# Inner Hebrides: Net Zero Load Growth Evidence Summary

An evidence case report for future electricity generation and demand load growth in the Inner Hebrides



May 2024

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Scottish & Southern Electricity Networks

# About Scottish and Southern Electricity Networks (SSEN)

SSEN is the electricity Distribution Network Operator (DNO) responsible for delivering power to over 3.8 million homes and businesses across central southern England and the north of Scotland. SSEN serve some of the most diverse and unique geographies across the UK, including the supplies to 65 Scottish Islands. SSEN are committed to keeping customers and communities connected whilst developing a flexible electricity network vital to achieving net zero.

# About Regen

Regen is an independent centre of energy expertise with a mission to accelerate the transition to a zero-carbon energy system. We have nearly 20 years' experience in transforming the energy system for net zero and delivering expert advice and market insight on the systemic challenges of decarbonising power, heat, and transport.

Regen is also a membership organisation, managing the Regen members network and the Electricity Storage Network (ESN) – the voice of the UK storage industry. We have over 150 members who share our mission, including clean energy developers, businesses, local authorities, community energy groups, academic institutions, and research organisations across the energy sector.

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# Executive summary

SSEN's RIIO-ED2 business plan included proposed investments in 15 subsea cables to enable the transition to net zero and maintain security of supply for specific Scottish Islands. Through SSEN's final business plan dialogue with Ofgem, the planning and approval of these cables were to be assessed under an investment re-opener, the Hebrides and Inner Hebrides Whole System Uncertainty Mechanism (HOWSUM).

SSEN commissioned Regen to support the HOWSUM assessment by collating evidence around future electricity load growth on the island groups. This builds on existing data and engagement from SSEN's 2022 Distribution Future Energy Scenarios (DFES) analysis – completed by Regen – supplemented where possible with analysis and updated data from SSEN's 2023 DFES, which is currently underway. Additional desktop research and industry engagement were undertaken to gain further insight into future electricity loads across industries that are not currently in the DFES technology scope, e.g. maritime decarbonisation, aviation, distillery electrification and aquaculture.

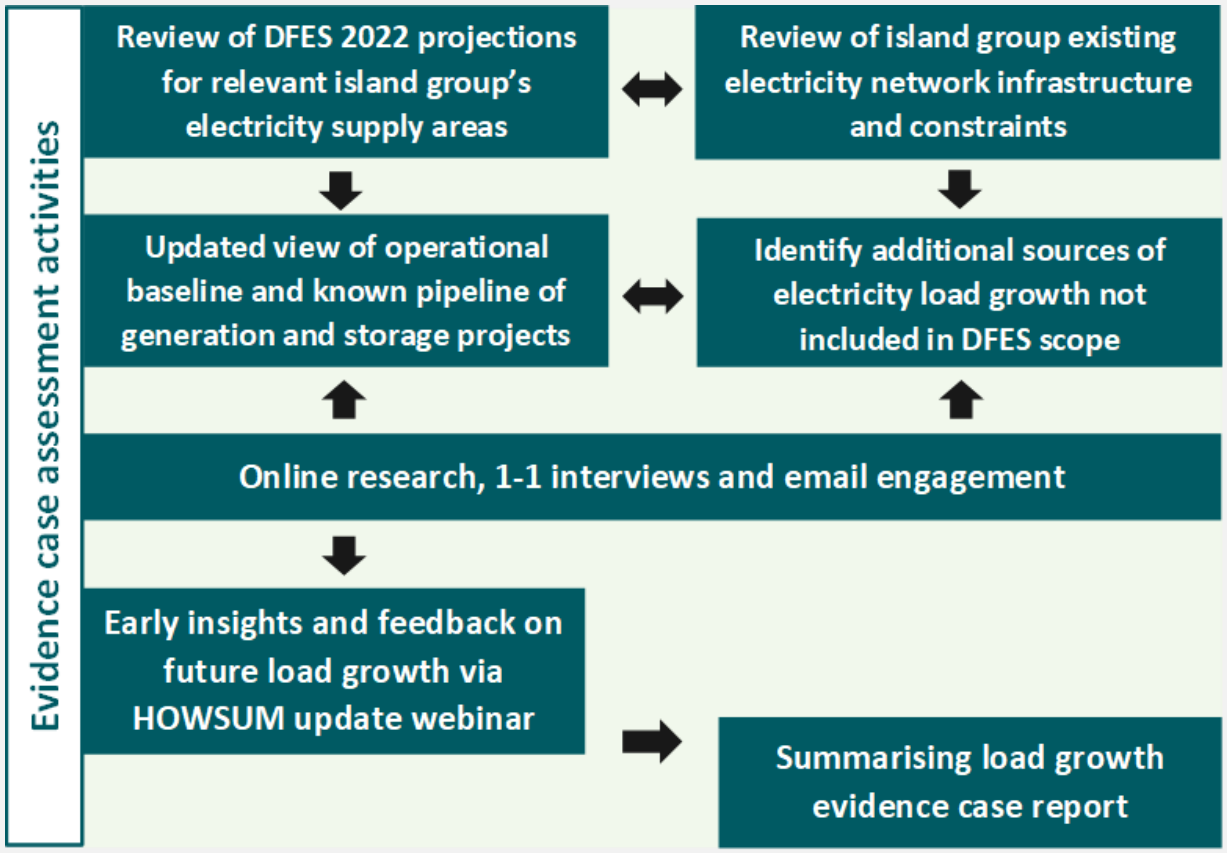


Figure 1
**Overview of load growth case methodology**

Argyll and Bute Council, which represents the part of the Inner Hebridean Islands that is the main subject of the HOWSUM process, set out a Decarbonisation Plan[1] that covers the period between 2022-2025 and sets out commitments to reach the council's target of net zero before 2045, with at least 75% carbon reduction by 2030. This Plan is continually updated by the council – the most recent update approved and released in February 2024[2] – and was used as an input throughout this study.

Analysis, research and engagement with organisations and industries on the islands suggest potentially significant future electricity generation load growth across the Inner Hebrides. There is significant market and community interest and unexploited resource that could drive further development of renewable energy generation. Under a Consumer Transformation scenario, there could be more than 600 MW of distributed electricity generation and storage capacity across the Inner Hebrides by 2050 (dominated by a notable expansion of onshore wind and marine generation), compared to the c. 70 MW of renewable generation and storage capacity connected today (see Figure 2).

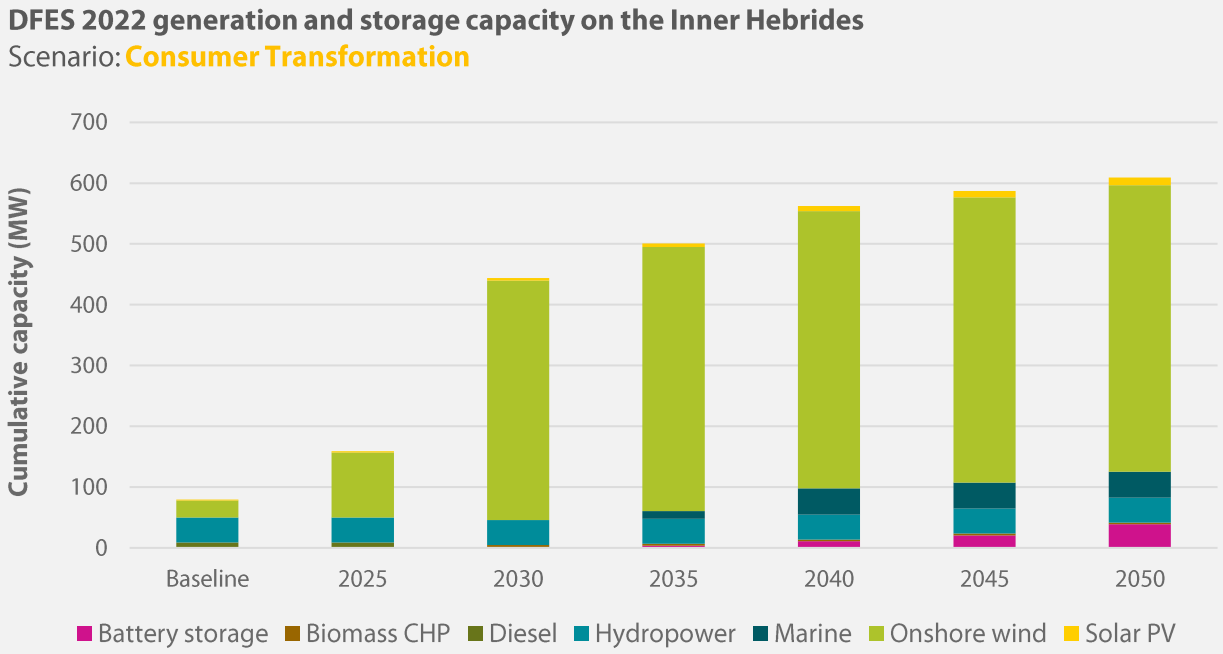


Figure 2

## Cumulative distributed generation and storage capacity in the Inner Hebrides, Consumer Transformation scenario

Source: SSEN DFES 2022 projections.

The electrification of transport, heat and other commercial decarbonisation activities could also increase electricity demand across the Inner Hebrides in the future. Under a Consumer Transformation scenario, there could be more than 190 MW of electricity demand across the Inner Hebrides by 2050, stemming from additional demand from electrified heating, transport and the development of hydrogen electrolysis projects. This is compared to the c. 65 MW of equivalent demand today (see

[1] Argyll and Bute, n.d. Climate commitments.
[2] Argyll and Bute Council, 2024. Climate change board update and decarbonisation tracker.

Figure 3). Note this projection does not include specific future demand from the industrial scale electrification of major energy-consuming industries such as whisky distilleries, though this is explored separately in this report.

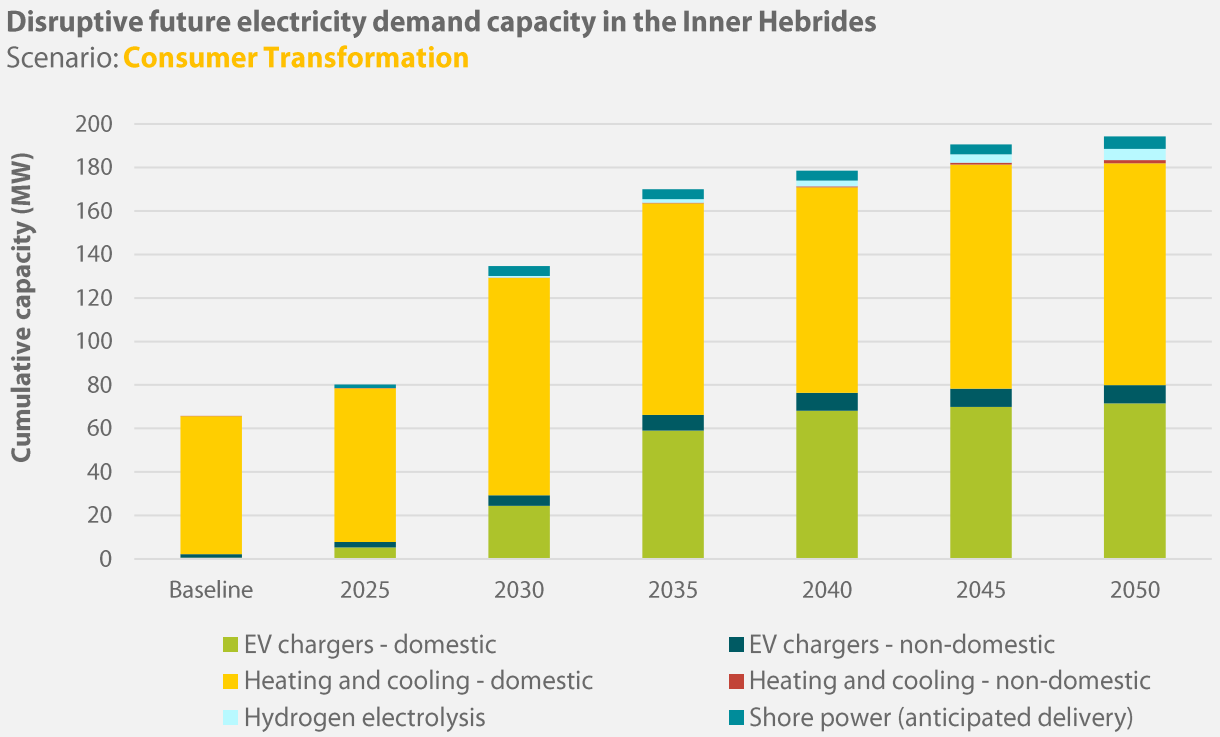


Figure 3

## Cumulative disruptive electricity demand capacity in the Inner Hebrides, Consumer Transformation scenario

Sources: SSEN DFES 2022 projections. SSEN connections data.
*Note that this does not include all domestic, commercial and industrial demand sources.*

### Next steps

Communities and industries across the Inner Hebrides are in the process of shifting to a net zero future, but this is, in part, limited by the challenges and constraints of the current electricity network.

SSEN will need to ensure that future reinforcement and Transmission-Distribution (T-D) coordination around the island's electricity system can enable the development of additional near-term generation capacity, whilst also preparing island infrastructure for the increased electricity demand that the net zero transition will bring for residents, businesses and island industries. In addition to T-D coordination, SSEN should supplement with meaningful engagement and collaboration with relevant communities and councils. Not only will this provide support to local Net Zero transition plans, but it allows parties across the islands to benefit from future network investments.

A summary of the evidence gathered, by sector, can be found in Table 1.

## Table 1
## Sector summary of potential distribution future load growth

| Energy Sector | Summary of future load growth on the distribution network |
|---|---|
| Renewable energy | Renewable energy will remain a significant source of future generation load growth across the Inner Hebrides. In particular, the repowering of existing wind projects, the development of additional onshore wind sites and marine generation projects, coupled with consistent hydropower generation, will be key technologies in the Inner Hebrides. |
| Battery storage | As one of the most rapidly developing sectors, battery storage has the potential to be a disruptive source of both demand and generation load in the future at various parts of SSEN's network. Whilst there is currently very limited development across the Inner Hebrides, this could change rapidly as use cases and business models constantly evolve. Further renewable generation development may see electricity storage (including potentially longer duration storage) as a solution to increase on-island energy use. |
| Hydrogen | Both as a source of electricity demand from electrolysis and as a potential offtake of local wind generation for local usage, green hydrogen could see notable development on the Inner Hebrides under some scenarios. SSEN should continue engaging with the distilleries and hydrogen innovation projects developing both on the islands and across Scotland, to understand the impact this may have on the island's electricity network. |
| Transport | Future electricity demand from transport could come from three different transport sectors that are on very different timelines. EV charging is likely to see rapid adoption to meet demand from residents and visitors. The development of shore power charging for ferries is already being explored with SSEN at key port locations; other vessels may increase future capacity requirements at these locations. Commitments from Loganair and Airtask, who operate flights at the three island airports are pushing for the electrification of on-ground assets, vehicles, and a longer-term view for aircraft decarbonisation. |
| Heating | Additional electrically fuelled space heating could be a significant source of future demand across Inner Hebrides. Many households are already using direct electric heating, of which energy demand could decrease if switched to heat pumps. Fossil fuel heated homes are expected to switch to heat pumps, increasing the overall electricity demand from residential heating by 2050. |
| Commercial and Industrial decarbonisation | The decarbonisation of industries specific to northern Scotland (i.e. whisky distilleries, fish and seaweed farming) and broader industries (e.g. agriculture and other commercial businesses) could involve a range of potential electrification outcomes. Particular note should be taken of the current and future energy demand of the distilling industry on Islay, the expansion and decarbonisation pathway for which is currently hindered by existing grid constraints and is forcing organisations to assess alternative fuelling options. If distilleries seek to electrify, the demand capacity on the distribution network could become one of the largest sources of electricity demand in the region. |

# Contents

Section 1:

# Introduction and approach

SSEN's RIIO-ED2 business plan included proposed investments in 15 subsea cables to various Scottish islands. These cables were identified as having a significant need for replacement or strategic reinforcement to allow for net zero and security of supply for specific island groups. Through SSEN's final business plan dialogue with Ofgem, the funding for some of these cables was determined to be assessed under an investment re-opener, the **Hebrides and Orkney Whole System Uncertainty Mechanism (HOWSUM)**. These investment re-openers are being assessed in January 2024 and January 2025. SSEN is continuing to engage with island stakeholders and developing a cost-benefit analysis to provide evidence to submit to these investment windows.

The broader optioneering approach taken to the HOWSUM whole system assessment can be summarised in five steps (see Figure 4). The process begins with collecting evidence about future electricity load requirements (demand, generation and storage) on the islands. This evidence feeds through to an assessment of options/solutions, a cost-benefit analysis and the identification of the proposed solution and associated capital design scheme.


Figure 4
**HOWSUM whole system optioneering assessment**

After ongoing work to deliver SSEN's annual Distribution Future Energy Scenarios (DFES) assessments,[3] Regen was commissioned to support SSEN to collate a body of evidence around future load growth on the island groups to support the HOWSUM assessment. This work is intended to identify future electricity needs and tailor the subsea cable network investment requirements for both net zero and security of supply within the island groups.

