CLEAN ENERGY FOR EU ISLANDS

CLEAN ENERGY TRANSITION AGENDA

Ulva, Scotland

July 2022

Final Submission

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1. Preface

This section introduces the Clean Energy Transition Agenda (CETA) conducted for the island of Ulva, including the background of the island, the objectives of this study and an introduction to key project partners.

Island of Ulva

The Isle of Ulva is located off the west coast of Mull and is approximately 2,000 hectares, 12 km long by 4km wide (see **Error! Reference source not found.**). The island has been inhabited for over 7,000 years. Ulva has suffered significant population decline since the 1800s, currently standing at 8 residents. Ulva's transport connection to Mull is via ferry from the village of Ulva Ferry, which has a population of 119 people across 53 households. The main industry currently on Ulva is tourism with approximately 7,000 visitors to the island in 2019, although fewer in 2020 – 2022 due to the effects of the COVID-19 pandemic.

In June 2018 with support from the Scottish Land Fund, the Macquarie Group, a crowd-funding appeal and local fundraising, Ulva was successfully purchased by the local community using the provisions of Scotland's Community Right to Buy legislation.

There are a number of ongoing projects on Ulva, including the refurbishment of six residential properties (including improving thermal efficiency and installing air-source heat pumps (ASHP)), investment in an electrified vehicle fleet (including 2 electric bikes, a quad and "Polaris" type vehicle), development of 7 plots for new housing, a £400,000 redevelopment of the jetty to support local fishing, the investigation of a barge or new ferry, and assessment of regenerative farming / land management options.

The Project

Ulva is in an unusual position for a Scottish island as there is an expectation that the island population will grow in the short to medium term, with an aim to reach a population of 50 within the next 20 years. From an energy and carbon emissions perspective, the aim is therefore not to decarbonise (as carbon emissions are relatively low at present) but to set out ambitions, targets, and principles to guide sustainable and low carbon local development.

The key areas of focus in relation to this project are:

- Understanding the current energy situation and projecting future energy scenarios on Ulva;
- Setting a carbon emissions target or ceiling, and setting out principles for low carbon development on the island;
- Energy and carbon modelling of the design loads, of the used, unused, and new properties and building plots on the island;
- Developing existing low carbon transport plans (EVs and bicycles) and investigating new options (e.g., ferry / barge);
- Assessment of low carbon generation options on island, including extension of the existing solar PV array, and a renewable heat supply (e.g., heat pump network).

New Energy Solutions Optimized for Islands (NESOI)

In 2021, the island of Ulva received funding from the EU-funded NESOI project to develop a clean energy transition agenda (CETA). 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.

The project is also being supported by the European Small Islands Federation (ESIN). Set up in 2001, ESIN is the voice of 359,357 islanders on 1,640 small islands. ESIN acts at two levels:

- **Local level**: strengthening islands cultural identity, facilitating the circulation of information between its members, allowing comparison on how different countries cope with issues, sharing knowledge.
- **European level**: informing relevant EU institutions, influencing EU policies and rules by increasing their awareness and understanding of small islands.

Clean Energy Transition Agenda (CETA)

A supporting Clean Energy Transition Agenda (CETA) has been developed alongside this study. The CETA is a strategic roadmap for the transition process towards clean energy. It is designed by the local community, for the local community. CETA's are intended to direct support to the transition process and development increases islands' visibility and networks. Being part of an EU-wide CETA network will raise awareness on your island's activities and enable you to share your transition experiences with other islanders in order to help each other move forward effectively.

More information about CETA's and the development process can be found at: https://euislands.eu/energy-transition-agenda

Part I: Island Dynamics

Part I of the Clean Energy Transition Agenda aims at providing a picture of the status of the island. This includes a description of the geographical, economic, and political situation on the island, but also an analysis of the Energy System and of the Stakeholders that are important for the Clean Energy Transition.

2. Geography, Economy & Population

Geographic Situation

The Isle of Ulva is located within the Inner Hebrides of Scotland, west of the larger Isle of Mull on the west coast of Scotland. The island covers approximately 2,000 hectares and is 12km long and 4km wide. Ulva is separated from Mull to the east by a narrow strait requiring a short ferry to cross; on its western side Ulva is connected to the adjacent island Gometra by a bridge allowing vehicles to cross. Ulva's highest point is Beinn Chreagach, reaching 313m.

Figure 1: The Isle of Ulva lies off the West Coast of Scotland.

The island was volcanically active around 60 million years ago, and it has a rocky and jagged coastline with beaches to the south. The interior is predominantly moorland, grassland, and native woodland. Together, Ulva, Gometra, and the west coast of Mull comprise the Loch na Keal National Scene Area (NSA).

Ulva is a place of high cultural sensitivity, having been inhabited for at least 7,650 in the Mesolithic era as well as having links to the Scottish Clan Macquarie, which originally laid claim to the land. There are 3 B-listed properties on the island, including Ulva Church, and Ulva Manse. There is one C listed building, the Ferry House (see appendix A – Graphics). Plans for regeneration on the island will need to account for these sensitivities to ensure that all developments consider the island's long-standing geographical and cultural identity and heritage.

Ulva is also environmentally sensitive, with three key designations which may be constraining factors for low carbon development, the National Scenic Area (NSA), which covers the island and nearby Mull, designated ancient woodland areas on the island itself, and a special area of marine conservation (SAMC) to the South and West of the island.

With few areas of standing or running water, hydropower developments are unlikely to be feasible. An assessment by consultants, Ricardo Energy and Environment, found that a series of ground-loop district heating systems and / or ground- or air-source heat pumps could make effective use of the islands unique environmental resources and represent a sustainable source of electric heating for the island's growing domestic, commercial, and touristic developments.

Demographic Situation

Ulva has been continuously inhabited for over 7,000 years. However, having hosted over 600 inhabitants across 16 small villages at its peak in the mid-19th century, the island has since suffered a precipitous population decline. As of 2022, the population now stands at 8 people. This is the second lowest number of inhabitants ever recorded on the island, with 5 people recorded in the early 2000s.

The Ulva community hopes to drive repopulation and demographic diversity on Ulva as part of its redevelopment plans for the island. These plans include building renovations, job creation, development of tourist infrastructure, and revitalisation of the islands' local timber, agriculture, and fishing industries. Together, these intend to make the island as a destination more attractive for visitors and residents to stay on the island on a longer term and year-round basis. Furthermore, the Ulva Redevelopment Masterplan aims to conduct this regeneration of the local community and population with a priority on environmental conservation, building a robust framework for continued repopulation sustainably into the future.

Local Government

Developments on the island are overseen by the North West Mull Community Woodland Company (NWMCWC), with close connections with, and support from, Argyll and Bute Council, the Mull & Iona Community Trust (MICT), and other local organisations, companies, and bodies.

The Island's Social and Economic Development Masterplan was led by NWMCWC, with the overall vision and ambitions approved by the Scottish Government's Scottish Land Fund[1]. Supported also by the Macquarie Group, the island was bought out for community ownership and regeneration in June 2018.

Economic Activities

Tourism has represented the primary economic activity on Ulva for the past few decades. Based on ferry usage between Ulva and Mull, the island received approximately 7,000 visitors in 2019, before the onset of the COVID-19 pandemic and related lockdown and travel restrictions in the spring of 2020 onwards. Kayaking and boat trips also allow tourists from Mull and other neighbouring islands to visit. Many tourists visit Ulva's Boathouse, an award-winning restaurant at the ferry port. The tourism industry also contributes to the island's provision of accommodation and food services, which employed 13% of the island's population.

In addition to tourism, Ulva's economy was reported to comprise small-scale agriculture, forestry, and fishing, which together employed just under 30% of the working population. Education accounted for just under 12% of the population.

Ulva's Social and Economic Development Masterplan focuses on the regeneration of the island's traditional fishing, forestry, and agricultural economic services, as well as significantly boosting the island's capacity to attract and host tourists. Agricultural development would

[1] https://www.tnlcommunityfund.org.uk/funding/programmes/scottish-land-fund

include the introduction of highland cattle, and the development of land to encourage biodiversity and productive use. Furthermore, the reestablishment of an Ulva fishing industry could seek to benefit from the oysters, winkles, and limpets along the island's shore.

As part of this economic drive, the Masterplan proposes to renovate 6 residential properties, renovate the island's 2 large properties (Ulva House and Ardalum House), and redevelop 8 derelict buildings to suit further accommodation and facilities for both existing residents and seasonal tourists alike (e.g., the Cragaig and Bearnis Bothies). Ardalum House is expected to open as a bunkhouse in Summer 2022. As of April 2022, the intention to develop Ulva House is on hold due to the high costs of refurbishment.

