New Energy Solutions Optimised for Islands

NESOI

EUROPEAN ISLANDS FACILITY

Feasibility study on Electric Vehicle & Renewable Energy Hubs

Z-305- Archipelago of Mull Actions for Zero Emissions

Authors: **Scene Connect Ltd.**

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* PU = Public

PP = Restricted to other program participants (including the Commission Services)

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List of Acronyms

CETA - Clean Energy Transition Agenda

CO_2e – Carbon Dioxide Equivalent: emissions from all gases as the equivalent warming effect of carbon dioxide.

EV - Electric Vehicle

kWp – Kilowatt Hour peak: The peak power output of a system, measured in Kilowatts (kW), a unit of power.

GHG – Greenhouse Gases

GWP – Global Warming Potential

HGV – Heavy Goods Vehicle

IPCC – Intergovernmental Panel on Climate Change

LGV – Light Goods Vehicle, such as a van

LSOA – Lower Layer Super Output Area

LULUCF – Land Use, Land Use Change, and Forestry

MICT - Mull & Iona Community Trust

MSOA – Middle Layer Super Output Area

NESOI – New Energy Solutions Optimised for Islands

kWh – Kilowatt Hour: unit of energy equivalent to one kilowatt of power operating for one hour

Mt - Megatonnes (one million tonnes)

MWh – Megawatt Hour: unit of energy equivalent to one megawatt of power operating for one hour, 1000 times greater than kWh

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1 Introduction

This feasibility study is focused on the development of community renewable energy hubs and an EV vehicle and charging network on the Scottish island of Mull and the surrounding archipelago (“the Mull Archipelago”). Building on a Clean Energy Transition Agenda (CETA) developed in 2023, the aim of the study is to provide viable community-led solutions for climate action and decarbonisation on the Mull Archipelago. It forms part of the overarching The *Archipelago of Mull Actions for Zero Emissions* (AMAZE) project with the aim of instigating community-led action to both improve the lives of island communities and reducing carbon emissions.

This report details the technical, economic, environmental, and social analysis undertaken, and provides recommendations for two decarbonisation opportunities identified for the Mull Archipelago:

1. Creation of decarbonisation plans for community-owned properties.
2. Development of a community-led electric vehicle and vehicle charging scheme.

This study has been produced by Scene Connect on behalf of the Mull and Iona Community Trust (MICT) and is supported by European Union (EU) funding from the New Energy Solutions Optimised for Islands (NESOI) consortium.

1.1.1 Project Location

The Mull Archipelago is located off the west coast of Scotland and consists of five inhabited islands – Mull, Iona, Ulva, Gometra, and Erraid – and many more uninhabited islands. These islands total approximately 90,000 hectares in land area and have been inhabited for over 7,000 years. The archipelago has experienced significant population decline since the 1800s, reducing from 10,600 people in 1820 to approximately 3,100 residents (Marsh, 2017).

The islands are connected to each other and the mainland by regular ferry services. The most heavily used of these is the Oban – Craignure ferry crossing, forming the main link to the mainland, with the Tobermory – Kilchoan and Fishnish – Lochaline crossings providing additional main land connections. The Fionnphort – Iona crossing links the islands of Mull and Iona, and Ulva is serviced by Ulva Ferry Community Transport.

The main industries currently on the archipelago are the tourism sector, with approximately 500,000 visitors in 2019, and the fishing sector. Tourism fell by two thirds in 2020 due to the COVID-19 pandemic, which caused a large impact on local businesses.

1.1.2 Supporting Studies

This study was conducted alongside a Clean Energy Transition Agenda (CETA) study for the Mull Archipelago. The CETA provides an assessment of the baseline energy use and carbon emissions on the archipelago, an understanding of technically viable decarbonisation opportunities, and a community vision and plan for a low carbon future on the Archipelago. The Mull Archipelago CETA report can be accessed at: [Link TBC]

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1.2 Project Partners

1.2.1 Mull and Iona Community Trust (MICT)

Mull and Iona Community Trust (MICT) is a local trust that works to engage and improve the communities of Mull, Iona, and associated islands. It is the lead organisation conducting this feasibility study and the wider CETA with the support of NESOI (below). The organisation's mission is to enable thriving and socially connected communities through high-quality local services, housing, and amenities, making use of natural and human assets to sustain its economic, cultural, and natural environment. As a community partner in the ACCESS project, they have assisted communities to connect to sustainable electrical sources, such as the trialling of the Garmony Hydro project (Community Energy Scotland, 2018).

1.2.2 New Energy Solutions Optimised for Islands (NESOI)

In 2021, the Mull Archipelago received funding from the EU-funded NESOI project to develop a clean energy transition agenda (CETA) and conduct an EV and renewable energy hub feasibility study. NESOI was set up to provide training, technical support, cooperation, and funding opportunities for islands. NESOI provides technical assistance to local authorities and communities to obtain funding and develop competencies to deploy investments required to realise an islands' energy transitions plans. The programme aims to mobilise more than EUR100 million of investments in sustainable energy by 2023, leading to an expected 440 GWh/year in energy savings and the avoidance of 160 $ktCO_2$.

NESOI proposes concrete support to the energy transition process at both the European level and in the implementation of interventions for the 60 islands they work with, including the Mull Archipelago.

1.3 Document list

This study is supported by several technical data and graphical study outputs. These may be found in the main report text and appendices and supporting document.

1. Feasibility Study on Electric Vehicle and Renewable Energy Hubs
2. Supporting Document – Hall Energy Audits

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2 Scope of intervention and general description

2.1 Project Context

Under the Climate Change Act, the Scottish Government has made a legislative commitment to reach net zero carbon emissions by 2045. This includes an interim target of a 75% reduction in emissions from 1990 levels by 2030. This interim target translates to an almost halving from current-day emissions by 2030. This is clearly an ambitious target, requiring progress and actions at a local level, as well as by the Scottish and UK governments (Scottish Government, 2020).

Mull and the surrounding islands have a population of approximately 3,100 people, with a large number of tourists visiting every year. This population utilised 102,329 MWh of final energy across all sectors in 2019, emitting the equivalent of 34,571 tonnes of Carbon Dioxide (tCO_2e) and therefore contributing to the continued warming of the planet. With 83% of these emissions coming from island residents, and the remaining 13% due to tourist activities, action must be taken by island residents, businesses, and visitors alike towards lower carbon, more energy efficient islands.

To achieve these aims, the Mull & Iona Community Trust (MICT) commissioned a Clean Energy Transition Agenda (CETA) report which included an audit of the energy and carbon emissions from the archipelago in 2022/23, the vision of the community, and viable options to decarbonise energy, transport, waste, and land use. This study, as part of the overarching AMAZE project, is an extension of these ambitions and investigates focused actions at the community scale, including:

1. Renewable energy and energy efficiency programmes for community halls throughout the archipelago
2. Investigation of transport use and creation of a community-led EV charging and vehicle network, seeking to improve low carbon access across the archipelago.

This study is supported by NESOI, an EU-funded programme to stimulate island decarbonisation, and has been conducted by local energy specialists, Scene.

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2.2 Report Format

To achieve the goals set out above, several work streams have been set out and conducted within this study. These workstreams have been detailed below in relation to the format of this report, leading to defined energy solution(s) and recommendations for island decarbonisation.

Chapter 3 / 4 - Technical Assessment

- Planning and environmental constraints analysis.
- A baseline travel assessment to understand existing travel patterns and future EV growth scenarios.
- Low carbon energy scenarios for 7 community-owned and management properties, considering renewable generation potential, storage scenarios, local energy supply, and energy export capacity.
- Preferred energy and transport hub proposals for each site, defining optimal infrastructure capacity for each location, including energy generation type and scale; number and type of EVs; chargepoints; direct supply; energy storage; and energy export.

Chapter 5 – Regulatory Assessment

- Review of regulatory and consenting requirements for energy and low carbon transport development in the Mull Archipelago.
- Review of EV car club models and definition of key performance indicators (KPIs) for short, medium, and long-term operation of a community club.
- Recommended governance approaches for EV network and energy hub development.

Chapter 6 / 7 - Financial Assessment

- Capital, operational and lifetime costs for renewable energy development.
- A financial model for a shared EV and EV charging scheme on the Mull Archipelago.
- Available funding opportunities and options for development.

Chapter 8 - Implementation Roadmap

- Next steps and a community roadmap towards implementation for energy hub and low carbon transport projects.

Appendix A – Low Carbon Transport Survey Results

- Results from the survey inform underlying demand for an EV car club and identify the characteristics most important to the community.

Appendix B – Hall Audits (Supporting Document)

- Full energy and carbon audits for each of the seven community halls proposed as hub sites, including recommended energy efficiency and renewable energy measures.

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2.3 Site Overview

This study focuses on 7 community-owned and managed halls located across Mull. These halls provide a variety of uses to the local community, including hosting meetings, markets, community events, and as educational facilities. The 7 sites are set out in the below figure and include:

- Aros Hall, Tobermory
- Bunessan Hall
- Craignure Village Hall
- Creich Hall
- Dervaig Hall
- Salen Church Hall
- Ulva Ferry Pontoon

Detailed description of each site within this study and supporting technical and financial appraisals may be found in supporting document, Appendix B.

Figure 2.1: Community Hall Sites on Mull

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2.3.1 Local Geography

The Isle of Mull is the second largest island located within the Inner Hebrides of Scotland and by far the largest of the islands examined here. The Mull archipelago lies west of mainland Scotland, covering approximately 90,000 hectares. The islands are separated from mainland Scotland and one another by narrow straits requiring short ferry crossings.

The Mull Archipelago is environmentally sensitive, with many national and international designations which may constrain low carbon development:

- The Loch Na Keal National Scenic Area (NSA) covers western Mull, Ulva and Gometra.
- Special Protected Areas (SPAs), including Cnuic Agus Cladach Mhuile covering the south coast and central Mull, including Ben More.
- The Inner Hebrides and the Minches Special Marine Areas of Conservation (SMAC), surrounding the archipelago.
- Sites of Special Scientific Interest (SSSI), including Ardnameanach and Ben More in central Mull and various sites across the south, west and north of the island.

Beyond these environmental constraints, there are conservation area designations covering Tobermory, Dervaig, and the main settlement on Iona. There are also 94 scheduled monuments across Mull and the wider Archipelago that should be considered in any low carbon or energy development planning.

2.3.2 Local Demography

As of 2021, the population has stabilised at approximately 3,100 people, substantially higher than the lowest number of inhabitants recorded on the islands in 1971, when there were roughly 2,000 inhabitants (The Gazetteer for Scotland, 2022). With the archipelago population anticipated to grow by 2% a year, (~62 people), the demography is expected to change over the short to medium term. The average age for the archipelago is 40, two years younger than the Scottish average.

2.3.3 Local Governance

The local government for the Mull Archipelago is Argyll and Bute Council (A&BC), with a service point in Tobermory, Mull. A&BC is the local planning authority and is therefore the deciding body for most planning applications, in line with the Local Development Plan (LDP). Further relevant parties in relation to low carbon development on the islands are the Scottish Government, in relation to low carbon and energy policy, and NatureScot / Historic Scotland, in relation to planning and permitting of low carbon developments.

Local governance is supported by community organisations across the archipelago, including Mull Community Council (MCC), Iona Community Council (ICC), the Mull & Iona Community Trust (MICT), South West Mull and Iona Development (SWMID).

2.3.4 Local Economy

Tourism has represented the primary economic activity on Mull for the past few decades. Based on ferry usage between mainland Scotland and Mull, it is estimated that the island received an estimated 480,000 visitors in 2019. The onset of the COVID-19 pandemic and related lockdown and travel restrictions in the spring of 2020 onwards reduced tourism by at least two thirds in 2020.

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The tourism industry is a key employer on the islands, with the tertiary (services) sector accounting for over 60% of all businesses or organisations on the islands.

In addition to tourism, forestry, small-scale agriculture, and a well-developed aquaculture sector form a large part of the islands' economy. The Tobermory distillery, a large four-still whisky distillery, is one of the largest commercial operations on the islands and is the largest single energy user on the island of Mull and the archipelago.

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3 Identification / Description of the preferred option

This section identifies the preferred EV car club solution, describing the technical solution, financial metrics and key project drivers and operating assumptions.

This "preferred solution" is based on the analysis and results of the subsequent sections, namely: the technical analysis of energy hub locations and transport demand (Section 4); the financial metrics detailed in the financial analysis (Section 6); the key project drivers identified in the procedural analysis (Section 5), and implementation guidelines (Section 8).

3.1 Technical Solution

The "Preferred Solution" is for an EV car club across seven hub sites, partly powered by community owned generation via rooftop solar PV and battery storage systems, with additional electrical requirements provided by the national grid.

It is recommended that a fabric and local-first approach is used for implementation, as detailed below:

1. Reduce hall energy consumption via energy efficiency measures and heat decarbonisation.
2. Utilise locally generated electricity to power the community hall(s) and proposed EV chargers.
3. Store excess electricity via battery energy storage for later use in community halls or EV chargers.
4. Sell excess electricity to energy suppliers via the Smart Export Guarantee

Project execution will require a degree of flexibility and it is important to implement hub site plans according to what works best for each location, even if this reduces some economies of scale and results in divergent timescales. The details set out below refer to the preferred solution, as modelled and tested within this feasibility study.

3.1.1 Vehicles and Chargepoints

The preferred solution for a low carbon transport network on the Mull Archipelago comprises:

1. A single dedicated chargepoint at each community hall location.
2. A single vehicle dedicated to each community hall location.

Assumptions

Vehicle Type:
The Renault Zoe is one of the most popular EVs used by community car clubs, and has been used for this study's modelling, although the final choice of vehicles will be based on availability and the community's preference. It is easy to use, reliable, relatively low cost, has good luggage space, a range of around 200 miles (enough for a day's driving in most cases), and excellent efficiency at 0.167 kWh/mile (Electric Vehicle Database, 2023). These are important metrics for

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choosing a car club car. There was some interest from the community transport survey in alternative vehicles such as vans or larger vehicles, although this could incur increased costs via additional cleaning, poor fuel economy, and reduced range.

EV Chargepoints:
This study proposes installing 7 chargepoints, each with two 22kW connectors, for the 7 hub sites. One connector is designated for the car club, with the other acting as a car club spare which can be used by the local community. 22kW is fast enough to fully charge a Renault Zoe in 2.5hrs. A faster chargepoint is not necessary for the club, as vehicles are anticipated to mainly charge overnight.

The “preferred solution” modelled for this study – which focuses on the requirements and financial viability of the EV car club – is for one chargepoint at each hub site to service club demand. However, the community’s desired long-term outcome is for multiple chargepoints at the hub sites to support the local demand from privately owned electric vehicles, and this should be factored in hub design.[1]

In the preferred energy hub system, solar-compatible chargepoints are powered by renewable energy generation and associated battery storage at the hub sites as well as National Grid electricity supply when local energy is not available.

However, a 22 kW chargepoint requires a three-phase electricity connection. Therefore, the four halls without a known three-phase electricity connection (Aros, Bunessan, Craignure and Salen) are expected to require upgraded electricity network connections. A comparison of the costs and benefits of this preferred solution against the alternative solutions of a slower 7.4 kW charger or a considerably larger battery storage system are provided in Section 3.3.

Figure 3.1: Example Renault Zoe and chargepoint

[1] A further longer-term consideration is the potential for vehicle-to-home (VTH) or vehicle-to-grid (VTG) technology to enable the EV battery to be used as storage for the hall’s electricity demand, which with smart management and flexible tariffs can bring cost savings. However, this technology is still in the trial phase for DNOs, most EV models are not yet equipped for bidirectional charging, and operation requires a (typically more expensive) compatible bidirectional charger and additional equipment (Clean Energy Reviews, 2023).

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3.1.2 Energy Hub Generation

The capacity of rooftop solar PV and battery storage recommended at each hall is summarised in Table 3.1. These are the optimal installations assessed via individual hall energy audits (Appendix B). There may also be some opportunities for wind power, ground-mounted solar or hydro, utilising land adjacent to some of the halls. The addition of such alternative renewable generators in combination with solar PV may better provide supply during winter months, although at higher overall project cost. However, the scope of this report means focus is on the potential of the community hall premises.

Hall income, savings and the ability for self-produced generation to meet chargepoint demand is greatly improved if energy efficiency improvements are undertaken first. A summary of the possible efficiency savings is provided in section 4.3, as well as in full in Appendix B.

Table 3.1: Hall PV generation capability and storage capacity

Hubs Locational Analysis	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Rooftop Solar PV (kWp)	5	8	11	10	19	19	8
Battery Storage (kWh)	5	8	10	10	20	20	9
Financial Savings and Income (£/year) (Solar PV & Storage)	£685	£1,625	£2,288	£1,972	£3,059	£2,953	£2,025

3.1.3 Energy Hub opportunities and constraints

A summary of the opportunities and constraints associated with each hall as a potential car club hub site is included below. For the preferred solution – using all 7 hub sites – the constraints of certain halls must be addressed. This will include liaising with Argyll & Bute council regarding on-road chargepoint installation, developing groups to enable carpooling and lifts to hub sites, providing supporting services (e.g., community e-bikes), and using grid electricity only for some sites.

The chosen hub sites offer good viability, although alternative hub sites may be considered following this suitability review. Fionnphort may be a more suitable location as a hub site than Creich Hall, as it better serves the local demand from Iona residents, has an existing large car park and community site (Columba Centre, owned by SWMID) with three-phase connection, and may have good solar and wind resources. However, this site has not been investigated here due to it being outside of the initial scope of this study.

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Full analysis is available in section 4, with an overview of the KPIs for hub site selection in section 4.5.

Cells in the below table and throughout this documented are highlighted:

- Green where there are clear opportunities for development according to the given criteria.
- Orange where there are some energy opportunities, but measures need to be taken to improve viability.
- Red for those with poor viability according to the given criteria.

Table 3.2: Opportunities and Constraints: Hall Summary

Halls	Category	Notes
All locations	Hub Locations	There is need and desire for a car club in all parts of the islands.
	Generation	Most halls are capable of self-generating renewable energy, saving money and cutting carbon emissions in the process. The halls are also capable of enacting substantial energy efficiency savings. Most halls are also capable of partially meeting the demand from a car club chargepoint but are limited by both the power capacity and storage capacity of the installed energy storage.
	Constraints to address	Those living outside the immediate hub catchment area (1-1.5km) are much less likely to use the club. Possible solutions include utilising existing community transport schemes, organised carpooling via community groups, community e-bikes or e-scooters. Dedicated e-scooters may also be a solution for when a user is waiting for their EV to charge. Electricity connections need to be upgraded to three-phase at some halls to enable fast charging. The alternative solutions are a much larger battery system or slow charging installations (see 3.3).
Aros Hall	Hub Location	Very high local demand thanks to population hub and ferry port. Well-connected on two bus routes. Lack of dedicated parking space.
	Generation	Generation potential may be insufficient for chargepoint usage without largescale efficiency improvements. Poor payback time (>20 years).
	Constraints to address	Council support required for on-road chargepoint installation. Using grid electricity or a different nearby site are good solutions.
Bunessan Hall	Hub Location	Moderate demand from immediate catchment area. Ample parking.
	Generation	Good generation potential.

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Halls	Category	Notes
	Constraints to address	Carpooling messaging groups or other local community transport solutions needed to widen the catchment area.
Craignure Hall	Hub Location	Limited demand from local catchment area but very high ferry port demand. Well-connected on two bus routes.
	Generation	Excellent generation capability.
	Constraints to address	As a regular one-way destination, a hub here is best suited to “flexible” not “back to bay” operation. This would incur logistical and procedural costs and risks in operation.
Creich Hall	Hub Location	Low demand from immediate catchment area but demand from nearby ferry port (~2km).
	Generation	Good generation potential.
	Constraints to address	Access from Fionnphort ferry port could be made easier with eBike or scooter availability, and/or a ridesharing group with fellow ferry passengers. Fionnphort could be a more suitable hub destination for Iona residents.
Dervaig Hall	Hub Location	High demand from local catchment area and school. Ample parking.
	Generation	Good generation capability.
	Constraints to address	N/A
Salen Hall	Hub Location	High demand from immediate catchment area.
	Generation	Excellent generation capability.
	Constraints to address	N/A
Ulva Ferry Pontoon	Hub Location	Low but growing residential demand from local catchment area. Ample parking and existing solar generation. High level of need from more rural population
	Generation	Excellent generation potential for chargepoint usage from existing rooftop solar PV and additional generators.

