VOAR

Report:

Bressay Community Energy Project Feasibility Study

A report for Bressay Development Limited

February 2025

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GLOSSARY

Term	Meaning	Context
BDL	Bressay Development Ltd	*Bressay's community development company*
BESS	Battery Energy Storage System	*Technology that stores electrical energy in batteries for later use*
CARES	Community and Renewable Energy Scotland	*Scottish Government programme to encourage local or community ownership of renewable energy*
CB	Community Benefit	*Payments made to communities for hosting renewable energy projects*
CES	Community Energy Scotland	*Members association for community energy projects*
CfD	Contract for Difference	*UK renewable subsidy mechanism*
CWB	Community Wealth Building	*Strategic approach to making long-term investments in the well-being of the community*
ENA	Energy Networks Association	*Industry body representing the UK/Irsih electricity and gas network operators - sets technical standards*
GSP	Grid Supply Point	*Electrical infrastructure connecting Shetland's local electricity distribution grid to the national UK transmission grid*
GW	Gigawatts	*1 GW = 1,000 MW = 1,000,000 kW*
HVDC	High Voltage Direct Current	*The power transmission system used to carry energy generated in Shetland to the UK National Grid*
kW	Kilowatts	*1 kW = 1,000 Watts of instantaneous power*
kWh	Kilowatt Hours	*1 kWh is a unit quantity of energy*
MW	Megawatts	*1 MW = 1,000 kW*
NYDC	North Yell Development Council	*A local community development body, and community wind farm owner/operator*
PV	Photovoltaic	*Type of solar panel e.g. as opposed to solar therma)*
SHEPD	Scottish Hydro Electric Power Distribution	*Owner and operator of the distribution network*
SHET	Scottish Hydro Electric Transmission	*Responsible for the electricity transmission network*
SIC	Shetland Islands Council	*Shetland's local authority*
SSEN	Scottish & Southern Energy Networks	*Company responsible for electricity transmission and distribution networks*

1. INTRODUCTION

1.1. Scope and report structure

1.1.1. Bressay Development Ltd (BDL) secured funding from the Scottish Government's Community and Renewable Energy Scheme (CARES) to seek the Bressay community's views on community energy and conduct a study into the feasibility of developing a community-owned energy project. BDL then contracted Voar to lead this work.

1.1.2. As this is the first study considering the potential for a community energy project on Bressay, we have endeavoured to provide additional context on a range of project and technology options, the broader energy sector context and relevant case studies, so that this document can better inform the community discussion.

1.1.3. This document is structured as follows:

- Community engagement
- Bressay energy overview
- Project concept and technology options review
- Concept feasibility and site visits
- Technical specification
- Yield assessment
- Market analysis / Shetland energy sector context
- Regulatory analysis
- Conclusions

1.1.4. Suggested next steps are highlighted in boxes as shown below.

Example recommendation box

1.1.5. These recommendations are then collated in a table in Table 3 page 41

1.1.6. Following initial discussions with Community Energy Scotland, a solar PV (photovoltaic) and BESS (Battery Energy Storage System) project had been identified as a good first option for a modestly sized community energy project, to build confidence in what Bressay can do. The operators of the Bressay fish factory at Heogan supported BDL's CARES application and confirmed that they could be a potential customer for the electricity produced.

1.2. Related work

1.2.1. In BDL’s Bressay Community Development Plan, there was an action to consider revisiting whether a turbine could provide income / energy for Bressay / BDL (Figure 1).

Island energy	Low	Consider revisiting whether a turbine could provide income/energy for Bressay/BDL	Directors	SIC, energy specialists, other CDCs	5 years

Figure 1: Action from Bressay Community Development Plan

1.2.2. In addition to this scope, BDL contracted Voar to develop a Community Climate Action Plan, the first version of which is due to be published in April 2025. This will be a live document informed by ongoing community consultation.

Figure 2: Meeting with representatives from North Yell, Rousay, Shapinsay, North Ronaldsay and CES

2. COMMUNITY ENGAGEMENT

2.1. Overview

2.1.1. BDL and Voar organised a number of well-attended community engagement events in Speldiburn:

- 1st October 2024 (project intro and kick-off)
- 29th October 2024 (event with North Yell, Rousay, Shapinsay, North Ronaldsay and Community Energy Scotland)
- 21st January (draft findings and feedback)

2.1.2. At the kick-off meeting, the reasons for considering a community energy project were discussed:

2.1.3. Such a project could build community wealth, make Bressay more self-sufficient in energy and reduce Bressay's greenhouse gas emissions. North Yell Development Council's Garth windfarm has shown the transformative impact that community owned renewables can have *(see Appendix 1 – North Yell Development Council Example)*

2.1.4. There are also tactical reasons to look into such a project. Shetland is set to see explosive growth in new energy projects. The north end of Bressay is an attractive development site, so it is important that residents are informed and can consider what scale and type of development they would accept, and whether there is an opportunity for the community to participate or become a part-owner of any future developments.

2.2. Q&A

2.2.1. Table 1 lists some questions that came up in the engagement events.

Table 1: Community engagement Q&A

Question	Answer
"How can we make Bressay more resilient – could we produce enough for ourselves?	- Energy can be produced on the island for use at source or export to the wider grid.
"Concerns about energy security and community resilience were raised at all three meetings. Could a project help protect Bressay?	- Yes. BDL has installed a solar array. This could also be done at the hall and possibly at the mail shop. The addition of battery storage capacity would improve community resilience. A series of domestic solar installations would also improve individual resilience within the community.
"Capacity issues. Wind projects elsewhere get turned off due to too much electricity - could this pose a problem for us? Other communities are losing out on income.	- Yes, this is an ongoing concern for any project larger than the connect and notify limit of 3.68kW. A parallel concern is the perceived unwillingness of the grid to take new smaller scale energy connections.
"Could this include info which might help the Hall - as the Hall Committee are keen to install further green energy systems?	- Yes, there are some costs included for different solar energy options, however we are recommending a separate study to consider a resilience zone incorporating the Bressay Hall, Speldiburn and the Shop.
"Is the land at Heogan really suitable for solar panels?	- The land around Heogan has a varied topography which give plenty of options for panel mounting locations. There are different ground mounting options which minimise disturbance. During design, the panel locations would need considered including the effect on any peat.
"Is hydrogen an option?	- Whilst technically an option, Hydrogen is a complex and less well-established technology. The community could however potentially partner with a larger developer.
"Can we be self-sufficient in energy i.e. run our own electricity grid.	- This is not realistically possible. The electricity grid is controlled by SSE and local control is not an option as things stand. A separate electricity grid is an expensive, complicated endeavour.

3. BRESSAY ENERGY OVERVIEW

3.1.1. Figure 3 provides an overview of Bressay's electrical grid and demand centres (houses in red, agricultural sheds and industry in blue).

Figure 3: Bressay electricity grid and power use locations

3.1.2. The main demands for power in Bressay are:

- 184 homes (including uninhabited)
- Community assets: Speldiburn Cafe, Public Hall, Mail Shop, Maryfield House Hotel, Bressay Heritage Centre.
- Heogan Fish Factory and Ward Transmitting Station
- Other smaller demands e.g. agricultural sheds, caravan site

3.1.3. An approximation of how Bressay's domestic power demand might vary over the year is shown below, with most power required for heating in the winter (say 250 kW average) and far less required in the summer (~100 kW).

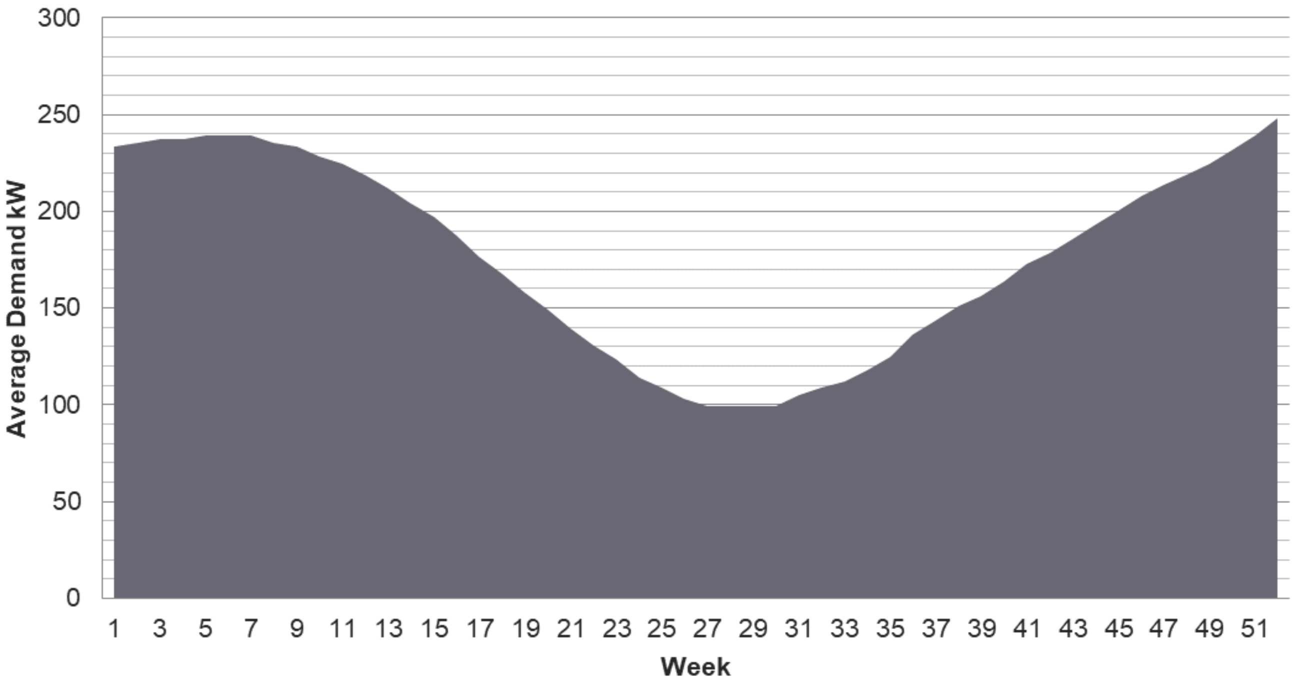


Figure 4: Indicative domestic power demand

3.1.4. It would be useful to better understand Bressay's domestic and agricultural power demand and the extent to which domestic and agricultural solar and wind installations could satisfy this demand.

Recommendation 1: Carry out a more detailed survey of Bressay's power usage and which homes and sheds / parks would be suitable for wind and solar installations.

3.1.5. There has been an active fish factory at Heogan since the early 1900s. In 2018, Norwegian seafood company Pelagia acquired full ownership, boosting efficiency and output. Today the facility specialises in converting fish trimmings and waste into high-quality fishmeal and fish oil for aquaculture, poultry, and pig industries. Trimmings and fish waste are received from fish factories and piers across Shetland - and increasingly from elsewhere in Scotland as well. The facility processes up to 360 tonnes of raw material daily. Throughput - and therefore energy demand - is set to increase in the coming years.

