Clooney/Spancilhill
Sustainable Energy Community

Energy Master Plan

February 2022

Tipperary Energy Agency Limited
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

TIPPERARY energy AGENCY

Executive Summary

February 2021

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 Clooney/Spancilhill Community Development Group SEC with assistance from the SEAI county mentor. The development of the plan has been funded as part of the SEAI Sustainable Energy Community (SEC) program.

Clooney/Spancilhill Community Development Group, 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 a certain year, and the formulation of a Register of Opportunities (RoO) that will deliver significant energy demand reductions and contributions from renewable energy sources. In this case, the study area consists of 25 townlands in the following electoral divisions: Clooney, Newgrove, Rathclooney, Spancilhill, Toberbreeda.

The Register of Opportunities, results from the energy audits and recommendations will be included in the final Energy Master Plan report.

The baseline year for the Energy Master Plan is 2016. The Clooney/Spancilhill Community Development Group have targeted a 50% reduction in energy use in residential and non-residential buildings within the community. The group also wishes to investigate the potential for renewable energy in the area to help meet some of the energy demand of the area, with a particular focus on the local farming and forestry sectors.

This report estimates that the Clooney/Spancilhill SEC has an energy usage of 14,224MWh/yr, emits 3,915 tons of CO_2 (carbon dioxide) a year, and currently spends **€3.272 million euro** on energy per year (fuel, electricity, heating, etc.).

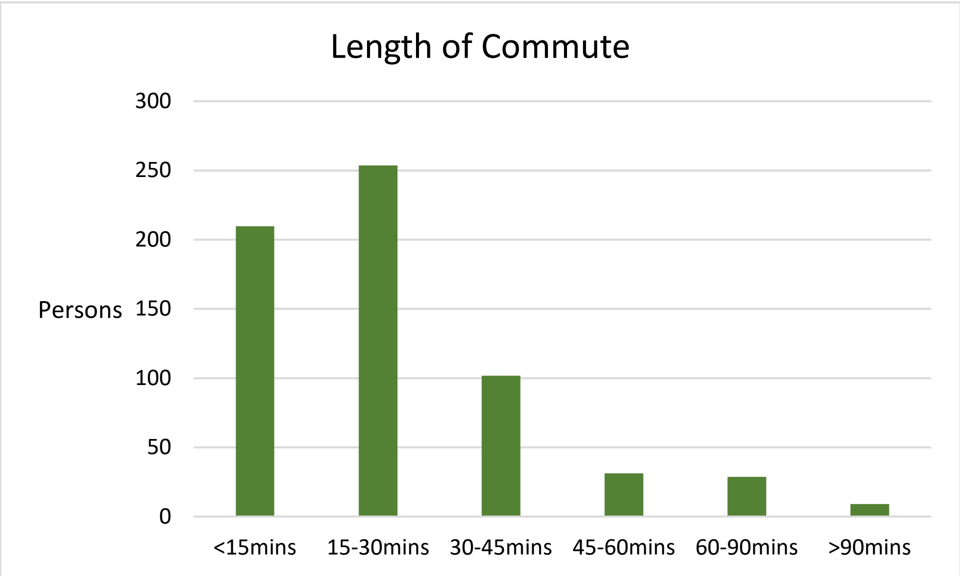
Baseline Energy Demand of Clooney/Spancilhill							
Sector	MWh	CO_2 tons	Cost	%MWh	% tCO_2	% € Cost	Primary Energy (toe)
Residential	7,522	1844	€1,388,855	53%	47%	42%	647
Non-Residential	392	100	€68,744	3%	3%	2%	34
Transport	4,859	1588	€1,607,844	34%	41%	49%	418
Agriculture	1,452	383	€207,045	10%	10%	6%	125
Total	**14,224**	**3915**	**€3,272,487**	-	-	-	1,223

To achieve the 50% reduction in energy usage from the homes of Clooney/Spancilhill SEC will require the retrofitting of 259 homes by 2029. 20 Homes ***per year*** would require a deep retrofit from a BER D or lower to get them to a BER B2 and 14 homes ***per year*** would require a shallow retrofit from an average BER C to a BER B2 for the next seven years. This would require an estimated investment approximately €10.9 Million Euro and with €25,000 in grant support now being made available in 2022 for a retrofit of each home this investment is reduced to €5.5 Million Euro. This is based on the high-level estimations of €30,000 for shallow retrofitting and €48,500 for full retrofitting. The community could save an estimated €315,946 per year going forward when this work is completed. The greenhouse gas savings (tCO_2/yr) from home retrofitting in Clooney/Spancilhill SEC would be in 926 tCO_2 or a 24% reduction of total greenhouse gas emissions per year when the full program of work completed for example.

Based on the analysis of the home energy audits, the uplift in energy savings achievable from actions recommended from the 8 No. Energy Audits performed on homes in the Clooney/Spancilhill SEC area is between 20% for more recent build homes to 63% for older and less energy efficient homes and this analysis was completed for the 8 sample homes in Clooney/Spancilhill. The analysis undertaken in the reports have suggested what building upgrade measures would need to be undertaken in each home to get the homes 'Heat Pump' ready. further engagement with a 'one-stop-shop' would be necessary if any home wish to undertake a full retrofit. From 2022 the SEAI have a €25,000 grant available for a full retrofit of homes to a BER B2 (terms & conditions apply).

Clooney National School was chosen for an energy audit from the non-residential sector. From the energy saving measures identified 24.6MWhr/year (64%) in energy savings could be achieved, saving 7.5 tons of CO2 saved per year with an average cost savings of €2,332 in each year for each building if the energy upgrades were completed. The estimated cost for upgrades to both buildings would be in the region of a €219,724 investment. Currently the school has a challenge of not having enough pupils.

The Clooney/Spancilhill community also want to see this area prioritised for smart meter rollout, currently 750,000 smart meters have been installed across Ireland. Smart meter deployment in Clooney/Spancilhill will complement the installation of rooftop solar PV systems in the area.



From the perspective of energy in transport 74% of car owners commute to/from work each day and the most frequent length of time for this commute is up to 30mins. The provision of a sustainable local bus route can be investigated to reduce the energy used in this sector.

Also, last but not least a final recommendation for the Clooney/Spancilhill sustainable energy community is to develop a community insulation scheme. There are generous grants available from the SEAI for building fabric measures.

Register of opportunities for Clooney/Spancilhill National school

List No	Recommendations	Estimated annual savings			Estimated cost (excl. VAT) (€)	Simple Payback (years)	Comments
		(€)	(kWh)	CO_2 (kg)			
1	Install attic insulation in original building and older extension and increase insulation in 2009 extension	€533	7,402	1,902	14,589	27	300mm mineral wool should be installed in the attic the original building and the older extension while the attic in the new extension should be increased to 300mm. In the hall, the sloped ceilings will have to be insulated on the internal side of the ceiling with 70mm insulated slab. Additional roof vents will also be required on the roofs of these areas.
2	Install internal dryline insulation in original building	€104	1,439	370	5,398	>50years	Remaining walls of the original building to be internally drylined with 70mm insulated plasterboard. This will significantly improve the heat retention of the building as a whole and increase comfort levels for occupants of the building.
3	Install external wall insulation on walls of old and new extension	€40	553	142	36,955	>50years	Exterior wall insulation should be added to the walls of the old and new extensions of the building. This will significantly improve the thermal comfort of the building and allow for a heat pump to be installed
4	Replace old external doors with new energy efficient doors	€35	482	124	13,644	>50years	Many of the external doors in the building are a major source of heat loss through air infiltration. The older doors with poor u-values tend to have air gaps, and some new doors are also facing the same issue and need to be replaced.

5	Replace old windows with triple glazed windows	€34	477	123	29,165	>50years	18 No. windows are in need of replacement throughout the building. While most windows have good airtightness, their u-values are poor, and mould was observed around the windows which suggests the frames are allowing heat to escape from the building. This indicates there is high levels of thermal bridging around the windows.
6	Upgrade all lighting to LED lighting	€963	3,179	817	13,800	14	Installing LED lighting with daylight sensors would provide adequate lighting in the school all year-round while also saving electricity.
7	Air to Water Heat Pump heating system	€392	7,889	2,340	58,250	>50years	An air-water heat pump would allow for a fully automated heating system that keeps the school at the same temperature all year round. The greatest cost savings come by avoiding the payment of carbon tax associated with oil in the future. Replacing existing radiators and pipework may have to be done which will incur additional cost
8	Installation of Mechanical Heat Recovery Ventilation system	N/A	N/A	N/A	63,095	N/A	This measure will provide ventilation throughout the building while also saving some heat energy that is typically lost through natural ventilation. Significantly improves the comfort and healthiness of the building.
Totals		**€2,101**	**21,422**	**5,818**	**€234,895**		

For the transport sector to achieve a 50% reduction in energy consumption, 467 private electrical vehicles and 36 commercial Electrical vehicles vans would need to be on the roads of Clooney Spancilhill. The lack of EV charging infrastructure in the Clooney/Spancilhill 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 parlours 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 TAMS Ⅱ can offer up to 60% in grants. This will need further engagement into the agricultural community from Clooney/Spancilhill SEC.

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 Clooney/Spancilhill 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). The economics of these projects are subject to capacity and proximity to the nearest ESBN 38kV substation and further action should be taken by Clooney/Spancilhill to engage with the ESBN.

The possibility of a two-turbine wind farm, which also would be community owned is activity being investigated by the Clooney/Spancilhill SEC. Suitable land has been identified for the installation on 2 No. 2.3 MW wind turbines, that would produce approximately 12,089MWhr of energy per year for the next 20 years. The investment cost would be in the region of €4.6 million euros with estimated annual revenue of €1.26 million euros per year once the initial payback period is overcome. It is recommended to keep the installation under 5MW otherwise an environmental impact assessment would be required for projects over 5MW.

There is also the potential for a 50-acre short rotation coppice forest in Clooney/Spancilhill. This would produce biomass in the form of wood chip that would supply local business in the surroundings areas like the town of Ennis. It has been estimated that 446 MWhrs in the form of thermal energy from the supply of wood chip per year from a 50-acre plantation. This project would also enhance the flora & fauna back into the area thereby creating a natural habitat and an amenity area for the community of Spancilhill for generations to enjoy. Further study of this project potential could be investigated by Clooney/Spancilhill.

Summary table of Opportunities in Energy savings & production in Clooney/Spancilhill

Sector	Measure	Target Achieved to 2029	% Of total energy saved per year by 2029	Financial Savings per year	Level of Investment required (total)
Residential	Retrofitting of 34 houses per year	50% reduction in sector	26.4%	€0.316M euros	€11M euros
Transport	Private EV adaptation: 467 EV + 36 commercial EV's	50% reduction in sector	17%	€0.879M euros	€20.1M euros
Non-Res	Building/services Energy Upgrades	50% reduction in sector	1.4%	€0.045M euros	€0.588M euros
Community Owned renewable Solar PV	5MW Solar PV Farm	25.3% increase in RE production	30%	€0.44M euros	€4.25M euros
Community Owned Coppice Forest	50-acre short rotation coppice forest (once mature) *carbon sink & natural habitat*	2.7% increase in RE production	3.1%	€35.6K euros	€107.5K euros
Community Wind Farm	2*2.3 MW wind turbines	72% increase in RE production	85%	€1.26M euros	€4.6M euros

Tipperary Energy Agency Limited
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

Clooney/Spancilhill Baseline Energy Demand Infographic

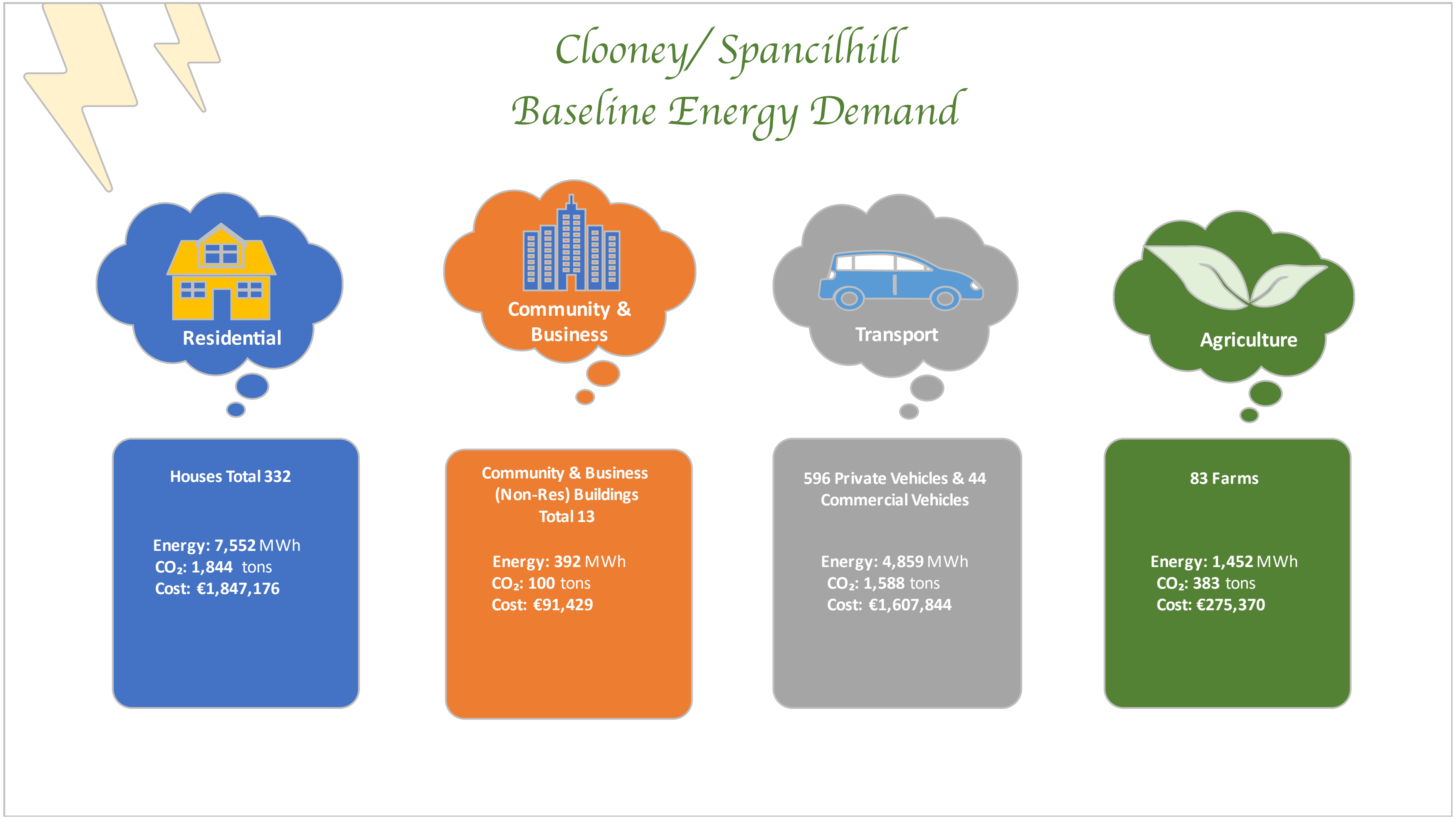


Table of Contents

Table of Figures

Table of Tables

1. 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., renewable electricity and renewable heat generation) or enhanced efficiency (e.g., insulation and glazing work on homes or medium to deep retrofit projects).
- **Social -**Self generation of local renewable 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.

1.2. Clooney/Spancilhill 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 Clooney/Spancilhill also plays a pivotal role in shaping their energy needs. From a demand perspective, householders, community facilities 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 in homes will also enable a better understanding of actual energy consumption, rather than relying on periodic meter readings (and estimated bills). From a supply perspective, Clooney/Spancilhill Community Development Association can look to develop local renewable energy electricity generation to support the community's 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 solar farm, wind farm or hydro power project. 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 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 Clooney/Spancilhill 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 Clooney/Spancilhill Sustainable Energy Community (SEC) is shown in Figure 3.

Figure 1: Location of Clooney/Spancilhill

Figure 2: Clooney/Spancilhill county map

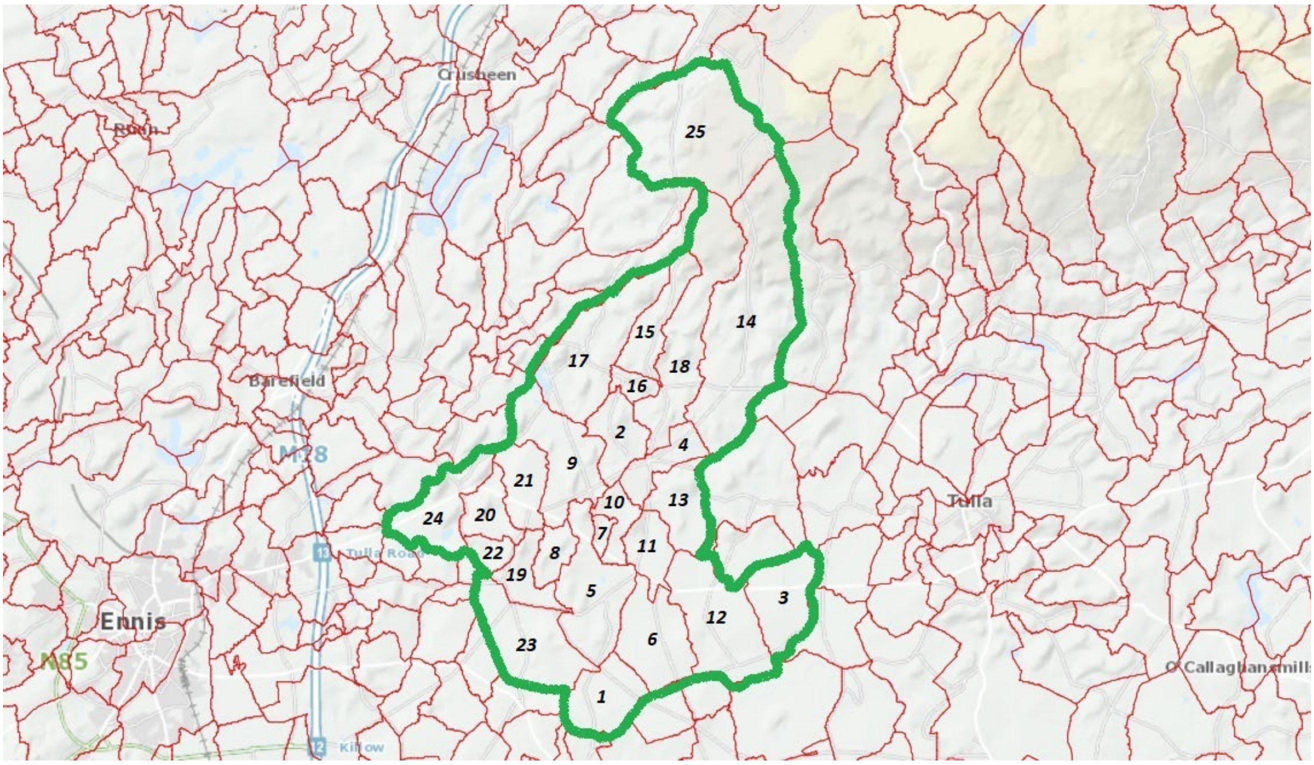


Figure 3: Townlands in Clooney/Spancilhill SEC

The green boundary encloses the townlands that are part of the SEC. The Clooney/Spancilhill Sustainable Energy Community (SEC) is spread across 5 electoral divisions (EDs). Below are the 5 EDs and the townlands that are part of the Sustainable Energy Community, along with the area of those townlands in acres.

Clooney ED

1) Ballyhickey 384
2) Ballyvergin 290
3) Caherloghan 422
4) Carrahan 236
5) Clooney 602
6) Corbally 520
7) Feenagh 52
8) Kilgobban 155
9) Knockanoura 584
10) Lassana 166
11) Sraheen 221
12) Toonagh 707

Newgrove ED

13) Knockaphreaghaun 328
14) Maghera 1462

Rathclooney ED

15) Ballyvroghaun Oughter 314
16) Ballyvroghaun Eighter 93
17) Rathclooney 736
18) Rylane 853

Spancelhill ED

19) Ballycrighan 213
20) Cahershaughnessy 228
21) Cranagher 290
22) Curraghmoghaun 110
23) Moyriesk 566
24) Muckinish 427

Toberbreeda ED

25) Derrycalliff 1201

1.4. Aims and Objectives

The wider consultation with the community on Clooney/Spancilhill, 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 very good response to the home energy survey so a bottom-up approach will be taken where possible, coupled with census CSO data for 2016, the latest agricultural census data, and SEAI BER mapping data to correlate and estimate the results in this study. 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, objectives relating to energy use in the community that were detailed within the quotation invitation are:

- A high-level analysis of renewable energy resources within the study area, with particular focus on the local farming/forestry sector.

- Development of a retrofit roadmap to achieve a reduction of 50% in energy use in residential and non-residential buildings in the community within the next 5-6 years.
- An analysis of the renewable energy potential in the area to help the community achieve their energy reduction goals. This analysis should focus on the community owned renewable energy potential on local farming and forestry land. The desired timeframe for these renewable energy projects is 10 years.

2 Characterisation of local area

2.1 Population

Summary of Population, Employment and Commuting

- The population of Clooney/Spancilhill community was 979 in 2016.
- 40-64 years old is the largest age group in the community (38%).
- 58% of the Clooney/Spancilhill population are economically active.
- 10% of the Clooney/Spancilhill population are retired.
- 22% of the community work in Professional Services, while 19% work in Commerce and Trade
- 73% of commute journeys made by people in the community are under 30 minutes in length.

