is subject to volatile prices and unpredictable supply chains.

Follow-up project in Titjikala in the Northern Territory

When Power and Water embarked on a second diesel/battery project, Rolls-Royce were the successful tenderer for the energy solution component of the project through an open tender process. The power plant of Titjikala consists of three diesel generators, one photovoltaic plant (400kW) and additionally implemented a battery storage (970 kW). The goal is to reduce fuel consumption by 66 percent after the plant is completed in December 2020. Similar to the

Daly River project, the battery stores excess solar energy and enables the diesel engines to be switched off during the day. When the battery storage is discharged at night, the diesel engines start up again. The transitions between on and off states occur seamlessly without interrupting the power supply.

“The share of renewable energy used in Daly River is 50 percent since their transition to battery storage. The diesel generators are completely shut down for an average of 10 hours per day”

Dow Airen
Manager Energy Strategy from Power and Water

Rolls-Royce provides world-class power solutions and complete lifecycle support under our product and solution brand *mtu*. Through digitalization and electrification, we strive to develop drive and power generation solutions that are even cleaner and smarter and thus provide answers to the challenges posed by the rapidly growing societal demands for energy and mobility. We deliver and service

comprehensive, powerful and reliable systems, based on both gas and diesel engines, as well as electrified hybrid systems. These clean and technologically advanced solutions serve our customers in the marine and infrastructure sectors worldwide.