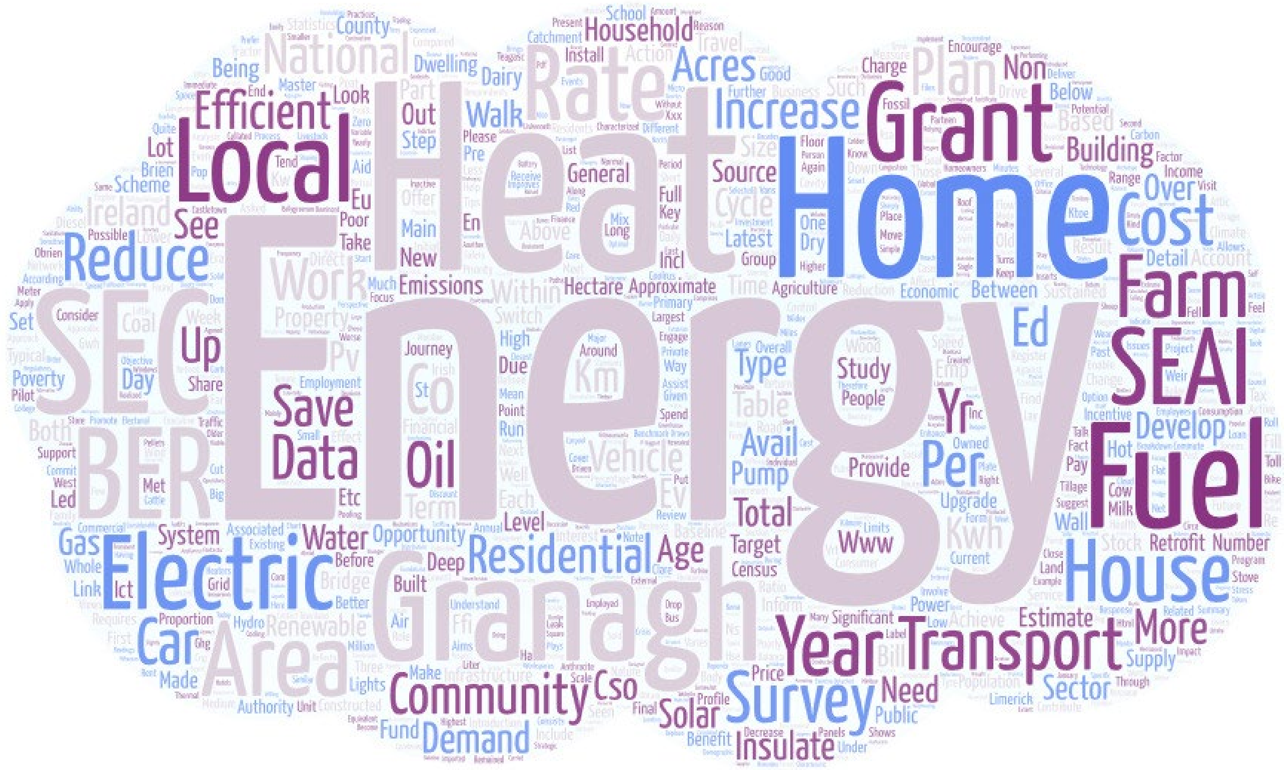
Granagh Development Association (SEC)

Energy Master Plan

Baseline Energy Balance

February 2022



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Erasmus Smith House, Church Street, Cahir, Co. Tipperary
Registered in Ireland no.280878 •VAT no.IE8280878K

353 (52)7443090
info@tippenergy.ie www.tippenergy.ie

Executive Summary

February 2022

This local Energy Plan has been developed to enable the community to look at its existing and future energy needs in terms of power, heat, and transport and to determine where it sees priorities and opportunities for action.

The development of the plan has been led by a steering group that includes representatives from the Granagh Development Association (SEC) and initial assistance from the SEAI county mentor, the development of the plan has been funded as part of the SEAI Sustainable Energy Community program.

Granagh Development Association, a registered member of the Sustainable Energy Authority of Ireland's (SEAI) Sustainable Energy Community (SEC) Network, has entered into a three-year Partnership Agreement with SEAI. The objectives of the SEC program are to:

- Increase energy efficiency
- Use renewable energy
- Develop decentralized energy supplies

Step 2 of this 5-step process involves the preparation of an Energy Master Plan (EMP) for the SEC territory (Study Area) to establish the baseline energy consumption for an agreed year, and the formulation of a Register of Opportunities that will deliver significant energy demand reductions and contributions from renewable energy sources. In this particular case, the Study Area consists of the Coolrus electoral divisional (ED), Ballygreenan ED, the townland of Graigbeg (Castletown ED), and townlands of Ballyguiletaggle and Ballyguilebeg both of which are in the Ballynoe ED. The total population of the Granagh catchment area according to the latest Census data is estimated to be 800 persons.

The baseline year for this energy master plan is 2016. In this milestone-report, it has been estimated that the total **energy usage** in the Granagh Sustainable Energy Community catchment area is approximately **14,883 MWh/y**r. and produces **3,861 tons of CO_2 per year** (carbon dioxide) with a total estimated spend in the purchase and use of energy of **€1.66 million per year.**

Baseline Energy Demand Granagh SEC						
TYPE	Granagh SEC Ktoe	MWh/yr.	$ktCO_2$/yr.	tCO2/yr.	% Energy demand	€/year
Transport Energy	0.7	8,590.1	2.3	2,268	58%	€899,636
Agriculture Energy	0.1	1,277.8	4.8	337	9%	€147,455
Non-residential Energy	0.1	584.0	0.2	154	4%	€115,722
Residential Energy	0.7	4,430.9	1.1	1,102	30%	€499,842
Total	**1.6**	**14,882.7**	**8.4**	**3,861**	**100%**	**€1,662,656**

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The Granagh Development Association would like to commit to an ambitious energy demand reduction in buildings with a target of 50% and to develop community-owned renewable energy projects to over 80% of energy usage by 2030.

From the findings in the local energy plan for Granagh Sustainable Energy Community the following suggestions could be a guide for the next steps:

- Outreach into the community and prepare list of homes that are interested in energy saving measures.
- Connect with local contractors about getting building fabric work to homes as individual measures done at scale as this should lower the costs.
- Connect with a one-stop-stop to offer turnkey solutions for full retrofitting of homes and for getting work done in different increments.
- Connect with Community Power to investigate further the opportunity for a community owned Renewable energy project i.e. Solar PV farm.

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Baseline Energy Demand for Granagh SEC infographic

To achieve the 50% reduction in energy usage from the homes of Granagh SEC will require the retrofitting of 250 homes in Granagh by 2032. 15 No. Homes would require a deep retrofit from a BER D or lower to get them to a BER B2 and 10 homes per year would require a shallow retrofit from an average BER C2 to a BER B2 for the next ten years. This would require an estimated investment approximately €5.25 Million Euro with €25,000 in grant support now being made available in 2022 for a full retrofit of each home. The community could save an estimated €254,951 per year going forward when this work is completed. The greenhouse gas savings ($tCO_{2)}$ from the full retrofitting of Granagh SEC would be in 865 tCO_2 (22%) per year when the full program was completed for example. The uplift in energy savings achievable from actions recommended from the 7 No. Energy Audits performed on homes in the Granagh SEC area is between 25% to 63% on a case-by-case basis, and the analysis undertaken in the reports have suggested what building upgrade measured would need to be undertaken in each home to get the house 'Ready Pump' ready. further engagement with a 'one-stop-shop' would be necessary if any home wish to undertake a full retrofit.

St Joseph's National School and the Granagh community Centre were chosen for an energy audit from the non-residential sector. From the energy saving measures identified there would be a combined 38MWhr in energy savings made, 10 tons of CO2 saved per year with an average €1,700 in saving each year for each building if these buildings received energy upgrades. The estimated cost for upgrades to both buildings would be in the region of a €311,926 investment.

For the transport sector to achieve a 50% reduction in energy consumption, 495 private electrical vehicles and 40 commercial Electrical vehicles vans would need to be on the roads of Granagh. The lack of EV charging infrastructure in the Granagh SEC and surroundings needs to be immediately addressed to allow the adaption of EV in local and wider area.

50% Energy Savings in the agricultural sector could primarily come from energy reduction from Milking parlors with the upgrade of hot water heating systems, upgrade of lighting and pumps and milk cooling equipment to more modern and energy efficient as well as with the installation of Solar PV on farms where applicable. Energy Savings from LED lighting upgrades of sheds which house livestock over the winter months can also be made and schemes like TAMS2 can offer up to 60% in grants. This will need further engagement from the Granagh SEC.

Also, a community owned Solar PV farm would provide locally produced green electricity in the area and further assist in decarbonisation of the local and national electricity grid. Once the economics would stack up a 15-year revenue stream would be available to the Granagh SEC and would net approximately €450,000 per year into the community. The estimated investment cost of a 25 Acre Solar PV farm would be in the region of €4.5 Million Euro (excluding ESB connection charges and potential substation upgrade).

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1.0 Introduction

1.1 What is an Energy Master Plan?

An Energy Master Plan (EMP) enables the local community to look at its existing and future energy needs (in terms of power, heat, and transport) and state where it sees priorities for action. It also identifies opportunities that the community determines offer practical action to support its current and future energy system developments.

Energy Master Plans are co-created by local communities rather than being developed for them by other bodies (e.g., local authorizes or National Government). They set out key priorities and opportunities identified by the community, assisted by a range of other organizations who have an interest in this community. These include residents, businesses, community organizations, local authorities, distribution network operators, and local generators.

A key aspect of the development process is the ability of the local community to understand its energy and transport systems, but also place them in context within the wider changes taking place across Ireland. It can therefore look for opportunities that offer local benefits consistent with national low carbon targets. These benefits can be:

- Direct - such as the generation of electricity or heat for local use displacing more expensive imported grid-supplied electricity or fossil fuel.
- Economic - developing employment opportunities associated with energy supply (e.g., micro-hydro generation) or enhanced efficiency (e.g., insulation and glazing work on homes or medium to deep retrofit projects).
- Social - Production of local energy to supply homes in fuel poverty can reduce stress and enhance health outcomes for residents.
- Strategic – using energy storage mechanisms to maximize outputs from community-owned generators or use of technology to enable better trading of locally produced energy offers the community more effective use of its local resources.

The EMP provides a start in the community's engagement with its energy needs. It offers a focus for immediate opportunities that can be developed in the short term. It also provides scope for longer-term planning for further changes in the future.

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1.2 Granagh and its Local Energy System

The supply of power and heat to homes and businesses is viewed strategically at a national level. However, the local community in Granagh also plays a pivotal role in shaping their energy needs. From a demand perspective, householders and businesses can look to reduce their energy needs through, for example, better insulation of buildings and using more efficient lighting and appliances. The roll-out of smart meters will also enable a better understanding of actual energy consumption, rather than relying on periodic meter readings (and estimated Bills).

From a supply perspective, Granagh Development Association can look to develop local Renewable energy electricity generation to support their energy needs. This can be, for example, at an individual consumer level (e.g., solar panels on the roof) or a community scale such as investment in a wind turbine, hydro scheme or solar PV farm.

Understanding the use of power, heat, and transport energy in the community is the first step to being able to develop local energy systems. This has several benefits:

- End users can better understand the amount of energy they use (and the mix of requirements for power, heat, and transport)
- The community as a whole can understand the size of energy demand and how this is proportioned between homes and businesses
- How much of this aggregate demand is met by the existing local generation can be more easily understood.
- Future energy requirements (e.g., new housing or business development) can be considered and compared with the size of the existing demand
- Affordability and reliability of energy supply can be examined
- All these details can be collated in a single information source shared by everyone

This EMP provides a summary of detail collated from the community in Granagh through several engagement routes and events.

1.3 Overview of 'whole system' approach

Our energy needs, and how these are met reliably, cost-effectively, and without long term environmental consequences are one of the key considerations for every community. The Irish government has committed to global efforts to reduce greenhouse gas (GHG) emissions and this commitment will mean significant changes to how we supply., store and use energy. For this reason, the present and future energy needs of a community are most usefully considered in a 'whole system' approach. In this way, the overlapping impacts of how we use power, heat, and transport can be considered at the same time, rather than being seen in isolation.

To apply a 'whole system' approach there needs to be a study boundary drawn to provide a primary area of focus. This does not exclude the linkages with neighbouring areas or opportunities that may be available within proximity of the study area (e.g., land available for energy generation). The study boundary selected for use in the present plan for Granagh SEC is shown in Figure1.

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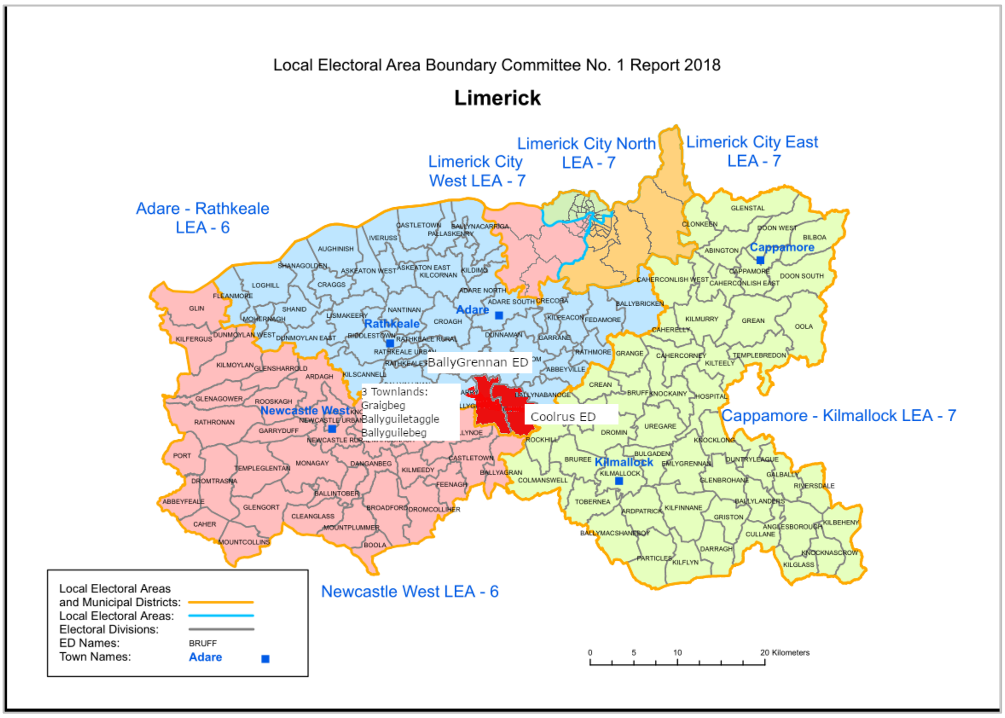

Figure 1: Local Energy Plan Boundary Granagh SEC

The area highlighted in red in the figure1 above is the geographical location of the Granagh SEC catchment area. Granagh SEC has an area of 39 km² (9702 Acres or 15.2 square miles) and consists of 19 Townlands spread over 4 electoral divisions (ED) in Co. Limerick.

Coolrus ED

Granagh	365 Acres
Doorlus	171 Acres
Coolrus	1034 Acres
Kingsland	214 Acres
Kilmore	968 Acres
Kilmore Demense	110 Acres
Liskennett East	236 Acres
Liskennett West	300 Acres
Kilmacanearla North	462 Acres
Kilmacanearla South	119 Acres

Ballygreenan ED

Ballygreenan	953 Acres
Ballyvologue	281 Acres
Ballynashig	150 Acres
Graigacurragh	611 Acres
Killoughty	205 Acres
Lisduane	675 Acres

Castletown ED

Craigbeg	219 Acres

Ballynoe ED

Ballyguiletaggle	484 Acres
Ballyguilebeg	95 Acres

1.4 Aims and Objectives

The wider consultation with the community on Granagh, in combination with the views of the Steering Group, has developed an initial set of priorities that should be addressed within the EMP. There was a good response to the home energy survey so a bottom-up approach will be taken where possible, coupled with accessing census CSO data for 2016, SEAI BER mapping data to correlate and estimate the results in this study and it is envisioned to demonstrate the benefit of that ongoing good awareness of behaviours that assist in reducing the overall energy requirement within homes and businesses (demand management) can have.

Building on this, issues relating to home energy use that were prioritized within the consultation are:

- Standard Retrofitting from a BER D or lower to a BER B2
- Shallow retrofitting from a BER C to a BER B2
- Insulation and draught-proofing
- Upgrading of heating systems

In terms of transport the main area of interest is:

- Support for the uptake of Electric Vehicles

As for community-scale energy projects, the areas of priority were:

- Improving the building fabrics of homes within the community
- Renewable energy supplying homes and businesses
- Community-owned Renewable energy generation i.e., Solar-PV farm

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2.0 Characterisation of the local area

2.1 Population of Granagh Sustainable Energy Community

Population and Employment – Summary

- The population has increased by over 50% since 2002 (2016 Census figures)
- Under-14 comprise 20% of the total population; 15 – 64 years olds 64%; Over 64s 16%
- 78% of the overall population are economically active and 98% typically travel to by car
- 28% of the workforce are employed in professional service sector
- 21% of the workforce are employed in the agriculture, forestry, and fishing sectors
- 16% of the workforce are employed in the commerce and trade industries

Introduction

The 2016 Census data provides a population estimate of 713 within the Granagh SEC. In this section, the demographics of age benchmarked against Co. Limerick averages and national averages are outlined along with the percentage of the local population who are economically active, and how the population move, and work are presented.

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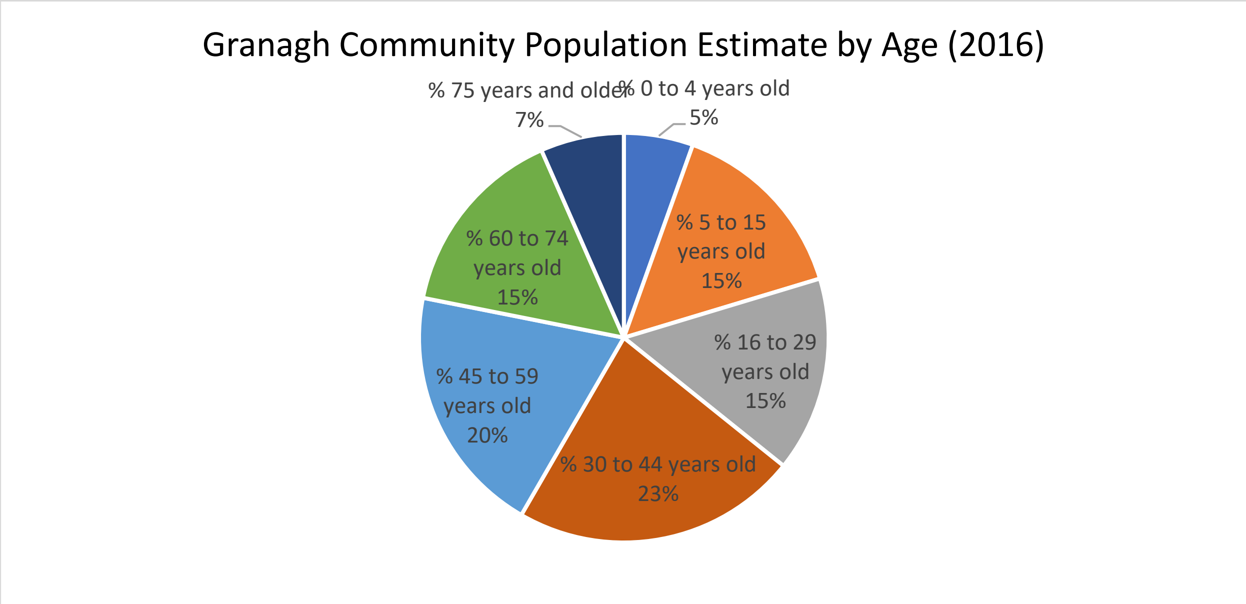

Figure 2: Age profile of residents within Granagh Community

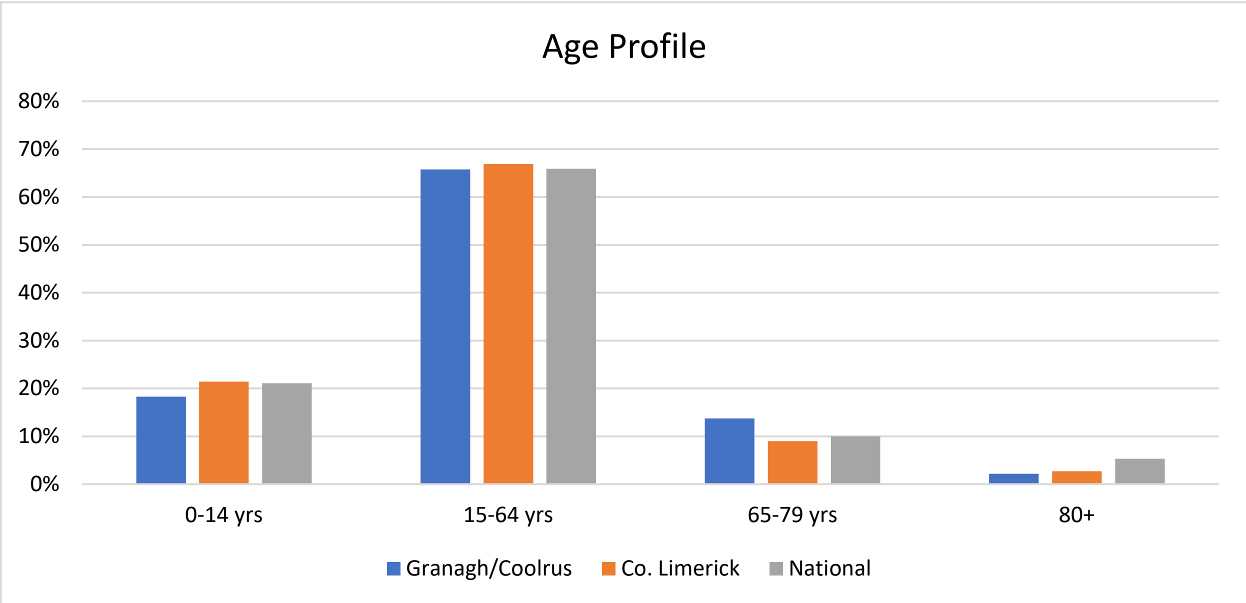

Figure 3: Demographic Profile (Granagh, Co. Limerick and national)

The demographic profile of the Granagh SEC community in comparison to county and national data suggests that the Granagh community has a lower younger population than the county or national averages, a comparable working population compared to Co. Limerick and national data, and a higher-than-average population of retirement age.

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2.2 Employment and journey to work

Of the local population, 55% are economically active; 43% economically inactive and other accounts for 2%. In terms of economic activity, the majority (83%) are in full-time employment, while 11% are full-time students/employed and approximately 5% are unemployed.

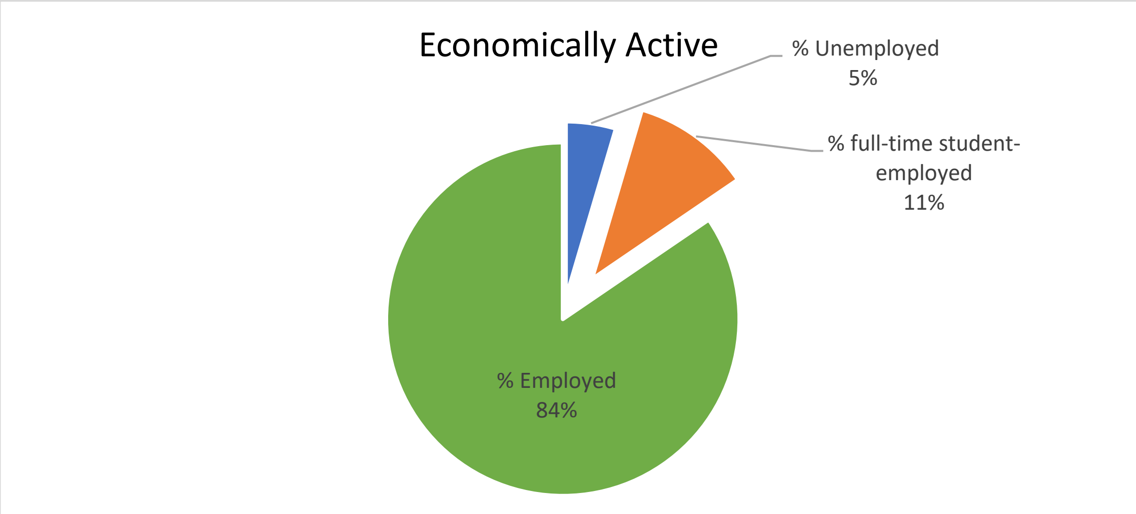

Figure 4: Economically active population

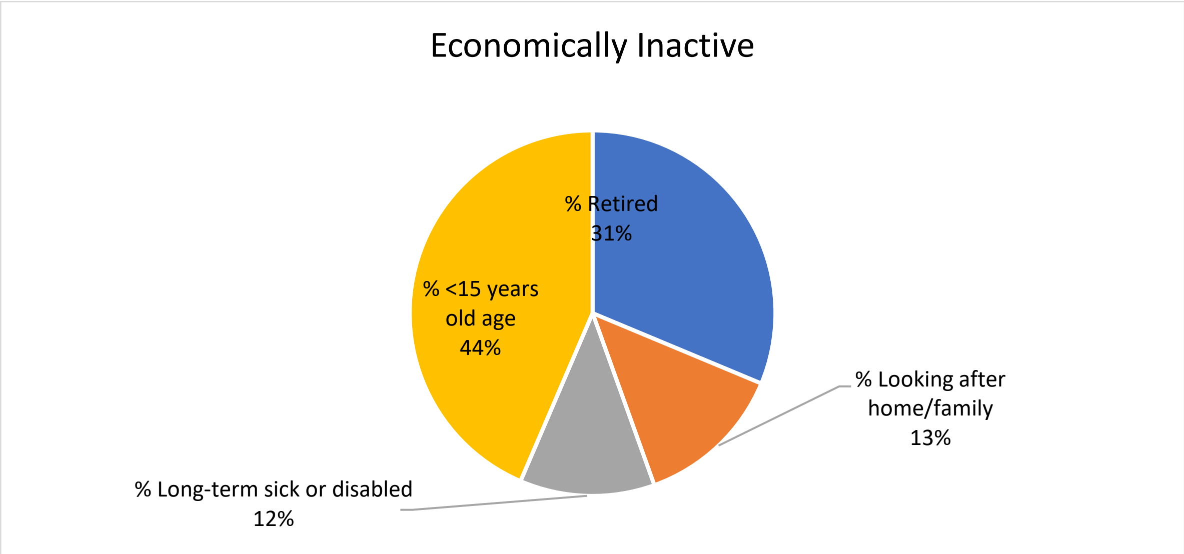

Figure 5: Economically inactive population

Of the economically inactive, 44% are under the age of 15, 31% are retired, 13% are taking care of home/family and 12% are long-term sick or disabled. In respect of employment, the main employment sectors employing people from the Granagh community (based on Census data) are summarised in table1.

