South Sligo Energy Partnership Sustainable Energy Community

Energy Masterplan

May 2023

Supported by

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1. Introduction

The SEAI Sustainable Energy Communities Programme provide supports to communities, through local mentors and co-ordinators, to assist them on their decarbonisation journey. The first step on this journey is the compilation of an energy master plan for the area. This will include the establishment of a baseline for energy used in the community and a register of opportunities for projects to be implemented across all sectors. The process of developing this master plan will identify how the SEC can maintain momentum over the period to 2025 and beyond.

South Sligo Energy Partnership (SSEP) is a volunteer team of motivated people working to support communities to move to a more sustainable future. The SSEP team joined the Sustainable Energy Communities network in 2019.

The South Sligo Energy Partnership SEC geographical area centres on Riverstown and encompasses adjacent towns (Geevagh, Drumnacool, Sooey and Castlebaldwin) and surrounding rural areas. The SEC has the following profile obtained from the CSO 2016 Census;-

- located in Co. Sligo
- With wind farms within the area, there is potential to access the Wind Farm Community benefit funds, approx. €1,500 per annum
- Population - 3,718 residents
- 2,082 cars
- 1,760 dwellings
- 83% owner occupied
- 50% owned outright
- 97% of dwellings are single and two storey dwellings
- 55% of homes built before 1990 of which 47% were built prior to introduction of building regulations.
- Residents aged 25 or under account for a third of the population and 55 % of residents are between 25 and 65 years of age, the remaining 15% are over 65.
- 45% of residents are in paid employment and the others are unemployed, retired or in full time education
- 23% of those in paid employment have a trade
- 78% of those working use their cars to travel to work, about 15% higher than the national average.
- Just 7% work from home

The above information is from the 2016 Census, once the data from the 2022 Census is available it will allow the above figures to be updated.

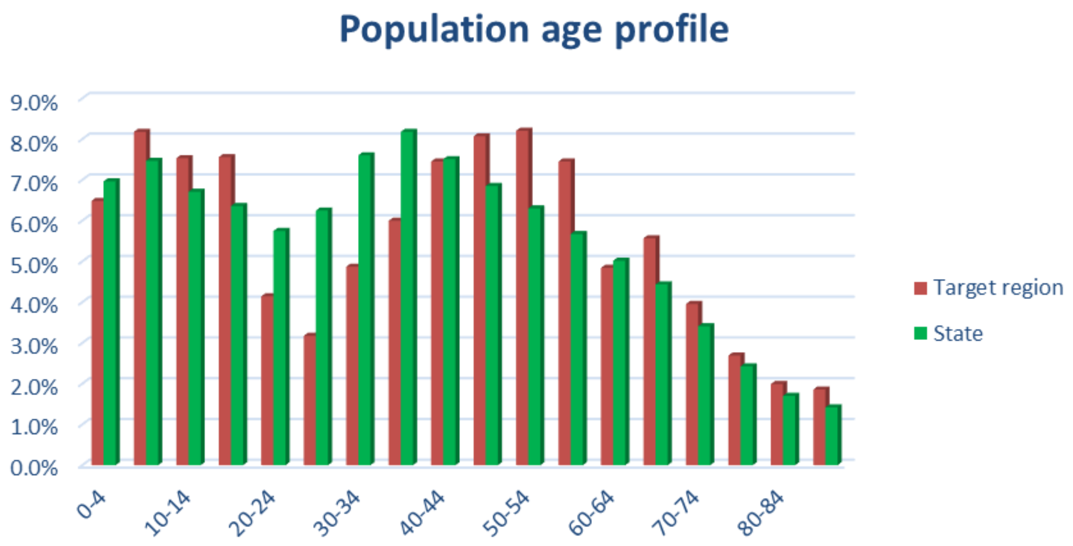

Figure 1 Age Profile of Residents

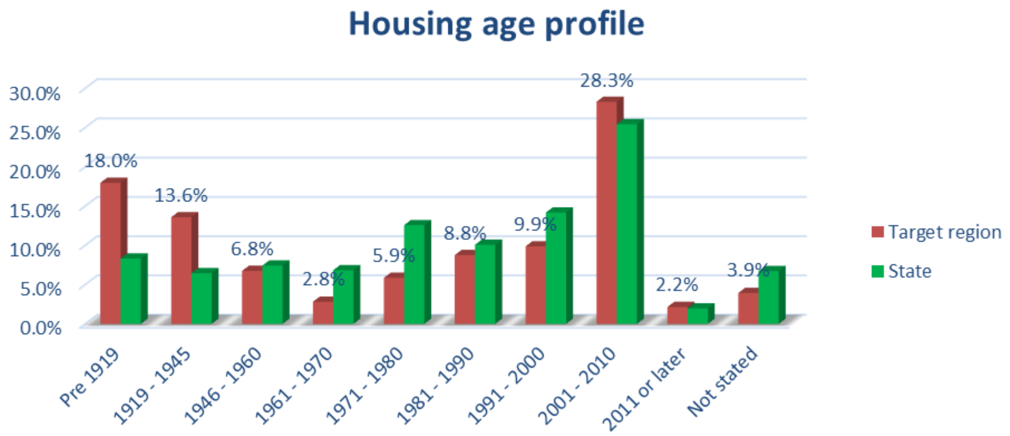

Figure 2 Age Profile of Housing Stock

1.1. South Sligo Energy Partnership Energy Masterplan

The aim of this Energy Master Plan is to enable South Sligo Energy Partnership SEC to understand it's current and future energy needs in order for them to make informed decisions and prioritise actions.

This EMP will demonstrate opportunities to South Sligo Energy Partnership SEC such that their community can become more energy efficient and transition to renewable energy where possible.

The committee of South Sligo Energy Partnership SEC comprises individuals with connections across the local community as shown below

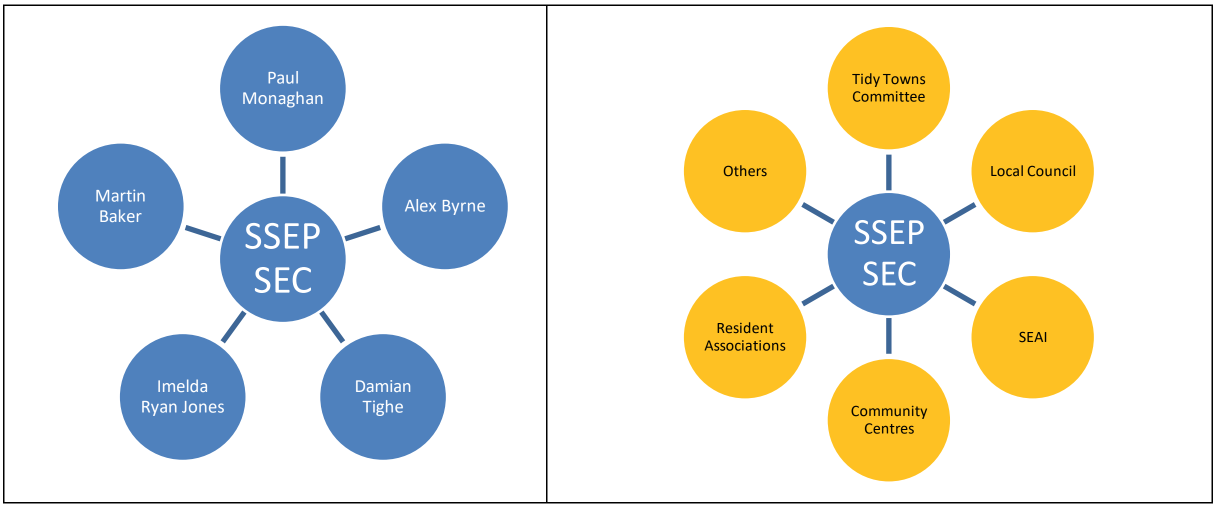

Figure 3 SEC Influence

The opportunity to define how Sligo County Council and the community can coordinate and collaborate on local climate action, specifically sustainable energy, will be explored as part of the development of this EMP

South Sligo Energy Partnership's vision is

- *"To Inform the community and raise awareness on how to reduce energy usage & carbon emissions and access funding opportunities for a more sustainable future."*

It hopes to achieve this by developing a wider Community Interest and involvement in:

- Behavioural change/energy education
- Energy efficiency & financial savings for dwelling occupiers
- Sustainable/low carbon community
- Sustainable transport

SEAI have invested over €400 million in sustainable energy projects throughout the country through the Better Energy Communities programme (BEC). This has saved the Irish economy over €1 billion during that period. Therein lies an opportunity for South Sligo Partnership community to avail of BEC funding and other grant aid in order to become self-sufficient and sustainable in all its activities.

The South Sligo Energy Partnership SEC geographical area centres on Riverstown and encompasses adjacent towns (Geevagh, Drumnacool, Sooey and Castlebaldwin) and surrounding rural areas.

Figure 4 SEC Area Map

1.2. Sustainable Energy Communities

According to the SEAI, in Ireland many communities are working together to become more sustainable in how they use energy. Changing the way energy is used has one of the biggest impacts for sustainability and the environment. When people act together this impact goes even further.

Energy bills can be reduced for homeowners and businesses in the community by doing local energy projects. This means more money is available to spend in the community in the longer term.

Quality of life, especially for the vulnerable in the community can be greatly improved and retrofitting homes and buildings means warmer, healthier homes and community buildings and less costly to run.

1.3. Climate 23

Climate 23 is a climate consultancy focused on community energy management that brings together experience in the community and voluntary sector with nationally recognised technical expertise in energy and carbon measurement.

2. Energy Master Plan (EMP)

2.1. Scope and outputs

There are no heavy industries located in the target area. The scope of the EMP therefore includes the following:

- Analysis of energy and related CO_2 emissions and costs within the residential sector including a high-level quantitative analysis using the SEAI Building Energy Rating data and CSO data for the area.
- Building Energy Rating (BER) analysis of selected and representative households
- BERWOW analysis of selected representative house types
- Energy assessments of relevant buildings / businesses within the target area
- Identifying potential for energy audits under the SEAI SSEA scheme
- Review of transport opportunities

The EMP references potential for local initiatives

- addressing energy poverty via the SEAI Warmer Homes scheme
- Local Authority rental properties

Summary of the EMP outputs include:

- Baseline of energy use
- Sustainable Energy Roadmap for each sector
- Register of Opportunities for each sector

2.2. Methodology

The key elements of the methodology employed are detailed in table below. Specifically in the residential energy use study a top down analysis was completed using the Central Statistics Office (CSO) data on residential sectors and the SEAI Building Energy Rating (BER) data, to develop a residential energy use baseline for the area.

Table 1 Methodology for EMP development

Methodology		
Data and tools used	**SEC input**	**Consultant input**
CSO & BER data	Collation of data from CSO and SEAI sources	Data analysis of BER/CSO data to model existing housing stock against new B rating targets Shallow and deep retrofit solutions identified and costed up together with energy CO_2 and cost savings for the residential sector
Energy survey – local small business and community facilities	Outreach to local businesses for participation Distribution of survey questionnaire	SME commercial sites to be assessed ROO Presented for each
Home energy survey	Outreach to local community for participation	BEW WOW Case studies of a sample of dwellings

	Distribution of survey questionnaire	Analysis of results Cross reference to CSO/BER data
Energy Audits - homes	Identification/selection of key home types for audit Coordination with homeowners	Energy analysis & report Retrofit menu / ROO
Energy Audits – non-residential	Identification/selection of facilities/buildings for audit Coordination with owners/managers	Energy audits
Local development plans and zoning maps	Identification of relevant maps	Analysis for Renewable Energy project potential
ESBN Generation Capacity Maps Designated areas maps	Identification of potential Renewable Energy Generator sites	Analysis for Renewable Energy project potential
Any other relevant tools		**BER WOW used to model and present case studies.**

2.3. Approach used in this study

This report uses a top-down approach using SEAI Building Energy Rating (BER) data mined by the Sligo Institute of Technology (IT) Contracts Research Units (CRU), Central Statistics Office (CSO) 2016 census data, other data sources and tools such as the BERWOW-Home[1] online tool developed by BERWOW Ltd[2] . This tool was developed to guide homeowners through the options, costs and benefits from different retrofit home improvement decisions.

The shift towards decarbonisation in the residential sector will require a combination of awareness building, behavioural change, energy demand reduction measures through deep energy retrofits, and electrification of heating systems in dwellings using heat pump technology as the primary source.

An initial target rating of residential dwelling B2 was set for the analysis with the option to consider deep retrofit as part of a drive towards Near Zero Energy Buildings (NZEb) being proposed by 2050.

BER analysis using the DEAP methodology and the BERWOW[3] platform on selected homes as part of the overall work commissioned the SSEP was used to compile approximate costings for the upgrades.

[1] https://www.sseairtricity.com/ie/home/home-upgrade-calculator/ accessed through the SSE Airtricity website

[2] https://berwow.ie/#products

[3] https://berwow.ie/#products

3. SEC Baseline Analysis

This section provides a sectoral baseline of energy use. Figures are expressed in kWh, CO_2 and € as much as possible. CO_2 is the most important in terms of Climate objectives and € are the most tangible for communities. The costs are estimated from the kWh figures using SEAI fuel cost comparison or similar.

The high-level analysis in the residential sector was undertaken using a combination of data form the CSO and from the SEAI small area maps BER data.

The high level analysis of the non-residential sector was completed using two methodologies,

I. the CIBSE TM46: Energy Benchmarks to estimate energy consumption combined with floor area data estimated/calculated using Valuation Office data (https://opendata.valoff.ie/api/).
II. analysis of energy use based on the energy assessments undertaken.

The energy cost data used was taken from the most recent 2022 SEAI fuel cost comparison and also from analysis of energy use based on the energy assessments undertaken. The valuation office data provided a list of 95 commercial non-residential facilities and 5 public sector facilities.

A register of opportunities has been developed for the facilities. This is included in Section 5 Register of Opportunities.

3.1. Energy Audits

Direct energy audits are a valuable way to engage greater local participation in the EMP. They also provide a quick path to implementing energy upgrade projects.

The facilities were chosen in conjunction with the SEC Committee and represented a range of energy uses across the local area.

3.2. Analysis of Residential Sector

3.2.1. Dwelling Types

There were 1,350 occupied dwellings on the night of the census including three mobile homes. The dwelling profile is dominated by house/ bungalow at 97% of units (86% nationally). Flats and bedsits account for a less that one percent. The latter is well below the national average where 12% of dwellings are in this category. The remaining 2% were bedsits, mobile homes or not stated.

3.2.2. Dwelling Tenure

Over 83% of dwellings in the area are privately owned or owner occupied.

Private landlords account for over 6%, and local authority and housing association almost 5%. Occupancy for the remaining 6% is rented from voluntary organisation or unknown.

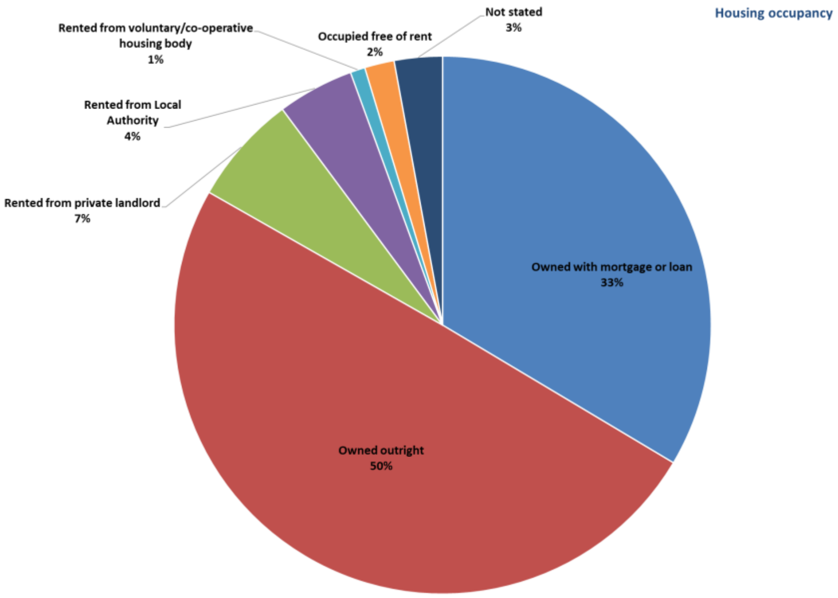

Figure 5: Dwelling Tenure

3.2.3. Energy Rating of Dwellings

The energy rating of dwellings in the SSEP Community area were modelled using the BER small maps area data from the SEAI This profile or distribution of dwelling numbers by BER is detailed below in below. A BER is required when a dwelling is constructed or at the point of sale or rental:

- Just 16% of dwellings in the target area had BERs undertaken.
- 35% of dwellings are in an E to G rating category.
- Just 3.2 % of dwellings are estimated to meet or surpass the target average B rating as outlined in the government's Climate Action Plan (CAP).
- The average rating across the whole portfolio is an E1 rating or 288kWh/m^2/year

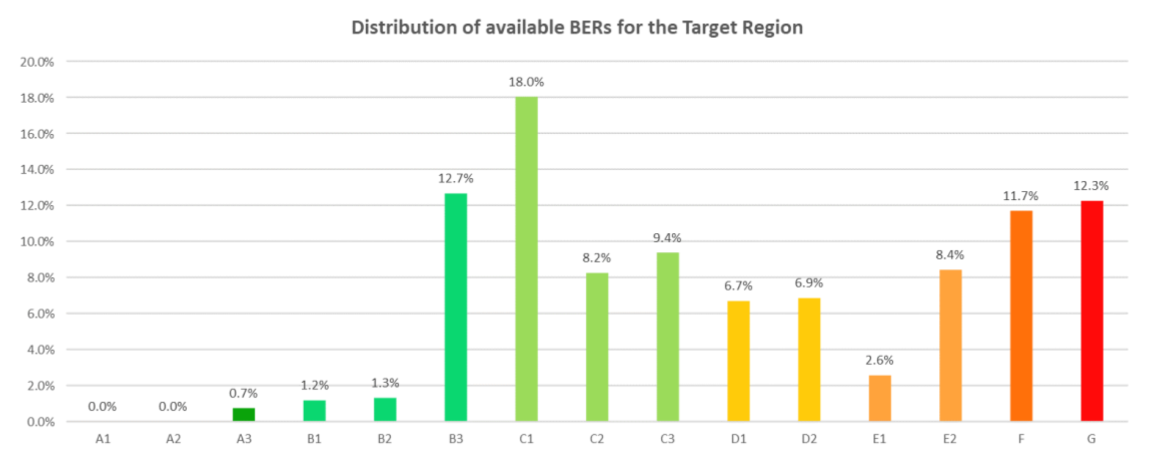

Figure 6: Energy Rating of Dwellings

The rating scale used by the SEAI DEAP methodology is shown below. The target B2 will have a rating of 100kWh/m2 primary energy. Primary energy is all the energy inputs and takes into account the energy used to generate electricity.

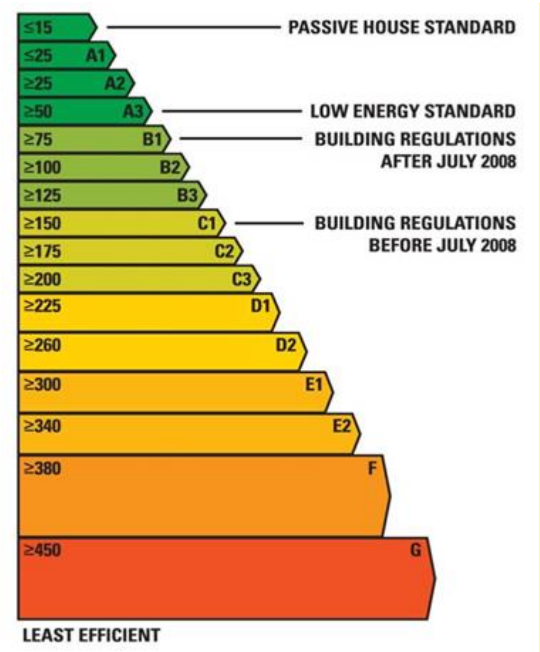

Figure 7: BER Rating Scale

3.2.4. Heating Systems Profile by Primary Fuel Source

Figure 9 below shows the full breakdown of system types available from the CSO. An analysis of heating system types indicated the following:

- 60% of dwellings had oil fired central heating as their primary source of heating.
- The second most popular source was solid fuel at 30% with turf accounting for 18% and coal for 12%.
- the remaining 10% of dwellings use LPG, “other sources” or have no heating at all.

