Achill Community Futures/Toghchaí Phobail Acla SEC Energy Master Plan

Baseline Energy Balance, Renewable Energy Potential and Register of Opportunities

August 2022

Supported by

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1.1 Executive Summary

The Achill and Corraun Sustainable Energy Community (SEC) was established as part of the Achill Community Futures Project. The National SEC network is coordinated by the Sustainable Energy Authority of Ireland (SEAI) to stimulate and support communities who seek to become actively involved in the transition to a low carbon future. It provides a wide range learning opportunity, it facilitates peer to peer support and leadership through example opportunities between community groups, and it also provides access to grant support.

An important step in the development of an SEC is to understand the community's current energy consumption. In 2021, the Achill and Corraun SEC commissioned this Energy Master Plan for the area.

This document provides an overview of the analysis undertaken by Energy Co-operatives Ireland on behalf of Achill and Corraun SEC, highlighting the relevant findings on the community's current energy demand, as well as the options available for reducing energy usage and switching to renewable energy sources: what is termed in the document the 'Register of Opportunities'.

The requirement for Ireland to meet its commitments to reduce dependence of fossil fuels and the consequent polluting and climate changing emissions needs the support of its citizens. This support is most proactive when it is co-ordinated and informed at the community level. This Energy Master Plan aims to provide the information around which that community co-ordination can take place.

The EMP is a living document. It is grounded in the principles of 'Learn-Plan-Do' whereby experience is tested and gained through active ongoing projects. There are resources not published here which can be increased and updated over time to help track the SEC's progress towards its targets.

The EMP is intended to promote dialog within the community about its recommendations: while we are confident that they are feasible, desirable and beneficial to the sustainability of the SEC, the active participation of the community is a pre-requisite of the EMPs success. We therefore see this document as the start of a wider consultation process which will be led by the SEC itself in conjunction with the residents of Achill and Corraun

1.2 Contents

1.2.1 List of Figures

1.2.2 List of Tables

1.2.3 Glossary of Terms

Although all efforts have been made to keep the language in this report non-technical, through the use of infographics and normal language it is not always possible. We provide a glossary of key terms used through-out this report and an explanation of their meaning.

Building Energy Rating (BER) - BER stands for Building Energy Rating. A BER certificate shows you the energy performance of your home

Carbon Dioxide/ CO2 - Carbon dioxide is a powerful greenhouse gas. It is naturally part of the air we breathe. However, human activities like burning of fossil fuels and deforestation have led to an increase in CO2 in the air that contributes to climate change.

Carbon Footprint - Carbon footprint measures the carbon emissions linked to a particular activity or product. It includes emissions involved in all stages of making and using a product or carrying out an activity.

Energy Efficiency - It is energy efficient when we use less energy to achieve the same result.

Energy Savings - Energy in whatever format it is being consumed usually costs money (€). By reducing the amount of energy consumed you are also reducing the cost associated with providing that energy.

Kilowatt hours (kWh) - One kilowatt-hour is equivalent to 1000 watts of energy used for 1 hour. For example, a 100-watt lightbulb switched on for 10 hours uses one kWh of electricity.

Register of Opportunities (RoO) - The Register of Opportunities is a list of projects or opportunities within your community which if executed will result in energy efficiency and a reduction in energy use and the associated CO2 output.

Renewable Energy - Renewable energy comes from renewable resources like wind energy, solar energy, or biomass.

Renewable Electricity Support Scheme (RESS) - This Government scheme provides financial support to renewable electricity projects in Ireland to help us achieve our renewable electricity goals. It also aims to increase community participation in, and ownership of, renewable electricity projects. It aims to make sure electricity consumers get value for money and to improve security of our electricity supply.

Units

Throughout this report we present energy use and energy production, in megawatt hours per annum (MWh/yr). This unit of measurement is used regardless of the fuel used. Energy costs are presented in euro spent on energy per annum

2 Context of this report

The vision of Achill Community Futures/Todhchaí Phobail Acla SEC (ACF SEC) is

> *'To turn the Parish of Achill into a sustainable and thriving community, respecting the natural beauty that surrounds us. We would like the Parish of Achill, Achill Island and Curran, to be a sustainable Community. Reducing our energy consumption and producing our own energy. Producing our own energy from wind and we would also like to look at Biomass, addressing the waste issue in our community. The produced energy can be turned into hydrogen or fed into the grid whatever is most viable. We would also like to develop a blueprint for existing buildings in the West of Ireland, how to best insulate and become energy independent. We would like this plan to be a tool for our journey, but we would also like it to be applicable to other communities in the West of Ireland and beyond.'*

To this end, ACF SEC commissioned Energy Co-operatives Ireland Ltd to conduct an Energy Master Plan for the Achill Island and Curran Peninsula areas. The study was supported by the Sustainable Energy Authority of Ireland (SEAI) as part of their Sustainable Energy Communities Programme.

2.1 Targets from the Government's Climate Action Plan 2019

The Climate Action Plan (CAP) is a roadmap developed by the Irish government for taking decisive action to reduce Ireland's emissions by 51% of the 2018 levels by 2030, and net zero by 2050. The statutory national climate objective and 2030 targets are aligned with Ireland's obligations under the Paris Agreement and with the European Union's objective to reduce GHG emissions by at least 55% by 2030, compared to 1990 levels and to achieve climate neutrality in the European Union by 2050.

The CAP targets reduction in energy use in Electricity, Transport, Buildings, Industry and Agriculture. This EMP examines these sectors as they relate to Achill and Corraun.

3 Achill Island and Corraun: Geography and Demographics

3.1 Geography:

Achill Island is located, see Figure 1, off the west coast of County Mayo and is the largest of the Irish Islands at 148km2. Achill is connected to the Corraun Peninsula (and thus to the mainland) via the Michael Davitt bridge land bridge between Gob na Chóire (*Achill Sound*). and Poll Raithní (Pollranny). The topography of the island is mountainous: the highest point is Cruachán (Croaghaun) at 688m, while Sliabh Mór (Sleevemore) is 671m, and there are four other peaks greater than 450m across the Island and Corraun. The island has large areas of blanket bogs and significant peatlands. It is very lightly forested. Achill and Corraun are considered to be of outstanding natural beauty and very significant as a haven for biodiversity. The impacts of this on energy opportunities is discussed in detail below. As a result of the Atlantic tides and inlets that characterise the coasts, there are strong tidal currents in the East of the island.

Figure 1: Achill Island and Corraun

3.2 Demography

According to the CSO 2016 census[1], Achill Island has a population of 2,459, while Corraun has 673 inhabitants. While both have a sráidbhaile[2] settlement pattern typical of Western Ireland, there are distinct villages in: Keel (i)[3], Dooagh (ii), Dooega (iii), Doogort (iv), Achill Sound (v), and Bunnacurry (vi). Some of these villages do not have shops or primary schools, however. The commercial hub of the island is at Achill Sound (v) where there is a Church, Supermarket and Secondary School (Coláiste Pobail Acla). The commercial and community building sector is dealt with in detail in Section 4.4 below.

As Figure 2 shows, the age profile of the SEC area is older than that of Mayo and Ireland in general.

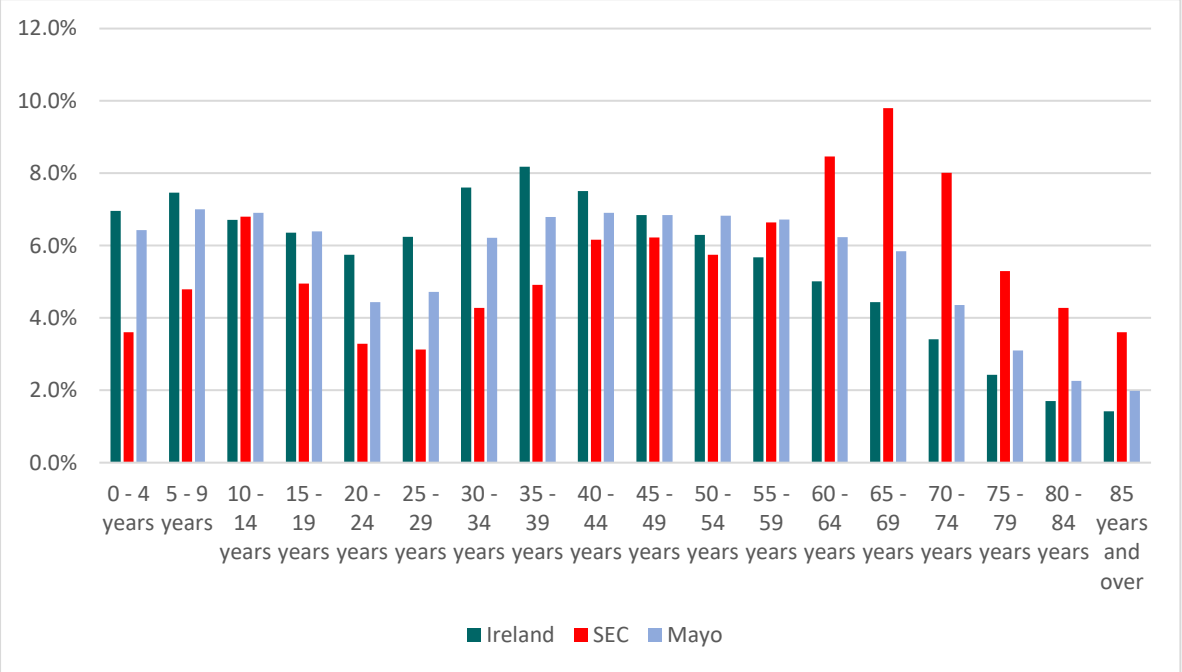


Figure 2: Age Profile SEC-Mayo-Ireland 2016

[1] All CSO data for this report is provided by https://www.cso.ie/en/census/census2016reports/census2016smallareapopulationstatistics/

[2] Sráidbhaile settlement pattern is defined as a distribution of dwellings along a roadside with no clearly defined urban centre where farmsteads and homes are co-located. The term comes from Gaeilge and is directly translatable as 'road-village'

[3] Numbers relate to those in Figure 1

4 Baseline Energy Balance

We assess the energy balance of the SEC area with regard to the following contexts: Residential, Transport, Services, and Industry. We will assess each in turn.

4.1 Residential Energy Use

In the home, we look at energy used in heating, in appliance use, and in transport. We do this using a variety of methodologies. We process the national data on Building Energy Rating Certificates (BERs) as published by the CSO: these are provided on a national and a county basis here[4]. We then compare these to the SEAIs average breakdown BERs for each CSO Small Area which were made available to the reports' authors. This presents us with a picture of the state of the energy efficiency of the housing stock in the SEC.

We further surveyed specific houses in Achill through a public recruitment process.

We use this as the basis for assessing the opportunities for energy and financial savings in the Register of Opportunities in Section below.

Transport was assessed using the CSO data from 2016.

4.1.1 Housing Stock

4.1.1.1 Year of Construction

As shown in Figure 3 the housing stock in the SEC area is older compared to the Republic and County Mayo. This will likely contribute to a need for energy efficiency upgrades to be carried out on many homes within the SEC area.

[4] https://www.cso.ie/en/statistics/climateandenergy/domesticbuildingenergyratings/ accessed 02/02/2022

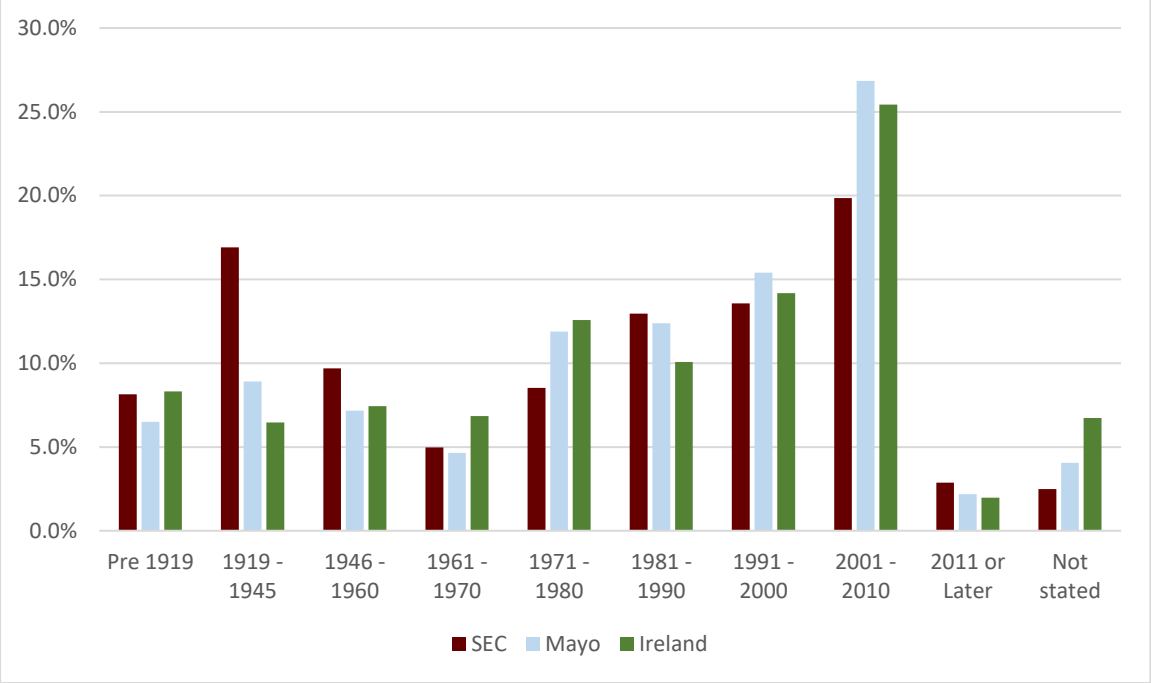


Figure 3: SEC/Ireland/Mayo Housing Stock Age

4.1.1.2 Type of Ownership:

As we can see in Figure 4 the level of home ownership in the SEC is greater than that both in Mayo and in Ireland. 84% of the homes in Achill are owner occupier, either with or without a mortgage. This compares to 75% of the homes in Mayo, and 67.6% in Ireland as a whole. This has significance for the Register of Opportunities to be discussed later. Owner occupiers are likely more inclined to finance retrofits as the benefits of lower fuel bills and greater comfort accrue to the occupiers of the homes. In the case of private rented accommodation, there is possibly less of an inclination on the part of the building owners to spend considerable sums on upgrades.

It should be noted that there are 70 homes in the SEC area that are rented from the Local Authority – Mayo County Council. This represents a significant opportunity to leverage the expertise and finances of the County Council in these building upgrades.

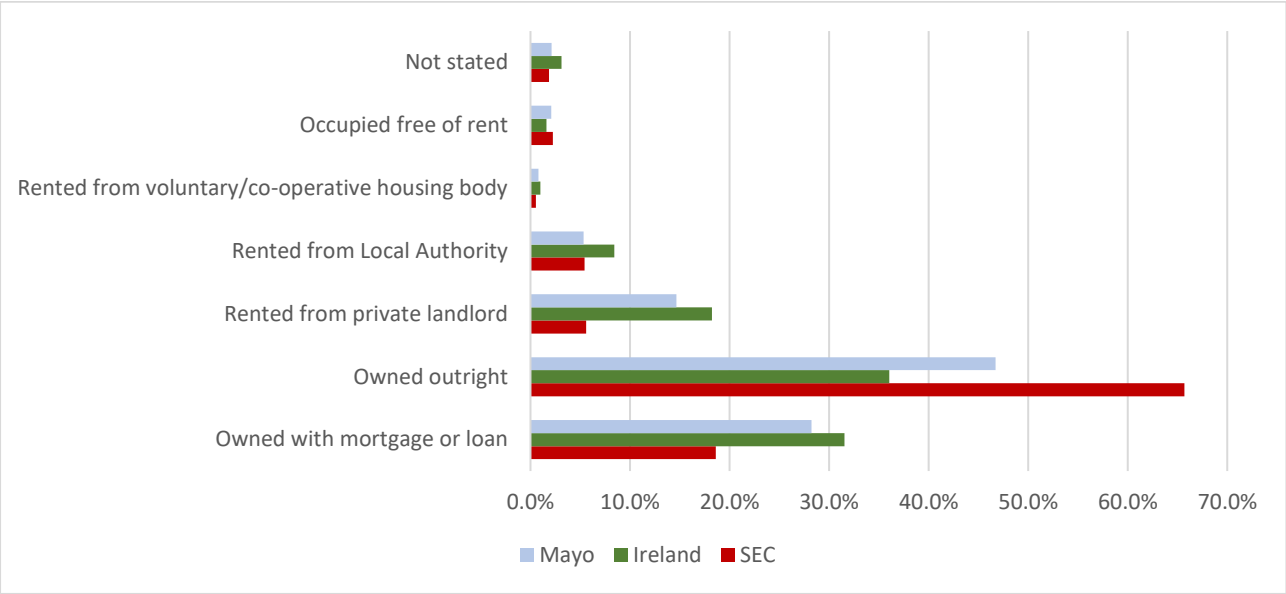


Figure 4: Homes by Ownership Type: SEC/Ireland/Mayo

4.1.2 Residential Heating

The SEAI has a building energy use certification system which classes buildings according to the amount of energy that they use for heating and hot water[5]. This BER system rates building energy ratings from A1 (most efficient) to G (least efficient). Efficiency is expressed in terms of the energy use (kilowatt hours – kWh) of the building in question per meter sq per year (kWh/m^2/yr).

