INISHTURK

Sustainable Energy Master Plan

Achieving Zero carbon energy

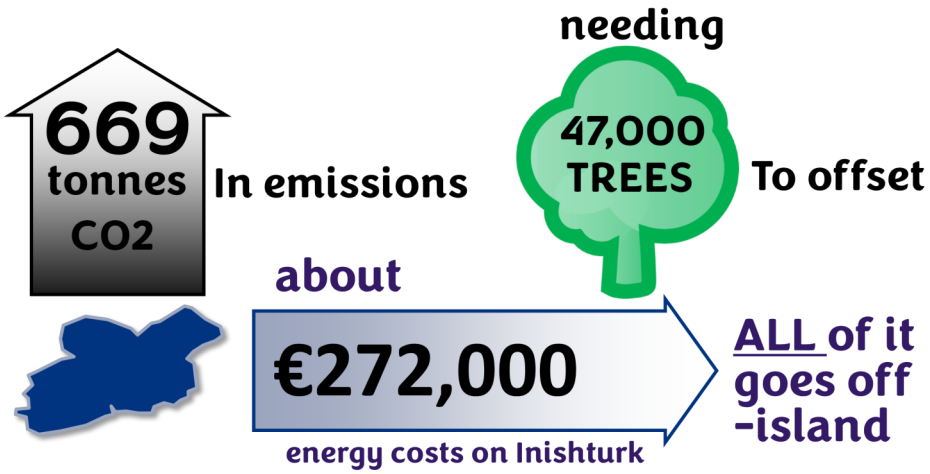
Supported by

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

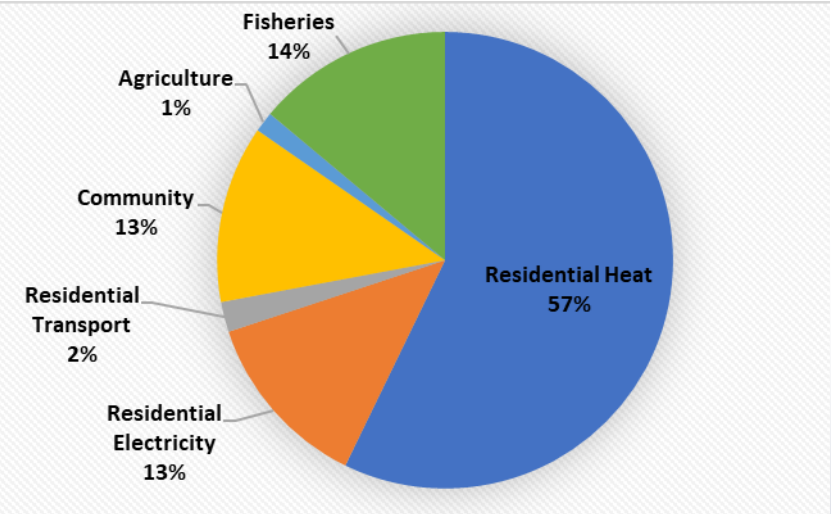
Comhairle Contae Mhaigh Eo
Mayo County Council

What is the cost of energy on Inishturk?

Like most communities in Ireland the island of Inishturk imports its energy. This is in the form of fossil fuels from abroad. The island 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.



What's Inishturk's Energy Balance?



Home heating is the biggest use of energy—if we can reduce the amount of oil, coal and electricity we use to heat pour homes by making them cosier and more efficient, we can save money and reduce emissions. The same is true of the school, church, and community club building. There are things that can be done to reduce fisheries and farming emissions without affecting production, and the island's electricity can be produced sustainably locally which will have a big impact on emissions, and will save money in the long run

The Inishturk Sustainable Energy Plan

Inishturk Sustainable Energy Community (SEC) supported and funded by the Sustainable Energy Association of Ireland, commissioned a full study of the energy uses of all sectors of Inishturk. This baseline energy survey also measured the carbon emissions produced by this energy use. Energy Co-operatives Ireland carried out onsite surveys of homes community, and other public buildings. The study also looked examined energy use in farming, fisheries and domestic transport. FULL REPORT AT: energyco-ops.ie/Inishturk.pdf including **all references for this document**