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Halls	Category	Notes
	Constraints to address	A sparse catchment area makes underlying residential demand and access a challenge at required car club membership levels. Served by existing Ulva Community Transport.

3.2 Key Project Drivers

Core characteristics of the car club should be designed to best suit the needs of the local community(s) and capacity of the project owner and / or operator. These decisions shape project outcomes and have a large impact on procedural and financial viability. This section briefly outlines some of these decisions, alongside the assumptions made within our analysis. Full analysis of procedural and regulatory drivers is available in section 5.

There are a number of available operating models, from the "Informal car club" which relies on community ownership and management, versions of the franchise model which combine community ownership with external management, and external ownership and management. Along this continuum there is a trade-off between control (such as over pricing, capital expenditure, maintenance contracts) and logistical ease (such as managing telematics, booking and billing systems, insurance, securing finance and taking on risk). We have assumed in our modelling a "middle ground" position with community control and ownership over the vehicles, pricing, branding and club governance, but external management of telematics, booking and billing systems and overarching framework, such as may be possible with a "franchise" partner like MoorCar (MoorCar, 2023)(see 5.7.2 for partner identification).

We have also assumed a "back to bay" operating procedure. This is the standard operating procedure for community car clubs and reduces operating costs and logistical challenges. A "flexible" operating procedure would incur high staff costs due to the need to move vehicles large distances back to hub locations. It could also result in the more frequent unavailability of cars, which was one of the two most important parameters (along with proximity) for the community as found via the low carbon transport survey. However, a "flexible" operating procedure would be highly useful on the islands for transportation to/from the ferry and could result in higher overall club utility.

Securing project partners is essential to successful project delivery. These include car club operation, booking and telematics providers, marketing/advertising, renewable and chargepoint installers, local authorities, or other financing partners. A full guide to project implementation is available in section 9.

3.3 Alternative Solutions

3.3.1 Chargepoint Power Output

The preferred solution is for 22 kW chargepoints. However, this requires a three-phase electricity connection, which only Creich, Dervaig and Ulva Ferry Pontoon sites are known to have.

Option A (Preferred): Upgrade hub sites to three-phase connection.

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Benefits:

- Enables a fast (22 kW) chargepoint connection.
- Reliable chargepoint supply – charging can be powered either by the hubs' renewable energy and battery system, or the national grid, or a combination of the two.
- The most financially viable way of ensuring fast charging capability.
- Three-phase connection is in place for additional fast chargepoints at the location in the future.
- A simple system.

Costs:

- Most three-phase upgrades cost between £3,500 - £6,000 (UK Power Networks, 2023).
- Connection costs can be higher at remote or complicated sites.

Option B: Install a larger battery energy storage system to power fast charging.

Benefits:

- Enables a fast (22 kW) chargepoint connection – a single-phase electricity supply can be used to back up the renewable resources and charge the DC battery, which in turn is the energy resource used by the chargepoint.
- Reliable chargepoint supply – provides energy security during grid failure.
- Three-phase upgrades are avoided.

Costs:

- A large-scale battery storage capacity is required - ~100 kWh capacity would cover around two full EV charges.
- Very high capital costs for the battery storage system, ~ £60k to £100k, with considerably poorer payback times than with "preferred solution" battery capacities.
- Unable to "charge" the battery via renewable resource or grid connection and "discharge" via the fast chargepoint at the same time.
- Battery system needs replaced at end of lifespan and degrades over lifetime.

Option C: Install a "less fast" 7 kW chargepoint

Benefits:

- No three-phase connection upgrades are required.
- Reduced capital costs from chargepoint installation.

Costs:

- Slower charging times - 6 to 8 hours for a 7kW chargepoint, compared to 2 to 3 hours for a 22 KW chargepoint.
- Cost savings are minimized by the availability of government grants for chargepoint installation (see 7.1).

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3.4 Financial Viability

3.4.1 EV Car Club

The preferred solution has good viability, but this is sensitive to the underlying assumptions of usage and financing. The financial analysis of section 6 details the financial viability of the project. This includes a full assessment of the likely costs (CAPEX, OPEX and financing), borrowing and the required revenue and car club usage to maintain financial viability for an EV car club on Mull.

Table 3.3 summarises the key financial metrics, alongside some project context, opportunities, and constraints. More detailed analysis is available in section 6.

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Table 3.3: Summary of financial metrics

Variable	Value	Context, Opportunities and Constraints
CAPEX and REPEX	**£360,600**	Includes seven Renault Zoe Cars, seven 22kW double-connector changepoints and installation, and club system implementation. Includes replacement costs at year 10.
OPEX (yearly)	**£67,300**	Includes electricity usage, insurance, administration, service & maintenance, booking/telematics/billing system, contingency
Revenue (yearly)	**£84,700**	Revenue from membership, mileage, and usage fees, given assumed usage.
Grant Funding (as % of CAPEX)	**20% (for vehicles)** **89% (chargepoints)**	Grant support is important, but not pivotal to overall viability. Reductions in grant support can be recouped from moderate usage fee increases.
Project Financing	**4%**	Obtaining a "preferred status" lending rate via Argyll & Bute council or other governmental sources is vital to project viability. Commercial lending would incur higher interest rates and may require improved IRR.
Internal Rate of Return (IRR)	**2.0%**	This is a suitable return for a community owned project which does not seek commercial profitability, whilst ensuring an element of return for scheme improvement, extension and wider community action.

Table 3.4 sets out required car club usage to maintain viability, given the above costs and financing assumptions.

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Table 3.4: Car club usage

Variable	Value	Context, Opportunities and Constraints
Customer Tariff	**£120 / year** **£0.25 / mile** **£3.95 / hour**	These are suggested car club fees, which would maintain financial viability given expected usage rates (below). Alternative pricing structures that also meet target revenue are included in section 6.
Usage	**30 members / vehicle** **14% utilisation rate** **40 miles per day / vehicle**	This is the required car club usage to achieve target revenue and is in line with CoMoUK guidance (CoMoUK, 2023), which sets these targets for membership and utilisation. Average Scottish car club vehicles travel 29 miles per day, with increased mileage anticipated for a Mull car club due to the large distances between destinations.
Electricity Usage	**3,900 kWh / vehicle**	Financial analysis assumes 100% of electricity usage is via the grid. If 50% of electricity usage originated from renewable generation at the hub sites, this reduces OPEX by 6% and project lifetime carbon emissions by 1.9%. Thus, hall generation is not pivotal to achieving car club financial and carbon success.

Table 3.5 demonstrates the promising social and carbon impacts that operating an EV car club could produce.

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement N° 864266.

Table 3.5: Social and Carbon Impacts

Variable	Value	Context, Opportunities and Constraints
Carbon Savings per year	**28 tonnes CO2e**	Carbon savings from using EV car club instead of ICE vehicles averaged over each year of the project lifetime. Assumes 100% of EV charging is using grid electricity.
Lifetime Carbon Savings	**552 tonnes CO2e**	Carbon savings over 20-year project lifetime. Carbon savings from using EV car club instead of ICE vehicles. Assumes 100% of EV charging is using grid electricity [2]
User savings	**£3,381 / year**	Substantial cost savings for the average member, using car club 500 mile / year instead of running ICE car. Individual Cost savings are maintained until 8,500-mile annual car usage.

3.4.2 Community Hall Energy Efficiency and Renewable Generation

Table 3.6 sets out the financial viability of implementing renewable generation and energy efficiency technologies at the community halls, with full energy audits for each site found in Appendix B. The data provided is an aggregate summary of the financial outcomes at each site, including the potential total cost savings from the proposed energy efficiency and renewable generation improvements, and payback times for solar PV and storage systems.

Table 3.6: Community Hall Energy Efficiency and Renewable Generation Financial Viability

Financial Metric	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Energy Cost Savings (£/year) (All interventions)	£3,435	£1,063	£3,690	£2,718	£4,071	£8,582	£2,996
Financial Benefit (£/year) (Solar PV & Storage	£685	£1,625	£2,288	£1,972	£3,059	£2,953	£800
Payback Period (years) (Solar PV & Storage)	22	19	10	11	11	10	8
Carbon Savings (tonnes CO_2e) / year) (All interventions)	2.1	0.6	2.3	1.7	2.5	5.4	1.9

[2] If 50% of chargepoint usage was powered by self-produced renewable energy, carbon savings would increase by a further 1.9%, or 10 tonnes CO2e over the project lifetime.

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4 Technical analysis and KPIs

This section provides a detailed assessment of the current energy and travel context across the 7 community hub sites considered within this study. This assessment is a necessary first step, enabling the design and appraisal of energy and transport interventions on the Mull Archipelago.

Section 4.1 provides an assessment of the current travel situation on Mull as well as projected future growth trajectories for EVs, electricity demand and the associated demand for public chargepoints. It also includes the key findings from a low carbon transport survey, with full results available in Appendix B.

Section 4.2 provides a summary of the energy scenarios for each of the 7 proposed energy hubs. This involves a comparison of which community halls are most suitable as an EV hub, based on metrics such as energy demand and electricity generation potential, as well as details on wider energy interventions which may be viable for each site.

Section 4.3 summarises the technical analysis and provides an overall options appraisal for the prospective EV car club hub sites.

4.1 Baseline Assessment

4.1.1 Baseline Travel Assessment

Table 4.1 presents the total numbers of vehicles across the Mull Archipelago. Petrol cars are the most common vehicle type (44%), although Mull has a higher rate of diesel car ownership (35%) than in Scotland as a whole, which is reflective of the rural nature of the area.

Vehicle data is further split into four geographic areas: North West Mull and Ulva (northwest from Killiechronan and Salen), South West Mull and Iona (includes Bunessan and Fionnphort areas), Tobermory, and Mull Central. Tobermory has the highest density of vehicles, as the largest settlement on Mull. In general, Mull has a higher proportion of multiple car households than Scotland - 1.20 cars/household in comparison to 1.14 in Scotland. This figure is particularly high in North West Mull (1.31) and Central Mull (1.25), where a car club may help reduce the need for multiple vehicle ownership in households, though in the short-term, such households may have less need for a car club.

The data presented in table 4.1 has been calculated using statistical adaptations to Census data alongside government road traffic statistics (Census, 2011) (Department for Transport, 2023).

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Table 4.1: Number of Vehicles on the Archipelago, breakdown by type and area

Vehicle Type	Total Number	% of total	North West Mull & Ulva	Tobermory	South West Mull & Iona	Mull Central
Petrol cars	855	43.8%	270	243	161	181
Diesel cars	679	34.8%	214	193	128	143
Battery Electric	14	0.7%	4	4	3	3
Plug-in Hybrid	9	0.5%	3	2	2	2
Motorcycles (petrol)	67	3.5%	21	19	13	14
LGVs	326	16.7%	103	93	61	69
Total Cars and Vans	1950	100%	616	554	368	412
Vehicles per occupied dwelling	1.20		1.31	1.11	1.14	1.25

Table 4.2 presents the distance travelled by cars on the islands, showing that:

- 30% of the total vehicle distance travelled is by tourists. There are around 69,000 car visitors per year, with an average of 265 tourist vehicles on the islands on any given day, increasing to over 500 tourist cars in August.
- 56.2% of car distance travelled is for general residents' activity.
- 10.8% of all distance travelled is for commuting to school or work. Only 29% of these commutes are less than 5km, which is longer than regional and national averages (>70%)

The statistics are calculated using government road traffic statistics (Department for Transport, 2023), with tourist numbers estimated using ferry carrying statistics (CalMac, 2023) and tourism board information (Visit Scotland, 2023).

Table 4.3 highlights the distance travelled by buses and coaches. There are 3 public bus routes, which each operate from 17 - 24 times per week. Each of the 7 community hubs are on a public bus route, with Aros and Craignure halls on two routes. Coach tours make up a substantial proportion of overall bus and coach distances travelled, estimated at 45% with peaks in the summer season.

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Table 4.2: Distance travelled by cars, breakdown by type and user

Distance driven per year (km)	Petrol Cars	Diesel Cars	Battery Electric	Plug-in Hybrid	Other	Total
Residents	7,796,000	6,189,000	124,000	83,000	3,874,000	**18,067,000**
Tourists	4,347,000	2,795,000	103,000	63,000	434,000	**7,740,000**
Total	12,144,000	8,985,000	227,000	146,000	4,307,000	**25,809,000**

Table 4.3: Distance Travelled by Bus and Coach

Public Bus Route	Destinations	Distance Travelled per Year (km)	Community Hub Sites on Route
494	Tobermory to Calgary	43,000	Aros Hall, Dervaig Hall
95/495	Tobermory to Craignure	108.000	Aros Hall, Salen Church Hall, Craignure Hall
96/496	Craignure to Fionnphort	100,000	Craignure Hall, Bunessan Hall, Creich Hall
Ulva Ferry Community Transport		~22,000	Ulva Ferry Pontoon
Coach tours (West Coast Tours, Turas Mura, etc.)		~137,000	-

There are five ferry crossings in operation which connect Mull with Iona, Ulva, and the mainland. All but the Ulva Ferry crossing have capacity to transport cars, and table 4.4 presents details of the peak monthly cars that were carried in the last 5 years (CalMac, 2023).

The Craignure - Oban crossing is the most popular crossing and constitutes an average of 71% of all cars carried per year. Peak figures can reach 34,100 cars carried to or from Mull per month, with the majority of this from tourists – we estimate island residents to be responsible for an average of 7,500 (or 3,750 round trips) per month.

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Table 4.4: Car carrying capacity on ferries.

Ferry Route	Estimated Car Capacity (existing vessel and sailing frequency per month)	Peak Cars Carried (peak month during last five years)	Community Hub Sites within 2km of port
Craignure - Oban	~31,000	22,300	Craignure Hall
Fishnish - Lochaline	~19,000	8400	
Tobermory - Kilchoan	~5000	2500	Aros Hall
Fionnphort - Iona	~1500	950	Creich Hall
Total	~56,000	34,100	

4.1.2 Electric Vehicles, Chargepoints and Future Demand

Electric vehicles are forecast to grow rapidly across the UK as we transition to net zero emissions. This transition will be accelerated by the UK ban on new petrol or diesel cars by 2030. However, the UK, and Mull in particular, is starting from a high emissions baseline. We estimate that 1.2% of Mull residents' cars and vans are currently electric (including battery or hybrid), compared to 1.9% in Scotland. Yet, in our forecast it is estimated that this could grow to 22% on Mull by 2030.

Figure 4.1 presents four possible electric vehicle growth trajectories on Mull (including all battery or hybrid cars and vans) and is based on four National Grid future energy scenarios (National Grid, 2022). Electric Vehicle growth is fastest in the Consumer Transformation scenario (where consumers and communities quickly adopt low carbon technology) and Leading the Way scenario (where this consumer transformation is augmented by system transformation led by governments). In the Leading the Way scenario electric vehicle penetration falls in the 2040s with the advent of alternatively powered vehicles, such as from hydrogen fuel cells. EV growth is slowest in the Steady Progression forecast, where 13% of Mull's vehicles are electric in 2030 and we fail to reach net zero by 2045, but in the long-term see the highest number of EVs due to there being more vehicles on the road and less government investment in alternative vehicle types than in other scenarios.

Figure 4.2 shows an average of the four scenarios growth forecasts broken down by battery and hybrid cars and vans. Hybrid vehicles are unlikely to play a substantial role in EV roll out and uptake is expected to reduce from the 2030s onwards. Hybrid cars are expected to grow five-fold by 2030, compared to 24-fold electric cars growth. In total, it is anticipated that there will be ~425 EVs on Mull in 2030 and ~1,600 EVs in 2040.

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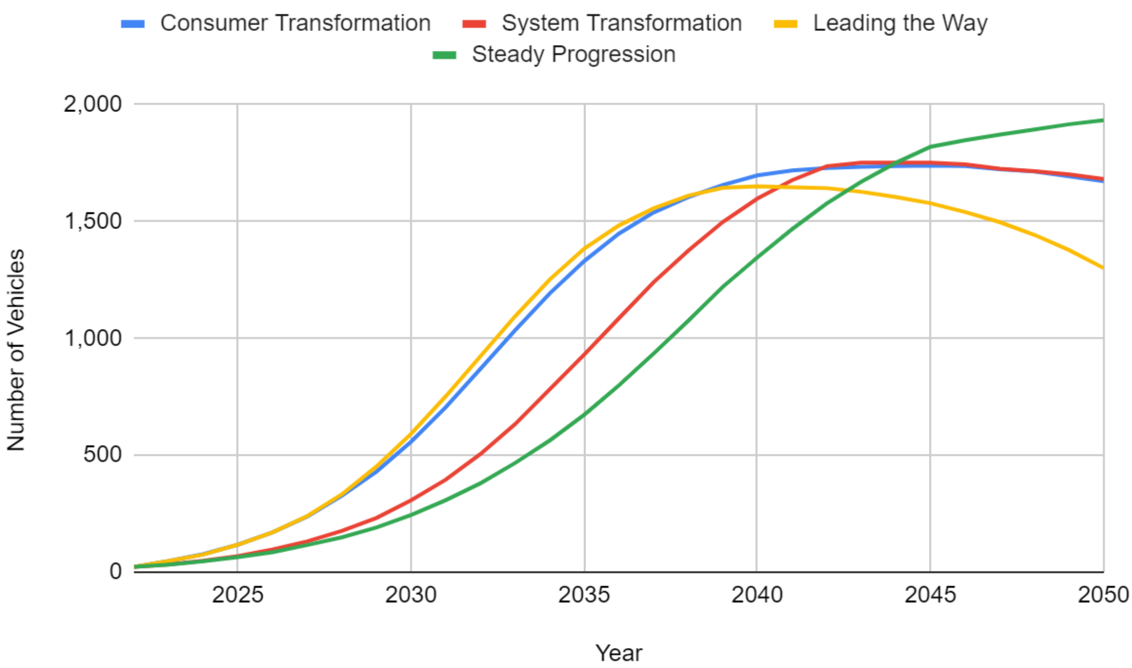

Figure 4.1: Mull residents' electric vehicle growth trajectories across four net zero scenarios, includes cars and vans, battery, or hybrid vehicles.

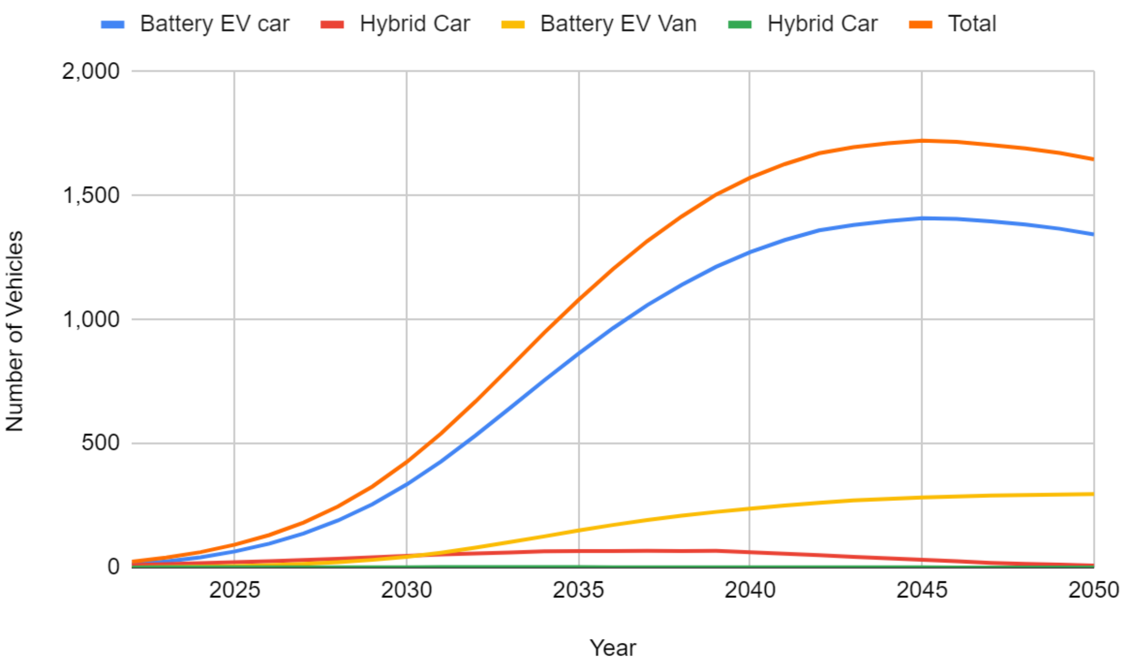

Figure 4.2: Average scenario trajectory for Mull residents' electric vehicle growth by type

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4.1.3 Charging Infrastructure

Table 4.5 catalogues Mull's 13 public chargepoints by area. The UK has set a target for 300,000 chargepoints by 2030 and Mull is halfway to its target of 29 public chargepoints. Whilst the demographics of Mull (characterised by low population and large land area) means it isn't always suitable to compare to Scotland-wide figures, this Mull-specific target is based on total vehicle distances travelled, including by tourists. Central Mull already exceeds this target with 7 chargepoint installed, all in the Craignure area. In contrast, Tobermory needs another 7 chargepoints to add to its single rapid charger to reach targeted levels.

