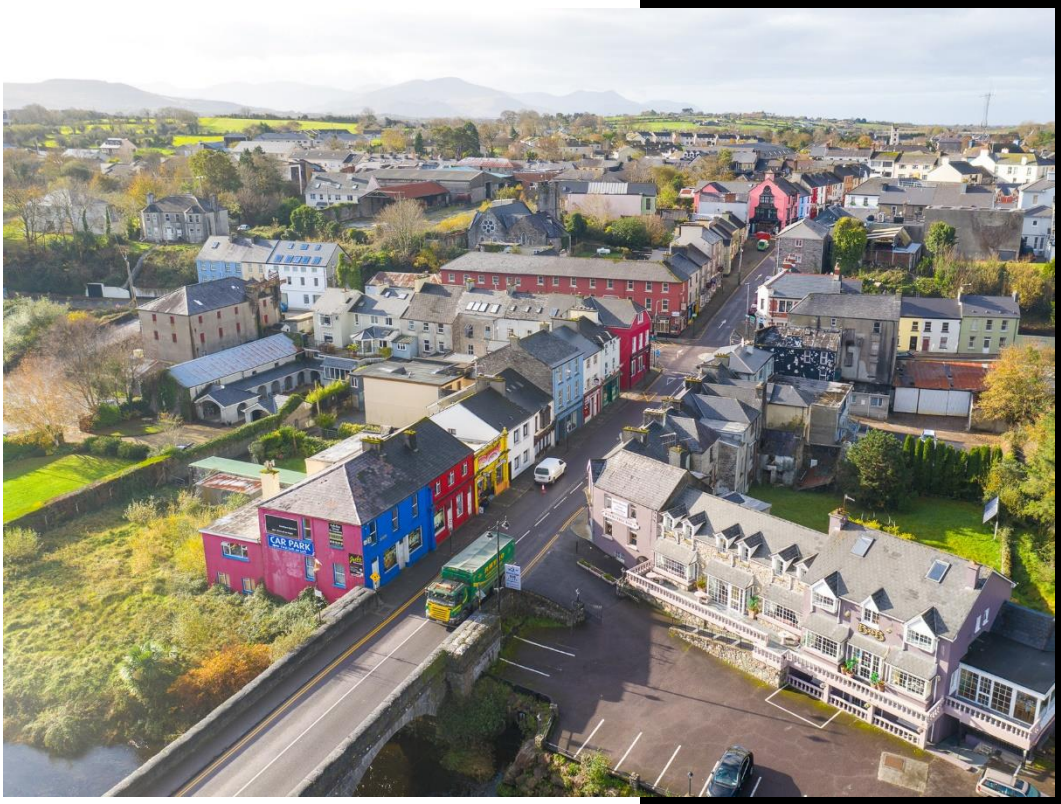
KSEC
Kerry Sustainable Energy Co Op

2022

Killorglin Energy Master Plan



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Killorglin Energy Master Plan

Kerry Sustainable Co-op (KSEC)

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1 Glossary of Terms

Building Energy Rating (BER)	An energy label with accompanying advisory report for homes. A BER makes the energy performance of a home visible to prospective buyers and tenants.
Central Statistics Office (CSO)	The Central Statistics Office is the statistical agency responsible for the gathering of "information relating to economic, social and general activities and conditions" in Ireland.
Climate Action Plan (CAP)	A detailed and strategic framework for measuring, planning, and reducing greenhouse gas (GHG) emissions and related climatic impacts.
Climate Action and Low Carbon Development (Amendment) Bill	A bill entitled an Act to provide for the approval of plans by the Government in relation to climate change for the purpose of pursuing the transition to a climate resilient, biodiversity rich and climate neutral economy by no later than the end of the year 2050.
Climate Action Fund (CAF)	A fund established to provide financial support to projects which will help Ireland achieve its climate and energy targets.
Commission for Regulation of Utilities (CRU)	Ireland's independent energy and water regulator. The CRU has a wide range of economic, customer protection and safety responsibilities in energy and water. The CRU's mission is to protect the public interest in Water, Energy and Energy Safety.
DART+ Programme	A programme that will see the DART network grow to 150km. It will promote multi modal transit, active transport, boost regional connectivity and make public transport the preferred option for more and more people.
Deep Retrofit	The Deep Retrofit of a home means carrying out multiple energy upgrades all at once to achieve a BER of A-rating.
Energy Master Plan (EMP)	This is a vehicle to help implement sustainable strategies within a community.
Energy Poor	A household is energy poor, if/when that household is unable to achieve an adequate (i.e., comfortable, and safe) standard of warmth, and supply of energy services at an affordable cost.
Heat Pump	A heat pump is a device that takes heat from one source and moves it to another location through electric or mechanical means. Heat pumps may be used either to heat or cool.
Kerry Sustainable Energy Co-op (KSEC)	KSEC formed in 2015 from the Transition Kerry energy group following a recommendation from the LEADER funded report - Transition Kerry's Sustainable Energy Community Roadmap - An Action Plan for County Kerry's Transition to 100% Renewable Energy Supply. KSEC's aims are to substitute our reliance on imported and non-renewable energy with locally sourced and owned energy, to increase security of energy supply to members, to reduce fuel poverty and to educate on energy efficiency.
Low Carbon Economy	An economy that causes low levels of carbon emissions. 'Carbon' refers to carbon dioxide which contributes to climate change. A low-carbon economy is rather a goal than a means/strategy for reaching the goal.
National Energy Efficiency Action Plan (NEEAP)	A set of national targets for 2020 to improve energy efficiency by 20%.

Net Zero	'Net zero' refers to achieving an overall balance between emissions produced and emissions taken out of the atmosphere.
Nearly Zero Energy Building (NZEB)	Nearly Zero Energy Buildings' means a building that has a very high energy performance, in which "the nearly zero or very low amount of energy required should be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby ".
ORS	ORS is a prominent Irish multidisciplinary building consultancy offering design, planning and management advice that is supported by expert guidance in energy efficiency. With a team of highly skilled designers, consulting engineers, planners, scientists, and surveyors ORS's mission is to design and build a better world by delivering sustainable solutions for their clients and creating a supportive workplace for our people.
Paris Agreement	An agreement that aims to substantially reduce global emissions to limit the global temperature increase in this century to 2°C above preindustrial levels, while pursuing the means to limit the increase to 1.5°C.
Project Ireland 2040	Government's long-term strategy to make Ireland a better country for all its people. Alongside the development of physical infrastructure, Project Ireland 2040 supports business and communities across all of Ireland in realising their potential.
Renewable Electricity Support Scheme (RESS)	The Renewable Electricity Support Scheme aims to promote the generation of electricity from renewable sources by providing financial support to renewable electricity projects in Ireland, including communities.
Register of Opportunities (RoO)	A Register of Opportunities is for recording all opportunities for energy savings & renewable energy technologies.
Sustainable Energy Authority of Ireland (SEAI)	Ireland's national sustainable energy authority.
Sustainable Energy Community (SEC)	A community in which everyone works together to develop a sustainable energy system. To do so, they aim as far as possible to be energy efficient, to use renewable energy where feasible and to develop decentralised energy supplies.
Thermal Energy	Energy associated heat and heat energy.
UNEP	United Nations Environment Programme addresses environmental issues at the global and regional level for the United Nations.

1 Introduction

1.1 Kerry Sustainable Energy Co-op (KSEC) SEC

The Sustainable Energy Communities programme was launched by the Sustainable Energy Authority of Ireland in 2016 in response Irelands 2015 Energy White Paper, which sets out actions for communities to effect change in energy use. A key action of this report is the community network. This Network, developed through the Sustainable Energy Community platform, is now operating in every part of the country (SEAI, 2020).

A Sustainable Energy Community (SEC) is a community in which everyone works together to develop a sustainable energy system. To do so, they aim as far as possible to be energy efficient, to use renewable energy where feasible and to develop decentralised energy supplies. Nationally, the programme has now reached over 650 SECs, a fantastic achievement to witness the continued and growing interest in the programme.

In Kerry there are currently 25 registered SEC's which provides the framework for communities throughout the county to engage in their transition towards sustainable energy in an informed, collaborative way. The network in Kerry comprises of members from multiple community groups in all key geographical areas across the county.

Most groups are in the Learn phase, which is where the community comes together to examine how they can use less energy, bring in smart energy &, where possible, use clean energy. These groups are beginning to solidify their steering committees who can represent a wide range of energy users within their communities, setting out the vision and targets of their group. These groups come together to complete a community charter which is a one-page overview of the sustainable energy community's vision and goals. The community charter is a statement of intent and represents the collective ambition of your community.

KSEC have used their community energy charter to apply for an Energy Master Plan for the wider community in the area. Working with their County Mentor, the purpose of the plan is to help the group understand the energy demand and supply in Killorglin now and into the future.

The Kerry Sustainable Energy Co-op (KSEC) SEC has worked alongside ORS to complete this Energy Master Plan for Killorglin town and surrounding areas, identifying a very large housing stock suitable for retrofit. Included as part of the study is a Register of Opportunities (RoO) highlighting a range of diverse energy related project including the possibility of community owned energy generation potential.

Working with ORS Energy Consultants, this plan provides more detail as to how the community will achieve their energy goals. This involves analysis of Building Energy Rating assessments for households, deepening community engagement including community and enterprises sectors and more detailed desk study of the data that provides wider visibility on energy use in those community sectors. This plan should act as a tool that will allow the group to use the data collected to record the energy saving opportunities in their community and illustrate the most effective measures they can take. This will inform the work plan going forward.

1.2 Energy Master Plan Aims and Objectives

To assist in achieving KSECs goals, an Energy Master Plan study has been conducted. This Energy Master Plan (EMP) will aim to provide a comprehensive overview of energy consumption and energy generation in Killorglin. Publicly available datasets and energy use estimates from a range of sources including but not limited to the Sustainable Energy Authority of Ireland (SEAI), the Central Statistics Office (CSO), and Kerry County Council is used. The requirements of the EMP are as set out below:

1. Quantify the current energy consumption/baseline of Killorglin – Baseline of electrical, thermal and transport energy demand.
2. Conduct Energy Audits of selected domestic and non-domestic buildings.
3. Create a Register of Opportunities (RoO).
4. Identifying projects that can avail of the Communities Energy Grant and identifying projects that can avail of the Better Energy Homes grant.
5. Identify additional/potential energy reductions or alternative energy options.

The Energy Master Plan will be used to support Killorglin's progression towards sustainable energy and can be used to support applications for capital grants to upgrade existing housing and commercial building stock. The study will also identify the potential for the implementation of sustainable transport models such as electric vehicle (EV) charging infrastructure, alongside renewable energy generation possibilities from many varying sources such as wind, solar etc.

1.3 Our Approach

Based on the study requirements, the Team within ORS complied various national data sources to compete a top-down analysis of the catchment's current energy performance. This was in conjunction with information collected from residents through surveys and energy audits (bottom-up). This has delivered a summary of different types of energy used, and a breakdown of energy demand per sector.

Recommendations are made on achieving retrofits on homes from the area, given the current dwelling status. These sample houses are intended to be representative of the broader housing stock within the town whereby the recommendations for these can be extended to other domestic dwellings within the region of Killorglin.

ORS also performed energy audits on 5 community and commercial sector buildings to identify energy saving measures. These audits are to the level of Type 1 in Annex A of ISO 50002 and are suitable to act as supporting information for SEAI grant applications. As with the domestic buildings, a series of energy saving opportunities are produced, defining the carbon, energy and cost savings associated with each upgraded. Indicative costs are outlined, and a simple payback highlighted to help gauge the scale of the measure and an approximate time for a return of investment.

Reviewing the natural resources available to the community, high level analysis is provided on various renewable energy technologies that the community could further pursue, alongside the "Next Steps" in this process.

The buildings surveyed as part of the EMP are as follows.

(1) KDYS Killorglin
(2) Killorglin SVP Shop
(3) KCYMS Community Hall
(4) Killorglin Old Courthouse
(5) Quinlan's Fish Shop

BERs were conducted on 8 domestic dwellings in the area. These dwellings are intended to be representative of the typical building types in the Killorglin area.

The EMP will also be used as a mechanism to increase awareness in energy efficiency. This process began through the community survey, meetings with the SEC committee, the energy audits alongside the launch of the report at its conclusion. This report includes recommendations, based of existing case studies, that a community can do to change behaviour and increase the understanding of climate action and how those involved can contribute toward this shared objective. This can be achieved through workshops and training modules supported through the various partnerships established such as with the SEAI, ETB's and Local Authorities.

The below image demonstrates this Energy Master Plan process, beginning with the initial kick off meeting with the KSEC committee, developing the towns energy baseline, conducting site audits, to the final report and summary supplement.

Figure 1: EMP Work Plan

2 Project Description and Background

2.1 Context

Ireland's commitment to meet international energy reduction targets is fundamental to achieving a sustainable and energy efficient future. As a member of the EU, and as a responsible nation, Ireland has committed to transitioning to a low carbon economy by 2050, and to becoming carbon-free by 2100. These commitments were stated in the December 2015 Energy White Paper titled "Ireland's Transition to a Low Carbon Energy Future 2015-2030".

Up to this point, the National Energy Efficiency Action Plan mandated Ireland's commitment to a 20% energy savings target by 2020, outlining the delivery of the national energy savings targets implemented under EU requirements as well as energy efficiency policy priorities to 2020.

In 2019, Ireland became only the 2nd country globally to declare a climate emergency when the Dáil voted to amend the Oireachtas report on Climate Action. In 2019 the Minister for Communications, Climate Change and Environment introduced the Climate Action Plan which sets out 183 actions setting out responsibility for different departments and government agencies with quarterly reporting requirements across the different sectors to reduce carbon emissions. The actions include several tasks focused on the built environment including the renovation of 500,000 homes to a BER B2 standard by 2030 and the installation of 400,000 heat pumps to replace fossil fuel boilers.

The targets set out in the Climate Action Plan (CAP) however would only achieve a 3.5% reduction in carbon emissions per year, this is in contrast the UNEP's annual Emissions Gap Report from 2019 stating that a 7.6% cut in emissions per year will be needed to meet the Paris agreement to restrict a global climate temperature rise to 1.5 °C. This was a matter for discussion in the formation of Government whereby the climate action plan needed to be radically revised to raise the level of ambition (IGBC, 2021).

Progressing from this, the latest Programme for Government sets out the Government's commitment to achieve an average 7% annual reduction in overall greenhouse gas emissions from 2021 to 2030 (a 51% reduction over the decade) and to achieving net zero emissions by 2050. In June of 2021, The Climate Action, and Low Carbon Development (Amendment) Bill 2021 was approved by Government. The Bill is a major piece of legislation that commits to dramatically migrate Irelands existing economy to that of achieving carbon neutrality by the year of 2050. The core takeaways from the Bill includes the following.

- The final version of the Climate Bill embeds the process of setting binding and ambitious emissions-reductions targets in law.

- The Bill provides for a national climate objective, which commits to pursue and achieve no later than 2050, the transition to a climate resilient, biodiversity-rich, environmentally sustainable, and climate-neutral economy.

- The Bill provides that the first two five-year carbon budgets proposed by the Climate Change Advisory Council should equate to a total reduction of 51% over the period to 2030, relative to a baseline of 2018.

- The role of the Climate Change Advisory Council has been strengthened, enabling it to propose carbon budgets to the Minister which match our ambition and international obligations.

- The government must adopt carbon budgets that are consistent with the Paris agreement and other international obligations. All forms of greenhouse gas emissions including biogenic methane will be included in the carbon budgets.

- The Government will determine, following consultation, how to apply the carbon budget across the relevant sectors, and what each sector will contribute in a given five-year period.

- Actions for each sector will be detailed in the Climate Action Plan which must be updated annually.

- Government Ministers will be responsible for achieving the legally binding targets for their own sectoral area with each Minister accounting for their performance towards sectoral targets and actions before an Oireachtas Committee each year.

- Local Authorities must prepare individual Climate Action Plans which will include both mitigation and adaptation measures and will be updated every five years. Local Authority Development Plans must be aligned with their Climate Action Plan.

- Public Bodies will be obliged to take account of Climate Action Plans in the performance of their functions (DECC, 2021).

This target of 7% requires a doubling of ambition, delivering in 5 years what the CAP said it would deliver in 10 years, and requires an additional 100 million tonnes in cumulative emissions reduction. The ambition of a 7% reduction per annum will require at least a doubling of the committed 30 billion euro investment in climate action in the period to 2030. This is approximately an additional investment of €600 per annum per Irish citizen. Figure 4 illustrates to the reader Irelands current climate ambitions, and compares these to that of 2030, demonstrating how significant a shift this is in the many respective sectors (MaREI, 2020).

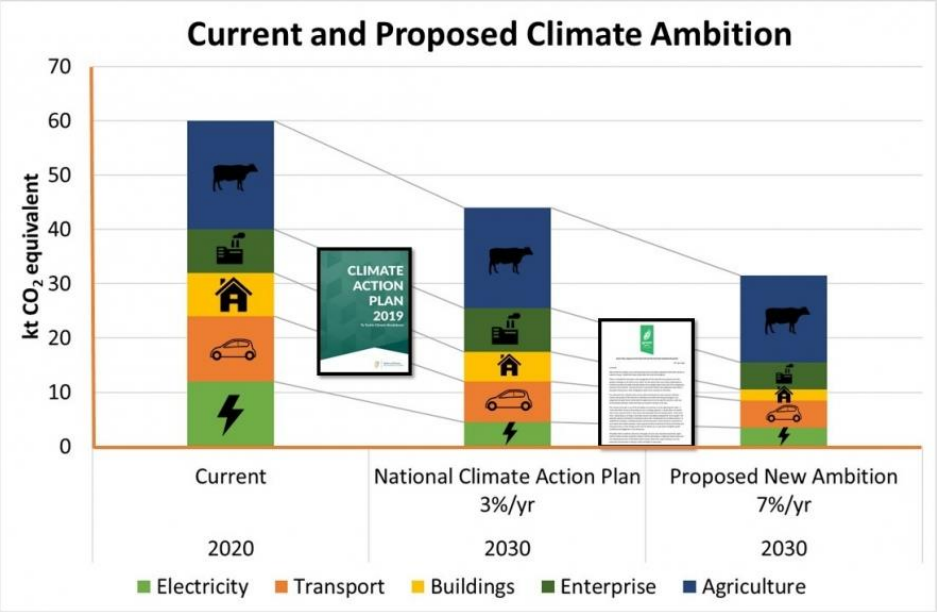

Figure 2: Climate Action Ambitions

The Bill names this programme the 'National 2050 Climate Objective'. The definition of a 'climate neutral economy' provides that by 2050 all greenhouse gas emissions in Ireland are balanced or exceeded by removal of emissions. To facilitate the targets in terms of reducing the emission of greenhouse gases the Bill mandates that the Minister for the Environment, Climate and Communications must submit several documents to Government for approval which are:

- a series of national long-term climate strategies
- a Climate Action Plan (which is required to be revised annually)
- a national adaptation framework
- sectoral adaptation plans
- a series of carbon budgets (Goodbody, 2020)

The Climate Action Plan puts in place a decarbonisation pathway to 2030 which would be consistent with the adoption of a net zero target in Ireland by 2050. The Plan also commits to evaluating in detail the changes which would be necessary if Ireland is to achieve this target (DCCAE, 2019).

The plan was launched on Thursday 4th of November 2021. It sets out indicative ranges of emissions reductions by 2030 for each sector of the economy and the actions needed to deliver on our climate targets.

Emissions reductions by 2030 – by sector

- Electricity: 62-81%
- Transport: 42-50%
- Buildings: 44-56%
- Industry/Enterprise: 29-41%
- Agriculture: 22-30% reduction
- Land Use, Land Use Change and Forestry (LULUCF): 37-58%

The climate action plan can be downloaded here and a short infographic booklet can be downloaded here.

SEAI's activity in consumer insight research, piloting new technologies, developing citizen and community focused supports and the Sustainable Energy Communities (SEC) programme provides the platforms to engage with consumers and build that confidence. Since the last strategy was published, the SEAI have invested over €400 million in sustainable energy projects throughout the country. This has saved the Irish economy over €1 billion in that time. Now it is time to be even more ambitious as the challenge set out in the Government's White Paper remains stark. It will require citizens, businesses, policy makers and regulators to work together in pursuit of this shared goal.

A key vehicle for citizens and communities in Ireland to take ownership of energy use is through local, sustainable renewable energy. The Renewable Energy Support Scheme (RESS) is a support scheme to help community participation in new local energy projects. Every year Ireland spends almost €6 Billion on imported energy. The RESS will help communities retain some of this money locally and reduce reliance on carbon intensive fuels. The importance of community involvement in this change has been explicitly detailed in the Climate Action Plan.

Recognising the scale of the task ahead, the SEAI will focus on several critical areas such as empowering citizens by giving them the means to use less energy and use clean energy at an individual level, raising awareness of sustainable energy, and increasing the impact from grant schemes. SEAI will also target DEEP retrofit of our building stock, greater uptake of electrical vehicles, further development in the public sector, provision of expert and authoritative analysis and enhancing the value derived from energy research and innovation.

Transition Kerry's Sustainable Energy Community Roadmap calculated the energy balance of the entire county. It was developed for 2008 as a baseline year. It found that

- Energy expenditure is almost €470 million per year in Kerry, equivalent to approx. €3,230 per capita per year.
- The residential sector spends €227 million on energy or an average of €4,300 per household per annum on energy and transport fuels.
- The total energy demand for the county was estimated at almost 4 TWh/year in 2008,

equivalent to 345,000 tonnes of oil per annum.

This EMP study will focus on the region of Killorglin in the hope that the information provided will help the community of Killorglin make decisions on their energy future.

