Island-owned power system for Sark

Background and FAQ

Sark Chief Pleas

February 2023

Introduction

Sark Chief Pleas are progressing plans to build a replacement electricity system for the island. The new system will completely replace Sark's current system including generation, control systems and the distribution network up to and including the connections and metering for each building on the island. It will provide a secure, independent, low carbon energy supply for the island and will be scalable to meet future needs, including a future where heating, cooking and transport are electricity-based.

The intention is the new system will be island-owned and run on a not-for-profit open-book basis to provide power to the island at a sustainable cost.

Sark Chief Pleas have engaged CfR CIC, a not for profit community energy company, to project manage the procurement and financing process and help set up the enterprise and new system which will be owned by the people of Sark.

This document provides some background on the plans for the replacement power system, the results of the community survey and some responses to questions and requests for further information we received via the survey.

Background

Sark's current electricity system

Sark's current electricity generation and distribution system is privately-owned by Sark Electricity Limited. Generation is from a power station equipped with four diesel engines which are at the end of their serviceable life. Sark has no interconnector. The distribution network consists largely of time-expired assets, parts of which are in a poor and dangerous condition. Sark Chief Pleas have commissioned independent consultants to assess the system. The whole system has been deemed obsolete and in need of complete replacement. This is an opportunity for the people of Sark to establish an island-owned system that is fit for the future.

For more information please see the EnergyPeople Report completed in May 2022 and available on the Sark Government website.

Sark's energy needs

Annual demand for electricity in Sark was recorded by Sark Electricity Limited (SEL) at 1,865MWh approximately ten years ago. Since then, it has reduced by 28% to around 1,400MWh due to a number of hotels closing and some houses and a hotel going 'off-grid'. High electricity prices are also likely to be suppressing demand. Peak demand with current reduced consumption has reduced from over 300kW (possibly as high as 870kW) to less than 250kW.

Electricity demand is likely to increase in future with:

- The re-opening of currently closed hotels.
- Increased affordability of power (if the unit price is reduced).
- Home working.
- A shift to electricity for heating and cooking – currently most heating is oil or solid fuel with some bottled gas and electric.

- A shift to electricity for transport. Whilst Sark is car free, the expectation is a low carbon electricity supply which would enable an increased use of electric bikes and small electric vehicles for transporting supplies around the island.

Current figures for the island's use of other fuels are below:

- Diesel for generators – 445,000 litres per year
- Fuel for heating – 500,000 litres per year
- Diesel for transport – 120,000 litres per year.
- Gas (Propane) bottles – 600 bottles x 47 kg and 150 bottles x 150 kg
- Petrol - 11,500 litres per year

If all these energy uses were to shift to electricity, it would mode than double Sark's electricity consumption.

Principles for Sark's new electricity system

Chief Pleas have established the following principles for Sark's replacement electricity system:

- Provide a secure and reliable supply provides electricity as a fair price for Sark.
- A safe system designed, built and maintained to UK standards and best practice.
- Provide energy independence (renewables-based system with back-up generation).
- Fair and equal pricing for all islanders.
- Operate under a sustainable open book business model that can demonstrate sufficient reserves are being built up to cover unplanned maintenance and replacements.
- Be professionally-managed using local workforce where possible.
- Be easily scalable to future needs – including a shift to electricity for heating, cooking and transport and growing business demand.
- If it makes sense to do so, to install fibre to door broadband network at the same time as the new distribution system is installed.
- To protect Sark's natural beauty and residents quality of life.

Ownership and finance model

The intention is the new company will be owned by the people of Sark and will have its community purpose and governance established in its articles of association. The electricity price will be set on an open book basis at the price required to cover running and finance costs and build up sufficient cashflow, unplanned maintenance and system replacement reserves. The company will hold an annual general meeting and publish its audited accounts each year. It will continue to operate under the review of the Sark Electricity Price Commissioner who will provide independent oversight of the consumer price set.

Contractor procurement and technical requirements

Sark Chief Pleas are obtained expressions of interest from a number of experienced companies to design and install the replacement power system. The next stage is to short-list and progress detailed discussions with up to 3 contractors. The selected contractor(s) will be invited to present their proposals to the Island residents.

High level requirements for the key elements of the system (as set out in the request for expressions of interest document) are included in Appendix C.

Community survey

Chief Pleas carried out a survey to seek feedback from Island residents on plans for the replacement island-owned electricity system. The survey was live through November to January. We received 120 responses and, overall, the survey showed broad support for the plans. The results are summarised in Appendix B.

The survey responses highlighted some concerns and areas where more information is needed. These are addressed, as far as we can at this stage, in the FAQ below.