To support this economic growth, the NWMCWC also propose to develop a sustainable transportation infrastructure throughout the island, comprising a fleet of electric vehicles for rural, domestic, and touristic use.

Connection to the mainland

The Isle of Ulva can be accessed from mainland Scotland only via Mull and then a short ferry from Ulva Ferry. The ferry carries residents, school children, and tourists, on foot and bicycle, between the two islands and operates according to seasonal demand (roughly 5,000 visit Ulva during the summer). The ferry does not operate during periods of rough weather and is Ferry is operated privately.

The Ulva Ferry also has an 8-berth pontoon, as well as facilities to launch kayaks and small boats for tourists wishing to explore the island's coast and waterways. This is owned by the Mull & Iona Community Trust Under specific circumstances, a larger barge has before been used to carry large equipment and vehicles onto the island (e.g., construction materials, quad bikes). Otherwise, large vehicles are unable to access Ulva.

With regards to the electrical system, Ulva is currently connected to the mainland via a domestic-scale 11kV single-phase electrical connection. This is a significant limitation for the realisation of Ulva's ambitions for island development, restricting the scale of additional building demand and renewable energy generation. Upgrading this to a three-phase connection would be of benefit to Ulva but reinforcement costs are expected to be high.

3. Energy System Description

The energy system description of the Isle of Ulva can be split into several separate relevant energy vectors:

- Electricity consumption
- Electricity generation
- Heating and cooling
- Transport on the island
- Transport to and from the island

Each energy vector has been analysed using available data provided by the residents of the island and otherwise suitable approximations where data is not available. The data on energy consumption is used to highlight the greatest contributors to greenhouse gas emissions on the island, therefore helping the development of a decarbonisation pathway and the appropriate allocation of attention, research, and resources.

The gathered data on all energy vectors associated with Ulva are summarised in Tables 1 and 2 below.

Energy System

The Isle of Ulva is currently connected to the mainland via a single-phase 11kV electricity cable which provides most of the required electricity. The island also has the capacity to produce part of the electricity that it consumes via a small ground-mounted solar PV system, although as of 2022 this is non-functional and in need of repair.

The island is off gas grid, with residents relying on a mixture of oil-fed boilers, wood fuel stoves (using locally sources wood), and air-source heat pumps (ASHP) in recently refurbished properties.

Electricity Consumption:

The network operator is SSEN (Scottish and Southern Energy), and the island is supplied with a 11kV sub-sea single-phase electrical supply. An upgrade to a three-phase supply would require significant works to the utility infrastructure – SSEN have quoted these works to cost around £258,000.

The electricity consumption of the island has been divided into residential, primary sector, secondary sector, and tertiary sector.

Residential Demand

Currently only 3 of the homes on the island are occupied. The other 3 homes require significant refurbishments to be made habitable and efficient. All properties are deemed to be below tolerable standards. Recent EPC reports, Residential Energy Reports, and billing data for the buildings on the island have been used to produce estimated total electrical demands of the 6 homes, assuming that all are occupied.

These dwellings include: The Manse, Fisherman's Cottage, Ferry House, 1 Bracadale, 2 Bracadale and 3 Bracadale.

The total electricity consumed annually across these 6 dwellings is approximately 37,350 kWh, or 6,225 kWh per home. This demand - higher than average for domestic properties - is due to the large proportion of homes using electric heaters, additional to existing oil-fed boiler

systems. These estimations are similar to those in the recent report (2016) by Ricardo on behalf of the Highlands and Islands Enterprise (HIE), stating that the island had a mean domestic electrical demand of approximately 6,500 kWh.

Primary Sector

Agriculture:

In terms of agriculture on the island, there has recently been research and planning into rewilding and rejuvenation of the local wildlife, such as wildflowers, corncrakes, and introducing a herd of highland cattle. Additionally, previously discarded grazing land that has since been overtaken with bracken has been proposed as locations for new cattle. Given this nascent state of local agriculture on the island, the emissions associated with the sector have not been calculated.

Coastal businesses:

According to the Development Plans for the island, there are intentions to reinstate local oyster farm, using previously farmed oyster beds off Ulva. These works are expected to have little impact on the overall energy demand of the island as the fishing boats are all based on Mull or the mainland. The ocean purification and carbon sequestration properties of the oysters may outweigh the environmental impacts of the farm itself. Further details on the environmental impacts of the industry and the scale of the operation would be needed to add reliable emissions data for this phase of the project.

Tourism:

The only tertiary service on the island is that of the Boathouse Restaurant and Café. The Boathouse is currently only operated between April and October, predominantly to serve tourists and visitors. There is no available fuel or billing data; however, similar low carbon projects delivered by Scene based on accurate billing data have indicated that a small, poorly insulated, seasonally-operated restaurant and bar similar to the Boathouse was found to **consume 6,021 kWh per year**. The EPC rating of the Boathouse is currently G, also in line with the compared example.

Secondary Sector

There are no known secondary sector activities on the island.

Tertiary Sector

The only tertiary service on the island is that of the Boathouse Restaurant and Café. The Boathouse is currently only operated between April and October, predominantly to serve tourists and visitors. There is no available fuel or billing data; however, similar low carbon projects delivered by Scene based on accurate billing data have indicated that a small, poorly insulated, seasonally-operated restaurant and bar similar to the Boathouse was found to **consume 6,021 kWh per year**. The EPC rating of the Boathouse is currently G, also in line with the compared example.

Heat

There is no access to the mains Scottish Gas Network (SGN), and therefore oil supplies for heating are transported to the island. All homes on the island have an EPC rating of F or worse, highlighting the urgent need for building efficiency upgrades and associated savings to emissions and energy costs. Three properties have recently been refurbished, including

installation of energy efficiency measures (internal wall and roof insulation) as well as ASHPs. Based on Ricardo's *Small Islands Energy System Overview* on behalf of Highlands and Islands Energy (HIE), Ulva has the worst EPC ratings across all Scottish islands studied. The EPC reports collected by Scene as baseline data also note that the main heating and fuel sources used are oil, mineral wood, and electricity for storage heaters and recently installed ASHPs.

The average domestic heat demand across the island is approximately 21,000 kWh annually.

From the available Residential Energy Reports, space heating and domestic hot water energy usage estimates for 6 of the homes on Ulva were produced. The total estimated energy consumption for heating for these homes from this RER report is 100,019 kWh if occupied year-round. This is lower than the EPC estimates, which amount to a total of 145,284 kWh per year.

Fuel use estimates from the EPCs are detailed in the table below. This table takes an average of the heating energy demand from the EPC and energy reports described above, at 122,652 kWh, across the 3 fuel types.

Fuel Type	Total Domestic Heat Demand (kWh)
Oil	59,176
Mineral and Wood	48,948
Electric Storage	14,528
Total	**122,652 kWh**

Table 1: Heating fuel type and usages estimates across the 6 residential properties on Ulva, based on EPC data.

Transport on the Island

Since there are no tarmac roads on the island, the only vehicles on Ulva are farm vehicles, a land rover, quad bikes, and bicycles.

The available data on transport and fuel was provided by the Ulva community as monthly fuel delivery totals since September 2019. These monthly totals are not disaggregated and do not distinguish between fuel types or fuel use per vehicle.

Average consumption of fuel, the associated CO_2e emissions, and energy used were estimated based on annual average costs of petrol and diesel.

Based on the above and following transport figures, annual energy consumption of fuel is estimated at 34,828 kWh per year, and average emissions associated with transport on the island are 8,110 kg CO_2e per year.

Year	Kg CO2e per l of fuel	Average cost of fuel (£)	Annual litre total	Annual CO2e total (kg)	Annual kWh of energy total
2020	2.495	118.20	381.9	952.8	4,010.0
2021	2.495	136.69	554.1	1,382.5	5,817.6
Average Year	2.495	127.45	468.0	1167.6	4913.8
Ferry Use	2.310	136.03	2,500.0	5,775.0	25,000
TOTAL	**-**	**-**	**2,968**	**6,942.6**	**29,913.8**

Table 2: Estimated fuel consumption, cost, and emissions, used for transportation on Ulva.

Transport to and from the Island

The local passenger ferry between Mull and Ulva is privately operated. The ferry is a small boat, predominantly used for foot passengers and bicycles. During the summer months the ferry is

available for tourists when required; however, during the winter months until April, the ferry is operated between 9.15am to 3.30pm to carry school children across to school on Mull.

Fuel and billing data has been obtained from the ferry operator. The billing data is given as monthly fuel totals for each season, the seasons defined as winter (November to March) and Summer (April to October). Approximately 150 litres of unleaded petrol are used per month during the winter, and 250 litres used during the summer months.