Figure 5: Pelagia Fish Factory at Heogan

3.1.6. Pelagia's General Manager at Heogan was receptive to the idea of a community-owned energy project selling renewable power to their operation, and provided a letter of support for BDL's application to the Scottish Government Community and Renewable Energy Scheme that funded this study.

4. PROJECT CONCEPT / TECHNOLOGY OPTIONS REVIEW

4.1. Overview

4.1.1. This section briefly outlines the technology options discussed during project scoping and community engagement:

- Solar PV and BESS (battery energy storage system)
- Onshore wind
- A programme of smaller scale domestic and agricultural solar and wind installs across Bressay
- Thermal store / community heat
- Standalone BESS to provide grid flexibility services
- Hydrogen or hydrogen-based fuel production
- Pumped storage
- Tidal power

4.1.2. A summary assessment of each technology and its relevance to Bressay is provided below. Where further work is required, we have suggested applying to Shetland Community Benefit Fund (SCBF) or the Scottish Government Community and Renewable Energy Scheme (CARES). Other funding sources are available and it would be useful to maintain a register of the different schemes, their relevance and associated application deadlines. It may also be helpful to consider creating a BDL subsidiary to focus on energy development options, as other communities such as Shapinsay have done[1].

Figure 6: Example draft register of different potential funding sources

[1] https://shapinsay.org.uk/sdt/shapinsay-renewables-ltd/

Recommendation 2: Develop and maintain a register of potential funding opportunities. Consider creating a subsidiary wholly owned by BDL to focus on energy development options.

4.2. Solar PV and BESS

Figure 7: 500kW ground-mounted (left)[2] and 144 kW roof-mounted (right)[3]

4.2.1. Solar photovoltaic (PV) systems convert sunlight directly into electricity using semiconductor materials that release electrons when exposed to solar radiation. This electricity is typically generated as direct current (DC) and then converted to alternating current (AC) for use in homes or on the grid. When paired with a Battery Energy Storage System (BESS), excess electricity generated during peak sunlight hours can be stored for later use, helping to balance energy supply and demand.

[2] https://nomoredigging.co.uk/case-studies/500kw-solar-array-scotland
[3] https://www.emtecenergy.co.uk/case-study/rautomead

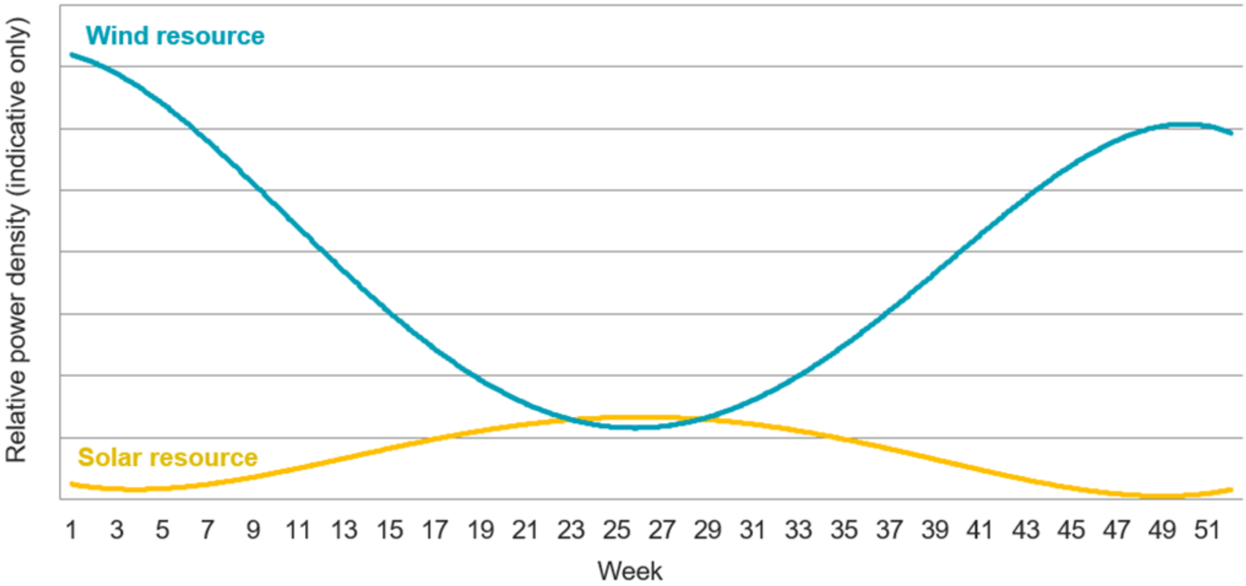


Figure 8: Shetland wind and solar resources

4.2.2. Shetland's location and climate do not make it an obvious choice for solar projects: the wind is more energetic than solar and it is windier in winter, when power demand is higher (*Figure 8*). However:

- Solar PV is simple and reliable, has come down in price, and is likely a less controversial option than wind turbines in Shetland.
- There is a lot of wind already connected to the Shetland grid: existing new generators are heavily constrained.
- Heogan fish factory daily power profiles are a good fit with solar generation.

4.2.3. Following initial discussions with Community Energy Scotland, the proposal at the start of this study was that a solar / BESS project would be a good first option for a modestly sized community energy project, to build confidence in what Bressay can do.

4.2.4. There are a large number of potentially suitable locations for solar PV and BESS projects across Bressay. The lead concept identified for this feasibility study is to install such a system at or nearby Heogan, so that a community-owned energy project could sell power directly to Pelagia, and export the remainder to the grid.

4.2.5. The possibility of using a solar PV and BESS project to create a resilience zone that could support the Bressay Public Hall, Shop and Speldiburn community hub in the event of a power cut was also discussed during community engagement and is certainly of interest. As things stand each of these three community hubs are considering their own needs separately. Confirming the feasibility of this would require more detailed technical analysis than was possible within the scope of this project. Discussions with SSEN would also be required.

Recommendation 3: Explore whether BDL, Bressay Public Hall Committee and the owners of the Bressay Shop would be interested to jointly apply for SCBF funding for a feasibility study considering a resilience hub project.

4.3. Onshore Wind

Figure 9: North Yell Development Council's 4.5 MW Garth Wind Farm[4]

4.3.1. Onshore wind turbines harness kinetic energy on sites with strong and consistent wind patterns. The wind turns the turbine blades, which spin a shaft connected to a generator that produces electricity. As shown in Figure 10, wind turbines installed in Shetland can be around twice as productive as the UK onshore average.

[4] https://nomoredigging.co.uk/case-studies/500kw-solar-array-scotland

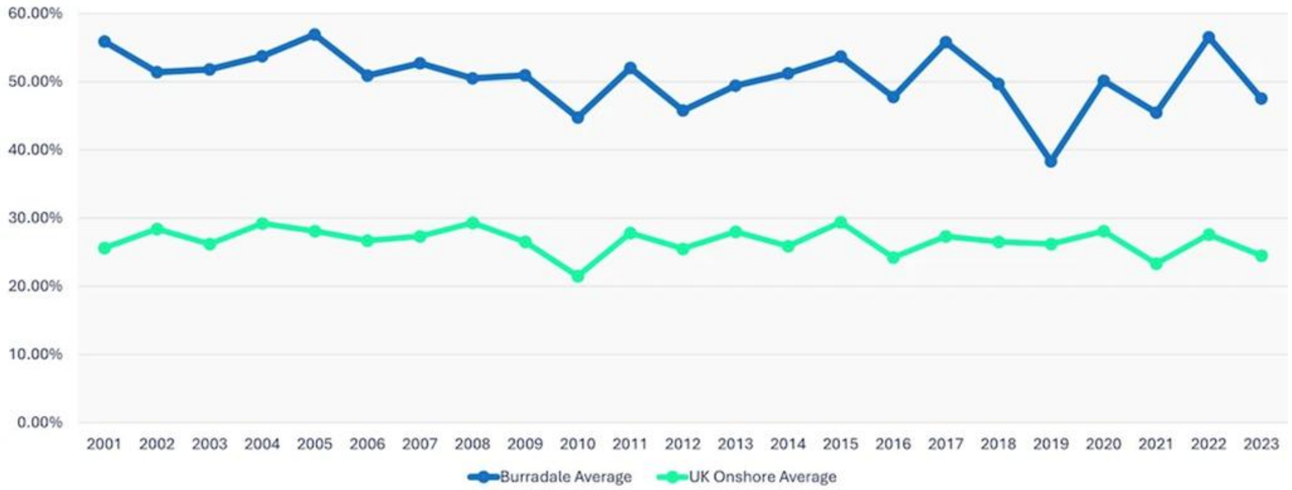


Figure 10: Shetland Aerogenerators Burradale Windfarm Capacity Load Factor[5]

4.3.2. Yell, Rousay and Shapinsay have all successfully developed community-owned onshore wind projects which have enabled everything from newbuild housing to a community-run ferry service, lunch clubs, travel grants etc. See Appendix 1 – North Yell Development Council Example for more details on that Scheme.

4.3.3. There is potential for a community-scale wind project on Bressay, however careful consultation and site selection would be needed to confirm the location(s) and size of project that would have broad community support. This could for example be a single large (say 4.2 MW) turbine, or a number of smaller (say 0.9 MW) turbines at the north end of Bressay.

4.3.4. For the reasons stated above, a solar PV and BESS project was considered a more suitable option for this first study. It would nonetheless be worthwhile spending more time assessing the options for community-owned onshore wind in Bressay.

Recommendation 4: Apply to SCBF / CARES or other funder to screen possible sites for a community-scale onshore wind project on Bressay.

[5] https://www.shetlandaero.co.uk/impact/data

4.4. A programme of smaller-scale solar and wind installations

4.4.1. This approach would involve seeking funding for a programme of solar panel and wind turbine installations within the G98 “connect and notify” limits whereby neither a grid connection application nor a transmission impact assessment is required (see Section **Error! Reference source not found.** for more details).

Figure 11: Nordri installation examples

4.4.2. Modern inverters can handle generation systems over-sized to for example double the grid limit, meaning that the maximum solar or wind capacity for each grid connection point in Bressay could be:

- 7.4 kW maximum generation capacity for domestic single-phase connections
- 22.1 kW maximum generation capacity for agricultural or industrial three-phase connections

4.4.3. In practice, there is a question of how many connections of such systems the grid operator would tolerate before they would consider the combined effects of many such small systems to be a problem.

4.5. Thermal Store / Community Heat

4.5.1. Thermal storage systems capture and store heat, often in the form of hot water or other heat-retaining materials for later use. Storage of heat over days, weeks and even months or seasons is a potentially attractive proposition in Shetland, given the large amount of wind generation capacity that is built or in planning, and our location at the extreme end of the UK transmission grid. To date the Viking Energy Windfarm has been turned off more than 56% of the time it could have been generating: the project has made a comparable amount of income from curtailment as from generation (Figure 12).