[5] https://www.seai.ie/publications/Your-Guide-to-Building-Energy-Rating.pdf

Table 1: Building Energy Ratings SEC-Mayo-Ireland

	SEC Area	Mayo	Ireland	kWh/m²/yr
A1-A3 rated[6]	0.0%	4.0%	8.0%	≤ 75
B1 rated	3.5%	1.0%	1.0%	>75
B2 rated	1.0%	2.0%	3.0%	>100
B3 rated	3.0%	5.0%	8.0%	>125
C1 rated	3.5%	9.0%	12.0%	>150
C2 rated	6.5%	12.0%	13.0%	>175
C3 rated	4.5%	15.0%	12.0%	>200
D1 rated	11.4%	13.0%	12.0%	>225
D2 rated	10.0%	12.0%	10.0%	>260
E1 rated	17.4%	6.0%	6.0%	>300
E2 rated	14.4%	5.0%	5.0%	>340
F rated	15.4%	6.0%	5.0%	>380
G rated	9.5%	10.0%	7.0%	>450

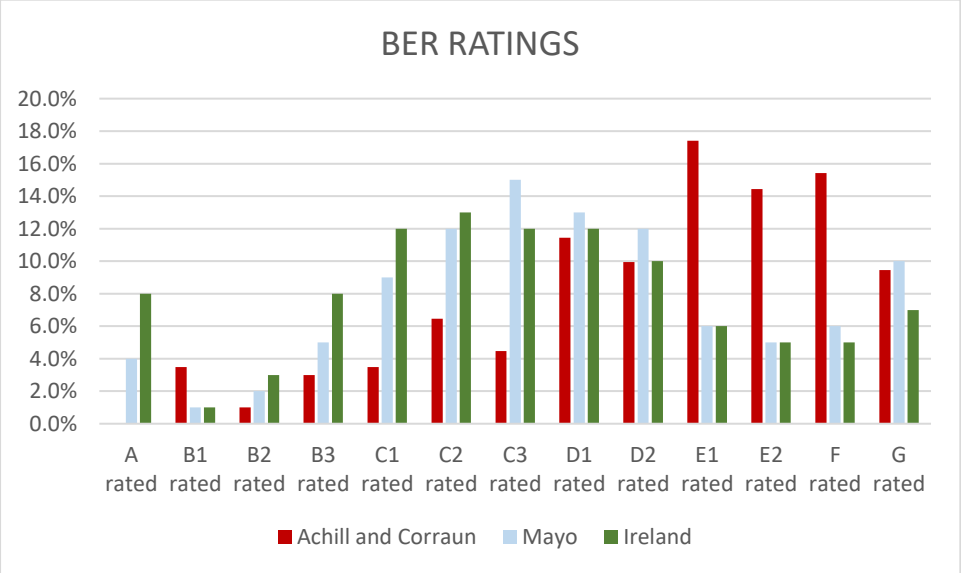


Figure 5: Distribution of BERs SEC Area, Mayo and Ireland

Figure 5 shows that the BER ratings for the SEC area are below both the County and the National Average (i.e., they are less energy efficient). There will be a significant need to address the energy efficiency of the homes in Achill as part of the strategy to reduce fossil fuel use and carbon emissions in the SEC area.

Using the BER data in conjunction with the CSO data we can now extrapolate the entire energy use for domestic heating.

[6] We have aggregated the A rated homes category as there are none in the SEC area.

Table 2: Domestic Energy Heating Energy Use SEC area

Building Energy Rating	Percentage of Homes Surveyed	Estimated Number of Homes Surveyed	Estimate of all homes area m2	Energy Consumption kWh/m/y Average	Estimated Total kWh/yr
A1-A3	0.0%	0	0	0	0
B1	3.5%	68	8,701	87.5	761,366
B2	1.0%	20	2,486	112.5	279,686
B3	3.0%	59	7,458	137.5	1,025,514
C1	3.5%	68	8,701	162.5	1,413,966
C2	6.5%	127	16,160	187.5	3,029,927
C3	4.5%	88	11,187	212.5	2,377,328
D1	11.4%	222	28,341	242.5	6,872,808
D2	10.0%	195	24,861	280	696,106,4
E1	17.4%	339	43,258	320	13,842,573
E2	14.4%	281	35,800	360	12,887,913
F	15.4%	300	38,286	415	15,888,628
G	9.5%	185	23,618	500	11,808,948
SUBTOTAL		1953			77,149,720
Lighting at 8%					6,171,977.6
EXCL Lighting					**70,977,742**

4.1.2.1 Achill and Corraun Heating Fuels by Type

The most common fuel source for domestic heating in the SEC area is home heating oil. This is unsurprising as the area is not connected to the gas grid.

Table 3: Homes by Central Heating Type[7]

	Oil	Natural Gas	Electricity	Coal & Anthracite	Peat & Turf	LPG	Wood & wood pellets	None,Not Stated, Other
Percentage Fuel Use SEC area	51.6%	1.2%*	4.1%	6.7%	30.1%	0.9%	0.8%	5.7%
Percentage Fuel Use Mayo	60.0%	2.0%	5.3%	7.5%	19.1%	0.8%	1.7%	3.5%
Percentage Fuel Use Ireland	40.4%	33.5%	8.6%	5.1%	5.3%	0.6%	2.0%	4.5%

*This includes small number of returns (14 in total who incorrectly stated 'Natural Gas' on the census form). There is no natural gas network in the SEC area.

[7] From CSO 2016

Not surprisingly, given the free availability of sod peat, peat and turf make an above-average contribution to home heating in the SEC area compared to both Co Mayo and the national average. There is also a greater use of home heating oil than the national average, but less use of oil than in the county as a whole – this again probably due to the greater use of turf and peat.

4.1.2.2 Home heating and emissions

Taking the gross estimate of energy use for home heating from Table 1 above and using the data from Table 3, we can estimate the amount of CO2 emissions created by home heating in the SEC area.

Table 4: Estimated Tonnes CO2 emitted SEC area for Home Heating

	Oil	Electricity	Coal & Anthracite	Peat & Turf	LPG	Wood (incl. wood pellets)	Not stated/ Other**	Total
Estimated Energy Use for Households MWh/y	36,617,687	2,918,402	4,790,585	21,364,906	660,770	550,642	4,074,750	70,977,742
CO2 per kg/kWh	0.257	0.296**	0.341	0.365	0.229	0.100[8]	0.265	
Total Estimated kg CO2	9,410,746	863,263	1,633,589	7,801,395	151,316	55,064	1,078,417	9,410,746
Fuel as % of total	51.6%	4.1%	6.7%	30.1%	0.9%	0.8%	7.0%	
Emissions as % of total	**45.3%**	**4.2%**	7.9%	37.6%	0.7%	0.3%	4.1%	

CO2 emissions per kWh from SEAI (excluding wood)[9]

*This includes the percentage of census that stated 'Natural Gas'. The carbon intensity for this category is based on the average carbon intensity of all fuels.

**The carbon intensity of electricity (CO2/kWh) has overall decreased steadily since 2008. 2021 was an outlier year however as climate conditions for the year led to decreases in rain and wind with consequent decreases in hydro and wind generated electricity. As more PV comes onstream, this will help balance climate variability. Equally, increases in wind capacity and reductions in carbon intense fuels used to generate electricity (such as coal) will likely lead to a reduction in the carbon intensity of electricity in the medium and long term.

We can also see in Table 4 that although oil and electricity account for 51% and 4.1% of fuel used, they account for 44% and 4.1% of emissions. This shows that they are less carbon

[8] We do not assume that wood is 100% carbon neutral. There are fossil fuel inputs into growing, harvesting and transporting timber. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69554/pb13773-ghg-conversion-factors-2012.pdf

[9] https://www.seai.ie/data-and-insights/seai-statistics/conversion-factors/

intensive than other fuels being used. Turf and peat account for 36.8% of emissions, but only 30.1% of fuel used. This demonstrates that turf is a more carbon intensive fuel than oil and its use should be reduced in order to reduce emissions. We further demonstrate in Section X below that typical method of turf burning (for example in fireplaces) has a negative impact on house insulation and home heating efficiency.

To illustrate what the level of carbon emissions represents, a single 10-year-old coniferous tree will sequester 14kg CO2 in a year[10]. This means it would require *1,611,849 trees* to offset the carbon produced by home heating alone in the SEC area.

There is therefore a considerable level of carbon emissions from the heating sector in the SEC area. To increase the sustainability of the heating sector there needs to be a reduction in the amount of energy used (energy efficiency) and a change in fuel type.

4.1.2.3 Non-heating domestic energy use SEC area

We did not survey all individual householders' levels of energy use for non-heating purposes in the SEC area. The SEAI does however provide national average data which we include here to generate a global energy use figure. The audits on the sample homes are in keeping with the SEAIs estimates.

Table 5: Total Home Energy Use SEC area

Item	Heating	Hot Water	Lighting	Appliances	Cooking	Total Domestic
kWh/a	58,826,662	18,323,059	6,171,978	8,679,344	2,893,115	94,894,156
Percentage of energy use	61%	19%	8%	9%	3%	100%
kg CO2	13,765,194	4,287,519	1,825,671	2,567,350	855,783	23,301,518

[10] https://www.treecouncil.ie/carbon-footprint

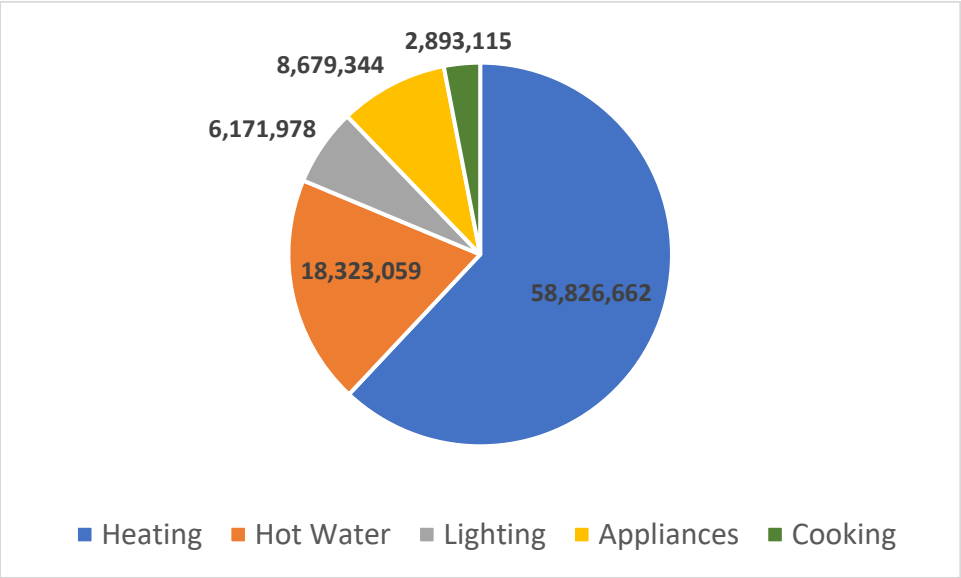


Figure 6: Total Home Energy Use SEC area

We can see that the majority (80%) of the energy use in a home is for heating and hot water. It also produces the bulk of the emissions. We will therefore focus on this area in the register of opportunities in Section 6.1 below.

4.1.2.4 Cost of energy in 2022

We estimate the cost of energy for the SEC area in Table 6. For a list of energy costs at the time of writing see Appendix Section 9.1

Table 6: Household energy spending

	Oil	Electricity	Coal & Anthracite	Peat*	LPG	Wood & wood pellets	Not stated/ Other	Total Item
Estimated Energy Use for Households kWh/y	36,617,687	2,918,402	4,790,585	21,364,906	660,77	550,642	4,074,750	70,977,742
Cost per kWh	€0.139	€0.281	€0.081	€0.082	€0.217	€0.118	€0.153	
Total Cost	€5,093,384	€820,655	€387,079	€878,098	€143,057	€64,866	€623,163	€8,010,300
Electricity Lighting								€1,735,560
Electricity Appliances and Cooking								€1,627,088
Total								**€11,372,948**

* We estimated that two thirds of the turf consumed for heating is hand cut. Thus, it has no outside cost. The remaining one third is priced as briquettes, locally bought, and collected from point of sale.

Table 6 shows that there is both an economic and environmental opportunity to be gained from energy efficiency measures both for the individual householders, and the SEC community in general.

4.1.3 Domestic Vehicle Use

The CSO data 2016 summarised in Figure 7 shows that broadly speaking the SEC is aligned with the national and county average. A slightly smaller number of households own two cars than the county and national average. In absolute numbers, there were an estimated 1,652 private cars in the SEC area.

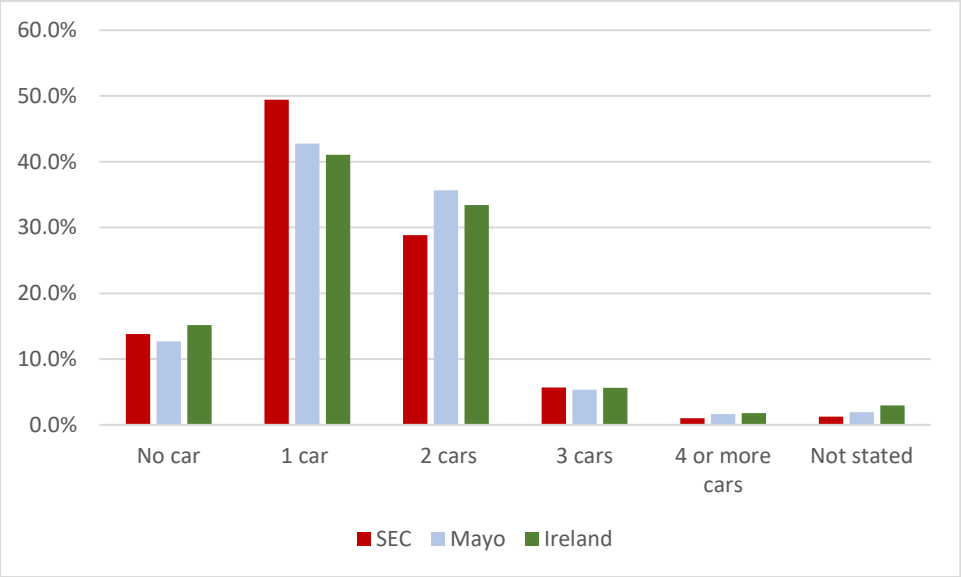


Figure 7: Levels of Car Ownership SEC/Mayo/Ireland

It is presumed that the majority of these will be diesel cars: diesel is the most popular choice of fuel type for private cars in Ireland[11]. This is even more so in the West of Ireland where typical distances travelled are greater than those in the East which suit diesel's superior fuel efficiencies. When calculating the global figures for fuel consumption by private cars in the region, we will thus assume diesel use: we feel that this will offer the most accurate approximation.

According to the CSO[12], the average kms travelled by domestic vehicles is estimated as 16,352 kms per vehicle (although rural use is likely to be higher than this average). Market sources estimate that the global average fuel consumption by light duty vehicles (in this

[11] https://publicpolicy.ie/papers/diesel-powered-vehicles-continue-to-dominate-the-irish-market/
[12] ttps://www.cso.ie/en/releasesandpublications/ep/p-tranom/transportomnibus2019/roadtrafficvolumes/

case passenger cars) is 7.2 litres per 100km[13]. Thus, shows the estimated fuel use (assumed as diesel) by domestic vehicles in the SEC area.

Table 7: Private Cars Fuel Consumption Cost and Carbon Emissions

	Total Private Cars	Estimated kms per year	litres diesel	GWh	Cost €	Carbon: kgCO2
SEC Area	1,652	27,013,504	2,026,013	20.26	€2,816,158	5,429,714

Combustion of one litre of diesel is estimated to produce 2.68kg CO2[14] and where one litre of diesel is estimated to cost €1.39[15]

4.2 Gross Domestic Energy Demand SEC area

We have aggregated the various energy demands in the domestic sector in Table 8 which shows that there is more than 1,15GWh[16] energy consumed in the domestic sector in the SEC area. This produces approximately 27,474 tonnes of CO2. If the SEC community were to attempt to offset this amount of carbon by forestation, it would require 1,962,428 mature conifer trees.

Table 8: Total Domestic Energy Demand SEC Sector

	Heating	Hot Water	Lighting	Appliances	Cooking	Transport	Total Domestic
MWh/a	58,827	18,323	6,172	8,679	2,893	20,260	115,154
percentage	51.09%	15.91%	5.36%	7.54%	2.51%	17.59%	
t/CO2	12,806	3,989	1,826	2,567	856	5,430	27,474

The breakdown of energy uses is significant. As Figure 8 shows, the energy used in the domestic sector for space heating is by far and away the most significant at 51% of the total energy demand. Transport (in this case car driving) is in second place with 18%. Water heating requires 16% of energy use.

The amount of energy needed to heat space and water in the SEC areas homes is therefore 67% of the total energy demand. Little by way of energy reduction will be effective that

[13] https://www.iea.org/reports/fuel-economy-in-major-car-markets
[14] https://www.tcd.ie/news_events/articles/are-diesel-cars-really-more-polluting-than-petrol-cars/

[15] The price of diesel in the calculations is not taken to be that at time of writing: diesel price fluctuates over time. The rational for this value of €1.39 is discussed in Appendix 1 Section 3.
[16] 1GWh=1,000MWh=1,000,000kWh

does not address this need. Therefore, the register of opportunities will focus on this area while also addressing private transport.

