ADoPT Pettigo SEC

Energy Master Plan for Pettigo Community

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seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

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Comhairle Contae
Dhún na nGall
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Purpose of this document

The document has been prepared to provide a common structure to the Energy Master Plans created for SECs. The document sets out the sections to be included in the EMP with guidance notes throughout. The objective of the EMP is described below:

Who is the audience for the EMP?	What do they want from it?
SEC team	● Info for grant applications ● Clear strategy/plan ● Tool for community engagement
Target community	● Motivation to work with local SEC team ● Motivation to seek energy upgrades ● Knowledge of appropriate options
Local stakeholders	● Partnerships with SEC ● Collaboration with other projects & initiatives
SEC network	● Understanding of the EMP process ● Inspiration for EMP options
General public	● Knowledge of SEC Programme

GDPR

General Data Protection Regulation (GDPR) is an EU data privacy and security law. If you process the personal data of EU citizens or residents, or you offer goods or services to such people, then the GDPR applies to you even if you're not in the EU. It is the responsibility of the Consultant to ensure personal data captured during the EMP process meets the requirements of GDPR, particularly for the final EMP report, which is to be made available to SEAI to be published and shared as required.

EMP template sections and guidance notes

1. Introduction

1.1. ADoPT Pettigo SEC

ADoPT Pettigo SEC was formed in late 2023. It is based on the geographic community as shown in Fig. 1.1.1. The area in question is comprised of the Small Area 057126002, which is located in Co. Donegal, the Electoral Division of Pettigo. It is located on the border with Fermanagh. The SEC is spearheaded by the Termon Complex, Pettigo, in collaboration with ATU Sligo and SEAI. As part of the SEC's charter, ADoPT Pettigo plan to play their part in the National Climate Action Plan. The Energy Master Plan (EMP) will assist in this goal. As part of the EMP, they shall identify a variety of energy implementation opportunities for individual residential, community, private, public and agriculture sites, and stimulate the local population to take individual and community-based actions towards energy efficiency and decarbonisation

Fig 1.1.1 – EMP study area

1.2. Sustainable Energy Communities

Sustainable Energy Communities (SECs) seek to address the fundamental issue that (a) energy is required for all human activity – lighting, heating, agriculture, construction, etc. and (b) the energy

consumed comes from non-sustainable sources – fossil fuels. If the source of our energy cannot be sustained in the future then neither can the fruits of its consumption.

Thus, SECs seek to (a) improve energy efficiency – achieve the same desired effect (light, heat, etc.) for a smaller amount of energy and (b) migrate away from over-reliance on fossil fuels to provide the energy in the first place.

This aim is consistent with, for example, the UN Sustainable Development Goal number 7, which itself informs national policy, such as the Irish Government's Climate Action Plan 2019 and Programme for Government 2025.

Specifically, SECs seek to address energy sustainability at a community-level. There are many advantages to this approach:

- Proposed energy projects can be targeted to meet the specific needs of the community
- Side-effects of energy efficiency can benefit the community – better insulated homes save heating energy but are also warmer and more comfortable, for example
- Behavioural changes with respect to energy can lead to significant savings through the cumulative effort of a whole community even if the saving in an individual case is minor
- By engaging the community, this can foster awareness of energy efficiency, lead to behavioural changes, and build experience and confidence with sustainability projects
- Other

The key steps involved in SECs are:

- Form/join a SEC network. The SEC can be defined by a geographic region but it can also be a disparate collection of entities with shared characteristics, for example a number of outlets from the same supermarket, a hotel chain, a group of community centres, etc.
- Be assigned a SEAI mentor, who will guide the SEC (the SEC is not expected to be expert when it comes to sustainability)
- Receive SEAI funding to develop an Energy Master Plan (e.g. this document)
- The Energy Master Plan (EMP) quantifies the baseline energy consumption for the community, analyses how sustainability can be improved, and recommends what steps the SEC can take next
- The SEC takes the actions recommended in the EMP. They can apply for grant funding for the individual actions or for community-level funding to tackle a suite of actions.

The SEC proceeds according to a Learn-Plan-Do approach. The 'Learn' is encompassed in the forming/joining of a SEC and meeting the SEAI mentor. The 'Plan' stage is encompassed in the EMP. The 'Do' stage is where the EMP is put into action.

Further information on the SEAI's SEC programme can be found at www.seai.ie/SEC/

1.3. EMP Consultant: Raleigh & Associates Ltd

The SEAI mentor advised the SEC on how to procure an EMP Consultant. The Consultant's role is to (a) identify the SEC's energy baseline, (b) propose energy-saving projects for the SEC to implement, including candidate funding supports for the projects, and (c) calculate the energy savings arising from the proposed projects. The list of proposed projects, their savings and predicted returns on

investment are summarised in a Register of Opportunities. The EMP consultant for this project is Raleigh & Associates.

Raleigh & Associates Ltd was founded in 1990 and delivers commercial and technical energy advice to SME's, Large Companies, Public Sector, Agriculture, and Communities across Ireland. The company has delivered major change programs in the State Sector (Bord Na Mona, Coillte) and Large Enterprises (Glanbia, Ornua) and mentored over 300 Lean Programs in companies throughout Ireland and the UK.

Raleigh & Associates Ltd has extensive experience of energy projects. Their client base includes community centres; sports clubs; farms; schools; hotels; restaurants; filling stations; cold-storage facilities; offices; quarries; factories; and more. Raleigh & Associates have completed numerous SEAI EXEED projects from 2018 onwards. They employ registered BER assessors (domestic and non-domestic) and registered energy auditors. Their auditors have completed over 300 SEAI supported energy audits. They have acted as Energy Efficiency Design (EED) Expert in HSE Pathfinder and School Pathfinder projects since 2022. They have served as EMP Consultant for a number of SECs in 2023 and 2024.

2. Energy Master Plan

2.1.Scope and outputs

Summary of the EMP scope taking into account the bespoke requirements of the SEC. This may include:

- EMP area or interest, or reference to the study area
- Sectors included specific to this SEC
- **Reference to local or specific SEC priorities or initiatives (examples below for reference)**
    - options for transition from coal/peat use
    - carbon reduction in commuting or sustainable transport
    - addressing energy poverty
    - addressing one-off housing/older housing
    - High number of rental or holiday properties

Summary of the EMP outputs including:

- Baseline of energy use
- Sustainable Energy Roadmap
- Register of Opportunities

The EMP scope is the energy baseline within the SEC. The SEC is a geographic community, defined in the Fig. 2.1.1:

Fig. 2.1.1. The geographic boundary of the SEC

The SEC is based around the town of Pettigo, Co. Donegal. It is located on the border with Fermanagh and on the river Termon. It is north of Lough Erne. The SEC comprises the Small area 057216002 and is located in the Electoral Division (ED) of Pettigo. The SEC is the village of Pettigo itself, excluding the surrounding countryside, which is sparsely populated. It is so sparsely populated, in fact, that the entire rest of the ED is a single Small Area (057216001).

CSO data provides insight into the SEC which might have implications for what opportunities the SEC prioritise at the Do stage of the project. The population profile is described in Fig. 2.1.2:

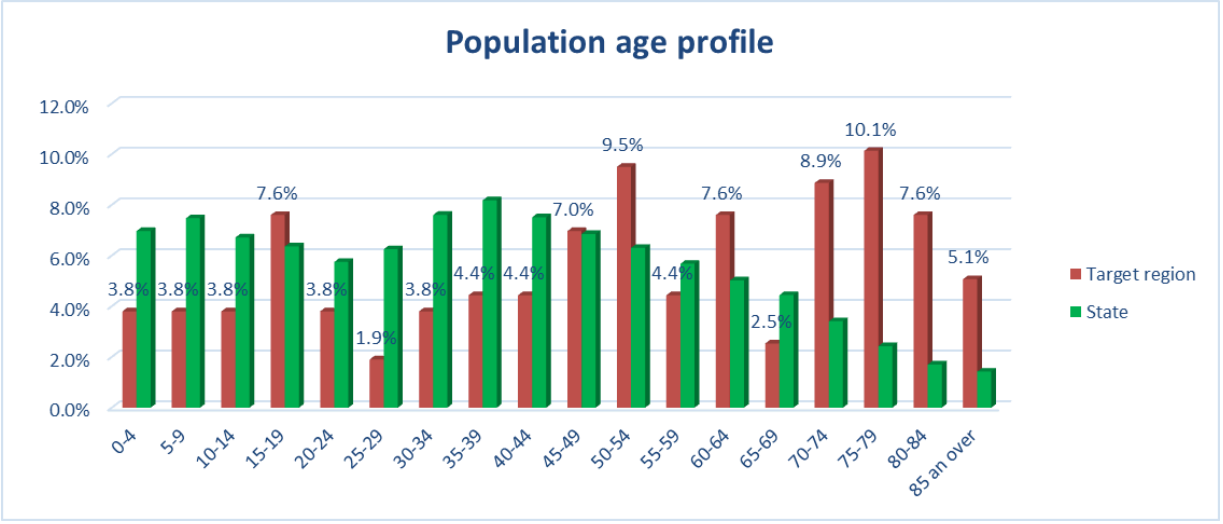


Fig. 2.1.2. The population profile for the SEC versus the state norm.

The total population is 158. It is clear from Fig. 2.1.2 that the SEC has a significantly higher share of the elderly (70 years old and higher) than the State norm. It also has a higher share of people from 60-64 and 50-54. The population cohorts under the age of 44 are generally significantly lower than the State norm. This indicates a significant issue with an ageing population. This might have implications for planning future public transport, as older people might be less capable of driving. It might have implications for the future presence of nursing homes and health clinics (which might be subject to Climate Action targets in their own right).

The population in question lives, travels and works in the SEC. it is therefore important to understand (a) the character of the housing present, (b) the character of the transport present and (c) the types of work employed in the area.

The opportunities and next steps for the SEC regarding the residential sector depend on what type of housing is present, whether it is owned or rented, how old it is and how it is heated. The main housing type present in the SEC is described in Fig. 2.1.3:

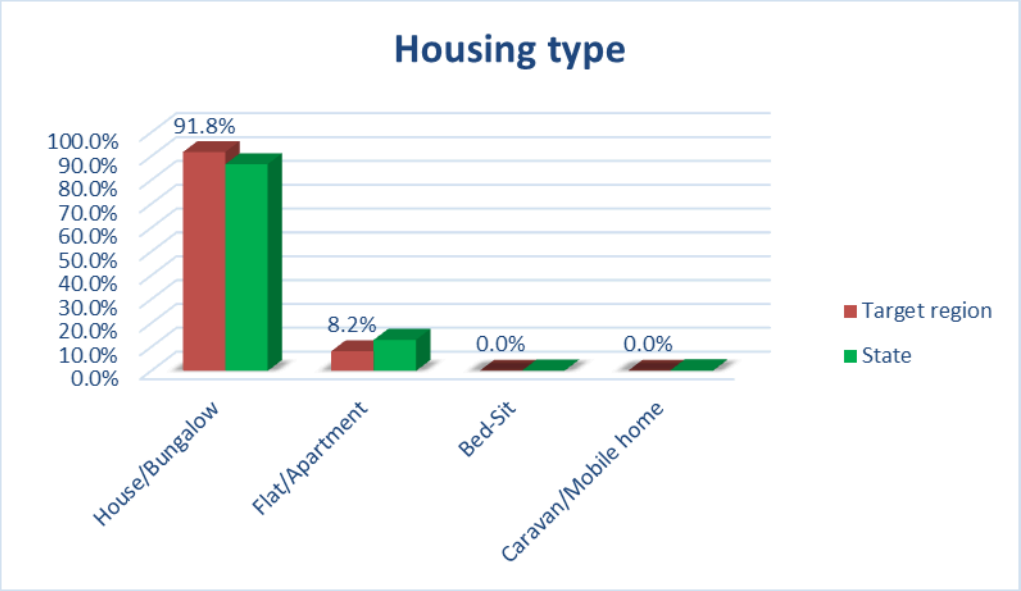


Fig. 2.1.3. The breakdown of housing by type in the SEC

It is clear from Fig. 2.1.3 that the vast majority of homes are houses or bungalows. These are more likely to be able to avail of solar PV (e.g. since they have available roof space). Individual houses could be adopted as pilot projects for the community, e.g. a Passivhaus showpiece. There might also have implications for EV uptake if more houses can host EV chargers.

The state of house ownership is described in Fig. 2.1.4:

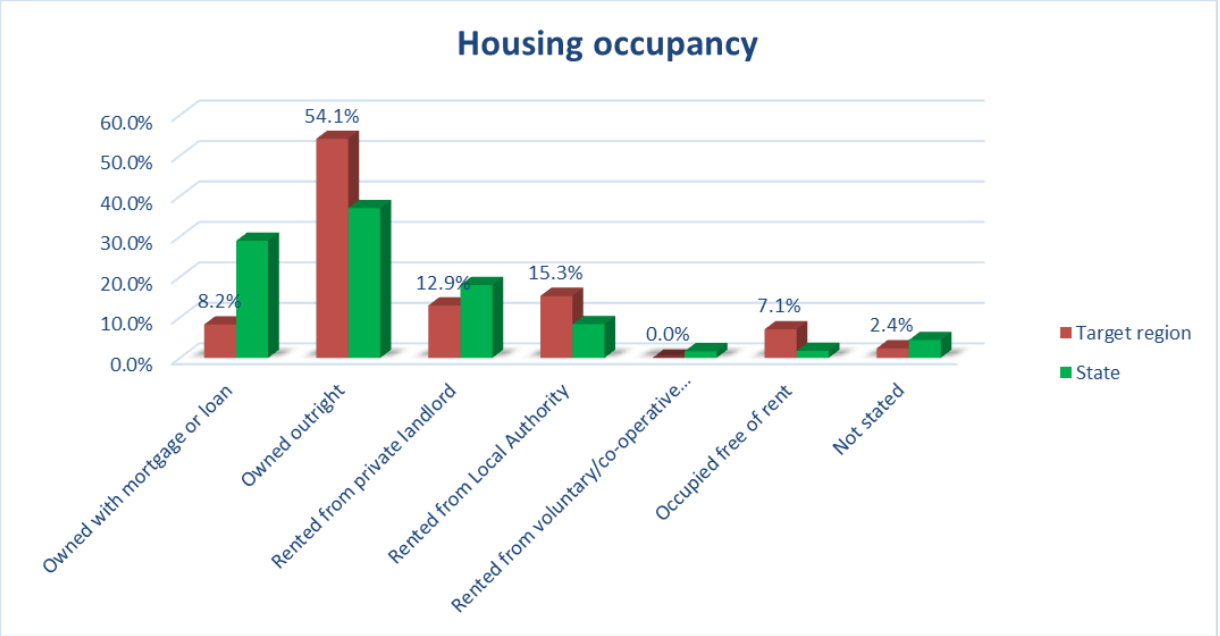


Fig. 2.1.4. The state of home ownership in the SEC

It is clear from Fig. 2.1.4 that outright home ownership is significantly higher than the State norm. Local Authority housing is also relatively high. People owning their own home might feel more willing to invest in home upgrades (e.g. insulation, solar), as opposed to rented accommodation, where the tenant might move (and is therefore less invested in the home's energy efficiency) or where the responsibility lies with the landlord, potentially complicating any upgrade works. Local authority homes might have access to support not available to private homeowners and the presence of Local Authority housing might be a way to invite the Local Authority to participate more fully in the SEC.

The age of the homes present in the SEC is described in Fig. 2.1.5:

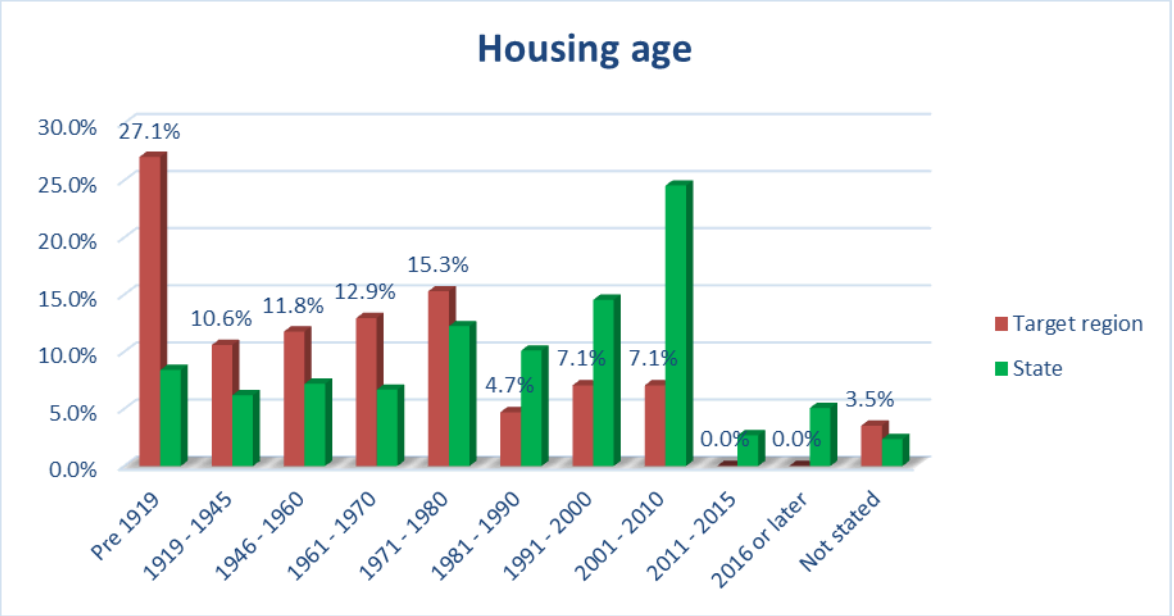


Fig. 2.1.5. The ages of homes present the SEC

In total, there are 85 homes in the SEC. A significant share, over one-quarter, is pre-1919. Older homes are more likely to be poorly-insulated (e.g. a default stone wall, typical for pre-1919, U-value is 2.1 W/m^{2}K, compared to 0.55 W/m^{2}K for a wall built between 1997 and 2008 – almost four times as much heat is lost through the older wall). In general, the housing stock is above the State norm for pre-1981 housing. Thus the levels of insulation are likely to be generally poor by modern standards. Furthermore, the efficiency of heating and hot water systems is likely to be low by modern standards (unless they have recently been replaced). Therefore, not only is more heating needed, but it is less efficient, so even more fuel is needed. For this reason, older homes tend to have worse BERs and are in more urgent need of upgrades.

As one of the goals of the SEC is to migrate away from fossil fuels, it is important to review to what extent the SEC houses use fossil fuels. Figure 2.1.6 shows a breakdown of heating fuels used in the SEC:

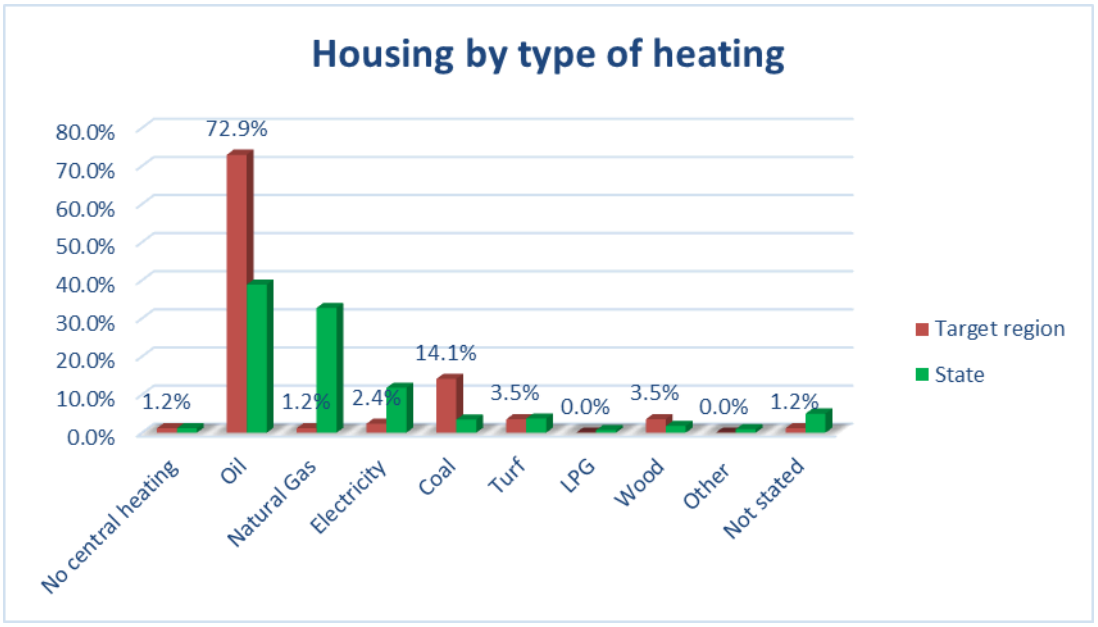


Fig. 2.1.6. The breakdown of heating fuels used in the SEC

It is clear from Fig. 2.1.6 that 73% of the homes use oil as their main heating fuel. This is significantly higher than the state norm, though it is partly explained as oil being used instead of natural gas. Natural gas is barely used compared to the state norm. This represents a clear need for renewable alternatives as part of the EMP. It is already noted from Fig. 2.1.5 that a higher share of older homes require more fuel to heat, so improvements to insulation, etc. will disproportionately reduce oil consumption.

The use of coal is significantly higher than the state norm too. This is to be expected when there is a higher share of older homes present. These frequently rely on open fires for heating. Open fires are extremely inefficient (approximately 30% is assumed according to DEAP methodology). Tackling the use of coal can significantly assist the SEC in their energy goals as well as improve thermal comfort in older homes via a more efficient alternative.

The use of coal can be evidence of fuel poverty. Coal can be more affordable purchased in smaller quantities more regularly compared to other fuel sources – e.g. a bag of coal versus hundreds of litres of oil.