Introduction

The 2016 Census data provides a population estimate of 979 within the Clooney/Spancilhill community. In this section, the demographics of age benchmarked against Co. Clare 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 will be presented.

Here we can see those 40-64 years old are the largest age group (38%) in Clooney/Spancilhill, while over 65s are the smallest age group (13%).

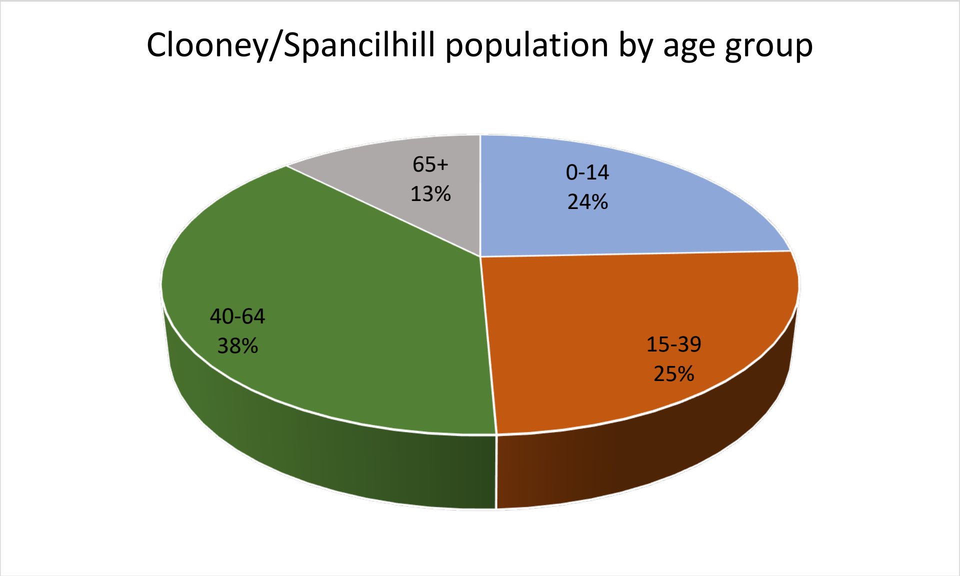


Figure 4: Population by age group (CSO)

Below we can see a comparison of the age profile of Clooney/Spancilhill vs Co. Clare vs Ireland. In Clooney/Spancilhill, the proportion of people 0-14 years old and 40-64 years old is greater than that of Co. Clare and Ireland. For people 15-36 years old, the proportion is much lower than Co. Clare and Ireland, and for over 65s, the Clooney/Spancilhill proportion is the same as Ireland, but lower than Co. Clare.

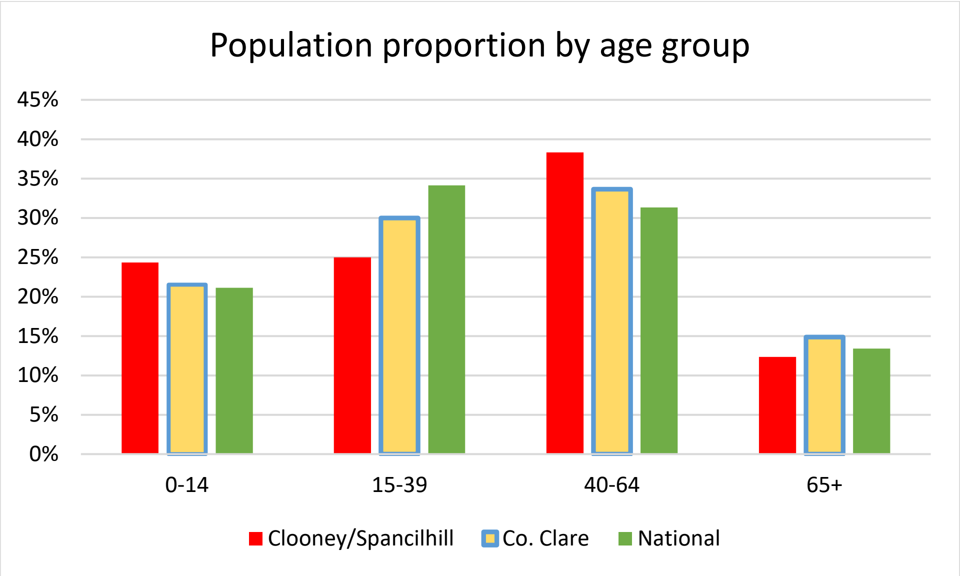


Figure 5: Population proportion by age group (CSO)

2.2 Employment and Commuting

According to the 2016 Census data, economic activity in Clooney/Spancilhill (58%) is comparable to that of Co. Clare (56%) and the country as a whole (57%). Someone who is economically active is deemed to be employed, a student, or unemployed. Someone who is economically inactive is deemed to be under 15 years old, retired, looking after the home or family, or unable to work due to disability or sickness.

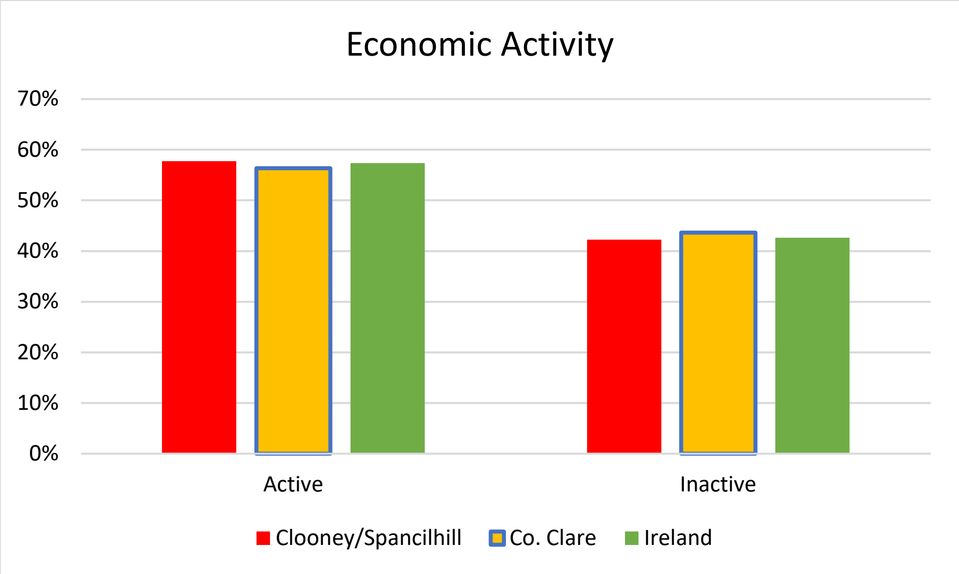


Figure 6: Economic Activity comparison (CSO)

Employed is the most common status of those who are economically active, followed by full time students at 15%.

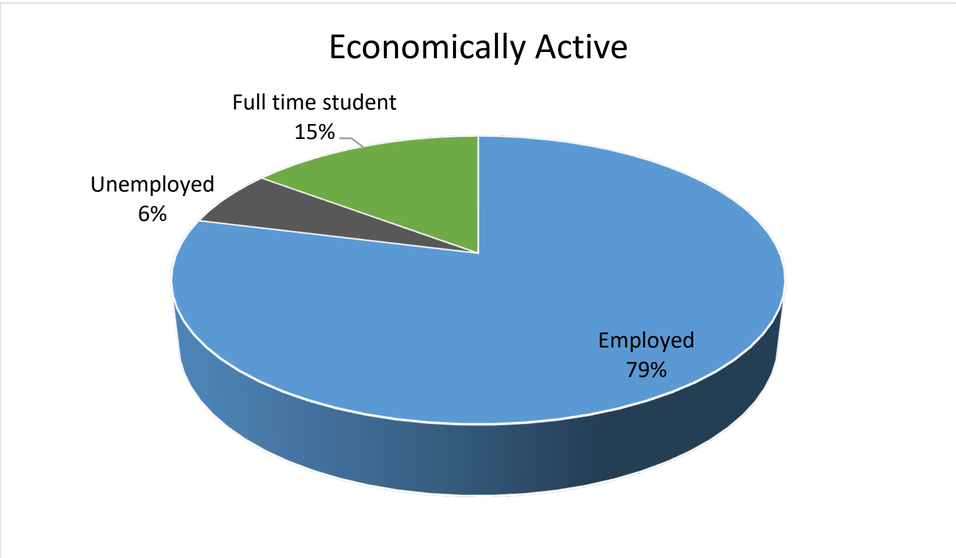


Figure 7: Economically Active (CSO)

The greatest majority of those who are economically inactive are under 15 (58%), followed by retirees (24%).

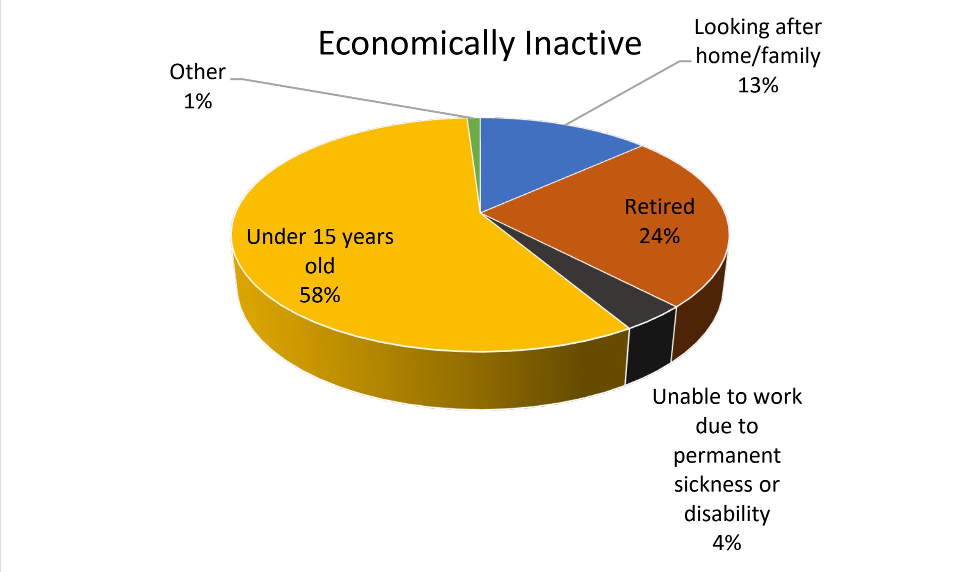


Figure 8: Economically Inactive (CSO)

Table 1: Employment Industries (CSO)

Industry	No. Persons	%
Professional services	99	22%
Commerce and trade	85	19%
Other	62	14%
Manufacturing industries	55	12%
Agriculture, forestry and fishing	49	11%
Public administration	41	9%
Transport and communications	32	7%
Building and construction	23	5%
Total	**446**	

The table above details the most common employment industries in Clooney/Spancilhill, with Professional Services being the most common at 22%.

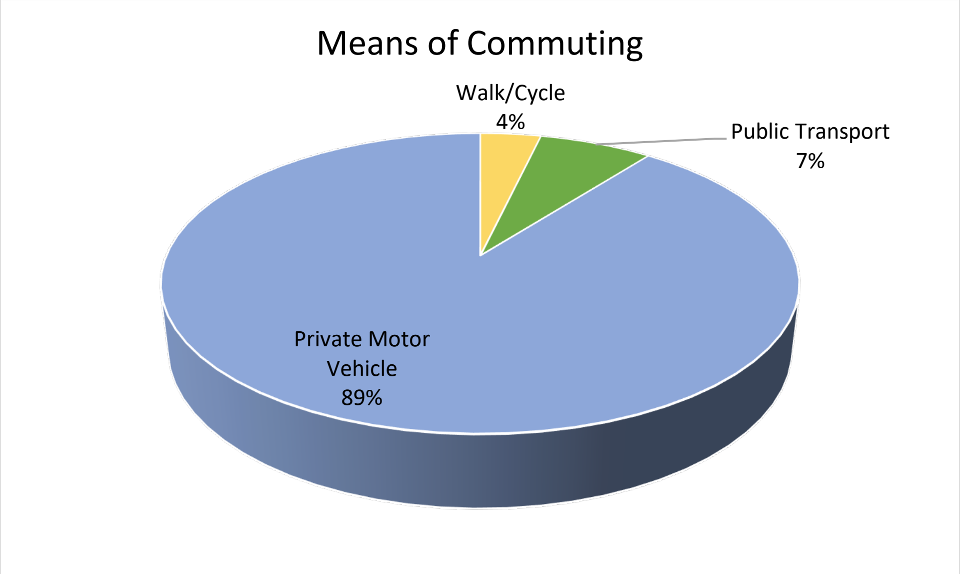


Figure 9: Means of Commuting (CSO)

Most commute journeys are made by private motor vehicle (car, van etc.), while only 11% of people are either walking, cycling or using public transport. This is not surprising given the rural location of Clooney/Spancilhill, and the lack of employment/education in the community. That being said, most commute journeys are less than 30 minutes, showing that a lot of employment/education is in Ennis, Shannon or Gort.

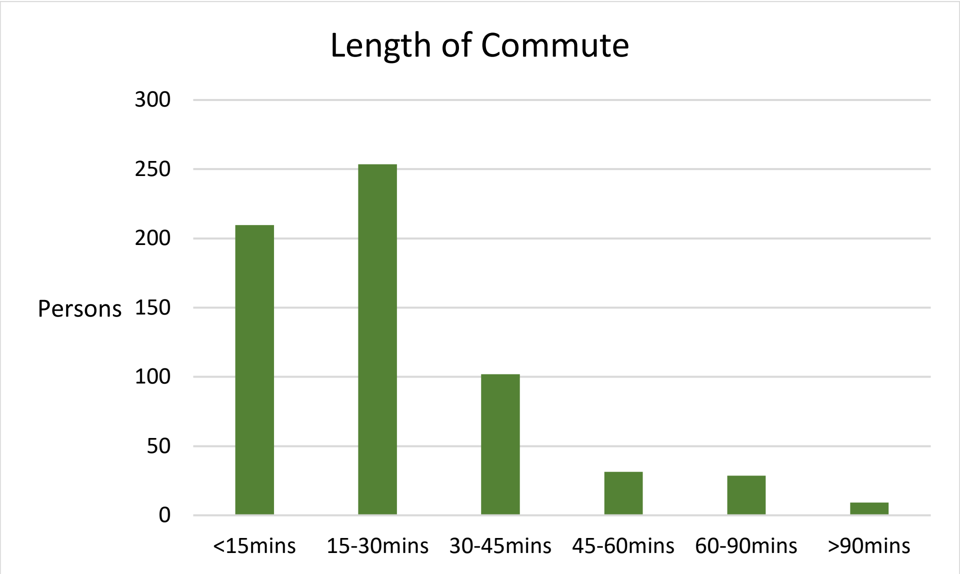


Figure 10: Length of commute (CSO)

3 Residential Sector of Clooney Spancilhill

Summary of Residential

- Oil is the most common residential heating fuel (71%)
- 98% of survey respondents own their house
- 64% of houses were built pre-2000
- The average estimated household heating and electricity cost is €5,570 a year
- Clooney/Spancilhill households use 7,500MWh of energy a year
- The estimated annual household CO_2 emissions from heating and electricity is 5.2 tons
- €1,847,176 is spent on heating and electricity in the community each year
- 1,045 acres of Sitka Spruce Forest would have to be planted to balance the CO_2 emitted by households in the community
- Approximately 25% of Clooney/Spancilhill households would be considered fuel poor
- The average BER score in Clooney/Spancilhill is 283kWh/m^2/yr (D2).
- 50% of houses (Qty: 167) in Clooney/Spancilhill are estimated to have a BER-D rating or lower.
- 42% of houses (Qty: 138) are estimated to be in the BER C range
- 4% of homes (Qty: 14) a BER-B rating or better.
- 4% of homes (Qty: 13) are unknown

Introduction

In this section, the homes in Clooney/Spancilhill are reviewed, the BER rating for all homes is estimated and compared to both Co. Clare and National BER averages. According to the latest CSO figures of 2016, there are 332 houses in the Clooney/Spancilhill community. Analysing the CSO statistics tells us that Clooney/Spancilhill has a high percentage of old houses with 34 houses (10%) of all houses built before 1919. Any house built before 1997 will have a considerably worse BER rating than those built after 1997. 167 houses (50%) were built before 1991 and therefore may be poorly insulated. New building regulations were introduced in 1997.

3.1 Census Analysis

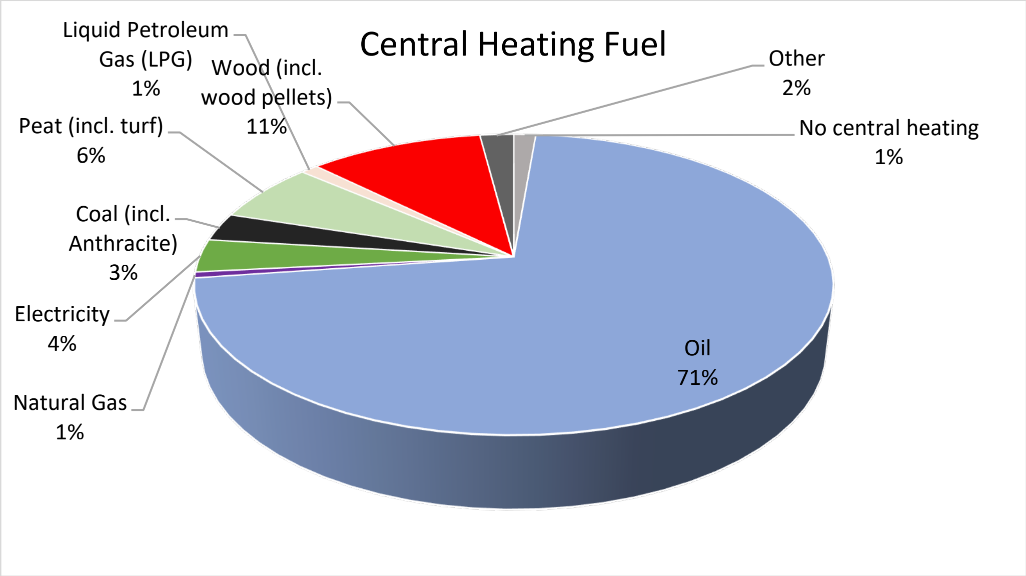


Figure 11: Central Heating Fuel (CSO)

The 2016 Census data tells us that Oil is the most common type of heating fuel in the community at 71%. The remaining 29% comprises mainly of wood (11%) and peat (6%).

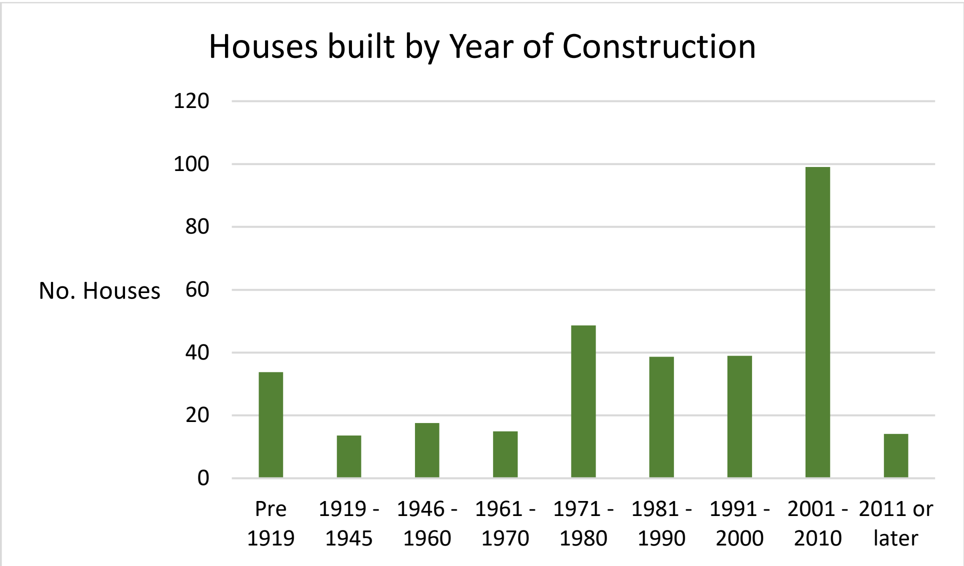


Figure 12: Houses built by Year of Construction (CSO)

Here we can see many houses (30%) were built between 2001 and 2010. 50% of houses in Clooney/Spancilhill were built before 1991. This would suggest a poor level of insulation and energy efficiency in most of these households.

3.2 Local Survey Analysis

The charts and tables below represent the responses to the survey. There were 66 responses to the survey, which represents approximately 20% of the community.