Oil fired system would typically have an efficiency of between 60% and 70% over the whole heating season. A replacement condensing oil boiler would deliver savings of about 20%.

There are no SEAI grants available for upgrading fossil fuelled systems so any retrofits would have to be self-financed or else renewable heat pumps installed which would require a complete upgrade to the distribution system radiators and the domestic hot water cylinder.

Heat pumps which use electricity as main fuel (there are gas driven ones as well) have efficiencies of upwards of 350%.

Homeowners wishing to push out the boundaries in terms of going beyond a B2 rating to an A2 or A3 for example would ideally need to consider a heat pump as the preferred option. These systems are quite expensive to install and more than likely the radiators will need to be replaced with low temperature radiators or underfloor heating. These upgrades with the heat pump will drive up the install costs but generous grants are available from the SEAI through the Better Energy Homes Scheme, or the Better Energy Communities Scheme. To qualify for the heat pump grant, the dwelling must achieve a minimum BER of B3/C1 before a heat pump grant can be considered

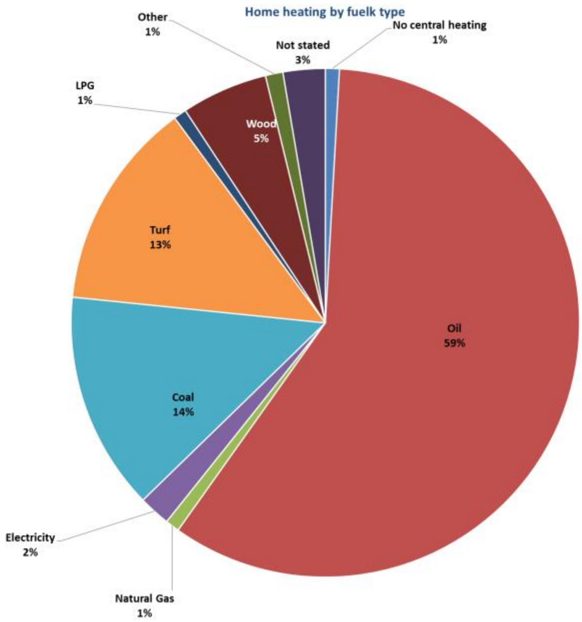

Figure 8: Breakdown of Central Heating by Fuel Types

3.2.5. Window U-Values in the SSEP Community

Thermal transmittance, also known as U-value, is the rate of transfer of heat through a structure (which can be a single material or a composite), divided by the difference in temperature across that structure. The units of measurement are Watts/meter squared/degree kelvin (W/m²K). The better-insulated a structure is and hence performance, the lower the U-value will be. The main observations for the BER sample is as follows:

- Current regulations aim for a u-value of 1.4 or less, just 18 of dwellings would closely align with this range. Homeowners aiming for a B2 should target this level during the upgrade.

- 6% of dwellings have a u-value of 4 or higher which would suggest single glazing so potential to reduce the losses by about 66% (2/3) by upgrading to low energy types.
- 64% of dwellings have windows in the range of 2 to 3 which is typical of 1990's to 2000 period dwellings. This is high when compared to age profile of dwellings indicating that some dwellings may have had some form of upgrade completed previously

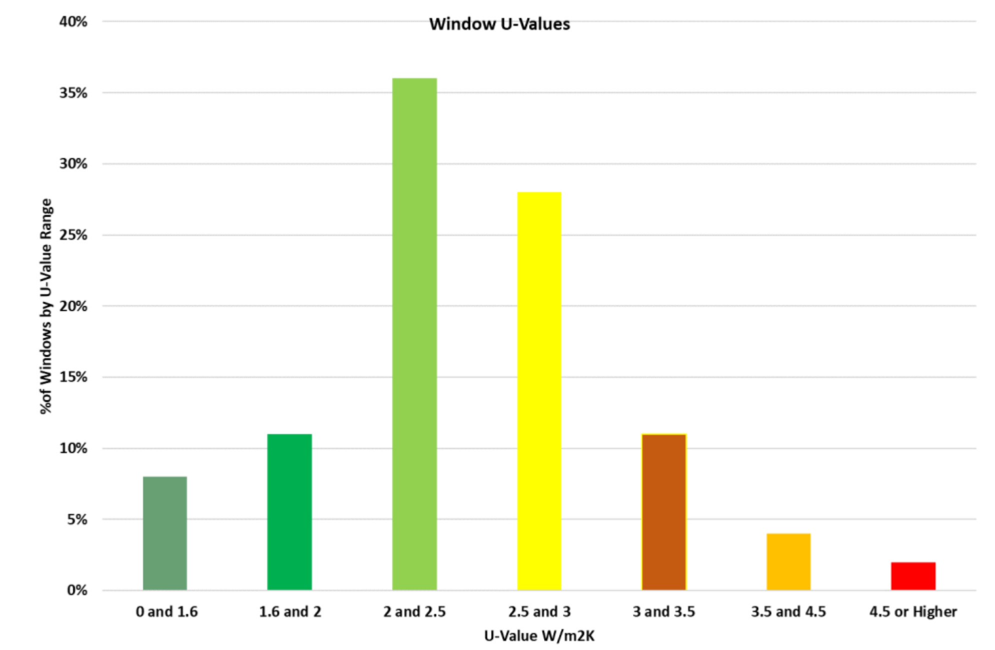

Figure 9: Breakdown of Window U-Value Range

3.2.6. Wall U-Values in SEEP Community

As is the case with windows, the same hold true for walls. The better-insulated the wall is the lower the U-value. The percentage of dwellings by wall u-value is shown in Figure 8 below. The main observations of wall u-values are as follows:

- Current regulation guidance is for a u-value of 0.16 $W/m^2/k$ of better (lower), the analysis indicated that 11% of dwellings within the range and another 50 % up to a 1998 standard.
- Over 40% of the dwellings (0.5 and above) have very minimal insulation or none at all!

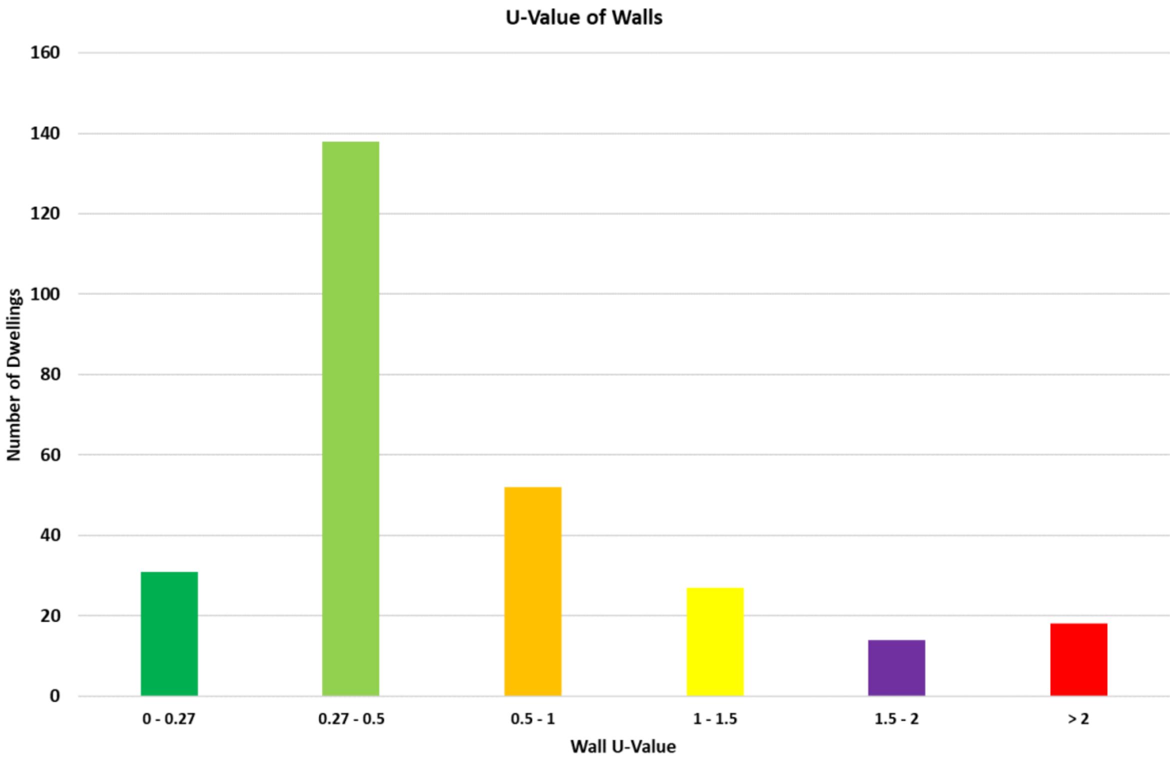

Figure 10: Breakdown of Wall U-Value Range

The analysis of wall types corroborates the insulation u-value analysis above and Figure 10 shows the various wall construction types. This is dominated by unfilled cavity at nearly 40% of dwellings. These walls could use pumped cavity wall insulation to bring them to 0.27 $W/m^2/k$.

- About 30% are of hollow concrete block or unfilled cavity and will have u-values of between 1 and 2 $W/m^2/K$
- Over 60%% of the walls have some form of insulation which will be of reasonable standard such as filled cavity and timber frame houses.

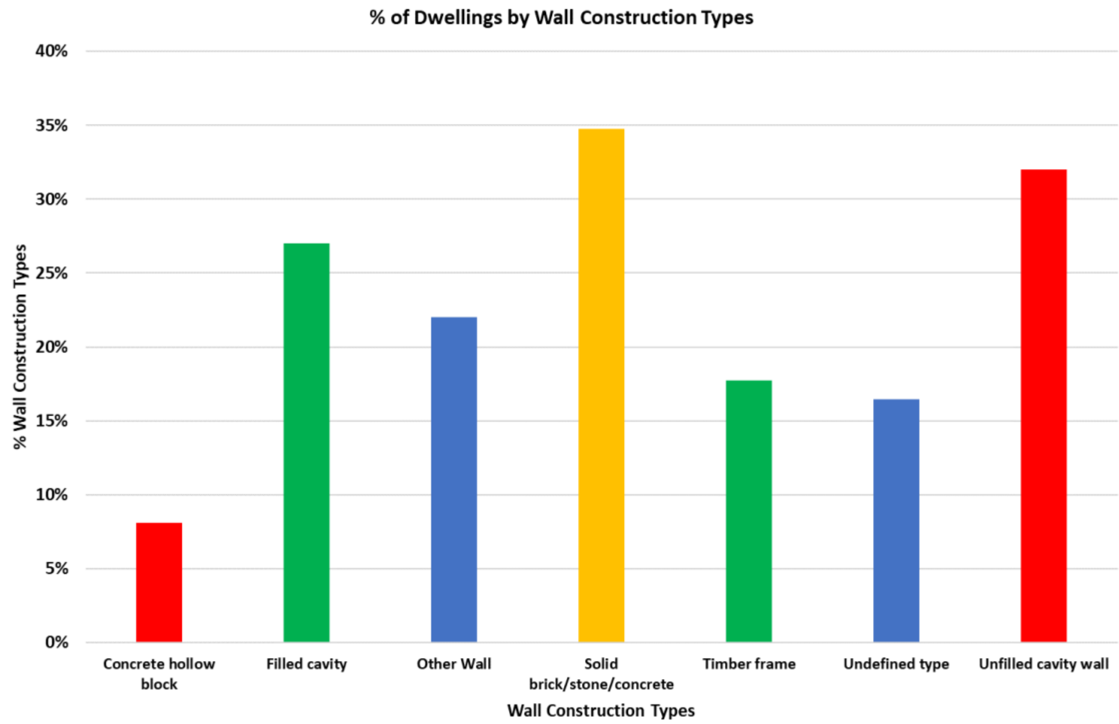

Figure 11: Breakdown of Wall Construction Types

3.2.7. Roof (Attic if present) U-Values in SSEP Dwellings

Figure 8 below indicates the percentage of dwellings by roof u-value. The following observations can be made:

- Over 28% of dwellings have a u-value of 0.5 or higher which suggests that insulation level ranging from zero to 50mm (two inches) of insulation will be applied.
- 18% of the dwellings have some insulation
- Over 45% of the dwellings fall into in the range to be expected from a B2 or better in line with NZEB[4] constructed houses (less than 0.16 $W/m^2/K$).
- **Over 70% of dwellings which can be insulated, would need insulation upgrades to bring them in line with the government's B2 target rating!**

[4] https://www.seai.ie/business-and-public-sector/standards/nearly-zero-energy-building-standard/

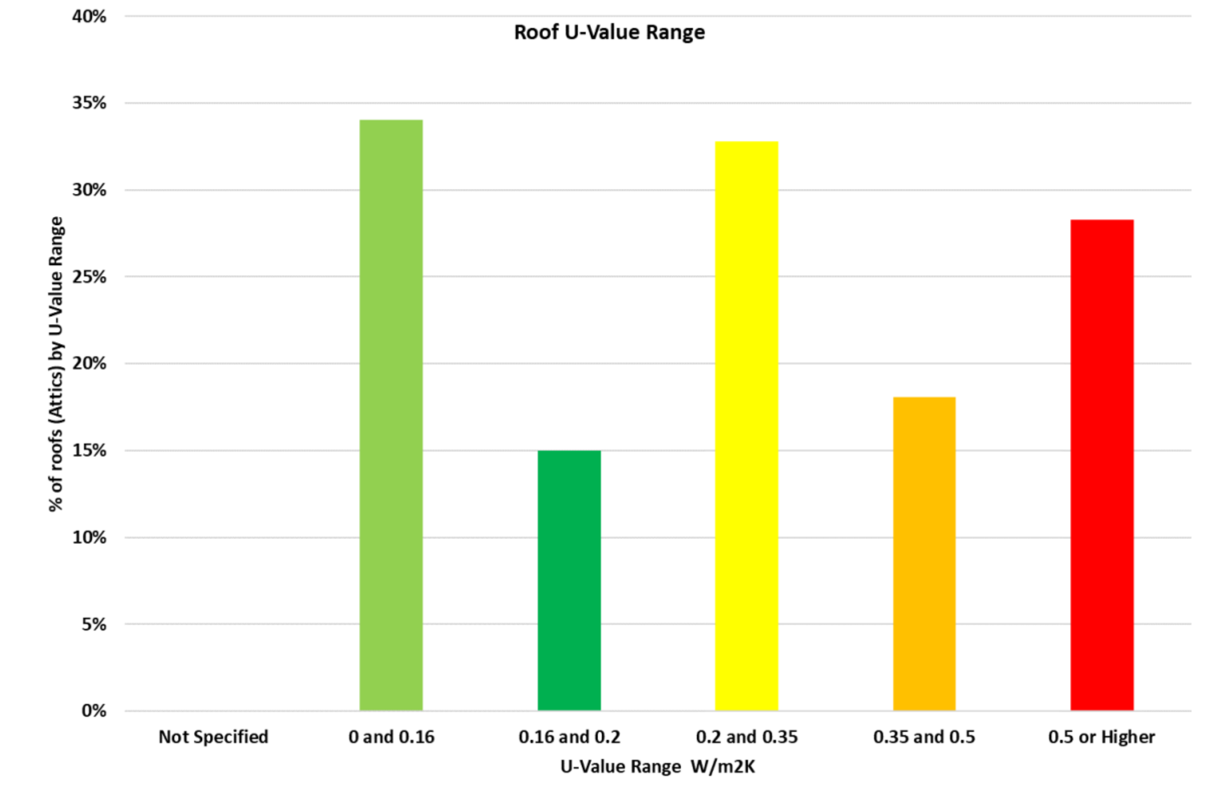

Figure 12: Roof U-Value Range

3.2.8. Space heating Controls

The BER data indicated the 80% of dwellings had no thermostat for heating controls. Thermostats provide the ability to control the space or water heating automatically to the desired comfort levels and hold them at that level so the overheating is minimised. When overheating occurs, occupants tend to open windows to reduce the overheating as opposed to switching off the heating or turning it down:

- **37% of dwellings had no controls, this is significant as 30% of space heating energy can be saved with good simple controls.**
- 36% had a basic programmer which allowed for some degree of time control over the course of the day or week.
- 27% of dwellings have full time and temperature controls of space and water heating.

Potential savings will vary between 5% to 20%[5] or even higher. Simple basic controls such as time clocks with thermostatic radiator valves could be introduced and more complex controls such as programmable thermostat with zone controls and boiler interlock could also be

[5] https://www.seai.ie/publications/Homeowners-Guide-To-Heating-Controls.pdf

considered. More modern controls use mobile phone Apps or other systems with live displays with which to programme heating.

Generous grants are available for such upgrades from SEAI. It should be noted that these modern controls may not necessarily be the most practical for all homeowners and so a cautious approach in consultation with occupiers should be considered.

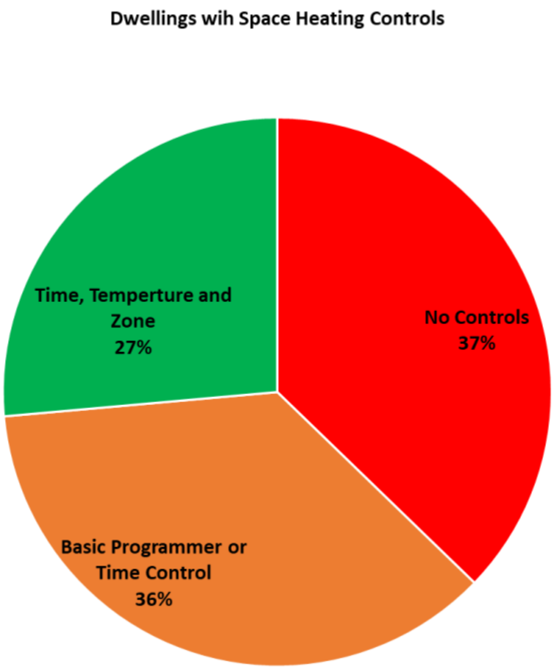

Figure 13: % of Dwellings with heating controls

3.2.9. Analysis of the Energy Use in the Residential Sector

Analysis of CSO data combined with general data from SEAI Building Energy Rating (BER)[6] from the SEAI BER small area maps data provided by the Sligo IT has been analysed and extrapolated against the 1760 dwellings in the area to produce a baseline of the energy use in the residential sector in the area.

The BER data covers 153 dwellings which represents about 16% of dwellings in the target area. According to the CSO data there are 163 rented dwellings and by law a tenant should receive a BER certificate for the rented property, this would suggest that if all renters have received their BER Certificates as required by law then there are just 10 other dwellings with BER certificates in the target area in the privately owned properties.