FAQ

Sark has been having problems with its electricity supply for years. Why has it taken so long to consider a replacement island-owned system?

Chief Pleas has been negotiating with Sark Electricity Limited (SEL) for some years about upgrading the current system to safe standards and bringing down prices. Chief Pleas introduced the price regulation act and price commissioner. Chief Pleas remain open to purchasing the current system from SEL at a realistic value but, for the moment, negotiations have stalled.

Chief Pleas was not able to progress plans for a replacement system plans without compulsory purchase rights and emergency powers, which we now have. If SEL cuts the power supply, Chief Pleas has the ability and funds to take over the network and install new diesel generators in a new building at the municipal site to maintain power supply.

What technology options are being considered?

The replacement electricity generation system needs to be based on established technology that can generate power at an affordable price. This is likely to mean a combination of solar PV and wind power with back-up from battery storage and diesel generators to ensure a consistent supply.

It may be possible to run the diesel generations on bio-diesel which would achieve a 100% renewable based supply. It would be interesting to look into the potential for turning waste cooking oil into biodiesel.

Wind turbines in the sea and tidal power will be too expensive and complex. However, it is something we could keep an eye on and consider in the future.

For more information, please see the 'system requirements' information included in Appendix C.

What sites are being considered for locating the generation?

The Island-owned fields around the abattoir and municipal site are potential locations for a new diesel generator building, a solar field and one or more wind turbines (see Appendix A). The community survey showed broad support for these sites. The solar is likely to take up less than one field. We will also consider leasing alternative sites which that respect the natural beauty of the Island will be considered.

For solar, we will consider both centralised generation from an island solar farm and the potential for more solar PV on roofs. It is likely a solar field will still be needed, even if some of the PV capacity to meet current and future demand can go on roofs.

How will land agreements for the cables and sub-stations be organised? What if landowners don't co-operate?

Wayleaves will be required for the cables and we think most landowners will want to co-operate. If there are landowners not willing to co-operate, and no alternative routes, Chief Pleas could pass a law to give it compulsory powers, which is normal for statutory bodies.

How can we ensure the new system is built and maintained to high electrical safety and quality of supply standards when Sark has no electricity safety and licensing standards?

The design, build and operations contractors will be required to design, build and operate the system in accordance to Guernsey electrical safety and quality of supply standards (which are largely the same as the UK). Therefore, we can 'adopt' Guernsey standards through the contracts. Please see the system requirements in Appendix C for more details.

Reputable contractors will only be willing to build to industry best practice, and UK-level standards will be needed for insurance.

Will the new system require planning consent and how will Chief Pleas ensure Sark's landscape and wildlife is protected?

The wind turbine(s), solar field and diesel generator shed will need planning consent. Chief Pleas will ensure appropriate ecology surveys are carried out and that local wildlife experts and the island community are consulted as part of the process. Photomontages will be produced to show what the solar field and wind turbine(s) will look like from key island viewpoints.

The request for expressions of interest document sates: '*The new system will be installed in parallel to the existing system, with properties switched over individually to minimise downtime*'. How will this work and what if Sark Electricity Limited does not co-operate? Will we end up with two competing electricity systems and companies?

If SEL does not agree to sell the existing system at a realistic price, we will install the new system in parallel and people will be able to switch over to the new system at no cost. The community survey indicates most people would want to switch over to the new system.

If SEL cuts off the supply we will use emergency powers to take over the system. Chief Pleas will ensure no-one left with redundant electrical equipment on their land.

How much is it going to cost and how are we going to fund it?

The costs of replacing the whole distribution system with an 11,000volt network and the generators with a wind/solar/battery/diesel based system has been estimated by EnergyPeople at around £5million. The Price Commissioner has endorsed this, but inflation and the challenges of building on Sark may increase the cost.

The plan is to raise the capital through debt-based funding to enable the island to retain ownership and governance of the new island energy company. One option is a community bond offer (with priority to Sark). Community bond offers are a common form of funding for community-owned energy

projects in the UK. The other option is a long-term loan from the Guernsey Infrastructure bond, which would be lower cost if available. A combination may be used. A number of community energy schemes in the UK have raised similar or larger amounts of capital.

We will also explore other funding models if these could achieve the same objective of a secure and affordable energy supply for Sark, and control by the island.

Will our electricity supply be cheaper?

The EnergyPeople report and Price Commissioner's model estimate the tariff needed to cover operating and finance costs of a new system based on wind/solar/diesel and a complete replacement of the distribution network is around 60p/kWh. This price may have to go up if build and finance costs are higher than originally expected. However, this is based on current suppressed electricity demand and a single tariff rate.