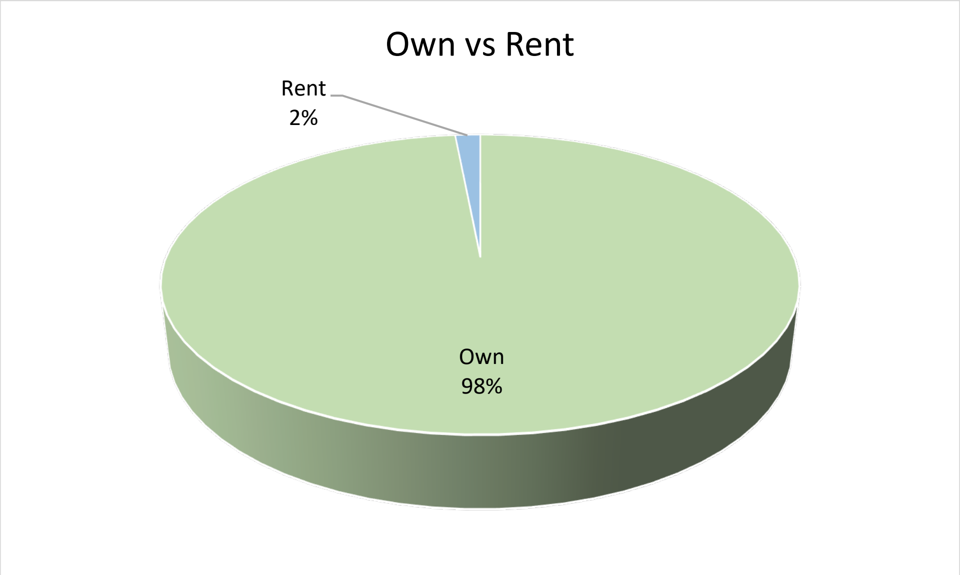


Figure 13: Owning vs Renting in the community (Survey)

We can see in figure 13 that most of the survey respondents own their house.

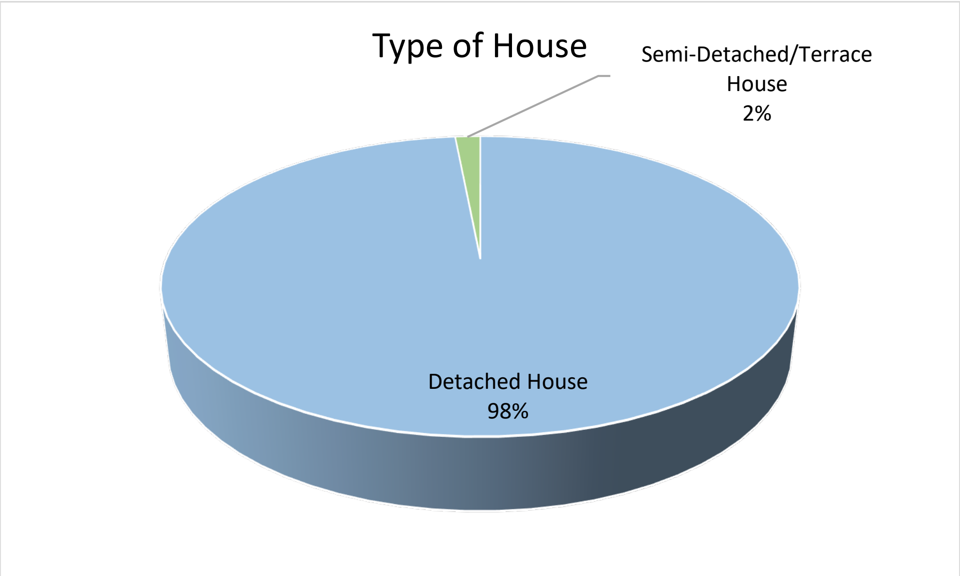


Figure 14: Type of House (Survey)

Figure 14 shows that 98% of houses in the community are detached houses. Figure 15 below details the period of construction of houses in Clooney/Spancilhill. A significant number of houses were built pre-1990, which may represent a lower level of energy efficiency in those houses.

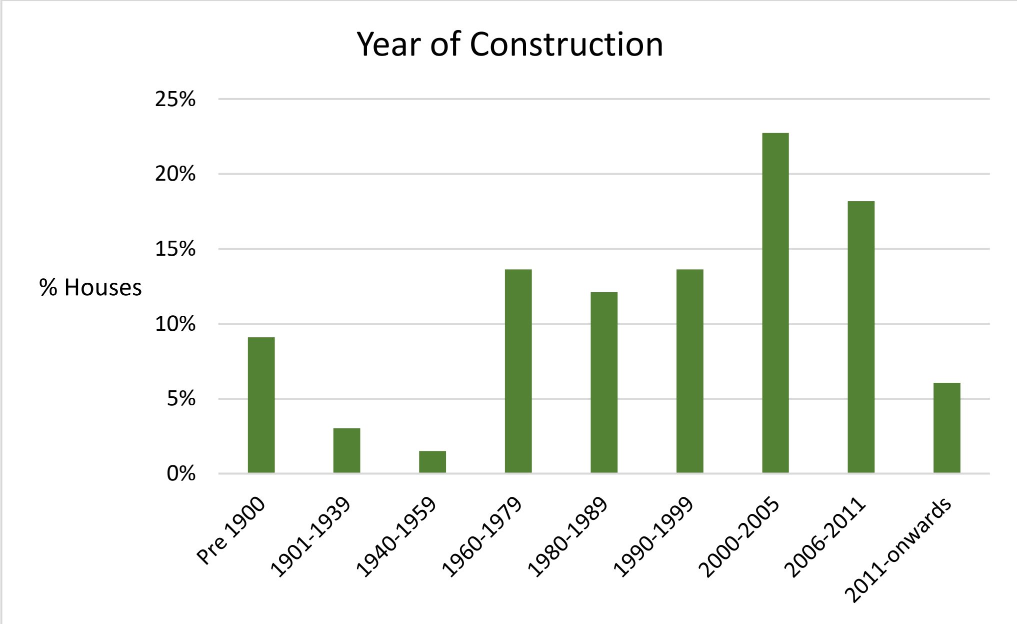


Figure 15: Year of Construction (Survey)

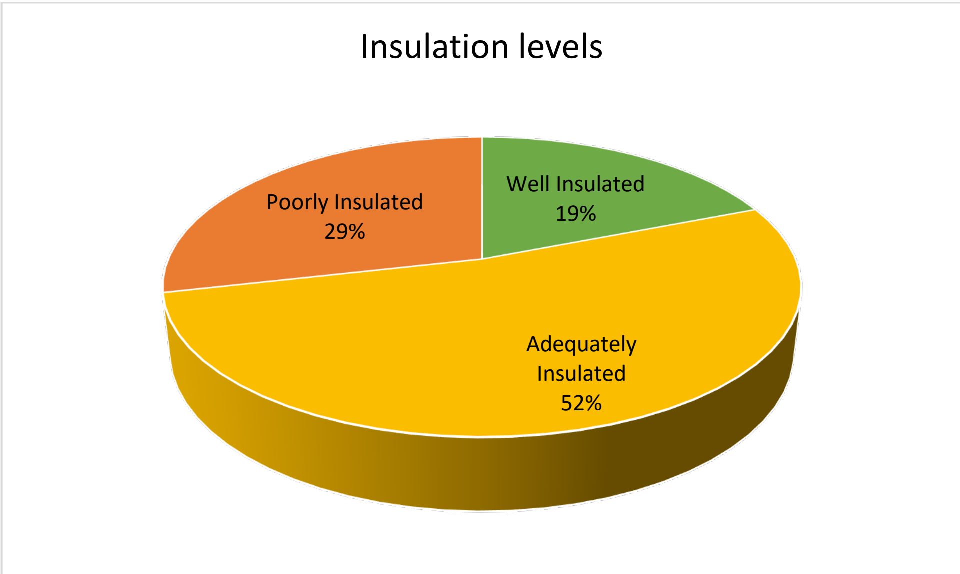


Figure 16: Insulation levels in Clooney/Spancilhill (Survey)

Figure 16 shows that 71% of respondents to the survey feel their house is either well or adequately insulated. 29% feel their house is poorly insulated. A total of 69 homes in Clooney/Spancilhill completed the home energy survey questionnaire.

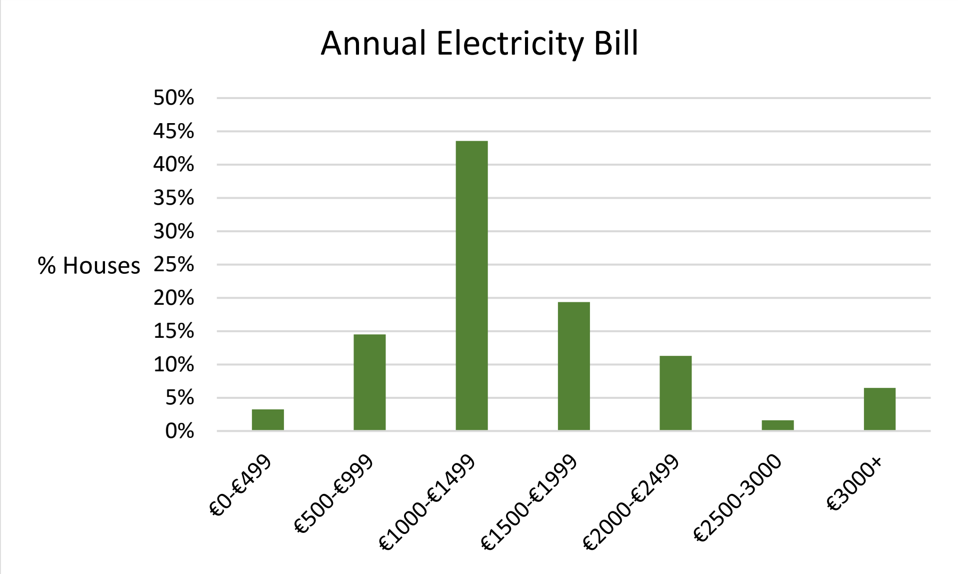


Figure 17: Annual Electricity Bill (Survey)

Figure 17 details the annual electricity bill paid by respondents. €1000-€1499 is the most common bill (44%) amount, and the average electricity bill of respondents is €1,421. According to Electric Ireland, the national average annual electricity cost is €1,098.

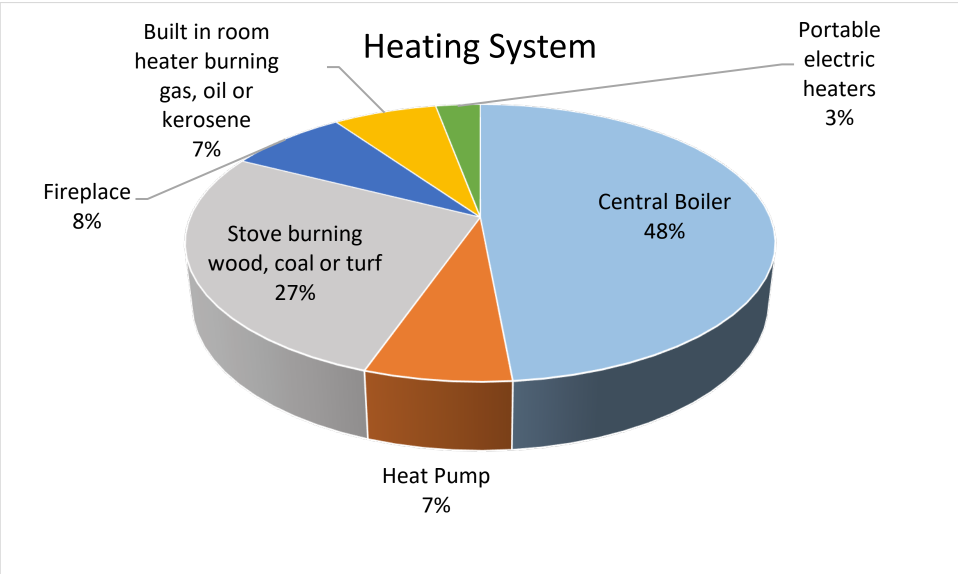


Figure 18: Central Heating System (Survey)

Figure 18 shows us that a central boiler is the most common (48%) heating system in Clooney/Spancilhill, followed by Stove burning wood, coal or turf (27%), Fireplace (8%) and Heat Pump (7%).

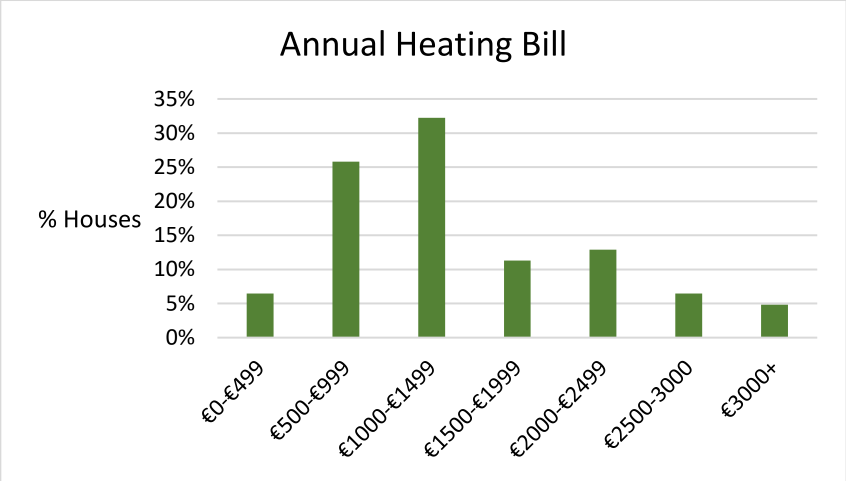


Figure 19: Annual Heating Bill (Survey)

Figure 19 shows that €1000-€1499 is the most common (32%) annual household heating bill in the community, followed by €500-€999 (26%). The average annual heating bill of survey respondents is €1321.

Table 2: Desired Energy Upgrades (Survey)

Measures	No. Houses	%
Attic Insulation	27	41%
Heating Controls	27	41%
Wall Insulation - Cavity Fill	25	38%
High Efficiency Boiler	24	36%
Heat Pump	16	24%
Wall Insulation – External	14	21%
Wood Stove/Stove Inserts	10	15%
Windows/Doors	2	3%
Solar	2	3%
Thermal Imaging	1	2%

Table 3: Desired Funding Sources (Survey)

Funding	No. Houses	%
Grant	47	71%
Own savings	32	48%
Loan finance	9	14%

Table 2 details the energy upgrades that respondents would like to have performed on their house. Attic insulation and heating controls are the most popular choices, followed by cavity wall insulation and the installation of a new high efficiency boiler.

Table 3 shows that most houses (47) would like to make use of grant funding to perform these energy saving measures, while 32 houses can fund using their own savings and 9 houses would be in a position to utilise loan finance to make energy improvements.

Summary

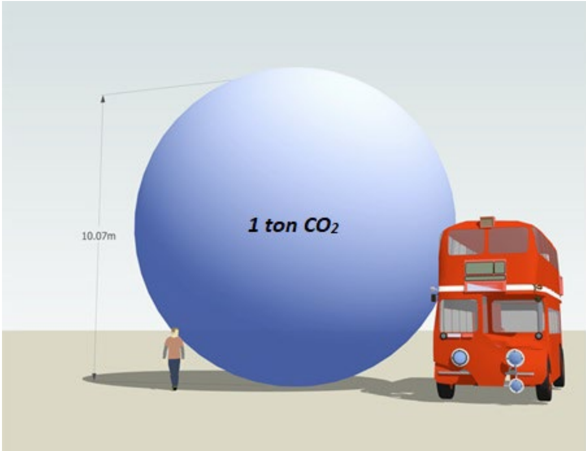
Table 4: Total € cost and CO_2 emissions of the residential sector in the community (CSO)

	Annual Cost in Euros		Annual CO_2 Emissions in tons	
Bill Type	**Per House**	**SEC**	**Per House**	**SEC**
Heating	€4,342	€1,108,306	4.4	1,464
Electricity	€2,228	€738,871	1.1	379
Total	**€5,570**	**€1,847,176**	**5.6**	**1,844**

To sequester (pull from the atmosphere) all the CO_2 emitted from the residential sector in Clooney/Spancilhill would require 1,045 acres of Sitka Spruce Forest to be planted. Sitka Spruce is one of the most common trees found in Irish forests today and is preferred by most in the forestry sector. Below is an illustration of the 1,045 acres of forest that would be required:

Figure 20: Illustration of CO_2 sequestering forest

Figure 20 is an example of the forestry required to sequester 'sink' carbon dioxide produced from the homes of Clooney/Spancilhill. Approximately 423 Ha of forestry would be required.



The above graphic gives a comparison of 1 ton of CO2 gas to an average human and a double decker bus.

3.3 Overview of Residential Sector in Ireland

Looking at national figures, the residential sector had the second-largest final energy demand in 2019 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 reduced energy use. Energy use has been increasing since 2014 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.

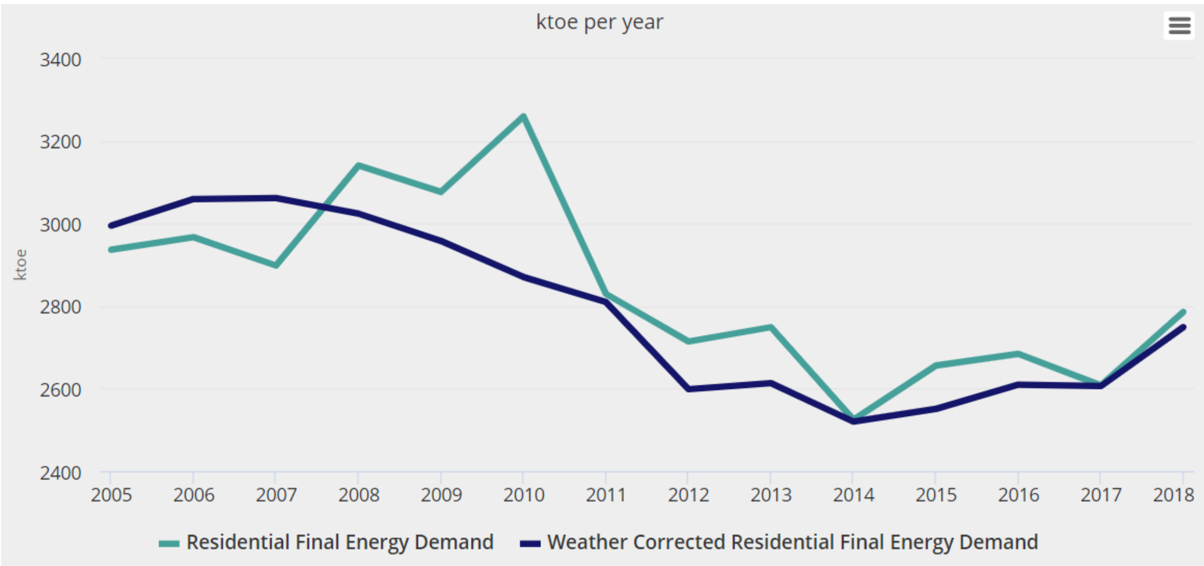
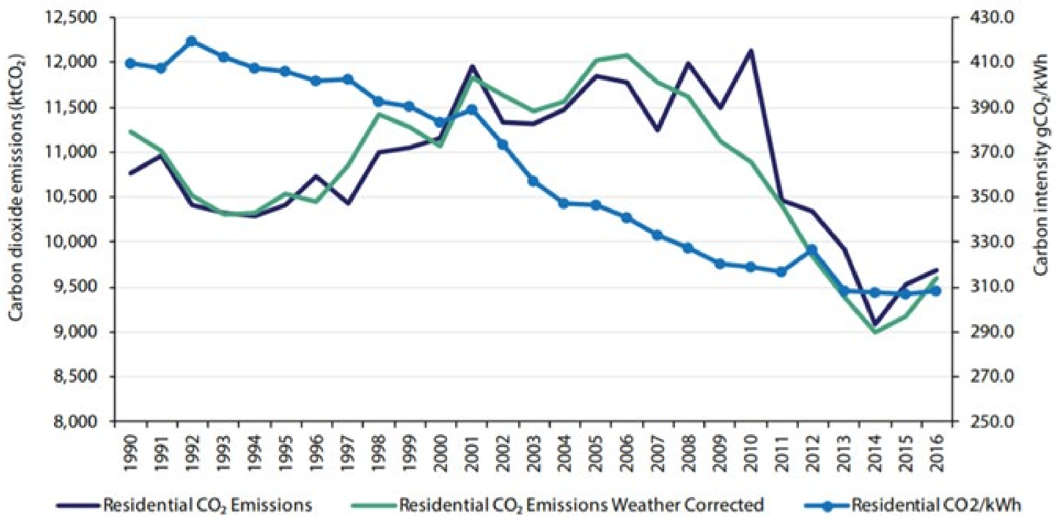


Figure 21: National Residential Energy Demand (SEAI)

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 CO_2 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 reduce our residential emissions even further. In 2018, the average dwelling emitted 5.1 tons of energy-related CO_2 (3.4 tons from fuels like oil, peat and wood and 1.7 tons from electricity).



Source: SEAI

Figure 22: National Residential CO_2 Emissions (SEAI)

3.4 Climate Action Plan

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, 200,000 into new builds).

Figure 23: Climate Action Plan Summary

3.5 Building Energy Rating (BER)

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/m^2/yr).

Looking at the overall BER ratings for Co. Clare for example the average BER rating is 267 kWh/m^2/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 house of floor area 200m^2.

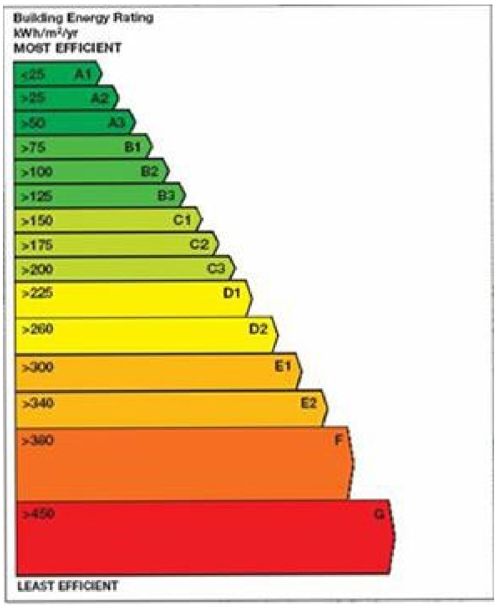


Figure 24: BER scale

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

Figure 25: Typical BER score by heating system and year of construction (SEAI)

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. Clare is 267kWh/m^2/yr (D2), which is approximately 1% or 7kWh/m^2/yr above the national average of 260 kWh/m^2/yr. The average BER in Clooney/Spancilhill is 283 kWh/m^2/yr (D2). This suggests that the energy efficiency of homes in Clooney/Spancilhill and Co. Clare are of a less standard than the national averages.

