Diffuse Energy: Reliable and resilient wind energy for off-grid telecommunication towers

Installation of wind turbine system at Mt Hyland, NSW, April 2021

LESSONS LEARNT REPORT 2

Project Details:

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EXECUTIVE SUMMARY

The main focus of the 3rd Milestone for the ARENA project is the installation of Diffuse Energy's wind energy systems across 10 customer telecommunication sites, split across 2 customers: Vertel, who has 2 existing sites in New South Wales; and Positive Off Grid Solutions, who has 8 sites in Western Australia. The wind energy system includes the Hyland 920 wind turbine, the Hyland maximum power point tracking (MPPT) controller and a Lufft WS700-UMB Smart Weather Sensor.

Additionally, the 3rd Milestone requires the completion of a remote monitoring system that allows the performance of the wind turbine to be measured and sent back from the site to a cloud-based database where it can be monitored in real time, in conjunction with the site weather data.

During the reporting period, wind energy systems were installed on the 2 Vertel sites. The site installations went well, with the systems on both sites being completed without incident. A connectivity issue with the remote monitoring system became apparent following the installation, stemming from an unshielded join in cabling which resulted in a lockup of the data monitoring system, preventing the data being sent to our database and making the system unresponsive. A software fix was applied which resolved the issue for 1 site, but the other site locked-up and is no longer responsive. A site visit is required to assess and remedy the issue, which is intended to be undertaken in June.

During this period, we were made aware that the Positive Off Grid Solutions sites did not receive grant funding that had been applied for. The 8 sites are very important for improving communications in the region that they are operating within and the financing of the sites is currently being restructured, but there is a potential that delays could occur in constructing the sites, with a follow-on delay in installing our wind energy systems for the ARENA project. We are currently engaging with Positive Off Grid Solutions and other stakeholders to get a timeline on the project and to assist with progressing the sites where possible. We are also engaging with other potential commercial partners with suitable sites should the Positive Off Grid Solutions sites be extensively delayed.

An installation at a site external to the ARENA project highlighted a potential issue where our wind energy system is not installed correctly. We provide a detailed set of installation instructions but there is currently no way to test if the system is installed correctly if there is no wind. This is a potential issue when installing on remote sites, where a revisit to site to rectify the problem could be very time-consuming and expensive. We will develop a test methodology, using readily available equipment, to resolve this issue.

KEY LEARNINGS

LESSON LEARNT NO.1:

Correct shielding of cabling for electrical equipment is required on telecommunications sites.

Category: Technical

Objective: Milestone 3 – installation of turbines

Detail Learning:
Diffuse Energy has installed our wind energy system on two customer sites in the Coffs Harbour region – Mount Wondurrigah and Mount Hyland. Each system included our Hyland 920 wind turbine and control system, a Lufft WS700-UMB Smart Weather Sensor, and our remote monitoring system developed by Sapphi as part of this ARENA project.

The installation of the system on each site went well although the cabling supplied with the weather station to connect to our remote monitoring system was not long enough as the required length of cabling was underestimated by the field personnel and communicated to the Diffuse Energy workshop. A field splice of the weather station cabling was undertaken to extend the cables to the necessary length but could not be shielded fully as the necessary materials were not available on site. It was not anticipated that this would be a problem, but it resulted in interference between the weather sensor and remote monitoring system. The interference caused the weather station to lock up in certain circumstances, which had the cascading effect of locking up the remote monitoring system and prevented the environmental and turbine performance data from being sent to our centralised database.

It was realised that there was an issue within 2 days of installation, when communications to the remote monitoring systems would lose signal. Sapphi remotely logged into the Mt Hyland system and investigated the issue and identified the potential cause of the problem along with a solution. Resetting the remote monitoring system and weather station fixes this issue and Sapphi have implemented an automatic reset function in the system software if data hasn't been received for a set period of time. This update was pushed out over the 3G/4G network to all the remote monitoring systems. This appears to have resolved the issue for the Mt Hyland system, but the Mt Wondurrigah system has since locked up and has not been able to be communicated with.

A site visit to both Mt Wondurrigah and Mt Hyland is planned for late June to assess and remedy the issue, and to replace the existing cabling with correctly shielded cables. This visit needs to be coordinated with the site technicians, who currently have a full schedule maintaining other sites within the region. We are putting procedures in place as part of our standard checklist to fully test the remote monitoring system before leaving site for future installations, and we will provide extra length of cable for the remaining project installs so that field splicing does not need to be undertaken. It should be noted that the weather stations are installed as part of the ARENA project and are not part of our standard offering.

It is unfortunate that we will not have access to the data from Mt Wondurrigah over this time period, but it is anticipated that the impact to the overall project will be minimal as once the issue is resolved, there will be ample opportunity to gather data over the remainder of the project. This is the first version of the remote monitoring system, which has been developed as part of the ARENA project, and it is precisely to identify and resolve these kind of issues

LESSON LEARNT NO.2:

Dependence on external funding can create delays in projects.

Category: Commercial

Objective: Milestone 3 – installation of turbines

Detail Learning:

The project has a total of 10 customer sites for trialling the Hyland 920 wind energy system, 2 of which are existing operational sites for Vertel and 8 of which are new greenfield sites with Positive Off Grid Solutions where the towers are yet to be built.

Our systems have been installed on the 2 Vertel sites with the turbines being retrofitted onto the towers, however the 8 greenfield sites were part of a federal government grant application, which Positive Off Grid Solutions has recently been notified was unsuccessful. The 8 sites are part of a network improving the connectivity in regional communities in Western Australia, which is very important for the communities involved and Positive Off Grid Solutions is currently looking at restructuring the financing but there is uncertainty around the timing of the project.

This could potentially cause delays in erecting the towers which could in turn cause delays in installing our systems. Although there are some cost implications for the project (we have already bought the weather stations and associated equipment for the 8 sites), the main impact to the ARENA project is a potential delay to the project. We are in the process of organising meetings with the project customer and stakeholders to determine next steps and discuss project timelines to assess the impact on the ARENA project. We are also talking to other potential commercial partners with suitable sites to step in if the Positive Off Grid Solutions sites are extensively delayed or no longer proceed.

The key lesson learnt from this process is that we need to have a more thorough understanding of the funding arrangements for new greenfield sites that have signed up for our wind energy systems and how far along in the planning cycle they are. We need to be involved early in the process, as we want our systems to be included in the tender/application, and we can potentially value add to the process by helping customers that may be inexperienced with the planning and application cycle.

LESSON LEARNT NO.3:

We require a method to electrically test the correct installation of wind turbine, controller, and remote monitoring system.

Category: Technical

Objective: Ensure correct installation of our wind energy system prior to leaving site.

Detail Learning:

We have had the situation, external to the ARENA project, where a turbine that had been installed at a residential site was not running correctly and exhibited poor performance.

A considerable amount of time was spent trying to identify the cause of the fault over the phone with the installer, and eventually it was discovered that the turbine had not been connected into the turbine correctly, with only 2 of the 3 phases properly connected.

We provide a basic step-by-step procedure for testing that the wind turbine and controller is installed correctly, but a system of electrically testing the setup as a last step if it is not windy would be beneficial to avoid the issue, or one like it, occurring on remote sites where a return visit to rectify a fault could be very time-consuming and costly.

We are looking at developing a simple methodology that installers can use to test the setup of our system prior to leaving site. The method will use readily available, standard tools and devices that a telecommunications technician should have as part of their toolkit.