Therefore, it has been concluded that annual consumption is approximately 2,500 litres of fuel which is equivalent to 5775 kg CO_2e and 25,000 kWh.

Electricity Generation

There is an existing solar PV installation on the island to the south-east of Bracadale Farm. The existing system has 48 panels with an estimated installed capacity of 18kWp. This installation requires upgrades including inverter replacements and restorations to the mains cable connecting to Ulva House. In addition to this, there is interest in expanding the solar array to provide electricity for an EV car charging and battery storage system as part of the island's broader development ambitions.

From the available data, £2,000 of income is generated through the Feed-in-Tariff (FiT) from the solar PV array annually. This 18 kWp system was modelled in PV*Sol to calculate annual generation from the current PV system. It was estimated that 20,914 kWh could be generated per year from the array on Ulva.

As of April 2022, the solar PV installation is non-operational due to a lack of demand at the unoccupied supply properties, technical problems with the array's inverter system and cable damage.

Future Use

A key objective of the community buy-out of the Isle of Ulva was to stimulate the repopulation and regeneration of the island. For this to be achieved, the following actions were proposed:

- Improved housing stock and construction of additional residential and accommodation buildings
- Improved transportation infrastructure
- Revitalisation and expansion of agriculture
- Management and expansion of native woodland
- Expand tourism capacity
- Promote cultural heritage
- Enhance biodiversity
- Ensure the island remains accessible for visitors and residents

All of these factors have been considered in the future energy demand calculations of the island.

Future Heat and Electricity Demand

Several assumptions have been made to estimate future energy demand, across three separate scenarios. The results are presented in **Error! Reference source not found.**.

1. There are plans for Ardalum House to become an 'Eco Hostel' within the next year. There is no concrete definition of an 'Eco Hostel', however the main aims are to reduce their environmental impact through green best-practices in maintenance, services,

logistics, products, and supplies. The core values revolve around reducing waste, saving energy, and cutting down on water usage. There are also plans to have 2 yurts and a 25-pitch camp site. As these additions will have a fairly low electricity consumption (shower and toilet facilities) the electrical demand for this has been combined with Ardalum after retrofit amendments have been made. The electrical demand of the amenity block will be approximately 5,200 kWh. This assumes that the campsite and yurts are at max capacity between April and October, with visitors having one six-minute instantaneous electric shower a day[2], and charging electrical devices.

2. As the boathouse is only used within the tourist season, and there is no billing data available, an estimate based on a medium sized dwelling has been used for both electricity and heat demand.

3. For the 6 retrofitted and 8 redeveloped homes, an annual electrical consumption of 3,000 kWh per home has been assumed. This lies between the broader island average of 6,500 kWh and the UK average of 2,900 kWh, accounting for efficiency upgrades and the decreased use of direct electrical heaters. The current homes on Ulva have been highlighted to lose up to 33% of their heat through the roof and ceiling structures, and up to 54% via the walls. It has also been estimated that through suitable energy efficiency measures, these homes could reduce their heat demand by an average of 44%, leading to an average annual consumption of 14,400 kWh.

4. The 10 proposed new homes have been modelled to have an individual electrical demand of 2,800 kWh, and heat and hot water demand of 10,000 kWh per year (8,000 kWh of that being space heating). Demand profiles have been modelled to show these properties with boilers, storage heaters and heat pumps to aid the options appraisal in section 5.

If all planned developments go ahead, there could be up to 46 full time residents on Ulva. Assumptions have also been made regarding the total number of people that could potentially be on the island during the peak summer months. There could be capacity for 74 people, with an estimated further 10-day trippers.

This estimate leads to a total of ~113 that could be on the island after all refurbishments, upgrades and developments have been made. This is 18 times greater than the total number of current full-time residents.

As all future plans for further tourism activities - such as cycle hire, pony trekking, wildlife guiding and water sports - are currently speculative, no future energy demand figures have been included for this exercise.

The total estimated future energy demand for heat and electricity based on the assumptions above is approximately 442.4 MWh (not including transport).

Future Scenario	Annual Electrical Demand (MWh)	Annual Heat Demand (MWh)
Ulva House, Ardalum House, and campsite (3 no.)	13.8	41.4
Boathouse	3.0	12.0

[2] https://www.viessmann.co.uk/heating-advice/which-appliances-use-most-energy-at-home

Retrofit and redevelopment of occupied and derelict buildings (6 and 8, respectively)	42.0	202.2
New buildings (10 no.)	28.0	100.0
Estimated future total	**86.8**	**355.6**

Table 3: Future electricity and heating demand estimates of the buildings on Ulva.

Data for year 2021	**Final energy consumption [MWh]**	**CO_2 emissions [tonne]**
Electricity consumption		
Residential	37.35	8.7
Primary sector	N/A	N/A
Industries	N/A	N/A
Tertiary sector	6.02	1.04
Transport on the island		
Quadbike, lawn mower, tractor, land rover	4.91	1.17
Transport to and from the island		
Foot passenger ferry	25	5.78
Heating and cooling		
Oil boilers	59.18	15.36
Wood and pellets	48.95	0.76
Electrical Storage	14.53	3.39
TOTAL	**195.93**	**36.2**

Table 4: Summary of the final energy consumption on the island. The table has been adapted to the information on the island that is accessible.

Data for year 2021	**Total energy production [kWh]**
Solar Photovoltaics	***20,914***
TOTAL	***20,914***

Table 5: Total electricity produced by the solar PV array on Ulva.

4. Stakeholder mapping

Civil society organizations

North West Mull Community Woodland Company (NWMCWC)

Perspective on the transition:
The NWMCWC spearheaded the shared community purchase of Ulva in 2018. To combat the island's significant population decline since the 1800's, the NWMCW intends to regenerate and lead a transition of the island in a sustainable way, minimizing environmental impacts and emissions.

Specifically, the aims of the development programme include improved housing stock, expanded agriculture, sustainable woodland management, expansion of tourist infrastructure, promotion of cultural heritage, and conservation of biodiversity and natural habitats.

In partnership with Scene as local energy consultants, as a key output of the CETA project, NWMCWC would like to develop a series of low carbon development principles. These would guide the refurbishment and design of existing and new buildings, to be used by residents, contractors, policy makers, and builders.

Engagement in the transition:
Supported by Ricardo environmental consultants, the NWMCWC have already conducted some preliminary assessments of the island's potential renewable energy options. Key opportunities for consideration include expansion of the existing solar PV array; an electrified ground-source district heating system; and expansion of an electric vehicle fleet on the island for more sustainable forms of transport, for residents and tourists.

Building on this initial assessment, NWMCWC co-developed the 'Isle of Ulva – Social and Economic Development Masterplan' (2020), proposing housing and land for redevelopment.

Contact person: Wendy Reid, Isle of Ulva Development Manager - wendy@nwmullwoodland.co.uk

Mull and Iona Community Trust (MICT)

Perspective on the transition: Founded in 1997, MICT is a community led local organisation, working to engage and improve the communities of Mull, Iona, and associated islands. Their Annual Strategic Plan describes their ongoing opportunities, challenges, and ambitions, guided by their primary mission - 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[3]. In line with this mission, MICT is fully in support of Ulva's community buy-out and ongoing ambitions for redevelopment.

Engagement in the transition: Since 2016, MICT have been supporting sustainable infrastructure and visitor access between the Isles of Mull and Ulva, funding 6 houses at Ulva Ferry Port (two of which are award-winning highly efficient 'passive houses') and securing funding for a ferry pontoon[4]. Ulva Ferry pontoon directly supports part-time employment for local businesses, and MICT are now seeking funding for further shore facilities to provide additional employment and visitor services and amenities.

[3] https://www.mict.co.uk/wp-content/uploads/2021/11/MICT-Strategic-Plan-2022-27.pdf
[4] https://www.mict.co.uk/projects-services/pontoon-development/

MICT also manage the Ulva Ferry Community Transport service, which offers sustainable transportation to the area via a hybrid minibus and fully electric car, scheduled to tie-in with existing public transport options. The transport service also includes an 8-berth pontoon. This provides a more sustainable and reliable way for residents and visitors to support local businesses.

Contact person: Sandy Brunton, MIC Convenor - enquiries@mict.co.uk

South West Mull and Iona Development (SWMID)

Perspective on the transition: South West Mull and Iona Development (SWMID) operates within the south west corner of the Isle of Mull and the Isle of Iona. Formed in 2014, they deliver activities led by the communities' needs and aspirations, to support a thriving and resilient community, to meet their four key thematic outcomes of: People (diverse backgrounds, skills, and ages); Home (accessible housing); Economy (wide range of businesses and employment); and Environment (preservation of the natural environment and reduced carbon emissions). They have been supportive of Ulva's community buy-out and redevelopment programme[5].

