Session Five:

Clarke Island Case Study – Hybrid SPS Installation

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Abstract

Clarke Island is a remote, isolated, beautiful and spiritual location. The island is home to a facility to assist indigenous youth with social and cultural issues, and is managed by the Tasmanian Aboriginal Centre Incorporated. Prior to the installation of a hybrid (2kW solar and 1kW wind) stand alone power system, the annual running cost of the diesel generator was $35k. Transporting fuel to the island was expensive, labour intensive, and inefficient.

The logistical complexities of this project required considerable precision as access to the island is limited to light chartered aircraft and a barge that visits only twice a year. The system had to be robust, require little ongoing maintenance and be correctly sized to meet the power demands of the island, all on a limited budget.

Presenter

Rob Wells is the Tasmanian manager of Apollo Energy. Rob has been installing solar, wind and micro hydro systems since 1985. With a track record spanning more than 25 years in the renewable energy industry, his breadth of knowledge and experience enables Rob to design and successfully deliver on the most complex and challenging green power projects.

Introduction

The project brief was “to design and implement a solution that used proven, robust technology to provide sufficient power such that zero diesel generator hours would be needed”.

Isolated locations present challenges which affect not only the project but also decision making in relation to ongoing systems maintenance and training requirements. Budget pressures also frequently drive the need for creative problem solving to meet further restraints on project design. Through sound project management and planning at every level of delivery, a timely and cost effective solution was provided.

Clarke Island

Geographically Clarke Island is 7 km by 5 km. At 40°31' south latitude and 148°12' east longitude, it is located in the Bass Straight and is adjacent to Cape Barron Island.

At the time of installation the island had only one permanent resident, with visitor numbers peaking at around eight for youth and corporate programmes.

There is no weather data for Clarke Island. The nearest weather station recording point is on Swan Island, located approximately 30 km to the south.

Vegetation, wind speeds and climate information were obtained anecdotally from the client and supported by a site visit by the installer.

Clarke Island is considered an extremely remote location in terms of handling freight, travel and waste disposal issues.

Infrastructure on the island is minimal and its buildings are ageing. A shed and residential dorm area featuring approximately five rooms comprised the main site for the power system to be supplied.

System Design

The project brief first necessitated removing an existing and dated standalone power system, which had previously been equipped with only 300w of solar and a rather tired SOMA 1000 wind turbine. The turbine still worked well and constituted the main source of energy for the island. However some components had to be replaced, and the fixings were re-painted and assessed with the aim of ensuring that it could produce energy for another 10 years.

A further 2.1kW of solar was added to the existing array to establish a base minimum daily level of energy production. A larger, Australian-made 7kW Latronics inverter with an auto changeover switch was also added to transfer load when the generator was brought on-line. The customer had prior experience of similar systems and specified their requirements for the type of products needed. The customer representative specified the installations required to deliver a power level suitable for operating large power tools.

The battery bank was replaced with a 1050ah 48v system, providing power autonomy for up to three days, and the control board completely re-wired to bring the entire install up to Australian standards.

The installation works in conjunction with a customer-supplied 12kVA diesel auto-start generator to deliver a fully automatic system that requires low ongoing maintenance and offers the benefit of using simple, modular components. Due to the combination of wind delivery from the turbine (9kWh) and upgraded capacity from the solar array, the generator is not needed for power production.

The photovoltaic panel install was located on an old shed which had notable structural integrity issues. This use of ageing infrastructure for the solar array became a key concern during the project.

Because the work was government funded a high level of detail was required in itemising during the quoting stage. Standard items that represented good value for money, were easy to access, and had a sound record of field testing in Australian conditions were selected in line with these guidelines.

Project Management

The first aim of the project was to increase electricity output to enable the use of power tools and ensure delivery of basic lighting and refrigeration during times of higher occupancy. Once the technical build specification for the system was designed, the next step was to transport the equipment out to Clarke Island.

Paying money up front for a detailed on-site inspection proved a good investment in the long run. It provided an opportunity for the installer to assess the structural integrity of the shed and existing wind turbine, photograph locations and obtain information specifics about the site. Limited schematics and documentation left by the previous installers were also provided.

Apollo Energy operates on the principle that careful planning is strongly connected with project success. High priority was therefore placed on the early planning stages and pre-job organisation of the project, which became the main challenge for the designer and installer.

Critical to the planning application was a detailed analysis of the customer's requirements for energy production: domestic lighting, refrigeration and general appliances amounted to an average usage of 10kWh per day. In addition, the system had to be as automated as possible to avoid the need for anyone to physically operate the generator. Instead, the generator would be guided by an auto start feature that would engage whenever the batteries were exhausted. Discussions were also held to ascertain the maximum demands on power usage that the system would be required to meet. These were later confirmed through written communication.

A key benefit of solar power is that ongoing maintenance requirements for solar panels are very low, due to the absence of moving parts.

Solutions:

Because of the obvious location restraints it was established early on that testing of control board components would be imperative for the project. This facilitated confirmation of testing results prior to shipping and cut the risk of delays due to components being unavailable or faulty.

Accurate estimates of the existing system, shipping logistics and "Plan B"contingencies are considered paramount to the success of installs of this type. Responses were prepared for a range of adverse scenarios, although they were not needed in this instance.

Logistical Difficulties

Navigating the complicated logistical and design considerations for a remote power system can be as challenging as the installation process itself. In this particular case, the distance between Clarke Island and the installation team had the potential to impede regular communication with the client and to hinder the planning progress as much as the anticipated challenges involved in freighting and installation.

Unlike general urban installations, where access to additional materials and support is typically straightforward, any potential mistakes or errors in this project would have been magnified by the costs taken to rectify in man hours and shipping expenses, potential communication and negotiation issues, and arranging new chartered flights.

Ultimately, due to the expense involved, only one light aircraft flight into and out of Clarke Island was arranged for the lifetime of the project. A generous luggage allowance enabled the three man team to carry essential hand tools as well as spares for key equipment parts in their on-board hand luggage.

Privately booked ferry excursions were the only viable way to bring in heavier loads and to remove waste from the island.

Conclusions

Elements of the Clarke Island project – the remote location, difficulty of access, reliance on ageing infrastructure and restraints on time and budget – presented a unique challenge to the team. By using detailed site investigations, a creative approach and careful planning, Apollo Energy was successful in delivering a solution on time and within budget. The benefits of sound project management at every level of delivery are demonstrably evident. Combined with sufficient team experience and knowledge of the sector, these methods offer an advantage of simplicity that is likely to be successful when designing similar systems for isolated areas elsewhere.

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