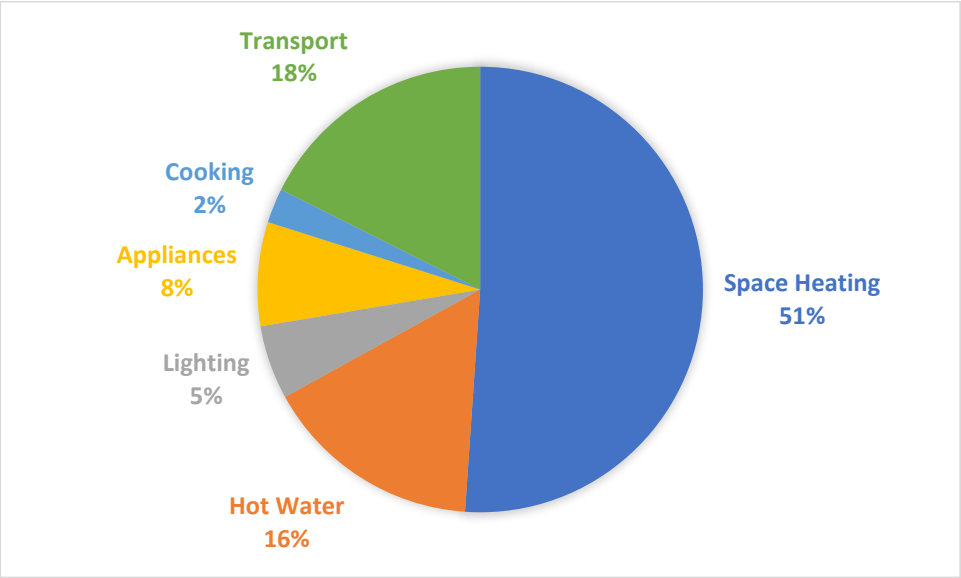


Figure 8: Domestic Energy Use by Function

4.3 Sampled Residential Energy Use

4.3.1 Purpose of the sample

An Energy Master Plan is required to conduct sample energy assessments on businesses and homes in the SEC area. This has a number of purposes. It helps generate awareness within the community that the EMP is occurring. It provides a corroborative sample which helps inform the generalised data collected at the macro level (see Section 5.). It also provides an opportunity to demonstrate the range, costs and feasibility of measures that can improve energy efficiency in homes and buildings. To this end this EMP surveyed 10 homes and two community/public buildings in the SEC area.

4.3.2 Methodology

The full methodology of the sample and reporting is outlined in Appendix 1 below. In summary ten homes and 2 community buildings were selected through an advertising recruitment campaign and for auditing. SEAI recognised building energy assessors were used: in the case of the homes, these were 2eva ltd.

4.3.2.1 Building Energy Ratings

A Building Energy Rating (BER) Certificate helps you to understand the energy efficiency of a home. It is a good indicator of how much you will spend and how much carbon you will produce to heat the home to a comfortable level. The rating scale looks like the energy rating labels for household appliances. It rates the home on a scale from A-G.

A-rated homes are the most energy-efficient and comfortable. They tend to have the lowest energy bills. G-rated homes are the least energy-efficient. They typically require a lot of energy to heat the home and have the highest energy bills.

A BER is calculated based on the amount of energy the home requires for space and hot water heating, ventilation, and lighting.

4.3.3 Summary of home audits

Current BER	Current E Use kWh/m2/y	Total Energy Use	Emissions	Costs	Total End Energy Use Savings	Cost Savings	Emissions Savings
G	530	60,924	14,151	€10,503	55700.85	€9,776	12,741
G	476	34,771	8,936	€4,837	30081.91	€4,184	6,992
C1	153	38,617	9,925	€5,372		€3,617	9,419
C3	219	29,030	4,038	€7,461	23434.6221	€3,260	6,875
C3	204	40,782	5,673	€10,481	31785.69	€4,421	9,875
G	507	127,901	32,871	€17,791	96114.87	€13,370	28,651

4.3.4 Example of Home Energy Upgrade Advisory Report

Home Energy Upgrade Advisory Report

BER No. 101057487

Your Home's Energy Performance Potential

Potential with upgrades

Loss of heat from your home

NOW	POTENTIAL
Very Poor	Good

An upgrade package to stop losing money on your energy bill

Your BER assessor has recommended a package of upgrades that will raise your home's energy performance.

Energy Performance of your home	NOW	POTENTIAL
Roofs	Poor	Good
Walls	Very Poor	Good
Windows	Poor	Very Good
Floor	Very Good	No Upgrade
Space heating	Very Poor	Very Good
Water heating	Very Poor	Very Good
Renewables	Very Poor	Very Good

GRANTS AVAILABLE?

subject to availability, terms and conditions

For further information visit www.seai.ie/grants or call 01 8082100

Compare your home's performance | Before and after upgrades

Your home's current **energy performance**	NOW G	Your home's potential **energy performance**	POTENTIAL A3

Benefits of upgrading your home

INCREASE your home's value

INCREASE your home's comfort

REDUCE your energy bills

SAVE

CO_2 TONNES 17.2

= the same as planting **1227 tree(s) each year**

To find out more visit **www.seai.ie**

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Home Energy Upgrade Advisory Report

Your journey from BER G **to** BER A3

Your BER assessor has recommended a package of energy upgrades that maximise the energy performance of your home. The recommendations are for guidance only and can be completed at your own discretion.
The recommendations are just one potential pathway to an improved BER and it is open to you to discuss alternative packages with your professional advisors.

Package of energy upgrades to save money, make your home more comfortable and protect the environment

Recommended Package of Energy Upgrades	Cost (Approx.)[5]	Grant Available [6]	Comfort
Roof insulation; pitched (at ceiling) 0.16 W/m^{2}K, pitched (on slope) 0.20 W/m^{2}K, room in roof (on side) 0.20 W/m^{2}K, flat 0.22 W/m^{2}K average U-Value [1, 2]	€ € € €	✔	★★★★☆
Wall insulation 0.27 W/m^{2}K average U-Value [1, 2, 3]	€ € € €	✔	★★★★★
Windows triple glazing 0.8 W/m^{2}K average U-Value [1, 2]	€ € € €	✔	★★★★☆
Air-to-Water or Ground-to-Water or Water-to-Water heat pump with fully integrated heating controls [4]	€ € € €	✔	★★★★☆
Solar Photovoltaic (PV) electricity System 2kWp.	€ € € €	✔	N/A
Whole-house extract ventilation	€ € € €	N/A	★★★☆☆

1. *Major Renovation is defined in the Building Regulations Part L Technical Guidance Document and means the renovation of a dwelling where more than 25 % of the surface of the dwelling envelope undergoes renovation. Where a dwelling undergoes a major renovation, the energy performance of the whole dwelling should be improved to the cost optimal level by achieving a B2 or by implementing the energy performance improvements as set out in the Building Regulations Part L Technical Guidance Document.*
2. *This energy upgrade will reduce your home's heat loss and is an important first step to improving the energy efficiency of your home.*
3. *For some wall types it may not be appropriate to install the amount of insulation recommended here, particularly in the case of solid walls such as stone and brick built prior to 1950. Please seek the advice of a professional.*
4. *A dwelling should have low heat loss to ensure the heat pump runs efficiently. An ideal heat loss indicator (HLI) is less than 2.0 W/(K·m^2). An upper HLI limit applies to SEAI grants. Where the HLI is between 2 and 2.3 W/(K·m^2), additional heat pump grant eligibility criteria apply.*
5. *Investment Cost Legend:*
   - *€ < 5,000*
   - *€€ 5,000 - < 15,000*
   - *€€€ 15,000 - < 30,000*
   - *€€€€ 30,000 - 50,000*
6. *A grant for this type of upgrade is available at the time of publication of this report. Grant availability is subject to eligibility criteria and should be checked to see if the works to your own home meet the eligibility criteria. Eligibility criteria are subject to change.*

GRANTS AVAILABLE?

✔

subject to availability, terms and conditions

For further information visit www.seai.ie/grants or call 01 8082100

Home Energy Upgrade Advisory Report

Start your journey to upgrade your home

If you're not ready for the maximum SEAI grant, consider picking one or two energy upgrades, selecting areas with the poorest performance.

GRANT APPLICATION

To start your application today visit
www.seai.ie/grants

Simple energy upgrades - quick, cheap, easy

Draughtproofing
Draughtproofing, fitted to windows, doors and loft or attic hatches, improves airtightness and thermal comfort, reduces heat loss, improves noise insulation and reduces dust ingress.

Cylinder thermostat
Space heating and hot water systems should have separate and independent time and temperature controls. The cylinder thermostat controls the hot water cylinder temperature.

Lighting
Correct lighting levels are essential for visual comfort, safety and for aesthetic effects. Fit efficient electric lighting and maximise the use of daylight.

Potential impact of the **recommended energy upgrades**

Energy upgrade	Now		Potential	
	Value	Energy Efficiency	Value	Energy Efficiency
Home Heat Loss Indicator (HLI)[1]	5.245 W/(K·m^2)	Very Poor	1.828 W/(K·m^2)	Good
Roof insulation (average U-Value[2])	1.316 W/m^{2}K	Poor	0.168 W/m^{2}K	Good
Wall insulation (average U-Value[2])	2.054 W/m^{2}K	Very Poor	0.270 W/m^{2}K	Good
Windows triple glazing (average U-Value[2])	3.100 W/m^{2}K	Poor	0.800 W/m^{2}K	Very Good
Air-to-Water or Ground-to-Water or Water-to-Water heat pump with fully integrated heating controls (Primary Energy Efficiency[3])	54%	Very Poor	168%	Very Good
Solar Photovoltaic (PV) electricity System 2kWp.	N/A	N/A	1,718 kWh/y	N/A
Whole-house extract ventilation	N/A	N/A	0.30 W/l/s	Very Good
Lighting	11.20 Lm/W	Very Poor	66.90 Lm/W	Very Good
Renewable Energy Ratio (RER)	0%	Very Poor	48%	Very Good

1. *The Home Heat Loss Indicator (HLI) is a summary of the overall performance of the home. It includes all the fabric and ventilation upgrades listed in the table*
2. *A U-value is a measure of the heat loss through the building fabric. The higher the U-value, the greater the heat loss*
3. *Primary energy efficiency is the efficiency divided by the primary energy conversion factor*
4. *Indicators are based on the average elemental U-values in the BER and where partial upgrades occur, average U-values may remain above the optimum U-value.*

Home Energy Upgrade Advisory Report

Your Home's Details

Home Address

REMOVED

House Details

Year of construction: 1920

Dwelling type: Detached house

Total floor area: 92.82 m^2

About the Home Energy Upgrade Advisory Report

This document is a first step to assist you in engaging with a professional to determine suitable energy upgrades for your home.

It was prepared by a BER assessor using general assumptions and information from your BER assessment. The improvement in the BER has been estimated based on the assumption of certain values for energy upgrades and is provided as an indicator only.

This document is for information only and does not constitute professional or legal advice. The homeowner waives and releases any and all claims against SEAI and/or the BER assessor arising from the contents of this advisory report.

Use this document to:

Better understand how your home performs and how to make it more comfortable and affordable to run.

Provide information on home energy upgrades to discuss further with a professional or contractor.

Identify small simple steps you can take to improve the comfort of your home, if grant supported works aren't suitable for you right now.

Start the grant application process with SEAI, who may have substantial support available.

Recommended Energy Upgrades

The recommendations contained within your advisory report have been generated based on the data inputs contained within your BER assessment. SEAI recommends you seek professional advice and use suitably qualified installers to assess the suitability of the recommendations for your own particular home.

SEAI and the BER assessor accept no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or fitness-for-purpose of the information contained herein and do not accept any liability whatsoever arising from the contents hereof.

Further information on upgrading your home is available in **S.R. 54:2014 Code of Practice for the Energy Efficient Retrofit of Dwellings**, available from www.nsai.ie.

Building Regulations

The aim of the building regulations is to provide for the safety and welfare of people in and about buildings. Where applicable, works should be completed in accordance with the relevant Building Regulations. The primary responsibility for compliance with the requirements of the Building Regulations rests with the designers, builders and owners of buildings. Technical Guidance Documents for the Building Regulations and other supporting documents are available from the Department of Housing, Local Government and Heritage website at www.housing.gov.ie.

Costs

The investment cost indicators are guidelines only. Actual costs will vary depending on house size, specification and market conditions. Cost indicators may be calculated based on a partial upgrade if some sections of the building element are already adequately insulated.

Please consider the environment before printing this document.

BER Privacy Notice: www.seai.ie/publications/BER-Privacy-Notice.pdf

Ventilation

Care should always be taken to ensure sufficient levels of ventilation in each room. Signs of inadequate ventilation are persistent condensation and mould growth and should be addressed in the first instance. It is important not to permanently close or cover over air vents as they are required to provide ventilation. Further guidance on ventilation provision when carrying out retrofit works is available in Section 10 Ventilation of S.R. 54:2014 Code of Practice for the Energy Efficient Retrofit of Dwellings.

Radon

Radon gas at high concentration causes lung cancer and is estimated to be responsible for 300 cases per annum in Ireland. Retrofitting provides an opportunity to test for, and remediate for, radon, where indicated. A radon test is low cost and non-disruptive. The only way to know if a home has a radon issue is to test. Further information on radon, including testing, is available on the EPA website www.epa.ie.

Heat producing Appliances

It is important to ensure that there is an adequate air supply to all heat producing appliances e.g. any fixed appliance (including a cooker or an open fire) which is designed to burn solid fuel, oil, bio-fuel or gas and to provide permanent ventilation for all non-room sealed combustion appliances. Useful health and safety information can be found on the Carbon Monoxide safety website: www.carbonmonoxide.ie. Further guidance on air supply for heat producing appliances is available in Section 7 and Section 10 Ventilation of S.R. 54:2014 Code of Practice for the Energy Efficient Retrofit of Dwellings.

Evidence for BER

Documentary evidence of energy upgrades is required for your BER and should be retained and provided to your BER assessor to ensure the energy performance uplift is captured in your BER. Your BER Assessor can advise you on documentary evidence requirements. Further information is available on https://www.seai.ie/home-energy/building-energy-rating-ber/.

4.4 Non-Residential Sector

4.4.1 Industry and Commerce: Building Energy Use

There are an estimated 127 commercial/non-domestic properties in the SEC area. These include the categories of buildings in Table 9 below. We exclude B&B accommodation and farms. This is due to the fact that these buildings also serve as homes, and thus the energy use of these buildings will fall into census data (we address the energy use of farms in general in Section 4.4.2 below).

The categories of buildings are comprised of those identified in the quarterly CSO Non-Domestic Building Energy Ratings release[17]. These adequately categories cover the broad range of non-domestic buildings in the SEC.

We compared Geocode NACE data on all registered business premises on Achill with a localised census of businesses.

Table 1Table 9 shows that the total estimated energy use for non-domestic premises in the SEC area is 48,720 MWh.

Table 9: Energy Use by number and type of premises

Type of Premises	Number of Premises	Estimated Energy Use kWh/yr
Community/ day centre	15	1,967,375
Hospitals and primary health care	1	233,800
Hotel	5	22,708,240
Industrial process building	6	9,501,330
Nursing residential homes	3	5,165,275
Office	26	1,230,294
Restaurant/public house	22	1,463,668
Retail	29	1,438,350
Schools and colleges	13	2,906,631
Sports facilities	4	1,840,488
Workshops/ maintenance depot	3	265,310
TOTAL	**127**	**48,720,761**

[17] https://www.cso.ie/en/releasesandpublications/er/ndber/non-domesticbuildingenergyratingsq12022/ Q1/2022 – accessed 10.05.22

4.4.2 Agriculture

In common with much of the west of Ireland, agriculture is generally non-intensive and medium scale livestock breeding and rearing. The cattle farmed are typically store cattle which are raised until two years or so and then sold on to farmers further east for 'finishing'. There is very little in the way of dairy farming in the area as the terrain is very mountainous. There is however extensive sheep grazing on both upland and lowland parts of both Achill and Corraun.

This is essence means that the carbon intensity of the island's agriculture is much less than that in other parts of Ireland.

According to the CSO Agricultural Census[18] there are 422 registered farms in the SEC area. The livestock breakdown for each electoral area is shown in Table 10[19]

Table 10: Livestock and Emissions by EA in SEC area

Area	Holdings	Cattle	Inferred total emissions cattle (kg CO2)	Sheep	Inferred total emissions sheep (kg CO2)	Total Emissions kg CO2
Slievemore	141	144	788,256	11,442	1,710,705	2,498,961
Dooega	62	0	0	4,204	628,544	628,544
Acla	98	197	1,078,378	4,319	645,738	1,724,116
Corraun	121	160	875,840	10,134	1,515,145	2,390,985
SEC AREA	**422**	**501**	**2,742,474**	**30,099**	**4,500,132**	**7,242,606**

Livestock Energy Inputs differ for Sheep and Cattle. The best estimations for energy inputs are shown in Table 11:

Table 11: Energy Inputs Agriculture

Species	Energy Inputs per Animal kWh	Number of Animals	Total MWh
Cattle	2,239	250	560
Sheep	93	6,626	616
Total			**1,176**

[18] https://www.cso.ie/en/releasesandpublications/ep/p-coa/censusofagriculture2020detailedresults/agriculturalstatisticsbyelectoraldivision/
[19] Methodology for these calculations are given in Appendix II Section 8.4

4.4.3 Fishing

The Fisheries sector in Achill is small by West of Ireland standards. There are 41 vessels registered to owners on Achill[20], but the vast majority of these are less than 8m in length. There is one large vessel registered on Achill, *The Kristel Patrick*. The value of the fishing industry in Achill is relatively small, for example in 2020 it was estimated the 36 tonnes of fish landed in Achill was estimated to be worth €210,000[21]. We do not view the energy use by fishing vessels to be a considerable contributor to the energy demand of the SEC area as a whole.

There is fish harvesting, in particular shellfish, and some processing, smoking, and curing, in the SEC area. As the companies involved (Achill Oysters and Keem Bay Fish) have sustainability strategies in place, we do not consider these as part of the Register of Opportunities.

4.4.4 Non-Domestic Transport

The public transport provision in the SEC area is by bus. There are two service providers: Bus Éireann and LocalLink.

The LocalLink service operates five routes: three on-island and two between the island and Castlebar. Although significant to transport for the community, these routes are not frequently operated: The three on-island routes are operated on a return journey basis once each Friday. The Achill to Castlebar route operates a return loop once each on Tuesdays and Saturdays. The distances travelled by these buses (approximately 51km one-way Achill Castlebar) are well within the range of EV Buses and therefore offer a significant opportunity for decarbonisation which we discuss below.