[3] Regen, 2017-2023, SSEN Distribution Future Energy Scenarios

## 1.1. Purpose of this report

This report summarises the approach taken and the evidence collected across the latter half of 2023 for future electricity load growth across the Inner Hebrides. The report includes a summary of the existing electricity network, constraints and an overview of the evidence collected around potential future electricity load growth, categorised by:

- Distributed electricity generation
- Electricity flexibility technologies (battery storage and hydrogen)
- Electrified transport
- Electrified heat
- Industrial electricity demand
- New property developments
- Offshore wind sector growth

This report will be combined with SSEN's wider evidence base and a companion cost-benefit analysis, completed by engineering consultants Jacobs, to feed into the HOWSUM dialogue and application process with Ofgem in January 2025.

## 1.2. Methodology

This evidence case report compiles existing data from SSEN's 2022 Distribution Future Energy Scenarios (DFES) analysis completed by Regen, supplemented where possible with analysis and updated connections data from SSEN's 2023 DFES. This has been augmented with online research and input from industry stakeholders to inform future load growth across the Inner Hebrides island groups.

The current baseline of operational generation, storage and demand on the Islands was determined using SSEN's latest data, supplemented with information on pipeline projects currently in development. Future scenario projections of generation, storage and demand were extracted from SSEN's 2022 DFES analysis, providing a forward-looking view of how generation and demand may evolve on the island group out to 2050. For this report, the 'Consumer Transformation' DFES scenario was chosen, as it is the scenario that most closely aligns with Scottish policy ambition and sector-specific targets.

In addition to the data sourced from SSEN's DFES 2022 and 2023, additional desktop research was undertaken to provide insight into additional sources of future electricity load from industries/sectors not currently included in the DFES technology scope. This includes maritime decarbonisation, aviation, whisky distilleries, agriculture and aquaculture. The findings were supplemented, where possible, with interviews with industry experts to gain insight into specific appetite/intention for potential future electrification on the Islands.

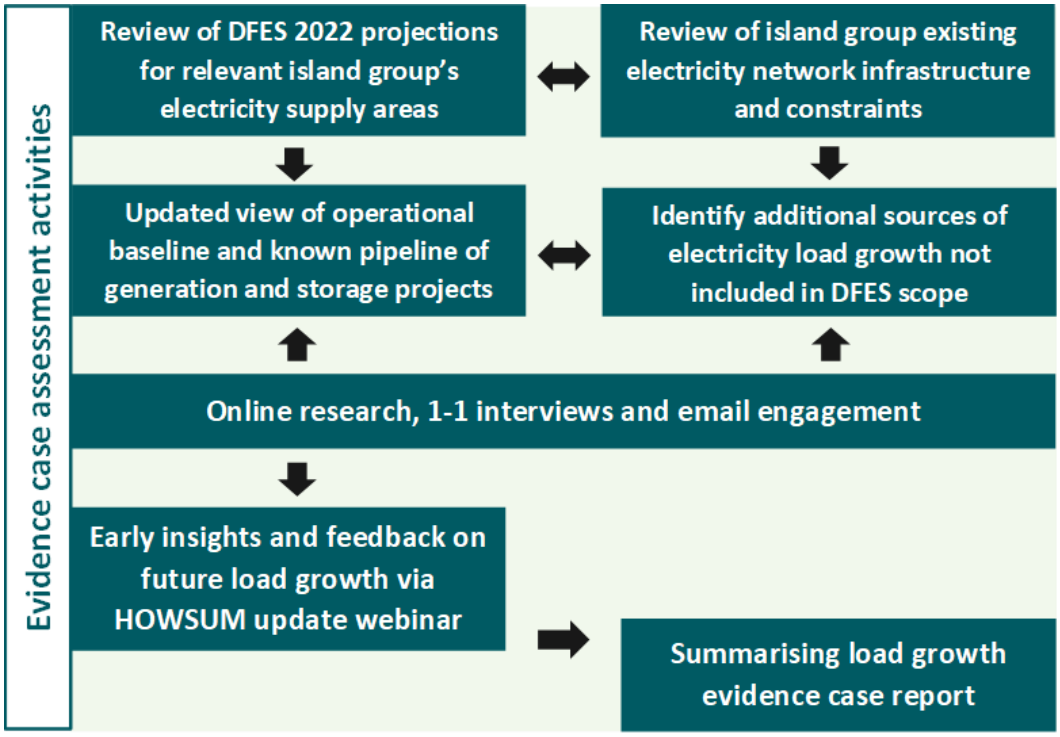


Figure 5
**Overview of load growth evidence case methodology**

## 1.3. Policy reform

Outside of the HOWSUM process, there are several wider industry reforms currently underway that have the potential to significantly impact future load growth of the islands. Significant reforms – including Ofgem's queue management rule, the Transmission Network Use of System (TNUoS) and constraint management reform and the Review of Electricity Market Arrangements (REMA) – aim to improve challenges within the energy system, including speeding up the grid connections process and addressing the geographical imbalance between generation capacity and demand. Ofgem's development of Regional Energy Strategic Planners (RESPs) will also likely impact network planning processes across the UK. The aim of the RESP is to ensure that regional strategic network planning aligns with national and local net zero ambitions and priorities. Current efforts and engagement activities from SSEN at this stage of network planning will need to coordinate and interface with the RESPs.

Any policy reform will contribute to the landscape of future load growth, influencing the scale and pace of wider future electricity generation deployment, the use of flexible assets and the ability for the network to manage load. Although the impact on electricity load growth from individual policy reforms is not assessed within this report, SSEN will closely observe the progression of relevant reforms to ensure that network reinforcements align with the wider energy market.

Section 2:

# The Inner Hebrides island group

This section provides some context of the Inner Hebrides as an island group, including population, existing transport infrastructure, electricity network infrastructure and an overview of the relevant local authority's net zero and energy strategies.

## 2.1. Overview of the islands

### Population statistics

The Inner Hebrides is a collection of inhabited and uninhabited islands located off the west coast of Scotland, stretching over 150 miles from Skye in the north to Islay in the south. At the time of the 2011 census, the archipelago had a population of around 19,000 people[4] – an increase from c.18,200 people recorded in the 2001 census – in which the four islands of Skye, Mull, Jura and Islay host the majority of the population.


Figure 6
**Inner Hebridean islands**

[4] Scotland's Census, 2021. 2011 census table data: Inhabited Islands 2011.

## Transport infrastructure

### Existing road transport

Road infrastructure on the Inner Hebrides is dominated by single carriageway routes that span the islands, only a handful of which are connected to mainland Scotland. The larger islands have active bus fleets that serve the key hubs, such as ports and schools. The future electrification of road transport is discussed in Section 3.4 of this report.


Figure 7
**Inner Hebrides main bus routes map**

Source: West Coast Motors and Argyll and Bute Council

### Existing maritime vessels

As a group of island communities and a prime tourist destination, transport within the Inner Hebrides relies heavily on maritime vessels for inter-island travel and travel to and from the Scottish mainland (see Figure 8). Businesses, residents and visitors rely heavily on these ferry services daily. As such, maritime transport and its associated infrastructure is arguably the primary transport sector in the Inner Hebrides, the significance of which has already led to work and engagement on decarbonising maritime transport and its associated infrastructure across the island group.

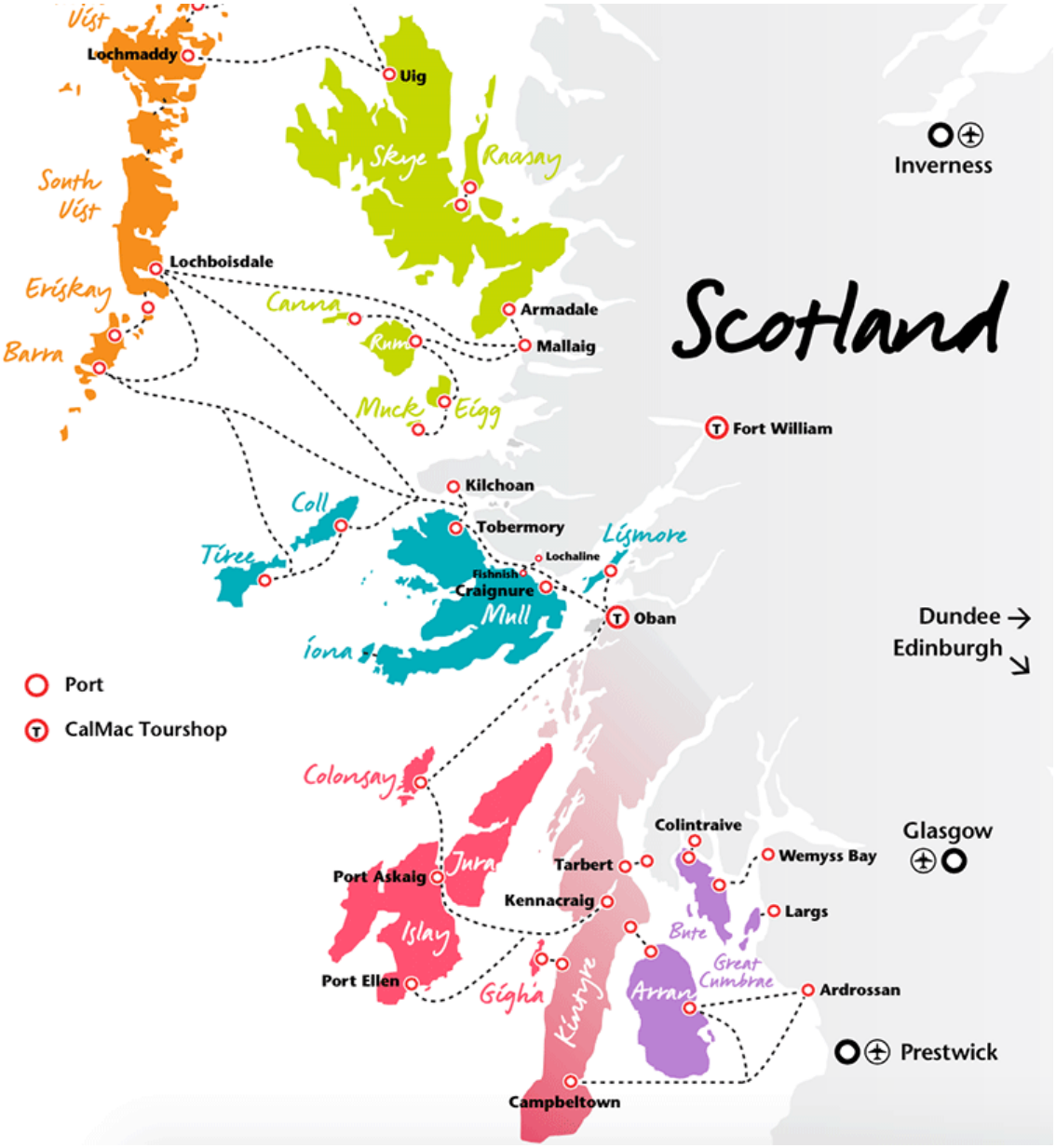


Figure 8

## Inner Hebrides ferry routes

Source: CalMac Ferries

The potential for the future electrification of the inter-island ferries and ferries connecting the Inner Hebrides to other parts of the Scottish Isles is explored in more detail in Section 3.4. It considers both future propulsion technology and fuels alongside the introduction of shore power infrastructure at key ports, all of which could be a notable source of future electricity load growth along the Inner Hebrides.

## Existing aviation

In addition to maritime transport, there are six airports that serve the Inner Hebrides; four of which are located on the islands (Figure 9). Inter-islands flights are operated by Hebridean Air, with Loganair operating flights from mainland Scotland to Tiree and Islay.

The potential future electrification of aviation on the islands is discussed in more detail in Section 3.4, which considers future thrust and lift technology and associated fuel usage, as well as a shift towards all-electric aircraft turnaround through the electrification of ground infrastructure, vehicles and associated equipment.

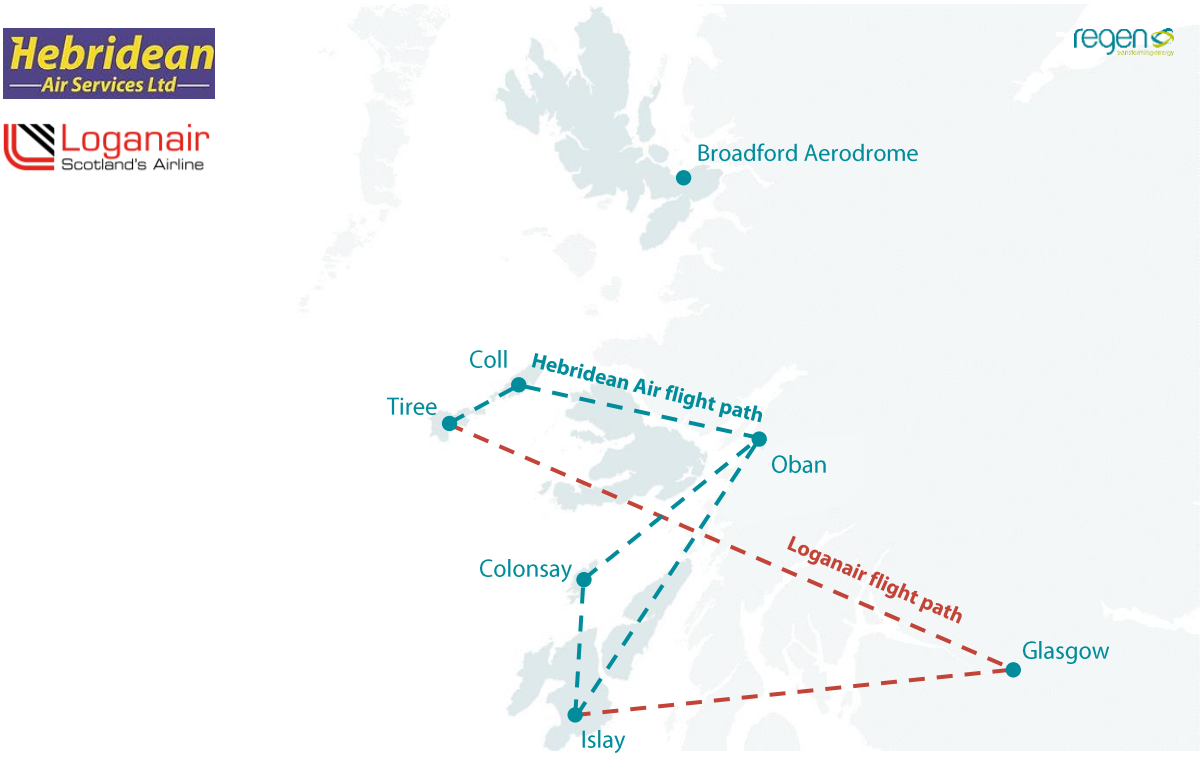


Figure 9
**Airports and airfields across the Inner Hebrides**

## 2.2. Existing network infrastructure

### Mull and Tiree

The Inner Hebridean archipelago of Mull and Tiree is currently supplied by SSEN's distribution network through two 33 kV circuits from Tullich Switching Station, located near Oban (Figure 10). Both of these circuits consist of overhead lines, underground cables and subsea cables. To ensure the security of supply in the event of fault scenarios, a third 33 kV supply to the island also exists which connects to the Fort William network.

Once on the island, a 33 kV ring operates on Mull that supports several primary substations on the island – Lochdonhead, Salen, Dervaig and Kinloch. These substations support the isles of Iona, Ulva, Coll and Tiree through a radial 11 kV network, which also consists of overhead lines, underground cables and subsea cables. There is currently no existing transmission network on the islands.

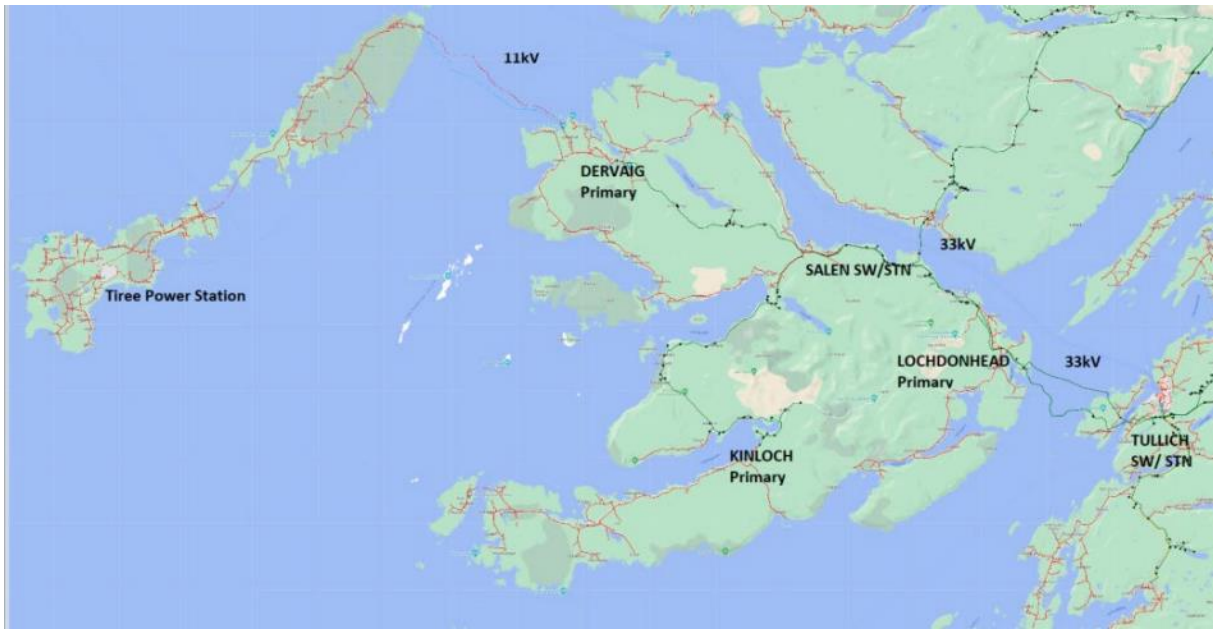


Figure 10
**Existing network infrastructure in Mull and Tiree**

Source: SSEN distribution network mapping data

To ensure the security of supply in the event of a fault on the 11 kV network, SSEN Distribution owns and operates a 2.7 MW diesel power station on Tiree. This diesel site is only operated when there is an outage or disruption and supports both Tiree and Coll.