14 of the current 26 connectors on the 13 Mull chargepoints are fast variants (3x7kW, 2x11kW, 9x22kW). There are also 11 rapid connectors (2x25kW, 3x43kW and 6x50kW) at Craignure car park, Ledaig car park, and Fionnphort. There is one slow variant charger (3kW) at Bunessan.

Table 4.5: Mull Public Chargepoints by area, including comparison to UK 300,000 by 2030 target (Zap Map, 2023)

Mull Public Chargepoints	Mull Archipelago	North West Mull and Ulva	Tobermory	South West Mull and Iona	Mull Central
Chargepoint Devices	**13**	2	1	3	7
Number of Connectors	**26**	4	3	3	14
% of current devices with rapid-charging capability	**31%**	0%	100%	33%	29%
2030 Devices Target	**29**	9	8	5	6
% Progress to 2030 Target	**45%**	22%	12%	55%	114%

4.1.4 Electrical Energy Demand

The predicted rapid roll-out in EVs will be associated with increased electricity demand. Figure 4.3 presents the projected increase in on-island electricity demand associated with the above EV growth projections. Electricity demand for EVs is forecast to peak at over 4,000 MWh in all four net zero scenarios. Under the Leading the Way scenario this is reached as early as 2040, before falling back as more alternatively powered vehicles progress. Our average scenario forecast sees electricity demand reaching 1,030 MWh by 2030, 3,677 MWh by 2040 and 4,000 MWh in 2050. By 2030, this is split between residents (63%) and tourists (37%).

It is estimated that public chargepoints will meet ~40% of this demand, led largely by charging undertaken by tourists. For residents, the majority of electric vehicle charging currently occurs at home or work, with only 11% via public chargepoints (Element Energy, 2019). The 2030 target of 29 public chargepoints on Mull (table 4.5) is only sufficient to cover 46% of our estimated public chargepoint demand in 2030, at the current average charge of 19 kWh per device per day. However, charging per device is expected to substantially increase with increased electric vehicle penetration.

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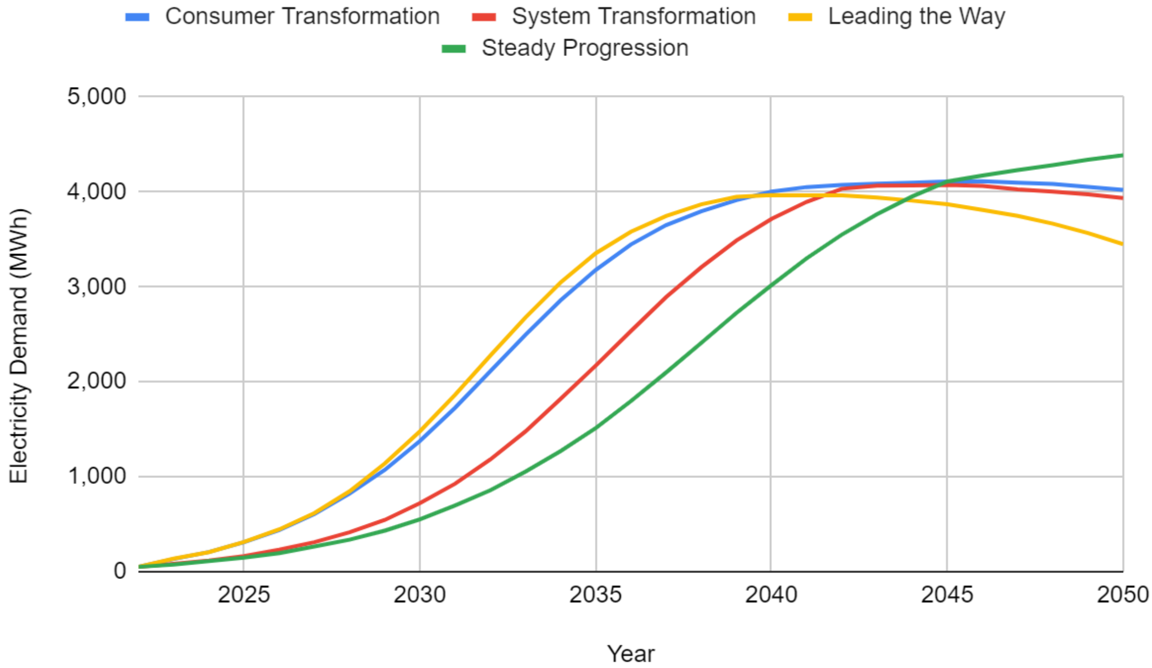

Figure 4.3: Projected total electricity demand from all electric vehicles across four scenarios

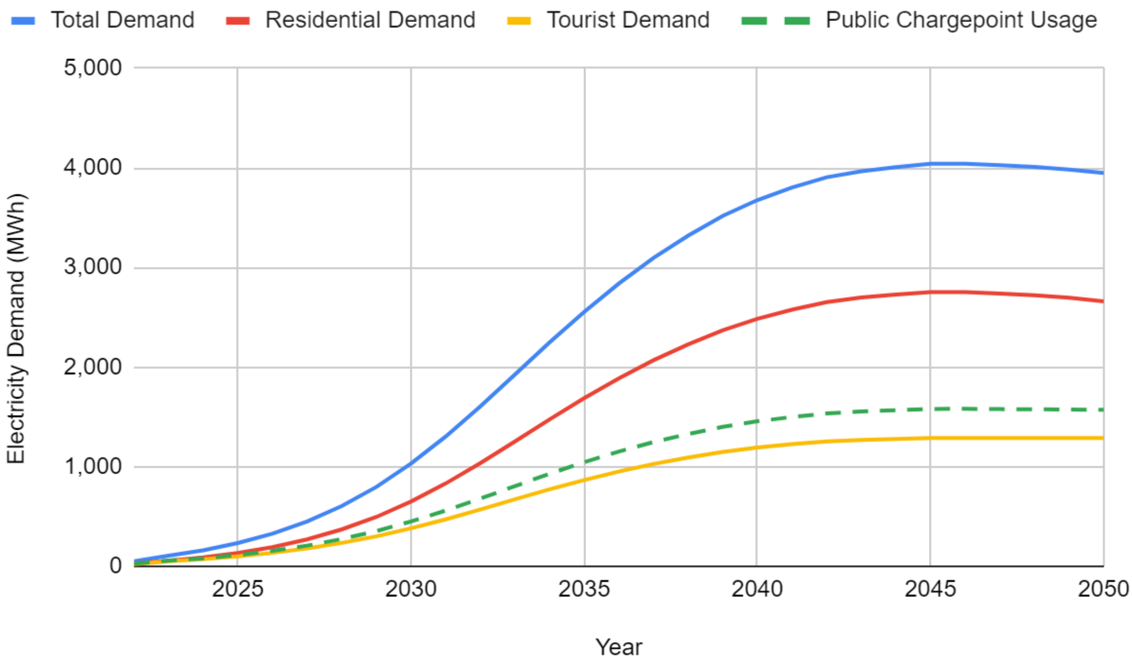

Figure 4.4: Total electricity demand, average scenario forecast, by user type

Table 4.6 presents EV characteristics for typical electric cars. The "average affordable EV" is the average characteristics of the best-selling Kia Niro EV, Volkswagen ID.3 Pro S and Nissan Leaf. The

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Renault Zoe ZE50 R110 is an example of a lower-spec vehicle well-suited to an EV car club and is used by Strathaven Car Club. In both cases the usable battery is sufficient to cover a lap around Mull and can be charged in 3 hours using a 22kW charger. However, the probable 10% to 20% drop in vehicle ranges over winter may make some particularly long journeys more marginal on one charge. (For context, Fionnphort to Tobermory and back is 116 miles (187 km).

Table 4.6: Typical EV characteristics and charging time.

	Useable Battery (kWh)	Guide Price (£)	Range (km)	Indicative Charging Time (hrs)			
				7.4kW	11kW*	22kW*	50kW*
Average Affordable EV	58	£35,600	342	8.7	5.9	2.9	1.3
Renault Zoe ZE50 R110	52	£29,000	312	7.8	5.3	2.6	1.2
**Some EVs are limited by on-board charger capacity and may not be capable of charging faster than 7kW*							

4.1.5 Hub Locational Analysis

Table 4.7 presents a locational analysis of each of the potential EV hub sites according to a series of indicators. For example, Aros Hall has very high local demand, with over 600 buildings within 1km. Salen, Dervaig and Bunessan have a moderate local demand. Although Craignure Hall is poor for the number of nearby buildings, it is only a 5 min walk to the ferry terminal. In contrast Creich Hall and Ulva Ferry Pontoon have less than 40. However, Creich Hall is only 2km from the Fionnphort ferry terminal, and there could be ample demand from Iona residents. A hub at Fionnphort may be more optimal and encourage usage by Iona residents. Craignure village hall already has 11 charging bays within 1km, whereas other sites would need charging facilities to act as an EV hub.

The community hubs are well spread out across the islands. Table 4.8 lists the distances between each pair of community halls (hub sites). There is one set of hubs less than 10km apart – Bunessan and Creich. Dervaig and Salen halls are within 20km of three other hubs, including each other. Craignure is on average the closest to all other hubs.

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Table 4.7: Community hubs locational analysis

Hubs Locational Analysis	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Buildings within 1km	620	109	69	36	160	186	20
Tourist footfall	High	Moderate	High	Moderate	Moderate	Moderate	Moderate
Distance to nearest ferry (km)	0.3	9.3	0.6	2.1	12.5	11.2	0.3
Nearest Public Chargepoint (km)	0.3	0.6	0.5	1.8	3.8	2.4	16
Number of charging bays within 1km	3	2	11	0	0	0	0
Distance to Bus Stop Bus Service(s)	~250m Tobermory -Calgary Tobermory -Craignure	~100m Craignure-Fionnphort	~750m Tobermory-Craignure Craignure-Fionnphort	~2km [3] Craignure-Fionnphort	~100m Tobermory -Calgary	~100m Tobermory -Craignure	~Local Ulva Community Transport

[3] Bus drivers will typically drop off or pick up near Creich Hall, but frequency remains a problem.

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Table 4.8: Distance by road between community hub locations (km)

Distance Matrix (km)	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon	Average
Aros Hall	80	33	88	12	16	31	43
Bunessan Hall		47	8	84	65	60	57
Craignure Village Hall			54	37	18	33	37
Creich Hall				91	72	67	63
Dervaig Hall					19	16	43
Salen Church Hall						15	48

4.1.6 Low Carbon Transport Survey

A low carbon transport survey was conducted in summer 2023 by Scene to gauge community need and interest in a car club scheme. Participation was encouraged via community workshops, advertising in community magazines and social media posts, and direct invites to participants. Questions covered demographic information, transport requirements, and likely usage of a car club in different scenarios. Full results are provided in Appendix A, with a summary of key findings as follows:

- There is high overall interest in having access to a car club, with 44% of respondents very interested and less than 10% not interested.
- It is uncertain whether a car club would reduce car ownership, with only 25% stating that they would consider selling or not purchasing a car if a car club was available, and 24% stating themselves unlikely to consider it.
- People are more substantially likely to use a car club with an electric vehicle.
- The most important factors for car club usage are the proximity of the hub site to the users' home, the availability of vehicles when needed, and overall costs.
    - The car club would be regularly used if the hub is less than a mile from the user's home. Beyond this distance usage would sharply decline.
- The Columba car park at Fionnphort is a popular alternative hub location.

Other general comments from respondents include:

- Frequent concerns were raised regarding distance to the hub sites and easy vehicle access:

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    - Creative solutions required, such as via existing community transport infrastructure, messaging/forums, ebikes.
- Price is a key consideration.
- There is a greater need for improved public transport.
- Both flexible usage (e.g., for one-way journeys) and high vehicle availability are desired.
- Numerous responses say that priority should be given to local users over tourists.

4.2 Community Renewable Energy Hub Audit

As part of this study, energy audits for the proposed renewable energy hub sites have been conducted. Information was gathered via phone audits and desktop surveys, supplemented by client-supplied data. Some site visits were conducted in May 2023.

The purpose of these energy audits was to collect and collate information regarding current energy consumption, energy efficiency, and the feasibility for renewable generation at each location. These audits focus on providing recommendations for community-owned renewable assets at these sites and understanding the viability of wider energy efficiency measures. The feasibility of installing Electric Vehicle (EV) chargepoints at each hall was also explored. The full results from each hall energy hall audit can be found in appendix B.

The scope of this report focuses on community hall premises, meaning that rooftop solar PV was the main renewable technology assessed in these remote audits. However, there may also be some opportunities for wind power, ground-mounted solar PV or run-of-river hydro, utilising land adjacent to some of the halls. In addition, "car-ports" could provide additional roof space for solar PV and a covering for chargepoints and vehicles (Transport Energy, 2023).

This section summaries and compares the key results from these audits, starting with energy efficiency and energy savings, before discussing the generation and chargepoint potential of the halls, and their overall suitability as hub sites.

The energy saving potential from the energy efficiency measures – including draught proofing, LED lighting, smart controls, double glazing, roof, wall, floor insulation, alternative heating, and renewable energy implementation – are show in table 4.9. Cells are highlighted:

- Green where there are clear opportunities for energy and cost saving.
- Orange for energy efficiency measures which would require grants to be financially viable.
- Red for those with poor financial viability (>100-year payback time).

As can be seen from the summary table, the potential savings are sizable and would cumulatively contribute to major energy and cost savings across the halls.

Efficiency savings vary across the halls, with results dependent on the existing building fabric, energy consumption profile and local setting. Capital costs, cost savings and anticipated payback times are detailed in the full energy audits (Appendix B). Most of the recommendations made are eligible for grant and / or loan support, which would reduce payback time. A summary of the available funding support is provided in section 7.1.

The energy saving estimates for energy measures can be used as indicators of viability ahead of commencing with detailed design and seeking funding.

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Table 4.9: Audit summary table 1: Potential Hall energy efficiency savings[4]

	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Draught Proofing							
Resource Saving	101 kWh	18 kWh	77 kWh	38 kWh	101 kWh	329 kWh	Assumed Installed
Cost-Saving (per year)	£34	£6	£26	£13	£34	£112	
Payback	7 years	37 years	9 years	17 years	7 years	2 years	
LED Lighting							
Resource Saving	All bulbs are LED	536 kWh	858 kWh	944 kWh	643 kWh	794 kWh	Assumed Installed
Cost-Saving (per year)		£182	£292	£321	£219	£270	
Payback		2 years	2 years	2 years	2 years	3 years	
Smart Thermostatic Controls							
Resource Saving	System has thermostatic controls	163 kWh	700 kWh	348 kWh	914 kWh	2,136 kWh	Assumed Installed
Cost-Saving (per year)		£56	£238	£118	£311	£726	
Payback		4 years	1 year	2 years	1 year	1 year	
Double Glazing							
Resource Saving	Windows secondary glazed	121 kWh	519 kWh	156 kWh	Extant windows double-glazed	1,431 kWh	Assumed Installed
Cost-Saving (per year)		£41	£176	£53		£487	

[4] As all halls use electricity for heating, in all cases energy savings refer to final electricity consumption.

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	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Payback		461 years	6 years	302 years		21 years	
Roof Insulation							
Resource Saving	1,341 kWh	171 kWh	Existing insulation to be retained	325 kWh	1,055 kWh	1,479 kWh	Assumed Installed
Cost-Saving (per year)	£456	£58		£110	£359	£503	
Payback	8 years	232 years		100 years	21 years	3 years	
Wall Insulation							
Resource Saving	2,151 kWh	249 kWh	942 kWh	820 kWh	1,394 kWh	1,693 kWh	Assumed Installed
Cost-Saving (per year)	£731	£85	£320	£279	£474	£575	
Payback	21 years	206 years	55 years	63 years	37 years	7 years	
Floor Insulation							
Resource Saving	746 kWh	138 kWh	476 kWh	270 kWh	914 kWh	3,240 kWh	Assumed Installed
Cost-Saving (per year)	£254	£47	£162	£92	£311	£1,102	
Payback	63 years	297 years	67 years	240 years	42 years	18 years	
Air Source Heat Pump							
Resource Saving	4,209 kWh	Existing heating system to be retained	3,231 kWh	1,604 kWh	Existing heating system to be retained	9,860 kWh	4,209 kWh
Cost-Saving (per year)	£1,431		£1,099	£545		£3,353	£1,431
Payback	10 years		9 years	11 years		6 years	8 years

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	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Solar PV and Storage (Energy Import Savings)							
Resource Saving	1,555 kWh	1,382 kWh	4,049 kWh	3,491 kWh	6,953 kWh	4,279 kWh	4,602 kWh
Financial Benefit (per year)	£685	£954	£2,288	£1,972	£3,059	£2,953	£2,205
Payback	22 years	19 years	10 years	11 years	11 years	10 years	8 years

Draught-proofing
Most community halls would benefit from draught-proofing, apart from those which already have these implementations. The most suitable sites for draught proofing improvements are Salen (2-year payback period), Aros, and Dervaig (7-year payback period). There is limited opportunity for draught proofing at Bunessan Hall, where cost savings are only £6 per year.

LED Lighting
All community halls would benefit from upgrades to lighting, apart from those which already have these implementations. The most suitable site for LED lighting improvements is Bunessan Hall where LED lighting would reduce total electricity consumption by 26%. There are paybacks of 2 – 3 years across all sites.

Smart Thermostatic Controls
The installation of smart thermostatic controls would benefit all community halls, apart from Aros Hall which already has such controls. Salen Church Hall could save £726 per year, and payback times are four years or less at all halls.

Double Glazing
There are three halls which already have modern double glazing (Aros Hall, Dervaig Hall and Ulva Ferry Pontoon). Craignure Village Hall and Salen Church Hall would benefit from installing double glazing, with 519 kWh and 1,431 kWh savings respectively. There is little benefit in upgrading double glazing to modern standards at Bunessan Hall and Dervaig Hall.

Roof Insulation
Several community halls would benefit from roof insulation, with potential energy savings of over 1,000 kWh identified at Aros Hall, Dervaig Hall and Salen Church Hall. There is more limited energy saving potential from upgrading the current roof insulation at Creich Hall and Bunessan Hall.

Wall Insulation
Wall insulation measures can lead to substantial energy savings across most halls, but the cost of implementation means grant funding would be required at most halls. Aros Hall and Salen Church Hall have the lowest payback times, at 21 years and 7 years respectively. Bunessan Hall is the least financially viable, with a payback time of 206 years for upgrading the existing wall insulation.

Floor Insulation

This project has received funding from the European Union's Horizon 2020 research and innovation program under grant agreement N° 864266.