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Table 1: Main employment sectors (Granagh community)

Employment Sector	% of Local Workforce
Professional services	27%
Agriculture, forestry, and fishing	21%
Commerce and trade	19%
Manufacturing industries	12%
Building and construction	9%
Other	6%
Transport and communications	3%
Public administration	3%

Those in employment typically use the car to travel to work with 65% of commuting journeys are made by car with 16% made by bus. It is noted that 10% work mainly from home, which again suggests demand for electricity and heat will be sustained in numerous homes throughout each day.

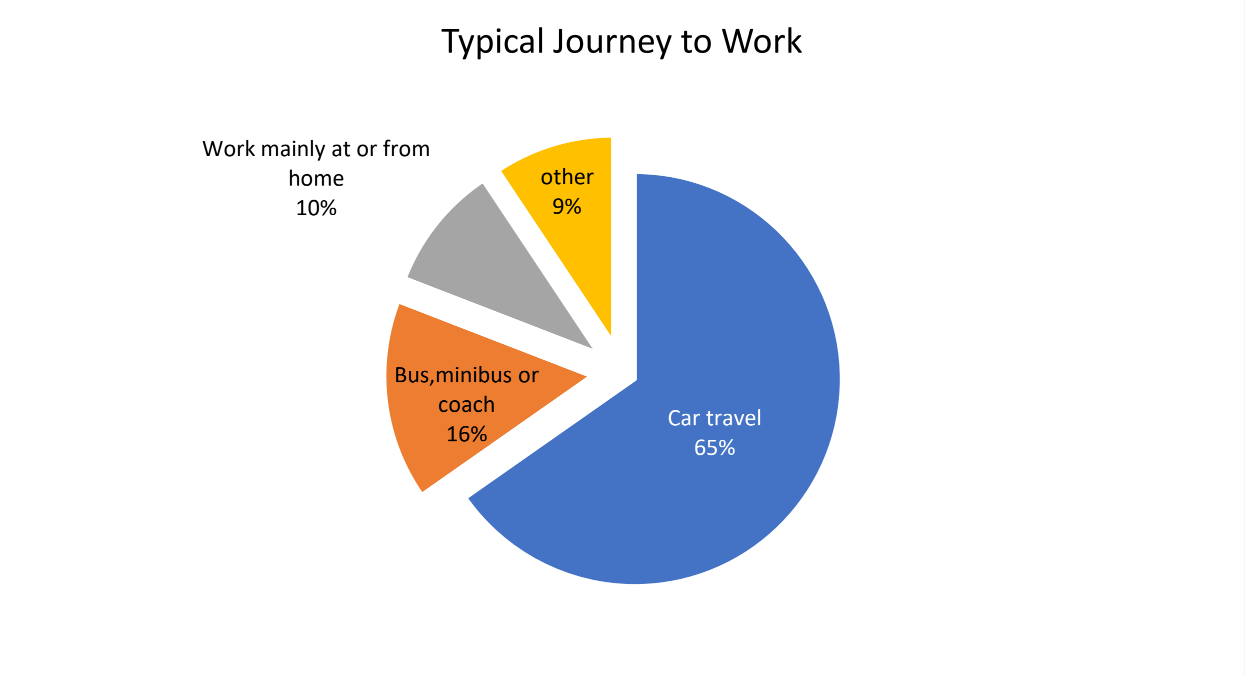

Figure 6: Typical journey to work (Granagh Community)

51% of daily commuters spend 30 minutes or less per journey, with 23% of daily commuters spending between 30-45 minutes per journey and 11% spend between 45 minutes to 120 minutes each day per journey.

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3.0 Residential

Residential Property – Summary

- 85% of domestic properties in Granagh Community are privately owned
- There are a broad mix of solid wall, cavity wall and timber frame construction types
- 74% of properties were built prior to 2000
- Oil heating is used by 68% of dwellings within Granagh SEC; Coal (inc. Anthracite) makes up 13%; Wood fuel 9%; electric heating 3% Peat (inc. turf) 1%
- Fuel poor homes account for an estimated 30% in the Granagh SEC
- Total residential energy demand per year is estimated 4,431 MWh (30% of total Energy)
- 73% (281 homes) of homes in the Granagh catchment area have a BER-D or lower
- Total estimated cost of energy usage in the residential sector is estimated to be €499,656 per year
- Total estimated carbon dioxide emissions are 1,102 tCO_2 per year

3.1 Introduction

In this part the homes in Granagh SEC are reviewed, the BER rating for all homes is correlated and compared to both Limerick County and national BER data. Granagh SEC area has approximately has 281 houses according to the latest CSO figures. In analysing the CSO statistics Granagh SEC has a high percentage of old houses with 16% (44 houses) of the houses built before 1919. Any house built before 1997 will have a considerably poor BER rating. 157 houses (64%) were built before 1991 and therefore may be poorly insulated. New building regulations were introduced in 1997.

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3.2 Granagh Residential Energy Use

Table 2: Summary of residential archetypes in Granagh SEC

Characteristic	Details
Archetype	House/Bungalow (98%) flat/Apartment (0.7%)
Age	Around 74% of the housing stock is at least 40 years old; 51% were built in the pre-1980 era. The largest proportion of housing stock was built during the period 2001-2010 (22%)
Tenure	85% of properties are owner-occupied; a further 1.2% are owned by the housing authority.
Construction Type	Solid wall construction predominates in pre-1950 properties; cavity and timber frame wall 1950-present construction in the period
Primary Heating Fuel	Oil is the primary heating fuel in 68% of properties; coal/anthracite a further 13%; wood fuel 9%
Estimated Energy Efficiency	Around 39% of all properties have an energy efficiency rating between E-G. 37% of properties have a BER-D rating, 21% have an energy efficiency rating of BER-C (post-2000) and only 4% with an efficiency rating of BER-B1

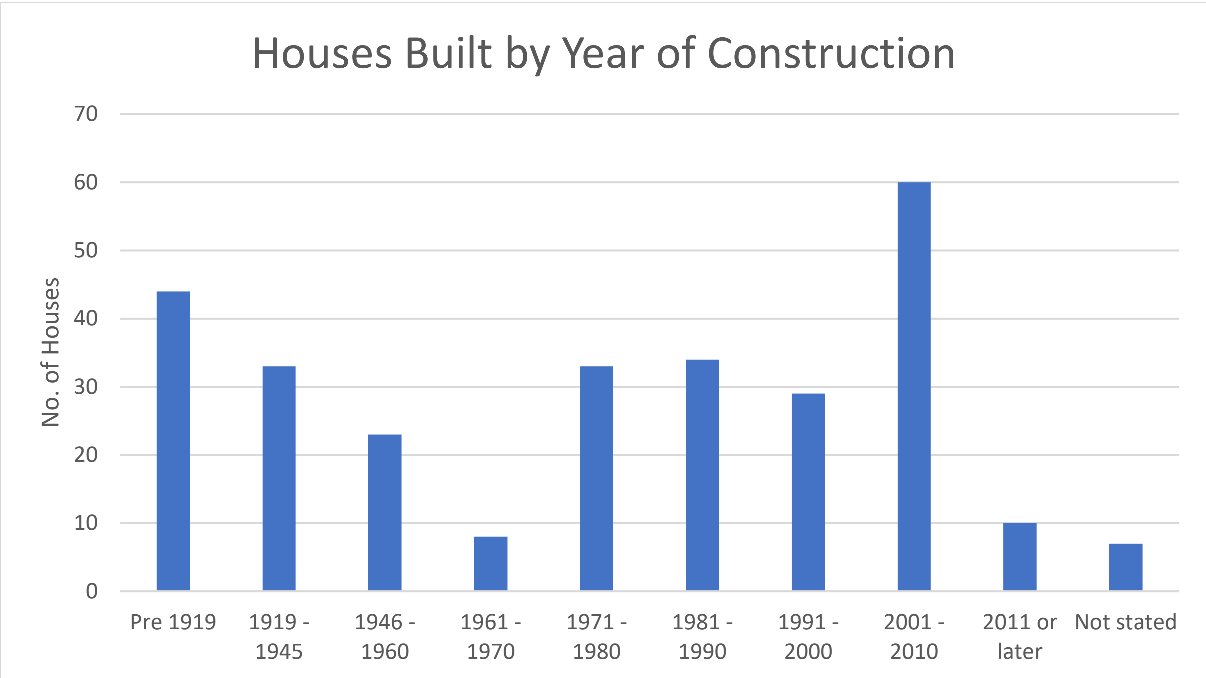

Figure 7: Year of Construction of Homes in Granagh SEC (CSO)

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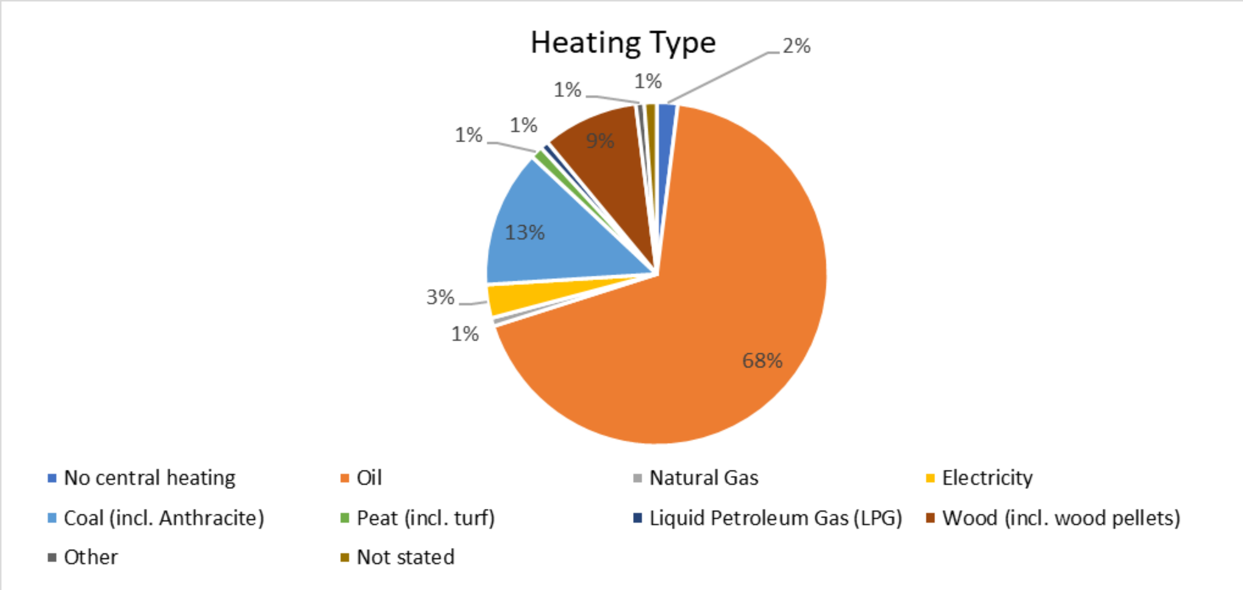

Figure 8: Household heating type in Granagh (Source: CSO Census data 2016)

In terms of primary fuel used for heating, the dominant sources in the Granagh SEC study area are oil and Coal (incl. Anthracite). As can seem from figure 8 approximately 68% of properties (173 homes) in the study area heat their homes using home heating oil (Kerosene); 13% with coal (incl. Anthracite) 9% with wood fuel; 3% with electricity.

Below in table3 is an estimation summary of the euro spending and carbon emissions per year of the residential sector in Granagh:

Table 3:Residential Summary

	Annual Cost in Euros		Annual CO_2 Emissions in tons	
Bill Type	**Per House**	**SEC**	**Per House**	**SEC**
Heating	€1,067	€299,905	2.5	881.6
Electricity	€712	€199,937	1.4	220.4
Total	€1,779	€499,842	3.9	1,102

3.3 National Residential Energy Use

Looking at national figures, the residential sector had the second-largest final energy demand in 2017 at 24%. As can be seen in the figure below the energy demand in the residential sector decreased every year from 2007 to 2012. This may be due to several reasons such as high energy prices and reduced household expenditure due to the recession which would have resulted in colder homes. An increase in fuel such as turf and wood which may not be entirely captured in the results as well as increased efficiency of new dwellings and upgrades of older dwellings may also account for the

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reduced energy use. Energy use has been increasing since 2015 and this may be due to an increase in household income as the economy improves reduced oil prices, and households switching from wood and peat to oil, gas, and electricity.

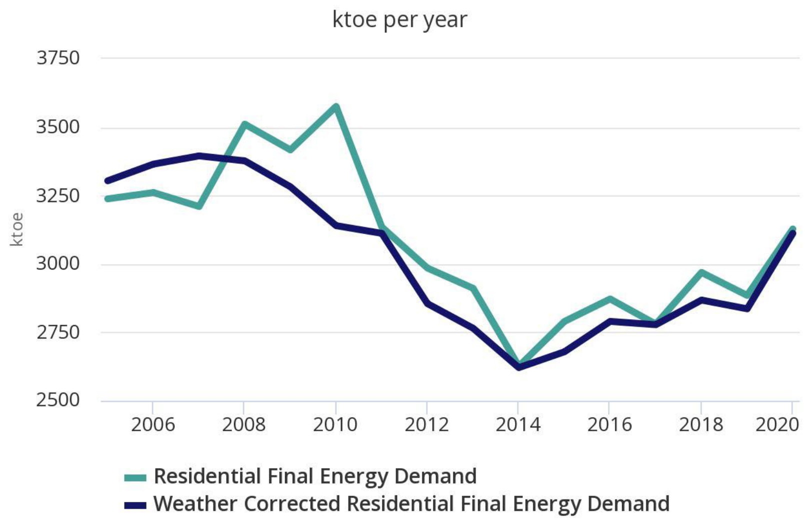

Figure 9: National Residential Energy Demand (SEAI)

The average house uses approximately 17,211 kWh of energy which comprises 74% of direct fuels and 4,503kWh (26%) of electricity. Direct fossil fuels account for over 70% of the energy use in the house and renewables only account for 3% according to the latest CSO figures.

Interestingly, as the final energy demand is increasing the CO2 emissions are falling. This is due to the reduced amount of coal and peat been used as residents switched over to natural gas or oil. Electricity generation is also cleaner as more renewables are brought onto the grid and less oil and coal are being used to generate electricity. Renewables such as PV and the use of heat pumps to heat our homes will decrease our residential emissions even further. In 2020, the average dwelling emitted 6.5 tons of energy-related CO2 (3.9 tons from fuels like oil, peat and wood and 2.6 tons from electricity).

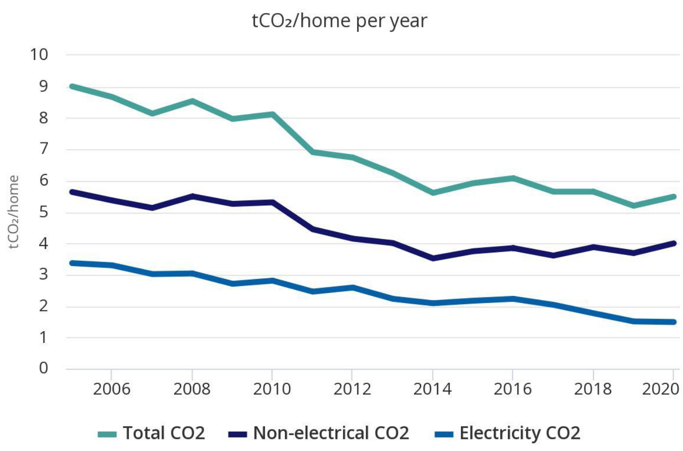

Figure 10: Residential Emissions

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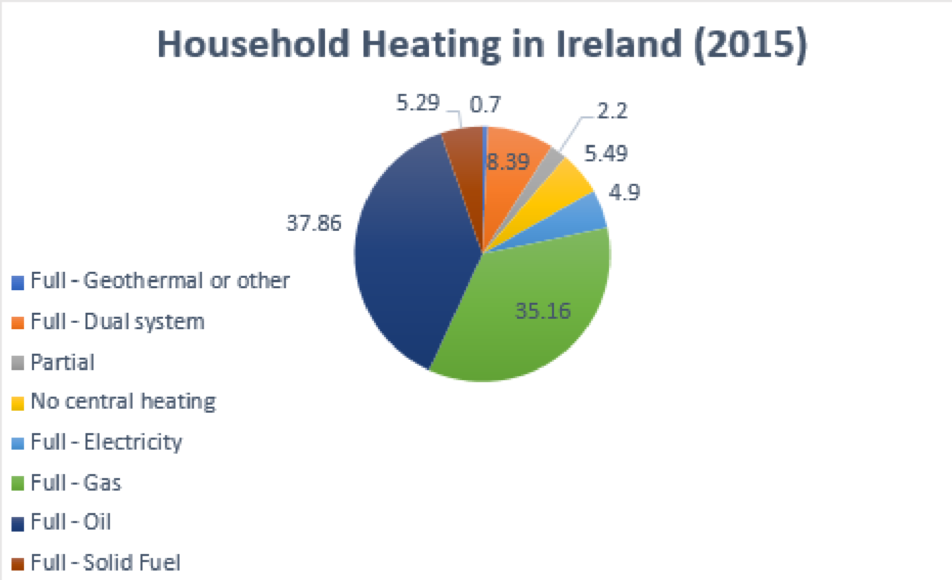

Figure 11: Household Heating type in Ireland

Figure 11 above shows the home heating type profile in Ireland (CSO) for 2015. It can be seen that oil accounts for circa 38% of home heating and gas heating account for 35% of household heating type. In Granagh SEC, oil heating accounts for 68% of home heating given that there is no natural gas infrastructure serving the catchment area, oil (kerosene) is the dominant fossil fuel used to heat homes.

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3.4 Climate Action Plan 2030

The Irish Government recently published its Climate Action Plan. The objective of the Plan is to enable Ireland to meet its EU targets between 2021 and 2030 to reduce its carbon emissions by 30 % and lay the foundations for achieving net-zero carbon emissions by 2050. The Plan has 180 actions that cover all sectors that need to be implemented to achieve these targets. Under this plan, the government in the [Climate Action Plan](#) has set a target of improving home energy efficiency through the retrofitting of 500,000 buildings to a BER B2 or cost-optimal carbon equivalent and moving buildings to more renewable heat sources with a target to install 600,000 heat pumps (400,000 into existing buildings).

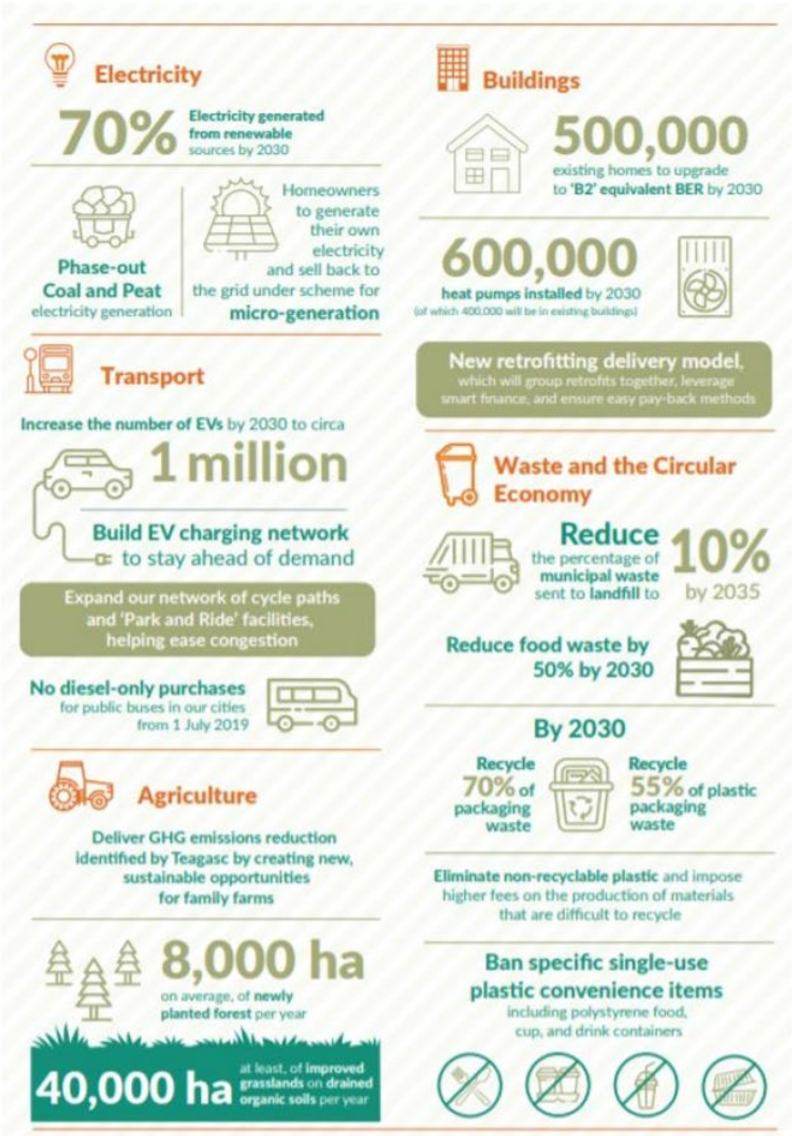

Figure 12: National Climate Action Plan Infographic

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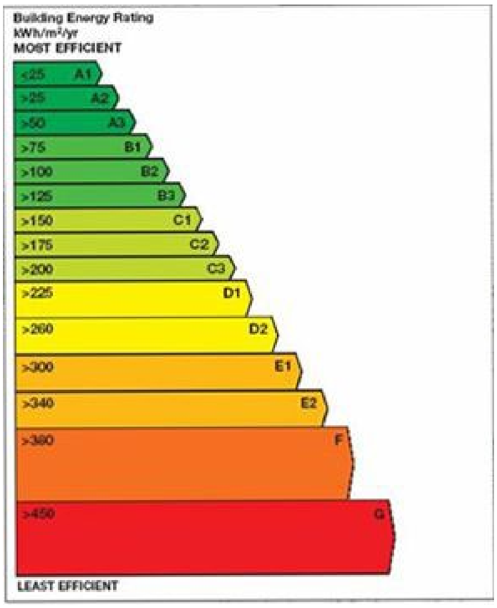
3.5 Building Energy Rating

A Building Energy Rating or BER is an energy label like the energy label on your fridge. The rating is a simple A to G scale. A-rated homes are the most energy-efficient and will tend to have the lowest energy bills. From 1st January 2009, a BER certificate became compulsory for all homes being sold or offered for rent. The BER is an indication of the energy use in your home and covers energy use for space heating, ventilation, lighting, and associated pumps and fans. The energy performance is expressed as primary energy use per unit floor area per year (kWh/m2/yr.).



Looking at the overall BER ratings for Co. Limerick for example the average BER rating is 278 kWh/m2/yr. which is equivalent to a BER rating of a D2. According to SEAI the cost to heat this type of house to a comfortable level is approximately €4,100 based on a detached 200m2 house.

3.6 How Might My Home Rate?

Table 4: Indictive Building Energy Rating for Typical dwellings

Oil/gas central heating		Standard electric heating		Solid fuel central heating	
Year of construction	Typical energy rating	Year of construction	Typical energy rating	Year of construction	Typical energy rating
2012+	A3	2012+	A3	2012+	A3
2010-2011	B1	2010-2011	B1	2010-2011	B1
2008-2009	B3	2008-2009	C3	2008-2009	B3
2005-2007	C1	2005-2007	D1	2005-2007	C2
1994-2004	C3	1994-2004	E1	1994-2004	D1
1978-1993	D1	1978-1993	E2	1978-1993	D2
Pre 1978	D2/E1/E2	Pre 1978	G	Pre 1978	F

These tables indicate the typical BER Rating for houses by age for various fuel types. The data reflects typical building regulations and practices at the time of construction. (Source: SEAI)

The average Building Energy Rating (BER) in Co. Limerick in 2016 is 278 (D2) kWh/m²/yr., which is approximately 7% or 18kWh/m2/yr. above the national average of 260 kWh/m²/yr. The average in Granagh SEC is 281 (D2) kWh/m²/yr. which is 9% above the national average and 1% above the county average. This suggests that the energy efficiency of homes in the Granagh catchment area is of a less standard than the county and national averages.

Data available from the latest CSO Census suggests that there is a total of 281 residential properties in Granagh SEC.

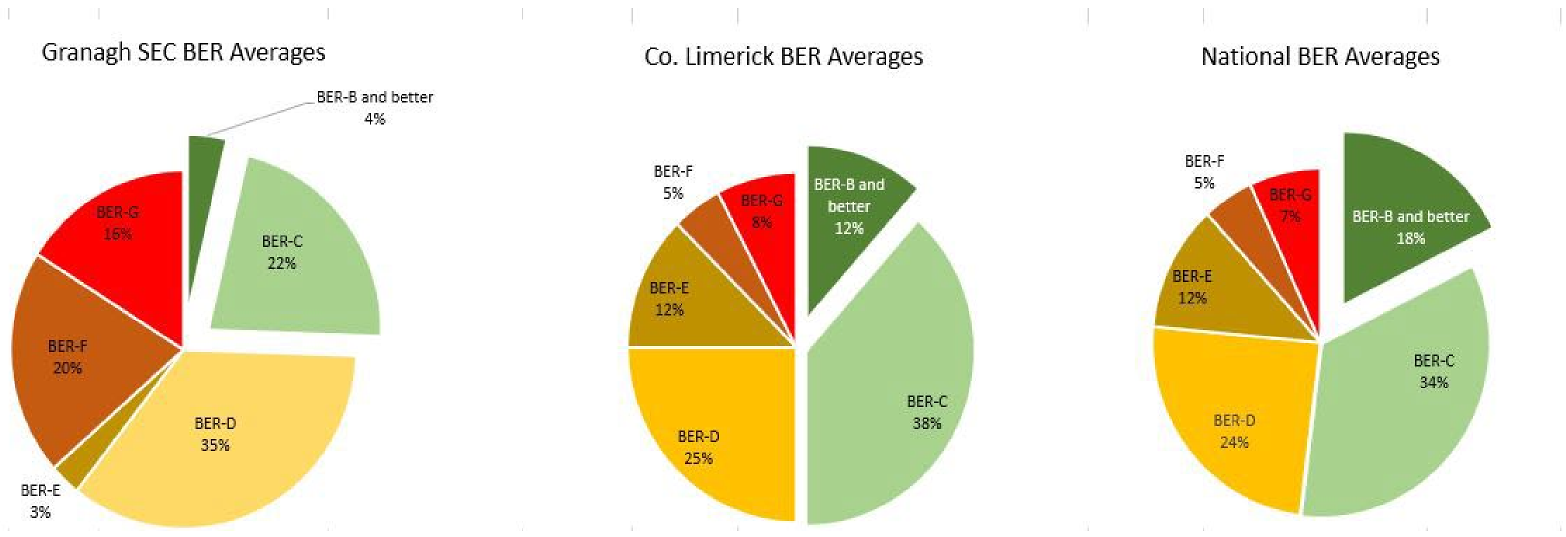


Figure 13: National County and local BER averages

Both the National BER averages and the Co. Limerick BER averages are quite similar. The Granagh SEC BER averages are somewhat different:

- Only 4% of homes in Granagh SEC have a BER-B or better compared to 12% within the county and 18% nationally
- 21% of homes in Granagh SEC have a BER-C compared with the national average of 34% and the county average of 38%
- 35% of homes in Granagh SEC have a BER-D compared to a Limerick County average of 25%, a 10% difference
- A BER-E or worse in Granagh SEC is estimated to be 39% of property compared to a Limerick County average of 25% and 24% of national figures.