The population lives at home but commutes to work or education. The breakdown of transport methods to work and to school, etc. are described in Figs. 2.1.7 and 2.1.8:

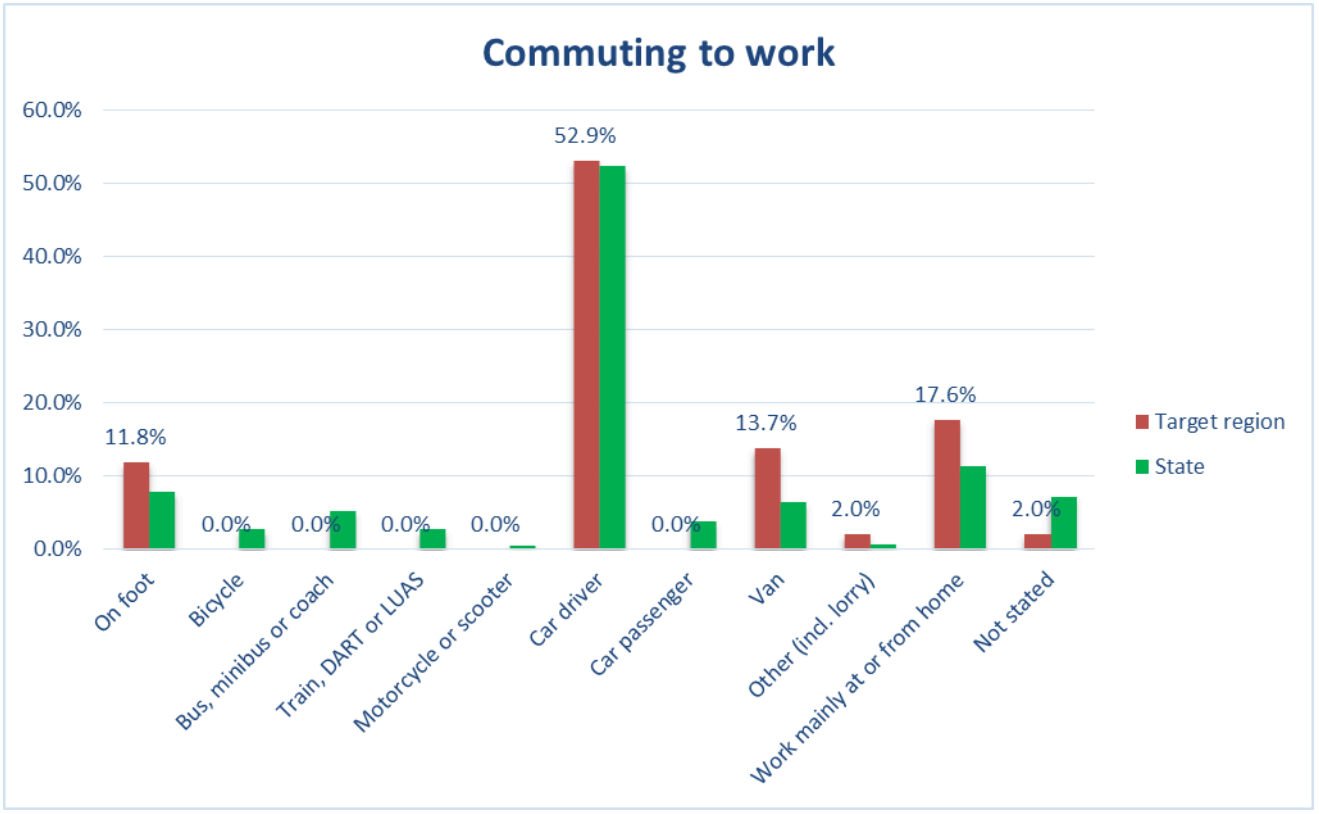


Fig. 2.1.7. The modes of transport used to commute to work in the SEC

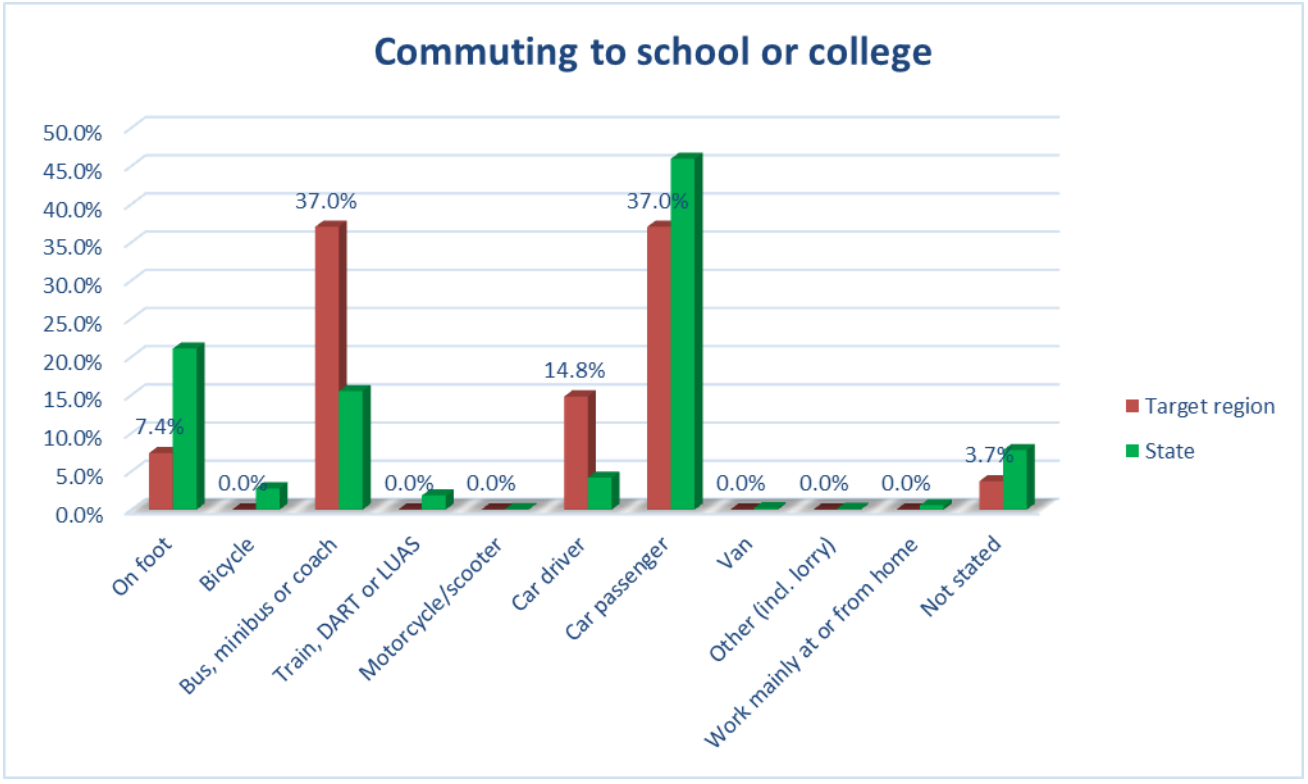


Fig. 2.1.8. The modes of transport used to commute to school or college in the SEC

It is clear from Figs. 2.1.7 and 2.1.8 that more people walk to work, use vans and work from home than the state norm; and fewer people walk to school or go as car passengers than the state norm, while more people drive to school or take a bus than the state norm. In total 51 people commute to work and 27 to school or college, according to the CSO data.

This appears to offer scope for carpooling, as nobody travels to work as a passenger even though many travel to school as passengers. A considerable number drive to school but the share of car passengers is lower than the state norm. This could point to a number of cars that could take passengers but do not. There is scope to improve public transport, possibly using the same or extra buses that are available. School buses seem to be highly-utilised yet none are used to travel to work.

People walk to work but do not cycle. This might point to a poor cycling infrastructure. Distances are clearly short enough to walk and it might be that for slightly longer distances people drive when they could cycle, if it were safe to do so. This might also increase the numbers walking to school, if the roads were safer.

With respect to switching from internal combustion to electric vehicles, the SEC should consider how many cars are associated with each home; if a home is reliant on a single car then there may be a higher perceived risk in switching to an electric alternative due to concerns over costs, maintenance and recharging. Multi-car homes might feel more comfortable experimenting with electric vehicles if they have another vehicle to act as a reserve. The number of cars per home is summarised in Fig. 2.1.9:

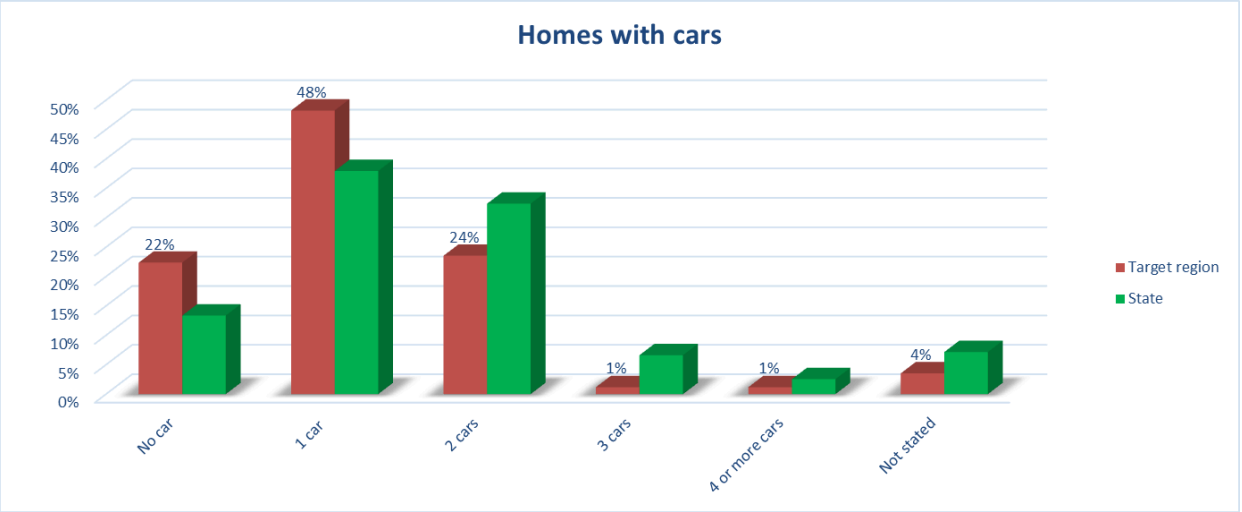


Fig. 2.1.9. The number of cars per home in the SEC

It is clear from Fig. 2.1.9 that the share of homes with no car or with one car is higher than the state norm. This is consistent with an older population (who perhaps drive less) and with a lower share of younger people in the SEC (who would be the ones driving to work, etc.). Home with no cars could benefit from some kind of public transport if it is lacking, or from cycle ways, etc. Multi-car homes, while a smaller share than the state norm, could be candidates for EVs in future. When it comes to replacing a car as a matter of course, the SEC could encourage the replacement to be an EV.

While the methods of transport matter, the duration of commutes is important too. Short trips might have scope to be replaced by public transport or cycling, for example. Fig. 2.1.10 shows the typical commute durations for work, school of college:

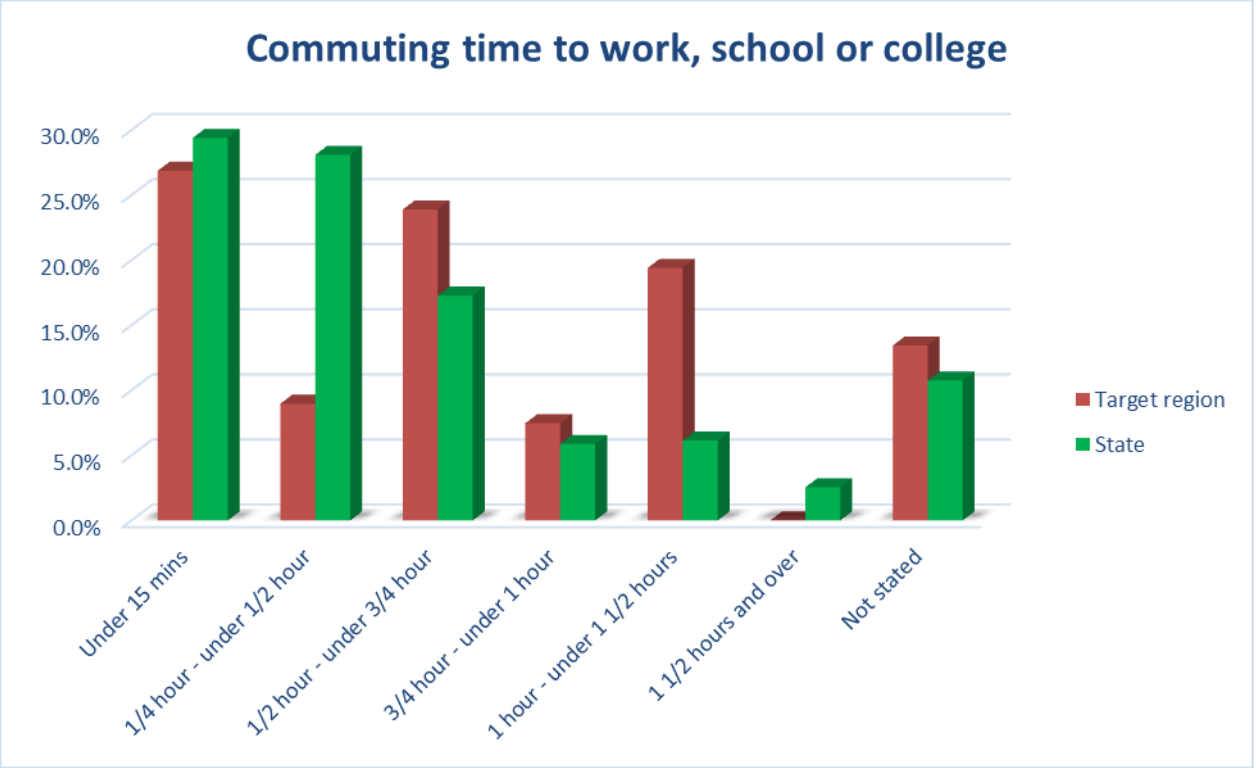


Fig. 2.1.10. The duration of commutes in the SEC

It is clear from Fig. 2.1.10 that longer commutes are more common than the state norm (e.g. half an hour to one-and-a-half hours). This might reflect people living in the SEC but working outside of it. The SEC is on the border but the nearest populated areas are a considerable distance away – places like Laghey and Donegal Town. The share of commutes of intermediate distance is low. This indicates that the commute is either short (e.g. within the SEC area) or long, with little in between. These in-between commutes could be prime candidates for cycling, if the SEC invested in the infrastructure.

At the other end of the commute from home is the place of work. The population's status in the SEC with respect to this is described in Figs. 2.1.11 and 2.1.12:

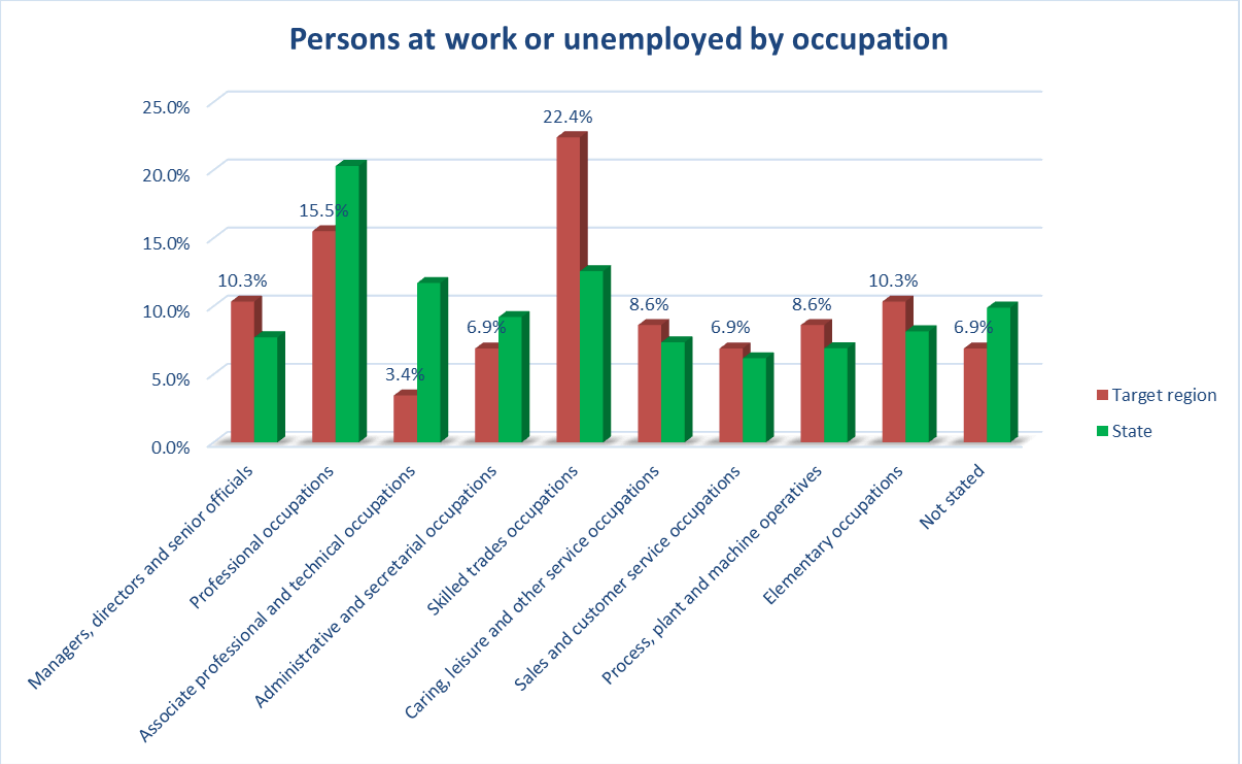


Fig. 2.1.11. The occupations people in the SEC hold

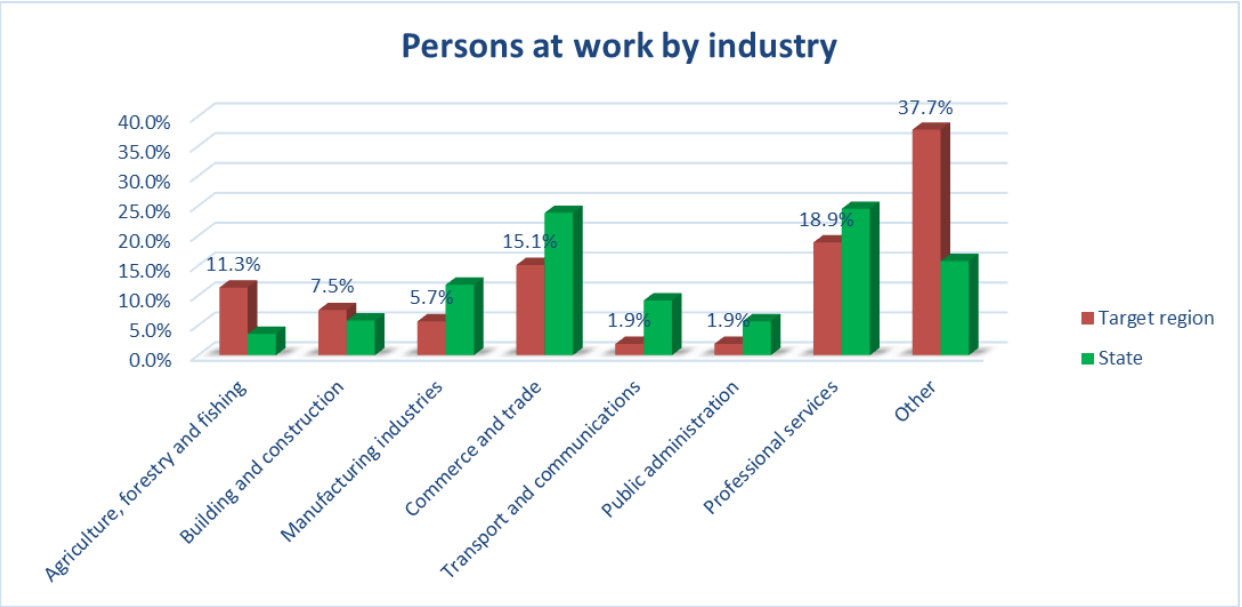


Fig. 2.1.12. The industries in which people in the SEC work

According to the CSO, approximately 55 people in the SEC provided the SEC data above. It is clear from Fig. 2.1.11 that there are more skilled traders, machine operators and managers present than the state norm, while there is a relative dearth of professionals and administrators. It is clear from Fig. 2.1.12 that agriculture and construction are well-represented while almost every other industry is under-represented.

The relatively high presence of agriculture could present opportunities for solar, anaerobic digestion and tree planting, with support from TAMS and Teagasc. The number of skilled traders, which might

explain why so many commute to work by van, might present opportunities for commercial electric vehicles. The number of office workers appears to have already offered scope for remote-working, as clear in Fig. 2.1.7. Though the manufacturing sector is low, there may be scope for energy metering, process improvement, etc. This can be supported through LEO (Local Enterprise Office) grants and Enterprise Ireland.

Figures 2.1.1 to 2.1.12 give some context for the SEC when it comes to the EMP. The EMP's key outputs are as follows:

- SEC energy baseline across Residential, Non-residential and Transport. This will provide an estimate of the total kWh, € and TCO_2 associated with energy consumption within the SEC. This baseline is the starting-point against which savings are to be made.
- 11 published domestic BERs. These houses were assessed according to the SEAI Domestic Energy Assessment Procedure (DEAP) and issued with BER certificates as well as Advisory Reports and Dwelling Reports. The Advisory Report includes a list of proposed actions a homeowner might take in order to improve the BER.
- 4 published non-residential energy audits. These farms and businesses were be visited, their energy bills reviewed, their energy-users reviewed and an energy balance study (EBS) compiled for the business/farm. The Consultant shall identify opportunities for energy saving and calculate the energy savings and potential supports for the opportunities.
- Register of Opportunities (ROO): This will include outputs from the energy audits and BER Advisory Reports. The ROO predicts energy savings, cost savings, capital costs and returns on investments
- Sustainable Energy Roadmap. This is an outline of a plan for the SEC to significantly reduce the baseline energy by 2030. There are national targets associated with 2030 to which the SEC can aspire but the main message of the Roadmap is to indicate the number of different projects that might be undertaken and what types of projects. For example, one project on the Roadmap might be to retrofit 3% of the housing stock to B2 or better per year, 30% over 10 years.
- Information on and suggestions for how projects in the ROO and Roadmap can be supported; what are the various schemes, what do they cover, who qualifies for them
- Recommended next steps for the SEC. While the ROO and Roadmap might pertain to technical projects, these cannot be expected to succeed without community engagement. Therefore the EMP details some steps that the SEC might take in the community to foster behavioural changes, disseminate the EMP, spread awareness, provide information, etc.

2.2.Methodology

Outline of methods and tools used. This section should explain how the SEC and consultant get from the Scope to the Outputs of the EMP.

This the main section for the consultant, and the SEC, to demonstrate their own specific methods e.g. if there is something innovative about their approach. It should also clearly outline the collaborative approach between the consultant and the SEC team…

Example of outlining collaboration in the methodology

Table 2.2a summarises the collaborative approach taken during the EMP. Table 2.2b summarises the data sources used to generate the energy baseline as well as what inputs the SEC and Consultant had, respectively.

The SEAI mentor, in collaboration with ATU Sligo, has prepared a methodology to extract CSO data for the specific small areas that comprise the SEC. The complete set of CSO data exists as a spread sheet with information regarding population, housing, commuting and employment (such as described in Section 2.1). The ATU tool allows for the total CSO spread sheet to be reduced in scale to only the specific small areas in the SEC. The Small areas are identified using PobalMaps – the small area identifiers from Pobal match the identifiers used by the CSO. ATU's further innovation is to parse the raw data from the CSO into separate themes, tables, bar charts (e.g. Figs. 2.1.1 to Fig. 2.1.11) for convenient navigation.