4.5.2. A community heat network could distribute stored thermal energy through insulated pipes, providing heating to multiple buildings from a central source. The costs for installing such infrastructure and retrofitting buildings may render such a scheme unattractive, however the results of the survey proposed in Recommendation 1 (page 12) will inform this e.g. by confirming how many houses in Voeside and the Glebe / Fullaburn / Hamilton Park are using storage heaters, wet radiators, etc.

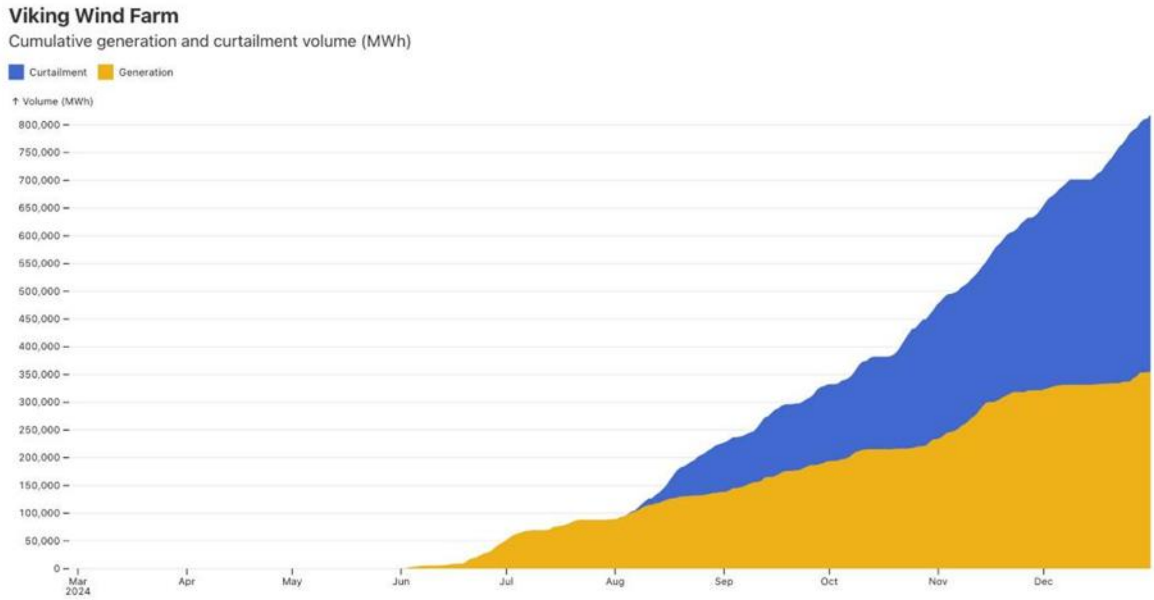


Figure 12: Viking Wind Farm generation and curtailment[6]

4.6. BESS

4.6.1. A standalone Battery Energy Storage System operates independently of renewable generation and generates income by providing “grid flexibility services” e.g.:

- Storing energy during times of low demand (off-peak hours) and discharging this energy during periods of peak demand – this is also known as “load shifting”
- Frequency regulation: Stabilises grid frequency by quickly absorbing or releasing energy to counteract fluctuations and maintain the grid's standard frequency (e.g., 50 Hz in the UK).
- Emergency backup power: provides a reliable power source during outages or grid failures, ensuring continuity of supply for critical infrastructure and services.

4.6.2. Point and Sandwick Trust in Lewis are looking to build on the success of their 9 MW community-owned windfarm7 (currently the UK’s largest) by developing a community-owned BESS project in partnership – see Figure 13.

[6] https://www.linkedin.com/posts/robhawkes_im-not-sure-viking-being-switched-off-over-activity-7294698694128402432-3oCl?utm_source=social_share_send&utm_medium=member_desktop_web&rcm=ACoAAAKSvBoBQmkTmmtt6uUOUDqYoPhJFfUOJls

[7] https://www.pointandsandwick.co.uk/about-us/our-wind-farm/

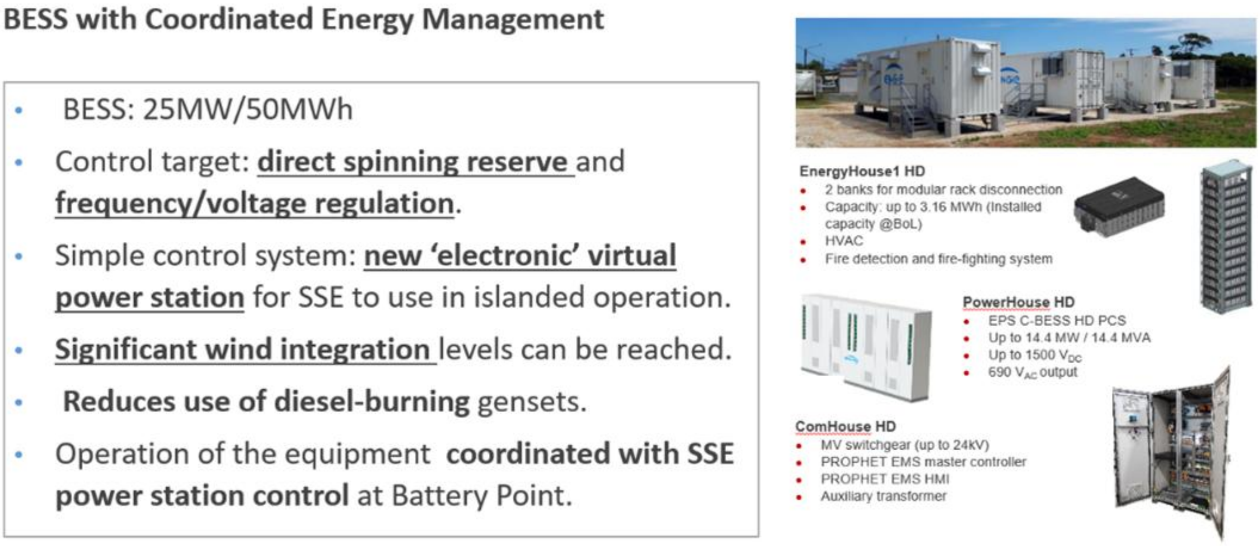


Figure 13: Point and Sandwick Trust's plans for a community-owned BESS project

4.7. Hydrogen or hydrogen-based fuel production

4.7.1. Green hydrogen production uses electricity from renewable sources to split water into hydrogen and oxygen by electrolysis. This hydrogen can then be stored and used as fuel itself, or combined with other elements such as nitrogen or carbon to produce derivative fuels such as methanol or ammonia.

4.7.2. The Norwegian state power company Statkraft and Sullom Voe operators EnQuest have plans for major green ammonia and hydrogen projects at Scatsa and Sullom Voe.

4.8. Pumped storage

4.8.1. Pumped storage hydroelectricity is a form of gravitational energy storage where water is pumped from a lower reservoir to a higher elevation during periods of low energy demand. When electricity demand spikes, the stored water is released to flow back down through turbines, generating power.

4.8.2. There is no natural reservoir at a suitable height in Bressay and the costs of building a reservoir of suitable capacity would almost certainly be prohibitively expensive.

4.9. Tidal stream power

4.9.1. Tidal stream power harnesses energy from the movement of tides through tidal stream generators (which function like underwater wind turbines, as opposed to tidal barrages which trap water at high tide and release it through turbines.

4.9.2. Bressay does not have any attractive tidal energy sites: the current speeds are not particularly high and even if they were, Noss Sound is too shallow and the north end of Bressay Sound where currents are strongest is a busy navigation channel. This technology is also pre-commercial, high cost and high risk.

4.10. Review of technology options

4.10.1. **Error! Reference source not found.** sets out the different options for a community owned energy project which were discussed during community engagement.

Table 2: Review of technology options

Concept	PROs	CONs	Conclusion
Heogan Solar PV and BESS, supplying Pelagia with power	Available customer for the power produced. Existing area of industrial activity.	Grid connection not guaranteed. Doesn't help with community energy resilience, but would generate some revenue.	Lead concept for this study
Community energy resilience hub at or nearby Speldiburn / Bressay Hall / Bressay Shop to create a resilience zone providing emergency back-up power for community buildings	Would support community resilience. Some solar PV panels could be mounted on existing buildings. Small-scale nearby wind generation may also be feasible.	Commercial model more difficult: less power being used and grid export likely curtailed. No new revenue. Integration of three buildings into a new resilience zone would have technical and regulatory challenges. Closer to more homes.	Merits more detailed study.
Community scale onshore wind project e.g. single 3-4 MW turbine at north end of Bressay, or a number of smaller turbines elsewhere	The most productive renewable option with the greatest capacity to generate significant community wealth for Bressay.	Site options TBC and likely fairly limited in number. Potentially controversial given visual impact and developments to date.	Merits more detailed study.
A programme of **Smaller-scale domestic and agricultural solar and wind installations**	Improves the resilience of individual properties. Likely easier and faster to achieve than a larger project.	Limited community wealth building (if any)	A relatively straightforward and low risk option to pursue, therefore included in this study.
Thermal Store / Community Heat	Could potentially generate revenue by providing grid flexibility services, and if use could be could potentially lower heating bills and generate revenue.	Best use for heat unclear. Up-front costs to install pipes and retrofit heating systems could be too costly.	Merits more detailed study.

Standalone BESS	Could improve resilience by providing back-up power and generate revenue by providing grid flexibilty services.	Doesn't help with making Bressay more self-sufficient in energy. 5 MW minimum size for grid flexibility services.	A viable option, but likely lower priority given type of project and existing plans in Lerwick
Hydrogen or Hydrogen-based fuel production	Significant revenue generation potential, given the scale of projects being talked about and government subsidies that are available.	High risk and cost. Unlikely to help make Bressay more self-sufficient or resilient.	Not recommended for a community-led scheme, but partnership opportunities may arise.
Pumped storage		Costs of building a reservoir at height would be prohibitive.	Not relevant
Tidal stream power		Pre-commercial high risk and high cost, no particularly attractive sites.	Not relevant

5. FEASIBILITY ASSESSMENT

5.1. Shetland energy sector context

5.1.1. This section provides some brief context on the development of Shetland's energy sector at the time of writing, and the relevance of recent developments to the ability of Bressay and similar communities to develop their own projects.

5.1.2. Figure 14 shows how Shetland's electricity grid operated as a standalone system before the arrival of the Shetland 1 cable connecting SSE's Viking Energy Windfarm to the UK mainland, which is now live. When Shetland's local electricity distribution grid is connected to the national UK transmission grid via the Grid Supply Point (GSP) in Lerwick, then homes and businesses in Shetland will join the Viking project in being part of the same UK system. The three consented Statkraft onshore windfarms (at Mossy Hill outside Lerwick and at either end of Yell) and the offshore windfarms north-east of Bressay will be on the transmission grid, but connected to Bressay via the GSP.