Engagement in the transition: No direct engagement on Ulva

Contact person: Morven Gibson, The Columba Centre - admin@swmid.co.uk

European Small Islands Federation (ESIN)

Perspective on the transition: ESIN is a not-for-profit organisation based in Sweden, acting to represent the voices of over 350,000 small islanders across Europe. ESIN's objective is to support the sustainable development of small European island communities through strengthening their cultural identity, facilitating knowledge sharing, and advocating for EU policy.

Engagement in the transition: For this study on Ulva, ESIN is acting as the Energy Working Group, community engagement specialists, and Project Coordinator. ESIN has secured an EU grant through the NESOI project, intending to mobilise sustainability research and development across four small island communities: Nagu (Finland), Fur (Denmark), Veno (Denmark, and most relevantly to this report, Ulva in Scotland[6]. ESIN have developed the Clean Energy Transition Agenda (CETA) framework, providing a strategic roadmap to articulate and plan the clean energy transition vision and process for these islands.

Contact person: Rhonda Twombly, ESIN Secretariat - rhodatwombly@gmail.com

Businesses

Local businesses on Ulva (Accommodation, Dining, Transport)

Perspective on the transition: Together, Ulva House, Ardalum House, the Boathouse Café, the Ferry House, and Ferry Operator, form central pieces of Ulva's cultural history, economic life, and tourist attraction for the island. Ulva House and Ardalum House comprise two of the existing housing stock on the island, in poor state of repair and marked for renovation. The

[5] https://www.ulva.scot/right-to-buy-has-been-triggered
[6] https://nesoi.eu/

Boathouse is an award-winning restaurant and key location for tourists the start and end of their ferry journey from the Ulva Ferry Port on Mull. The Boathouse is being considered for extension by NWMCWC, to meet expected increases in demand and to improve facilities. Adjacent to the Boathouse Café is Ulva Ferry House, an historic property now in urgent need of renovation.

With regards to transportation, Ulva Ferry is a privately-operated business (run by Donald Munro), crossing between Ulva Ferry Port on Mull, to the Boathouse on Ulva[7]. A school run for children operates twice daily.
West Coast Motors operate a regular public bus service within the Ulva Ferry area, coinciding with the ferry service on most days.
Engagement in the transition: There are a small number of privately owned businesses on Ulva, all of which will be considered for their contribution within the CETA sustainability agenda. For each site, Scene will gather information regarding energy consumption (heating and electricity), energy efficiency, patterns of building use, and economic data (energy costs, materials etc.). Scene will consider different scenarios by which these businesses could reduce their demand and contribute to an island-wide low carbon energy system.

Contact person: Wendy Reid, Isle of Ulva Development Manager - wendy@nwmullwoodland.co.uk

Ricardo Energy & Environment

Perspective on the transition: Ricardo have played a role in the energy transition on Ulva as technical advisors. Their perspective is supportive of the clean transition on Ulva, although they are no longer actively involved on the island.

Engagement in the transition: Ricardo have previously conducted low carbon energy studies on Ulva, on behalf of the Highlands and Islands Enterprise. The 'Islands Energy System Overview' provided a high-level summary of electricity and heat consumption of Ulva, and reviewed energy efficiency quality across the island's buildings[8]. The second 'Heat Supply Options Report' appraised the island's potential to host various low carbon district ground-source heating schemes. While Ricardo is no longer actively working on Ulva, they have provided much of the initial groundwork for further low carbon assessments and development for Ulva's clean energy transition.

Contact person: Simon Morris, simon.morris@ricardo.com

Scottish and Southern Electricity Networks (SSEN)

Perspective on the transition: SSEN are committed to a net-zero energy transition with a focus on community-led initiatives, to help combat climate change[9]. However, their ability to support such initiatives will be highly conditional on certain technical requirements. Most relevantly to this investigation on Ulva will be the ability and capacity of SSEN's local distribution network to accommodate changes and additions to local generation, made by the installation of new renewables and other low carbon technologies.

The island currently hosts a single-phase distribution network. At present, this limits the scale of additional renewables generation for consideration within the Transition Agenda.

[7] https://www.facebook.com/theulvaferry
[8] https://www.hie.co.uk/media/8139/hie-small-islands-low-carbon-energy-overview-final-report-for-publication-pdf-060420-a3410152.pdf
[9] https://ssenfuture.co.uk/

Engagement in the transition: SSEN already provide funding to support rural households in the north of Scotland to connect to its electricity network[10]. It is uncertain whether this support extends to existing connections in need of network upgrades.

Contact person: SSEN's Innovation Team is responsible for exploring solutions to distribution network constraints: commercial.contracts@sse.com

Public Sector

Governmental Actors

Scottish Government

Perspective on the transition: The Scottish Government has provided ongoing support on Ulva since the very beginning of plans made for the island's purchase and redevelopment in 2017. This support, made through the Community Empowerment Act of 2015, aligns with the Government's vision of unlocking community potential throughout the country, and giving local people a say in their future: "The Scottish Government will continue to promote community land ownership and work to ensure that land in Scotland delivers benefits for everyone[11]."

Engagement in the transition: The Scottish government endorsed community redevelopment on Ulva when they approved the Community Right to Buy application of the NWMCWC in 2018[12]. Furthermore, through the Scottish Land Fund, the Government also provided a grant of over £4m for this purchase, supplemented by an additional £500,000 from the Macquarie group.

Since then, in February 2020, an ambitious 5-year agricultural, environmental and climate scheme (AECS) for redevelopment on Ulva has received government funding[13]. Key to this scheme was to establish a herd of highland cattle - introduced to the island in 2019 – as well as to re-establish productive grazing land.

Contact person: https://www.gov.scot/groups/islands-strategic-group/

NatureScot

Perspective on the transition: Originally known as 'Scottish Natural Heritage (SNH)', since 2020 NatureScot is the nature agency of Scotland, working to protect, improve, and promote Scotland's landscape and natural heritage, contributing to a cleaner environment as well as to human well-being. NatureScot is the leading public body responsible for advising the Scottish Government on all matters relating to natural heritage. It is funded mainly by the Environment and Forestry Directorate of the Scottish Government.

Engagement in the transition: As an island of extremely rich cultural and natural heritage, Ulva is a highly relevant location for preservation and protecting by NatureScot. The island's community buy-out and ongoing development has also been supported by the Scottish Government's Natural & Cultural Heritage Fund, which is one of the European Regional

[10] http://news.ssen.co.uk/news/all-articles/2021/june-2021/scottish-hydro-electric-community-trust-funding-available/
[11] https://blogs.gov.scot/rural-environment/2018/02/01/success-for-ulva/
[12] https://www.ulva.scot/right-to-buy-has-been-triggered
[13] https://www.ruralpayments.org/topics/all-schemes/agri-environment-climate-scheme/

Development Fund's Strategic Interventions being led by NatureScot (the other is the Green Infrastructure Fund).
Additionally, in 2014, Ulva was included within a study by NatureScot into the marine biological and site conditions across eight sites on Scotland's West Coast[14].

Contact person:
https://www.nature.scot/

Highlands and Islands Enterprise (HIE) – Scottish Government

Perspective on the transition: HIE supports groups with capital funding and expertise to research and deliver community development projects across a 3-year period. HIE capital funding can be significant but often provides 'last brick in the wall' support.

Engagement in the transition: Funded the initial community buy-out business plan for Ulva in 2018. And then provided funds in March 2021 to support the development of community-led tourism infrastructure and regeneration to welcome back visitors after COVID travel restrictions e.g., community buildings, outdoor seating, improved walkways, e-bikes, and electric vehicle charging points[15].

Contact person: enquiries@hient.co.uk

Argyll and Bute Council (ABC)

Perspective on the transition: The local council authority responsible for reviewing and approving all planning applications on the Isle of Mull, adjacent to the Isle of Ulva. ABC has an interest in ensuring that local development plans on both islands (e.g., Isle of Ulva Community Masterplan[16]) are well-aligned and mutually supportive.

Engagement in the transition: Not directly engaged in developments on Ulva itself but is responsible for approving planning applications on the adjacent Isle of Mull e.g., new housing and the pontoon at the Ulva Ferry port on Mull. ABC is a critical stakeholder for improving and encouraging access to the Isle of Ulva e.g., through the Ulva Ferry port[17].