It was unascertainable to quantify how many homes have had some energy upgrades since houses were built and the estimates given for Granagh SEC are based on SEAI data for a dwelling defined by its age of construction, floor area, etc.

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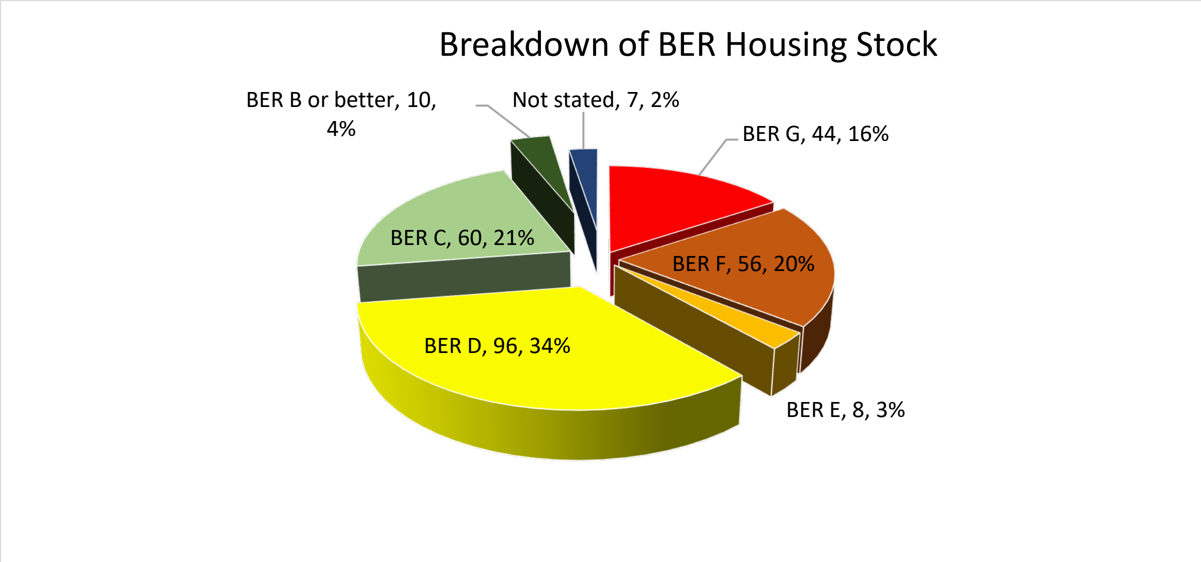

Figure 14: Breakdown of BER rating of dwellings in Granagh

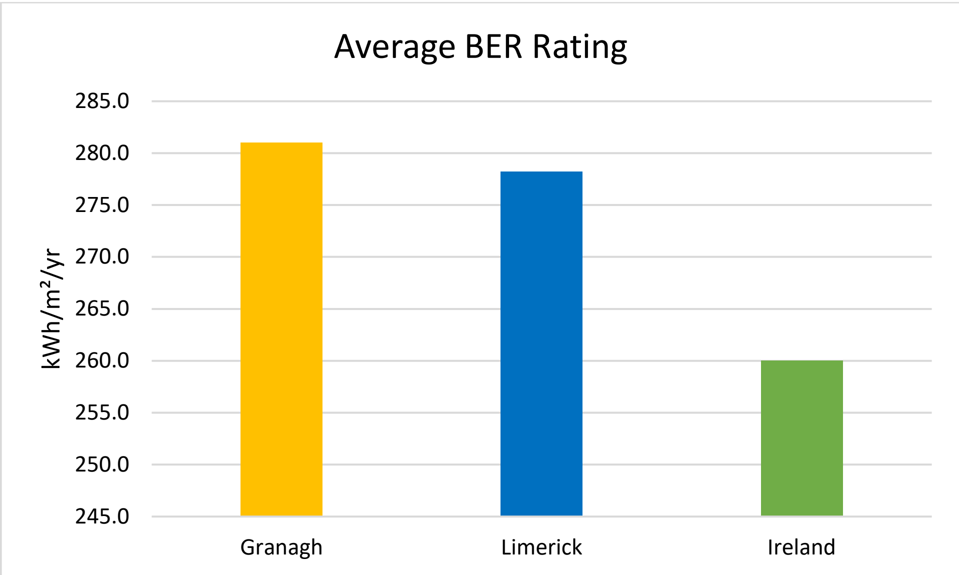

Figure 15: BER Comparison

The BER ratings of properties in Granagh was calculated using data from the CSO Census 2016 and benchmarked against the year of construction and total floor area to discern the approximate BER rating for each dwelling within the SEC. From this it is possible to approximate the number of dwellings with specific BER Ratings. What is not known is the level of upgrades that homes would have completed down through the years. Based on the analysis, 73% of residential properties in the Granagh area have a BER-D rating and lower with only 27% of homes having a BER-C or better. The energy efficiency of a property depends on its physical characteristics. Factors such as the age of construction, the dwelling type, the heating and hot water systems in use, and the extent to which the building fabric is insulated, all influence energy efficiency. Domestic energy efficiency ratings in the Granagh study area varies greatly depending on building type and age.

3.7 Fuel Poverty

A survey of 1,500 Irish households has found that 2 in 3 are suffering from energy 'fuel poverty'. Fuel poverty is universally defined as a household spending over 10% of its income on energy costs. Exclusive of taxes, Ireland has the second-highest electricity prices in the EU[1]. This survey has revealed the toll these prices are having on households right around the country. The survey was conducted by Ireland's biggest consumer network; One Big Switch in response to the energy price crisis. When asked about the effect the high cost of energy has had on their homes.

- 1 in 3 households declared themselves facing 'high' or 'extreme' energy bill stress,
- 1 in 4 said they did not run heaters this winter, even when it made them uncomfortable,
- 5% of households are so fuel poor, they are spending over 40% of their income on energy costs

3 in 4 people from every county in Ireland, varying in age from 21 to 90 and household sizes of 1 – 6+ took the survey showing the effect of fuel poverty is hitting many different families. What is most alarming about the results of the survey is not so much the number of people suffering from fuel poverty, but more the fact so many are doing so needlessly.

The survey revealed that 60% of people are 'not receiving a discount' or 'don't know if they are' and just 5% are receiving discounts more than 20%, despite these being widely available in the market.

The Fuel Poverty Ratio is defined as:

$$\textit{fuel poverty ratio} = \frac{\textit{fuel costs (usage x price)}}{\textit{income}}$$

If this ratio is greater than 0.1 then the household is Fuel Poor.

The fuel poverty ratio shows that fuel poverty can be considered to be an interaction of three main factors:

- The energy efficiency of the dwelling (affecting the numerator).
- The cost of energy (affecting the numerator); and
- Household income (affecting the denominator).

Finding lower electrical tariffs by switching electricity suppliers and availing of discounts could immediately reduce the financial burden of fuel poor households. Based on a statistical analysis of the Granagh SEC housing stock an estimated **30%** of households could be considered to be fuel poor.

[1] https://www.rte.ie/news/business/2017/1129/923775-ireland-4th-most-expensive-eu-country-for-electricity/

3.8 Financial Incentives

There are several routes for grant assistance:

1. Better Energy Homes Scheme

- To qualify for this scheme the dwelling must be built before 2006 for insulation and heating controls systems
- To qualify for heat pump and solar thermal grants the dwelling must be built before 2011
- Have a BER assessment after the work has been completed.

Measures included:

- **Insulation grant** – Attic, Wall-Cavity, Wall-External, Wall – Internal Dry Lining
- **Heat pump grant** – SEAI is offering grants to replace old fossil fuel boilers with heat pumps.
- Your house will need to be heat pump ready i.e., well insulated and good airtightness.
- **Heating control grant** – Heating controls can reduce your heating bills by up to 20%.
- Upgrade comprising of two-zone heating, & day programmable timer, Time/temperature of electric immersion, additional zone, or installation of sufficient TRVs (Thermostatic Radiator Valves)
- **Solar Thermal Grant** – SEAI currently has grants available to install solar thermal water heating panels on houses built before 2011. The solar thermal system (panel/tube) must be an SEAI registered product and supplying 10kWh/m²/yr.

Further information visit: https://www.seai.ie/publications/Homeowner-Application-Guide.pdf

2. Better Energy Community 2021

Better Energy Communities is the national retrofit initiative with grant support of up to €28 million for 2021. The SEAI supports new approaches to achieving energy efficiency in Irish communities. Upgrades can take place across building types to reduce energy use and costs throughout the community. We aim to deliver energy savings to homeowners, communities, and private sector organizations. All projects should be community-oriented with a cross-sectoral approach, and you must show that you can sustainably finance the proposed project.

Projects Supported

Successful projects must demonstrate:

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

Measures Supported

Building Fabric Upgrades
Technology and System upgrades
Integration of Control Systems
Domestic Combined Fabric Upgrade
Single Building Demonstration projects

Further information visit: https://www.seai.ie/grants/community-grants/project-criteria-and-funding/

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353 (52)7443090
info@tippenergy.ie www.tippenergy.ie

3. National Home Retrofit Scheme

This new government grant scheme is designed to encourage the development of One-Stop-Shops and engage groups of private households, registered Housing Associations, and Local Authorities who wish to participate in delivering energy efficiency upgrades, specifically in domestic buildings.

Homeowners can now receive €25,000 in grant aid for full retrofit of their homes to a BER B2

4. Criteria for this scheme

- The scheme only applies to pre 2006 homes that are currently C2 or lower.
- Min. BER Primary energy uplift required = 100kWh/m²/yr.
- Upgrades must deliver a B2 (minimum requirement)

Further information visit: https://www.seai.ie/grants/home-energy-grants/one-stop-shop/

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3.9 Local Energy Survey

An energy survey was carried out in Granagh SEC. Survey sheets were circulated among the residents to fill out and return. The number of returned surveys was good and has stimulated interest further in the Energy Master Plan. 96% of homes are privately owned from the results of the survey group. Of the surveys that were returned the average yearly electricity bill was €1,201 per year and the average yearly heating bill was €1,242 per year. The average national electricity cost is €1,098 for a detached house so the houses surveyed are an average of 9% above this figure for a dwelling with a smaller floor area than the average household in Ireland. Concerning heating, the national average for heating is approximately 11,000kWh per year which costs approximately €928.4 per year, based on the results, the residents of Granagh SEC are paying an average of 25% more to heat their homes. The difference between the national figure and the Granagh SEC figures could be due to the fact the average house size surveyed is 148 m^2 with is below the national average of 160m^2 both heating and electrical costs are higher this could be a result of poorly performing homes with portable electric heaters and hot water immersion heating frequency used.

While the number of surveys that were returned was good this may not be a representative sample of the Granagh SEC area with the datum being 18% of total households in the catchment area.

3.10 Residential Property Profile

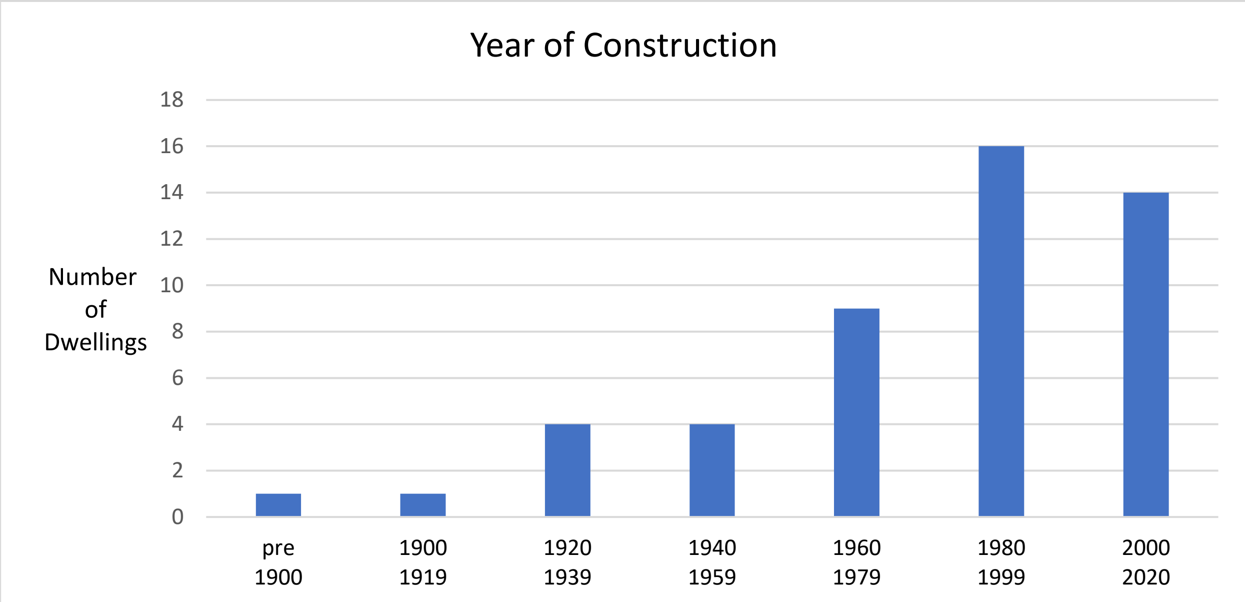

Figure 16: Year of construction from the survey

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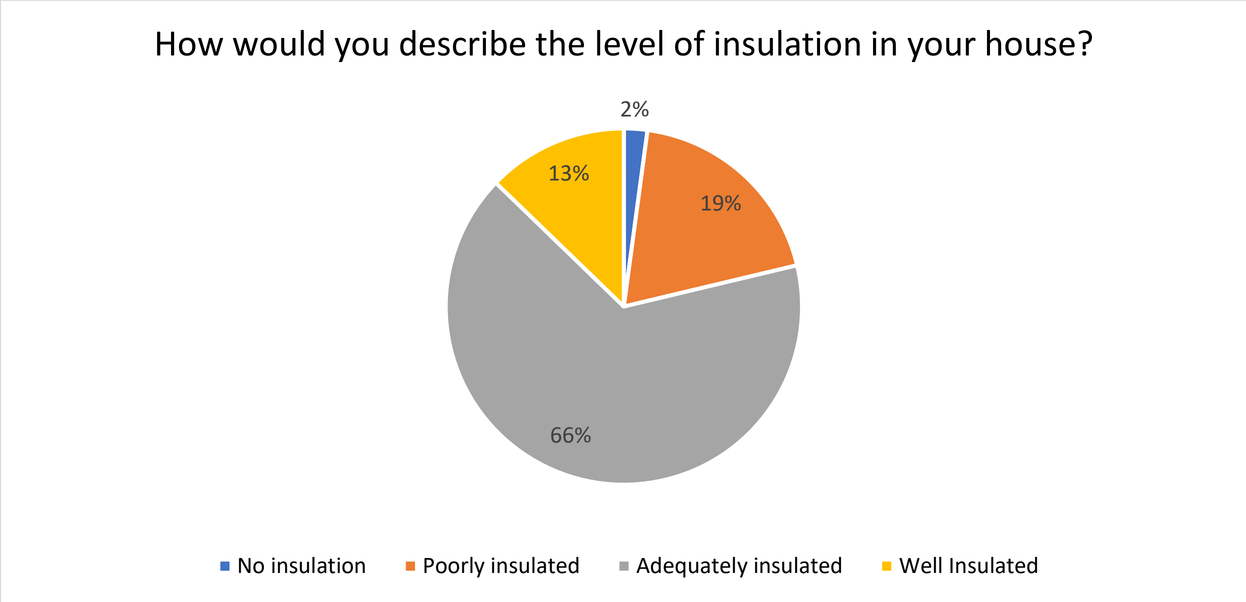

Figure 17: Home energy survey insulation levels

As we can see in the chart above, 79% of respondents feel their house is well or adequately insulated. 21% feel their house is poorly or not insulated at all. This data and the data obtained on the year of construction could suggest that a lot of properties in the SEC have had remedial energy-saving works done on them in the past. This deduction can be made as a significant proportion of properties were constructed at a time when building standards were a lot different than the standards of today.

Table 5: Preferred energy-saving methods of residents

Energy Saving Measure	Number of houses	Proportion
Wall Insulation - Cavity Fill	21	43%
High-Efficiency Boiler	13	27%
Attic Insulation	11	22%
Heat Pump	9	18%
Heating Controls	9	18%
Wall Insulation – External	6	12%
Solar	6	12%
Windows	5	10%
Wood Stove/Stove Inserts	4	8%

When asked about energy savings measures, 43% of respondents expressed interest in getting their cavity walls insulated, 27% are interested in a high-efficiency boiler, 22% are interested in upgrading attic insulation, 18% interested in heat pumps & upgrades to heating controls, 12% in external wall insulation, 12% in solar PV, 10% in upgrading windows, and 8% in installing a wood-burning stove or stove inserts.

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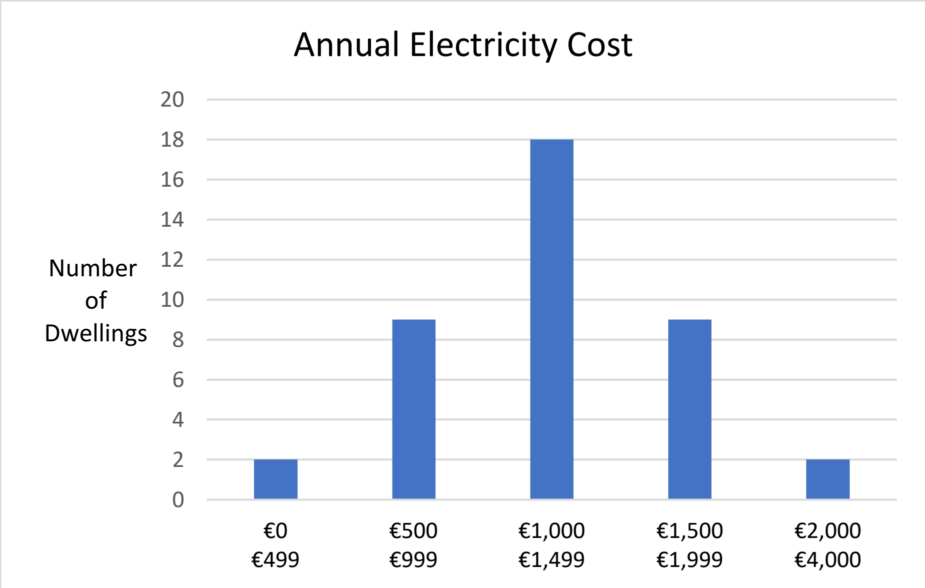

Figure 18: home energy survey annual electricity cost

A significant proportion (45%) of the survey group pay between €1,000 to €1,499 a year for electricity with the survey group average cost of electricity is €1,201 a year. According to Electric Ireland, the national average annual electricity cost is €1,098.

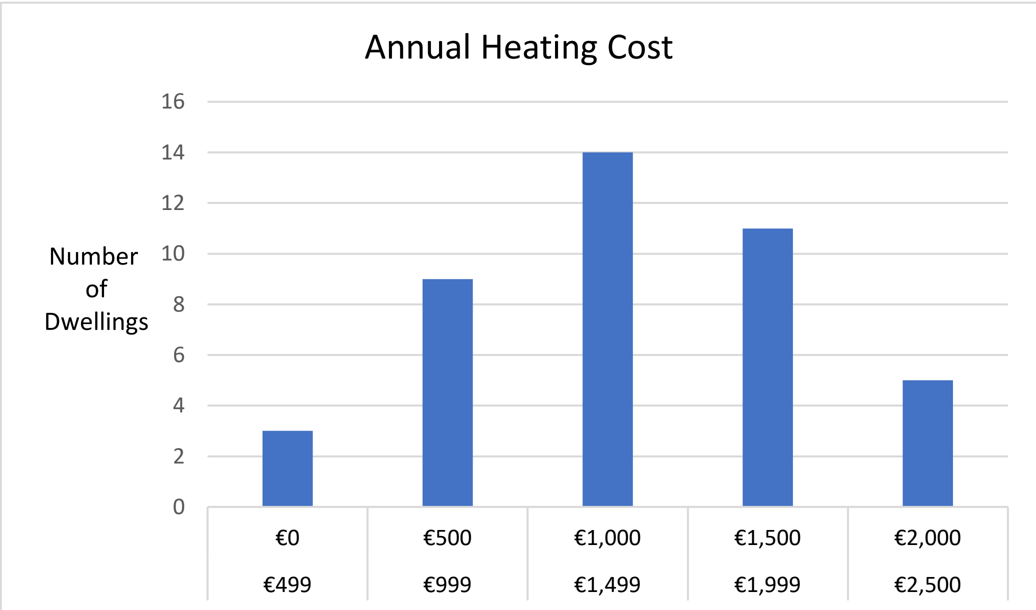

Figure 19: Home energy survey annual heating cost

A significant proportion (33%) of the survey group pay between €1,000 to €1,499 a year in home heating costs with the average cost to heat a home from the survey data collected at €1,242 per year. In Ireland, the average annual heating cost is estimated to be €928 per year using based on a household using 11,000 kWh/year of thermal energy used to heat properties.

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Table 6: Heating fuel type used from home energy survey data

Fuel Type	Number of houses	Proportion
Oil (kerosene)	41	84%
Wood (incl. pellets)	14	29%
Electric (direct)	7	14%
Coal (inc. Anthracite)	5	10%
Heat Pump	3	6%
Other	3	6%

The table above shows the number of houses and the percentage of each fuel type used to heat dwellings from the results of the home energy survey. Oil heating is the prominent heating fuel used at 84%, with wood fuel (incl. pellets) at 29%, direct electric heating accounts for 14% and coal (incl. Anthracite) accounts for 10%. Heat pumps account for 6%.

3.11 Transport Profile

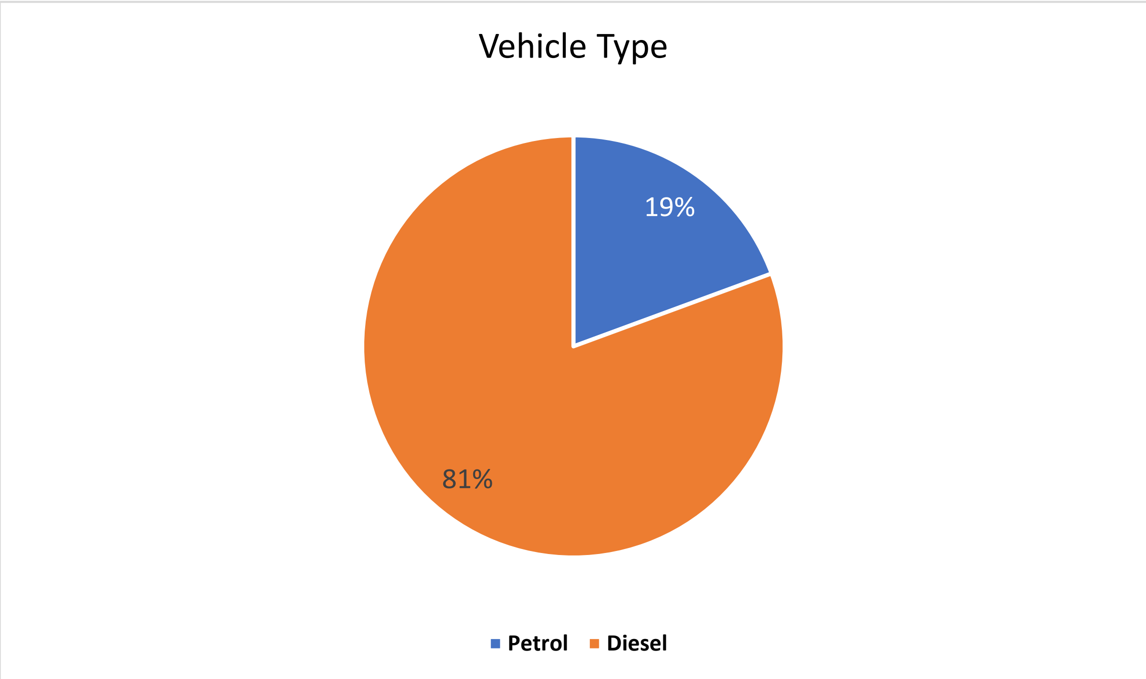

Figure 20: Vehicle fuel type from survey data

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All vehicles owned by respondents are either petrol or diesel vehicles, with diesel being by far the most popular at 81%.

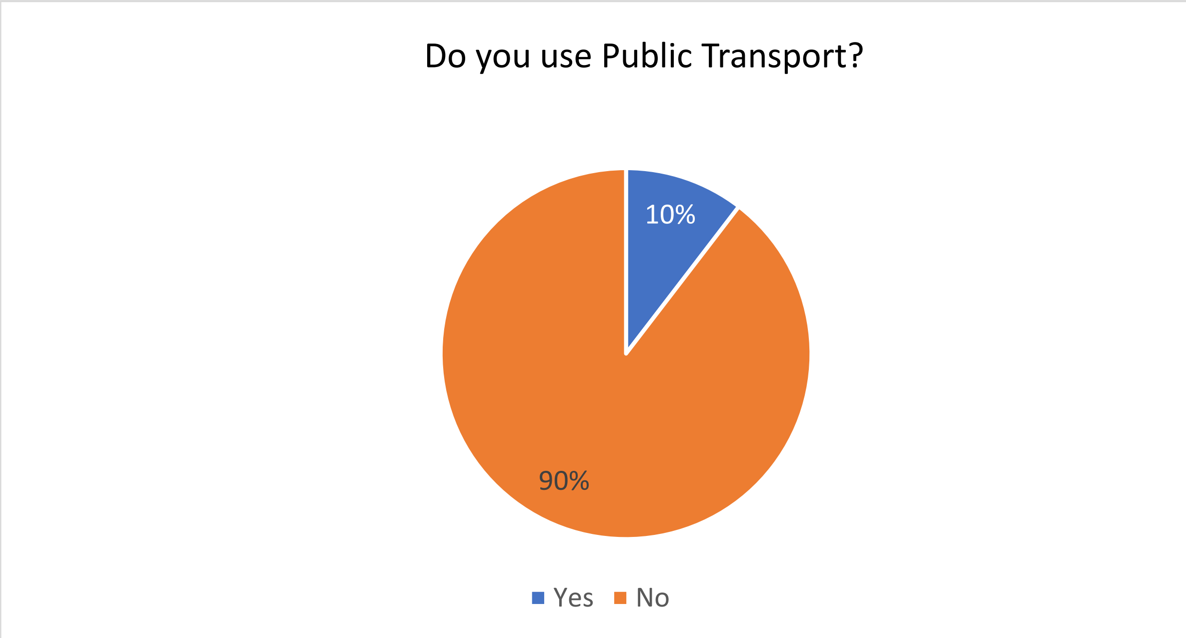

Figure 21: Public transport usage from survey data

Only 10% of the respondents use public transport. Reasons for using public transport included school, work, and hospital appointments.