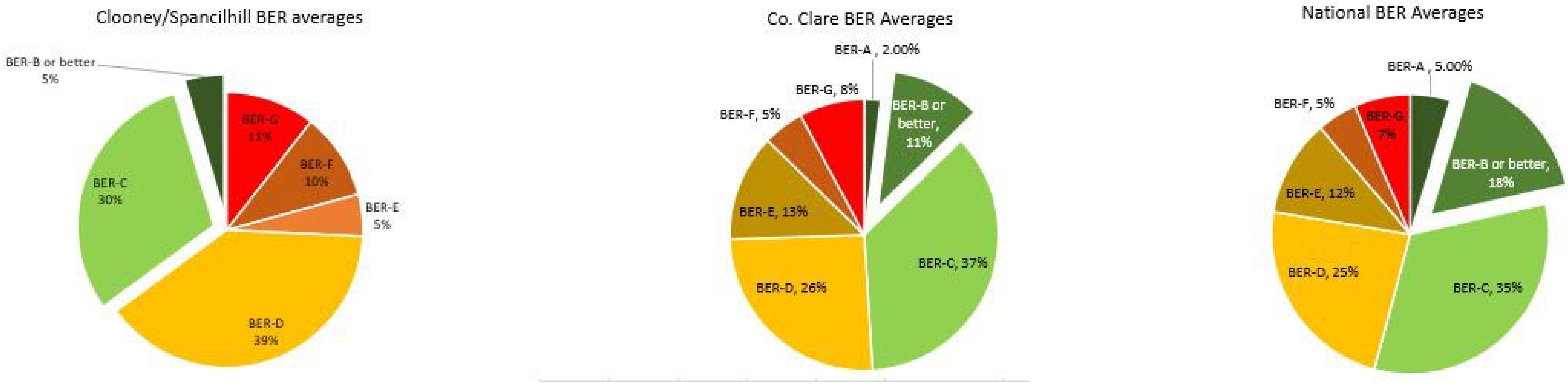


Figure 26: BER Comparison

Above we can see a comparison of Clooney/Spancilhill BER scores vs Co Clare and National average BER scores. Clooney/Spancilhill has 5% of houses BER-B or better, 30% BER-C, 39% BER-D, 5% BER-E, 10% BER-F, 11% BER-G. Clooney/Spancilhill has 26% of houses BER-E or worse, Co. Clare has 26% and national has 24%. This shows that the BER score of Clooney/Spancilhill, and Co. Clare is worse than that of Ireland as a whole.

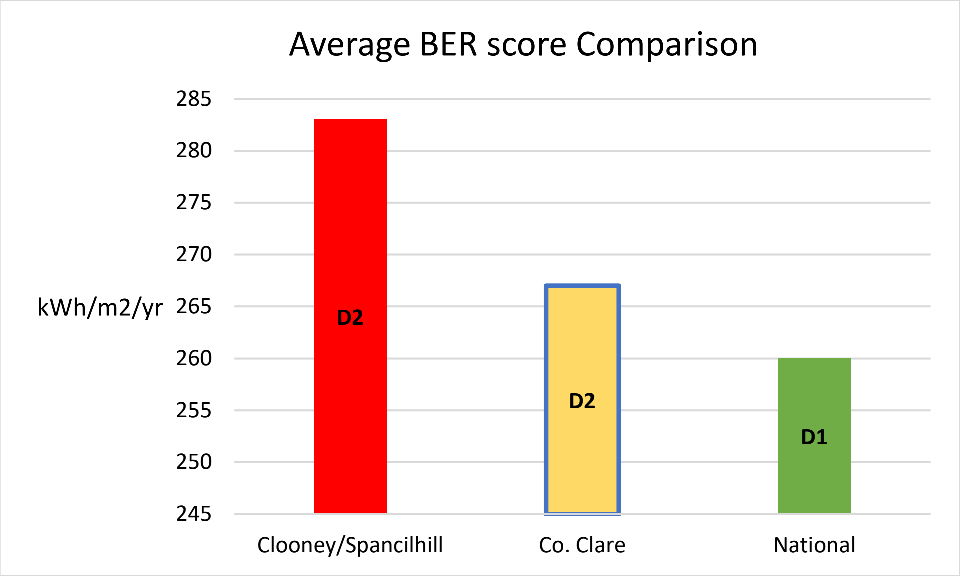


Figure 27: BER score comparison

Figure 27 shows the difference between the average score of Clooney/Spancilhill (283 kWh/m^2/yr) vs Co. Clare (267 kWh/m^2/yr) vs Ireland (260 kWh/m^2/yr). That equates to a BER-D2 rating for Clooney/Spancilhill and Co. Clare and a BER-D1 rating for Ireland.

3.6 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. 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 varied by 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 Clooney/Spancilhill housing stock an estimated **25%** of households are in fuel poverty.

3.7 Financial Incentives Available to Clooney Spancilhill

There are three main routes for grant assistance:

1. **<u>Better Energy Homes Scheme</u>**

   - 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 high level of 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/

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.

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 BER rating of B2 or better

Further information visit: https://www.seai.ie/grants/national-home-retrofit/

From the CSO statistics, 71% of the houses in Clooney/Spancilhill community may qualify for this scheme. The average cost of the works is approximately €50,000 without grant aid. If 71% of the houses received a deep retrofit the total cost of the works would be in the region of €12 million.

4 Non-Residential

Summary of Non-Residential

- There are 11 non-residential properties in Clooney/Spancilhill
- The non-residential sector in Clooney/Spancilhill uses around 390,000kWh of energy per year (3% of total energy use)
- This energy use results in approximately 100 tons of CO_2 being released into the atmosphere per year (3% of total CO_2 emissions)
- The € cost associated with this energy use is approximately €91,429 a year (2% of total € spend)

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 Clooney/Spancilhill Sustainable Energy Community catchment area, there are 11 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 using a proportional method from the CSO commercial energy database.

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 2020.

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 2020.

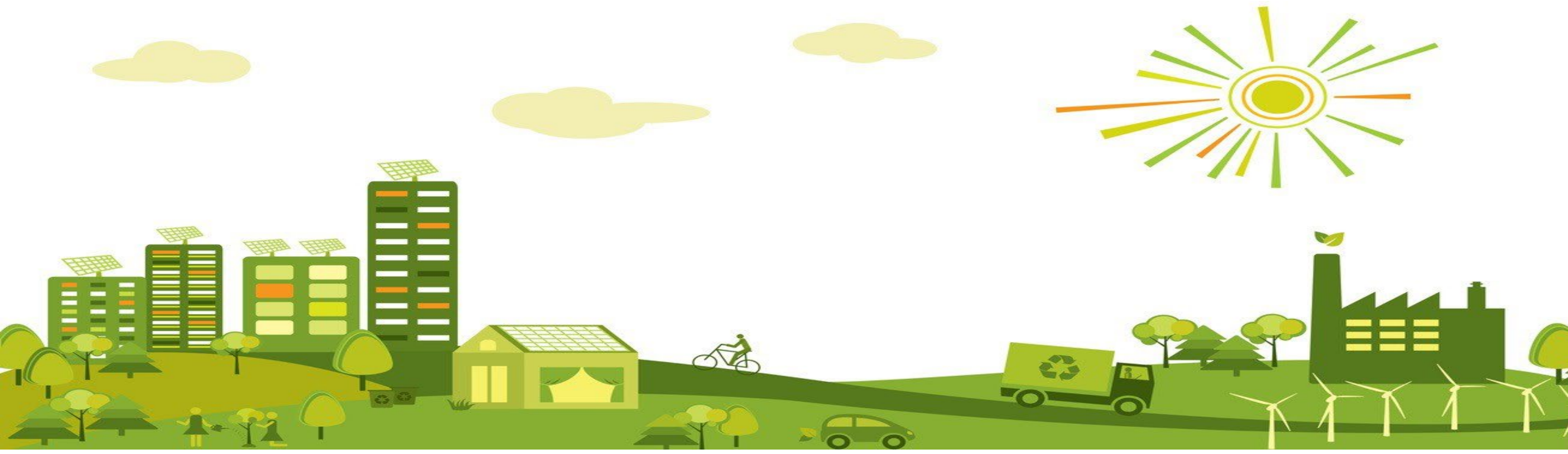


Figure 28: National heating fuel by business type (SEAI)

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.

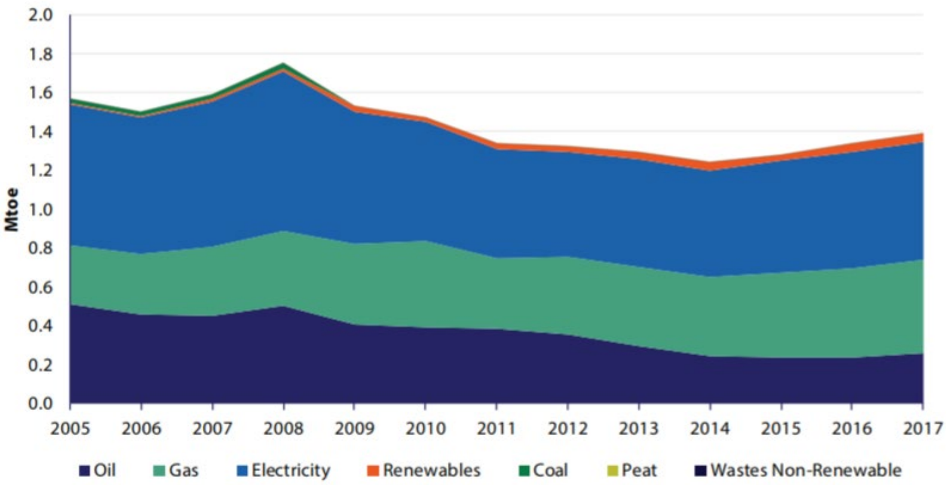


Figure 29: National fuel demand since 2005 (SEAI)

There are 11 non-residential properties in the Clooney/Spancilhill Sustainable Energy Community catchment area. As part of this EMP, Clooney NS has been selected to have a non-residential audit performed. The data and learnings obtained from this audit will feed into the Register of Opportunities (RoO). The 11 properties are listed below:

- 2 No. Rural pubs
- 2 No. Churches
- 2 No. Car sales businesses

- 1 No. Shop inc. filling station
- 1 No. Mechanic's garage
- 1 No. Welding & fabrication business
- 1 No. Precast concrete business
- 1 No. National school

Table 5: Non-Residential Energy Summary

Quantity	Estimated energy usage (kWh)	Estimated CO_2 emissions (kg)	Estimated € cost
11	**392,139**	**99,995**	**€91,429**

Using referenced and published benchmark documents with data from energy audits performed on similar buildings, the table above estimates the total annual energy usage, CO_2 emissions and energy-related € cost of the 13 non-residential properties/businesses in Clooney/Spancilhill.

5 Transport Sector of Clooney Spancilhill

Summary of Transport

- 96% of Clooney/Spancilhill residents have access to one or more cars.
- 99% of vehicles in Clooney/Spancilhill are petrol or diesel fuelled.
- The nearest electric vehicle charging point is 6.8km away in Ennis.
- The total annual energy used in transport is 4,859 MWh/yr (34% of total usage)
- The total CO_2 emitted by transport is 1,588 tons CO_2 (42% of total emissions)
- The total € cost of fuel in transport is just over €1.6 million (49% of total € cost)

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 vehicle ownership within the Clooney/Spancilhill Sustainable Energy Community (SEC) catchment area is 596 private vehicles and 44 commercial vehicles. **Private vehicle driving accounts for 87%** of the total energy used in transport in Clooney/Spancilhill (13% of energy from commercial transport). Greenhouse gas emissions from transport (private & commercial) account for approximately 42% of total emissions within the catchment area. Ennis (7km), Newmarket-on-Fergus (15km), Sixmilebridge (28km) and Gort (31km) are the nearest electric vehicle charging points to the Clooney/Spancilhill community.

5.1 Census Analysis of Transport in Clooney/Spancilhill

We can see from figure30 that over half (52%) of households have 2 motor cars. This is expected in a rural setting, where cars are essential for everyday activities like commuting, shopping, socialising etc.

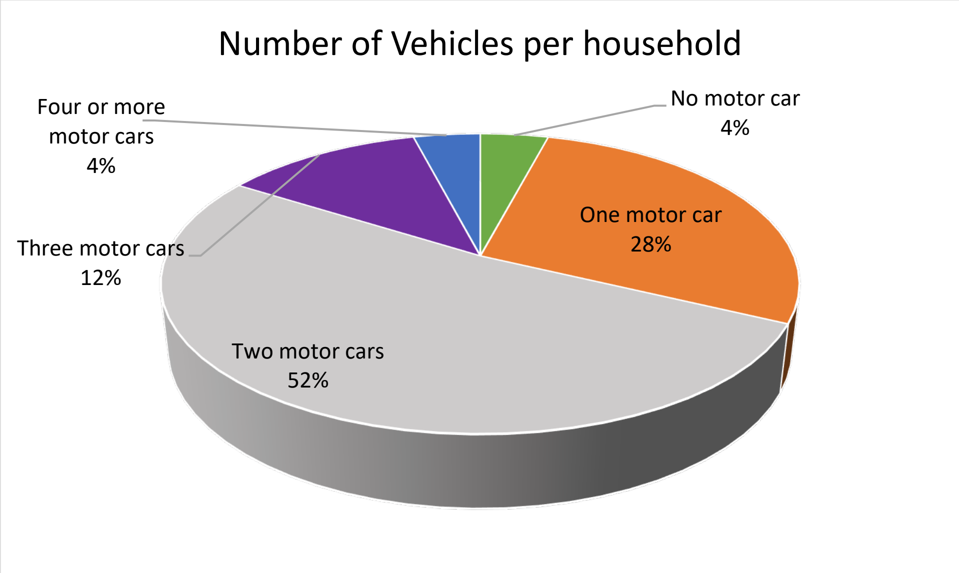


Figure 30: No. vehicles per household (CSO)

5.2 Local Survey Analysis on Transport

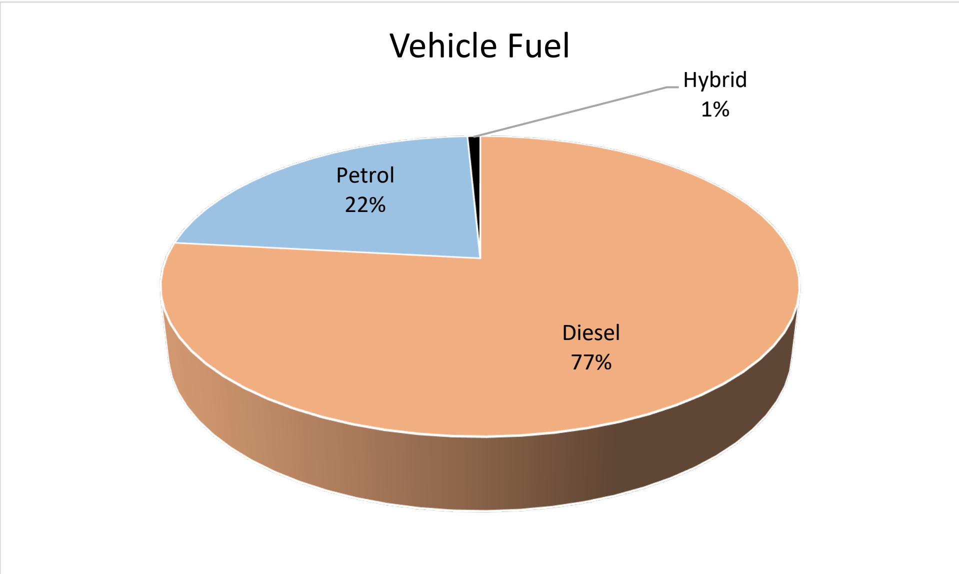


Figure 31: Vehicle Fuel (Survey)

Figure 31 shows that 77% of vehicles in the community are fuelled by Diesel, with 22% being fuelled by Petrol and Hybrid cars making up 1% of the vehicles in Clooney/Spancilhill.

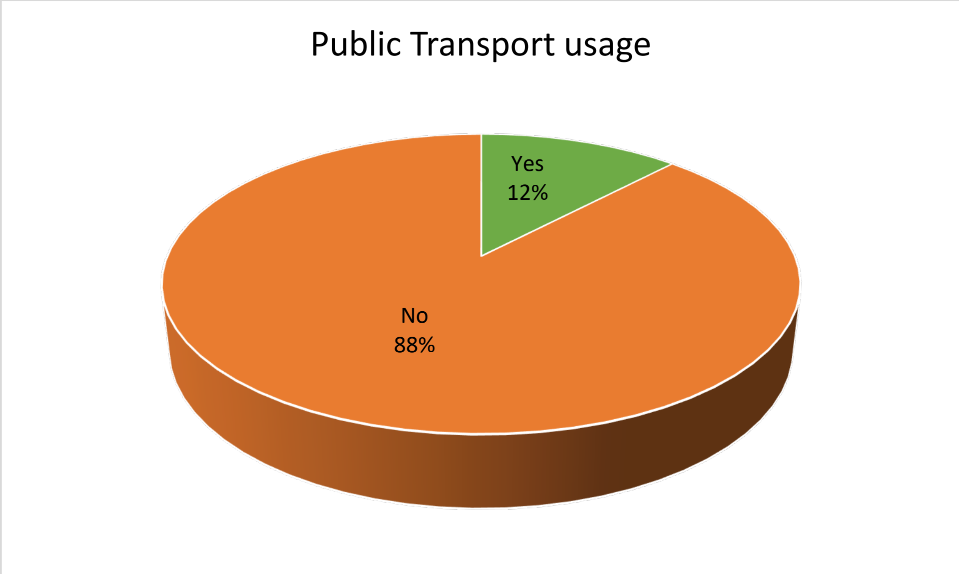


Figure 32: Public Transport Usage (Survey)

Figure 33 details that only 12% of respondents use public transport. Reasons for using public transport included Leisure, School and College.

The table below details the energy usage, carbon emissions, and € cost per house and for the community as a whole **per year**.

Table 6: Transport Summary for Clooney/Spancilhill

Sector		Estimated energy usage (MWh)	Estimated CO_2 emissions (tons)	Estimated € cost
Private	Per House	12.6	3.8	€4,202
	Total	4,190	1,253	€1,393,570
Commercial (total)		668	334	€214,273
Total		**4,859**	**1,588**	**€1,607,844**

5.3 Electric Vehicle Info and local infrastructure

There are several ways that Clooney/Spancilhill Sustainable Energy Community (SEC) can reduce their energy used in the transport sector.

- Encourage Car-share where possible to reduce the No. of vehicles traveling.
- Increasing the public transport network and its use where possible and financially viable.
- 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 within Clooney Spancilhill SEC

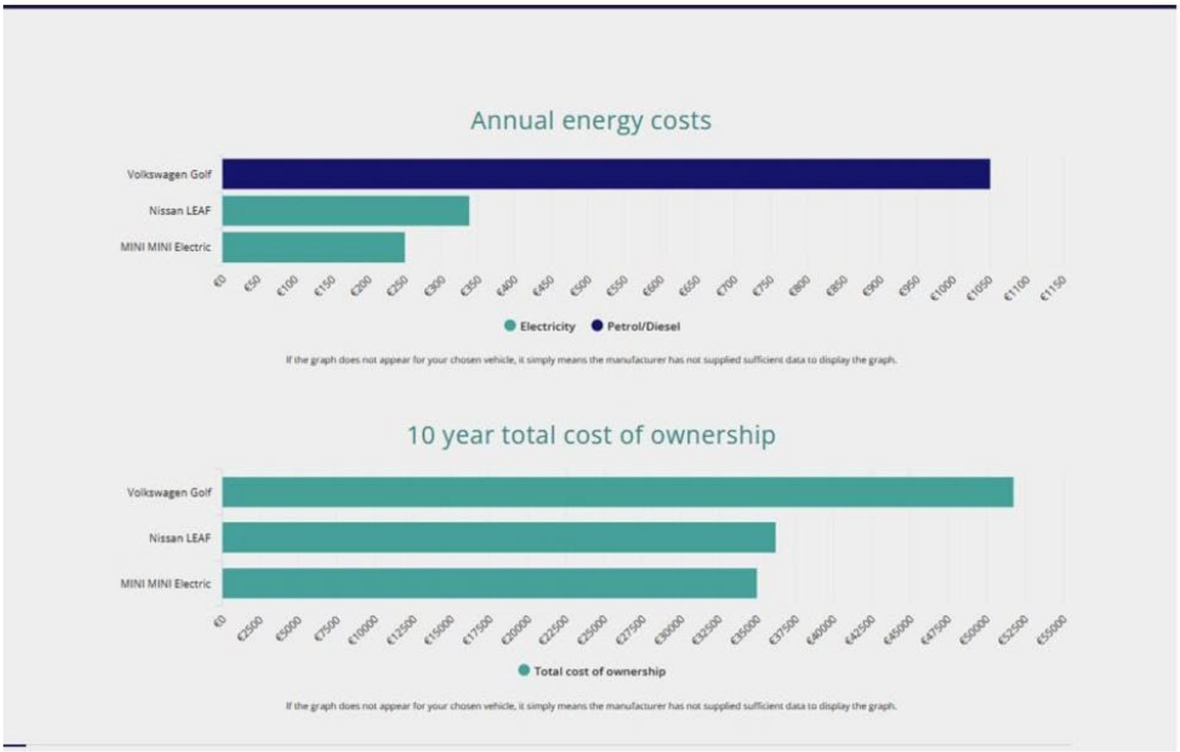


Figure 33: Electric Vehicle performance versus diesel car (SEAI)

Figure 34 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.