Contact person:
Councillor David Kinniburgh, Policy Lead for Planning, Protective Services, and Licensing.
Councillor Robin Currie, Policy Lead for Housing, Roads and Infrastructure Services.
planning.olandi@argyll-bute.gov.uk

New Energy Solutions Optimized for Island (NESOI)

Perspective on the transition: A European Commission/EU Horizon 2020 body, providing high-level funding and support for the Isle of Ulva CETA, through ESIN. Its objective is to identify and leverage the clean energy transition opportunities available to small island communities across the EU.

[14] https://www.nature.scot/doc/naturescot-commissioned-report-754-baseline-survey-and-mapping-intertidal-features-within-selected
[15] https://www.obantimes.co.uk/2021/03/19/coll-ulva-and-islay-benefit-from-1-5m-fund/
[16] https://www.argyll-bute.gov.uk/moderngov/documents/s163208/00804%20MPLAN%20Report%20Ulva%20AB%20210520.pdf
[17] https://www.argyll-bute.gov.uk/news/2020/jul/council-congratulates-mict-new-development-plans

Engagement in the transition: NESOI has provided the necessary funding to ESIN, who are more directly supporting sustainable transition research and development agendas (CETAs) on the Isle of Ulva (alongside other islands in Denmark and Finland).

Contact person: Alexis Chatzimpiros, CARING Coordinator, ESIN - ac@esin.ngo

Economic Activities

Mull Fishermen's Association (MFA)

Perspective on the transition: Supportive, expecting expanded access and infrastructure to the piers and waterways of the Sound of Ulva.

Engagement in the transition: None known.

Contact person: Nick Turnbull, MFA Chairman

Schools and Academia

Primary Education

Ulva School and Ulva School Community Association

Perspective on the transition: Supportive of the initial community buy-out of Ulva, in recognition of mutually supportive aims of both the buy-out and the association. The UCSA aims: "to advance community development, including rural regeneration within the Community", and to; "Manage community land and associated assets for the benefit of the Community and the public in general". The UCSA also recognise that the repopulation of Ulva would ultimately provide positive support the school.

Engagement in the transition: Issued a letter of support to NWMCWC in the proposed buy-out of Ulva.

Contact person: Anna Hogan, Acting Secretary of Ulva School Community Association - secretary@uscamull.org.uk.

5. Policy and Regulation

Scotland has set out ambitious targets for achieving net zero and supporting sustainable development through a number of policies, regulation, and legislation. This section sets out policies relevant to Ulva's low carbon transition and opportunities arising from local development planning.

National Policy

There are several key national policies which are relevant to low carbon development and decarbonisation, including:

Climate Change (Scotland) Act (2019): sets targets to reduce Scotland's emissions of all greenhouse gases to net-zero by 2045, with interim targets for reductions of at least 56% by 2020, 75% by 2030, and 90% by 2040. The Act requires Scottish Ministers to, when publishing an infrastructure investment plan, publish an assessment of the extent to which investment in accordance with the plan is expected to contribute to the meeting of the emissions reduction targets.

Scottish Energy Strategy (2017): outlines the Vision for Energy in Scotland. This Vision specifically focuses on delivering a flourishing, competitive local and national energy sector, delivering secure, affordable, clean energy for Scotland's households, communities, and businesses. The Strategy acts to guide the decisions that the Scottish Government, working with partner organisations, needs to make over the coming decades. The vision remains guided by three core principles: a whole-system view; an inclusive energy transition; a smarter local energy model.

In 2019, a policy position paper was published by the Scottish Government, highlighting key priority areas for energy development in Scotland. These are:

- Decarbonisation of heat and energy efficiency, including £1.6bn committed to Heat in Buildings capital funding;
- Local Energy, including a renewed focus on delivering 2GW of locally-owned energy projects by 2030;
- Energy transition, including £62m Energy Transition Fund and a Hydrogen Action Plan to deliver net zero by 2045;
- Renewable, including the actions resulting from the Offshore Wind Policy Statement;
- Consumers, to gather an act on feedback in the energy sector;
- Strategy, to revise and renew energy strategies and pathways for Scotland.

Heat Policy Statement (2015): Setting out the future policy direction of heat in Scotland, including a hierarchy of objectives: reducing the need for heat, supplying heat efficiently and at least cost to consumers, and using renewable and low carbon heat. The policy sets out an ambition to achieve 1.5TWh of Scotland's heat demand to be delivered by district or communal heating and to have 40,000 homes connected to communal heating by 2020.

Energy Efficiency Route Map (2018): is underpinned by the Energy Efficiency Scotland programme, which has allocated over £1 billion pounds since 2009 on tackling fuel poverty and improving energy efficiency since 2009. Energy Efficient Scotland delivers across two key policy areas of Government: fuel poverty and climate change. Because of this it has two main objectives:

- Removing poor energy efficiency as a driver for fuel poverty.
- Reducing greenhouse gas emissions through more energy efficient buildings and decarbonising our heat supply.

Energy Efficient Scotland includes work with Scotland's local authorities on the development of Local Heat & Energy Efficiency Strategies (LHEES).

Local Energy Policy Statement (2021)

The LEP Statement sets out the approach the Scottish Government wishes to promote to help and inform the decisions of all those participating in, or developing, local energy projects as Scotland's energy system transitions to a low carbon future. The ten key principles, which fall under five key themes:

- **People**: Undertake early engagement and tailoring support to the different ways people will want to engage.
- **Places**: Local energy projects should reflect local characteristic and focus on collaborative strategic approaches and partnership working.
- **Network and infrastructure**: All activity should provide a high level of security and quality of supply to all, and the design and operation of energy networks should consider the whole energy system while supporting local, regional, and national solutions.
- **Pathway to commercialisation**: Prioritise projects that demonstrate a commercially viable and replication, and prioritise and act upon 'low regret' opportunities
- **Opportunity**: Local energy projects should seek to support the creation of high value jobs and ensure a just transition for Scotland's workforce.

Particularly relevant to Ulva and the Scottish Islands, the statement suggests that islands can be at the forefront of the transition to low carbon energy and commits the Scottish Government to publishing a Scottish Islands Energy Strategy document. It identifies the specific energy constraints, opportunities and local specificity of island localities and sets out key methods of addressing these through local energy development (e.g., LHEES).

National Islands Plan (2021)

The Islands (Scotland) Act 2018 requires that a report is presented to Parliament each year setting out the progress made towards delivery of the National Islands Plan. The Plan provides a framework for action in order to meaningfully improve outcomes for island communities. The Plan has 13 Strategic Objectives which the Scottish Government will use to direct work. Whilst all topics are relevant to all Scottish islands, particularly important to Ulva and this energy study are:

- **SO1**: To address population decline and ensure a healthy, balanced population profile
- **SO2**: To improve and promote sustainable economic development
- **SO3**: To improve transport services
- **SO4**: To improve housing
- **SO8**: To improve and promote environmental wellbeing and deal with biosecurity
- **SO9**: To contribute to climate change mitigation and adaptation and promote clean, affordable, and secure energy

Particular relevant outcomes include a commitment to 30% of public-owned ferries being low emissions by 2032, with aspirations to decarbonise across public and private fleets, commitments to locally-owned renewable energy generation and developing net zero islands and developing island-based carbon reduction schemes (e.g., woodland planting).

Local Policy

Argyll & Bute Council formally adopted the Argyll and Bute Local Development Plan on the 26th of March 2015. The Argyll and Bute Local Development Plan 2 (LDP2) is currently in

development and has been issued as a pre-submission written statement and proposal maps as of November 2019. This report section to LDP2 in all instances.

Argyll and Bute Local Development Plan 2 (LDP2)

The LDP2 is a statutory planning document, which provides guidance about built development to residents, developers, and investors. The broad outcomes of the LDP2 are to make Argyll & Bute: (1) a successful, sustainable place, (2) a low carbon place, (3) a natural, resilient place, and (4) a more connected place. Underpinning these outcomes is a commitment to supporting local and sustainable development which is in keeping with the aims of the Ulva community.

A selection of relevant policies and statements which bear direct relevance to Ulva are set out below.

Policy 04 – Sustainable Development

This policy is most relevant to sustainable development on Ulva and shows broad support in the emerging LDP2 for the type of energy and regeneration activities planned by the Ulva community.