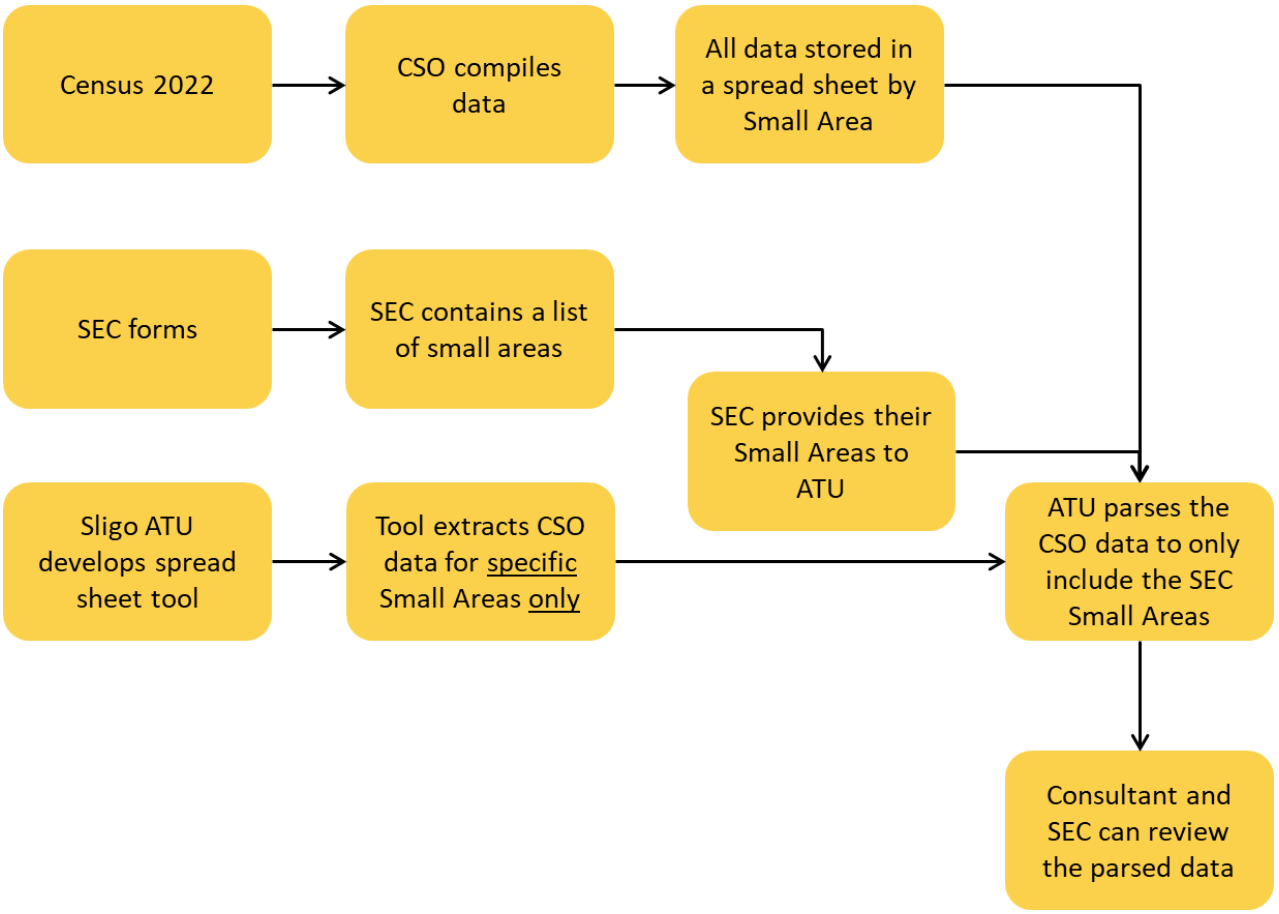


Fig. 2.2.1. A description of how the CSO data is parsed and used by the SEC

ATU Sligo prepared a similar spread sheet tool for parsing BER data. Published BER data from the SEAI covers the whole of Ireland while ATU's tool allows for just the published BERs within the SEC to be included. This allows for the residential energy baseline to be calculated directly. Each BER includes a home's energy and fuel sources for heating, hot water, lighting, cooling, ventilation and auxiliary energy. The energy data is presented in kWh/m^2/y format but each BER includes the home's area in m^2. Thus by multiplication and addition, the total energy for all homes with published BERs is readily accessible.

It is noted that not all homes in an area have a published BER. This is taken into account in the BER tool; for each age bracket, the BER tool displays the number of homes with published BERs and the total number of homes in that age bracket.

Table 2.2a – Collaboration		
Data and tools used	**SEC input**	**Consultant input**
CSO & BER data	▪ Collation of data from CSO and SEAI sources	▪ Data analysis
Energy survey – local small business	▪ Outreach to local businesses for participation ▪ Distribution of survey questionnaire	▪ Survey design & setup ▪ Analysis of results
Home energy survey	▪ Outreach to local community for participation ▪ Distribution of survey questionnaire	▪ Survey design & setup ▪ Analysis of results ▪ Cross reference to CSO/BER data

The CSO data reveals commuter habits (Figs. 2.1.7 to 2.1.9). This data can be used to estimate the number of km travelled per year in the SEC. SEAI data on kWh/km and gCO_2/km for different modes of transport (provided in the template for the EMP) allows for the baseline transport energy consumption to be calculated.

While CSO and BER data supplied by ATU Sligo provides comprehensive, general data for the SEC, the Consultant also completed more specific energy audits. A number of domestic BERs were published as part of the EMP. The publication process for a BER is a controlled process, based on an established, published procedure (DEAP) by a qualified BER assessor. The Consultant employs qualified BER assessors. The SEAI has a quality-assurance process for its BER assessors to ensure the validity of published BERs.

Non-residential energy audits were completed too. These were conducted as part of the SEAI SSEA scheme. The Consultant has published approximately 350 SSEA reports. There is an established methodology and report template supplied by the SEAI. Published reports are checked by the SEAI and reverted if there are any issues. The typical process involves:

- A site visit to obtain 12 months' worth of energy bills (kWh, cost) and to record all energy-users present on site
- Analysis of the billing data to determine the overall monthly energy profile
- Analysis of the equipment observed, its kW power, running hours, controls, condition, etc. to break the total energy consumption down among the energy users
- Identification of the chief energy-users (e.g. heating, refrigeration)
- Identification of energy-saving opportunities (e.g. building fabric upgrade, LED lighting, improved equipment/controls/maintenance/management)
- Prediction of energy-savings using energy benchmarking, calculation tools, etc.
- Selection of supports (SSRH, Microgeneration scheme, etc.) for the opportunities

Thus each audit identifies specific savings for the audited entity. These savings can be presented as kWh/m^2, or otherwise normalised, and extrapolated to the overall population of non-residential entities. Further information on energy audits is provided in Section 3.1.

For the domestic BERs, these are published along with Advisory Reports. These indicate possible improvements to the home in question and can be used to estimate a general level of savings to apply to the residential baseline.

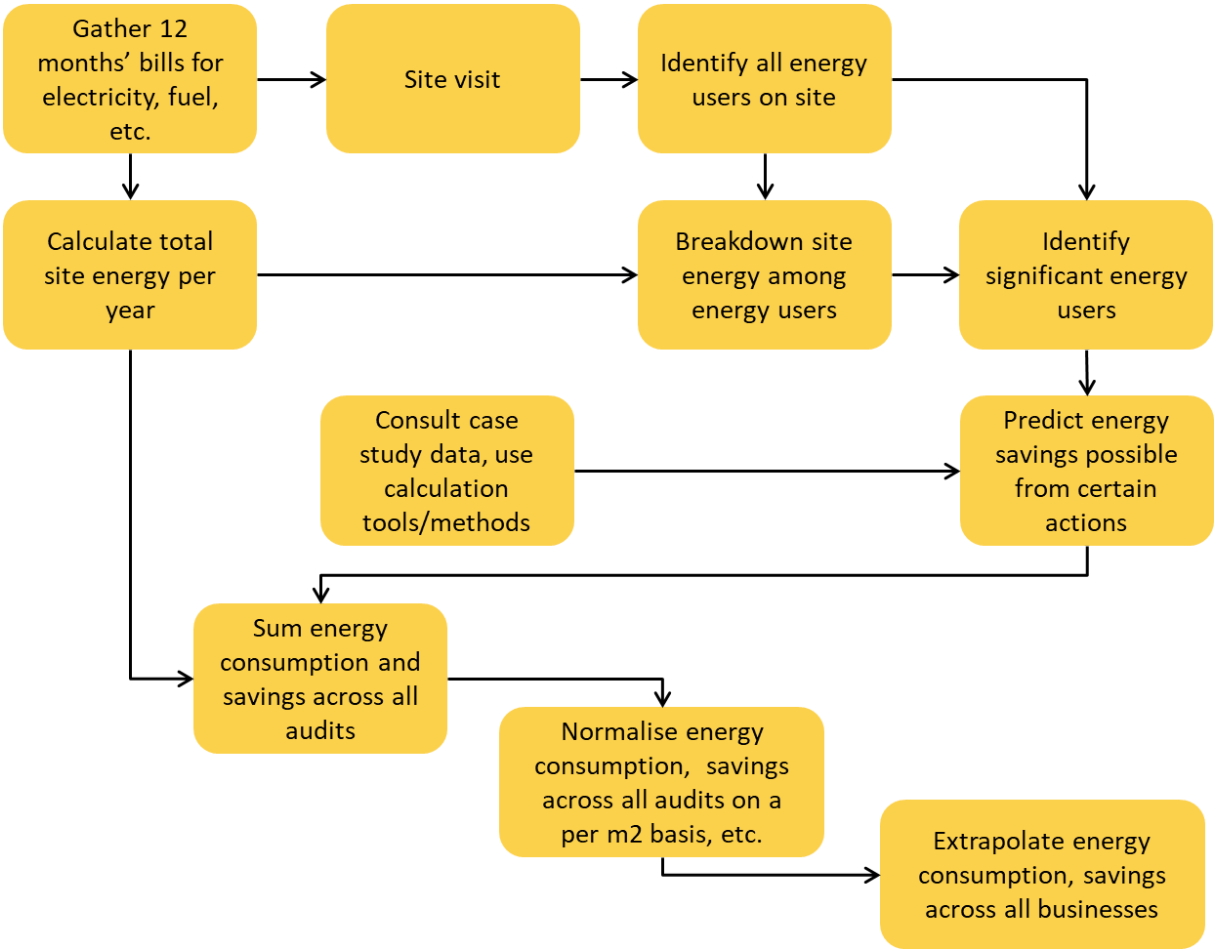


Fig. 2.1.2. The methodology for non-residential energy audits as part of the EMP summarised

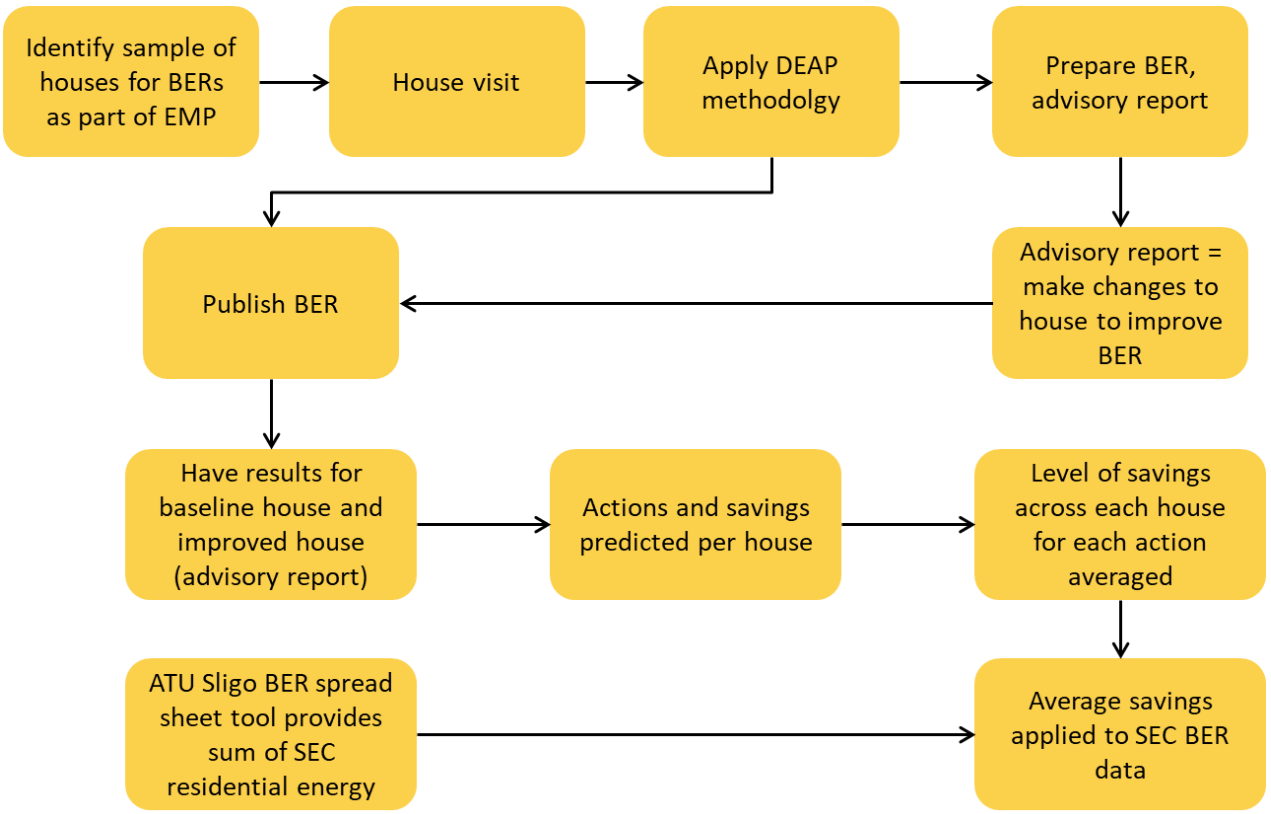


Fig. 2.1.3. The methodology for residential energy assessments as part of the EMP summarised

Table 2.2b – Methodology

Data and tools used	SEC input	Consultant input
CSO & BER data	▪ Collation of data from CSO and SEAI sources	▪ Data analysis ▪ Energy base-lining
Energy survey – local small business	▪ Outreach to local businesses for participation ▪ Distribution of survey questionnaire	▪ Survey design & setup ▪ Analysis of results
Home energy survey	▪ Outreach to local community for participation ▪ Distribution of survey questionnaire	▪ Survey design & setup ▪ Analysis of results ▪ Cross reference to CSO/BER data
Energy Audits - homes	▪ Identification/selection of key home types for audit ▪ Coordination with homeowners	▪ Energy audit & report ▪ BER & advisory report ▪ Heat pump assessment ▪ Retrofit menu / ROO
Energy Audits – non-residential	▪ Identification/selection of facilities/buildings for audit ▪ Coordination with owners/managers	▪ Energy audit & report ▪ ROO ▪ Identification of grant opportunities
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	▪	Calculations tools/models for use in calculating energy-savings: ▪ PVSol (solar PV) ▪ IESVE (HVAC, solar PV) ▪ SEAI lighting tool (lighting) ▪ SEAI VSD tool (VSD motors, pumps) ▪ Atlantic Technical University farm models (biomass, solar PV) ▪ Case study data: Consultant has a library of percentage energy savings for a range of energy saving actions across a wide variety of building-types (hotels, shopping centres, schools, kitchens, factories, farms, cold stores, etc.)

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 the communities and will give the report greater impact. The costs are based on SEAI SSEA audits, which are based on billing information.

The baseline analysis covers (a) Residential, (b) Non-residential, and (c) Transport energy. Residential energy is derived from BER data, as described in Section 2.2. The agriculture energy baseline is presented separately from the rest of the non-residential energy baseline; the nature of farms is significantly different from other non-residential businesses. Farms tend to be highly intensive of transport fuel compared to other non-residential entities (e.g. a school, a hotel). Farm energy is also benchmarked differently compared to other entities, for example kWh per head of livestock, kWh per hectare, as opposed to kWh per m^2. It is also noted that transport fuel consumption is not easily estimated based on km of travel. Adverts for second-hand tractors refer to operating hours rather than km, as would be the case for a second-hand car, for example.

This EMP template contains a number of mandatory tables that must be included. These present the energy baseline as separate components (residential, non-residential, transport) and as a combined total, where the results are summed. The energy data in these tables is presented as primary kWh. Primary kWh is the energy delivered to the point of use (so-called 'Delivered' kWh, such as appears in electricity bills or can be calculated from fuel deliveries) plus the energy invested in delivering the energy to the point of use. For example, 1 kWh of electricity from a power station requires more than 1 kWh to produce owing to losses in the electricity transmission cables and the inefficiency of the power plant generator. 1 kWh of oil delivered required extra energy to transport it, etc. The

primary energy factors used by the Consultant are 1.75 for electricity and 1.1 for fossil fuels of all kinds. These values are well-established and used by SEAI.

3.1.Energy Audits

Direct energy audits are a valuable way to engage greater local participation in the EMP. A number of SSEA audits have been completed for the following businesses:

- The Termon Complex, EA003177
- Britton's Pub, EA006537
- Stop and Shop/Post office, EA006418
- Smolt Hatchery, EA006544
- Little Smarties, EA006539 – under review, to be published in May/June
- Leonard Farm, EA006628 – under review, to be published in May/June

They provide a quick path to implementing energy upgrade projects. Information from them is included in the EMP to determine the overall energy baseline and overall energy savings. Energy savings are calculated using a wide literature-review of academic papers, case studies, etc.

All BERs and SSEA audits are published. The BERs were conducted according to DEAP methodology. The SSEA audits were conducted to ISO 50002 Type 1 detail as a minimum. They were published and paid by the SEAI, confirming their rigour and suitability. The audit detail is summarised below.

Table 3.1a – Audit detail

Audit element	Details
Energy bills	• Review and analysis of energy billing information for a minimum of 1 year: kWh, average unit price (€/kWh), day/night electricity share, penalties, etc.
Building operation	• Review of building operation (occupancy, opening times, annual operating hours)
Significant energy users	• List of significant energy equipment or facilities • Estimates of associated energy demand with calculations • Rank-order of energy users by use/cost
General building assessment	• Visual inspection of building envelope and services • Note significant energy related defects (e.g. dampness, draughts, over-/under-heating)
Renewable energy potential	• Analysis of appropriate renewable technologies e.g. solar thermal, solar PV, heat pump, heat recovery, biomass, wind, hydro
Register of Opportunities (RoO)	• Should include a concise list of energy upgrades with cost and savings estimates • Candidate supports (e.g. SSRH, TAMS, Micro-generation scheme, EEOS)

The SEC approached the businesses in question and encouraged them to apply to the SEAI for SSEA, naming the Consultants as the auditor. This had the advantage of saving money for the SEC to prepare the EMP. The EMP is funded by SEAI but SSEA is funded separately, thus enabling the energy audits not to consume any of the EMP budget. A summary of the energy audits completed is as follows:

Table 3.1b - Summary of non-residential energy audits completed				
Audit	**Audit number**	**Total €**	**Total kWh**	**Total TCO2**
Termon Complex	EA003177	26,078	270,867	18
Brittons Pub	EA006537	10,527	73,192	20
Stop and Shop/Post office	EA006418	15,260	61,044	19
Smolt Hatchery	EA006544	98,493	438,035	138
Little Smarties	EA006539	17,676	97,885	28
Leonard Farm	EA006628	37,637	330,911	89

11 BERs were published as part of the EMP. Their results indicate the level of energy savings to expect while the BER database allows the residential energy baseline to be estimated. The SEC identified and approached a number of homeowners to elicit their participation in the EMP. In general, homes without BERs were prioritised as (a) they tend to be older, with higher BER ratings and are in more urgent need of upgrades, and (b) it is a legal requirement for any home being made available for rent or for sale to have a BER. The BERs for the assessed homes are as follows:

Table 3.1c - Summary of residential energy assessments completed				
BER no.	**BER rating**	**kWh/m2/y**	**kgCO2/m2/y**	**Dwelling year of construction**
118242221	C1	156	39	1999
100732643	G	517	129	1909
118241470	F	391	96	1857
118269091	D1	240	60	2003
118268861	D1	237	59	1997
118283852	G	461	113	1900
118294412	B3	136	33	2010
117230391	C1	166	40	1993
114448418	E2	347	82	1900/1988
106986946	D2	290	75	1985
118386648	C2	199	49	1991

3.2.Analysis of Residential Sector

The ATU Sligo tool is used to determine the residential energy baseline. The sample size for the energy baseline is as follows:

Age of construction	**Sample size (No. of homes)**	**Approx. total number of homes in age bracket in target area**	**BER sample % of total in age bracket**
Pre 1919	9	23	39%
1919 - 1945	2	9	22%
1946 - 1960	1	10	10%
1961 - 1970	0	11	0%
1971 - 1980	12	13	92%
1981 - 1990	1	4	25%
1991 - 2000	0	6	0%
2001 - 2010	8	6	133%
2011 - 2020	0	0	0%
2021 - 2030	0	0	0%
Totals	**33**	**82**	**40%**

Fig. 3.2.1. The sample of homes in the SEC with and without BERs

It is clear from Fig. 3.2.1 that the overall rate of BERs is 40%, meaning a majority lack a BER. In particular, homes built pre-1970 are poorly-represented, as are homes built in the 1990s. There appears to be some confusion over how old certain houses are, with 8 listed from the 2000s as having BERs despite there apparently being only 6 such houses. The data was provided by ATU Sligo and is assumed to be an error. However, the Consultant accepted the data as the number of houses in question is low, both in absolute terms (2 houses) and relative terms (2 out of 32 with BERs, 82 in total). Poor BER coverage, especially in older houses, could cause the residential baseline to be underestimated (e.g. the residential baseline lacks almost all the 1950s houses' contribution and all of the 1960s houses').

The 1970s housing stock is the largest in terms of BERs while the pre-1919 stock is the largest overall. In general, there is significant opportunity to identify savings for houses given (a) how many lack BERs and (b) the ages of the houses lacking BERs – these older homes, as discusses earlier, are more likely to be inefficient.