[6] https://renewables.maps.arcgis.com/apps/webappviewer/index.html?id=360f7b3f6f484d7d89b967b41231daef

Table 2: Baseline Summary Analysis

No. of dwellings in BER data set	1,760	
Total kWh	**Total Cost**	**Total kgCO2**
55,777,948	€5,905,258	21,101,517
Average kWh/dwelling	**Average Cost/dwelling**	**Average kgCO2/dwelling**
32,088	€3,399	11,989

Baseline Summary Analysis Overview

- 1,760 dwellings located within the SSEP community area based on the small area maps analysis (1,358 based on CSO data including mobile homes)
- Average BER is 288kWh/m2 which equates to an E1 rating.
- 56GWh of primary energy used.
- Energy cost of almost €5.9 million[7] and average cost per household estimated at €3,400 per annum.
- 21,100 tonnes of CO_2 emitted or about 12 tonnes per household.

3.2.10. Scenario Analysis

Using the SEAI guidance coupled with BER data the energy use profile was developed in order to determine the potential energy, emissions and cost savings by undertaking a retrofit of the houses in the SSEP community.

Two scenarios were modelled to analysis:

1. All houses brought to BER B2 Standard of <100kWh/m2/year
2. All houses brought to an A2/A3 <50kWh/m2/year

The high level recommendation or retrofit solutions that would potentially increase the BERs to a B2/A3/A2 rating would include some or all of the upgrade items listed below, depending on the individual entry point on the BER scale.

Given that over 97 % of dwellings fall outside the B2 rating (i.e. **Only 3% of houses in the South Sligo SEC area currently meet the B2 or better rating**) then it is likely that most of these solutions will be needed in some part:

- Attic Insulation to 300mm.
- Cavity Wall upgrade where needed.
- Full outside/internal Wall insulation (outside only where full cavity or solid wall).
- High efficiency solid fuel stove or wood pellet stove/room heater in place of open fires.
- High performance double glazed or triple glazed windows and doors u-value 1.4w/m2/^{O}C or lower.

[7] Electricity price €0.30/kWh and Fuel price at €0.13/kWh (€1.30/litre)

- Improved airtightness
- Demand-controlled ventilation.
- Energy efficient lighting
- Heating Controls
- Heat pump.
- Solar PV

The impact of these measures in a B2 retrofit is shown graphically below in Fig 11

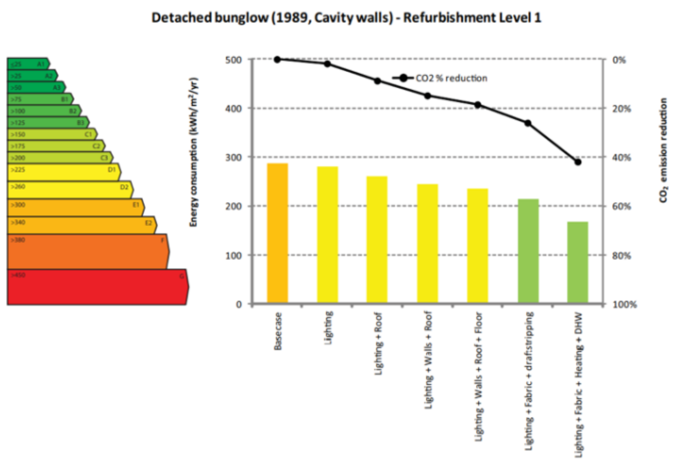

Figure 14: Impact of shallow retrofit measures on a typical bungalow[8]

An estimated average investment of up to €38,440 would see a BER of B2 rating being achieved from the E1 rating of 288 kwh/m²/yr to B2 100kWh/m²/yr.

The table below shows the B2 standard model, in this case over 20,854 kWh primary energy will be saved and resulting in a cost saving of over €1,748 per dwelling.

Table 3:Target B2 rating

Modelled BER B2 for 1,760 dwellings		
Total kWh	**Total Cost**	**Total kgCO2**
19,428,727	€2,905,393	6,605,964
Average kWh/dwelling B2	**Average Cost/dwelling**	**Average kgCO2/dwelling**
11,234	€1,651	3,753

Table 4: SSEP B2 Headline data

Overall Headline Data for B2 scenario		
Potential Energy Savings	**Potential Cost Savings**	**Potential kg CO2 Savings**
36,349,220	€2,999,865	14,495,554

[8] Graphics reproduced from NSAI SR 54 Code of Practice - https://www.nsai.ie/about/news/publication-of-sr-542014-code-of-practice/

Savings per Household		
Potential Energy Savings kWh	**Potential Cost Savings €**	**Potential CO2 Savings**
20,854	1,748	8,236

- Potential energy savings are estimated at 65% or about €1,748 per household at a B2 rating.
- Final energy cost per household is estimated at €1,651 per annum at a B2 rating.
- CO_2 savings estimated at 14,500 tonnes
- Potential cumulative saving of €3 million for all B2

A further model was developed to determine the potential cost savings if all houses were brought up to a potential A2/A3 rating under a deep retrofit upgrade.

The table below shows the potential savings if an A2/A3 rating was achieved through the retrofit measures identified.

Table 5: A2/A3 BER Headline Data

Overall Headline Data A2/A3		
Potential Energy Savings	**Potential Cost Savings**	**Potential kg CO2 Savings**
46,063,584	€4,452,562	17,798,535
Savings per Household		
Potential Energy Savings kWh	**Potential Cost Savings €**	**Potential CO2 Savings**
26,471	2,574	10,113

Table 6: SSEP Target A2/A3 Rating

Modelled BER A2/A3		
Total kWh	**Total Cost**	**Total kgCO2**
9,714,364	€1,452,697	3,302,982
Average kWh/dwelling B2	**Average Cost/dwelling**	**Average kgCO2/dwelling**
5,617	€825	1,877

- Final energy cost at an A2/A3 rating would be €825 per dwelling per annum or an 83% energy reduction.
- Potential cumulative saving of €4.45 million for home owners in an A2/A3 rated dwelling. Cost savings of 75% achieved per dwelling.
- The equates to an expenditure of between €25,250 and €60,400 per dwelling.
- Net of grants this would be €17,970 and €36,240 per dwelling.
- Promote the SSEP Community as a “green” location potentially attracting in new businesses and associated revenue and employment potential.

- Potential for job creating through residential energy retrofit/renewable energy generation projects.

Table 7: Residential Performance Indicators

Residential Performance Indicators			
Total number of Dwellings	**% B rated or better**	**% of Fossil Fuel Heating Systems**	**% of Renewable Energy**
1,760[9]	3.2%	98%	0

Table 8: SEC Residential Energy, CO2 and Spend

SEC Residential Energy, CO_2 and Spend				
	Electricity	**Fossil Fuel**	**Renewable**	**Total**
Total Primary Energy (kWh)	11,155,590	44,622,358		55,777,948
Total CO2 (tonnes)	9,097,595	12,003,923		21,102
Total Spend (€)	€2,160,460	€3,744,798		€5,905,258

It would cost an estimated €56,100 to get from an E1 rating to a BER of A2/A3 rating.

The impact of these measures in a A2/A3 retrofit is shown graphically below in Fig 11

[9] 1,760 dwellings modelled as contained in the BER small area maps data

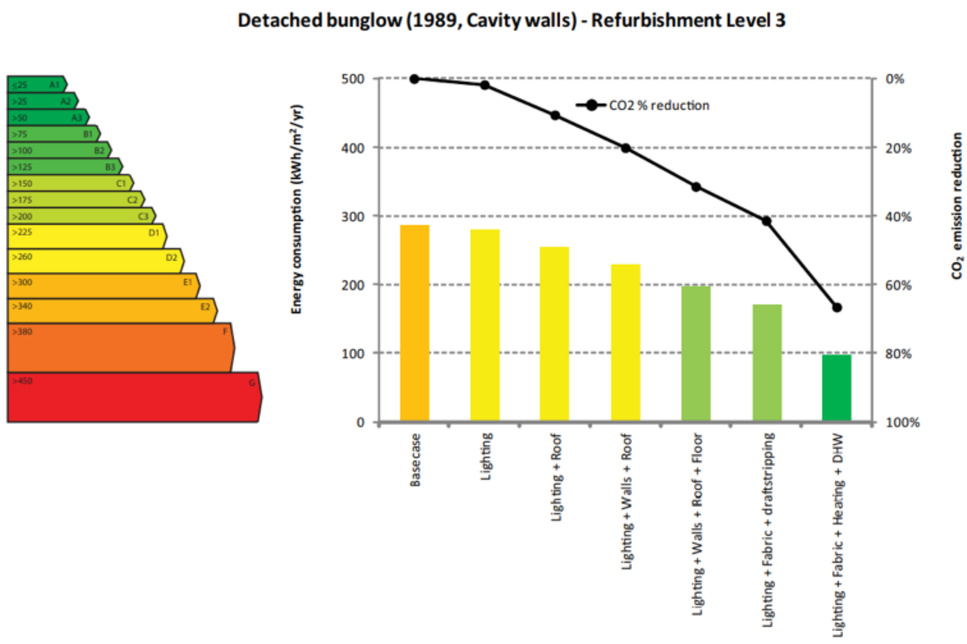

Figure 15: Impact of deep retrofit measures on a typical bungalow

3.2.11. Overall Headline numbers for the residential housing stock:

- 1,760 dwellings located within the SEEP Community area.
- Average BER is a E1.
- 28GWh of primary energy used.
- Energy cost of over €5.9 million and average cost per household estimated at €3,400 per annum.
- 21,101 tonnes of CO_2 emitted or about 12 tonnes per household.
- Potential energy savings are estimated at 65% or about €1,748 per household at a B2 rating.
- Final energy cost per household is estimated at €1,651 per annum at a B2 rating.
- Final energy cost at an A2/A3 rating would be €825 per dwelling per annum.
- Potential €4.45 million savings cumulative for home owners at an A2/A3 rating.
- The overall investment in energy retrofit measures is estimated at between €61.2 million to B2 rating and €75.2 million to a deep retrofit A2/A3 rating.
- The equates to an expenditure of between €29.950 and €60,400 per dwelling.
- Net of grants this would be €19,970 and €36,240 per dwelling.

Some of the immediate benefits for the SSEP Community will include:

- Between €3 million and €4.45 million extra income to be spent in the local community.
- Improved living conditions and increased comfort due to better insulated homes and thus it will contribute to better health and well-being of the residents.
- Reduced heating and running costs for homeowners.

- Contribute towards and exceed the national CO_2 emissions reduction targets of ~50% by 2030 and carbon neutral by 2050.
- Promote the SSEP community as a "green" location potentially attracting in new businesses and associated revenue and employment potential.
- Potential for job creating through residential energy retrofit/renewable energy generation projects.

Summary of key challenges for the residential community:

- The analysis suggests that around 98% or over 1,700, dwellings may require some intervention to achieve the target B2 rating. Some will be shallow retrofit for dwellings constructed in the last 15 years which will a relatively modest outlay to bring it up to the standard.
- The analysis of the data indicates that 663 dwellings or nearly 50% were constructed before the 1980's, before introduction of building regulations governing levels of insulation so they will require substantial capital outlay under a deep retrofit even with the grant.
- There were just 13 "A" rated dwellings identified in the analysis.
- 12% or 211 of the dwellings are rented from private landlords or the local authority. Older rented properties can be less energy efficient than owner occupied properties because of the "split incentive problem". A split incentive happens because landlords, who would have to meet the cost of the improvements, do not reap the benefits of a warmer home and cheaper energy bills. Tenants, on the other hand, do not own the property and therefore have little incentive to invest.
- The predominant heating type is oil fired central heating at 60%

3.3. Analysis of Non-Residential Sector

3.3.1. General

The high level analysis of the non-residential sector was completed using two methodologies, the CIBSE TM46: Energy Benchmarks to estimate energy consumption combined with floor area data and estimated/calculated using Valuation Office data (*https://opendata.valoff.ie/api/*). The energy cost data used was taken from the SEAI fuel cost comparison and also from analysis of energy use based on the energy assessments undertaken. The valuation office data provided a list of 95 private sector facilities and five public sector facilities.

The SEC provided a list of non-residential facilities broken down by facility type and approximate size (small, medium, large).

The table below provides an overview of the level of engagement with the sector:

Table 9: Non-Residential Engagement

Non- Residential Sector Engagement			
Sector	**No of Facilities Identified**	**Audited/Assessed**	**%**
SME	88	3	3
Medium	1	1	100
Public	5	2	40
Community	2	2	100

- The SME facilities engaged in this study included a cross sector mix of retail outlets, services including welfare, and small manufacturing businesses.
- Public facilities included the two local schools/
- Community facilities included the Rectory and Sligo Folk Park and community centre
- One medium size SMP provide care to the elderly

As part of the Sligo SEC programme, all local organisations and businesses were contacted regarding participating in the programme and offered a free Level 1 audit to help identify potential projects that could be implemented as either part of the community programme or separately by the various businesses/organisation. The audit also helps to identify the potential energy saving in the business/commercial sector in the Riverstown SEC.

A Level 1 audit is the most basic level of audit, often called the “walk-through analysis.” This type of audit is designed to give businesses a beginning point to make changes or to complete more in-depth audits. The auditor takes a high-level view of a building's energy usage and operations. Level 1 audits were undertaken an energy audit of the following 5 organisations;

1. Bru Moytura, Corlisheen, Riverstown, County Sligo F52D290
2. Ardkeeran National School, Riverstown Co Sligo,
3. Taunagh NS, Riverstown, Co Sligo, F52HE92,
4. Riverstown Church of Ireland F52FY71.
5. Martin Baker, Butcher Shop, Riverstown, F52Y781

The main objective of the audit was to identify opportunities to reduce energy costs. The project scope included each building's electrical and thermal energy usage. These audits were carried out on 10th February 2023.

3.3.2. Agriculture

Due to the evolving situation in relation to climate action plan targets and grant aid for agriculture, it may be that agriculture would be better addressed later in the development of the SEC.

Key farm types and sizes in the study area are mainly agricultural marginalised land of small holdings – Small Dairy, Beef and Suckler- high percentage of the area is covered in forestry and bog.

Two farms were visited as part of the energy review and auditing process:

3.3.3. Large Industry

There are no large industries in the community, a large industry is defined as one employing over 250 people or with a turnover in excess of €43 million and balance sheet in excess of €50 million.

Aurivo do have an outlet serving the local farm community with agricultural supplies.

3.3.4. Transport

3.3.4.1. Cars

There are a total of 2,082 cars in use in the SSEP Community according to the CSO analysis. The department of transport data indicates that the average distance travelled in 2020 by car in Sligo is 19.078[10] kilometres, this is over 6% higher than the national average.

Extrapolating out the number of cars against the number of cars registered in county Sligo (2019 data)[11] by fuel type would indicate that 64% or over 1,300 cars are diesel. Over 34% 1,570 will be petrol and the remaining 2% will be electric or electric (diesel/petrol) hybrid versions.

Just 6% of houses have no cars, while 38% have one car. The remaining households have 2 or more cars.

78% of those in employment use their cars to travel to work, over 13% above the national average. Just 1.4% using public transport and over 6.8% work from home.

Students travel to school mainly by car at almost 57% and a further 30% travel by bus. Less than 1% cycle.

There are no car sharing/car clubs stationed in the area.

3.3.4.2. Public/Bus Transport Services

There seems to be a return bus service on to Sligo on Monday to Saturday serving Riverstown, this is disappointing given the Governments initiatives to promote public transport.

There is no provision of cycle lanes within village boundaries and the footpaths in villages are deemed not suitable for developing cycling lanes.

One public bus stop location is provided in Riverstown and does not have a bus shelter. There is no seating provided and passengers awaiting use the privately owned seating adjacent to the stop.

Three Rural Transport Initiative (RTIs)[12] serve County Sligo: County Sligo Leader Partnership's Rural Transport Programme, Community of Lough Arrow Social Project (CLASP) and Rural LIFT, a community transport project. These services provide access to transport for key target groups of the rural population, namely older people, people with disabilities, women at home, lower income groups and young people. The Rural Transport Programme provides 22 weekly bus services, hackney, taxi and community car scheme services in the west, south, south-west and north Sligo. CLASP provides 26 services in south-east Sligo. Sligo Rural Transport Programme (RTP) serves all passengers, but especially those who are at risk of social isolation as a consequence of their rural location, and provides access to employment, recreation, education and essential services. All vehicles are wheelchair accessible. Services are demand-responsive, door-to-door, scheduled and once-off trips.

There are no specific bicycle parking or E-Bike charging facilities provided in the villages.

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[10] Road Traffic Volumes - CSO - Central Statistics Office

[11] Transport | Energy Statistics In Ireland | SEAI

[12] Sligo County Development Plan, section 8 Transport

3.3.4.3. Walking infrastructure

- There were no walking trails in the area identified.

3.3.4.4. Battery Electric Vehicle (BEV) Charging

There are no public electric vehicle charging points in the target area, the nearest points are at Collooney railway station where two 7kW type 2 chargers[13] are available. These are 13 km from Riverstown village.

Ideal locations would include Homeland Agri parking area, the Community Park and the Folk Park and specific grants are now available for these facilities through the SEAI.

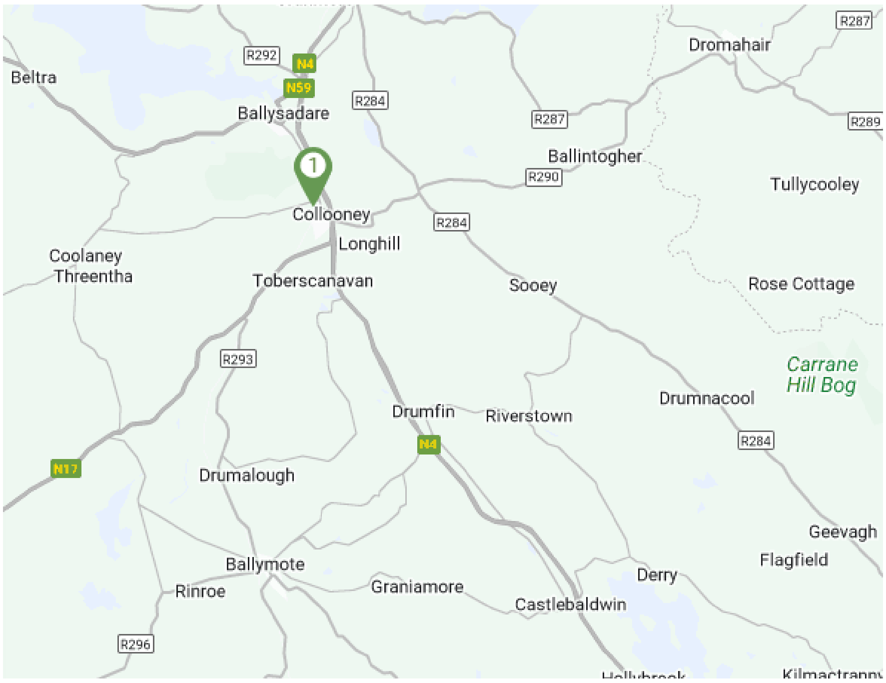


Figure 16: Public Charging Infrastructure in the area

3.3.5. Non-residential sector baseline

The non-residential baseline is shown below

Table 10: SEC Non-Residential Energy, CO2 and Spend

SEC Non-Residential Energy, CO2 and Spend				
	Electricity	**Fossil Fuel**	**Renewable**	**Total**
Total Primary Energy (kWh)	1,459,471	1,454,658		2,914,120
Total CO_2 (tonnes)	205	396		601
Total Spend (€)	432,282	145,466		577,748