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 size of them are increasing. As previously mentioned above there are a lot more chargers being installed and with the increase in the range of cars, range anxiety should not be a factor in the future.

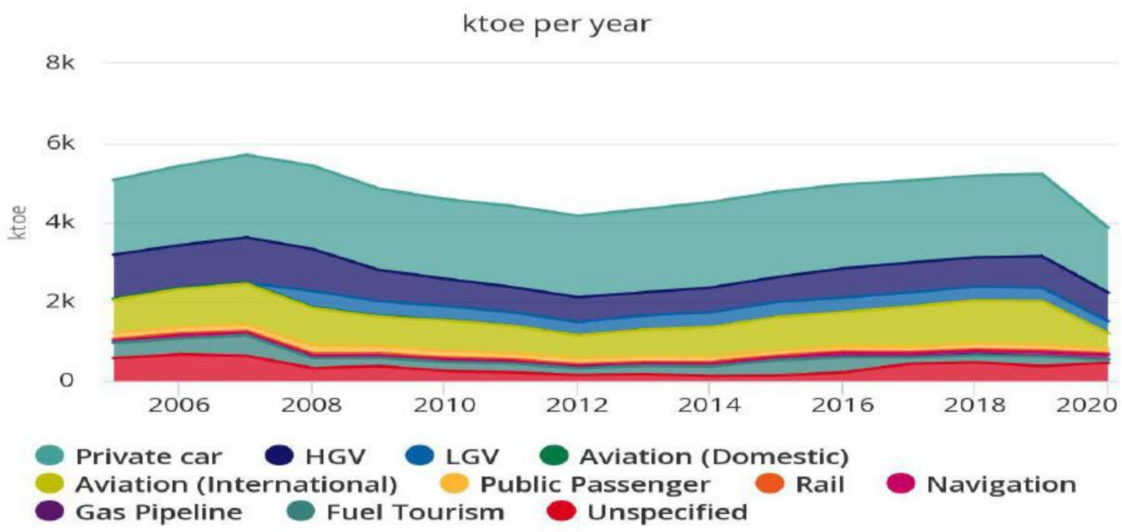


Figure 34: National transport energy demand (SEAI)

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 and has taken a dip into 2020 due to more people working from home and the country grinding to a halt in 2020. (Source SEAI)
Figure35 in the next page show where the nearest Electric vehicle charging is in relation to Clooney/Spancilhill with the nearest charging stations in Ennis which is 12kM away.

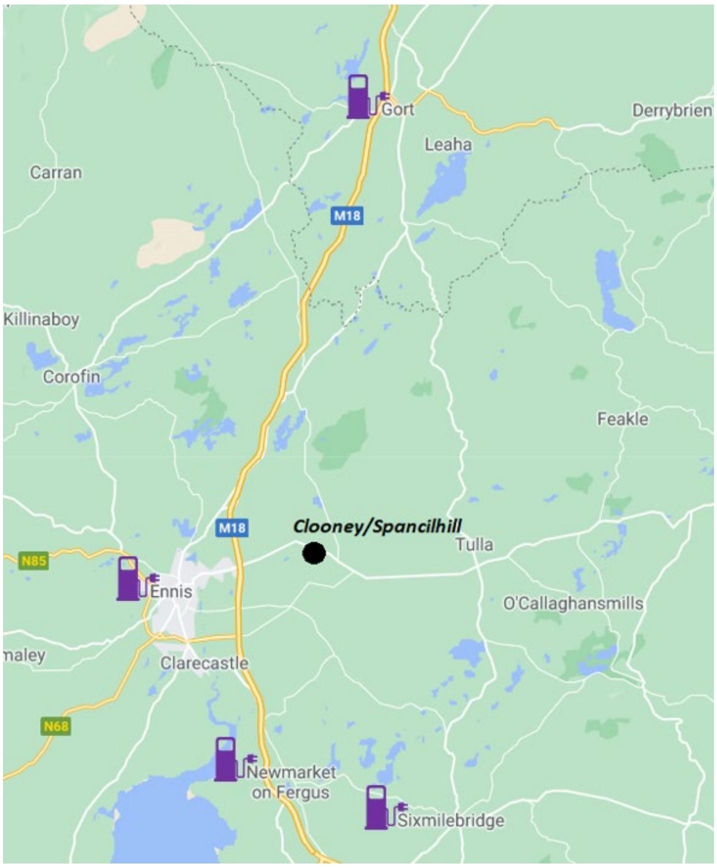


Figure 35: Local EV charging stations (ESB)

Table 7: Local EV charging stations (ESB)

Location	Provider and Rating	Distance from Clooney/Spancilhill (km)	€/kWh
Doora Industrial Estate, Quin Road, Ennis	Not managed 3.7kW	6.8	Unknown
Abbey St, Ennis	ESB ecars TYPE 2: 2 No. 22kW/AC -three phases	6.9	€0.268
O'Connell St, Ennis	Not managed 3.7 kW	7.3	Unknown
Circle K, Limerick Road, Ennis	1 No. AC43 /43kW /AC 1 No. CHADEMO /50kW /DC 1 No. COMBO CCS EU /50KW/AC	10.2	€0.305
Ennis Road, Newmarket on Fergus	ESB ecars TYPE 2: 2 No. 22kW/AC -three phases	14.6	€0.268
The Green, Sixmilebridge	ESB ecars TYPE 2: 2 No. 22kW/AC -three phases	27.8	€0.268
Gort Train Station	ESB ecars TYPE 2: 2 No. 22kW/AC -three phases	30.9	€0.268

5.4 Sustainable Transport Opportunities

This section discusses the Register of Opportunities that are within the transport section of the community. These opportunities are not based on firm facts and figures as with those identified for buildings but are developed from knowledge, experience, and understanding.

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. Clooney/Spancilhill SEC has recommended setting up of a website/app for the community to develop the sharing within the community.

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

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.

Clooney/Spancilhill SEC have recommended the setting up of a Digi hub in the Local GAA club

http://clareherald.com/2020/09/clare-hubs-receive-reopening-funding-28409/

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

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

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%[1]. 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 2020)
- 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.

EV- Charging Infrastructure Clooney/Spancilhill

Clooney/Spancilhill SEC have identified 3 locations for EV charging infrastructure could be installed.

- Clooney Church Carpark
- Clooney National School
- Clooney/Quin GAA Grounds

[1] 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

6 Agriculture

Summary of Agriculture

- The number of farms has reduced from 96 to 83 since 1991.
- 23% of farms are run by farmers over the age of 65.
- The sheep herd has decreased by 88% since 1991.
- The dairy herd has decreased by 69% since 1991.
- Cattle account for 88% of livestock in Clooney/Spancilhill.
- 61% of agricultural land in Clooney/Spancilhill is under pasture (1,514ha).
- The agriculture sector in Clooney/Spancilhill uses approximately 1,452 MWh of energy per year and emits 383 tCO_2 per year and spends an estimated €275,370 on energy

Introduction

Clooney/Spancilhill farmland is predominantly pasture-based and uses approximately 61% of the total area farmed (1,514ha) and there is little to no tillage. 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 decreased since 1991 by 88%, dairy cows have decreased by 69% since 1991. Based on the latest CSO figures, cattle account for 88% of livestock. The number of farms has reduced from 96 farms in 1991 to 83 farms in 2010. Energy use in agriculture is from petroleum and electricity use and is estimated to be 10% of total energy usage in the community. The number of people employed in farming has declined from 214 in 1991 to 177 in 2010. This is a 17% decrease in employment in agriculture in the community.

6.1 Census Analysis of Agriculture in Clooney/Spancilhill

In Clooney/Spancilhill, 30% of farms are of size between 30 and 50 hectares followed by farms between 20 and 30 hectares accounting for 24% of farms. 13% of farms are between 50 and 100 hectares. There were no farms greater than 100 hectares in size.

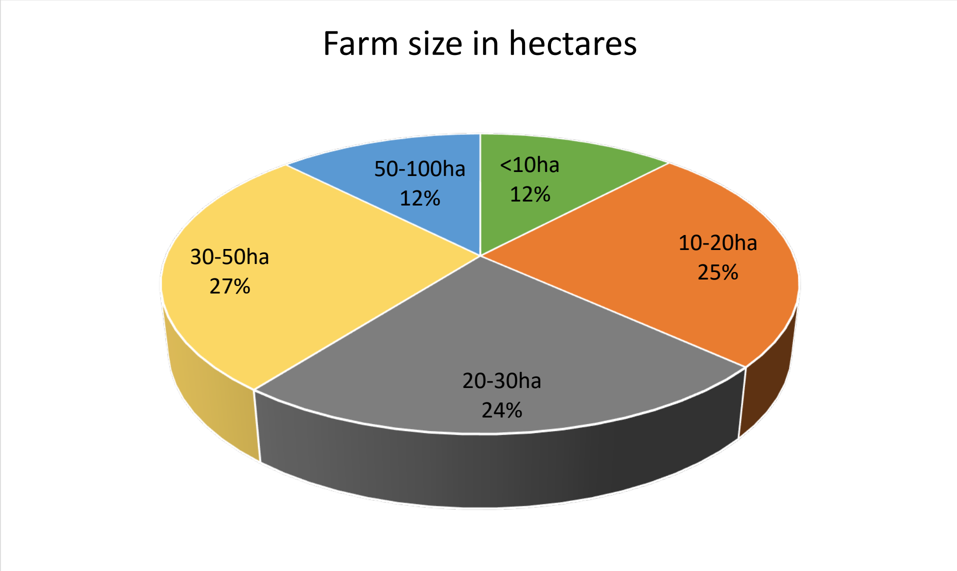


Figure 36: Farm size in hectares (CSO)

In Clooney/Spancilhill, pasture is the largest agricultural land use, followed by silage. Pasture has increased from 1200ha to 1500ha between 1991 and 2010, while rough grazing has decreased from 500ha to 250ha.

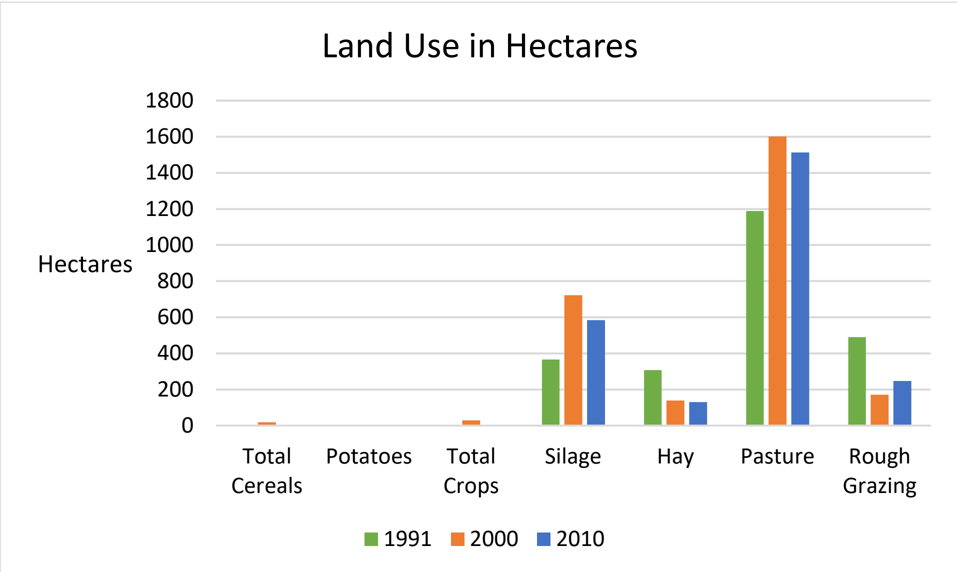


Figure 37: Breakdown of land use (CSO)

Cattle are by far the most common livestock seen on farms in Clooney/Spancilhill with total numbers over 3,700. Sheep stock has rapidly decreased from 1,700 to 200 between 1991 and 2010.

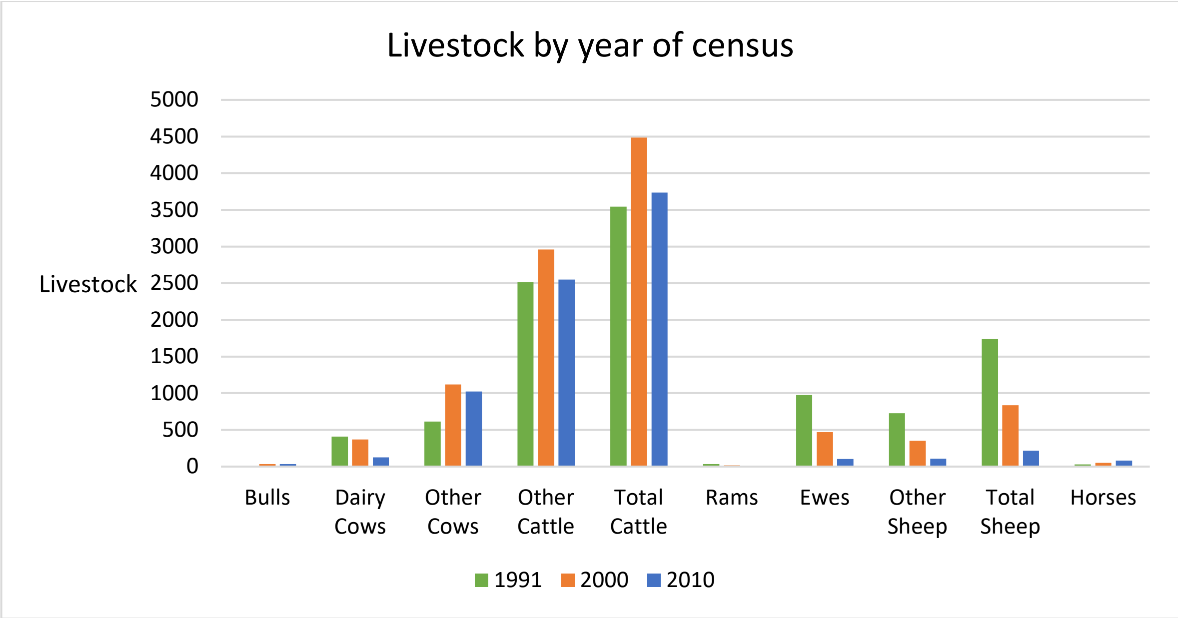


Figure 38: Breakdown of livestock (CSO)

6.2 Energy on 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.

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. Install water harvesting systems.
- 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.

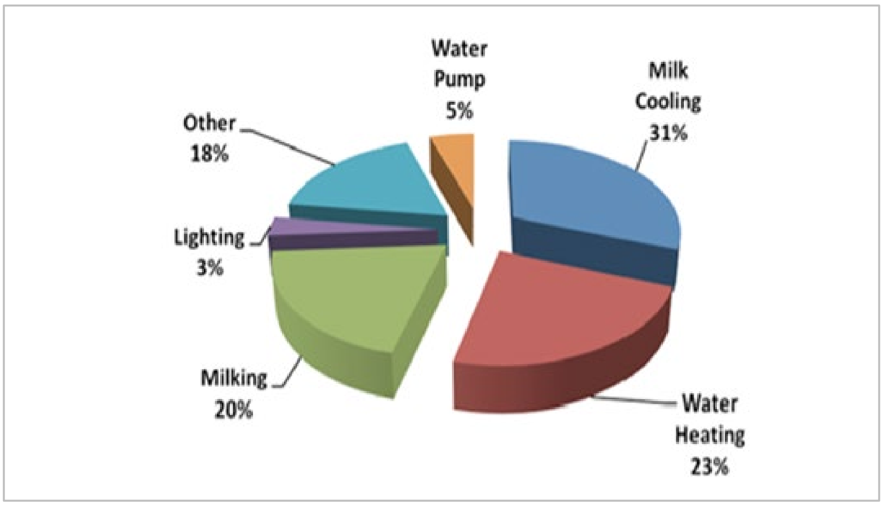


Figure 39: Average energy use based on 60 dairy farms (Teagasc)

6.3 Energy on 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.

6.4 Rainwater Harvesting on Farms

It may be a worthwhile investment to harvest rainwater to cut down on water bills. Rainwater harvesting can be used in all livestock sectors where there are buildings to collect water.

There are lots of different rainwater-harvesting systems available for farms, which can:

- minimise the environmental impact on the farm
- and reduce the amount of water entering the slurry pit by up to 30%.

These setups range from DIY systems through to more expensive plug-and-play kits. Some will have filtration systems and pumps, whereas others will rely on gravity to feed the water.

For TAMS Ⅱ Grants the following guidelines should be followed:

Design of Systems

A rainwater harvesting system involves collection, filtering and storage of rainwater. Further treatment of the collected rainwater is necessary to make it potable and, therefore, suitable as drinking water for lactating dairy cows and for washing milking machines, bulk tanks, etc.

Roofs

Only rainwater from roofs can be harvested i.e., rainwater can't be harvested from yard areas. Rainwater may be collected from tiled, metal and fibre cement roofs but not from asbestos-cement roofs.

Tanks

Tanks may be constructed of concrete, steel, plastic or GRP. Above ground tanks will have to be insulated and opaque to minimise the potential problems of freezing, warming and algal blooms.

- All tanks will require a solid cover and screened ventilation to prevent entry of dirt.
- Tanks will require a calmed inlet to prevent the disturbance of any sediment at the bottom. Where feasible, a floating extraction point from the tank will have to be used, approximately 100mm below the surface of the water. Otherwise, a fixed extraction point may be used, 150mm to 200mm above base.
- Where more than one tank is used, the pipework connection must ensure through-flow of water to avoid stagnation.
- Where mains water is fitted to the tank as back up, there must be back flow protection.
- Tanks will have to be fitted with an overflow outlet attached to a suitable clean water drainage system.

Tank Size

The capacity of the rainwater harvesting tank will have to be sufficient to hold between seven days and 18 days rainfall from the collection area. The capacity will be calculated from the average annual rainfall, the size of the collection area and the demand on the harvested water.

Filters

Rainwater Harvesting systems will require proprietary self-cleaning filters to remove leaves, moss, etc.

Water Treatment

Where used, UV treatment systems and chlorination treatment systems will have to be sized, installed and maintained in accordance with the manufacturers recommendations.

Gutters/Drains

Rainwater must be collected by leak proof gutters/valleys and fed through downpipes into piped drains. Drains will bring harvested rainwater to the storage tank. Where an overground tank is used; a sump will be constructed to hold a pump that will transfer the rainwater into the storage tank.

6.5 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. **Micro-Generation Support Scheme**

   The MSS is targeting support for 380MW of installed micro-generation capacity, to contribute to the target of up to 2.5GW of solar renewables under the Climate Action Plan. Depending on panel size, that equates to over 1 million solar panels, on approximately 70,000 buildings.

   Farm buildings come under non-domestic applications (i.e., not dwelling houses). These applications will be eligible to receive the Clean Export Guarantee (CEG) tariff, for any exported electricity, at a “competitive market rate” from their electricity supplier up to 5.9kW.

   Projects between 6kW and 50kW will receive a Clean Export Premium (CEP) tariff per kWh (kilowatt-hour) exported, for a period of 15 years, from their electricity supplier.
   The 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 CEP tariff will be capped at 80% of generation capacity in order to incentivise self-consumption.
   It is expected that the Clean Export Premium (CEP) will commence in the third quarter of 2022, when a payment mechanism will be determined by the Commission for Regulation of Utilities (CRU).

   Businesses; farms; and community buildings such as schools, and sports clubs, generating up to 5.9kW, will be eligible for a Sustainable Energy Authority of Ireland (SEAI) grant at the same levels as domestic applications. This specific grant will be available later in 2022.