Bus Éireann operates a route from Dooagh to Louisburg via Westport (a rail and bus hub for onward travel to Dublin) at an approximate distance of 81kms one way. The service schedule is summarised in Appendix II Section below. This represents a considerable energy use which is open to decarbonisation. It must be noted that the distances travelled, and the consumption of fuel involved makes the use of BEV buses less practical from the point of view of recharging times. This represents an opportunity for the deployment of a FCEV (Fuel Cell Electric Vehicle) bus.

[20] https://www.gov.ie/en/organisation-information/5907a-sea-fisheries-administration/?referrer=http://www.agriculture.gov.ie/seafood/seafisheriesadministration/
[21] https://www.cso.ie/en/releasesandpublications/er/fl/fishlandings2020/

Table 12: Bus Éireann Service Energy Use

Day	Outward	Inward	Total Distance km/y	Diesel Use L/y	MWh/y
Mon	6	6	50,544	12,636	126
Tue	6	6	50,544	12,636	126
Wed	6	6	50,544	12,636	126
Thu	6	6	50,544	12,636	126
Fri	6	6	50,544	12,636	126
Sat	6	6	50,544	12,636	126
Sun	3	3	25,272	6,318	63
Total	**39**	**39**	**328,536**	**82,134**	**821.34**

5 Aggregated Energy Use SEC area

As we see in Table 13 the SEC area uses 165,872MWh of energy across all sectors per annum. This energy demand generates as much as 48,695 tonnes of carbon dioxide. This is a substantial carbon footprint and equates to 15.5 tonnes of CO2 for each of the 3,132 inhabitants of the SEC area. This excludes dietary and air travel emissions. This is above the national average of 12.6 tCO2/pp/a, and significantly higher than the EU average of 8.2 tCO2/pp/a. To mitigate offset this level of carbon emissions, the SEC area would need to plantation of 3,478,214 conifers (more if native woodland species)

Table 13: All Sectors Energy Use, Carbon Emissions, cost

Energy	MWh/a	t CO2/a	Cost
Residential Heat	77,150	16,795	€10,029,464
Residential Electricity	17,744	5,249	€4,258,665
Residential Transport	20,260	5,430	€2,816,140
Commercial	48,721	13,420	€6,333,699
Public Transport	821	222	€114,166
Agriculture	1,176	7,580 [22]	€152,882
TOTAL	**165,872**	**48,695**	**€23,705,016**

Figure 9 shows that residential heat is the largest energy use sector in the SEC. This indicates that this will be a focus in the register of opportunities to both reduce energy consumption and emissions. The commercial sector is the second largest sector for carbon emissions. As we saw in Section 4.4.1 most of this is in the hospitality sector. This also suggests actions in improving building energy efficiency will be critical to reducing the energy footprint of the SEC overall. Agriculture contributes less of the carbon emissions of the SEC area than it does

[22] Includes emissions from energy inputs (electricity and diesel) as well as emissions from ruminants

on a national basis. This is owing to the less intensive agriculture practiced here. There can be actions taken to increase efficiency and reduce emissions in farming, and these are addressed in the register of opportunities. As we discussed above in Section 4.4.3, the fisheries sector in the SEC area is not a considerable contributor to emissions.

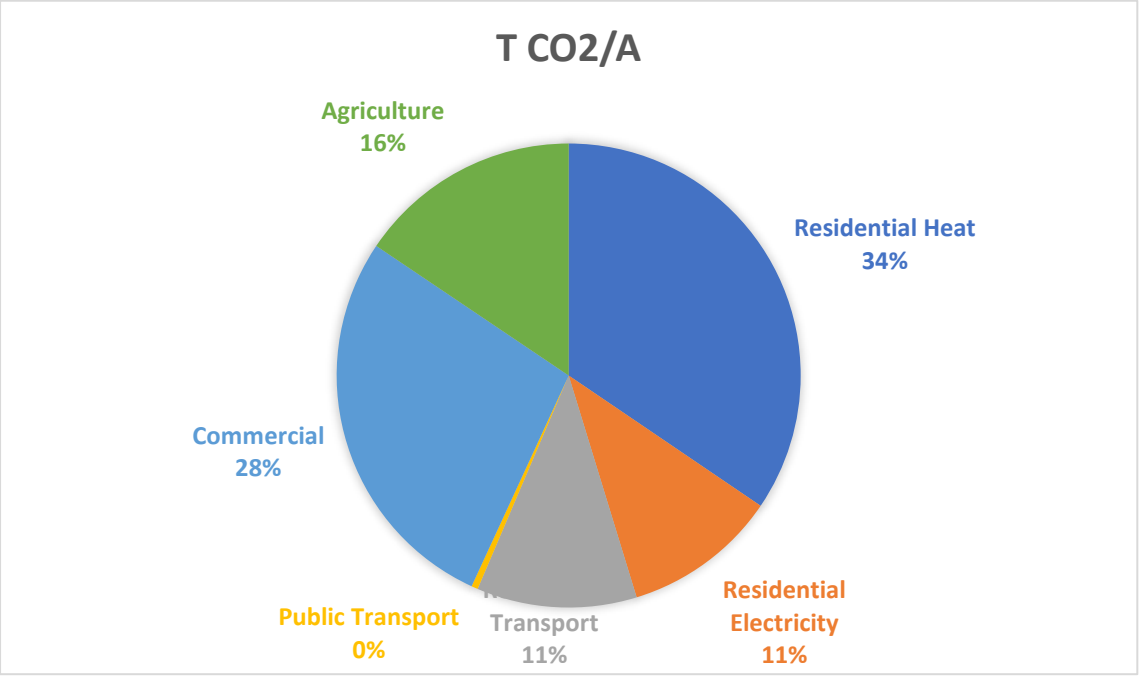


Figure 9: CO2 emissions by sector

We do see that the manufacturing sector does have a high energy use and significant emissions. It constitutes almost 20% of the commercial energy use. This will be addressed in the Register of Opportunities.

6 Register of Opportunities

6.1 Residential

We look at a range of opportunities for homeowners and community residents to have a positive impact on increasing the sustainability of their lives: through improving the energy efficiency of their homes, their transport choices as well as simple behavioural changes that can reduce their imported fossil fuel dependency.

6.1.1 Individual Level Behaviour Changes

While we are all aware of the scale of the environmental challenge that faces our communities, it is critical that we as citizens are also aware of our own role in addressing that challenge. Research shows that what we do at home can help guide us to taking bigger, more noticeable community actions:

> *Individual behavior creates the foundation for action in social, economic, and environmental sustainability, and potentially guides our ability to work with one another to make life-affirming decisions. In short, it is a matter of aligning our day-to-day behaviors with our well-stated values that will result in greater sustainable community action.*

Pappas & Pappas (2014)[23]

We present a list in Appendix, Section 10.1, of some actions that the homeowner can take to reduce the level of energy use in their own home with simple behaviour changes. We summarise the highlights here:

Cost reduction measures:

- Change your energy provider
- Consume less electricity and bottled gas, and more oil to heat your home and water

Home Improvement Measures:

- Track down and eliminate draughts: check windows, external doors, vents, interstitial floor spaces, fireplaces, and stoves.
- Check insulation levels in attic, basement, walls (including the meter box), and interstitial floor spaces.
- Check your boiler and stove

Energy Reduction Measures:

- Switch to more efficient appliances and lower temperature settings
- Don't use standby on devices and turn off lights when possible.

[23] https://files.eric.ed.gov/fulltext/EJ1060565.pdf

6.1.2 Home Energy Upgrade Case Studies

Achieving energy efficiencies through building upgrades and behaviour change are the key to reducing the cost of energy and the carbon emissions in this sector.

Our survey of homes and domestic energy upgrade reports show that considerable efficiencies can be achieved.

6.1.3 Method

We discussed the methodology of the sampling, building energy assessments and upgrades in Section 4.3 above.

The assessors provided home owners with a set of recommended upgrades which could be carried out to improve the energy efficiency and comfort of their homes. As sample of such a report is shown below as a live excel report to which other homes can be added (Figure 10)

Dwelling Type	Single Storey, detached House, built 1949							
	(m2)							
Total Building Area	74.43							

Element	BER Rating	Energy Value	CO2 Emissions	Energy Savings	Total Annual Space & Water Heating	Heat Loss Indicator	Space & Water Heating Costs Per Year	Total Carbon Emissions
		(kWh/m2/yr)	(kg CO2/m2/yr)		(kWh/yr)	(W/K m2)	EURO (€)	(kg CO2/yr)
Dwelling Current Condition	G	476	120	-	34,771	5.82	4,837	8,936

Element	BER Rating	Energy Value (kWh/m2/yr)	CO2 Emissions (kg CO2/m2/yr)	Energy Savings kWh	Total Annual Heating (kWh/yr)	Heat Loss Indicator (HLI w/k/m	Heating Costs Per Year EURO (€)	Total Carbon Emissions (kg CO2/yr)
Pump Cavities and Wrap All Walls with 100mm EWI	F	413	106	4,031	30,740	4.91	€4,276	7900
Upgrade Attic Insulation to >300mm & 140mm Flat Roof Insulation	D1	238	61	13,025	17,714	2.75	€2,464	4553
Change two doors to 1.5 W/m2K U-value	D1	231	59	521	17,193	2.46	€2,392	4419
Change windows and Slider ot >0.9 W/m2K U-value	C3	212	54	1,414	15,779	2.20	€2,195	4055
Intsall Controlled ventilation system - DCV, CMEV or full MVHR	C2	195	50	1,265	14,514	1.90	€2,019	3730
Install Air to Water Heat Pump & Hot Water (zoned full time & temperature control)	B3	131	34	4,764	9,750	1.90	€1,356	2506
Install 2.5kWp PV Panels	A3	63	16	5,061	4,689	1.90	€652	1205
Overall Savings	**A3**		**94**	**30,082**			**€4,184**	**6992**

Post Works HLI	1.9 W/K m2	A3	CO2 Emission Reduction	6,992	
BER Uplift	413 kWh/m2/yr	BER	Equal to 499	Trees	

Figure 10: Sample Page from Excel Energy Report

6.1.4 Recommendations

There is a recognised need to decarbonise home heating by replacing oil and gas-powered boilers with heat pumps. These can be Ground Source Heat Pumps (GSHP) or, as they are more commonly in Ireland, Air Source Heat Pumps (ASHP[24]). These heat pumps are electrically powered and as the country's electricity supply becomes increasingly decarbonised so does the energy source for a heat pump. Heat pumps are more efficient than oil or gas boilers as the convert input to output in a 1:3 ratio: i.e., for every one kWh of energy put into the system the equivalent of 3kWh of heat is produced for the home. As a solution to the country's heating needs, heat pumps, in particular ASHPs are a recommended route[25]. They are particularly recommended in areas where there is no gas grid; the economics of the ASHP are very favourable in comparison to an oil alternative.

A very real technical requirement for the successful installation and operation of an ASHP is that the building achieves a low Heat Loss Indicator (HLI). An HLI of less than 2.0 is required – this HLI would mean that the home does not lose heat through drafts or uninsulated building elements such as walls, roofs, windows, or doors. Therefore, it is a requirement that for nearly every building where an ASHP is to be installed, a full upgrade on the fabric of the building must also be carried out.

Our recommendations for building upgrades operate on the fabric first approach and this is reflected in the steps outlined in the sample above.

6.1.5 Community Level Effects of Retrofitting Programs

Our sample indicates that on average, homes in Achill would greatly benefit economically and environmentally by implementing a bottom-up approach to domestic upgrades. This would target the worst BER rated homes (G and F rated) with uplifts moving up to D2-C3 homes.

Table 14: Average Upgrade to B2 or Above Based on Sample

Current BER	Current E Use kWh/m2/y	Total Average Energy Use kWh/y	Emissions kgCO2/y	Current Energy Costs €/y	Potential Cost Savings €/y	Potential Emissions Savings kgCO2/y
G-F	504	74,532	18,653	€11,044	€9,110	16,128
E1-E2	340	43,325	11,828	€6,022	€5,136	10,088
D2-C3	211	34,906	4,855	€8,971	€3,841	8,375

[24] ASHPs are cheaper to install and require much less space than GSHPs
[25] Initial concerns about the effects of atmospheric salts on the lifespan of ASHPs in the West of Ireland particularly have been addressed by both the manufacturers and the installers. A typical ASHP in the West of Ireland will operate sustainably for up to 10-15 years

Table 14 shows the average values for current and future energy use and environmental impact of energy upgrades on home heating in the sampled homes (these are in line with samples ECI have conducted elsewhere in the West of Ireland[26]) for homes rated C3 and below. These homes should be a target for retrofitting programmes in the SEC area.

Table 15:Estimated Total Impact of Energy Upgrades to B2 or Above on SEC Area

Building Energy Rating	Estimated Number of Homes Surveyed	Estimated Total kWh/yr	Current Energy Costs €/y	Potential Cost Savings €/y	Potential Emissions Savings kgCO2/y
D1-D2	417	13,833,872	€1,922,908.21	€807,621.45	11,343,775
E1-E2	620	26,730,486	€3,715,537.55	€3,158,206.92	21,918,999
F-G	485	27,697,576	€3,849,963.06	€3,156,970	22,712,012
ALL	1,522	68,261,934	€9,488,408.83	€7,122,798	55,974,786

Table 15 shows what the global effects on the SEC would be from a programme of retrofitting targeting those homes with the greatest need. We feel that the financial benefit from the program is evident from the table. Homeowners who have had similar home energy upgrades will attest to the benefits in comfort that accrue from the works. The environmental benefits can be illustrated in a variety of ways. The carbon emission savings of the work would be equivalent of the carbon sequestration of 3,998,199 mature trees.

6.1.6 Supports

6.1.6.1 Community Energy Grants

The Community Energy Grants scheme is a Sustainable Authority of Ireland (SEAI) scheme to achieve national retrofitting of community, SME and homes. It provides capital grants for energy efficiency projects for communities throughout the country. The criteria for participating in BEC projects are that they must be community orientated with a focus on cross-sectoral approach. This means that they involve homeowners, SMEs and Community Buildings, and have inputs from private citizens, companies, community groups and if possible municipal and corporate bodies.

[26] https://www.energyco-ops.ie/resources/energy-audits-10-examples-from-galway-county/

According to the SEAI, successful Community Energy Grant projects demonstrate some or all of the following characteristics.

- Community benefits
- Multiple elements, not a single focus
- Mix of sustainable solutions
- Innovation and project ambition
- Justified energy savings
- An ability to deliver the project

The types of measures that are targeted through the grant program are:

- Building Fabric Upgrades
- Technology and System upgrades
- Integration of renewable energy sources
- Domestic Combined Fabric Upgrade
- Single Building Demonstration projects will be considered under the Communities Grant

The EMP has therefore collected enough information from community buildings and homeowners to potentially bring together an application with a Community Energy Grant application specialist. This project would be strengthened by the participation of local SMEs as well as input from the local authority who own and rent approximately 70 homes in the SEC area.

Table 17: BEC 2021 Funding Levels

Residential		
Home type	Category	Funding Level
Private	Fuel Poor	Up to 80%
Private	Non-Fuel Poor	Up to 35%
Housing Association		Up to 50%
Local Authority		Up to 35%
Private Rented Homes		Up to 35%

Non-Residential	
Type	Funding Level*
Not for profit/community	30% Up to 50%
Private and public sector	Up to 30%
Public Sector	> 30% ≤ 50%

* Subject to state aid rules and SEAI approval

We discuss the SEAI homeowner grants for individual homeowner applicants in Appendix Section 10.2

A list of Community Energy Grant Project co-coordinators is available here: https://www.seai.ie/grants/community-grants/project-coordinator/

6.2 Private Transport

There are a number of opportunities available to the residents in the SEC areas to increase the sustainability of their transport use.

6.2.1 Context

The National Climate Action Plan[27] states that there will be a 42-50% reduction in emissions from the transport sector by 2030 if Ireland is to meet its Climate targets.

To achieve these reductions, a transition towards more sustainable forms of transport is required, including safe and accessible walking and cycle routes to appropriate public transport links serving the needs of the residents, and the implementation of appropriate infrastructure to support the electrification of private car and fleet vehicles.

The Climate Action Plan aims to encourage active travel (walking and cycling), with public transport being encouraged over the private car. The SEC area has real opportunities in these areas which are discussed below.

6.2.2 More Efficient Car Use:

As with individual actions to achieve home energy efficiency, there are actions the citizen can take to reduce the impact of their private car use. These are described in Table 16: More Efficient Car UseTable 16.

Table 16: More Efficient Car Use

Reduce the most inefficient journeys where possible, i.e., 3 kms or under
Save up to 1 tonne of CO2 and €1,000 per year by sharing journeys.
Plan ahead by combining trips (shopping, school runs etc.)
For cars that do not automatically turn off when idling, switch off if you will be stopped for more than 9 seconds
An energy-aware driving style can save 13% on fuel and emissions
Inflate tyres correctly to manufacturer's recommendation
Avoid harsh acceleration or heavy breaking also slowing down in good time saves fuel, smooth style around bends
Cars are parked 95% of the time, do you need a second car?
The sun-roof fully open consumes up to 4% more fuel, half-open - 3%
A roof rack can increase fuel consumption by 40% and a cycle rack with two bicycles by 10% - 15%

[27] https://www.gov.ie/en/publication/6223e-climate-action-plan-2021/

Use air-conditioning sparingly – it increases fuel costs
Rear screen heater's increases fuel consumption by 3% - 5%, so switch it off once the window is demisted
Front windows left half open consume more fuel at higher speeds so use the air vents instead
Do not carry unnecessary weights in the boot, clean it out!
The average new car emits 120g of carbon dioxide for every kilometre. SUV's can emit a staggering 330g carbon dioxide per km.