INISHTURK

Sustainable Energy Master Plan

Achieve Sustainability in your HOME

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

The average home on Inishturk emits **19,588 kg CO2** each year. This is well above the national average of 3,800kg CO2 as reported by the EPA. Some of this is due to the relative size of homes on Inishturk (which are also detached houses and thus exposed on all sides) as well as the lack of availability of natural gas which is much less carbon intensive than most other home heating fuels. The island's electricity supply has a higher carbon intensity as it is produced by diesel generators.

Step	Item	Action	BER post action	Energy Costs Post Action	CO2 emissions post action
0	Current State	No Upgrades	G	€9,737.65	27,639
1	Insulation Attic	Upgrade Attic Insulation to 300mm+	F	€7,903.09	22,432
2	Roof Insulation	Flat Roof Insulation	E2	€6,695.26	19,003
3	Internal Insulation	Insulated Plasterboard internally on original stone walls	E1	€5,847.69	16,598
4	External Insulation	Extension Walls	D1	€4,689.71	13,311
5	Windows	Change Single Glazed Windows to < 1.1 w/m2k or better	D1	€5,967.16	16,937
6	Secondary Heating System	Remove Range Cooker	D1	€4,594.24	13,040
7	Heating System	Air to Water Heat Pump for heating and hot water	B1	€2,615.53	4,049
8	Photovoltaic	6 PV Panels to South facing roof 2.19 kWp	A2	€1,584.35	2,453

A G-rated home (the lowest) can be upgraded to an A2 rating saving up to €8,153.30 per year in heating costs and 2,150 kg of CO2 emissions following the actions recommended by our survey of an Inishturk home.

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: energyco-ops.ie/Inishturk.pdf

Taking a grouped, staged approach to improving the energy efficiencies of the island's homes will enable the community to move forward rapidly to sustainability. Contractors are more likely to quote for work when there is a group contract of more than 10 homes. Costs savings from bulk purchase of materials will help offset additional transport costs to the island. There are contractors willing to participate in grouped retrofit projects

Sustainable Community Buildings

Retrofitting three key community buildings on Inishturk

We surveyed the community club, the church and the national school, finding that all three would benefit from retrofitting works that will save money, cut emissions and future-proof them for good.

Premises	Energy Use kWh/yr	Cost €/yr	Emissions kg CO2/yr	Energy Use Post Works	Energy Use % Saved	Emissions Saved kg CO2/ yr
Community Club, Shop and Bar	116,176	€23,388.55	36,320	65,059	44%	116,176
National School	12,691	€2,821.56	5,291	2,808	78%	12,691
Church	11,500	€4,218.00	7,452	4600	60%	11,500
TOTAL	**140,367**	**30,428**	**49,063**	**72,467**	**48%**	**140,367**

would save the same amount of carbon dioxide as planting 10,000 trees

Works recommended for the Community Club

	Current	Potential
Energy management	★★	★★★★★
Building fabric	★★★★	★★★★★
Building services	★★★	★★★★★
Manufacturing & processing equipment	N/A	N/A
Manufacturing & processing controls	N/A	N/A
Use of renewables	★★★★★	★★★★★

Action	Energy saving per yr (€)	Emissions reduction per yr (t CO_2e)	Cost of action (€)	Payback period (years)	First step
Install heat pump	€ 1,325	2.68	€ 12,000	9.06	Own funds a will not qualify for grant
Timers on bottle beer/drinks cabinets	€ 60	0.06	€ 70	1.17	Communities grant application
Building Fabric Upgrades	€ 1,422	2.49		Long	Communities grant application
Heating Controls on space heating	€ 829	1.69	€ 70	0.08	Communities grant application
Lighting upgrades	€ 328	0.33	€ 1,800	5.48	Communities grant application
Occupancy sensors in toilets and stores	€ 141	0.14	€ 500	3.55	Communities grant application
Energy Monitoring and Staff Engagement	€ 2,339	3.77	€ 5,000	2.14	Communities grant application
Total	**€ 6,444**	**11.16**	**€ 19,440**		

