

Fair Isle Renewable energy system – A brief summary - July 2023

Population – C.50

Dwellings – C.25 crofts and 10 Utility buildings including a school.

Island ownership – NTS

Weather – Moderate Wind, bright with rain showers.

Fair Isle lies between Shetland and Orkney, and is supplied by its own passenger and cargo vessel, the Good Shepherd. There is also a small airstrip with flights every other day from Shetland, subject to weather. The sailing from Sumburgh in Shetland takes around 3 hours and there are many other comparisons to Lundy.

The Fair Isle power system is managed by a community owned electrical company and managed by the island shopkeeper, who was instrumental in project managing the development and installation.

The current system replaces 2 previous Turbines and generators and was installed between 2016 & 2018 with funding from a variety of sources. Previously power was switched off between 23.30 & 07.30. The new system runs 24 hours/day.

Most of the island is SSSI due to archaeology and the wind turbines sit in the middle of the SSSI and the island.

The system supplies every island property and includes electric storage heating, using spare power at a cheaper rate, but noticeably there are no electric cookers, due to limitations of the supply. Residents use either gas or oil for cooking. Since the system was introduced, the load has increased as islanders have gradually added more electrical equipment and additional refrigeration storage to their dwellings.

The system comprises:

- 3 x 60kw turbines
- 3 x banks of 15Kw Solar PV
- 2 x 80Kva Generators
- Battery bank. 7 clusters x 48 batteries (336 in total)
- Control system
- 24 hour power.

Turbines

There are three Harbon 60Kw turbines, each turbine stands 30m (100ft) tall with 2.5m (8ft) blades. These turbines are sectional and use a hydraulic ram to raise and lower them. At the time of my visit, one turbine was dropped with a mechanical problem. It had been on the ground for almost 12 months awaiting repair.

Each turbine had its own inverter in a cabinet at the base along with touch screen controls. All three however, can be controlled by an app on a mobile phone. The turbines are high wind velocity units and self-brake during 50 kt winds.

Considerations:

Visual impact - On arrival from the air, the turbines blended into the landscape and were difficult to define. The galvanised construction helped with visual appearance. From the ground, with open moorland (SSSI) surrounding the towers, they blended in well with the landscape and looked in keeping with the island.

Noise - Noise from the turbines was noticeable in the immediate vicinity but wind noise overwhelmed any mechanical noise when moving a short distance away.

Reliability and failure history – One turbine had been out of action for almost 12 months as the manufacturer has gone into receivership, although they are expecting to effect repairs in the near future. Since install they have suffered 1 x motor failure, 1 x yaw drive failure and currently they have 1 x valve failure.

Maintenance – It takes 8 minutes to drop each tower if required. Servicing is conducted at height every 3 months by the islanders, using appropriate PPE.



Harbon 60Kw Turbine



No 2 Turbine on the ground on the hydraulic ram



Turbines from the air



The power head and blade

Solar PV Array

There are three solar arrays on Fair Isle, close to the control room. Each array consists of 15Kw each providing a maximum of 45Kw of power. The Arrays face South for maximum efficiency and are configured in portrait. The array sits at around 3m (10ft) tall and there is an inverter for each array in the control room.

Considerations:

Visual impact - On arrival from the air, the array blended into the landscape and were difficult to see as the overall footprint is quite small. However, the proposed Lundy array of 400Kw would be considerably larger than the Fair Isle system. Galvanised construction also helped with visual appearance. From the ground, with open moorland (SSSI) also surrounding the panels, they blended in well with the landscape from a distance and weren't out of keeping with the island. On close inspection however, they were noticeable taller than first envisioned and stood quite tall, which would be a consideration for Lundy, unless they were orientated in Landscape, reducing the visual impact.

Noise – No impact

Reliability and failure history – They look well maintained and all the electrical joints are well protected from the elements. They have suffered no reliability issues with the panels. One x inverter has been changed after failing.

Maintenance – The only maintenance required is to keep the panels clean, which normally happens naturally with rainfall and wind.



Solar Array x 3



Giving an idea of the height of the Array, with Portrait panels.