The delivered energy associated with the homes, extrapolated from published BERs is as follows:

Age of construction of homes	BER sample % of total in age bracket	Approx. total number of homes in target area	Approx. total kWh in target area	Average of Average kWh/home/year	Approx. total kgCO2 in target area	Average of Average kgCO2/home/year
2021 - 2030	0%	0	-	-	-	-
Pre 1919	39%	23	1,279,173	55,616	437,906	19,039
1919 - 1945	22%	9	222,024	24,669	63,674	7,075
1946 - 1960	10%	10	318,400	31,840	88,341	8,834
1961 - 1970	0%	11	-	-	-	-
1971 - 1980	92%	13	226,570	17,428	66,425	5,110
1981 - 1990	25%	4	119,029	29,757	33,703	8,426
1991 - 2000	0%	6	-	-	-	-
2001 - 2010	133%	6	125,361	20,894	36,052	6,009
2011 - 2020	0%	0	-	-	-	-
Grand Total	**32%**	**82**	**2,290,557**	**18,020**	**726,102**	**5,449**

Fig. 3.2.2. The estimate of total delivered residential energy within the SEC

The total residential energy by energy users is shown in Fig. 3.2.3:

Breakdown of energy use (kWh)	
Space heating	1,600,671
Water heating	347,710
Lighting electricity	43,319
Other electricity	298,858

(a)

Breakdown of energy use (kgCO2)	
Space heating	502,400
Water heating	105,240
Lighting electricity	17,885
Other electricity	100,577

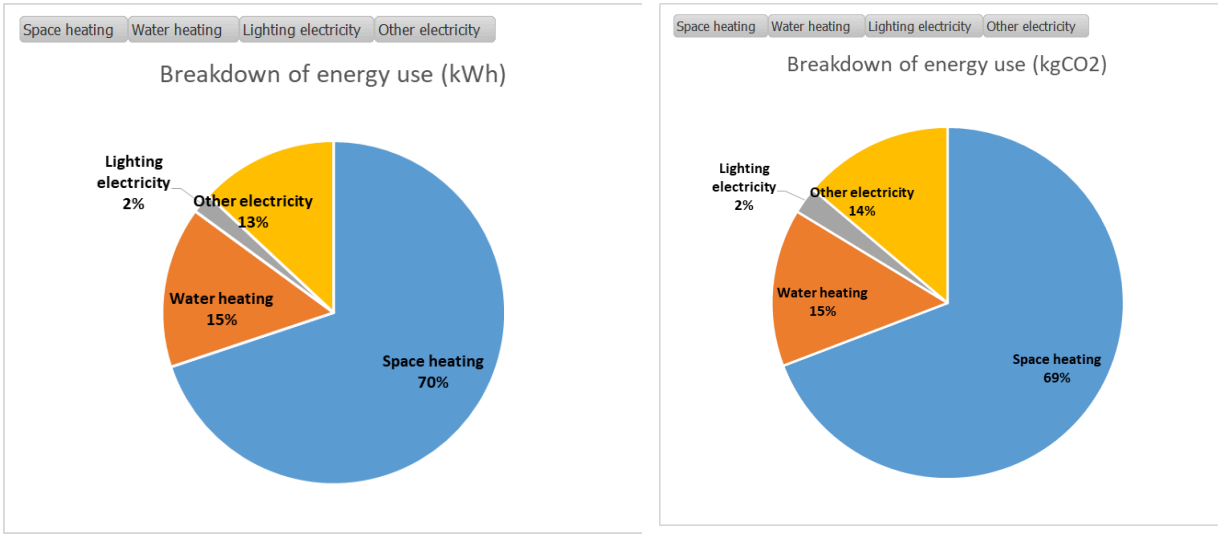
(b)

Fig. 3.2.3. The estimate of total delivered residential (a) energy and (b) carbon emissions within the SEC by energy user

By splitting up the energy by end users, it is possible to predict the effects of different measures separately. For example, a fabric upgrade can be assumed to affect space heating but not water

heating. Solar PV affects electricity users but not thermal users. Thus a more granular energy baseline allows for a more granular Register of Opportunities (ROO).

The breakdown of residential energy by end user is summarised in Fig. 3.2.4:



(a) (b)

Fig. 3.2.4. The breakdown of (a) energy and (b) carbon emissions among end-users

It is clear that the space heating is the most significant energy user to address, as it is 70% of the kWh and 69% of the carbon emissions. Tackling it will significantly affect the overall residential baseline energy and emissions.

The average BER in the SEC is described in Fig. 3.2.5:

BER	No. of homes	% of homes
A1	-	0%
A2	-	0%
A3	-	0%
B1	-	0%
B2	-	0%
B3	2	6%
C1	2	6%
C2	2	6%
C3	1	3%
D1	7	21%
D2	2	6%
E1	3	9%
E2	1	3%
F	3	9%
G	10	30%
Totals	**33**	**100%**

Average BER rating	Average BER category
379	E2

Fig. 3.2.5. The average BER in the SEC

It is clear from Fig. 3.2.5 that the average BER is E2. The average BER has implications for the ROO for two reasons: Firstly, the Irish government has a national target for homes to achieve a BER of B2 or better. If the average is higher then it indicates how many potential projects are in the area. Secondly, poorer BERs are associated with scope for upgrades in general, aside from attempting to achieve a B2.

The BER data reveals the following with respect to building fabric:

U-values in roofs

SEAI Code of Practice target U-value **max 0.16 W/m2.K**

S.R.54 indicates 100 mm quilt insulation between joists = 0.4 W/m2.K

Upgrading to 300 mm quilt insulation between joists = 0.13 W/m2.K

% of homes with less than optimal roof insulation (U > 1.6 W/m2.K)	**70%**

Fig. 3.2.6. The share of homes in the SEC that could benefit from roof fabric upgrades

U-values in walls

SEAI Code of Practice target U-value **max 0.35 W/m2.K**

S.R.54 indicates U-value 0.6 W/m2.K for cavity wall indicates only partial fill of 40mm to 50mm.

Cavity walls with no cavity insulation, U-value will generally be in excess of 1.6 W/m2.K

Min upgrade to full cavity fill, typically achieves U-value = 0.32 W/m2.K

Greater improvements can be achieved with either EWI or IWI

% of homes with less than optimal wall insulation (U > 0.35 W/m2.K)	79%

Fig. 3.2.7. The share of homes in the SEC that could benefit from wall fabric upgrades

U-values in windows

SEAI Code of Practice target U-value max 1.4 W/m2.K

S.R.54 indicates double glazed, metal frame, 6mm gap, typical U-value 3.7 W/m2.K

Double glazing units will typically have U-values of 1.2 to 3.7 W/m2.K, depending on condition

Triple glazing can typically achieve U-values < 1.0 W/m2.K

% of homes with less than optimal window units (U > 1.4 W/m2.K)	100%

Fig. 3.2.8. The share of homes in the SEC that could benefit from glazing & doors upgrades

U-values in floors

SEAI Code of Practice target U-value max 0.36 W/m2.K,
or 0.15 W/m2.K where underfloor heating is installed

S.R.54 indicates double glazed, metal frame, 6mm gap, typical U-value 3.7 W/m2.K

Double glazing units will typically have U-values of 1.2 to 3.7 W/m2.K, depending on condition

Triple glazing can typically achieve U-values < 1.0 W/m2.K

% of homes with less than optimal floor insulation (U > 0.36 W/m2.K)	100%

Fig. 3.2.9. The share of homes in the SEC that could benefit from floor upgrades

It is clear from Figs. 3.2.6 to 3.2.9 that a considerable number of homes in the SEC can reduce their energy use through passive measures such as fabric upgrades. It is unlikely that many people can avail of floor upgrades but roof, wall and glazing upgrades are straightforward and readily supported through various SEAI grants.

While fabric upgrades will reduce heating energy, the efficiency of the heating plant and the controls thereof also affect the heating energy. The status of the SEC residential heating plant is summarised in Fig. 3.2.10.

Guidance notes

A serviced condensing oil/gas boiler will have efficiency > 90%

Heating system efficiency < 70%: May indicate poor condition & non-condensing boilers

Heating control category = 1: Indicates poor system controls in place

Heating system efficiency > 200%: Indicative of heat pump systems

% of homes with poor heating system efficiency (<70%)	39%
% of homes with poor heating system control	33%
% of homes with heat pump systems	0%

Fig. 3.2.10. A summary of the heating equipment and controls in the SEC

It is clear from Fig. 3.2.10 that a significant share of the homes has low-efficiency equipment and poor controls. This is likely to be true of the many homes lacking a BER, since many are older homes. There is clear scope for the SEC to investigate upgrades by (a) replacing boiler equipment with heat pumps or other alternatives, (b) replacing baseline control systems with superior options, and (c) informing, advising and training homeowners to adopt simple energy management practices in the home.

The Irish government has a target with respect to heat pump installations to replace fossil-fuel boilers. An important consideration for the SEC and the ROO is whether the homes in the SEC are heat pump ready or not.

Given how many homes could benefit from fabric upgrades and given the average BER of E2, it is unlikely that many homes are heat-pump ready. It is unlikely that the majority of homes lacking a BER are heat pump ready either. However, this provides the SEC with an opportunity to make homes heat pump ready and install heat pumps as combined projects, rather than tackling fabric upgrades and heat pumps piecemeal.

It is clear from analysis of the residential baseline that the SEC has significant scope for home upgrades. A number of supports for home upgrades exist and can be used to offset costs identified in the ROO. Details of supports are provided in the appendix.

The Residential performance indicators, based on the data above, is summarised in Table 3.2a while the SEC Residential energy baseline is summarised in standard format in Table 3.2b.

Table 3.2a – Residential Performance Indicators			
Total number of Dwellings	**% B rated or better**	**% of Fossil Fuel Heating Systems**	**% of Renewable Energy**
82	6%	94%	16%

Table 3.2b – SEC Residential Energy, CO2 and Spend				
	Electricity	**Fossil Fuel**	**Renewable**	**Total**
Total Primary Energy (kWh)	598,808	2,143,219	41,650	2,783,677
Total CO2 (tonnes)	118	608	-	726
Total Spend (€)	152,627	192,774	-	345,401

While the baseline is described above based on the complete sample of BERs in the SEC, the predicted energy savings for this baseline are identified as follows:

- A sample of houses are assessed
- BERs are published
- Advisory reports indicate potential BER uplifts from a range of opportunities
- The average savings for different upgrades (fabric, solar, heat pump, etc.) are calculated
- The average level of savings is applied to the baseline.

As the SEC is located on the border with Northern Ireland, the SEAI mentor advised that comparison be made with some of the homes across the border with respect to BERs. In Northern Ireland, a different energy rating is used; rather than a BER, EPCs are used. However, like BERs, EPCs are rated A to G. The average EPC for Northern Ireland is D, which might be consistent with a BER D, or superior to the SEC average of E2 (Fig. 3.2.5). The results for a number of specific cross-border homes are shown in Table 3.2c:

Table 3.2c - Summary of energy ratings for homes across the border				
EPC no.	EPC rating	kWh/m2/y	Approx. BER	Source
0340-3483-6050-2399-2685	B	68	A3	https://find-energy-certificate.service.gov.uk/energy-certificate/0340-3483-6050-2399-2685
9897-6267-5029-6800-0283	D	446	F	https://find-energy-certificate.service.gov.uk/energy-certificate/9897-6267-5029-6800-0283
0289-7082-0202-6593-9904	E	312	E1	https://find-energy-certificate.service.gov.uk/energy-certificate/0289-7082-0202-6593-9904
0367-3979-0889-9179-6931	C	119	B2	https://find-energy-certificate.service.gov.uk/energy-certificate/0367-3979-0889-9179-6931
0219-8080-0225-6479-1984	F	394	F	https://find-energy-certificate.service.gov.uk/energy-certificate/0219-8080-0225-6479-1984
0268-3976-0046-9009-9405	C	129	B3	https://find-energy-certificate.service.gov.uk/energy-certificate/0268-3976-0046-9009-9405
9639-8041-0299-6994-1900	D	424	F	https://find-energy-certificate.service.gov.uk/energy-certificate/9639-8041-0299-6994-1900
0300-2925-3190-2302-3305	E	300	D2	https://find-energy-certificate.service.gov.uk/energy-certificate/0300-2925-3190-2302-3305
1200-1353-0822-2101-3923	D	212	C3	https://find-energy-certificate.service.gov.uk/energy-certificate/1200-1353-0822-2101-3923
9108-7146-0929-9400-9183	F	387	F	https://find-energy-certificate.service.gov.uk/energy-certificate/9108-7146-0929-9400-9183
0267-2995-0928-9505-5111	E	297	D2	https://find-energy-certificate.service.gov.uk/energy-certificate/0267-2995-0928-9505-5111
Average		281	D2	

It is clear from Table 3.2c that the EPC is not a perfect analogue for the BER; one EPC D is approximately equivalent to a BER C3, while another EPC D is equivalent to a BER F. However, the approximate average BER is D2, compared with the SEC average of E2; 281 kWh/m^2/y versus 379 kWh/m^2/y (Fig. 3.2.5). This indicates that the rated homes across the border are on average 98 kWh/m^2/y more efficient than the rated homes in the SEC. However, the average rating in Table 3.1c (the homes the Consultant assessed as part of the EMP) is 285 kWh/m^2/y, only 4 kWh/m^2/y higher than the cross-border average. This demonstrates the effect of sample-size on estimating averages.

It can reasonably be supposed that the typical energy rating across the border is similar to the typical energy rating in the SEC area. This can be supposed based on the numbers in Tables 3.1c and 3.2c, and in Fig. 3.2.5. It can also be supposed based on geographic proximity; per Fig. 2.1.5, many of the homes predate 1919 and partition. Thus, it can be expected that a similar number of older homes are present across the border and that they are qualitatively the same as those in the SEC area. It can be assumed to be a similar story during successive decades before the introduction of efficient building regulations. This is especially true within the town of Pettigo itself, as Tullyhommon (the cross-border section of the town), was surely established along with Pettigo.

Thus, the SEC might consider cross-border projects as any opportunities with respect to the residential energy baseline within the SEC will surely be appropriate across the border.

3.3.Analysis of Non-Residential Sector

3.3.1. General

Analysis of the non-residential sector provides an overall picture of energy consumption, CO_2 emissions and energy spend for all non-residential sectors (commercial, industrial and public) in the SEC area. The Consultant worked with the SEC to establish a list of non-residential buildings.

Táilte Éireann, the valuations office, was also utilised. Its website provide two important resources with respect to non-residential properties; the API tool provides a list of properties, addresses, valuations, industry-type and floor area while the online interactive map displays the locations of properties in the SEC. The API can provide a complete list of all properties in an administrative area (e.g. a county) while the map allows for the specific property numbers to be identified and then cross-referenced with the list.

The SEC approached a number of businesses to encourage them to apply to SEAI SSEA, naming the Consultant as the auditor. The energy audits serve the energy benchmarking in two ways; firstly they provide energy data associated with specific businesses and farms in the SEC. This allows for specific energy savings in the SEC to be predicted and specific projects suggested. With enough audits, the SEC could have a direct measure of the energy baseline but this is impractical. Instead, it is recommended that energy benchmarking be used and here the energy audits serve their second purpose – their results can act as benchmark data. The audits will collectively provide kWh/m^2 and TCO_2/m^2 values for the non-residential sector and these values can be applied to those businesses not audited as part of the EMP. Alternatively, CIBSE TM46: Energy Benchmarks can be used as the benchmark but this document is quite old and might be out-dated. Energy audits carried out as part of the EMP provide more up-to-date data, more characteristic of the SEC. The energy audits also provide modern prices for energy to use in the EMP for calculating cost savings.

All SSEA audits include a floor area value, so extrapolation on a per-m^2 basis is possible when combined with the Táilte data. However, not all entries in the Táilte data include floor areas. In this case, the missing floor area is estimated based on the valuation €/m^2 for the property. A €/m^2 value can be determined for the properties with both floor-areas and valuations and then applied to those with valuations only. For example, if there is €100,000 worth of property but only €50,000 has an associated floor area, say 5,000m^2 (€10/m^2 overall), then then the other €50,000 can have an estimated floor area of 5,000m^2 too, for a total of 10,000 m^2.

The Consultant completed 5 SSEA audits, as described in Table 3.1b. The total floor area involved in the audits is 3,500 m^2. The total floor area per the completed audits and the Táilte evaluations for the area is 3,769 m^2. The SEC area and the Táilte map are shown in Fig. 3.3.1. It is noted that the Termon Complex is not present on the Táilte map.

(a) (b)

Fig. 3.3.1. The SE area and the commercial properties identified via Táilte Éireann

It is clear from Fig. 3.3.1 and Table 3.1b that there are a total of approximately 18 businesses in the SEC (approximately 10 do not appear in Fig. 3.3.1b). The business types include shops, cafés, community halls and pubs. The total extrapolated non-residential, non-agricultural baseline energy is shown in Table 3.3a.

Table 3.3a – SEC Commercial Energy, CO2 and Spend

	Electricity	Fossil Fuel	Renewable	Total
Total Primary Energy (kWh)	1,064,459	179,907	280,913	1,525,279
Total CO2 (tonnes)	197	43	-	240
Total Spend (€)	155,037	14,802	11,135	180,974

3.3.2. Agriculture

Agriculture is an important sector in the SEC. The Consultant and SEC worked together to identify the key farm types and sizes in the study area. Estimates of energy use are based on direct survey data, extrapolated to the total number of farms. The CSO has 2020 farm data available online:

(https://visual.cso.ie/?body=entity/ima/coa&boundary=C03904V04656&guid=2AE19629208A13A3E055000000000001)

The resolution of the data is by Electoral Division. The SEC area might not overlap perfectly with the boundaries of Electoral Divisions such that not every farm included in the CSO map is included in the SEC area. The Consultant introduces a 'farm factor' to account for the discrepancy. For example:

- SEC area has 5 small areas
- The small areas are within Electoral Divisions containing 20 small areas.
- The Electoral Divisions contain 200 farm holdings (per CSO)
- The CSO data indicates that the SEC has 10 people working in agriculture
- The data for the 200 farms is reduced by a farm factor of 10/200 = 0.05
- The number of farms, hectares, animals, etc. is multiplied by 0.05 to estimate the farm data pertaining to the SEC area only
- This reduced data can then be used for benchmarking the energy baseline

Table 3.3b shows a summary of the SEC farm factor:

Table 3.3b – Estimated number of farms in SEC area

Electroal Division	SEC	Pettigoe		
Area type	SEC area	Electroal division		
Small areas	57126002	57126001; 002		
No. small areas	1	2		2
Total farm holdings	-	72		72
average size (ha.)	-	37		37
Total ha.		2,657		2,657
How many Small Areas contain farms	1			
How many people work in agriculture	6			
Farm factor	0.08			

The farm factor is taken as 0.08. Thus the SEC is presumed to include 6 farms, covering 221 hectares. The summary for the farms in the SEC is as follows:

Table 3.3c – Summary of farms in SEC area				
Electroal Division	Pettigo			Sum
Average size (ha.)	37			
No. cattle	90			90
No. sheep	894			894
Cereal ha.	-			-
Dairy cow	-			-
Other cow	40			40
Total ha.	221			221

The farm data in Table 3.3c is a reflection of the ED as a whole. It is clear that sheep farming predominates and that there is no dairy farming. This has implications for the SEC, as the nature of sheep farming is different from cattle farming or dairy farming and a number of farm opportunities to do with dairies will not apply.

The Consultant audited a number of farms under SSEA in Co. Donegal. As with Pettigo, these farms were from a region where sheep farming predominates. In total, these farms accounted for: 151,000 kWh of electricity, 81,000 kWh of thermal fuel and 278,000 kWh of transport fuel.

These farms, along with the farm audited in Pettigo, act as a benchmark for the farms in the SEC area, with kWh, TCO2 and cost normalised based on farmed hectares. Table 3.3c provides a value for the number of hectares in the SEC area, so the agricultural baseline can be established.

According to Teagasc, the tillage farm of 150 ha. uses 10,500 kWh/y of electricity and 8,500 L/y of diesel. A 100-cow dairy unit uses 30,000 kWh/y of electricity. This can serve as a point of comparison for the SEC area's farms. The Consultant's benchmarking indicates:

Table 3.3d – Summary of farms benchmarking							
Source/type	Ha.	Animal	kWh e	L diesel	kWh diesel	kWh e/ha.;e/an	kWh diesel/ha.;/an
Teagasc tillage	150		10,500	8,500	86,437	70	576
Consultant	221	-	220,360		624,709	995	2,822
Teagasc dairy	-	100	30,000		-	300	-
Consultant		984	220,360		624,709	224	635
Shorthall et al.		1	336		-	336	
Farm Advisor Service (Scotland)		1				200-400	
Farm Advisor Service (Scotland)	1			100	1,017		1,017

Even though the other benchmarking pertains to tillage and dairy farms rather than sheep farms, Table 3.3d provides a useful comparison. On a per-animal basis, the Consultant estimates 224 kWh/y in electricity and 635 kWh/y in diesel. This compares to an estimated 200-400 kWh/y in electricity per animal from other sources. The Consultant estimates 2,822 kWh/y per hectare in diesel, compared to 576-1017 kWh/hectare. However, the estimates from other sources for diesel/hectare are for tillage farms. The Consultant's electricity kWh/hectare is 995 kWh/ha. compared to 70 kWh/ha., so it seems reasonable that the diesel/ha. for a non-tillage farm will be higher than the tillage benchmarks. Thus it seems reasonable that the audited farms can serve as benchmark data to generate an agriculture baseline.

The Consultant's energy benchmarking from the SSEA audits, together with the farm data described in Table 3.3c, provides the following estimate for the agricultural energy baseline:

Table 3.3e – SEC Agricultural Energy, CO2 and Spend				
	Electricity	Fossil Fuel	Renewable	Total
Total Primary Energy (kWh)	385,630	915,127	-	1,300,758
Total CO2 (tonnes)	72	220	-	291
Total Spend (€)	64,071	122,475	-	186,546

3.3.3. Large Industry

The SEC is not host to any large industry. The company Envirogrind/Envirogyp Recycling Systems is located along the road to Laghey near Pettigo but not in the SEC boundary. It appears from aerial imagery to have about 8,500 m^2 of roof space and so could be a suitable site for a large solar PV array (roof-mounted). This company processes wood, garden waste and plaster board into compost via grinding, etc.

It is evident from its business model that environmentalism and sustainability is a key operating philosophy. The SEC could consider approaching them for collaboration in future projects, such as lending expertise in projects, providing funding, or allowing access to their roof space as part of a large solar projects (e.g. under RESS; 8,500 m^2 of roof space could equate to 2,000 kWp of solar).

The waste wood this company uses as a raw material could be used as biomass fuel for heating projects, while garden waste could be used for anaerobic digestion and the production of biogas, heat and/or power. This large company, while not part of the current EMP, could be a useful collaborator in the SEC's future endeavours.

