GALWAY
ENERGY CO-OPERATIVE LTD

Sustainable Energy Master Plan

Achieving Zero carbon energy

Supported by

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

Comhairle Cathrach na Gaillimhe
Galway City Council

What is the cost of energy in Galway?

Like most communities in Ireland Galway imports almost all of its energy. This is mainly in the form of fossil fuels from abroad.
The city loses a significant amount of income (approximately €272,000) on energy costs which could be kept in the community.
As this energy is in the form of diesel, home heating oil and coal, this produces a lot of pollution. All this can be avoided by following the steps outlined here.

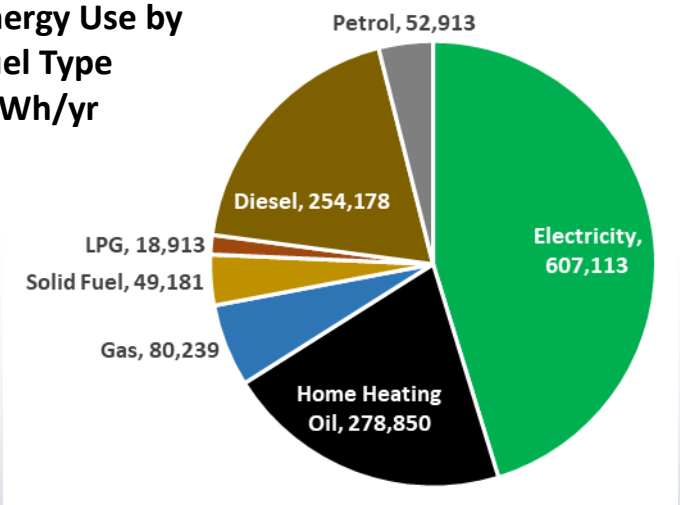
emissions 399k tonnes CO_2 **needing** 28.5m TREES **To offset**

costing €238m

Nearly ALL of it imported

What's Galway SEC's Energy Balance?

Energy Use by Fuel Type MWh/yr



Heating is the biggest use of energy —if we can reduce the amount of oil, coal and electricity we use to heat our homes and businesses by making them more comfortable and efficient, we can save money and reduce emissions.

The same is true of the **Electricity** that is used in businesses: there are many opportunities to be more efficient and save energy and money and also reduce emissions to create a more sustainable community

The GEC Sustainable Energy Plan

Galway Energy Co-op Sustainable Energy Community (GEC SEC) supported and funded by the Sustainable Energy Association of Ireland, commissioned a full study of the energy uses of all sectors of Galway City West. This baseline energy survey also measured the carbon emissions produced by this energy use. Energy Co-operatives Ireland carried out onsite surveys of homes, SMEs, community, and other public buildings. The study also examined energy use in domestic and no-domestic transport. FULL REPORT AT: energyco-ops.ie/galway-energy-co-operative-energy-master-plan including **all references for this document**

2030 GEC Sustainability strategy

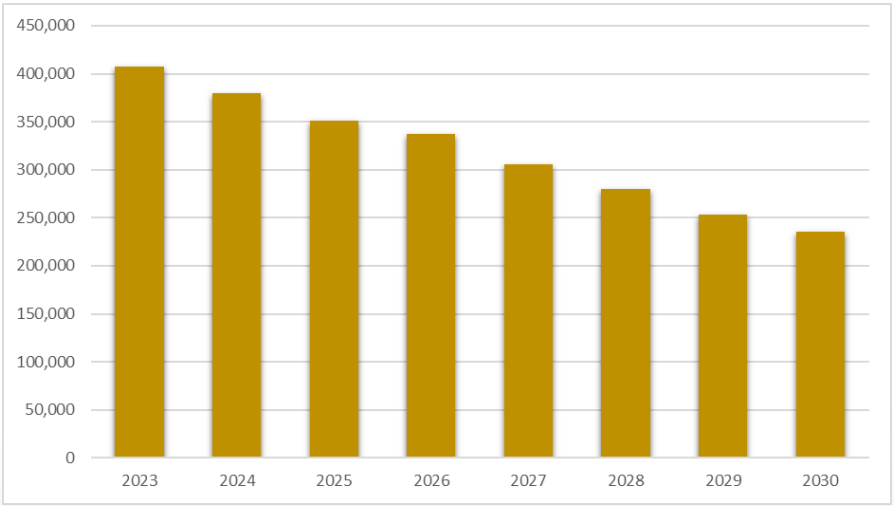
Energy use has rightly become the focus of much of our social and political discourse. The ownership, origin, security, and effects of our energy sources is a matter of critical socio-economic importance. This fact is highlighted by the level of engagement that the members of the Galway Energy Co-operative SEC have voluntarily committed to on behalf of their wider community.