### Islay and Jura

The isles of Islay and Jura are supplied by SSEN's distribution network from Port Ann Grid Supply Point (GSP) via a single 33 kV radial circuit from Lochgilphead switching station, which consists of overhead lines, underground cables and subsea cables (Figure 11). The isle of Colonsay is supplied by a single 11 kV circuit that is fed from Port Askaig Primary substation.

The 33 kV radial circuit on Islay and Jura supports five 11 kV Primary substations – Lussagiven and Tarbet and Port Askaig, Bowmore and Port Ellen (all located on Islay). There is currently no existing transmission network on these islands.

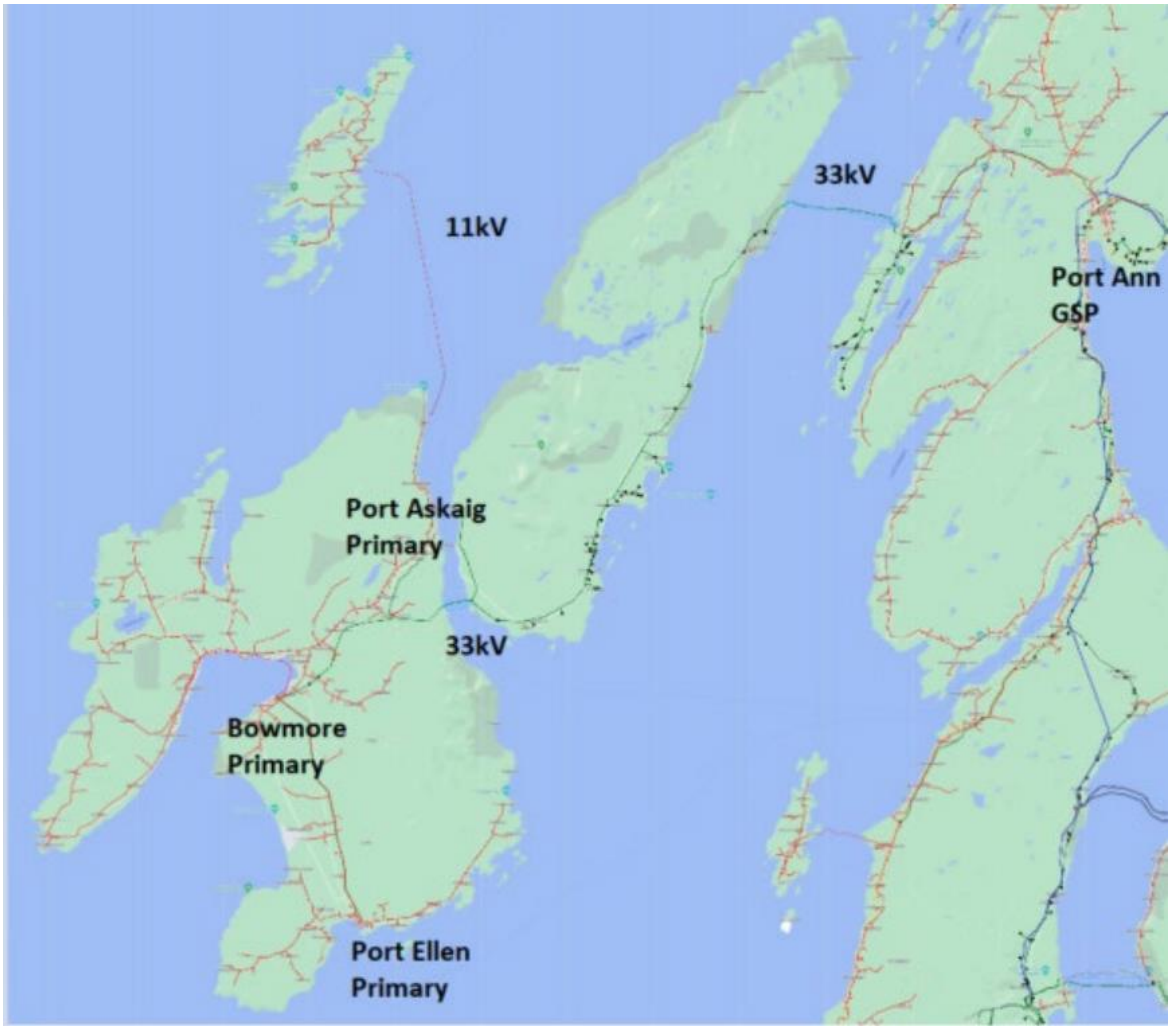


Figure 11
**Existing network infrastructure in Islay and Jura**

Source: SSEN distribution network mapping data

To ensure the security of supply in the event of a fault on the 33kV network, SSEN distribution owns and operates a 6 MW diesel power station at Bowmore (Islay). This diesel site is only operated when there is an outage or disruption to the main subsea cable network. Hydropower generation also supports Jura during 33kV network outages.

## 2.3. Network constraints and reinforcement

The physical condition and future requirements of SSEN's network assets supplying the islands are under regular review. Many of the subsea cables connecting the Scottish Islands are c. 30 years old. In addition to this, through several discussions with island stakeholders, the scale of future electricity requirements on some of these islands (especially from high energy-consuming industries seeking

to decarbonise), may mean that the existing network is inadequate to meet the islands' net zero plans and energy needs.

Through their RIIO-ED2 business plan, SSEN has identified several subsea cables with the North of Scotland licence area that require targeted intervention. Since 2020, two subsea cables connecting the Inner Hebrides to the Scottish Mainland have already been replaced due to asset conditions. The replacement of a further three inter-island subsea cables has already been planned and is expected to be undertaken from 2024. See Table 2.

Table 2

## Current SSEN ED2 plans for subsea cable projects across the Inner Hebrides island group

| Cable route | Proposal | Proposed Installation Year |
|---|---|---|
| Jura ←→ Islay | Installation of new subsea cable plus maintain existing cable until failure | 2024 |
| Coll ←→ Tiree | Installation of new cable plus maintain existing cable until failure | 2025 |
| Mull ←→ Iona | Existing cable to be replaced | 2025 |

## 2.4. Inner Hebrides Islands Council net zero strategy

Argyll and Bute Council, which represents the Inner Hebridean Islands that are the main subject of the HOWSUM process, currently aims to reach net zero before 2045 with at least 75% carbon reduction by 2030. These targets are in line with the Scottish Government's Climate Change (Emissions Reductions Target) Bill.[5] The Highland Council (Comhairle na Gàidhealtachd) which represents other islands of the Inner Hebrides has also committed to the same Scottish Government 2045 target.[6]

Part of Argyll and Bute's decarbonisation plan is to lead by example and to develop innovative and collaborative practices to inspire others. In 2011, the Argyll and Bute Renewable Energy Alliance (ABRA) was established to bring together public and private sector partners to develop awareness of local renewable development and to help deliver the Renewable Energy Action Plan. ABRA have supported community renewables, as well as helping to develop a council wind turbine, Miss Hoolie, located on Mull. The council aims to further support offshore wind development as part of the Scotwind Leasing Rounds, as well as the Islay Local Energy network, as part of the Rural Growth Deal. Some of the Council's specific commitments around energy and transport are summarised in Figure 12.

| |
|---|
| E1 – Deliver Renewable Sourcing Strategy 2 |
| E2 – Delivery of Renewable Heat Incentive (RHI) projects |
| E3 – Delivery of Non-Domestic Energy Efficiency Framework (NDEEF) projects |
| E4 – Deliver additional solar PV installations at council assets |
| E6 – Delivery of Energy Efficient Scotland program |
| E7 – Complete LED streetlight replacement program |
| E8 – Continue support of ABRA and review Renewable Energy Action Plan annually |
| E9 – Continue support for offshore development of renewables |
| T1 – Develop a Fleet Replacement Strategy supportive of fuel efficient, electric and hybrid |
| T3 – Develop an Electric Vehicle Infrastructure Strategy |

Figure 12
**Climate commitments from Argyll and Bute Council Decarbonisation Plan 2022-2025**

Source: Argyll and Bute Council

[5] Argyll and Bute Council, 2021. Climate Commitments – Argyll and Bute Council Decarbonisation Plan 2021
[6] The Highland Council, 2023. Net Zero Strategy

Section 3:

# Baseline and future electricity load in the Inner Hebrides

Based on SSEN's DFES 2022 assessment, current (2023) connections data, desktop research and stakeholder engagement, this section summarises the potential load growth (generation and demand) that could be seen across the Inner Hebrides, categorised by sector.

## 3.1. Distributed electricity generation

### DFES 2022 projections

Based on SSEN's DFES 2022 projections, under a Consumer Transformation scenario, distributed renewable electricity generation across the Inner Hebrides could increase significantly over the next two decades, from a 2022 baseline of 70 MW to around 500 MW by 2035 and increasing further to just over 570 MW by 2050 (see Figure 13).

Onshore wind is the primary contributor to this potential increase in renewable capacity, seeing an uplift from the 2022 baseline (28 MW) to 430 MW by 2035 and 470 MW by 2050. This reflects strong wind resources and policy support for onshore wind in the region.

Under this scenario, marine power could also play an increasing role on the islands, with 13 MW projected by 2035, increasing to over 40 MW by 2050. Hydropower is also expected to continue to be a key technology in the Inner Hebridean renewable generation mix, with the 40 MW of existing capacity continuing to generate out to 2050. Projections also suggest 2.8 MW of biomass generation could be installed by 2030 – an increase from the 0 MW of biomass generation baseline – and a decline in diesel generation post-2025.

With only around 13 MW of solar PV (primarily rooftop arrays) deployed by 2050, it is noted that solar will have a limited role in the Inner Hebrides energy generation mix. This is due to very low solar irradiance levels in the region. If further technology cost reductions are realised and battery storage co-location becomes a viable business model, a larger uptake of solar could be seen. Overall, a potentially significant growth of onshore wind and marine generation capacity demonstrates that the Inner Hebrides is a strong area for renewable energy development if additional grid capacity is made available.

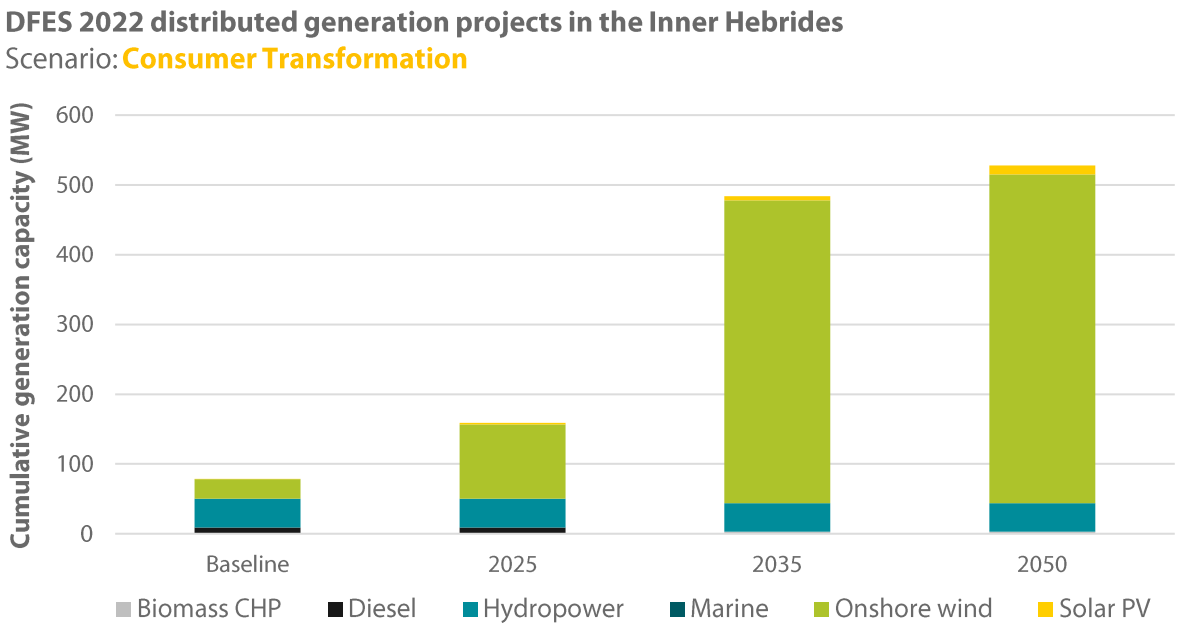


Figure 13

## Projected cumulative distributed renewable generation and storage capacity across the Inner Hebrides

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

### Baseline and pipeline distributed generation as of 2023

As of August 2023, 81 MW of distributed generation is operating in the Inner Hebrides (see Table 2 and Figure 14). Most of the connected generation mix is dominated by nine hydropower sites, equating to half of the total generation capacity on the island. Another large proportion of generation capacity is from onshore wind sites, which collectively account for c.32 MW of capacity. The remainder of the electricity generation baseline comes from a small amount of solar PV, alongside diesel back-up generators.

In addition to this baseline, a pipeline of 145 MW of distributed generation sites holds accepted connection agreements with SSEN across the Inner Hebrides. This is based on an analysis of SSEN's connection data as of October 2023. This pipeline consists primarily of new onshore wind projects, as seen in Table 3 and Figure 15. The largest sites currently in the pipeline are the 45 MW Balmeanach Wind project and the 41 MW Ben Sca Wind Farm, both of which are located on the Isle of Skye. Balmeanach Wind has submitted a planning application and is awaiting a decision. Planning permission for the Ben Sca project was approved in 2021.

The pipeline also consists of other technologies, including a 10 MW tidal stream energy project in the Sound of Islay.

Table 3

## Baseline and pipeline distributed electricity generation connected and accepted to connect in the Inner Hebrides.

| Generation technology | Number of installed sites | Installed capacity (MW) | Number of pipeline sites | Pipeline capacity (MW) |
|---|---|---|---|---|
| Fossil fuel (diesel) | 2 | 9 | 0 | 0 |
| Hydropower | 8 | 6 | 1 | 0.1 |
| Marine | 1 | 0.2 | 1 | 10 |
| Onshore wind | 11 | 31 | 5 | 135 |
| Solar PV | 2 | 0.8 | 0 | 0 |
| Total | 25 | 81 | 7 | 145 |