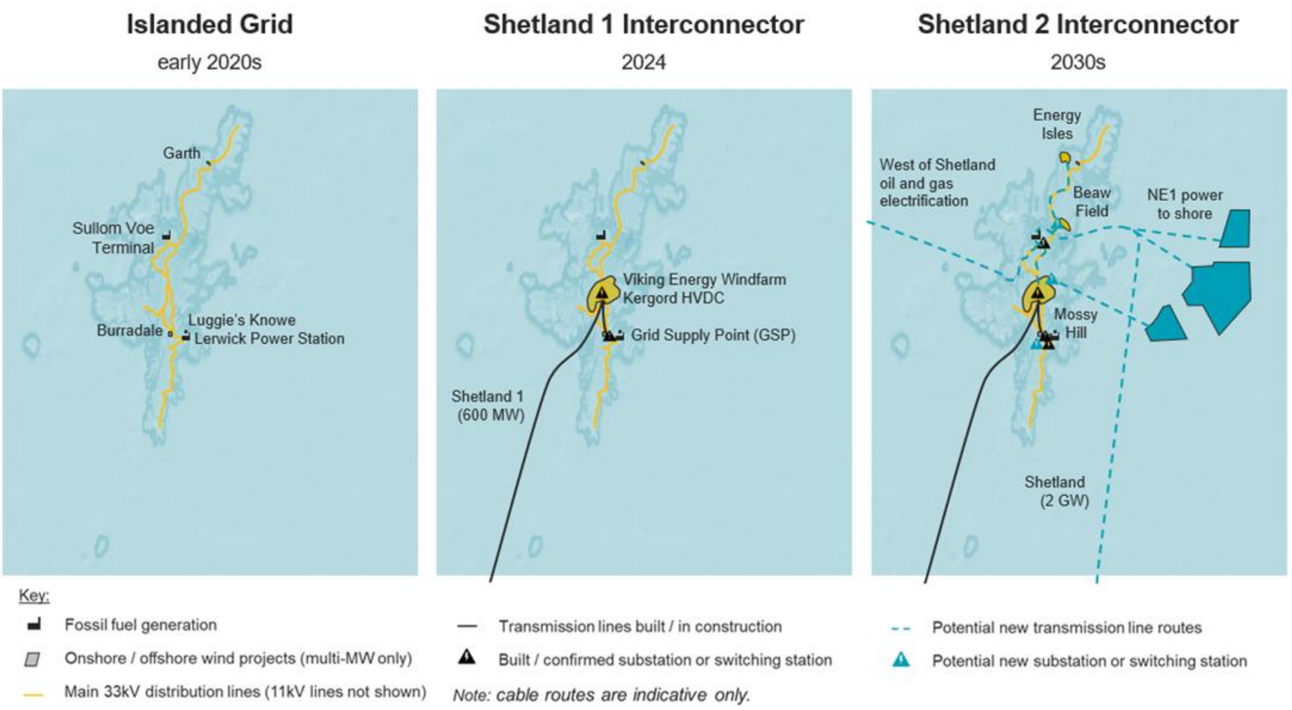


Figure 14: Development of Shetland's energy sector

5.1.3. In Shetland as in the Western Isles it had been understood that the arrival of an interconnector would enable more community and locally owned projects to proceed8, however large transmission-side generation projects have rapidly secure the available capacity and it is unclear when and if communities will be able to do so.

[8] https://www.stornowaygazette.co.uk/business/no-room-on-the-grid-for-community-renewables-4639701

5.1.4. The difficulty of securing a grid connection was a driver in this study for considering whether the Bressay community could develop a project supplying power directly to an existing industrial power user on the island i.e. Pelagia at Heogan.

5.1.5. Shetland is expected to see very rapid growth in new onshore and offshore wind projects and for hydrogen project developers to achieve their production goals, more projects than those shown in Figure 14 would be required. Figure 15 shows approximately how much electrical generation capacity would be required to produce the million tonnes of green hydrogen proposed by EnQuest, for example[9].

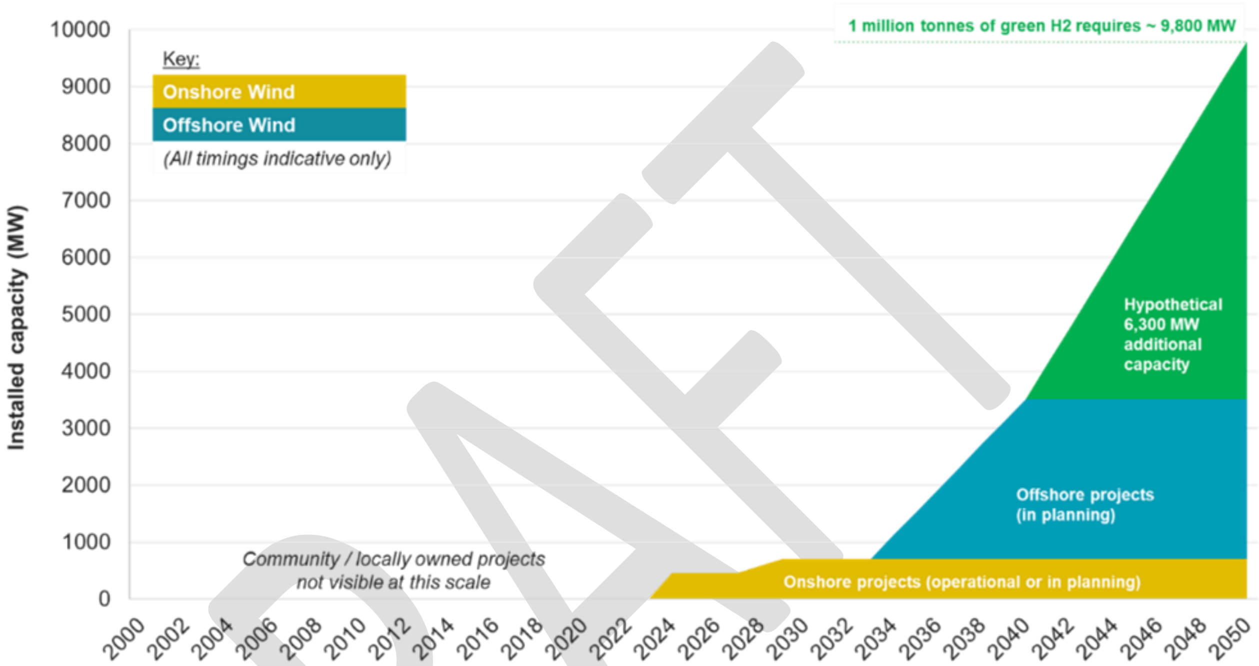


Figure 15: Forecast for development of onshore wind, offshore wind and hydrogen

5.1.6. The forecasts shown in Figure 15 are relevant for Bressay and particularly the north-west corner of Bressay because a large increase in industrial activity is expected in Shetland and this area is likely to be attractive for developers looking to build new industrial facilities (Figure 16). It is important local residents are aware of this early, and able to form their own view on what type and scale of development(s) would be appropriate or desirable from the community's perspective.

[9] https://www.enquest.com/veri-energy/new-energy-and-decarbonisation

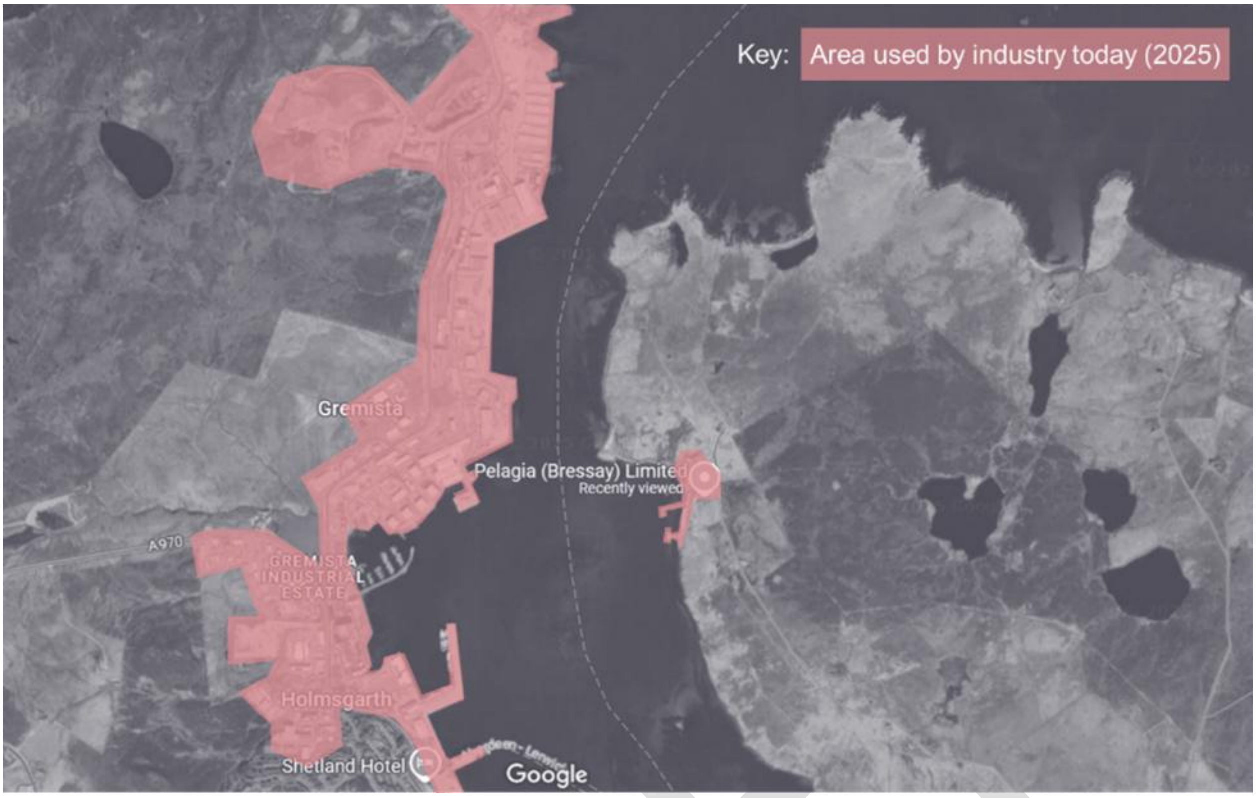


Figure 16: Land use by industry at the north end of Lerwick and Bressay

5.2. Subsidies for generation

5.2.1. The UK Government has implemented various schemes to promote renewable energy generation. Some of the most relevant of these are outlined below.

5.2.2. **Renewables Obligation Certificates (ROCs)** – now closed to new projects

5.2.3. Launched in 2002, the Renewables Obligation (RO) scheme aimed to encourage large-scale renewable electricity generation. Under this scheme, electricity suppliers were obliged to source an increasing proportion of their electricity from renewable sources. For each megawatt-hour (MWh) of eligible renewable electricity generated, a Renewable Obligation Certificate (ROC) was issued. These certificates could be traded, providing an additional revenue stream for renewable energy producers. The scheme closed to new generating capacity on 1 April 2017, but existing accredited stations continue to receive support for up to 20 years from their accreditation date, with the scheme set to conclude entirely by 2037.