[13] https://esb.ie/what-we-do/ecars/charge-point-map

The breakdown of the non-residential energy by sector is shown below

3.3.6. Total Primary Energy Non Residential Sector

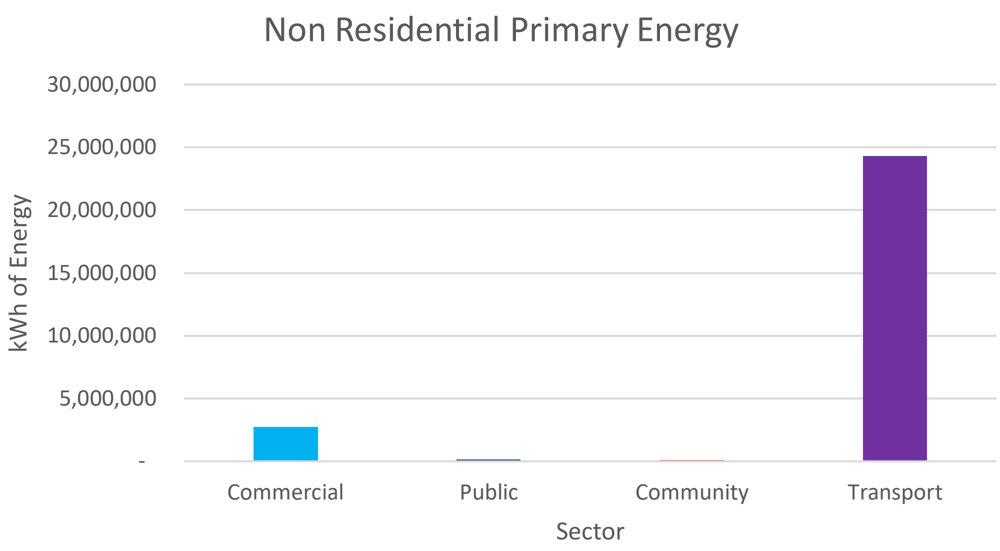


Figure 17: Non Residential Primary Energy Total

3.3.7. Total CO_2 emissions Non-Residential Sector

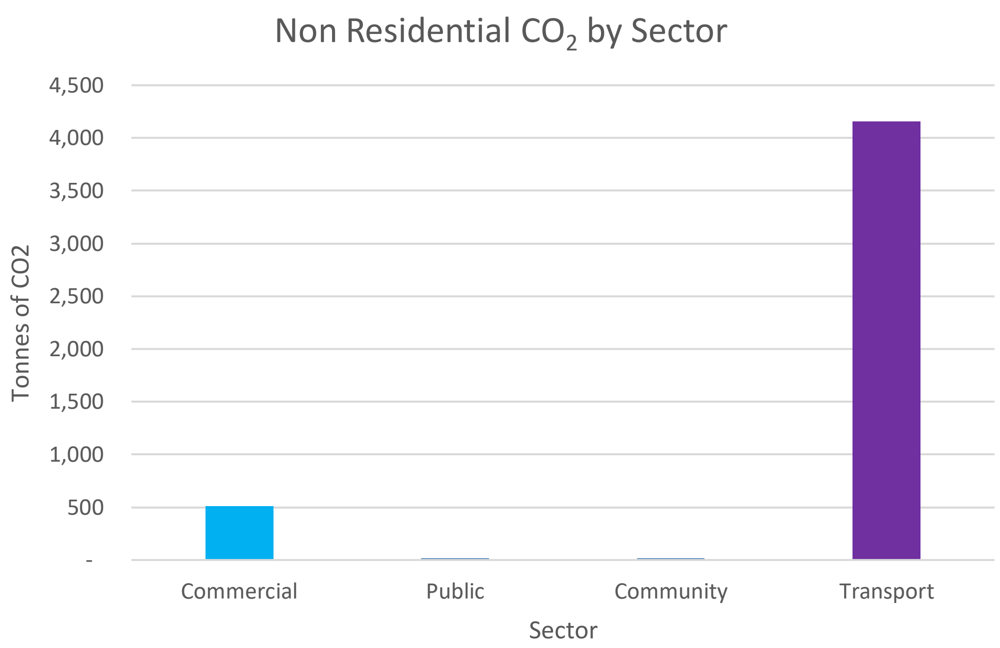


Figure 18: Non Residential CO_2

3.3.8. Total Energy Spend – Non Residential Sector €

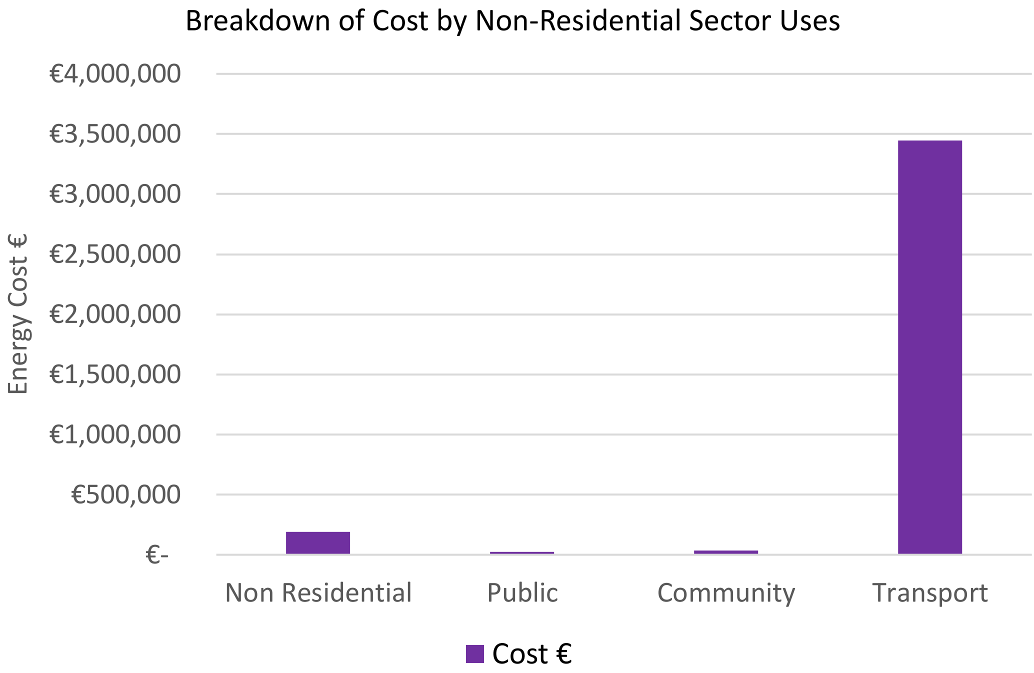


Figure 19: Non Residential Costs

The renewable portion can be taken as the renewable content of electricity consumed (40% in 2020), 5% of petrol consumption and 7% of diesel consumption (as per the Biofuels Obligation Scheme).

Table 11: SEC Transport Energy, CO_2 and Spend

SEC Transport Energy, CO_2 and Spend[14]				
	Electricity	**Fossil Fuel**	**Renewable**	**Total**
Total Primary Energy (kWh)	389,675	24,086,965	759,855	24,476,640
Total CO_2 (tonnes)	33	4,024		4,057
Total Spend (€)	€116,902	4,456,089		€4,572,991

3.4. Energy Baseline

The table below provides a summary of overall energy use across the various sectors withing the community.

Table 12: Energy Baseline Summary

[14] EV Cost Savings | Electric Vehicle Business Benefits | SEAI

SEC Primary Energy Baseline (kWh)				
Sector	**Electricity**	**Fossil Fuel**	**Renewable**	**Total**
Residential	11,155,590	44,622,358		55,777,948
Non-residential (Commercial)	1,351,139	1,343,373		2,694,512
Transport	389,675	24,086,965	759,855	25,236,495
Other (Public Sector)	37,060	95,460		132,519
Other (Community)	71,272	15,825		87,097
Total Energy	13,004,736	70,163,981	759,855	83,928,572

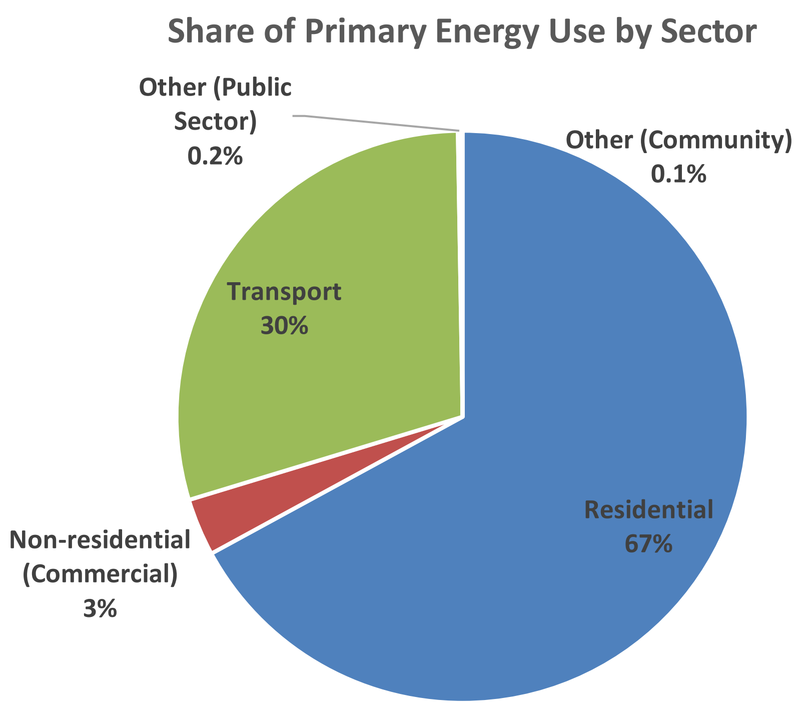


Figure 20: Share of Primary Energy Use by Sector

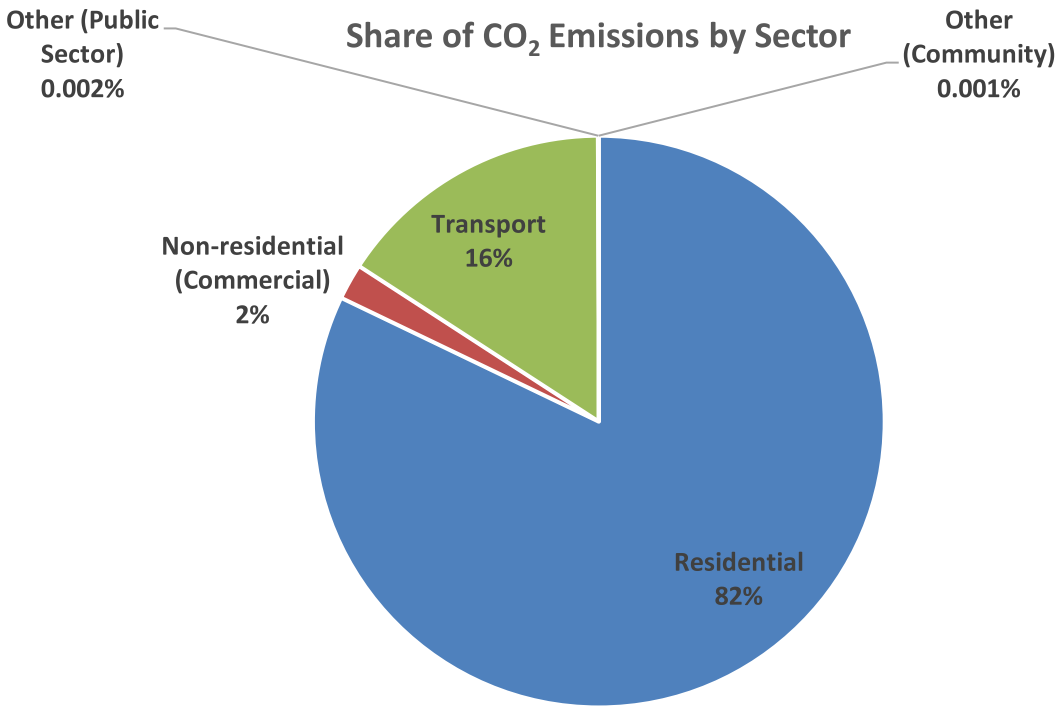


Figure 21: Share of CO_2 Emissions by Sector

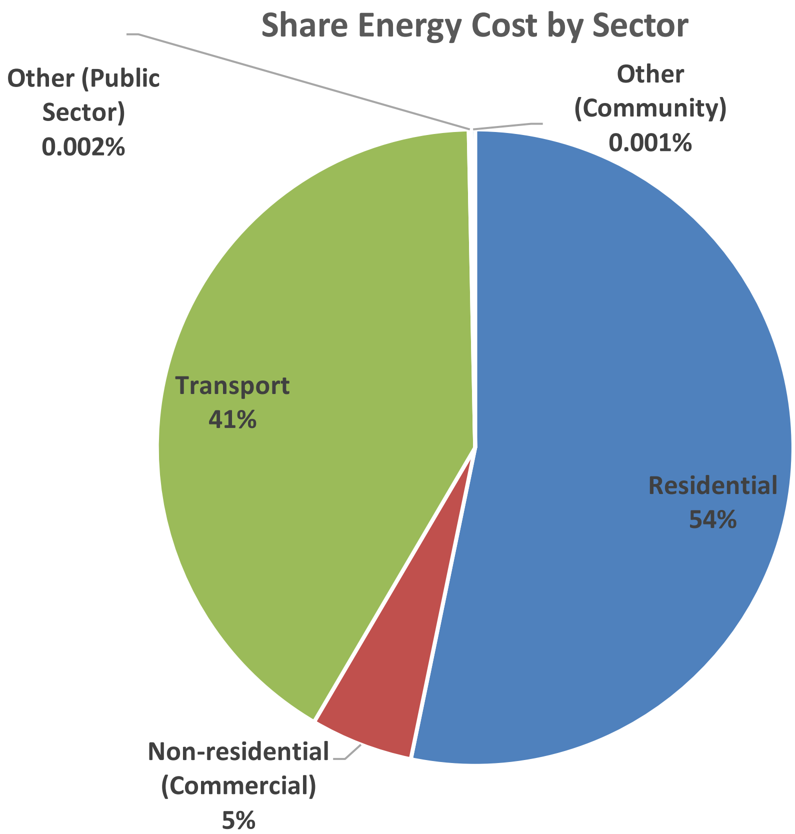


Figure 22: Share of Energy Costs by Sector

4. Sustainable Energy Roadmap

A sustainable energy roadmap in the form of a 3-year action plan for the period 2023-2026 has been developed and is indicated below. This is for further development by the SEC committee as time and expertise evolve.

This Sustainable Energy Roadmap is an important output for South Sligo Energy Partnership SEC and is separate to the Register of Opportunities.

Focus Areas	TIME	2023	2024		2025		2026
	LEAD	JUL - DEC	JAN - JUN	JUL - DEC	JAN - JUN	JUL - DEC	JAN - JUN
A. SEC Development							
How can the SEC group support the community around local climate action?							
Project A1 - SEC Participation in Existing Community Events	ALL						
Project A2 - RYU Energy Management project with School(s)	ALL						
Project A3 - EV Community Charging Point	PM						
B. Residential Sector							
How can the community enable B2 retrofits for the local housing stock?							
Project B1 - Energy Upgrade / Retrofit pathways information campaign	ALL						
Project B2 - Collect candidates and coordinate for one stop shop	ALL						
Project B3 - Local Retrofit Supply Chain	ALL						
C. Commercial Sector							
How can the community enable business owners to meet carbon reduction targets?							
Project C1 - Communicate supports & benefits	ALL						
Project C2 - Showcase completed examples	ALL						
Project C3 - Connect with other SEC's	ALL						
D. Public Sector							
How can the community have a say in the climate actions planned by the council to meet 2030 targets?							
Project D1 - Community Council means of collaboration							
Project D2 - Lighting upgrades							
Project D3 - Other							

Figure 23: Action plan to 2026

The focus areas in the 3 year action plan are designed to support the project pipeline as identified in table 19 below. Details of these projects are contained in the Register of Opportunities. More information on how to develop these projects is given in section 6 Project Development Strategy.

Table 13: Projects required to deliver on targets to 2030

Roadmap Plan to 2030			
	Number of projects	Primary Energy saving (kWh)	CO_2 saving (tonnes)
No. houses to be refurbished to a B	1,703	36,349,220	6,605
Potential from commercial sector	47	808,353	152
Potential from Public Sector	5	39,755	4
Potential from Community Sector	2	26,130	5
Renewable Energy potential	1,860	1,596,666	471
EV potential	1,750	20,663,280	2,069
Total saving potential		59,483,404	9,306

The above table provides an informed perspective on the scale of the challenge faced by SSEP SEC in order to achieve the 2030 reduction targets. The SEC cannot deliver these targets on their own – finance and logistics are key to the delivery of successful projects – however the one stop shop and community grant schemes offer a framework that will evolve to support communities meet the 2030 targets.

There are a minimum 1,703 residential projects necessary to achieve the B2 BER 2030 target. The One Stop Shop (OSS) model provides a financial and logistical solution to some homeowners who don't have the capacity to manage a grant application on their own. The degree of upgrade and level of retrofit will largely depend on the BER received and this too will determine the retrofit pathway to be selected. The indicative number of upgrades identified in the residential sector are shown on Table 20 below.

Table 14: Numbers of Homes requiring some form of intervention to get to a B2 or better.

No of Houses	Upgrade Measure
1703	Attic Insulation
1703	Heat Pump/Heating Controls
1760	Solar PV
1480	Walls Pumps/Drylined
1480	Windows and Doors replaced
643	Ventilation/Airtightness

The role of the SEC is to collect details of those residents motivated to undertake an energy upgrade and to support them in their application for grant aid support. A lead in period of 18 months for an OSS project may present an opportunity for the SEC to identify behavioural based energy efficiency projects that would be appropriate within the community.

The analysis of CSO data indicated there are 182 people on some form of disability allowance, and a further 463 retired. It is possible that some of these families would qualify for the "Fully Funded Energy Upgrades" (formerly the Warmer Homes Scheme). SEEP should work with the relevant agencies to identify the families and provide information and support to these families. This should be prioritised as these are likely to be the most vulnerable and potentially in fuel poverty as a result of the current high energy prices.

4.1. Renewable Energy Potential

Renewable energy in Ireland comes in many forms. The primary sources are wood, water, wind, wave and some wastes. Others include tidal power, solar power (thermal and Photo Voltaic (PV)), biomass and biofuels.

Electrically driven heat pumps are also considered renewable because, while they require energy to operate, they extract and produce more than they use from the air, water or the ground which is deemed to have been heated by the sun.

The 2021 Climate Action Plan being implemented by Government includes an average 7% annual reduction in greenhouse gas emissions over the years 2021-2030, which equates to a reduction of 51% by 2030. Government has also set a target to achieve a 80% of supply of renewable electricity on the grid by 2030. All home owners and businesses can retrofit solar PV onto their premises/buildings.

The renewable energy options open to the SSEP Community include the following:

Table 15: Renewable Energy Potential

Local Renewable Energy suitability				
Technology	**Scale range (kW, MW)**	**Target application**	**Suitability (RYG rating)**	**Rationale**
Wind	1MW?	Some large-scale wind farms withing the SEC boundary, potential to develop a community scale project may be possible	Medium potential	Some turbines located in the target area as terrain is suitable to capture the resource. No large industry to benefit from autogenerating. New RESS 3 to be launched shortly.
Solar PV	1,918 kW	880 residential 50 Retail/businesses /public sector	Medium potential	Some already installed, based on 2kWP per 50% of dwellings and 3kWP in 50% of non-residential premises.
Hydro	Folk Parks as educational/demonstration of low head hydro (Needs further evaluation)	Refurbishment of old hydro power site	Low potential	Cost of development may be prohibitive, planning permission in a spawning river feeding Lough Arrow.
Biomass	Largely Privately owned forests with some state owned	NA	Low potential	No large industry/public/commercial

				scale facilities to present commercial opportunity.
Biogas	0	Potential for biomethane raw material supplies to centralised biomethane plant supplying large businesses in Sligo.	Low potential in the target area	Needs further investigation on quantity and availability of feedstocks supplied by local farmers.