The new island owned energy company would operate on an open book basis and set the price at the level required to cover operating and finance costs and build up sufficient reserves to maintain and upgrade the system. With a renewables-based system, the operating and finance costs are largely fixed. As long as the basic charge can cover these fixed costs, we can explore different tariffs including providing low cost electricity when there is a surplus of renewable generation. A tariff that provided low cost electricity when it is windy in the winter could help islander's heat their homes. A tariff that provided low cost electricity when there is a surplus of solar power in the summer could help reduce costs for cafes and hotels which have high day-time demands in the summer.

New meters will be required in each property. Metering will be based on actual consumption, ideally on an hour by hour basis to enable smart tariffs.

The procurement process underway will help us develop the business case. If the power price for a complete replacement system ends up being too high, we may have to think again.

Has Chief Pleas really got the skills and resources to do this?

Chief Pleas has succeed in introducing the price regulation act and price commissioner. We have led negotiations with SEL with the support of Guernsey Government. We have secured emergency powers to take over the existing system if needed to maintain supply, with the support of the CCA.

We have ongoing legal support from Guernsey Government and we have engaged CfR to manage the staged procurement process to engage an experienced contractor to design and build the system. The selection procuress is supported by Guernsey Electricity Limited and the University of Exeter. CfR will also help us set up the new island owner energy company and raise the finance.

We will need other support down the line including an owner's engineer to oversee the design and build contractor and support from a financial and legal advisor to work with CfR on the finance raising.

The current intention is Guernsey Electricity Limited will employ and manage the island engineers to maintain the new system on behalf of the new island energy company.

Appendix A: Initial proposed areas within which renewables could be located

The island-owned fields above Creux Harbour shown below may be an option for locating wind and solar. The solar is likely to take up less than one field. Other locations on Sark that respect the natural beauty of the Island will be considered.

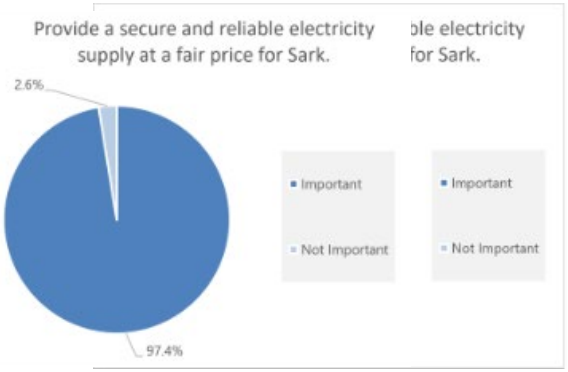
Potential Location for Renewable Energy on Sark

Potential Site for Renewables
Abattoir
Sark Municiple Site

Appendix B: Community survey results

Principles and priorities for the replacement power system

1



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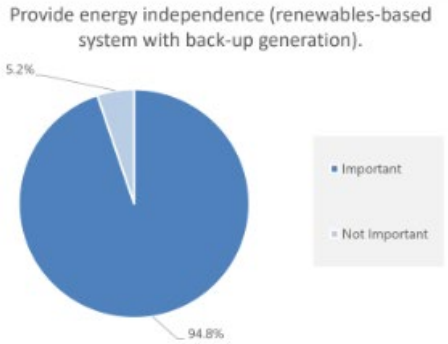

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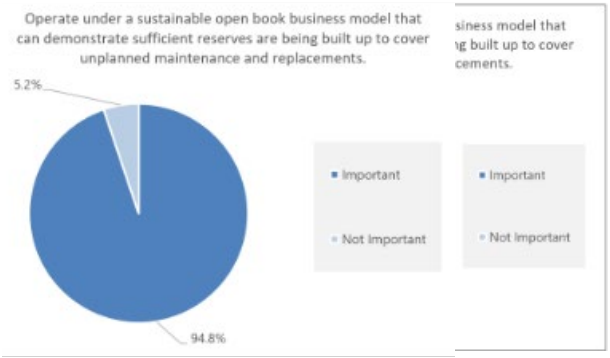
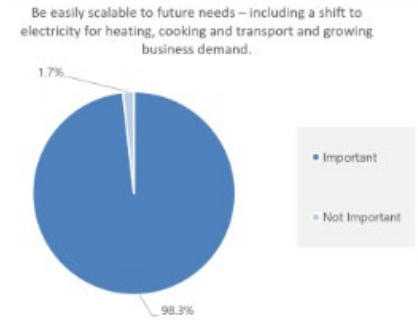

Operate under a sustainable open book business model that can demonstrate sufficient reserves are being built up to cover unplanned maintenance and replacements.
5.2%
94.8%
Important
Not Important
siness model that
g built up to cover
cements.
Important
Not Important