There is mixed viability for installing floor insulation to modern standards across the halls. Salen Church Hall is the most viable hall for floor insulation, with associated energy savings of 3,240 kWh and a payback time of 18 years. Upgrading floor insulation at Aros Hall, Craignure Village Hall and Dervaig Hall would likely require grant funding to become financially viable.

Heating Systems

All halls currently use electric heating systems – mainly infrared heaters, and with some storage heaters. Storage heaters have the benefit of acting as a thermal store for self-produced renewable generation, which could be particularly beneficial with smart grid tariffs. However, Air Source Heat Pumps (ASHP) have very high efficiency levels and can lead to sizable energy savings – for modelling purposes we have assumed a coefficient of performance (COP) of 2.5. With most electricity usage being used for electric heating at each of the halls, this leads to an overall energy saving of close to 40% at each of the halls, and an improvement on the existing electric heating. (Note: these efficiency savings are separate to those detailed above, and not additive). There are excellent payback times (10 years or less) for all halls. However, optimal heat pump installation may also require concurrent energy efficiency improvements.

Solar PV

Solar capacity (kWp) is largely determined by the amount of roof space (m^2) available, alongside the orientation (ideally south-facing), roof angle, and potential impacts from shading. The technical outputs for the anticipated solar PV arrays are summarised in table 4.10.

Roof-mounted solar PV systems are viable to be installed at each hall. Dervaig Hall and Salen Church Hall have high suitability for rooftop solar PV, with 19kWp arrays able to being installed, which are capable of generating 11,587 kWh and 14,264 kWh per year, respectively. Aros Hall has lower capability for rooftop solar PV, with shading from a nearby spire limiting capacity to a 5kW installation and generating 2,592 kWh, 23% of current total electrical consumption at the hall. The yearly financial benefit from solar PV generation is over £1500 per year at most sites, and payback times are less than 11 years at Craignure Village Hall, Creich Hall, Dervaig Hall and Salen Church Hall.

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Table 4.10: Audit Summary Table 2: Solar PV Generation Outputs

Technical Output	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Current Consumption (kWh/year)	11,500	2,061	8,828	4,383	11,525	26,941	11,500
Potential Solar Capacity (kWp)	5	8 [5]	11	10	19	19	8
Potential Generation (kWh)	2,592	4,607	10,122	8,727	11,587	14,264	7,670
Potential Generation as % of hall consumption (%)	23%	224%	115%	199%	101%	53%	67%
Financial Benefit [6] (per year)	£487	£822	£1,902	£1,641	£2,178	£2,682	£1,442
Payback Period (years)	23	15	7	9	11	7	21

Solar PV and Storage

Table 4.11 details the viability of solar PV with battery storage at each of the halls. The addition of energy storage, at the capacities outlined in the table, increases the proportion of energy which can be used locally and therefore reduces energy bills, providing greater savings than if electricity is exported. With smart system operation and variable tariffs, battery storage could also be utilised for electrical energy time-shifting, further lowering hall bills.

Solar PV and storage systems are financially viable with combined cost savings and SEG income totalling over £2,500 per year for Dervaig Hall and Salen Church Hall, and over £1,500 per year for Craignure Hall, Creich Hall and Ulva Ferry Pontoon. Payback periods are 13 years or less at all halls apart from Aros Hall and Bunessan Hall.

Table 4.11 also highlights the energy we expect to be available for export after usage from hall demand. This electricity is effectively surplus to local requirements and using this electricity to charge EVs, whether private or car club vehicles, would be a financially preferable solution.

[5] Bunessan Hall has available rooftop space for a 15 kW installation. A smaller capacity has been modelled here to produce a more optimal payback time – Bunessan Hall generation potential is far beyond current electricity demand.
[6] Financial benefit is equal to the export income via SEG, and financial savings from usage by the hall. The financial benefit is calculated for the specified solar PV system capacities.

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Annual EV demand is anticipated to be 3,900 kWh / vehicle / year. Excess generation is highest at Salen Church Hall, with excess generation also outstripping EV car club demand at Bunessan, Craignure, Creich and Dervaig Hall. However, the seasonal generation profile of solar PV does mean that energy is less available to be captured for car club demand over winter months.

Excess generation can be exported to the National Grid using the Smart Export Guarantee (SEG). Currently, the best rate is £0.15/kWh. Utilising SEG requires a meter than can deliver half-hourly meter readings, typically via a smart meter. However, some halls may not have adequate communications signal for a smart meter. In these cases, an export meter may be installed instead, or in future smart meters using broadband may be available.

Table 4.11: Audit summary table 3: Solar PV with Storage Generation Outputs

Technical Output	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Solar PV System with Storage							
Battery storage (kWh)	5	8	10	10	20	20	9
Energy available for export after hall usage (kWh)	1,037	3,225	6,073	5,236	4,634	9,985	3,068
Excess generation as a % of EV car club demand	27%	83%	156%	134%	119%	256%	79%
Payback Period (years)	22	19	10	11	11	10	8
Financial Benefit * (£/year)	685	954	2,288	1,972	3,059	2,953	2,025
**Financial benefit is equal to the export income via SEG, and financial savings from usage by the hall. The financial benefit is calculated for the specified solar PV and storage system capacities.*							

Parking Availability
Bunessan, Dervaig and Ulva Ferry Pontoon have available parking spaces that could accommodate a car club vehicle and chargepoint. Based on energy audits, Craignure, Creich and Salen Church Hall only have 2 spaces available. Using these for a two-connector chargepoint is viable, but checks should first take place that this implementation won't limit hall accessibility. Aros does not have dedicated parking and assessment of parking space availability and charger installation on a public highway will be required to understand feasibility.

Electrical Connection

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Only three of the prospective hub sites (Creich, Dervaig and Salen Church Hall) have a three-phase electricity connection. This connection type is typically required for chargers with charging speed of 11kW and higher. A higher speed charging connection requires electricity connection upgrades that typically cost £3,500 - £6,000 (UK Power Networks, 2023). A slower single-phase 7.4kW would fully charge a Renault Zoe in 7 - 8 hours, whereas a 22kW connection fully charges in less than 3 hours. However, if most charging needs occurred overnight a 7.4kW connection may be suitable, and the Renault Zoe range of 200 miles is unlikely be exceeded in a day.

Using locally generated electricity to supply the hub chargepoints would either require concurrent charging while the sun is shining or battery storage. To fully supply a 22kW chargepoint (or even a 7.4kW chargepoint) with battery storage would require a much higher power output (and thus expensive) battery storage system that may be not feasible given the overall system size. However, the above stated battery storage systems can partially supply chargepoint demand, augmented by National Grid electricity supply to reach the required power output.

Battery buffered EV chargers are coming to market which include a built-in battery (Telford, 2022). However, these are typically used as buffers to enable ultra-fast charging without need for electrical network upgrades, and given the high specifications required are an expensive solution. There are additional charge/discharge inefficiencies in using battery storage for charging rather than charging directly from electricity supply. Further, with grid carbon emissions declining year-by-year, using self-produced renewable generation does not substantially reduce overall carbon emissions from the project (see section 6.4).

Table 4.12 highlights hall characteristics that impact the implementation of chargepoints at the prospective hub sites.

Table 4.12: Audit Summary Table 4: Chargepoint Outputs

Technical Output	Aros Hall	Bunessan Hall	Craignure Village Hall	Creich Hall	Dervaig Hall	Salen Church Hall	Ulva Ferry Pontoon
Electrical Connection	Single-phase	Unknown	Unknown	Three-phase	Three-phase	Single-phase	Three-phase
Car Park Spaces	n/a	30	2	2	30	2	24

4.3 Energy & EV Options Appraisal

This section provides an appraisal of each renewable energy hub site in terms of local energy development and EV charging / car club suitability. This options appraisal is the basis for the preferred solution set out in Section 3. The hub sites are assessed here against some of the most critical metrics, with results colour coded according to overall suitability:

- Green: Results suggest high suitability as a hub site
- Amber: Results suggest moderate suitability as a hub site
- Red: Results suggest low suitability based on chosen metric

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As set out in Table 4.13, the most viable locations for a car club hub site are Aros Hall, Craignure Village Hall and Salen Church Hall. Aros Hall scores highly on all locational metrics thanks to the local bus links, ferry port and very high local demand. Whilst Craignure Village Hall only has moderate demand from residents, it is close by to the busiest ferry port on the islands and is well-connected by bus. Salen Church Hall is a viable location thanks to the high local population density and bus connections.

Dervaig Hall and Bunessan Hall do not have as strong a local demand base, with their wider catchment area necessitating creative solutions for how people arrive at the hub site. Creich Hall is also limited by the local demand base, with Iona residents better suited to a hub location at Fionnphort. Ulva Ferry Pontoon is also characterized by a sparse residential population who may find it difficult to travel to the venue without other community transport solutions.

Table 4.13: Hub Options Appraisal: Locational suitability

Halls	Ferry Link	Local Residential Demand
Aros Hall	Tobermory-Kilchoan	Very High Demand – very high population density in largest town.
Bunessan Hall	None	Moderate demand - shallow but broad Ross of Mull catchment area.
Craignure Village Hall	Craignure-Oban	Moderate local demand from nearby residents. A high demand destination – best suited for one-way, not “back to bay” usage.
Creich Hall	Fionnphort-Iona	Moderate demand from Iona residents with ferry port 2km away. Limited local catchment area.
Dervaig Hall	None	Moderate demand from local catchment area. Local school demand.
Salen Church Hall	None	High demand – high density local catchment area.
Ulva Ferry Pontoon	Ulva Crossing	Low residential demand – sparse population already partially served by UCT. But high level of need at remote location.

Table 4.14 sets out possible energy generation measures at each site, highlighting the most suitable development options. Bunessan Hall, Craignure Village Hall, Creich Hall, Dervaig Hall, Salen Church Hall and Ulva Ferry Port are all recommended taken forward as preferred development options for hosting an EV hub site on the basis that they have suitable on-site parking spaces and generation capabilities.

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Aros Hall does not have dedicated parking, and so assessment of parking space availability and charger installation on a public highway will be required to understand feasibility. The relatively low generation capacity at Aros Hall does not inhibit its suitability as a hub site. As noted in the financial analysis (see section 6), the usage of self-generated electricity for charging is not critical for the project's financial viability and makes a relatively small difference to overall project carbon emission savings.

Further details on the preferred solution can be found in Section 3.

Table 4.14: Hub Options Appraisal: Generation

Halls	Generation capacity	Energy available for export after hall usage, kWh (as % of car club vehicle demand)	Solar PV and Storage Payback time (years)	On-site parking spaces
Aros Hall	5 kWp	1,037 kWh (27%)	22	0
Bunessan Hall	8 kWp	3,225 kWh (89%)	19	30
Craignure Village Hall	11 kWp	6,073 kWh (156%)	10	2
Creich Hall	10 kWp	5,236 kWh (134%)	11	2
Dervaig Hall	19 kWp	4,634 kWh (119%)	11	30
Salen Church Hall	19 kWp	9,985 kWh (256%)	10	2
Ulva Ferry Pontoon	8 kWp	3,068 kWh (79%)	8	24

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4.4 Technical KPIs

This section defines key performance indicators (KPI) for the development, implementation, and operation of an EV car club with seven hubs on the Mull Archipelago. This section should be used as a guide to development as well as a framework for future monitoring and evaluation throughout operation. Full implementation guidelines are provided in section 8 and financial analysis in section 6.

Table 4.15: Financial and Technical KPIs

Performance Indicator	Project Stage	Measure	Measurement Timescale
Car Club Project Financing	Development	~£180,000 secured	During development stage
Car Club Project Grant Funding	Development	~£42,000 vehicle grants secured. ~£15,000 chargepoint grants secured	During development stage
Community Hall Energy Efficiency and Renewables Funding	Development	Grant and Loan Funding secured	During development stage
Chargepoints	Implementation	7 x 22kW chargepoints 154 kW installed power	During implementation stage
EV procurement	Implementation	7 x EVs owned by club	During implementation stage
Club Staff	Implementation	Staff employed	During implementation stage
Renewable generation (all 7 hub sites)	Implementation	80kWp installed. ~60 MWh generated ~27 MWh self-consumption	During implementation stage
Community Hall Energy Savings	Operation	~77.8 MWh[7] cumulative ~£31,000 bill savings	Annual

[7] Cumulative energy and cost savings across all halls, all viable energy efficiency and renewable measures

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Performance Indicator	Project Stage	Measure	Measurement Timescale
Number of club members	Operation	30 members / vehicle	Annual
Car usage	Operation	14% utilisation rate	Annual
Car club Mileage	Operation	14,600 miles / vehicle	Annual
Revenue	Operation	£84,700	Annual
Earnings before Interest and Taxes (EBIT)	Operation	£17,400	Annual
Carbon Savings	Operation	28 tonnes CO_2e from car club 16.5 tonnes from hall efficiency & renewable measures	Annual (average)
User Cost Savings	Operation	£3,381 / average member	Annual (average)
User Satisfaction	Operation	Number of complaints User Survey	Annual

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5 Legal, regulatory, and procedural analysis and KPIs

This section provides a breakdown of legal and regulatory considerations for EV Car Clubs and local renewable energy development in Scotland.

5.1 Low Carbon Development

This section focuses on the development of renewable energy proposals at the seven community hub sites within this study. Energy development on the Mull Archipelago is governed by UK and Scottish Government planning regulation, with planning decisions for smaller scales of development made by Argyll and Bute Council, in line with the Argyll and Bute Local Development Plan (LDP, 2015) and the emerging LDP2.

The Planning Process
Application for planning permission is a process that adheres to a national framework – the National Planning Permission Framework (NPPF) – and is administered by Argyll and Bute Council for Mull and the wider archipelago. The planning permission process is detailed below.

EIA Screening / Scoping

Initial discussions with the Council in relation to Enviornmental Impact Assessment (EIA) requirements and scope.

↓

Planning Application

Submission of planning application to the Council.

↓

Consultation Period

21 day consultation with statutory, community and local consultees.

↓

Planning Decision

Decision by Council Planning Department or Scottish Government

↓

Appeal

Where planning permission is not granted, an appeal may be submitted.

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5.2 Electricity Generation

The legal and regulatory limitations for electricity generation are dependent on the technology and scale of development deployed. In general, there are two separate approaches to electricity development, which are:

- **Local Use:** This refers to local generation and consumption of electricity with no or minimal export of energy to the UK national electricity grid. Energy is consumed "behind the meter" such as via battery storage and renewable generation systems. In this instance, a grid connection is required from SSEN – see below – where the property or site has a connection to the grid. In off-grid locations, no grid connection is possible and therefore no regulation applies in this regard.
- **Grid Export:** This refers to the development of generation particularly for export to the national grid, with revenue derived from selling energy to energy supplier(s) rather than through the offset of energy bills. Grid connection regulations apply in this situation, as do technology specific legal and regulatory considerations, as detailed below. Flexible export tariff rates (as opposed to fixed rates) can maximise export revenue with the benefit of a battery storage system.

5.2.1 Grid Connection

A grid connection application must be applied for all grid-connected generation assets on the Mull Archipelago. This process differs depending on the nature of the existing electrical connection at the property / site and the rated capacity (kWp) to be connected. At the point of commissioning a Microgeneration Certification (MCS) may be required to activate the connection, and on-site DNO test and witnessing is required for larger connections.

Grid connection G.59 and G.83 processes were phased out in 2019 and any new application must follow the G.98 / G.99 process as shown below.

A grid connection typically takes 60 days from the point of application before a connection offer is made, although this timeframe may be significantly longer for larger scales of development. Connections >1 MW may require simulation study for generation loads to be undertaken and shared with the DNO.

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<3.75kW (Single Phase) or <10.25kW (Three Phase)	No grid application required
<17kW (Single Phase) or <50kW (Three Phase)	G.98 Application Form for Microgeneratoin
Type A >50kW - 1MW	G.99 Application Form Form A2-2 / A2-3
Type B 1 MW - 10MW	G.99 Application Form Form B2-1
Type C 10 MW - 50 MW	G.99 Application Form Form C2-1 / Part 1
Type D >50 MW	G.99 Application Form Form C2-1 / Part 2

5.2.2 Solar Photovoltaics (PV)

As this study focuses on community halls, the focus of this appraisal is on roof-mounted solar PV only. From a planning and consenting perspective, solar PV is one of the simplest and most widely deployed energy generation technologies in the UK.

Rooftop mounted and small-scale ground-mounted solar PV systems do not require planning permission under General Permitted Development Order (GDPO, 2015). This does not apply in conservation areas, on listed properties, or similar cultural and environmental designated areas.

The greatest barriers to development for the renewable energy hub sites identified is anticipated to be:

- **Roof Condition**: ensuring roof suitability and integrity is critical to ensure that solar panels can be mounted to the roof structure without risk of collapse or leaks. There are solar panel solutions for most roof types, and where direct mounting is impossible, ballast systems may be used if the roof has suitable weight bearing properties.
- **Grid Connection**: Following the process set out above, a grid connection must be applied for and secured prior to any export of electricity to the national grid. Considering the grid constraints on the Mull Archipelago, export limiting equipment may be necessary to secure grid connection in some instances.
- **Microgeneration Certification Scheme**: Whilst not a legal requirement, most export contracts require MCS certification for schemes under 50kWp. This is relatively simple to obtain and, increasingly, may not be required.
- **Planning Permission**: Permission is likely to only be required in Tobermory (Aros Hall) and Dervaig (Dervaig Hall) due to the conservation status of these settlements. This would

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affect any solar panels visible from roadways or key viewpoints in the area. Engagement with A&BC planning department is recommended in these instances.

5.2.3 Wind Energy

Whilst this study does not focus on the wind energy potential of the hub sites, several of the halls may have capability to develop wind energy in concert with local landowners. Small scale, <50m height to tip (HTT) wind energy developments are deemed permissible for large areas of Mull, according to the Argyll & Bute Landscape Wind Energy capacity Study (Argyll & Bute, 2017).

Major constraints include:

Visual impact: Impacts on Special Protection Areas (SPA), Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC) and National Scenic Areas (NSA) located across the Ross of Mull and around Loch Na Keal. A visual impact assessment is likely to be required to obtain planning permission, including an assessment of Zone of Theoretical Visibility (ZTV).

Ecological Impact: Covering similar areas as the above but also any areas with notable protected bird species, such as Golden and White-tailed Eagles. Ecological surveying is necessary for any wind development on Mull and engagement with A&BC and RSPB Scotland will be required to understand and mitigate ecological impact.

Noise Impact: Limiting development near domestic properties and settlement areas, in line with the scale and level of local support for the wind development in question. Assessment must be conducted in line with noise regulations ETSU-R-97, Institute of Acoustics (IOA) (Institute of Acoustics, 2013).

5.2.4 Hydroelectric

Whilst no hydroelectric generation potential has been identified at the renewable energy hubs, a short overview is provided for small-scale hydroelectric development for reference. Several of the halls may have capability to develop hydroelectric energy in partnership with local landowners.

The Scottish Environmental Protection Agency (SEPA) regulates hydroelectric development via the Water Environment (Controlled Activities) (Scotland) Regulations 2011 more commonly known as CAR regulations. Obtaining a CAR license requires registration of any planned scheme with SEPA before application, most likely under the “small scheme” (>0.35 GWh / annum and <100kWp).

Licensing requires a detailed understanding of water abstraction volumes and limits year-round, abstraction impacts on current and future water flow, and demonstration that ecological impacts are accounted for and mitigated appropriately (e.g., inclusion of a fish pass). Planning permission is also required for hydroelectric developments.

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5.3 Heat Generation

Heat generation technologies are typically low impact as they are housed fully or partially within domestic or non-domestic properties. Each of the halls has recommendations for heat decarbonisation in their respective hall audits.

5.3.1 Heat Pumps

Installation of an air- or ground-source heat pump on domestic premises is permitted development, not needing an application for planning permission when certain conditions are met:

- Microgeneration Certification (MCS 020) is obtained for the development.
- The volume of the heat pump housing is <0.6m^3.
- All parts of an Air-source heat pump are >1m from the property boundary.
- Rooftop installations are installed on flat roofs only and are >1m from the roof edge.