Cutting Emissions in Transport

Inishturk's terrain and current vehicle use requires a mixed approach to reducing emissions

The approximately 30 cars in use on the island are spit between saloon and SUV-type cars. Saloon diesel cars can be easily switched to electric vehicles (second hand with shorter ranges). SUVs and four-wheel drive vehicles used in rough terrain will be expensive to electrify. For these drivers we recommend HVO as the best medium term route to reduced emissions.

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**

Hydrotreated Vegetable Oil (HVO)

HVO is a type of renewable diesel fuel that is produced by hydrotreating vegetable oil. It can be used as a direct replacement for fossil diesel in diesel engines.

Emissions for HVO are said to be up to 90% those of diesel. However, it should be noted that HVO is a short term solution which will need to be replaced by other solutions in the future: from newer biofuels, to high performance BEVs, to fuel cell SUVs.

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 300km or more and cost about €30,000 new. This EMP recommends **second hand** BEVs for use on Inishturk and mid-range BEVs on a vehicle shared scheme on the mainland.

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

Off-island Driving

There is a car park on the mainland at Roonagh pier. Residents on the island have cars there to enable mainland travel as there is no scheduled bus service to Roonagh pier. In the absence of such a bus, islanders could explore a car-share of two or three electric vehicles. Long range high spec BEVs are not required as the distance to the rail hub at Westport is 30km, medium range 150km models (often costing €30k) are adequate. Two to three dedicated EV charging points at Roonagh would be required. It is proposed that this be discussed at a community meeting hosted by the SEC steering committee.

Marine Transport

The operators of the ferry were not consulted directly for this report as the sector was not covered by the commission. We feel that this does represent an opportunity, however, as a reduction in emissions in a sector that may well be the largest source of carbon emissions for the islanders. There are regulatory concerns using an alternative fuel in a ferry. This has been examined by the European Maritime Safety Agency. We propose that this could be investigated with the department of the marine as a possible research project.

Keeping Farming and Fishing Sustainable

Inishturk relies on fisheries and agriculture as a source of income and jobs: this can be protected and sustainable.

While the island has a strong tourism sector, primary industries are still very significant. They do not in general have a major role in the island emissions, but they are sectors where sustainability gains can be made. We address the energy emissions of each sector here as places where emissions can be reduced.

Energy	kWh/yr*	kg CO2/yr	Cost
Agriculture	23,250	57,140	€4,118
Fishing	225,000	93,000	€36,000

*Mainly diesel

Farming

The energy use in Sheep Farming in the West of Ireland is generally quite low. Transport of animals is generally 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 on Inishturk is likely to be classified as micro-generation for export to grid (although a minimum auto-consumption of 20% is required). We look at this in the renewable energy generation section below.
Mayo County Council has produced a report on carbon reduction opportunities on farms Mayo farms which is available at this LINK

There are possibilities for reducing the (low) emissions in the agriculture sector on Inishturk through the replacement of agri-diesel with HVO. This will of course have cost implications as agri-diesel is heavily subsidised while HVO is not.

Fisheries

There is a long-term need to move away from fossil fuels as the energy source of our fisheries. Bord Iascaigh Mhara (BIM) have produced a useful document on the issue. While overall, the seafood sector in general can be considered a low-carbon industry and food source, BIM suggests the drive to decarbonise the Irish seafood sector will intensify. The main contributors towards emission reductions will be international obligations to achieve Net Zero emissions by 2050, maintaining ecosystem biodiversity and sustainability, consumer demand for low-carbon products, and increasing fuel costs.