5.2.4. **Contracts for Difference (CfD)** – only valid for Solar PV projects of 5MW capacity or greater

5.2.5. Established under the Energy Act 2013, the Contracts for Difference (CfD) scheme replaced the RO as the primary mechanism to support large-scale renewable energy projects. CfDs provide long-term price stability by guaranteeing a fixed "strike price" for electricity generated from renewable sources. If market prices fall below this strike price, the generator receives a top-up payment; if market prices rise above it, the generator pays back the difference. This reduces revenue uncertainty. At the time of writing, CfD is only available for Solar PV projects of 5 MW capacity or greater.

5.2.6. **Feed-in Tariffs (FIT)** – now closed to new projects

5.2.7. The Feed-in Tariff (FIT) scheme, introduced in April 2010, was designed to promote small-scale renewable energy generation by individuals, businesses, and communities. Participants received payments for both the electricity they generated and used onsite (generation tariff) and the surplus electricity exported to the grid (export tariff). The scheme applied to installations completed between July 2009 and March 2019, offering contracts typically spanning 20 to 25 years. The FIT scheme closed to new applicants on 31 March 2019.

5.2.8. **Smart Export Guarantee (SEG)**

5.2.9. Following the closure of the FIT scheme, the Smart Export Guarantee (SEG)10 was introduced requiring licensed electricity suppliers to offer payments to small-scale generators for surplus electricity exported to the grid. Unlike the FIT, the SEG does not provide a generation tariff; instead, it focuses solely on exported electricity. Eligible technologies include solar PV and wind systems with capacities up to 5 megawatts (MW). Figure 17 shows how average tariff rates have tended to increase to date.

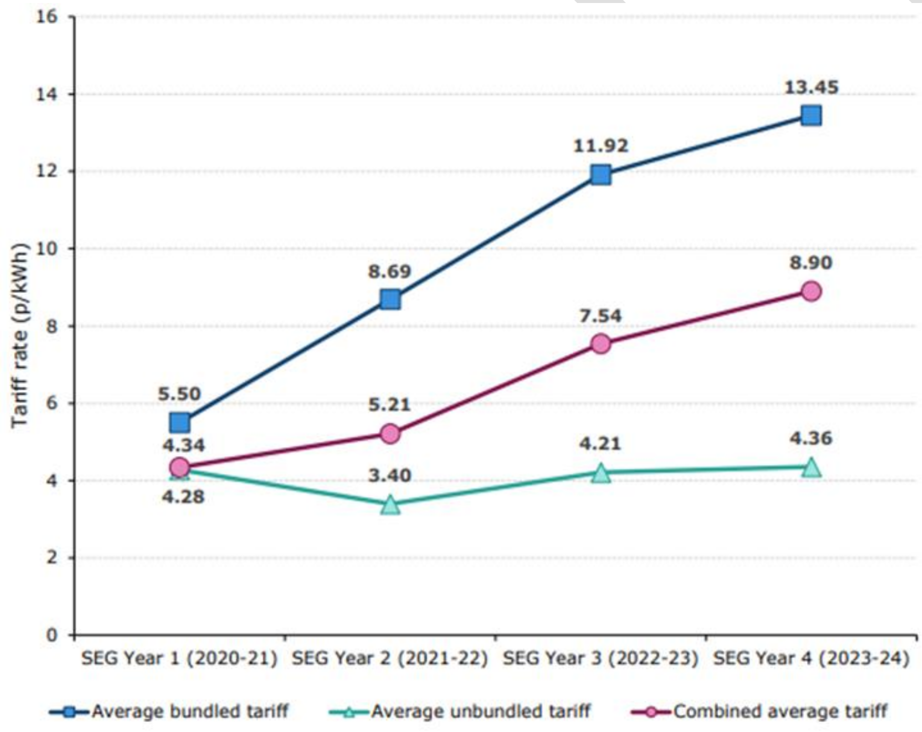


Figure 17: SED tariffs[11]

5.2.10. Subsidy-free projects are now also a conceivable option: The Radio City Community Wind Project, led by the Radio City Association in North Ayrshire, Scotland, is pioneering the UK's first 100% community-owned, subsidy-free onshore wind turbine. Located near Kilbirnie, this 2.5 MW turbine is

[10] https://www.gov.uk/government/publications/smart-export-guarantee-seg-earn-money-for-exporting-the-renewable-electricity-you-have-generated
[11] https://www.ofgem.gov.uk/sites/default/files/2024-10/Smart_Export_Guarantee_Annual_Report_SEG_Year_4.pdf

expected to generate approximately 7,839 MWh of clean electricity annually, sufficient to power over 2,000 homes and reduce carbon emissions by 3,324 tonnes each year. Profits from electricity sales will be reinvested into local community initiatives, such as enhancing sports facilities and refurbishing the historic Knox Institute building (Figure 18).

Figure 18: Radio City community wind project

6. REGULATORY

6.1. Grid connection

6.1.1. **ENA standards (G98 and G99)** - In the UK electricity sector, two standards - G98 and G99 - are set by the Energy Networks Association (ENA). These frameworks establish the technical requirements for connecting generating units to the national grid. The key distinction between the two lies primarily in the scale and capacity of the energy generation involved.

6.1.2. **G98** governs small-scale generation, commonly referred to as microgeneration. This standard applies to units with a capacity of up to 16 Amps per phase, which translates to approximately 3.68 kW for single-phase systems and around 11.04 kW for three-phase systems. One of the defining features of G98 is its simplified connection process, often called the "connect and notify" or "fit and inform" approach. Under this system, installation can proceed without prior approval from the Distribution Network Operator (DNO), with notification provided only after the system is in place. The primary goal of G98 is to ensure that small-scale generators operate safely and are compatible with the existing grid, all while minimising any potential disruption to the network.

6.1.3. In contrast, **G99** covers generation systems that exceed the thresholds defined by G98 - specifically, those with a capacity greater than 16 Amps per phase. This standard is designed for larger-scale installations, including commercial solar farms, large wind turbines, and industrial cogeneration systems. Unlike G98, G99 requires a more comprehensive and structured connection process. Before installation can commence, operators must secure prior approval from the DNO and demonstrate compliance with rigorous technical and operational standards. These requirements focus on ensuring grid stability, effective protection systems, and the capability to handle faults without disrupting the wider network.

6.1.4. **Transmission Impact Assessments** - In Shetland and other Scottish islands, a Transmission Impact Assessment (TIA) is required for generation projects exceeding 50 kW in capacity. This threshold is lower than in mainland Scotland due to specific transmission network constraints affecting the islands: SSEN Transmission has increased the TIA threshold from 50 kW to 200 kW for most of mainland northern Scotland, but the 50 kW threshold still applies to projects in Shetland.

6.2. Planning

6.2.1. Securing planning permission for an onshore solar photovoltaic (PV) project in Scotland is a structured process that involves several stages, including regulatory assessments and stakeholder consultations, all of which are governed primarily by planning legislation and environmental regulations.

6.2.2. The first step is typically to engage with Shetland Islands Council as the local planning authority as larger solar PV developments may require formal planning permission under the Town and Country Planning (Scotland) Act 1997, as amended. Early engagement with the LPA is crucial for understanding specific local policies and potential concerns. It is advisable to conduct a pre-application consultation, especially for larger projects, to gather feedback from planning officers and potentially affected stakeholders, which can help shape the development proposal.

6.2.3. An essential part of the process involves determining whether an Environmental Impact Assessment (EIA) is required under the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017. This depends on the size and nature of the project. For solar PV developments exceeding certain thresholds - typically where the site area exceeds 0.5 hectares or is likely to have significant environmental effects - developers must submit a screening request to the LPA. If the authority deems that an EIA is necessary, the developer must prepare an Environmental Statement (ES), detailing the potential environmental impacts of the project and outlining mitigation measures.

6.2.4. Regardless of whether an EIA is formally required, various environmental surveys are typically necessary. These often include ecological surveys to assess potential impacts on local wildlife, such as protected species (e.g., otters, birds), and landscape and visual impact assessments (LVIA) to evaluate how the development would affect the visual character of the surrounding area. Other surveys might cover areas such as hydrology, archaeology, and cultural heritage, depending on site-specific factors.

6.2.5. Once these assessments are complete, the developer submits a planning application to the planning department, including all relevant documentation: site plans, design details, environmental reports, and a planning statement demonstrating how the proposal aligns with national and local planning policies. Public consultation may be required and is always advisable.

6.2.6. The planning authority then assesses the application considering factors such as environmental impacts, local development plans, public feedback, and national renewable energy targets set by the Scottish Government.

6.2.7. If planning permission is granted, other necessary consents may include grid connection agreements and land use permissions from landowners. Compliance with conditions attached to the planning consent, such as construction mitigation measures or ongoing environmental monitoring, is required throughout the development’s operational lifespan.

7. FEASIBILITY ASSESSMENT

7.1. Site visits

7.1.1. Pelagia's General Manager Gary Henderson provided Tom Wills and Daniel Gear from Voar with a tour of the Bressay factory and he outlined the current and future power demands and their seasonal variation (see below for more details).

7.1.2. During the first site visit a number of different potential locations for siting solar panels were discussed, including the roofs of the existing buildings and areas of ground within Pelagia's site boundary. In a second site visit, Voar took photographs of the site layout and surrounding area with a drone. In a third visit, expertise was sought from a local peat specialist – see □.

Figure 19: Pelagia Fish Factory Buildings

7.2. Pelagia demand

7.2.1. Pelagia shared their weekly average power data for most of 2024 (we have estimated December). As can be seen in Figure 20: Pelagia weekly average power demand (2024) below, the facility has a highly seasonal power demand peaking at nearly 500 kW, with an average baseload of around 50 kW.

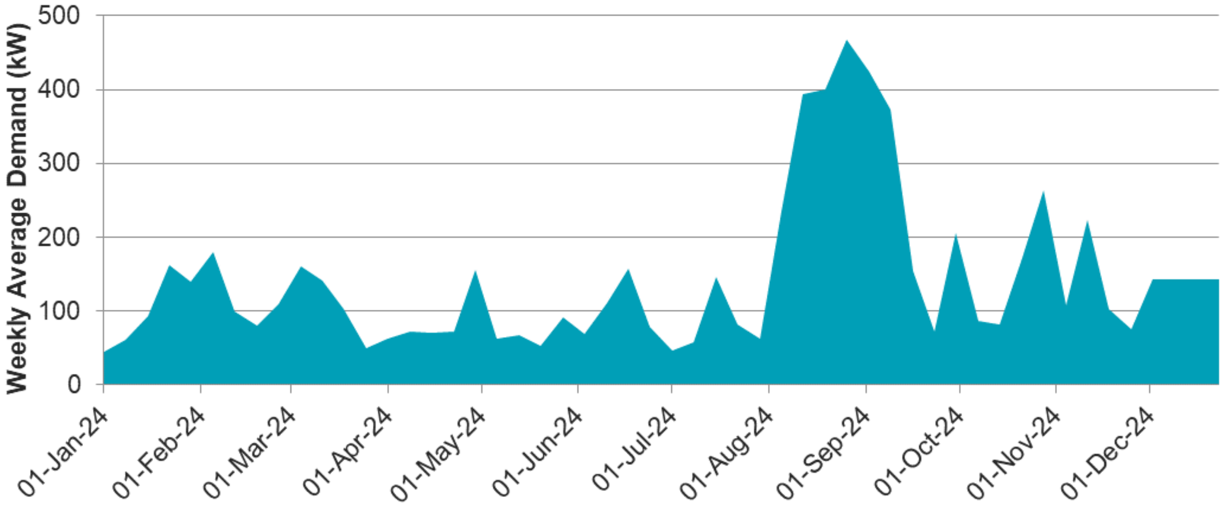


Figure 20: Pelagia weekly average power demand (2024)

7.2.2. Figure 21 combines the data from Figure 20 with the estimate for Bressay's domestic demand from Figure 4 (12), indicating that Bressay's total baseload is at least 150 kW (no estimate of agricultural use has been included here). As per **Recommendation 1** on page 12, a more detailed assessment of domestic power use would help better quantify peaks in energy use.