It is anticipated that any heat pump installation at the renewable energy hub sites would meet the above criteria and therefore would not require planning permission. That said permission may be required for listed properties and in conservation areas (Aros, Dervaig), and engagement with the A&BC planning department is recommended.

5.3.2 Fossil Fuels

Fossil fuel installations would include oil and natural gas-based heating systems. These systems are permitted developments and engagement and consents are very unlikely to be required. The main situation planning permission could be necessary is where external oil storage is to be installed in a new location (i.e., not replacing an existing oil tank).

No fossil fuel options are recommended due to the low carbon focus of the study.

5.3.3 Biomass

As above, biomass systems are generally considered permitted developments and would not require planning permission. External buildings or structures for fuel (e.g., woodchip) storage may require planning permission depending on their siting, visibility, and scale.

No biomass heating systems have been recommended within this study.

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5.4 Energy Efficiency

5.4.1 Efficiency Improvements

Efficiency improvements refers to insulation, draught proofing, double glazing, and other forms of intervention which improve the thermal or electrical efficiency on the property. As actions are generally undertaken within a building, planning permission is largely not required and for external changes, is typically considered a permitted development right. External measures - such as external wall insulation or double glazing – may need planning permission in conservation areas or in relation to listed buildings.

This includes properties within conservation areas, where it is more likely you will need to make an application or adhere to certain conditions. Similarly, listed buildings typically need permission, including for internal alterations.

5.4.2 Energy Performance

The Scottish Government's Heat in Buildings Strategy (2021) sets out the national strategy and targets for reducing emissions from all buildings. In this strategy the Scottish Government proposes introducing energy efficiency regulations between 2023 to 2025 requiring all owner occupier homes to be energy efficiency, meeting an EPC band C equivalent where technically feasible and cost effective.

The Scottish Government are committed to introducing regulations to ensure properties in the private rented sector reach an EPC rating C from 2025 onwards where technically feasible and cost-effective, at change of tenancy, with a backstop of 2028 for all properties. No social housing should be let after 2025 if the energy efficiency rating is lower than EPC D. The Scottish Government is consulting on a new regulatory framework for non-domestic buildings to ensure they are net zero by 2045, with regulations to be introduced in 2025 (Scottish Government, 2023).

5.5 EV Charging

The Electric Vehicle Supply Equipment (EVSE) Code of Practice (EVSCP) sets out the technical and operational requirements for EVSE that connects to the electricity distribution network in Great Britain. The EVSCP is mandatory and aims to ensure that EV chargers are installed, operated, and maintained safely and efficiently.

From June 2022, all new EV chargers must feature smart functionality which includes:

- Smart functionality, including the ability to send and receive information, the ability to respond to signals to increase the rate or time at which electricity flows through the charge point, demand side response services and a user interface.
- Electricity supplier interoperability, allowing the charge point to retain smart functionality even if the owner switches electricity supplier.
- Continued charging even if the chargepoint ceases to be connected to a communications network.
- Safety provisions, preventing the user carrying out an operation which could risk the health or safety of a person.
- A measuring system, to measure or calculate the electricity imported or exported and the time the charging lasts, with visibility to the owner of this information.
- Security requirements consistent with the existing cyber security standard ETSI EN 303 645.

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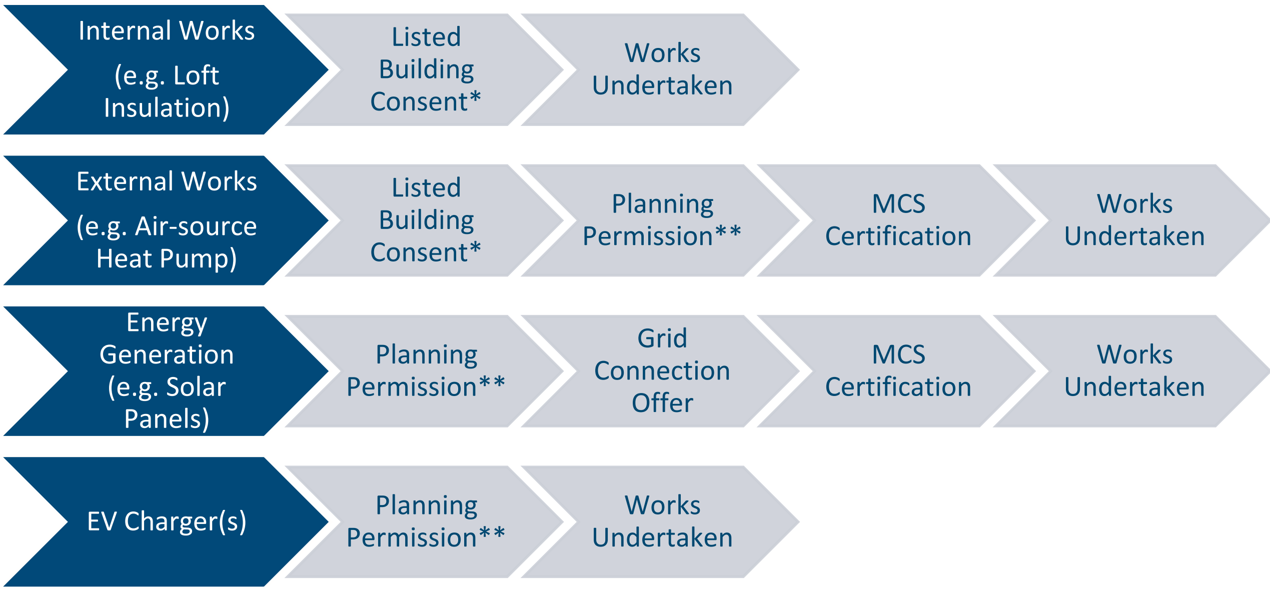
From 30th December 2022 Schedule 1 of the new charging regulations comes into effect and means that manufacturers must provide adequate security to protect users, including passwords, communications protection, cyberattack protection, security logging, tampering protection and logging, and software update functionality.

5.6 Key Performance Indicators

In relation to the renewable energy hubs, there are several recommended steps which should be undertaken, and performance indicators associated.



* For Grade A, B or C listed properties following engagement with Historic Scotland

** Where development is not a general permitted development right and / or is in a conservation area or is a listed property.

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5.7 EV Car Clubs

5.7.1 Operational models

There are several operational models commonly employed for community-led car clubs in the UK. These are grouped into three main categories: full community ownership and management, community ownership with external management, and external ownership and management.

The below table presents an overview of these commercial models alongside the benefits and drawbacks. Whilst the models have been presented as clearly delineated options, in reality the characteristics of clubs are dependent on the partners and may not fit neatly into one of these designations.

Table 5.1: Car Club Operation Models

Operation Model	Description	Benefits	Drawbacks	Examples
Community Ownership and Management				
Informal Car Club	Typically conducted on an ad hoc basis between individuals. A simple management structure, agreement of responsibilities and costs. Insurance covering named drivers across one or more vehicles.	Simple to set up and run. Does not involve much more work than goes with being an individual car owner.	Not feasible to be implemented at scale or across multiple Mull communities.	N/A
Independent Car Club	Run entirely by the community for the community's benefit. Requires full vehicle ownership and a management system. Operation conducted on trust-based system with logbooks (e.g., Moray Carshare) or more likely with online booking providers (e.g., SuperSaaS) and low-cost telematics for keyless car access (e.g., Instacar or Keysafe).	Full autonomy over pricing structures and operation. Increased demand from the community to use vehicles that are owned by the community.	Insurance can be expensive or unavailable, especially for fleets with fewer than 5 vehicles. Staff resourcing required for organisation and active management (whether volunteers or paid positions).	**Moray Carshare** **Trip To** (Mid-Wales car club)

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Operation Model	Description	Benefits	Drawbacks	Examples
Community Ownership, External Management				
Peer-to-peer car club	A brokerage service which allows car owners to rent their vehicle to people who need to borrow them. The owner supplies details of their vehicle and its availability to the club, which displays them on the central website. The club ensures drivers are insured and handles financial transactions.	A telematics unit can easily be installed in the owner's car enabling keyless unlocking for the user that has booked it using a phone app. The brokerage service handles all management, booking and insurance.	Demand can be stifled by the variable availability of cars, and reluctance to be sharing cars from a driveway or street. Lack of control over price-setting for car owner. High fees and deposits reduce demand.	**Strathaven Car Club** via Karshare. **St Andrews Car Club** with Hiyacar. Other platforms: Turo
National Operator Licence (Franchise)	Licensing a car club model from a national operator can reduce the burden of running a car club independently. Community-owned vehicles or clubs may be entered into the scheme with a monthly fee.	A high level of support is available, including advice, centralised support, access to promotional materials, online presence, and national network. Cars are often insured as part of the service, with access to booking systems.	Monthly fees can be prohibitive - reduced payback time for community owned vehicles. This can stifle demand.	**Car Bute** with Moorcar - car clubs co-operative. **Teviot Electric Car Club** with Hiyacar.
External Ownership and Management				
National Operation	A national operator owns the cars and runs all operations, including bookings, billings, and insurance. The community may assist with marketing and promotion.	Organisational and practical needs managed externally. Straightforward operation via apps.	Typically operate in high density areas. A financial subsidy from the community to the operator can be required.	**Enterprise Car Club** **Co Cars** **Co Wheels**

5.7.2 Partner Identification

The table below provides an overview of potential partner organisations, depending on the car club commercial model chosen. Partnering with a national operator as part of either external ownership, franchise, or peer-to-peer models means that only one partner is required for management, booking, telematics and insurance. If operating under a model with a higher degree of community control, partnership with telematics, booking and insurance firms would be required. More information on telematics and back-office systems for car clubs is provided by Collaborative Mobility UK (CoMoUK, 2023).

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Table 5.2: Partner Identification

Partner Type	Potential Partners
Information, Advice and Support	Collaborative Mobility UK (CoMoUK) – a national charity dedicated to the social, economic, and environmental benefits of shared transport. The Scottish Shared Transport Knowledge Centre – a portal gathering information on establishing transport schemes
Car Club Operators (Full ownership or franchise owner)	Enterprise Car Club Co Wheels HiyaCar Moorcar (a small co-operative for multiple car clubs) Non-national at present: ZipCar, Ubeeqo, Co Cars
Peer-to-peer car sharing platforms	Karshare Hiyacar Turo Getaround
Independent Telematics Support [8] (For keyless access or mileage tracking)	KeySafe TomTom Telematics Convadis AMV (partnered with Azowo)
Booking and Billing Support	Playmoove SuperSaas Quick Books Azowo Good Travel Software HireGo

[8] Care must be taken during system design that it accounts for the currently poor mobile and internet signal throughout much of the archipelago.

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5.7.3 Ownership and Governance Structures

Legal structures which are suitable for community-led car club operation in Scotland include:

Community Interest Company (CIC)
This relatively new legal form is simple to set up and requires annual reporting to both Companies House and the CIC register. It requires both a 'community interest statement' and an 'asset lock' charity (who will decide on disposal of assets if the company is wound up). For example, the national car club operator co-wheels are a CIC.

Co-operative Society (Co-op)
One of several types of 'mutual societies' co-ops are set up mainly for the benefit of its members under a democratic one-member, one-vote constitution. Co-operatives can take several forms but are owned and controlled by the members to suit their needs. Delineation of asset ownership and liability is critical if ownership of the low carbon resources is distributed between different actors.

Community Benefit Society (BenCom)
This is another form of "mutual society" and provides the ability for local ownership and membership of the club. The society is based on "model rules" but any modifications to these take time and cost money. The BenCom differs from a Co-op in that it is set up for the benefit of the wider community, rather than just members. It provides an overarching framework which can be subsided by separated community "clubs" who may have their own objectives and assets. It is regulated by the Financial Conduct Authority (FCA)

Company Limited by Guarantee (CLG)
This is a corporate body regulated by Companies House and is the easiest format to set up (can be as little as 2 weeks). It does not have any shares or shareholders and any profits are re-invested to fulfil the company objectives. The company is a distinct legal entity - owners have limited financial liability.

Companies Limited by Guarantee, BenComs and Co-ops can also be registered as a charity with associated tax benefits. Further information relating to car club governance, commercial structuring and operation is available from CoMoUK.

5.7.4 EV car club specifications

Car Clubs are increasingly using electric vehicles: 18% of vehicles used by car clubs in Scotland are electric, compared to general EV penetration of just 2% (CoMoUK, 2022). However, the upfront costs of EVs are more expensive than petrol vehicles. For example, the Renault Zoe ZE50 is a typical EV car club vehicle (used by Strathaven) and typically costs £29,000. Whereas the similar specification petrol Renault Clio typically costs £19,000. Yet, as laid out in section 7, there may be funding available specifically for the purchase of low carbon vehicles in a community club.

Car clubs work best where there are good public transport links and everyday journeys can be made by walking or cycling. Given the rural nature of Mull, limited bus schedules and preponderance for longer journeys, it may be hard for people to give up their car. However, in these cases car share opportunities can replace the need for a second car in households. EV car clubs are an accessible and reliable alternative to private EV ownership. It also serves as an opportunity for EV usage for those who would not be able to charge an EV at home.

The average community car club in Scotland has 14 members per vehicle, although CoMo recommends nearer 30 members per vehicle (CoMoUK, 2023). Car club demand and likely usage is

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highly dependent on the type of scheme chosen and population characteristics. However, the Car Club Annual Report for Scotland in 2021 (CoMoUK, 2022) details some key characteristics:

- 73% of car club members say the car club has saved them money.
- 17 private cars are replaced by each car club vehicle - 16% of members got rid of a car since joining the club.
- Although 81% of users were satisfied with driving electric car club vehicles, this falls to 62% satisfaction with charging at the end of hire and just 42% for mid-hire charging.
- Users are spread throughout the age and income spectrum.
- The most popular reason for joining a car club is “I don’t need a car often, so it fitted my lifestyle”. Saving money on motoring, avoiding the hassle of ownership, and reducing environmental impact are the secondary factors.
- Most members (70%) use a club less than 5 times over a year. There is a wide distribution in length of hire.

A successful EV car club may require access to 3 types of charging infrastructure, as set out in Table 5.3.

Table 5.3: Chargepoint Types and Uses

Chargepoint Type	Reason for Use
Dedicated charging bays for EV car club members at hub sites.	This is a requirement for “back to bay” car clubs, where vehicles are returned to such designated bays.
Fast or rapid chargepoint access at hubs or in the wider network.	This is a key consideration for car clubs given their more intensive charging needs, including in-trip charging by users. Rapid charging also reduces the turn-around time required between vehicle sessions.
“Destination” chargepoints.	Here, vehicles can be charged while they are at a destination of interest during the hire period.

The reliability of chargepoints and equipment is key, with faults, substandard operation, or unclear procedures affecting the popularity of the club. Any one-off faults or process errors can have knock-on effects to customers even after the instigating user incident if the EV has reduced charge or is situated in the wrong location.

Table 5.4 details the current thirteen (13) public chargepoint locations on the Mull archipelago, stating their charging speeds, current tariffs, and the distance from the nearest hub site. All chargepoints are operated by Chargeplace Scotland, and currently require access to the ChargePlace Scotland app or an RFID card. 9 of the chargepoints are within 1km of the proposed hub sites, and only one is greater than 5 km away (Treshnish).

According to Chargeplace Scotland data, only half of Mull’s chargepoints owned by ChargePlace Scotland were regularly used over the last 6 months (winter season 2022/23) (ChargePlace Scotland, 2023). The most popular is the Ledaig Car Park charger in Tobermory, the sole charger in Mull’s capital. It was used an average of 42 times per month with 750kW drawn per month. The

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multiple chargepoints in Craignure Car Park, Isle of Mull Hotel and Fionnphort charging devices each had an average of 16 - 20 charging sessions per month.

Table 5.4: Chargepoint Locations and specifications on Mull (Zap Map, 2023)

Chargepoint Device	Area	Connector power ratings	Nearest Hub	Distance to nearest hub (km)	Charging Price (£/kWh)	£ per mile	Price to fully charge
Regularly used ChargePlace Scotland devices							
Ledaig Car Park	Tobermory	1x43kW 2x50kW	Aros	0.3	£0.26	£0.07	£13.52
Isle of Mull Hotel and Spa	Craignure	2x22kW	Craignure	1.4	£0.00	£0.00	£0.00
Craignure Car Park 1	Craignure	2x22kW	Craignure	0.5	£0.26	£0.07	£13.52
Craignure Car Park 2	Craignure	2x25kW 1x43kW	Craignure	0.5	£0.26	£0.07	£13.52
Craignure Car Park 3	Craignure	2x22kW	Craignure	0.5	£0.25	£0.07	£13.00
Craignure Car Park 4	Craignure	1x43kW 2x50kW	Craignure	0.5	£0.25	£0.07	£13.00
The Columba Centre	Fionnphort	1x22kW, 2x50kW	Creich	1.8	£0.25	£0.07	£13.00
Other available devices (according to Zap Map)							
Am Birlinn	Dervaig	2x22kW	Dervaig	3.8	£0.20	£0.05	£10.40
Treshnish Point	Treshnish	2x11kW	Dervaig	12.5	£0.37	£0.10	£19.24
Devices with unknown status (according to Zap Map)							
Glenforsa Hotel Mull	Glenforsa	7kW	Salen	2.4	Unknown current status		
MICT Craignure	Craignure	1x7kW	Craignure	0.5	£0.15	£0.04	£7.80
MICT Bunessan 1	Bunessan	1x3kW	Bunessan	0.6	£0.15	£0.04	£7.80
MICT Bunessan 2	Bunessan	1x7kW	Bunessan	0.6	£0.15	£0.04	£7.80

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Pricing and Costs

As detailed in table 5.4 most chargepoints on Mull cost £0.15 - £0.26/kWh, and prices increase in line with charging speed. A typical 25p/kWh chargepoint will fully charge a typical EV car club vehicle at a cost of £13, or 7p/mile. This compares favourably with 15p/mile for petrol (if petrol is 150p/L and an average efficiency petrol car). The current electricity price cap is £0.34/kWh placing the cost above that of chargepoints. This translates to a cost of 9p/mile, still well below ICE cars. However, long-term electricity prices are expected to fall, and averaged £0.21/kWh in 2021 and were half of current levels ten years ago (NimbleFins, 2023).

If the electric cars in the club are charged (whether partially or fully) using stored or excess renewable generation from the community halls, then the cost is dependent on the relationship between the car club and hub generator. As a reference, the Smart Export Guarantee rate with Octopus Energy for excess distributed renewable generation is currently £0.15/kWh - this is the opportunity cost for using self-generated renewable energy generated charging.

There are 3 main sources of income for a community car club: membership fees, mileage usage rates and hourly usage rates. Typical rates for a range of operators in Scotland are presented below (table 5.5).

Membership fees typically make up a small percentage of overall income as most people don't use a car club frequently enough to warrant a high joining fee. With an average 14 members per car, even a £60 membership fee only contributes £840 per year. However, Moray Carshare operates a different model, with typical membership fees over a year for 14 members totalling £4,620. This is well suited to their high utilisation rate and close-knit, non-car owning membership.

The **mileage rate** covers the cost of fuel and vehicle maintenance. Electric car clubs may be able to charge a lower mileage rate than petrol cars thanks to cheaper fuel costs. Indeed, Enterprise Car club and co-wheels charge a 46 - 48% cheaper rate for EVs. A 15 p/mile rate would bring an annual income of £352 given typical car usage. A high rate such as the £0.35/mile charged by the Trip To EV community club would produce £3,080 annual income.

The **hourly rate** provides the majority of car club income. Given the Scottish average utilisation rate of 14% (almost four hours per day), a £4.50 hourly rate would provide an annual income of £5,500. Community Clubs who follow the fully independent ownership model typically charge very low rates here. The Moray Car Club charges just £1.70/hr on its "contract" plan. In contrast, the Strathaven community car club hosted on the Karshare platform charges £9 - 11/hr.

For community clubs, the combination of membership, hourly and mileage income is highly variable, with tariffs dependent on the operating model and producing a sustainable business model to recoup any investment and operational costs. For community EV clubs that choose to operate independently insurance can be one of the largest costs that is faced, as is finding insurers willing to insure EV club vehicles.