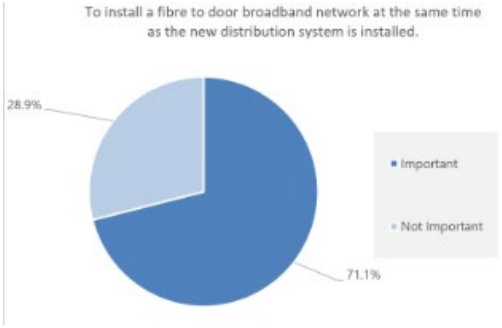
6


Be professionally managed using local workforce where possible.
2.6%
97.4%
Important
Not Important

7


Be easily scalable to future needs – including a shift to electricity for heating, cooking and transport and growing business demand.
1.7%
98.3%
Important
Not Important

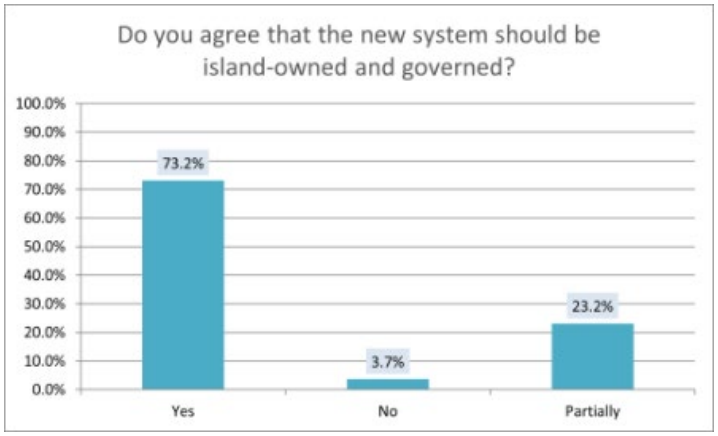
8


To install a fibre to door broadband network at the same time as the new distribution system is installed.
28.9%
71.1%
Important
Not Important

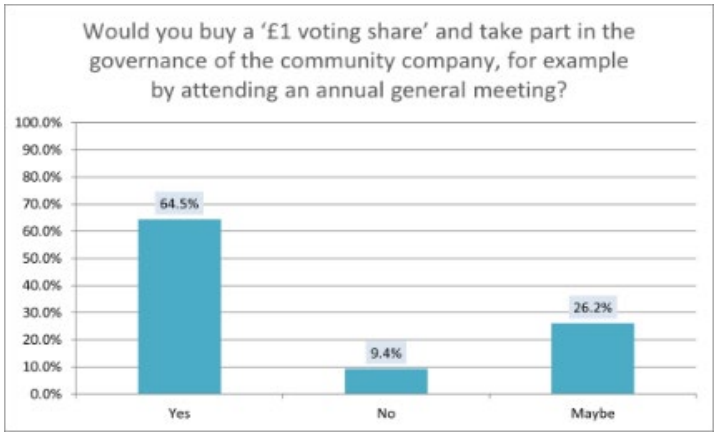
9


Be professionally managed using local workforce where possible.
2.6%
97.4%
Important
Not Important

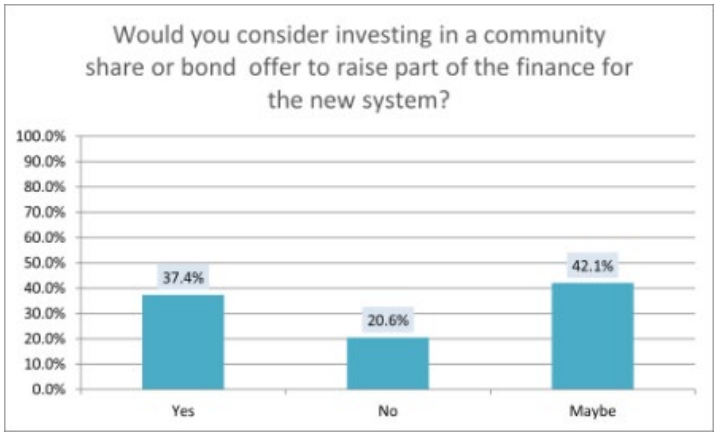
1


Do you agree that the new system should be island-owned and governed?
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
73.2%
3.7%
23.2%
Yes
No
Partially