Source: SSEN 2023 connections data

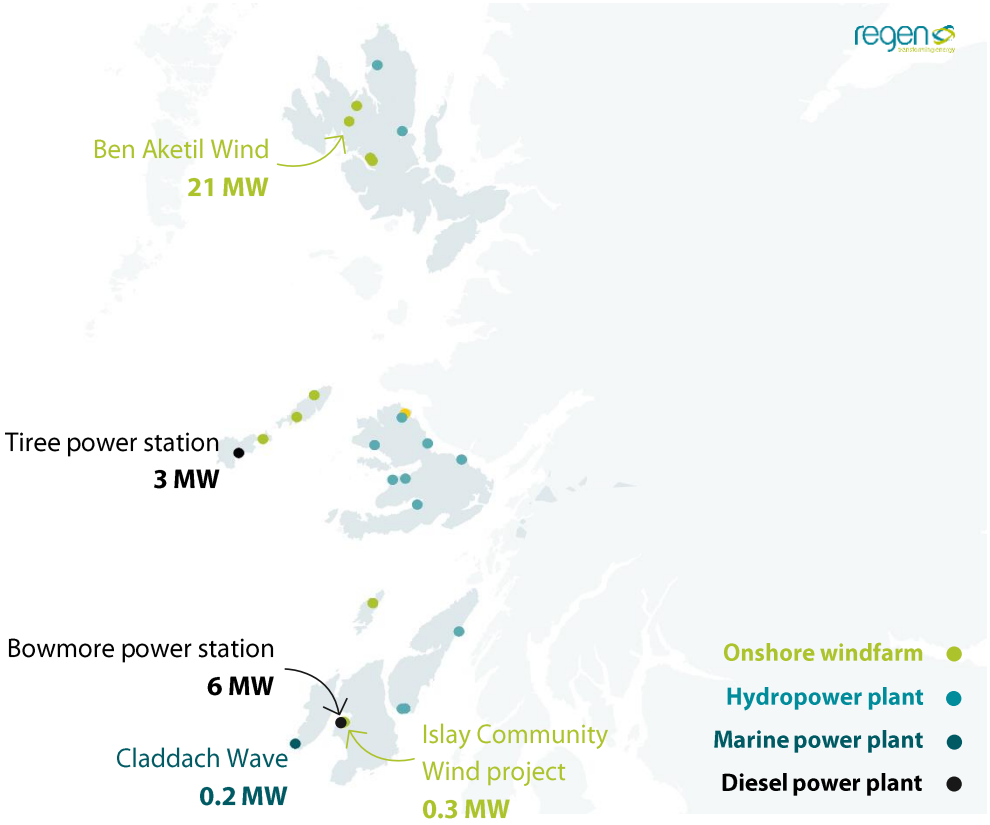


Figure 14

## 2023 baseline of distributed generation projects

Source: SSEN connections data

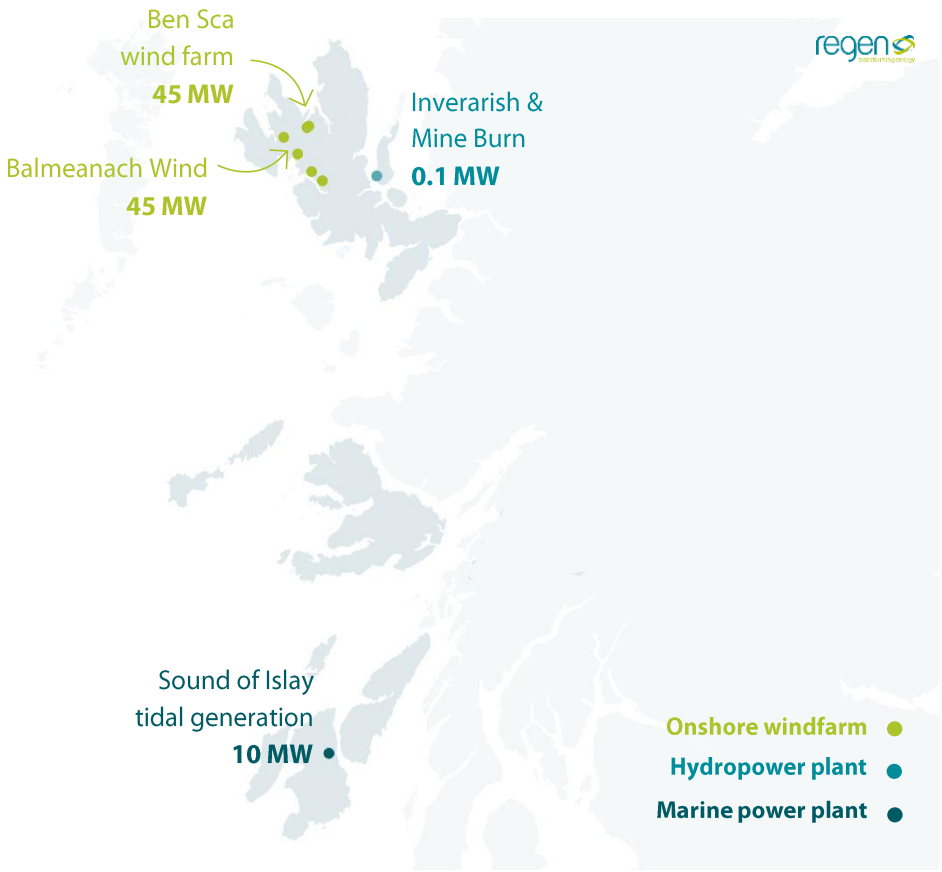


Figure 15
**2023 pipeline of distributed generation projects**
Source: SSEN connections data

## Further industry insights

### Repowering of existing onshore wind

Alongside the pipeline of future onshore wind projects, the repowering of existing wind turbines may need to be considered in the context of additional load growth. Onshore wind project operational lifetimes can vary depending on location, size and age. Still, an estimated range is between 15-20 years,[7] with some operators already seeking to repower legacy sites with more efficient, higher yield, higher capacity turbines on existing site footprints.

The 10 onshore wind projects currently operating in the Inner Hebrides range in age (see Table 4), with most over a decade old. The Islay Community Wind project has been operating for two decades and is coming to the end of its lifespan. The Ben Aketil Wind project follows closely behind at 17 years in operation. Government and Argyll and Bute Council both support the repowering of existing wind farms.[8]

[7] SIA Partners | Climate Analysis Centre, 2022, Repowering existing wind farms will help reach renewable electricity targets faster.
[8] Argyll and Bute Council, 2017. Argyll and Bute Landscape Wind Energy Capacity Study 2017.

Table 4

## Operational lifetimes of existing onshore wind projects in the Inner Hebrides

| Project Name | Capacity (MW) | Date Connected | Age (yrs) |
|---|---|---|---|
| Ben Aketil Wind | 21 | 2007 | 17 |
| Caolas House (plus additional capacity) | 0.065 | 2011-13 | 11-13 |
| Colonsay House Wind | 0.05 | 2016 | 8 |
| Edinbane Wind | 0.09 | 2014 | 10 |
| Gallanach Wind | 0.9 | 2017 | 7 |
| Islay Community Wind | 0.33 | 2004 | 20 |
| Meadle Wind | 0.33 | 2013 | 11 |
| Struan | 0.33 | 2013 | 11 |
| Luing | 0.11 | Unknown | - |
| Ruaig Wind Generator | 0.9 | Unknown | - |

Source: SSEN connections data

Repowering is factored into Regen's DFES projections, but engagement with existing operators could provide more detail on the scale and intention of repowering at specific locations.

## 3.2. Offshore wind

As part of the Scotwind leasing round,[9] 2 GW of offshore wind capacity has been awarded option agreements from Crown Estate Scotland to generate electricity off the coast of the Inner Hebrides. Scottish Power Renewables is currently developing the 2 GW MachairWind fixed-bottom offshore wind farm.[10] Whilst the location of the offshore wind project is in proximity to Islay (where there is no lack of decarbonisation ambition) the scale of the electricity generation means that offshore developers will seek to connect directly to the most cost-effective electricity transmission network connection point. This will likely be on mainland Scotland. However, the proximity of the island group to the proposed areas of seabed could make the Inner Hebrides an attractive location for the development and ongoing maintenance of a wind farm.

As part of the Scotwind process, Scottish Power Renewables demonstrated clear intentions to engage with suitable partners, such as Highland and Islands Enterprise and Scottish Government, to develop local capabilities and ensure that skills development and transfer is well structured to a level sustainable for the long-term operation of wind farms beyond Scotwind.[11] Localised distributed electricity demand on the islands could be impacted throughout the operation and maintenance (O&M) phase of the wind farm (across the range of 20 years) through the use of port facilities, heavy machinery and personnel accommodation. However, whether the islands will be used as an O&M base is yet to be decided, with relevant third-party conversations still ongoing.[12]

MachairWind was awarded through the Scotwind leasing round, a key step in reaching the Scottish Government's target of 11 GW of offshore wind by 2030[13]. As such, increased electricity demand for this project could be expected by 2028 at the earliest – subject to current policies – where a lack of distribution grid reinforcement could impact build-out and put targets at risk.

Alongside the Scotwind leasing round, Crown Estate Scotland has awarded an option agreement to ESB Asset Development UK who, in partnership with Dublin Offshore Technology and CATAGEN, are planning to deliver the 100 MW Maling Sea Wind floating offshore wind project off the coast of Islay. As part of the INTOG (Innovation and Targeted Oil & Gas) leasing round, Malin Sea Wind aims to support the decarbonisation of the aviation sector by powering sustainable aviation fuel production technology that is currently in development by CATAGEN. Although this site is also unlikely to directly feed electricity to the Inner Hebrides distribution network, there may be scope for the island group to host the construction and ongoing maintenance of the Malin Sea Wind project. As with MachairWind, this support would require sufficient capacity on the distribution network.

[9] Crown Estate Scotland, 2022. Scotwind leasing round.
[10] Scottish Power Renewables, n.d. MachairWind Offshore Development.
[11] Scottish Power Renewables, 2021. Scotwind Leasing. Part A – A13 – SCDS Outlook: MachairWind.
[12] Scottish Power Renewables, n.d. Supply Chain.
[13] Scottish Government, 2020. Increased offshore wind ambition by 2030.

## 3.3. Flexibility technologies

### Battery storage

Electricity storage will be a significant source of flexibility in a net zero electricity system. Regen's analysis suggests electricity storage could account for 20-25 GW of flexibility capacity by 2035. Whilst other longer-duration storage technologies are being pioneered across the UK,[14] lithium-based battery storage is the most dominant technology being developed and leveraging flexibility markets. Thousands of battery storage projects are being developed at various scales across the UK, with a pipeline of around 200 GW of capacity.

Battery assets can be categorised in the following ways:

- Standalone grid services – typically MW scale, modular, containerised battery storage assets that provide a range of ancillary services to the network.
- Generation co-location – typically MW scale, designed to geographically co-locate, grid connection share, or physically co-operate with large-scale generation projects (i.e. wind farms or solar farms) to reduce curtailment and optimise pricing and revenues.
- High energy user – 'hundreds of kW' scale, located onsite at commercial or industrial business premises, for onsite energy management, backup supply support, or to maximise the self-use of onsite generation (i.e. commercial rooftop PV).
- Domestic batteries – potentially 1-15 kW scale, designed to enable households to increase the self-consumption of domestic solar PV and act as a backup power supply for rural households.

In recent years, the ESO has evolved their suite of response and reserve services, including the new trio of frequency response markets: Dynamic Containment, Dynamic Regulation and Dynamic Moderation. Large commercial batteries are very active in these and other ancillary service markets. Under the Government's Review of Energy Market Arrangements (REMA), opportunities for flexibility services will continue to evolve, and battery storage is likely to remain a significant market participant.

### DFES 2022 projections

The North of Scotland licence area has seen a notable increase in applications to connect new battery storage projects. In 2022, this totalled 4.2 GW of contracted or quote-issued sites, of which 1.8 GW was active in planning. Only one site is currently seeking to connect in the Inner Hebrides. As a result, only a moderate amount of battery storage capacity (c.15 MW) is projected to connect across the island group by 2050. This includes 11.5 MW of batteries co-located with renewable generation and 3 MW of domestic batteries located across homes that have rooftop solar PV installed (Figure 16).

[14] See Longer Duration Energy Storage Demonstration competition funding, managed by DESNZ

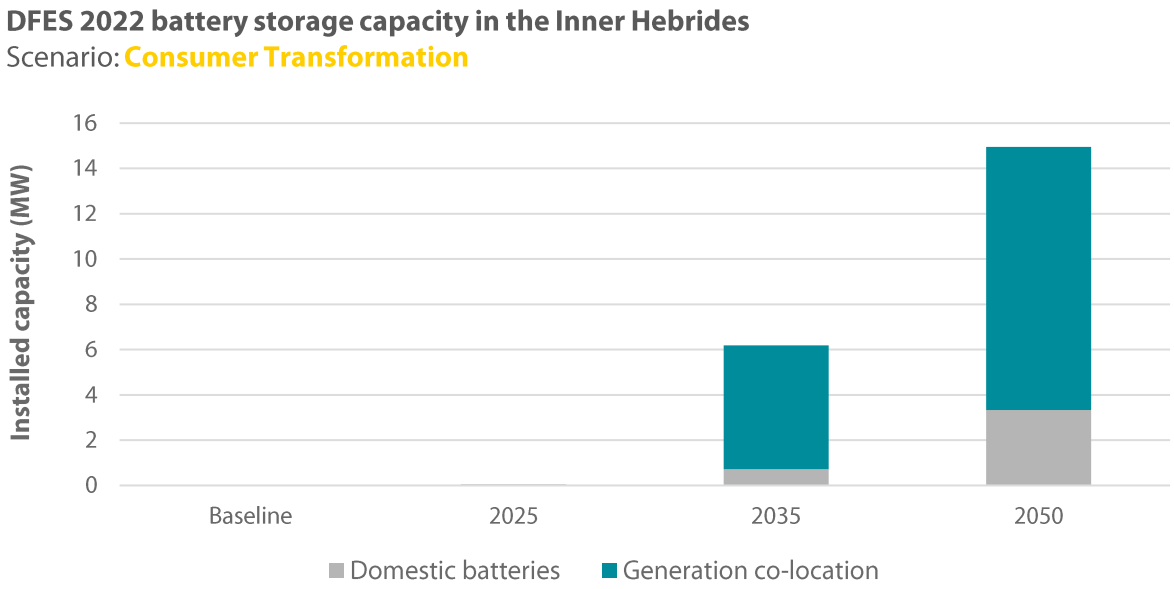


Figure 16

## Projected cumulative battery storage capacity across the Inner Hebrides by storage business model

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

### Baseline and pipeline as of 2023

The pipeline of battery storage projects has surged across the country in the last couple of years, reaching upwards of 180-200 GW as of September 2023.[15] Whilst this has created a bottleneck to secure grid connections and long connection queues, there remains significant interest in connecting battery storage projects of various scales across GB.

The North of Scotland licence area has seen a significant increase in battery projects seeking to connect to the distribution network, with the total pipeline of contracted or quote-issued sites now reaching 7.7 GW, of which 4.1 GW (52%) is currently active in planning. However, to date, no large-scale battery projects have come online in the Inner Hebrides, and only a single project, located on the Isle of Skye, holds a connection offer with SSEN. The proposed capacity of this battery storage asset has not yet been confirmed.

### Further industry insights

Future battery storage projects connecting in the Inner Hebrides will be largely developer-led. With the current network constraints and logistical limitations of the island group itself, battery developers are currently prioritising the mainland and other parts of the UK to develop projects. However, with onshore wind and marine generation capacity set to further increase, and businesses and homes on the island looking to maximise the self-consumption of onsite generation and

[15] Regen analysis completed for Energy Storage Summit 2023

potentially install backup power supplies, there could be a number of use cases for battery storage to be developed on the Inner Hebrides.

## Hydrogen electrolysis

Although the production of green hydrogen through electrolysis plants could be a potentially significant source of future electricity demand, as an emerging technology, there is uncertainty around the scale of development of green hydrogen production that could be seen nationally, regionally and locally.

At present, several factors are unclear regarding hydrogen production:

- Whether electrolysis will be largely transmission or distribution network connected
- The volume of hydrogen that will be produced via electrolysis (green hydrogen) versus via CCUS-enabled methane reformation (blue hydrogen)
- The degree to which electrolysers will be located near storage facilities for distribution versus near potential end-user sectors.

However, the British Energy Security Strategy[16] outlined a target for 5 GW of low-carbon hydrogen from electrolysis by 2030, including an electrolytic hydrogen fund to support new projects. The Scottish Government Hydrogen Action Plan[17] also confirmed ambitions to install 5 GW of low-carbon hydrogen by 2030 and 25 GW by 2045, with £100m of funding to develop a Scottish hydrogen economy. Some islands on the Inner Hebrides are already being considered for the development of low-carbon hydrogen projects led by Argyll and Bute Council[18] as well as several of the local distilleries, and as highlighted in Scottish Government's Hydrogen Action Plan.

**2. Argyll & Islands**
Machrihanish Airbase Community Company (MACC) Hydrogen Futures aims to establish a renewable hydrogen production and distribution site at Machrihanish Airbase on the Kintyre Peninsula. A former military aerodrome, Machrihanish has been transformed into a community-owned business park offering over 1,000 acres (400+ hectares) of unique properties, development land and assets, as well as its own airport.

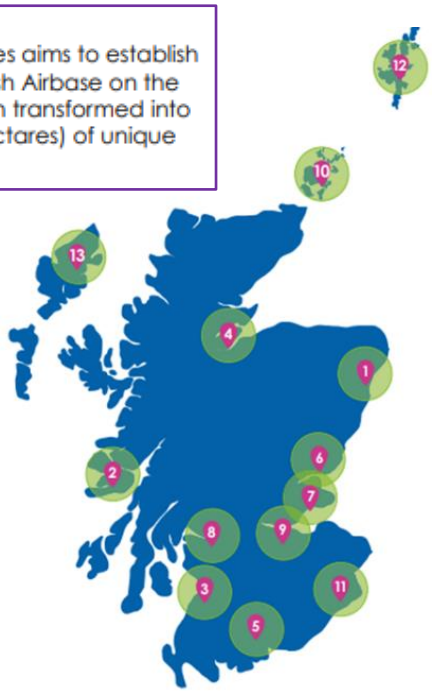


Figure 17
**Map of potential regional hydrogen hub locations**

Source: Scottish Government Hydrogen Action Plan

[16] UK Government, 2022, British Energy Security Strategy
[17] Scottish Government, 2022, Hydrogen Action Plan
[18] Argyll and Bute Council, 2023. Argyll and Bute Council Capital Investment Strategy 2023-38.

## DFES 2022 projections

For the whole of the North of Scotland licence area, SSEN's DFES 2022 analysis projected 395 MW of hydrogen electrolysis capacity by 2050 under Consumer Transformation. Other scenarios (Leading the Way and System Transformation) see moderately higher projections (560-820 MW) due to the higher demand for low-carbon hydrogen from heating, transport and industry consumers. Of the regional projections for electrolysis under Consumer Transformation, only a relatively small amount of capacity is modelled to operate in the Inner Hebrides, totalling just over 5 MW by 2050 (Figure 18). This reaches just under 8 MW under Leading the Way.