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Table 5.5: Car Club Tarif Structures

Car club	Operating Model	Membership Fee	Hourly Rate (£/hr)	Mileage Rate (£/mile)
Enterprise Car Club Standard (Glasgow)	National Operator	£20 per year	£7.95	£0.27
Enterprise Car Club EV (Glasgow)	National Operator	£20 per year	£7.70	£0.14
Co-wheels Everyday (Standard package)	National Operator	£25 per year	£5.95	£0.22
Co-wheels EV (Standard package)	National Operator	£25 per year	£4.46	£0.12
Zipcar (Smart - London)	National Operator	£6 per month	£7.00	60 miles free then £0.29
Strathaven Car Club	Peer to Peer	£0	£9-11	150 miles per day free
Teviot Electric Car Club	Franchise	£27.50 per year	£3.60 + insurance	150 miles per day free
Car Bute	Franchise	£60 per year	£3.50	£0.21
Moray Car Share EV ("Contract" Plan)	Independent Community Club	£27.50 per month	£1.70	£0.276 for first 20 miles, then £0.192
Trip To Car Club EV ("Light user tariff)	Independent Community Club	£3 per month	£1.50 per hour	£0.35/mile

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5.7.5 Case Studies and Precedents

This section provides a selection of relevant case studies which have been selected as tailored examples of how similar communities have implemented car clubs. Hence, they can provide a tangible example of how a car club can function, its role in the community, and the club characteristics. These also illustrate the breadth of operational model that car clubs can use.

1) Collaborative Mobility UK (CoMoUK)

Collaborative Mobility UK is a national charity which works together with community groups, public and private sector to promote and enable shared transport and sustainability. Numerous resources are available which provide practical advice and information regarding energy clubs. This includes the Scotland's 2021 Car Club Annual Report (CoMoUK, 2022), an overview of shared car systems including a catalogue of existing schemes and advice on how to run a scheme (CoMoUK, 2023), and specific advice tailored to community car clubs, including on telematics and marketing (CoMoUK, 2023). The Scottish Shared Transport Knowledge Centre (SSTKC, 2023) acts as a portal for local authorities, developers or communities to access information and tools. A funding list for community projects is regularly updated (SSTKC, 2023). CoMoUK also offers accreditation for car club operators to ease the process in dealing with authorities, and membership opportunities. They provide a community car and bike share event every 3 months.

2) Strathaven Car Club

Climate Action Strathaven is a charitable company set up by climate-conscious residents of Strathaven, an historic market town in South Lanarkshire. Strathaven owns the electric vehicle, a Renault Zoe ZE50, thanks to a £23,000 grant from the Scottish Government's Community Climate Asset Fund (currently closed). They partner with peer-to-peer platform Karshare UK. The other two vehicles that make up the club are petrol vehicles owned by residents who earn up to £550 per month by renting out their cars to fellow residents – keyless technology streamlines the rental process, and all operation is managed by Karshare. There is no membership fee but hourly charging ranges from £30 for one hour, £11 per hour for four hours, £9 per hour for 6 hours or £52 per day. The community has seen demand fall due to increased insurance and service fees charged by Karshare. For example, four-hour rental costs £20, but after Karshare insurance and service fees this increases to £46. Demand has also fallen due to a deposit of as much as £500 for an electric vehicle user.

The Strathaven car club sits as part of a unified low carbon vision. Climate Action Strathaven hosts an Eco Hub Desk at the local post office which acts as the base for eBike hire – there is a fleet of eBikes available for the community thanks to Energy Saving Trust eBike grant funding. This hub also provides a community space where residents can ask questions about more general decarbonisation matters. Strathaven's eCargo bike delivery service delivers goods from local businesses to customers, strengthening links to local businesses at the same time as reducing road emissions. They have also delivered a community bus service and community fridge. (CAS, 2023)

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3) Car Bute

Car Bute is a community operated car club with one car accessible to all local residents and tourists. It is a local organisation that operates under the wider framework of Fyne Futures. It also operates an eBike hire service. The club is partnered with Moorcar as the service provider, a co-operative of 10 car clubs which provides the overarching online booking service and group insurance. Each club sets its own prices and so this partnership offers a good degree of community control but with the booking and telematics expertise of the Moorcar service.

CarBute has a £60 annual membership fee (or £20 as a 4-week member) and a £50 returnable deposit. The club charges £0.21 per mile and £3.50 per hour or £35 per day. (Car Bute, 2023) (Moorcar, 2023)

4) Moray Car Share

Moray Car Share is the largest independent community car club in the UK, with 14 cars, 10 ebikes, a trailer and camper van across Morayshire. It is Scottish Charitable Incorporated Organisation and is owned by its over 300 members. The Moray fleet recently added 2 Renault Zoe EVs, which have proved extremely popular and travel more miles than most of their petrol cars.

Independent car clubs such as Moray need to develop online booking provision, telematics and provide insurance which takes resources – the car share hires 3 staff. The car share has multiple pricing plans depending on vehicle usage. The “Contract” Price Plan charges £27.50 per month with £1.50 per hour and mileage charges. The “Pay as you GO” price plan charges £31 per year with a £3.70 hourly rate. (Moray Carshare, 2023).

5) Teviot Electric Car Club

The Teviot Electric Car Club is fully mutual co-operative society in Hawick with two electric vehicles, a BMW i3 and Nissan Leaf. It operates through the Hiyacar platform, which as the franchise holder handles booking, telematics, and insurance. Membership costs £27.50 and gives full voting rights in the co-operative. Thereafter, a hire rate is available from HiyaCar of £3.60 per hour plus insurance

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6) Mull and Iona Lift Share

Since 2015 this self-run Facebook group has used a Teamup online shared group calendar to offer, request and arrange shared journeys. The Facebook group membership, currently standing at 721, is an impressive 23% of the archipelago population. Average use has dropped off since the peak of 50 lifts offered per month and 14,622km in shared journeys. However, the scheme is indicative of the underlying demand for car sharing and vehicle access on the Mull archipelago. The scheme was most popular with women, the under 35s and Tobermory residents. (CoMoUK, 2023) (facebook, 2023)

7) TripTo (Mid-Wales Electric Car Clubs)

TripTo is the trading name of a non-profit company limited by guarantee. It brings together 4 neighbouring clubs in Mid-Wales with an electric car each, a Renault Zoe. Booking is self-organised via a shared online calendar tool, TeamUp. Members book a slot for a specific car and location and can easily see availability, with usage tracked by the group. There are three membership tariffs costing £0, £3 or £10 per month with hourly rate ranging from £1 to £1.50 per hour and 25p to 35p per mile. For journeys of 150 miles or less the cost of charging is included in the price and can be charged for free using a TripTo prepaid swipe card. The car is returned to its base location (as is the case with most car clubs) but agreement with a local organiser may permit return to another base location.

Where a car is not available members book for a “phantom” car. This notes interest and may lead to an additional vehicle being procured or allows you to use the car if the existing booking is cancelled or changed. The TeamUp App easily allows management of bookings on the go or online and disallows overlapping events. A unique calendar link is created for each member and can be deleted when a member leaves the club. (TripTo, 2023).

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6 Economic-financial analysis and KPIs

This section provides a financial appraisal of the preferred solution of a 7 hub EV car club, operating on a “back to bay” operating procedure. Based on the chosen pricing structure (Section 6.2) the project has marginal financial viability.

Financial analysis for the installation of rooftop solar PV, battery storage and energy efficiency measures at each of the hub sites is included in Appendix B.

6.1 Financial Results

The financial viability of the project over a 20-year project timeframe is presented in Table 6.1. Based on the proposed tariffing structure and assessment of demand and costs, an internal rate of return (IRR) is 2.0% is achievable. This is suitable for a community-owned project which is not prioritising profit generation, rather aiming to deliver an economically and socially impactful project, and which is anticipated to utilise non-commercial lending, i.e., grant or preferred lending rates from governmental sources (Section 7.2). The project breaks even from year 18.

Table 6.1: KPIs: Financial Results

Variable	Value	Notes
Capital Costs (CAPEX) (Year 0)	£240,400	Seven Renault Zoe Cars, seven 22kW double-connector changepoints and installation, and club system implementation.
Replacement Cost (REPEX) (Year 10)	£120,200	All capital replaced at year 10 with 50% resale value recouped.
OPEX (yearly)	£67,300	Includes electricity usage, Insurance, Administration, Service & Maintenance, Booking/Telematics/Billing System, Contingency
Revenue (yearly)	£84,700	Revenue from membership, mileage and usage fees.
Earnings before Interest and Taxes (EBIT) (yearly)	£17,400	Pre-financing net income.
Internal Rate of Return (IRR)	2.0%	
Breakeven Year	Year 18	
Net Present Value (NPV)	£50,178	Value after all expenditures, financing and revenue over the 20-year project lifetime, nominal terms, using a 0% discount rate. (Cost of finance is included and project is anticipated to be non-commercial in scope.)

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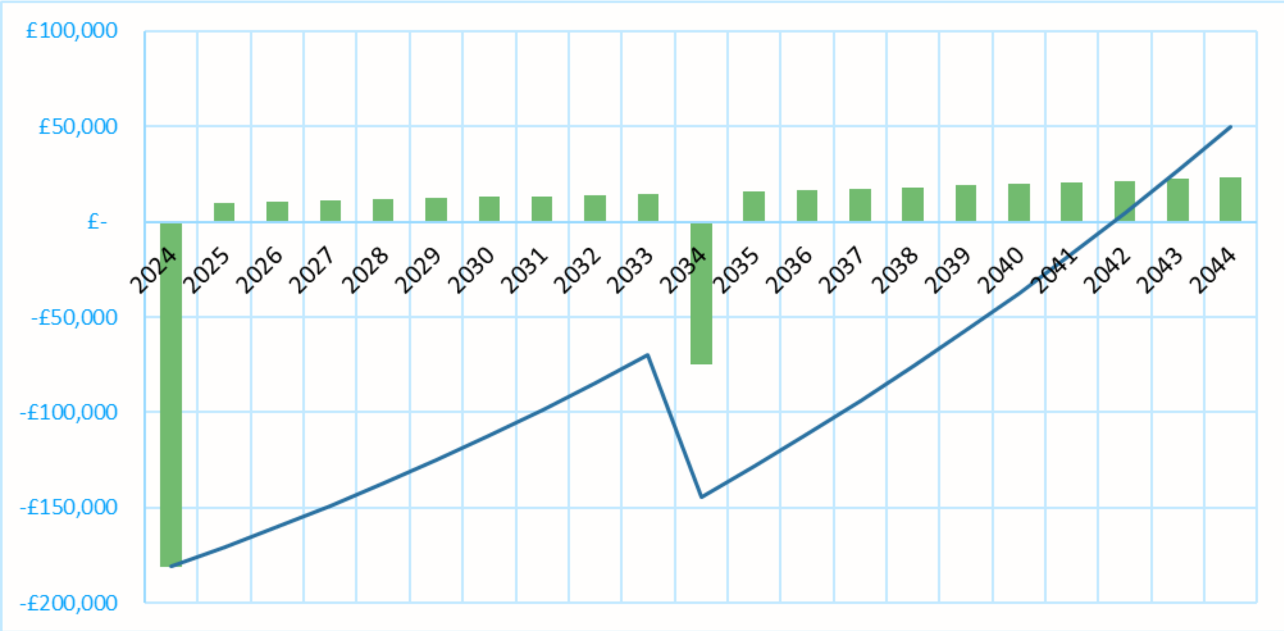

Figure 6.1: Net income flows and cumulative net income over project lifetime

The proposed fee structure is below. A relatively high membership fee of £120 per year (or £10/month) ensures that residents' usage is prioritised over tourists and promotes car availability – these were key themes brought up in the survey (see 4.4). This also provides a guaranteed income to be banked for project management purposes and some balance in the revenue accrued across the three fees. The mileage fee of £0.25 / mile is sufficient to cover electricity costs (£0.08 / mile) and service & maintenance (equivalent to £0.10 / mile) whilst not too high to unfairly penalise long rural journeys. The usage fee of £3.95 / hour is substantially lower than national operators (e.g., Enterprise Glasgow EV - £7.70) but is high enough to ensure financial viability and incentivise car availability.

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Table 6.2: Proposed fees structure and associated yearly revenues.

Fees	Price	Total Revenue (yearly)
Membership Fee	£120 / year	£3,600
Mileage Fee	£0.25 / mile	£3,650
Usage Fee	£3.95 / hour	£4,850

6.2 Project Assumptions and Sensitivity

This subsection outlines the assumptions behind the financial results of 6.1, alongside a sensitivity analysis of what any changes to these assumptions would be for overall project viability.

Table 6.3 outlines our usage assumptions. We expect a car club vehicle to cover 14,600 miles per year, slightly above the average UK car. This is spread across 30 members per vehicle, which is an achievable aim and that which is set by CoMoUK, although the Scottish average is 14 (CoMoUK, 2023). Keeping all else equal, only 14 members per vehicle would reduce overall yearly revenue by 16%, necessitating reciprocal price increases. 14% is the optimal car utilisation rate (or 3.4 hours / day) (CoMoUK, 2023). A drop to 10% utilisation alongside a corresponding drop in distances travelled would decrease revenue by 20%, whilst an increase could lead to poor car availability.

Table 6.3: KPIs: Car club usage assumptions

Variable	Value	Notes - club operation
Members per vehicle	30	This is the participation level recommended by CoMoUK (CoMoUK, 2023).
Car usage	3.4 hours/day	Equivalent to 14% utilisation rate, the Scottish car club average (CoMoUK, 2023).
Distance travelled per day	40	Expected to be higher than the Scottish car club average of 29 miles / day due to large distances between main towns (CoMoUK, 2023).

Table 6.4 presents alternative fee structures which would maintain the same revenue as our presented preferred solution, given the underlying usage assumptions. This permits a comparison between which fees solution may work best for the community. Reducing the mileage fee to the minimum required to cover electricity and maintenance/servicing costs (£0.18/mile) requires a £4.80 / hour rate to compensate the revenue. A high membership fee of £240 / year would also enable this minimum mileage but alongside hourly fees of just £1.85 per hour. Lower membership fees, such as £20 / year, would encourage more occasional users and tourists, but come at the cost of the regulars, with substantially higher usage fees, at £6.40 per hour.

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Table 6.4: Alternative Fee Structures

	Proposed Fee Structure	Minimum Mileage Fee	High Membership Fee	Low Membership Fee	Very Low Membership Fee
Membership Fee	£120 / year	£120 / year	£240 / year	£60 / year	£20 / year
Mileage Fee	£0.25 / mile	£0.18 / mile	£0.18 / mile	£0.25 / mile	£0.25 / mile
Usage Fee	£3.95 / hour	£4.80 / hour	£1.85 / hour	£5.50 / hour	£6.40 / hour
Total Revenue	£85,000	£85,000	£85,000	£85,000	£85,000

Sensitivity Analysis
A specific opportunity to lower capital costs would be purchase of second-hand vehicles or securing a bulk purchase discount. This could provide a 33% reduction in upfront vehicle costs (£20,000 per vehicle), increasing IRR to 8.9% or enabling a 6% reduction in all user fees.

CAPEX and OPEX estimations have been made in line with CoMoUK guidance (CoMoUK, 2023), and assume a franchise operating model using telematics. For example, a car club operating as part of the MoorCar co-operative, which handles booking and billing systems. A more independent operating model was also modelled, which would reduce CAPEX by 4% via reduced system implementation costs and OPEX by 5%, via reductions in booking & billing costs but increased insurance and administration costs. Overall, these cost reductions would increase the IRR to 6%, albeit under a high degree of uncertainty and a greater level of liability and risk attributed to the community entity. For all capital replacement costs (REPEX) to take place in year 10, a small additional loan would likely be required. An increase in usage fees by 2% would ensure that no further loans are required. Usage fees are optimally set after knowledge of the capital costs incurred (and grant and loan terms)

We have assumed that 100% of electricity is sourced from the grid, rather than hall self-generation. However, if 50% of electricity was self-produced this would increase the IRR from 2.0% to 6.2%, reducing OPEX by 6%. However, this amount of self-generated electricity usage being used for 22kW chargepoints would require high power output (and thus expensive) battery storage.

Reducing the number of hub sites, for example from 7 to 3, reduces the IRR to -5.2%, requiring a 22% increase in user fees to reach a positive IRR. This is due to the assumed economies of scale gained from operating across multiple vehicles. Alternatively, the impact could also be fully offset by an increase in the assumed grant funding level as a share or the total capital costs, from 20% to a required 49%.

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Table 6.5: Costs Variables and Assumptions

Variable	Value	Notes
CAPEX	£240,400	7 x £30,000 for new Renault Zoe ZE50 vehicles. 7 x £2,500 for 22kW chargepoints, plus installation costs. 7x £1,700 + £1,000 fixed for system implementation for telematics, branding and booking/billing systems.
OPEX	£67,400	Electricity usage - £8,200 Insurance - £14,000 Administration - £14,500 Service & Maintenance -£10,500 Booking/Telematics/Billing System - £14,000 Contingency - 10%
Operating Model	Franchise with Telematics	CAPEX and OPEX estimated assuming a franchise operating model with the system including telematics, such as being part of Moorcar.
Electricity Usage per car	3,900 kWh	Based on car efficiency of 0.267 kWh / mile.
Electricity cost	£0.30/kWh	Current Price Cap level, July-September 2023.
Grid Electricity Usage	100%	All electricity is sourced from the national grid.
Hub sites	7	All seven community halls are hub sites.

We have assumed a favourable financing landscape, with these variables summarised in table 6.6. This includes 20% grant support for electric vehicle purchase and 89% grant rate for chargepoint implementation. No grant funding is available for solar PV implementation, although 0% finance may be available via the Scottish Government SME Loan Scheme.

The assumed interest rate for financing makes a larger impact, an increase from the assumed 4% to 6% would reduce IRR to -0.9%. We have assumed that the project can access a preferred lending rate of 4% with Argyll & Bute Council, thanks to the social impact of the project which fulfils the council's objectives of increased chargepoints and EV usage and accessibility for rural communities.

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Table 6.6: Financial variables

Variable	Value	Notes
Grants for vehicles	20% of vehicle CAPEX	Grant funding covers 20% of vehicle CAPEX, equivalent to £42,000.
Grants for chargepoints	89% of chargepoint CAPEX	Grant funding covers 89% of chargepoint CAPEX thanks to the 75% business chargepoint funding scheme and £350 OZEV grant.
Financing interest rate	4%	Preferred lending rate via council-backed loans. Fixed rate.
Tax	0%	Assuming a non-taxable governance structure.
Inflation	3%	Applied to both membership fees and OPEX.
Discount Rate	0%	Cost of finance is included, and project is anticipated to be non-commercial in scope.

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6.3 Individual User Costs

An assessment of EV car club costs to the users in comparison to ownership of a typical internal combustion engine (ICE) vehicle is produced in table 6.7. It demonstrates that although individual trip costs are higher for car club users, annual costs are significantly lower. For the average car club member (with a usage of 497 miles per year) using a car club vehicle instead of a private vehicle for these journeys saves £3,380 per year. This remains true up to an annual mileage of 8,500 miles.

Table 6.7: Car club costs to users

Cost Category	Average car club member usage (497 miles)		2,500 miles / year		5,000 miles / year	
	Car Club	ICE Vehicle	Car Club	ICE Vehicle	Car Club	ICE Vehicle
Upfront costs[9]	£0	£2,667	£0	£2,667	£0	£2,667
Annual costs[10]	£120	£1,040	£120	£1,040	£120	£1,040
Usage costs[11]	£284	£78	£1,457	£400	£2,914	£800
Yearly Cost	£404	£3,785	£1,577	£4,107	£3,034	£4,507
Car club saving	**£3,381**		**£2,530**		**£1,473**	

6.4 Carbon Savings

The total carbon savings of the project, given the variables and assumptions used, is calculated as 28 tonnes CO_2e per year, or 552 tonnes CO_2e over the 20-year project lifetime. If 50% of chargepoint usage was powered by self-produced renewable energy, carbon savings would increase by only a further 1.9%, or 10 tonnes CO_2e over the project lifetime.