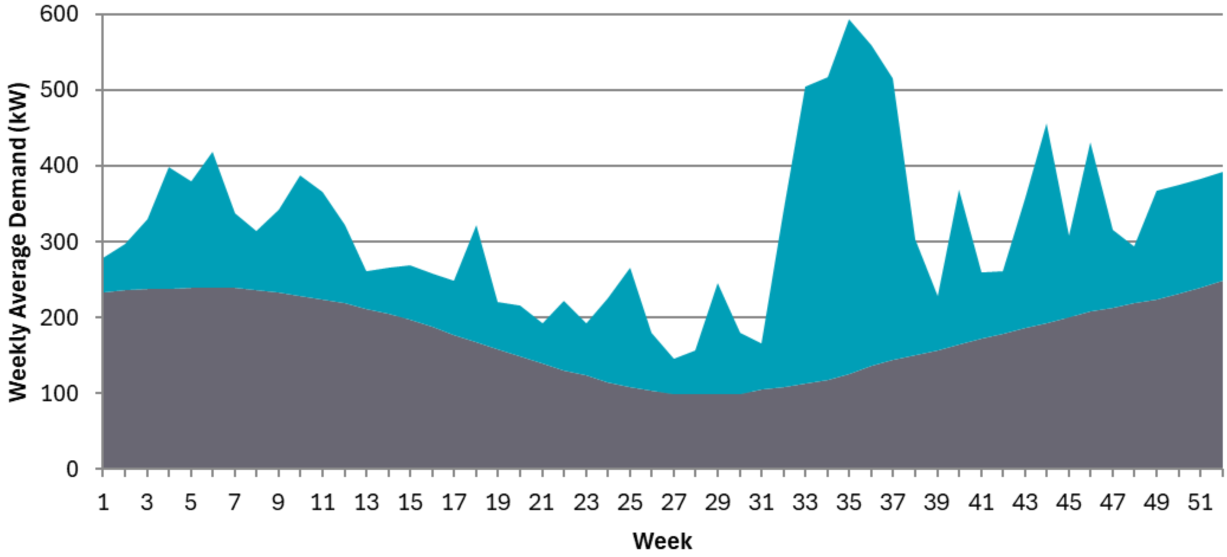


Figure 21: Indicative total demand for Pelagia and Bressay domestic users

7.3. Potential sites

7.3.1. Figure 22 shows an indicative 1 acre (4,000m^2) site footprint and the land ownership around Heogan.

Figure 22: Indicative site footprint and land ownership around Heogan

7.4. Drone survey

7.4.1. The images below show the land surrounding Heogan – see also *Figure 5* on page 13.

Figure 23: View showing two distribution lines heading south and towards Beosetter

Figure 24: View towards S showing north-facing hill down towards fish factory

Figure 25: View towards Noss showing distribution line running parallel to road

7.5. System sizing and technical specification

7.5.1. When considering the size of potential Solar PV and BESS project supplying Pelagia, the main factors considered were:

- Energy demand, consumption patterns and solar resource
- Available land areas
- Ground conditions and topography
- Existing electricity grid
- Local power market situation and grid connection rules

These are discussed in more detail below:

7.5.2. **Energy demand, consumption patterns and solar resource:** as outlined in 4.2, Pelagia's baseload is around 50 kW, with peak weekly average demand can as high as 500 kW. The general tendency is for demand at the fish factory to vary broadly in line with solar radiation. According to Nordri's analysis, a 500 kW system would be appropriate to supply most of Pelagias summer demand, considering the Shetland solar resource. This is being modelled in more detail and an update will be included in a subsequent version of this report.

7.5.3. **Available sites:** there are a number of different potential sites within the vicinity of Heogan and preliminary discussions have been held with some of the most relevant landowners, see 4.1 and Figure 16 above.

7.5.4. **Ground conditions and topography:** Figure 22 shows the local topography (10m contour lines). While south-facing is optimal and there are some locations with this orientation, flat sites or those combining moderate east and west panel orientations have been deployed in other high latitude locations[12]

7.5.5. **Existing electricity grid:** the availability of physical power lines is not a problem, these are nearby – see Figure 3 (page 11) and Figure 23.

7.5.6. **Local power market situation and grid connection rules:** this is perhaps the greatest barrier to further community owned projects at the moment. Although as discussed in **Error! Reference source not found.** it had been understood that an interconnector to the UK mainland would facilitate more community and locally owned projects, it now appears that distribution connections could suffer from curtailment for years or decades until local Distribution demand increases such that local Transmission connections are satisfied, which is a hypothetical scenario. Put more crudely, the large commercial projects have secured the right to supply local power demands, but it is currently unclear whether communities will be able to do so and under what terms. That being said, for communities to be able to take advantage of any future opportunties such as the reintroduction of a floor price being mooted by Community Energy Scotland, they ideally need to have started the process of developing their plans.

7.5.7. Given the above, we have opted to consider one fairly large solar project (on the assumption that grid access will at some point be resolved) and to also include "connect and notify" options which could be installed within existing grid constraints.

7.6. System proposed to supply Pelagia

7.6.1. Nordri's initial proposal was for a 500kW PV only system (both installed panels and kW output rating). This would consist of:

- 1,200 solar PV modules (504.0kW)
- 5 x 100kW three phase solar inverters (500kW)
- Ground mounted modules
- Underground cabling to mains site

7.6.2. **Estimated annual yield: 411mWh**

7.6.3. **Budget estimate for this size of system: £700,000 (ex VAT)**

7.6.4. Comparing the aforementioned proposal with other Scottish solar projects built or in planning, Figure 26 shows this to be a mid-range scale of project.

[12] https://arctic-council.org/news/the-old-crow-solar-project/

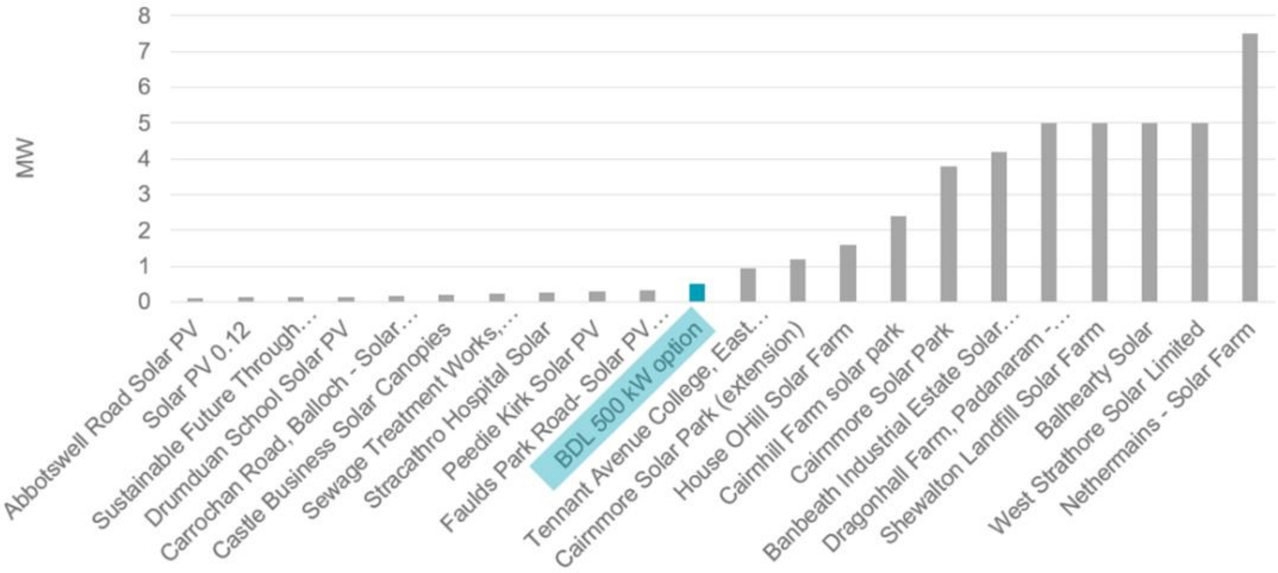


Figure 26: 500 kW project capacity compared to other Scottish solar projects built or in planning[13]

7.6.5. Nordri also considered what size of system could be installed within existing grid limits, for single and three-phase connections. These are outlined in the following section.

[13] https://localenergy.scot/projects-overview/projects-index/

7.7. Connect and notify option (Domestic Property, Single Phase Connection)

7.7.1. Domesic Property PV (single phase). 10 x All black PV modules – 4.2 kW (will vary slightly depending on exact module model)

Nordri.co.uk

T 01595 695166
info@nordri.co.uk
Staney Hill Industrial Estate
Lerwick | Shetland | ZE1 0NA

Bressay Development Ltd

Domestic Property PV+EESS Proposal & Notes

Basic Outline of Proposed Spec, Performance & Savings:

10 x All black PV modules – **4.2kW** *(will vary slightly depending on module model)*
Grid Tied Hybrid Inverter *(Sunsynk, Tesla, MyEnergi)* – **3.68kW** *(G98)*
EESS *(Battery Storage)* – **10-13.5kWh**
Annual generation – **3,070kWh**
Estimated annual bill saving – **£690.75**
Estimated additional savings through off-peak charging – **£190.00**
Estimated total annual bill savings per household – **£880.75**

Costings:

Average single install price for the above system - **£16,615.20**

Install costing for Nordri to complete 10 homes as a 'job lot' - **£162,828.96**
Per property install price - **£16,282.90**
Bulk installation savings per property - **£332.30**

Install costing for Nordri to complete 20 homes as a 'job lot' - **£319,011.84**
Per property install price - **£15,950.59**
Bulk installation savings per property - **£664.61**

Assumptions:

1. *Single south facing array of PV modules, mounted in portrait orientation, in either a single row of 10 or 2 rows of 5,*
2. *Roof pitch between 25-45 degrees,*
3. *Roof covering, concrete tile, flat tile, steel profile sheeting,*
4. *Roof covering in good condition and accessible,*
5. *Inverter and battery mounted externally to the main building or in an attached shed/garage area within 5m of incoming mains electricity,*
6. *No underground cabling or custom design out with the standard install,*
7. *Self consumption of 90% used as average,*
8. *Electricity unit rate of 25p/kWh used in calculations,*
9. *Off peak charging estimation based on 6 months per calendar year charging of battery to 100% during 5-7 hours of electricity at an off-peak rate of 14p/kWh and discharging to 20% during peak times,*
10. *No inclusion of VAT (all domestic installations direct to a private client are 0% VAT rated until 2027),*
11. ***All figures outlined are estimations only.***

Thank you for enquiring with Nordri,
Kind Regards,

Brydone Williamson
Director

7.7.2. Nordri are to provide the above information in electronic format with additional information informed by the information in this report and ongoing community engagement.