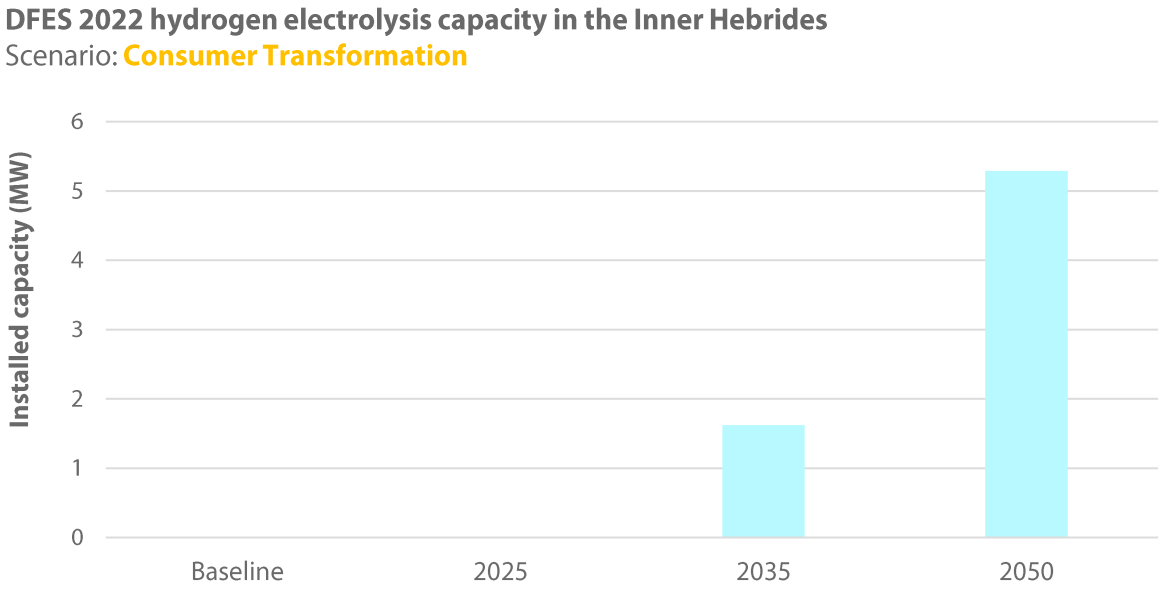


Figure 18

### Projected cumulative hydrogen electrolysis electricity demand capacity across the Inner Hebrides

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

## Baseline and pipeline as of 2023

At present, there is neither a baseline or pipeline of electrolysis projects that are connected or are seeking to connect to SSEN's distribution network. However, initiatives are being investigated on the islands that could lead to future grid connections for electrolysers. Specifically, Protium,[19] a green hydrogen energy services company, is currently engaging with several distilleries across the Inner Hebrides (including Islay) to investigate the option to produce green hydrogen to support the distillation process. Pilot sites are currently at planning and pre-planning stages, with the anticipated demand requiring several strategic hubs.

[19] Protium, n.d. Pioneering green hydrogen energy solutions.

## 3.4. Transport electrification

The shift to electrified transport could be one of the biggest sources of electricity load growth across the islands and will need to be a key consideration for strategic network planning.

### Electric vehicles

The predominant fuel type for both private and public transportation across the Inner Hebrides is currently fossil fuels. However, as local and national policies start to initiate a technological and industrial shift away from petrol and diesel-based fuels, the network must be ready to take on the potentially significant increase in electricity demand. Being able to travel by road/ferry between the islands and the Scottish mainland will remain critical for residents, businesses and tourists.

In line with the Scottish Government's 2045 net zero target, Argyll and Bute Council has recognised the decarbonisation of transport as a key priority. Its Electric Vehicle Charging Strategy Update[20] acknowledges these wider policy reforms and demonstrates strong public sector commitment to EV uptake expansion and future development of charging infrastructure across the jurisdiction.

#### DFES 2022 projections

Based on SSEN's 2022 DFES analysis, there could be just over 11,500 EV cars and light goods vehicles (LGVs) registered in the Inner Hebrides by 2035 (see Figure 19). This is in line with an accelerated uptake of battery EVs across the next decade as a ban on the sale of new petrol and diesel cars comes into force, coupled with an increase in consumer confidence and an expected decrease in EV capital costs.

The uptake of EVs does slow in the Inner Hebrides post-2035, increasing to just over 13,500 by 2050, which is likely due to increased use and deployment of public transport and active travel across the islands. All road vehicles considered in this scenario are projected to be fully electric rather than hybrid, due to policies favouring fully electric battery EVs.

In addition to resident vehicle owners, the impact of growing tourism to the Inner Hebrides could be a significant source of future EV charging demand. For example, just under 500,000 vehicles travelled to the isle of Skye in 2023,[21] a 50,000 increase since 2022.

[20] Argyll and Bute Council, 2022. Electric Vehicle Charging Strategy Update.
[21] The Press and Journal, Jan 2024. Calls for cash for Skye as visitor numbers rocket

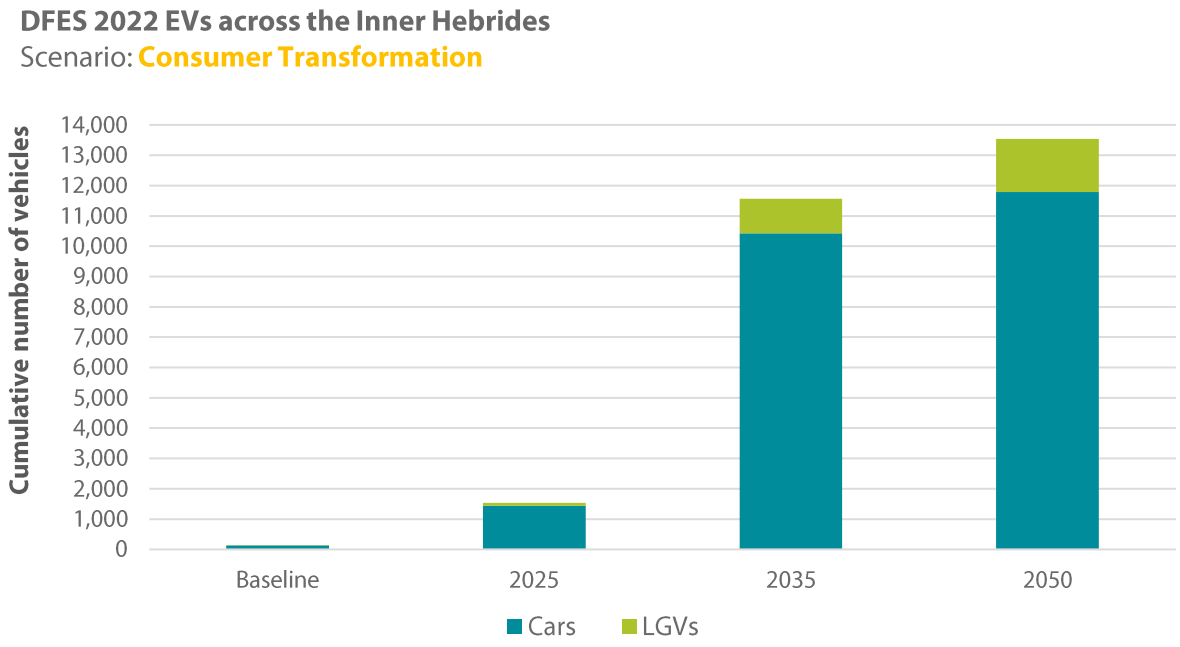


Figure 19

## Projected cumulative number of EV cars and LGVs across the Inner Hebrides

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

The additional electricity demand that this uptake of EVs could create on the network in the Inner Hebrides can be conveyed through the projected EV charger capacity (expressed in MW) from SSEN's DFES 2022 analysis. The EV charger capacity was assessed using the projections of vehicles types, an analysis of mileage driven and a range of different EV charge archetypes. The resulting total connected EV charger capacity across the Inner Hebrides could reach 7.8 MW by 2035, increasing to 9.2 MW by 2050 (Figure 20). This capacity is purely for non-domestic EV archetypes, such as chargers at car parks, workplaces, fleet depot locations and enroute/local charging stations.

As well as the non-domestic demand, there is expected to be a significant uptake in the number of domestic EV chargers installed in households across the Inner Hebrides. DFES 2022 projections show just over 8,300 off-street domestic chargers by 2035 under Consumer Transformation, increasing to over 10,000 by 2050 (Figure 21). This is in line with the Building (Scotland) Regulations[22] – in force since June 2023 – which require at least one EV charger (minimum rating of 7 kW) to be installed in all new residential buildings with a parking space, as well as in properties under major renovation. Argyll and Bute Council's Strategic Housing Investment Plan[23] outlines several locations of new developments, all of which will require EV charging points.

[22] Scottish Government, 2023. Building Scotland (Amendment) Regulations 2022.
[23] Argyll and Bute Council, 2022. Argyll and Bute Strategic Housing Investment Plan 2022/23 - 2026/27.

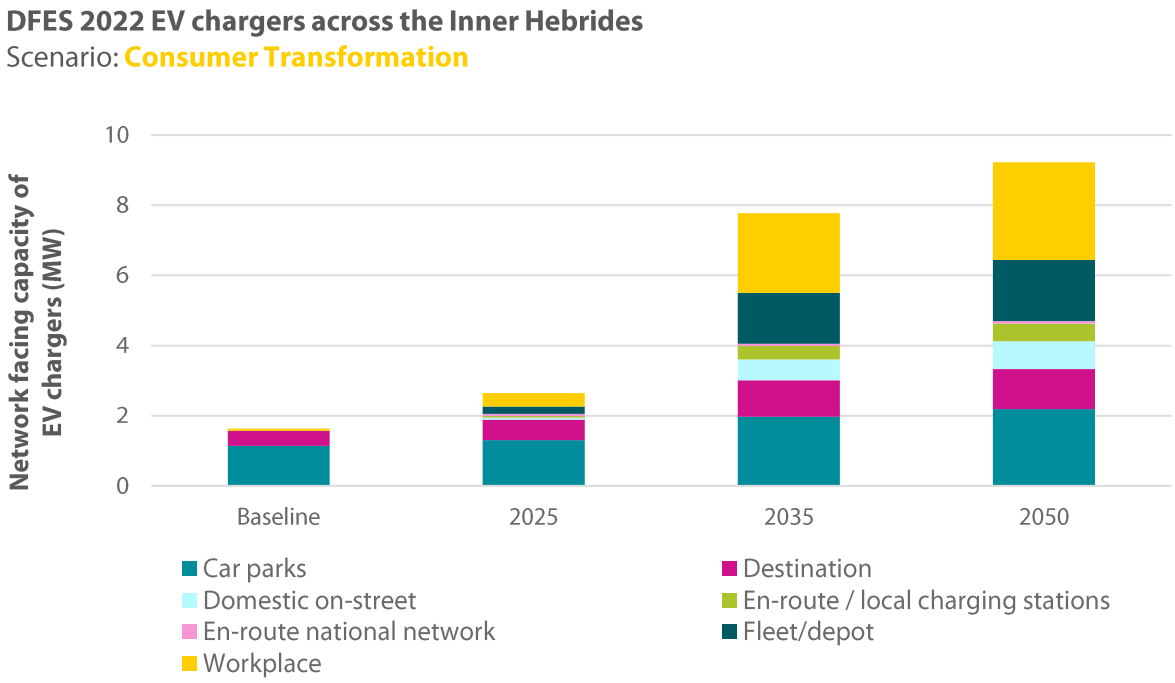


Figure 20

## Cumulative EV charger capacity across the Inner Hebrides

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

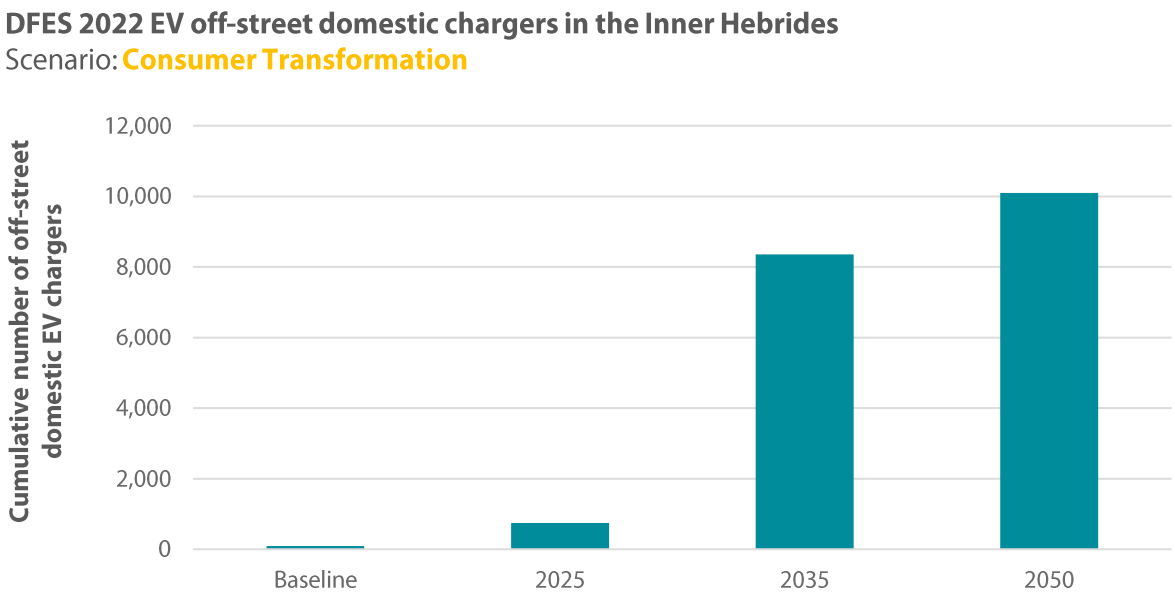


Figure 21

## Cumulative domestic off-street EV chargers across the Inner Hebrides

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

When considering the various potential EV charging behaviours that could be adopted by drivers in the Inner Hebrides, the actual diversified peak EV charging demand that could be seen on SSEN's LV network is unknown. There are a variety of factors that would affect the combined diversified charging profile and peak demand from EVs, including types of car, vehicle use and the type of property the EVs are associated with. These factors, coupled with the uptake and increased use of public transport, could all significantly affect the charging profiles that could be used to determine a diversified peak transport electricity demand. However, it is clear from the DFES projections that the electricity demand from road transport in Inner Hebrides will increase significantly between 2025 and 2035.

## Further industry insights

A key consideration for the Inner Hebrides' future transport load growth is the number of tourists that visit the islands each year, where additional capacity across summer months could significantly impact the distribution network.

Alongside EVs, public transport is a potentially significant impact on future electricity demand. The bus networks across the islands are heavily used all year by school children and particularly by visitors in the summer months. There is also free bus travel available across Scotland for under 22-year-olds. With a shift towards electrifying bus transportation, current range considerations of these vehicles, coupled with the necessary number of vehicles and their associated network charging profiles ,could also be a source of future electricity demand.

Engagement with the commercial sector also suggested that the current grid is a potential barrier to the installation of EV chargers for local businesses and depots. Several large organisations across the Scottish islands have already installed EV charging points for either staff or visitors. However, the installation of additional chargers may be challenging due to constraints in the network.

## Maritime transportation

Many of the inter-island ferries and crossings between the Inner Hebrides and other Scottish Isles and the Scottish mainland are operated by Caledonian MacBrayne (CalMac Ferries), who run 33 vessels spanning 30 routes across the north and south of the island group. Baseline analysis from CalMac's Environmental Strategy[24] estimated their 2019 – 2020 carbon emissions to be in the region of 126,000 $tCO_2e$ (approximately 2% of the UK's domestic shipping total).

Argyll and Bute Council also run four ferry routes from/to Cuan, Lismore, Jura and Easdale[25].

Many of the islands' ferries, including lifeline services, are reaching the end of their operational lifespan – if not already exceeding their estimated lifespan[26]. As such, ferries are currently in the process of being replaced. Caledonian Maritime (who own infrastructure and vessels for CalMac Ferries) have committed to decarbonising their ferry fleet. This includes electrifying the current propulsion systems on all small ferries by 2027 and increasing the number of hybrid vessels from three to eight. These changes could result in a range of expected power requirements at each port location, potentially in the realm of 5-7 MVA across the whole of the Inner Hebrides.


Figure 22
**Ports within the Inner Hebrides**

The timeframe of possible electricity load growth is heavily linked to the timeline of individual vessel propulsion systems being changed/replaced. This timeline is currently difficult to quantify due to

[24] Caledonian MacBrayne, 2020. CalMac Environmental Strategy.
[25] Argyll and Bute Council, Ferry Travel timetables
[26] BBC News, 2023. CalMac's race to keep its ageing fleet afloat.

uncertainties around technology readiness. However, partial/hybrid or full electrification at some scale (as opposed to ammonia or biomethane) is being considered, particularly for smaller-scale roll-on/roll-off ferries.

Ferries are one of the primary modes of maritime transport across the Inner Hebrides. As such, the associated use of shore power to charge these vessels could equate to a significant load at each of the relevant ferry terminals. This could be in the range of 8 MW of additional future demand capacity across the islands group through 'cold ironing' – shore power to berthed ferries[27]. In addition to their shore power requirements, the ferries charging profiles and ports' abilities to charge EVs will be major considerations for any network reinforcement.