6.2.3 Active Travel in the SEC Area

The SEC benefits from the Achill – Mulranny – Westport Greenway. While initially a tourism infrastructure project, it has benefits for the local community. Notwithstanding the challenges of the local climate, as well as distances between settlements and service hubs (shops, healthcare centres and entertainment venues), there are opportunities for some greater use of active transport for example school cycle buses.

6.2.4 Public Transport

The SEC is well serviced by public transportation. As we have seen the Bus Éireann service is regular, and the fleet has been updated and comfortable.

The impact of a wider use of the service (including its possible extension) would be significant and feasible.

It is estimated that each km travelled by bus produces 82g of CO2 in contrast to the average emissions from a diesel car of 178g CO2/km. This represents a greater than 50% reduction of CO2 per journey.

CSO 2016 data show that 568 people reported driving themselves to work by car in the SEC area (64% of all commuters). Further, 67% of commuter journeys were reported as taking less than half an hour. Therefore, it can be assumed that there is a significant number of commuters in the SEC that could feasibly travel by bus.

We suggest that a motivational behaviour change campaign to demonstrate the feasibility for commuters to switch to bus commuting be undertaken with a target of 60 passengers in 2024. This would reduce emissions by approximately 83,341kg CO2 per year[28]

6.2.5 Private Cars

Replacement of Diesel cars by Battery Electric Vehicles (BEV) is a national policy aim in the medium term. There is still however some slowness of car owners to buy in to this policy, particularly in the West of Ireland. It is important to note however, that battery range has

[28] Calculations in Appendix II

increased rapidly in the past few years. As we have seen above, commuting data shows that the vast majority of car journeys driven by residents in the SEC area are well within the range of Battery Electric Vehicles.

There are still state sponsored incentives for drivers wishing to switch to BEVs (see Appendix III, Section 10.3) through the SEAI. The condition that these be new and of eligible make and model means that they start in price at €24,995, for the Fiat 500e, inclusive of the SEAI grant and VRT relief.

There are 2.197m private cars registered in Ireland[29]. 104,932 new cars were registered in 2021[30] This indicates an approximate renewal of 5% of private cars per annum in Ireland. To rely on replacement such as this to attain the target of The Climate Action Plan of one million EVs on Irish roads by 2030 requires that 100% of all new cars bought between 2022 and 2030 are BEVs.

The replacement over time of 5% per annum of the diesel vehicle stock with BEVs in the SEC area would have a significantly positive effect on emissions and reduced fossil fuel imports. As Figure 11 shows, if over the period from 2023 to 2030 the natural 'churn' rate of cars was switched to BEVs only, it would result in a **34% reduction** in CO2 emissions from private cars.

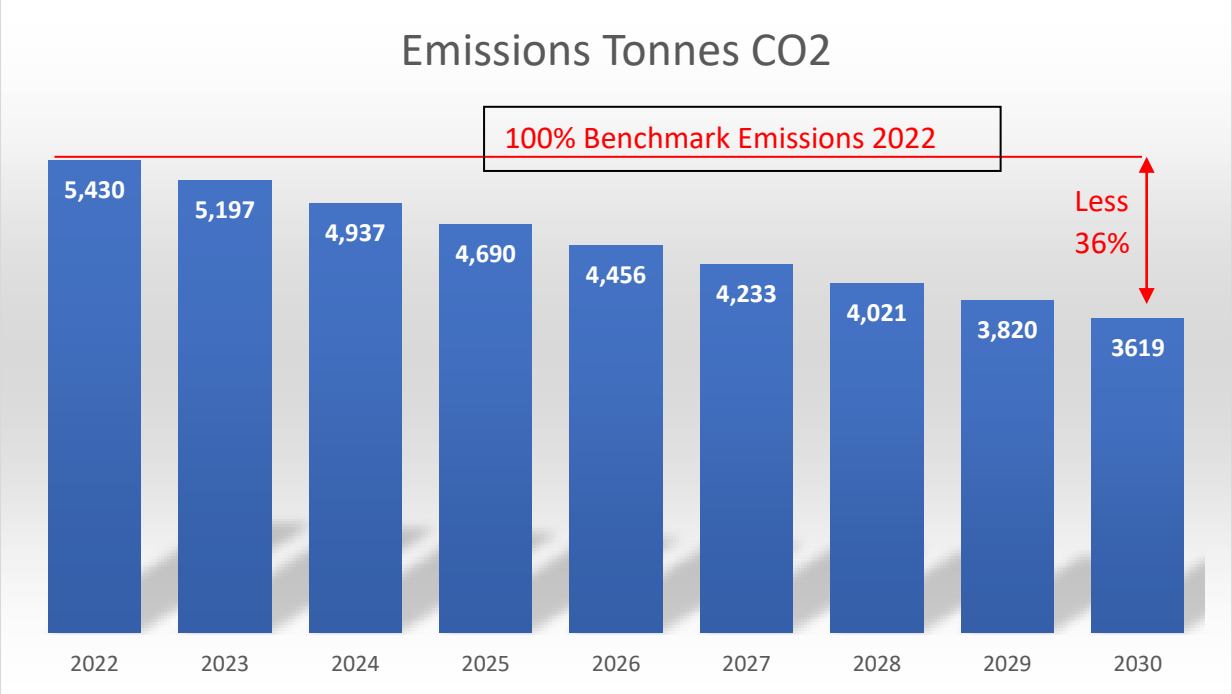


Figure 11: Reduction of tCO2 from Car Emissions with 5% annual replacement of private diesel fleet

[29] https://www.statista.com/statistics/452305/ireland-number-of-registered-passenger-cars/#:~:text=In%202019%2C%20the%20number%20of,approximately%202.2%20million%20registered%20units.

[30] https://www.simi.ie/en/news/2021-new-car-registrations-up-19

It is therefore recommended that there is an information-based campaign in the SEC to convince driver who are replacing cars to choose BEVs. This would focus on the fact that very seldom do drivers exceed the vehicle range new of BEVs. It should also highlight the fact that there is a national rail connection on the Bus Éireann service[31]. There are also combined benefits for those who co-install PV with BEV charging.

[31] The workshop to disseminate the EMP will demonstrate that there are a range of web tools that can track a person's actual car use in such a way as to demonstrate the viability of BEVs.

6.3 Services

As we have seen there are a great many of short as well as long term interventions that can be made to reduce energy consumption and thus reliance on fossil fuels in the domestic sector. Many of the SMEs in the SEC area have very similar needs as homes: there are 44 B&Bs which to all intents and purposes are homes – their BER data is included with the residential energy demand.

There are SEAI supported programs to assist SMEs identify where they can reduce their energy demands and fossil fuel use. These are outlined in Appendix III, Section 10.5.3.

There are a great many SMEs in the area that qualify for the SEAIs supports – that is they are independent businesses or the are public bodies with a floor area less than 500m2 and spending less than €10,000 per year on energy.

From our buildings survey we have identified that there are approximately 25 SME offices, 18 restaurants and bars, and 27 retail businesses that qualify under the SEAI Energy audit scheme. It is recommended that these building owners/managers apply for assistance in a batched process whereby energy efficiencies and sustainability measures can be identified and carried out.

A typical energy review can achieve energy savings of 20-30%[32]

Therefore, if the 70 qualifying SMEs were recruited to participate in the SEAI's relevant Energy reduction program we estimate that it would save 1,033 MWh energy saving local businesses in the SEC **€537,201 per year and avoiding 305,791 kg of CO2 emissions**[33]

Type of Business	Estimated Energy Use MWh 2023	Reduction @ 20% (MWh)	Post 2028 Energy Use (MWh)	Cost Today	Savings 2028
Office	1,230	308	923	€159,938	€39,984
Restaurant/ public house	1,464	366	1,098	€190,277	€47,569
Retail	1,438	360	1,079	€186,986	€46,746
ALL	**4,132**	**1,033**	**3,099**	**€537,201**	**€134,300**

[32] https://www.seai.ie/publications/SME-Guide-to-Energy-Efficiency.pdf
[33] Where we assume kerosene .296g CO2/kWh for heat is avoided. If electricity was avoided the CO2 emissions reduction would be higher.

6.4 Industry

While there are few manufacturing or processing industries on the island, there are two of significant energy use: namely Achill Sea Salt, and Achill Island Distillery. Both of these are amenable to energy reduction strategies.

The authors of this EMP understand that Achill Island Salt is investigating a viable fossil fuel replacement strategy and so we do not discuss this here.

Achill Island Distillery would benefit from a close examination of a published case study of energy efficiency at Terra Spirits County Cavan[34]. There a business of similar size identified a number of key areas to lower its carbon footprint and cost base, including an Air-to-Water Heat Pump technology to generate hot water, and Solar PV generation for the site's electrical demand. Their strategy:

- Switched from oil to Bio-LPG gas Delivered 132,000kg CO2 savings and 80% reduction of NOx[35]
- Doubled existing Solar PV farm to 340 KWh (approx. 1,100 panels) in 2020
- 15% of normal weekly electrical demand on heat pumps is saved due to Solar PV integration
- 25% reduction in Terra's energy demand overall

6.5 Agriculture

The authors of the EMP did not identify any key energy reduction opportunities in the agriculture sector.

The energy use in Sheep and Cattle Farming in the West of Ireland is generally quite low. Most cattle are not housed even in winter. Farms are generally contiguous and adjacent to the homestead and therefore transport to and of animals is not mechanised. Lighting and some heating for lambing sheds is required, and therefore some micro-PV generation would ordinarily be suggested. However, two key elements to note in relation to this are that PV output is low in Mayo generally and even that is at its weakest when ewes are bearing young, and lambs may require being housed. PV generation in an agricultural setting in the SEC area is likely not to be for auto-consumption (by the farm itself), instead it would more likely be classified as micro-generation for export to grid. We address this in the renewable energy generation section of the EMP below in Section 7.

Mayo County Council has produced a report on carbon reduction opportunities on farms Mayo farms which is available at this LINK

[34] https://www.climatetoolkit4business.gov.ie/case-study/energy-savings-at-terra-spirits/

[35] NOx represents nitrogen oxides that are most relevant for air pollution, namely nitric oxide (NO) and nitrogen dioxide (NO2). They contribute significantly to poor air quality and are very harmful to human health

6.6 Community Sector

In common with many communities in the West of Ireland, there is a strong community sector in the SEC area. In relation to energy efficiencies that are achievable, there are a number of viable projects that could be achieved in the short and medium term

Community Buildings Upgrades

As part of this EMP, 2 community buildings have been audited. These were Keel Hall, and Halla Acla. Significant opportunities for upgrades were identified which are described in Table 17: Energy Upgrade Reports Two Community Buildings

Table 17: Energy Upgrade Reports Two Community Buildings

	Keel Hall	Halla Acla
Current BER	D2	D1
Current Energy Use (kWh/m2/y)	384	254
Total Current Energy Use (kWh/y)	46,464	106,172
Current Emissions (kg CO2)	13,800	31,533
Estimated Costs	€6,040	€13,802
BER Post Proposed Works	B3	B2
Revised Energy Use (kWh/m2/y)	195	132
Total Revised Energy Use (kWh/y)	23,595	55,176
Emissions (kg CO2)	7,008	16,387
Emissions Reduction (kg CO2)	49%	48%
Energy Costs	€3,067	€7,173
Savings	€2,973	€6,629
AREA m2	121	418

These two buildings therefore present clear opportunities for the community to benefit by reducing the energy use of their community buildings. It should be noted that these two buildings could very well present key participants in a BEC scheme.

We can extrapolate the effect of conducting similar upgrade works on the other community buildings in the SEC area.

Table 18: List of Community Buildings is SEC Area

Name Community Building	Type of Building
Church of the Holy Trinity	Place of Worship
Church of Mary Immaculate	Place of Worship
Church Of The Sacred Heart	Place of Worship
Currane Community Centre	Community Hall
Halla Naomh Bhreandáin	Community Hall
House of Prayer	Place of Worship
Our Lady Of The Assumption	Place of Worship
Our Lady Queen of the Universe Church	Place of Worship
St Columba's Church	Place of Worship
St Thomas' Church	Place of Worship
St. Joseph's Church	Place of Worship
St. Patrick's Church	Place of Worship
The Queen of the Valley Church	Place of Worship
Achill Boxing Club	Sports' Centre
Achill Davitt GAA Club	Sports' Centre
Number of Community Buildings[36]	15

Potential benefits of energy upgrades to these buildings are shown in Table 19. The SEC area could have a significant impact on the levels of carbon emissions through energy efficiency works carried out on community buildings.

Table 19: Outcomes from Energy Upgrades All Community Buildings SEC Area

Estimated kWh/yr	Carbon kg CO2/yr	Costs €/yr	Potential Reduction 30% kWh/yr	Carbon Reductions CO2/yr	Cost Reduction €/yr
2,366,849	**702,954**	**€307,690**	**710,055**	**210,886**	**€40,000**

It is useful to note that 'Places of Worship' are the most numerous communities building category. Communities of faith can be key drivers of the establishment of positive sustainability norms as well as pro-active behaviour changes. Measuring the actual energy use of these places of Worship would however be key to establishing the economic validity of building upgrades. The unique character of the buildings would also affect how they

[36] This excludes the two buildings already audited

could be upgraded. High Temperature AWHPs[37] could prove useful in these scenarios. At a minimum, an BEC project that looked at such innovation would be worth pursuing.

We can see that setting an ambitious target of homes for retrofitting will be the greatest contributor to the reduction in emissions. This is required as Figure 9 above showed, the domestic home heating sector is the greatest source of carbon emissions.

[37] HT AWHPs are designed to replace oil heating systems without the need to upgrade buildings to a low HLI or replace existing radiator systems. This could make them viable for use where building fabric is protected through heritage regulations.

7 Renewable energy options

7.1.1 Wind energy

In common with much of the West of Ireland the SEC area is well resourced in wind energy (Figure 12). It is therefore reasonable to investigate whether there is an opportunity to generate renewable energy in the SEC which could offset the energy use and carbon emissions produced locally.

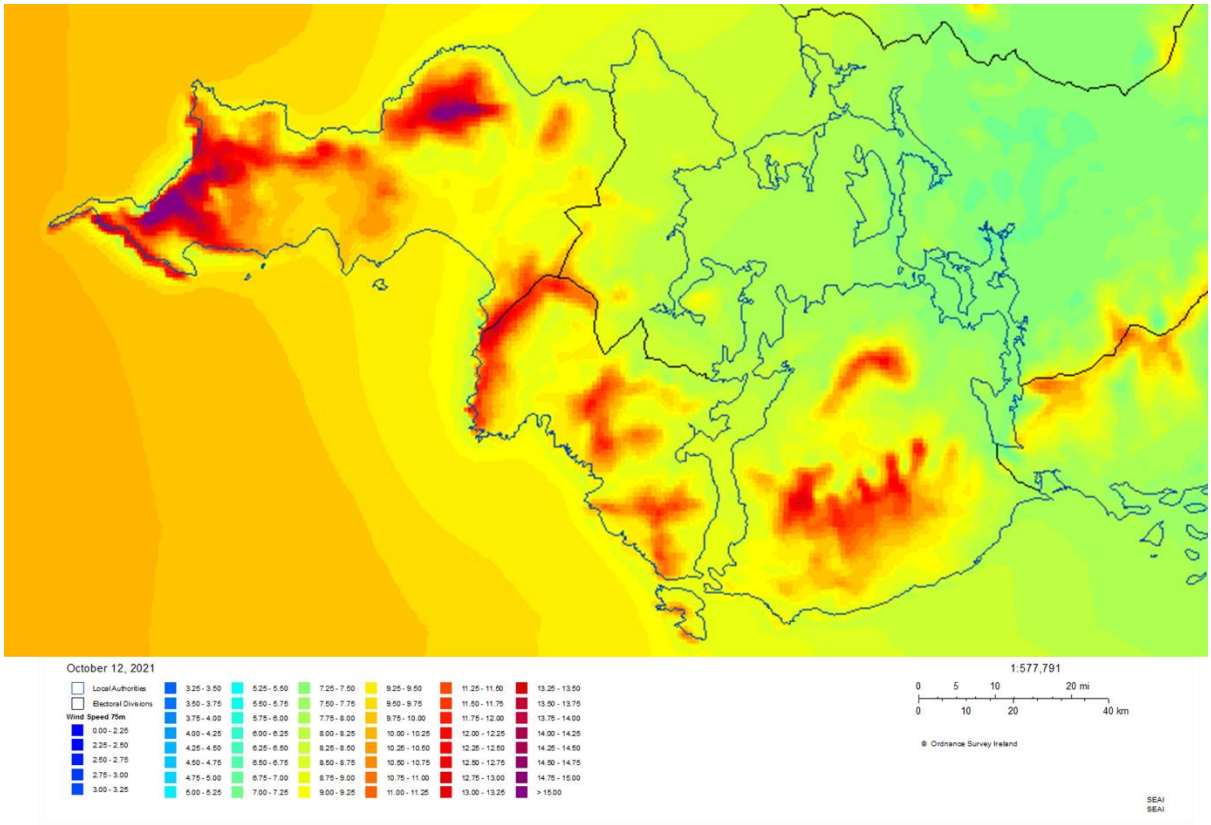


Figure 12: Wind Speeds SEC area

Source: SEAI Wind Mapping System[38]

The available wind energy onshore in Achill are determined by the modelled Wind Distribution pattern shown in below in Figure 13 . The estimated output of a 1.5MW turbine on Achill could produce approximately 4,200 MWh/yr – this would on the face of it represent a very productive wind resource, should planning policy and an economic price

[38] https://gis.seai.ie/wind/ accessed 10.05.22

for grid connection be achieved (see below). It would in effect offset 1,243,268 kgs of CO2[39] annually, 2.5% of the SEC areas total emissions.