3.3.4. Non-residential sector baseline

The non-residential (commercial & farms) energy baseline is as follows:

Table 3.3f – SEC Non-Residential Energy, CO2 and Spend				
	Electricity	Fossil Fuel	Renewable	Total
Total Primary Energy (kWh)	1,450,089	1,095,035	280,913	2,826,036
Total CO2 (tonnes)	269	263	-	532
Total Spend (€)	219,107	137,277	11,135	367,519

The data in the table above is visualised in Fig. 3.3.2:

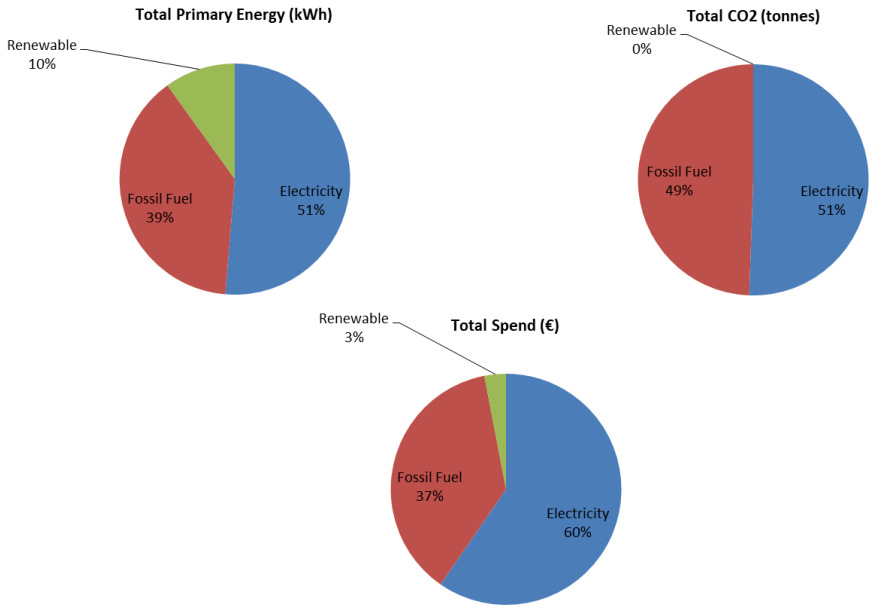


Fig. 3.3.2. The breakdown of kWh, TCO2 and € per energy source for non-residential energy.

It is clear that the electricity is the most significant energy source, at 51% of the kWh, 51% of the carbon emissions and 60% of the cost. Tackling it will significantly affect the overall SEC non-residential baseline. Fossil fuels are the next most significant energy source.

The data in Table 3.3F and Fig. 3.3.2 is for the non-residential energy baseline, including commercial and agriculture energy. These are disambiguated in Fig. 3.3.3 below:

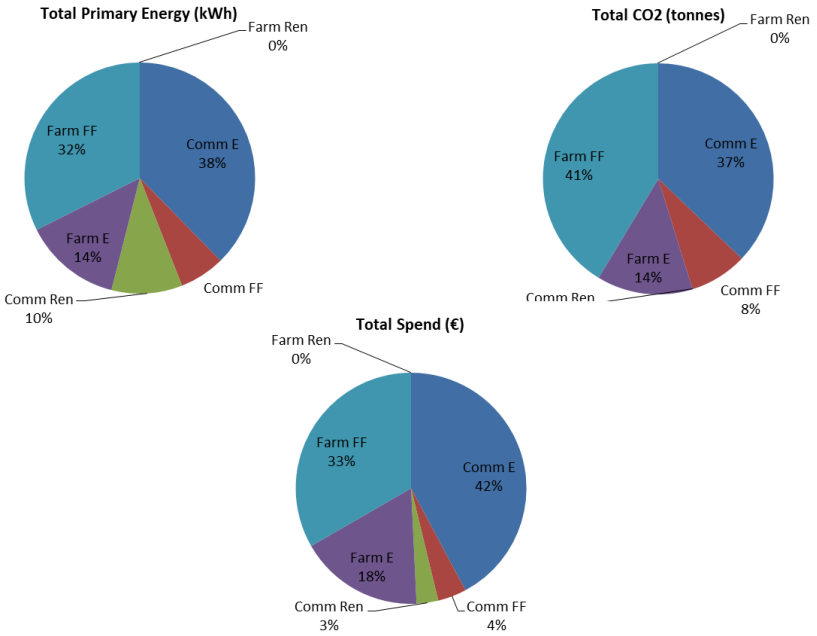


Fig. 3.3.3. The breakdown of kWh, TCO2 and € per energy source for agricultural (Farm) and commercial (Comm.) energy.

It is clear from Fig. 3.3.3 that the commercial electricity is the main energy source, at 38% of the use, 37% of the carbon and 42% of the cost. The SEC might consider tackling the commercial electricity as a priority. The next most significant energy source is the agricultural fossil fuels.

3.4.Transport

The analysis of the transport sector considers the energy consumption and carbon emissions of all vehicles which are normally stationed in the SEC area. Public transport use and active travel will also need to be quantified, as modal shift to reduce car journeys will be a key component of any low-carbon mobility plan.

The consultant worked with the SEC to compile estimates for the total number of cars, motorcycles, vans and trucks in the SEC area. The CSO census was used rather than resort to local survey data, given that the census likely to be the most comprehensive survey available.

Cars are sub-categorised based on fuel type – petrol, diesel or battery electric vehicle (BEV), and vehicle type – either conventional car or SUV. Hybrids (including plug-in) are counted with petrol or diesel cars rather than BEVs.

The following table is used to calculate the total annual distance travelled, energy consumption and CO_2 emissions for each vehicle type. The national stock breakdown is applied in order to calculate energy consumption and emissions (56.9% diesel, 42.7% petrol, 0.4% BEV). For simplicity, it is assumed that all motorcycles are petrol-fuelled and all vans and trucks are diesel-fuelled.

Table 3.4a – Private Vehicle Transport Energy and CO2 impacts

		National average annual km	kWh/km (TPER)	gCO2/km
Car	**Petrol**	12,113	0.73	167
	Diesel	19,681	0.70	167
	BEV	12,958	0.38	65
Motorcycle		2,741	0.41	94
Van		19,787	1.01	243
Truck		44,671	3.47	832

Total annual distance travelled and the associated energy consumption and emissions for each mode is calculated based on the following table:

Table 3.4b – Transport mode energy and CO2 impacts

	kWh/passenger-km (TPER)	gCO2/passenger-km
Bus Éireann	0.129	31
Dublin Bus	0.100	24
Irish Rail	0.100	24
LUAS	0.111	19
DART	0.082	14
E-bike	0.009	2
Walk	0	0

Cycle	0	0

The renewable portion is 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). The information above regarding kWh/passenger/km, etc. is used in conjunction with CSO data (see Figs. 2.1.7, 2.1.8, 2.1.10). The following is assumed:

- 0 kWh/km, 0 gCO2/km for pedestrians, cyclists, Others, Workers from home and Not stated
- Car passengers are the equivalent of Bus Éireann passengers with respect to kWh and carbon
- Car drivers use a weighted average kWh/km and gCO2/km value (based on 56.9% diesel, etc. as described above)

From the data and assumptions above, it is possible to identify kWh/km and gCO2/km values across the spectrum of commute. It comes to 35 kWh/km and 0.01 TCO2/km. The average commuting times from Fig. 2.1.10, along with assumed average speeds per mode of transport, as well as assumed numbers of trips per year, provide the total km/year and therefore the total kWh/y and TCO2/y. The assumed average speeds are as follows:

- On foot = 3 km/h
- Bicycle = 9 km/h
- Bus, train, motorcycle/scooter, car (driver & passenger), van = 60 km/h
- Other, work-from-home, not stated = 0 km/h

The weighted average speed and weighted average commute times across the modes of transport provide the following estimates across the SEC:

- 828 kWh/trip
- 0.20 TCO2/trip

For the total number of trips, the following is assumed:

- 2x trips per day, 6x days per week, 52x weeks per year
- 2 x 6 x 52 = 624 trips/year

The number of trips per year is used to estimate the total kWh and TCO2 per year, however there is a renewable share of this energy. It is calculated as a weighted average based on the mix of cars (diesel, petrol, BEV) described above and the renewable shares of each fuel described above. It is assumed that:

- Buses, trains, vans, trucks = diesel only
- Motorcycles/scooters = petrol only
- Car driver, passenger = weighted average for diesel, petrol, BEV

An overall renewable energy share is established and applied to the total kWh and TCO2 values above. The renewable share is assumed to (a) carry no carbon emissions and (b) subtract from the total carbon-emitting kWh, thus reducing the TCO2 from the value above. The energy baseline is summarised as follows:

Table 3.4c – SEC Transport Energy, CO2 and Spend				
	Electricity	Fossil Fuel	Renewable	Total
Total Primary Energy (kWh)	-	540,708	27,952	568,660
Total CO2 (tonnes)	-	116	-	116
Total Spend (€)	-	45,927	-	45,927

The total kWh is approx. 570,000 kWh/y and 116 TCO2. Per Figs. 2.1.7 and 2.1.8, the rates of walking to work are above the State norm but cycling to work of school is below the norm. The SEC might consider investing in superior walking/cycling infrastructure, if possible, to increase uptake. According to the data present in Figs. 2.1.7, 2.1.8 and 2.1.10, 27% of the people have a commute of under 15 minutes but only 10% walk or cycle. This might indicate that there is scope to increase the uptake. The SEC might review the walking/cycling infrastructure and the availability of bicycles/E-bicycles.

The SEC seems to have a good uptake of people working from home. Per Fig. 2.1.11, approximately 14% of people appear to work in jobs relating to administration and sales (it is assumed that these could be performed from home) while 12% of people work from home. The SEC could review whether more people could work from home and liaise with employers to facilitate this.

Carpooling could be a solution the SEC investigates. Currently, nobody appears to travel to work as a car passenger while 27 drive. There may be scope to improve passenger numbers and reduce traffic, especially as 10 people travel to school as passengers. 10 people also travel by bus to school and none travel by bus to work. The SEC might consider whether the available bus routes might serve working people, either in mixed buses or by providing extra buses. There is no park & ride in the area but the SEC could consider whether it is feasible. The SEC should liaise with local schools to see whether any have sustainable travel programs. If so, then the SEC might try to emulate them on a wider scale or else if not, work with the schools to implement such programs.

Per Fig. 2.1.9, most homes have a single car or no car. This might mitigate against EV uptake since the perceived risk in an EV might seem greater when there is no reserve car. There appears to be no charging infrastructure in the SEC, which would further mitigate against EVs. There are two petrol stations (one in the SEC, one nearby) where the SEC could consider installing chargers. The Termon Complex is another candidate location for chargers. Many homes are on the main street, so plugging cars into them would block the footpath. The SEC should consider preparing adequate EV infrastructure before encouraging EV uptake.

3.5.Energy Baseline

The findings from each sector are summarised in the following table:

Table 3.5a – SEC Primary Energy Baseline (kWh)				
Sector	Electricity	Fossil Fuel	Renewable	Total
Residential	598,808	2,143,219	41,650	2,783,677
Non-residential	1,482,494	803,726	280,913	2,567,133
Transport	-	540,708	27,952	568,660
Other				-
Total Energy	2,081,303	3,487,653	350,514	5,919,470

The share of the total baseline energy is visualised in Fig. 3.5.1:

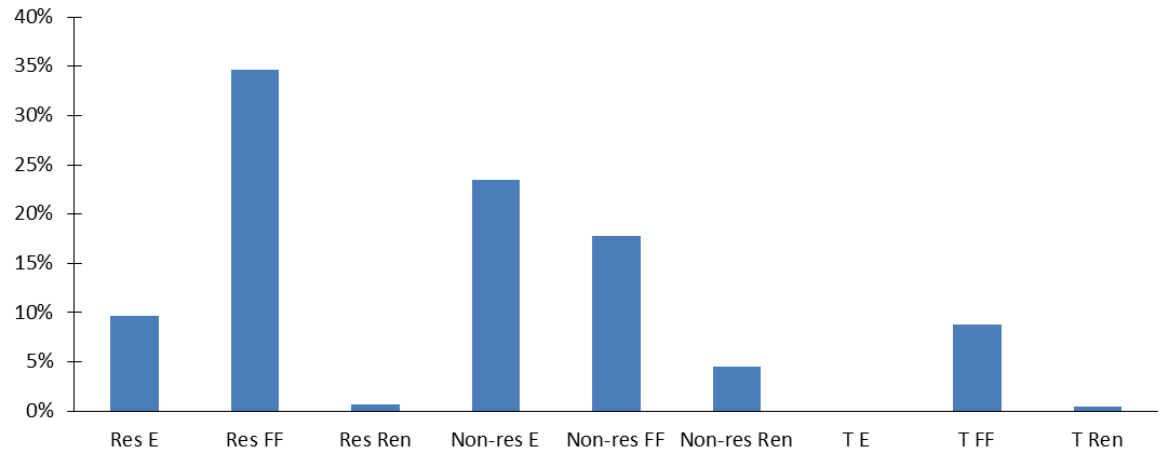


Fig. 3.5.1. The share of baseline energy by energy source and sector

In Fig. 3.5.1, the following nomenclature is applied:

- Res = Residential
- T = Transport
- Non-res = Non-residential
- E = Electricity
- FF = Fossil fuels
- Ren. = Renewables

It is clear from Fig. 3.5.1 that the Residential fossil fuels are the greatest share of the baseline energy. This should be prioritised via (a) residential fabric upgrades, (b) residential renewable heating, and (c) behavioural change.

More broadly, the electricity use can be tackled with renewables like solar PV, as well as behavioural changes, energy metering and equipment/process improvements (non-residential). Transport fuel can be tackled with EVs, public transport, carpooling and walking/cycling, as discussed in Section 3.4. The commercial and agricultural fossil fuels can be tackled with process/equipment improvements, heat-recovery, and possibly renewables like biomass or biogas. The SEC might also consider carbon-capture via tree-planting as an option.

4. Sustainable Energy Roadmap

The Sustainable Energy Roadmap is an important output for the SEC and is separate to the Register of Opportunities. The analysis provides a general path or plan for the SEC to reach each reduction target: 30% CO2 reduction, 50% energy reduction and 30% renewable energy generation by 2030.

The Roadmap is separate from the Register of Opportunities but related since some of the ROO pertains to meeting the 2030 targets. However, it is important that the SEC have an informed perspective on the scale of the challenge faced in moving from their baseline to achieving 2030 reduction targets.

From Section 3, the baseline is as follows:

Table 4a – SEC Energy baseline and 2030 targets			
	pKWh	TCO2	RER
Baseline	6,178,373	1,374	6%
2030	3,089,187	962	30%
Saving/Improvement	50%	30%	24%
Saving	3,089,187	412	24%
Saving/improvement per year	617,837	82	5%

It is clear from Table 4a that the SEC would have to save over 590,000 primary kWh/y and 79 TCO2/year. For context, this is the equivalent of removing 19 homes per year in terms of kWh or 10 homes per year in terms of TCO2.

While the scale of the challenge might seem daunting at first, the Consultant notes the following:

- The primary energy factor associated with electricity reduces year-on-year. It was 2.09 kWh/kWh, is now 1.75 kWh/kWh, and is expected to be 1.3 kWh/kWh by 2030. Thus the primary electricity kWh/y will reduce by 26% even if the SEC does nothing. This is due to the increase of wind- and solar energy supplying the grid.
- Decarbonisation through renewable projects (e.g. solar, biomass) not only increases the Renewable Energy Ratio (RER) but also reduces the TCO2. Thus two of the 2030 targets are tackled at the same time
- The 2030 target is aspirational rather than a fixed goal. The SEC might not literally meet the targets by 2030 but the EMP will encourage them to put in place processes, establish practices and implement projects that move them in the direction of the targets
- As the SEC is a community, the effort is shared across the community so the burden on individual members is less daunting and the collective effort sums to a significant whole

As the renewable energy opportunities satisfy both the RER and carbon targets, it is important to review the SEC's suitability for different technologies.

Solar PV:

Solar PV converts solar irradiance from the sun to electrical energy. This can be used in place of grid electricity. The SEC should consider different factors when approaching solar PV. Key to the performance and savings of solar PV is the solar irradiance to which it is exposed.

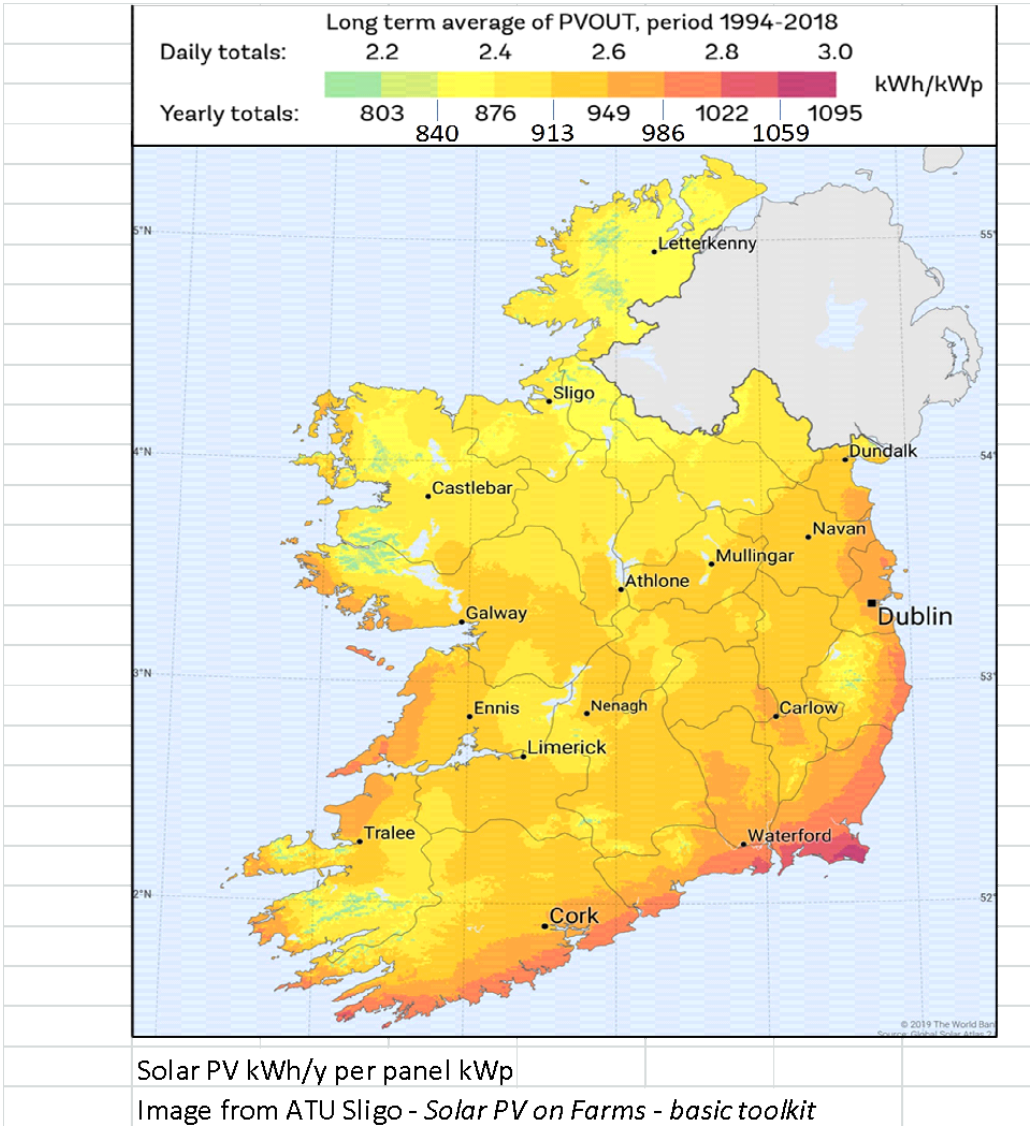


Fig. 4.1. The kWh/kWp of solar across Ireland

It is clear from Fig. 4.1 that the output from a solar PV panel varies depending on where it is installed. 1 kWp of solar PV can generate over 1,000 kWh/y in Co. Wexford compared to 850 kWh/y in Co. Donegal. However, solar PV is clearly viable throughout the country. The SEC should bear this in mind considering where they are located so as to avoid overestimating the effect of solar PV. The Consultant has calculated solar PV savings with Fig. 4.1 in mind.

Table H2: Annual solar radiation, kWh/m²

Tilt of collector	Orientation of collector				
	South	SE/SW	E/W	NE/NW	North
Horizontal	963				
15°	1036	1005	929	848	813
30°	1074	1021	886	736	676
45°	1072	1005	837	644	556
60°	1027	956	778	574	463
75°	942	879	708	515	416
Vertical	822	773	628	461	380

Solar PV kWh/y per m2, based on orientation, inclination
SEAI DEAP manual 4.2.6

Fig. 4.2. The kWh/m² of solar, depending on orientation and inclination angle of the panel

It is clear from Fig. 4.2 that the orientation and inclination of the solar PV plays a significant role in the solar output. A south-facing panel at 30 degrees is the best combination, with a vertical, north-facing panel the worst. The SEC should bear in mind what orientations and angles are feasible for each solar PV array in order to maximise output and savings.

Additionally, the level of overshading can affect the solar PV output; if the PV panel is in a shadow, it receives less irradiance than if in direct sunlight.

Table H3: Overshading factor

Overshading	% of sky blocked by obstacles.	Overshading factor
Heavy	> 80%	0.5
Significant	> 60% - 80%	0.65
Modest	20% - 60%	0.8
None or very little	< 20%	1.0

Solar PV overshaidng factors
SEAI DEAP manual 4.2.6

Fig. 4.3. The overshading factor to apply to solar PV output

It is clear from Fig. 4.2 that heavy overshading can reduce the nominal solar PV output by 50% and modest overshading by 20%. The SEC should bear this in mind when selecting locations for solar PV arrays.

It should be noted that Fig. 4.1 assumes optimal PV panel orientation and inclination. That is to say, the 1,000 kWh/y in Co. Wexford is not then hampered by poor angles, inclinations or over-shading factors. Thus the actual solar PV the SEC might consider could generate less electricity per year than suggested in Fig. 4.1, depending on orientation, inclination and overshading.