Shore power requirements for other vessels and the roles they provide to residents and businesses should also be considered:

- Recreational sailing – may require shore power installed at marinas and harbours.
- Cargo – freight vessels regularly operate between the Inner Hebrides and the Scottish mainland, catering to all types of traffic. Shipping routes are particularly busy around Islay due to the transport of whisky.
- Cruises – as a popular tourist location, the Inner Hebrides hosts a variety of cruises each year. Cruise liners operating across the Inner Hebrides are already beginning to take part in decarbonisation initiatives, including installing more efficient generators.[28] The potential to electrify the cruise industry depends on the availability of the network, with each cruise ship requiring significant power when moored. However, larger industry targets of net zero cruising by 2050[29] and increasing external pressure from the general public suggest a strong call to decarbonise. This could become a significant source of future electricity demand at key port locations within the Inner Hebrides.

An estimate of the electricity load requirements from recreational sailing, cargo and cruise industries would require a more detailed assessment. However, most of these industries have acknowledged that implementing shore power for their vessels is part of their current route to reach net zero.

[27] SSEN, 2023. Stakeholder engagement.
[28] Hebrides Cruises, 2024. News from our Green Initiative Crew Member.
[29] Cruise Lines International Association, 2023. Cruise lines tackling impact on the environment.

## Aviation

The electrification of aviation could also be a source of future electricity demand across the Inner Hebrides. Highlands and Islands Airports Limited (HIAL) has ambitions to decarbonise operations by 2040,[30] and both the Scottish Government and HIAL have committed to creating the world's first zero-emission aviation region through decarbonising airport operations, infrastructure and flights across the Highlands and Islands. This will be supplemented with activity to progress low and zero-emission planes.

Inter-island flights between the Inner Hebrides islands are operated by Hebridean Air, part of the Airtask Group. Flights between the Inner Hebrides and the Scottish mainland are primarily operated by Logan Air, the UK's largest regional airline. Both operators have committed to net zero targets: Airtask Group by 2045 and Loganair by 2040 (five years earlier than the Scottish Government's target).

At present, there have been no aviation electrification trials on the Inner Hebrides. However, aircraft operators operating in the island group are currently pursing trials to decarbonise their operations in other Scottish island groups. For example, Loganair has already achieved its first all-electric aircraft turnaround at Stornoway Airport[31] and has announced that electric ground equipment for aviation turnaround will be installed at Kirkwall, Benbecula and Sumburgh airports. This will allow the current diesel-powered ground equipment to be phased out and replaced by electrically powered alternatives. There is the ambition to establish this technology across all of Loganair's Highlands and Islands airports, mitigating 70,000 litres of diesel annually and ultimately increasing the electricity demand capacity across the islands.

Engagement with aviation organisations operating within the Scottish Islands provided some estimates of the potential electricity load that could be seen from electrifying aviation:

- Ground power unit - 225 kW.
- Electric tug (for towing aircraft) - 400 kW.

The decarbonisation of future thrust/drive systems for aircraft is difficult to quantify because of:

- Drive system technology readiness levels
- Fuel/charge range uncertainties
- Challenges around energy density versus aircraft payloads

It is anticipated that most aircraft fleets will electrify. However, whether aircraft fully electrify or use hybrid systems – particularly for long-duration flights – will depend on these and other considerations. As such, the electrification of the aircraft will likely be a longer-term consideration than the electrification of ground-handling equipment.

[30] Highlands and Islands Airports Limited, 2022. Sustainability Strategy 2023-33.
[31] Loganair, 2023. Loganair (. . .) cleaner greener ground operations after first all-electric turnaround.

## 3.5. Electrification of heat

Decarbonising space heating technologies in homes and businesses could be a significant consideration for future electricity load in the Inner Hebrides. The islands currently have no mains gas connection and so households rely on direct electric heaters (radiant and night storage), oil and solid fuels for heating. In addition, the Inner Hebrides' relatively older housing stock results in households using more fuel for space heating over the year than some other parts of GB.

The transition to heat pumps could notably increase the number of properties with electrified heating. That being said, as most households in the Inner Hebrides rely on night storage and direct electric heating currently, a transition to heat pump systems across the islands may not equivalently increase the overall electricity demand, as heat pumps use much less power to deliver equivalent levels of heat. This will be impacted by housing stock energy efficiencies.

Argyll and Bute Council is currently underway with the development of their Local Heat and Energy Efficiency Strategy (LHEES), which aims to decarbonise heat in buildings and improve energy efficiency across the local authority area. The council has already completed the first two stages of theLHEES delivery and anticipates that the final two stages will be completed by early summer 2024 (Figure 23).[32]

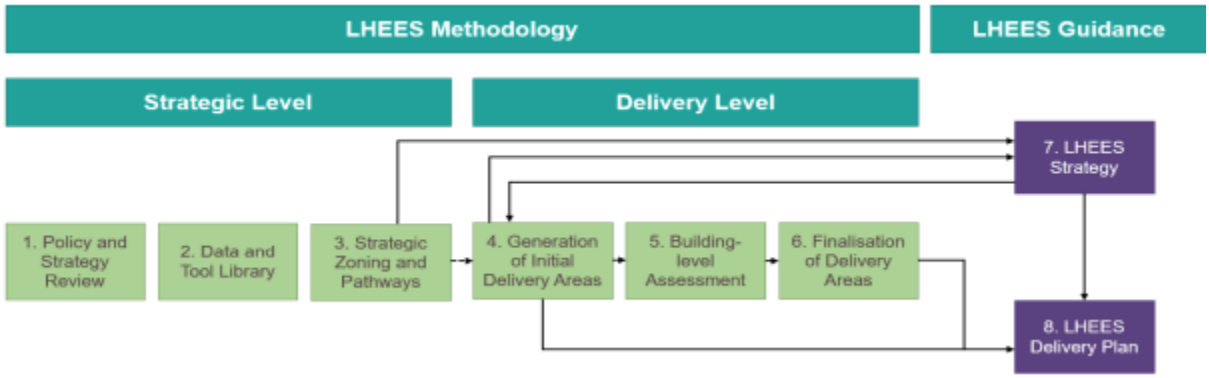


Figure 23
**The LHEES process**

Source: Argyll and Bute's Climate Change Board update Feb 2024

The resultant impact of heat pump roll out on network planning for an island with significant existing electrified heating will require SSEN to consider: diversification factors; the coefficient of performance of heat pumps in homes on the islands; and the resultant impact on the low voltage network in more urbanised areas.

### DFES 2022 projections

The Inner Hebrides' household heating demand comes primarily from direct electric heating (approximately 3,400 units). Under the Consumer Transformation scenario, there is expected to be

[32] Argyll and Bute Council, 2024. Climate Change Board update and decarbonisation tracker Feb 24.

an increase in the uptake of heat pumps, with around 6,500 heat pumps operating in homes by 2035 across the Inner Hebrides – including hybrid and standalone units. This could increase to over 8,200 by 2050 (Figure 24). According to 2022 DFES projections, all heat pumps deployed out to 2050 will be domestic – no non-domestic heat pumps for space heating are modelled.

This adoption of heat pumps is aligned with several targets and policies, including the Scottish Government's ban on fossil fuel installations in new builds from 2024[33] and a target peak installation rate of 200,000 new heat pump systems per annum in Scotland in the late 2020s.[34] In addition to these targets, the Scottish Government have recently provided additional support by amending the Home Energy Scotland Scheme in 2022,[35] making it easier for households to access funding for heat and energy efficiency measures. This scheme also provides additional support for rural areas, including in the Inner Hebrides, by increasing the maximum funding to £9,000 per household. This could create enough incentive for residents to transition to low-carbon heating.

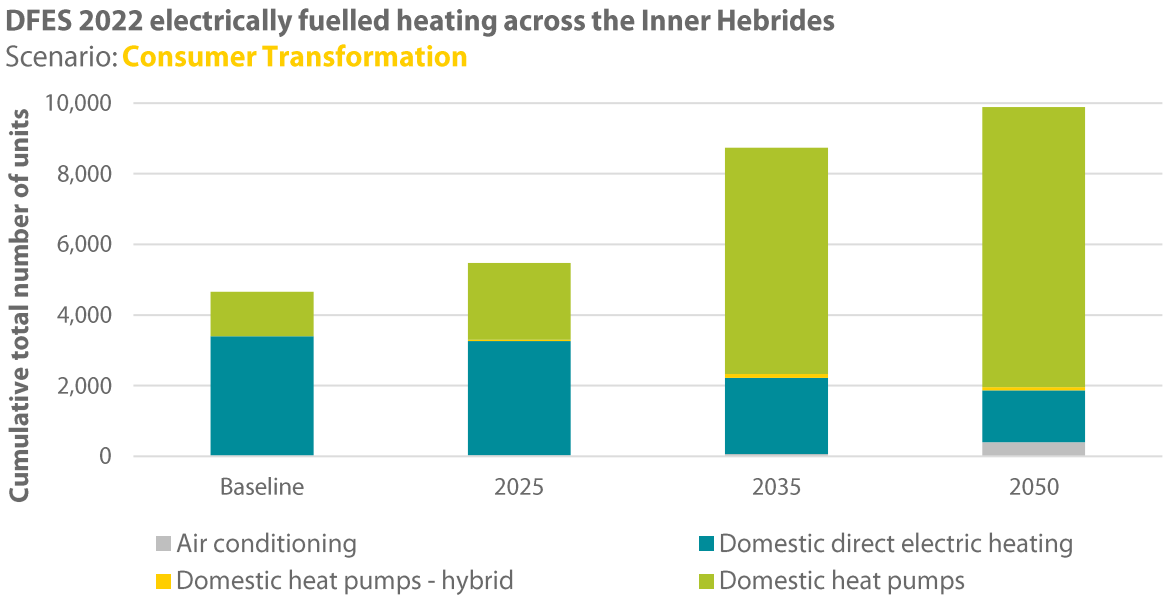


Figure 24

## Projected cumulative number of heat pumps in Inner Hebrides

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

The Consumer Transformation scenario does not prioritise hydrogen-fuelled space heating. As such, heat pumps are the dominant low-carbon heating technology in this scenario.

Although not directly within the Inner Hebrides region focused on in this report, local wind farm operator and Scottish-owned independent green energy company GreenPower has submitted a planning application to build a green hydrogen production and distribution facility in Oban.[36] One option being assessed for this facility is the potential for the hydrogen produced to support the

[33] Scottish Government, 2021. Heat in Buildings strategy.
[34] Scottish Government, 2023. Housing/Net Zero Freedom of Information release
[35] Scottish Government, 2022. Enhanced support to make homes warmer and greener
[36] GreenPower, 2023. The Argyll Hydrogen Hub Takes Big Step Forward.

transition away from carbon-intensive fuels such as heating oils and liquified natural gas (LNG). However, the outcomes of these initiatives should be considered alongside broader strategic decisions and policy developments by both the UK Government and the Scottish Government on using hydrogen for home heating.

## 3.6. New building developments

### DFES 2022 projections

Based on an analysis of a register of new developments supplied by Argyll and Bute Council and Highland Council, there are projections for new housing in the Inner Hebrides totalling 970 new homes by 2035, increasing to over 1,000 by 2050 – see Figure 25.

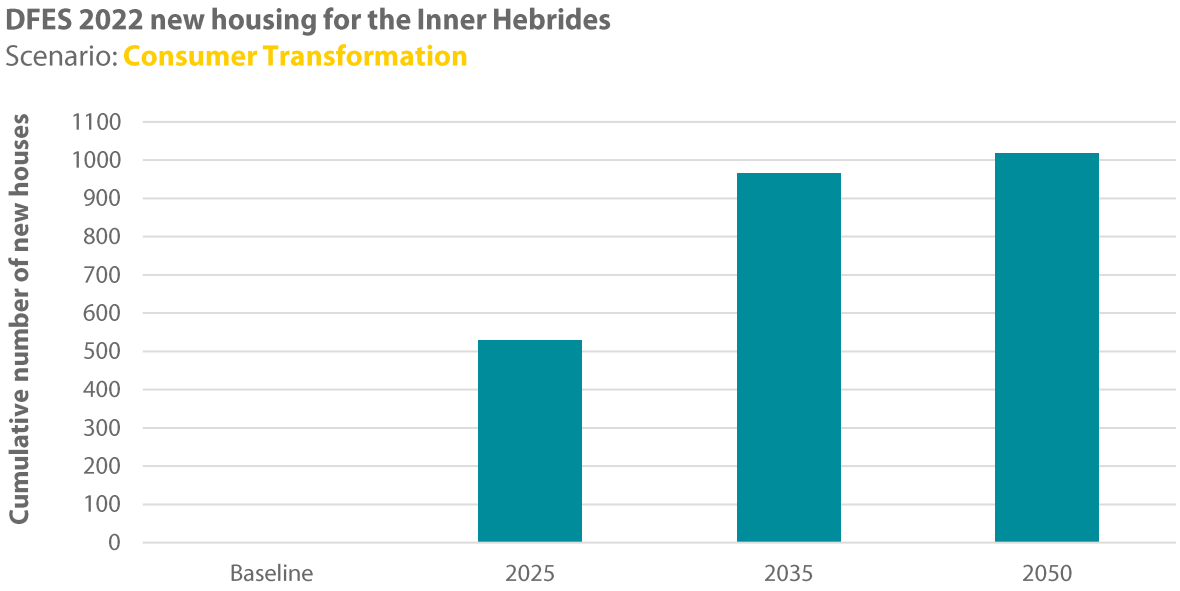


Figure 25
**Projected cumulative number of new houses developed**

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

In addition to domestic properties, the local authorities shared data for non-domestic developments. By 2035, c.90,000 $m^2$ of non-domestic development floorspace is projected to be built out across the Inner Hebrides, see Figure 26. This includes 28,500 $m^2$ of new sport and leisure facilities and 1,600 $m^2$ of new office space. The majority of this increase (>60,000 $m^2$) is projected to stem from new factory and warehouse developments, in which the significant scale of the distilling industry is likely to play a key role. This is discussed further in Section 3.7.

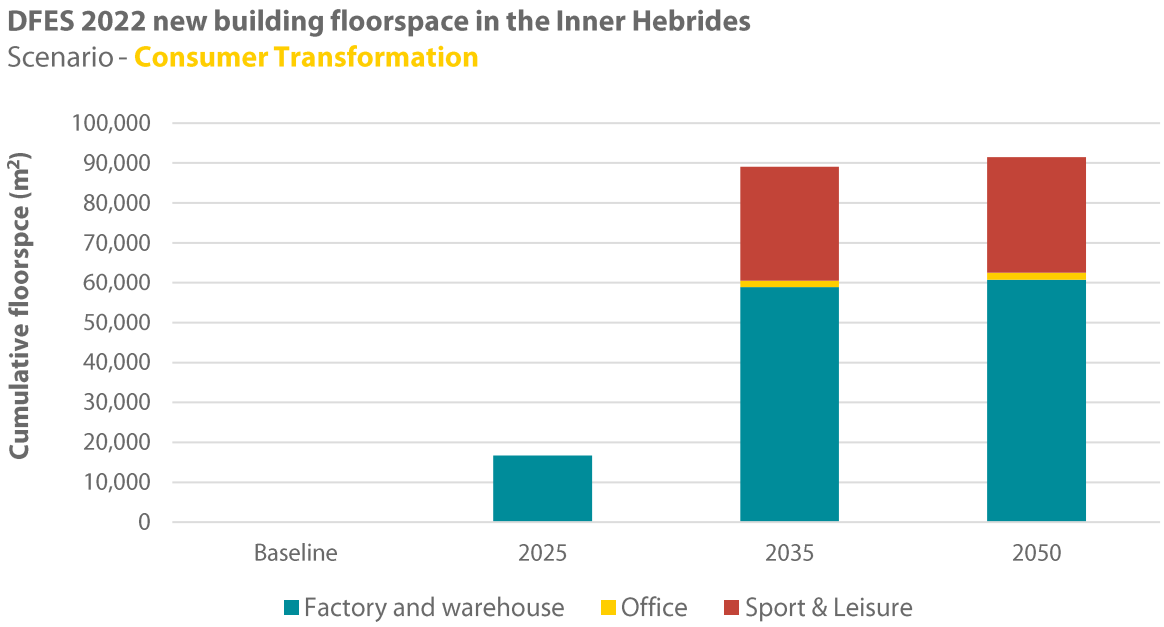


Figure 26

## Cumulative floorspace for new non-domestic buildings

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

## 3.7. Commercial and industrial electrification

In addition to the electrification of transport and space heating, the Inner Hebrides is home to a range of commercial businesses and industries. The future decarbonisation pathways and resultant electricity requirements from these businesses are rapidly evolving areas. Engagement with several businesses and island representatives provided some insight into several areas of energy-intensive sectors operating in the Inner Hebrides. This included views on the electrification of processes, transport and heat as well as broader aspirations and installation plans related to decarbonisation and net zero commitments of businesses.

### Distilleries

The Inner Hebrides currently hosts nearly two dozen operational distilleries that produce spirits including whisky, gin and rum (Figure 27). The distillation process is energy intensive, fuelled by fossil fuels and accounts for a significant proportion of energy demand across respective islands.