Results from Surveys about Funding and Grants

Table 7: Method of funding energy upgrades from survey data

Funding source	Number of houses	Proportion
Grant only	36	73%
Grant + own savings	18	37%
Grant + loan finance	10	20%

When respondents were asked about which funding source they would use if they went ahead with energy-saving upgrades on their home, 73% said they would prefer only to make use of grants, while 37% said they would be willing to use their savings with a grant and 20% they would obtain loan finance to fund energy upgrades with SEAI grants. Note that some respondents chose more than one funding source. Sustainable Energy Authority Ireland (SEAI) offers different levels of grant support depending on the homeowners' status. For fuel poor homeowners, the SEAI can fund up to 80% of the cost of performing an energy-saving upgrade, and for non-fuel poor homeowners, the SEAI offers up to 35% of the cost. This grant is given based on the fulfilment of several criteria and standards.

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4.0 Non-Residential

Non-Residential Property – Summary

- There are 12 non-residential properties in the Granagh catchment area
- It is estimated that the non-residential sector accounts for 3% of the total energy demand consuming an estimated 584 MWh (3.9%) of energy per year
- Carbon emissions account for an estimated 3.9% (154tCO_2) per year
- The estimated cost of non-residential energy usage is €115,722 per year

4.1 Introduction

In this section of the local energy plan, the non-residential sector was investigated. The non-residential sector includes buildings and activities that do not form part of the residential sector. Typical non-residential entities are community buildings, i.e., schools, community centres, hospitality buildings, commercial enterprises, retail and medical facilities, etc. In the Granagh SEC catchment area, there are 12 non-residential type activities, and the energy footprint was estimated using typical energy metrics for similar type buildings and activities benchmarked against CIBSE Part F where possible and also using a proportional method from the CSO commercial energy database.

4.2 Non-residential Activity in Granagh SEC

There are 12 non-residential properties (the pig farm is included in the agricultural energy sector) in the Granagh SEC catchment area. As part of this EMP, Granagh NS and the local Community Centre have been selected to undertake non-residential energy audits which will identify where savings in energy can be made with potential energy measures proposed and this data will feed into the Register of Opportunities (ROO) and roadmap to achieve energy reduction targets.

Non-residential properties include:

- 2 No. Local shops
- 2 No. Local Pubs
- 2 No. National Schools
- 1 No. Pre-cast concrete business
- 2 No. Churches
- 2 No. Community Centres
- 1 No. small poultry business

The total number of commercial buildings in Ireland is around 109,000. This figure is broken down into 4 main groups, office buildings (42,000), retail buildings (40,000), Restaurants/ public houses (16,000), and Hotels (4,000). Of the buildings surveyed approximately 60% have electrical heating.

Public sector bodies have achieved annual primary energy savings of 2,336 GWh, yielding a cost-saving of €133 million. The public sector has a target of 33% energy efficiency improvement by 2022.

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Public sector bodies have achieved annual primary energy savings of 2,336 GWh, yielding a cost-saving of €133 million. The public sector has a target of 33% energy efficiency improvement by 2022.

Figure 22: Heating of Commercial Buildings

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Erasmus Smith House, Church Street, Cahir, Co. Tipperary
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The range of fuels used in this sector is small – essentially oil, gas, and electricity. Oil and gas are used predominantly for space heating, but also water heating, cooking. Since 2005, gas consumption has increased by 62% to 484 ktoe. Electricity is used in buildings for heating, air conditioning, water heating, lighting, and information and communications technology (ICT). Electricity in services is also used for public lighting and water and sanitation services. Electricity consumption in services fell by 17% (1.5% per annum) between 2005 and 2016, to 604 ktoe (7,027 GWh), and has a higher share at 43% than any other individual fuel in services, down from 46% in 2005. Electricity use in services is driven by the changing structure of this sector and the general increase in the use of ICT, electric heating, and air conditioning.

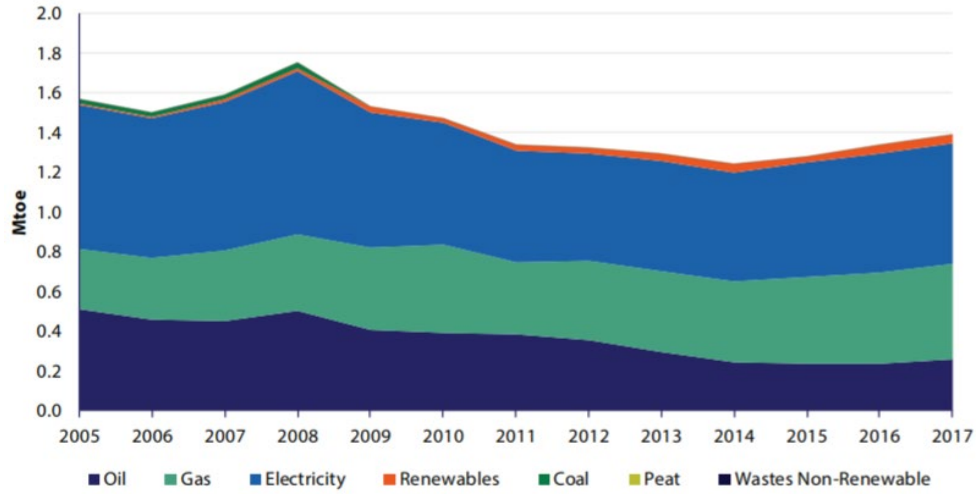

Figure 23: Energy demand in the Commercial Sector

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info@tippenergy.ie www.tippenergy.ie

Table 8: Potential energy savings identified in the non-residential sector from Energy Audits

Non-residential Energy Savings from Energy Audits					
Building Type	**Energy Savings [kWh/yr.]**	**% Improvement of energy consumption**	**tCO_2/yr. Savings**	**Euro Savings[€/yr.]**	**Euro Investment Req.**
St Joseph's National School	24,932	73%	6.9	€1,661	€174,194
Granagh Community Centre	13,471	82%	3	€1,755	€137,732
Total	**38,403**		**9.9**	**€3,416**	**€311,926**

As part of the Granagh SEC energy master plan, 2 No. Energy Audits were performed on St Joseph's National School Granagh also the Granagh community Centre. If building energy upgrades were carried out on both buildings, it would contribute to a 6.6% energy reduction per year in the non-residential sector in Granagh SEC. Table 8 above outlines the savings and estimated investment costs for both buildings. Its apparent from the calculations performed that the pre-cast business is a significant energy user and should be encouraged to investigate on how to reduce its energy footprint of invest in renewable energy technology to reduce its energy and associated costs.

The other non-residential activities and buildings also could make savings by investing in energy reduction measures outlined in the non-residential energy audits that were undertaken on a cross section of business and community building activity (non-residential) in Granagh SEC as part of this energy master plan. It would be recommended to continue to engage with this sector and promote awareness of what can be achievable with energy upgrades, deliver on further auditing of buildings and availing of all grants and assistance to accomplish Granagh Energy goals in line with the Climate Action plan 2021.

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5.0 Agriculture

Agriculture – Summary

- Individually owned farms have by reduced by only 24% since 1991.
- 23% of faming farms are ran by persons 65 years old and older.
- There are only 5% of under 35’s working on farms in the Granagh catchment area.
- The sheep herd has increased by 23% since 1991.
- The dairy herd has decreased by 40% since 1991.
- Cattle account for 52% of total livestock.
- 67% of total agricultural land is under pasture (1,802 Hectares).
- Employment in Agriculture has declined by 64% since 1991.
- Energy usage from agricultural activity is estimated at 9%; 1,278MWh/yr. and 337 tCO_2/yr.
- Energy Cost from farming activity is estimated to be €147,455/yr

5.1 Introduction

Granagh SEC farmland is predominantly pasture-based and uses approximately 67% of the total area farmed (1,893 hectares) and there is little or no tillage since 1991. The land in the area is of good quality and is suitable for most types of livestock farming. The number of sheep on the land increased since 1991 by 23%, dairy cows have decreased by 40% since 1991. Based on the latest CSO figures cattle account for 52% of livestock. The number of farms has reduced from 82 farms in 1991 to 66 farms in 2010. Energy use in agriculture is from petroleum and electricity use and is estimated to be 7% of total energy usage in the catchment areas. Also, the number of people employed in farming has declined from 181 in 1991 to 64 in 2010 this is a 64% decrease in employment in agriculture. There are only 3 persons under the age of 35 working on farms in the area according to the latest census data.

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5.2 Agricultural Statistics Granagh

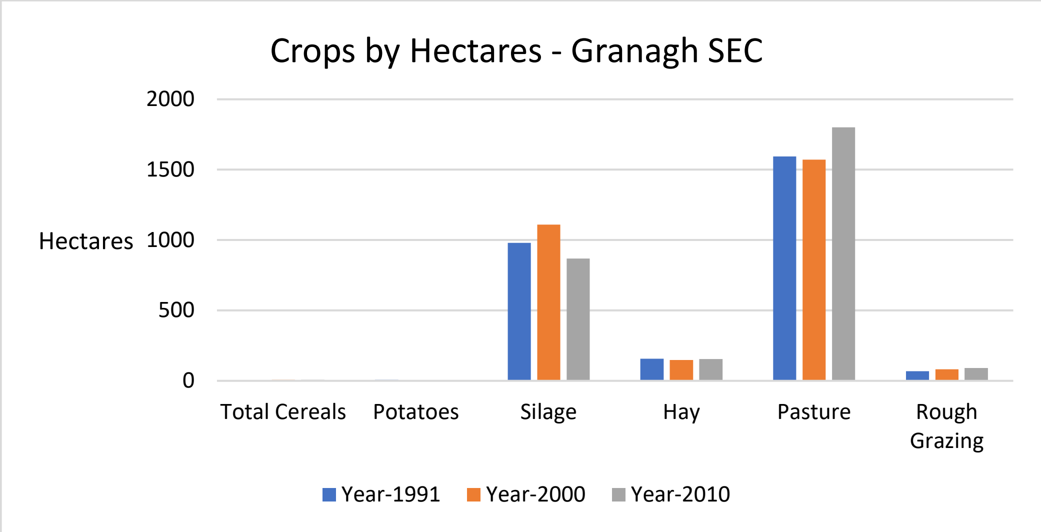

Figure 24: Crops by hectares 1991 to 2010

Land under pasture has increased in the Granagh SEC catchment area by 12% since 1991 according to the latest agricultural CSO data, the main crop in the catchment area is silage and this has reduced by 13%, the hectares of hay fodder is slowly decreasing with a 2% decrease since 1991 with rough grazing steady increasing by 24% since 1991.

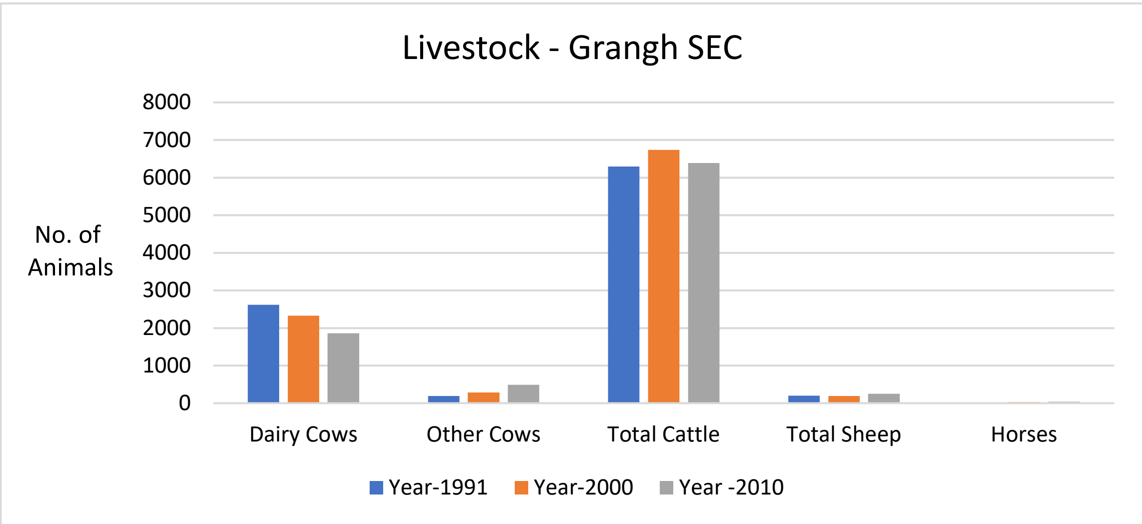

Figure 25: Farm size Breakdown

The dairy herd has decreased by 40% since the year 1991, and other cows (sucklers, Pedigree, etc.) have increased by 62% in the same period. The sheep herd has increased by 23% since 1991.

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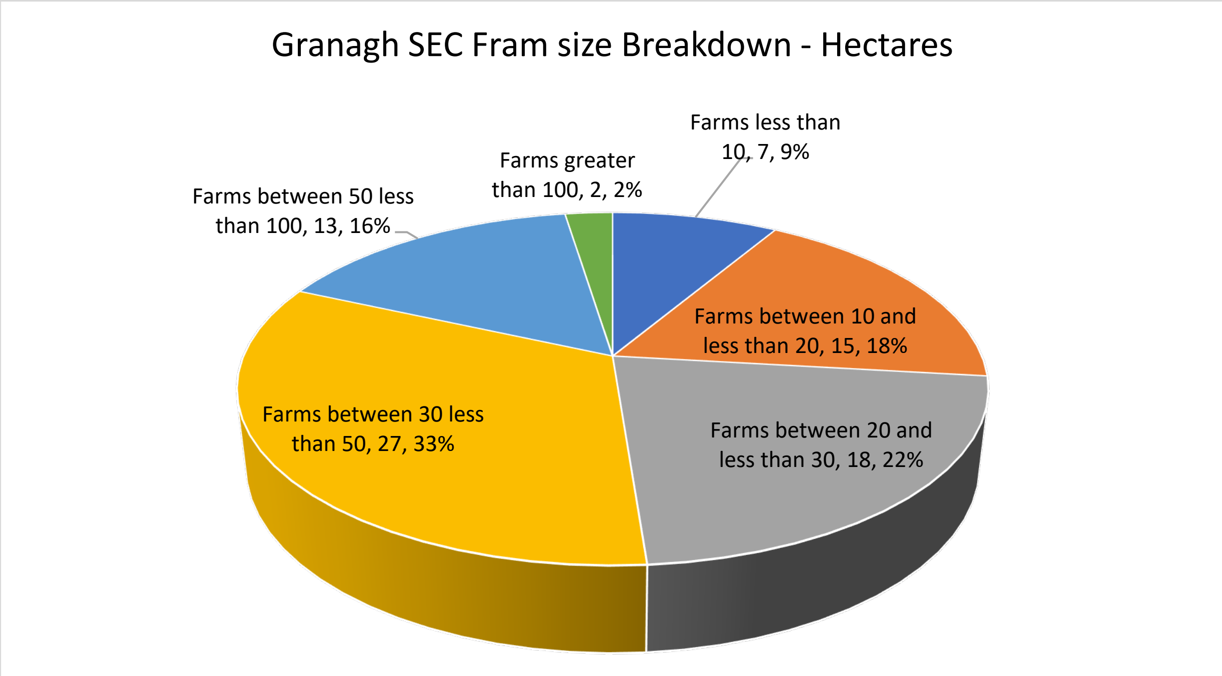

Figure 26: Granagh average farm size since 1991

According to Teagasc the average farm size in 2019 remained just over 43 hectares and the average income level per hectare increased slightly relative to 2018 to €555 (but remained well down on the €693 recorded in 2017). The average size for a dairy farm in 2019 remained close to 59 hectares. An Average Family Farm Income (FFI) of €1,132 per hectare was earned on Dairy farms in 2019; this reflects a year-on-year increase of €86 per hectare. Across all systems, the income per hectare in 2019 was next highest on tillage farms at €568, down €109 per hectare on the 2018 level. Cattle and sheep farms in Ireland, are typically characterized by lower profitability and smaller holdings. In 2019, the average income per hectare remained lowest on Cattle Rearing farms, albeit that the figure rose to €288 in 2019. (Source: Teagasc National Farm Survey)

Table 9*: *Average farm size & FFI per Ha 2019

	Size (ha)	Income € per ha
Dairy	58.8	1,132
Cattle Rearing	31.9	288
Cattle Other	36.2	384
Sheep	47.0	310
Tillage	60.6	568
All	43.2	555

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5.3 Agricultural Energy Savings

5.3.1 Dairy Farms

Dairy farms by their nature use large amounts of electrical energy and there are significant savings to be made. Teagasc has measured the average component consumption on dairy farms and from the figure below it can be seen that milk cooling, water heating, and milking use the most energy and these areas should be targeted for energy savings. According to Teagasc, the cost of electricity varies from 4 kWh/cow/week to 7.3 kWh/cow/week. This is equivalent to €0.60/cow/week to €1.10/cow/week and savings of up to 50% can be achieved on some farms.

5.3.2 Energy Saving Tips

- Eliminate energy wastage; fix all hot water leaks, insulate all hot water piping and refrigerant gas piping, and use lights only when necessary. A leak as small as one litre per hour can waste 8,500 litres of hot water and 3,800 kWh per year.
- Optimize plate cooling by increasing water flow to achieve the correct water to milk flow ratios. Increasing the milk to water flow ratios from 1:1 to 1:3 can reduce the power consumed by the bulk tank by over 40%.
- Switch all water heating tonight rate only.
- Consider using a variable speed drive controller on vacuum pumps. This can save over 60% on vacuum pump running costs.
- Use energy-efficient lighting.

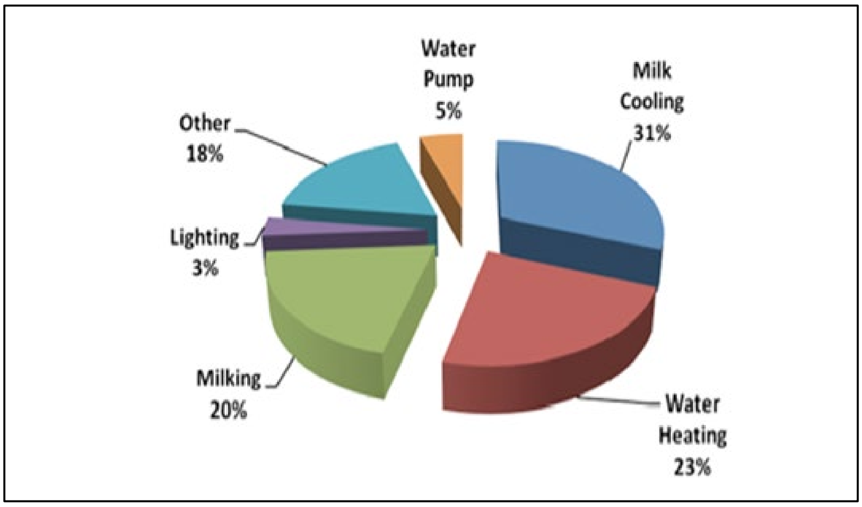

Figure 27: Average consumption on 60 commercial dairy farms

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5.3.3 Dry stock and Tillage Farms

Energy use on dry stock farms is normally low in comparison to dairy farms. The main energy used on both dry stock and tillage farms is from machinery.
Energy Saving Tips

- Tractors should be maintained regularly by replacing filters, changing the oil, and keeping tires inflated to the correct pressure, this will keep the tractors working efficiently.
- Idling tractors can use up to 20% of total fuel use so they should be switched off when not in use.
- Weights should be removed from tractors when not required which will both save fuel and tire wear.
- The horsepower of the tractor should match as close as is practical the implement requirements as too much or too little horsepower will reduce fuel efficiency.
- Driving tractors at lower rpm and higher gears will also reduce fuel use. Implements should also be maintained to increase fuel efficiency such as keeping knives sharp in balers etc.

5.4 Agricultural Financial Incentives

1. **Accelerated Capital Allowance**

   Under the Finance Act 2008, a provision is made for accelerated wear and tear allowances for certain energy-efficient equipment. This allows a business to write off 100% of the value of the cost of the equipment against their profit over 1 year as opposed to the normal 8 years.

2. **TAMS on-farm investment scheme**

   Under this department of Agriculture scheme, €10million has been made available for energy efficiencies and renewable energy technologies. These include a solar PV installation of up to 6kW and battery storage, LED lighting, plate coolers, heat transfer units, and internal ice builders for the dairy sector. Other grants are available for the pig and poultry sectors.

3. **SEAI Pilot scheme for Dairy Farmers**

   SEAI ran a pilot scheme that provided grant aid for variable speed drives in 2017 and this may or may not reopen as it is currently closed.

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6.0 Transport

Transport – Summary

- 88% of residents of Granagh SEC have access to 1 or more cars/vans
- Current vehicles are predominantly diesel/petrol fuelled
- There are no Electric Vehicle charging points in Granagh catchment area
- The closest electric vehicle charge point is approximately 14.5km away at Adare
- The total energy used in road transport is approx. 8,590 MWh/yr. (58% total energy)
- The total tCO_2 produced from road transport is approx. 2,268 tCO_2/yr. (59% of emissions)
- An estimated 86% of residents of Granagh travel to work outside of the catchment area
- 81% of persons commuting journey is 45 minutes or less

6.1 Introduction

Transport is the sector with the largest energy demand and is the most sensitive to the economy. It tends to grow or reduce sharply in response to economic growth or contraction. This is evident over the past three decades. Energy demand from transport increased by a massive 183% between 1990 and 2007. It then decreased by 27% between 2007 and 2012, increased again by 25% between 2012 and 2018. (Source SEAI). The estimated total domestic vehicle ownership within the Granagh SEC catchment area is 254 private vehicles and 49 commercial vehicles (based on the latest Census data). Private vehicle driving accounts for 65% of the total energy used in transport (11% of energy from commercial transport). Greenhouse gas emissions from transport (private & commercial) account for approximately 46% of total emissions within the catchment area. Data from the latest CSO Census suggest that there are no electric vehicles or electric infrastructure in the catchment area with the closest charge point being Adare 14.5km; Charleville Co. Cork 16.2km; and Newcastle West 22.1km.

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6.2 Transport in Granagh sec

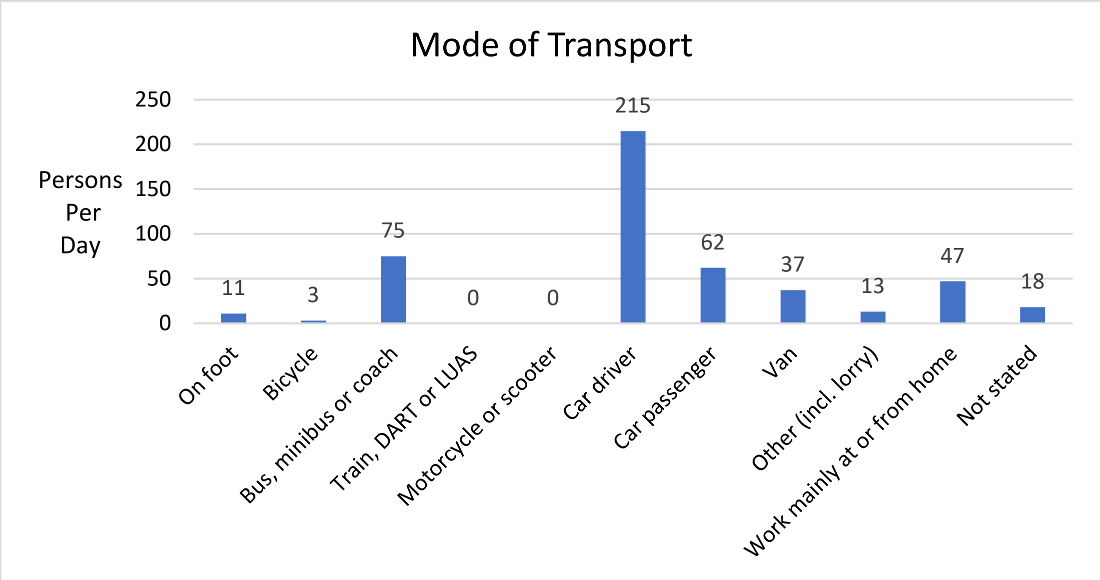

Figure 28: Granagh SEC Mode of transport to work/college

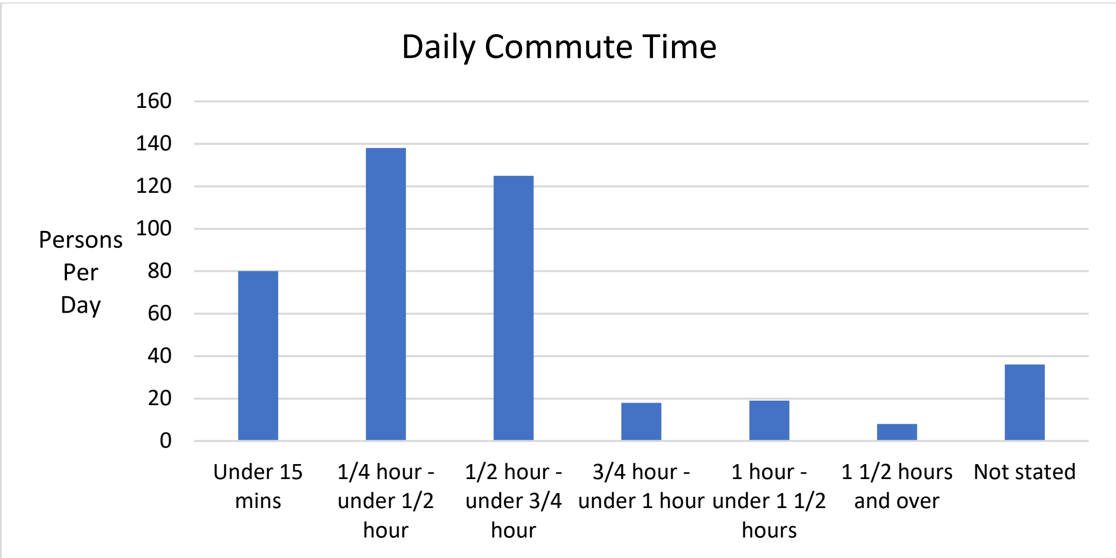

Figure 29: Daily Commute time

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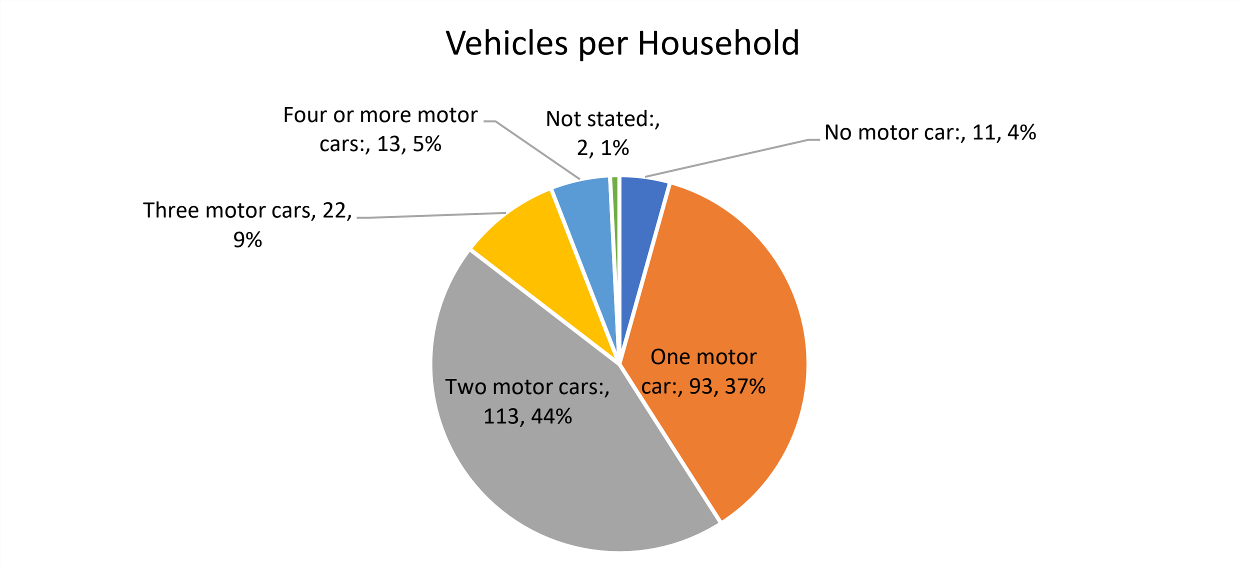

Figure 30: Vehicles per household Granagh SEC

No specific statistics in terms of vehicle fuel type and use are available in this Local Energy Plan. To estimate household vehicle energy use, therefore, it has been presumed that the mix of vehicle fuel type will be similar to that produced from the home energy survey and averaged in Ireland as a whole. Based on census data the estimated ownership within the catchment area is 536 cars/vans. The average km/yr. was used for both passenger vehicles (18,000km/yr.) and commercial vehicles (40,000km) in deriving the energy, emissions, and costs associated with road travel within the catchment area.