7.8. Connect and notify option (Agricultural / Industry Three Phase Connection)

7.8.1. **Agricultural or industrial connection (three phase).** Nordri ran a maximum G98 system through their assessment software and for the BESS element proposed the Tesla Powerwall 3 which allows up to 20kW per phase to be connected i.e. 3 x 20 kW = 60 kW of PV modules installed.

7.8.2. This would have a peak output of 11 kW across all three phases. The Tesla Powerwall 3 has a built in 13.5 kWh battery, this means the complete install would have 40.5 kWh of storage.

7.8.3. Looking at the software the battery capacity built in and the high base load are contributing heavily to the increase in annual production.

7.8.4. Increasing the storage capacity any further has no further impact on annual production.

7.8.5. System stats:

- 143 Solar PV modules (60 kW)
- 3 x Tesla Powerwall 3 (3 x 3.7 kW)
- 3 x Tesla Powerwall 3 13.5 kWh battery (built into inverter)
- Ground mounted modules
- Underground cabling to mains site

7.8.6. Estimated annual yield: 49,290 kWh

7.8.7. Budget estimate for this size of system: £80,000 - £100,000 (ex VAT)

7.8.8. Nordri and Voar are in ongoing dialogue with BDL about the most appropriate location and layout for such a project.

8. CONCLUSIONS AND NEXT STEPS

8.1. Conclusions

8.1.1. Community-owned energy projects can have a transformative effect on island communities:

- In North Yell the 4.5 MW Garth Windfarm has funded many new development workers and social initiatives, a new marina, and the cost of moving new families into the area, helping to keep the school open and make that community much more sustainable.
- In Shapinsay in Orkney, a single 0.9 MW community wind turbine has funded an out-of-hours ferry service enabling and is set to lead to 11 new homes being built.
- Other islands like Eigg, Foula and Fair Isle now produce enough for their own needs.

8.1.2. The path to Bressay achieving something similar is however unclear at present, primarily because the rules governing how the electricity grid is managed mean that it currently seems to be difficult if not impossible to secure the right to export power to other users, or even to supply local demands. Another factor is that the subsidies for generation that other projects have benefitted from are not available today.

8.1.3. That being said, the energy sector is changing rapidly and there is an increasing understanding of the stark unfairness of communities being unable to develop their own small projects to supply their own needs, at a time when large international developers are able to develop projects many hundreds of times the size. As recently as mid-February, 2025, Scottish and UK cabinet ministers were acknowledging the need to reform the electricity system so that more community and municipal power projects can proceed. Community Energy Scotland's main three requests at the moment are:

- For space to be made available on the electricity grid for community projects
- A floor price to be introduced for community projects
- Further support to be made available to support communitie in developing their energy project ambitions.
- For Bressay to have a chance of taking advantage of any future opportunities that might arise from some or all of these requests being fulfilled, it is important to do the ground work now and build the community's capacity to develop such schemes.

8.1.4. Considering the above, our conclusions from the feasibility assessment are:

- Connect and notify installations to supply local demands are feasible now and BDL may be able to support a programme of such installations e.g. through the proposed energy survey.
- A 500 kW solar PV and BESS project is technically feasibly but likely to be held up by grid access and funding constraints at present – so a wider review of the feasibility of other energy project options (e.g. onshore wind and community heat) would be advisable before proceeding further with the solar concept.

8.2. Next steps

8.2.1. Table 3 lists the main recommendations for next steps set out in the body of this report.

Table 3: Suggested next steps

Ref	Recommended next steps	Page
1	**Carry out a more detailed survey of Bressay's power usage and which homes and sheds / parks would be suitable for wind and solar installations.**	12
2	**Develop and maintain a register of potential funding opportunities. Consider creating a subsidiary wholly owned by BDL to focus on energy development options.**	15
3	**Explore whether BDL, Bressay Public Hall Committee and the owners of the Bressay Shop would be interested to jointly apply for SCBF funding for a feasibility study considering a resilience hub project.**	17
4	**Apply to SCBF / CARES or other funder to screen possible sites for a community-scale onshore wind project on Bressay.**	18

8.2.2. Additional next step proposals and report conclusions will be informed by feedback from BDL and Nordri on this first issue of this report, and through the next community engagement event.

APPENDIX 1: NORTH YELL DEVELOPMENT COUNCIL EXAMPLE

The North Yell Development Council example

VOAR

North Yell Development Council
Unit 3 and 4 Sellafirth Business Park, Sellafirth, Yell, Shetland ZE2 9DD
Tel. 01957 744215
www.northyell.co.uk office@northyell.co.uk
Enterprise **Initiative** **Self-Help**

Formed in the 1940's over the early years NYDC was responsible for many initiatives and developments, including:-

- Promoting the development of the local pier in conjunction with Shetland Islands Council
- Supporting local public hall associations and other groups
- Supplying shared equipment to local crofters
- Planning, building and running a 5,000 m² industrial estate
- Actively promoting various forms of renewable energy
- Attracted a considerable amount of investment into the local area
- Pursuing and representing the local community's interests with the Local Authority and other agencies

Following a public consultation in 2003, NYDC decided to investigate a community renewable energy project. A study was undertaken which recommended 5 wind turbines with a total capacity of 4.5 MW, sited at Garth. Fourteen years later, in 2017, the wind farm was completed at a cost of £8.3 million. This was funded entirely by loans.

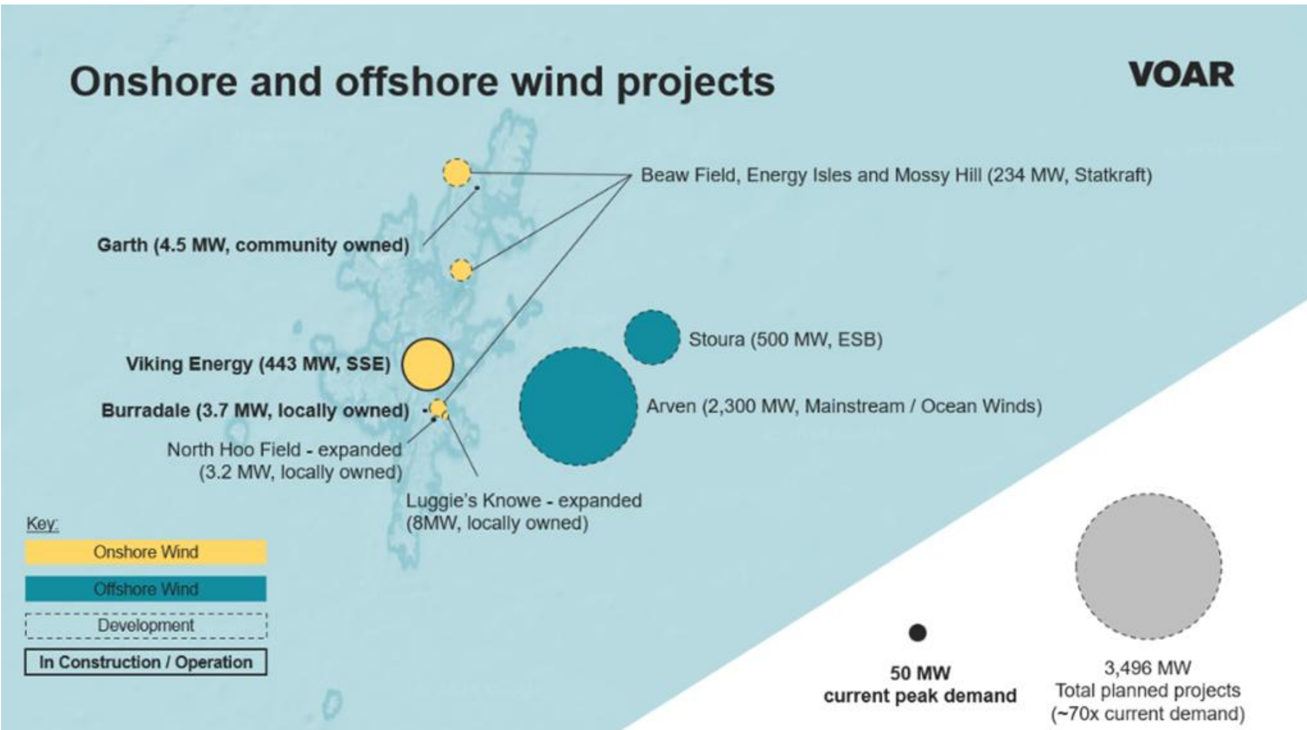
NYDC Garth Windfarm results

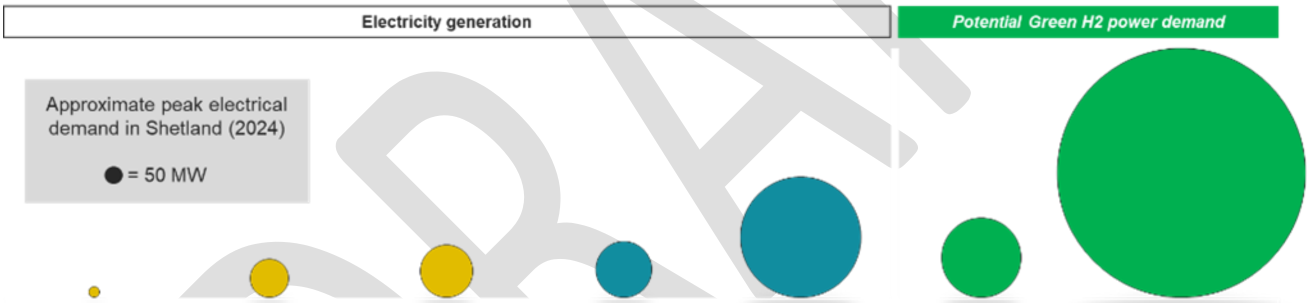
VOAR

Since 2017 the windfarm has generated significant income for the community which has allowed NYDC to :

- **Construct a 10 site extension to the industrial estate at Cullivoe Harbour**, with all sites let to local businesses and employers. Bringing the total size of the industrial estate up to 13,500 m² over 14 sites, completed in Summer 2023.
- **Construct a 28-berth marina**, for commercial, recreational and tourism vessels, opened in May 2022. Including an amenity building with toilet, shower and laundry facilities, completed in Summer 2023. The 2 projects above cost £3.2m with £600k from Garth funds. Caravan park and wigwams at the marina planned in the next phase of development.
- Undertaking a **2-year social inclusion programme to Get North Yell Going Again** (GNYGA) part funded by the lottery. Sep 22 to Sep 24. This helps run the **lunch club** in conjunction with the Cullivoe Hall, **Wicked Wednesday Youth Club, shopping and prescription delivery, various adult and bairns' trips** etc. Lunch club, youth club and delivery services to continue to be funded post project.
- **Energy voucher scheme giving £400 to every household in North Yell** funded 50/50 lottery/NYDC
- NYDC are currently in the process of bringing both **the local shop and 2 of the Sellafirth units into community ownership**, with support from the Scottish Land Fund.
- **Funded a relocation scheme to bring 3 families to the area to prevent mothballing of the Cullivoe school.**
- **Purchasing a house** for community rental. **Undertaking housing needs analysis**, and business plan for purchasing land/property for development of community housing.