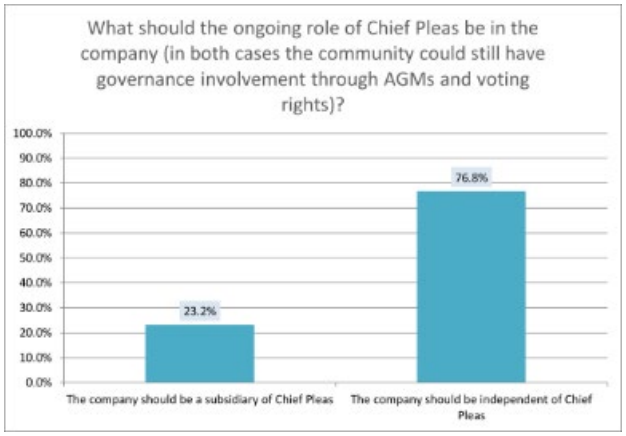
2


Would you buy a '£1 voting share' and take part in the governance of the community company, for example by attending an annual general meeting?
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
64.5%
9.4%
26.2%
Yes
No
Maybe

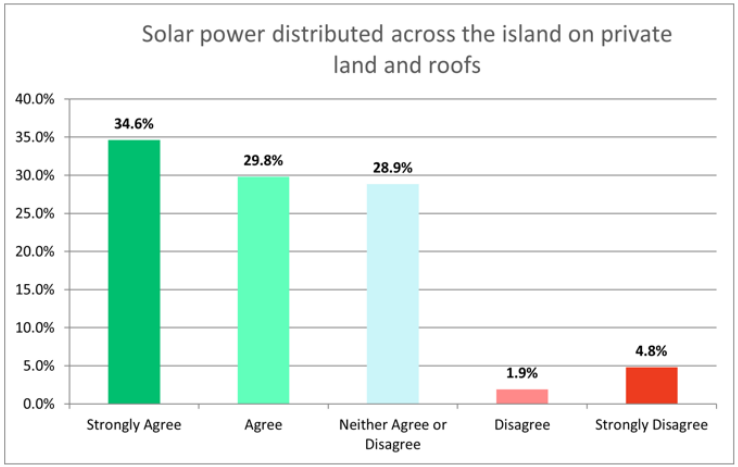
3


Would you consider investing in a community share or bond offer to raise part of the finance for the new system?
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
37.4%
20.6%
42.1%
Yes
No
Maybe

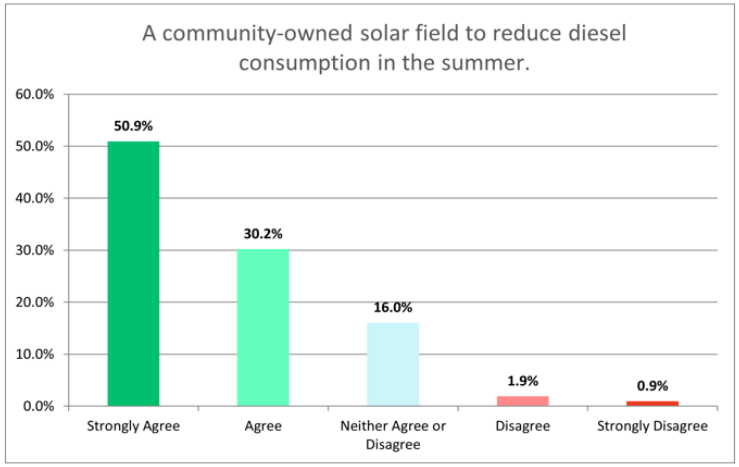
4


What should the ongoing role of Chief Pleas be in the company (in both cases the community could still have governance involvement through AGMs and voting rights)?
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
23.2%
76.8%
The company should be a subsidiary of Chief Pleas
The company should be independent of Chief Pleas

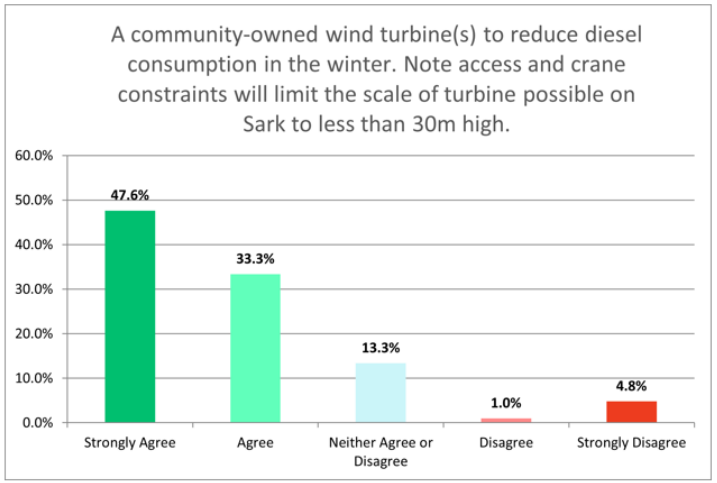
1


Solar power distributed across the island on private land and roofs
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
34.6%
29.8%
28.9%
1.9%
4.8%
Strongly Agree
Agree
Neither Agree or Disagree
Disagree
Strongly Disagree