There is still a long way to go in terms of technology and supply chain development for zero emissions vessels. While these are valid long-term opportunities, there are realistic short-term options we can recommend here. Biodiesel has moderate a carbon emissions reduction possibility for the Inishturk fishing boats as an additive to diesel. HVO has been seen as a ‘drop-in’ option for some boats: it requires no engine modifications and is seen as achieving a 90% level of carbon emissions. It is sold in Ireland. Achieving such a reduction in the carbon emissions of the fisheries on Inishturk would be no small achievement and should be investigated by the relevant members of the community. We propose a trial, perhaps with scientific monitoring in place to validate the percentage reductions claims of HVO. There are academic and research organisations that will be interested in pursuing this.

Can Inishturk Power Itself?

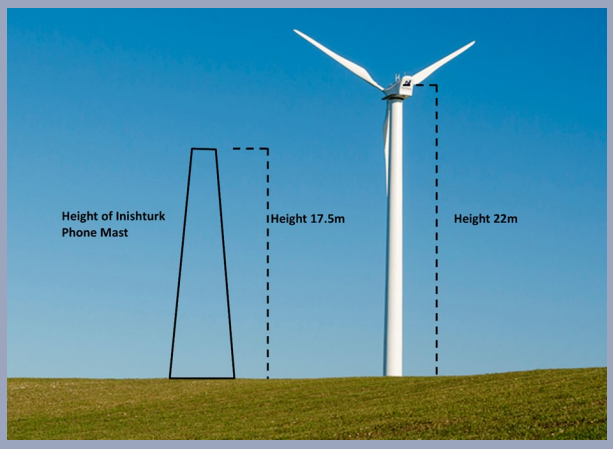
Inishturk is not connected to the national electricity grid. Electricity demand is met by on-island diesel generators. There are viable renewable energy resources on the island that could meet the level of the island's energy demands removing the total reliance on diesel for electricity. These become even more viable where renewable energy generation is matched with the energy efficiency and energy switching strategies outlined above.

Inishturk could rapidly become almost 100% energy self sufficient in electricity. This would be as a result of taking three potential opportunities:

Small Scale Wind Generation— Small Scale Photovoltaic (PV)— Micro-Scale PV

Small Scale Wind

The details of the proposal are laid out in the full study. In summary, there is adequate wind resources for a small 100kW turbine to meet much of the island's demand. This would replace much of the diesel required by the on-island generators (which would be retained as a back-up when the turbine is offline). The economics of wind generated electricity are superior to those of diesel. **The sustainability impact and emissions reduction would be undeniable**. From a planning point of view, it should be seen that a 100 kW turbine is not very much larger than the communications mast on the island. The reliance of the island's electricity on diesel need to be addressed in any case. Without an onshore renewable energy source, the island will be obliged to use diesel to supply all of its electricity. This would run counter to the overall national policy goal of decarbonisation through increased electrification.



There are further significant needs in relation to the ownership and management of the local distribution grid which need to be investigated in the case of Inishturk. Before any progress is made, investigatory discussions with ESBN would be necessary.

Before any progress is made, investigatory discussions within the community, with relevant landowners and ESBN would be necessary.

500kW PV farm on 1 hectare

In comparison to other locations in Ireland, Inishturk receives less solar radiation. This by no means indicates that PV generation at Small Scale is unfeasible. The estimated output of power for a 500 kWp farm on Inishturk is approximately 457,000kWk/yr. This would meet the demand of a post retrofitted , electrified island . A farm this size requires a 1 hectare south facing site. There are numerous available. Landowners typically receive a payment for PV farm land lease.

Planning, environmental and community acceptance considerations are critical to feasibility, but economically and technically, such a PV farm would be possible and profitable as well as sustainable. Such a PV farm would reduce Inishturk's carbon footprint by 25% on 2023 levels.