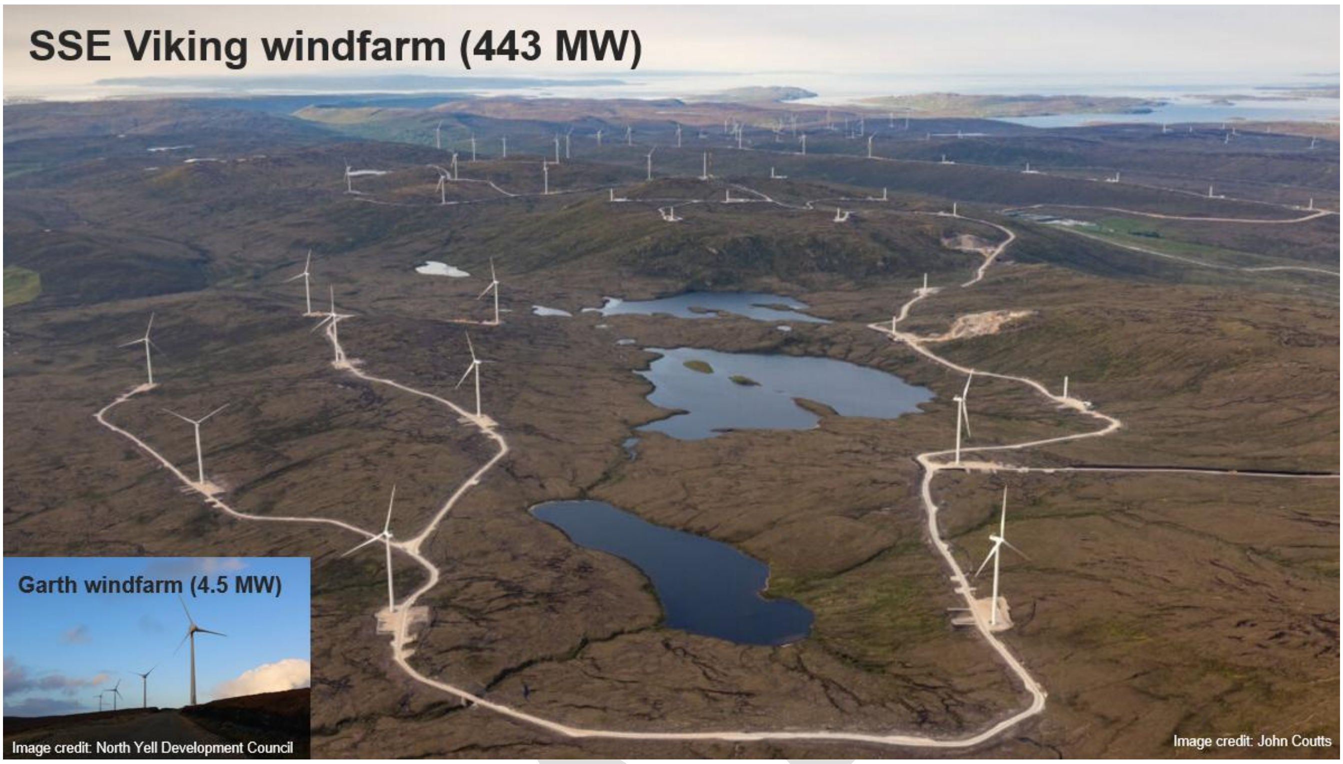
APPENDIX 2: SHETLAND ENERGY SECTOR CONTEXT



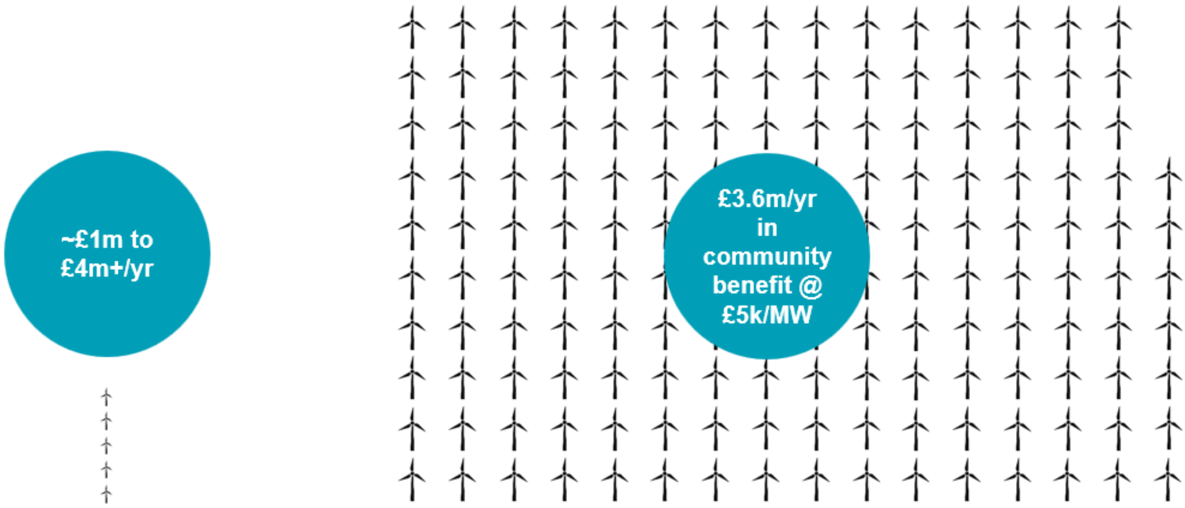


Burradale, Luggie's Knowe, Garth and North Hoo Field	Mossy Hill, Beaw Field and Energy Isles	Viking Energy	Stoura	Arven	*Scatsa Green H2 / Ammonia*	*"1m tonnes of Green H2"*
19 MW	234 MW	443 MW	500 MW	2,300 MW	*1,000 MW*	*~9,800 MW (@60% capacity factor)*
Operational + in development	In Development	Operational	In Development	In Development	*Stated Ambition*	*Stated Ambition*
Community + locally owned	Statkraft	SSE	ESB	Mainstream / Ocean Winds	*Statkraft*	*EnQuest*
3,496 MW total generation					*~10,800 MW demand (~3 times total generation)*	
Onshore wind			**Offshore wind**		***Onshore H2 / derivative fuels***	

APPENDIX 3: ADDITIONAL SHETLAND ENERGY SECTOR CONTEXT



5 small turbines can earn a comparable amount for North Yell as 157 large turbines might generate in community benefit payments for the whole of Shetland



Garth (4.5 MW)
5 turbines, 64 m tip height

Viking Energy Mossy Hill (443 MW) + Beaw Field + Energy Isles (234 MW)
157 turbines, 145 – 200 m tip height

APPENDIX 4: NORDI CASE STUDIES

SETTER FARM WIND TURBINES - TINGWALL

INSTALLATION: 3X SDWE SD6 6KW GRID CONNECTED WIND TURBINES ON 15M TOWERS

Nordri specified, supplied and installed a three wind turbine system for a dairy farm in Shetland. With all the machinery for milking the cows, plus a busy farm and agricultural contracting business the farm had high electricity use.

Nordri designed a system to make best use of the 3-phase plus single phase connections at the farm, as well as meeting the strict criteria of the local grid requirements.

Two of the turbines supply the 3-phase connection for the main farm connection, with a split phase turbine feeding 2-phases, and the other turbine feeding the 3rd phase and also a dump heater which can warm the workshop.

The third turbine supplies the farm house single phase connection, meaning the 3 machines help to reduce the electricity consumption for both the farm business and the house.

The 3 turbines have been running for 6 years and have produced over 325mWh of renewable energy to the farm, house and local grid.

BRESSAY SCHOOL COMMERCIAL SOLAR PV

SYSTEM: SCHLETTER ON-ROOF PITCHED ROOF BRACKETS.

INPUT: 44X 340W TRINA MONO HALF-CUT PV MODULES - 15KW (150% OVERSIZED)

INVERTER: FRONIUS SYMO 10KW 3 PHASE

ESTIMATED ANNUAL PRODUCTION: 9,380KWH

Bressay Development Limited approached Nordri to design and propose a solar PV system to reduce the energy consumption of the Old School building.

This building is used by various small businesses, makers and community groups. Nordri Liaised with the trustees and other contractors to propose a system which could maximise potential savings.

The 44x 340w modules fitted in an east/west split on the shallow pitch roof is our largest PV job to date. The overspec of panels on the input to the inverter (15kW of panels into 10kW inverter) means the system performs much better in the duller days, of which we have plenty!

Nordri was able to complete the project against a tight deadline for spending grant funding, despite some very cold winter weather to deal with.

GROUND MOUNTED SOLAR PV, SOUTH WHITENESS

SYSTEM: RENUSOL CONSOLE+ HDPE GROUND MOUNT TUBS

INPUT: 9X 340W TRINA MONO HALF-CUT PV MODULES, SOLAREDGE OPTIMISERS - 3KW

INVERTER: SOLAREDGE 3KW

ESTIMATED ANNUAL PRODUCTION: 2,340KWH

Nordri was approached to design a PV system for an unusual house in South Whiteness.

The house featured a "green" living grass roof, which was unsuitable for all the standard roof mounting systems for solar PV. The site was restricted as well, with the house dug into hard rock, and an established garden to preserve.

The customer identified a small corner of the garden where panels could be fitted. Due to the hard ground and small space the usual ground mounting kits and designs were inappropriate, so Nordri specified Renusol Console+ HDPE tubs.

These tubs fit one panel each and can be arrange in any orientation in the available space, then filled with ballast to anchor them in place. This can be gravel, sand, soil, or anything heavy. In this case the customer used rocks removed from his garden, a good use on on-site materials and saved disposing of them.

With all the panels at slightly different orientations Nordri opted to use a SolarEdge optimised system.

This has an optimiser fitted to each panel which monitors the available solar energy on a per panel level meaning each individual panel is always doing its maximum in any given conditions. It also means the inverter is much smaller, which was ideal for this small house, and comes with a long standard warranty.

The system is connected to a wireless monitoring system meaning both the customer and Nordri can see how it is performing and any faults remotely.

Standard Disclaimer

Strictly Private & Confidential