> *In preparing new development proposals, developers should seek to demonstrate the following sustainable development principles, which the planning authority will also use in deciding whether or not to grant planning permission:*
>
> *a. Maximise the opportunity for local community benefit;*
> *b. Make efficient use of vacant and/or derelict land including appropriate buildings;*
> *c. Support existing communities and maximise the use of existing infrastructure and services;*
> *d. Maximise the opportunities for sustainable forms of design including minimising waste, reducing our carbon footprint, and increasing energy efficiency;*
> *e. Avoid the use of locally important good quality agricultural land;*
> *f. Utilise public transport corridors and active travel networks;*
> *g. Avoid the loss of important recreational and amenity open space;*
> *h. Conserve and enhance the natural and built environment and avoid significant adverse impacts on biodiversity, natural and built heritage resources;*
> *i. Respect the landscape character of an area and the setting and character of settlements;*
> *j. Avoid places with significant risk of flooding, tidal inundation, coastal erosion, or ground instability; and*
> *k. Avoid having significant adverse impacts on land, air, and water environment*

Specific to Ulva, there are a few relevant designations and allocations made in the 2015 LDP, including:

- National Scenic Area – Loch na Keal, Isle of Mull (NSA 19)
- Special Area of Conservation (10508) – Inner Hebrides and the Minches
- Development Management Zone (Countryside Zone) – Ulva Ferry, north coast of Ulva and south coast of Gometra (LDP DM1)
- Rural Opportunity Zone – Ulva Ferry (MU029 & 030)
- SSSI Laggan Ulva Wood, Ulva Ferry (879)

It is important to note that Ulva lies within the **National Scenic Area (NSA**) which is a nationally recognised designation. The Council states in LDP2 (Policy 70):

> *Argyll and Bute Council will resist any development in, or affecting, National Scenic Areas that would have an adverse effect on the integrity of the area either individually or cumulatively, or that would undermine the Special Qualities[18] of the area unless it is adequately demonstrated that:*
>
> *a) Any significant adverse effects on the landscape quality for which the area has been designated are clearly outweighed by social, environmental, or economic benefits of national importance; and*
>
> *b) The proposal is supported by an LVIA and consistent with the relevant Argyll and Bute Landscape Capacity Assessment.*

More specifically, the LDP2 addresses renewable energy development and proposes that the NSA designation covering Ulva would preclude any wind development where turbines heights are greater than 50m[19].

Regarding the **Countryside Zone** designation (Policy 02A), the LDP states that:

> *"Within the Countryside Areas there is a presumption in favour of sustainable development where this is of an appropriate scale, design, siting and use for its countryside location, as detailed in the relevant subject policies. All developments will require a Landscape and Visual Impact Assessment demonstrating to the satisfaction of the Planning Authority, that the proposal can be successfully integrated into its land scape setting unless they are:*
>
> - *Infill; or*
> - *Rounding off; or*
> - *Redevelopment opportunities of clusters; or*
> - *Previously developed sites. Development adjacent to, but outwith settlement boundaries which are delineated in the Proposals Maps will not constitute infill, rounding off or redevelopment"*

In non-designation, or "*remote countryside area*" designations (Policy 02B), the only specific categories of development which can be considered are renewable energy related development; telecommunication / digital infrastructure; development which supports existing agricultural or aquaculture units; or "other recognised countryside activity."

LDP2 (para. 7.26) Highlights Ulva as an area which would benefit from a **community plan or local place plan**. These plans are community-led plans setting out proposals for the development and use of land. Introduced by the 2019 Act, these plans will set out a community's aspirations for its future development. Once completed and then registered by the planning authority, they are to be considered in the preparation of the relevant local development plan.

[18] As detailed in The Special Qualities of the National Scenic Areas; SNH (2010)
[19] Based on Argyll and Bute Landscape Wind Energy Capacity Study (2017)

Part II: Island Transition Path

This section provides an analysis of the energy resource potential of Ulva within the context of current and future energy demand. Due to the limited grid connection and various environmental and cultural constraints on Ulva, large scales of energy development and grid-export based energy development are not considered to be feasible.

The focus of this chapter is on maximising local energy generation and use, the available technology pathways for these actions, and the necessary governance and management requirements of such project(s).

6. Vision

The community on Ulva and its related community organisations – including North West Mull Community Woodland Company and Mull & Iona Community Trust – have a strong combined vision for Mull and for the islands within the Mull archipelago. This vision has an underlying aim of empowering residents to manage and control their island and its resources, whilst promoting and encouraging new people to come and live on the archipelago.

The objectives on Ulva are:

- To stimulate population growth on Ulva and encourage new residents and businesses to settle on the island.
- To promote and develop low carbon development on Ulva, minimising carbon emissions and targeting net zero carbon.
- To reduce and gradually remove the dependency of Ulva on fossil fuels (oil, diesel for transport) by replacing them with alternative and more sustainable sources of energy.
- To preserve the island's unique landscape and heritage by providing sustainable employment and a sustainable environment for people to live in.
- To facilitate the conversion of properties to be more sustainable in their energy usage and to develop new low carbon homes for new residents.

Particular Goals include:

- To develop a clean energy transition agenda ("CETA") for the island of Ulva.
- To remove the island's dependence and use of fossil fuels.
- To increase the island's year-round population within the coming decade
- To have all properties insulated to a sufficient level via retrofit and new build energy efficiency, heat decarbonisation and local electricity generation.
- To take action to reduce the island's dependence on fossil fuels for transport, including on-island, to-island (ferry) and off-island (Mull, mainland) for residents, services, and tourists.
- To engage with the Ulva and local Mull community to raise awareness of low carbon intentions and projects, and to generate new ideas for sustainable development.
- To act as a catalyst for sustainable development on the Mull Archipelago and wider Scottish islands through project development and knowledge sharing.

7. Transition Governance

Current Governance

Projects on Ulva are currently run by the island owner – The North West Mull Community Woodland Company. To date the Company have created a 16.5km haul route to bring landlocked timber to market, built a 95kw micro hydro scheme, created 9 Forest Crofts and set up Island Woodfuels, producing all the island's woodchip and running a firewood business. The focus now is on forest design planning and replanting. In 2018 the company was successful in a community right-to-buy of the island of Ulva, with plans centred around re-population, economic renewal, and sustainable development of the island.

NWMCWC currently have 5 staff members and 5 directors, including:

- Ulva Development Manager
- Office Manager
- Storas Ulbha Development Manager
- Woodfuel Operator
- Woodfuel Operator

Resourcing is a key concern for the development of any project, and, whilst NWMCWC has staff members to draw on, long term operations will require continued recruitment across the existing and future posts.

NWMCWC is a Private company limited by guarantee without share capital, meaning it can act as a commercial body in asset purchase and management. This is suitable for most low carbon project governance, but some consideration should be given to the management of risk. Most often risks can be managed via "arms-length" organisations where a community organisation or charity plays a role in governance but does not operate the operational commercial entity. The operational entity may be a subsidiary company (e.g., a community special purpose vehicle) or a third party.

Governance of the CETA on Ulva should be managed by NWMCWC, as the island owner and therefore the organisation responsible for its future. Furthermore, links with local organisations (e.g., MICT) are critical for the success of any low carbon project, as an Island off an island.

Table 1 provides an overview of the available forms of community governance most frequently utilised in the energy sector and in relation to low carbon development. These models should be considered in regard to specific low carbon projects.

Name	Description
Community Land Trust (CLT)	A CLT is a non-profit, community-based organisation committed to the stewardship and affordability of land, housing and other buildings used for community benefit in perpetuity. CLTs are usually constituted as Industrial & Provident Societies (IPS), or Companies limited by Guarantee and have charitable status. They typically provide affordable homes, community gardens, civic buildings, pubs, shops, shared workspace, energy schemes and conservation landscapes. CLTs have particularly been used to deliver and manage heat networks in the UK.