The extensive on the ground survey work we conducted was strongly supported by community and business groups who have also demonstrated a keen interest in engaging with helping to achieve sustainability through efficiency measures and behaviour change

This report shows clearly how the SEC can **reduce fossil fuel energy use by over 30% by 2030**. It shows how the SEC can reduce levels of energy related carbon emissions by the same degree, potentially reducing CO2 emissions by **126,503 tonnes annually**. This would be the equivalent of the carbon uptake from **9,035,928 mature conifer trees** over a year.

This energy reduction would be accompanied by a reduction of 440,106 MWh of fossil fuel use – the equivalent of **44,010,600 litres of oil**.

A 126,503 reduction in kgs of Carbon Dioxide emissions is equivalent to the emissions uptake from **9 million trees**



Under the substantiable energy strategy outlined here, emissions from the Galway SEC's consumption of energy would be reduced to just 4% of 2023 levels.

The carbon measurements here looked specifically at emissions from energy use in the SEC and do not include emission from food consumption, and out of Galway traffic such as ferry or air travel. You may want to look at your total footprint. A good place to start is with the carbonfootprint.com tools

Achieve Sustainability in your home

Our research found that the homes of Galway SEC produce higher emissions than the average in Ireland:

The average home in the Galway SEC uses **25,834 kWh energy** each year. This is 20% above the national average of 20,424 kWh/yr. Below are the steps to be taken by a surveyed home in the Galway SEC to increase efficiency and reduce emissions

Step	Item	Action	BER post action	Energy Costs Post Action	CO2 emissions post action
0	Current State	No Upgrades	F	€6,410.45	11,852.42
1	Windows	Upgrade Existing Windows to Achieve Minimum U-Value of ≤0.73 W/m²K	E2	€5,902.23	10,913
2	External Insulation	Upgrade Original Walls to Achieve Minimum U-Value of ≤0.20 W/ m²/K	D2	€3,719.48	7.966
3	External Insulation	Install 400mm Insulation on Flat Ceiling	D1	€3,421.65	7,328
4	Airtightness	Improve Building Airtightness to Achieve ≤ 5m³/hr/m2 & Block Existing Chimney	C3	€3,149.20	6,745
5	Heating System	Install Air To Water Heat Pump (HP) - Upgrade Heating Controls & Hot Water to Full Time & Temperature Control	B1	€1,941.91	2,269
6	Heating System	Air to Water Heat Pump for heating and hot water	B1	€2,615.53	4,049
7	Photovoltaic	PV Panels to South facing roof 2 kW	A2	€1,071.47	1,252

A F-rated home can be upgraded to an A2 rating saving up to €5,338.98 per year in heating costs and 10,600 kg of CO2 emissions following the actions recommended by our survey of a typical Galway home.

The costs of these measures were estimated to be €64,785.80 excluding grant. So with a grant of €30,000 the works would have a simple payback <7yrs

There are grants available based on set grants per measure, this can be grant funded by SEAI 45 - 50% of the cost for a typical family home.