This is assuming that the journeys taken by car club vehicles would otherwise have been done with an ICE vehicle. It assumes an average grid carbon intensity of 0.04 tonnes/MWh, which is the expected 20-year average forecast by National Grid as part of their future energy scenario forecasts (National Grid, 2023). The carbon intensity of a petrol vehicle is assumed as 0.017 tonnes CO_2e/km (BEIS, 2023).

[9] ICE upfront costs are based on a £8,000 purchase paid over a three-year lease period.
[10] ICE annual costs include insurance, car tax, MOT and breakdown cover. Car club annual costs are the membership fee.
[11] ICE usage costs include the price of petrol at 16p/mile. Car club usage costs include the mileage and hourly fees.

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7 Existing financial opportunities

7.1 Funding Opportunities

Obtaining funding is critical for the delivery of a financial viability project. Table 7.1 provides an overview of available and relevant funding streams which may support the development of an EV car club. This includes several opportunities for grants for EV vehicles and chargepoints.

The Scottish Shared Transport Knowledge Centre (SSTKC, 2023) keep an up-to-date list of available funding sources for communities, although some will not be relevant for an EV car club on Mull.

Table 7.2 outlines funding sources for community solar PV on community halls. Some funding schemes may be suitable for use either for EV or solar PV.

7.1.1 EV and Chargepoint Funding

Table 7.1 provides an overview of key funding streams for EV and EV charger deployment in Scotland.

Table 7.1: Available funding for community EVs and chargepoints

Grant Fund	Amount	Deadline	Area	Description
Grant funding for community EVs and chargepoints				
The National Lottery - Community Led	£10k-150k	Ongoing	UK	Supports community organisations with a social purpose to improve the places in which they live and the wellbeing of those most in need. Funding is available for people-led, connected and strengths-based projects. (TNL, 2023)
The National Lottery – Awards for all Scotland	£300-£10k	Ongoing	Scotland	Available to community organisations which bring communities together, improve local places and spaces, or help people reach their potential. (TNL, 2023)
People's Postcode Lottery	£500-£25k	Monthly	Scotland	Available for community developments, health, and sustainability purposes. (PPT, 2023)
The Workplace Charging Scheme	75% or £350 per device	Ongoing	UK	A voucher-based scheme that supports 75% (or £350 cap) of upfront cost for every chargepoint device, including for charities or public sector. (OZEV, 2022)

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Grant Fund	Amount	Deadline	Area	Description
Business Chargepoint Funding Scheme	Up to 75% grant	Closed until 23/24	Scotland	Available for third sector organisations or rural businesses.
EV Infrastructure grant	75% or £350 per device and £500 per parking space	Ongoing	UK	Available for SMEs or charities and supports the cost of installing chargepoints, including enabling parking spaces. (OZEV, 2023)
eBike Grant	£25k-£200k	Closed until 23/24	Scotland	Community groups can apply for Transport Scotland grant funding to adopt eBikes, etrikes, and eCargo bikes. This is either for projects that enable people to trial eBikes or for large-scale fleets of pool bikes or public bikeshare/hire schemes. (EST, 2023)
Robertson Trust - Community Vehicle Grants	£1k-10k	Ongoing	Scotland	Available for registered charities with annual income over £25,000 (Robertson Trust, 2023)
On-Street Residential Chargepoint Scheme (for local authorities)		Closed until 23/24	UK	This is for local authorities towards the cost of installing on-street residential electric car chargers. This is great for people who do not have off street parking. The scheme is run by the Energy Saving Trust for OZEV, with an allocated budget available a first-come, first served, basis. This funding requires partnership with the local authority to implement.
Loan Funding for Communities				
Used Electric Vehicle Loan - Energy Saving Trust	Up to £30k	Ongoing	Scotland	Interest-free financing for Scottish residents for EVs
eBike Loan	£6k for two	Ongoing	Scotland	An interest-free loan for eBikes

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7.1.2 Renewable Energy Funding

Table 7.2 provides an overview of key funding streams for community-led energy development in Scotland.

Table 7.2: Available Funding for community hall solar PV

Funding	Amount	Deadline	Area	Description
Funding for community energy development				
CARES Community Building Fund (Grant)	Up to £80k (max 80%)	Ongoing until 2025	Scotland	This supports communities to engage with, participate in and benefit from the energy transition to net zero emissions and helps community organisations reduce their building energy costs and greenhouse gas emissions. Grants are available for installation of renewable technologies such as PV. Funding is available for many types of self-managed community buildings, including village halls. Applicants must be constituted non-profit distributing community organisations that are established and operating across a geographically defined community. (LES, 2023)
Scottish SME Loan Scheme	Up to £100k loan	Ongoing	Scotland	Interest-free loans of up to £100k are available for energy and carbon-saving upgrades for businesses or non-profit organisations. Upgrades may be for heating and ventilation, renewable heat technologies, improved insulation, LED lighting, or solar panels. A cashback grant of 75% of eligible costs can be claimed for energy efficiency or renewables measures. A Business Energy Scotland Assessment is typically the gateway to accessing funding. (BES, 2023)
Energy Industry Voluntary Redress Scheme (Grant)	Min. £20k	Phase 3 Jan 2023	UK	This scheme is funded by energy companies who have breached Ofgem Rules. Registered charities, community interest companies, co-operative societies and community benefit societies can apply for funds to deliver energy related projects that help those most at risk from cold homes and high energy bills. The grant can fund 100% of the project cost to cover both capital and revenue measures. It is often undersubscribed. (EST, 2023)

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Funding	Amount	Deadline	Area	Description
Community Financing	Variable		UK	Community financing has had success in the UK using community share offers and bond offers to raise finance. This can be a low-cost source of finance which may attract environmentally and socially aware investors (see below for more detail).
VAT	5%		UK	To support households against rising inflation and energy prices, in April 2022 the UK government scrapped the previous 5% VAT tariff on energy-saving measures, which includes solar panels. In March 2027, this period will finish and a VAT rate of 5% will return.
Smart Export Guarantee (SEG)	15p/kWh from Octopus		UK energy retailers	In January 2020, the UK Government replaced the Feed-in Tariff (FiT) with the Smart Export Guarantee (SEG), under which energy companies offer competitive tariffs for exported renewable energy to the grid.

7.1.3 Community Financing

A community share or bond raise may be a viable way to raise finance for community-owned energy projects. Share and bond offers have been used frequently throughout the UK community energy sector over the last decade, financing all types of low carbon energy infrastructure. This includes community projects such as the Garmony Hydropower project on Mull.

A share issue is an offer for shares by a company or an industrial and provident society (IPS) (i.e., Cooperative). Bond issues or loan stock issues (the terms are interchangeable) are offers to several people to lend money to an organisation on similar terms for several years. It is long-term debt capital.

Several organisations in the UK support share and bond offers from community organisations, including Co-operatives UK, Ethex, Sharenergy, and Resonance. Share and bond offers can be time-consuming tasks due to the level of advertising, engagement, and administration required to successfully raise the required level of finance. It is highly recommended that if MICT choose this option they work with a recognised expert partner for any share or bond offer issue.
It is important to understand investor motivations when it comes to community shares, enabling the issuing organisation to clearly state the benefits of their proposed project in a way that captures investor attention and, in turn, secures investment. Co-operatives UK (2020) details investor rationales, demonstrating that financial performance and returns, whilst important, are not the most critical underpinning factor in most community share raises. Figure 7.1 displays that

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the most important reason for investing in community shares is the opportunity for wider social or environmental benefits.

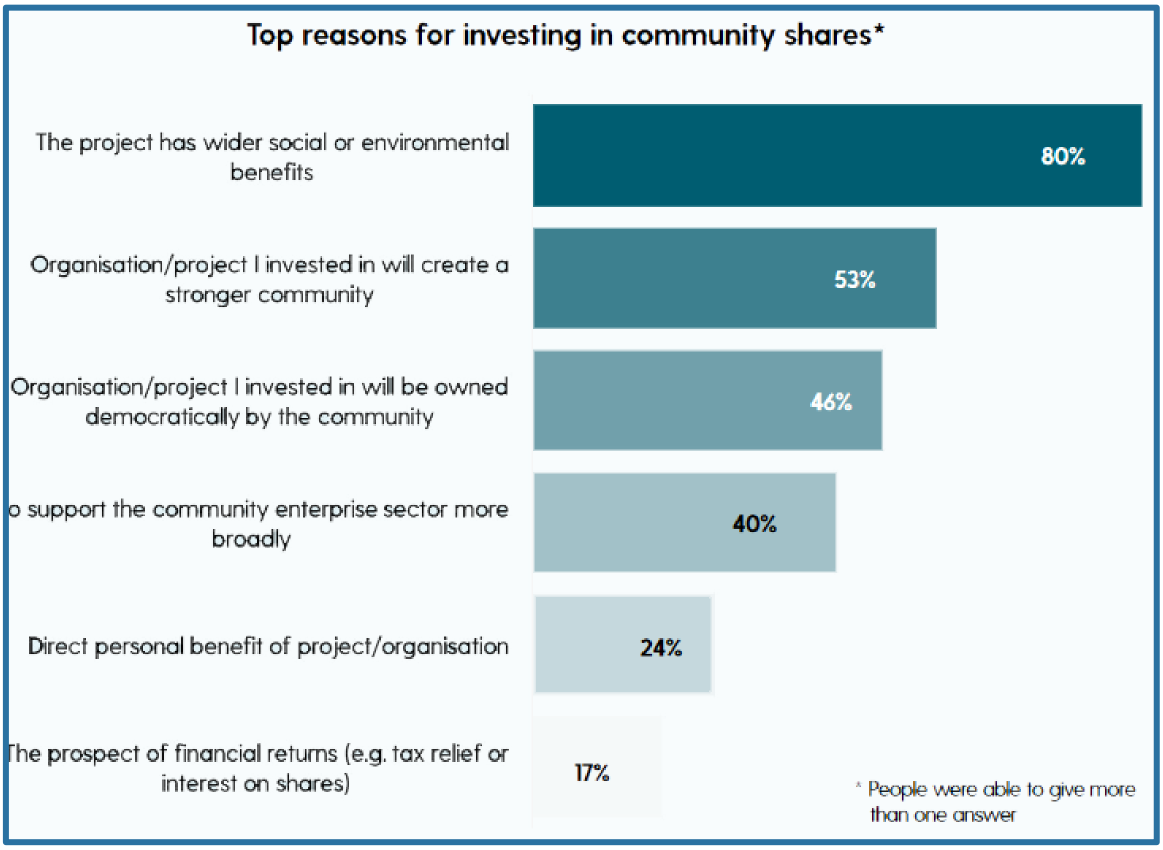

Figure 7.1: Reasons for community share investment (Co operatives UK, 2020)

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8 Implementation guidelines

This section provides an implementation roadmap for the AMAZE EV car club and renewable energy hub project. This includes a summary of the activities and actions required for successful implementation, the outcomes which successful implementation may be judged, the timescale for delivery, and general guidelines.

All implementation actions have been previously detailed, so in this section they are summarised alongside a links to additional detail in the report. The guidelines are split into two tables, one regarding setting up the car club and one for infrastructure at the renewable energy hub sites.

Table 8.1: Implementation Guidelines 1: Car club

Implementation Activity	Actions	Outcome	Timescale	Guidelines
Governance Structure	1. Confirm governance structure. 2. Register as a legal entity (as required)	Governance structure in place	< 6 months	Required to begin car club activities. Possible legal structures include: CIC, Co-op, BenCom, CLG (See 5.2.3)
Operating Model	1. Confirm operational model to fit the aims and resources of the club.	Operational model confirmed	< 6 months	There is typically a trade-off between community control and ease of use. Flexibility required to adapt to the financial landscape and conditions of project partners (see 5.2.1).
Council Involvement	1. Discuss partnership options. 2. Put forward business case. 3. Secure project finance (as required)	Council supports the project.	6 months - 1 year	See section 6 for financial viability. A preferred lending rate of 4% is pivotal for overall project viability. Otherwise, commercial lending requires enhanced IRR.

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Implementation Activity	Actions	Outcome	Timescale	Guidelines
Other Financing	1. Apply for grant funding for vehicle purchase. 2. Seek commercial lending opportunities.	Finance secured for car club vehicle purchase.	0.5 - 1 year	An overview of available grant and interest-free loan support is provided in section 7, and in more detail in CETA reporting.
Project Partners	1. Secure partnerships covering: • Car club operation. • Franchise Partnership. • Booking System. • Telematics. • Financing (see above). • Insurance. • Sponsorship and branding. • Vehicle Maintenance. • Vehicle Cleaning. • Existing Community Transport Organisations	Partnerships secured.	0.5 - 2 years	This is a vital process in establishing the framework for the car club to be successful. Some other car clubs have found this a tricky process, with insurance for EV car club vehicles a stumbling block. Compromise on the pricing structure or ownership model may be required. See 5.2.2 for partner identification.
Hub sites	1. Liaise with community hall owners and stakeholders. 2. Confirm number and location of hub sites (and vehicles).	Car club hub sites confirmed.	0.5 - 2 years	Hub sites determined based on section 4 technical analysis on locational suitability and generation capability.

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Implementation Activity	Actions	Outcome	Timescale	Guidelines
Vehicles	1. Purchase club vehicles. 2. Brand vehicles with scheme logo and sponsorship.	Car Club EVs purchased and made ready for scheme start.	1 - 2 years	Decision should be based on the community's overarching requirements of the vehicle, availability and price. Seek bulk purchase discounts or consider the second-hand market.
Club Characteristics	1. Define club procedural characteristics, including: • Pricing structure. • Usage format ("Back to Bay" or "Flexible"). • Charging procedure • Booking procedure • Restrictions • Hub to Home journeys	Operating procedures in place.	1 - 2 years	Pricing structure must maintain the balance between being low enough to incentivise use but also generate enough revenue to be financially viable. (See section 6). "Flexible to any bay" usage may be optimal for users but is logistically more challenging, requiring staffing for vehicle transfers and multiple bays at hub sites.
Employ Staff	1. Employ car club staff to handle day to day running.	Staff employed.	1 - 2 years	Role and scope dependent on operational model and procedures chosen. Staff costs must be factored into pricing structure.
Marketing	1. Commence marketing activities for car club launch.	Marketing Campaign launched.	1 - 2 years	Mixture of advertising forms required to reach all ages. Host a kick-off event at each of the hub sites.
Launch club	1. Launch the car club with kick-off events and free trials.	Car club launched.	2 years +	The end goal of all previous implementation steps. The early period is crucial in forming local opinions and shaping future usage.

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Implementation Activity	Actions	Outcome	Timescale	Guidelines
Monitor Financial Goals	Targets: Net Revenue: £84,700. Members per vehicle: 30. Car utilisation: 14%. Mileage per vehicle: 14,600 miles / year.	Car club is an ongoing concern, maintains financial viability.	2 years +	Achieving the financial goals is vital to the financial position of the car club. Metrics here are in line with those set for the "preferred solution" in sections 3 and 6.
Monitor Social Goals	Targets: Reduction in ICE vehicle usage and emissions. Vehicle availability and accessibility. User cost savings. User satisfaction with charging and hire procedures.	Car club meets the social needs of the community.	2 years +	Achieving the social goals is the driver of the project and must be prioritised during project delivery.

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Table 8.2: Implementation Guidelines 2: Hall/Hub Infrastructure

Implementation Activity	Actions	Outcome	Timescale	Guidelines
Engage Contractors and Installers	1. Engage contractors to assess and quote for: • Chargepoint installation. • Solar PV and Storage system. • Energy Efficiency Improvements.	Each hall understands the costs, benefits, and suitability of intervention. Decision made on interventions to be pursued.	< 6 months	Chargepoints are the priority to enable car club operation. See Section 4 for technical analysis, and appendix B for hall audits.
Council Involvement	1. Liaise with Argyll & Bute council on the project as a key project partner. 2. Obtain planning permission where required.	Permissions and consents obtained.	0.5 - 1 year	An on-road chargepoint would be required at Aros Hall and may be required at other sites with limited on-site parking. Small-scale generation is unlikely to require planning permission.
SSEN Involvement	1. Liaise with SSEN in relation to grid connection and costs. 2. Secure network upgrades to 3-phase connections (as required). 3. Apply for grid connection for renewable assets.	Network connections and upgrades secured.	0.5 - 1 year	A 3-phase connection is required at some sites to enable fast charging. Otherwise, slow charging must be installed (See 4.2). Application procedure for grid-connected renewable assets depends on proposed capacity. (See 5.1.1.)
Financing	1. Obtain grants and / or loans to implement chargepoints, renewables system, and	Finance in place to commence hall infrastructure improvements.	0.5 - 1 year	The business chargepoint funding scheme and OZEV scheme could provide grant funding for 89% of overall chargepoint costs.

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Implementation Activity	Actions	Outcome	Timescale	Guidelines
	energy efficiency improvements. 2. Switch energy provider to maximise SEG tariff rate.			Business Energy Scotland provide free energy efficiency assessments, which are the gateway to obtaining an interest-free loan for SMEs. (See sections 6 and 7.)
Installation	1. Procure installers to implement chosen hall infrastructure upgrades.	Renewable generation, chargepoints and energy efficiency improvements implemented.	1- 2 years	Ensure chargepoint is connected to the solar and storage system to enable its use for vehicle charging.

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10 Appendix A – Low Carbon Transport Survey Results

A low carbon transport survey was conducted in summer 2023 by Scene to gauge community need and interest in a car club scheme. Participation was encouraged via community workshops, advertising in community magazines and social media posts, and direct invites to participants. Questions covered demographic information, transport requirements, and likely usage of a car club in different scenarios.

10.1 Demographics

There were 73 respondents, which is 2.5% of total Mull Archipelago population. This is enough to form impressions of the overarching community sentiment, but too low to provide comprehensive overall guidance on likely demand. 81% of respondents are Mull residents, with four responses each from Ulva and Iona, and one from Erraid. There are five respondents (7%) from outside of the islands. It is worth noting that the attitudes of tourists and visitors are not represented in the results. There may also be a bias towards people already interested in low carbon solutions on Mull, since many of the respondents attended community workshop events.

Table 10.1: Age brackets of survey respondents compared to archipelago population (Census, 2011)

Age Bracket	Survey Respondents	Islands total adult population
18-25	1%	8%
26-40	14%	20%
41-60	31%	37%
Over 60	54%	35%

The age range of respondents is skewed, with over representation from the over 60s, which represent 35% of the archipelago's population but 54% of survey respondents. Only 15% of survey respondents are under 40, compared to 28% in the archipelago population. There is therefore also a bias towards the views of older residents. As displayed in figure 10.1, most respondents (58%) have access to one vehicle, with overall levels of car access well in line with census statistics.