Solar PV installations fall into three main categories: Home-energy, Micro-generation, and large-scale generation. There is a separate funding stream for farms, known as TAMS III

- Home Energy: This is a grant for solar PV up to 4 kWp and €1800, as described in Fig. 4.4. Further information can be found at: https://www.seai.ie/grants/home-energy-grants/individual-grants/solar-electricity-grant
- Micro-generation: This is a grant for solar PV up to 1,000 kWp and €162,600, as described in Fig. 4.5. Further information can be found at: https://www.seai.ie/grants/business-grants/commercial-solar-pv
- SRESS: For solar PV from 50 kW to 6 MW. Up to 1 mW is covered by the microgenetation scheme. From 1 MW to 6 MW solar, or up to 6 MW wind, SRESS provides grid feed-in tariffs to cover the costs. Community projects have slightly higher tariffs than SMEs. From 2026, micro-generation projects will also receive the fed-in tariffs https://www.gov.ie/en/publication/96110-small-scale-generation/
- Large-scale generation: For installations over 1,000 kWp, the SEC might consider applying to the Renewable Electricity Support Scheme. It is a competitive auction process and the supports available depend on the proposed annual kWh output. RESS has a certain number of GWh (1 GWh = 1 million kWh) for auction. Different projects bid for their right to supply portions of the total kWh, e.g. 3 million kWh might be split among 6x 500,000 kWh projects. The bids are awarded based on cost per kWh output (e.g. the average successful RESS solar project cost €0.105/kWh in 2024). There are specific auction timetables during the year. If the energy company succeeds with their application, they will pay €2/MWh produced per year into a Community Benefit Fund. This fund is then used to fund other community projects (not necessarily energy projects). People living in close proximity to the solar PV array can receive direct payments from the fund. For example, a 5,000 kWp solar farm, generating 4 million kWh/y will pay €8,000/y into the Community Benefit Fund for use in the community. Further information can be found at: https://www.eirgrid.ie/industry/renewable-electricity-support-scheme-ress
- TAMS III: This is a grant for solar on farms. The grant covers 60% of costs and the grant value is up to €90,000. Further information can be found at: https://www.gov.ie/en/service/6ab0f-solar-capital-investment-scheme/

Grant value for solar electricity

**the grant is paid on a pro rate basis e.g. for a 2.5kWp system the grant value would be €1500*

Grant name	Value	Example
Solar PV grant	€700 per kWp up to 2kWp	€1400 for 2kWp solar panels
	€200 for every additional kWp up to 4kWp	€1600 for 3kWp solar panels
	Total Solar PV grant capped at €1800	€1800 for 4kWp solar panels

https://www.seai.ie/grants/home-energy-grants/individual-grants/solar-electricity-grant

Fig. 4.4. Home-energy grants for solar PV

The grant amount you receive is based on the standard output of your solar PV system. A solar PV system with an output of a maximum 1000kWp can be grant funded through the scheme. If the system installed is larger than 1000kWp, then the applicant may apply for the maximum grant offering of €162,600* and this is available for systems from 1kWp to a maximum of 1000kWp.

*Figure based on the maximum grant offering

Solar PV system	Grant value
1kWp*	€900
2kWp	€1,800
3kWp	€2,100
4kWp	€2,400
5kWp	€2,400
6kWp	€2,400
7kWp - 20kWp	€300/kWp
21kWp - 200kWp	€200/kWp
201kWp - 1000kWp (1MWp)	€150/kWp

https://www.seai.ie/grants/business-grants/commercial-solar-pv

Fig. 4.5. Business micro-generation grant breakdown

The home energy grant is the most suitable for homes and the micro-generation scheme most suitable for individual businesses (businesses tend to have more room for larger arrays plus they tend to consume more electricity and their operating hours tend to mostly be by day). The larger the proposed solar PV array, the more extra considerations arise: electrical substations, grid-export licences, etc. The SEC should carefully consider implementing large solar arrays.

It is also noted that solar PV does not have a constant energy output during the year. The typical annual output per month is described as follows:

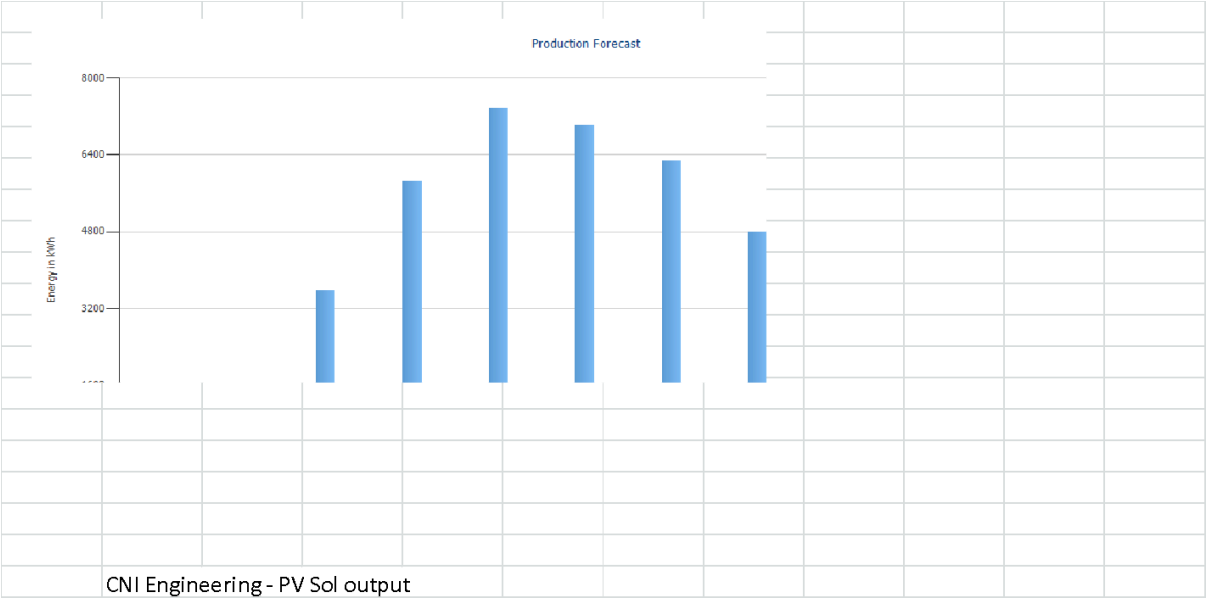


Fig. 4.6. Typical monthly trend for solar PV output

It is clear from Fig. 4.6 that the solar PV generation is mostly in the summer months. The SEC should consider this when applying for solar projects – does the consumption profile of the home/business match the profile in Fig. 4.6? The Consultant has taken such a trend into account an, as part of SSEA, always recommended solar PV that would see at least 50% utilisation. Where solar power is not utilised, it can be exported to the grid for €0.135/kWh. The SEC can consider this a possible income stream for future projects, aside from the financial savings associated with solar power replacing grid electricity.

The SEC should also consider that, like in Fig. 4.6, solar PV has a daily output trend too. This is described in Fig. 4.7:

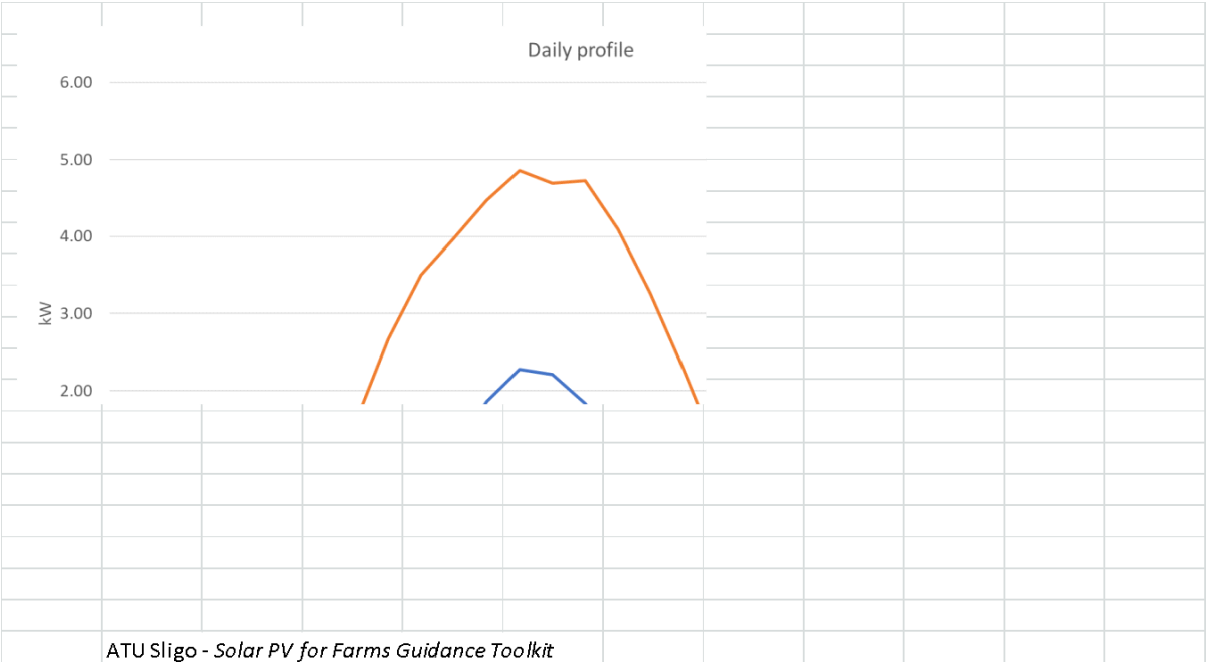


Fig. 4.7. The daily solar PV output profile for June (higher) and January.

Fig. 4.7 Displays the obvious limitation of solar PV – it does not produce electricity at night. The SEC can consider a number of ways to store electricity that is not used by day in order to use it at night, assuming the SEC does not want to export the surplus solar power to the grid.

The surplus energy can be stored in batteries, which can be discharged overnight. Battery technology has advanced rapidly in recent years and most solar PV providers can also provide appropriate battery storage. Alternatively, the surplus solar energy can be diverted into hot water via immersion heaters. This can be particularly attractive for houses, where the hot water would otherwise use fossil fuels or grid electricity. It might also be beneficial for farms and businesses with hot water demands – such as for wash down (e.g. a dairy farm washing out milk tanks, a kitchen washing dishes), or showers (e.g. a GAA club). Solar PV providers can easily provide EDDI hot water diverters to redirect surplus electricity towards hot water heating.

Wind:

The SEC might consider wind turbines as a source of renewable energy. Wind has some advantages over solar PV, most notably the ability to generate electricity at night. However, wind turbines need space so it is likely that they can only be installed on farms or elsewhere with copious space. Furthermore, the main government support for wind energy is RESS, which mitigates against a small-scale application.

The SEAI provides a Wind Atlas, which the SEC might find useful for guidance on the feasibility of wind: https://experience.arcgis.com/experience/adeb20a08bdd477082a3975b3483cce6

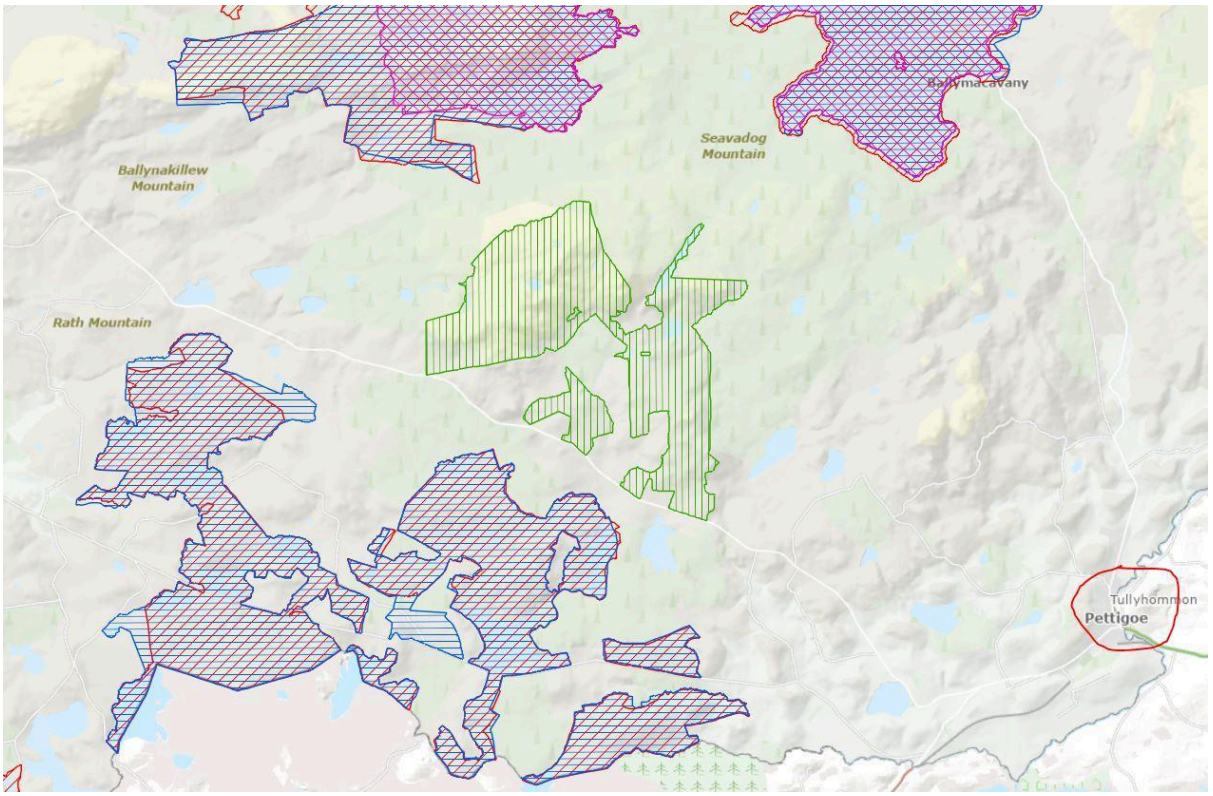


Fig. 4.8. The SEC area; current and contracted wind farms nearby; areas of special conservation, special protection, natural heritage. The SEC area is circled.

It is clear from Fig. 4.8 that there are no wind farms in the SEC's vicinity, nor have any been contracted. This would indicate that the area has already been found unsuitable for wind energy. Part of the reason might be the various areas of protection/conservation:

- To the north is the Lough Derg Special Protection Area (SPA)
- To the northwest is the Lough Fad Bog Natural Heriage Area (NHA)
- To the west is a proposed NHA of Tamur Bog
- Further afield is the Dunragh Loughs/Pettigo Plateau Special Area of Conservation (SAC), also to the northwest

Therefore it seems unlikely that any large-scale wind power is feasible. However, small-scale wind located on individual farms might be something for the SEC to consider, if they are found to be feasible.

Hydro:

The SEC might consider hydro turbines as a source of renewable energy. However, hydro turbines needs water sources with adequate flow and head, so suitable sites can be limited.

The SEAI provides a Hydro Atlas, which the SEC might find useful for guidance on the feasibility of hydro: https://experience.arcgis.com/experience/89eb4f55bb9c4eecb86be02b47ed7497

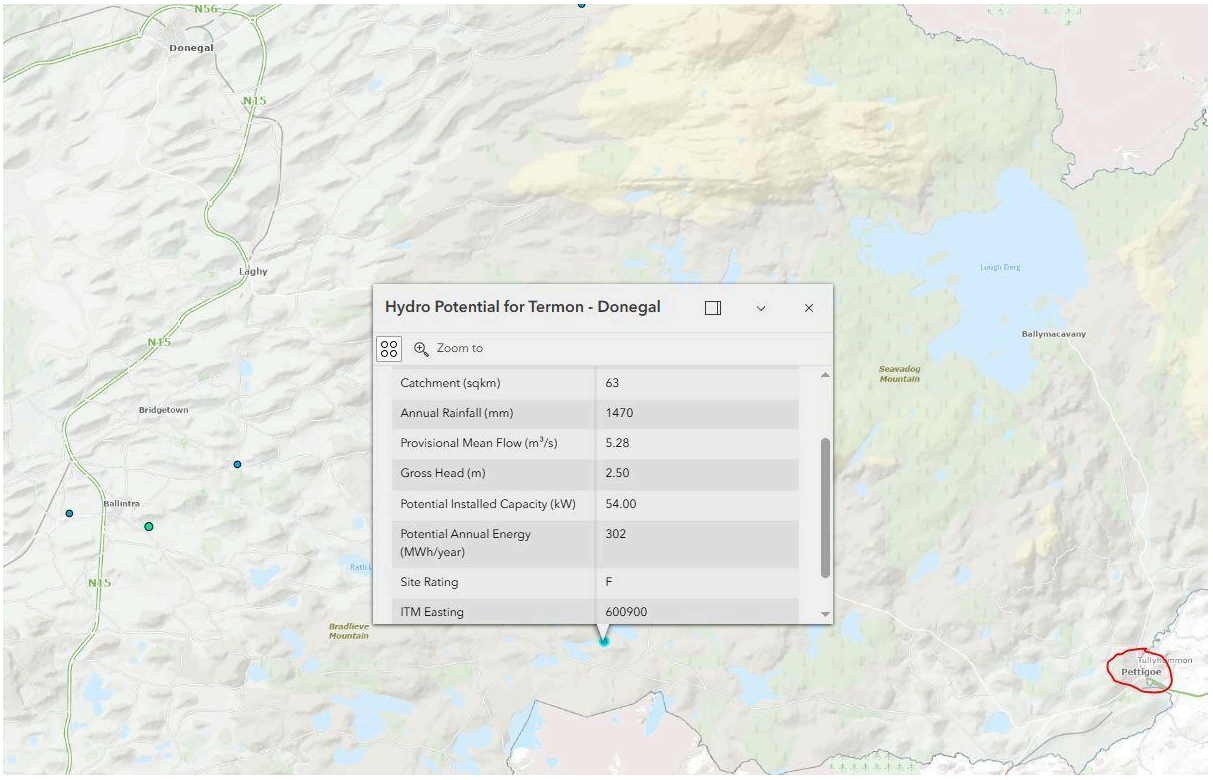


Fig. 4.9. The SEC area current and potential hydro sites. The SEC area is circled.

It is clear from Fig. 4.9 that there are no hydro sites currently in the SEC area, despite the presence of the river Termon, and only one potential site had been identified by the SEAI, remote from the SEC area. This site is on the river Termon and has a potential of 54 kW, producing 302,000 kWh/y. The SEC might consider a hydro project to realise this potential. However, the potential site is within the proposed Tamur Bog NHA (Fig. 4.8), so the SEC might find this site unfeasible.

Biomass:

From the energy baseline data, it is clear that alternatives to fossil fuels are needed for the SEC to meet its 2030 targets. Biomass is a renewable fuel. Examples include wood logs, wood chips and wood pellets. Even though they are burned as fuel, they are considered renewable because by definition, any carbon present in the wood was originally removed from the air through photosynthesis. Thus any carbon emissions released through burning are balanced by the carbon absorbed in order to grow the wood in the first place.

The chief concern with biomass is fuel storage and supply. Biomass is not as energy-dense as fossil fuels: biomass typically has 4.5 kWh/kg compared to 7.6 kWh/kg for coal or 14.0 kWh/kg for LPG (per SEAI commercial fuel cost comparison). Thus for the same number of heating kWh, significantly more kg of biomass is needed and this fuel must be stored. Furthermore, the fuel's kWh/kg reduces if it gets wet, since the moisture is non-flammable. The SEC might consider where fuel can be stored if implementing biomass heating projects and whether the storage should be communal or individual.

The SEC can consider whether biomass is suitable based on the baseline fossil-fuel demand. Large, individual thermal users (e.g. schools) might find biomass a practical replacement for fossil fuels compared to heat pumps as (a) the technology is similar in principle (boiler technology), (b) the costs of heat pumps might balloon rapidly with increasing heat demand compared to boiler costs, and (c) large heat pump installations might lead to issues with MIC, electricity costs, etc. The Consultant has found consistently across hundreds of SSEA audits that the cost of electricity per kWh is multiple times that of the cost of fossil fuels so a large thermal energy user might find heat pumps unaffordable to run long-term.

The SEC might also consider whether it is feasible to grow biomass via coppice woods. These are fast-growing woods that can be harvested for fuel. The feasibility of such a project has many variables, including:

- Area of land dedicated to growing trees (affects how many trees can be harvested, how much fuel is available)
- Tree species (affects how long it takes for wood to mature, the frequency of harvesting – if it takes 20 years to mature then only 5% of the trees can be harvested per year to give time for the first batch to be replanted and grow to maturity)

Growing biomass will assist with fuel-security in the community but the SEC might also consider tree-planting not as a source of fuel but as a carbon-capture method (growing the woods removes carbon from the atmosphere), as well as a habitat for birds, rodents and insects. The Teagasc Neighbourwoods Scheme is designed to provide forestry and recreational facilities: https://www.teagasc.ie/crops/forestry/grants/neighbourwoods/

The Neighbourwoods Scheme provides a grant and an annual premium for a set number of years. This could provide the SEC with funding for future projects as well as provide a new forestry amenity.

Biogas:

The SEC might consider whether LPG or natural gas is used in the area. Biogas is an alternative; it is used in an identical manner but is considered renewable. The SEC could pursue biogas as simply as

arranging for members of the community to purchase bioLPG rather than normal LPG. Alternatively, the SEC could attempt to produce biogas and use it, possibly as an alternative to oil.

Biogas is essentially methane and is emitted by rotting organic matter. On a large scale, the SEC could investigate whether biogas can be produced on farms in the area through a process called anaerobic digestion. Here, bacteria breaks down material such as slurry, silage, etc. and releases methane, which is gathered and stored. The Irish Government aims for 5.7 TWh of energy from biogas by 2030 (Ireland's Draft National Biomethane Strategy, January 2024), across anything up to 250 dispersed plants. The SEC could receive much interest and support by helping to meet the national biogas target. The SEC could approach local farms to determine suitability and willingness to produce biogas, as well as any potential biogas users in the SEC or beyond (e.g. the hospitality sector often uses gas for cooking and not just heating so hotels and restaurants could be prime biogas consumers should the SEC produce any; selling the biogas could help to fund future projects).

On a small scale, food waste can be turned into biogas through a similar process. A product known as GUG (https://mygug.eu/) is a small-scale system for producing biogas, which can be used for cooking. The scale in question here is 5.5 kg to 18 kg per day in food waste, so the SEC might consider piloting them in restaurants or hotels or even homes.

It should be noted with both GUG and larger anaerobic digestion that the gas production depends on heat – the colder it is, the less active the bacteria. At a large scale, some of the gas can be burned to heat the digester while the GUG uses electricity to heat it. The SEC might have to consider whether the energy invested in the biogas production justifies the energy from the biogas.

Other:

The SEC might consider different applications of the above technologies:

- Biomass gasification: This is a process where biomass is heated, but not burned, to release flammable biogas, which can then be used as an alternative to LPG and nat. gas. One application is biomass CHP – where biomass is used to fuel an electricity generator that also uses its waste heat to provide heat.
    - CHP typically produces electricity and heat at a ratio of 1:2, so the SEC should carefully consider whether any member of the community has a matching consumption profile.
- Thermal batteries: This is a process where electric heaters (e.g. powered by solar, wind, hydro) heat an insulated silo filled with sand or salt. The sand can be heated to hundreds of degrees Celcius and then retain the heat for a period of weeks. This heat can then be used to provide space heating or hot water on demand. This might be of use to someone with a large thermal demand (e.g. drying harvested biomass, heating a hall, etc.)
    - Sand batteries can even be used to convert heat back to electricity on demand through the use of ORC turbines and Stirling Engines
- Hydrogen production: Vehicles, such as forklifts, fuelled using pressurised hydrogen tanks are competitive in terms of performance with electric vehicles using Lithium-Ion batteries, except that they recharge much more quickly. Solar/wind/hydro power along with electrolysers can produce hydrogen gas, which could then be used to fuel vehicles as an alternative to fossil fuels.