Registered Society (RS) / Community Co-operative	There are various forms of RS which provide a social or community benefit which include a co-operative, a company limited by guarantee and a community benefit trust or BenCom (further details on the BenCom structure below). RS are registered under the Co-operative and Community Benefit Societies Act 2014. They are all forms of body corporate. The co-operative and BenCom structure both have a share capital and are owned and controlled by the stakeholders who become members upon acquiring a share. Each member will have one vote. An RS is registered with the Financial Conduct Authority and not under the Companies Acts. Co-operatives have previously been used by community organisations to deliver wind, solar and heat projects but more recently have fallen out of favour due to ineligibility for a number of tax relief programmes, including Social Investment Tax Relief (SITR).
Community Interest Company (CIC)	A CIC is a body corporate which can take the form of a company limited by guarantee or with a share capital or even a RS structure. A CIC is designed either to trade for a social purpose, or to carry out activities which will benefit the wider community. A CIC must therefore pass a community interest test and satisfy the CIC Regulator that it will provide some form of community benefit. A CIC, as a company limited by shares, can raise equity finance. The assets of a CIC however are protected by means of an asset lock. In general terms, an asset lock will restrict profits being distributed to the members or shareholders to ensure that they are applied in accordance with the CIC's purposes. Dividends for investors are also capped, which can make it an unattractive investment for investors seeking a higher rate of return on their investment A CIC cannot be a charity. Whilst this has the advantage that the purposes of a CIC are not restricted to the approved categories of charitable purposes set out in the 2005 Act with the result that they can be much wider in their application, it does mean that a CIC does not receive favourable tax treatment.
Community Benefit Company (BenCom)	A BenCom is designed to benefit the wider community as a whole, within the scope of its' defined purposes. Unlike an IPS co-operative, it is not necessary to be a member of the BenCom in order to benefit from it. So, a BenCom will provide a wide level of public benefit within the defined community. BenComs have a number of benefits, including: - Every member has an interest in the running of the BenCom owing to their shareholding and will therefore have a greater say in the community benefits that it will provide. Every member has one vote. - Limited liability protection for members. - They can raise funds through the issue of share capital. - It can become a charitable body with favourable tax treatment.
Scottish Charitable	SCIOs are a purpose-built limited liability structure for charities in Scotland. The SCIO is a corporate body which is a legal entity having, on the whole,

Incorporated Organisation (SCIO)	the same status as a natural person. This means it has many of the same rights, protections, privileges, responsibilities, and liabilities that an individual would have under the law. As a legal entity, the SCIO may enter into the same type of transactions as a natural person, such as entering into contracts, employing staff, incurring debts, owning property, suing, and being sued. Iona Renewables was set up as a SCIO in 2017 to undertake low carbon projects, including energy efficiency and a heat network, on the island.
Trust	A trust is usually set up where assets (e.g., property, investments) are given by one person (the Donor) to another (the Trustees) with the intention that is should be applied for the benefit of a third party or the public (the Beneficiary). Once this occurs, the trustees own the asset, but can only apply it in accordance with the trust for the benefit of the beneficiaries. Development Trusts are commonly used in Scotland for renewable energy projects, with a commercial special purpose vehicle (SPV) conducting the initial investment and asset ownership, before donating revenue to the primary trust for use and disbursement.

Table 1 - Overview of Governance Structures and Low Carbon Development

8. Pathways

Ulva's pathway to net zero is not as simple as accounting for current emissions and setting out a reduction pathway. This is due to the strategic ambition which underlies all work on Ulva – to increase the population of the island. Increases in population inevitably lead to increased emissions as a result of the new activities, homes and infrastructure required to support new residents and businesses.

The focus of this CETA is therefore on sustainable growth, working from a baseline condition – with limited and relatively low efficiency buildings, relatively high transport emissions and reliance on a weak energy grid – to a future where a greater number of island residents can be supported with equal or lesser emissions, and significantly lower emissions per capita in comparison to the current baseline. To achieve this, a number of technologies are assessed within this chapter are set out in Table 2, alongside the key considerations and limitations to scale and scope of development.

As a remote and weak-grid island, Ulva must look towards a number of technologies in unison to achieve low carbon support of electricity, heat, and transport. To this end, and through bespoke analysis of each technology type detailed below, two future development scenarios have been created for Ulva.

- **Moderate Ambition ("Meeting Demand")**: to assess the energy, financial, and environmental outcomes of meeting minimal on-island energy demand and energy efficiency objectives on Ulva, through renewable generation and supply.
- **High Ambition ("A low carbon future"):** to assess the energy, financial, and environmental outcomes of meeting a higher and more diverse energy demand on Ulva, across 27 used buildings, with more ambitious energy efficiency objectives, and transportation needs both on and off the island, through a low carbon energy system.

Full assessment of these scenarios is set out in section 9.

Sustainable Development Technology Pathways		
Pillar	**Suitability**	**Detail**
1. Electricity		
Wind Turbine(s)	Moderate	High year round windspeeds Limited by local constraints, particularly a limit of 50m height within NSA.
Solar PV (standalone)	High	Good solar resource. Existing solar installed means new solar PV would likely be acceptable.
Solar PV (rooftop)	High	Suitable for new build properties. Not suitable for listed properties. Concerns around structural capacity of existing building stock.
Hydroelectric	Low	Little to no suitable resource.
2. Heating		
Biomass Boiler	Low	Fuel delivery a barrier due to limitations of ferry connection. Potential linkages with local wood processing and NW Mull woodland.

Heat Pumps	High	High prospect and suitability for all heat pump types. Some concerns around longevity of ASHP in saline environment.
Energy Efficiency	High	Critical approach to reducing island energy demand. MEEP legislation regarding improvement of EPCs to band C by 2030.
3. Transport		
Electric vehicle fleet (on-island)	High	Already partially implemented. Extension / scheme planning to ensure availability to locals and tourists required.
Electric shuttle (Mull)	Moderate	Reduction of upstream emissions. Potential collaboration with MICT and benefit to Ulva Ferry Residents. Limited impact on-island.
Electric Ferry	Moderate	High emissions reduction potential. High cost and moderate risk due to innovate nature of the proposition (e.g., impacts on service quality).

Table 2 - Sustainable Development Technology Pathways for Ulva

9. Pillars of the Energy Transition

The two development scenario options for a low carbon energy transition on Ulva are set out below.

Moderate Ambition – 'Meeting Demand'

The Moderate Ambition scenario was designed to assess the energy, financial, and environmental outcomes of meeting minimal on-island energy demand and energy efficiency objectives on Ulva, through renewable generation and supply. More specifically, this scenario included:

Energy type	Description
Demand:	• 10 new-builds built to EPC 'C' level, and heated by air-source heat pumps with a COP of 3; • The 14 existing buildings, refurbished to EPC 'D' level and heated by air-source heat pumps • Demand of Ulva House, Ardalum House, the Boathouse Café; • Energy demand of the campsite.
Generation:	• 10 new-builds fitted with rooftop solar PV (4.4 kWp each) • Use of existing 18kW ground solar PV • Simulation of potential 100 kW wind turbine(s)
Transport:	On-island transport: 1) 2x E-mountain bikes 2) 1x E-ATV 3) 1x E-off roader 4) 2x E-tractors

Table 3 - Moderate Ambition Scenario Parameters

Energy Demand

Total energy demand of the Moderate Ambition Scenario on Ulva amounts to 224,254 kWh of electricity per year, comprising domestic consumption across 27 moderately efficient buildings (EPC C and D) fitted with air-source heat pumps, and the demand of 4 electrified vehicles for on-island transportation:

- Buildings: 89,821 kWh per year.
- ASHPs: 114,533 kWh per year.
- On- island electric charging: 19,900 kWh per year.

Total energy demand for this Moderate Ambition Scenario is lower than for the High Ambition, described below, largely due to this scenario including the fewer electric vehicles.

Energy Generation

Energy generation is the same for both the Moderate and High Scenario. The existing 19 kW ground-mounted solar array generates and estimates 20,914 kWh of electricity per year, added to 46,554 kWh of generation from the simulated 44 kW rooftop solar PV across the 10 new-builds. Simulated 100 kW wind turbine(s) on Ulva would produce around 375,400 kWh of electricity per year, totalling 421,958 kWh of renewable energy production each year between ground solar, rooftop solar, and wind generation on the island.

Financial and Carbon Impacts

Renewable energy generation is expected to meet around over 82% of the island's total electricity demand, representing grid electricity cost savings of £52,066 per year and earning around £11,302 per year in income by exporting excess generation to the grid.

These renewables would offset 32.1 tonnes of grid carbon (tCO_2e) emissions, while the use of air source heat pumps instead of heating oil could confer an additional reduction of up to 58.7 tCO_2e - if heat pump electricity demand is supplied by the national grid - or 70.8 tCO_2e if heat pump electricity demand is met by a mix of locally generation and grid electricity.

The island's total net carbon emissions, by meeting its remaining electricity demand through the grid, comes to 8.1 tCO_2e per year.

This remaining electricity demand (38,302 kWh per year) would be expected to cost around £10,725 for the island, to provide for domestic electricity, heating with air-source heat pumps, and electric vehicle charging from the grid.

Compared to the island's existing baseline emissions, the Moderate Ambition Scenario represents a net carbon reduction as measured per property in use. While the baseline represents emissions of 2.5 tCO_2e per used property per year[20], this Moderate Ambition scenario amounts **to 0.3 tonnes for each property**, or a reduction of over 87%[21].