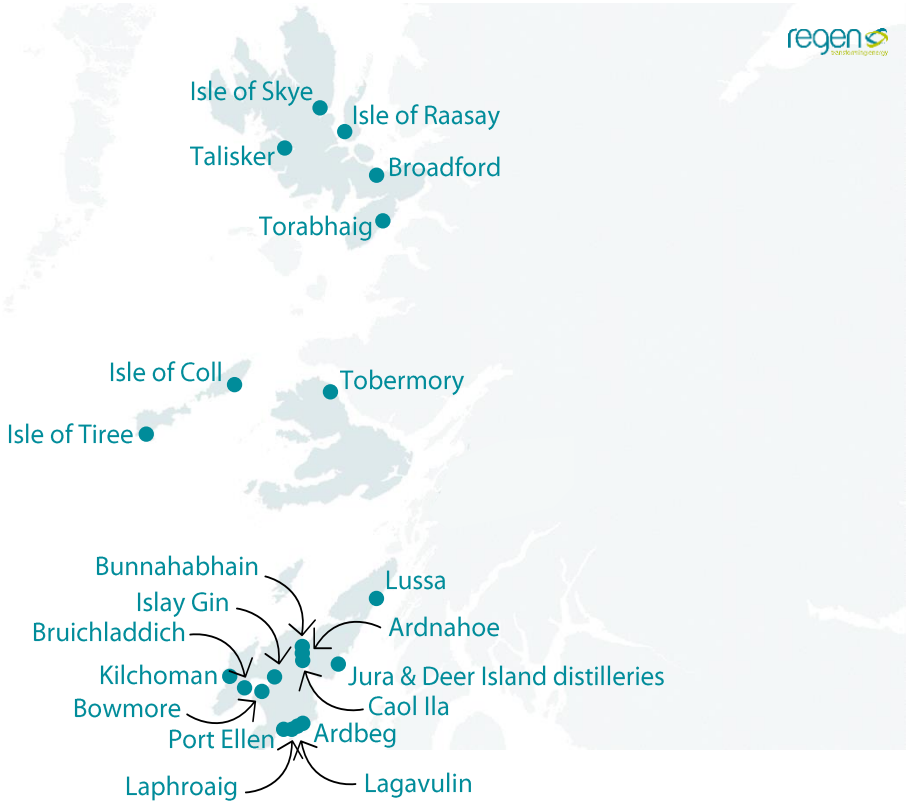


Figure 27
**Distilleries currently operating across the Inner Hebrides**

Over half of the distilleries within the Inner Hebrides primarily focus on whisky production, which is one of the most energy-intensive products to produce in the food and drink industry.[37] Estimates

[37] Heriot Watt University, 2021. Distilleries need blend of green energy and storage for net zero.

suggest that whisky production is significantly more energy intensive than gin production, with 12.7-13.9 kWh per litre needed for whisky compared to only 1.7-2.3 kWh per litre needed for gin.[38]

This is particularly relevant for Islay – referred as the 'whisky-capital' of Scotland – which currently hosts nine whisky distilleries with a total production capacity of around 22 million litres of pure alcohol (LPA)[39] annually. Estimates from the Scotch Whisky Association indicate a typical distillery energy consumption of c.8kWh/LPA.[40] This includes energy requirements for fuel consumption for production and heating alongside electricity consumption. Based on these estimates, the current production capacity on Islay alone would require approximately 176 GWh annually, as well as other fuel used for other buildings/activities. However, the current pipeline of new distilleries means whisky production capacity on Islay is projected to increase to around 28 million LPA by 2025. This could cause increased energy use (through existing fuels) to 224 GWh per annum.

Distillery decarbonisation could be the largest source of potential future electricity demand across the Inner Hebrides, specifically on Islay. Due to the lack of gas network infrastructure on the islands and challenges around the timescales and economic viability of other solutions (such as hydrogen or bioenergy), the electrification of the distilling process is being considered a priority for many sites. This could include the use of high-temperature electric boilers or heat pumps to provide steam for the distilleries, alongside process optimisation measures such as mechanical vapour recompression[41].

Nova Innovation, a marine energy company, previously announced an ambition to provide the local Scotch Whisky sector with renewable electricity that could displace currently-used fossil fuels.[42] The 3 MW Òran na Mara tidal stream project, planned for the Sound of Islay, is also currently in its pre-application stage and follows the successful BlueMull Sound tidal project that Nova has been operating in Shetland since 2016.[43] Whether this project connects to distilleries through private wire or via the grid will depend on factors such as cost and connection capacity. SSEN will likely be engaged throughout the development of this project.

The distilling process requires significant volumes of high-temperature heat across long periods. This is currently mostly provided through solid and liquid fossil fuels (such as kerosene in the Inner Hebrides). The wider whisky industry has made progress towards decarbonisation, with non-fossil fuels making up 20% of its energy use in 2018, up from only 3% in 2008.[44] Engagement with the Scotch Whisky Association (SWA) highlighted that their 2023-25 strategy, includes commitments to achieving net zero emissions in their own operations by 2040.[45] A Riccardo report commissioned by the SWA in 2019 investigated how carbon reduction in the distillery industry could be achieved.[46]

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[38] EMEC Hydrogen, 2019. Industrial Fuel Switching Competition – HySPIRITS Public Report
[39] Based on engagement with the Islay Energy Trust.
[40] Scotch Whisky Association, 2020. Scotch Whisky Pathway to Net Zero.
[41] The Spirits Business, 2023. Chivas shares carbon-saving tech with whisky industry
[42] Crown Estate Scotland, 2021. Whisky from beneath the waves.
[43] Marine Scotland, 2016. Case study: Nova Innovation – Shetland Tidal Array.
[44] Heriot Watt University, 2021. Distilleries need blend of green energy and storage for net zero.
[45] Scotch Whisky Association, 2021. The Scotch Whisky Industry Sustainability Strategy.
[46] Scotch Whisky Association (Ricardo), 2020. Scotch whisky pathway to net zero.

This included various options and technologies to reduce emissions, from energy efficiency to onsite renewables and hydrogen (see Figure 28).

Engagement for this study with a range of distillery organisations and representatives such as the Islay Energy Trust identified that a significant barrier to decarbonisation is the lack of available electricity network capacity. This is more prevalent on some Scottish Islands, with some new or expanding distilleries planning to run entirely on diesel generators due to a lack of demand capacity on the local grid. Discussions with distillery representatives revealed that new/extension distilleries with confirmed planning applications on Islay cannot connect to the electricity network until 2029 due to the lack of demand capacity. This suggests that new build distilleries will be forced to rely on fossil fuels as an interim solution, even before additional electrical demand from decarbonisation solutions is taken into account. The electrification of high-temperature processes for distilling at existing sites could reduce overall energy use by up to half.[47] However, the lack of grid capacity is forcing some companies to explore alternatives, such as biofuels, first.

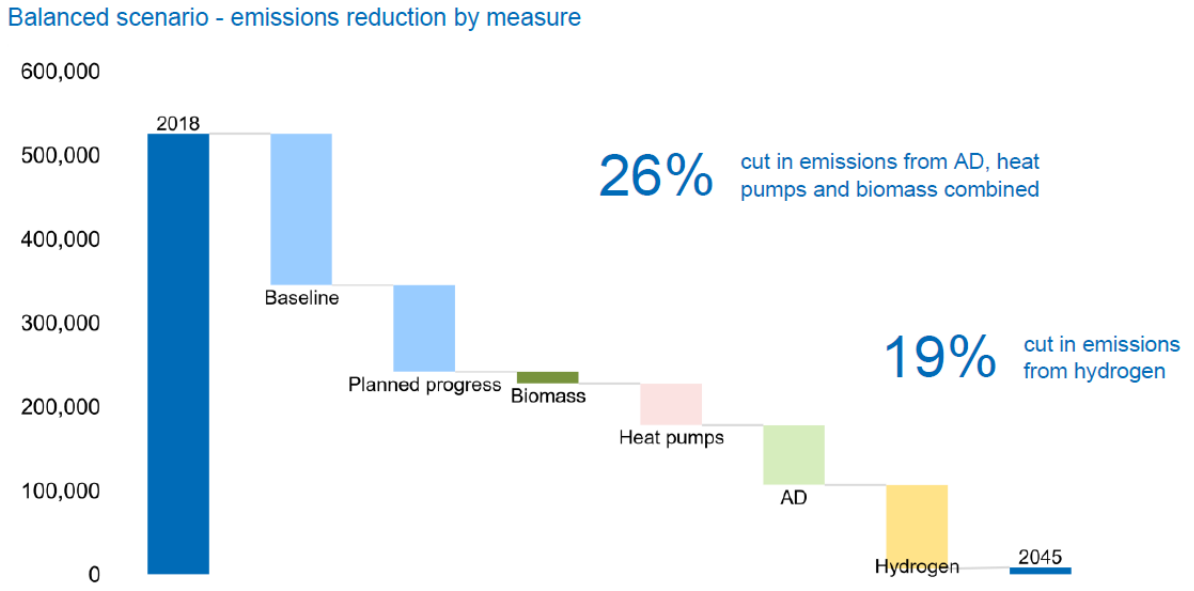


Figure 28

## Emissions reductions in the Scotch Whisky industry by measure – Balanced scenario

Source: Scotch Whisky Association

Back in 2021, Bunnahabhain Distillery installed a biomass energy centre – powered by local biomass and spent malt – which made the distillery the first on Islay to have a net zero distillation process.[48] Some distilleries on Islay and Jura are exploring similar decarbonisation solutions and are assessing the potential for biomass to decarbonise the distilling process.

Other distilleries are assessing the option for green hydrogen. Bruichladdich Distillery, located on Islay, has partnered with Protium[49] to develop an innovative hydrogen combustion technology

[47] Based on engagement with Diageo, 2023.
[48] Bunnahabhain, 2021. Introducing Bunnahabhain Distillery's New Biomass Plant.
[49] Protium, n.d. Pioneering green hydrogen energy solutions.

which will be used to create heat for the distillation process. The project is supported by £2.65m in UK Government funding from the Green Distilleries Competition [50] and is key to progress Bruichladdich's 2025 distillation decarbonisation target. [51] Once proven, the intention is to potentially commercialise and install this technology across other distilleries across Islay.

Depending on the co-location opportunities and the potential for private wire connections, the required additional renewable electricity generation to produce green hydrogen locally on Islay could also be a potential source of load growth across the island's network.

Alongside energy use, the distilling process also needs large quantities of fresh water. As a result of this and water resource challenges, many distilleries are looking into energy-intensive desalination to meet freshwater demand and not impact local water resource needs. There will also be a further need for fresh water and desalination if distilleries look towards using the production of hydrogen through electrolysis as a fuel source for high-temperature heating.

In addition to replacing fossil fuels for the distilling process, companies are looking to decarbonise other aspects of their businesses, including electrifying/decarbonising associated operations (such as bottling plants), distribution and export via road and sea, and onsite decarbonisation for shops, visitor centres and offices.

Each year, the Inner Hebrides hosts a variety of week-long festivals that celebrate the region's whisky industry, such as The Hebridean Whisky Trail and Fèis Ìle (The Islay Festival). Stakeholder engagement suggested that the population of the region can increase by c.20,000 throughout each festival period, with the potential to increase year-on-year as the distilleries expand operations and tourism increases. Not only will the network need to be able to support new distilleries in the region, but it will also need to ensure it can cope with the increased electricity demand expected from the number of visitors the region will be hosting during event periods.

Future electricity load from distilleries is not currently included within the DFES methodology scope. There are several factors that make the scale of future electricity load growth modelling challenging to develop. These factors include:

- The number of distilleries intending to electrify, as opposed to using alternative low-carbon fuels or methods of decarbonisation.
- For those that do electrify, the electrification technology used, e.g. high-temperature electric boilers or high-temperature commercial-scale heat pumps.
- For those that do not electrify, the type of alternative fuel used. For example, low-carbon bioenergy heating would not directly impact the electricity network, whereas low-carbon hydrogen via electrolysis could have a significant impact due to input electricity and high-quality water resource requirements, that could link to on-island desalination

However, it is clear that distilleries are a significant source of both current and future energy use. Several organisations are already pursuing options to decarbonise the distilling process, including

[50] Department for Business, Industrial and Energy Strategy & Department of Energy Security and Net Zero, 2021. Green Distilleries Competition: Phase 2 (Demonstration) successful projects.
[51] Bruichladdich Distillery Company, n.d. Energy.

through direct electrification or via the production of on-island green hydrogen or bioenergy, which may create significant additional demand on SSEN's electricity networks. However, even without efforts to decarbonise, current constraints on the electricity network are also delaying or impacting the viability of new distilleries from being built and existing distilleries from expanding their operations. These factors alone may drive the need for potentially major upgrades to the network infrastructure supplying the islands. This is a particularly concentrated issue on Islay but is also applicable to other islands with distillery sites.

To gain a more comprehensive understanding of the possible future electricity requirements of distilleries within the Inner Hebrides, SSEN would welcome further engagement with the distilling industry and any relevant stakeholders, to develop more a detailed visibility of the electricity load requirements in the future of specific island groups.

## Agriculture

Several of the islands within the Inner Hebrides have economies that rely, in part, on agricultural practices such as crofting (a land tenure system of small-scale food producers unique to the Scottish Highlands and Islands[52]) and cattle raising.[53] There is also a significant demand for barley from the distilleries on the islands.

The volume of agricultural petroleum consumed by the agricultural sector specifically across the Inner Hebrides is difficult to establish, with the former Department for Business, Energy and Industrial Strategy (BEIS) estimates suggesting around 120 GWh was used across Argyll and Bute Council's jurisdiction in 2019.[54] The use of petroleum for the agricultural sector in the Inner Hebrides alone is a smaller proportion of this figure; however, the decarbonisation of farm machinery and processing will be key to a wider transition to net zero.

The is no clear decarbonisation pathway for farm machinery. Electrification could be one solution, with alternative fuels such as ammonia, hydrogen and biofuels also being considered.

The potential electrification of processing centres and heavier livestock transportation vehicles could increase demand load growth. However, as a fairly specialist subset of HGV electrification, the scale of electrification is unclear. Further engagement with the National Farmers Union and livestock transportation companies (both national scale, such as WM Armstrong and Gilders Transport, and locally in Inner Hebrides, such as Sinclair Haulage and B & F Kemp Haulage) would be recommended to explore the direction of travel for the decarbonisation of these vehicles.

[52] Scottish Crofting Federation, n.d. About Crofting.
[53] Britannica, 2024. Inner Hebrides.
[54] BEIS, 2021. Sub-national residual fuel consumption: 2005-2019

## Aquaculture

The Highlands and Islands are the largest aquaculture production region in the UK[55], incorporating finfish, shellfish and seaweed farming. The Isle of Mull accounts for a large proportion of the aquaculture farms within the Inner Hebrides,[56] where approximately 8% of the population are employed by fishing and aquaculture companies.[57] Fish are largely farmed, landed and processed on the islands before being distributed via ferry to the mainland. A 2030 growth strategy is in place to double the sector's economic contribution in Scotland to £3.6 billion and support job growth to 18,000.[58] The processing and transportation of this predicted growth in the industry could significantly increase electricity demand and could be a notable source of future electricity demand at key port locations, particularly as vessels are shifting towards decarbonisation.

Salmon farms are particularly important for the Isle of Mull, with two major farms currently engaging with the community on proposed expansions.[59] [60] Salmon Scotland, the representing organisation for all salmon producers in Scotland, has a net zero 2045 target, which includes working towards 100% renewable energy use for powering farms and facilities and electrifying modes of transport.[61] With projected expansion, the Isle of Mull could see an increase in volume in salmon production and, as such, there is potential for a move towards increased electrification, particularly for marine vessels. However, the role of other renewable energy sources, such as anaerobic digestion, could see a similar increase, linking to an Outer Hebrides Local Energy Hub initiative, which used fish processing waste in an anaerobic digestor.[62]

Another notable source of existing energy demand is the drying of seaweed, which is currently heavily fuelled through burning kerosene. Whilst a small industry on the islands compared to finfish and shellfish farming, with only three wild seaweed harvesting businesses located within the Inner Hebrides, conclusions from the Scottish Government in 2022 suggested that there is potential for growth in the harvesting and export of seaweed in Scotland, due to increasing market demand[63].

# 3.8. Community energy initiatives

The Inner Hebrides region has a proven record of innovative community energy schemes. Whilst not connected to the SSEN network, the Isle of Eigg have created their own renewable energy system. Through the formation of Eigg Electric company, they provide 24 hour power to island residents and business through a 300 kW system.[64] This is made up of three hydroelectric generators, four small wind turbines and a solar PV array. They also have battery storage system

[55] Highlands and Islands Enterprise, 2023. The Blue Economy in the Highlands and Islands.
[56] Crown Estate Scotland, n.d. Crown Estate Scotland Spatial Hub: Aquaculture.
[57] Scottish Parliament, n.d. Submission from Mull Aquaculture and Fisheries Association.
[58] Highlands and Islands Enterprise, 2021. Aquaculture Growth to 2030.
[59] Bakkafrost, n.d., Mull.
[60] Scottish Sea Farms, n.d. Proposed farm expansion.
[61] Salmon Scotland, 2020. A Better Future For Us All
[62] Community Energy Scotland, n.d. Outer Hebrides Local Energy Hub (OHLEH)
[63] Scottish Government, 2022. Understanding the potential scale for seaweed-based industries in Scotland
[64] Isle of Eigg, n.d. Eigg Electric

capable of powering the whole island for up to 24 hours and two back up diesel generators. Whilst Eigg is not connected to the mainland, and therefore doesn't impact SSEN's network plans, it does indicate the enthusiasm, perseverance and dedication of local communities to develop community owned renewable solutions. This type of approach could be replicated across islands with connections to the mainland, as communities try to reduce their reliance on fossil fuel sourced energy.