7 Clooney/Spancilhill Energy Baseline Infographic

Figure 40: Clooney/Spancilhill Energy Baseline Infographic

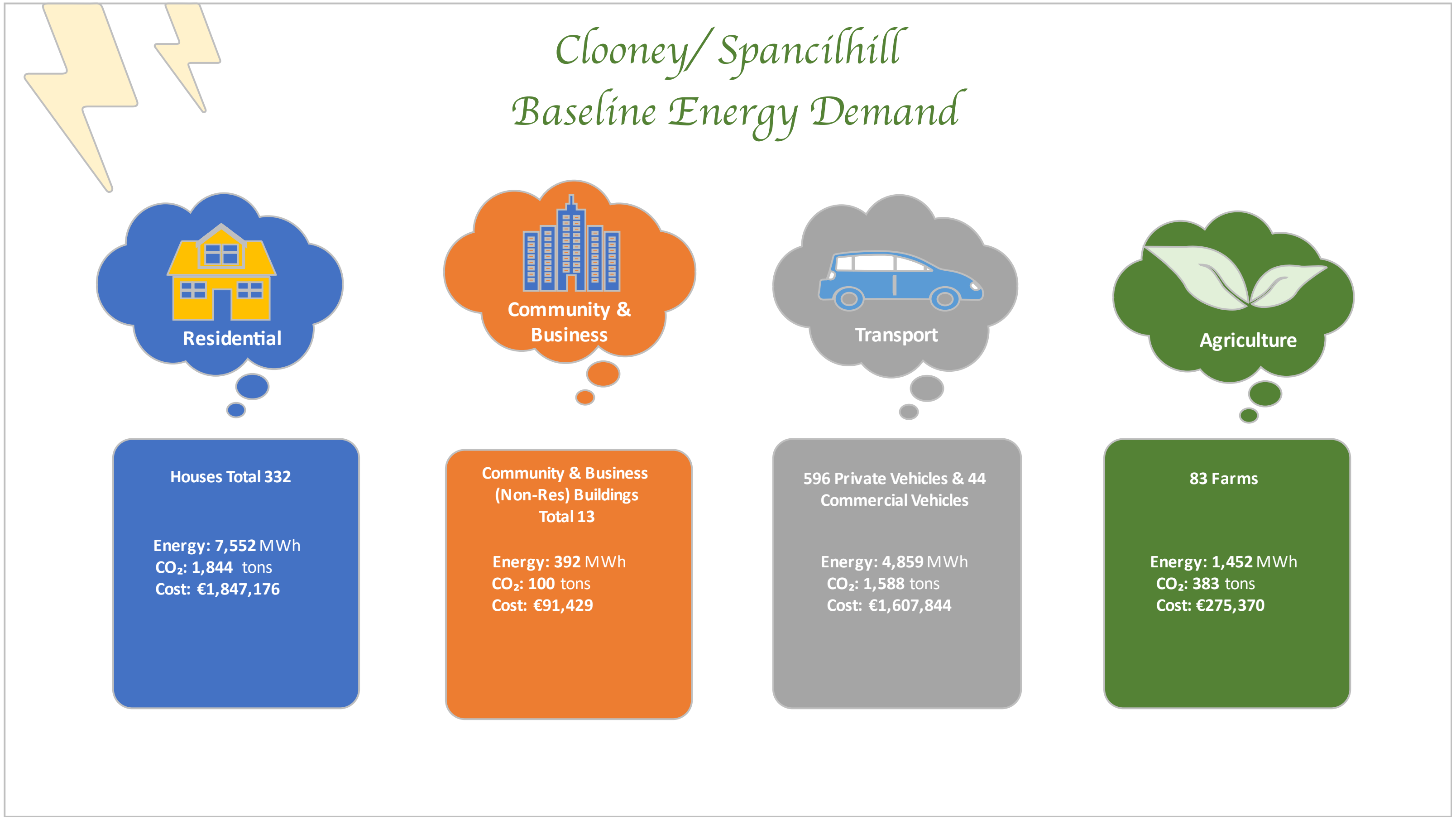


Table8 below summarises the energy usage, carbon emissions and € spend on energy **per year** by the

4 sectors in the Clooney/Spancilhill Sustainable Energy Community (SEC).

Table 8: Energy Baseline for Clooney/Spancilhill

Sector	MWh	CO_2 tons	€	% MWh	% CO_2	% €	Primary Energy (toe)
Residential	7,522	1,844	€1,847,176	53%	47%	35%	647
Non-Residential	392	100	€91,429	3%	3%	2%	34
Transport	4,859	1,588	€1,607,844	34%	41%	54%	418
Agriculture	1,452	383	€275,370	10%	10%	9%	125
Total	**14,224**	**3,915**	**€4,352,408**				**1,223**

Table 8 shows that the residential sector is the largest energy consumer in the community at 53%, followed by transport (34%) and then agriculture (10%). The residential sector is also the largest carbon emitter at 46%, followed by transport at 42% and agriculture at 10%. Note that the emissions of the agriculture sector are for carbon dioxide only, and do not take into consideration other emissions from ruminant livestock.

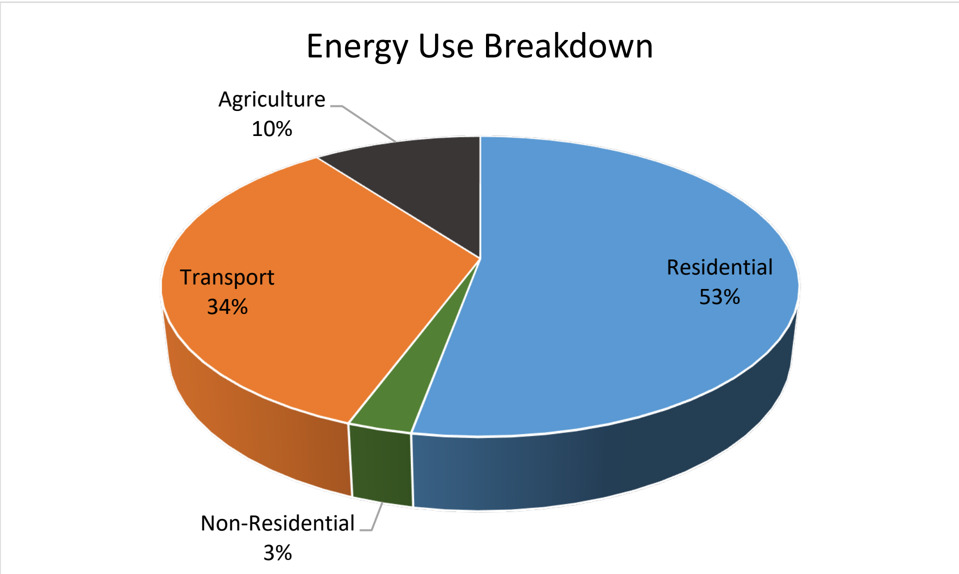


Figure 41: Energy Use Breakdown

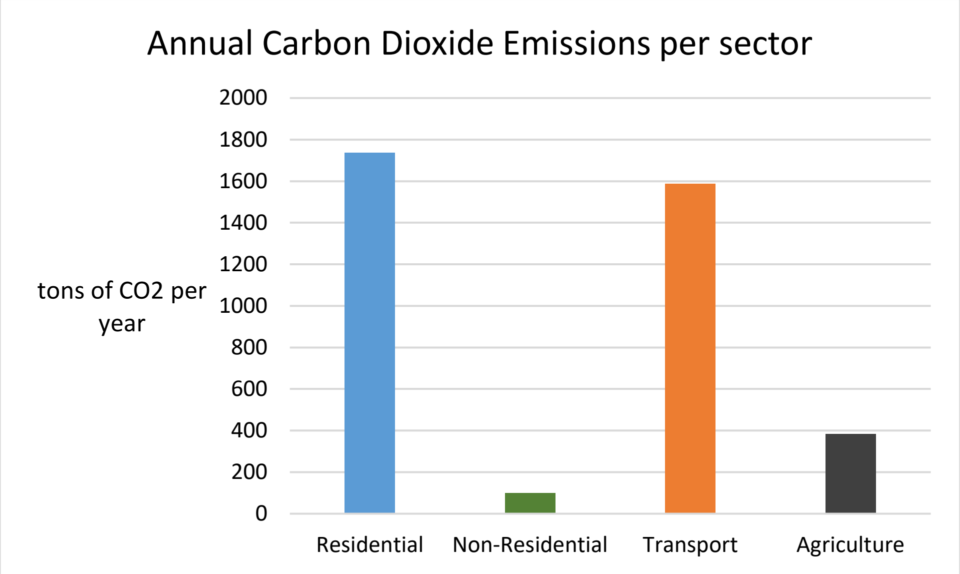


Figure 42: Carbon Emissions per sector

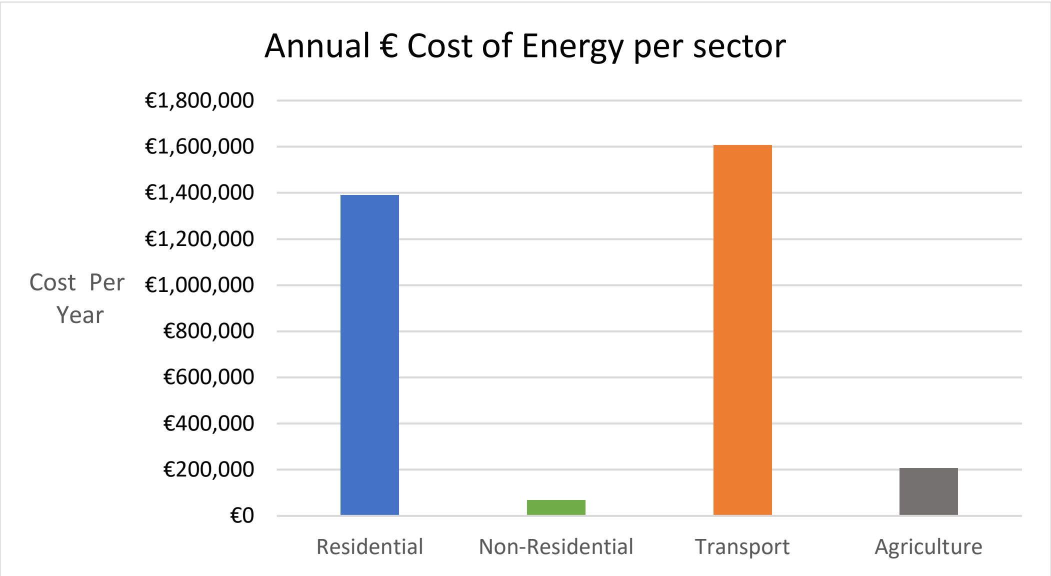


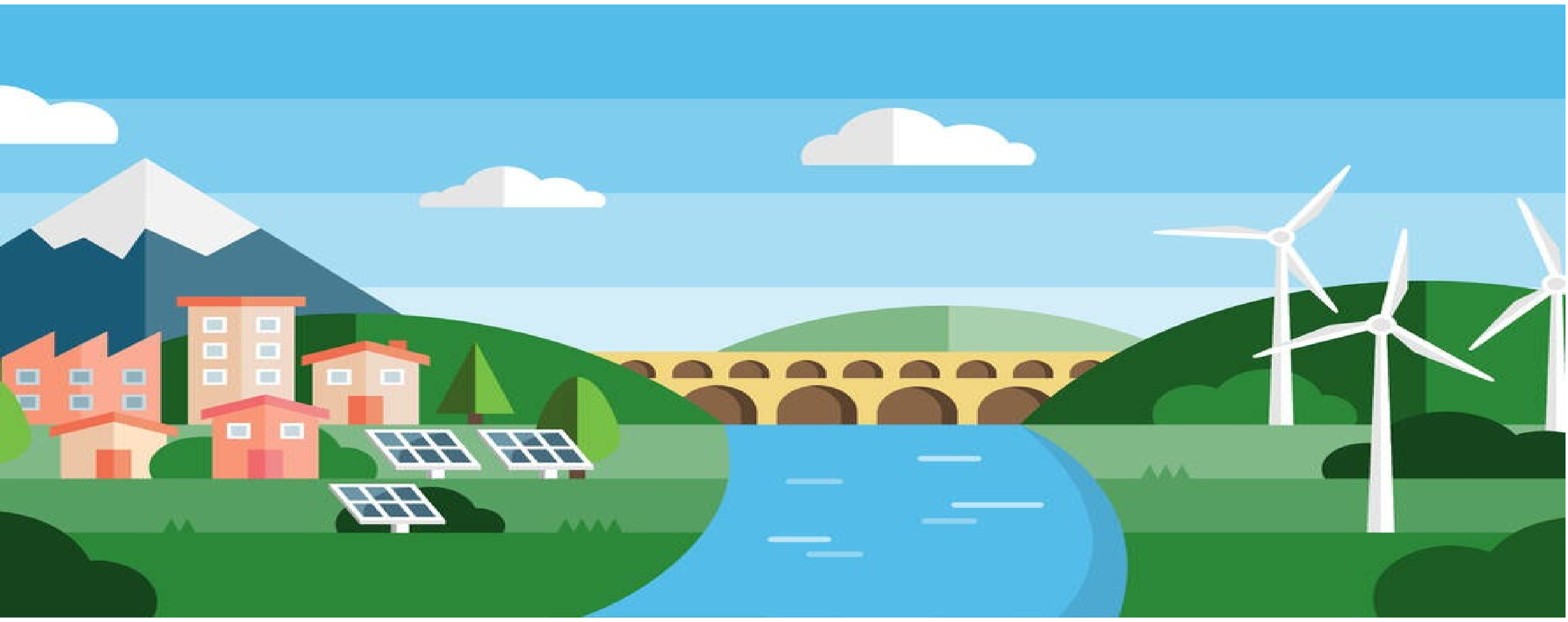
Figure 43: Annual € spend on energy per sector

Figure 43 shows that over €1.6 million is now spent on transport fuel annually in the community. The second most expensive sector is residential, which amounts to nearly €1.4 million a year. These graphs are a reflection of the rising cost of fossil fuel energy in Clooney/Spancilhill community.

8 Renewable Energy Generation in Clooney/Spancilhill

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 Micro-generation**: The potential long-term impacts of and support for a distributed generation will be noted by energy developers and investors. The government has set out a roadmap for Facilitating Micro-generation: The potential long-term impacts of and support for a distributed generation will be noted by energy developers and investors. Building on an existing pilot program, a permanent ongoing support scheme which would enable individual homes to install their own generation and receive a price for selling excess electricity back to the grid will be put in place by 2021. 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 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 44 illustrates the annual global solar irradiation received by Ireland and its neighbouring European countries.

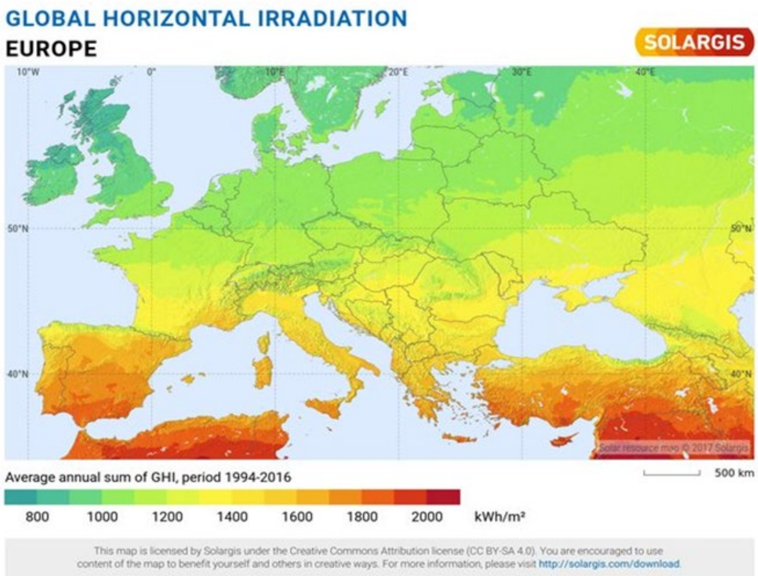


Figure 44: Global Solar Radiation Potential in Ireland and Europe

8.2 Solar Energy Potential in Ireland

Figure 45 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 900–1,300 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.

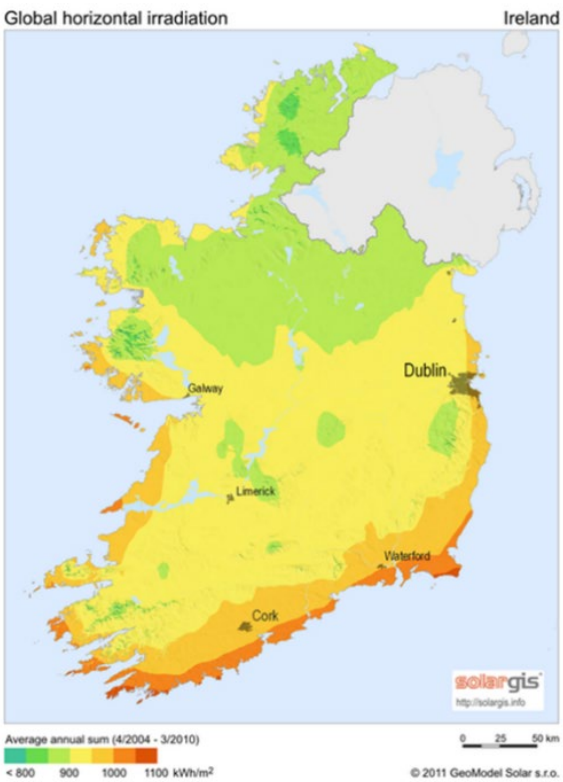
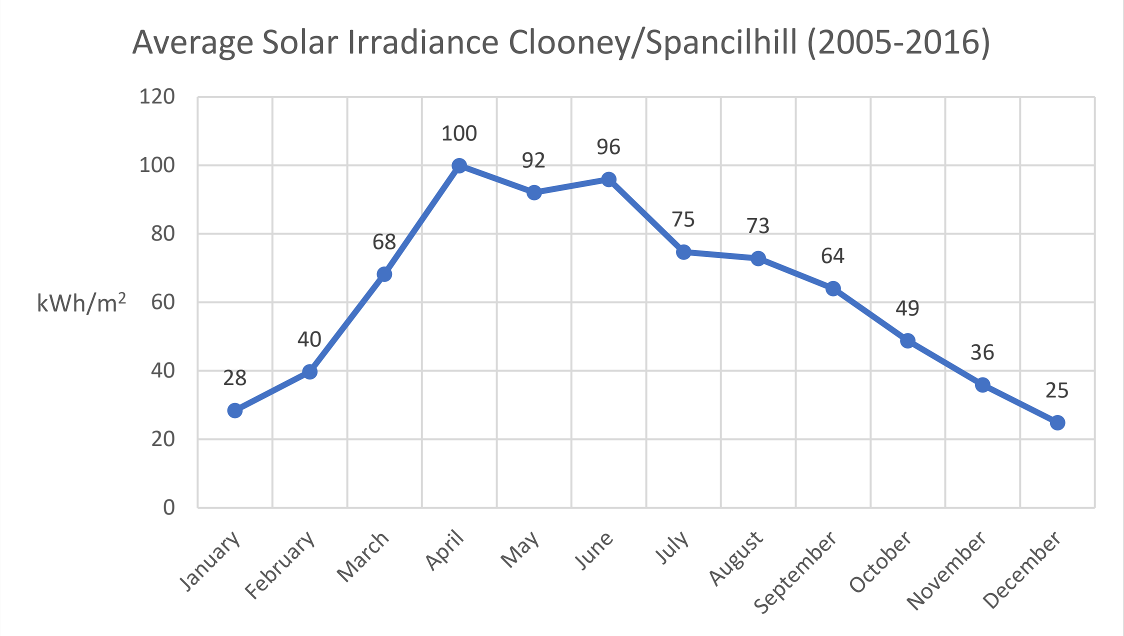


Figure 45: Global Solar Radiation Potential in Ireland and Europe

8.3 Estimated Solar Resource in Clooney/Spancilhill



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 most of the generated 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.

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.

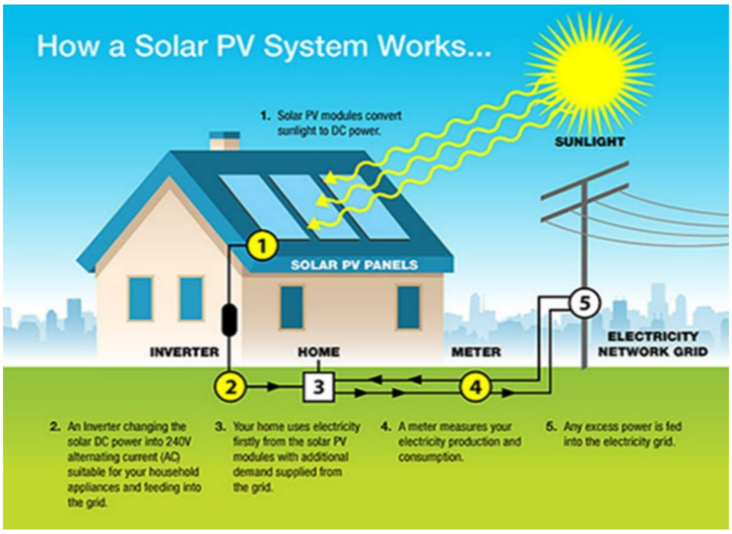


Figure 46: How Solar PV Systems Work

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 400 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 47 below shows the main components of a PV system.

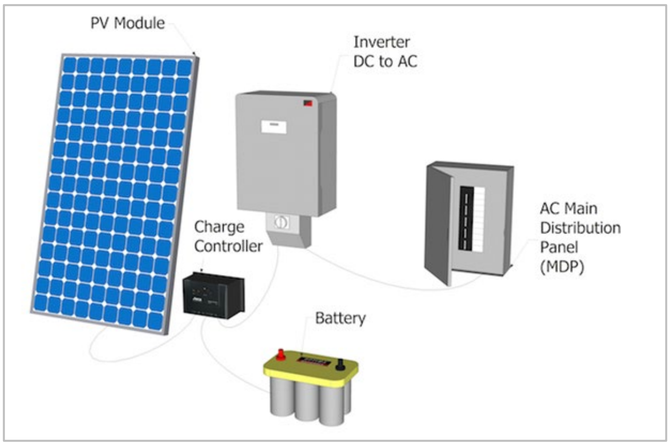


Figure 47: Basic Components of a Photovoltaic System

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 300 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.

Clooney/Spancilhill 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 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 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 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.

8.4 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

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 48: Clean Export Guarantee tariff grant funding and Clean Export Premium tariff

Figure 48 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:

- 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 an unlimited install of Solar PV with funding supports between 40% to 60% to a ceiling of €80K per holding.

8.5 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 the 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 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, and believe people should also have a 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, and many people are struggling to pay high energy bills in cold homes. That's why they are working to make sure the many benefits of generating renewable power are shared by the people and communities of Ireland.