- Modular electrolysers can be mounted to farm vehicles; they produce hydrogen gas and mix it with the air for the diesel engine. This has been found to improve the engine's fuel efficiency.

The SEC's suitability is reviewed by the Consultant and summarised in Table 4b, below:

Table 4b – Local Renewable Energy suitability

Technology	Scale range (kW, MW)	Target application	Suitability (RYG rating)	Rationale
Wind	0 kWp to 100 kWp	Farms; individual turbines		No scope for large-scale wind generation. Some individual farms might be suitable.
Solar PV	2 kWp to 1,000 kWp	Homes, farms, businesses		Technology is well-understood and affordable; solar installations are actively encouraged; few issues with over-shading on available roof spaces
Solar PV	>1,000 kWp (RESS)	RESS solar farm		Unclear if there is any site for such an array; enough demand to justify it; enough infrastructure to cope with it (substations, etc.) or whether an application could win the RESS auction. Envirogrind could play host but are not part of the SEC. Large solar PV appears beyond the scope of this EMP
Hydro	0 kW to 100 kW	Potential site at Tamur Bog		The SEAI has identified the site as having potential; SEC might consider it in future works – the location is outside the SEC area
Biomass	0 kW to 100s of kW	Any businesses/farms that are identified as suitable via SSEA		Technology is well-understood; biomass will be sized to suit demand as identified by energy audit
Biogas	0 kWh/y to 1,000,000 kWh/y	Farms		Currently no biogas infrastructure; SEC should conduct a feasibility study and analyse the logisitics of transporting organic matter/biogas/waste
Wood planting (carbon-capture)	0 ha. to 100 ha.	Private land, farms		Simple in principle; SEC could identify willing participants and local waste ground
Biomass CHP	0 kW to 100 kWe	Businesses, farms		The logistics involved in securing biomass, gasifying it and then using it in CHP might be a challenge; identifying suitable CHP to match electricity/heat demand profiles might be

				challenging; O&M of CHP might be a challenge
Thermal battery – heating	0 kWh/y to 1,000,000 kWh/y	Businesses, farms, district heating		The energy needed to produce the heat might require extra solar, etc. or extra grid electricity; the SEC would need to identify where and when heat is needed; how large a thermal battery is needed; where such a battery can be sourced and sited; the SEC might have to consider district heating. This could be challenging beyond the capacity of the SEC at present
Thermal battery - electricity	0 kWh/y to 300,000 kWh/y	Businesses, farms, homes		Extra step of complexity versus using the battery for heat: would require specialist equipment like ORC turbines or Stirling engines, with the attendant O&M
Hydrogen production	0 kWh to 100,000 kWh/y	Businesses, farms		Modular electrolysis kits for farm vehicles might be feasible; large-scale hydrogen production, storage and use might be beyond the SEC's capacity

The Consultant reviewed the energy baseline and estimated energy savings associated with a number of opportunities. These are available in the ROO. It is clear from Table 3.5a and Fig. 3.5.1 that the residential energy is a significant portion of the total baseline. It is noted in Table 3.2a that only 6% of homes in the SEC are rated B or better. Thus up to 85 houses could benefit from retrofitting to a target of B2. This equates to approx. 17 houses per year retrofitted. The retrofits are taken to include fabric upgrades, heat pump installations and solar PV installations.

For the non-residential sector, a number of projects are possible. These range from solar PV and building fabric upgrades to changes to training and behaviour regarding energy-efficiency practices. These are identified through energy audits and extrapolated to the SEC as a whole to indicate how they might contribute to the 2030 targets. The measures are included in the ROO.

For EVs, an assumed 2030 uptake of 20% to replace some of the current SEC cars is used to recalculate an improved transport baseline and thus calculate savings. The number of EVs involved is described in Table 4c, below:

Table 4c – Plan to 2030			
	Number of projects	Primary Energy saving (kWh)	CO2 saving (tonnes)
No. houses to be refurbished to a B2	85	1,452,351	657
Potential from commercial sector	80	2,081,580	515
Potential from Public Sector			
Renewable Energy potential*	165	1,723,949	700
EV potential	18	49,783	13
Other			
Total saving potential	183	3,583,714	1,185
*Note that the Renewable Energy Potential is a subset of the houses and Commercial - not to be double-counted			

The results in Table 4c are put into context in Table 4d with respect to the 2030 targets:

Table 4d – Plan to 2030			
	Primary Energy saving (kWh)	CO2 saving (tonnes)	RER
Total saving potential	3,583,714	1,185	1,723,949
Total saving potential (%)	59%	87%	82%
Total saving potentil (%), with change to primary electricity factor	61%		

It is clear from Table 4d that the SEC's 2030 targets can be met. The carbon and renewable targets in particular can be met. The kWh savings can be met by a narrower margin but can still be met. Therefore the SEC can proceed with confidence that it can contribute to the national climate targets as well as reduce energy consumption and costs in the SEC area.

5. Register of Opportunities

The Register of Opportunities provides the foundation block to establish the SEC's 3-year sustainable energy roadmap. It is to inform future applications to the Community Energy Grant programme from SEAI (or other suitable funding streams) for priority energy efficiency and renewable energy projects for the SEC.

The register of opportunities is available as a separate document, an Excel spread sheet. It contains a number of opportunities, of which a number represent general, SEC area-wide opportunities in order to meet the 2030 targets. The remainder are based on SSEA recommendations and the domestic BER advisory reports generated as part of the EMP. The register of opportunities spread sheet includes predicted kWh, cost and carbon savings; as well as estimates of investment costs and simple payback periods. The spread sheet includes assumptions for €/kWh prices and $kgCO_2$/kWh values per fuel type (e.g. electricity, oil, LPG, or a generalised fossil-fuel value). The SEC should note that the ROO displays delivered kWh values, not primary kWh values. This is in contrast to some of the tables earlier in the report.

The availability and impact of grants/supports is not included in the ROO spread sheet. Most of the opportunities can be grant-aided. The SSEA recommendations generally include a potential support and the BER advisory reports say whether certain upgrades have grants available. A summary of different grants/supports/loans is provided in the appendix. Supports can be sought for individual actions or for bundles of actions, depending on the actions. The SEC should pay close attention to how grants are provided – are they provided up-front, in instalments, or retrospectively?

Regardless of supports for actions, the SEC should seek to generate some income as part of the EMP in order to support future projects. For example, a Year 1 project might be for solar PV; in Year 2, the revenue from exporting surplus solar energy to the grid can assist with the costs of the Year-2 projects.

Table 4c indicates how many projects are needed to achieve reduction targets by 2030. The SEC could aim to complete 20% of these projects per year. However, it is noted that the Consultant prepared the ROO but their perspective is technical – what new processes, equipment, controls, etc. can deliver savings? The SEC must not lose sight of their role as a community; community-engagement is a key output of the EMP even if it has no quantifiable energy savings. Therefore, apart from the ROO spread sheet, this EMP section can recommend a number of actions to the SEC.

Dissemination of the EMP:

The SEC should disseminate the EMP to the community. The EMP carries important information that is pertinent to the community – the energy baseline, information on supports, etc. The SEC should consider presenting the EMP via information nights, or a similar method, a possibly target different nights for different members of the community – homeowners, businesses, farms, schools, GAA clubs, etc. These different sectors have different energy baselines, opportunities and supports available to them so it seems logical to address them in their own right. That way, the different members of the community can receive targeted guidance and information.

The EMP itself should be published in hardcopy and available from a public amenity for the community to access, e.g. a library, a specific shop or business, etc. It might be useful to provide the appendix listing the potential supports separately, as this could be the most relevant document for many people.

The SEC might also generate posters with summaries of different parts of the EMP and directions on where to find the EMP in full, as well as give notice of information nights. The SEC might also consider preparing a presentation, or making available the information-night presentations, available online for the community to peruse at their leisure.

The SEC might find it useful to disseminate the EMP to Tullyhommon, across the border. Many of the opportunities identified in the EMP are likely applicable across the border, given the similar baseline scenario with respect to the residential sector (Table 3.2c), as well as possibly other sectors like agriculture.

Community engagement:

The SEC can take steps to enable the community to participate in energy-saving even without applying for specific projects. There is a body of literature that suggests that behavioural changes can

lead to significant energy savings for no cost. The SEC should obtain a stock of simple tools to help with energy-efficiency, such as:

- Laser thermometer guns: These can be used to check for gaps in insulation, cold-bridging, etc. in a home of business that is otherwise invisible to the naked eye (a spot on a wall will be of a significantly different temperature compared to adjacent spots). It can also reveal if radiators are in fact producing heat.
- Temperature cards: These cards change colour depending on the temperature and have a temperature scale printed on them. This allows a homeowner to measure the temperature in a room at any given moment. The card also has information about what temperatures are appropriate for different types of room. This can help people to reduce heat and save energy if the temperatures are excessive.
- Electricity monitors: These plug into the socket and appliances plug into it. Thus the monitor can record how much electricity the appliance consumed while it was plugged in. This can give people an indication of what appliances use more energy than others (and therefore whether special care is needed to switch them off when not in use)
- Energy checklists: These can be simple checklists of energy-saving actions that people can follow at home or at work – reminders to switch off lights, to draw curtains at night to conserve heat, to set HVAC temperatures appropriately, to maintain boilers, etc. This list should provide indications of what savings are possible.

In each case, the SEC provides the community with the tools and knowledge to take action themselves. Apart from the energy savings, this will foster a sense of progress and make the EMP tangible.

The SEC might also maintain a list of completed project, keep it updated, and display it somewhere prominent. Thus as the months and years pass, the community remains aware that there is an EMP and that they are a part of it. It might also be worth completing specific projects on small-scale, even pilot projects, like Passivhaus designs or public EV chargers. These will serve as permanent, physical reminders in the community that there is an EMP.

The community engagement need not be limited to Pettigo. Tullyhommon, immediately over the border, could benefit equally from the community engagement described above.

<u>Selection of Year 1 opportunities:</u>

The SEC has a variety of projects from which to choose in the ROO. Some are direct outputs from SSEA audits and pertain to specific measures for specific buildings. Some are for specific houses to be upgraded. Others are broader in scope to reflect the 2030 energy targets. The SEC should begin with projects that are (a) simple in concept, (b) inexpensive, and (c) rapid to implement. Some examples are as follows:

- Energy management training: This is similar to some of the actions described as part of community engagement. This is essentially housekeeping when it comes to energy. You could apply this measure to all energy users – checking things are switched off or set to the correct settings, etc. The savings arise from the assumption that things will drift away from energy efficient practices over time unless a conscious effort is made to maintain them. Part of this would be to keep a record of what is being done, have a written policy, and to report findings

at regular intervals so that the conscious effort is maintained. In general, this does not cost any money to implement.

- LED lighting: Replacing non-LEDs with LEDs is simple, rapid and is known to save energy.
- Attic insulation: Horizontal insulation over a ceiling can be added simply and quickly and have immediate effects.
- Energy metering: Similar to the energy monitor above, this will provide people with concrete data on their energy use and where energy use is highest. This action lends itself to energy management, since it is easier to manage energy when it is quantified.
- Solar PV: While this can be expensive, it is a well-understood technology and is straightforward to implement.
- Replace open fires with stoves: This is simple in concept, rapid and relatively low-cost. It can have significant effects on heating energy efficiency immediately.
- The SEC can select other opportunities from the ROO in a similar vein to those above.

Key advantages to addressing relatively simple and straightforward projects at first include:

- The SEC does not incur high costs immediately, discouraging future projects in Year 2 and Year 3. The projects ought to be short in duration, so the SEC can gain experiences of seeing a project through from inception to completion and apply that experience later with more involved projects. The simpler projects allow the SEC to refine its project-management skills, learn lessons and improve ahead of more complicated projects.
- Simple projects are more likely to succeed and less harmful if they fail; the SEC can produce early evidence of progress and success. Members of the community can immediately benefit from the EMP rather than having to wait on a longer project, during which nobody appears to benefit.
- The community is more likely to engage with simpler, more tangible projects as there is a greater confidence that they will succeed: LED lighting is well-known to save energy; a heat-recovery system is riskier.
- Pursuing simpler projects first might avoid the need for more complicated projects later: a good switch-off policy for a boiler might save so much energy that there is no longer urgency to replace the boiler (as opposed to replacing it as a first resort, with the associated expenses)

The ROO includes home retrofits to improve the BER. When a BER is published, a second report known as the advisory report is generated. In the advisory report, the BER assessor applies changes to the house model (insulation, solar PV, etc.) to see how it can achieve an improved BER. The advisory report will typically advise multiple measures. Table 5a shows the results of a stepwise analysis, where the results of individual measures on the advisory report are recorded. This is illustrative of how different measures affect the BER.

Table 5a – Stepwise BER upgrade			
Measure	BER	kWh/m2/y	Improvement
Baseline	F	391	0%
External doors	F	389	1%
Roof insulation	E2	346	12%
Windows upgrade	E1	322	18%
Wall insulation	C2	197	50%
Lighting upgrade	C2	197	50%
Solar PV	C1	158	60%
Floor insulation	B2	121	69%
Heat pump	A2	43	89%

In Table 5a, the dwelling in question was assessed as a BER of F but, with the right combination of upgrades, could become A2 (A1 is the lowest rating possible). This represents an 89% improvement. Note the effect of insulation upgrades – the wall upgrade improved the BER by 22% and the roof insulation improved the BER by 11%. The heat pump upgrade improved the BER by 20% but it is noted that a heat pump upgrade is only feasible following fabric upgrades (which is why it appears last in Table 5a). Solar PV improved the BER by 10%. In this particular case, floor insulation was recommended (otherwise the heat pump was not feasible) but in the Consultant's experience floor upgrades are rarely advised in order to improve the BER.

It is noted that the investment costs for the ROO pertaining to SEC-wide, 2030 projects are extrapolated from the sample of domestic BERs and SSEA audits or a per-house, per-m^2, or per-hectare basis. This is the same approach described when extrapolating the non-residential energy baseline costs.

The SEC should also encourage members of the community to continue to apply for SSEA audits, BERs, etc. and assist with projects in the community not already identified as part of the current ROO. The SEC can update the ROO as new opportunities are suggested. Should the SEC succeed in generating a community fund (e.g. through solar PV export tariffs, Neighbourwoods premiums, selling biogas, etc.) then it can solicit applications from the community for individual projects and provide extra support to them along with any official supports contained in the appendix.

6. Project development strategy

Section 5 suggested a number of actions the SEC might take regarding community engagement, etc. as immediate next steps for the EMP. However, the EMP is a 3-year plan, so the SEC should consider its strategy with that time-scale in mind and with the Sustainable Energy Roadmap (Section 4) in mind.

The SEC and Consultant reviewed the Sustainable Energy Roadmap and the baseline data and identified priority targets for the project. The residential fossil fuel consumption is the primary target for the SEC. It can best be tackled along the lines in Table 5a – fabric upgrades and heat pumps. Per Table 4c, approximately 17 homes per year should be upgraded.

The SEC reviewed its capacity to tackle these priorities. It has some experience with engaging with the community – this EMP is itself a community project – and the Termon Centre is host to many community events. The Termon Centre itself is a highly-sustainable building – using solar PV and

biomass. As the top priority is residential fossil fuels (e.g. heating), the SEC can engage directly with the SEAI and consultants to deliver Individual Energy Upgrades, One-stop Shop Services, and Fully Funded Energy Upgrades. Home upgrades are not dependent on the SEC's capacity to deliver projects, so there should be no obstacles. The SEC mentor and Sligo ATU can provide further guidance, if necessary.

The appendix details numerous available supports for all kinds of measures. The home energy supports have been mentioned previously but others such as TAMS III (farms), EEOS (lighting upgrades), SSRH (biomass), LEADER (various) and Local Enterpise Office (businesses) exist. The Consultant has experience with a variety of support/grant funding bodies. There might be some cross-border initiatives with which the SEC has experience.

As a result of this review, the SEC proposes the following strategy going forwards:

- Disseminate the EMP and engage with the community as described in Section 5.
- Co-ordinate straightforward projects along the lines of those described in Section 5.
- Approach homeowners and attempt to co-ordinate retrofits, aiming for up to 17 per year
- Approach business owners and farmers to implement energy audit recommendations
- Investigate the requirements for a Community Grant and consider whether or not to apply for one, or proceed with individual projects and grants
- Liaise with whomever they share partnerships to identify scope for projects/feasibility studies in the SEC
- Seek to establish contacts/partnerships with Donegal County Council, Envirogrind, Coillte, Leader, Teagasc, etc.
- Review the feasibility and interest in pilot projects, such as biogas production, Passivhaus, etc.

Appendix 1: Supports for projects

A number of supports exist for homes, businesses, etc. A summary of these is provided below. This appendix can be provided as a separate booklet for the SEC's information. Some of these supports do not directly address energy efficiency etc. but the projects they do support can have energy-efficiency/decarbonisation results. For example, a Lean programme in a factory can save energy by reducing the number of machines, reducing machine idling; a digitalisation project might enhance machine controls and improve energy efficiency; a project meant to make a business more competitive/resilient might tackle energy costs.

SEAI: Residential

Name	Covers	Typical support
National home energy upgrade scheme; One Stop Shop https://www.seai.ie/grants/home-energy-grants/one-stop-shop	Suite of upgrades – not just one • Fabric upgrades • Heat pumps • Dry-lining • Windows & doors • Solar PV • Solar water • Etc. House must be built before 2011; BER = B3 or worse; will achieve BER = B2 or better, post-works; works must improve BER by 100 kWh/m^2/y; house has not already received grants for the works in the past	€350 to €8,000 per measure, depending on the measure Median costs/grants: • Apartment: €22,914/€6,100 (26%) • Mid-terrace: €50,889/€18,800 (37%) • Semi-detached/end-of-terrace: €62,485/€21,000 (34%) • Detached: €66,503/€23,200 (35%)
Better Energy Homes; Individual grants https://www.seai.ie/individual-energy-upgrade-grants	Individual projects – not a suite • Attic insulation* • Wall insulation* • Heating controls* • Heat pump** • Solar thermal** • Solar PV (max. 4 kWp)** *House occupied before 2011 **House occupied before 2021	Median support rate across different types of homes: • External wall: 19% to 33% • Internal wall (dry-lining): 33% to 51% • Cavity wall: 73% to 89% • Roof: 50% to 68% • Heat pump: 41% to 43% • Solar PV: 14% to 29% • Heating controls: 19% to 21%
Warmer homes scheme; fully-funded upgrade https://www.seai.ie/grants/home-energy-grants/fully-funded-upgrades-for-eligible-homes	Homeowners who receive any of the following: • Fuel allowance as part of the National Fuel Scheme • Job Seekers Allowance (>6 months) and have a child under 7 years old • Working Family Payment • One-parent Family Payment • Domiciliary Care Allowance • Carers Allowance and live with the person under your care • Disability Allowance (>6 months) and have a child under 7 years old Also: • You must own and live in the home • The home was built and occupied before 2006	Fully-funded – 100% support

	As of Jan 2025, SEAI covers heat pumps (if suitable) but not oil/gas boilers Can take approx. 2 years from application to completion ● Attic insulation ● Wall insulation ● Renewable heating ● Windows (occasionally) ● Lighting, lagging jackets, draught-proofing	

SEAI: Business

Name	Covers	Typical support
Energy audit https://www.seai.ie/grants/business-grants/energy-audits	To be eligible, you must: ● Be an SME or public sector with <500m^2 of useful floor space, spending under €35,000/y on energy ● Be tax compliant ● Be registered in the Republic of Ireland ● Spend at least €10,000 on electricity and thermal fuels (transport fuels do not count towards the €10,000)	€2,000 voucher for audit 1 voucher per company
Business grants; rapid approval https://www.seai.ie/grants/business-grants/rapid-approval	The following are covered: ● Solar thermal (hot water) ● Building fabric ● Heat pumps ● Pumps ● Air handling units ● BMS optimisation (already have a BMS) ● BMS controls (install or upgrade existing) ● Design assistance (someone to design a complete renewable heat/energy efficiency/BMS system for your building)	Rates/caps: ● Solar thermal: 30%/€15,000 ● Building fabric: 30%/€120,000 ● Heat pump: 30%/€100,000 ● Pumps: 30%/€10,000 ● Air-handling units: 30%/€25,000 ● BMS optimisation: €2,000 ● BMS controls: €30,000, depending on complexity ● Design assistance: 50%/€25,000
Non-domestic microgeneration https://www.seai.ie/grants/business-grants/commercial-solar-pv	Up to 1,000 kWp of solar You must use at least 50% of what is generated Open to: ● Businesses ● Farms ● Public sector ● Schools ● Community centres ● Non-profits	Rates/caps: ● 1 kWp – 2 kWp: €900/kWp ● 3 kWp: €2100 ● 4 kWp to 6 kWp: €2400 ● 7 kWp to 1000 kWp: €386/kWp to €162/kWp ● Max. €162,600
Tailored supports; EED https://www.seai.ie/grants/business-grants/exeed-certified-grant	Stage 1 = pre-investment – like a detailed energy audit and plan for what to do Stage 2 = capital investments in new equipment/processes/etc. Must use at least 100,000 kWh/y in energy	Stage 1 ● Small business = 70% ● Medium = 60% ● Large = 50% Stage 2 = Up to €3,000,000:

	Can be a new design project; e.g. comparing a baseline building design against a candidate improved one Project covers a suite of opportunities, from fabric to new processes, substitute fuels, renewable energy, new equipment/controls, etc. as long as energy savings can be demonstrated	• Capital costs under €50,000 = full amount • Capital costs over €50,000 = capped at €2,500/tCO2 saved (up to €3,000,000) You calculate the €50,000, etc. based on the following percentages: • Small business = 50% • Medium = 40% • Large = 30%
Renewable heat; Support scheme for renewable heat (SSRH) https://www.seai.ie/grants/business-grants/support-scheme-renewable-heat	Biomass/biogas heating systems (tariff scheme): • Biomass boiler • Biomass CHP • Biogas (anaerobic digestion) boiler • Biogas CHP Commercial heat pump (grant scheme) Heat is used for: • Space heating • Hot water • Steam • Absorption chilling Heat is not used for: • Drying wood pellets, etc. • Drying AD digestate, etc. • Heating open swimming pools • Generating electricity • Pasteurisation Non-domestic users Must not be receiing any other grant/support for the same works Must not be part of REFIT Can compete for RESS (CHP) but if successful must inform SEAI	Tariff = up to 15 years at following rates: Biomass • 0-300,000 kWh/y = €0.0566/kWh • 300,000 – 1,000,000 kWh/y = €0.0302/kWh • 1 million – 2.4 million kWh/y = €0.005/kWh • 2.4 million – 10 million kWh/y = €0.005 Biogas • 0-300,000 kWh/y = €0.0295/kWh • 300,000 – 1,000,000 kWh/y = €0.0295/kWh • 1 million – 2.4 million kWh/y = €0.005/kWh Grant: • Heat pump = up to 40% • Related works (fabric, ventilation, heat recovery) = 30%