As energy efficiency continues to develop as a resource for financial and public development across all economies, understanding its real value is increasingly important. The multiple benefit approaches to energy efficiency policy seeks to expand the perspective of energy efficiency beyond the traditional measures of reduced energy demand and lower greenhouse gas (GHG) emissions by identifying and measuring its impacts across many different spheres. Investment in energy efficiency can provide many different benefits to many different stakeholders such as:

- Increase health & wellbeing
- Energy security
- Improve air quality
- Increased asset value
- Household savings (IEA, 2019)

2.2 Kerry County Development Plan

The current county development plan 2015-2021[1] has 5 volumes.

(1) Written Statement
(2) Record of Archaeological Monuments & Protected Structures & Public Rights of Way
(3) Maps (Areas of Amenity, Rural Area Types, Environmental Designations)
(4) Environmental Reports (Strategic Environmental Assessments (SEA), Habitats Directive Assessment (HAD), Strategic Flood Risk Assessment (SFRA))
(5) Housing Strategy

The Kerry County Development Plan 2022-2028[2] sets out the overall strategy of the proper planning and sustainable development of the County over a six-year period, within the context of the national, regional framework of strategies and guidelines. Kerry County Council is commencing the process of preparing the new Development Plan 2022-2028. The plan sets out the strategic spatial vision and future direction for the county from 2022 to 2028.

Kerry County Council have commenced the review of the County Development Plan of 2015-2021 in preparation for the New County Development Plan 2022-2028. At the time of research for this EMP, the Plan was at stage 2 of the process. There are 4 stages. Up to this point in the overall Development Plan process, the focus is on identifying strategic issues that need to be addressed. Specific land use zonings were not considered. In addition, several issues and projects highlighted in individual submissions were at a local level and are of more relevance to the Local Area Plan process. A draft Development plan is now available, a public consultation process has been conducted and the deadline for submissions has now passed. The next output will involve the report on submissions.

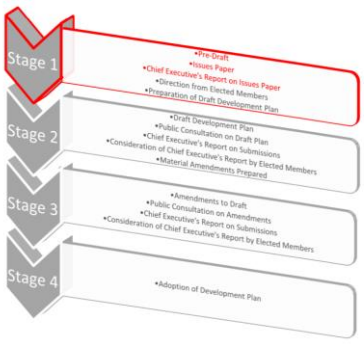

Figure 3: Kerry County Development Plan Process (KCC, 2021)

The Pre-Draft Consultation Process began on the 24th of June 2020. The broad topics considered in the issue paper[3] included the Strategic Vision for the County, Economic

[1] https://cdp.kerrycoco.ie/kerry-county-development-plan-2015-2021/

[2] https://www.kerryppn.ie/proposed-kerry-county-development-plan/

[3] http://kerryppn.ie/wp-content/uploads/2020/06/IssuesPaperKerryCDP.pdf

Development & Activity, Tourism, Tralee & Killarney, Towns & Villages, Sustainable Places to Live, Rural Development, Natural Assets & Environment, Climate Change, Flooding & Coastal Zone Management, Transportation & Connectivity, Community Facilities & Quality of Life, Culture and the Gaeltacht, Infrastructure & Energy and Heritage.

The policies and objectives of the new Plan must align with national and regional planning policy. Project Ireland 2040: National Planning Framework (NPF) is the Government's high-level strategic plan for shaping the future growth and development of the country to the year 2040. The NPF is implemented at a regional level through the Regional Spatial Economic Strategies (RSES) and at county level through the development plan. The current RSES for Kerry identifies Tralee and Killarney as the two key towns in the settlement hierarchy. Killorglin is identified as a regional town. Regional towns are defined as towns which provide a housing, employment, or service function. The category is broad and ranges from large commuter towns to more peripheral towns.

The focus of Kerry's new County Development Plan will be on developing the key towns of Tralee and Killarney, as provided for in the RSES, to act as economic drivers and provide for strategic employment locations supported by the regionally important self-sustaining growth towns such as Killorglin.

Figure 4: Kerry Settlement Hierarchy

2.3 Killorglin Local Area Plan 2010-2016

Killorglin Local Area Plan 2010-2016[4] was prepared with the objectives of the County Development Plan in mind. This plan remained in force for a period of up to 6 years from its date of adoption. The overall aim for the plan was to provide a comprehensive local planning framework for the functional area of Killorglin which clearly sets out the policies and objectives for its development. Taken in conjunction with the Regional Planning Guidelines and the County Development Plan it completed the planning framework for the area. The plan clearly set out the policies and objectives for the development of each settlement and made clear to landowners, developers, and agents the vision of the Planning Authority for the area.

[4] https://www.kerrycoco.ie/planning/planning-policy/local-area-plans/killorglin-functional-area-local-area-plan-2010-2016/killorglin-functional-area-lap-2010-2016/

3 Profile of Killorglin

3.1 General

Killorglin town is located approximately 27km southwest of Tralee and 22km northeast of Killarney, at the intersection of two National Secondary routes, the N70 and N72. These routes meet at the bridge crossing of the River Laune (SAC) which flows into the adjoining Castlemaine harbour (SPA) to the North of the plan area. Its dramatic mountain backdrop and river setting has ensured Killorglin gained the title as the "gateway" to the Iveragh peninsula and the Ring of Kerry tourist route.

Killorglin town functions as an important local service centre for the northern part of the Iveragh Peninsula and has a wide diversity of services and facilities, ranging from public services, convenience shops, cafes, restaurants, public houses, and financial services. One of the primary employers in the town is FEXCO Financial Services, a privately owned company, which is a focused provider of global payment services and processing. Through three core product groups Global Corporate Payments, Global Consumer Payments, and Business Services they process millions of international payment transactions annually. Several manufacturing industries have also been established in the town, including Fujisawa Ireland Limited Pharmaceuticals, Astellas Pharma, Temmler Ireland and Aqua Designs amongst others. The education facilities in the town include one primary school and two post primary schools. The town is well located being equidistant from Tralee, Killarney, and Kerry airport.

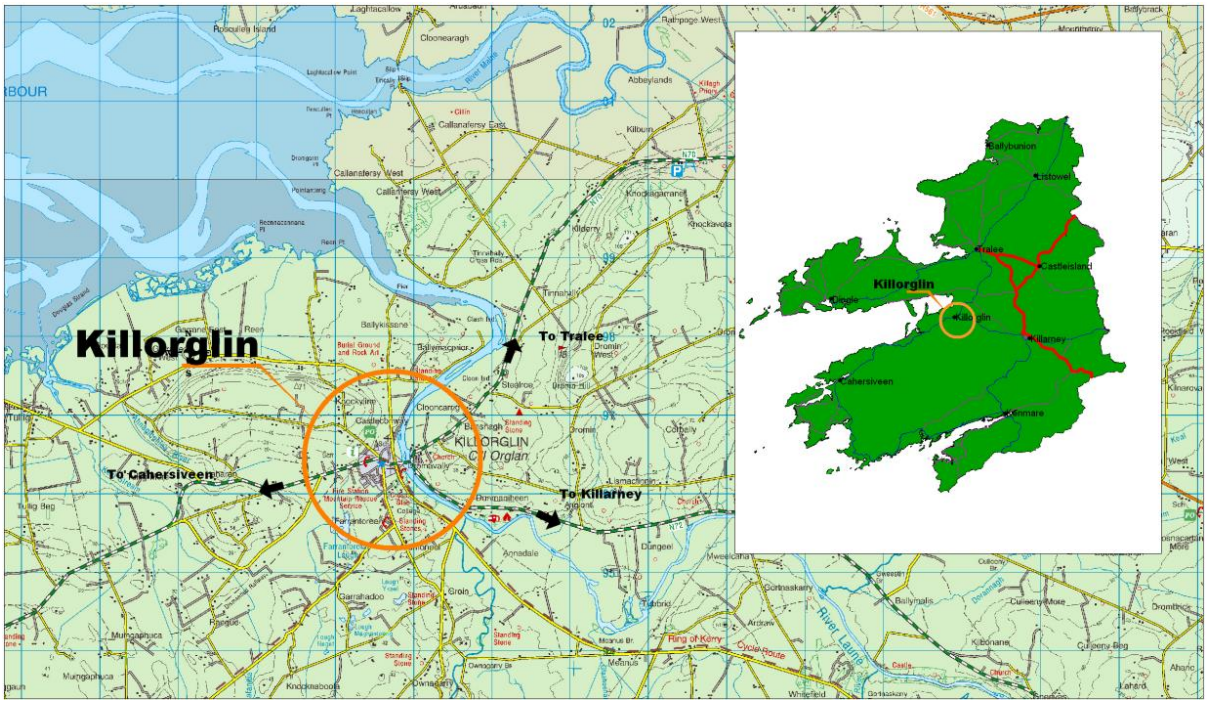

Figure 5: Map of Killorglin (Council K. C.)

4 Killorglin Energy Profile

4.1 Energy Baseline

To move the town of Killorglin to a space of low or net carbon emissions, an understanding must first be developed regarding the current energy performance of the area in question. This study will focus on 3 core areas of energy use, this will be the residential, commercial & the transport sectors. In understanding the current energy performance, the baseline is identified. This baseline analysis will focus on energy used annually (kWh/yr.), energy spend annually (€/yr.) and carbon emissions annual ($kgCO_2$/yr.).

Using various verified sources, such as the national CSO & SEAI BER database, alongside benchmarking and statistics from the NTA, the baseline analysis for Killorglin was complete. A summary of this can be seen in the table below.

Table 1: Killorglin Energy Baseline

Killorglin Energy Baseline				
Sector	**Annual Energy Use (kWh/yr.)**	**Annual Carbon Emissions (kg CO_2/yr.)**	**Annual Energy Cost (€/yr.)**	**Percentage Energy Split (%)**
Residential	52,028,516	14,214,191	€8,824,036	53.8%
Community/Non-Domestic	17,117,616	4,917,496	€3,343,319	17.7%
Public Sector	344,060	111,449	€80,876	0.4%
Transport	27,236,808	6,420,686	€12,249,967	28.2%
Total	**96,727,000**	**25,663,822**	**€24,498,198**	**100%**

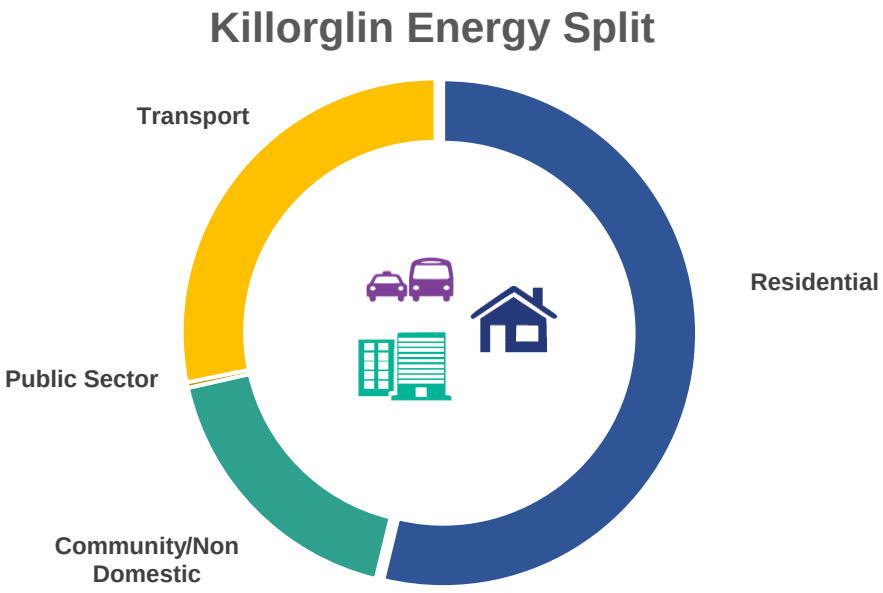

Chart 1: Killorglin Energy Baseline Split

5 Analysis of Residential Sector

The residential profile of Killorglin is typical of other counties throughout Ireland with a significant proportion of private housing throughout the countryside combined with housing estates, apartments, and communal housing more typical to urban areas.

Analysis of CSO data alongside general data from the SEAI and KSEC has been combined to produce a background picture of the housing sector and the surrounding areas highlighted in the map below. This data along with the results of the SEAIs BER Heatmap data and the community survey develops an understanding regarding energy efficiency in Killorglin.

5.1 Residential Baseline

To review the residential sector, national residential data was obtained from the Central Statistics office (CSO), the CSO's Small Area Population Statistics (SAPS), listed the housing stock present in the area by house type and year of construction. Approximately 2,194 dwellings were recorded for the area covered in the KSEC region of Killorglin.

BER data showed that the average dwelling consumed approximately 23,714 kWh/yr. This figure was applied to the number of dwellings in the region. Space heating accounted for 61% and water heating accounted for 19% of the total energy use. It was assumed that oil was the energy source used for heating. The remaining 20% of the total energy use was split between lighting (8%), appliances (9%) and cooking (3%), electricity was assumed to be the energy source. SEAI's corresponding prices and emission factors as of 2022 were applied to calculate the total spend and CO_2 emissions.

Table 2: Killorglin Residential Energy Baseline

	Electricity	Fossil Fuel	Renewables	Total
Energy (kWh/yr.)	12,486,844	34,338,821	5,202,852	52,028,516
Carbon Emissions ($kgCO_2$/yr.)	3,411,406	10,802,785	-	14,214,191
Cost (€/yr.)	2,117,769	5,823,864	882,404	8,824,036

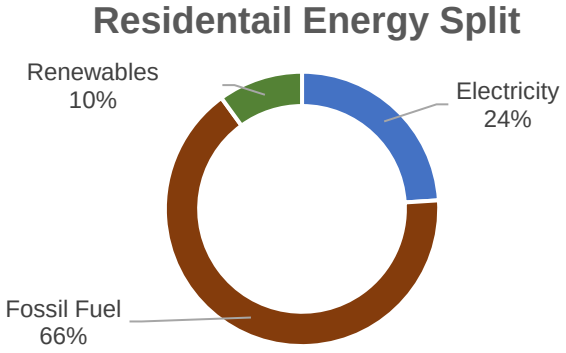

Chart 2: Killorglin Residential Energy Split

5.2 Central Statistics Office (CSO) Data Analysis

Killorglin town shown in the figure below has a reported population of 2,199 people and 927 households (CSO, 2016).

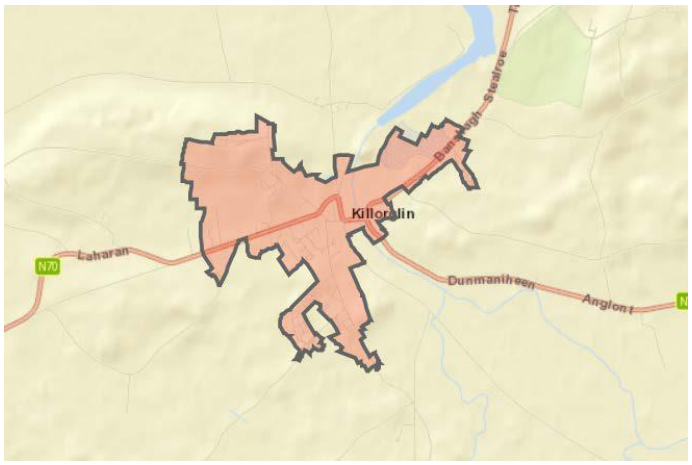

Figure 6: Killorglin Town - Study Area A

The Electoral Division of Killorglin combines Killorglin town and surrounding areas as shown in Figure 7: Killorglin Urban and Rural study Areas Combined. CSO statistics report a total population of 4,355 people and 2,194 households.

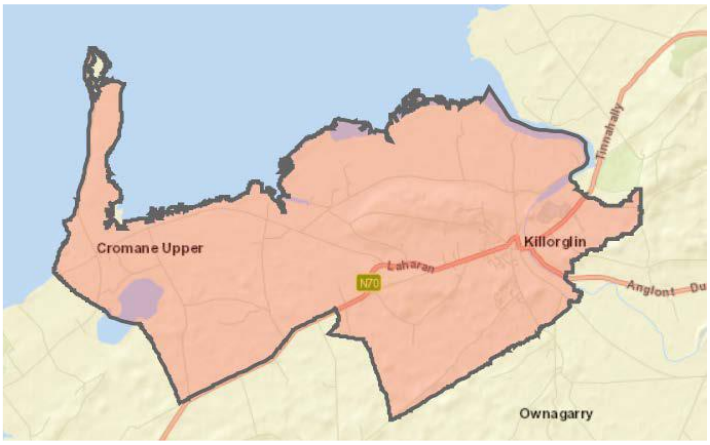

Figure 7: Killorglin Urban and Rural study Areas Combined

These figures indicate that a significant proportion of people reside outside of the town boundary. There are less households in larger electoral division which indicates that there is a higher proportion of people living within a single dwelling in rural Killorglin than within the town.

The CSO data analysis for Killorglin indicates the types of homes that are scattered throughout the study area. The largest majority of these, at 89%, are houses and or bungalows, with 8% registered as apartments.

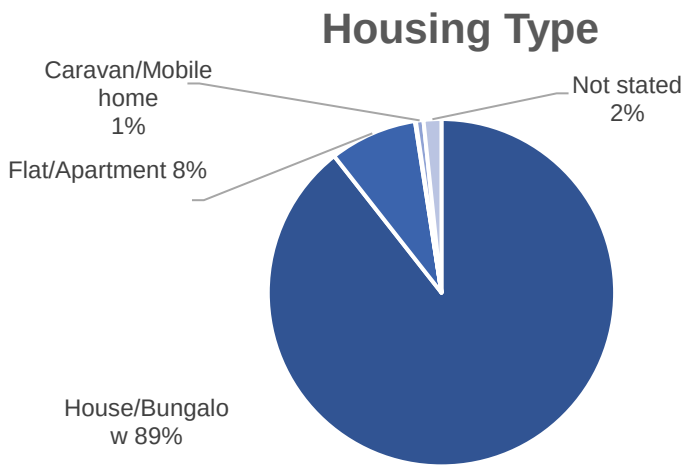

Chart 3: Killorglin Housing Type (CSO, 2016)

Recently constructed dwellings are expected to yield a relatively high level of energy efficiency, and therefore are typically not the focus in respect to retrofits. This is due to the requirement for new dwellings, particularly post 2011 constructions, to comply with modern building regulations for energy performance, specifically Technical Guidance Part L. The chart below indicates that 8% of homes within the region are constructed post 2011, while the remaining are scattered from pre 1919 to 2010. This data was compiled in 2016 by the CSO, with recent significant housing developments within the town likely increasing this rate of new builds since this period after 2011. However, a housing construction boom occurred in the area between the years of 2001-2010, which was proportionately higher than the state average. This chart strongly indicates that a very large number of homes will present opportunities to improve energy efficiency as most constructions would originate from an era of less energy efficient practices.

From the findings below, 39% of these homes were constructed between 1971 and 2000. This is a period before which building control regarding energy efficiency was only just enforced. As a result, a large proportion of homes have very poor insulation, with external walls containing little to no insulating material which would limit heat loss. The same would apply to roof spaces such as attics and ground or exposed floors. More complex building design such as dormers would be very problematic in this regard also. Typically, basic double-glazed windows were installed, but limiting strategy was applied to reduce draughts, this extended throughout the entire dwelling which would very often lead to high levels of heat loss from unwanted air infiltration. Homes constructed around this time also used carbon heavy fuels such as oil, gas and/or solid fuel while open fires as secondary heaters were very common.

A slightly lesser proportion of homes, 22% were constructed pre-1970. The types of buildings of older age bands present many challenges due to the historic construction methodologies applied from their era and the materials used, alongside the important significance associated with preserving of heritage of these homes. Specialist heritage audits would need to be

complete on each home to ensure the correct measures are applied, which may be very limited due to structural, planning and moisture ingress/egress concerns.

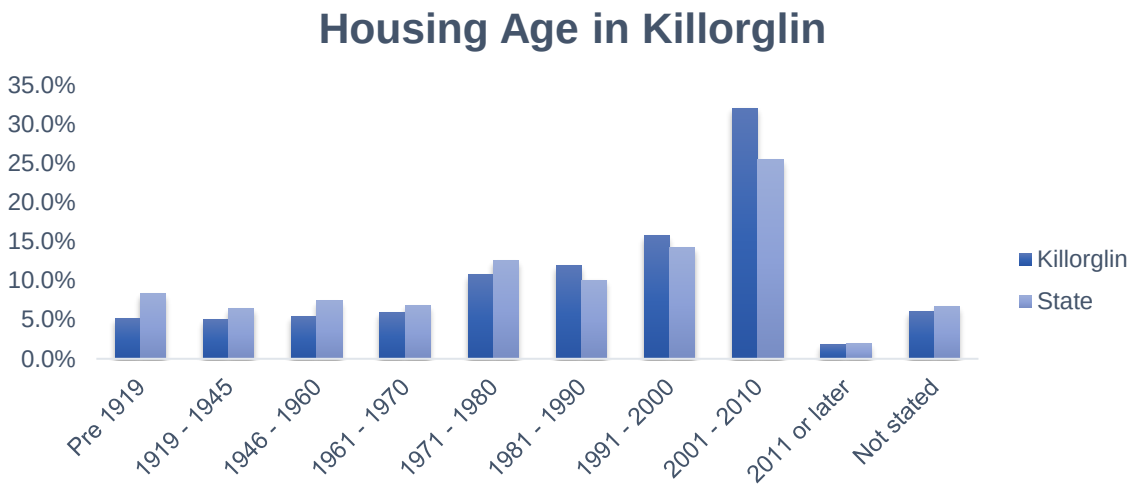

Chart 4: Killorglin Housing Age compared with state average (CSO, 2016)

The greatest proportion of homes throughout Killorglin are owned outright at 41%. Research has shown that owner occupiers have a greater incentive to invest in energy saving measures than landlords or tenants in rented accommodation.