4.1.1. Residential Photo Voltaic (PV) Electricity Generation

PV probably offers the biggest potential for renewable energy generation into the South Sligo Energy Community. The Solar PV electricity generated could offset some of the imported grid electrical energy used in dwellings mainly during summer months.

Using renewable electricity generation would be particularly important if dwellings are undergoing a retrofit with electric heat pumps being the preferred source of heating. Also, if residents are to switch form hydrocarbon fuelled internal combustion engine (ICE) cars to full battery electric vehicles (BEV).

Combined with additional hot water storage, this might allow some flexibility to “store” the excess electricity for periods when excess electricity is available outside the normal demand periods. Residents could install a ‘diverter switch’ which diverts any unused electricity to heat hot water in the storage cylinder. In this way some of the energy generated is stored as hotwater, which can be used later in the day. As the penetration of wind energy and solar farm produce electricity on the grid increases nationally then “Storage Systems” will become an increasingly important feature in this scenario.

Currently any excess electricity that is exported/spilled to the grid will generate no income, but this is situation is evolving with feed in tariffs being available from certain suppliers.

The simplest way to use a higher percentage of the electricity generated is to design the PV system to meet the electricity demand of the house. This means the value of electricity produced will offset a large proportion of the electricity used with little or no export and therefore saving at your current kWh charge. It should be noted that electricity has to be used when it is generated otherwise it will be spilled into the grid.

Many dwellings in the target area have roof spaces with the orientation to accommodate PV panels. Ideally the roof should be south facing or east/west but the latter not as effective the south facing systems. The potential for solar electric generation is based on 50% of the detached/semi-detached houses to have a southerly orientation with 2kWp installed and also 50% of the 100 or so business and public sector facilities utilising 3kWp.

- Assuming that 2kWp[15] installed and so will generate approximately 1,465,460 kWh for 880 dwellings.
- Assuming that 3kWP installed for the non-residential facilities, then 131,106 kWh will be generated.

[15] According to SEAI a simple 2kWp system or less is appropriate for most Irish homes.

- Value of electricity saved is €638,466.
- Potential CO_2 savings of 471 tonnes per annum.
- Overall cost of install is estimated at €2,000,000, simple payback of just over 3 years.

Table 16: PV savings

PV					
	Total Facilities	Modelled facilities	kWP	kWh	€@40ct/kWh
Residential	1,760	880	1,760	1,465,060	€ 586,024
Commercial	95	48	143	118,620	€ 47,448
Public	5	3	15	12,486	€ 4,994
Total kWp			1,918	1,596,166	€ 638,466

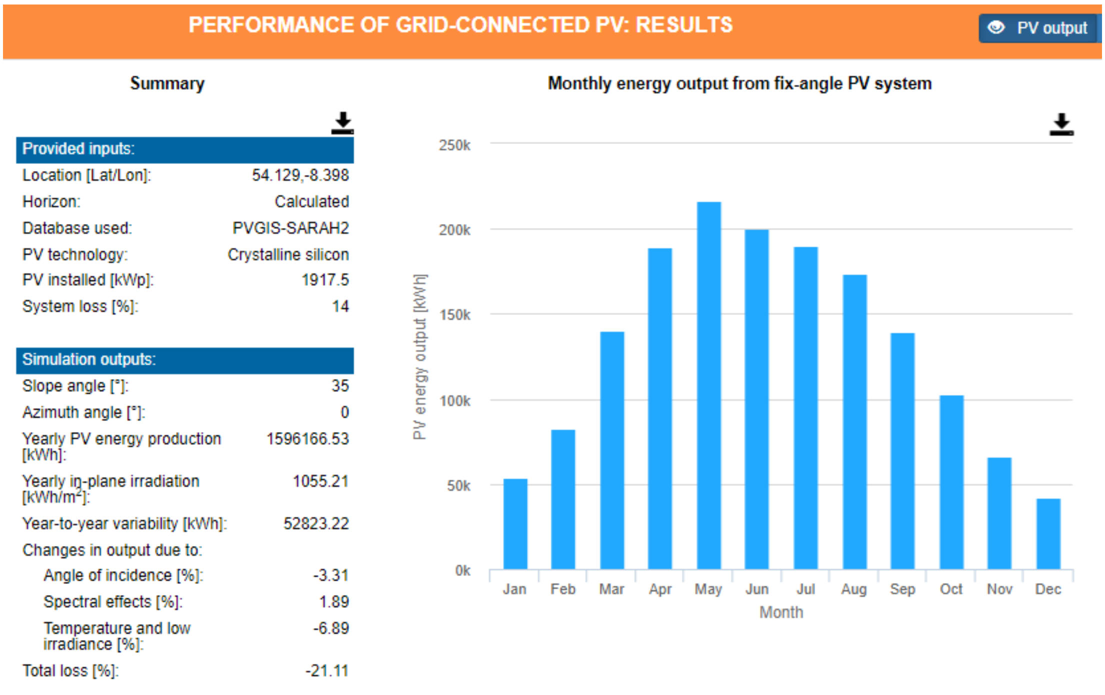


Figure 24: PV system model for SSEP Community

4.1.2. Wind Electricity Generation

There are a number of windfarms within or adjacent to the SEC. Windfarms have an obligation to provide community funds within their local area

An 'Area of Benefit' or AOB is a radius of up to 10km around a wind farm, which is set to ensure that communities directly neighbouring wind farms benefit most from the funds. Applications from within the AOB will receive priority.

The diagram below illustrates

Figure 25: Wind Farms and SEC Area of Benefit

1. Carrane Hill Wind Farm*
2. Carrownyclowan Wind Farm
3. Derrysallagh Windfarm
4. Garvagh Glebe Wind Farm*
5. Arigna Wind Farm
6. Black Banks Wind Farm*
7. Tu l l y n a h a w Wind Farm*

The funds are available to not-for-profit community and voluntary organisations for projects which are based in the vicinity of one of our wind farms. These include, but are not limited to;

- Registered charities.
- Community development groups.
- Tidy town committees.
- Sports, and recreation clubs.
- Primary, and secondary schools.

The windfarms marked with an* are open for applications from community groups from 1/3 to 26/4 2023.

The funds support projects which focus on the following themes:

- Education and skills
- Health, safety and well-being
- Environment and habitat conservation
- Energy efficiency and sustainability
- Culture and heritage
- Recreation, sport and social inclusion
- Tourism

Details on how to apply are available https://windfarmcommunityfunds.ie/application-form/

There is also the potential to create a flagship wind energy project in the community, via the recommissioning of Bru Moytura. This is discussed further in the register of opportunities and project pipeline.

4.1.3. Hydro Power Electricity

The river adjacent to the Sligo Folk Park, provides a potential source of hydro power which could be used within the folk park itself. The key factor is that the waterflow is at a sufficient rate to drive a turbine. Environmental considerations around the existing biodiversity will have to be addressed.

4.1.4. Bio Energy

Bioenergy is a broad term which encapsulates a diverse range of technologies and feedstocks. There is potential for the South Sligo SEC to form partnerships with other SEC's in the area (eg, Sligo SEC) and to participate in the development of the Sligo Gas Network for the benefit of local farms, businesses and residents

5. Register of Opportunities

5.1. Purpose of this register

The Register of Opportunities (RoO) is intended to provide the data and information necessary for South Sligo Energy Partnership SEC to develop a 3-year sustainable energy roadmap for their local community.

This roadmap will identify the opportunities that have potential for application to the SEAI Community Energy Grant programme or other grant aid such as the Community Centres Investment Fund from the Department of Rural and Community Development.

The RoO enables energy efficiency and renewable energy projects to be prioritised, as it provides preliminary capital costs and expected energy savings.

The South Sligo Energy Partnership SEC ROO will be developed using the SEAI template and made available as an Microsoft Excel workbook. It is intended that this workbook is developed over time and considered as being a “live” document.

The Register of Opportunities will focuse on projects that have the greatest potential from the residential and non-residential building audits completed as part of the EMP process.

5.2. Non-Residential Opportunities

5.2.1. Scope

The Register of Opportunities has focused on participants that have the greatest potential for projects. These opportunities were identified during the non-residential building audits undertaken as part of the EMP process.

The participants are listed below. These locations are well known to the SSEP SEC committee and existing relationships should be developed to start addressing the climate emergency.

The Level 1 energy audits of the five Buildings has identified potential savings of €15,506 (102,330 kWh), which equals 11.9 tonnes of CO_2 emissions; Detail is provided in appendix.

The main area that should be given priority in short to medium term is as follows;

- Upgrade all lighting to LED
- Installing PV panel

Actions which should be considered in the longer term are as follows;

- Deep retrofit of building insulation fabric
- Installing Heat Pumps

Table 17: Non-Residential Opportunities

Location	Report Ref.	Action	Annual Energy Savings kWh	Annual Financial Savings €	Annual CO_2 Savings Tonne	Estimated Cost €	Simple Payback years
Bru Moytura	2.20	Install PV system	5,424	1,085	1.9	8,000	7.4
Bru Moytura	2.20	Re-installing the wind turbine	1,400	298	0.5	1,500	5.0
Ardkeeran National School	3.20	Install Heat Pump with oil boiler as back-up	44,100	2,624	7.1	30,000	11.4
Ardkeeran National School	3.20	Install LED Lighting	2,401	480	0.8	4,000	8.3
Ardkeeran National School	3.20	Install PV system	6,780	1,356	2.4	10,000	7.4
Taunagh National School	4.20	Install LED Lighting	593	136	0.2	950	7.0
Taunagh National School	4.20	Install PV system	6,328	1,451	2.2	10,000	6.9
Sligo Folk Park	5.20	Installing Heat Pump & Building Deep Retro-fit	11,605	500	4.0	80,000	160.0
Sligo Folk Park	5.20	Install LED Lighting	3,932	1,456	1.4	7,500	5.2
Sligo Folk Park	5.20	Install PV system	6,328	2,343	2.2	11,000	4.7
Church	6.20	Install PV system	6,328	1,266	2.2	10,000	7.9
Butcher Shop	7.20	Install LED Lighting	782	177	0.3	1200.0	6.8
Butcher Shop	7.20	Install PV system	6,328	1,431	2.2	10,000	7.0

Location	Report Ref.	Action	Annual Energy Savings kWh	Annual Financial Savings €	Annual CO_2 Savings Tonne	Estimated Cost €	Simple Payback years
		Annual Savings	**102,330**	**14,602**	**27**	**184,150**	**12.6**

Note 1: The high differential unit cost between heating oil and electricity impacts the viability of installing heat pumps, and there is usually also the additional cost of building fabric upgrades. Heat Pump installations need a more detailed investigation and consider the building fabric's condition, the increase in the MIC, and the need for companies to decarbonise.

Note 2: The capital costs listed in Table 1 are indicative only and are best estimates based on the author's experience. For more detailed costing, equipment suppliers should be contacted. It is recommended that equipment monitoring is undertaken before any decisions are made on capital expenditure on energy-saving projects.

Note 3: Savings shown are based on individual actions and don't consider their interactive effect.

Note 4. Energy Cost has increased significantly recently, so payback will have improved. Still, knowing how long the increase will continue is impossible, so the payback periods can be deemed conservative.

SEAI has several grant schemes to help support organisations, as follows;

1. BEC Community https://www.seai.ie/grants/community-grants/
2. EXEED http://www.seai.ie/publications/EXEED-Grant-Guidelines.pdf
3. Renewable Heat Programme/ Heat Pumps & Biomass Boiler. https://www.seai.ie/business-and-public-sector/business-grants-and-supports/support-scheme-renewable-heat/

Also, the Energy Efficient Obligation Scheme (EEOS) supports the business through the leading energy supplier. Further detail can be found on the following link;

https://www.seai.ie/business-and-public-sector/business-grants-and-supports/energy-efficiency-obligation-scheme/

5.2.2. Non-Residential Headline Opportunities

- 808,353 kWh : Potential reduction in annual energy use
- €161,670 : Potential reduction in annual energy costs
- 4,057 tonnes : Potential reduction in CO_2 emissions
- €75 million : Capital cost of investment
- 5 – 25 years : Payback periods
- Additional renewable energy savings using PV for electricity generation

5.2.3. Next Steps

- Identify potential beneficiaries for Funded Energy Efficiency Upgrade programme
- Consider project grouping to encourage price reductions and savings for participants
- Work with one of the obligated energy suppliers[16]or aggregators
- Communicate the availability and impact of grants
- Finalise 3-year plan

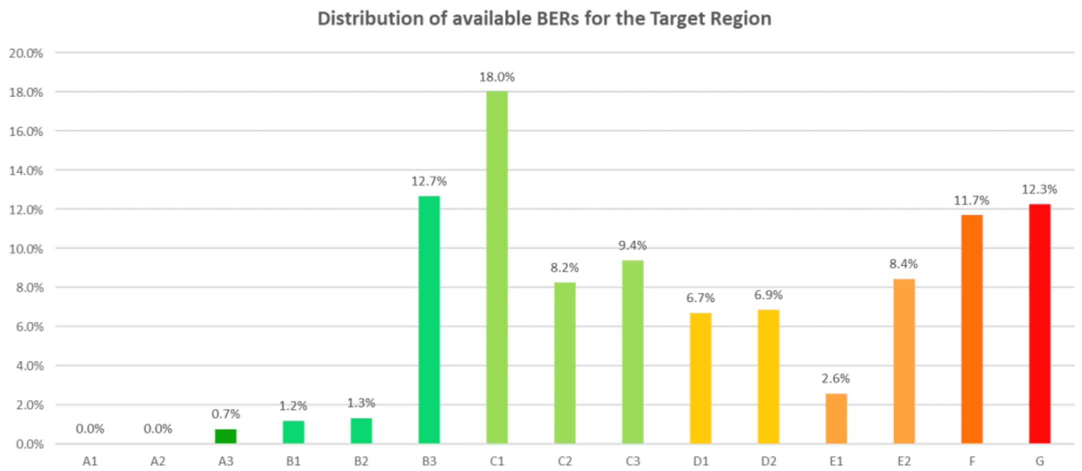
5.3. Residential Opportunities

5.3.1. Scope

The Register of Opportunities has focused on how the SSEP SEC and project will contribute to the Government target of 500,000 homes retrofitted to B2.

A residential survey has identified local residents that have the greatest potential for projects.

The range of residential opportunities were identified as shown below in the BER distribution diagram.



16 https://www.seai.ie/business-and-public-sector/business-grants-and-supports/energy-efficiency-obligation-scheme/

Figure 26: Distribution of BER's

5.3.2. Residential Headline Opportunities

- 19,428,727kWh : Potential reduction in annual energy use
- €2,905,393: Potential reduction in annual energy costs
- 5160 tonnes : Potential reduction in CO2 emissions
- €35,744,435 : Capital cost of investment
- 1 – 15 years : Payback periods

5.3.3. Next Steps

- Communicate the availability and impact of grants
- Residential Workshop with Questionnaire Respondents
- Finalise 3 year plan

5.4. Transport Opportunities

There are 2,080 cars in use in the community emitting over 4,000 tonnes of CO_2. In order to deliver on the Climate Action Plan targets of a 51% reduction then 1,150 diesel cars or and 600 petrol cars or would need to be replaced with Battery Electric vehicles (BEVs). There are currently no public charging points visible on the Ecars charge point map in either Riverstown or locality[17]. The nearest location is the railway station in Collooney, 13km away.

Next Steps

- Consult with relevant authorities to have a number of public charge points installed.
- Identify grant funding opportunities and apply for same
- Promote the use of BEVs at various events

[17] https://esbecars.esb.ie/ecars/charge-point-map

6. Project development strategy

For South Sligo Energy Partnership SEC to be able to develop projects within their local area, we suggest that three requirements need to be in place; -

- Having a targeted and resourced action plan, against which progress can be tracked
- Having a team of people meeting regularly
- Partnerships for collaboration

These requirements are discussed below.

6.1. Action Plan 2023-2026

Options for local project developments exist within the public, residential and commercial sectors of the South Sligo Energy Partnership SEC.

These can be summarised as follows:-

- SEC Development
    - Engagement with existing community events, such as summer fetes will help promote the work of the SEC in the local area. Supporting schools around energy measurement projects such as identified in the Taunagh National School audit report (item 4.2) will help build awareness of the role of the SEC in the local community.
    - Other focused opportunities can include;
        - Development of EV community charging point
        - Re commissioning of Wind Turbine in Bru Moytura
        - Solar PV Installation Collective
        - Solar PV support for the Farming Community
- Residential Sector
    - The SEC can create awareness in the local population of what is involved in a home energy upgrade, thus creating a project pipeline for one stop shops and/or other financial or logistical solutions.
- Commercial Sector
    - The SEC can enable local businesses to come together as a group to promote energy efficiency – all energy savings go straight to the bottom line.
- Public Sector
    - Engagement with Sligo County Council may prove to be mutually beneficial in relation to climate actions.

The action plan as shown below is divided into 6 monthly intervals. This allows for short- and long-term tracking of progress. The action plan should be evaluated twice a year and successes celebrated.

Focus Areas	TIME	2023	2024		2025		2026
	LEAD	JUL - DEC	JAN - JUN	JUL - DEC	JAN - JUN	JUL - DEC	JAN - JUN
A. SEC Development							
How can the SEC group support the community around local climate action?							
Project A1 - SEC Participation in Existing Community Events	ALL						
Project A2 - RYU Energy Management project with School(s)	ALL						
Project A3 - EV Community Charging Point	PM						
B. Residential Sector							
How can the community enable B2 retrofits for the local housing stock?							
Project B1 - Energy Upgrade / Retrofit pathways information campaign	ALL						
Project B2 - Collect candidates and coordinate for one stop shop	ALL						
Project B3 - Local Retrofit Supply Chain	ALL						
C. Commercial Sector							
How can the community enable business owners to meet carbon reduction targets?							
Project C1 - Communicate supports & benefits	ALL						
Project C2 - Showcase completed examples	ALL						
Project C3 - Connect with other SEC's	ALL						
D. Public Sector							
How can the community have a say in the climate actions planned by the council to meet 2030 targets?							
Project D1 - Community Council means of collaboration							
Project D2 - Lighting upgrades							
Project D3 - Other							

Figure 27: Action Plan Focus Areas

6.2. SEC Capacity Development

To develop projects in the community requires a mix of technical and local knowledge. A key focus of the South Sligo Energy Partnership sustainable energy community is to develop residential projects. To this end, it may be helpful for additional specialists and community representatives to join the SEC committee. Additional capacity of knowledge and expertise in home energy upgrades, may support the SEC in the delivery of their 2023-26 action plan. In addition a series of energy upgrade pathways are contained in the appendix to this document

Figure 28: SEC Team

Key requirements that the SEC team need to have the capacity to deliver on are

- Knowledge of currently available grants and support schemes
- Raising awareness
- Coordinating small groups
- Building partnerships

The capacity of the South Sligo Energy Partnership SEC team can be regularly evaluated and developed using the SEAI Competency Compass tool as shown below.

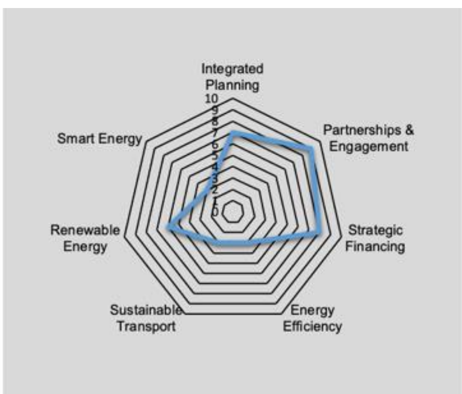


Figure 29: SEAI Competency Compass

6.3. Partnerships for Collaboration

For Community Grant projects, key partnerships are vital. For South Sligo Energy Partnership SEC these partnerships may include

- One Stop Shop
- Project Coordinator
- Energy Agencies
- EEOS Participating Energy Supplier

Initial discussions between the SEC team and a One Stop Shop / Project coordinator have proved insightful and informative.