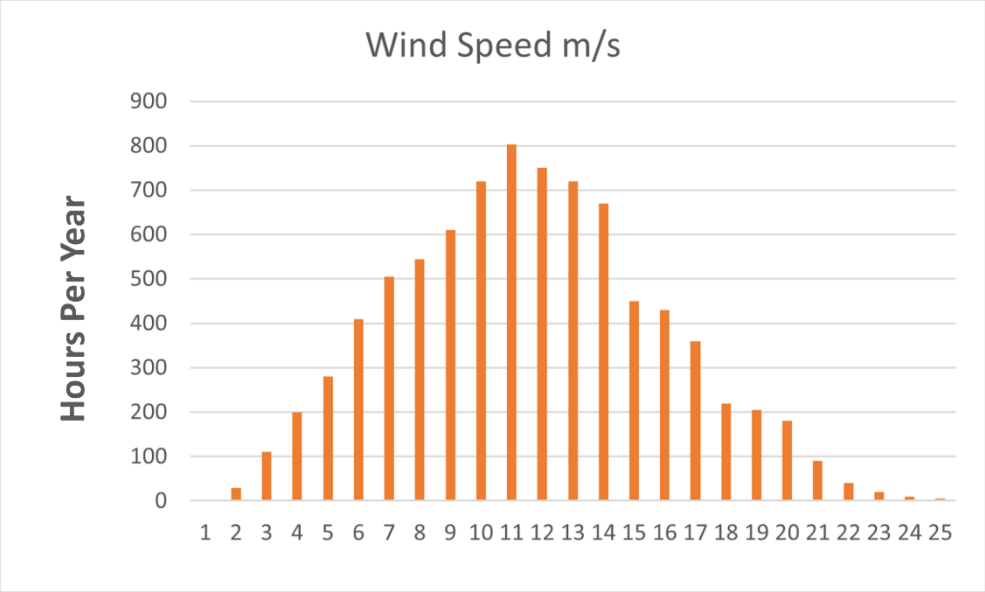


Figure 13: Wind Speed Frequency Distribution Achill

7.1.1.1 Planning Restrictions

In the Mayo County Development Plan 2021-2027, Achill Island is located in 'Policy Area 1, Montaine Coastal Zone': this highly restricts the acceptable forms of development in the area.

[39] The CO2 per kWh of electricity (carbon intensity) in Ireland in 2020 was .296 kg CO2/kWh (https://www.seai.ie/data-and-insights/seai-statistics/key-statistics/electricity/#:~:text=CO%E2%82%82%20emissions%20intensity%20of%20electricity&text=In%201990%2C%20the%20CO2,gCO2%2FkWh%20in%202020.).

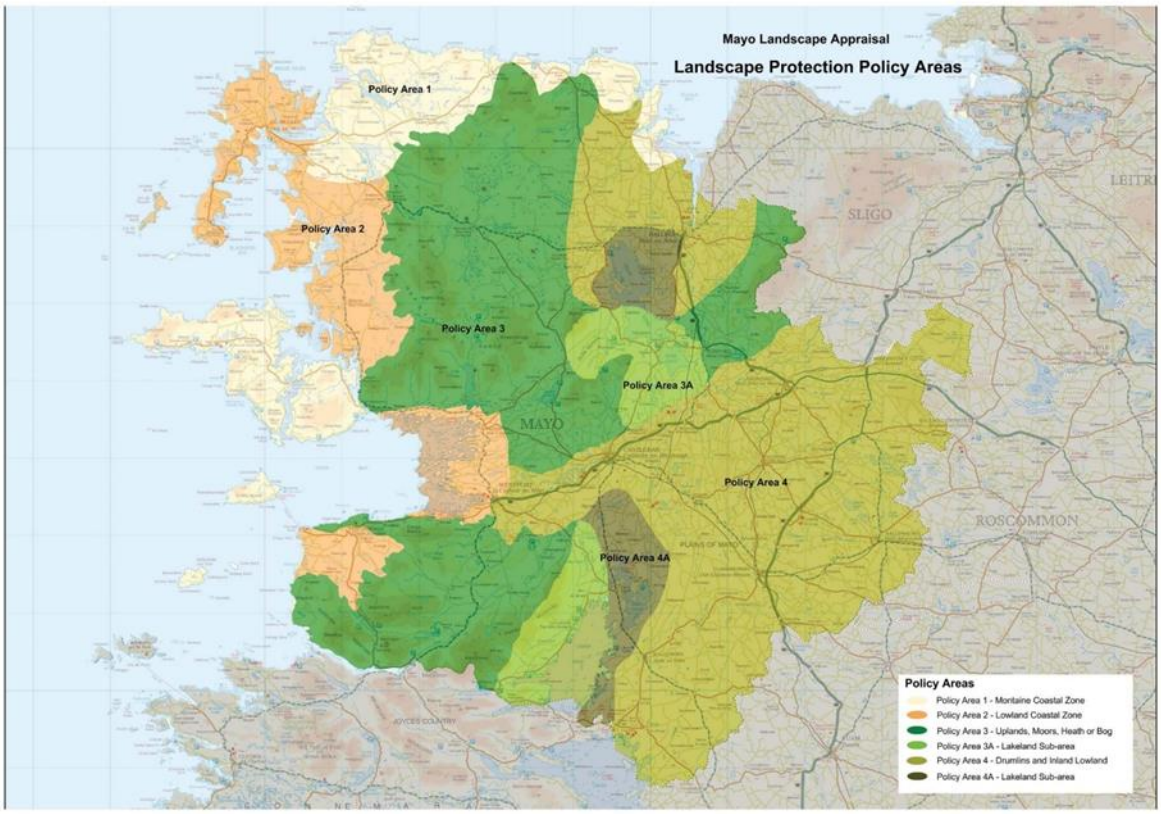


Figure 14: Mayo Landscape Protection Policy Areas

Source: Draft Mayo County Development Plan, 2021 – 2027[40]

The Policy Area 1 designation restricts wind turbines and grid developments specifically as having:

'High potential to create adverse impacts on the existing landscape character. Having regard to the intrinsic physical and visual characteristics of the landscape area, it is unlikely that such impacts can be reduced to a widely acceptable level.'

It is therefore the assessment of the authors that there would be barriers to an onshore wind development of scale in the SEC that would be very difficult to overcome.

[40] https://consult.mayo.ie/en/consultation/draft-mayo-county-development-plan-2021-2027/chapter/10-natural-environment

7.1.2 Solar PV

We will examine the case for PV in the SEC areas at three scale: RESS scale 500kW -5MW), Small Scale (50kWp-500KWp) and micro scale (<50kWp)

7.1.2.1 RESS Scale PV

This is the scale of PV generation that would be exported directly to the grid. Recent policy and technical developments have led to an increasing focus on PV as a viable renewable power generation in the West of Ireland. There has been a rapid increase in the level of investment by large developers since the creation of the Renewable Energy Support Scheme 2020 where 63 solar projects totalling over 1,000 MW (767.3 GWh) were awarded contracts in the RESS-1 auction. Of these, two were community owned projects at scale (c. 4MW each) in Mayo and North Galway. This EMP examines grid scale PV potential in the SEC area.

7.1.2.2 PV farms outline

Over the past 10 years there has been an increase in the efficiency of new PV panels and a reduction in costs per unit owing to greatly increased volumes of production worldwide resulting in an overall reduction in cost per MWh produced. Taken with the policy context, and the planning and environment restrictions discussed in Section 7.1.1.1 above, these factors require us to fully investigate the PV opportunity in the SEC area.

7.1.2.3 Location

In general, 5MW PV sites require approximately 10 hectares of contiguous land in a relatively low-lying flat location (incline <5 degrees) with an unobstructed South facing aspect, sheltered from the sea with a good solar resource. A proximity of less than 2km to 38kV substation with open capacity is advantageous.

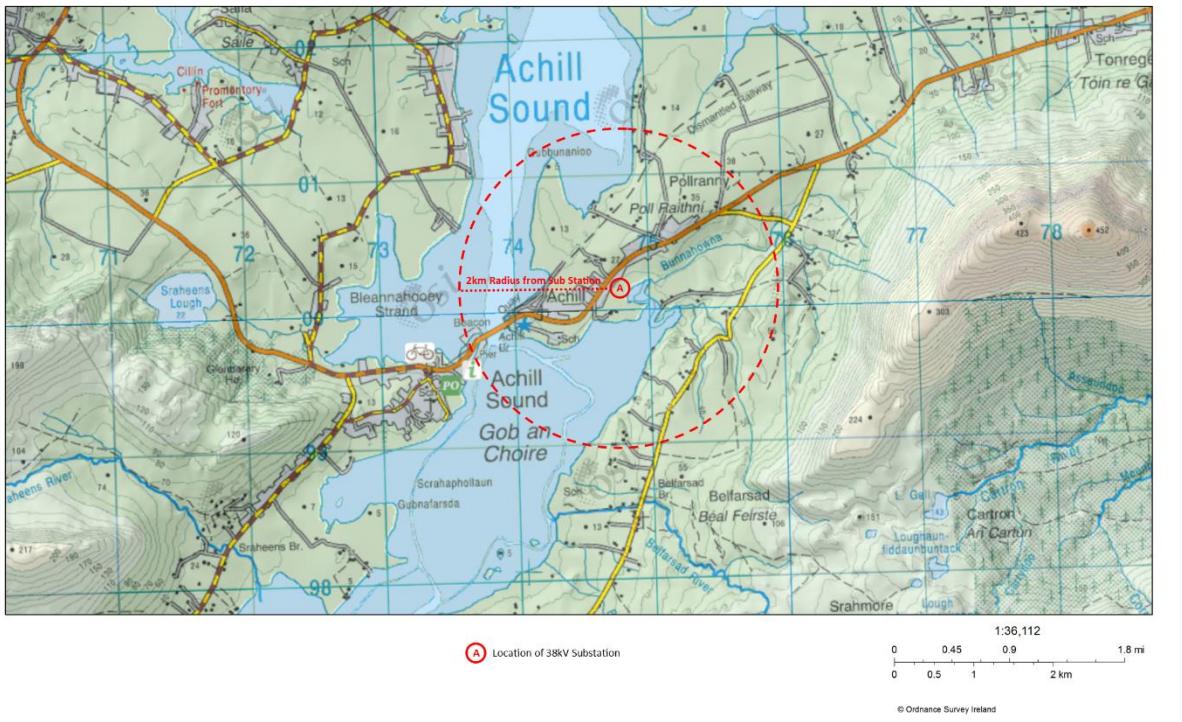


Figure 15: PV to grid site parameters

Figure 15 shows the effect of the parameters including grid proximity on the potential locations in the SEC area which may be suited to a PV development of 5MW

In this location there are a limited set of locations which may be suited to such a PV development, should the grid capacity be available. It should be noted that area is not subject to any protected designations.

7.1.2.4 Solar Resource

In comparison to other locations in Ireland, Achill receives less solar radiation. This by no means that PV generation at scale is unfeasible. Indeed, as Figure 16 shows, the estimated output of power for PV Site A is superior albeit marginally than either of the two sites (Mayo and Galway) successful in the RESS-1 auctions in 2020.

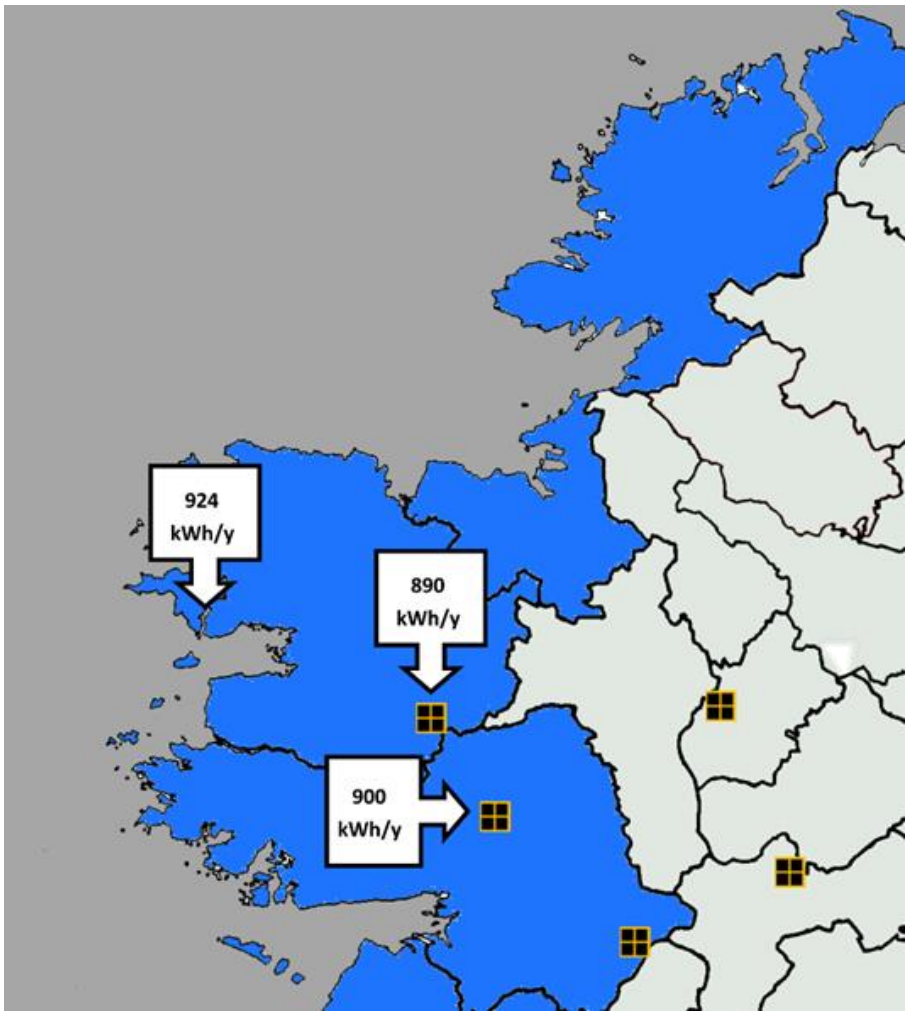


Figure 16: PV farms in West of Ireland successful in 2020 RESS 1 auction. Including solar radiation values for two Mayo sites and Achill: kWh/kWp per annum

kWh outputs taken from: PHOTOVOLTAIC GEOGRAPHICAL INFORMATION SYSTEM[41]

7.1.2.5 Energy Outputs for 5MW PV Farm Sites Areas A and B

Figure 17 shows the expected power outputs by month for a ground mounted southern aspect 5MW power solar PV farm at a suitable site on Achill. The total generation would be 4,620,000 MWh/yr. These figures take into account system losses of 14%. System losses are all the losses in the system, which cause the power actually delivered to the electricity grid to be lower than the power produced by the PV modules. There are several causes for this loss, such as losses in cables, power inverters, dirt on the modules and so on. The kWh/yr/kWp installed is based on Crystalline Silicon panels which are now considered to be high performing. Thus, the production estimates here are conservative.

[41] https://re.jrc.ec.europa.eu/pvg_tools/en/#MR

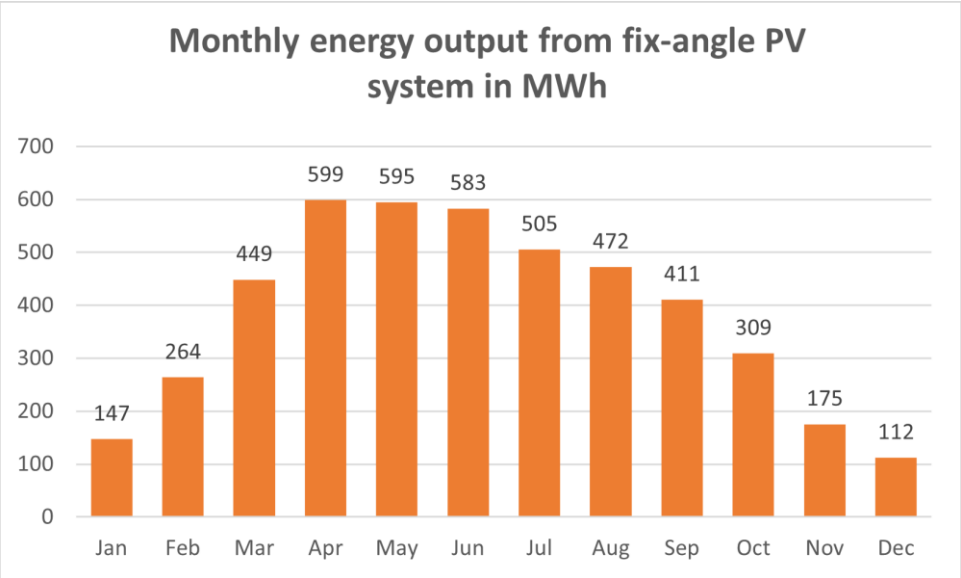


Figure 17: Monthly energy output from fix-angle PV system in MWh

7.1.2.6 Economics of Grid connected PV:

Levelized cost of electricity is a measure of the average net present cost of electricity generation for a generating project over its lifetime.

It is described by the following formula in Appendix III Section 11.1.1.

The LCOE for a grid connected PV installation at a hypothetical location in Achill is between €100.50/MWh and €134/MWh. This is in large part due to assumed higher than average installation costs, in particular any grid upgrades required, and also the relatively reduced solar radiation available on the island.

The LCOE above indicates that a developer led project is not likely to be economically viable.

Such an LCOE is generally above the *average* auction bid for community-owned power in RESS-1 (which was 104.15 €/MWh). Although it should be stated that this included both wind and PV projects, and that two PV projects had lower radiation values (Figure 16 above). It is likely that the community PV sector will be more competitive in RESS2 and subsequent auctions. There are also likely to be more bids from parts of the island that have better solar resources and easier access to the grid. Thus, a 5MW community-owned PV farm may have to have lower installation costs than average and be willing to be less profitable than other community PV projects.