Full List of Grants Amounts available in the study at this link: https://www.seai.ie/grants/home-energy-grants/

More Sustainable Businesses

Ten Businesses and Community Buildings Audited

We surveyed a range of businesses in the Galway SEC area and identified how much energy and money they could save by taking simple actions. The typical payback was under four years. In this example of one business below it was just 2.6 years.

Priority	Opportunity	Capital Cost (€)	Annual Cost Savings (€)	Annual Energy Savings (kWhs)	Annual CO_2 Savings (kg/Year)	Simple Payback Period	BER
	Current		-	-	-	-	D2
1	Increase MIC		687	-	-	-	D2
2	Upgrade Lighting & controls	5000	2,229	6,187.10	2,152	2.2	C1
3	Install 7-day timer on drinks fridge	500	1,972.	5,475.00	1,904	0.25	C1
4	Install Night Blinds on refrigerated cabinets	4000	4,417	12,264.00	4,265	.9	C1
5	PV Installation	22,400	10,806	30,000	10,434	2.07	B3
All	Totals	31,900	20,111	53,926	18,755	2.6	B3

This would save the same amount of CO2 as planting 1,339 trees

Supports for non-domestic efficiency and generation work

Energy Efficiency Grant, available through the Local Enterprise Offices, provides funding to small businesses to invest in more energy efficient technology. It supports the investment in technologies and equipment identified in a Green for Micro Report, GreenStart Report or a SEAI Energy Audit, with 50% of eligible costs up to a maximum grant of €5,000. The aim of the scheme is to reduce the impact of enterprises on the environment thereby increasing the agility and resilience of these businesses.

Energy Efficiency Loan Scheme supports eligible SMEs to invest in the energy efficiency of their enterprises. Loan amounts from €10,000 to a maximum of €150,000 per borrower, over terms of 1 year up to 10 years.

Non-Domestic Microgen Scheme from the SEAI funding ranges from €2,700 to €162,600, to support a wide range of businesses to switch to solar electricity.

The EXEED Grant Scheme - SEAI is designed for organisations who are planning an energy investment project. Grant support of up to €1,000,000 per project is available.

Accelerated Capital Allowance - SEAI is a tax incentive encouraging investment in energy saving technology. Companies and sole traders that operate and pay corporation tax in Ireland can avail of the scheme.

More details of available supports are in the EMP full version: energyco-ops.ie/galway-energy-co-operative-energy-master-plan

Cutting Emissions in Transport

The switch to EVs in Galway may be much easier than you'd think

There are about 18,966 private cars in the SEC . These are with 58% diesel, and 37% petrol and 5% other (probably EVs). The vast majority of journeys travelled by Galway drivers are well within the range of EV batteries. Park and ride can meet the demands of nearly all the remainder of trips. A closer look at your actual driving distances just using google timeline can show you just how feasible transferring to an EV can be for you.

Removing Carbon and NOx from transport

Diesel Vehicles

These are vehicles powered by fossil fuel use (petrol of diesel). They are due to be phased out from the European market from 2035.

Diesel engines emit high levels of pollutants from significant amounts of nitrogen oxides (NOx), particulate matter (PM), and sulfur dioxide (SO2), which contribute to poor air quality. These pollutants are associated with respiratory problems, cardiovascular diseases, and other health issues.

Older diesel vehicles may lack proper emission control technologies altogether. The emissions for a diesel SUV are approximately **200 g CO_2/km.** This means that on standard Galway driving patterns the SUV will emit **4,000 kg CO2/yr,** 40 tonnes over a 10 year lifespan. **Needing 2,857 trees to offset.**

Battery Electric Vehicles (BEV)

These are vehicles powered by a battery that does not include any fossil fuel use (petrol of diesel). Most new BEVs have a range of 270km or more and cost from about €30,000 new.

Comparing a typical BEV (Nissan LEAF) to a Diesel equivalent (VW Golf), the annual cost of energy for the BEV is €688 compared to €1,424 for the Golf. Over a 10yr lifetime of the car, the LEAF costs €45k and the Golf €61k.