7. Appendix

7.1. Energy Upgrade Pathways

These Energy Upgrade Pathway documents provide logistical and financial guidance to motivated homeowners and can be used as part of the project development strategy.

7.1.1. House Type: Mid Terrace 1940's with recent extension

House Type: Detached

Location: Riverstown, Co. Sligo

Year of Construction: 1940, upgrades and extension

Floor Area (m²): 108

Current Rating: -C3 -

Target Rating: - A3–

Domestic Retrofit Upgrades (Step by Step)				
Energy Efficiency Measure			***Cost***	***BER Impact***
0	No upgrades		€0	**C3**
1	Floor Insulation	Insulated under wooden floors in rooms	€5,000	**C2**
2	Heat pump	Air source heat pump with heating controls	€16,400	**B1**
3	PV System	3kWp	€7,000	**A3**
	Total Cost		€28,400	
	SEAI Grant		-€8,900	
	Net Project Cost		**€19,500**	

*Individual grants assumed

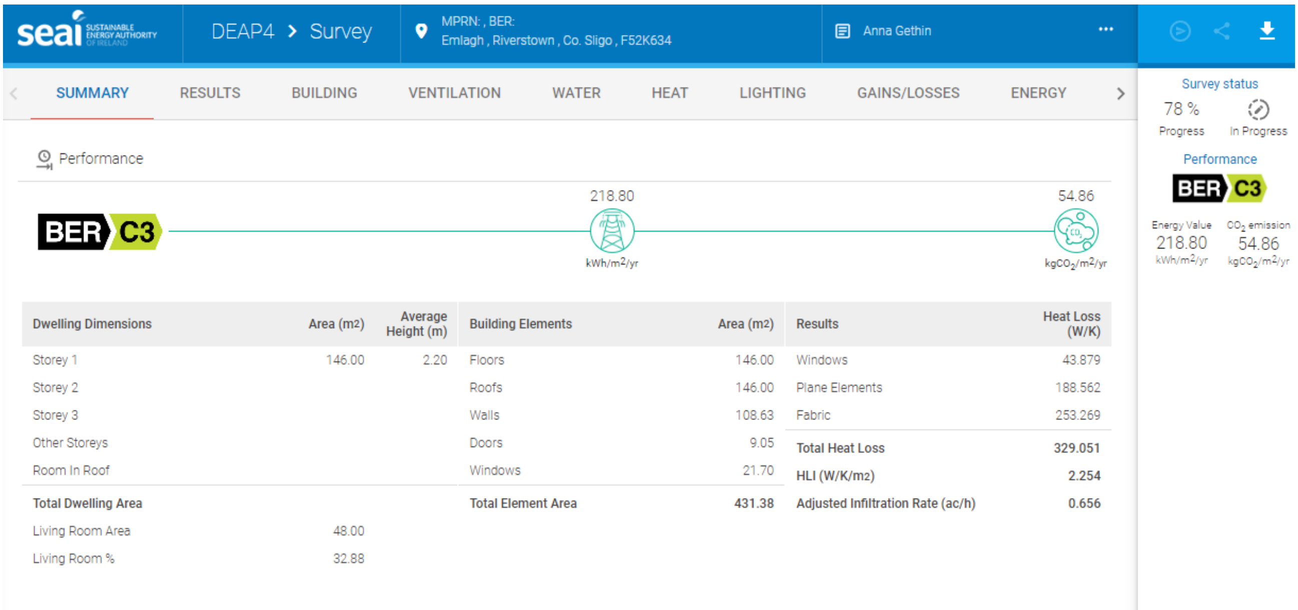
- Insulate wooden floors No grant unless one stop shop
- Heat pump €6,500
- 3kWp PV €2,400

Heat Loss Indicator (HLI)

HLI is 2.2, this value should be less than 2.0 to qualify for the heat pump grant, , floor insulation to bedrooms should push house below the 2.0 to allow to get the heat pump grant.

Building Regulations

The assumption is made that the house built in 1940's was upgraded to 2009 building regulation standards for the extension and with walls drylined, windows and doors upgraded in the remaining part of the house.



7.1.2. House Type: Detached 2003

House Type: Detached

Location: Carrowcashel, Riverstown, Co. Sligo

Year of Construction: 2003/4 with extension after 2010

Floor Area (m²): 240

Current Rating: -C1 -

Target Rating: - A3-

Domes tic Retrofit Upgrades (Step by Step)				
Energy Efficiency Measure			***Cost***	***BER Impact***
0	No upgrades		€0	**C1**
1	Roof Insulation	Loft insulation top-up to achieve 300mm- 400mm across all roof area.	€1,500	**C1**
2	Wall insulation	Pump existing older cavities with ECO Bead Platinum on top of partial fill	€3,50	**B3**
4	Heating System	Heat Pump, radiators and controls	€16,500	**B1**
5	PV System	3kWp	€7,000	**A3/A2**
	Total Cost		**€28,500**	
	SEAI Grant		-€11,800	
	Net Project Cost		**€16,700**	

*Individual grants assumed

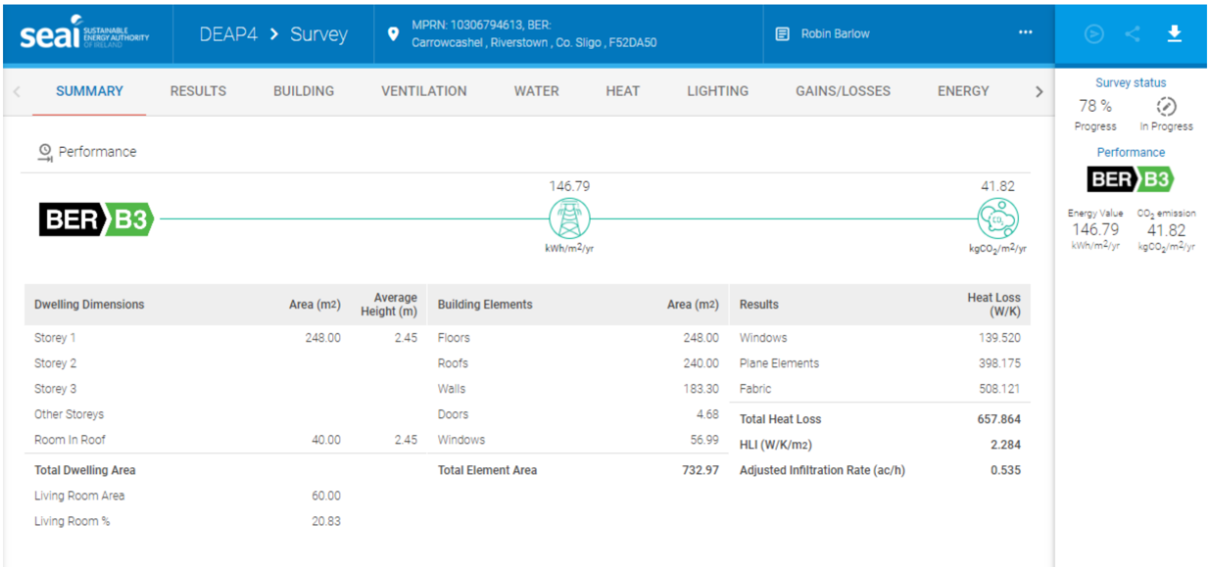
- Attic €1,500
- Cavity insulation €1,700
- Heat pump €6,500
- 3kWp PV €2,400

Heat Loss Indicator (HLI)

HLI is 2.5, this value should be less than 2.0 to qualify for the heat pump grant, top up attic insulation, outside/inside wall insulation, controls should push house below the 2.0 to allow to get the heat pump grant. This would need to be checked with a proper technical assessment which will be needed to apply for the heat pump grant anyway.

Building Regulations

The assumption is made that the house built in 2003 and extension added after 2010 and so new building regulation standards for the extension and 2003 regulations in the remaining parts of the house.



Key recommendations

- Upgrade attic insulation to 300mm fibre glass throughout (ESI Green energy, 087 7924740)
- Pump cavity walls on top of existing partial fill with ECO bead platinum in older walls
- Replace external doors with insulated type
- Windows are good but modern triple glaze units would reduce heat loss by 1/3rd again
- Improve boiler controls with possible programmable thermostat, and boiler interlock if heat pump not being installed, potential for 20% saving on oil use
- Introducing additional zoning on heating for bedrooms and living area if layout allows
- Put thermostat on water heating
- Install Solar PV panels on house
- Fit non closable vent close to the stove to provide direct air supply. Permanent ventilation should be provided in the room containing the appliance for health and safety reasons.

7.1.3. House Type: Detached Mid 1940's

House Type: Detached

Location: Riverstown, Co. Sligo

Year of Construction: 1940

Floor Area (m²): 108

Current Rating: -C3 -

Target Rating: - A3-

Domestic Retrofit Upgrades (Step by Step)				
Energy Efficiency Measure			***Cost***	***BER Impact***
0	No upgrades		€0	**C3**
1	Roof Insulation	Loft insulation top-up to achieve 300mm- 400mm across all roof area.	€1,500	**C3**
2	Wall Insulation	Pump cavity	€2,000	**C1**
3	Heatpump	Air source heat pump with heating controls	€16,400	**B1**
4	PV System	3kWp	€7,000	**A3**
	Total Cost		€26,900	
	SEAI Grant		-€12,350	
	Net Project Cost		**€14,550**	

*Individual grants assumed

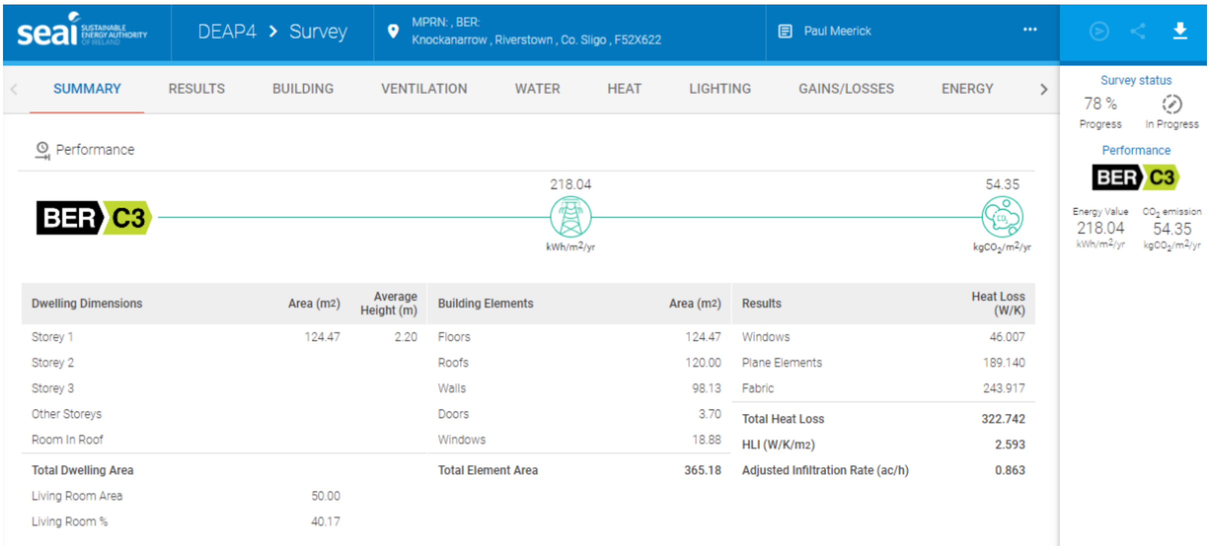
- Attic €1,500
- Cavity insulation €1,700
- Heat pump €6,500
- 3kWp PV €2,400

Heat Loss Indicator (HLI)

HLI is 2.6, this value should be less than 2.0 to qualify for the heat pump grant, top up attic insulation, outside/inside wall insulation, floor insulation to bedrooms should push house below the 2.0 to allow to get the heat pump grant.

Building Regulations

The assumption is made that the house built in 1940's and extension added about 2005 and so building regulation standards for the extension and with windows and doors upgraded in the remaining part of the house.



Dwelling Dimensions	Area (m2)	Average Height (m)
Storey 1	124.47	2.20
Storey 2		
Storey 3		
Other Storeys		
Room In Roof		
Total Dwelling Area		
Living Room Area	50.00	
Living Room %	40.17	

Building Elements	Area (m2)
Floors	124.47
Roofs	120.00
Walls	98.13
Doors	3.70
Windows	18.88
Total Element Area	365.18

Results	Heat Loss (W/K)
Windows	46.007
Plane Elements	189.140
Fabric	243.917
Total Heat Loss	322.742
HLI (W/K/m2)	2.593
Adjusted Infiltration Rate (ac/h)	0.863

Key recommendations

- Upgrade attic insulation to 300mm fibre glass throughout (ESI Green energy will do it for about €250 087 7924740)
- Pump cavity walls on new extension with ECO bead platinum
- Dryline all other rooms in older house with 82mm insulated back plasterboard
- Replace external doors with insulated type
- Windows are good but modern triple glaze units would reduce heat loss by 2/3rds
- Block off redundant chimney as it is a significant source of heat loss even when not in use, cap on chimney to stop rain penetration
- Improve boiler controls with possible programmable thermostat and boiler interlock if not going for a heat pump
- Introducing zoning on heating for bedrooms and living area if layout allows
- Put thermostat on water heating
- Install Solar PV panels on house or cattle sheds to offset electricity use.

7.1.4. House Type: Detached 1994

House Type: Detached

Location: Barroe, Riverstown, Co. Sligo

Year of Construction: 1994

Floor Area (m^2): 175

Current Rating: -C2-

Target Rating: - A3-

Domestic Retrofit Upgrades (Step by Step)				
Energy Efficiency Measure			***Cost***	***BER Impact***
0	No upgrades		€0	**C2**
1	Roof Insulation	Loft insulation top-up to achieve 300mm- 400mm across all roof area.	€1,500	**C2**
2	Wall Insulation	Pump cavity	€3,000	**C2**
3	Upgrade windows and doors	Triple glazing	€15,000	**C1**
3	Heat pump	Air source heat pump with heating controls	€16,400	**B1**
4	PV System	3kWp	€7,000	**A2**
	Total Cost		€42,900	
	SEAI Grant		-€12,100	
	Net Project Cost		**€30,800**	

*Individual grants assumed

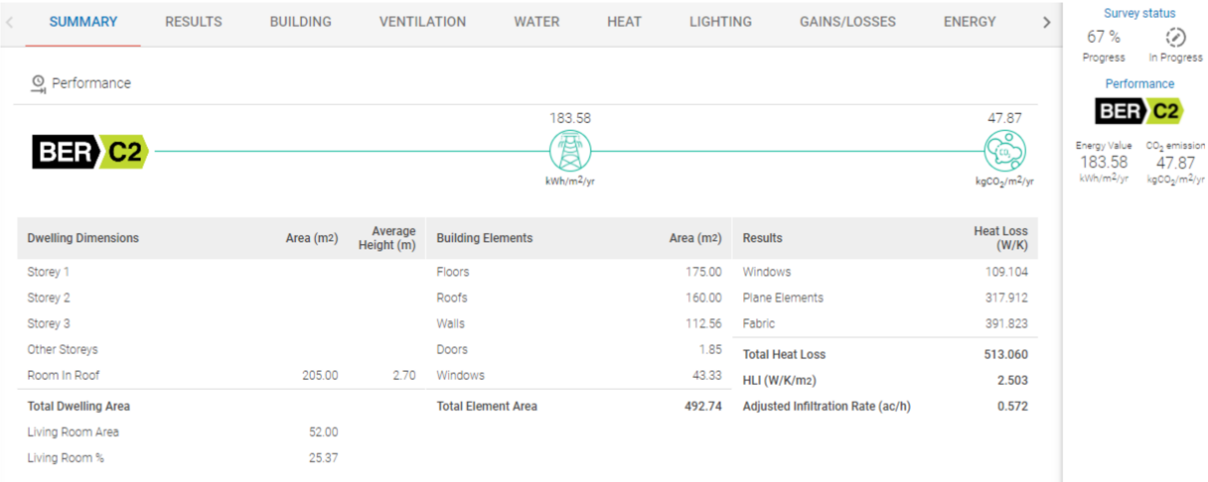
- Attic €1,500
- Cavity insulation €1,700
- Heat pump €6,500
- 3kWp PV €2,400

Heat Loss Indicator (HLI)

HLI is 2.7, this value should be less than 2.0 to qualify for the heat pump grant, top up attic insulation, outside/inside wall insulation, replace windows and doors and heating controls should push house below the 2.0 to allow to get the heat pump grant. This would need to be checked with a proper technical assessment which will be needed to apply for the heat pump grant anyway.

Building Regulations

The assumption is made that the house built in 1994.



Dwelling Dimensions	Area (m2)	Average Height (m)
Storey 1		
Storey 2		
Storey 3		
Other Storeys		
Room In Roof	205.00	2.70
Total Dwelling Area		
Living Room Area	52.00	
Living Room %	25.37	

Building Elements	Area (m2)
Floors	175.00
Roofs	160.00
Walls	112.56
Doors	1.85
Windows	43.33
Total Element Area	492.74

Results	Heat Loss (W/K)
Windows	109.104
Plane Elements	317.912
Fabric	391.823
Total Heat Loss	513.060
HLI (W/K/m2)	2.503
Adjusted Infiltration Rate (ac/h)	0.572

Key recommendations

- Upgrade attic insulation to 300mm fibre glass throughout (ESI Green energy, 087 7924740)
- Pump cavity walls on top of existing partial fill with ECO bead platinum in older walls
- Replace external doors with insulated type
- Windows are good but modern triple glaze units would reduce heat loss by 1/3rd again
- Improve boiler controls with possible programmable thermostat, and boiler interlock if heat pump not being installed, potential for 20% saving on oil use
- Install heat pump, radiators may not need to be replaced.
- Introducing additional zoning on heating for bedrooms and living area if layout allows
- Put thermostat on water heating
- Install Solar PV panels on house
- Fit non closable vent close to the stove to provide direct air supply. Permanent ventilation should be provided in the room containing the appliance for health and safety reasons.