It is therefore recommended that the SEC initiates a public consultation process with the community in Achill Sound and Polranny as to the acceptability of a 10 hectare 5MW PV to grid project. In advance of this a scoping exercise with relevant landowners may be worthwhile.

The SEAI has produced a very helpful guide explaining how to carry through Community Energy PV projects to fruition which is available at this LINK.

7.1.2.7 Small Scale PV

At between 50 and 500kWp, these projects fall into what is often called the auto-consumer category. That is the electricity produced is, as much as possible, consumed on site on the property that hosts the PV panels (it is currently not permitted to supply electricity between properties). Typically, large energy users such as factories, farms and hotels have installations such as these.

These energy users were identified through the commercial energy consumption study in Section 4.4. The SME Energy Audit and training programme (Appendix III Section 10.5) will identify where it is feasible to undertake auto-production in PV. The Case Study discussed in Section 6.4 is certainly applicable to both of the larger food processing businesses in the SEC area.

7.1.2.8 Micro Scale PV

This option is also addressed in the domestic sector retrofitting opportunity above in Section 6.1.2.

A domestic solar PV system consists of a number of solar panels mounted to your roof (or in your garden) and connected into the electrical loads within your building. Solar PV systems are rated in kilowatts (kWp). A 1kWp solar PV system would require 3 or 4 solar panels on your roof. In the SEC area, 1kW installed will generate approximately 924kWh of electricity per annum (though this can up to 10% be higher with newer better, more expensive performing panels).

Since a consumer pays approximately €0.23 per kWh to their electricity provider, a 1kWp PV panel (if all the energy is consumed by the home owner) will save the homeowner €212.52 per year.

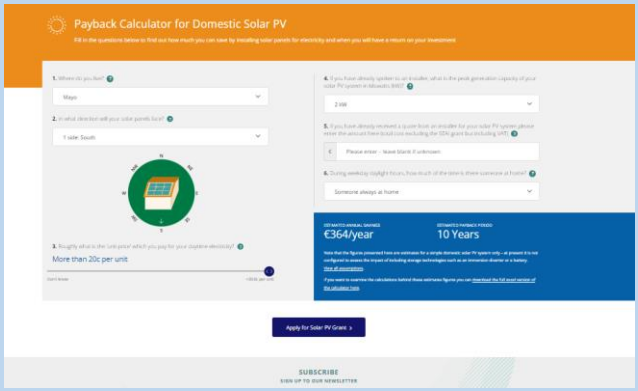
There is a significant grant incentive available from the SEAI for PV installation for homeowners. The full details are available at this link.

Table 20; SEAI PV Grants for Homeowners

Value	Example
€900 per kWp up to 2kWp	€1800 for 2kWp solar panels
€300 for every additional kWp up to 4kWp	€2100 for 3kWp solar panels
Total Solar PV grant capped at €2400	**€2400 for 4kWp solar panels**

Any excess electricity produced can be stored in a hot water immersion tank or in a battery. It can also be used to power a BEV that is parked during the day at the home. It can also be

exported from the house into the electrical network on the road outside your home for €0.135 per kWh. The best solution is to manage your electricity consumption to match the best PV generation times i.e., daytime.



The SEAI has a useful Calculator that shows payback period for typical installations, customisable by county, size of system and retail price of electricity. It is available at this LINK

Economics of a 2kWp System in Achill

System Cost (with grant)	Annual Savings	Payback Period	Lifetime** Profit
€3,600	€364/year*	10 Years	€4,368

*It is not assumed that the homeowner will consume all the electricity.

**A typical PV System has a 22-year lifespan.

7.1.3 Tidal Energy

Bulls Mouth was identified in a Tidal & Current Energy Resources in Ireland report from the SEAI as having a potential to generate 6GW of power[42]. Figure 18 shows the location identified which is between Achill and Inis Biggle.

Figure 18: Map Showing Location of Tidal Resource

A large-scale tidal power generating project is currently being installed in the MeyGen tidal stream project in the Pentland Firth, Scotland installation is at construction stage.

[42] https://www.seai.ie/publications/Tidal_Current_Energy_Resources_in_Ireland_Report.pdf p65-66

Figure 19: MeyGen Tidal Stream Turbine

Thus, the technology is proving feasible. Irish tidal installations are likely to concentrate on the East Coast where the tidal resources are greater, access to grid is easier and the conditions are easier to cope with.

The planning issues that were discussed in Section 7.1.1.1 do arise, however. As Figure 20 shows, the area is surrounded by Special Areas of Conservation. It is difficult to envisage a favourable view taken by the County Planners to development of scale in the area.

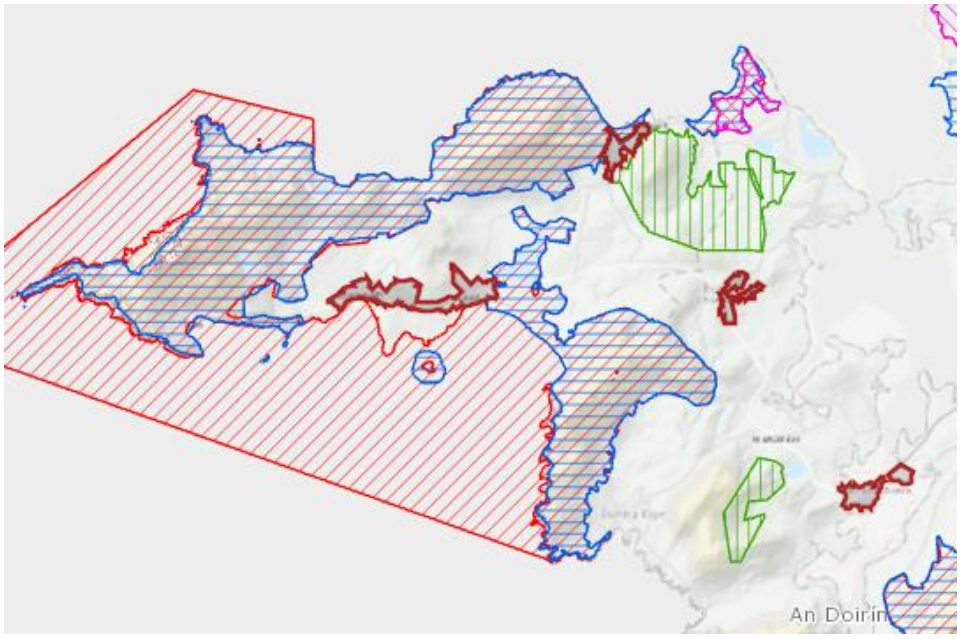


Figure 20: SAC, SPA and Heritage Designations

7.2 Renewable Energy Production Opportunities Recommendations

It is suggested that the SEC investigate PV at all three relevant scales as the most developed opportunity with the greatest likelihood of success in the medium term.

7.2.1 One Community PV Project

This will have a limited effect on the overall carbon footprint of the SEC, but it will serve an important community affirming purpose as well as in the future providing an income which could be used by the community for social benefit

7.2.2 Three to Four Small-Scale Auto Consumer Projects

The SEC committee's experience and expertise will be of benefit when recruiting SME and Community Organisation collaborators in this project. Very often organisation managers are pre-occupied with running the day-to-day affairs of their organisation. They would benefit from voluntary support that can be provide by the SEC. A savings sharing scheme could be of mutual benefit to all parties.

7.2.3 100 Homes with 2-4 kWp PV

Convincing homeowners to invest €3,500 plus of their own money must come from a position of trust – such as from a neighbour or friend. The SEC group can do this hard but rewarding work. There is also the potential for the SEC to reach out to community funders, so as to make the job of finding the credit necessary to pay the up-front cost of PV installation easier.

8 Conclusion: Holistic Effects of Co-ordinated Strategy

In this section we bring together the energy conservation and generation measures to show the potential positive impact of carrying through the Energy Master Plan on a wholistic level.

		Emissions Reductions Each Year in t Co2								
Priority	Action	2023	2024	2025	2026	2027	2028	2029	2030	TOTAL
1.1	Retrofit 10% of G-C3 homes each year n= 100	1,310	1,310	1,310	1,310	1,310	1,310	1,310	1,310	10,483
1.2	7 SMEs upgraded annually, each achieving 20% energy reduction	110	110	110	110	110	110	110	773	1,546
1.3	Refit of two Community Buildings year achieving 46% energy reductions on average	23	23	23	23	23	23	23	23	187
1.4	100 homes with 2-4kWp installations with 100 additional homes recruited each year until a maximum of 600		82	164	246	328	410	492	492	2,215
2.1	Public Transport: Based on a ramping up campaign amongst commuters achieving 60 individual commuter participants over three years	28	55	83	83	83	83	83	83	583
2.2	A 10% reduction of Industrial Energy per yearly to a maximum of 40%	0	0	0	75	75	75	75	0	302
2.3	Four 100kWp projects with four added every two years based on success				219	328	985	109	109	219
3	5% replacement of Diesel cars with BEVs annually	233	260	247	235	223	212	201	201	1,811
4	A 5MW Community PV Project Exporting to the Grid								1,367	1,368
	Total Emissions Reduction	**1,705**	**1,759**	**1,774**	**1,838**	**1,826**	**1,815**	**1,804**	**2,391**	**14,912**

Priority level is based on both achievability, the timescale required and the effect on emissions.

The effect of these measures, taken in consort will achieve the ambitions stated by the SEC in their scoping document for this EMP. Figure 21shows how the actions would achieve a 40% reduction in emissions with a consequent reduction in energy use.

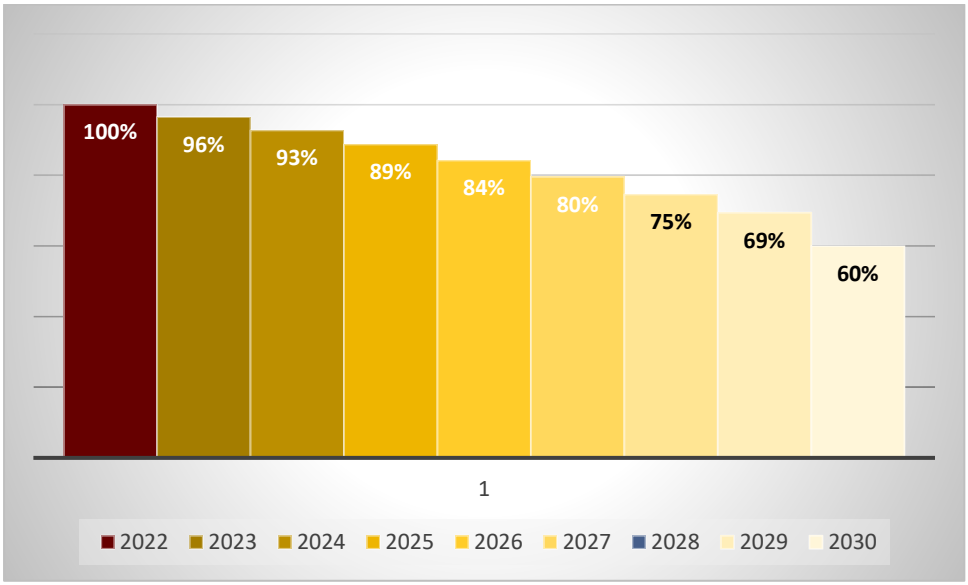


Figure 21: Reductions in Emissions Achieved through EMP Strategy

Financial Savings from Actions are equally significant. As Figure 22 shows, the SEC will achieve considerable financial benefits to match the sustainability gains that are possible from the actions outlined in this EMP.

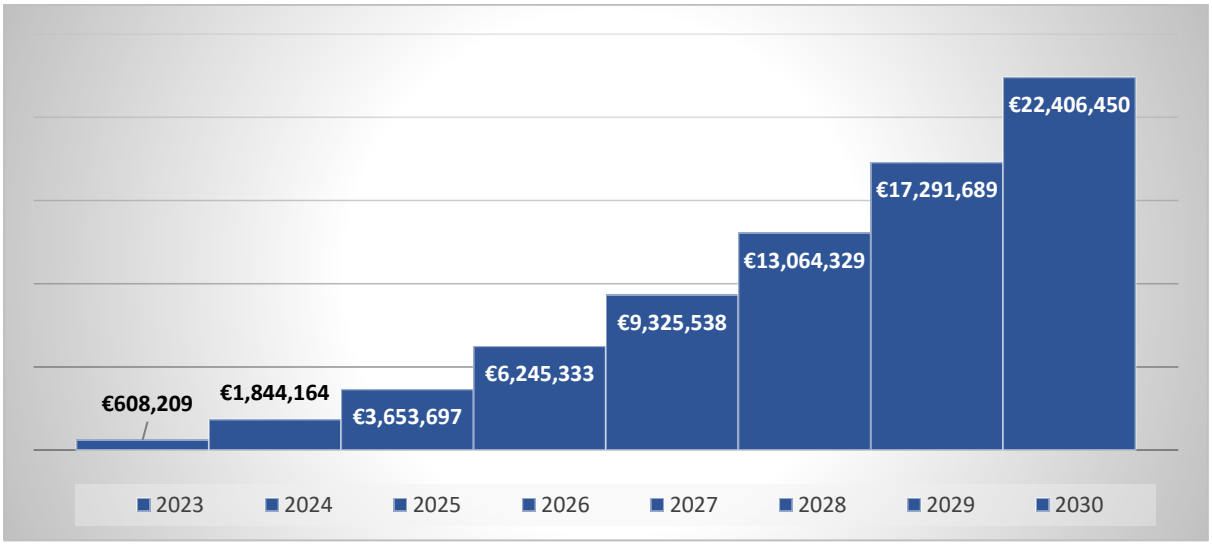


Figure 22: Financial Savings 2023-2030

8.1.1 Build Capacities

Building expertise and capacities within the group is critical to achieve the success of the SEC. Already there has been a continuous process of 'learning, planning and doing', both through the Community Futures Program and the SEC program. Increasing the membership

of the group, delegating responsibilities to achieve different elements of the Master Plan will have the twin benefits of reducing overload on the individuals as well bringing in fresh perspectives.

We recommend a resources analysis exercise which will help build connections with other stakeholders as well as deepening the reservoir of talent and person-power that is available to the SEC to achieve the ambitious program outlined in the EMP

8.1.2 Energy Master Plan Dissemination to Community

The dissemination of the Energy Master Plan throughout the community is one of the key actions for the SEC now that the plan has been completed. The Energy Master Plan will provide the community with an understanding of what their current energy profile is and where they as a community should put their efforts in reducing their energy and carbon footprint. We suggest that the SEC host workshop events for each of the community subgroups that are targeted by the sustainability actions outlined in this EMP. These would be:

- Homeowners – in particular the fuel poor in relation to home upgrades
- SME managers
- Community Facilities Managers, including those managing [places of worship
- Large Industrial bodies and/or their landlords
- School Principles

These workshops will enable the SEC to recruit participants in the EMP actions. It is vital that these workshops are pitched appropriately – the needs of each group are very different, even if there are commonalities between all members of the community.

8.1.3 Low Lying Fruit First

The SEC is encouraged to develop low-effort, low-cost efficiency projects first to increase their internal capacity and skills. These low-effort, low-cost efficiency measures can be quick wins for the community and encourage the group to tackle more complex, higher effort projects in the future. These projects also provide a focus point for the greater community to prompt discussions and knowledge sharing experiences. We recommend that the SEC seek to partner with the very pro-active local authority in a BEC project: this will build capacity and demonstrate the value of the collective approach to sustainability. It will also develop the skill sets within the group. There are BEC specialists who have wide experience in managing successful projects. However, the SEC should remain engaged with every step of a BEC to maximize learnings as well as ensuring widest possible community benefit.

8.1.4 Continue the Journey with the SEAI

The SEC program has resources in addition to the county level SEC mentoring. The engagement of specialist mentors is possible, as is the Trusted Intermediary program.

The SEC can also benefit from the SEAI's funding streams for energy efficiency projects within your community. These are constantly evolving, and the SEC should continue to engage with SEAI mentors to learn what funding and supports are available.

9 Appendix I

9.1 Fuel Prices:

Fuel	Price per kWh	Source	Notes
Home Heating Oil	€0.139	https://www.cheapestoil.ie/heating-oil-prices/Mayo	Based on 500L delivered
Electricity	€0.281	https://www.electricireland.ie/switch/new-customer/price-plans?priceType=D	Standard Tariff no discounts, incl VAT, excl Charges
Coal	€0.081	https://www.seai.ie/publications/Domestic-Fuel-Cost-Comparison.pdf	Bagged Coal: delivered
Peat *Briquettes*	€0.082	https://www.seai.ie/publications/Domestic-Fuel-Cost-Comparison.pdf	Briquettes collected*
LPG	€0.217	https://www.seai.ie/publications/Domestic-Fuel-Cost-Comparison.pdf	Bottled Butane, collected
Wood	€0.118	https://www.seai.ie/publications/Domestic-Fuel-Cost-Comparison.pdf	Small Bagged, collected

*As was stated in Section 5.1.1.3 above, we estimated that two thirds of the Turf consumed on the island is hand cut and thus has no cost.

9.2 Domestic Heating Estimates Methodology

The estimates are based on extrapolating total building areas,

We calculate:

The mean value for energy per sqm per year for each BER category, multiplied by the total number of homes in the SEC area, multiplied by the percentage of homes surveyed that were in that category, multiplied by the average area in sqm for homes in that category.