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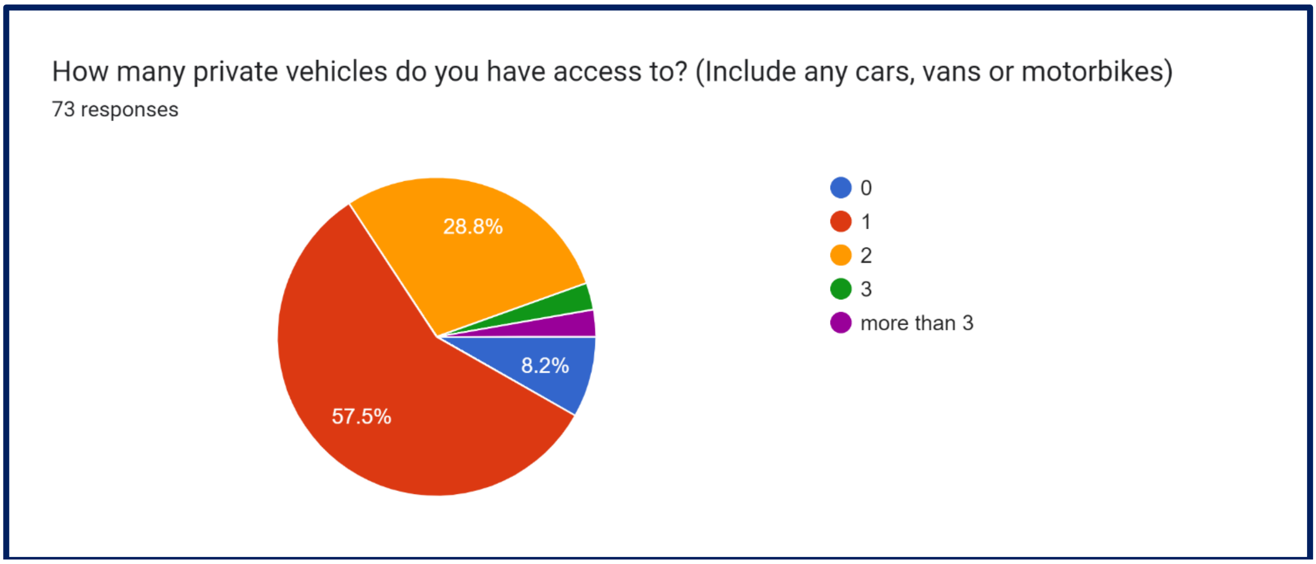

Figure 10.1: Survey Results: Private Vehicle Access

10.2 Car Club Usage

Figure 10.2 display the high overall interest in having access to a car club, with 44% of respondents very interested and less than 10% not interested. These strong results confirm that the AMAZE project overarching aim of an EV car club is well supported by the community and should have community backing.

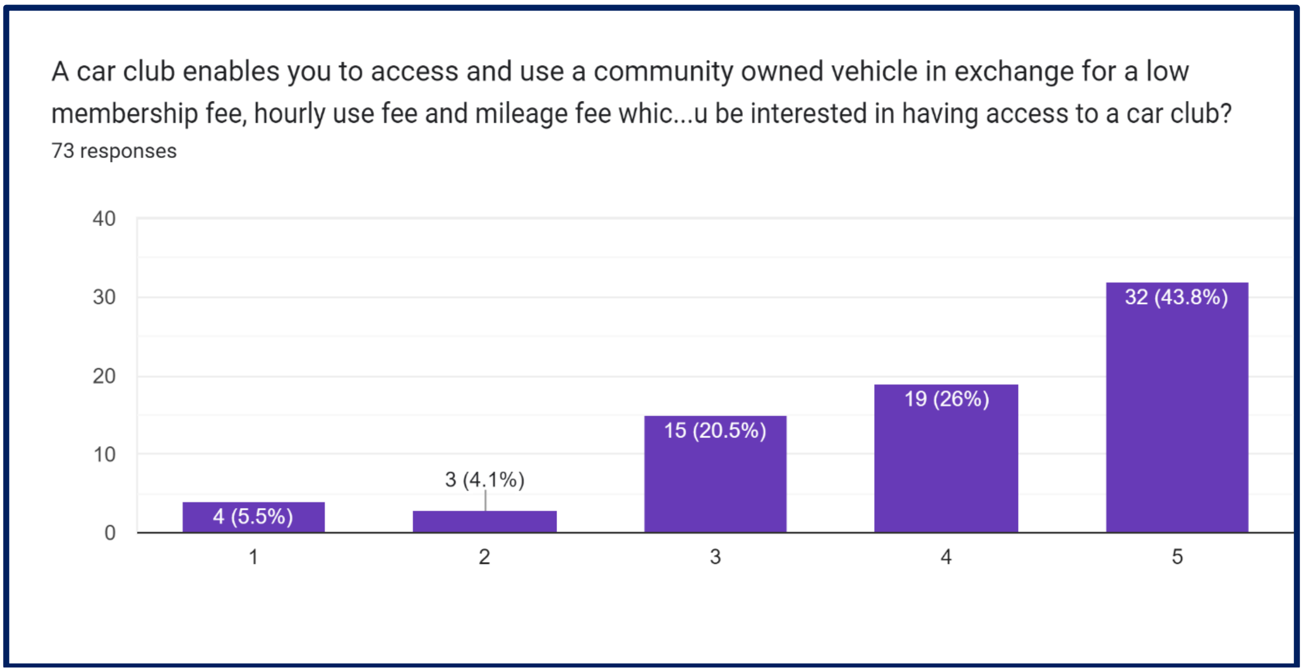

Figure 10.2: Survey Results: Interest in access to a car club. ***(1 = Not interested. 5 = Very interested)***

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It is uncertain whether a car club would reduce car ownership, with 25% of respondents stating they would consider selling or not purchasing a private car in future if a car club was available, but 24% say they are unlikely to consider it.

However, given the rural nature of the archipelago, large distances between towns and destinations, and infrequency of public transport, that so many would consider getting rid of a car may be encouraging. This replacement of ICE vehicles with the EV car club is a key method for reducing carbon emissions and encouraging regular car club usage. Respondents are more likely to consider selling or not owning a private vehicle if they only currently have access to one vehicle, in comparison to multiple car owners. This is counter-intuitive, as it would be expected that access to a car club vehicle offers an ideal way to reduce running costs from a second vehicle.

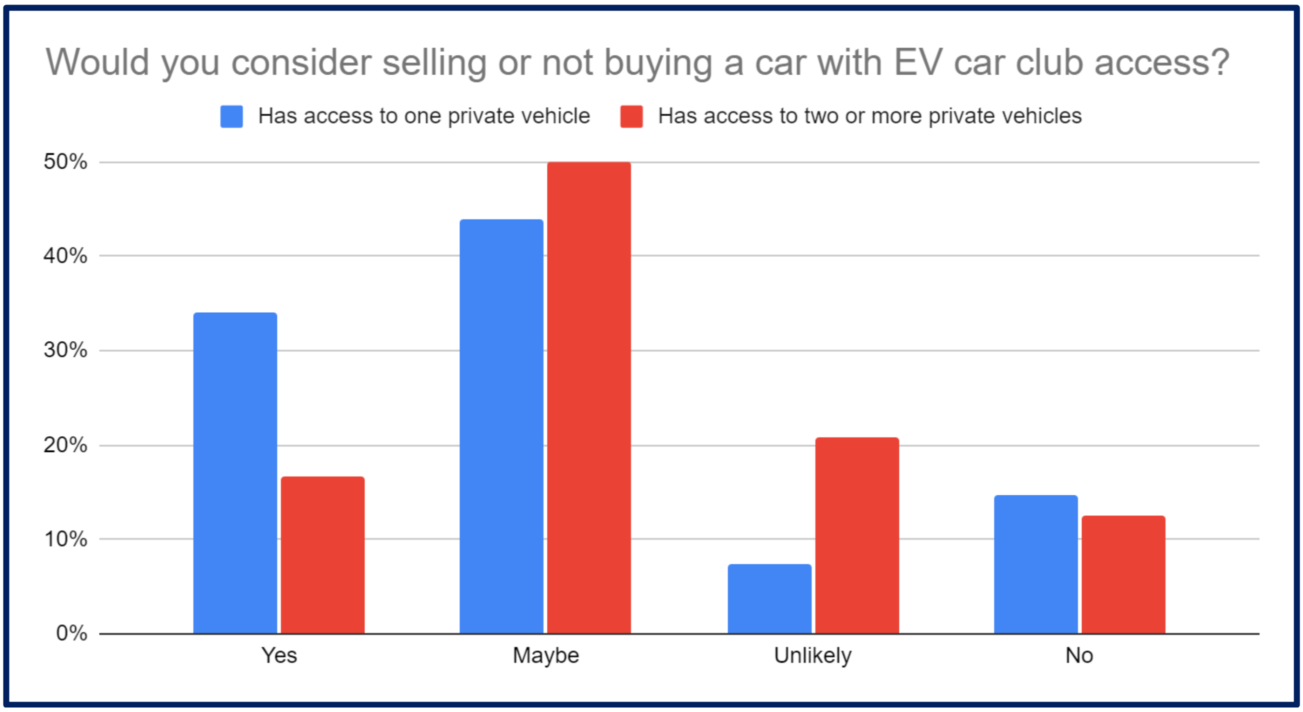

Figure 10.3: Survey Analysis: Propensity to sell or not buy private vehicle

As seen in Figure 10.4 and Figure 10.5, the most important factors for car club usage are the proximity of the hub to the respondent's home, the availability of vehicles, and overall costs.

Car club usage is expected to be regular (frequent, weekly or monthly usage) if the hub is less than half a mile from the respondent's home for around two-thirds of respondents, and regular

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usage is expected from half of participants if they live less than a mile from the hub sites. Beyond a mile, usage is expected to be significantly lower.

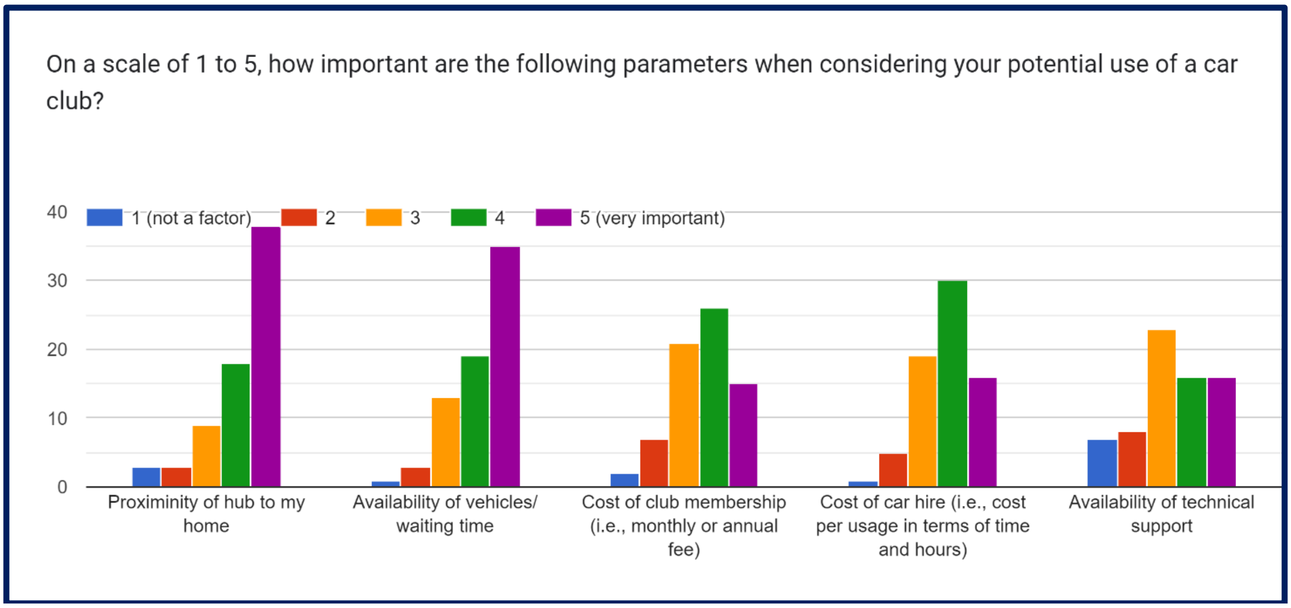

Figure 10.4: Survey Analysis: Parameters for car club usage

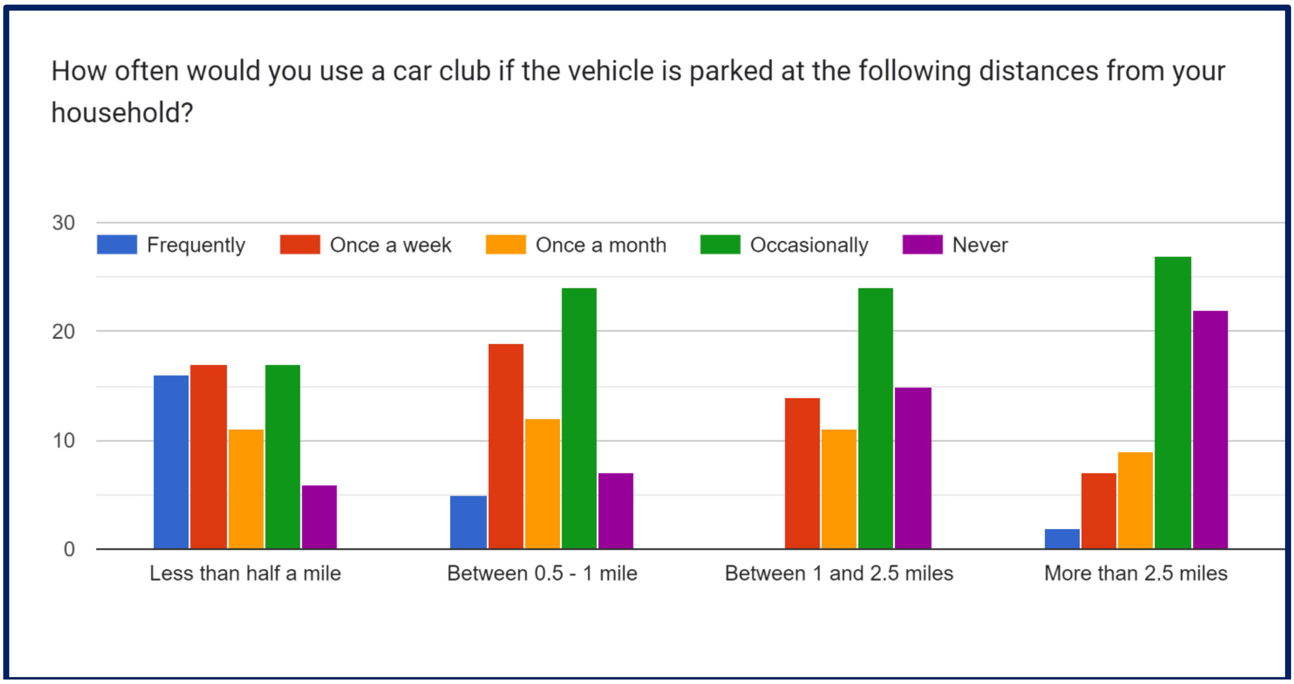

Figure 10.5: Survey Analysis: Hub Proximity

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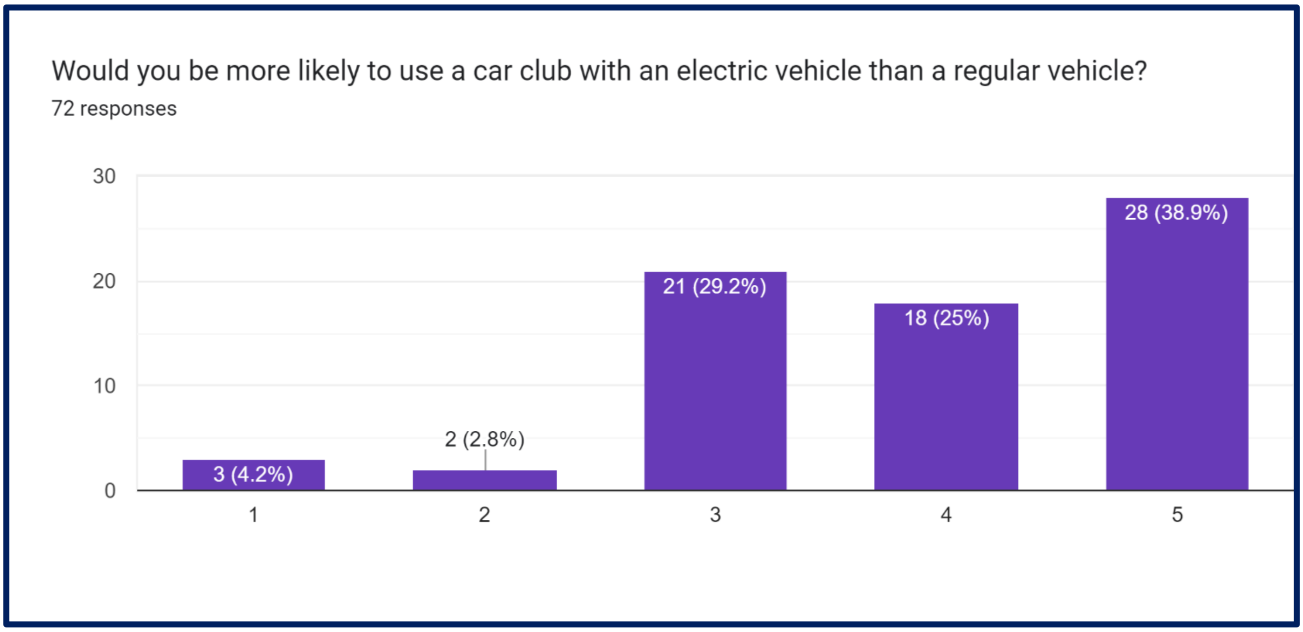

Figure 10.6: Survey Analysis: Electric Vehicle Usage. ***(1 =Much less likely. 5 = Much more likely)***

10.3 Further Feedback

Survey respondents also had the opportunity to leave comments on a series of questions. A summary of these responses is included in the following tables. Table 10.2 summarises the locations that respondents would want considered as hub sites.

Table 10.2: Survey Analysis: Responses to question - is there a location you'd like to be considered as a hub?

Existing Hub Sites		Alternative Sites	
Location	**Number of mentions and notes**	**Location**	**Number of mentions and notes**
Bunessan	16 Village hall or car park	Fionnphort	18 Columba car park
Craignure	9 Car park	Knockvologan	2
Tobermory	8 Marina or harbour car park	Calgary	1
Ulva Ferry	8	Ardtun	1
Dervaig	5	Tioran	1
Creich	2	Kintra	1
Salen	1	Kellan Old Farm	1

Do you think a car club would work on the Mull Archipelago?

Frequent concerns were raised regarding distance to the hub sites, especially for those in outlying areas. This involves the difficulty in returning the vehicle after usage with the opinion that the scheme may only work for some areas or communities.

- Creative methods for transporting the vehicle requester to the car club site needed, such as by using existing community transport infrastructure and messaging.
- There are opportunities to co-ordinate with existing community transport vehicles.
- The greater need may be for frequent and reliable public transport.
- The scheme will work if vehicles are easily accessible and available.
- The scheme would mainly work for short (not multiple day) journeys.
- Success depends on charging infrastructure.
- The scheme may get used but it is unlikely people would opt not to own their vehicles.
- The scheme could well replace second cars.

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- Pricing should be set at less than the cost of transporting a car on the ferry. Price is a key consideration for whether a car club would be used.
- The scheme would work depending on usage restrictions, such as whether you can take the car to the mainland.
- Some don't see how the scheme could be viable given the cost for residents and need for easy access to vehicles.

What features would you desire from a car club on the Mull Archipelago?

Multiple concerns were raised regarding travelling to the hub sites, the lack of public transport and reliability of accessing a vehicle.

- Ease of booking, good technical support and locally run.
- Electric vehicles should use energy supplied on the islands.
- Good vehicle range.
- Child seats accessible.
- Priority for medical appointments.
- Resident usage only.
- Either a car also in Oban, or to be able to be used on the mainland.
- Hubs on a bus route or similar way to access vehicle.
- A small car would not be able to carry the gear some would want to carry. Several requests for a van or large vehicle.
- Clear cleaning policies, users must leave the vehicle in good condition.

General Feedback

- Frequent mention of including eBike, eCargo bike or e-scooter sharing, which would better enable users to arrive at hub sites and discourage car use for very short journeys.
- There is a need to liaise with existing community transport schemes.
- Flexible usage (e.g., one-way) is wanted, especially for journeys to the ferry, with multiple responses regarding this.
- Using car clubs for ferry would reduce carbon emissions from ferry travel thanks to not carrying a vehicle.
- Desire to be able to have a vehicle for longer periods of time and take it to the mainland.
- Online ride-sharing spaces could be set up to enable journeys to reach the hub, or to replace the need for a car club.
- A decision would need to be made regarding whether it can be used by tourists.
- Transport to and from the hub is the major problem to be addressed.
- Risk that co-operative schemes end up only benefiting a few people.
- Several suggestions that a car club could reduce ownership of second cars.

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11Appendix B – Hall Audits

Individual audit reports for each hall are provided as supporting documents.

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