Emissions for an EV come from the carbon intensity of the local electricity supply. If the BEV is charged at home from a PV panel, the CO2 emissions are close to zero

There is a comparison tool at this link which enables you to measure the cost of BEV ownership of nearly all models on the market with diesel and petrol equivalents: **COMPARISON TOOL >>**

Active Travel: Walking and Cycling

In the Western side of the SEC which includes Barna and Rahoon there is a larger proportion of drivers (41.9%) and only 13.2% of commuters walk. These less densely populated areas of the SEC are amenable to increased cycleways.

Providing walking and cycling infrastructure, including the Galway City Cycle Network, is a key objective of policy. The older medieval streets make this more difficult in Galway, but in the Western side of the SEC, there are still strong opportunities. In any case, building cycleways does not guarantee increased cycling. There are still projects which the SEC could carry out that will have the effect of increasing active travel and reducing emissions. Shifting just 1,000 people in the western half of the SEC (Knocknacarra, Barna, and Rahoon) from cars to non-motorised transport would remove 201,960 kg CO2 from the SEC roadways. This would be an 8.5% reduction of emissions from car commuting in the SEC. It's behaviour and habit that can matter most when it comes to active travel.

Mass marketing is simple, and politically visible but usually not very effective. Instead a peer-to-peer campaign to show just how realistic active travel commuting is in the SEC would have real impacts. An information campaign led by in the study/workplace 'cycling ambassadors' to convert 1,000 daily commutes is very achievable. This could be led by a trusted community group like Meitheal Rothar, and supported by the Council and could have deep and long-ranging effects. The EMPO report provides resources and links to groups which have demonstrated how this could work.

Community Energy: Photovoltaics (PV)

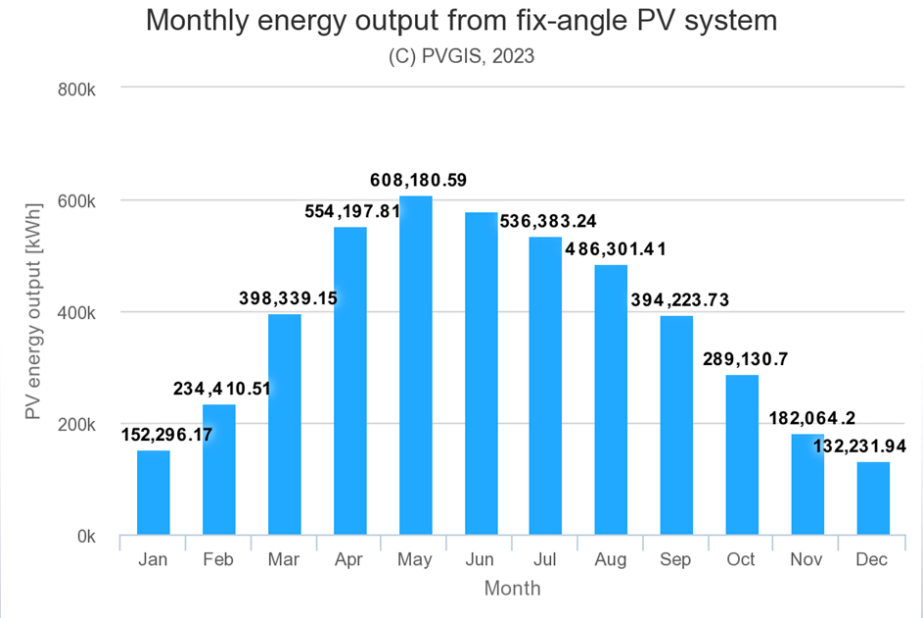
Photovoltaic (PV) Electricity is carbon neutral energy generated by panels. The current carbon intensity of Ireland's grid electricity is 345g of carbon dioxide per kilowatt-hour. PV generation in the SEC area can help reduce this locally.