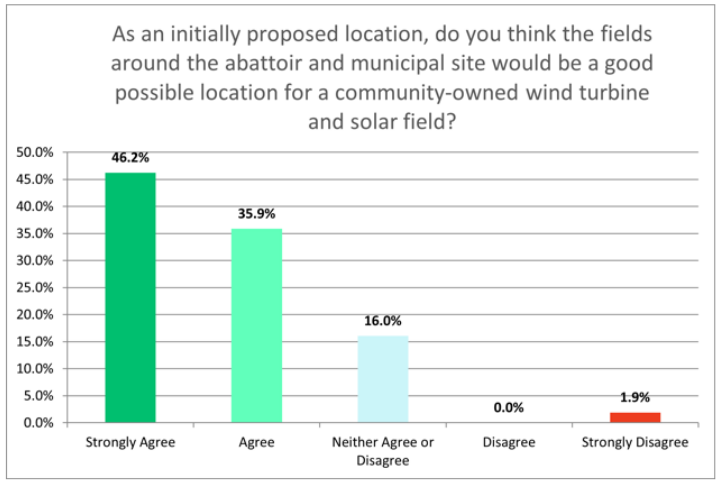
2


A community-owned solar field to reduce diesel consumption in the summer.
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
50.9%
30.2%
16.0%
1.9%
0.9%
Strongly Agree
Agree
Neither Agree or Disagree
Disagree
Strongly Disagree

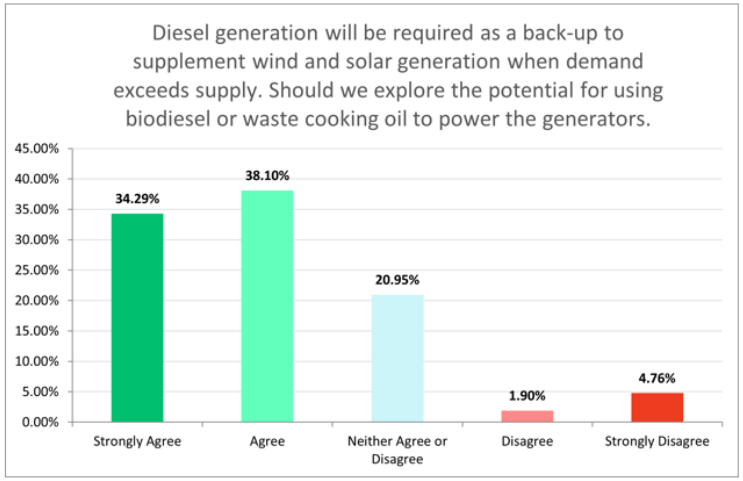
3


A community-owned wind turbine(s) to reduce diesel consumption in the winter. Note access and crane constraints will limit the scale of turbine possible on Sark to less than 30m high.
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
47.6%
33.3%
13.3%
1.0%
4.8%
Strongly Agree
Agree
Neither Agree or Disagree
Disagree
Strongly Disagree

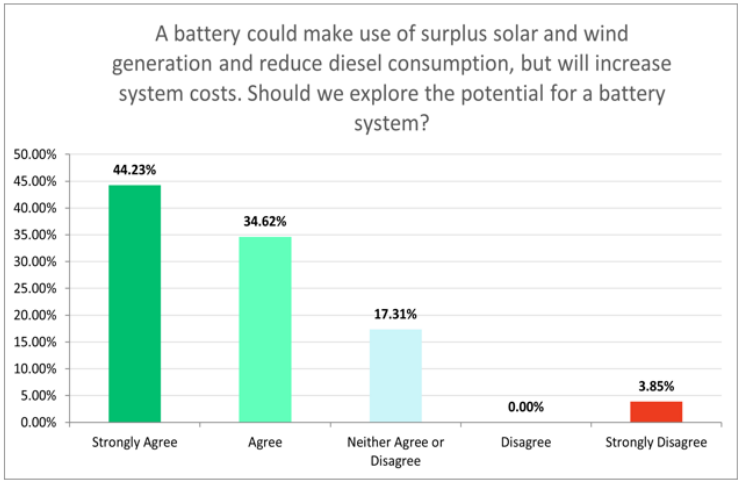
4


As an initially proposed location, do you think the fields around the abattoir and municipal site would be a good possible location for a community-owned wind turbine and solar field?
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
46.2%
35.9%
16.0%
0.0%
1.9%
Strongly Agree
Agree
Neither Agree or Disagree
Disagree
Strongly Disagree