7.1.5. House Type: Semi Detached 1993

House Type: Detached

Location: Barroe, Riverstown, Co. Sligo

Year of Construction: 1994

Floor Area (m²): 175

Current Rating: -C2-

Target Rating: - A3-

Domestic Retrofit Upgrades (Step by Step)				
Energy Efficiency Measure			***Cost***	***BER Impact***
0	No upgrades		€0	**C2**
1	Roof Insulation	Loft insulation top-up to achieve 300mm- 400mm across all roof area.	€1,500	**C2**
2	Wall Insulation	Pump cavity	€3,000	**C2**
3	Upgrade windows and doors	Triple glazing	€15,000	**C1**
3	Heat pump	Air source heat pump with heating controls	€16,400	**B1**
4	PV System	3kWp	€7,000	**A2**
	Total Cost		€42,900	
	SEAI Grant		-€12,100	
	Net Project Cost		**€30,800**	

*Individual grants assumed

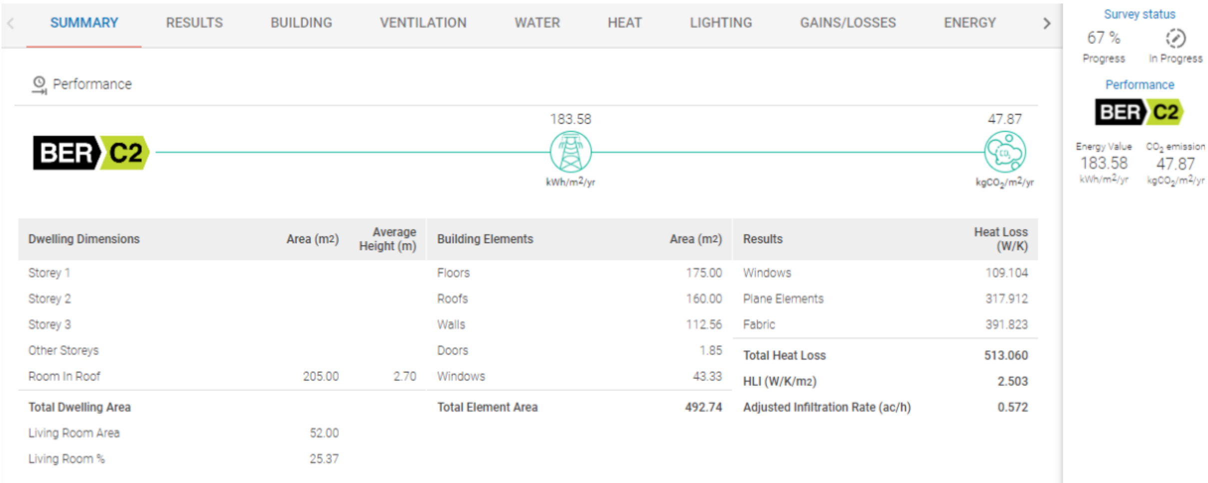
- Attic €1,500
- Cavity insulation €1,700
- Heat pump €6,500
- 3kWp PV €2,400

Heat Loss Indicator (HLI)

HLI is 2.7, this value should be less than 2.0 to qualify for the heat pump grant, top up attic insulation, outside/inside wall insulation, replace windows and doors and heating controls should push house below the 2.0 to allow to get the heat pump grant. This would need to be checked with a proper technical assessment which will be needed to apply for the heat pump grant anyway.

Building Regulations

The assumption is made that the house built in 1994.



Dwelling Dimensions	Area (m2)	Average Height (m)
Storey 1		
Storey 2		
Storey 3		
Other Storeys		
Room In Roof	205.00	2.70
Total Dwelling Area		
Living Room Area	52.00	
Living Room %	25.37	

Building Elements	Area (m2)
Floors	175.00
Roofs	160.00
Walls	112.56
Doors	1.85
Windows	43.33
Total Element Area	492.74

Results	Heat Loss (W/K)
Windows	109.104
Plane Elements	317.912
Fabric	391.823
Total Heat Loss	513.060
HLI (W/K/m2)	2.503
Adjusted Infiltration Rate (ac/h)	0.572

Key recommendations

- Upgrade attic insulation to 300mm fibre glass throughout (ESI Green energy, 087 7924740)
- Pump cavity walls on top of existing partial fill with ECO bead platinum in older walls
- Replace external doors with insulated type
- Windows are good but modern triple glaze units would reduce heat loss by 1/3rd again consider for older sections
- Improve boiler controls with possible programmable thermostat, and boiler interlock if heat pump not being installed, potential for 20% saving on oil use
- Install heat pump, radiators may not need to be replaced.
- Introducing additional zoning on heating for bedrooms and living area if layout allows
- Put thermostat on water heating
- Install Solar PV panels on house
- Fit non closable vent close to the stove to provide direct air supply. Permanent ventilation should be provided in the room containing the appliance for health and safety reasons.
- Have room in roof crawl spaces draught proofed to reduce cold air ingress around this room.

7.1.6. House Type: Detached 1900

House Type: Detached

Location: Collooney, Co. Sligo

Year of Construction: 1900

Floor Area (m²): 440

Current Rating: G

Target Rating: - A3-

Domestic Retrofit Upgrades (Step by Step)				
Energy Efficiency Measure			***Cost***	***BER Impact***
0	No upgrades		€0	**G**
1	Roof Insulation	Loft insulation top-up to achieve 300mm- 400mm across all roof area.	€3,000	**G**
2	Wall Insulation	Internal Dry Lining	€50,000	**E2**
3	Window/Door Upgrade	Install highly insulated windows and doors	€30,000	**E1**
4	Ventilation	Demand controlled extract ventilation, air tightness	€6,200	**D2**
5	Heating System	Heat Pump and heating controls upgrade*	€20,000	**B2**
6	Lighting	LED Lighting throughout	€150	**B2**
7	Solar PV (3.85kWp)		€9,000	**A3**
	Total Cost		**€118,350**	
	SEAI Grant		**-€14,800***	
	Net Cost		**€103,550**	

Note 1: BER G achieved with open fire and electric storage heating

Note 2: Ber D1 achieved when storage heating replaced with the split air to air heat pumps installed but not operational. These systems are quite efficient and so should be recommissioned if possible.

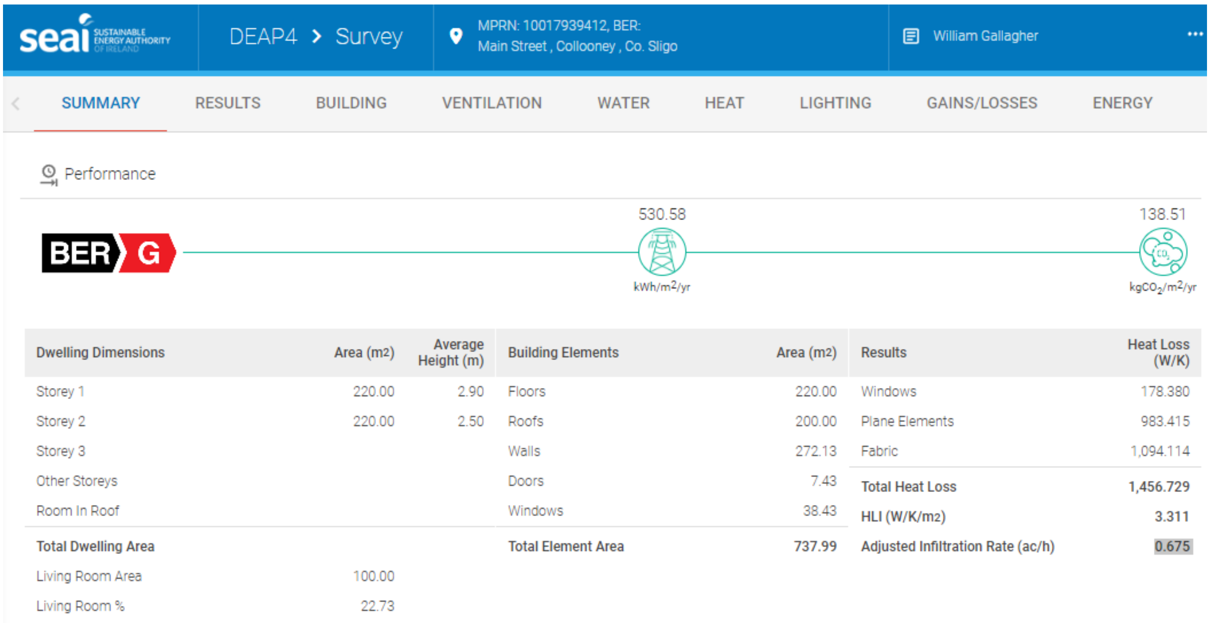
Heating system performance will not impact on the heat loss indicators in any major way.

*Individual grants assumed

- Attic €1,500
- Drylining €4,500
- Heat pump €6,500
- 3kWp PV €2,300

Heat Loss Indicator (HLI)

3.3 W/K/m², this value should be less than 2.0 to qualify for the heat pump grant, upgrading attic, wall insulation and windows may not be sufficient on their own to push the value below the 2.0 value required to get the heat pump grant.



Dwelling Dimensions	Area (m2)	Average Height (m)
Storey 1	220.00	2.90
Storey 2	220.00	2.50
Storey 3		
Other Storeys		
Room In Roof		
Total Dwelling Area		
Living Room Area	100.00	
Living Room %	22.73	

Building Elements	Area (m2)
Floors	220.00
Roofs	200.00
Walls	272.13
Doors	7.43
Windows	38.43
Total Element Area	737.99

Results	Heat Loss (W/K)
Windows	178.380
Plane Elements	983.415
Fabric	1,094.114
Total Heat Loss	1,456.729
HLI (W/K/m2)	3.311
Adjusted Infiltration Rate (ac/h)	0.675

7.1.7. House Type: Detached 2006

House Type: Detached

Location: Riverstown, Co. Sligo

Year of Construction: 2006

Floor Area (m²): 108

Current Rating: -C1 -

Target Rating: - A3/A2 –

Domestic Retrofit Upgrades (Step by Step)				
Energy Efficiency Measure			***Cost***	***BER Impact***
0	No upgrades		€0	**C1**
1	Roof Insulation	Loft insulation top-up to achieve 300mm- 400mm across all roof area.	€0	**C1**

2	Wall insulation	Pump existing cavities with ECO Bead Platinum on top of partial fill	€3,640	**B3**
4	Heating System	Heat Pump, radiators and controls	€16,400	**B1**
5	PV System	3kWp	€7,000	**A3**
	Total Cost		**€27,040**	
	SEAI Grant		-€11,620	
	Net Project Cost		**€15,420**	

*Individual grants assumed

- Attic €1,500
- Cavity wall €1,700
- Heat pump €6,500
- 3kWp PV €1,920

Heat Loss Indicator (HLI)

2.1, this value should be less than 2.0 to qualify for the heat pump grant, upgrading attic, wall insulation and windows will easily push house below the 2.0.

Building Regulations

The assumption is made that the house was built to 2005 building regulation standards, however the prevailing regulations would be those in place when planning permission was obtained and so the regulations in place could be the 1998/2000 standards. If this is the case then the HL will be much lower and so inclusion of upgraded windows will be necessary to achieve the relevant HLI target.

7.2. Non Residential Audits

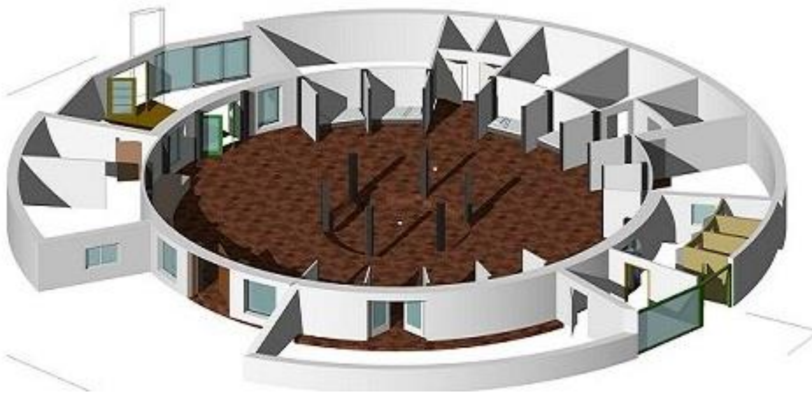
These Energy Upgrade Pathway documents provide logistical and financial guidance to motivated homeowners and can be used as part of the project

2.0 Bru Moytura

Address: Bru Moytura, Corlisheen, Riverstown, County Sligo, F52D290, Contact details 0873280789 hello@brumoytura.org

Bru Moytura is a 30-bed retreat centre. The cairn-like structure was built in 2001/2002 with the help of a team of builders and volunteers, with energy efficiency and sustainability as a significant driver. Fig. 1 shows the design plan and floor layout. It has a floor area of 572 m^2 and five employers with an average working week of 100 hours. It's mainly open at the weekend, approximately 40 per year, with visitors arriving at 4 pm on a Friday and departing at 4 pm on a Sunday. In the summer months, there may be higher occupancy during the weekdays. The centre includes a full self-catering kitchen, dining facility, sleeping accommodation and showering/washing facilities for up to 30 guests.

Fig.1 Design of Bru Moytura



2.1 Annual Energy Consumption & Cost

No details were made available on the centre's annual electricity consumption. Therefore, the annual energy consumption was calculated using the Energy Benchmarks CIBSE TM47: 2008, as shown in Table 2. This may be overestimating the annual electricity consumption and cost.

Table 2 Annual Energy Electricity Consumption & Cost

Energy Type	Usage kWh	%	€	%	Delivery Cost c/kWh	Useful Cost c/kWh	Tonne CO_2	kWh/m²
Electricity	85,800	100%	17,160	100%	20.00	20.00	30	150
Total	**85,800**		**17,160**				**30**	

2.2 Brief Overview of Technologies

Heating is provided by a geothermal heat pump supplying an underfloor heating system. Although all the underfloor heating is installed, some areas have yet to be connected to the heat pump, and this may require the existing heat pump to be replaced by a larger unit. A solid fuel stove also provided space for heating to an adjacent circular seating area in the middle of the building. The stove has a small boiler, estimated to be approximately 2 kW, which has yet to be connected to the installed piping under the seating area, which is separate from the underfloor heating system. The stove added to the ambience of the building at night time when guests are in the circular seating area.

In the past, the site installed a 3.6-metre diameter Hugh Piggott wind turbine. Appendix A provided detail on a 1.7 kW Piggott wind farm from the following website;

https://scoraigwind.co.uk/2013/11/test-report-for-recipe-3-6-metre-turbine/.

The unit is now taken down and not in use but is under consideration for re-installation. It is estimated that this unit could contribute approximately 1,400 kW of electricity to the centre. An average unit cost of 20 c/kWh equates to €280 saving per annum, and the cost of re-instating the turbine is estimated at €1,500.

The building roof is insulated with approximately 250 mm of fibreglass insulation. Still, there is some dough about the effectiveness in some areas due to the slanting design of the roof, and some of the insulation may have moved and compacted. It is challenging to identify the affected area, and this was discussed by either undertaking an infrared survey of the roof during the heating season or observing frost or snow melting on the roof area. Either way, it may be challenging to identify the area affected without undertaking the very costly work of removing all the ceiling wooden planks.

Some of the roofs have been repaired as thought to be caused by a leak, but in fact, it may have been caused by moisture in the building accumulating at the apex of the inside of the pyramid-shaped roof. This was discussed, and installing an extract fan at a high level operated by a humidity sensor may prevent this problem from occurring.

The roof design makes the building suitable for installing solar photovoltaic (PV). The viability of installing solar photovoltaic (PV) units to supplement part of the centre's electricity demand has increased significantly over the last few years, with the cost of the panels reducing. PV systems operate very effectively and require little or no maintenance.

The southward-facing part of the building, with no obstructions such as trees, makes it suitable for installing PV panels. The roof area available is approximately 5 m long by 4 meters wide slanting roof, providing an area of up to 20 m2 for PV. The roof is in good condition, with easy access.

The SEAI Micro-Generation scheme provides a grant of €2,400 for a complete installation of 6 kWp. Therefore, installing 12 PV (5.16 kWp) panels is calculated to reduce the site imported electricity by 5,424 kWh, a saving of €1,085 based on the average unit cost of electricity at 20 c/kWh. The simple payback is approximately 7 years. Such an installation would reduce the building's carbon footprint by about 1.9 Tonnes of CO_2.

Therefore, this is a project to be considered in the short term. It is suggested that a PV contractor be contacted regarding a quote to install a PV system, including its potential energy output and financial savings.

3.0 Ardkeeran National School

Address: Ardkeeran National School, Riverstown, County Sligo, Contact details Edel Dwyer, admin@ardkeeran.com

Ardkeeran National School was initially built in 1902 as a 2 teacher school. This has been added with an extension on each end of the original building and a new school connection to the original school in 2015. It is now a 5 classroom school.

3.1 Annual Energy Consumption & Cost

Annual electricity consumption is based on the annual cost, as shown in Table 3. The total cost for energy is €9,800, with an estimated consumption of 93,100 kWh based on the average unit cost before the recent increases.

Table 3 Annual Energy Consumption & Cost

Energy Type	Usage kWh	%	€	%	Delivery Cost c/kWh	Useful Cost c/kWh	Tonne CO_2	kWh/m^2
Electricity	19,600	21%	3,920	40%	22.00	22.00	7	28
Gas Oil	73,500	79%	5,880	60%	11.08	13.84	15	105
Total	**93,100**		**9,800**				**22**	

3.2 Brief Overview of Technologies

School heating is provided by a Grant Vortex condensing boiler rated at 58-70 kW. A programmer controls the boiler schedule and, on average, operates for 2 hours in the morning and 1 hour in the afternoon with a booster facility. These times vary throughout the year and are scheduled by the principal.

Most of the building is well insulated. The attic of the old and new school areas was inspected, and the level of insulation is approximately 150 mm. The windows are all double-glazed PVC, although some are now 20 years old, although they seem to be in good condition. Internal insulation has been added to the inner wall of the old building, and in general, the building heating is comfortable, with some exceptions in the corridor area of the older school. This would indicate that the building could be suitable for a heat pump with the oil boiler as backup. The attic insulation could be increased to 300 mm, some of the older PVC double-glazed windows replaced and possibly some extra radiators in the corridors to increase heat output. This needs a more detailed investigation, but a rough estimation would indicate a potential saving of 44,100 kWh, reducing energy costs €3,528 and reducing CO^2 by 7 tonnes The school should contact the Department of Education to enquire about relevant support.

A lighting survey was carried out, and the results can be found in appendix B. Lighting accounts for 4,512 kWh at €902. It is the school's significant electrical energy user. Lighting combines LED, T5 and T8 fluorescent fittings with a few 2D compact fittings. LED's consumed at least 60% less electricity than equivalent fluorescent tubes. Replacing the remainder of the school lights with LEDs offers an excellent potential to reduce costs. The savings, capital costs, and payback period are estimated as follows;

Option	**Save kWh**	**Save €**	**Cost**	**SPB yrs.**
LED	2,401	480	4,000	8

The southward end part of the new school is suitable for installing PV panels. The available roof area is approximately 25 m^2 for PV. The roof is in good condition with easy access. There may be some shading from the church adjacent to the school in the wintertime.

The SEAI Micro-Generation scheme provides a grant of €2,400 for a maximum installation of 6 kWp. Therefore, the installation of 15 PV (5.45 kWp) panels is calculated to reduce the site imported electricity by 6,780 kWh, a saving of €1,380 based on the average unit cost of electricity at 20 c/kWh.

The simple payback is approximately 7 years. Such an installation would reduce the building's carbon footprint by about 2.4 Tonnes of CO_2.

4.0 Taunagh National School

Address: Taunagh National School, Riverstown, County Sligo, F52HE92 Contact details Chloe McGoldrick (school principal), 0719165605, taunaghns@gmail.com

Taunagh National School was built in 1850, and an extension was added in 2009 for internal toilets. It is a two-classroom school, with 29 pupils with a floor area of approximately 144m^2.

4.1 Annual Energy Consumption & Cost

The annual energy consumption and costs for electricity consumed by Taunagh National School are shown in Table 4 below at 15,470 kWh and €3,548, respectively. Electricity accounts for 100% of the total energy cost, with an average unit cost of 22.93 c/kWh. The Maximum Import Capacity (MIC) is 15 kVA. Appendix C includes details of the 2022 electricity invoices.

Table 4 Annual Electricity Consumption & Cost

Energy Type	Usage kWh	%	€	%	Delivery Cost c/kWh	Useful Cost c/kWh	Tonne CO_2	kWh/m^2
Electricity	15,470	100%	3,548	100%	22.93	22.93	5	107.4
Total	**15,470**		**3,548**				**5**	

Appendix C includes detail of the 2022 invoices. The school is on a day-night tariff. It can be seen that the average unit cost for day and night increased on April 22 from 17.84 c/kWh and 7.99 c/kW to 37.79 c/kWh and 19.66 c/kWh, respectively. Night-time electricity accounts for 68% of the school's total electricity consumption,

It is recommended that a check be undertaken to read the meter each quarter at the following time.