High Ambition – 'Low Carbon Future'

The High Ambition scenario was designed to assess the energy, financial, and environmental outcomes of meeting a higher and more diverse energy demand on Ulva, across 27 used buildings, with more ambitious energy efficiency objectives, and transportation needs both on and off the island, through a low carbon energy system. More specifically, this scenario included:

Energy type	Description
Demand:	• 10 new-builds built to EPC 'A'/*passivhaus* level, and heated by air-source heat pumps with a COP of 3; • The 14 existing buildings, refurbished to EPC 'D' level and heated by air-source heat pumps. • Demand of Ulva House, Ardalum House, the Boathouse Café; • Energy demand of the campsite.
Generation:	• 10 new builds fitted with rooftop solar PV (4.4 kWp each) • Use of existing 18kW ground solar PV • Simulation of potential 100 kW wind turbine(s) • Battery storage • EV chargers
Transport:	• On-island transport: 1) 2x E-mountain bikes 2) 1x E-ATV 3) 1x E-off roader 4) 2x E-tractors • Off-island transport: 1) Electrified shuttle bus to Ulva ferry (on Mull)

[20] *Including 3 houses, Ulva House, Ardalum House, and the Boathouse Café.*
[21] *Including 10 new builds, 14 renovations, and 3 businesses.*

	2) Electrified ferry from Mull to Ulva.

Table 4 - High Ambition Scenario Parameters

Demand

Total energy demand of the High Ambition Scenario on Ulva amounts to 296,364 kWh of electricity per year, comprising domestic consumption across 27 total highly efficient buildings fitted with air-source heat pumps, and the demand of 8 electrified vehicles for transportation both on and off the island:

- Buildings: 89,821 kWh per year.
- ASHPs: 111,200 kWh per year.
- On- and off-island electric charging: 95,344 kWh per year.

Note that, while the ASHPs represent an additional electric demand for the island, they replace the use of oil as a heating fuel, meeting the same space heating demand using just one-third the energy, and so actually confer a reduction in carbon emissions for heating.

Generation

Total renewable energy generation on the island is an estimated 442,872 kWh per year. This assumes use of the existing 19 kW ground-mounted solar array, 4.4 kW of rooftop solar PV across 10 new-build properties, and simulated 100 kW wind turbine(s) on the island:

- Ground mounted solar PV: 20,914 kWh per year.
- Rooftop solar PV: 46,554 kWh per year.
- Wind turbine(s): 375,404 kWh per year.

Financial and Carbon Impacts

Renewable energy generation is expected to meet around 51% of the island's total electricity demand, representing grid electricity cost savings of £42,439 per year, and earning around £11,652 per year by exporting excess generation to the grid.

Renewables would offset 32.1 tCO_2e per year, while the use of air source heat pumps instead of heating oil would confer an additional 23.6 tCO_2e if using grid electricity only - or 11.5 tCO_2e if splitting the electricity supply between local renewables and the grid.

The island's total net carbon emissions, by meeting its remaining electricity demand through the grid, comes to 30.7 tCO_2e per year.

This remaining electricity demand (144,798 kWh per year) would be expected to cost around £40,543 for the island, to provide for domestic electricity, heating with air-source heat pumps, and electric vehicle charging, or £18,870 if electric shuttle bus and ferry are not included.

This High Ambition scenario represents a net carbon reduction compared the island's existing baseline situation. The current baseline entails emissions of 2.5 tonnes CO2e per used property per year[22], while in the High Ambition scenario **each property represents 1.1 tonnes CO2e**, a reduction of over 50%[23]. The higher emissions and costs related to this scenario result from greater use of energy for transport.

[22] *Including 3 houses, Ulva House, Ardalum House, and the Boathouse Café.*
[23] *Including 10 new builds, 14 renovations, and 3 businesses.*

Key Pillars

The below pillars of the energy transition should be considered critical for future sustainable development on Ulva.

1. Reduce baseline energy demand

It is often the case that the quickest, cheapest, and most effective cost and carbon emission reductions can be achieved by reducing a property's baseload energy demand in the first instance. This can be done through energy efficiency measures, comprising the insulation of windows, lofts, and roofs at the more basic, to the more advanced cavity and solid wall insulation options. Our models simulated this as an initial measure, achieving EPC ratings of C and D in the Moderate Scenario, and ratings of B and A in the Ambitious Scenario. We consider these measures to be 'low hanging fruit' - low-cost and high-reward methods to achieve meaningful economic and carbon savings. Based on previous and ongoing energy efficiency work on Ulva, it is expected that EPC ratings of D or C are viable through retrofit, with higher levels of efficiency a consideration for new build properties.

After having reduced a property or community's base energy demand, measures to supply that remaining energy with as little carbon intensity and cost as possible are then recommended.

2. Integrate clean energy supply with new developments

Where possible, new developments on the island should be integrated with their own energy supply source as standard. For example, the 10 new-build properties currently in development should be fitted with rooftop solar, to meet as much of their direct energy demand as possible and reduce their energy costs.

We simulated this in both model scenarios, assuming that each new-build property could host a small rooftop solar PV array of 4.4 kW based on industry standard solar PV software.

This would also be a more cost-effective way of increasing the island's renewable energy supply compared to installing stand-alone assets or extending the existing ground-mounted array as part of a separate development – this is because the cost of the rooftop solar system would represent a small marginal additional cost to the total existing costs already incurred for the new-build developments.

3. Consider an Ulva Island Energy Fund

The island could consider selling its renewable energy supply to its community and visitors for a discounted tariff compared to the cost of grid electricity. (e.g., 20p / kWh compared to 28p / kWh). Not only incentivising the uptake of locally generated clean energy, and providing energy cost savings to local island residents, this would also enable the development of an Island Development Fund to support continued renovation, development, and repopulation of the island in keeping with the vision and aims as set out in Ulva's Redevelopment Masterplan. Under the Moderate Ambition Scenario, this scheme could generate over £37,000 per year for the Fund, or £30,000 under the High Ambition Scenario.

This income would be in addition to that generated by selling excess renewable energy to the energy supplier through the grid, which by itself would generate and estimated £11,300 under a Moderate scenario, or £11,700 under High Ambition. The Fund could also be supported by selling electricity charging for the fleet of e-vehicles across the island, for use by visitors and residents.

Note that this income does not account for the up-front capital or ongoing operating costs associated with installing or maintaining these technologies and schemes.

4. Continue building a smart energy system to improve energy resilience

Ongoing geopolitical crises and rising energy bills have demonstrated the importance and value of building resilient and self-sufficient energy systems across national and regional scales. As an island, Ulva is particularly vulnerable to energy supply chain delays and costs, and should therefore seek to build a comprehensive smart, efficient, and low carbon energy system of a complexity that is beyond the scope of this initial high-level study. Such as system would be able to leverage its abundant wind and solar renewable energy resources, maximise the use of this energy for local consumption, make use of battery storage, flexible demand, and monitoring assets to improve efficiency and build diverse sources of income to produce wider social, environmental, and economic benefits and resilience throughout the island.

10. Monitoring

Whilst no actions have been undertaken on Ulva during the preparation of this CETA, there are a number of monitoring approaches which should be considered to ensure projects deliver the impacts which they set out to (e.g., carbon emissions reduction, cost savings, revenue generation). These are detailed in Table 5.

Indicator	Description	Actions
CETA	Ensure that CETA and supporting documents are utilised by Ulva community.	Share with island community. Promote via NESOI and ESIN. Support development of wider CETAs for Mull.
Community Engagement	Ensure outcomes of reporting are widely shared and actions discussed.	Raise awareness through events and one-to-one engagement. Promote involvement of community members in management of island.
Community Organisation engagement	Share outcomes with wider community organisations and explore collaboration opportunities.	Work with local organisations to action recommendations Roundtable discussions to enable collaboration
Public sector engagement	Engagement with Argyll & Bute Council (A&BC) to secure support for project(s).	Communicate intentions to A&BC. Collaborate on key opportunities
Energy Demand	Monitor energy demand to ensure efficacy of demand reduction projects.	Conduct EPCs and similar energy audits for all work undertaken. Long term monitoring of energy use / billing.
Energy Generation	Monitor energy generation to ensure efficacy of energy generation projects.	Long term monitoring of energy generation. O&M provider monitoring.
Revenue / Cost Savings	Monitor cost savings / revenue to ensure they match financial projections.	Collect and evaluate cost data from residents Monitor company accounts
Energy supply	Monitor energy supply to identify issues with local grid, grid management opportunities and facilitate DNO collaboration.	Collect grid data locally (e.g., energy monitoring) Work with DNO to establish grid use and mutually beneficial projects. Obtain funding from DNO
Road mapping	Set out roadmap and business plan for Ulva	Regular review of milestones and programme.

Design Guide	Set up an island sustainable design guide setting out the intentions and rules for future development on Ulva.	Review of design guide Informing stakeholders of design guide (e.g., housebuilders, ferry operator)

Table 5 - Ulva transition monitoring matrix

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