8.6 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 RESS-1 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 requirements states that **community projects must 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/

8.7 Community owned vs. Individually owned Solar PV systems

In this section, we compare a 1,050 kWp (kilo-Watt-peak) ground-mounted solar PV farm to the equivalent of panels installed on rooftops. As can be seen in Table 9 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[2]. 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 25m² 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 in Clooney/Spancilhill is approx. 1,493 MWh (10% of total energy) per year.

Table 9: Example for the development of Solar PV Clooney/Spancilhill

	Ground mounted	Rooftop
Install capacity	1,050 kWp	1,050 kWp
Annual output	943,000 kWh/yr	943,000 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	€1,312,500	€1,837,500
Area required	8 acres	332 roofs with 25m² each S/SE/SW facing
	Approx. 6 GAA pitches	

There are 332 homes in the Clooney/Spancilhill community and if each home had 25m² of south/southeast/southwest facing roof space and 100% of homes installed solar PV panels to generate electricity would produce an estimated 943,000 kWh which would be equivalent to providing 50% (2,750kWh) of the average annual power demand per home for the next 20 years in Clooney/Spancilhill. The cost would be an estimated €5,535 per household for a 3.16 kWp installation and require approximately 332 properties with 25m² of suitable roof space.

Alternatively, by collaborating and investing in a 1,050kWh community-led solar PV farm, 50% of residential and non-residential electrical requirement would be met. The cost of a share in this community owned solar farm would be approximately €4,000 for a 20-year investment. This is a hypothetical scenario in Clooney/Spancilhill, and it goes to prove that the economy of scale principles applies to the community coming together in a community-led Solar PV farm which would require approx. 8 acres of suitable land or to give it perspective equivalent to 6 GAA pitches.

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

8.8 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%.

Under the Clare County Development plan 2017-2023 the County Council has set out Clare Wind Energy Strategy and it is available on their website. This strategy was developed to encourage the development of renewable energy projects in appropriate locations.

Figure 49 shows the County Council's policy areas. Clooney/Spancilhill and the surrounding areas is designated 'Open for Consideration' for new wind energy development but would not have the best wind energy potential within the county.

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.

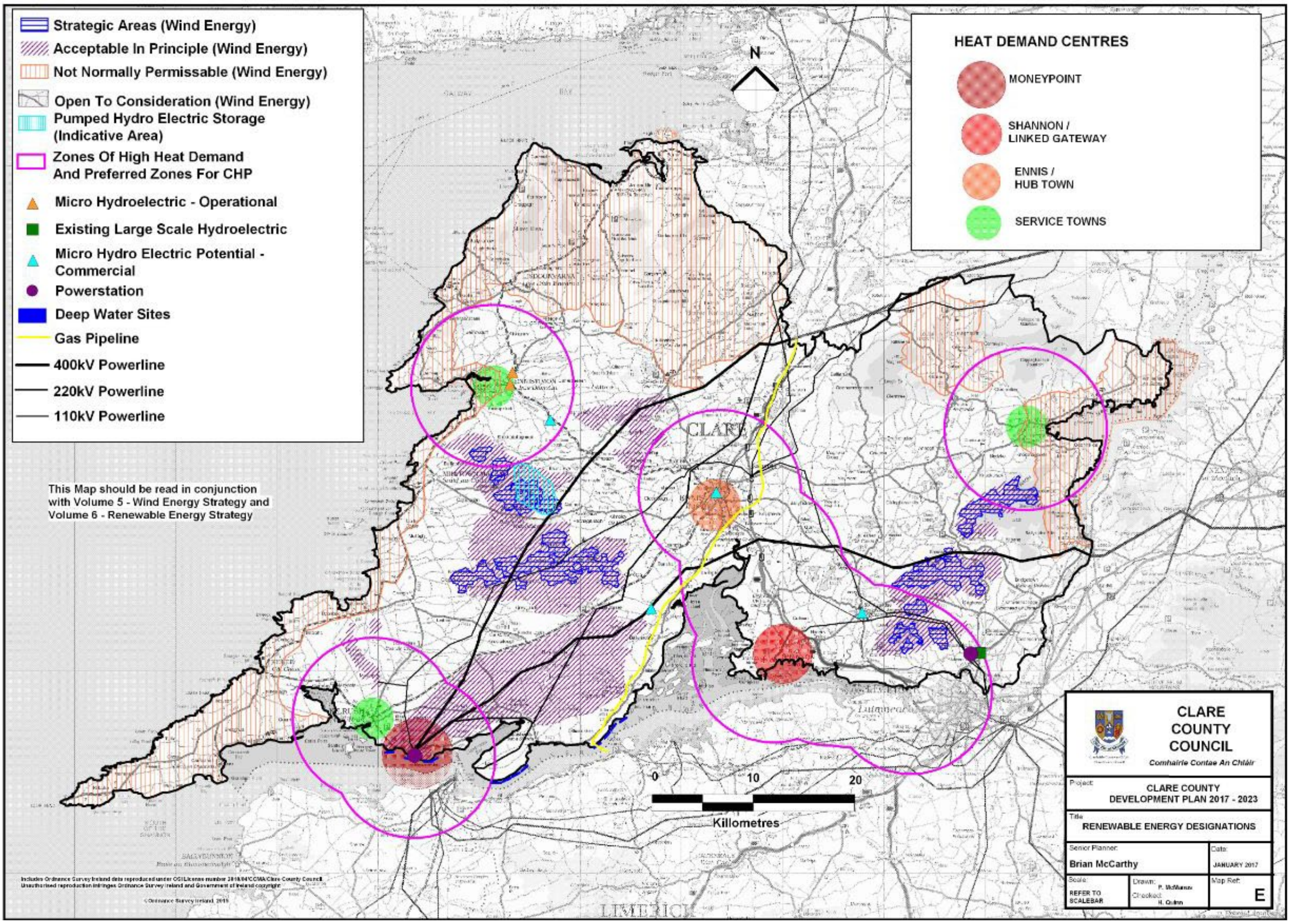


Figure 49: Wind Resource of Clare and surrounding counties (SEAI)

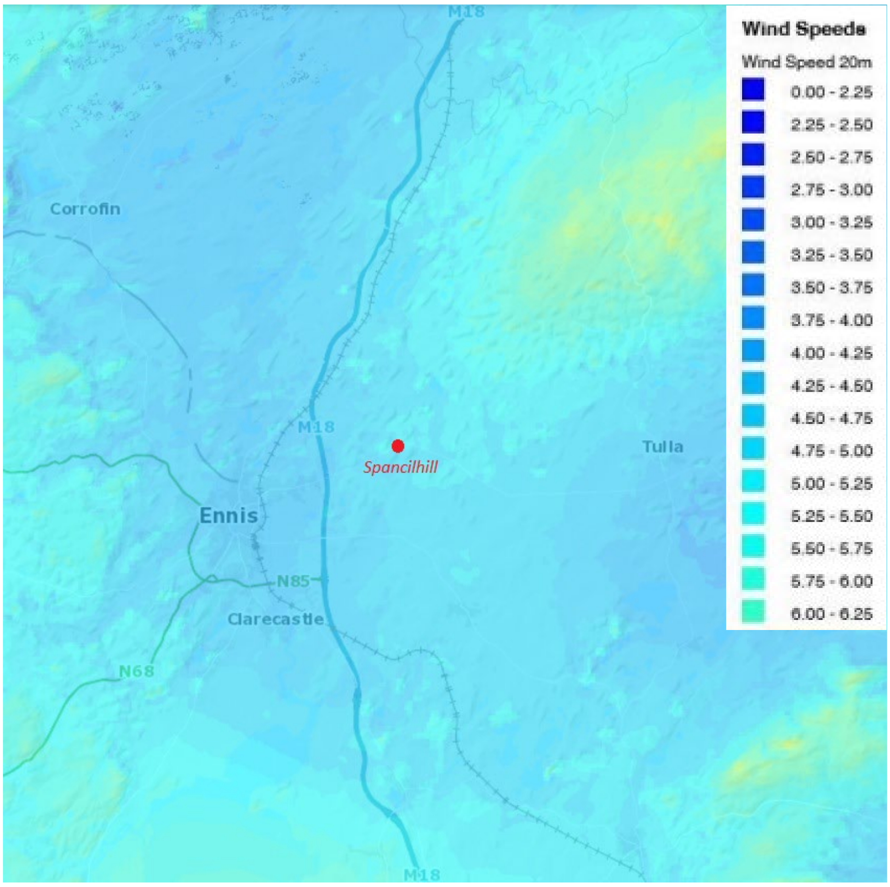


Figure 50: Wind Resource of Clooney/Spancilhill (SEAI)

We can see that the average wind speeds at 20m in Spancilhill are consistently between 4 and 6 m/s in lower lying areas but increases to between 7 and 8 m/s in higher altitudes areas (green/yellow shade) north of Tulla. These speeds would indicate potential for the installation of a community wind farm.

The first 100% community owned wind farm in Templederry, Co Tipperary was finished in 2012 and has been generating annual revenues of no less than €1.1million by selling the green electricity they generate through Community Power. Some of this revenue is used for operation and maintenance costs of the wind farm, but most of it is pumped back into the Templederry community.

8.8.1 Potential Wind Farm Site Clooney/Spancilhill

The Clooney/Spancilhill SEC are very active within the community in identifying potential sites for community owned renewable generation projects. A potential site has been identified in an area called Derrycalliff, Bunratty Upper, Co Clare. The land holding is 5.3 hectares and further investigation into the suitability of the site for a wind farm will be required.

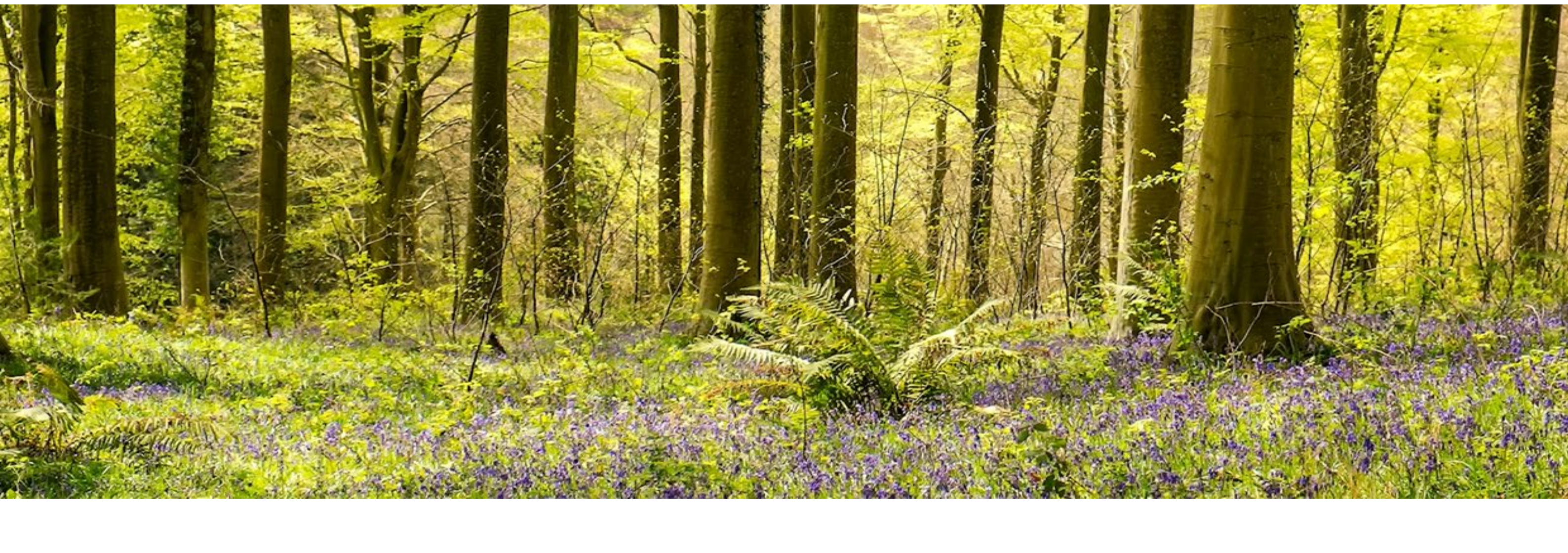
Figure 51: Overview of potential location of Community owned wind farm

Figure 52: finer detail of land holding in Derrycalliff

8.9 Biomass Potential in Clooney/Spancilhill

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.



With the constant rise in prices of oil and fossil fuels and increasing carbon taxes, many homeowners started looking for alternative ways of heating their homes that are more budget and climate friendly. One of the options that is gaining popularity is an investment in a Wood Pellet boiler. Wood Pellet heating is a new and modern solution consisting of a range of decorative stoves and boilers for your home.

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.

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 more stable 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.
- Over one million people have wood pellet boilers installed in their home in Europe.
- Wood pellet fuel is a more space-efficient option than logs and burns better.
- The Support Scheme for Renewable Heat (SSRH) payments[3] can help you bring down the cost of instalment on a commercial project.
- In the long run, you will benefit from fuel cost savings.
- Wood pellets are 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.

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

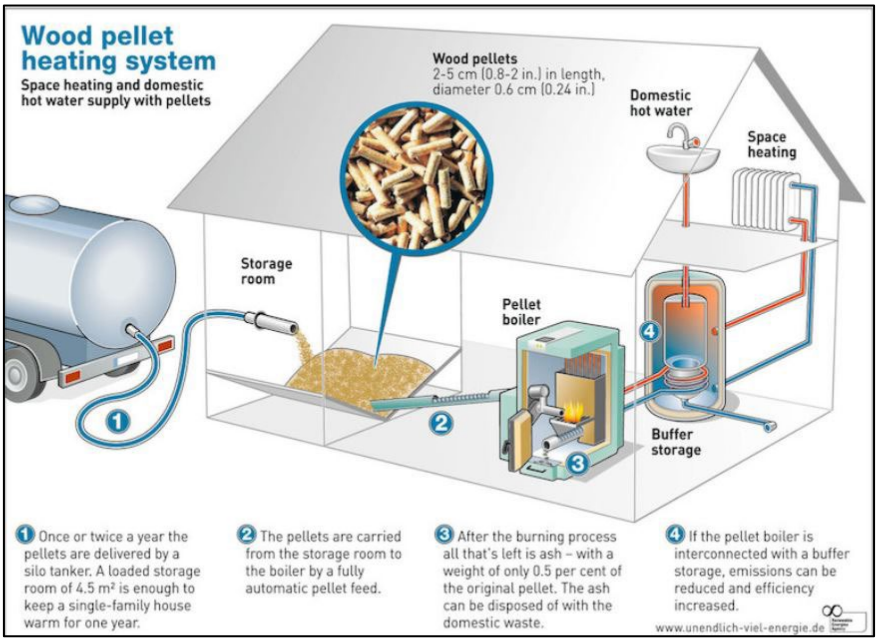


Figure 53: Example of a domestic bulk pellet boiler system

8.10 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 eligible for the SSRH. 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.

Table 10 Breakdown of tariff payments per kWh thermal 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 office.

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

8.11 Example of Wood Heating Potential of a 50-acre Coppice site

Why we use coppicing?

and allowing them to regrow, in order to provide a sustainable supply of timber. This practice has a number of benefits over replanting, as the felled trees already have developed root systems, making regrowth quicker and less susceptible to browsing and shading.

It can be dated back to the Stone Age by the discovery of Neolithic, wooden track ways that have been constructed entirely from coppiced material.

These days the demand for coppice timber is lower, but it remains a popular conservation practice for the benefits it offers to wildlife and to the trees themselves. Trees naturally retrench (shedding their branches to extend their lifespan) and coppicing can be an excellent way of simulating this to increase the life of the tree.

It also increases woodland biodiversity, as greater amounts of light can reach the ground, allowing other species to grow there. Many of these species are food sources for butterflies and other insects, which in turn provide food for birds, bats and mammals.

In well managed coppice woodland, the varied age structure of the vegetation also provides good habitat and cover for a number of different bird species.

Coppice Woodland Management System

Short Rotation Forestry

Trees are cut back periodically to stimulate new growth (between 3- & 10-years harvesting rotation, average 8 years)

Benefits

- Increased wood fuel production
- Dense cluster of shoots around stem great habitat for birds and small mammals
- Trees maintained in juvenile stage in exceptional longevity
- Healthy root system protects against erosion
- (indefinite) carbon storage in the root system

Potential Yield

- Oak 2-4 tonnes per hectare per year over a 30-year rotation
- Sweet chestnut up to 10 tonnes/ha/yr. over a 15 yr. rotation
- Mixed species 3-5 tonnes/ha/yr. or 45-75 tonnes at year 15 and 90-115 tonnes at year 30
- Hazel 25 tonnes/ha at year 10 of a rotation

Source: http://smallwoods.org.uk/our-work/woodland-products/a-brief-history-of-coppicing/

Wood fuel potential, based on mixed species coppice stand:

- 4 tonnes (50% moisture content) per ha X 20 ha (1 Acre = 0.405 ha) X 2.23 MWh/tonne (NCV, 50% MC) = 446 MWh/year

8.12 Summary of Biomass Potential in Clooney/Spancilhill

446 MWh/year of biomass in the form of wood chip could be supplied after the initial growth period for a 50-acre site in Clooney/Spancilhill. A more in-depth study would be required on the economic model to supply a business with a large thermal energy requirement.

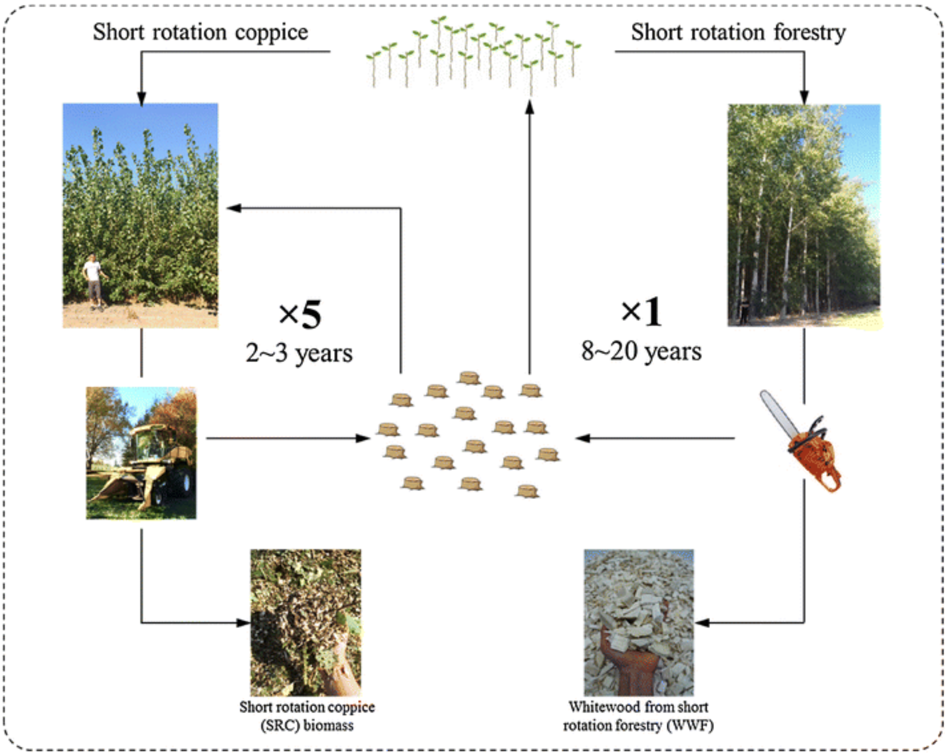


Figure 54: Graphic Explaining the principle of short rotation coppice

8.13 Hydropower in Clooney/Spancilhill

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 last in September of 2020 (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 defaulting purchaser of all renewable energy supplied to the network was the main deterrent to developing small-scale hydro generation.

[4] https://communitypower.ie/

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.

How to build a small-scale hydroelectric power plant

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:

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

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.*

2. Research Planning and Licence 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.

3. Consider the Environmental Impacts

Environmental effects must be considered (the effect of the dam on fish, flooding, and so on). 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.

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.

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.

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.

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.

8.14 Anaerobic Digestion

Anaerobic digestion (AD) is the conversion of feedstock (any organic non-woody material) by micro-organisms in the absence of oxygen into biogas and digestate. It is a natural process and is well understood by mankind, having been harnessed for many years.

Manure and other possible biomass feedstocks are inserted into a large, sealed airless container. In this oxygen-free environment, bacteria will produce biogas. In most digesters, the contents will be heated to accelerate the process. The produced biogas can be used to generate heat or electricity or both. This last option of combined heat and power (CHP) is the most common. The electricity that is generated through the gas engine can be either supplied to the electricity grid or used for own consumption. The heat can be used for the digester, with the surplus sold and used for heating residential or commercial buildings. AD can be applied at a range of scales, depending on the amount of biomass available. Systems can range from small farm- based digesters to large centralised anaerobic digesters (CAD) supplied with feedstocks from several sources. The microbial process of AD requires careful management to maximise its potential output.

There are several design options, which have different cost implications and return varying efficiencies, including:

- operation temperatures
- moisture levels
- continuous or batch system
- single, double or multiple digesters
- vertical or horizontal tank layout

AD feedstocks

- Slurries (cattle/poultry/pigs)
- domestic food waste (brown bin waste)
- food processing waste
- crops grown specifically for AD (whole crop wheat/maize)
- silage/grass.

Biomethane

Ireland's biogas industry will centre on upgrading biogas to biomethane for injection into the national gas grid. Before injection into the grid, biogas has to undergo further upgrading to remove CO2 and other trace gases. This process creates biomethane, with a methane content of around 99%. Biomethane closely resembles the properties of natural gas.