24% of homes are owned with a mortgage or loan, this can imply that the occupants may already be in significant debt but could also suggest that they are young and have a greater appetite for home energy upgrades than those who may be retired or those who are renting accommodation and are faced with the many associated barriers as a result. Homes rented from private landlords can suffer from a phenomenon called split incentives where landlords do not feel the benefits from improving energy efficiencies as tenants pay electricity and heating bills. A strong strategy of engagement and encouragement will be required for landlords until obligatory measures are put in place around private rented accommodation upgrades.

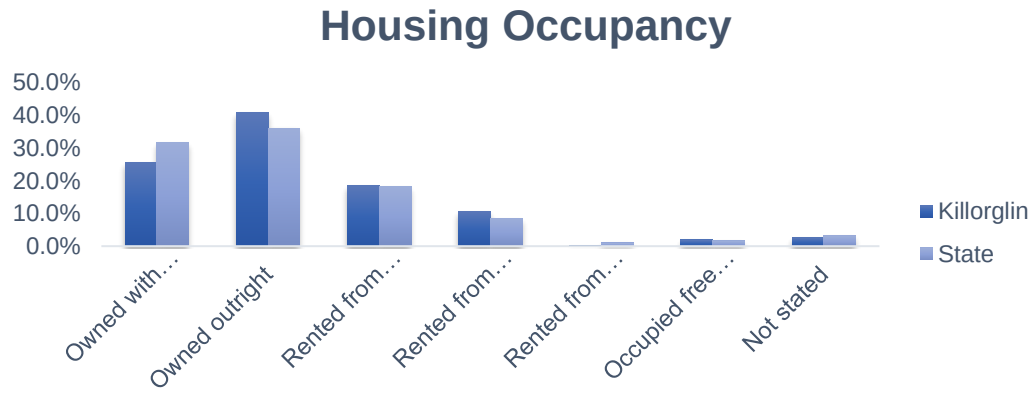

Chart 5: Killorglin Housing Occupancy (CSO, 2016)

Oil is the primary source of central heating throughout Killorglin followed turf. Collectively coming in at 75% of all fuels used for central heating throughout the study area. Central heating is defined as a system that provides heat to the entire internal volume of a building from one point to multiple points. The finding of this data, although unsurprisingly, raises cause for concern as these fuels are the most carbon intensive and the most widely used of all the fuels used in Killorglin. However, it also demonstrates the huge level of potential for improvement within the residential sector across the area.

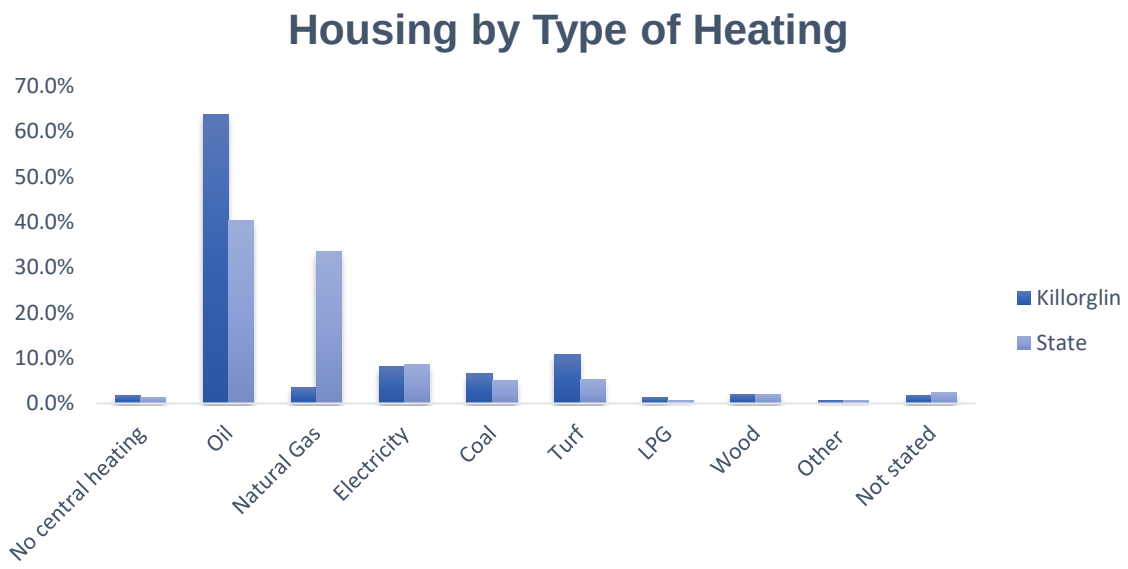

Chart 6: Killorglin Home Heat Sources (CSO, 2016)

5.3 Building Energy Rating (BER) Data Analysis

A Building Energy Rating, or BER, is an energy label with an accompanying advisory report for homes provided by the SEAI. The rating is a simple A to G scale. A-rated homes are the most energy efficient and will tend to have the lowest energy bills.

The SEAI's National Building Energy Rating Map below displays colour coded 'Small Areas' of Kerry. The colour of a given small area represents the BER of the median geo-located dwelling in that area. The map only contains BER Information at the Small Area level for dwellings that have had a BER complete. The medians were derived from all geo-located dwellings with a BER in that Small Area. For example, Small Areas that are green represent areas with a 'good' median BER. Small Areas with dwellings that have a poor median BER are either red or purple.

By analysing the Building Energy Rating data files for all the small areas in Killorglin, the following information was observed. Of the 2,218 homes registered within the catchment of the rural and urban Killorglin (slightly higher than the register number under CSO data), 529 have Building Energy Rating certificates, representing a sample size of 24%. This would correlate with the findings in the CSO data analysis which tells us that 41% of the homes in Killorglin are owned out-right, these are the homes that would most likely not have a BER certificate. BER's were required, by law, for anybody selling or letting a property from January 1st, 2009. Houses bought and sold post 2005 would have been the most likely to have had BER certification.

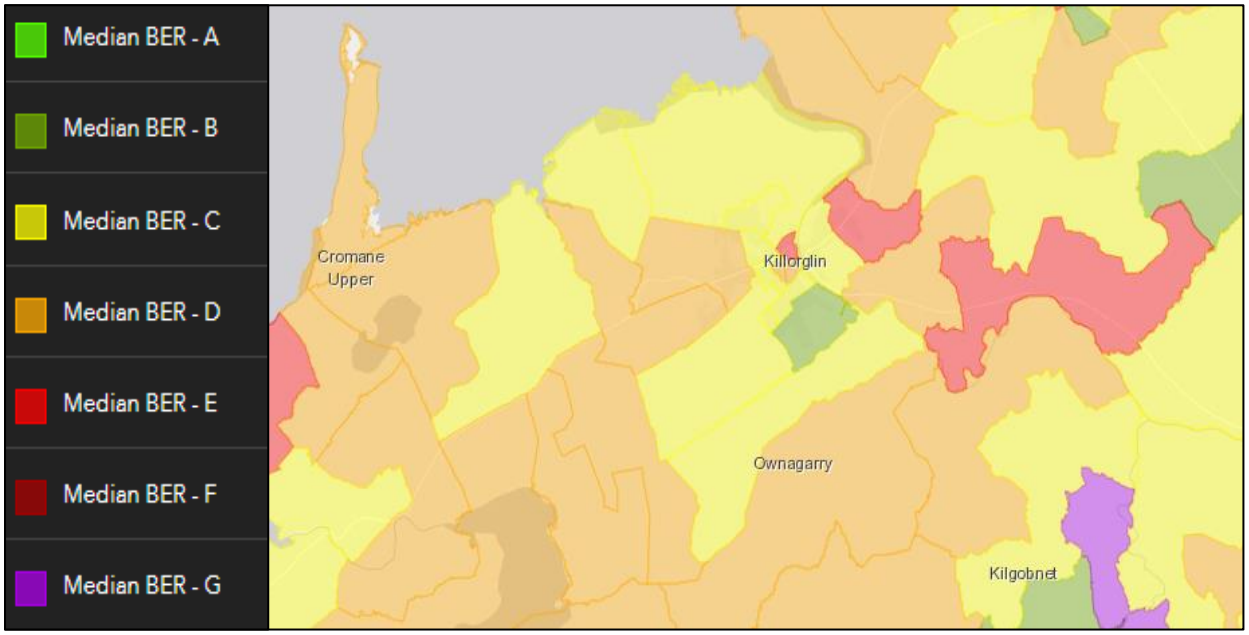

Figure 8: SEAI BER Heat Map (Killorglin Region)

By analysing the Building Energy Rating data files for Killorglin, the following information was observed.

The data below tells us that the average Building Energy Rating for homes in the Killorglin area is a D1, with a typical dwelling requiring between 225-260 kWh/m^2/yr. of energy. The CSO data indicates that most homes in this area are fuelled through oil, with the BER data showing the same at 67%.

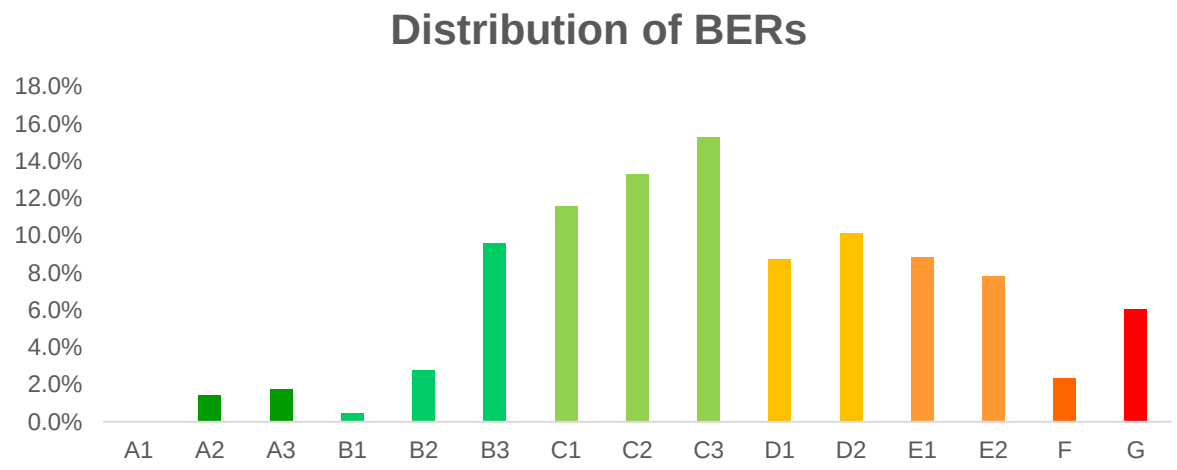

Chart 7: Killorglin BER Summary

BER data categorizes housing types further, building on what information was established through the earlier CSO analysis. We can see that the largest proportion of homes are detached at 48%, a reflection of the majority proportion of one-off rural dwellings, owned outright. This is followed by semi-detached, mid and end of terrace which would be more reflective of the houses within the urban area of Killorglin town.

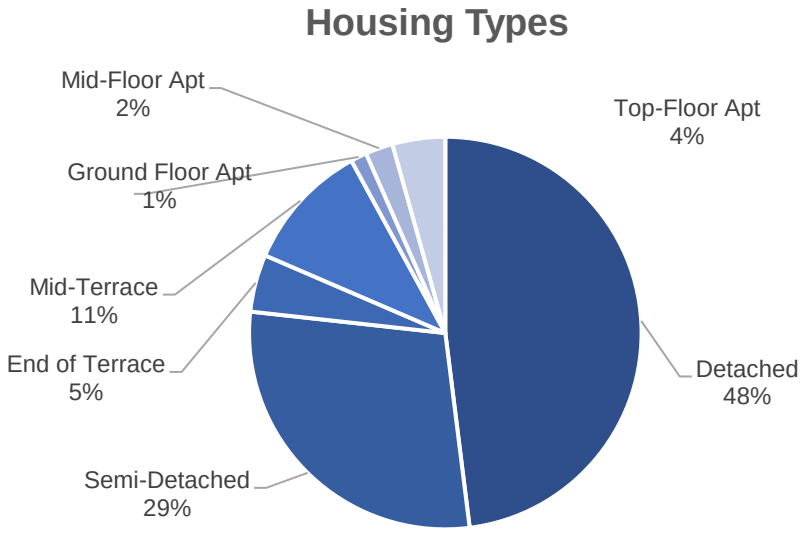

Chart 8: BER Analysis of Housing Types in Killorglin

The BER data also highlights the construction age of the housing stock. According to the BER data over 23% of the dwellings surveyed were constructed from 2005 onwards, next to houses built between 2000 and 2004 (31%). The remaining 45% surveyed were constructed before 2004 back to pre-1900.

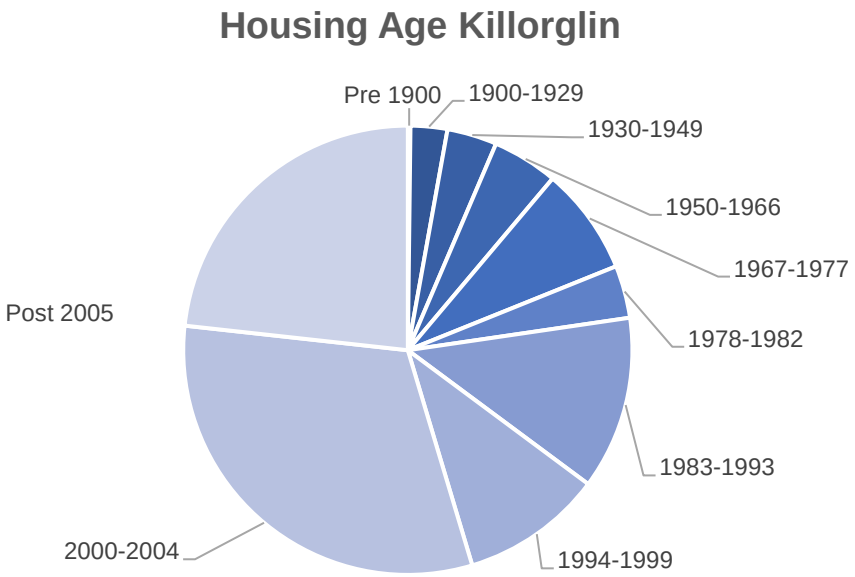

Chart 9: BER Analysis - Housing Age

The table below provides Indicative Building Energy Rating Grades for Typical Homes (SEAI, A Guide to Building Energy Rating for Homeowners, 2021), dwellings constructed between the period of 2000-2004, using oil as the primary heating system would expect to yield a BER of a C3. The data, when compared against the BER map for Killorglin, indicates the average BER is slightly lower than this in the D1 range.

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

Standard electric heating	
Year of construction	Typical energy rating
2012+	A3
2010-2011	B1
2008-2009	C3
2005-2007	D1
1994-2004	E1
1978-1993	E2
Pre 1978	G

Solid fuel central heating	
Year of construction	Typical energy rating
2012+	A3
2010-2011	B1
2008-2009	B3
2005-2007	C2
1994-2004	D1
1978-1993	D2
Pre 1978	F

Figure 9: Typical BER Grades

In conclusion to the above analysis, the following provides a whistle stop summary of the residential, sector within the region.

- 62% of Homes Built Between 1971 – 2010.
- 33% of Homes are Owned by the Occupant.
- 16% of Homes are Privately Rented.
- 77% of Homes are Fueled by Oil and Turf.
- 67% of Homes have BER's Ranging from E1 – C1
- 14% of Homes have BER's Ranging from E2 – G
- Average Building Energy Rating of D1

5.4 Domestic Home Energy Survey

A key objective of an Energy Master Plan, and indeed an SEC, is to engage the wider community and begin the conversation of energy efficiency and opportunities that they may pursue to further reduce the carbon emissions associated with local homes, community buildings and businesses. Aside from engaging the community, the survey is also a useful source of information in establishing more detail on the current condition of homes throughout the area. This allows the SEC to develop a better understanding of what areas the primary focus should be for homeowners, allowing support to be tailored specifically to this.

A comprehensive interactive online survey was issued to the Killorglin community to assist in developing a more detailed understanding of the local domestic housing stock and to assist in identifying areas which can contribute to the development of more energy efficient dwellings. The results of the survey develop an illustration of what type of dwellings are contained within the community and the responses to same help identify the challenges and understanding of an approximation of works and opportunities that present themselves. The series of charts below have been developed from the results of the survey.

Of the 24 responses, 23 dwellings were classified as detached with one terrace in the mixture. 10 of the respondents claim to live in a single-storey dwelling, otherwise known as a bungalow, while 14 states their homes to be 2 storeys.

The graph below illustrates the year the associated dwellings were constructed, with the highest proportion built from the year 2000-2006 at 25%. Followed closely behind this at 21% are homes built from 1960-1980 and 1990-2000. From SEAI data, homes built from 1978 – 2004 with oil as the primary heating system, will range in BER's from a D1 to C3. Dwellings constructed prior to 1978 can yield BER's from D2/E1/E2 where oil is again the primary form of space heating. However, where electricity or solid fuel are used, this BER can reduce further to G & F ratings, respectively.

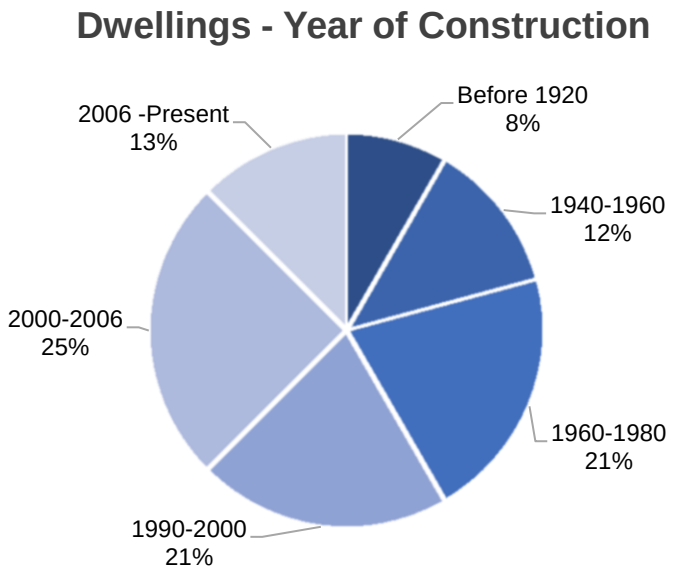

Chart 10: Home Energy Survey - Dwellings by Year of Construction

In respect to the existing primary heating systems installed, oil fired systems were found to be the highest user at 83% with a small number of dwellings using a combination of both oil and solid fuel, very carbon heavy systems. On the positive side however, one of the homes did have a heat pump system installed demonstrating the capacity and demand for considered renewable energy technologies. It is worth noting however that the dwelling with the air to water heat pump did construct their dwelling post 2006 and may have been guided by Building Regulations for energy efficiency (TGD Part L).

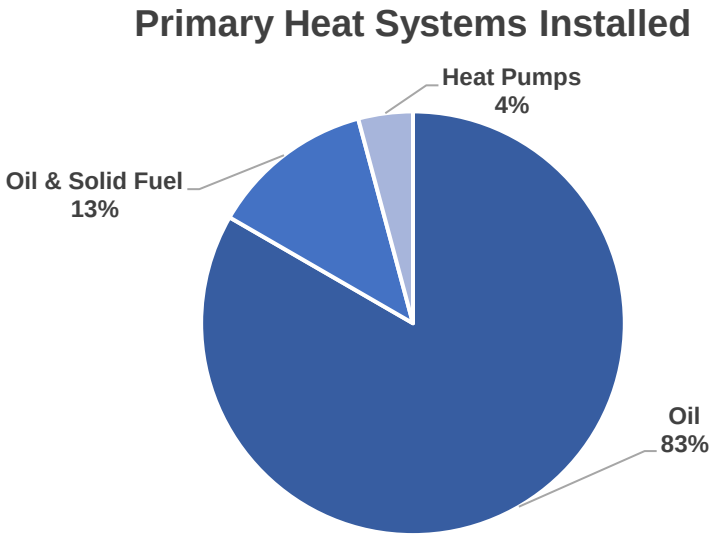

Chart 11: Home Energy Survey - Primary Heat Systems Installed

In additional to the main heating system, respondents were also asked about additional secondary heaters installed. As can be seen from the chart below, the vast majority, at 64%, have solid fuel stoves installed, with 20% using a traditional open fire. 8% of respondents use a form of electrically driven heater.

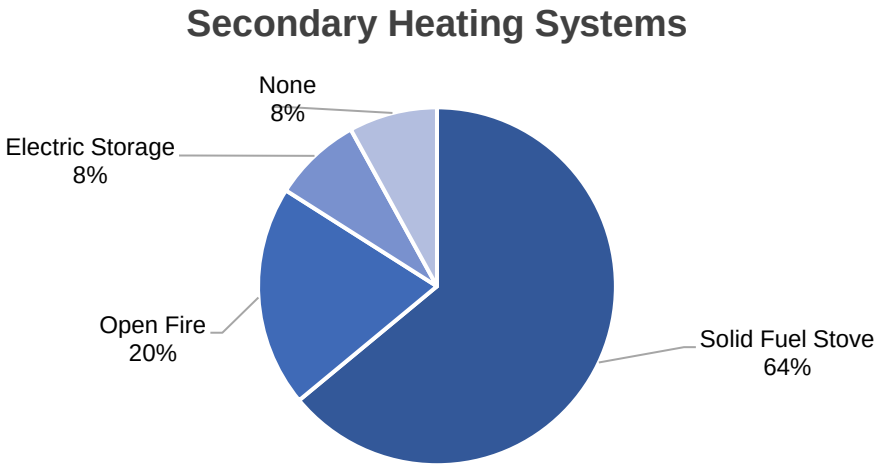

Chart 12: Home Energy Survey - Secondary Heating Systems Installed

The mechanisms used to control the heating system in the homes of those who partook in the survey were also assessed based on the responses. Ideally an automated system such as an oil boiler or a heat pump system will have capacity to control both the space heating (i.e., radiators) and hot water (i.e., shower etc) separately. This creates a significant efficiency as the homeowner can control the use of fuel consumed based on their specific needs. This comes into relevance during the summer months when the requirement for heating radiators is not there, but hot water is still needed for basic services such as showers, baths, and wash hand basins. Without the ability to directly control hot water and space heating individually, additional fuel will be used. Alternatively, electric immersion heaters are utilised costing significantly more than the primary fuel in the house.