Solar panels and Turbines from the air

Generators

Fair Isle has two 80Kw acoustically clad generators in a room adjacent to the control room, similar to the Lundy set up, other than that they don't provide any hot water (CHP) heating. When synchronised, they can provide up to 160Kw. The generators normally come on for up to 6 hours per day to top up the batteries. They burn approx. 15/18 litres of oil per day = C. 6500 ltrs per year. They have a 7500 ltr fuel tank, similar to Lundy, and a small bowser to transport fuel from the ship. The Shopkeeper maintains the generators and calls for mainland support on a PAYG basis for any breakdowns.

Considerations:

Visual impact – None – Lundy would utilise it's existing generator set up.

Noise – Significant reduction of daily running hours.

Fuel use – With a larger solar array, we would expect the run time to be lower than the Fair Isle system.

Reliability and failure history – Nothing significant.

Maintenance – Routine servicing, which would be completed by the island engineer.



80Kw Acoustically clad Generator

Battery Clusters

The Turbines, Solar Array and Generators charge up the batteries, which in turn provide the islands power supply. The Generators can however be switched to run independently in the event of critical failure of the renewable system.

There are 7 clusters x 48 batteries, 336 batteries in total. With no other input, the batteries last for approx. one day. They discharge to 40% before the generator automatically starts to charge them back up to 80%.

Considerations:

Visual impact – Lundy will have to build a new battery and inverter house adjacent to the lambing shed to accommodate both batteries and invertors. (which change the power from DC to AC).

Noise – None

Reliability and failure history – Fair Isle has suffered 5 failures in 5 years.

Maintenance – Routine servicing, which involves topping up the distilled water and checking the voltage. Approx. 1 day per month.

Size - Batteries are approx. 1m high



DC Battery clusters – Each “bank” contains 48 individual batteries

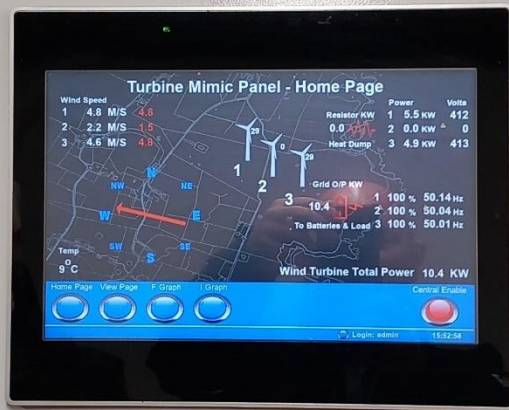


DC – AC Invertors



Main control panel

CB-CP-01
User Interface Panel



Warning
415V .AC

HEALTH & SAFETY AT WORK
What you should know!