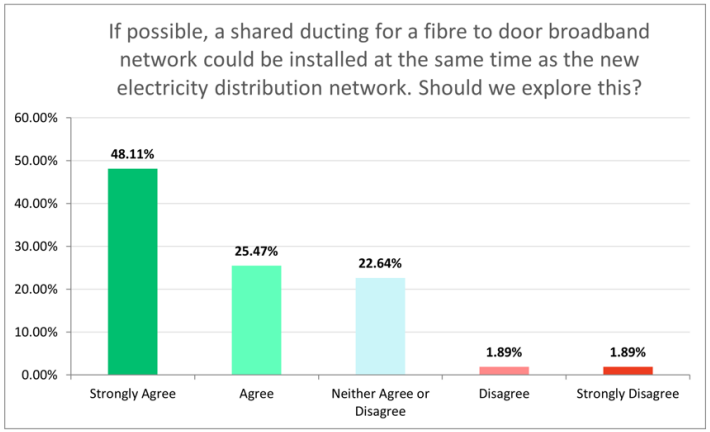
6


Diesel generation will be required as a back-up to supplement wind and solar generation when demand exceeds supply. Should we explore the potential for using biodiesel or waste cooking oil to power the generators.
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
34.29%
38.10%
20.95%
1.90%
4.76%
Strongly Agree
Agree
Neither Agree or Disagree
Disagree
Strongly Disagree

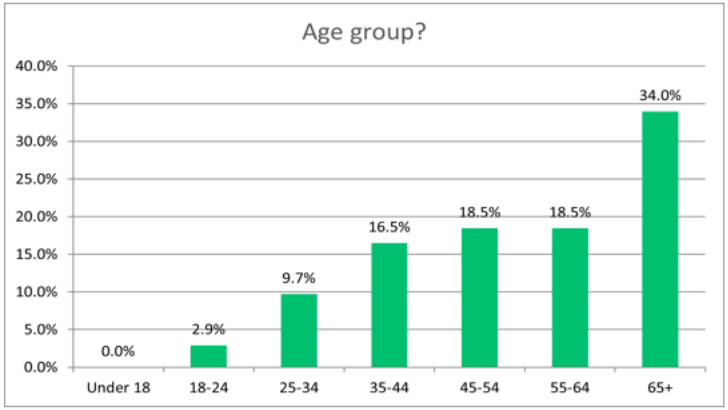
7

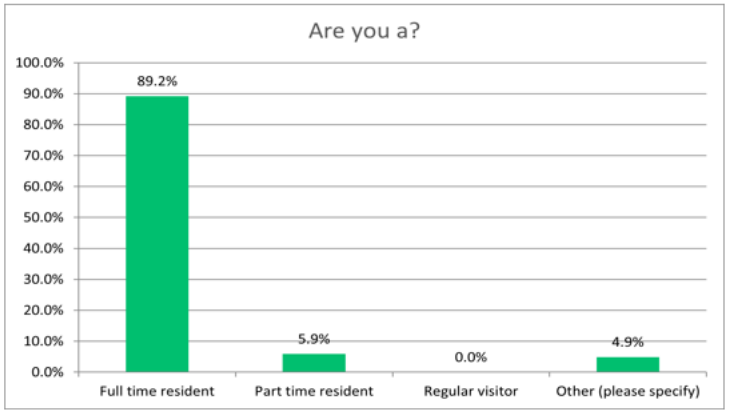

A battery could make use of surplus solar and wind generation and reduce diesel consumption, but will increase system costs. Should we explore the potential for a battery system?
50.00%
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
44.23%
34.62%
17.31%
0.00%
3.85%
Strongly Agree
Agree
Neither Agree or Disagree
Disagree
Strongly Disagree