Statistics from the CSO National Travel Survey 2016 provide a breakdown of vehicle-km travel within each local authority region and by road classification. This can be combined with energy statistics that provide a breakdown of vehicle fuel usage estimated for each local authority area.

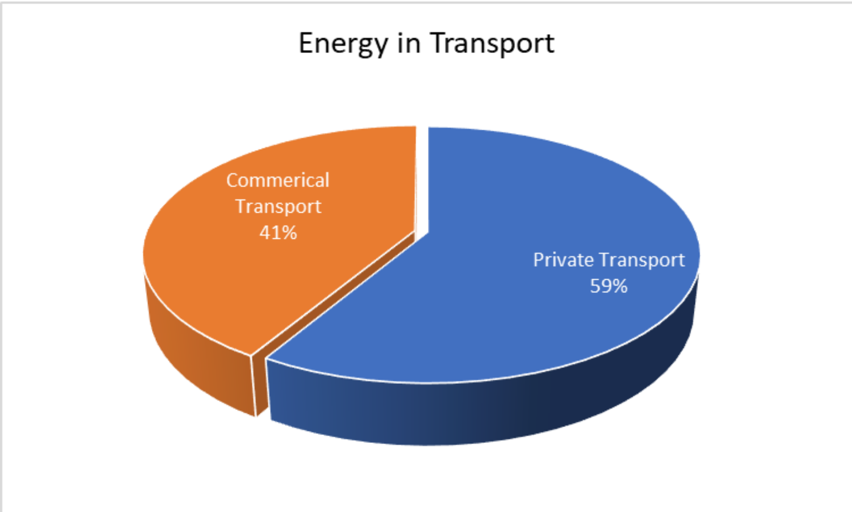

Figure 31: Energy in transport Granagh SEC

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6.3 Transport Energy Savings and Financial Incentives

There are several ways that Granagh SEC can reduce their energy used in the transport sector.

- Encourage Walking and Cycling
- Encourage car-share where possible to reduce the No. of vehicles traveling.
- Electric vehicles are a fantastic way to reduce CO2 emissions. The range of e-cars is improving all the time and the Hyundai Kona is now capable of traveling 400Km without charging. There are several financial incentives including up to a €5,000 grant from SEAI, reduced VRT of up to €5,000, and zero Benefit in Kind for employees with an electric company car. They are also cheaper to run, tax, and have reduced toll rates.
- Increasing the local public transport network and its use where possible with Granagh SEC

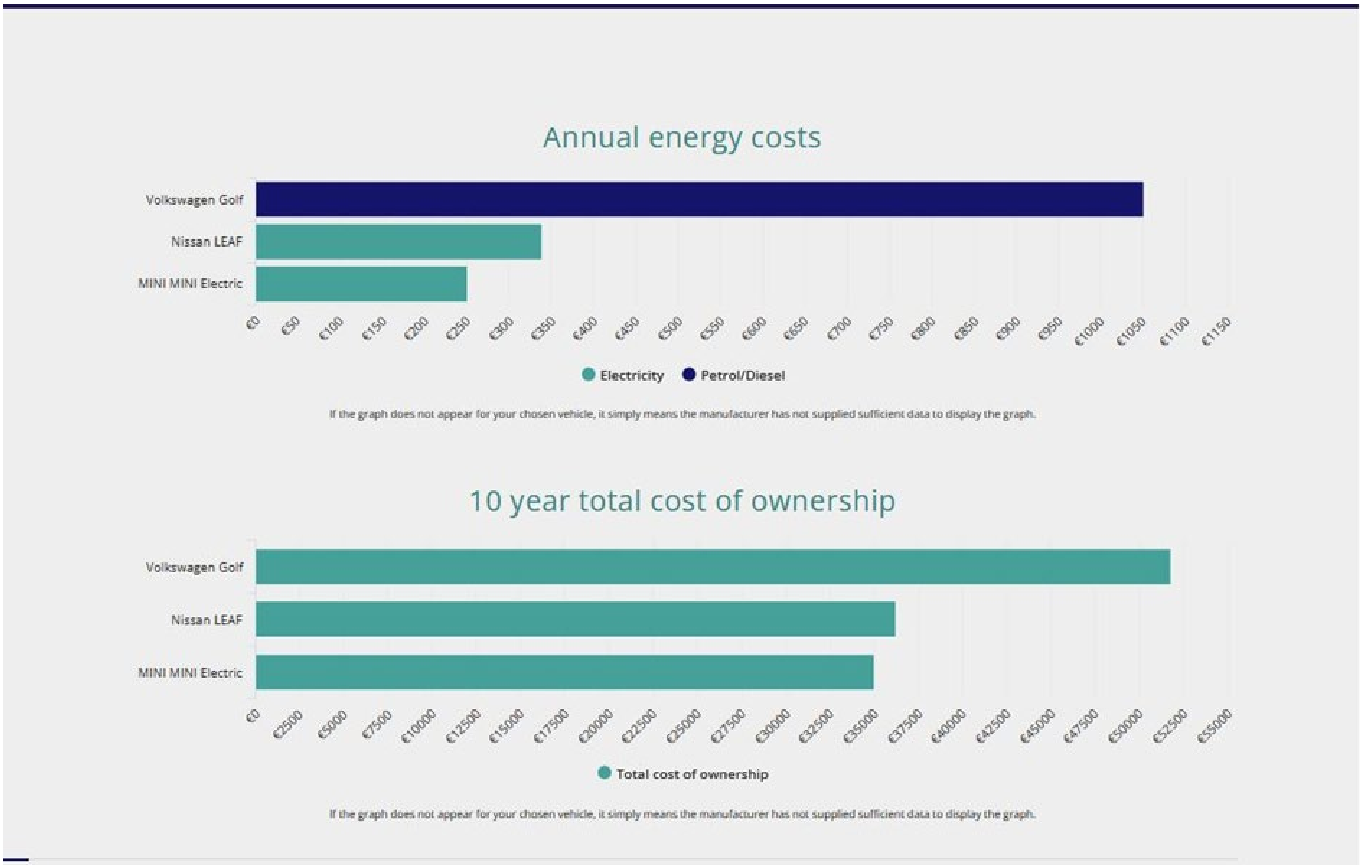

Figure 32: Electric Vehicles performance Versus Diesel car comparison (SEAI)

Figure 32 is from the SEAI website and on this portal is possible to compare the purchase of various EV's to a new diesel golf for example. What is becoming more impressive is the annual energy cost savings from Electric Vehicles when compared to the purchase of a new fossil fuel car.

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Comparisons of electric cars can be made on the SEAI website. https://www.seai.ie/grants/electric-vehicle-grants/grant-eligible-cars/ From this comparison above the CO_2 emissions can be cut by 56% and fuel costs savings as much as 70% when compared to a diesel car. Currently, the price of batteries is drastically reducing while the range and storage capacity of them are increasing. As previously mentioned above there are a lot more EV charging stations being installed throughout Ireland and with the increase in the range that EV's can travel before their next charge, range anxiety should not be a factor in the near future.

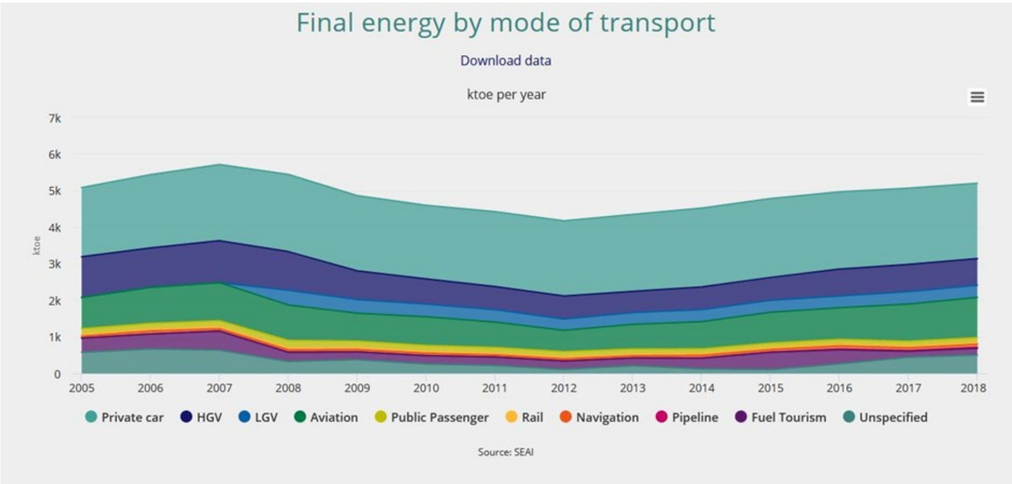

Figure 33: Final energy by mode of transport

Transport is the sector with the largest energy demand and is the most sensitive to the economy. It tends to grow or reduce sharply in response to economic growth or contraction. This is evident over the past three decades. Energy demand from transport increased nationally by a massive 183% between 1990 and 2007. It then decreased by 27% between 2007 and 2012 and increased again by 25% between 2012 and 2018. (Source SEAI)

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6.4 Existing Car Charging Infrastructure

Figure 34: EV Charging Points in proximity to Granagh SEC

Currently, the are 1,100 public charge points in Ireland with the closest being approx. 14.5 km from the Granagh catchment area in Adare Co. Limerick.

6.5 Cycling

Cycling is a great form of exercise that brings lots of health benefits. As with walking, it also reduces the reliance on traveling by car, which then reduces, traffic congestions and transport-related emissions. Cycling requires more specific infrastructure compared with walking, such as:

- Cycle lanes
- Bicycle shelters

The development of cycle lanes is likely to be a more long-term goal as it requires significant infrastructure work, which would be under the responsibility of the local authority. It is likely to already part of the local development plans, but this Energy Master Plan (EMP) is an opportunity for the community to engage with the local authority on the matter and find out more about what is planned and what is achievable.
Another important factor in encouraging (or discouraging) cycling is speed limits and their influence on road safety. There is a lot of momentum in Ireland and Europe at the moment around reducing speed limits in different areas to:

- Reduce emissions to help reach CO_2 targets
- Increase road safety (for all users)

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The reduction of the speed limits would increase safety and encourage more people to cycle, who would previously have driven. The article below provides some additional information following a national review of speed limits.

https://www.rsa.ie/en/Utility/News/2013/Speed-Limits-Review-body-publishes-report--recommends-new-appeals-system/

For those considering taking up cycling again (or for the first time), there is a cycle to work scheme that allows employees to purchase a new bike and pay for it in instalments. The scheme was developed to incentivize employees to cycle to work. See more information in the link below.

https://www.citizensinformation.ie/en/travel_and_recreation/cycling/cycle_to_work_scheme.html

6.6 Car Pooling

Car-pooling is not an opportunity that in itself will have a significant impact, but it does have a contribution to make to transport in the local area. The area where this would have the most benefits is in the school drop. It provides parents with the chance to take turns bringing children to school, which means the volume of traffic around the school gates drops, which creates a safer local environment around the school, reduces congestion, and allows parents to have days/weeks where they can get to work earlier than normal. The article below summarises the benefits of car-pooling for school.

https://www.gokid.mobi/6-reasons-carpool-school/

6.7 Shared Workspaces

Shared workspaces have become increasingly popular as an option for both self-employed persons and employees who are given the option of working remotely for part or all of the week. This reduces the frequency and duration of journeys and therefore reduces traffic, congestion, and emissions. Shared workspaces also provide a fantastic opportunity for networking and socializing for people who may otherwise become quite isolated in the work that they do. They also boost the local economy by encouraging workers to stay local during the week, where they may avail of local services. There are shared workspaces in the region, see the link below.

http://clareherald.com/2022/09/clare-hubs-receive-reopening-funding-28409/

https://www.clarecoco.ie/your-council/contact-the-council/directory/broadband-digital-it/digiclarehubs/digiclare-digital-hubs.html

6.8 E-Mobility

The move to electric vehicles is not a simple switch and there are a variety of factors for a person to consider before making a purchase. These factors include:

- E-charging infrastructure locally
- Typical journey lengths
- E-charging infrastructure along typical routes travelled
- Cost

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As a first step, the community should contact their Local Authority to find out more about the current e-charging infrastructure and what the plans are for the next few years. The first step will inform the next steps, but ideally, the next steps would be to promote the switch to e-cars. If there are issues with the infrastructure, however, this may need to be a more long-term goal. A local talk on electric cars, i.e., what you need to know before making the switch, maybe a useful idea to explore.
There are grants currently available for electric cars, see link below. Another potential financial incentive for those thinking about making the switch is for those with solar electricity, which would provide a very economical way of charging the car at home.

https://www.seai.ie/grants/electric-vehicle-grants/

The overall target is to reduce CO_2 equivalent emissions from the transport sector by 45-50%[2]. The targets to be delivered are to increase the number of electric vehicles (EV's) to 936,000, comprised of:

- 840,000 passenger EV's (from 9,170 in 2022)
- 95,000 electric vans & trucks
- 1,200 electric buses

The blend proportion of biofuels in road transport will be raised to 10% in petrol and 12% in diesel

Also, by 2030 there will be 4,500 Compressed Natural Gas (CNG) trucks on Irish roads.

[2]https://www.gov.ie/en/organisation/department-of-the-environment-climate-and-communications/?referrer=http://www.dccae.gov.ie/en-ie/climate-action/publications/Documents/16/Climate_Action_Plan_2019.pdf

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7.0 Granagh SEC Baseline Energy Balance

Baseline Energy Balance – Summary

- 58% of total estimated energy consumed (8,590 MWh/yr.) is used in transport.
- 30% of total estimated energy consumed (4,431 MWh/yr.) is used to heat and power homes.
- 8.6% of total estimated energy is consumed (1,278 MWh/yr.) by agricultural practices.
- 4% of total estimated energy is consumed (584 MWh/yr.) by non-residential sector.

Introduction

Transport energy use is the largest source of energy consumption (58%) within the Granagh SEC catchment area with residential energy the second highest energy consumer (30%). The data analytics employed used both census data and average transport statistics benchmarked against national figures where applicable for each of the four categories of residential, Non-residential transport, and agricultural energy use. The average km/year travelled is based on the national averages of 18,000km/yr. 68% of the Granagh area population have to travel by car to their place of employment, school, or college.

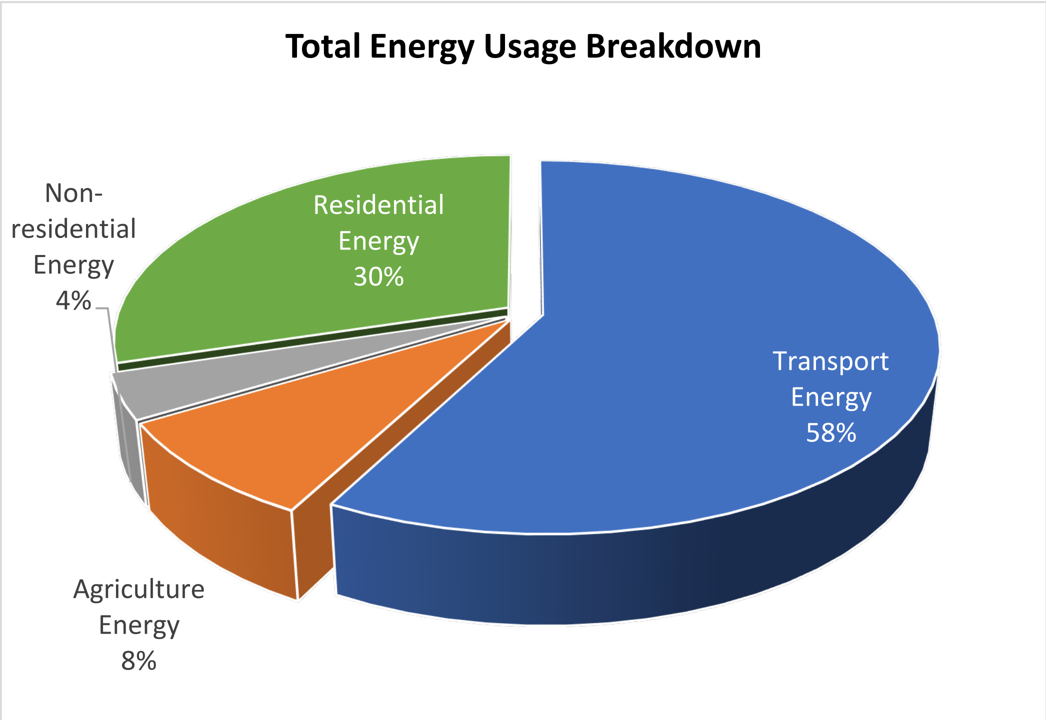

***Figure 35:* Baseline Energy for Granagh SEC**

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Table 10: Breakdown of energy use, CO2, and annual spend on energy for Granagh SEC

Baseline Year of 2016						
TYPE	Granagh SEC Ktoe	MWh/yr.	$ktCO_2$/yr.	tCO2/yr.	% Energy demand	€/year
Transport Energy	0.7	8,590.1	2.3	2,268	58%	€899,636
Agriculture Energy	0.1	1,277.8	4.8	337	9%	€147,455
Non-residential Energy	0.1	584.0	0.2	154	4%	€115,722
Residential Energy	0.7	4,430.9	1.1	1,102	30%	€499,842
Total	**1.6**	**14,882.7**	**8.4**	**3,861**	**100%**	**€1,662,656**

From the analysis of the total energy usage in the Granagh catchment area, transport energy use consumes the largest share of energy 58% (8,590MWh/yr.), and residential energy usage accounts for 30% (4,430 MWh/yr.) of the total energy used with agriculture accounting for an estimated 9% (1,261 MWh/yr.) and non-residential energy use at 4% (584 MWh/yr.) of total energy within the Granagh SEC study area. In A 'Do Nothing Scenario,' it is not anticipated that there will be a significant change in overall energy demand within Granagh SEC in the short to medium term. Also, the tonnes of carbon dioxide greenhouse gas per sector and the estimated spend in euro on energy per sector is included in figure 36 and figure 37.

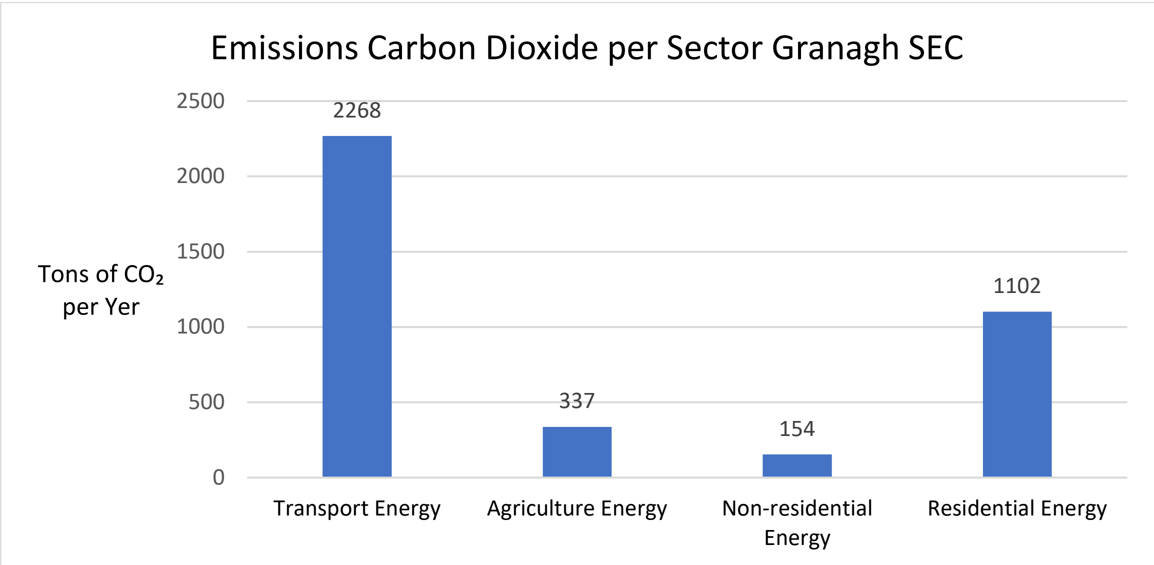

Figure 36: Greenhouse emissions per sector in Granagh SEC

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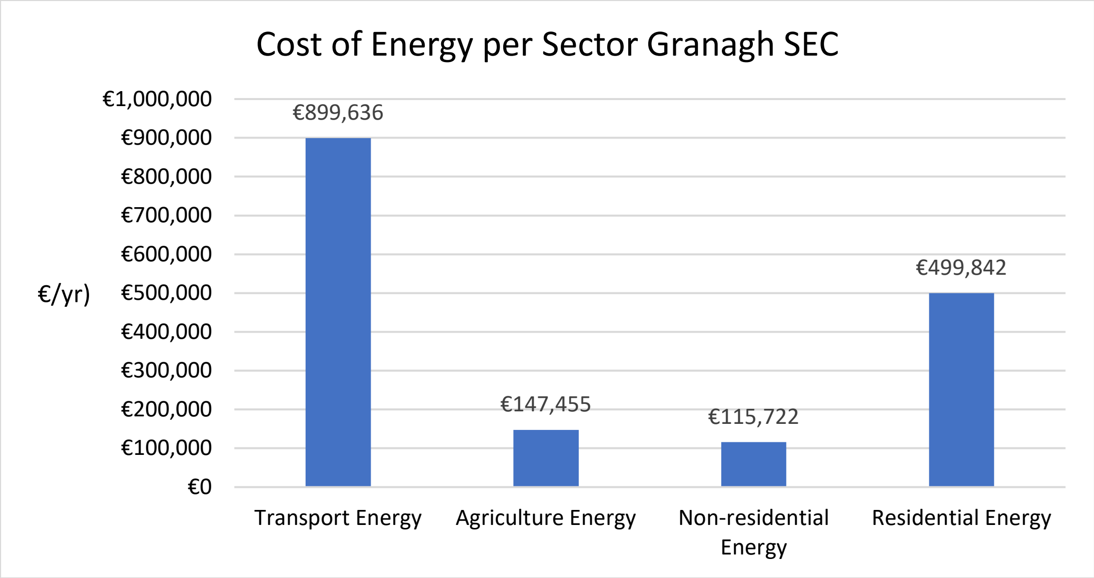

Figure 37: Cost of energy per* year *sector Granagh SEC

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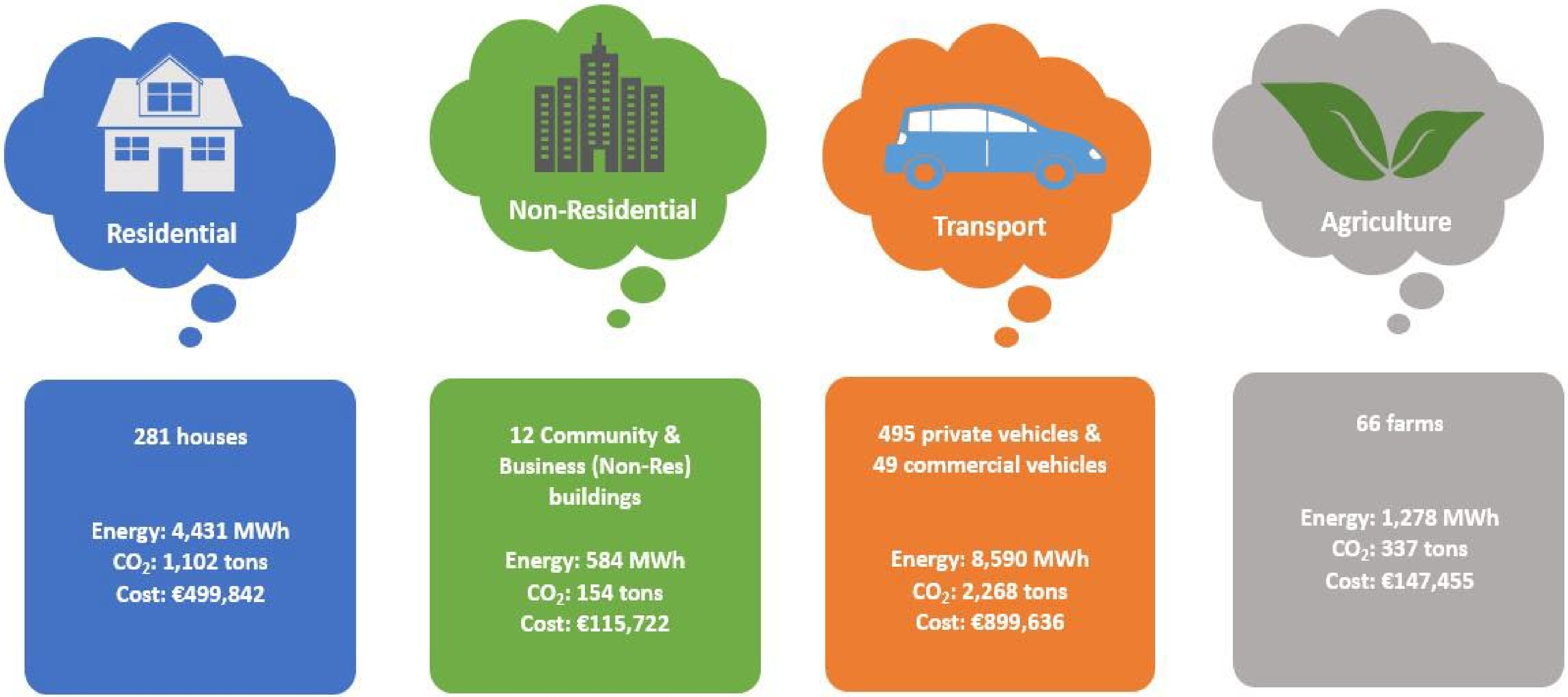
Granagh SEC baseline Energy Demand Infographic