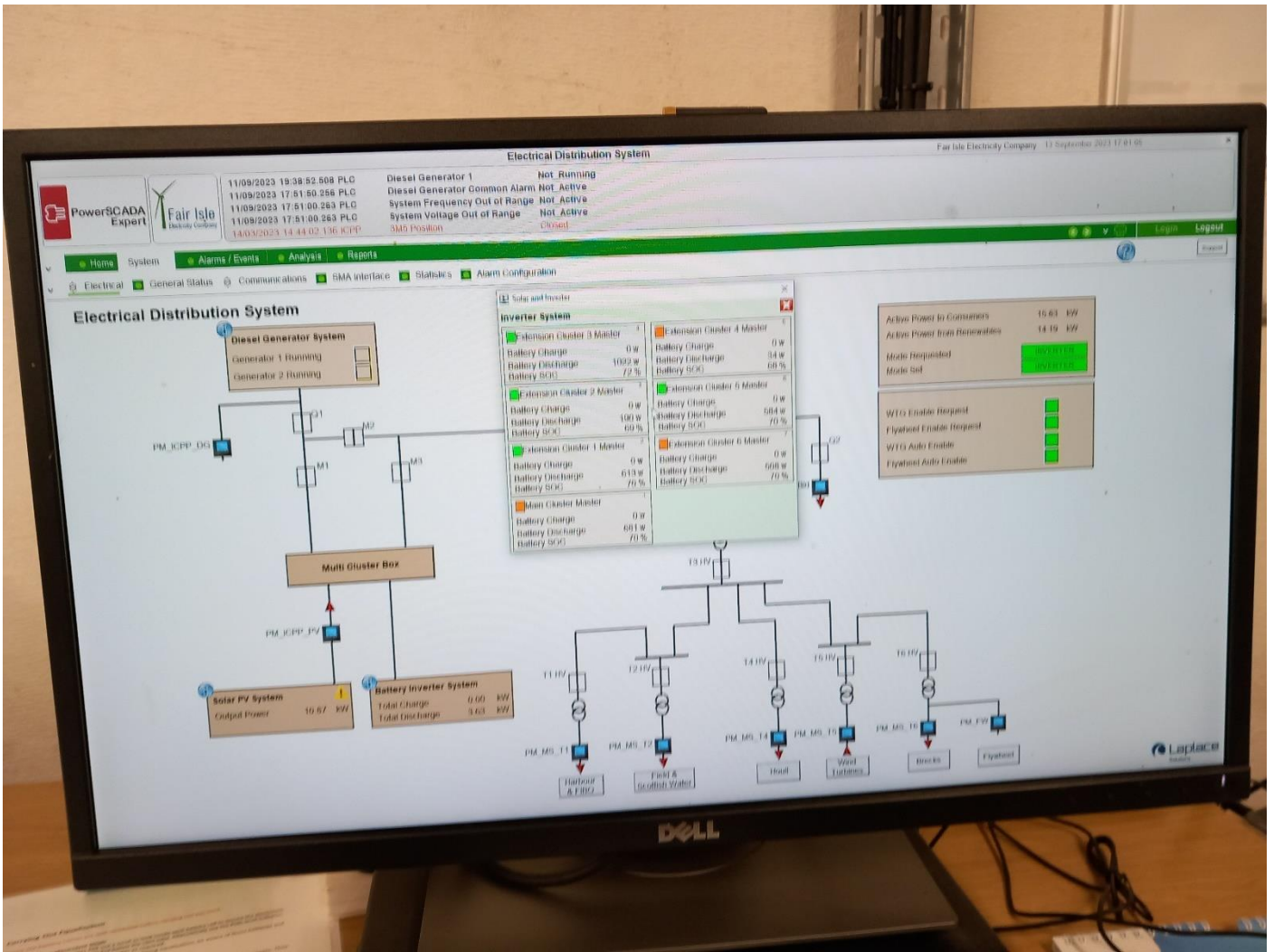
SAFETY AT WORK REGULATIONS
Under the Management of Health and Safety at Work Regulations 1999, employers are required to provide a suitable work environment for employees to comply with the minimum Health and Safety requirement

WARNING MULTIPLE SERVICES
Isolate all electrical supplies before carrying out work

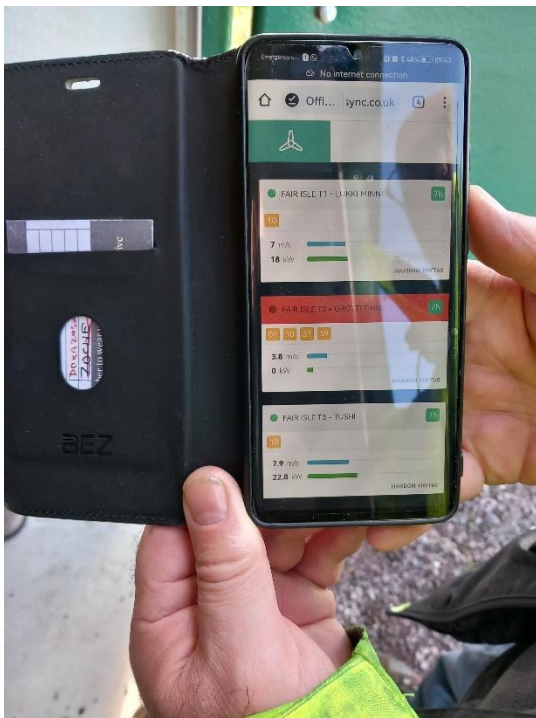
External Supply 1 - EWP
External Supply 2 - EWP Power Supply via EWP

Laplace Solutions
All Electrical services
Wired & Test
24 Hour Emergency Call Out
10 Years Experience

Turbine controls



Online monitoring



Mobile Phone App