Another point to note is that heating controls vary in terms of the level of control they provide the homeowner. There are basic components and configurations such as timeclocks and manual valves, alongside more detailed systems such as double and three channel programmes which allow individual control between both space heating and hot water. Couple this with room thermostats and a cylinder thermostat and a high level of both fuel and heating system efficiency can be achieved. The chart below summarises they variation in heating controls across the respondents of the survey. The results are quite spread across a range of categories with a relatively high percentage of homeowners have a high level of control through double/three channel programmes at 29%. However, a wide range of homes claim to have a poor level of control with 63% claiming to have a single channel timeclock only, a cylinder or room thermostat only, or no heating controls at all.

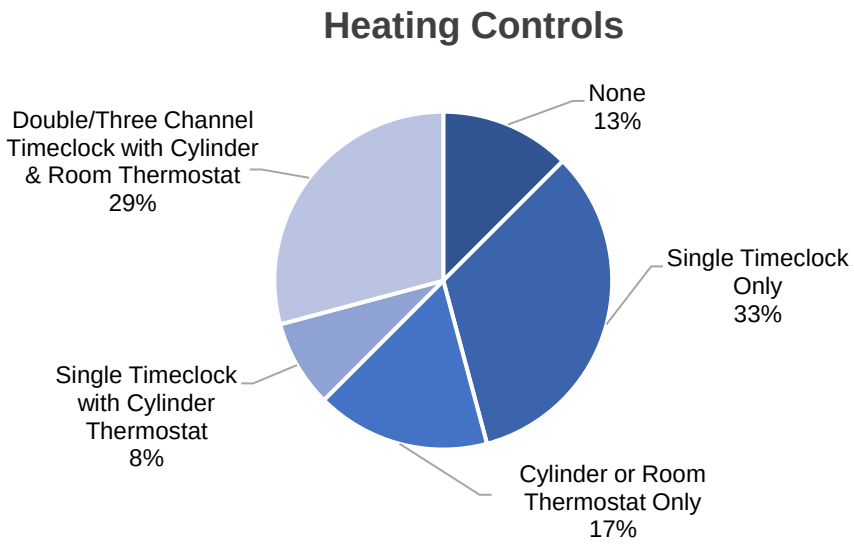

Chart 13: Home Energy Survey - Heating Controls

Moving on from the heating systems, and in respect to the building fabric, 82% of dwellings surveyed classified their external walls as cavity wall. This type of wall construction can be seen in the picture below where there is an external brick finish.

The remaining dwellings were constructed with either a solid block, hollow block, or stone. Of the external walls referenced in the survey, 52% were stated as having either an unknown quantity of insulation, or none. A positive trend is that just under half of the dwellings surveyed stated that external wall insulation, internal drylining and/or pumped bead to cavities were installed to insulate walls.

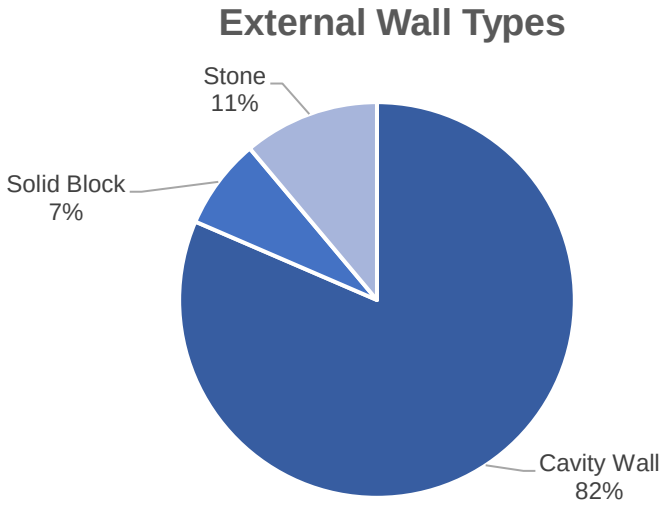

Chart 14: Home Energy Survey - External Wall Type

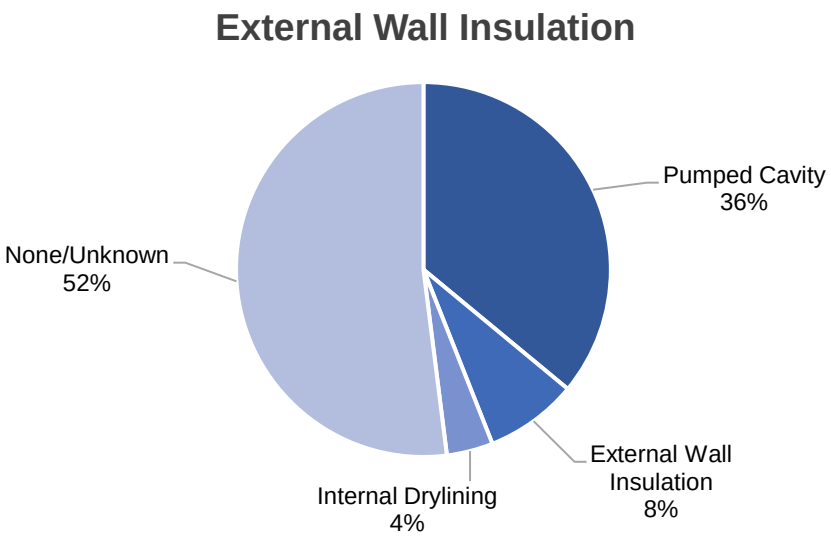

Chart 15: Home Energy Survey - External Wall Insulation

One of the most significant factors which contribute to heat loss within a home is the quality of roof insulation. This is largely due to how heat will rise. However, attic insulation is also one of the most cost-effective measures that can be taken to mitigate heat loss within any home. From the findings of the survey, a very large proportion of homes, 58%, had either an unknown quantity or no insulation installed in their attic spaces. Only 13% had the recommended quantity, greater than 300mm, installed.

Details on the external windows were also provided and yielded relatively positive results however more detail would be needed to fully assess the quality of the glazing installed. Of all the homes surveyed, 83% had double glazed windows installed, with 13% having triple glazed. A small fraction of 4% have single glazed units which certainly require attention and will contribute to excessive levels of heat loss in the home. Retrofitting windows can be a costly project and can also be quite destructive in nature. However, upgrading from old, draughty single glazed windows to modern day double or triple glazed windows can reduce heat loss within that space by up to 80%. Removing existing windows also presents the opportunity to address draughts around the frame and revels.

Of significant interest to the Sustainable Energy Community is the level of renewable energy technologies installed throughout the community. For Killorglin to make the transition to becoming low/zero carbon, a significant movement in the mobilisation, installation and integration of renewable energy technologies will be required across all sectors. Of the information within the results of the survey, 75% of homes did not utilize any form of renewable energy technology with 21% benefiting from solar thermal systems to support hot water production. One air to water heat pump system is installed as the main heating system in a dwelling.

In terms of the quantity of money spent annually on both heating and electricity for the

participants and their responses to the survey, the average homes using oil or solid fuel reported spending in the region of €2,050 in a year. Contrast this to the homeowner who has an air to water heat pump, declaring an annual energy bill of approx. €750.

Finally, and likely a key indicator of the level of buy-in and community engagement there may be in the process of decarbonisation for the community, participants were asked about their ambitions regarding improving the energy efficiency in their homes. The types of works referenced range from full DEEP retrofits including upgrading all the buildings insulation and installing heat pumps to utilizing renewable energy technologies such as solar thermal and solar photovoltaic panels. Many homeowners also stated electric vehicles as a desire to replace existing petrol and diesel cars.

In conclusion to the findings of this home energy survey, an understanding has been gained on many of the challenges alongside opportunities facing the SEC in achieving the transition to low carbon homes. The findings, as supported by the CSO and BER data, confirms the relatively high reliance on carbon heavy fuels such as oil and solid fuel. This is an area that requires key focus, as to realise the reality of decarbonisation, such systems will need to be replaced with green, sustainable solutions such as heat pumps, biomass etc.

Energy efficiency should be considered a high priority also, where the current profile of insulation will contribute to this. The findings of the survey highlight a significant number of homes have little to no insulation installed such as the external wall and roofs. If alternative heating systems are to be considered, such as heat pumps, both the quality and quantity of insulation across the entire home must be addressed. This is known as the **Fabric First Approach**, whereby effectively insulating and draught sealing the dwelling ensures a system such as a ground or air source heat pump can achieve high levels of efficiency and maintain a comfortable temperature for a homeowner to habitat.

While the above are considered significant works, and will require a certain amount of commitment, these are not the only solutions a homeowner can take. Investing in heating controls and upgrading all the lights to LED’s can offer significant improvement in home comfort and reduce electricity bills. Low-cost measures such as attic insulation and draught stripping should also be considered as one of the first measures and will improve a buildings thermal performance.

6 Home Energy Retrofits

To maximize the relatability of this study to Killorglin and the wider community, a total of 7 home energy assessments including BER Certificates were carried out on typical dwellings from within the town and its region. The aim of these assessments was to provide the community with a tangible sense of what typical upgrades could be completed for a house that they would be familiar with. All BER certificates, and advisory reports have been made available to the SEC.

6.1 Specific Site Assessments

Working alongside the KSEC committee, a sample of dwellings were selected based on age band, location, and heating system. These locations are as follows.

- Sunhill, Laharn, Killorglin.
- Lynch Heights, Killorglin.
- 2 No. Dun an Oir, Killorglin.
- Langford St., Killorglin.
- Clooncarrig, Killorglin.
- Douglas, Killorglin.
- Gurrane West, Killorglin.

- **Sunhill, Laharn, Killorglin, Co. Kerry**
    - Detached bungalow, constructed in 1980.
    - Floor area of 87m².
    - Pitched roof, 300mm of insulation.
    - 300mm cavity block.
    - Single glazed windows.
    - Incandescent lighting throughout.
    - Regular oil boiler - 79% efficiency.
    - Solid fuel room heater.

Figure 10: Sunhill, Killorglin

Recommended Retrofit Measures

	3, Sunhill, Laharn, Killorglin, Co. Kerry					
	Energy Upgrades	BER Energy Value (kWh/m²/yr.)	BER Rating	Estimated Annual Savings (€)	Estimated Cost of Works (€)	Estimated Annual Energy Bill
Existing Level	None	377	E2	N/A	N/A	€4,673
Low Level	Low Energy Lighting	372	E2	€70.10	€50	€4,603
	Insulate/Upgrade Hot Water Cylinder & Primary Pipework	353	E2	€230.15	€600	€4,373
Medium Level	Upgrade Heating System Controls	288	D2	€808.97	€1,500	€3,564
	Install Sealed Wood Log Stove in Living Room. Seal additional chimney Ope.	245	D1	€534.57	€2,000	€3,029
	Pump Bead to Cavity Wall	183	C2	€757.31	€2,000	€2,272
High Level	Install Double Glazed Windows & New Door	165	C1	€227.19	€8,000	€2,045
	Externally Insulate Cavity Walls	132	B3	€408.95	€8,000	€1,636
	Upgrade Floor Insulation (Optional)	112	B2	€245.37	€12,000	€1,390
	Install ASHP	73	A3	€486.65	€10,000	€904

Summary	
Total Estimated Cost of Works (€)	€44,150
Total Estimated Cost of Works (€) (Inc One Stop Shop Grant)	€22,075
Estimated Annual Savings (€/yr.)	€3,769
Estimated Annual Energy Savings (kWh/yr.)	26,532

- **Lynch Heights, Killorglin, Co. Kerry**
  - Detached bungalow
  - Constructed in 1999
  - Floor area 109m²
  - Pitched roof
  - 300mm of insulation to ceiling
  - 300mm filled cavity
  - Double-glazed, air filled windows
  - LED lighting throughout
  - Condensing oil boiler - 95% efficiency
  - Bottled LPG room heater

Figure 11: Lynch Heights, Killorglin, Co. Kerry

Recommended Retrofit Measures

	10, Lynch Heights, Killorglin, Co. Kerry					
	Energy Upgrades	BER Energy Value (kWh/m²/yr.)	BER Rating	Estimated Annual Savings (€)	Estimated Cost of Works (€)	Estimated Annual Energy Bill
Existing Level	None	147	B3	N/A	N/A	€2,381
Low Level	Insulate Primary Pipework	144	B1	€47.63	€100	€2,334
High Level	Install New Double Glazed Windows & Front Door	129	B3	€233.38	€9,500	€2,100
	Improve Whole Building Air Tightness	116	B2	€210.04	€2,500	€1,890
	Install EWI	105	B2	€189.04	€10,000	€1,701
	Install ASHP	89	B1	€255.20	€10,000	€1,446
	Install 6 No Solar PV (Electric) Panels	71	A3	€289.23	€6,000	€1,157

Summary	
Total Estimated Cost of Works (€)	€38,100
Total Estimated Cost of Works (€) Inc One Stop Shop Grant)	€19,050
Estimated Annual Savings (€/yr.)	€1,225
Estimated Annual Energy Savings (kWh/yr.)	8,204

- **11, Dun an Oir, Killorglin, Co Kerry**
  - Detached bungalow
  - Constructed in 2000
  - Floor area 161m²
  - Pitched & Roof in Roof
  - Approx 150mm of insulation to ceiling
  - 300mm filled cavity
  - Double-glazed, air filled windows
  - LED & incandescent lighting throughout
  - Air to water heat pump – 340% efficiency
  - Bottled LPG room heater

Figure 12: Dun an Oir, Killorglin, Co Kerry

Recommended Retrofit Measures

	11, Dun An Oir, Killorglin, Co. Kerry					
	Energy Upgrades	BER Energy Value (kWh/m²/yr.)	BER Rating	Estimated Annual Savings (€)	Estimated Cost of Works (€)	Estimated Annual Energy Bill
Existing Level	None	98	B1	N/A	N/A	€789
Low Level	Low Energy Lighting	96	B1	€11.83	€80	€777
	Insulate Primary Pipework	95	B1	€15.54	€100	€762
	Upgrade Room Heater & Seal Chimney	90	B1	€38.08	€1,500	€724
Medium Level	Cavity Wall Insulation	81	B1	€72.35	€2,000	€651
	Install Double Glazed Windows & Front Door	73	A3	€65.12	€9,000	€586
	Install Solar PV (Electric) Panels	65	A3	€58.61	€6,000	€527

Summary	
Total Estimated Cost of Works (€)	€18,680
Total Estimated Cost of Works (€) Inc One Stop Shop Grant)	€9,340
Estimated Annual Savings (€/yr.)	€262
Estimated Annual Energy Savings (kWh/yr.)	5,421

- **Langford St., Killorglin, Co. Kerry**
  - Mid Terraced.
  - Constructed in early 1900's.
  - Floor area 67m².
  - Pitched & sloped roof.
  - Approx 100mm of insulation to ceiling.
  - Solid stone & 300mm filled cavity.
  - Triple & double-glazed.
  - LED lighting throughout.
  - Condensing oil boiler – 94% efficiency.
  - Solid fuel room heater.

Figure 13: Langford St., Killorglin, Co. Kerry

Recommended Retrofit Measures

	23, Langford St, Killorglin, Co. Kerry					
	Energy Upgrades	BER Energy Value (kWh/m²/yr.)	BER Rating	Estimated Annual Savings (€)	Estimated Cost of Works (€)	Estimated Annual Energy Bill
Existing Level	None	191	C2	N/A	N/A	€1,810
Low Level	Draught Stripping & Pipework Insulation	188	C2	€27.16	€300	€1,783
	Upgrade Attic Insulation (Pitched Roof)	172	C1	€142.67	€1,000	€1,641
	Upgrade Room Heater & Seal Chimney Ope	154	C1	€164.07	€1,000	€1,477
Medium Level	Pump Extension Cavity Wall with Bead	147	B3	€73.83	€1,000	€1,403
	Replace Windows & Doors	123	B2	€224.44	€8,000	€1,178
High Level	Install Internal Wall Insulation	105	B3	€176.75	€7,500	€1,002
	Insulated Sloped Roof & Upgrade Air Tightness	92	B1	€120.19	€6,500	€881
	Install ASHP	66	A3	€220.35	€4,499	€661
	Install Solar Thermal Panels	52	A3	€99.16	€4,500	€562

Summary	
Total Estimated Cost of Works (€)	€34,299
Total Estimated Cost of Works (€) Inc One Stop Shop Grant)	€17,150
Estimated Annual Savings (€/yr.)	€1,249
Estimated Annual Energy Savings (kWh/yr.)	30,116

- **17, Dun an Oir, Killorglin, Co Kerry**
  - Detached dwelling.
  - Constructed in 2002.
  - Floor area 171m².
  - Pitched & sloped roof.
  - Approx 100mm of insulation to ceiling.
  - 300mm cavity.
  - Double-glazed.
  - LED & incandescent lighting throughout.
  - Regular oil boiler – 79% efficiency.
  - Solid fuel room heater.

Figure 14: 17, Dun An Oir, Killorglin, Co. Kerry

Recommended Retrofit Measures

	17, Dun An Oir, Killorglin, Co. Kerry					
	Energy Upgrades	BER Energy Value (kWh/m²/yr.)	BER Rating	Estimated Annual Savings (€)	Estimated Cost of Works (€)	Estimated Annual Energy Bill
Existing Level	None	156	C1	N/A	N/A	€3,905
Low Level	Low Energy Lighting & Draught Stripping	151	C1	€117.16	€100	€3,788
	Insulate Primary Pipework, Install Flow Restrictors to Showers	141	B3	€265.18	€350	€3,523
Medium Level	Upgrade Room Heater	134	B3	€176.15	€1,500	€3,347
	Replace Windows & Doors	120	B2	€334.69	€9,500	€3,012
	Cavity Wall Insulation	108	B2	€301.22	€2,000	€2,711
High Level	Install External Wall Insulation	97	B1	€271.10	€12,000	€2,440
	Upgrade Attic Insulation & Air Tightness	83	B1	€365.99	€5,000	€2,074
	Install ASHP	66	A3	€518.48	€10,000	€1,555
	Install MVHR	60	A3	€388.86	€7,500	€1,167

Summary	
Total Estimated Cost of Works (€)	€47,950
Total Estimated Cost of Works (€) Inc One Stop Shop Grant)	€23,975
Estimated Annual Savings (€/yr.)	€2,739
Estimated Annual Energy Savings (kWh/yr.)	13,075

- **Clooncarrig, Killorglin, Co. Kerry**
  - Detached dwelling.
  - Constructed in 1959.
  - Floor area 167m².
  - Pitched & flat roof.
  - Approx 300mm of insulation to pitched roof.
  - 300mm cavity.
  - Double & single glazed.
  - LED, fluorescent & incandescent lighting throughout.
  - Condensing oil boiler – 95% efficiency.
  - Solid fuel room heater.

Figure 15: Clooncarrig, Killorglin, Co. Kerry

Recommended Retrofit Measures

	Clooncarrig, Killorglin, Co. Kerry					
	Energy Upgrades	BER Energy Value (kWh/m²/yr.)	BER Rating	Estimated Annual Savings (€)	Estimated Cost of Works (€)	Estimated Annual Energy Bill
Existing Level	None	200	C3	N/A	N/A	€4,832
Low Level	Low Energy Lighting & Draught Stripping	196	C2	€96.64	€300	€4,735
	Insulate Pipework, Install Shower Flow Restrictors	191	C2	€142.06	€1,000	€4,593
	Upgrade Primary Room Heater & Seal Additional Chimney Ope	162	C1	€688.97	€1,000	€3,904
Medium Level	Replace Windows & Doors	130	B3	€780.83	€10,000	€3,123
	Examine Cavity Walls & Optimes Pumped Insulation	117	B2	€312.33	€2,500	€2,811
High Level	Upgrade Flat Roof Insulation	108	B2	€210.82	€7,500	€2,600
	Install External Wall Insulation	95	B1	€312.02	€6,500	€2,288
	Install ASHP	76	B1	€457.63	€4,499	€1,831
	Improve Air Tightness & Install Mechanical Ventilation	62	A3	€274.58	€6,500	€1,556

Summary	
Total Estimated Cost of Works (€)	€39,799
Total Estimated Cost of Works (€) Inc One Stop Shop Grant)	€19,900
Estimated Annual Savings (€/yr.)	€3,276
Estimated Annual Energy Savings (kWh/yr.)	23,177

- **Douglas, Killorglin, Co. Kerry**

  - Detached dwelling.
  - Constructed in 1930.
  - Floor area 135m².
  - Pitched & sloped roof.
  - Approx 200mm of insulation to pitched roof.
  - Solid stone & 300mm cavity.
  - Double glazed.
  - LED & incandescent lighting throughout.
  - Condensing oil boiler – 95% efficiency.
  - Solid fuel room heater.