Farmers	Food processors	Local community	Environment	Government
Profit	Food waste removal	Less smell	Less nitrate pollution	Landfill Directive
Support for livestock	Cheap option	Local renewable energy	No net greenhouse gas (GHG) release	Nitrates Directive
Nitrates Directive	Good image	Local heat supply	Diverts landfill	Renewable
Available nutrients		New jobs	Diverts incineration	Fuel security
Diversification		Cleaner environment	Replaces manufactured nitrogen	Biofuel obligation
Pathogen kill			Carbon saving	Decentralised electricity
Weed seed kill				

Figure 55: Benefits of AD to Various Sectors

The economics will depend on the scale of the digester and the availability of feedstocks being digested. AD requires a high capital cost and payback will be determined by the price received for the renewable electricity produced. There is currently no Renewable Energy Feed-in Tariff (REFIT) supporting AD in the Republic of Ireland. Economics are not favourable for digesting energy crops/grasses; however, with access to food wastes and the availability of a gate fee, certain projects may become viable, and would require a detailed feasibility study to justify investment.

Summary

- Economics are variable depending on scale and mix of feedstock.
- waste handling potential is also of interest to the food processing sector.
- working with local 'waste' suppliers and heat/power users improves the economics significantly; and,
- payback is dependent on a suitable REFIT for the substrate being

[6] https:// www.teagasc.ie/rural-economy/rural-development/diversification/anaerobic-digestion/

11 High-level Technology Review

Several technologies could be considered for use within the Clooney/Spancilhill community. 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 Clooney/Spancilhill.

A simple Green/Amber/Red qualitative scoring system is used. Green means that the technology would be well suited to local needs; Amber means that it may be suited to local energy needs; and red means that the technology would not be recommended for Clooney/Spancilhill.

Overall Technology suitability for Clooney/Spancilhill	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 high potential in the Clooney/Spancilhill area with areas directly North of Tulla that may be feasible for the development of a community owned wind farm
	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)
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.
	Fuel Cells	Some limited potential use in the Clooney/Spancilhill area if able to supply larger non-domestic buildings.
Low	District Heating	The size and distribution of heat demand in the Clooney/Spancilhill 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 Clooney/Spancilhill area makes this option expensive. Alternative gas supplies would need to be imported and processed prior to use in any system
	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.
	Hydro	The potential for hydro power in the Clooney/Spancilhill area is low due to the lack of appropriate water resource (with enough flow and height difference)

12 Register of Opportunities

Register of Opportunities – Summary

- Standard retrofit of 186 homes (31 homes per year) to a BER B2
- Shallow retrofit of 140 homes (20 homes per year) to a BER B2
- Scope for sustainable transport and opportunities for community EV charging points
- For a 50% reduction in transport 467 private and 36 commercial EV's would be required in Clooney/Spancilhill
- Business and community buildings should be encouraged to conduct lighting audits
- Development of a community owned 5MW solar PV project in Clooney/Spancilhill
- Development of a community owned Wind Farm
- Development of a 50-acre short rotation coppice plantation to supply biomass into the local markets and natural habitat.
- Support the upskilling and provision of training to local contractors (Coast to coast & McInerny) to work on insulation & upgrade works.

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:

- Development of a retrofit roadmap to achieve a reduction of 50% in energy use in residential and non-residential buildings in the community within the next 5-6 years.
- A prioritised list of renewable energy projects appropriate for development and/or community ownership, with the potential to cover the energy usage on the study area, within the next 10 years, with recommendations of technical feasibility for frontrunner generation initiatives.
- An analysis of the renewable energy potential in the area to help the community achieve their energy reduction goals. This analysis should focus on the community owned renewable energy potential on local farming and forestry land. The desired timeframe for these renewable energy projects is 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 Opportunities shall provide preliminary capital costs and expected energy savings arising from the priority projects.

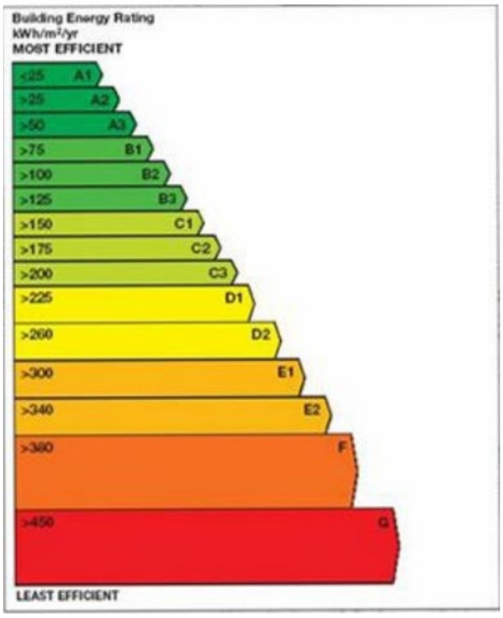
Community Engagement:

- 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.
- Engagement and communication with the SEC Steering Committee will take place throughout the study, to ensure that the needs and capabilities of the community are fully catered for.
- The study should both leverage local knowledge as well as facilitate knowledge development for the community.

12.1 Residential

Target:

- **50% reduction in energy usage in residential buildings by the year 2029**



The BER is a measure of how well a home retains heat, with electrical energy usage also considered. Effectively, the BER approximates the total amount of energy being used in a house. The BER is 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 Clooney/Spancilhill is a BER of D2. Upgrading a house from D2 to B2 would reduce the amount of energy required by around 55%.

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. Templemore can play its part by encouraging and enabling residents to retrofit their houses.

Meeting the 50% energy reduction target in the residential sector by 2029 would require:

- 126 homes with a BER D or lower, to complete a standard retrofit, bringing the home to a BER B2. This equates to between 18 homes being deep retrofitted each year, starting in 2023.

- 98 homes to complete a shallow retrofit, to upgrade from a BER C to *at least* a BER B2 rating (must achieve a 100 kWh/m^2/yr uplift as per grant scheme requirements). This equates to 14 homes being shallow retrofitted each year, starting in 2022.

Table 11: Estimated Retrofit Costs

Retrofit Type	Retrofits per year (starting in 2023)	Capital Cost
Shallow	14	€420,000
Deep	20	€1,000,000
Total	**34**	**€1,420,000**
Total by 2027	**224**	**€11,040,000**

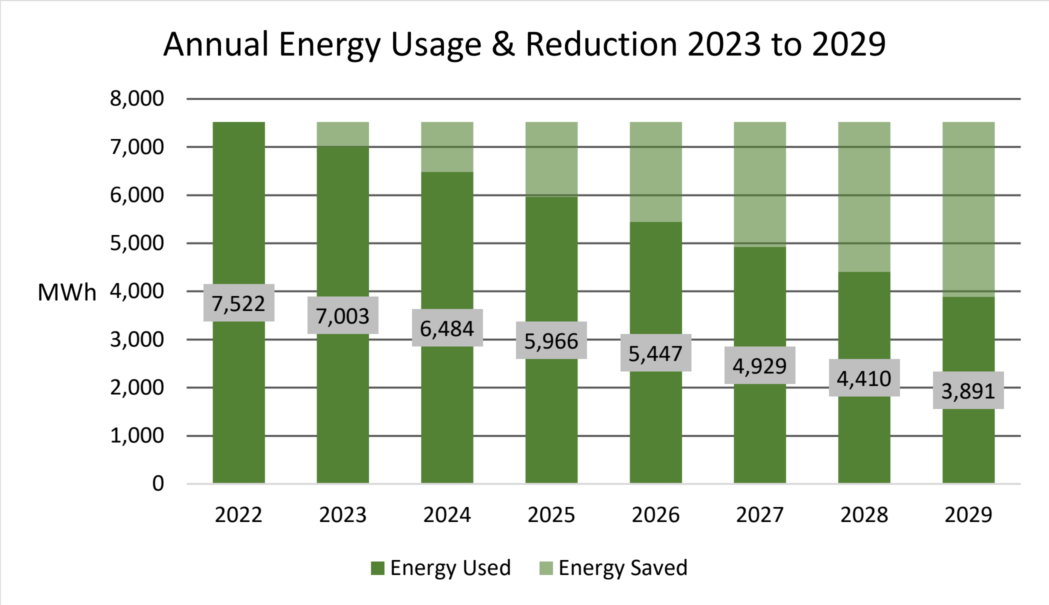


Figure 56: Projected usage and savings from residential retrofit 2023 to 2029

Deep retrofitting 20 homes and shallow retrofitting 14 homes **per year** would reduce residential energy usage in Clooney/Spancilhill by 50%. This would suggest that 259 homes would have to receive a retrofit be it a deep or shallow retrofit and this would account for 78% of the housing stock needing to retrofit by 2029. It would also save approximately €376,939 per year for the residents when the retrofitting programme is completed. This retrofitting programme, once completed, would also reduce the CO_2 emissions of the residential sector in Clooney/Spancilhill by 50%.

The cost of a full home retrofit to a BER B2 is circa €48,500 per house, or €10.9 million euro in total by 2029. However, under the National Home Retrofit program each home going forward for a retrofit will be entitled to a €25,000 grant (approx. 50% of total cost), which would reduce the total cost of upgrades from €10.9 million to €5.45 million and stimulate employment in the area.

The average BER score for the community would be improved vastly, achieving an average BER B3 rating, compared to the current rating of D2. This would bring the homes of Clooney/Spancilhill in line with the targets of the climate action plan and provide a warm, low energy and low Greenhouse gas home for generations to come. update

Table 12: Retrofit Estimated Costs Breakdown

Retrofit Type	Energy Savings (%)	€ savings (Incl. carbon tax)		tCO2 savings	
		By 2029	per year thereafter	By 2029	per year thereafter
Shallow	16%	€530,788	€75,827	292	292
Deep	34%	€1,680,831	€240,119	635	635
Total	50%	€2,211,620	€315,946	927	927

Table 13: Summary table of home energy audit analysis

Residential Energy Audit											
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.
1970's	detached	80	585	8	G	217	C3	63%	2.7	13.3	634
1930/2005	detached	180	205	2.7	C3	152	C1	26%	2.00	1.9	91
1800's/1980	detached	174	216	3.2	C3	131	B3	39%	2	3.1	147
1993/1999	detached	180	194	2.2	C2	155	C1	20%	1.7	1.4	67
1700/1960/1970	detached	64	439	6.1	G	220	C3	50%	2.60	7.9	377
2003	detached	120	130	2.20	B3	104	B2	20%	1.85	0.9	45
2004/2011	detached	140	182	2.6	C2	134	B3	26%	1.9	1.7	83
1993	detached	229	283	3.1	D2	170	C2	40%	1.9	4.1	195

The above table outlines the sample homes that received one of eight home energy audit that was available as part of the Clooney/Spancilhill Energy Master Plan. From the sample group if the homeowners undertake the recommended home energy upgrades the improvements in energy savings are between 20% to 63% in savings per year and will get those homes up to a better standard between a BER C3 to a BER B2. If the homeowners choose to progress with these measures, then six out of the eight would have a Heat loss index of 2 or lower. 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 and further reduce the heating cost of these homes.

12.2 Non-Residential

Target:

- **50% reduction in energy usage in non-residential buildings within the next 5-6 years.**

Energy audits were carried out on:

- Clooney National School
  - Cost savings of 60%
  - Energy-saving of 59%
  - Emissions reduced by 60%

If all the measures are undertaken, table 13 is representative of the savings.

Table 14: Non-residential estimated euro, energy and GHG savings

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.**
Clooney National School	24,665	64%	7.5	€2,332	€219,724

The other non-residential buildings could make similar savings by investing in energy reduction measures outlined in the Clooney National School energy audit that were undertaken. It would be recommended to perform energy audits on such buildings.

The hospitality, retail and other community buildings in the Clooney/Spancilhill SEC catchment area should be encouraged to undertake lighting audits, where a list of bulbs for upgrade to high efficiency LEDs could be completed for each building. 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 and low-cost upgrades to undertake.

12.3 Transport

Private Electric Vehicles

To achieve a 50% reduction in private vehicle related energy use in Clooney/Spancilhill, 81% of today's cars would need to be replaced by electric cars. This will result in the residents of Clooney/Spancilhill collectively owning 467 electric vehicles and 108 fossil-fuelled vehicles. In addition to the large reduction in energy usage, the carbon emissions related to transport in Clooney/Spancilhill would drop by over 73% (drop of 23% of total SEC emissions) by 2030.

Commercial Electric Vehicles

Similarly, commercial vehicles will be required to make the transition to electric. Of the 44 commercial vehicles in Clooney/Spancilhill today, 36 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 84% reduction in carbon emissions from Clooney/Spancilhill's commercial fleet by 2030.

The electrification of transport in Clooney/Spancilhill 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.

12.4 Community-led Renewable Energy

12.4.1 Solar PV Farm – 5MW

There is also an opportunity to develop a large-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 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.

Table 15: 5MW Solar PV Farm Potential

	Clooney/Spancilhill PV Array
Install capacity	5 MWp
Annual output	Estimated 4,249MWh/yr.
	Equivalent to 56% of residential electricity use
Capital cost (€/MWp)	€850k
Total cost	€4,250,000
Area required	25 acres
	Approx. 18 GAA pitches

Table 15 shows that by commissioning a 5MW PV array could potentially provide 4,250MWh of energy each year which is enough to power the equivalent of 187 homes. This would result in a 56% improvement in the baseline energy required for the residential sector in Clooney/Spancilhill.

A feasibility study will need to be carried out to determine the viability of such a project and is dependent on the location and capacity of the nearest 38kW sub-station & costs are estimates only.

12.4.2 Wind farm – 4.6MW

There is also an opportunity to develop a 2-turbine wind farm s up to 5MW and qualify for the RESS auctions as a community generation project. The land area required would be small and the *circa* 5 ha site that has been identified by Clooney/Spancilhill SEC could be adequate. For a wind farm development under 5MW no environmental impact assessment would be required but planning permission, and grid connection is all required before you can enter an auction process. The price that will be paid for each MWh of power produced will depend on the price submitted during the auction.

Table 16: 4.6MW Wind Farm Potential

	Clooney/Spancilhill Wind Farm
Install capacity	4.6 MW
Annual output	Estimated 12,089MWh/yr.
	Equivalent to 160% of residential electricity use
Capital cost (€/MWp)	€1M euro
Total cost	€4.6M euro* (ex. grid connection etc.)
Area required	-
	-

Table 16 shows that by commissioning a 4.6MW (2 No. 2.3MW turbines) Wind farm could potentially provide 12,089MWh of energy each year which is enough to power the equivalent of 532 homes and contribute to 85% of the Clooney/Spancilhill total current energy needs.

A feasibility study will need to be carried out to determine the viability of such a project and is dependent on the additional costs of grid connect. costs are estimates only.

13 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 Clooney/Spancilhill can be realised. This would include the retrofitting of 259 (78% of total housing stock) homes to a very high standard of a BER B2 and availing of grant aid to assist in the investment This would net a 26% reduction in the current baseline energy consumption of Clooney/Spancilhill by 2029 when all the work could be completed.

Clooney National School was audited as part of the Non-Residential section for this Energy Master Plan. The resulting energy saving for this building was 24,664kWh/yr. (64% energy reduction), if all the proposed measures were carried out that were identified form the energy audit. The decarbonisation of the non-residential sector would require continued energy auditing of buildings to identify suitable energy upgrades and be able to receive SEAI Better Energy Community (BEC) grant aid on some of the capital investment involved. It is assumed that a 50% energy reduction will occur in this energy sector of Clooney/Spancilhill by 2029 and engagement with this sector is encouraged.

From the perspective of energy reduction in the transport sector in Clooney/Spancilhill, big gains could be made with the introduction of Electric Vehicles onto the roads to achieve a 50% reduction in from the transport energy sector, 484 EV's and 36 EV commercial vans will need on the roads of Clooney/Spancilhill by 2029. This would result in an overall 17% energy reduction when compared to the current baseline energy demand for Clooney/Spancilhill. A plan for deployment of an electric vehicle charging infrastructure in Clooney/Spancilhill and Surroundings needs to be investigated.

A 5MW solar Farm which would need to occupy approx. 25 Acres of suitable land would generate circa 4,249MWh of energy per year, produce an estimated €450K in revenue via the Renewable Energy Support Scheme (RESS) and displace 1,275 tCO_2 each year for the 15 years of its project life. The estimated cost would be in the region of €4.5M Euro (excluding cabling and connection charges to a suitable substation).

The possibility of a two-turbine wind farm is activity being investigated by the Clooney/Spancilhill SEC. Suitable land has been identified for the installation on 2 No. 2.3 MW wind turbines, that would produce approximately 12,089MWhr of energy per year for the next 20 years. The investment cost would be in the region of €4.6 million euros with estimated annual revenue of €1.26 million euros per year once the initial payback period is overcome. It is recommended to keep the installation under 5MW otherwise an environmental impact assessment would be required for projects over 5MW.

Last but not least a 50-acre short rotation coppice forest once beginning to mature, would return local flora & fauna to the area and generate 446MWh of biomass as zero carbon heating fuel and potentially generate revenue in the locality and sustain jobs in the area. Biomass in the form of wood chips could be supplied to businesses in the area that have a large thermal requirement. A more in-depth study of the biomass potential would need to be carried out by Clooney/Spancilhill SEC.

Table 17: Summary Table of opportunities in Clooney/Spancilhill

Sector	Measure	Target Achieved to 2029	% Of total energy saved per year by 2029	Financial Savings per year	Level of Investment required (total)
Residential	Retrofitting of 34 houses per year	50% reduction in sector	26.4%	€0.316M euros	€11M euros
Transport	Private EV adaptation: 467 EV + 36 commercial EV's	50% reduction in sector	17%	€0.879M euros	€20.1M euros
Non-Res	Building/services Energy Upgrades	50% reduction in sector	1.4%	€0.045M euros	€0.588M euros
Community Owned renewable Solar PV	5MW Solar PV Farm	25.3% increase in RE production	30%	€0.44M euros	€4.25M euros
Community Owned Coppice Forest	50-acre short rotation coppice forest (once mature) *carbon sink & natural habitat*	2.7% increase in RE production	3.1%	€35.6K euros	€107.5K euros
Community Wind Farm	2*2.3 MW wind turbines	72% increase in RE production	85%	€1.26M euros	€4.6M euros

If all the suggestions for energy reductions and energy production were implemented, Clooney/Spancilhill would become a net exported of energy as it would have energy surplus to requirements.

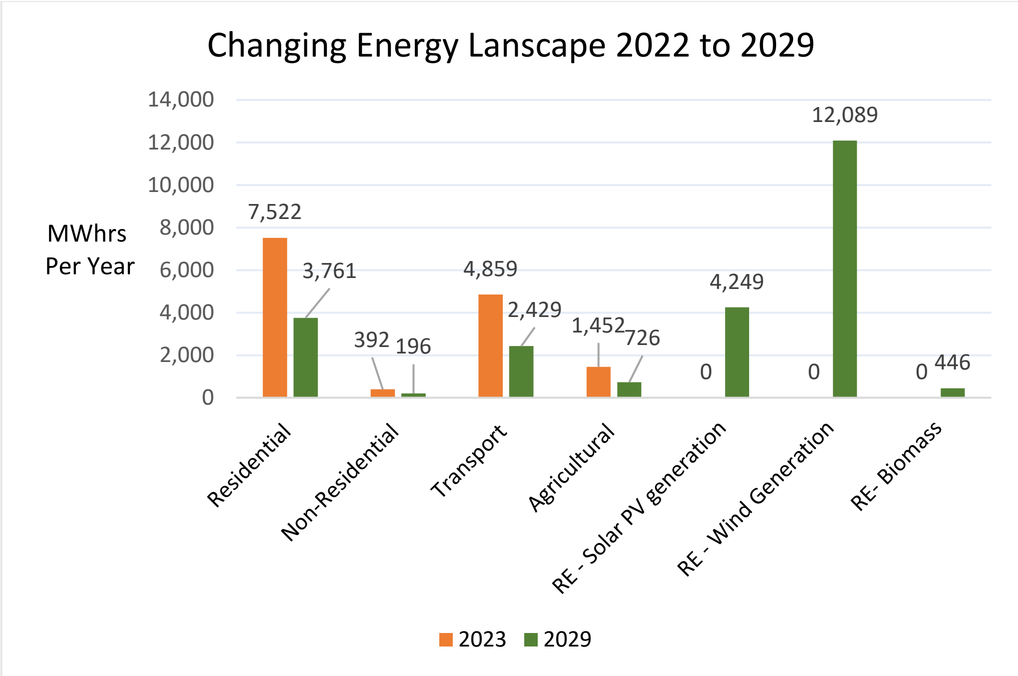


Figure 57: Changing energy landscape 2020 to 2029

Figure 57 above summarised what the energy landscape could look like across all the energy sectors of residential energy, Community and business (non-residential), transport and Agriculture in Clooney/Spancilhill SEC when a 50% reduction in energy is achieved across all energy sectors of Clooney/Spancilhill SEC. Also, there is the potential for a 100% community owned Solar PV farm and/or a community owned wind farm if either the substation can be upgraded, and local land utilised, or a suitable location can be found for this project further from Clooney/Spancilhill and in proximity to an electrical substation with generation capacity.

Exciting also, is the potential for a 50-acre short rotation coppice forest that would produce 446MWhrs of biomass for wood chip boilers and create a local amenity for the community and also a natural habitat for flora and fauna and further support additional jobs in the area.

Further study would be further required for the biomass production and renewable energy generation project in Clooney/Spancilhill SEC.