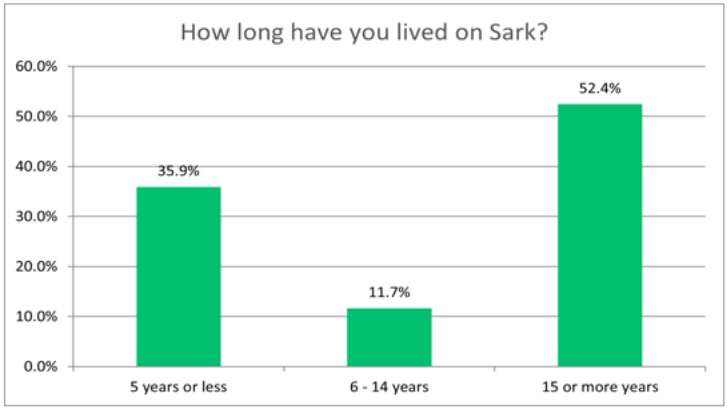
9

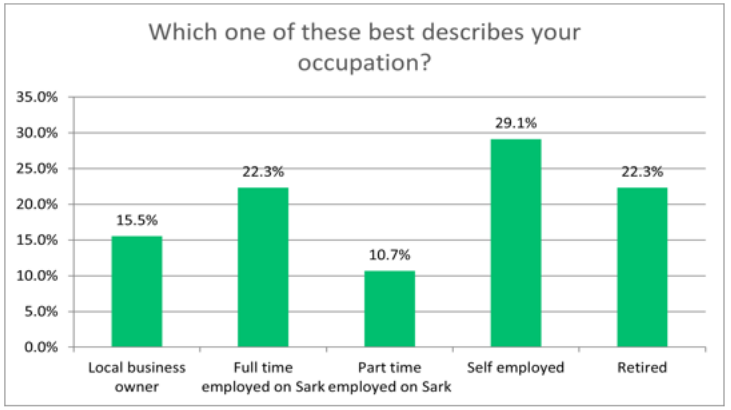

If possible, a shared ducting for a fibre to door broadband network could be installed at the same time as the new electricity distribution network. Should we explore this?
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
48.11%
25.47%
22.64%
1.89%
1.89%
Strongly Agree
Agree
Neither Agree or Disagree
Disagree
Strongly Disagree

5. Final Questions









Appendix C: System requirements

Generation system requirements

- Scaled to meet an annual consumption of 2,000MWh and a peak demand of 400kW (to be confirmed at detailed design phase). This provides some headroom for demand growth over the Island's consumption prior to demand being supressed.
- Easily scalable to meet future increased annual and peak demand, including the potential for the island to shift to electricity for heating, cooking and transport.
- Use reliable technology and provide security of supply in accordance with Guernsey benchmarks for customer minutes lost and interruptions and system redundancy. Specifications will be confirmed at the detailed design phase.
- Be renewables based, as far as technically and economically practical. This is likely to mean a combination of solar and wind with storage (if economically viable) and a diesel (or alternative) back-up system.
- The diesel (or alternative) back-up system should be modular units with sufficient capacity to meet the entire energy needs of the island when needed. EnergyPeople have recommended three silenced 200kVA generators such that two could meet maximum demand with the third providing an (n-1) level of redundancy when there is no renewable energy available.
- Power quality, voltage and frequency shall be in-line with UK standards.[1]
- Power system and generator protection shall be in-line with UK standards.
- Where possible, island contractors will be used for ground works, lifting and transport of components around the island. Capability and capacity to be confirmed at detailed design phase.

Distribution system requirements

- Replacement of the entire distribution system, likely with an 11KV system, from generators to and including the connection and metering for each property. A lower voltage distributed system could be considered if it provided significant cost savings without compromising security and quality of supply and future growth potential.
- To be designed and built to UK standards and UK Energy Networks Association guidance and best practice.
- Power quality, voltage and frequency shall be in-line with UK standards.
- The system should have sufficient cable and transformer capacity to meet the maximum likely future electricity demand and peak load, to enable the island to shift to electricity for heating and transport.

[1] The Electricity Safety, Quality and Continuity Regulations 2002 (legislation.gov.uk) and Energy Networks Association (ENA) - The voice of the networks

- System redundancy to include low voltage back feeds to sub-stations so they can be maintained without loss of supply). Specifications will be confirmed at the detailed design phase.
- 3 phase supply to be provided to all properties to enable transition to electric heating.
- Cables should be undergrounded and should be routed in roads where possible.
- Where possible, Island contractors will be used for ground works, lifting and transport of components around the island. Capability and capacity to be confirmed at the detailed design phase.
- Wayleaves will be used for all new installations.

The new system will be installed in parallel to the existing system, with properties switched over individually to minimise downtime.

Metering and control system requirements

The control system should enable security and quality of supply requirements to be met and maximise use of renewables.

It should be operatable both remotely and by the on-island engineers.

The metering system should enable real-time monitoring and logging of half hourly consumption of each property and support an automated billing system that can be managed both on-island or remotely via a data connection. It should enable consumers to monitor their energy consumption and cost via an app. The billing system and app should enable time of use tariffs and for different tariffs to be set for different types of consumer. If possible, it should enable 'smart' tariffs to enable different rates to be charged for power generated by renewables and diesel.