There are relatively few opportunities for large-scale energy generation in the SEC area. This is largely connected to the density of population and thus the unavailability of the kind of space usually required to accommodate large grid-scale energy generation.

The vast majority of the SEC is zoned residential, community, amenity. Areas designated as enterprise or related uses are already densely developed.

Community scale PV would be possible in certain areas of the SEC but would require positive community acceptance and even partnership within the development to overcome planning obstacles and public acceptance issues. Thankfully, in Galway Energy Co-operative, there is the opportunity for organised community involvement in a large scale PV project.

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 prevailing elements and sea with a good solar resource. A proximity of less than 2km to 38kV substation with open capacity is advantageous.



The total production from a 5MW PV project would be 4,548 MWh. This would have the effect of removing **1,500 tCO2 annually** from the SEC's energy system.

At a realistic projected capital cost of €8.8m and OPEX of €3m for the 30-year lifespan of the project, the LCOE would be €125MWh making it an economically viable project. If a community initiative, the project is likely to qualify for support from the upcoming Small-Scale Generation Scheme (SSGS).

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.

CAPEX: Capital costs for the installation. Includes design, planning, installation and grid works
OPEX: Includes maintenance, insurance and land rental
LCOE: The 'levelized cost of electricity' which is how much the electricity would cost to cover the OPEX and CAPEX. In a community development, profit considerations are not paramount as the aim of reducing carbon emissions could be considered to be more significant once costs are covered.

Community Energy: Hydroelectricity

The Galway City Development Plan states that: 'consideration will also be given to the potential for developing hydroelectric energy schemes, potentially located on the Eglinton Canal.'

Hydroelectricity is a proven resource of renewable energy in Ireland and elsewhere. In Austria it accounts for approximately 60% of all electricity generation.

The river Corrib runs into Galway Bay through the SEC. Historically there were a number of mills on the river banks.

Modern Hydro-electric systems are designed to protect fish-life through screening and so would not effect biodiversity or salmon and other valuable angling tourism resources.

There is a considerable resource across eight sites on the Corrib in the SEC area. Despite the generally low headraces <5m, the flow-rates are extremely strong. There is a calculated hydro-electric resource of 6,265 MWh per year across the sites.

Hydroelectric potential in the SEC area across 8 sites in the SEC

Site	1	2	3	4	5	6	7	8	ALL
HEAD	2.5	2.5	3.9	2.7	3	2.6	2.6	5.8	-
POWER kWp	117	100	465	35	31	33	33	330	1144
OUTPUT MWh/yr	643	549	2,554	192	153	181	181	1,812	6,265
tCO2 avoided per yr	217	186	863	65	52	61	61	613	2118

Hydroelectricity wider opportunities

According to the Environmental Protection Agency (EPA), there are over 560 sites in Ireland capable of operating at scale to export electricity to the National Grid (i.e >10kW power). Of these there are only a small number (less than 60) in operation today. The EPA estimated that these sites could generate a considerable amount of renewable energy which would help avoid over 50,000 tonnes of carbon emissions per annum.

There are non-energy related opportunities that may arise from a successful micro-hydro installation in the SEC area, namely that a community-based organisation with skills and expertise in micro hydroelectricity projects could have a very strong business model that could be applied to the 560 sites identified by the EPA above. The GEC SEC includes in its membership experts on hydro-electricity – there is therefore a clear opportunity for the SEC to pursue medium scale hydro projects in the Eglinton Canal area.

Within the SEC there are land ownership and access issues that would need to be fully investigated while any project to harness the hydro-electric resource of the SEC area is fully explored.