Micro Generation PV

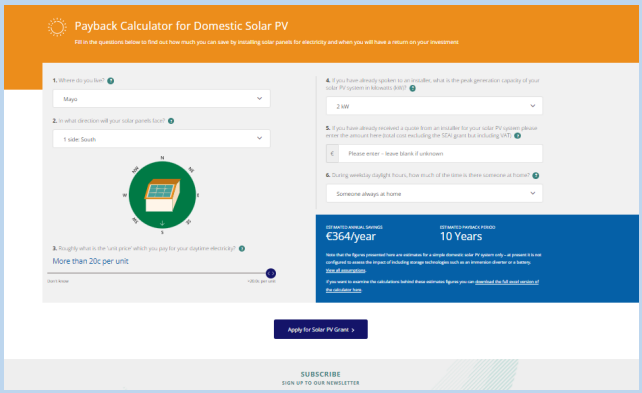
A domestic solar PV system consists of a number of solar panels mounted to your roof (or in your garden or adjacent field) and connected into the electrical loads within your building. Solar PV systems are rated in kilowatts (kWp). A 1kWp solar PV system would require 3 or 4 solar panels on your roof.

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

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 even on Inishturk. 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 on Inishturk

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, 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^{0}C (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.

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

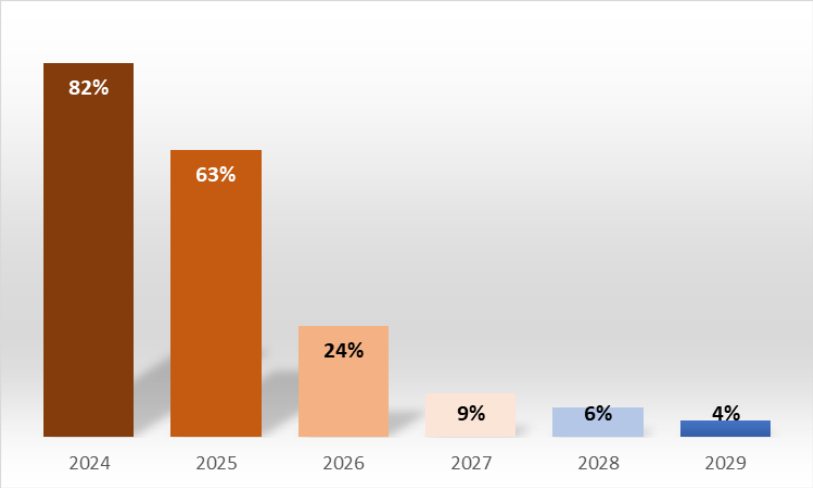
For homes built and occupied before 2006 for insulation and heating systems

*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 Sustainability strategy

Emissions Reductions Each Year in kg CO2								
Priority	Action	2024	2025	2026	2027	2028	2029	TOTAL
1.1	Retrofit 25% of G-C3 homes each year	76,826	76,826	76,826	76,826			**307,305**
1.2	2 Community Buildings upgraded each year achieving >50% energy reduction overall	41,611	28,257					**69,868**
2	5 homes with 2kWp installations with 5 additional homes recruited each year until a maximum of 21	2,722	2,722	2,722	2,722	544		**11,431**
3	Community/ESB/Mayo Co Co Partnership 100kW-500kW electricity generation project			157,854				**157,854**
4	20% replacement of Diesel saloon cars with BEVs annually	880	880	880	880	880		**4,402**
5	Replacement of Diesel by HVO in 20% of the SUV fleet n=3	352	352	352	352	352		**1,761**
6	Replacement of Diesel by HVO in 20% boats per year		18,600	18,600	18,600	18,600	18,600	**93,000**
	Total Emissions Reduction	**122,391**	**127,637**	**257,235**	**99,380**	**20,377**	**18,600**	**645,621**

A 645,621 reduction in kgs of CO2 is equivalent to the emissions uptake from **46,000 trees**



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

carbon footprint™

The carbon measurements here looked specifically at emissions from on-island energy and do not include emission from food consumption, and off-island traffic such as ferry or air travel. You may want to look at your total footprint. A good place to start is the carbonfootprint.com tools