Here Comes The Sun

NautelNav demonstrates how it is harnessing the sun as a primary power source to run a non directional beacon on a remote Mauritian island

Non directional beacons (NDB) are often located in extremely remote sites, and many do not have readily available AC power. And while some may have AC power, it can be unreliable. Rather than exclusively using generators, which can be costly and maintenance-intensive, some municipalities are opting to use solar power as the primary power source with generators as backup.

One such solar installation for an NDB was commissioned recently off the coast of Mauritius. Nautel partner Systems Interface (SIL), based in the UK, installed a Nautel VR250 Vector Dual Solid State NDB, operating at 250 Watts, on the Agalega Islands, approximately 1,250 km north of Mauritius.

Nautel says the VR250 was designed to provide ultra-reliable operation in remote locations such as Agalega. Its patented design can maintain system coverage regardless of undesirable antenna effects such as salt build-up on antenna insulators or ground plane resistance changes.

The VR250 includes a synthesized exciter with advanced DDS technology to produce highly stable RF drive at the operating frequency; extensive automatic fault monitoring and extensive remote command/control and monitoring capabilities.

Installing and commissioning the NDB site on Agalega posed interesting challenges for Systems Interface Ltd. The Agalega islands comprise two landmasses: North Island is 12.5 km long and 1.5 km wide; the South Island is 7 km long and 4.5 km wide. Population of the islands is approximately 300 people.

The North Island has one landing strip used by light aircraft; no harbours are available so visiting ships must anchor in the high sea approximately 500m from the North Island's jetty. Although the nearby village has generator-based power, the rest of the island is without any. The Department of Civil Aviation in Mauritius wanted the NDB site to be completely independent of any existing power systems.

SIL acted as the prime contractor for the project and were responsible for all equipment design, supply, civil works, installation and commissioning of the Nautel NDB and solar system. They worked with their partner company and solar expert Aviation Renewables Corporation to custom-design a self-contained solar power system.

Back Up

How do you determine the solar power requirements for such a system? Even the most reliable NDB requires consistent power for operation. Power 'down time' is not an option for NDBs, therefore sufficient battery banks must be installed to maintain power requirements, or backup power sources must be available to account for those periods when the solar panels are not actively supplying power.

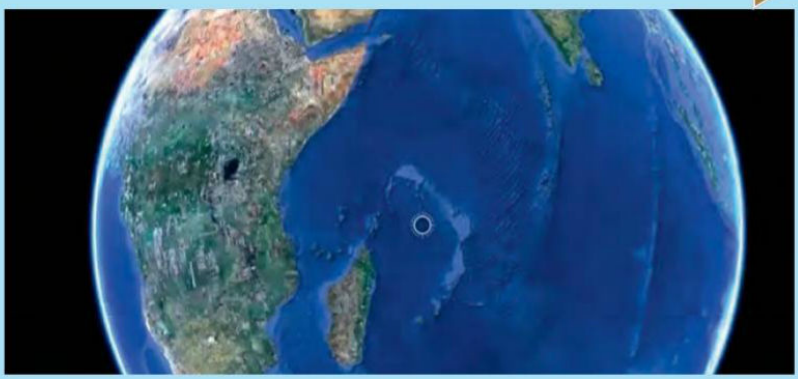
Allister Willmott, president of Aviation Renewables, says: "We try to spec in at least 7 days' autonomy for every system of this type, but the more battery you put in, the more expensive the system becomes. We specified a backup generator on Agalega because it let us deliver a smaller, less expensive solar system."

Aviation Renewables designed the power system for Systems Interface around a maximum NDB input requirement of 400 Watts, providing a 4,670 Watt solar photovoltaic array with a Deka Unigy II, sealed AGM 2016 amp-hour battery bank.

Because the customer had requested an AC-powered NDB, a 48 VDC to 120 VAC inverter was also required. The solar array mounting structure was designed to be low-profile; it was placed approximately 122 cm high by 320 cm deep by 152 cm wide at a 25 degree tilt.

SIL sub-contracted a local building engineering company to build the concrete pad for the Solar assembly and 16m NDB mast. Paul Gurney, sales director at SIL says: "It was a complicated logistics scenario for our sub-contractor to get all the aggregates to Agalega from the mainland. However, when the engineers and I arrived on the island to begin the installation, everything was constructed exactly to plan, making it possible to install and commission the system in the five days we had on the island."

Systems Interface faced numerous logistical challenges getting all the equipment to the site. Even at the time the tender was released, the airstrip was classified as unsafe so SIL was un-



able to conduct a site survey, instead basing all plans on information provided by the Mauritius DCA and with all communications via fax and 'snail mail' as internet was not available.

On contract award, getting the equipment to the site was another challenge; only two supply ships per year were visiting the islands at that time and each only stayed for two days per visit. Equipment was sent on one of those ships and was kept in storage until SIL could determine a way to get the engineering team to the island for the five-day installation.

Until they arrived for the actual work, SIL had no way of knowing if the equipment had made it to the site intact – over two tons of equipment had to be transferred in small boats from the supply ship anchored 500m off the coast! Fortunately everything had survived the shipment and transfer. Installation went according to plan, during which time the SIL staff were well-fed and given almost-endless supplies of coconut milk by the locals while working. The complete system was commissioned and flight-calibrated, going operational in 2012. According to SIL, the operations director at the Agalega North Island airfield reports that the system has been operating successfully since that time with negligible energy costs.

The Agalega installation, although it faced interesting logistical issues, is nonetheless a 'typical' solar-powered facility. Customers considering this type of installation are encouraged to work with a systems integrator who is familiar with the logistics involved.

ICAO, FAA and other requirements will need to be addressed, and while it was not an issue on Agalega, security of the solar panels should be considered while planning an installation.

PROJECT HIGHLIGHTS

This remote Island is part of the outer island territory of the Republic of Mauritius.

Lying some 1,100km north of Mauritius it comprises two islands: North Island - 12.5 km long and 1.5 km wide, and the South Island - 7km long and 4.5km wide.

The North Island has one unusable landing strip. With no harbour, visiting provisions ships have to anchor in the high sea at about 500m from the North Island's jetty.

Systems Interface provided civil works, installation and commissioning of the Nautel VR250 Vector Dual Solid State 250W NDB system.

Due to the lack of power and communications on the island, Systems Interface worked with partner business and solar expert, Aviation Renewables and manufacturer Solar Electric Supply, to custom design the Solar Series MAPPS self-contained solar power system, to suit both airfield, climate and power requirements of the NDB and to provide continuous 24-hour operation.

An Avlite AV310 Solar Powered Obstruction light was also fitted on top of the NDB mast.

Costs

Costs of solar panels continue to drop while efficiency continues to rise, and Aviation Renewables reports that solar power systems now have a very good ROI.

"The biggest challenge for a lot of remote locations is the transportation of diesel fuel to the site," says Mark Luttrell, VP of operations at Aviation Renewables. "We have seen cost estimates of over $1.00 per kWh for a number of installations of diesel generators. At that rate, the solar MAPPS would pay for itself in four years or less." ATM