Figure 16: Douglas, Killorglin, Co. Kerry

Recommended Retrofit Measures

	Douglas, Killorglin, Co. Kerry					
	Energy Upgrades	BER Energy Value (kWh/m²/yr.)	BER Rating	Estimated Annual Savings (€)	Estimated Cost of Works (€)	Estimated Annual Energy Bill
Existing Level	None	270	D2	N/A	N/A	€5,406
Low Level	Low Energy Lighting & Draught Stripping	265	D2	€108.11	€300	€5,297
	Insulate Pipework, Install Cylinder Thermostat Install Shower Flow Restrictors	257	D1	€158.92	€750	€5,139
	Upgrade Primary Room Heater & Seal Additional Chimney Ope	231	D1	€513.85	€1,000	€4,625
Medium Level	Install Zoned Heating Control & 3 Channel Programme	208	C3	€462.47	€1,250	€4,162
	Insulate Pitched/Attic Ceiling	187	C2	€416.22	€1,251	€3,746
	Examine Rear Extension Cavity Walls & Optimes Cavity Fill	169	C1	€374.60	€1,500	€3,371
High Level	Install External Wall Insulation	143	B3	€505.71	€15,000	€2,866
	Upgrade External Doors & Windows	122	B2	€429.85	€12,000	€2,436
	Improve Air Tightness	110	B2	€243.58	€2,500	€2,192
	Install ASHP	85	B1	€438.45	€10,000	€1,754
	Install Solar PV (Electric) Panels	68	A3	€350.76	€6,500	€1,403

Summary	
Total Estimated Cost of Works (€)	€52,051
Total Estimated Cost of Works (€) Inc One Stop Shop Grant)	€26,026
Estimated Annual Savings (€/yr.)	€4,003
Estimated Annual Energy Savings (kWh/yr.)	25,119

- **Gurrane West, Killorglin, Co. Kerry**
  - Detached dwelling.
  - Constructed in 1986.
  - Floor area 217m².
  - Pitched roof.
  - Approx 200mm of insulation to pitched roof.
  - 300mm cavity.
  - Double glazed.
  - LED, halogen & incandescent lighting throughout.
  - Regular oil boiler – 70% efficiency.
  - Solid fuel room heater.

Figure 17: Gurrane West, Killorglin, Co. Kerry

Recommended Retrofit Measures

	Gurrane West, Killorglin, Co. Kerry					
	Energy Upgrades	BER Energy Value (kWh/m²/yr.)	BER Rating	Estimated Annual Savings (€)	Estimated Cost of Works (€)	Estimated Annual Energy Bill
Existing Level	None	207	C3	N/A	N/A	€6,628
Low Level	LED Lighting, Draught Stripping, Pipework Insulation & Flow Restrictors	203	C3	€132.56	€300	€6,495
	Upgrade Attic Insulation (Pitched Roof)	193	C2	€519.63	€1,000	€5,976
	Upgrade Room Heater & Seal Flu Ope Appropriately	174	C1	€597.58	€1,000	€5,378
Medium Level	Optimise Pump Insulation within Cavity Wall	165	C1	€268.91	€1,500	€5,109
	(Optional) Upgrade to Higher Efficiency Oil Boiler & Zonal Control	140	B3	€766.39	€5,000	€4,343
	Upgrade Windows & Door - Improve Air Tightness	116	B2	€738.29	€12,500	€3,605
High Level	Install External Wall Insulation	95	B1	€540.69	€20,000	€3,064
	Insulate Floor & Install Underfloor Heating	86	B1	€367.67	€15,000	€2,696
	Install GSHP	67	A3	€539.25	€15,000	€2,157
	Optimise Airtightness & Upgrade to MECHANICAL Ventilation with Heat Reco	57	A3	€431.40	€6,500	€1,726
	Install Solar PV (Electric) Panels	48	A2	€258.84	€4,500	€1,467

Summary	
Total Estimated Cost of Works (€)	€82,300
Total Estimated Cost of Works (€) Inc One Stop Shop Grant)	€43,650
Estimated Annual Savings (€/yr.)	€5,161
Estimated Annual Energy Savings (kWh/yr.)	34,510

6.2 Typical Dwelling – Energy Upgrade

Based on above data analysis, home energy survey and understanding of the study area to date, the following is designed to demonstrate typical energy efficiency steps that the average homeowner and typical dwelling type within the KSEC catchment could take to achieve a Building Energy Rating of an A3, from a baseline of a D2.

To coincide with the findings from the CSO & SEAI BER data defined above, the type of dwelling these measures apply to will be a

- Detached, constructed in circa 1994-2004
- Baseline Building Energy Rating of a D2.
- Oil boiler (75% efficiency)
- Programmer & Room thermostat.
- Cavity wall, partially filled with 50mm polystyrene insulation boards.
- Pitched roof, 100mm insulation.
- Solid floor.
- Double glazed PVC/Wood.
- 100W tungsten bulbs throughout.

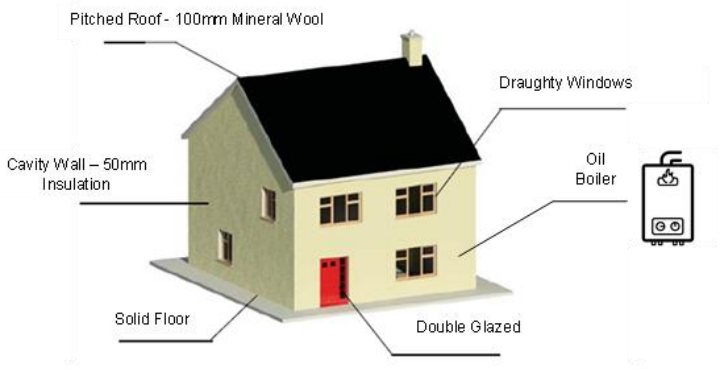

Figure 18: Typical Dwelling

Shallow & DEEP Retrofit Measures

Retrofit Options			
Building Elements		**Insulation**	**U-Value**
Walls	Cavity walls, partially filled	50mm	0.55
Roofs	Pitched, insulation between joists	150mm	0.41
Floors	Solid	20-30mm	0.26
Windows	Double glazed, PVC/wood	N/A	2.80
Doors	Solid wood	none	3.00
Heating System Characteristics		**Fuel**	**Efficiency**
Primary	Central heating boiler, pipe work un-insulated.	Oil	75%
Secondary	Open fire in grate	Smokeless	30%
Hot Water	From primary heating system. Separated time controls		
Cylinder	Insulated, loose jacket 50mm thick, no cylinder thermostat.		
Controls	Programmer for space heating and hot water, room thermostat		

Shallow Retrofit			Primary Energy kWh/m²/yr.	CO_2 kgCO_2/m²/yr.	Energy Rating
Building Elements		**Expected U-values**	**259 (Current State)**	**55 (Current State)**	**D2**
1. Standard & Roof	**Standard:** Draft stripping, 80mm lagging jacket for DHW cylinder and low energy light bulbs. **ADD** 150mm mineral wool over existing insulation and installation of required vents.	0.13	269	69	**D2**
2. Walls	**ADD** remaining cavity filled with insulation beads	0.32	249	64	**D1**
System Upgrade					
3. Space & Water Heating	**Relace with:** Condensing wood pellet boiler (89.5% efficiency) with two separate heating zones with time and thermostatic control, independent water heating. Hot water cylinder insulated with 50mm insulation. Remove existing secondary heating system and seal chimney.		**167**	**8**	**C1**

DEEP Retrofit			Primary Energy (kWh/m²/yr.)	CO_2 (kgCO_2/m²/yr.)	Energy Rating
Building Elements		**Expected U-values**	**259 (Current State)**	**55 (Current State)**	**D2**
1. Standard & Roof	**Standard**: Draft stripping and low energy light bulbs.. **ADD** 150mm mineral wool over existing insulation and installation of required vents.	0.13	269	69	**D2**
2. Walls	**ADD** remaining cavity filled with insulation beads & 100mm of External Wall Insulation	0.21	165	53	**C1**
System Upgrade					
3. Space & Water Heating Incl. Renewable Energy	Air source heat pump, 380% efficient, two separated heating zones with time and thermostatic control, independent water heating, solar thermal panels providing 50% of hot water demand with combined HW cylinder. Mechanical Ventilation with Heat Recovery (MVHR). Secondary space heater is removed and chimney is sealed **Bonus (A2)** 5 x solar PV panels installed on the southern aspect of the property.		70	16	**A3**

Shallow & DEEP Retrofit Costings

Shallow Retrofit				
1. Low Level & Fabric	**Note**	**Initial Cost (€)**	**SEAI Grant (€)**	**Final Cost (€)**
LED lighting	Approx €5/bulb (12xbulbs)	€60	€0	€60
Draft Stripping & General Airtightness	Approx €300/day	€1,000	€0	€1,000
Lagging Jacket for Hot Water Cylinder	Fixed fee	€30	€0	€30
Roof Insulation	Ceiling Level - upgraded to 300mm fibre glass or equivalent (U-value of 0.16 W/m²K or better).	€850	€400	€450
2. Fabric	**Note**			
Cavity Wall Insulation	(U-Value of 0.35 W/m²K or better) €10-€20/m²	€2,280	€1,699	€581
3. System Upgrade	**Note**			
Boiler & Heating Controls	Remove existing oil boiler, and replace with new wood pellet boiler. Ensure 3 zone heating control through 3 channel programme, cylinder & room thermostats.	€5,950	€700	€5,250
Upgrade Secondary Heating System	Install wood log secondary room stove, sealed system.	€350	€0	€350
Hot Water Cylinder	42x15 Indirect Copper (50mm foam insulation) *Renewable Energy sources require different types of cylinders. If intending to add RE later - Measurement No.1 sufficient until upgrade	€230	€0	€230
	Total	**€ 10,750**	**→**	**€ 7,951**

DEEP Retrofit (One Stop Shop)				
1. Low Level & Fabric	**Note**	**Initial Cost (€)**	**SEAI Grant €**	**Final Cost €**
LED lighting	Approx €5/bulb (12xbulbs)	€60	€0	€60
Draft Stripping & Advanced Airtightness	Use of air tightness membranes & tapes	€1,700	€1,000	€700
Roof Insulation	Ceiling Level - upgraded to 300mm fibre glass or equivalent (U-value of 0.16W/m²K or better)	€550	€400	€150
2. Fabric	**Note**			
Cavity Wall Insulation & External wall Insulation	100mm of EWI (EPS) or equivalent.	€16,000	€8,000	€8,000
3. System Upgrade	**Note**			
Fully Integrated Heating Controls	Dully zoned with thermostats	€1,800	€700	€1,100
Solar PV	Batteries not included	€9,000	€2,100	€6,900
Solar Thermal	-	€3,200	€1,200	€2,000
Mechanical Ventilation with Heat Recovery	-	€5,000	€1,500	€3,500
Air Source Heat-Pump	Replacement of existing heating system with new heat pump, pipework and radiators	€12,000	€8,500	€3,500
Launch Bonus OSS			€2,000	
Total		**€ 49,310**	**→**	**€ 25,910**

The tables above demonstrate measures which can be undertaken to upgrade a typical residential dwelling within the region of Killorglin. Please note, the prices and works referenced are estimates based on our experience with such projects.

Cost inflation in the retrofit sector has been exacerbated by several factors, predominantly BREXIT, Covid, availability of materials. Reports (Nov 2021) have stated that an average 6.8% increase in the price of construction materials is expected throughout 2023/2023, while labour costs are expected to rise by 4.4%[5]. One of the largest suppliers of insulation in the country, Kingspan, has stated that the ‘’unprecedented and ongoing raw material inflation with price

[5] https://www.irishtimes.com/business/construction/soaring-costs-in-building-materials-a-threat-to-economic-growth-report-warns-1.4660275?localLinksEnabled=false

recovery on track''. This statement potentially reflects not only the companies attempts to improve operation efficiencies to overcome revenues but also the increased pricing for their customers going forward[6].

Twenty-one contractors were contacted about current prices and price increases on upgrade measures. 14 companies provided information on their prices. The SEC, and indeed homeowners/business owners are advised to contact a contactor and receive an exact quote and scope of works.

The detail below provides further detail on domestic retrofit measure which will further help inform the reader.

- **Upgrade to Low Energy LED Lights, Draught Stripping & General Airtightness**

Draught proofing and general airtightness involves ensuring all draught striping associated with window, door and attic hatch opens are not only installed, but effectively working. The cost of this can vary, but generally it is a simple measure with effective results. For the purposes of this dwelling type, we will assume a cost of €1,000 for a contractor to make good any damaged draught stripping. Simple works may be as low as €250 for a contractor's time onsite for a day.

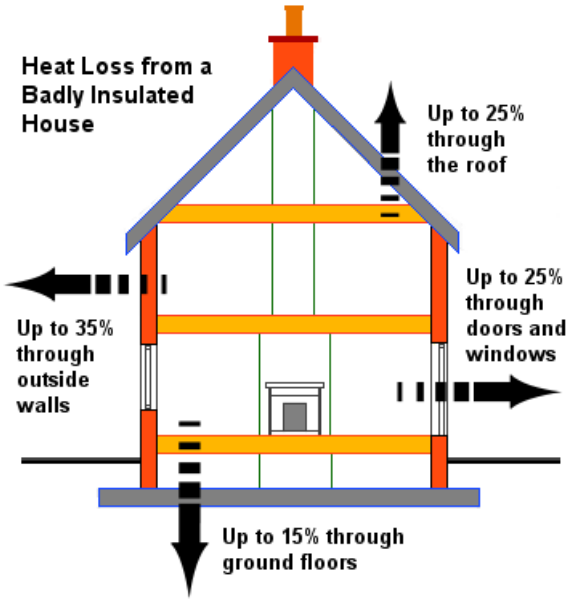

Figure 19: Typical Draughts

It is advised that the open fireplace be sealed. This can cost in the region of €200-€500. Failing this, a cheaper alternative would be to install a chimney balloon to the chimney opes. This will stop draughts, and keep the expensive heated air inside the room, however, it will not improve the BER rating of the dwelling as it is not a permanent measure.

[6] https://www.kingspan.com/group/news-insights/kingspan-news/kingspan-2021-half-year-results

Poorly installed natural ventilation covers can also be problematic. A cheap but effective method is to ensure all internal vent covers are fully functioning and are controllable, allowing them to be both manually opened/closed. Anti-draught covers can also be installed where extract fans are used in W/C's & kitchens. All independent mechanical extract fans within kitchens, W/C's and utilises should be examined to ensure they are effectively operating with appropriate time delay switches ensuring they operate for period enough to clear high levels of moisture from said space.

- **Fully Insulate Attic & Pump Cavity**

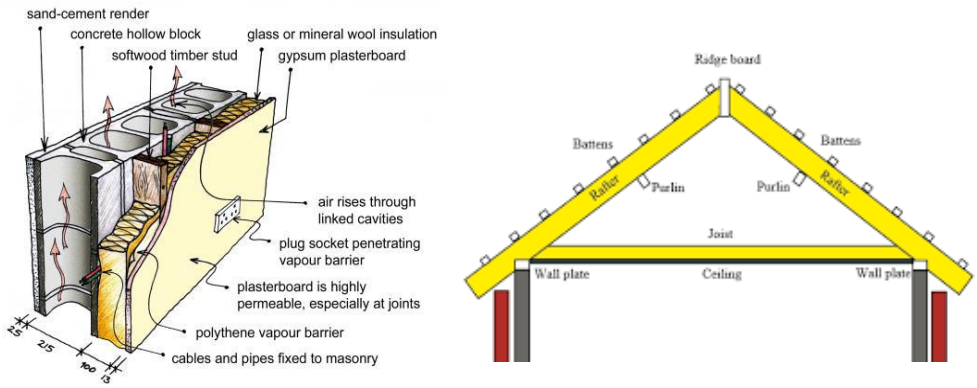

Figure 20: Attic/Roof Insulation

A significant proportion of energy from our homes heating is lost through poorly insulated attic spaces. A relatively straight forward job, insulating this space can be expected to cost approx. up to and slightly above €1,000. This would include rolling out a minimum of 150mm of fibre insulation and installing walk boards to services such as water tanks etc for optimal access and safety.

The cavity wall can be pumped at a cost up to €20 per m^2. The dwelling used in this example has a measured external wall of approx. 115m^2. Based on this, the expected cost of pumping a bead would be in the region of approx. €2,200.

- **New Wood Pellet Boiler with Solar Thermal Panels**

Removing and replacing the existing medium efficiency, non-condensing oil boiler with a low level of control would cost approx. €6,000. The homeowner should look to install a new wood pellet boiler with an efficiency of between 89-90%, ensuring all pumps used to operate the system are A+ rated. Heating controls should also be upgraded, these alone can cost up to €1,500 but can be combined with the wood pellet boiler package to save costs, both material and labour.

- **Solar Thermal Panels**

Solar thermal panels will help with the production of hot water for showers, wash hand basins and taps. There are different types of solar thermal panels on the market, but the most efficient

are known as an evacuated tube collector system. The homeowner would be advised to install in the region of 4m^2 of solar thermal collectors at a cost of approx. €3,200.

- **Solar PV Panels**

Solar PV (2kWp) system installed typically cost up to €4,000. This would not include batteries.

- **Install Air Source Heat Pump**

The dwelling used in this example opted to replace the existing non-condensing, medium efficiency (75%) oil boiler with a new, high efficiency, wood pellet boiler. While this will have a positive impact on the dwellings BER and reduce energy waste, this is not the cleanest source of fuel that can utilised. With all the fabric upgrades defined above, this home would likely be suitable to house an air source heat pump, a system which is considered a renewable energy technology, and is also highly efficient. Powered through electricity, the heat pump will take free energy from the air outside. Using electricity as its fuel, the system will increase the temperature of that air and exchange it with the water feeding radiators and the hot water cylinder within the dwelling.

This type of system is however significantly more expensive than a conventional oil, gas, or solid fuel boiler costing in the region of €8,500-10,500 to install and commission but will offer high savings on energy bills and much more comfort to the homeowner. One point to note is that the SEAI does provide a grant for heat pumps, and have since stopped supporting fossil fuel systems such as oil, gas etc.

Referenced when suggesting a heat pump is that the dwelling must be significantly insulated. This is known as the Fabric First Approach and essentially ensures the dwellings heat loss is completely minimized before a heat pump is installed. Typically, in Ireland we are used to using high temperature systems to warm our homes, meaning they have enough strength to heat the house even when the insulation is poor. Heat pumps however only achieves its high efficiency when installed within a very well insulated house as it is opposite to our conventional methods and considered a low temperature system. This means that the low output temperature would not be sufficient to heat the uninsulated house, subsequently putting the system under high pressure, damaging components, and dramatically increasing the dwellings electricity bill.

7 Energy Poor: Overview

Energy poor communities can be defined as areas that spend more than 10% of their household income on fuel. The below graph displays the reported spend on fuel and light from the nationwide Household Budget survey carried out by the CSO. As technology and energy efficiencies have improved since 1980s the amount spent on energy has reduced. Unfortunately, there are still several communities that have not benefited from these efficiencies, these are typically much older houses and housing estates that rely heavily on fossil fuels for energy production.

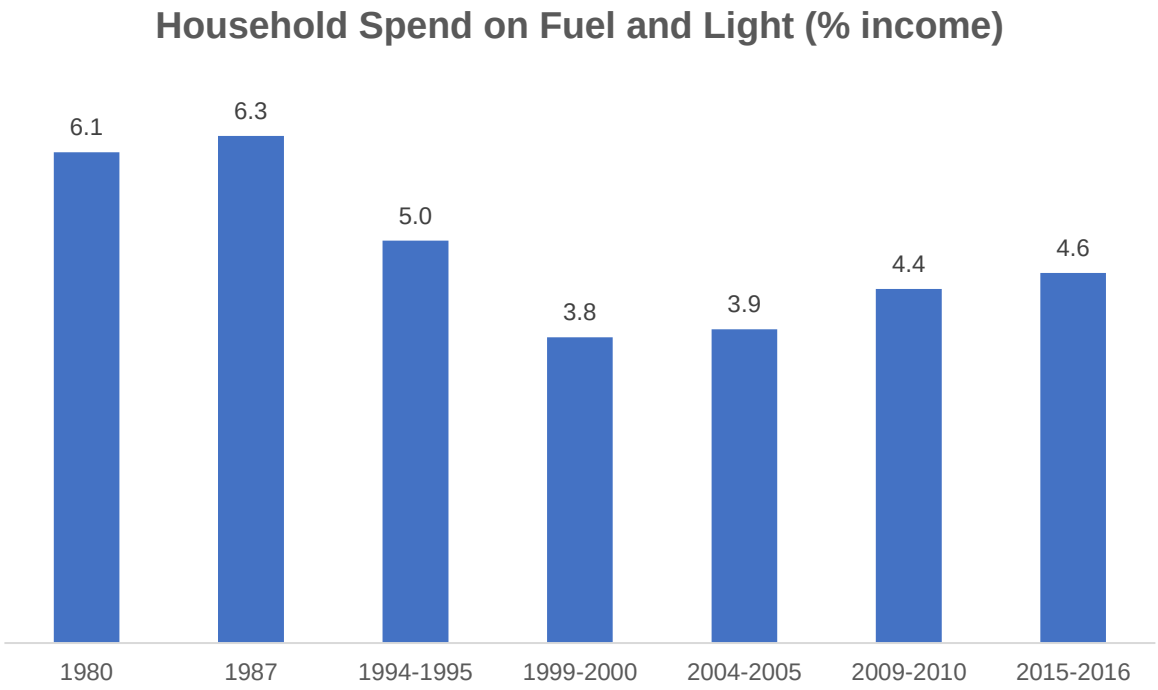

Chart 16: Reported Household Spend on Fuel and Light (Household Budget Survey, CSO, 2016)

Kerry County Council will have to make significant commitments to improving the sustainability of their housing stock. From 2020, domestic dwellings provided by Kerry County Council will have to be designed to comply Near Zero Energy Rating (NZEB) standards. Near zero-energy building' means a building that has a very high energy performance. The nearly zero or very low amount of energy required should be primarily covered by energy from renewable sources.

While the adaptation of NZEB into Irish Building Regulations will further improve the performance of new residential dwellings, a proportion of existing local authority housing stock exists that requires immediate attention. As of September 2020, €20 million has been allocated to eight local authorities through a new pilot programme known as the Midlands Retrofit Project. Under the proposal, This pilot is part of a programme to retrofit 750 local authority homes throughout Offaly, Laois, Westmeath, Roscommon, Galway, Tipperary, and Kildare. This pilot will aim to support the larger national retrofit target of 500,000 homes by 2030

(DHLGH, 2020).