- Electricity Usage from 9.0 am to 2.45 pm (normal school hours)

- Electricity Usage 2.45 am pm to 9 am (Use outside regular school hours)
- Electricity Usage 2,45 pm Friday and 9 pm Monday (Weekend use)

There will help to identify the percentage usage of the storage heater at the weekend. i.e. that should be Off Friday and Saturday and operate early Monday Morning to ensure the school is warm.

4.2 Brief Overview of Technologies

School heating is storage heaters and 2 air condition units for each classroom. The air condition units are programmed to operate, say, 2 hours in the morning from 8 am to 10 am and 1 hour in the afternoon, and this is controlled by the teacher in each room and adjusted as the season changes. Heating is estimated to account for approximately 80% of the school's total energy consumption. The time switch to control the storage heating could not be identified, and therefore the heat could be on even during the daytime, although the daytime consumption does not indicate this. The school electrician should be contacted to check if a time clock is installed. It should be a 7-day timer to ensure that the storage heaters are switched off Friday and Saturday nights. The recommendation to read the electricity meter will help to identify any savings by providing that the storage heaters are correctly controlled.

A lighting survey was carried out, and the results can be found in appendix D. Lighting accounts for 10,143 kWh (€1,878) and 51% of the building's electricity energy consumption and is the site's electrical significant energy user.

The lighting is mainly fluorescent-type fittings with a few LEDs. LEDs consume at least 60% less electricity than equivalent fluorescent tubes. Replacing office lights with LEDs offers an excellent potential to reduce costs. The savings, capital costs, and payback period are estimated as follows;

Option	**Save kWh**	**Save €**	**Cost**	**SPB yrs.**
LED	539	136	950	7

The estimated breakdown of the school's annual electricity consumption and cost is as follows;

Equipment	**kWh**	**Cost**	**% total**
Storage Heaters	10,710	2,456	69%
Air Cond. Units	1,500	344	10%
Lighting	1,015	233	7%
Other	2,245	515	15%
Total	**15,470**	**3,548**	**100%**

Other included kitchen and IT equipment.

The front of the building is south facing and suitable for installing PV panels. The roof area available is approximately 10 m long by 5 meters wide slanting roof, providing an area of up to 50 m2 for PV. There was no access to the roof, so the condition needs to be inspected to ensure it is suitable for PV. The school is on a plateau, so there is no risk of shading from the shops across the road from the school. It should be clarified if there are any listed building constraints relevant to Taunagh National school.

The SEAI Micro-Generation scheme provides a grant of €2,400 for a maximum installation of 6 kWp. Therefore, installing 14 PV (6.0 kWp) panels is calculated to reduce the site imported electricity by 6,238 kWh, a saving of €1,451 based on the average unit cost of electricity at 22.93 c/kWh. The simple payback is approximately 7 years. Such an installation would reduce the building's carbon footprint by about 2.2 Tonnes of CO_2.

5.0 Sligo Folk Park

Address: Sligo Folk Park, Millview House, Ardkeeran, Riverstown, Co. Sligo. F52TX06

Contact: Alex Muschketat, Manager, Sligo Folk Park, Riverstown, Sligo, Ph.: 071 91 65001, www.sligofolkpark.com

Sligo Folk Park is a community-based attraction that provides an experience of rural life and Irish heritage at the turn of the 19th Century. The Folk Park is set on the grounds of the restored Millview House, originally built in 1873 and includes 12 exhibits and 6 acres of space. It employs 8 people, and the business is opened on average 50 to 60 hours per week, depending on the time of the year. The main building includes a small cafe in use all year round.

5.1 Annual Energy Consumption & Cost

The annual energy consumption and costs for electricity and heating oil by Sligo Folk Park are shown in Table 5 below at 51,461 kWh and €14.711, respectively. Electricity accounts for 69% of the total consumption and 90% of the cost, with an average unit cost of 37.03 c/kWh. The Maximum Import Capacity (MIC) is 15 kVA. Appendix E includes details of the 2022 energy invoices.

Table 5 Annual Electricity Consumption & Cost

Energy Type	Usage kWh	%	€	%	Delivery Cost c/kWh	Useful Cost c/kWh	Tonne CO_2	kWh/m²
Electricity	35,636	69%	13,195	90%	37.03	37.03	12	66.0
Gas Oil	15,825	31%	1,516	10%	9.58	11.98	4.2	29.3
Total	**51,461**		**14,711**				**17**	

Appendix C shows that the storage heating is no longer in use. The energy supplier should be contacted regarding changing to a day/ night tariff. This may reduce cost by 5-10%, depending on the percentage usage from 11 pm to 8 am GMT.

5.2 Brief Overview of Technologies

The main building heating is provided by a boiler rated at 62.5 kW. The heating system is zoned into 5 separate circuits, and a time switch controls the boiler, and there are manual switches to control each zone. The heating system is very well controlled.

The building was constructed in 1999 and is only suitable for installing a heat pump with the fabric being upgraded. This would include increasing the attic insulation from 100 mm to 400 mm, replacing the wooden glazed window and insulating the wall. The cost of installing a heat pump and undertaking a deep retrofit of the building is estimated to be at least €80,000, with an energy saving of approximately €500, which is well outside the standard criteria for energy-saving projects. Consideration should be given to improving the installation over the next 5 -10 years, starting with the attic, then windows and finally, the wall. The SEAI grant community scheme will support projects with a fabric-first approach with long payback periods.

Electricity consumption is estimated to be broken down as follows;

Area	kWh	Cost	%
Kitchen	26,630	9,860	75%
Lighting	6,979	2,584	20%
Pumps	670	248	2%
Other	1,357	502	4%
Total	**35,636**	**13,195**	**100%**

A lighting survey was carried out, and the results can be found in appendix F. Lighting accounts for 6,979 kWh (€2,584) and 20% of the building's electricity energy consumption and is the site's significant electrical energy user outside the kitchen. Lighting is a mix of LED, T8 fluorescent fitting with a few 2D compact fittings. LEDs consume at least 60% less electricity than equivalent fluorescent tubes. Replacing the remainder of the building l lights with LEDs offers an excellent potential to reduce costs. The savings, capital costs, and payback period are estimated as follows;

Option	Save kWh	Save €	Cost	SPB yrs.
LED	3,932	1,456	7,500	5.2

The southward end of the new building above the kitchen is suitable for installing PV panels. The available roof area is approximately 5 m long by 5 meters wide slanting roof, providing up to 40 m2 for PV. The roof is in good condition with easy access.

The SEAI Micro-Generation scheme provides a grant of €2,400 for a maximum installation of 6 kWp. Therefore, installing 14 PV (5.45 kWp) panels is calculated to reduce the site imported electricity by 6,328 kWh, a saving of €2,343 based on the average unit cost of electricity at 37,03 c/kWh. The simple payback is approximately 5 years. Such an installation would reduce the building's carbon footprint by about 2.2 Tonnes of CO_2.

6.0 Riverstown Church of Ireland

Address: Riverstown Church of Ireland, Riverstown, Co Sligo, F52Fy71,

Contact: Hilda Shaw, Email hildarshaw@gmail.com

The church was built in 1818. It is a listed building with a floor area of approximately 210 m^2. The weekly use is Sunday service and during the week for funerals and weddings; the annual use is about 200 – 300 hours. All lighting is energy-efficient bulbs.

6.1 Annual Energy Consumption & Cost

The annual energy consumption and costs for electricity and heating oil for the Church are shown in Table 6 below at 22,900 kWh and €2,930. Consumption is calculated based on an average unit cost of 20 c/kWh and 8 c/kWh for electricity and heating oil, respectively. Electricity accounts for 40% of the total consumption and 62% of the price.

Table 6 Annual Electricity Consumption & Cost

Energy Type	Usage kWh	%	€	%	Delivery Cost c/kWh	Useful Cost c/kWh	Tonne CO_2	kWh/m^2
Electricity	9,150	40%	1,830	62%	20.00	20.00	3	44
Natural Gas	13,750	60%	1,100	38%	8.00	10.00	3	66
Total	**22,900**		**2,930**				**6**	

6.2 Brief Overview of Technologies

The Church heating is provided by a boiler rated at approximately 60 kW. The heating system is zoned into two separate circuits, with radiators under every second/third pew. This helps trap the heat at a low level and provides a more comfortable heating environment. Three of the large single-glazed windows were replaced in 2002 at €6,600 each. The replaced windows are single-glazed wooden sash windows to match the existing design. Consideration could be given to applying to the SEAI grant community regarding replacing the other 3 windows.

The Church was constructed in 1818 and is unsuitable for installing a heat pump. The boiler will need to be replaced soon. The potential to install a heat pump should be investigated. However, there is unlikely to be any energy cost savings, as the heat pump may need to operate longer to bring the church temperature to the required comfort level.

The Church has a large slanted roof facing Southwards, making it suitable for installing PV panels. Access due to it being high and the roof condition would need to be considered before any PV system is installed. The roof area available is up to 40 m^2 for PV.

The SEAI Micro-Generation scheme provides a grant of €2,400 for a maximum installation of 6 kWp. Therefore, installing 14 PV (6.02 kWp) panels is calculated to reduce the site imported electricity by 6,328 kWh, a saving of €1,266 based on the average unit cost of electricity at 20 c/kWh. The simple payback is approximately 7 years. Such an installation would reduce the building's carbon footprint by about 2.2 Tonnes of CO_2.

7.0 Riverstown Butchers Shop

Address: Martin Baker The shop, Riverstown, co Sligo, Eircode F52y781,

Contact: Martin Barker 0861608334

Martin Barker Butcher Shop was built in 2008 and has a floor area of 616 m2. The shop is open 6 days per week.

7.1 Annual Energy Consumption & Cost

The annual electricity consumption and costs for the shop are shown in Table 7 below at 41,800 kWh and €9,451. The average unit cost for electricity is 22.61 c/kWh, which has increased in the last months.

Table 7 Annual Electricity Consumption & Cost

Energy Type	Usage kWh	%	€ Cost ex vat	%	Delivery Cost c/kWh	Useful Cost c/kWh	Tonne CO_2	kWh/m2
Electricity	41,800	100%	9,452	100%	22.61	22.61	15	360
Total	**41,800**		**9,452**				**15**	

6.2 Brief Overview of Technologies

Refrigeration is the shop's significant energy user accounting for up to 80% of the energy cost. A centralised refrigeration system supplies four units and includes a heat recovery system which provides domestic hot water to a 100-litre tank. The water temperature was observed at 48 deg. c

One of the cold stores is not in use, and a small chest freezer has been installed. This is an excellent example of reducing cost by utilising the smaller energy-rating chest freezer but still having availability for a larger storage area for periods when extra chilling capacity is required, i.e. Christmas and Easter.

The shop lighting accounts for 1,303 kWh (€294) and 3% of the shop's electricity energy consumption. Lighting is mainly fluorescent fitting. LEDs consume at least 60% less electricity than equivalent fluorescent tubes. Replacing the shop lights with LEDs offers an excellent potential to reduce costs. The savings, capital costs, and payback period are estimated as follows;

Option	**Save kWh**	**Save €**	**Cost**	**SPB yrs.**
LED	782	177	1,200	7

The shop roof is south facing and is suitable for installing PV panels. The available roof area is approximately 20 m^{2-} for PV, and the roof is in good condition with easy access.

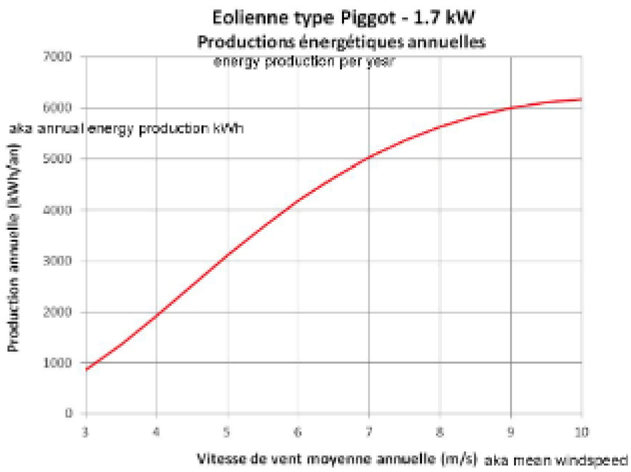
The SEAI Micro-Generation scheme provides a grant of €2,400 for a maximum installation of 6 kWp. Therefore, installing 14 PV (6.02 kWp) panels is calculated to reduce the site imported electricity by 6,328 kWh, a saving of €1.431 based on the average unit cost of electricity at 22.61 c/kWh. The simple payback is approximately 7 years. Such an installation would reduce the building's carbon footprint by about 2.2 Tonnes of CO_2.

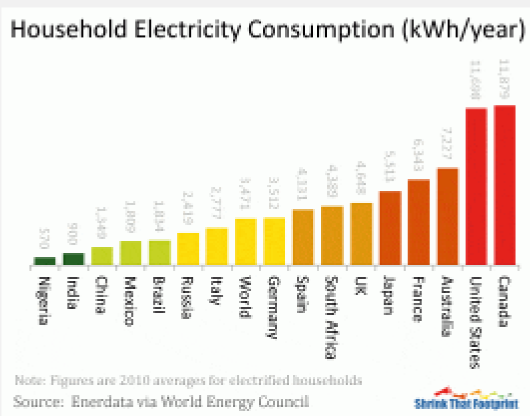
Appendix A

[Rapport SEPEN 32.6 – Eolienne autoconstruite Piggot – 1.7 kW – Reseau]

Above is a link to the full test report in French of a [Recipe] style 3.6 metre diameter grid connected wind turbine, built by [Tripalium].

I can understand a bit of French, but I mostly look at the pictures, which I like because they show it producing a bit more energy than my [predictions] in the [Recipe Book].





I put this international chart in for your info… it's not part of the test report! (Hugh)

This is a high budget test site, and it is a privilege to have had such a test conducted on one of my designs. Thanks to Jay Hudnall of [Ti'eole] for doing this!

Site Expérimental pour le Petit Eolien National — Rapport de Test n° 32.6 du 27/09/2013

Site Expérimental pour le Petit Eolien National

Rapport de Test n° 32.6 du 27/09/2013

Eolienne auto construite Piggott - 1.7 kW

Marque	Eolienne auto construite type Piggott
Référence	Type Piggott 3.6 m
Type	axe horizontal
Nombre de pales	3
Diamètre du rotor	3.6 m
Type de régulation	électronique
Puissance nominale	1.7 kW
Connexion réseau	Onduleur monophasé
Type de mât	Mât haubané
Apporteur	Ti'eole
Période de test	12/07/2012 – 12/06/2013
Période de mesure	03/05/2013 - 12/06/2013

Appendix B Lighting Survey

Lights	No Lamps	Lamps/Fit	watts	kWh	Type
Office	1	2	49	85	T5
Class Room	7	2	49	593	T6
Class Room	4	1	18	62	D2
SET Room	2	2	49	169	T5
Corridor	3	4	58	601	T5
Corridor	4	1	36	124	T5
Entrance	1	1	18	16	D2
Toilets	1	2	58	100	T5
Entrance	1	1	18	16	D2
Isolating Room	1	1	36	31	T5
Isolating Room	1	2	58	100	T5
Senior Infants	6	1	58	301	T5
3rd & 4th Class	2	12	58	1,203	T5
5th & 6th Class Room	6	2	58	601	T5
Teachers Room	2	1	30	52	LED
1st & 2nd class room	12	1	30	311	LED
Toilets	2	1	10	17	LED
Staff Toilers	7	1	10	60	LED
Toilets	1	4	10	35	LED
Special Ed Room	4	1	10	35	LED
				4,512	902

Appendix C

Taunagh National School Electricity invoices

Supplier Panda

MPRN 10017112147

Acc. No. 156797

TARIFF: Day/Night Tariff

MIC 15

Date	No. Days	Day kWh	Night kWh	Total kWh	Cost inc vat	% Night	Day Unit c/kWh	Day Unit c/kWh	Ave. c/kWh	Ave kW	Ave Day kW	Ave Night kW
13th Oct to 16th Dec. 21	64	1,222	3,293	4,515	887.63	73%	17.84	7.99	19.66	2.94	1.27	5.72
16th Dec to 14th Feb 22	60	907	3,107	4,014	767.19	77%	17.84	7.99	19.11	2.79	1.01	5.75
14th Feb to 21st Apr 22	66	862	2,780	3,642	716.28	76%	17.84	7.99	19.67	2.30	0.87	4.68
21st Apr to 17th Jun 22	57	624	600	2,012	694.36	30%			34.51	1.47	0.73	1.17
17th Jun to 13th Aug 22	57	26	-352	-326	17.80	N/A	37.79	19.66				
13th Aug to 27th sept 22	45	263	672	935	308.90	72%	37.79	19.66	33.04	0.87	0.39	1.66
Total	**349**	**3,904**	**10,100**	**14,792**	**3,392**	**68%**			**22.93**	**2.8**	**1.0**	**5.8**
Annual	**365**	**4,083**	**10,563**	**15,470**	**3,548**	**68%**			**22.93**	**2.9**	**1.3**	**5.8**

Appendix D Lighting Survey

Lights	**No Lamps**	**Lamps/Fit**	**watts**	**kWh**	Type
Toilets	2	2	58	209	T5
Class Room	3	2	58	313	T5
Class Room	3	2	58	313	T5
Entrance	1	1	18	16	D2
Resource Room	1	2	58	104	T5
Stairs	1	2	18	32	D2
Office	1	1	30	27	LED
Total				1,015	

Appendix E Electrical Tariff

Date	No. Days	Day kWh	Total kWh	Cost ex. vat	Cost/ Day	kWh/ Day	Day Unit c/kWh	Ave. c/kWh	Ave kW	Ave Day kW	Night Unit c/kWh
Jan-22	31	2,016	2,016	376.27	12.14	65	15.92	18.66	2.71	4.34	8.33
Feb-22	28	2,831	2,831	490.66	17.52	101	17.33	17.33	4.21	6.74	8.33
Mar-22	31	3,126	3,126	1,259.48	40.63	101	37.45	40.29	4.20	6.72	20.19
Apr-22	30	3,247	3,247	1,301.76	43.39	108	37.45	40.09	4.51	7.22	20.19
May-22	31	2,762	2,762	1,122.50	36.21	89	37.45	40.64	3.71	5.94	20.19
Jun-22	30	2,565	2,565	1,046.13	34.87	86	37.45	40.78	3.56	5.70	20.19
Jul-22	31	3,920	3,920	1,558.27	50.27	126	37.45	39.75	5.27	8.43	20.19
Aug-22	31	3,599	3,599	1,437.47	46.37	116	37.45	39.94	4.84	7.74	20.19
Sep-22	30	2,802	2,802	1,135.30	37.84	93	37.45	40.52	3.89	6.23	20.19
Oct-22	31	2,891	2,891	1,127.23	36.36	93	37.45	38.99	3.89	6.22	20.19
Nov-22	30	3,386	3,386	1,336.50	44.55	113	37.45	39.47	4.70	7.52	20.19
Dec-22	31	2,491	2,491	1,003.25	32.36	80	37.45	40.27	3.35	5.36	20.19
Total	**365**	**35,636**	**35,636**	**13,195**	36.15	98		**37.03**	**5.3**	**8.4**	

Appendix F Lighting Survey`

Lights	**No Lamps**	**Lamps/Fit**	**watts**	**kWh**	Type
Village Shops	13	2	58	1,954	
McGee Building	5	2	58	752	
McGee Building	10	1	30	389	LED
Entrance	1	1	9	12	LED
Corridor	1	5	60	778	
Meeting Room	2	4	26	270	
Shop	1	1	30	78	
Shop	1	1	10	26	LED
Office	3	1	30	233	
Toilets	5	1	16	207	
Canteen	6	1	60	467	
Kitchen	2	2	58	601	
Military Expo.	13	2	36	1,213	
	63			6,979	