Furthermore, on Islay almost 90% of residents have indicated that they want to see more local renewable energy generation as part of improvements to Islay's overall energy system.[65] Islay is taking part in the Scottish Government's Carbon Neutral Islands project[66] to help decarbonise six island communities, with the aim of reaching net zero by 2040. Currently, Islay consumes around 240 GWh per year, of which 80% is supplied by imported fossil fuels and 15% from grid supplied electricity. The island produces around 5% of its electricity demand from Islay-based renewables; however, located in a Constraint Managed Zone (CMZ) there are restrictions to import and export.[67] As a result, the island has a 6 MW (soon to be 8 MW) diesel generator to provide backup power during network outages. Islay will see a significant increase in electricity demand with the electrification of heat and transportation across the island, as well as the strong desire to electrify whisky distillation processes - if sufficient grid capacity can be created. The island's largest renewable generator is the community owned wind turbine (330 kW) which is owned and managed by the Islay Energy Community Benefit Society (IECBS). This further highlights the appetite for community-owned renewables to play an important part in Islay's decarbonisation.

The introduction of a community benefit society has already been replicated across other Inner Hebridean islands, with the Isle of Mull creating Green Energy Mull. [68] This is an island-run Community Benefit Society that owns and manages Garmony hydro, a 400 kW run of river system generating local electricity that is sold into the national grid. The scheme is estimated to have an income of £200,000 per year for the community, where net profits are donated to a local benefit fund that supports community projects on Mull and Iona. The community have shown a strong desire to work towards a zero emissions future with the AMAZE project (Archipelago of Mull Actions for Zero Emissions) that researched decarbonisation strategies, including increased renewable generation and installing EV chargers and car clubs.[69] This indicates the ambition to develop further community owned or initiated projects that will want to connect to SSEN's distribution network, at various voltage tiers.

SSEN should continue to engage the Carbon Neutral Islands project to further discuss future decarbonisation plans for electricity and heating on the islands, as part of the considerations for future investment in the Inner Hebrides electricity network.

As mentioned in Section 3.1, a large proportion of community-owned wind turbines currently operational across the Inner Hebrides are over a decade old, reaching the end of their operational

[65] Islay - Carbon Neutral Islands, 2023. Community Energy Scotland
[66] Scottish Government, 2021. Renewable and low carbon energy.
[67] Islay Energy Systems Options Appraisal, 2021. Local Energy Scotland
[68] Garmony Hydro Scheme, 2016. Mull and Iona Community Trust
[69] The AMAZE project, 2024. Mull and Iona Community Trust

lifespan and potentially looking to repower in the next few years. Most of this repowering will include turbines with higher power capacity than the original sites, leveraging the advancement of wind turbine technology.

Engagement with Inner Hebrides community stakeholders highlighted that the local ambition to repower community wind turbines has partially stemmed from difficulties community groups have experienced when developing new projects. The challenge of grid capacity and business cases for new sites has triggered a shift in appetite from developing new community projects to repowering existing ones to increase annual renewable energy yields. This suggests that current network constraints are forcing local community groups to choose between repowering existing wind turbines or installing new onshore wind capacity in a wind resource rich area of Scotland. There is a clear ambition to develop new community wind projects, should sufficient grid capacity be made available.

Section 4:

# Conclusions

From reviewing the projections from SSEN's DFES 2022 analysis and undertaking additional research and engagement, there is clear evidence that the requirements of the electricity network in the Inner Hebrides will significantly evolve in both the near and longer term. SSEN will need to ensure that future investment around the island's electricity system can enable the development of additional near-term generation capacity, which is currently a major blocker to the expansion of the distillery industry and new community wind farms. The network also needs to prepare for the increased electricity generation and demand that the net zero transition will bring for residents, businesses and island industries. Engagement with stakeholders and the local communities are particularly key, given strong decarbonisations ambitions in the region.

DFES analysis suggests that distributed generation capacity could increase from an 80 MW baseline to c. 600 MW by 2050. Most of this generation capacity could consist of onshore wind, which could see an additional 280 MW deployed between 2022 and 2030. Marine electricity generation may also be developed in the region, with analysis suggesting 43 MW of operational capacity by 2045. A moderate amount of battery storage could also be deployed in key locations, potentially leveraging co-location opportunities with wind farms.

**DFES 2022 generation and storage capacity on the Inner Hebrides**
Scenario: **Consumer Transformation**

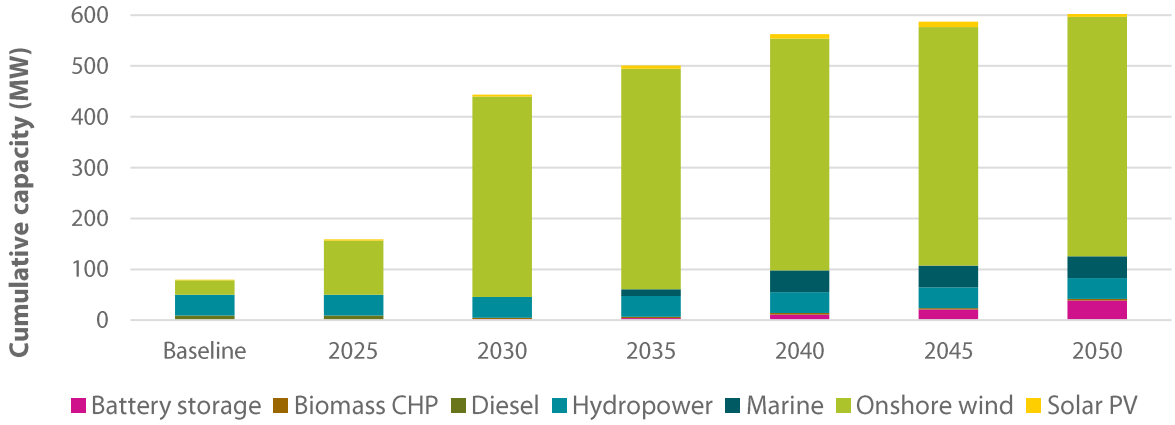


Figure 29

## Cumulative distributed generation and storage capacity in Inner Hebrides, Consumer Transformation scenario

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

Distributed electricity demand across the Inner Hebrides is projected to follow a similar trend to distributed generation capacity. The DFES 2022 baseline shows 63 MW of demand capacity from

domestic heating and cooling systems (including a lot of existing direct electric heating and some heat pumps). The demand capacity from domestic heating and cooling systems is projected to increase to c. 100 MW by 2030 as more properties move off fossil fuel heating to heat pumps. Heat technology capacity plateaus between 2030 and 2050, as some residual homes with direct electric heating and fossil fuel heating install domestic heat pumps.

The electricity demand from domestic and non-domestic EV chargers – and the assumed uptake of EVs – is estimated to be limited out to 2025, with just 0.5 MW of additional demand. However, this is expected to increase to around 60 MW by 2035 and to 70 MW by 2050. The installation of non-domestic EV chargers sees a similar trend, although the total capacity is much smaller than that of domestic EVs, with up to c.8.4 MW of charging expected by 2050. In addition to road transport, the demand from marine vessel and aviation electrification could bring additional vessel/aircraft charging demand. The scale of this additional capacity is unclear without additional detailed analysis and engagement. An estimated 5 MW of network-connected hydrogen electrolysis could also connect by 2050. However, engagement suggests that the scale of electrolysis will be linked to decarbonisation pathways of distilleries and the connection arrangements with associated island renewables and hydrogen production facilities.

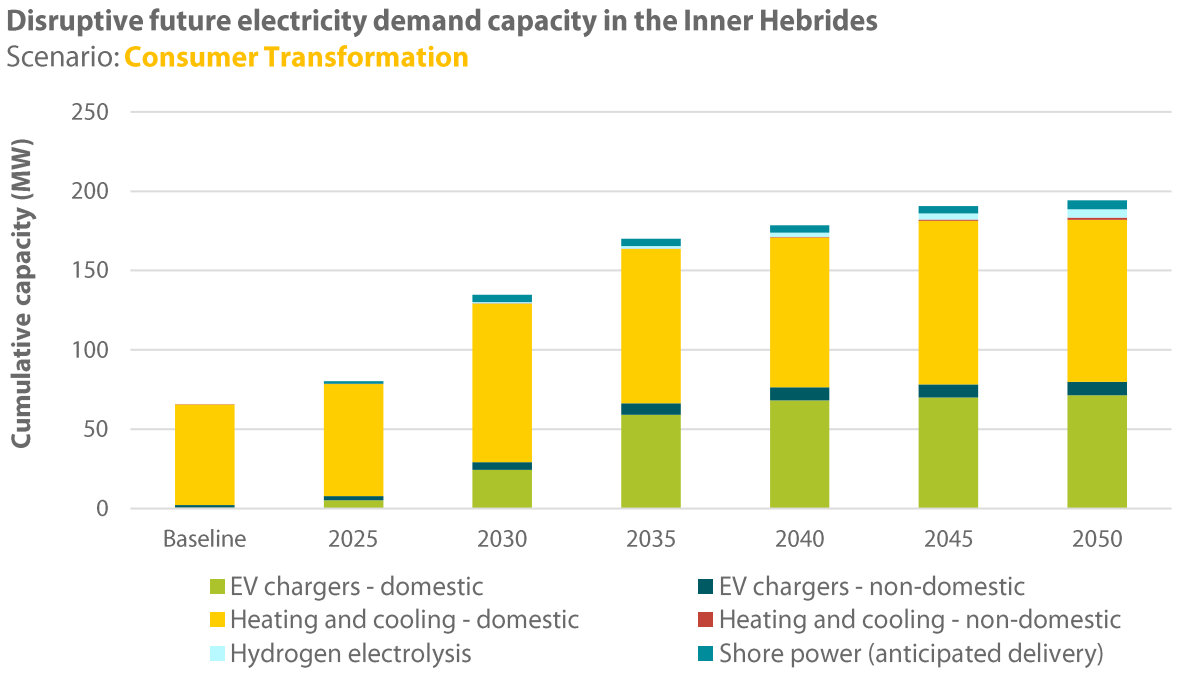


Figure 30

## Cumulative distributed generation and storage capacity in Inner Hebrides, Consumer Transformation scenario

Source: SSEN DFES 2022 projections – Consumer Transformation scenario

The graphs above detail projections of the potential future electricity load growth in the Inner Hebrides. Although this data alone demonstrates the potential need for future reinforcement in the distribution network, engagement with stakeholders and industry experts has highlighted

potentially significant, but less clear additional future demands from other industries, such as maritime transportation, aviation and commercial sectors.

An overall position on future electricity load growth across the sectors covered in this evidence case report is outlined in Table 5 below.

Table 5

## Summary of potential future load growth on the distribution network in Inner Hebrides by sector

| Energy Sector | Summary of future load growth on the distribution network |
|---|---|
| Renewable energy | The Inner Hebrides has extensive resources for wind, tidal stream and hydropower. These resources have enabled the existing onshore wind baseline of 31 MW to develop and a near-term pipeline of 135 MW of prospective new onshore wind projects. It has also enabled the Inner Hebrides to attract marine generation technology developers, seeking to progress a near-term pipeline of 10 MW. Under some scenarios, these renewable resources could expand further into the future to reach 450 MW of onshore wind and 40 MW of marine energy by 2050.<br><br>Whilst the Inner Hebrides has very low irradiance levels compared to other parts of the UK, there is the potential for a moderate development of new small-scale solar PV, including on domestic and commercial buildings. Some businesses on the islands are looking to explore the potential for solar to reduce electricity costs.<br><br>Renewable energy will remain a significant source of future generation load growth across the Inner Hebrides. In particular, the repowering of existing wind projects, the development of additional onshore wind sites and marine generation projects, coupled with consistent hydropower generation, will be key technologies in the Inner Hebrides. |
| Battery storage | There are currently no commercial battery storage assets operating on any islands across the Inner Hebrides. Despite a very large, growing pipeline of new projects seeking to connect to the wider SHEPD network, there is currently only a single battery project with an accepted connection offer, with the connecting capacity yet to be confirmed. As a result, under some scenarios, battery storage capacity has been projected to reach c.15 MW by 2050. However, with the development of more onshore wind sites, marine electricity generation and solar, the potential for storage co-location as a business model could drive the development of more battery storage capacity.<br><br>The replacement of the existing backup diesel power stations supporting the islands could include, in-part, the installation of longer-duration batteries.<br><br>As one of the most rapidly developing sectors, battery storage has the potential to be a disruptive source of both demand and generation load in the future at various parts of SSEN's network. Whilst there is currently very limited development across the Inner Hebrides, this could change rapidly as use cases and business models constantly evolve. Further renewable generation development may see electricity storage (including potentially longer duration storage) as a solution to increase on-island energy use. |
| Hydrogen | The Inner Hebrides has been identified as a potential hub for future hydrogen development, spearheaded by the distillery industry which is beginning to look into offtaking green hydrogen to fuel the distillation process. Grant funding has been awarded to Bruichladdich Distillery, located on Islay, to demonstrate the potential for green hydrogen to fully decarbonise the distillery's process heating requirements.<br><br>Both as a source of electricity demand from electrolysis and as a potential offtake of local wind generation for local usage, green hydrogen could see notable development on the Inner Hebrides under some scenarios. SSEN should continue engaging with the |

| | |
|---|---|
| | distilleries and hydrogen innovation projects developing both on the islands and across Scotland, to understand the impact this may have on the island's electricity network. |
| Transport | There are currently c. 140 EV cars and LGVs registered across the Inner Hebrides. Under the Consumer Transformation scenario, this could significantly increase, reaching over 11,500 EVs by 2035.<br><br>Argyll and Bute Council has recognised the decarbonisation of transport as a key priority. Its Electric Vehicle Charging Strategy Update acknowledges wider policy reforms and demonstrates strong public sector commitment to EV uptake and the future development of EV charging infrastructure across their region. This includes the electrification of the Council's private fleet. Tourism will continue to significantly impact the local economy and infrastructure, including EV charging requirements for tourists travelling to the islands via vehicle ferry routes. Under the Consumer Transformation scenario, non-domestic EV charger capacity reaches over 9 MW and the number of domestic EV chargers totals over 10,500 by 2050.<br><br>Marine vessels could also be a significant source of future electricity demand at particular locations on the islands. The local ferry operator (CalMac) operates a number of routes both intra-island and between the island and the mainland and is currently looking to a number of options to decarbonise its fleet, including electrification.<br><br>There are four airports in the Inner Hebrides, with several flights operated from Tiree and Islay to the Scottish mainland. Both the electrification of on-the-ground assets and future flight thrust/drive systems are being investigated by aviation operators and other consulting organisations. The airports could consequently become a further source of additional electricity demand.<br><br>Future electricity demand from transport could come from three different transport sectors that are on very different timelines. EV charging is likely to see rapid adoption to meet demand from residents and visitors. The development of shore power charging for ferries is already being explored with SSEN at key port locations; other vessels may increase future capacity requirements at these locations. Commitments from Loganair and Airtask, who operate flights at the three island airports are pushing for the electrification of on-ground assets, vehicles, and a longer-term view for aircraft decarbonisation. |
| Heating | The Inner Hebrides has no mains gas connection, so households rely on primarily on electricity for heating, alongside some use oil and solid fuels. Under the Consumer Transformation scenario, the number of homes with electric heating is set to increase from c.3,400 to c.7,900 across the Inner Hebrides by 2050.<br><br>Additional electrically fuelled space heating could be a significant source of future electricity demand across Inner Hebrides. Many households are already using direct electric heating, of which energy demand could decrease if switched to heat pumps. Fossil fuel heated homes are expected to switch to heat pumps, increasing the overall electricity demand from residential heating by 2050. |
| Commercial and Industrial | There are several specific commercial businesses and industries operating across the Inner Hebrides. There are 21 distilleries across the island groups, of which over half are currently producing whisky. Islay specifically has a concentration of whisky distilleries and is facing a number of challenges and limitations of the existing network. For example, meaning that expansions to existing distillery sites are struggling to obtain grid connections, as well as impacting on new housing developments.<br><br>Individual distilleries and parent companies on Islay, across the Inner Hebrides and across Scotland are currently looking at a number of solutions to rapidly decarbonise their high-temperature distillation processes that currently rely on fossil fuels. This decarbonisation could include green hydrogen production through electrolysis, electric boilers or high temperature heat pumps and other low-carbon fuels such as bioenergy. |

| | |
|---|---|
| | The decarbonisation of associated operations (bottling and distribution) is also being explored, which may involve the development/use of onsite renewables and EVs.<br><br>Agriculture and aquaculture industries in the Inner Hebrides are both looking to decarbonise their machinery, processing facilities and produce transportation.<br><br>The decarbonisation of industries specific to northern Scotland (i.e. whisky distilleries, fish and seaweed farming) and broader industries (e.g. agriculture and other commercial businesses) could involve a range of potential electrification outcomes. Particular note should be taken of the current and future energy demand of the distilling industry on Islay, the expansion and decarbonisation pathway for which is currently hindered by existing grid constraints and is forcing organisations to assess alternative fuelling options. If distilleries seek to electrify, the demand capacity on the distribution network could become one of the largest sources of electricity demand in the region. |

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09/05/2024