7.1 BER

A key indicator of an energy poor community is the Building Energy Ratings. Typically, the lower the BER the higher the energy bills, as displayed in the figure below. There is an associated cost with improving the BER of a home, but the payback can be significant in the long term. A detailed range and cost of works to improve BER ratings in the sample area is included in Section 5 above.

7.2 Split Incentives

Another barrier for the region in its move to sustainable energy communities is a potential lack of investment by lessors because of split incentives in the rental sector. A significant proportion of the household stock in Killorglin is rented from a private lessor.

There are significant benefits for lessors to upgrade the energy efficiency of their rented homes especially regards tenant relations and improving value of their asset. The initial capital cost may be a deterrent for many; therefore, incentives may be required. One example is known as the Environmental Upgrade Agreement and involves local authorities providing funding for lessors to upgrade their houses. These upgrades could include upgrading insulation, replacing lighting with LEDs, replacing old boilers etc. A finance provider agrees to advance capital to the council to fund the works and the money is repaid to the lender through council rates charged to the lessor.

8 Analysis of Commercial Sector

ORS completed several energy audits on public and private buildings. The aim of the reports is to assist the facilities with the identification of energy efficiency measures. ORS recommends that the organisations implement the measures identified in their reports to contribute towards the energy consumption reduction goals and national targets, as set out in the National Energy Efficiency Action Plan (NEEAP). The recommendations within the reports are based on utility data, a site audit, and related engineering calculations. The site audit consisted of a walk-through of the facility and review of the electrical and mechanical systems and equipment. The commercial and community building audits as part of the KSEC EMP are as follows.

1. KDYS Killorglin
2. Killorglin SVP Shop
3. KCYMS Community Hall
4. Killorglin Old Courthouse
5. Quinlan's Seafood Bar

An important theme throughout all these reports is the importance to engage employees and the public regarding good energy management and wastage reduction. Education of all building users on the simple ways in which everyone within the building can contribute towards saving energy. Simple measures, such as switching lights off when exiting a room, or switching off TVs, and computers rather than leaving on standby, have proven to be successful in saving energy.

The full reports are included in Appendix B. A summary of each, and recommended energy efficiency opportunities are displayed overleaf.

- Kerry Diocesan Youth Service (KDYS)

Figure 21: KDYS, Killorglin

The following table represents the Energy Efficiency Measures recommendations for KDYS, as well as the approximate cost and projected savings for the measures.

Table 3: Register of Opportunities, KDYS, Killorglin

Ref	Opportunity	Estimated Annual Savings						
		Fuel Type Saved	[kWh]	[€]	[$kgCO_2$]	Capital Cost	Simple Payback (Yrs.)	Payback w/50% (Yrs.)
1	Lighting Upgrade	Electricity	2,497	€469	1,296.1	€3,000	6.40	3.20
2	Electric heaters replacement	Electricity	8,324	€1,562	4,320.4	€6,300	4.03	2.02
3	External Wall Insulation	Electricity	14,486	€2,719	7,518.1	€70,000	25.75	12.87
4	Flat Roof Upgrade	Electricity	5,432	€1,020	2,819.3	€20,000	19.62	9.81
5	1.4 kWp Solar PV System	Electricity	1,158	€217	600.9	€1,500	6.90	3.45
6	Energy Monitoring	Electricity	350	€66	181.7	€150	2.28	1.14
7	Carry out energy awareness days for staff. Employ a switch off policy on all plug loads after hours and holidays.	Electricity	200	€38	103.8	€100	2.66	1.33

- Vincent's, St. Vincent de Paul Charity Shop, Killorglin

Figure 22: Vincent's, St. Vincent de Paul Charity Shop Entrance

The following table represents the Energy Efficiency Measures recommended for the Vincent's, St. Vincent de Paul Charity Shop, as well as the approximate cost and projected savings for the measures.

Table 4: Register of Opportunities – Vincent's, St. Vincent de Paul Charity Shop, Killorglin

Ref	Opportunity	Estimated Annual Savings						
		Fuel Type Saved	[kWh]	[€]	[$kgCO_2$]	Estimated Cost (Excluding VAT)	Simple Payback (Yrs.)	Payback w/50% (Yrs.)
1	Double Glazed Windows	Electricity	803	€215	416.6	€8,400	39.04	19.52
2	Replace the remaining lights with LED's, with Occupancy Sensors	Electricity	2,007	€538	1,041.6	€3,000	5.58	2.79
3	Solar PV System	Electricity	5,155	€1,382	2,675.4	€6,600	4.78	2.39
4	Energy Monitoring Equipment	Electricity	468	€126	243.0	€200	1.59	0.80

- KCYMS Community Hall

Figure 23: KCYMS Community Hall

The following table represents the Energy Efficiency Measures recommendations for KCYMS, as well as the approximate cost and projected savings for the measures.

Table 5: Register of Opportunities - KCYMS, Killorglin

Ref	Opportunity	Estimated Annual Savings						
		Fuel Type Saved	[kWh]	[€]	[$kgCO_2$]	Estimated Cost (Excluding VAT)	Simple Payback (Yrs.)	Payback w/50% (Yrs.)
1	Install a Wood Pellet Boiler	Oil	1,856	€1,737	489.9	€10,000	5.76	2.88
2	Radiant Heaters for the Hall	Oil	742	€695	196.0	€6,000	8.64	4.32
3	Replace the remaining lights with LED's, with Occupancy Sensors	Electricity	1,908	€338	990.1	€3,000	8.88	4.44
4	Solar PV System	Electricity	5,155	€912	2,675.4	€6,600	7.23	3.62
5	Roof Insulation	Oil	742	€695	196.0	€3,000	4.32	2.16
6	Rainwater Harvesting	Water	-	€270	-	€4,000	14.81	7.41
7	Energy Monitoring Equipment	Electricity	445	€79	231.0	€200	2.54	1.27

- Killorglin Courthouse

Figure 24: Killorglin Courthouse

The following table represents the Energy Efficiency Measures recommendations for Killorglin Courthouse, as well as the approximate cost and projected savings for the measures.

Table 6: Register of Opportunities - Killorglin Courthouse

Ref	Opportunity	Estimated Annual Savings				
		Fuel Type Saved	[kWh]	Estimated Cost (Excluding VAT)	Simple Payback (Yrs.)	Payback w/50% Grant (Yrs.)
1	Internal dry lining	Electricity	30-40% Savings	€20,000	7-10 years	3-5 years
2	Air to Water Heat Pump, with underfloor heating	Electricity	30-50% Savings	€45,000	7-13 years	3-6 years
3	Roof Insulation	Electricity	15-20% Savings	€8,000	3-5 years	1-3 years
4	Replace windows with double glazing	Electricity	10% Savings	€16,000	40-50 years	20-30 years
5	Replace the remaining lights with LED's, with Occupancy Sensors	Electricity	50-70%	€11,000	3-9 years	1-4 years
6	Solar PV System	Electricity	2,400	€4,200	10.94	5.47
7	Energy Monitoring Equipment	Electricity	5-10%	€200	1.00	0.50

8.1 Quinlan's Seafood Bar

Figure 25: Quinlan's Seafood Bar

The following table represents the Energy Efficiency Measures recommendations for Quinlan's Seafood Bar as well as the approximate cost and projected savings for the measures.

Table 7: Register of Opportunities – Quinlan's Seafood Bar

Ref	Opportunity	Estimated Annual Savings				Capital Cost	Simple Payback (Yrs.)	Payback w/30% (Yrs.)
		Fuel Type Saved	[kWh]	[€]	[$kgCO_2$]			
1	Small Lighting Upgrade	Electricity	938	€156	486.9	€1,000	6.40	4.48
2	Small Window & Door Upgrade	Natural Gas	1,232	€55	301.7	€3,500	63.15	44.21
3	Biomass Boiler	Natural Gas	0	€0	8,180.0	€75,000	N/A	N/A
4	30 kWp Solar PV System	Electricity	23,112	€3,851	11,995.1	€30,000	7.79	5.45
5	Energy Management System	Natural Gas	4,926	€222	1,206.9	€25,000	112.77	78.94
6	Carry out energy awareness days for staff. Employ a switch off policy on all plug loads after hours and holidays.	Electricity	150	€25	77.9	€100	4.00	2.80

9 Energy Efficiency Potentials

Utilising energy in the most efficient manner is an excellent approach to reducing CO_2 emissions and assisting the sustainability of an area. Killorglin, with its large proportion of energy intense activities, will see an immediate benefit from implementing energy saving initiatives.

Implementing an energy management system like ISO 50001 in businesses can be an excellent way to quantify and measure energy use in an organisation. Benefits reported from the certification include:

- Energy reduction of up 10% within first 12 months.
- Reduced greenhouse gas (GHG) emissions and carbon footprint.
- Globally recognised International Standard.
- Assist in compliance with current and future voluntary and/or mandatory energy efficiency targets.
- Improved corporate image and credibility among customers, clients, and stakeholders.
- Excellent marketing tool.
- Informed decision-making processes from system design through to operation and maintenance.
- Increased energy awareness among staff members at all levels.
- Improved operational efficiencies and maintenance practices.

10 Analysis of Transport Sector

10.1 Sustainable Transport

A report from the Department of Transport, 2020 Vision – Sustainable Travel and Transport, states that "*Sustainable transport is concerned with the movement of goods and people in a manner, which improves quality of life and ease of access for all. It also aims to protect the environment for future generations and enhance economic competitiveness*" (Transport, 2008).

To realise this, many forms of transport options must be maintained, planned, and provided for a region. This ranges from safe and accessible walking and cycle routes to appropriate public transport links serving the needs of the residents, to the implementation of appropriate infrastructure to support the electrification of private car and fleet vehicles.

Kerry currently has strong links to sustainable transport solutions through the existing rail line. An influential factor in the use of more sustainable modes of transport develops through engagement and awareness with all throughout the community of the respective modes of less carbon intensive transport options available. This should provide the foundation on which to build more structed sustainable transport solutions. Ensuring community residents are aware of the carbon intensity associated with their transport habits, what sustainable solutions look like how to become more sustainable and the awareness of funds to support same such as Bike to Work, TaxSaver for public transport commuting, EV's etc.

From a school's perspective, the Safe Routes to School Programme is designed to encourage as many pupils and students as possible in primary and post-primary schools to walk and cycle. It has three aims:

- To accelerate the delivery of walking/scooting and cycling infrastructure on key access routes to schools.
- To provide "front of school" treatments which will enhance access to your school grounds.
- To expand the amount of bike parking available at schools.

The Safe Routes to School (SRTS) Programme launched in March 2021 and was open to all schools in Ireland to apply for active travel funding and delivery. The programme is an initiative of the Department of Transport and supported by the Department of Education. It is operated by the Green-Schools Programme in partnership with the National Transport Authority (NTA) and the local authorities (Green School, 2021).

10.2 Local Transport

Driving by car to work/school/college is the primary method of transport in Killorglin with over 64.5% of commuters being the car driver to work and 62.4% being the car passengers. The analysis also showed that 49.4% of journeys were under 15 minutes.

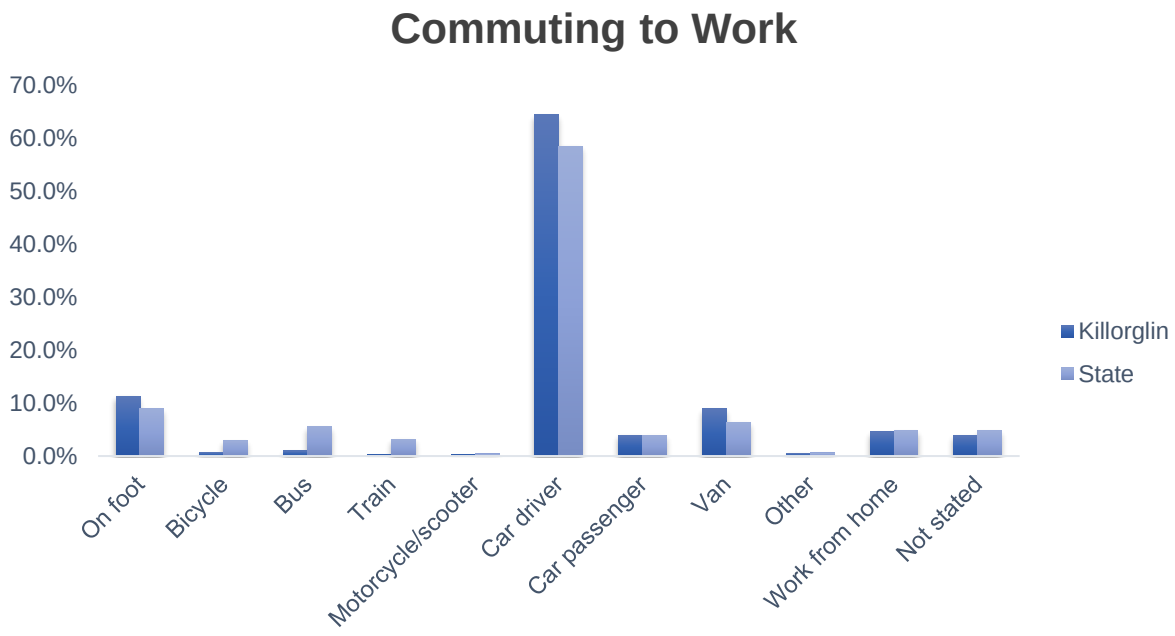

Chart 17: Commuting to Work Profile of Killorglin

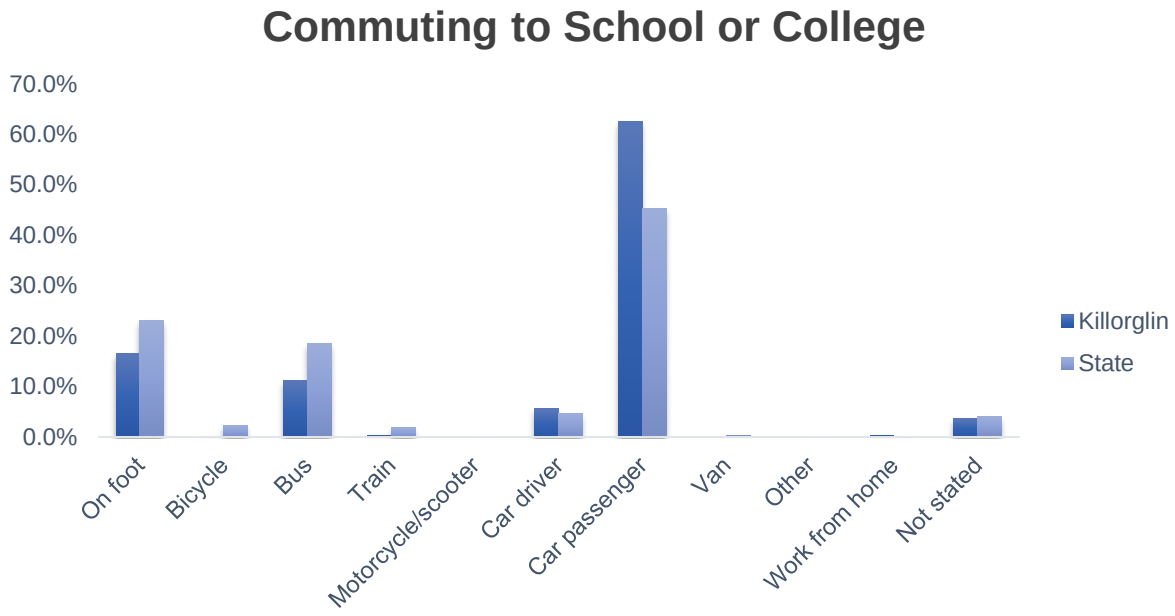

Chart 18: Commuting to School/College Profile of Killorglin

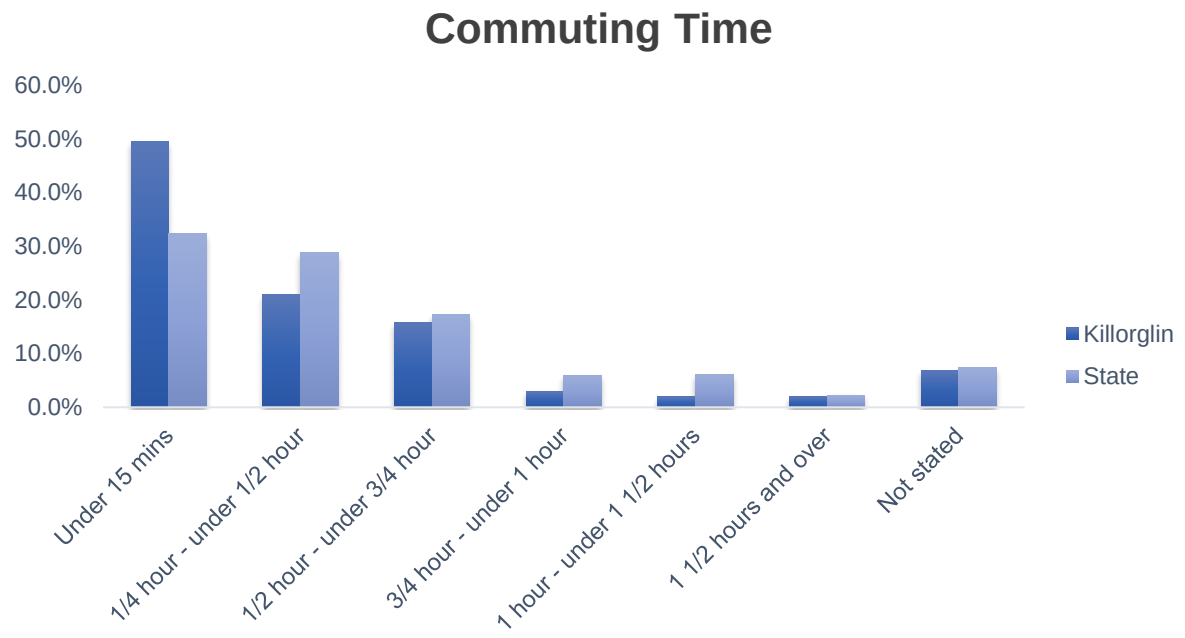

Chart 19: Commuting Journey Times – Killorglin

10.3 Transport Baseline

The table demonstrates the transport baseline for the Killorglin region. CSO (2016) figures were gathered, however a breakdown of fuel-type was not available so the national stock breakdown of 56.9% diesel cars, 42.7% petrol cars and 0.4% Battery Electric Vehicle (BEV) cars was applied. It was assumed that all motorcycles are petrol fueled and all vans and trucks are diesel-fueled.

Table 8: Transport Baseline

Transport Type		Energy (kWh/Yr.)	Spend (€/Yr.)	Emissions ($kgCO_2$/Yr.)
Car	Petrol	8,060,287	€3,622,712	1,843,929
	Diesel	16,734,221	€7,843,569	3,992,307
	BEV	44,494	€2,342	7,611
Motorcycle		5,077	€4,063	1,164
Van		2,392,729	€777,281	575,676
Total		27,236,808	€12,249,967	6,420,687

10.4 Electric Vehicles Uptake

According to the SEAI, transport is considered the greatest source of final energy demand in Ireland, accounting for up to 42% of our overall national energy use and is growing. Of this, private owned cars are the form of transport which contribute the greatest at around 40%. The CSO data for KERRY supports this trend, indicating a significant number of residents opt to drive a private vehicle as their primary mode of transport, which is illustrated by the findings above. While the fuel used to power these cars is unknown, as of 2019, there were

approximately 2.10 million cars on Irish roads, compared to an estimated 4,825 electric vehicles (The Irish Times, 2018) (ENFO, 2019). This would indicate that most of these cars registered in Killorglin would also be powered by either petrol or diesel, and subsequently contributing to increased GHG's within the region. The uptake of EV's would represent a significant opportunity, however increased EV infrastructure will be needed to support this, along with increased awareness of electric vehicles and how they can contribute towards the mitigation of climate change. To support the uptake of private electric vehicles, the SEAI provide grant funding ranging for €2,000 - €5,000 subject to the value of the car. Figure 26: Private Electric Vehicle Funding (SEAI, 2020) provides details of the grant funding available from same from the SEAI for same.

Aside from private electric vehicles, the SEAI also provides financial support for the purchase of category N1 EVs for business and public entities. The maximum amount available is €3,800, with figure 16 proving greater detail on this funding support.

List Price of Approved EV	Grant
€14,000 to €15,000	€2,000
€15,000 to €16,000	€2,500
€16,000 to €17,000	€3,000
€17,000 to €18,000	€3,500
€18,000 to €19,000	€4,000
€19,000 to €20,000	€4,500
Greater than €20,000	€5,000

Figure 26: Private Electric Vehicle Funding (SEAI, 2020)

List Price of Approved EV	Grant
€14,000 to €15,000	€2,000
€15,000 to €16,000	€2,500
€16,000 to €17,000	€3,000
€17,000 to €18,000	€3,500
Greater than €18,000	€3,800

Figure 27: Commercial Electric Vehicle Funding (SEAI, 2020)

From an infrastructural perspective, the cost of commercially available e-chargers ranges from €785 to €29,995 depending on the type and speed of charging required. This price does not include civil works that may be required to connect electricity or that require restructure of walls or paths. A full in-depth feasibility study would be recommended to analyse the associated costs of installing charge points as there are significant additional initial and ongoing costs that need to be considered. These include civil costs associated with installation, ongoing maintenance costs etc. EV charging stations require an annual service to ensure the unit is operating as it should, which is essential due to the units being exposed to outside weather conditions and having an electrical supply. Repair or maintenance services may also be required at times due to possible issues such as power failures, shorts, slower than normal charge times, power malfunctions, or excess energy consumption.

There is currently 1 public electric vehicle charging station with 2 charging leads located within the town catchment of Killorglin, it is located at Market St. and is a Type2 22kW charger, charging at a rate of €0.375/kWh as of Nov 2022. The image below illustrates the peak use time for this exact charging dock.