	SEC		
Total number of dwellings with BER	201	i	
Total number of dwellings in Small Area as recorded by GeoDirectory	1951	ii	
Percentage of all dwellings as recorded by GeoDirectory that have BER	10.3%	iii	(i)/(ii)
Number of Detached houses with BER	170	iv	
Number of Semi-detached houses with BER	15	v	
Number of End-terraced houses with BER	5	vi	
Number of Mid-terraced houses with BER	6	vii	
Number of Ground-floor appartments with BER	5	viii	
Number of Mid-floor appartments with BER	0	ix	
Number of Top-floor appartments with BER	0	x	
Percentage of all dwellings with BER that are Detached house	84.6%	xi	(iv)/(ii)
Percentage of all dwellings with BER that are Semi-detached house	7.5%	xii	(v)/(ii)
Percentage of all dwellings with BER that are End-terraced house	2.5%	xiii	(vi)/(ii)
Percentage of all dwellings with BER that are Mid-terraced house	3.0%	xiv	(vii)/(ii)
Percentage of all dwellings with BER that are Ground-floor appartment	2.5%	xv	(viii)/(ii)
Percentage of all dwellings with BER that are Mid-floor appartment	0	xvi	
Percentage of all dwellings with BER that are Top-floor appartment	0	xvii	
Average BER value (kWh/m2/yr)	*387.04*	*xviii*	
Median BER value (kWh/m2/yr)	*308.8*	*xix*	
Minimum BER value (kWh/m2/yr)	*76.2*	*xx*	
Maximum BER value (kWh/m2/yr)	*1418.8*	*xxi*	
Standard deviation BER value (kWh/m2/yr)		*xxii*	
Number of A1 rated BER'd dwellings	0	xxiii	

Number of A2 rated BER'd dwellings	0	xxiv	
Number of A3 rated BER'd dwellings	0	xxv	
Number of B1 rated BER'd dwellings	7	xxvi	
Number of B2 rated BER'd dwellings	2	xxvii	
Number of B3 rated BER'd dwellings	6	xxviii	
Number of C1 rated BER'd dwellings	7	xxix	
Number of C2 rated BER'd dwellings	13	xxx	
Number of C3 rated BER'd dwellings	9	xxxi	
Number ofD1 rated BER'd dwellings	23	xxxii	
Number of D2 rated BER'd dwellings	20	xxxiii	
Number of E1 rated BER'd dwellings	35	xxxiv	
Number of E2 rated BER'd dwellings	29	xxxv	
Number of F rated BER'd dwellings	31	xxxvi	
Number of G rated BER'd dwellings	19	xxxvii	
% dwellings with BER that are A1 rated	0.0%	xxxviii	(xxiii)/(i)
%l dwellings with BER that are A2 rated	0.0%	xxxix	(xxiv)/(i)
% dwellings with BER that are A3 rated	0.0%	xl	(xxv)/(i)
%dwellings with BER that are B1 rated	3.5%	xli	(xxvi)/(i)
%dwellings with BER that are B2 rated	1.0%	xlii	(xxvii)/(i)
%dwellings with BER that are B3 rated	3.0%	xliii	(xxviii)/(i)
%dwellings with BER that are C1 rated	3.5%	xliv	(xxix)/(i)
%dwellings with BER that areC2 rated	6.5%	xlv	(xxx)/(i)
%dwellings with BER that are C3 rated	4.5%	xlvi	(xxxi)/(i)
%dwellings with BER that are D1 rated	11.4%	xlvii	(xxxii)/(i)
%dwellings with BER that are D2 rated	10.0%	xlviii	(xxxiii)/(i)
%dwellings with BER that are E1 rated	17.4%	xlix	(xxxiv)/(i)
%dwellings with BER that are E2 rated	14.4%	l	(xxxv)/(i)
%dwellings with BER that are F rated	15.4%	li	(xxxvi)/(i)
%dwellings with BER that are G rated	9.5%	lii	(xxxvii)/(i)
Average total living area of dwellings with BER	128.2	liii	
Median total living area of dwellings with BER	127.4266667	liv	
Number of BER'd dwellings without thermostat	176	lv	
Number of BER'd dwellings with thermostat	25	lvi	
%BER'd dwellings without thermostat	87.6%	lvii	
%BER'd dwellings with thermostat	12.4%	lviii	
Number of BER'd dwellings with poor heating system controls	83	lix	
Number of BER'd dwellings with good heating system controls	31	lx	
Number of BER'd dwellings with ideal heating system controls	87	lxi	
%dwellings with BER that have poor heating system controls	41.3%	lxii	
%dwellings with BER that have good heating system controls	15.4%	lxiii	
%dwellings with BER that have ideal heating system controls	43.3%	lxiv	

Number of BER'd dwellings with Biomass (wood) heating system	0	lxv
Number of BER'd dwellings with Comunity heating system	6	lxvi
Number of BER'd dwellings with Electricity heating system	91	lxvii
Number of BER'd dwellings with Oil heating system	90	lxviii
Number of BER'd dwellings with LPG heating system	4	lxix
Number of BER'd dwellings with Mains gas heating system	0	lxx
Number of BER'd dwellings with Solid fuel heating system	10	lxxi
%dwellings with BER that have Biomass (wood) heating system	0	lxxii
%dwellings with BER that have Community heating system	3.0%	lxxiii
%dwellings with BER that have Electricity heating system	45.3%	lxxiv
%dwellings with BER that have Oil heating system	44.8%	lxxv
%dwellings with BER that have LPG heating system	2.0%	lxxvi
%dwellings with BER that have Mains gas heating system	0.0%	lxxvii
%dwellings with BER that have Solid fuel heating system	5.0%	lxxviii

9.3 Private Car Use Statistics and calculations

Small Area Number	Total	Estimated kms per year	litres diesel	GWh	Cost* €	Carbon: kgCO2
157139001	56	915,712	68,678	0.69	€95,463	184,058
157139008	96	1,569,792	117,734	1.18	€163,651	315,528
157074006	65	1,062,880	79,716	0.80	€110,805	213,639
157060005	93	1,520,736	114,055	1.14	€158,537	305,668
157074004	37	605,024	45,377	0.45	€63,074	121,610
157139003	68	1,111,936	83,395	0.83	€115,919	223,499
157001002	86	1,406,272	105,470	1.05	€146,604	282,661
157060002	123	2,011,296	150,847	1.51	€209,678	404,270
157139006	116	1,896,832	142,262	1.42	€197,745	381,263
157074002	51	833,952	62,546	0.63	€86,939	167,624
157074008	71	1,160,992	87,074	0.87	€121,033	233,359
157001003	128	2,093,056	156,979	1.57	€218,201	420,704
157060004	89	1,455,328	109,150	1.09	€151,718	292,521
157139002	92	1,504,384	112,829	1.13	€156,832	302,381
157001001	104	1,700,608	127,546	1.28	€177,288	341,822
157139010	51	833,952	62,546	0.63	€86,939	167,624
157001006	53	866,656	64,999	0.65	€90,349	174,198
157001005	78	1,275,456	95,659	0.96	€132,966	256,367
157060003	77	1,259,104	94,433	0.94	€131,262	253,080
157139007	72	1,177,344	88,301	0.88	€122,738	236,646
157074007	46	752,192	56,414	0.56	€78,416	151,191
All Areas	**1652**	**27,013,504**	**2,026,013**	**20.26**	**€2,816,158**	**5,429,714**

*The price of diesel here is not based on a simple 2022 price at time of writing. It is based on the AVERAGE cost of diesel in Ireland from 2016-2022. This is taken from the CSO's consumer price data report[43]. We have done this as the price of diesel, despite its current high price in June 2022 has fluctuated around an average price of €1.353 since 2011.

[43] https://data.cso.ie/table/CPM12

10 Appendix II Register of Opportunities Supporting Documentation

10.1 Individual Level Behaviour Changes for homeowners

These are some quick and easy sustainability 'wins' the homeowner can achieve while they are planning long term solutions to their reliance on imported fossil fuels.

Step 1: Do Your Own Audit:

- Check windows, external doors, vents, interstitial floor spaces, fireplaces, and stoves with a stick of incense: and track down and eliminate draughts.
- Check insulation levels in attic, basement, walls (including the meter box), and interstitial floor spaces.
- Check your boiler and stove; what age are they? When were they last serviced?
- Collect energy bills and scrutinise them over a year or 2.
- To save money in the short term see if you need to change your electricity supplier.

Step 2: Actions to save 36% of your energy costs and fossil fuel use:

- Turn everything off – don't leave on standby (2%)
- Use a clothes line when possible - no tumble dryer (7%)
- Wash clothes @ 30 degrees (1%)
- Turn off lights when not in a room, replace bulbs with CFLs at least, or with LEDs if possible (2%).
- Use oil to heat water – not electric immersion or electric shower (24%)

Step 3: Save energy by thinking about the way you control and use heat

Close the curtains at dusk to keep heat in the room that would otherwise be lost through the cold windows, and you could save up to 10% of your heating costs.

Consider fitting shelves above radiators as they redirect the warm air that rises from them back into the room.

Ventilate your house 3 to 5 minutes, a couple of times a day, instead of opening windows a little bit all day. Shut off your heating, during ventilation. This can reduce heat loss by 16%.

Maintain room temperature 19^0C (this can save up to €350 every year for each degree lower you heat the house)

Bleed your radiators regularly. If there is air in your radiator your boiler burns longer. Always start with the lowest and end with the highest radiator.

10.2 SEAI Supports for Individual Homeowner Applicants

There are three categories of applicants to the SEAI Home Energy Grant Scheme[44] of which this is a brief summary. These are:

Individual Energy Upgrade Grants	**One Stop Shop Service**	**Fully Funded Energy Upgrade**
Up to 80% of the cost of the upgrade for a typical family home with SEAI grants *Homeowners manage their upgrades including:* • contractor selection • grant application • contractor works • pay for full cost of works and claim grants afterwards • follow up BER *For homes built and occupied before:* • 2011 for insulation and heating controls • 2021 for heat pumps and renewable system	Based on set grants per measure, this can be grant funded by SEAI 45 - 50% of the cost for a typical family home *A One Stop Shop contractor manages upgrade including:* • home energy assessment • grant application • project management • upgrade to a minimum B2 BER • contractor works • homeowner pays for the works net of grant • follow up BER *For homes built and occupied before:* • 2011 for insulation and heating controls • 2011 for renewable systems	<u>For qualifying* homeowners in receipt of certain welfare benefits (see below)</u> All home upgrade costs covered by SEAI *Service is managed by SEAI and includes:* • home survey • contractor selection • contractor works • follow up BER *For homes built and occupied before:* 2006 for insulation and heating systems *Receiving one of the following: • Fuel Allowance • Job Seekers Allowance • Working Family Payment • One-Parent Family Payment • Domiciliary Care Allowance • Carers Allowance • Disability Allowance for over six months with a child under seven

There is a full explanation of the schemes, grants, and levels of funding on the SEAI site here

[44] Available at this link: https://www.seai.ie/grants/home-energy-grants/

10.3 Incentives for Battery Electric Vehicles from the SEAI

List Price of Approved BEV	Level of Grant
€14,000 to €15,000	€2,000
€15,000 to €16,000	€2,500
€16,000 to €17,000	€3,000
€17,000 to €18,000	€3,500
€18,000 to €19,000	€4,000
€19,000 to €20,000	€4,500
€20,000 to €60,000	€5,000

Grant Eligibility: to qualify for SEAI grant assistance, the purchased vehicle must be new and one of the approved car models. The full list of car models (illustrated in Figure 23) is available at this link.

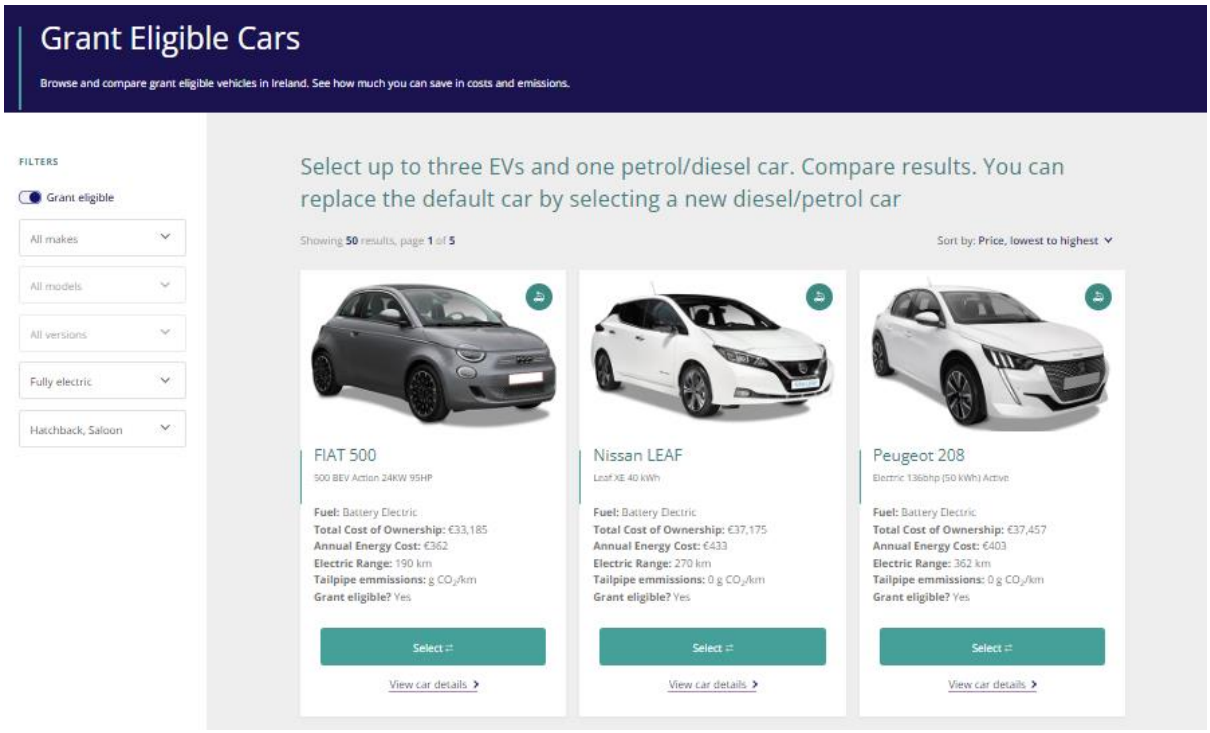


Figure 23: Grant Eligible Cars

10.4 Public Transport Behaviour Change Calculations

Item	Value	Notes
Number of Switchers	60	The bus has a capacity of 80 passengers
Average Journey Distance kms	26	Distance to Mulranny
Return Trip Journey	52	
Passenger kms/day	3120	
Reduction in Emissions per g CO2 /km	106	Based on DEFRA figures
Reduction in Emissions Per Day kg CO2	330.72	
Annual Working Days	252	
Total Emissions Avoided	83,341	

10.5 SME Supports

10.5.1 SEAI Energy Academy

The SEAI Energy Academy is a free, online, e-learning platform designed to help businesses increase their energy efficiency and reduce their energy related costs.

The SEAI Energy Academy allows anyone to learn with short, interactive, animated modules. It's mobile friendly and offers flexible, self-paced learning with access available 24/7.

Business owners, CEOs, managers, and facilities teams can join the SEAI Energy Academy and start learning. The SEAI Energy Academy courses are also a great way of engaging, up-skilling, and retaining staff. Courses can be implemented into any business's sustainability strategy helping them embed energy efficiency across their organisation.

LINK HERE

10.5.2 Climate Toolkit 4 Business

The Toolkit helps your business get started on your zero-carbon journey. It recommends the most impactful steps to understand and address your environmental impacts.

This Toolkit provides practical and cost-effective actions that every business can take to support this transformation and build resilience.

The Energy bills / usage information calculator asks how much electricity and gas your business uses every year on average.

The Business travel information calculator asks for vehicle fuels (petrol or diesel) volumes or cost as well as flights taken for business purposes in a year

Waste and Water Usage is also tracked

LINK HERE

10.5.3 SME Energy Audits

An energy audit is an important step for businesses that want to save money, save energy, and enhance their brand. An energy audit may be carried out on buildings, processes, or systems and it is a three-step process which involves preparation, a site visit and reporting. The audit report that compiles the findings will help you to understand:

- how much energy your business uses
- the equipment and processes that use the most energy
- what actions you should take to save energy, and their estimated cost and impact

SEAI's Support Scheme for Energy Audits (SSEA) will offer SMEs a €2,000 voucher towards the cost of a high-quality energy audit. In most cases, this will cover the total cost of the audit. Application to the scheme is easy, with automatic approval for eligible businesses.

Businesses applying to the scheme must be:

- non-obligated entities
- tax compliant
- registered in the Republic of Ireland
- spend at least €10,000 on energy per year at the site being audited

Non-obligated parties (that is those who are eligible for the scheme) are: small and medium enterprises (SMEs), or public sector bodies with a useful floor area less than 500m2 and spending less than €35,000 per year on energy

10.5.4 SEAI SME Guide to Energy Efficiency

This document is an excellent short guide for SMEs. This practical guide is based on the real-world experiences of a team of professionals who've been helping companies improve their energy efficiency for decades, so the recommendations are tried and tested.

'Based on experience, the average SME could reduce its energy bill by up to 30% by implementing energy efficiency measures. Typically, 10% saving can be achieved with little or no capital cost. Some investment may be required to get the remaining 20% but the payback is generally around 1.5 years. You won't make a better investment!'

SUSTAINABLE ENERGY AUTHORITY OF IRELAND

SME Guide to Energy Efficiency

Figure 24: SEAI SME Guide to Energy Efficiency: LINK HERE

10.6 Levelized cost of electricity

$$\text{LCOE} = \frac{\text{Sum of Costs over Lifetime}}{\text{Sum of Electrical Energy Over Lifetime}} = LCOE = \frac{\sum_{t=1}^{n} \frac{I_t + M_t + F_t}{(1+r)^t}}{\sum_{t=1}^{n} \frac{E_t}{(1+r)^t}}$$

I_t = Investment expenditures in year t (including financing)
M_t = Operations and maintenance expenditures in year t
F_t = Fuel expenditures in year t
E_t = Electricity generation in year t
r = Discount rate
n = Life of the system

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