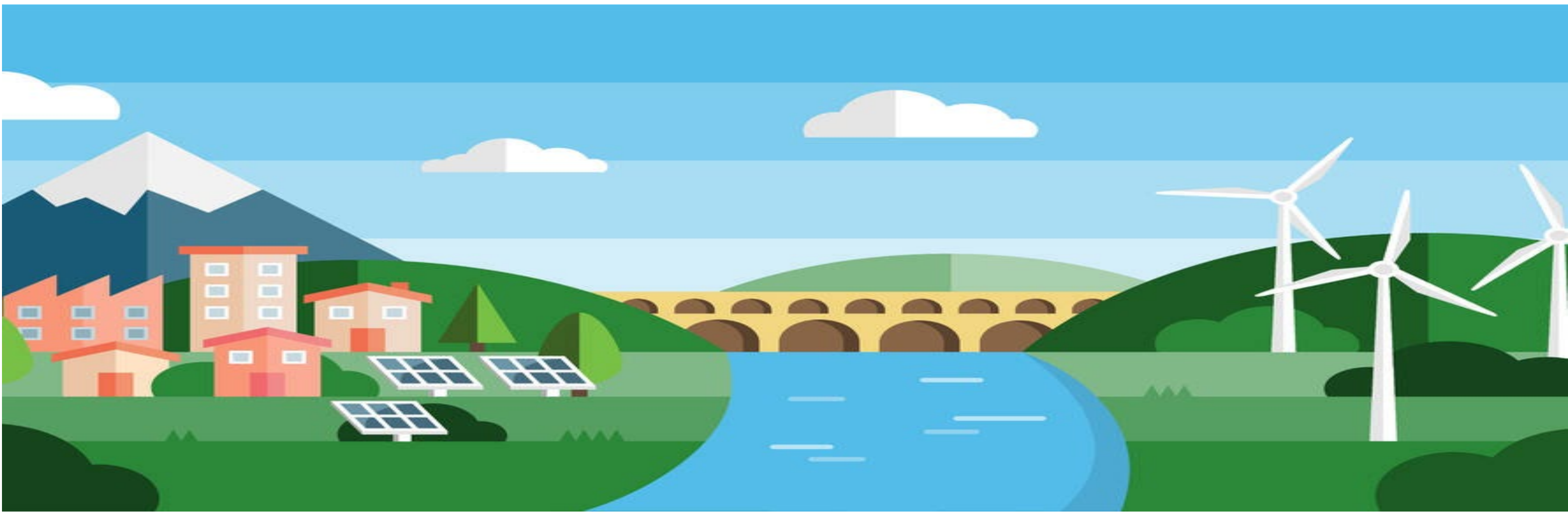
8.0 Renewable Energy Generation in Granagh

Renewable Energy – Summary

- Solar PV has the potential to produce up to 139kWh/m²/month during peak daylight hours
- The onshore wind energy potential is 7 - 8 m/s and may make the area viable for wind generated energy.
- Wood pellets boilers have a potential to replace gaseous fossil fuel in the catchment area, but fuel cost is set to rise.
- A 5MW Solar PV farm requiring approx. 25 acres of land and developed as a community led generation project for Granagh SEC would contribute to 28% of energy currently. There could be 58% of Granagh energy requirement by 2032 if all measures were completed.

The Climate Action Plan includes an ambitious target to deliver 70% of Ireland's electricity from renewable energy by 2030. In doing so, the Government has identified clear winners (wind, solar, and CHP) and losers (coal and peat). To meet the forecasted growth in energy demand, including from data centres and electric vehicles, the plan envisages an additional 12GW of renewable energy capacity coming online by 2030. The Republic of Ireland currently has over 3,000 MW of installed renewable energy, so this target effectively represents increasing that capacity four-fold.

The government has set out a roadmap for Facilitating of Micro and Mini-Generation: The potential long-term impacts of and support for a distributed generation will be noted by energy developers and investors. As of December 2021, the Government has introduced a Mini Generation Support Scheme for projects between 6kW and 50kW. Projects within this range will receive a Clean Export Premium (CEP) tariff per kWh exported, for a period of 15 years, from their electricity supplier. The Clean Export Premium (CEP) will be €0.135/kWh in 2022, which is higher than the current average wholesale electricity price. Any difference between the CEP tariff and wholesale electricity prices will be supported by the Public Service Obligation (PSO) levy. Exported volumes of electricity eligible for the Clean Export Premium (CEP) tariff will be capped at 80% of generation capacity – to incentivise self-consumption.



Also, the government is backing larger-scale community-led Renewable energy projects with the first Renewable Energy Support Scheme (RESS-1) delivering the first 7 community-led green energy projects and have guaranteed a €104.15/MWh of green energy produced for 15 years.

8.1 Community Owned Renewable Energy in Ireland

Currently Community Power is Ireland's first community owned electricity supplier. they are a partnership of community energy groups working for a sustainable energy future for Ireland. they grew out of Ireland's first community owned wind farm, Templederry Wind Farm in Co Tipperary, and now are working with Irish communities to develop more renewable energy projects 100% owned by people.

It took community power almost 12 years to build the first and only community owned wind farm, and it has been operating from the foothills of Slieve Feilim in Tipperary since 2016. Their two turbines are generating about 15 GWh of electricity every year, which is about the amount of electricity used by the town of Nenagh. Now they are buying renewably generated electricity from a handful of small and micro hydro and wind generators across Ireland and selling it to our customers to use in their homes, businesses, farms and community buildings.

Community Power's mission is to support Ireland to run on clean, renewable power, but as if that's not enough they also think people should also have a real stake in it and own it for themselves. they recognise that Ireland's energy system is in crisis, with over 90% reliance on climate polluting fossil fuels, but many people are struggling to pay high energy bills in cold homes. That's why we are working to make sure the many benefits of generating renewable power are shared by the people and communities of Ireland. Community power state. The Irish government in 2021 have now declared that any community led project must be 100% owned by the community.

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info@tippenergy.ie www.tippenergy.ie

8.2 Microgeneration in Ireland

The new microgeneration Scheme announced in Ireland by the Department of the Environment, Climate and communications (Jan 2022) is set to be a gamechanger will allow excess energy to be exported to the local electricity grid with producers getting an export tariff payment from Q3 of 2022. This will directly benefit citizens and there homes, businesses and community groups who now wish to proceed with Solar PV projects on their roofs.

Micro-generation is defined as:

"micro-generation technologies, including micro-solar PV, micro-hydro, micro-wind and micro-renewable CHP with a maximum electrical output of 50kW, designed to primarily service the self-consumption needs of the property where it is installed".

Year of Microgen System Installation	Domestic / Non-Domestic <6kW system		Large Non-Domestic 6kW-50kW system
	Maximum SEAI grant amount	Clean Export Guarantee (CEG) tariff	Clean Export Premium (CEP) tariff €/kWh
2022	€2,400	Competitive market rate (CEG) available to all micro-generators	€0.135
2023	€2,400		€0.135
2024	€2,100		€0.125
2025	€1,800		€0.115
2026	€1,500		€0.105
2027	€1,200		€0.095
2028	€900		Competitive market rate (CEG) available to all micro-generators for new installations from this point on

Figure 38: Clean Export Guarantee tariff grant funding and Clean Export Premium tariff

Figure 38 details the launch of both the Clean Export Guarantee (CEG) and what grant funding is available in 2022 and for the coming years. The actual CEG tariff payment rate was yet to be defined as of writing this energy plan. The CEG scheme is for both domestic and non-domestic systems up to 5.9KWe. The Clean Export Premium (CEP) that will also be available from Q3 of 2022 is designed for larger 6kW to 50kW micro renewable generation systems.

Summarising the schemes is as follows:

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- Domestic & non-domestic can apply for grant of up to €2,400 for a max of 5.9 kWe system from 2022 this grant amount will reduce over time
- Domestic homes pre 2021 are eligible and no minimum BER required.
- Non-Domestic applicants e.g., Farms, Schools, Community Buildings, businesses can also apply for same grant amount as domestic up to 5.9kWe
- Non-domestic applicants > 6kWe to 50kWe can apply for Clean Energy Premium (CEP) from Q3 2022 at a start rate of €0.135/kWh fixed for 15Yrs and capped at 80% of generation capacity to encourage self-consumption
- Supports under MSS will wane over time
- Grid connect for < 6kW (single phase, usually domestic & 11kW 3-phase usually farm/commercial setting) see ESBN "inform, Fit & Forget" process
- New process for 12-50kW projects, See Mini-Generation Application Form (NC7)
- Tax based incentives: Accelerated Capital Allowance Scheme & Employment and investment inventive
- Farmers can get refund of VAT paid on equipment purchased for micro-generation of electricity for use on farm.
- TAMS has been updated to support a max of 11kW solar PV & 6kW battery 40% funded & 60% under Young Farmers Scheme to a ceiling of €80K per holding.

Figure 39: Ground Mounted Solar Array

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8.3 Renewable Electricity Support Scheme

The Renewable Electricity Support Scheme (RESS) is the new State funded program which enables communities to become involved in energy generation projects. Significant revenue streams, six and seven figure sums, can accrue to communities annually via such projects.

The State guarantees that successful RESS projects will have their electricity output presold, at fixed prices, for upwards of fifteen years. Therefore, the economic viability of the projects can be validated, de-risked and made bankable even before construction takes place. Communities now have an opportunity to lead in the decarbonisation of our society and economy. In the RESS1 scheme 7 community led projects were approved consisting of five solar energy and two onshore wind community projects. These projects are located across three provinces in counties Kilkenny, Galway, Mayo, Wexford, Clare and Cork. As of February 2021, the new requirement states that **community projects will be 100% community-owned to gain 15-year support in Government's renewable electricity support scheme (RESS). Further information available here:**

https://communitypower.ie/community-energy-must-be-100-community-owned-minister-ryan/

https://www.gov.ie/en/press-release/a3abb-minister-ryan-steps-up-ambitions-for-community-energy-sector/

8.4 What is a photovoltaic (PV) system?

A solar photovoltaic (PV) system generates electricity from sunlight, as opposed to solar thermal panels which use solar energy to heat water. There are two types of PV systems, grid-connected, and off-grid. Grid-connected systems are connected to the mains electricity grid through a distribution panel. An off-grid system is not connected to the electricity grid and is normally only used in remote areas or for leisure activities such as caravanning and boating.

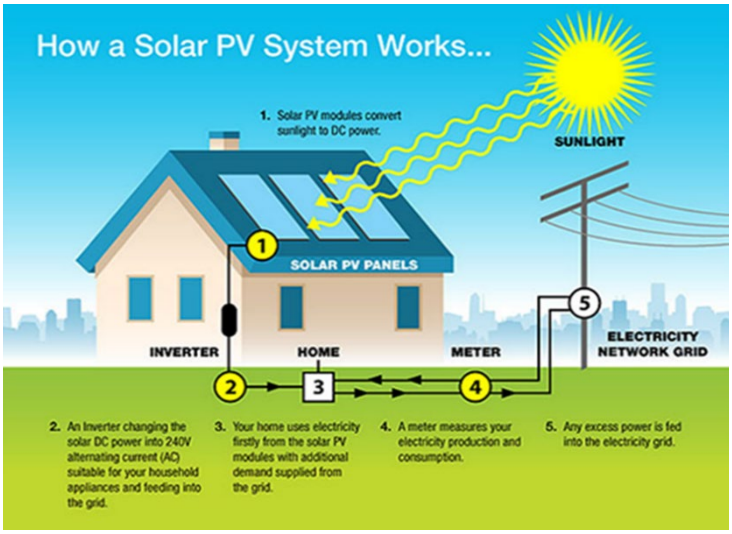

Figure 40: How Solar PV Systems Work

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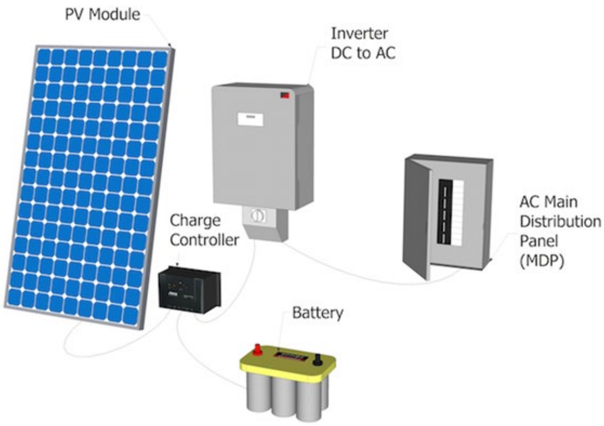

Figure 41: Basic Components of a Photovoltaic System Incl. Battery Storage

The PV system is made up of two main components, PV modules, and an inverter. The standard rooftop PV module is 1000mm x 1600mm and produces approximately 300 Watts at peak output. The PV modules generate electricity in the form of direct current (DC). Most appliances are powered with alternating current (AC). In Ireland, this AC electricity is 230V, with a frequency of 50Hz. Hence, the electricity from a solar PV system needs to be converted to this form of electricity. This function is performed by an inverter. A battery and a controller can also be added to the system so that excess power from the solar PV system can be stored and used when it is required later. Figure 41 above shows the main components of a PV system.

Solar Photovoltaics (PV) could be a viable technical solution to reduce the electricity demand from your supplier and produce green energy on your site. The cost of PV has drastically reduced in recent years now making it financially viable to install, even more so with the financial supports available. Since 2009 the price of PV modules has fallen by 80%. Solar PV systems are mature and proven technology, with high reliability, and require very little maintenance once installed correctly. Facilities that have a constant demand for electricity during daylight hours are most suitable for a PV system. It is in the middle of the day the PV array will produce the most electricity. The first step is to determine your electricity profile. Twelve months of electricity bills should be analysed to determine electricity demand. Once a demand profile is established the most feasible size of your system can be determined.

Ideally, PV is installed on the roof of an existing structure. The roof must be structurally sound and have a future lifespan of at least 25 years. South-facing roofs are most suitable. A ballast system can be installed on a flat roof and panels can be South facing or East/West facing depending on the design. A standard panel is 1600mm x 1000mm and it has a peak output of approximately 400 Watts. This equates to 187.5 Watts per meter squared of panels. The maximum installation for your roof can be easily calculated once you know the size of your roof. A battery and a controller can also be added to the system so that excess power from the solar PV system can be stored and used when it is required later.

Granagh has the potential to install PV panels either ground mounted as part of a community energy project or on the roof of buildings that have a high energy demand during the day. The number of panels that are required will depend on the energy demand of the building. For a business, planning

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permission is required to install more than 50m² which is currently around 9.3kW based on 300Watt panels. Electricity generated on-site will have to be used on-site and any unused electricity will be exported onto the grid in 2021 and export payment is set to be introduced.

There is also an opportunity to install farm-scale solar panels > 25 acres. For this size of developing an environmental impact assessment, planning permission, and grid connection is all required before you can enter into an auction process. The site in question will have to be situated close to a substation as the further away from the substation the more expensive the grid connection fee will be. This is a complex process that can be very expensive, and it is advised to seek legal advice before entering into any contracts with a developer. The price that will be paid for each kW of power will depend on the price submitted during the auction.

8.5 Estimated Solar Resource

Global Solar Irradiation Overview

The sun is an average star that has been burning for 4 billion years and is responsible for nearly all the energy available on earth. Our present demand could be met by covering 0.1% of the Earth's Surface with solar panels using a conversion efficiency of 10%. (Crabtree and Lewis, 2007). The International Energy Agency (IEA) projected that more than 25% of the global electricity demand will be met from solar PV and concentrated solar power. This would make solar the world's largest source of electricity. (McIntosh et al., 2017). Figure 42 illustrates the annual global solar irradiation received by Ireland and its neighbouring European countries.

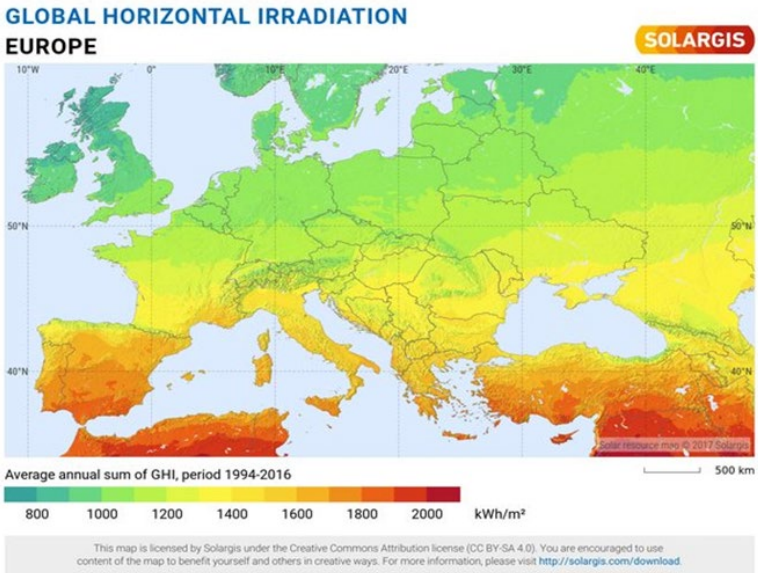

Figure 42: Global Solar Radiation Potential in Ireland and Europe

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8.5.1 Solar Energy Potential in Ireland

Figure 43 provides an illustrated map of the various levels of solar irradiation received by different parts of Ireland. The southern coast of Ireland receives the highest level of solar irradiance, otherwise known as global solar irradiation, receiving approximately 900 - 1300 kWh per square meter on an annual basis. In general, coastal areas receive the most solar irradiation compared to inland areas and therefore, will produce more electricity per panel. Even though some areas are better for solar irradiation in Ireland, in general, there is only around a 10% difference in energy production between the best southerly locations and worst northerly locations in Ireland.

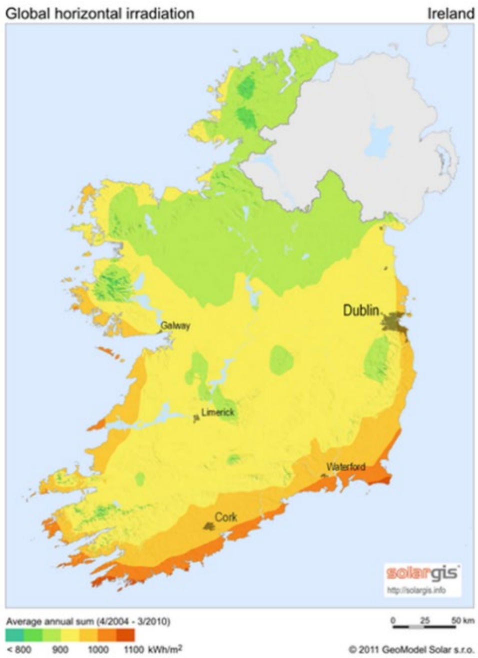

Figure 43: Global Solar Radiation Potential in Ireland and Europe

8.5.2 Estimated Solar Resource in Granagh

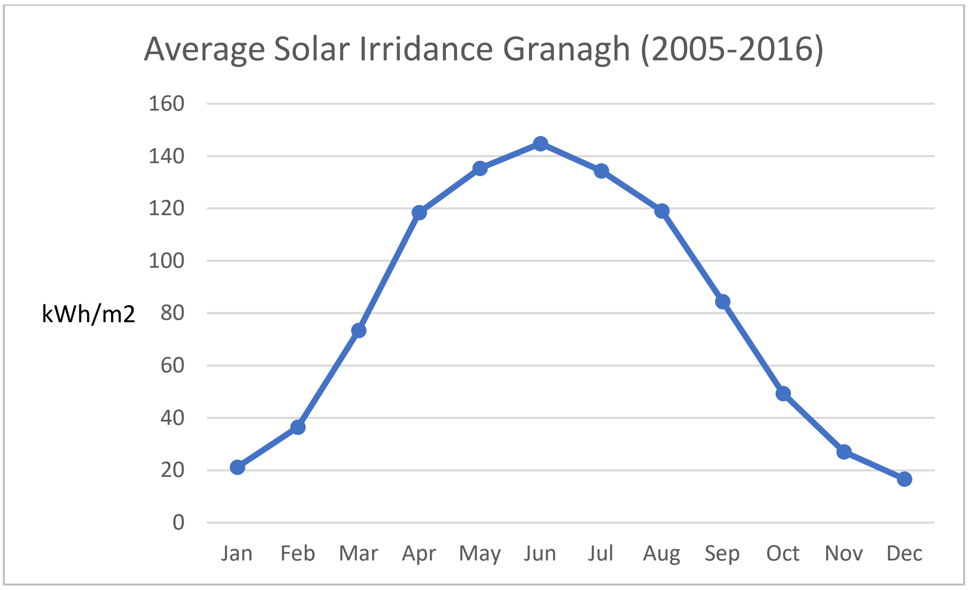

Figure 44: Average Solar Irradiance Granagh

8.5.3 Is Solar PV right for me?

Before considering solar panels, it is best practice to firstly reduce the energy requirement of the building. Using the fabric first approach and upgrading lighting, heating systems and equipment will significantly reduce the building energy needs. Fabric refers to the roof, walls, floors, windows, and doors in your building. This entails upgrading the insulation of your entire building and upgrading windows and doors where necessary. Upgrading existing lights to LEDs and installing new energy-efficient equipment such as heat pumps to heat water where appropriate can drastically cut electricity consumption and therefore the size of the required PV array. Solar Photovoltaics (PV) could be a viable technical solution to reduce your electricity demand from your supplier and produce green energy on your site.

Do you have a steady electricity demand during the summer?

Do you have available roof space?

Is your roof South-facing or East/West facing?

Can you use the majority of the electricity on-site?

Is your building energy efficient?

If you have answered "Yes" to the questions above, you may have a basis for a viable project.

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8.5.4 Community owned vs. Individually owned Solar PV systems Example Only

In this section, we compare an 850 kWp (kilo-Watt-peak) ground-mounted solar PV farm to the equivalent of panels installed on rooftops. As can be seen in Table 12 below, larger-scale projects can deliver a cheaper cost per kWp installed. According to KPMG's report on Ireland's Solar PV potential, the cost of a domestic installation in 2017 was roughly €2,000/kWp compared to €1,200/kWp for a commercial size project[3]. This has been adjusted to reflect the price drop of €1,750kWp for rooftop and €1,250kWp for large scale solar as prices of Solar PV keep coming down. This means that it would make greater economic sense for households to collaborate to build a community project rather than individual households installing solar PV systems by themselves. While it would be unrealistic for 100% of homes to commit to Solar PV, and 100% of homes would have 10m² of south-facing roof space, the table below sets as an example of what can be achieved collectively. The current electrical demand for the homes and non-residential buildings in Granagh is approx. 1,520 MWhr. (10% of total energy) per year.

Table 11: Example for the development of Solar PV Granagh

	Ground mounted	Rooftop
Install capacity	850 kWp	850 kWp
Annual output	763,000 kWh/yr.	763,000 kWh/yr.
	Equivalent to 50% of residential and non-residential electricity use	Equivalent to 50% of residential and non-residential electricity use
Capital cost (€/kWp)	€1,250	€1,750
Total cost	€1,062,500	€1,487,500
Area required	6.46 acres	281 roofs with 12m² each S/SE/SW facing
	4.5 GAA pitches	

There are 281 homes in the Granagh community and if each home had 12m² of south/southeast/southwest facing roof space and 100% of homes, installed solar PV panels to generate electricity would produce an estimated 763,000 kWh which would be equivalent to providing 50% (2,715kWh) of the average annual power demand per home for the next 20 years in Granagh. The cost would be an estimated €5,250 per household for a 3kWp installation and require approximately 281 properties with 12m² of suitable roof space, which is unrealistic but this is given only as an example of the economics of a community owned large scale project.

Alternatively, by collaborating and investing in an 850-kWh community-led solar PV farm, 50% of residential and non-residential electrical requirement would be met. The cost of a share in this

[3] http://irishsolarenergy.org/wp-content/uploads/2019/11/A-Brighter-Future.pdf

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community owned solar farm would be approximately €3,779 for a 20-year investment. Compared to €5,293 per household to install Solar PV on each home rooftop individually

The example from table 12 in the previous page is just to show to financial advantages of a community-led renewable energy project versus each household going it alone with projects.

8.6 Electrical Distribution Network Granagh

The ESB have a heat-map that can be accesses from their website. From this map it can be known if the ESB substation (38kV substation) which supplies the Granagh catchment areas would have capacity to allow the export of electricity energy form any potential community-owned renewable generation project. In this instance currently there is 5.8MVA in FIRM capacity available.

On consultation with the ESBN generation Capacity Heatmap the 38KV substation in Granagh is constrained, meaning that there is current capacity available to connect a sizable renewable energy generation project at this location currently. In understanding the principle of local electrical distribution, the term firm load and non-firm load is explained.

Firm capacity is the amount of energy available for production or transmission which can be (and in many cases must be) guaranteed to be available at a given time.
Non-firm energy refers to all available energy above and beyond firm energy.

An example in this case is the Kilmallock 38kV substation which has a 5.8MVA Firm rating (contracted to deliver) and a 0MVA Non-Firm capacity rating (can supply but not contracted).

In support of distributed generators (local renewable energy generation) connecting to the grid, ESB networks have committed to introduce Non-Firm access (NFA) to the distribution system. The introduction and development of NFA will enable the connection of local and community renewable energy systems to the main electrical distribution grid, as well as other measures this will assist local communities been able to further play their part and assist in achieving the targets set out in the Climate Action Plan 2019 will respect to generation of electricity from renewable sources.