Micro Generation PV

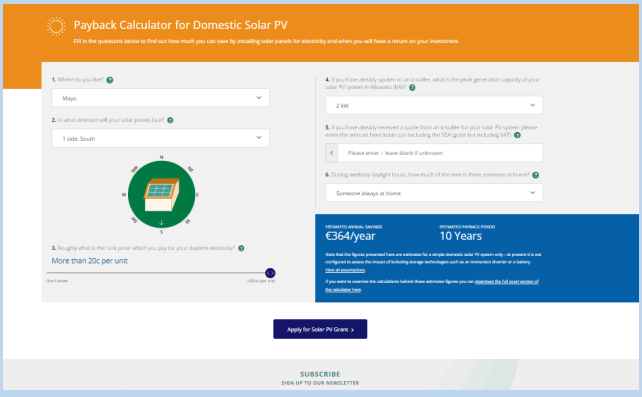
A domestic solar PV system consists of a number of solar panels mounted to your roof (or in your garden or adjacent field) and connected into the electrical loads within your building. Solar PV systems are rated in kilowatts (kWp). A 1kWp solar PV system would require 3 or 4 solar panels on your roof.

Since a consumer pays approximately between €0.28 and €0.40 per kWh to their electricity provider, a 2kWp PV panel (if the home is occupied during the day) will save the homeowner €418 or more per year. On an installation costing €5,000, this would achieve a simple payback of 8 years if the installation qualified for a grant. There would also be an additional payment from the Clean Export Guarantee (CEG) Tariff (of approximately €75 per year in this case)
There is a significant grant incentive available from the SEAI for PV installation for homeowners. The full details are available at this link.

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. 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 Galway

System Cost (with grant)	Annual Savings	Payback Period	Lifetime** Profit
€3200	€418/year*	8 Years	€5,996

*It is not assumed that the homeowner will consume all the electricity. This is based on a cost of €0.28/kWh unit electricity.

**A typical PV System has a 22-year lifespan. This does not include any increase in cost of electricity which will increase the lifetime profitability.

Individual actions for homeowners

...some quick and easy sustainability 'wins'

Step 1: Do Your Own Audit:

- Check windows, external doors, vents, 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 floors.
- 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

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

- 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.

Supports for Individual Homeowners

Three categories of applicants to the SEAI Home Energy Grant Scheme

Individual Energy Upgrade Grants

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

One Stop Shop Service

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

Fully Funded Energy Upgrade

<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

2030 GEC sustainability strategy outline

Emissions Reductions Each Year in kg Co2/yr									
Priority [1]	Action	2024	2025	2026	2027	2028	2029	2030	TOTAL/yr
1.1	Retrofit 15% of G-C3 homes each year	15,961	15,961		15,961	15,961	15,961	10,640	90,443
1.2	15% ND Buildings upgraded each year achieving >30% energy reduction overall	8,000	8,000	8,000	8,000	8,000	8,000	5,333	53,330
1.3	Active Travel Campaign to switch 330 commuters in Barna and Knocknacarragh to Cycling per year	67	67	67					202
1.4	Information campaign to encourage GV owners to switch to EV Vans	1,020	2,040	3,060	4,080				10,201
1.5	5% replacement of FF ICE domestic cars with EVs annually	104	104	104	104	104	104	69	694
1.6	Campaign for Tractors & Machinery in SEC to switch to HVO	1,779	1,779						3,557
1.7	500 homes with 2kWp installations with 500 additional homes recruited each year until a target of 3,322	275	275	275	275	275	275	183	1,834
1.8	Encourage 50 PSVs to transfer to EV per year	221	221	221	221				883
2	Community/Council Partnership 5MW PV electricity generation project			1,500	1,500	1,500	1,500	1,500	1,500
3.1	50% Replacement of Diesel Bus by Hybrid Bus on Private Route		48	48					96
3.2	Micro-Hydro Scheme 1		186						186
4.1	25% of Bus Éireann Buses from Hybrid to EV			322	322	322	322		1,289
4.3	Micro-Hydro Schemes 2 per year			282	915	122	612		1,932
	Total Emissions Reduction tCO2	**27,426**	**28,679**	**13,879**	**31,377**	**26,284**	**26,774**	**17,726**	**166,146**

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