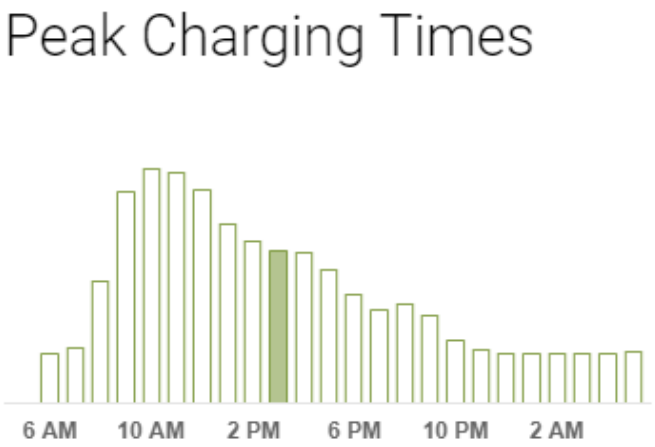

Figure 28: Market Street EV Charger Profile

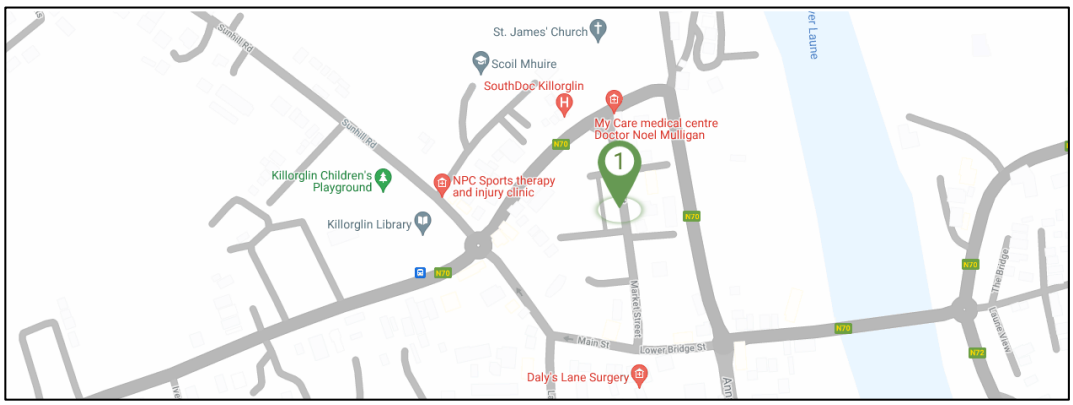

Figure 29: Location of EV charging points in Killorglin

Electric vehicle charging infrastructure is a developing field, where the Climate Action Plan states the commitment of developing a network capable of accommodating for 800,000 electric vehicles by 2030. To support this, LA's have been tasked with the install of 1,000 on street e-charging points over the next 5 years. To support the roll out of this, the SEAI have a grant for public EV charge points designed specifically for Local Authorities. The grant payments are capped at 75% per charge point, or €5,000. In the scenario where a charge post contains 2 charge points, the post in its entirety would be eligible for €10,000. The Local Authority is also limited to 20 EV CPs per application, however once approved, they can apply again. The types of e-chargers typical of the application ranges from 3-22kW through lamppost chargers and charging posts. The SEC would be encouraged to develop a positive relationship within the respective departments within the Local Authority to ensure the SEC's vision is considered in the rollout of this infrastructure.

11 Renewable Energy Potentials

Over the past number of years, energy communities in the form of renewable energy-related initiatives led by citizens, local authorities and non-energy SMEs have spread across Europe. Community Power is Irelands first community owned renewable electricity supplier. This initiative began in Tipperary with Ireland's first community owned wind farm. Such initiatives are gaining a growing role in the transition towards a more decarbonised and decentralised energy system.

Irelands CAP, Action 106, clearly calls for support to ensure a pipeline of community projects for each RESS auction to contribute to 500 MW of community renewable energy by 2030.Therefore it is integral that community led organisations engage but are supported in the development of clean energy generation resources.

11.1 Community-led Renewable Energy Projects - RESS

The Renewable Electricity Support Scheme provides support to renewable electricity projects in Ireland. With a primary focus on cost effectiveness, the RESS delivers a broader range of policy objectives, including:

- an Enabling Framework for Community Participation through the provision of pathways and supports for communities to participate in renewable energy projects
- increasing technology diversity by broadening the renewable electricity technology mix
- delivering an ambitious renewable electricity policy to 2030
- increasing energy security, energy sustainability and ensuring the cost effectiveness of energy policy

In July 2021, the Commission for Regulation of Utilities (CRU) changed the definition of a community-led Renewable Energy Project. A community led energy project must be 100% community owned to be processed under category C in ECP2.2 (Enduring Connection Policy Stage 2) and subsequent ECP batches.

- The Commission for Regulation of Utilities (CRU) published the Enduring Connection Policy (ECP-1) in March 2018 which was the first step in a fundamental redesign of Irish grid connection policy.
- The ECP-2 Decision published by the CRU in June 2020 was the next stage in the CRU's enduring connection policy. This framework consists of a one batch application window per year for three years. Applications are currently being taken for inclusion in this.

Category C consists of Community-led Energy Projects. New Applicants must complete an application form. Applicants are not required to have planning permission but will be prioritised by planning permission grant dates and then by application forms Received Complete Date.

A step by step guide to familiarise communities with the process of connecting community led Renewable Energy Projects to the electricity network can be found here[7].

In 2022 the SEAI launched the Community Enabling Framework to further support communities in developing renewable energy generation sites. This Framework provides end to end support to the community.

The Framework currently provides a range of supports including (but not limited to)

- Advise
- Financial Support
- Mentoring support to Communities

The RoO developed as part of this Master Plan provides a very high-level analysis of yields that may be expected as a results of Wind & Solar technology at this scale (Up to 5MW). However, the SEC is now advised to create a subcommittee, register as a Renewable Energy Community, and engage in the support of the SEAI's CEF advisors to conduct a feasibility study on a solar and/or wind farm site.

11.2 Wind/Solar Projects – Community Owned Renewable Energy

Community owned wind or solar farms are in their infancy in Ireland, but some excellent examples have paved the way for the wider community like Templederry Community Wind Farm [8]. The Renewable Energy Support Scheme (RESS) has allocated several opportunities for communities to bid for access of community energy to the grid. This has improved the process by which community groups can plan and develop locally owned renewables and ensure renewable energy creates positive economic benefits in the locality. The new allocation of community focused projects in the bidding process has removed some of the gamble for communities. Planning permission is not required for community groups before bidding and therefore removes the financial risk for communities before they know they will get grid access. SEAI offer support to communities who intend on establishing community owned renewable energy enterprises[9] in the following two RESS auctions.

There are several steps required for Killorglin to develop their own community owned renewable energy project. The initial steps are outlined below and in the Register of Opportunities:

- Establish a steering group to identify the local appetite for a community wind/solar farm. Setting up a Renewable Energy Community is recommended with guidelines on this available from CRU[10].There will be a significant initial financial capital outlay required to buy and fund the wind/solar farm. Typically, this is funded through local investors (from small to large contributions) and funding institutes. Further details on

[7] https://www.esbnetworks.ie/new-connections/generator-connections-group/community-led-renewable-energy-projects

[8] https://tippenergy.ie/projects/templederry-community-wind-farm/

[9] https://forms.office.com/Pages/ResponsePage.aspx?id=RuNk9vvW5UOFuowECBAjVQknnvuwFxFGr-DEQWPUn3lUOVZRNElOVkgyV0ZGWDNNSTBUSFpMSjZYNy4u

[10] https://www.cru.ie/wp-content/uploads/2020/06/CRU20060-ECP-2-Decision.pdf

the types of potential frameworks for undertaking partnerships is available here. An initial meeting with experienced communities in this area would be recommended at this stage to get advice on community/company structure.

- Complete a feasibility study to identify a suitable site for the turbines or solar farm, the number and scale of the turbines/panels and the initial capital outlay and return on investment for the community (some good examples of community renewable energy feasibility studies can be found here).

    - Application to the RESS auction via an ECP application to ensure there is capacity on the grid for the proposed enterprise (this step can be carried out before the feasibility study or in conjunction with it).

    - An example of two community wind turbines sized at 2.3 MW each would result in an electricity contribution of 11,169,637 kWh/year (27% capacity factor) based on a footprint of approximately 2 hectares. In contrast a 3MW solar farm could produce 2,516,433 kWh/year based on a footprint for the project of approximately 6 hectares.

    - A suite of technical and finical support are available to the community once registered as an REC, and an Expression of Interest is issued to the SEAI's RESS Team. The SEC are advised to avail of this support to further explore the practical viability of renewable energy generation locally.

11.3 Micro-generation

Micro-generation is the general term used to refer to the generation of electricity from renewable technologies including solar photovoltaic (PV), micro-wind, micro-hydro and micro-renewable combined heat and power (CHP).

Action 30 of the Climate Action Plan provides that a support payment for excess electricity generated on site and exported to the grid will be available to all Irish micro-generators, whilst ensuring principles of equity, self-consumption, and energy efficiency first are incorporated.

This payment, or Clean Export Guarantee (CEG), is available to all renewable generators that export to the grid, regardless of what energy provider they have a supply contract with. This is subject to regulatory arrangements and the transposition of Articles 21 and 22 of the recast Renewable Energy Directive (RED II). This tariff represents the first phase of a comprehensive enabling framework for micro and small-scale generators in Ireland, allowing generators to receive remuneration from their electricity supplier for all excess renewable electricity exported to the grid, reflective of the market value of that electricity.

Under the Government's Climate Action Plan, the aim is for 2.5GW of the country's energy needs to come from solar by 2030. The Micro-generation Support Scheme (MSS) is aiming to deliver 380MW of this. Depending on panel size, this equates to over 1 million solar panels on approximately 70,000 buildings.

Local business, particularly those with significant roof or ground space, should be encouraged to consider the microgeneration scheme to help off-set electricity cost and support in grid supply. Those that should be targeted are, not limited to, the following.

- Large retail
- Manufacturing plants
- Farming sector
- Large community center
- Significantly large electrical energy users

11.4 Solar Potential

According to the SEAI, solar energy is set to play an ever-increasing role in the form, appearance, and construction of buildings, and it is apparent that ground mounted large-scale solar projects will be proposed and developed in Killorglin. The principal reason for this is that solar PV systems which produce electricity directly from solar radiation are becoming more widespread as their advantages become apparent and as costs fall.

There are two methods that could be adapted by households and industries in the Killorglin region mainly.

• Solar PV: which uses the photons of light from sun to generate electricity can help move away from carbon-based electricity generation.

• Solar Thermal: converts the sun's radiation into heat to use for residential and commercial hot water use.

Killorglin has potential to generate electricity and hot water form solar energy and typically receives 1,000 kWh/m^2/year of solar radiation. The sunniest months are May and June. During these months, sunshine duration averages between 5 and 6.5 hours per day over most of the county. Due to its long hours of daylight, particularly in the summer, Ireland has good potential to capture energy from the sun. For optimally located PV systems, each installed kW can be expected to produce in the order of 850kWh (units) of electricity per year in Ireland. A 4kW system would thus produce approximately 3,400kWh / year for consumption.

The Register of Opportunities for this town identified an annual saving of 5,070,773kWh, €1,360,488 and 2,631,731kg/CO_2 if all 2,194 dwellings in the town installed, on average, a 3kW PV system. The total cost would be in the region of €3,150 per household considering the SEAIs' solar PV grant.

11.5 Biomass District Heating and CHP

District heating (DH) is heat distributed from a central boiler or CHP plant often using heated water. DH has had low uptake in Ireland due to the relatively mild climate and low-density housing that make it impractical to pump warm water over long distances. DH systems are most suited to areas of high heat demand and are cheaper to integrate into new-build scenarios as opposed to retro-fit. It is thus more likely that successful DH schemes in Killorglin would be proposed in areas of higher density population and high heat demand from industry or commercial enterprises.

The concept of a biomass district heating system is a simple one - the centralized production of heat through a network of insulated pipes, usually underground. Fuelled by locally grown and harvesting wood fuels. Tralee hosts one of the few district heating systems in Ireland at

the Mitchel's/Boherbee regeneration project where Tralee Town Council is developing a sustainable energy community based on home grown energy. It is reported that a feasibility study was completed for two estates in Killorglin and found that a biomass fuelled heating system would be feasible for the area. The recent introduction of the Support Scheme for Renewable Heat (SSRH) may enhance the feasibility of this project. Further information on the scheme can be found here.

CHP is the generation of usable heat and power (usually electricity) in a single process and uses the heat produced in electricity generation rather than releasing it into the atmosphere. CHP can provide a secure and efficient method of generating electricity and heat at the point of use. Conventionally CHP applications have been divided into two broad categories, based on design output: Large scale (greater than or equal to 1MW), and small scale (less than 1MW). Small Scale CHP is particularly suitable for applications such as hotels, hospitals, and leisure centres, where there is a steady demand for heat and power throughout the year. Large Scale CHP Systems are suitable for use in larger industrial and commercial processes such as chemical/pharmaceutical plants, breweries, third level educational institutes and food processing plants.

The landscape surrounding Killorglin has a significant supply of forestry to supply feedstock for such boilers and the large industrial areas in proximity. County Kerry is the most forested county in Ireland with 55,000 ha planted (11.5% of land area).

11.6 Anaerobic Digestion

Anaerobic Digestion (AD) is a biological process in which microorganisms break down biodegradable material in the absence of oxygen. One of the end products is biogas which can be combusted to generate electricity and heat or can be processed into renewable natural gas and transportation fuels.

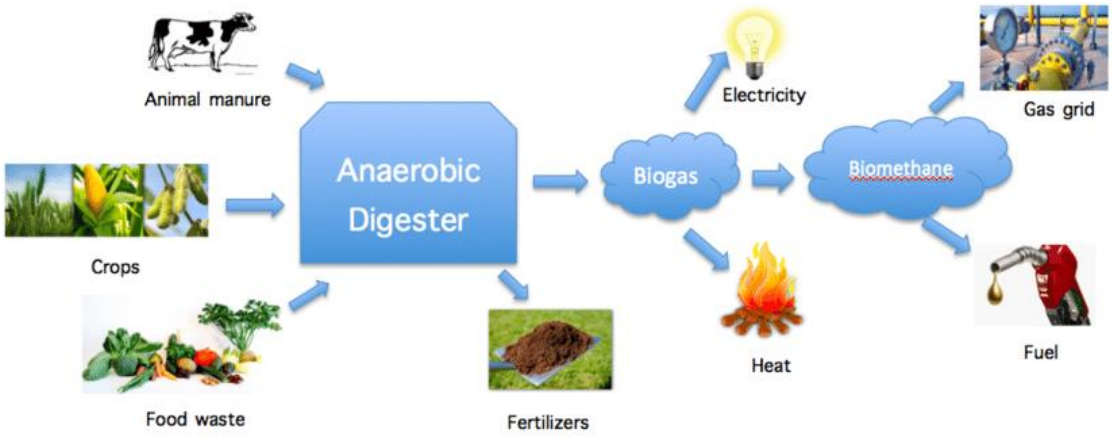

Figure 30: Anaerobic Digestion Potential Feedstocks & Outputs

AD has several associated environmental benefits. Energy from AD is effectively carbon neutral. AD also lowers the organic pollution potential of slurries resulting in water quality benefits, the by-products result in better quality fertilisers and reduces the need for artificial

fertiliser use. The process also has the advantage of utilising waste substances that are otherwise difficult to dispose of in an environmentally acceptable manner.

There are a small number of AD digesters in operation in Ireland however the viability of these systems is dependent on access to an adequate and consistent quantity of suitable wastes, which can require large storage areas. Ideally, digesters should be near both a supply of raw materials and a demand for the energy outputs. The Support Scheme for Renewable Heat (SSRH) has introduced mechanisms to support heat from renewable sources, like biomass boilers and AD plants, for a 15-year period in specific areas. Anaerobic Digestor plants require large capital investment and the SSRH scheme intends to help businesses and individuals overcome this obstacle. Further information on the scheme can be found here. A thorough feasibility study was undertaken on introducing AD on the Dingle Peninsula and is available here for further information.

Killorglin has potential to utilise its organic and agricultural waste in anaerobic digestion. Every tonne of domestic food waste that is diverted from landfill has associated emissions savings while also having the potential to generate biogas that can be used for energy production. Food and agricultural waste, sewages sludges and specifically grown crops could be diverted to an AD plant to produce biogas for heat and electricity generation in the area. A feasibility study like Dingle would be required to study the potentials in the area regards feedstocks and capital and ongoing investments in such a system.

12 Strategic Roadmap

The following provides a strategic roadmap for KSEC as they transition from the Plan to the Do phase of the SEC programme. The aim of this visual is to illustrate the respective stages the SEC are advised to take in the development of various initiatives identified throughout this study. The initial stage involves bringing the wider community with the SEC through raising awareness and understanding in the core areas of energy efficiency and sustainable development. The second stage involves obtaining commitment from local homeowners and businesses to partake in projects like those identified through the various audits and assessment in this report. Stage 3 involves the project management and completion of these projects and measuring the reduction of the areas carbon output

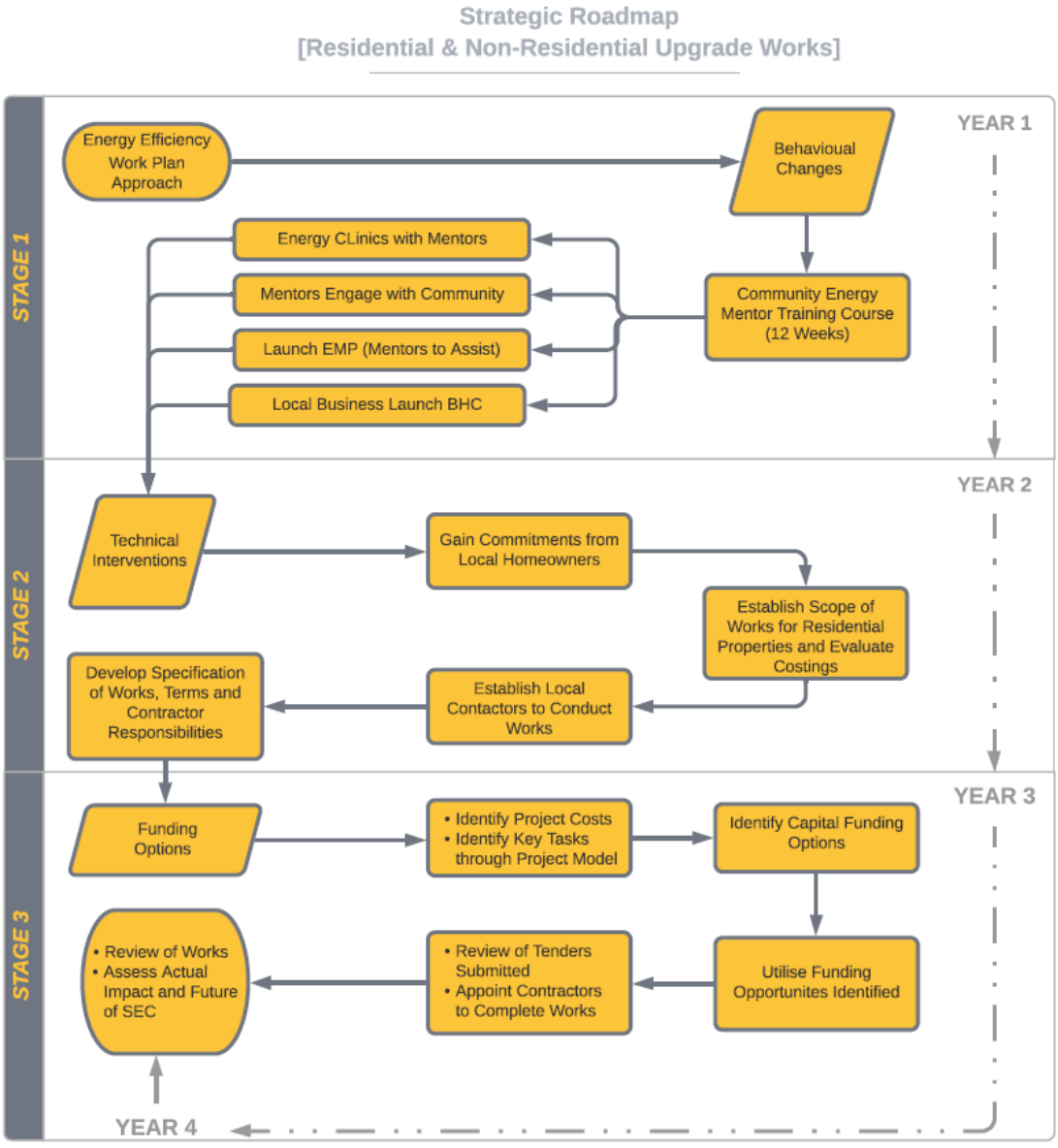

Figure 31: KSEC Roadmap

Stage 1

The core objective of Stage 1 of the roadmap is engagement. The aim for the SEC is to ensure the fundamental messages of the Energy Master Plan are communicated to the entire community, and that this message stays relevant. By communicating this throughout the community, the SEC can be in the position to inform its people in an efficient manner, increasing the target audience reached.

The SEC are encouraged to organise community and contractor training. Examples of these are demonstrated further within the report. The SEC should also liaise with their local SEAI County Mentor and run regular energy clinics and workshops using the already available material from the SEAI's SEC Team.