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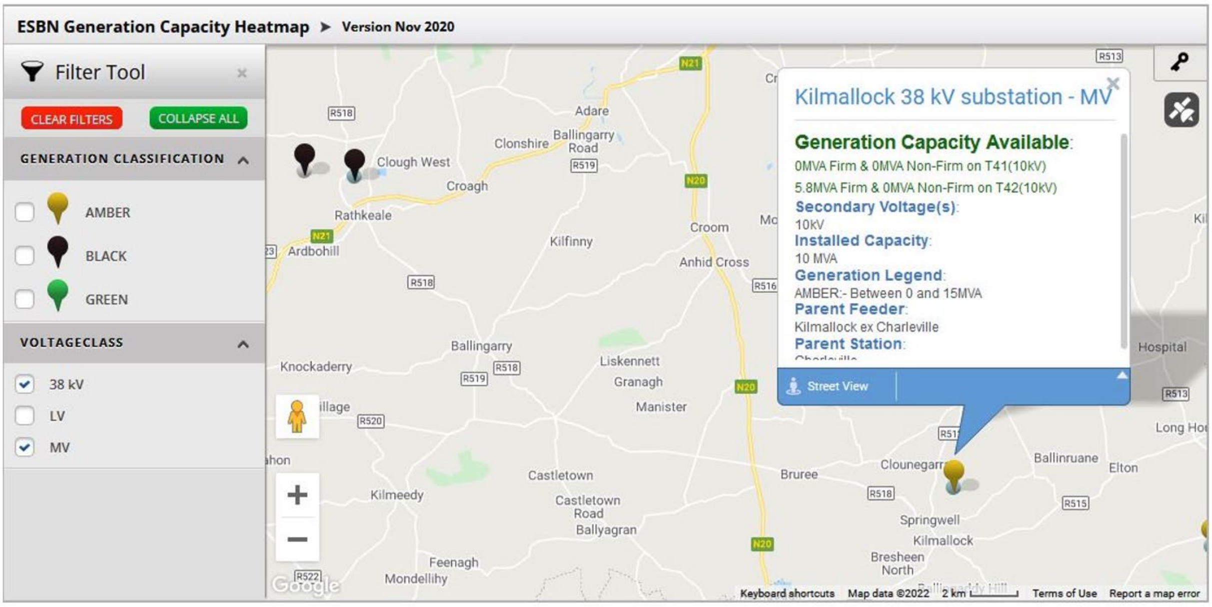

Figure 45: Analysis of Granagh 38kV substation capacity for renewable generation

The yellow pin is the Kilmallock 38KV/10KV substation which is main electrical input to Granagh. It is invaluable to know this information early on in researching the potential of a community renewable generation project as having capacity available on the substation will omit the extra costs of having to contact the ESB to upgrade its infrastructure for any potential project and either make a project viable or non-viable.

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8.7 Estimated Wind Resource

Wind energy is Irelands greatest source of renewable energy. In 2018 Wind provided 85% of Ireland's renewable electricity and 30% of our total electricity demand. It is the second greatest source of electricity generation in Ireland after natural gas. Ireland is one of the leading countries in its use of wind energy and 3rd place worldwide in 2018, after Denmark and Uruguay. Eirgrid has announced last year that it can now handle 65% variable renewable energy on the electricity grid which is predominately made up of wind power. Eirgrid is currently trying to raise this limit to 75%.

Most local authorities in Ireland have a local wind energy strategy, which details the regions that the council consider suitable or not suitable for the development of wind energy. Currently, Limerick City and County Council does not have a wind energy strategy, but this may change as they are developing a Limerick Development plan for 2022-2028. The draft plan should be completed and open to public consultation in summer 2021.

When assessing a location for a wind turbine wind speeds are critical to its profit as the wind's power is proportional to the cube of its speed. Therefore, if you double the wind speed you get 8 times more power. For any wind energy projects, a meteorological mast will have to be erected to measure wind speeds to make sure there is enough wind to be viable and it will also be required for selecting a suitable wind turbine. Planning permission, an environmental impact assessment, and a grid connection offer will also be required before entry into an auction. Smaller-scale wind turbines are also an option for micro-wind generation but would be more expensive per kW installed than the larger scale wind turbines but can offer a home or small business the potential to generate green energy during both daytime and night-time hours.

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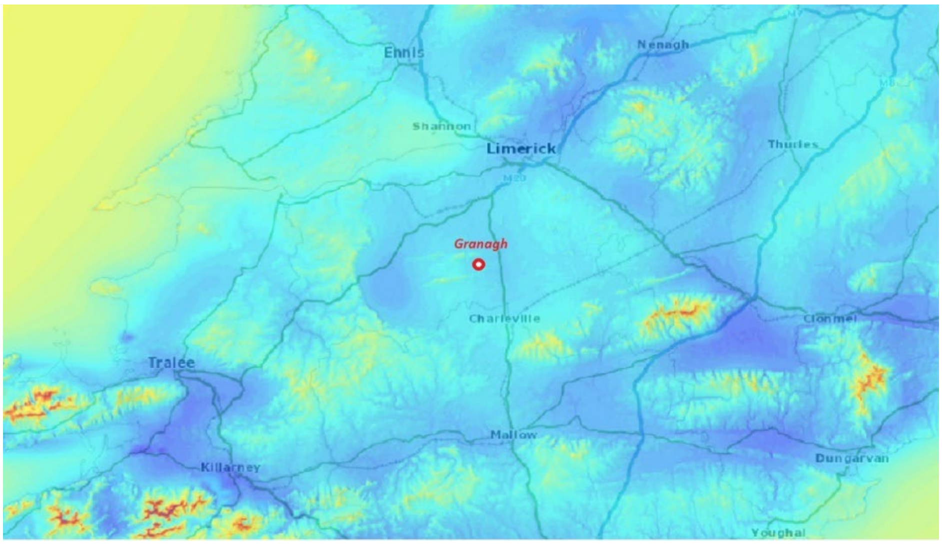

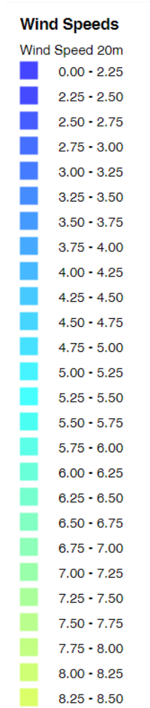

Figure 46: Wind Resource of Limerick and surrounding counties (SEAI)

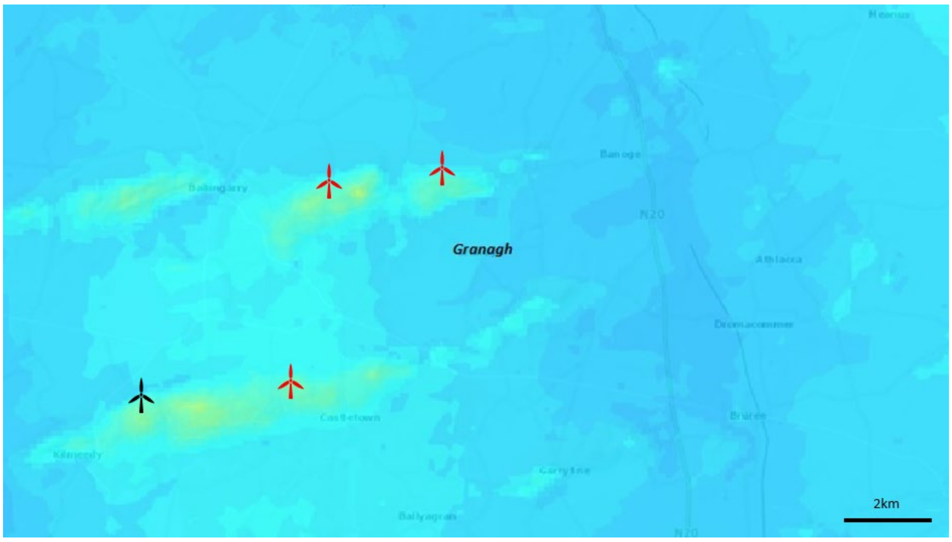

Figure 47: Wind Resource of Granagh with current (black) and potential (red) sites (SEAI)

We can see that the average wind speeds in Granagh are consistently between 5 and 6 m/s in lower lying areas but increases to between 7 and 8 m/s in higher altitudes areas (green/yellow shade) near Granagh. This wind resource is already being used to generate clean wind energy in Kilmeedy wind farm (black turbine in Figure 47). This wind farm consists of 2x 2.35 MW turbines. Potential sites (red turbines in Figure 47) have been identified for development for a community owned wind farm.

8.8 Renewable Electricity Support Scheme

The Renewable Electricity Support Scheme (RESS) is the new State funded program which enables communities to become involved in energy generation projects. Significant revenue streams, six and seven figure sums, can accrue to communities annually via such projects.

The State guarantees that successful RESS projects will have their electricity output presold, at fixed prices, for upwards of fifteen years. Therefore, the economic viability of the projects can be validated, de-risked and made bankable even before construction takes place. Communities now have an opportunity to led in the decarbonisation of our society and economy. In the RESS1 scheme 7 community led projects were approved consisting of five solar energy and two onshore wind community projects. These projects are located across three provinces in counties Kilkenny, Galway, Mayo, Wexford, Clare and Cork. As of February 2021, the new requirement states that community projects will be 100% community-owned to gain 15-year support in Government's renewable electricity support scheme (RESS). Further information available here:

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info@tippenergy.ie www.tippenergy.ie

8.9 Biomass

8.9.1 Introduction

Wood is not a new type of fuel, but the technology has improved considerably to make it more efficient. Domestic biomass can be a budget saving replacement for gas or oil boilers and provide you with space heating and hot water. Biomass boilers can provide cost savings on fuel when compared to alternative options. This justifies the higher initial boiler cost as it is a long-term investment. The cost per unit of energy (kWh) for wood pellets is 5.96 cent/kWh for bulk delivery and approximately 7.21 cent/kWh for bagged wood pellets compared to 8 cent/kWh for oil and 12 cent/kWh for bulk LPG. Wood fuel is exempt from carbon taxes as a heating fuel as it is deemed to be from sustainable sources. (Source: SEAI)

Wood pellet boilers, or biomass boilers generate heat by burning wood pellets, which are considered a renewable source of energy. They can be installed in almost any home and have become increasingly popular in the UK. They work similarly to oil and gas boilers and new models are fully automated and easy to use for domestic space and hot water heating

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Erasmus Smith House, Church Street, Cahir, Co. Tipperary
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353 (52)7443090
info@tippenergy.ie www.tippenergy.ie

With the constant rise in prices of oil and fossil fuels and increasing carbon taxes, many homeowners have started looking for alternative ways of heating their homes that are more budget friendly. One of the options that are gaining popularity is an investment in a Wood pellet boiler. Wood pellet heating system technology is a mature solution to decarbonisation of Irish Homes and businesses and consist of a very wide range of stoves and boilers

These types of Biomass boiler cost less than most boiler types on the market, making for both an energy and cost-efficient means of heating your home. As with any heating system, pros and cons of biomass boilers are numerous, which is why we research and examined several wood pellet boiler reviews. A boiler like the wood pellet boiler is a great alternative to gas boilers, electric- combi boiler or oil-fired boilers. Over one million people have wood pellet boilers installed in their home in Europe.

Advantages of Wood Pellet Boilers

- You can save up to 40-60% on heating costs by installing a wood pellet boiler
- Wood is a cheap fuel, and its prices are much stabler than those of gas and fossil fuels, which keep rising year after year.
- You will enjoy the same level of comfort you would with a traditional gas or oil boiler.
- Suppliers of wood pellets can be found throughout Ireland and can deliver them directly to your home.
- Wood pellet fuel is a more space-efficient option than logs and burns better.
- The Support Scheme for Renewable Heat (SSRH)5 payments5 can help you bring down the cost of instalment on a commercial project.
- In the long run, you will benefit from fuel cost savings including savings from carbon taxes
- Wood pellets are considered carbon neutral: they are a renewable source of heat and sustainable solution that is much better for the environment than traditional fuels such as propane, natural gas, oil, and most electric power.

Disadvantages of wood pellet boilers

- Pellet fuel is bulkier than oil
- Wood pellets must be loaded weekly (or more often, depending on the how small the bags/bins are) if not delivered in bulk.
- Most modern wood pellet boilers have an automatic cleaning system, but some need to be cleaned manually by the owner every 1-2 weeks.
- Ash bins must be emptied, but wood ash contains many minerals and can, therefore, be spread on lawns, gardens and woods.

[5] https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/

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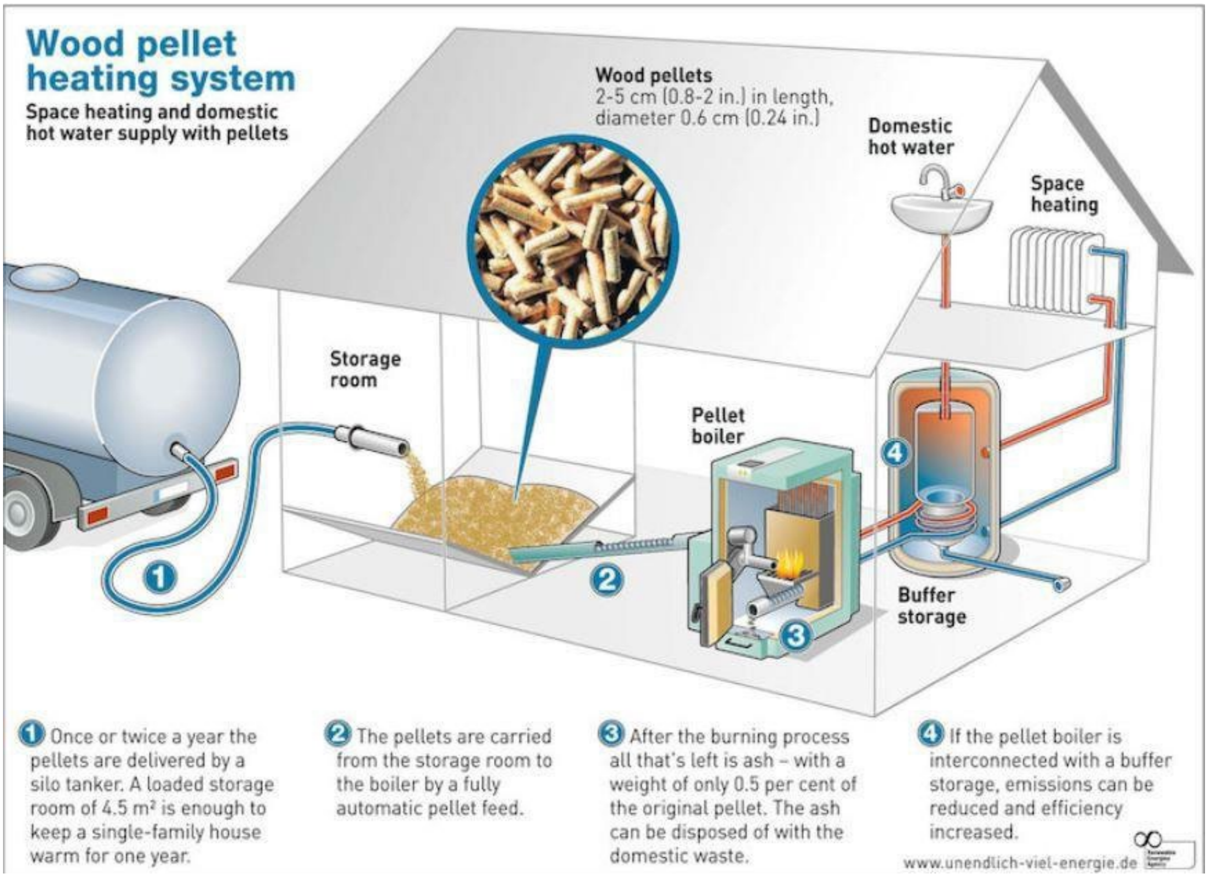

Figure 48: Example of a domestic bulk pellet boiler system

8.9.2 Support Scheme for Renewable Heat

The Support Scheme for Renewable Heat (SSRH) is state support aimed at replacing fossil fuel heating with renewable energy for commercial, industrial, agricultural, district heating, public sector, and other non-domestic heat users. It is now in operation subject to SEAI terms and conditions. Domestic customers are not included in the renewable heat incentive scheme. The SSRH is a government scheme that provides financial support to convert to renewable heat for a 15-year period.

How does it work?

SSRH will pay ongoing operational support to business owners depending on the amount of heat generated. The aim is to bridge the gap between the installation and operating costs of renewable heating systems and the conventional fossil fuel alternatives. This government-funded scheme will pay 5.66c/kWh for the first 300,000kWh of heat produced, 3.02c/kWh for the next 700,000kWh, and so on. The table below gives a breakdown of the tariffs per kWh.

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Table 12: Breakdown of tariffs per kWh for non-domestic buildings

Tier	Lower Limit	Upper Limit	Biomass Heating Systems Tariff
	(MWh/yr)	(MWh/yr)	(c/kWh)
1	0	300	0.0566
2	300	1000	0.0302
3	1,000	2400	0.005
4	2,400	10000	0.005
5	10,000	50000	0.0037
6	50,000	N/A	0

How can I apply?

The scheme is open to all businesses who have a legitimate use for heat – whether it is for process heating, heating sheds for farm animals or simply space-heating for your offices.

Businesses will only receive payments for displaced fossil fuels, such as oil or gas. This means that you cannot claim payments if you already have a biomass boiler for heating since before the scheme opened. However, if you decide to up-size your business and require more heat than you are already getting from your original boiler, you will be able to claim payments on the difference.

There are no limits on the capacity of the boiler. Biomass boilers start at outputs of 18kW and go all the way up to outputs of 10MW and more.

For more detailed information on the scheme. View the **SSRH publication from the Department of the Environment, Climate and Communications**

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8.10 Hydropower

8.10.1 Introduction

Presently about 2.5% of Ireland's electricity generating capacity is in the form of hydropower. The national greenhouse gas emissions avoided from using hydro as a form of renewable electricity is 283 kt CO_2. The Ardnacrusha hydroelectric station built in the 1920s is still the country's largest renewable energy generating unit.

Hydroelectricity is derived from the power harnessed from the flow of falling water, typically from fast-flowing streams and rivers. There is no international agreement on the definition of small hydropower. In Ireland 'small' refers to an upper limit capacity of 10MW. Small-scale schemes (under 10MW) have been operated by private developers and small companies but has now changed with the introduction of the Renewable Energy Support Scheme which was in September of 2022 (RESS 1) and Community Power which is a 100% community-owned organization can now purchase this green electricity. This offers the likes of communities the opportunity to produce and sell their green energy through an auction process or sell directly to Community Power for example4. Start-up costs are high, but, after the initial payback period, the developer is rewarded with power production from a "free fuel" at relatively low operating costs. Hydropower requires the source to be fairly close to the site of power usage or the national grid. The turbine converts potential energy stored in the flow of water to produce electricity. Up to now, lack of a default purchaser of all renewable energy supplied to the network was the main deterrent to developing small-scale hydro generation.

[4] https://communitypower.ie/

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8.10.2 The Market

Small-scale hydro is a useful way of providing power to houses, workshops, or villages that need an independent supply. Considerable unexploited hydropower potential exists in Ireland at the small to micro-scale level. The electricity generated can potentially be supplied to the local community. Surplus electricity can be sold to the national grid.

By investing in a small hydropower system, it is possible to reduce exposure to future fuel shortages and price increases and help reduce air pollution. Improvements in small turbines and generator technology mean that “micro” technology (under 100 kW) hydro schemes are an attractive means of producing electricity. As a result, much focus nowadays is on small developments. The likely range is from a few hundred watts (possible for use with batteries) for domestic schemes to a minimum of 250 kW for commercial schemes. Another option is to refurbish old buildings (for example sawmills) to generate electricity.

8.10.3 How to build a small-scale hydroelectric power plant

8.10.3.1 Identify sites with potentially good water resources

A sufficient volume of falling water must be available. Determine the amount of power that you can obtain from the flowing water on your site. The power available at any instant is the product of what is called flow volume and what is called head. The best sites have a reliable water supply year-round and a large vertical drop in a short distance.

A rough estimate of the power available at a specific micro-scale site can be calculated from the equation:

$$\textbf{Power (kW)} = \textbf{6 X Head (m) X Flow (m}^3\textbf{/sec)}$$

Head = *the vertical flow of the water, essential for hydropower generation*

Flow = *volume of water passing per second*

Note: *Heads less than 2m are liable to be uneconomic.*

8.10.3.2 Research planning and license requirements

If the potential output of a scheme is attractive, then one needs to be certain that permission will be granted. It is wise to commence informal discussions with planning and fishery board authorities early in the assessment to get a better feeling for their attitude towards the project. The relevant local authority will decide if an Environmental Impact Assessment (EIA) is required. An EIA is carried out at the project proposal stage to determine if an Environmental Impact Statement (EIS) is required. Most proposed small-scale hydro schemes would have an output well below 20 megawatts and may not impound any water. A change in 30% of mean river channel flow is likely to occur and it is in this context that an EIA is required.

8.10.3.3 Consider the Environmental Impacts

Environmental effects must be considered (the effect of the dam on fish, flooding, etc.). Turbines can have a visual impact and produce some noise, but these can be mitigated relatively easily. The main issue is to maintain the river's ecology by restricting the proportion of the total flow diverted through the turbine.

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8.10.3.4 Determine proximity to Electricity Grid

The distance from potential sites to the nearest suitable connection point on the grid should be estimated and the cost of same. It is important to determine to whom the power will be sold. The electricity generated by a scheme may be used at the point of generation, in place of electricity supplied by the ESB. Alternatively, it may be exported via the national grid. Presently, any new generator into the network must secure their customers and buy any surplus at unpredictable prices. Therefore, it is financially advantageous to consume as much power as possible on-site and only export the surplus into the network.

8.10.3.5 Establish access to Capital

Economics dictates the feasibility of a hydro plant. The economic viability of hydropower development is highly site-specific. Generally, a hydro system requires substantial initial capital investments and relatively low operating costs. It is considered that the location and site conditions determine a significant amount of the development cost. The final point is to calculate the cost per kWh produced by the hydro plant. In this order, an estimated cost of building the plant at the site, the annual cost of the plant, and all other costs must be done.

8.10.3.6 Build the Plant

The next step is to design and to effectively build the plant. The major steps involved include:

- The preparation of the budget and facilities
- The turbine, generator, batteries, pipe for penstock, the inverter, and any other items must be ordered.
- The delivery of mechanical and electrical components can take some time. Meanwhile, the dam, powerhouse, headrace, tailrace, and other civil works can be built. The next step is to install the penstock and valves.

8.10.3.7 Costs

Most of the development cost is determined by the location and site conditions the rest being the cost of manufacturing the electromechanical equipment. Initial costs may be high due to strict environmental regulations. To generalize, though, is estimated that production of electricity from small-scale hydro would range from 0.07 – 0.15 cents per kWh depending on closeness to the gridline. A large proportion of the capital costs are associated with the civil engineering works and, for plants in remote locations, the grid connection charges can also be significant.

Granagh SEC could investigate further if any of the local rivers and old water mills in the catchment area or beyond could be upgrades as a small hydro project, again as a community generation project.

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9.2 High-level Technology Review

High level technology review – Summary

- Upgrading to Heat pump heating technology all housing and heat pump upgrade for BER-B properties
- Solar PV both domestic and community scale to be encouraged
- Any heating solution involving supply of hot water for space heating will involve expensive retrofit for properties that use electric heating only (dry system).
- Biomass (wood pellet) boilers can provide an option to upgrade any fossil (wet) heating system where the building fabric is not suitable for deployment of heat pumps
- Fuel cell technology can offer an innovate and novel zero-carbon solution for apartment & retail complexes for Heat and power applications and for hydrogen transport fuel.

Several technologies could be considered for use within the Granagh area. The following section provides a brief overview of the major technologies that could be considered and some details regarding how they work and an overall suitability rating in the context of energy needs in Granagh.

A simple Green/Amber/Red qualitative scoring system is used. Green means that the technology would be well suited to Granagh needs; Amber means that it could potentially be suited to Granagh's energy needs; Red would not be recommended presently for Granagh.

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Table 13: High level technology review for Granagh

Overall Technology suitability for Granagh SEC	Technology	Commentary
High	Heat Pumps	Air-source heat pumps offer potential alternative to electric and oil-based heating systems. Local experience suggests they are effective in different dwelling designs and can supply wet heating as well as underfloor systems. Ground source and water source heat pumps are more expensive options (more civil works are required during their installation). Fitting to existing properties complements building fabric improvements and is often done at the same time.
	Wind	Wind Energy has a better potential, especially in the hills outside of the Granagh SEC catchment area.
	Solar PV	Rooftop solar PV offers potential for homes/community and commercial buildings to offset energy demand. A community solar farm would significantly reduce the installed cost of solar PV also.
	Solar Thermal	Given the local solar resource, the majority of homes would benefit from solar watering heating, but a supplementary heating system would need to also be in place.
	Biomass	Potential alternative to fossil fuel heating systems. Not a direct alternative for electrically heated properties (requires wet heating system)

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Medium	Energy Storage	Household scale storage systems (linked to solar PV) are expensive. The benefit of solar-fed individual storage would be limited for properties using night-rate electricity as this is a lower tariff price, multi property storage systems could be viable.
	Energy from waste	The main potential route would be anaerobic digestion. Costs are likely to be prohibitive since the cost per installed kW is very high and the demand for thermal energy not present all year round.
Low	District Heating	The size and distribution of heat demand in the Granagh SEC area is not well suited to a district heating scheme. Small scale clusters of housing served by a communal system may be viable
	Electrolysers	Given the potential wind power output, community-scale electrolyser systems could be viable. These would provide a means of producing hydrogen that could be used as a transport fuel in future years. This technology is of low suitability as the area currently doesn't have a local power source, but this may change in the future.
	Gas CHP	No mains gas supply to the Granagh SEC area makes this option expensive. Alternative gas supplies would need to be imported and processed prior to use in any system
	Fuel Cells	No potential for Fuel cells in Granagh SEC
	Hydro	The potential for hydro power in Granagh SEC area is low due to the lack of appropriate water resource and proximity for direct usage

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10.0 Register of Opportunities

Register of Opportunities – Summary

- Standard retrofit of 150 homes (20 homes per year) to a BER B2
- Shallow retrofit of 100 homes (15 homes per year) to a BER B2
- Scope for sustainable transport adaptation of electric vehicles, opportunities for EV charging points and local community engagement
- For a 50% reduction in transport 402 private and 40 commercial EV's would be required in Granagh
- 50% reduction in dairy farm sector with net a 9MWh saving per year
- Further engagement with the non-residential sector should be encouraged to conduct lighting audits
- Development of a community owned 5MW solar PV project in Granagh

The register of Opportunities will provide the foundation block to establish a sustainable energy roadmap for the study area considering the following factors from the summary above.
The Register of Opportunities includes:

- A prioritised list of renewable energy projects appropriates for community ownership, within the next 10 years.

- A roadmap for energy retrofit of residential and non-residential buildings in the study area, with the potential to reduce energy use in buildings by [50%], within the next 10 years.

The Register of Opportunity is to inform future applications to the Better Energy Community programme from SEAI (or other suitable funding streams) for priority energy efficiency and renewable energy projects on the Island. As such, the Register of Opportunity shall provide preliminary capital costs and expected energy savings arising from the priority projects.

Community Engagement:

- The Baseline Energy Balance analysis and the development of the Register of Opportunity specified above are to be informed and guided by the community, under the leadership of its SEC steering committee.