SEAI: Community

Name	Covers	Typical support
Solar Meitheal https://www.seai.ie/blog/solar-pv-meitheal	Solar PV for homes Rather than a single home applying for its own PV, an SEC can organise a group of homes as a single PV project and reduce costs	
Community Grant https://www.seai.ie/grants/community-grants	Must be a mix of sectors/organisations, e.g. not just business, not just residential • Fabric upgrades • Renewable energy • Technology/system upgrades • Control systems • No CHP Community appoints a project co-ordinator	Min application = €100,000 Max. = €5 million (any single project = max. €2 million) Grant request/cap: • Up to €500,000 = €1,000/tCO2 • >€500,000 = €850/tCO2

	Application is competitive based on cost/kWh, percentage savings, cost per kgCO2, higher marks for completing an EMP	Supports within a project: ● Building energy upgrades: 30% ● Building fabric, single-measure: 25% ● Heat pumps: 30% ● Solar PV: 20% ● Projects with renewables as part of them: 30% ● EV charger, single measure: 20% Must provide a counterfactual for the above; otherwise max grant is capped at 15%, not 30%
Community enabling framework https://www.seai.ie/plan-your-energy-journey/for-your-community/enabling-framework	Support for grid-scale renewable electricity projects ● Solar ● Onshore wind Requires community to form (Renewable Energy Community, REC), applications, feasibility study, finances, etc Submit application to RESS or SRESS	Project feasibility = covered by SEAI RESS: ● Early stage: 80% of €75,000, whichever is lower (need detailed feasibility study, demonstrate REC status) ● Mid-stage: 80% of €130,000, whichever is lower (need detailed feasibility study, demonstrate REC status, planning permission) ● Late stage: 80% of €180,000, whichever is lower (need detailed feasibility study, demonstrate REC status, route-to-market offer, grid connection offer from ESB)
SRESS https://www.gov.ie/en/publication/96110-small-scale-generation/	Solar PV or wind for communities, SMEs ● 50 kW to 6 MW ● 50 kW to 1 MW = microgeneration scheme1 ● 1 MW to 6 MW = SRESS ● 50 kW to 1 MW for export (not self-consumption) = SRESS Supported via a feed-in tariff (e.g. by exporting to the grid). No RESS auction needed After 2025, micro-generation scheme projects will also get the tariffs	Community tariffs: ● Solar PV <1 MW: €015/kWh ● Solar PV 1 MW to 6 MW: €0.14/kWh ● Wind <6 MW: €0.09/kWh SME tariffs: ● Solar PV <1 MW: €013/kWh ● Solar PV 1 MW to 6 MW: €0.12/kWh ● Wind <6 MW: €0.08/kWh
RESS https://www.eirgrid.ie/industry/renewable-electricity-support-scheme-ress	Solar PV or wind projects > 1,000 kW ● Community will prepare application with energy company ● Company will bid at RESS auction to supply XX kWh/y ● RESS judges bid based on cost and lifetime kWh output	If successful, the energy company owning the project will provide €2/MWh to a Community Benefit Fund for use in community projects 14-16 year contract

SEAI: EV

Name	Covers	Typical support
EV grant values https://www.seai.ie/grants/electric-vehicle-grants/grant-amounts	Private EV Commercial EV Large panel van – 3500 kg	• Private: €1500 - €3500 (vehicles costing €14,000 to €60,000) • Commercial: €2000 - €3800 (vehicles costing €14,000 to €60,000) • Large panel: €7,600 (van costing up to €90,000)
Electric vehicle charging grants https://www.seai.ie/grants/electric-vehicle-grants/electric-vehicle-charging	Homes: Off-street parking, no previous EV charger Apartments	• Home: up to €300 • Apartment: 90% (Local authority/approved housing body) • Apartment: 80% (Owners' management company) • Apartment: 60% (Management company of build-to-rent development) • Apartment: €600 per charger plus the 90%/80%/60%

Local Enterprise office

Name	Covers	Typical support
Feasibility study grant https://www.localenterprise.ie/Discover-Business-Supports/Financial-Supports/Feasibility-Grant/	Researching demand for a new product/service • Market research • Consultancy costs • Technical development/prototype/innovation • Etc. For: • Businesses with <11 employees • Manufacturing • Internationally-traded services • Businesses in commercial sphere	South & East = 50% or €15,000 – whichever is less Border, Midlands, West = 60% or €15,000 – whichever is less
Green for business https://www.localenterprise.ie/green/new-green-images/what-is-green.html	For businesses: • <51 employees • Turnover >€30,000/y • Trading >6 months • Not farms 2 days mentoring with a Green Consultant, produces Green for Business report	Free Having the Green for Business report/SSEA audit allows for 75% grant up to €10,000 for energy upgrades – Energy Efficiency Grant
Greenstart https://www.localenterprise.ie/green/other-green-supports/greenstart.html	For businesses: • <10 employees and who have already done Green for Business • 10 – 50 employees • Turnover >€30,000/y • Trading >6 months • Not a client of Enterprise Ireland/Udaras na Gaeltachta	Contact Local Enterprise Office

	• Not domestic-focused business • Not agricultural sector, etc. 7 days mentoring with a Green Service Provider	
Energy efficiency grant https://www.localenterprise.ie/Portal/Energy/WHAT-IS-THE-ENERGY-EFFICIENCY-GRANT-/What-is-the-Energy-Efficiency-Grant-.html	For businesses: • <51 employees • Have done Green for Business/Greenstart/SEAI energy audit • Not clients of Enterprise Ireland/IDA Covers: • Energy meters/controls • LED lighting (as part of a package of other measures) • Heat recovery • System upgrades (e.g. process heating via heat pump to replace boiler) • Replace old (>5 years) equipment with high-efficiency models • Small wind/hydro turbine • Food waste systems (e.g. micro anaerobic digestion) • Water management systems • Circular economy • Sustainable packaging Does not cover: • Solar Pv • Biomass/biogas boilers • Fabric upgrades • Space heating systems/equipment • Fossil-fuel boilers • Mobile assets (forklifts, air compressors, etc.)	75% or €10,000, whichever is less

Enterprise Ireland

Name	Covers	Typical support
Digital discovery https://www.enterprise-ireland.com/en/supports/access-advice-digital-discovery	Business is: • >9 employees • Manufacturing • Internationally-traded services • Enterprise Ireland high potential start-up Covers: • External digital expert • 3-7 days over 8-12 weeks • Advice on digital/data/automation systems to identify gaps in meeting business needs • Recommendations for improvements	80% or €5,000, whichever is less Max daily rate supported is €900/day
Green Start https://www.enterprise-ireland.com/en/supports/access-advice-green-start	Covers: • External expert • Analyses business practices, processes, etc.	80% or €5,000, whichever is less Max daily rate supported is €900/day

	• Develop improved management/processes/practices	
Lean Start https://www.enterprise-ireland.com/en/supports/access-advice-leanstart	Covers: • External expert • Analyses business practices, processes, etc. • Develop improved management/processes/practices based on Lean principles	80% or €5,000, whichever is less Max daily rate supported is €900/day
Capital Funding Support https://www.enterprise-ireland.com/en/supports/capital-funding-support	Your project must demonstrate that productivity will increase while employment does not reduce Covers: • Capital equipment • Computers/software used for production	Contact Enterprise Ireland
Climate Action Voucher https://www.enterprise-ireland.com/en/supports/climate-action-voucher	Training/advice from external expert to develop initial sustainability action plan	Up to €1800 (€900 per day x up to 2 days)
Digital Process Innovation https://www.enterprise-ireland.com/en/supports/digital-process-innovation	For SMEs and large companies: • New digital systems for data/processes/etc. • New production methods (e.g. equipment/controls)	50% grant or €150,000, whichever is less
Energy and Environmental Aid https://www.enterprise-ireland.com/en/supports/energy-and-environmental-aid	Must be a client of Enterprise Ireland/Udaras na Gaeltachta Manufacturing/Internationally-traded services • Projects that enable carbon emissions reductions, energy efficiency, low-carbon production methods, resource efficiency • Improve environmental performance of existing facilities; deploy new facilities • Decarbonisation, electrification, water efficiency	Contact Enterprise Ireland
Capital investment for decarbonisation processes https://www.enterprise-ireland.com/en/supports/capital-investment-for-decarbonisation-processes	Decarbonise manufacturing combustion processes: New technologies, equipment, etc. • Industrial heat pumps • Electric steam boilers • Heat recovery • Mechanical Vapour Recompression evaporators • Biomass boilers (company is in Emissions Trading Scheme. If not then see SSRH) • Etc. Will need measurement and verification (M&V) at the end to draw down the grant	Min. €20,000 Max. €1 million Depends on business size, efficiency of carbon reduction
Enterprise Emissions Reduction Investment Fund - Energy Monitoring and Tracking Systems https://www.enterprise-ireland.com/en/supports/	Manufacturing clients of Enterprise Ireland/IDA/Udaras na Gaeltachta 10 or more employees Generating sales for at least 5 years For metering systems (electricity, fuels, steam, data-loggers, etc.)	50% or €50,000, whichever is less Minimum expenditure = €10,000 (min. grant = €5,000)

energy-monitoring-and-tracking-systems		
Exploring innovation grant https://www.enterprise-ireland.com/en/supports/exploring-innovation-grant	Clients of Enterprise Ireland Support for a feasibility study around new technologies/equipment/etc. ● Identify possible research partners ● Develop prototypes ● Feasibility studies	50% or €35,000, whichever is less
Green Plus https://www.enterprise-ireland.com/en/supports/green-plus	Clients of Enterprise Ireland; SMEs and large companies Training, etc. on environmental best practices in the company: ● Management practices ● Operational practices ● Policies ● Strategic plans ● E-learning digital content	50% or €100,000, whichever is less
Innovative Partnership Programme https://www.enterprise-ireland.com/en/supports/innovation-partnership-programme	Client of Enterprise Ireland/IDA/Udaras na Gaeltachta/Local Enterprise Office Research towards new and improved ● Products ● Processes ● Services Partner with a research institute to access their expertise	80% for research work Up to 100% for capital costs if the research indicates it is necessary
Innovation voucher https://www.enterprise-ireland.com/en/supports/innovation-voucher	For SMEs: ● Cannot have been funded by Enterprise Ireland for over €300,000 over the previous 5 years Innovation: ● New products/processes/etc. ● Innovation management ● Audit of innovation/technology	Voucher = €10,000 Co-funded = 50% of €10,000, whichever is less SME can have up to 3 vouchers + 1 co-funded voucher Only 1 active at a time
Lean plus https://www.enterprise-ireland.com/en/supports/leanplus	Lean training and processes: ● Value stream mapping ● Production flow ● Process efficiency ● Lead time ● Etc.	50% or €100,000, whichever is less
Operational Excellence https://www.enterprise-ireland.com/en/supports/operational-excellence-offer	Investment in projects to improve operational excellence: ● Digitalisation ● New equipment/processes/technologies ● Training – Lean, etc. Minimum expenditure = €100,000	10% to 35% for SME equipment/software/computers 50% or €300,000, whichever is less, for digitalisation 50% to 70% for training
Regional development feasibility fund	Feasibility study by external expert on development projects	50% or €15,000, whichever is less

https://www.enterprise-ireland.com/en/supports/regional-development-feasibility-fund		
Research, Development & Innovation Fund https://www.enterprise-ireland.com/en/supports/research-development-innovation-fund	Client of Enterprise Ireland/Udaras na Gaeltachta/Local Enterprise Office. Must have enough cash resources to implement the project. Development of new products/services: ● Resolves a technical challenge ● Non-routine ● Will be an upgrade in terms of the company's RD&I capability ● Feasibility studies/research/patents/certification ● Consultancy ● Capital costs	Business: ● Small: 45% ● Medium: 35% ● Large: 25% For collaborative projects, add 15% to each
Training funding support https://www.enterprise-ireland.com/en/supports/training-funding-support	Training of leadership and staff: ● Lean, continuous improvement, innovation ● Operational effectiveness, automation, digitalisation ● Decarbonisation	Contact Enterprise Ireland

LEADER

Name	Covers	Typical support
LEADER https://dldc.org/programme/rural-development-leader/	Theme 3: Sustainable Development of the Rural Environment & Climate Change Mitigation & Adaptation ● Renewables, decarbonisation	Capital projects = 75% for community projects, 50% for private applicants, €200,000 – whichever is lower Feasibility study: 90% or €30,000, whichever is lower

Sports capital

Name	Covers	Typical support
Sport Capital Grant https://www.sportscapitalprogramme.ie/	This covers various non-energy upgrades – pitches, tracks, nets, etc., but also: ● Rainwater harvesting ● LED floodlighting ● Building/refurbishment (could include improved fabric) ● Modifications to reduce energy consumption (e.g. solar, LED, fabric, heat pump, etc.) Must be able to demonstrate at least 5 years or remaining lease on the land/property involved; ideally 15+ years/ownership	Max. grant = €200,000 Club must contribute at least 5% of total cost Local authority must contribute 30% of total costs

Community recognition fund

Name	Covers	Typical support

Community Recognition Fund	Area/localities/communities with foreign populations (Ukrainians, Temporary Protection IPAS, etc.). The scheme is aimed at developing/enhancing public community facilities: Some examples: ● Buildings: Club/sports facilities, school/parish facilities, refurbishment of buildings (fabric, solar, heating could be sought here) ● Transport: Community vehicles ● Community parks/gardens Cannot use this scheme to co-fund any projects already receiving funding	Each county has a budget allocated to it Application for funding, based on the projects 100% funding Max. €500,000 total costs Min. €50,000 total costs

Teagasc

Name	Covers	Typical support
Basic Income Support for Sustainability Scheme https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/services/basic-income-support-for-sustainability-biss-scheme/	Must have eligible hectares (at least 1); must have a herd number; must be an active farmer	1x payment per 1x hectare Max. €285/ha/y Max. €66,000 per farm
ECO Scheme https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/services/eco-scheme/#:~:text=Contact-,What%20is%20the%20Eco%2Dscheme%3F,agricultural%20practices%20on%20their%20farms.	Any farm type or intensity: Must do at least 2 of the 8 ● Space for nature (non-productive areas): Copses, scrub, orchards, trees, stone walls, etc. 7% of total hectares* ● Extensive livestock production (max. 1.4 livestock units per hectare)**. At least 50% of eligible hectares must be grassland ● Limited chemical nitrogen usage ● Planting native trees/hedgerows. Plan mix of native trees plus certain metre of hedgerow* ● Use a GPS-controlled fertiliser spreaders; at least 50% of total hectares must be arable ● Soil sampling & appropriate liming ● Planting a break crop ● Sowing a multi-species sward *If 10% of total hectares is given over, rather than 7%, just one action counts, rather than two **Or max. of 1.2 livestock units per hectare to count this action as two Need a valid BISS application first	€60-€65 per hectare
ACRES https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/services/agri-climate-rural-e	This covers a range of actions: ● Planting/maintaining grass buffer-zones ● Tree planting, tree-belt planting ● Low-emissions slurry ● Coppicing ● Farm Sustainability plan	General: Up to €7,311, Co-operation: up to €10,500 (including €3,500 for non-production investments)

nvironment-scheme-acres/		Depending on the action and type of land, the payments range from €60/hectare/y to over €1,000/ha/y
Straw Incorporation measure https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/services/basic-income-support-for-sustainability-biss-scheme/	Tillage farmers: ● Straw cut from combinable crops is ground into the soil as a carbon-capture measure	€150 - €250 per hectare
TAMS 3 https://www.gov.ie/en/department-of-agriculture-food-and-the-marine/collections/tams-3/	This covers a range of measures for farms: ● Solar PV ● Dairy Equipment: water heaters, heat recovery, washers, milking machines – vacuum pumps, etc., ● Low-emission slurry ● Organic capital investment: For farmers in Organic Farming Scheme to upgrade buildings/equipment ● Nutrient storage: Slurry pits, etc. ● Pig & poultry: LEDs, solar PV, heat recovery, heat pumps, biomass boiler, insulation ● Tillage capital: LED yard lights, rainwater harvesting, underfloor ventilation, GPS-guided machinery (tractors/sprayers), minimum-disruptive tillage meachines (not PTO-driven), grain dryers, GPS-guider fertiliser spreaders, etc.	Solar PV: €90,000 or 60%, whichever is less Slurry: €40,000 or 60%, whichever is less All other TAMS 3 grants combined are capped at €90,000 combined per holding. The grant rates under that are: ● Dairy: 40% ● Organic: 40% ● Nutrient: 70% ● Pig & poultry: 40% ● Tillage: 40%
Native tree area scheme https://www.teagasc.ie/crops/forestry/grants/native-tree-area-scheme/	Can plant trees on farmland or alongside streams/rivers, etc. ● At least 0.1 ha at a time ● At least 20 m wide ● Fencing grants exist too	€6,744 per hectare; plus 10x annual of €2,206 - €2,284 Fencing: €4.50 to €7.00 per metre, depending on what animal the fence is for
Other forestry grants https://www.teagasc.ie/crops/forestry/grants/overview-of-forest-establishment-grant-rates/	This is an overview of a range of forestry-planting grants. Different types of forests apply: ● Native ● For water ● On public land ● Neighbourwoods ● Emergent ● Oak/beech ● Other broadleaf ● Etc.	Upfront grant per hectare with annual premiums per hectare for a number of years: Upfront: €2,500/ha to €10,544/ha Annual: €350/ha to €2,284/ha Years: 10 to 20
Bioenergy – willow https://www.teagasc.ie/rural-economy/rural-development/energy/grants--schemes/	Planting of willow on: ● Up to 10 hectares ● Uncultivated margin must be under 4m ● Must have a process ready for storage/drying of harvested willow ● Must have a potential user for the energy	€1,040 per hectare or 40%, whichever is less

Bord Iascaigh Mhara

Name	Covers	Typical support
Sustainable Aquaculture Scheme https://bim.ie/funding/sustainable-aquaculture-scheme/	Any project satisfying any of a number of objectives, including: ● Product innovation ● Energy efficiency ● Renewable energy	50%
Sustainable fisheries scheme https://bim.ie/funding/sustainable-fisheries-scheme/	Any project satisfying any of a number of objectives, including: ● Catch-handling ● Energy efficiency The projects pertain to fishing vessels	50%
Seafood processing capital investment scheme https://bim.ie/funding/seafood-processing-capital-investment-scheme/	Any project satisfying any of a number of objectives, including: ● Add value to, fully utilise raw materials ● Operational optimisation ● Energy efficiency	Add value: 50% Optimise operations: 30%

CLÁR

Name	Covers	Typical support
CLÁR https://grantsandfunding.ie/clar-2025-programme-launched-by-minister-calleary/	Community facilities: ● Sports facilities, youth clubs; minor building renovation ● Walking tracks ● Community gardens/allotments/etc. ● Community transport: EVs, charging, solar PV Apply via local authority.	90% or €100,000, whichever Is less Transport: 80% for diesel/petrol, 90% for hybrid/EV; €50,000 to €100,000, whichever is less

Pathfinder

Name	Covers	Typical support
Dept. of Education Pathfinder https://www.gov.ie/en/department-of-education/press-releases/ministers-foley-and-ryan-launch-schools-energy-retrofit-pathfinder-programme-for-2023-2024/	Retrofitting schools to help to achieve national targets. The project is based on various levels of retrofit, from Medium to ZEB, each with reduction targets: ● Fabric upgrades ● Lighting ● Renewable heating ● Solar PV	100% - application made to Dept. of Education
The HSE also has a Pathfinder scheme, which operates in a similar manner	Retrofitting schools to help to achieve national targets. The project is based on various levels of retrofit, from Medium to ZEB, each with reduction targets: ● Fabric upgrades	100% - application made to Dept. of Education

	• Lighting • Renewable heating • Solar PV	

Dept. of Education

Name	Covers	Typical support
Schools photovoltaic programme https://www.gov.ie/en/department-of-education/publications/schools-photovoltaic-programme/	Install 6 kWp on eligible schools If the school already has less than 6 kWp installed, it can apply for the full 6 kWp If the school already has 6 kWp or more, it is not given more	100%

Low-interest loans

Home Energy Upgrade Loan Scheme https://sbci.gov.ie/products/home-energy-upgrade-loan-scheme	Used to finance SEAI home energy upgrades Must be spent on the home energy upgrade Up to 25% of the loan can be spent on ancillary costs	€5,000 to €75,000 per property, up to 3 properties 1-year to 10-year loan Available up to 31/12/2026 Low interest: AnPost = 3.75%; Bank of Ireland =2.95%, etc.

Údarás na Gaeltachta

Name	Covers	Typical support
Digital Transition Fund https://udaras.ie/en/digital-transition-fund/	Numerous things, including: • Digital discovery: Similar to Enterprise Ireland; consultancy to introduce new digital technologies/solutions • Process innovation: Enhance production processes using digital/lean methods No projects involving fossil fuels or their use are supported	Disocry: 80% of €5,000, whichever is less Innovation: 50% of €150,000, whichever is less
Green Transition Fund https://udaras.ie/en/green-transition-fund/	Decarbonisation and digitalisation; specifically designed to help with the government's Climate Action Plan: • Climate Planning Fund: Develop & implement a plan to decarbonise • Emission Reduction Investment Fund: Decarbnonisation, energy metering, etc. See also Enterprise Ireland supports, as many are duplicated here: • Climate Action Voucher • Greenstart • Greenplus • Etc.	Planning: €1800 for the plan; up to €50,000 match-funding for capacity-building Investment fund: up to €1 million
Co-funded by EU:	Transition to green energy	The total budget is €1.96 million

LEAP https://udaras.ie/en/business/leap/	Atlantic Technical University is a partner, as are the Donegal, Sligo and Leitrim county councils	
Others: https://udaras.ie/en/business/how-we-help/grants/	• Research and development of innovative products/processes. • Capital grant: setting up a new establishment, expanding a current establishment, new products, new processes	Contact Údarás na Gaeltachta

Community Centres Investment Fund

Name	Covers	Typical support
Community Centres Investment Fund https://www.gov.ie/en/department-of-rural-and-community-development/services/community-centres-investment-fund/	Refrubishment and improvement of urban and rural community centres: • Building fabric • Solar PV • Kitchen/catering equipment • Heating systems (including boilers) • Skylights • Lighting Must be a not-for-profit/community/voluntary organisation; established for at least 2 years; no new-builds;	Category 1: €10,000 - €25,000 Category 2: €25,001 - €100,000 Must provide at least 5% of total costs (Cat 1) or 10% (Cat 2)