Furthermore, the community should aim to collaborate and engage with local SMEs. This is in respect to the recently launched SEAI SME Energy Audit voucher of €2,000 for eligible parties. An energy audit is an important step for businesses that want to save money, save energy, and enhance their brand. An energy audit may be carried out on buildings, processes, or systems and it is a three-step process which involves preparation, a site visit and reporting. The audit report that compiles the findings will help you to understand:

- how much energy your business uses
- the equipment and processes that use the most energy
- what actions you should take to save energy, and their estimated cost and impact

The advantages of an energy audit of this type include helping the business to better understand onsite energy use. Helping you to learn where you use energy, where you waste energy and what can be done to be more efficient. As a result, you can expect to save money through the identification of zero-cost and low-cost changes, allowing you to realise immediate savings. Improving energy use, and becoming more energy efficient fundamentally reduces your energy related carbon emissions and can enhance both your brand and reputation

The SEAI's Support Scheme for Energy Audits (SSEA) offers SMEs a €2,000 voucher towards the cost of a high-quality energy audit. In most cases, this will cover the total cost of the audit. Application to the scheme is easy, with automatic approval for eligible businesses. Further information on this grant, and the application process can be found by following this link.

The SEC should also form a stable and structured committee that will oversee projects and initiatives going forward. This should be a committee which takes advantage of local skills, meets on a regular basis and is seen as a local point of contact for energy projects. This structured team will be very significant as the SEC progresses towards more ambitious projects over the coming years.

Stage 2

Stage 2 of the strategy looks to build on the awareness, training, and engagement through Stage 1, to begin collecting expressions of interest and commitments from local home and business owners in respect to retrofits. Using the funds available, the SEC should help coordinate contact with a retrofit contactor to elaborate on actual current scope of works and costing that would be aligned with current market happenings These should be complete using the various funds available, such as the SEAI's One Stop Shop. For non-domestic & not for profits, the SEC should expand beyond SEAI funding and look to both national and EU programmes to support financing. A relationship should be developed with a local lender to ensure green finance can be acquired for these projects.

Vacant/derelict properties can be upgraded also to help increase housing stock, but also improve the general aesthetic of the town. The updated Croí Cónaithe (Towns) Fund can provide up to €50,000 for upgrade works to such buildings. This fund can be used alongside SEAI retrofit grants.

Stage 3

Stage 3 involves submission of grant documents and application forms, securing of funds and appointment of contractor to complete works. This should be coordinated by the SEC group, with support from home and business owners. The SEC are also advised at this stage, after forming a solid and structured committee, to explore alternative sustainable initiatives such as community renewable energy generation through solar or wind technology. Using the technical support provided under the SEAI Community Enabling Framework, the SEC should look to form as a Renewable Energy Community (REC), identify potential sites that could house a project of this nature, and have a 100% funded feasibility study conducted. This will demonstrate the viability of the project, identify the pathway for completion, and help in the progression of same.

This type of initiative can support funding for community projects into the future, while also decarbonising the electricity supply for local energy use, further supporting Irelands cardon reduction targets. The committee are advised to visit an up and running community renewable energy farm as part of Stage 1 to support leaning to help solidify the concept and begin the community buy-in process.

12.1 Strategies

The most efficient approach to improve energy efficiencies in the Killorglin study area is to start with areas that are particularly high users of energy. Typically, cultural, and behavioural changes around energy use are the first steps in achieving a more efficient energy use profile with the least investment and disturbance. This approach can be challenging as habits can be difficult to change, encourage and measure. Science and alternative energies can offer a large contribution of the solution, but behavioural changes regard energy waste must be a founding cornerstone of a sustainable community. Possible approaches to engage communities and mobilise change are detailed below. Some of these interventions overlap and compliment behavioural and technical approaches.

12.1.1 Behavioral Interventions

Providing households with regular feedback on their energy use and encouraging them to set energy saving commitments in public can generate energy savings.

- Incentivise energy saving by use of smart meters and the potential introduction of energy reduction competitions run by local authority and/or community groups. The biggest loser wins (have been carried out by the US-EPA in schools but could be initiated in all areas of Killorglin).

- Energy awareness regards turning off lights, plugging out chargers and powering down electrics.

- Encourage public transport use and walk or cycle to work schemes. Promote a competition for most steps walked for staff, students, and services users to reduce car use.

- Develop partnership with local Hubs, Local Authorities, PPNs and Education Training Boards. Along with the SEAI consider running an Energy Champion training course for a select number of representatives across the community. With technical assistance from the SEAI and ETB, upskill the Energy Champions in areas of renewable energy technologies, energy efficiency, smart finance, and sustainable transport. This can used as a means of filtering the message of the SEC and the EMP to the wider community and increase both awareness and activity in retrofits within the locality. Examples of this model can be seen with the Dingle SEC based in county Kerry.

- Develop local contractor retrofit skills by participating in LOETB National Retrofit Training programme. With many of the courses 100% funded, this presents an immediate opportunity for KSEC to develop localised capacity to prime contractors for potential regional retrofits. By upskilling the local sector, works and finances generated can recirculated back into the local economy bringing several benefits. Currently the available training programmes are as follows.

    - NZEB Fundamentals (Fully Funded) - This course aims to provide participants with the knowledge in the general principles and practices of Nearly Zero Energy Building (NZEB).

    - NZEB Ventilation Systems (Fully Funded) - This course aims to provide participants with the principles and practices required to effectively design ventilation flowrates, install ventilation systems, and commission ventilation systems, in accordance with Technical Guidance Document Part F 2019.

    - QQI Level 5 Retrofit Insulation Skills (Fully Funded) - This course aims to provide participants the knowledge and skill to insulate a building using best practise. This includes internal, external, floor and roof insulation.

    - External Wall Insulation Applicator (Fully Funded) - This course aims to provide participants with the knowledge and skills to apply external wall insulation (EWI) using best practice. At the end of this course, successful learners will have received the theoretical and practical training required to be able to participate

in the preparation, setting out and practical application of EWI as part of a retrofit project.

12.1.2 Technical Interventions

- Low level, low investment upgrades to housing stock like lighting upgrades, attic insulation etc.
- Medium level upgrades like upgrading heating and boiler controls.
- Higher level upgrades like boiler replacement, installing heat pumps or externally insulating houses.
- Install more e charging points around the town to encourage use of electric vehicles.
- Introduce energy efficiency technologies to industries like economisers on boilers, steam expander energy recovery systems and introduction of low energy lighting and e chargers to sites.

12.1.3 Target Strategies

The Register of Opportunities has identified several projects that are ready to reduce energy spend throughout the town of Killorglin over the next three years and beyond. The key recommendations are to upgrade the non-domestic buildings and the domestic homes that were audited using the Community Energy Grant/Better Energy Communities grant (details below). If these upgrades (or upgrades of similar homes and businesses) were undertaken this could save an estimated 226,889kWh of energy per year alongside an approximate energy spend of €37,249 on electricity and heating bills per year. This can be achieved in the next 12 months through engagement with all stakeholders and ensuring an application to the below grant scheme is made to a registered SEAI One Stop Shop (Homes) and Communities grant Project Coordinator (Community & Business).

Furthermore, a series of grant supports have been recently launched to promote and encourage small businesses to carry out energy audits on their businesses. This is a core action in the short term for the SEC. Section 12 of this report details the particular of this scheme, alongside how it should be integrated within the SECs roadmap.

A longer-term strategy for Killorglin may be to develop a community owned solar or wind farm that can offset an immense amount of imported fossil fuel derived energy. This will also allow local ownership of these assets and give local opportunities to invest in clean, green technologies. Further details of typical yields can be found within the RoO which supplements this report.

13 SEAI Grant Funding Opportunities

The Better Energy Communities fund for 2022 is open year-round. This grant aids a proportion of the work needed to upgrade community ran and non–residential buildings. This report can be used as a key component of the towns BEC application for 2023.

For homes, the SEC are encouraged to participate in the new One Stop Shop grant programme. A requirement of receiving the grant aid is that the BER must be greater than B2 on completion of work. This means a significant retrofit is required, however significant funding is provided to help achieve this.

The next steps for the community in pursuing the BEC/Communities or One Stop Shop grant would be to first identify projects within the town that are likely to proceed in the coming year. These projects can come from the findings directly established within this EMP, such as from the audits, or they can come from ideas that may have generated because of reading this report. Bringing a Project Coordinator in to speak directly with interested parties may be considered an action in this regard by the SEC. The PC will discuss the specifics of the fund, helping to collate projects and assist in the grant documentation.

It is advised that an SEAI approved Project Coordinator be contacted as they will essentially manage the grant application on behalf of the community. As the community grant is competitive, applications which are submitted must be cognisant of this. The scope of works, carbon reductions and energy savings are factors which all influence how strong a project is. Meeting these criteria can sometimes be difficult for a community as they are only starting out. Engaging with a PC (Project Coordinator) can take this roadblock away from the community by merging their projects with others across the county. In essence, the PC is bundling a series of projects from various regions in to one application to ensure it is strengthened. A list of SEAI approved BEC/Community Grant project coordinators can be found via this link.

The tables below indicate the level of funding that may be available to an individual or entity under the community grant programme, these percentages may vary from year to year, alongside the actual works that are considered eligible under the fund. From more visit the SEAI's Community Grant website via this link.

Table 9: Grant Funding Level for Residential Dwellings (SEAI)

Home Type	Fuel Type	Funding Level
Private	Fuel Poor	Up to 80%
Private	Non-Fuel Poor	Up to 35%
Local Authority	-	Up to 35%
Housing Association	-	Up to 50%

Table 10: Grant Funding Level for Non-Domestic/Community Buildings (SEAI)

Type	Funding Level
Not for profit/community	Up to 50%
Private and public sector	Up to 30%
Public sector (exemplar)	> 30% ≤ 50%

There are also one-off SEAI funds available for homeowners under the SEAIs Better Energy Homes scheme. This is funding available for specific home energy saving measures all conveniently highlighted within the SEAI's Home Energy grants webpage. This support is very useful where a homeowner wishes to proceed with energy upgrades works without the BER B rating as a restriction and requires less of a financial commitment to fully retrofit the home, where measures can be completed at the homeowners' pace. It is worth noting that this grant does not support the upgrade of windows and doors, alongside ventilation systems and any fossil fuel based central heating systems such as oil, natural gas, or solid fuel. The homeowner will also not require, and subsequently have, the support of a Project Coordinator.

13.1 State Grant Funding Opportunities

The below agencies offer a range of grant aids to organisations involved in improving energy efficiencies.

- SEAI
    - EXEED (Excellence in Energy Efficient Design) - incentivise companies to demonstrate excellence in undertaking energy efficient projects.
    - Project Assistant Grant - designed to help companies and organisations evaluate energy efficiency opportunities by funding a feasibility study.
    - SSRH - The Support Scheme for Renewable Heat is a government funded initiative designed to increase the energy generated from renewable sources in the heat sector. The scheme is open to commercial, industrial, agricultural, district heating, public sector, and other non-domestic heat users.
    - National Home Retrofit Scheme - This grant is suitable for developing One-Stop-Shops and engaged Residential Service Providers, Employers, Financial Institutions, registered Housing Associations and Local Authorities who wish to participate in delivering home energy upgrades.
    - Warmer Homes Scheme - This free home energy upgrade service is available for qualifying homeowners. The SEAI deliver free energy upgrades to homeowners who receive certain welfare payments. If you qualify for the scheme, the SEAI can help to make the home warmer, healthier, and cheaper to run.

- Solar Electricity Grant (PV) - This grant will help you install Solar PV panels in your home to generate renewable electricity. A battery storage grant is available for larger solar PV systems, to store excess electricity generated during daytime hours.
- Electric Vehicle Grant – SEAI's electric vehicle grants make it more affordable to switch to an EV. By following the link, you can choose your make and model and buy from the SEAI's dealers list. The grant support private and commercial EVs, alongside EV charging docks.
- Support Scheme for Energy Audits - SEAI's Support Scheme for Energy Audits (SSEA) will offer SMEs a €2,000 voucher towards the cost of a high-quality energy audit. In most cases, this will cover the total cost of the audit. Application to the scheme is easy, with automatic approval for eligible businesses.
- Renewable Energy Support Scheme - The Renewable Electricity Support Scheme (RESS) has been designed to promote investment in renewable energy generation in Ireland. Ireland has set a target of 70% renewable electricity, and an EU-wide renewable energy target of 32%, by 2030. This competitive auction based, cost effective framework will help us achieve these targets.

- Dept of Environment, Climate & Communications

  - Community Climate Action Programme - The Community Climate Action Programme supports projects and initiatives that facilitate community climate action through education, capacity building and learning by doing. The programme is being run by Pobal, on behalf of the department.

- Dept of Housing, Local Government & Heritage

  - The Croí Cónaithe Fund - The Vacant Property Refurbishment Grant provides people with a grant to support the refurbishment of vacant properties while under the Ready to Build Scheme, local authorities make serviced sites available in towns and villages at a discounted rate to individuals who want to build their own home.

- EPA grant

  - Green Enterprise - Grant aid provided to demonstration type projects by organisations that produce goods and provide services in more environmentally friendly ways.

- Enterprise Ireland

  - GreenPlus Assignments - assist companies to develop and drive energy

and environmental efficiencies and improve sustainability.
    - Innovation Voucher - Funding towards collaborating with registered college or knowledge provider to explore a business opportunity or technical problem.
    - Green Start - Grant support towards hiring an Environmental consultant/trainer to undertake in-company assessment
    - Commercialisation Funds - Targeted to researchers in third level institutions, non-profit research agencies and organisations.
    - Innovation Partnership Grant Programme - Grant aid providing up to 80% of the cost of research work to develop new and improve products, processes, services or generate new knowledge.

- NTMA
    - Ireland Energy Efficiency Fund - Energy efficiency funding for larger projects.

- Department of Rural and Community Development
    - LEADER Programme – grant aid with several themes around community and local business development. Renewable energy is a specific theme for grant funding to both communities and businesses.
    - Community Centre Investment Fund - This is a new capital fund of €15 million which will provide funding for the improvement and refurbishment of existing community centres in both urban and rural areas.

- Skillnet. Ireland
    - Climate Ready Academy - The Climate Ready Academy aims to support Irish businesses in developing the skills and talent required to mitigate the effects of our changing climate and environment. The programmes, training, and supports offered as part of this national upskilling initiative are fully funded for Irish businesses and employees in the private sector.

13.2 Matching Funding Opportunities

There are numerous institutes that offer funding to community organisations for SEC work. A brief list of these is outlined below.

- Credit Unions have expressed their willingness to lend to community groups for energy efficiency projects.
- Clann Credo offer loans for community, voluntary and charitable organisations throughout Ireland. They have €10 million to lend to communities involved in climate projects.

13.3 Alternative Funding Opportunities

There are some interesting approaches to financing energy efficiency projects throughout Europe and Ireland. A summary of these is outlined below.

- Energy Performance Contracting (EPC) or ESCO funded upgrades involve an external organisation financing energy upgrade and the company or organisation repay the ESCO through energy savings. The IEA highlighted this as an excellent way to fund projects with only a small number of ESCO companies presently working in Ireland.

- Community Benefit Funds - All RESS projects must register a Community Benefit Fund for their local area. These Funds will ensure that communities can support sustainable initiatives and decide themselves as to what worthy local causes need support. The contribution is to be set at €2 per Megawatt hour of generation of the RESS Project. This means there are real and quantifiable funds being made available annually for the benefit of the local community. The Fund will be aligned to incentivise investment in local renewable energy, energy efficiency measures and climate action initiatives. The SEC are encouraged to liaise with the Local Authority to understand the location of any existing or purposed renewable energy sites that come under this category.

- Pay and Save initiates are a way for residential sectors to save energy like the EPC/ESCO model above but on a smaller scale. Minister Bruton has announced his intention to make money available for this type of scheme as Ireland will not achieve our targets to retrofit the housing stock of Ireland through the proposed methods in the next decade.

- The Innovation Fund is intended to be a key funding instrument for delivering the EU's economy-wide commitments under the Paris Agreement and in support of the European Commission's strategic vision of a climate neutral Europe by 2050. The Innovation Fund along with the EU Emissions Trading Scheme (ETS) will provide long-term incentives for deployment of innovative technologies required to deliver the EU's low carbon transition.

Funding for the Innovation Fund will derive from revenues raised by the EU Emissions Trading System (EU ETS), the world's largest carbon pricing system, and any unspent funds from the NER300 programme.

The Innovation Fund is likely to have a value of approximately €10 billion, depending on the level of the ETS carbon price over the period 2020 to 2030.

The Innovation Fund will support projects in the following areas:

- Innovative low-carbon technologies and processes in energy intensive industries, including products substituting carbon intensive ones.

- Carbon capture and utilisation (CCU).
- Construction and operation of Carbon capture and storage (CCS).
- Innovative renewable energy generation.
- Energy storage.

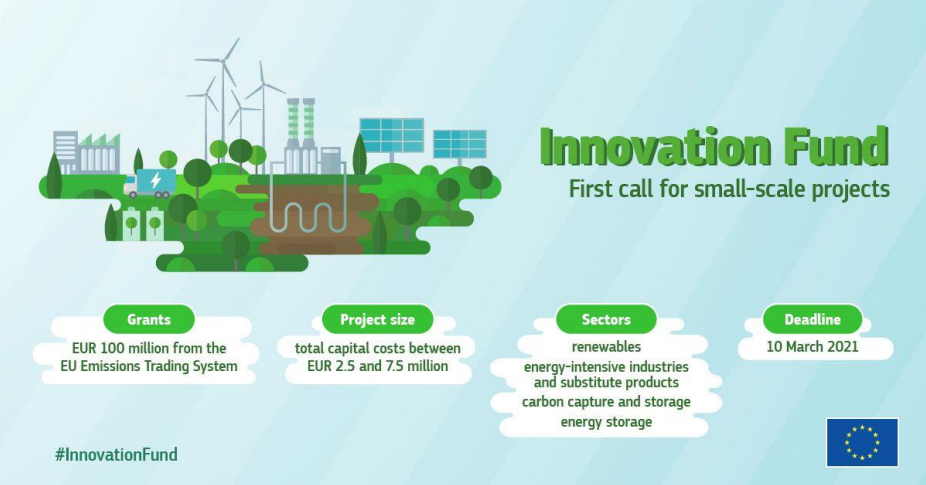

Figure 32: Innovation Fund

14 Schools & Sustainable Energy Development

As part of the target audience, KSEC are advised to engage and collaborate with the local primary and post primary schools. The SEAI have developed and adapted a range of technical supports regarding energy efficiency and sustainability and made them fun and engaging for children of all ages, including for both teaches and staff. The SEAIs' Energy in Education programme offers various workshops and training for teachers, helping them to develop and deliver material to the class about sustainable energy. This training also helps to make teachers and staff more aware of how to monitor and track energy use within their own facility. A selection of some of the SEAI school specific resources would include

- One Good Idea Competition
- SEAI School Workshops
- Climate SOS Publication
- Tutorial on Energy Experiments
- Monitoring & Reporting for Schools
- Energy Audits
- Grant Funding

Furthermore, in the summer of 2021, Ministers Norma Foley TD and Eamon Ryan TD launched a €14 million Pathfinder programme, which will demonstrate the approach to deep retrofit in the schools' sector, testing energy efficiency solutions and renewable heat technology. This programme will target energy use and CO_2 emission reduction by 50%, testing deep retrofit and low carbon heating solutions, with six schools benefitting from a selection of energy efficiency works in 2021.

In a statement, Minister Ryan said: "The public service must reduce emissions by at least 50% by 2030 and to net-zero by 2050. This project is an example of leadership, which is producing sustainable solutions that can be scaled up around the country. Schools are at the centre of our communities and are where our children learn skills for their future. By ensuring that older schools undertake energy upgrades to become low-energy buildings, we can demonstrate the steps necessary to our children, and the wider community, while critically reducing running costs, emissions, and improving the comfort levels and learning environment in these vital buildings."

Figure 33: Project Ireland 2040

15 Register of Opportunities

The Register of Opportunities is included as part of this report. This register will include potential approaches to reduce energy use in the study area and can be used as examples for further opportunities.

The opportunities highlighted within the RoO are technical in nature, involving a range of energy efficiency, smart energy, and renewable energy technology systems. However, the foundation of sustainable energy will develop from behaviour change, increased awareness, and whole community engagement. In parallel with the completion of the identified technical opportunities of the RoO, Killorglin SEC are encouraged to progress energy awareness through continued outreach within the wider community. As identified within section 12, this can be through a range of initiatives from basic workshops, an increased presence on social media, developing partnerships with existing public and private entities and through the identification and upskilling of Energy Champions, utilised as a voice to articulate energy efficiency and support a range of community queries to support in its growth.

16 Conclusion

A wide range of energy saving opportunities have been identified through this Energy Master Plan study of Killorglin. The drive and ambition of this very active and engaged Sustainable Energy Community will now have the knowledge to better understand how to make the journey toward reducing their carbon footprint, from the initial steps of engagement, to improving energy efficiency and how to also progress toward more self-sufficient practices to regenerate finance to help support this transition for the benefit of the region.

This Energy Master Plan can be used as a guiding document to facilitate the move from fossil fuel intense energy sources to renewable and sustainable energy from the ground up. It can be used as a framework for initiatives from small cultural changes to more ambitious larger scale approaches. The Register of Opportunities and strategic roadmap gives specific examples of projects that can be implemented in the short and longer term. The town of Killorglin has immense potential and ample natural resources, from renewable energy to an enthusiastic community which will lead the charge for sustainable energy use.

KSEC's first steps must be to increase local awareness and engagement of energy related climate action, this can be achieved through organised, and community led training and education on the subject matter, including utilising SEAI workshops on energy efficiency, bill analysis, sustainability, insulation etc. Also, though examples of similar held initiatives, such as through the experiences of the Dingle SEC. This should be followed by local contractor training through the National NZEB training programme.

Supporting local SME's in acquiring energy audits through the new SEAI voucher scheme can further support the identification of projects that will help accelerate the committee into the Do phase. This can be followed by the facilitation of domestic retrofits through a local contractor

expo day, with the aim of signing up holds to consider energy related works, with the support of grant funding. Through this pathway, the community of Killorglin can take tangible steps toward reducing energy use, and improving energy efficiency for the town and its hinterlands