- It is expected that an appropriate level of engagement and consultation with key stakeholders will take place at key stages of the study, to help understand the needs and capabilities of the community.

- 80% of energy usage in the study area will be from community-owned Renewable Energy Projects within the next 10 years.
- 50% reductions in energy/emissions in transport will be included in recommendations

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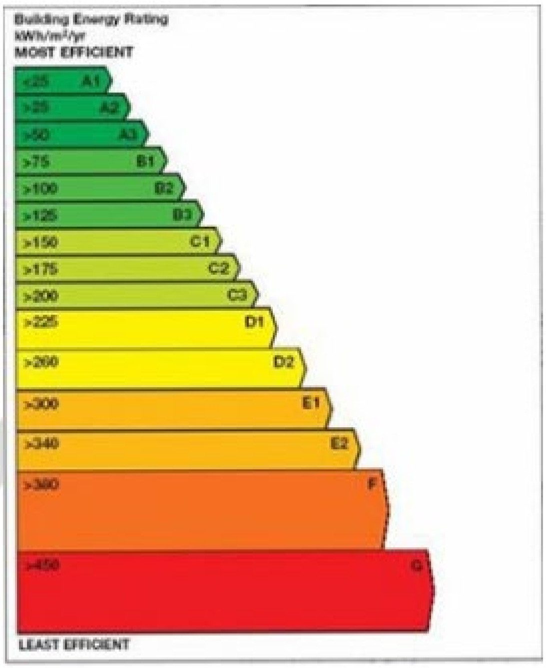
The study should both leverage local knowledge as well as facilitate knowledge development for the community.

10.1 Residential

Targets:

- **50% reduction in energy usage from both residential and non-residential buildings within the next 10 years.**



The BER is a co-measure of how well a home retains heat with electrical energy usage defined for use in lighting, scaled from BER A (well-insulated homes requiring very little heating) down to a BER-G (poorly insulated homes requiring a lot of heating). For example, the average BER in Granagh is a BER of D2. Upgrading to a BER of B2 would reduce the amount of heat energy required by around 55 – 60%.

Comparing dwellings in Ireland to dwellings in the EU, we see that the average Irish dwelling uses 16% more energy than the average EU dwelling. Adjusting these figures for the weather and temperature shows that we use 25% more than the EU average. The recent increase in retrofitting in Ireland will bring our residential sector in line with EU averages. Granagh can play its part by encouraging and enabling residents to retrofit their houses.

Meeting the 50% energy reduction target in the next 10 years would require:

- 160 homes within Granagh to complete a deep retrofit from the housing stock with a BER D and lower (generally built before 2000) being retrofitted to a BER B2.
- 100 homes to complete a shallow retrofit, to upgrade from a BER C to at least a BER B2 rating (must achieve a 100 kWh/m²/yr. uplift as per grant scheme requirements). This equates to 10 homes being shallow retrofitted each year, starting in 2023

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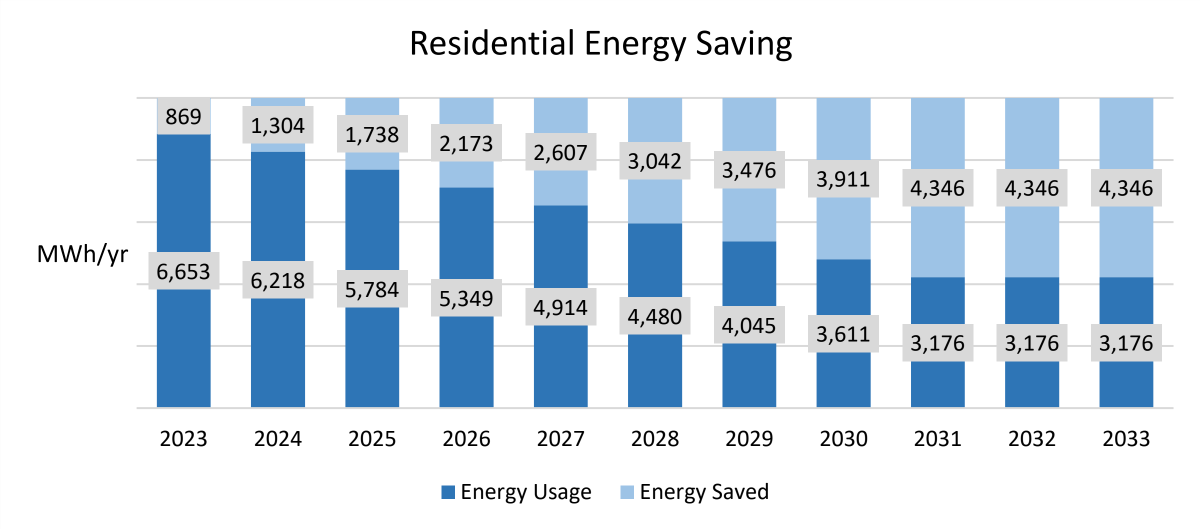

Figure 49: Projected usage and savings from residential retrofit

Standard retrofitting of 15 homes and shallow retrofitting 10 homes per year would reduce residential energy usage in Granagh by 55% in the next 10 years. It would also save approximately €254,951 per year in energy costs for the residents when the retrofitting programme is completed. This retrofitting programme would also reduce the CO_2 emissions of the residential sector in Granagh by 55%. Monetary values given are guide pricing only assuming material costs have increased by 30-40%. each housing project will need to be assessed on a case-by-case basis. If the average cost of retrofitting a home to a B2 is an estimated €12.5 million in total. However, under the national retrofit plan a €25,000 grant is now available (Better Energy Communities) scheme, the community could avail of grants, which would reduce the total cost of upgrades from €10.5 million to €5.225 million (50%). The average BER score for the Granagh community would be improved vastly, achieving an average BER B2 rating compared to the current rating of D1which would be in line with the National retrofit Plan as part of the Climate Action Plan 2021.

Table 14: Quantity and estimated cost of Retrofits required in Granagh

Retrofit Type	Retrofits per year (starting in 2023)	Capital Cost
Shallow	10	€300,000
Deep	15	€750,000
Total	**25**	**€1,050,000**
Total by 2032	**250**	**€10,500,000**

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Table 15: Estimated Savings from Retrofitting to achieve 50% energy savings

Retrofit Type	Energy Savings (%)	€ savings (incl. carbon tax)		CO_2 savings (tons)	
		by 2030	Per Year thereafter	by 2030	per year thereafter
Shallow	12%	€435,919	€100,576	849	189
Deep	44%	€1,562,527	€360,509	3,045	677
Total	**57%**	**€1,998,447**	**€461,085**	**3,894**	**865**

Table 16: Residential Energy Audits potential result of home energy upgrades

Residential Energy Audits											
Year Built	**Type**	**Floor Area [m²]**	**Estimated Current BER Score**	**Current HLI**	**Estimated BER**	**New Ber Score**	**New BER**	**% Improvement of energy consumption**	**New HLI**	**GHG Savings tCO_2/yr.**	**Eqv. Trees Req.**
1997/2020	detached	219	221	2.36	C3	166	C1	25%	1.84	2.0	95
1995	detached	194	215	2.46	C3	147	B3	32%	1.90	2.5	117
2008	detached	91	183	2.39	C2	133	B3	27%	1.83	1.8	86
1930	detached	127	476	5.59	G	177	C2	63%	1.89	10.8	515
1957/1983/1990	detached	96	347	2.72	E2	190	C2	45%	1.90	5.7	271
1945/1995/2005	detached	136	245	3.30	D1	163	C1	33%	2.20	3.0	141
1820/1985	detached	78	528	6.0	G	216	C3	59%	2.03	11.3	538

The above table outlines the sample homes that received one of seven home energy audit that was available as part of the Granagh Energy Master Plan. From the Sample group if the homeowners undertake the recommended home energy upgrades the improvements in energy savings are between 25% to 59% in savings per year and will get those homes up to a good standard between a BER C3 to A BER B3. If the homeowners choose to progress with these measures, then these homes would be considered to be 'Heat Pump' ready as the Heat Loss index (HLI) would to be < 2.3 for grant aid to be sought for the installation of a heat pump system which would electrify the heating of these homes.

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10.2 Non Residential

Target:

50% reduction in energy usage in non-residential buildings within the next 10 years.
Energy audits were carried out on two buildings and their related activities in Granagh to sample the potential for energy upgrades. Non-residential activity accounts for 3.3% of energy consumption in Granagh. The range of buildings and their activities that were audited, consisted of a National School and the Community Centre. If the recommended energy upgrade measures are carried out, this would result in a 7% energy reduction in this sector for Granagh and would stimulate further interest in energy upgrades in the non-residential building sector.

Table 17: Results of energy audits for non-residential buildings in Granagh

Non-Residential Energy Savings from Energy Audits					
Building Type	Energy Savings (kWh/yr.)	% Improvement of Energy Consumption	tCO2/yr. Savings	Euro Savings (€/yr.)	Euro Investment Req.
St Joseph’s National School	24,932	73%	6.9	€1,661	€174,194
Granagh Community Centre	13,471	82%	3.0	€1,755	€137,732
Total	**38,403**	**1%**	**9.9**	**€3,416**	**€311,926**

The other non-residential buildings could make similar savings by investing in energy reduction measures outlined in the non-residential energy audits that were undertaken on a cross section of business and community building activity (non-residential) in Granagh as part of this energy master plan. It would be recommended to continue to engage with this sector and promote awareness of what can be achievable with energy upgrades, deliver on further auditing of buildings and availing of all grants and assistance to accomplish Granagh’s energy goals.

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10.3 Sustainable Transport in Granagh.

Private Electric Vehicles

To achieve a 50% reduction in private vehicle related energy use in Granagh, 81% of today's fossil fuel powered cars would need to be replaced by electric cars. This will result in the residents of Granagh collectively owning 402 electric vehicles and 93 fossil-fuelled vehicles. In addition to the large reduction in energy usage, the carbon emissions related to transport in Granagh would 69% (drop of 13% of total SEC emissions) by 2030. This is based on the assumption the carbon intensity of electricity from the national grid available to charge electric vehicles will be 100g/kWh as opposed to 300g/kWh as it can be in 2022.

Commercial Electric Vehicles

Similarly, commercial vehicles will be required to make the transition to electric. Of the 49 commercial vehicles in Granagh today, 40 of them would need to be replaced with electric vehicles to achieve a 50% reduction in commercial transport energy use. This would lead to an 69% reduction in carbon emissions from Granagh's commercial fleet by 2030. The electrification of transport in Granagh would enable community owned renewable energy projects to fuel this energy demand. On top of that, as more and more wind and solar farms are being constructed across Ireland and its seas, the electricity grid becomes greener and greener, ever decreasing the environmental impact of houses, cars and businesses that are connected to the grid. At the time of writing this report there was no working electric vehicle charging station to serve Granagh. Section 6.4 on page 51 provides of details of the nearest EV charging stations to Granagh.

10.4 Sustainable Agriculture in Granagh SEC

Section 5 outlined the data collected on Agriculture energy in Granagh SEC. with focusing on the dairy farming practices a 50% reduction from dairy practices would reduce the energy footprint by 8.6 MWhr/yr. this would be focused primarily on upgrades to milking parlours, with further savings possible with lighting upgrades and investment in Solar PV of throughout the sector in Granagh. There is a large dry stock footprint of cattle in Granagh SEC and winter lighting upgrades to high efficiency LED lighting of sheds could be the primary focus here.

10.5 Community-led Renewable Energy

There is also an opportunity to develop a farm scale solar farm of up to 5MW and qualify for the RESS auctions as a community generation project. The land area required would be circa 25 acres and from an economic point of view would need to be in proximity to an electrical substation with capacity for such a generation project of this scale.

For this size of developing an environmental impact assessment, planning permission, and grid connection is all required before you can enter an auction process. The site in

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question ideally should be located in proximity substation that has available capacity or else this substation will need to be upgraded which can incur significant costs to the overall capital spent of any project. Also, the further away the community own renewable energy project is from the substation the more expensive the project will become with additional power lines required to connect. This is a complex process that can be very expensive, and it is advised to seek legal advice before entering any contracts with a developer. The price that will be paid for each MWh of power produced will depend on the price submitted during the auction.

10.6 Lighting Energy Reduction in Granagh SEC

The hospitality and retail sectors in Granagh SEC could be encouraged to undertake lighting audits. These reviews can be used to quantify the simple payback and subsequent annual savings by upgrading to lower energy lighting solutions. These upgrades have short payback periods and are a relatively simple upgrades to undertake.

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10.6 Conclusion

With forward-thinking and planning, winning the heart and the minds of the community and taking an optimistic approach the 50% energy reduction target in Granagh can be realised. This would include the 150 (pre-2006 built) detached / semidetached homes could receive a full retrofit from an average of BER-D2 to a BER-B2 and 100 (2006-2010 built) detached / semidetached homes could receive a shallow retrofit and be further upgraded from a BER-C3 to a BER-B2. This would deliver the Granagh community to an average BER-B2 from an average BER of D2 by 2030. This would include installing high-efficiency heat pumps to heat people homes into the future but subsequent to improvements to the building fabric of each home.

A sample of non-residential (community & business) buildings were audited as part of this Energy Master plan. Two energy audits of buildings were performed one in the Granagh Community Center and the other in St Joseph's National School and the cumulative energy savings if the work were to be carried out would result in 38MWh/yr. (7% in energy savings from the non-res sector). in energy savings. The decarbonisation of the non-residential sector would require continued engagement and development of a roadmap to achieve a 50% energy reduction by 2030.SEAI BEC Grant aid varies between 30% to 50% for approved projects.

From the perspective of energy reduction in the transport sector, for Granagh SEC to achieve a 50% reduction from the transport energy sector, 402 private electric vehicles and 40 commercial electric vans will need on the roads of Granagh by 2030. Big gains will be made with the introduction of Electric Vehicles onto the roads of Granagh. A plan for deployment of an electric vehicle charging infrastructure in Granagh and the wider commuting areas needs to begin to offer fast charging EV options for the citizens of Granagh SEC.

The TAMS scheme for farmers is straight forward and can offer grant aid between 40% to 60% when certain criteria are met. The agricultural sector should be encouraged to install rain water harvesting equipment, solar PV systems especially for dairy farms, and upgrade lighting to very high efficiency LED lighting.

If the ESB electrical infrastructure is made more accessible to the Granagh community and connection to a suitable 38kV substation is possible and economically viable then a 5MW solar PV farm with would require about 25 Acres of suitable land could create a annual income into to the community for 15-20 years to assist in the investment cost of energy upgrades.

Figure 50 on the next page summarises what the energy landscape could look like in the next 10 years across all the energy sectors of residential energy, Community and business (non-residential) and transport in Granagh. Also, there is the potential for a 100% community owned Solar PV farm if either the substation can be upgraded, and local land utilised, or a suitable location can be found for this project further from Granagh and in proximity to an electrical substation with generation capacity

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10.7 Summary

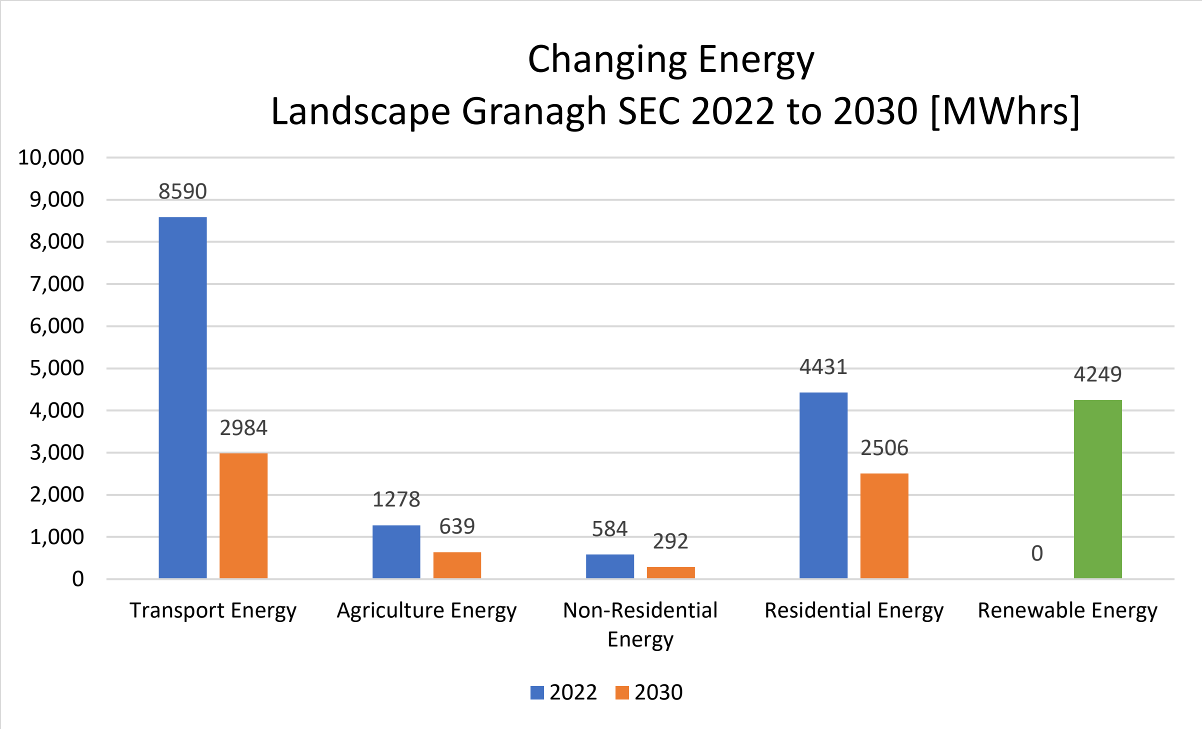


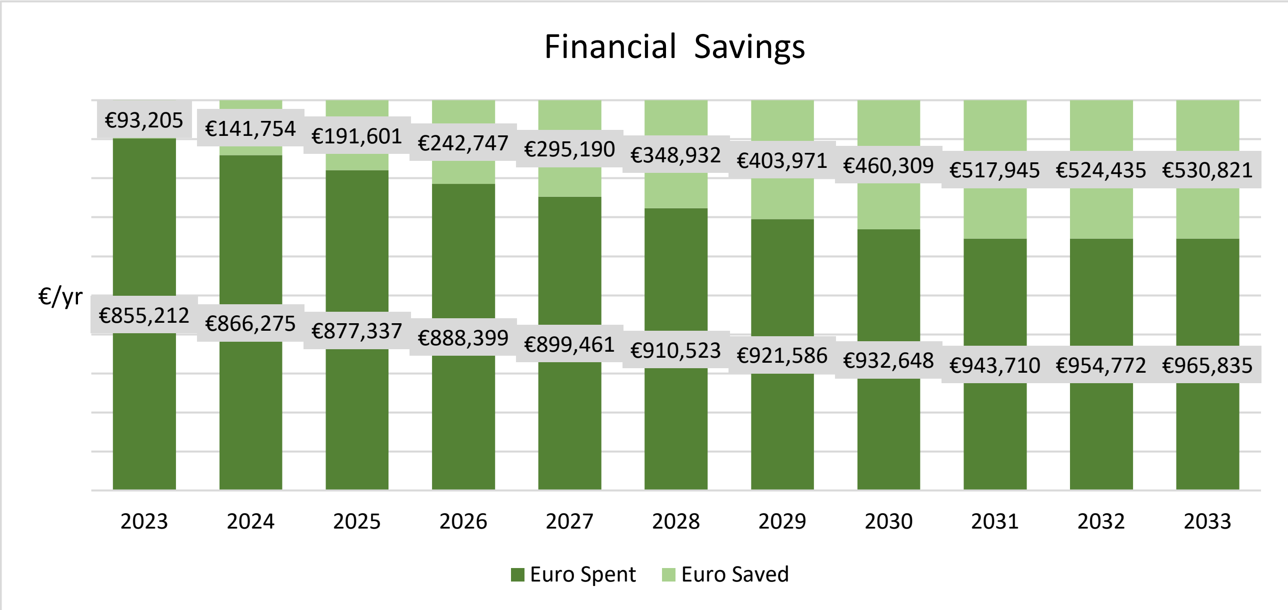
Figure 50: Energy reduction possibilities per sector in Granagh

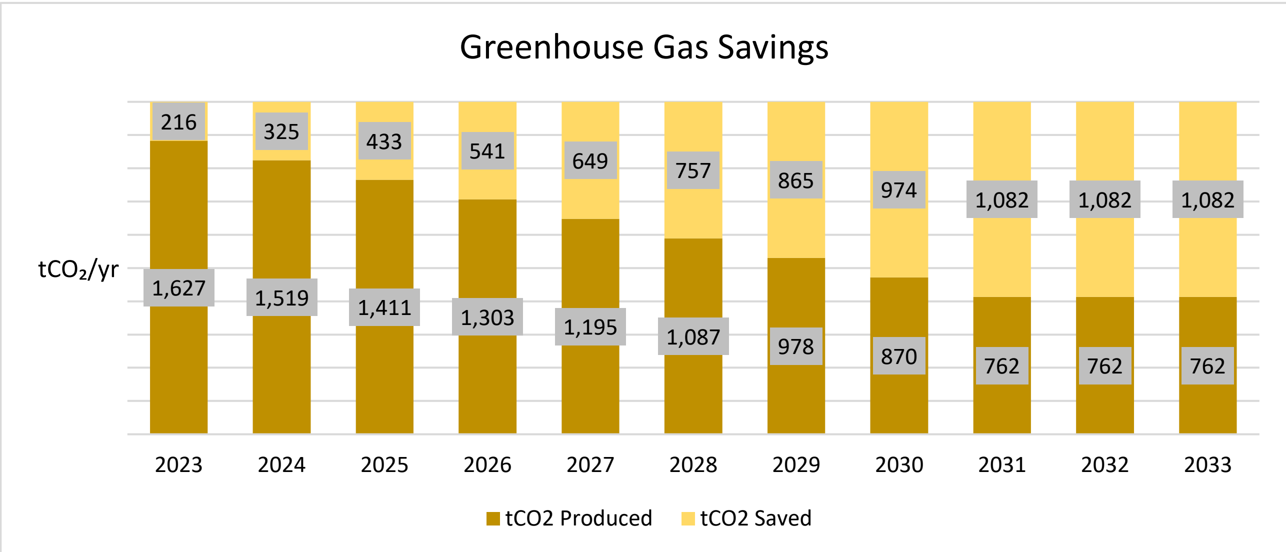
From Figure 50 above big wins can be made in energy reductions in transport and the residential sector by 2030. Transport energy well most likely reduce organically as more drivers opt for energy efficient and lower running costs of electric vehicles instead of traditional fossil fuel vehicles. Substantial gains can be made also in the upgrading of homes in Granagh SEC to a very high BER B2 standard. Energy reduction gains can also be made with focussing on the dairy farm sector and dry stock sector with replacing old lighting with high efficiency LED lighting and also upgrading equipment in milking parlours. Engagement and analysis with the agricultural sector will be required to produce a roadmap for a 50% reduction. The TAMS scheme for farmers is straight forward and can offer grant aid between 40% to 60% when certain criteria are met.

The jewel in the crown for Granagh SEC would be a 5MW solar- PV farm which would require approx. 25 acres of suitable land and connection to a suitable ESB substation. This solar PV farm would generate an income for Granagh SEC for the next 15 years and could further assist in funding the energy transition in Granagh SEC. The estimated investment in a community owned Solar PV farm with be in the region of €4.5M to €5M and could return a revenue to Granagh SEC of circa €450,000 per year.

Appendix A Supporting Information

Tables A.1 Tables of Financial & Greenhouse Savings





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Appendix B Supporting Information

Table B.1 Example of remedial actions for homes

#	Measure	Description of measure
1	Replacement of fluorescent/incandescent lightbulbs with LED equivalent	Carry out a program of replacement of incandescent bulbs with LED equivalent within households
2	Loft insulation top-up	Program of loft insulation upgrades to ensure minimum 300 mm thickness in relevant households
3	High-efficiency storage heaters	Program of replacement of storage heaters with modern equivalent in relevant households
4	Replacement of existing oil boilers	Program of replacement of existing boilers in households with oil used as primary heating fuel with Heat pumps/biomass boilers
5	External wall insulation	Program of external wall insulation work on relevant households
6	Underfloor insulation works	Program of insulation work to be installed beneath wooden floors in identified households
7	Replace entry doors with modern equivalent	Program of replacement of main entry doors to households with modern insulated equivalent
8	Install A-rated windows (uPVC frames)	Program of replacement glazing for relevant households
9	Installation of Solar PV	Program of installation of domestic scale Solar PV on appropriate buildings. Potential to develop community body to co-ordinate investment and/or installation
10	Air source heat pump	Look to use air source heat pumps as part of the heating solution for retrofit/new build properties alongside high levels of building fabric and insulation.
11	Community Minibus	Explore the potential of a community bus route using low emissions minibus and smart on-demand timetabling
12	Smart meters	ESB will complete the roll-out of smart metering in 2024

Impact Factors

In assessing the potential overall benefits of each option, the following factors have been considered:

Electrical Grid Capacity – the influence of local grid network capacity on the viability of proposed supply schemes. Where large schemes are proposed these might need reinforcement works to be carried out to enable the export of electricity into the wider grid network. For a smaller scheme, it may not be possible to export all of the available energy from the system therefore reducing the value of this output to the local community.

Environmental designations – the influence that any proposed action might have in terms of designated areas such as Site of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC). This is both in terms of preventing the use of land areas for energy development to avoid disturbing such sites and also landscape and visual impacts of any energy supply schemes.

Cultural heritage designations - the influence that any proposed action might have in terms of designations such as ancient monuments, burial grounds, or archaeologically significant sites. This is

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both in terms of preventing the use of land areas for energy development to avoid disturbing such sites and also landscape and visual impacts of any energy supply schemes.

Supply chain – The relative size of the supply chain for the technology and availability of relevant equipment. This includes consideration of whether required equipment is readily available at different scales or whether orders are bespoke to local requirements.

Technological maturity – Assessment of how well developed any technology is, and where there is risk associated with its operation. This includes how easily technology could be used within the local area without the need for significant modification.

Community ownership – The scope for community ownership and potential investment in the proposed solution.

The scale of development cost – Assessment of the relative scale of development costs involved in the proposed solution, capital cost requirements, an initial view of investment return rates.

Lower energy costs – Estimate of impact on energy costs to end-users

Local economic benefit – Assessment of potential local economic benefit. This is both in terms of whether any additional employment may arise from the proposed solution as well as additional benefit arising from the likes of lower fuel costs, enhanced community income via revenue generated from community-owned assets

Carbon impacts – Estimate the impact of solutions in terms of net carbon emissions associated with energy supply and use.

Human health impacts – Any impacts of measures on the local environment in terms of air quality and any other benefits from a change in energy supply or transport. This is predominantly focused on reduced pollutants (e.g., particulates and oxides of nitrogen/Sulphur from existing transport)

Increased mobility for vulnerable groups – Specifically for transport-related projects, an assessment of whether the proposed solution will provide benefit for local mobility

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353 (52)7443090
info@tippenergy.ie www.tippenergy.ie