arden energy

Energy Master Plan and

Register of Opportunities

Stoneybatter Sustainable Energy Community (SEC) Known as “Cosybatter”

This project is supported by the Sustainable Energy Authority of Ireland

Supported by

seai SUSTAINABLE ENERGY AUTHORITY OF IRELAND

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1 Summary

Cosybatter's Sustainable Energy Community

Cosybatter SEC was set up under the SEAI programme by local volunteers from the community in Stoneybatter with TU Dublin as a lead partner on April 9th 2021. Cosybatter encompasses a large area comprising 4,681 households ranging from the river to the South and Grangegorman campus to the North. The energy spend is in excess of €10 million per annum.

Total Energy Consumption 79,986,646 kWh/yr.	**Estimated Energy Spend** € 10,932,423	**Residential Total Energy** 51,268,786 kWh/yr.
Tertiary (Public and Commercial) Total Energy 15,564,893 kWh/yr.	**Average Domestic BER** 330 kWh/m^2/yr. (E1)	**Total Dwellings**[1] 4,681

Figure 1. Current Cosybatter SEC Baseline Data

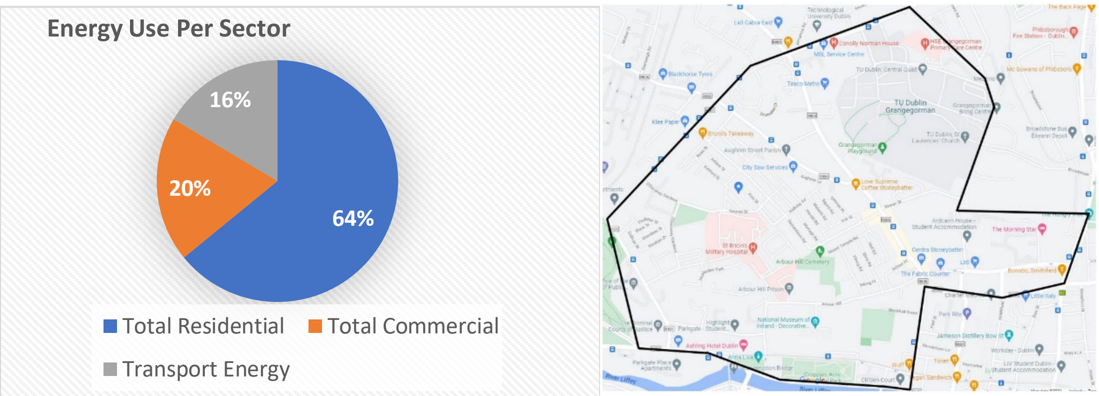


Figure 2. Energy Use per Sector (L) and SEC boundary (R)

The average residential energy consumption in Stoneybatter is 8.5% above the national average due to the older age profile of housing and consequent poorer energy performance.

Residential Retrofit Measures

Five households were selected for residential audits based on responses to a survey circulated by Cosybatter and the profile of house types in the area. The following tables summarise the recommended residential retrofit measures based on the domestic surveys.

Retrofits are cost effective and apart from energy savings will improve comfort and health of occupants and will also add to the value of the house. There are significant grants available from SEAI towards the cost of residential energy retrofits. Anyone interested in progressing plans for an energy retrofit should contact a One Stop Shop or Communities grant project co-ordinator.

[1] Including occupied and unoccupied.

	Level of Domestic Retrofit			
Measure Implemented	Basic	Intermediate	Advanced	Deep
Low energy lights	Yes	Yes	Yes	Yes
Roof Insulation & Draught Proofing	Yes	Yes	Yes	Yes
Heating Controls	Yes*	Yes*	Yes*	No
Internal Insulation	No	Yes*	Yes*	Yes*
External wall insulation	No	Yes*	Yes*	Yes*
Windows	No	Yes*	Yes*	Yes*
Floor Insulation	No	No	Yes*	Yes*
A/W Heat Pump	No	No	No	Yes
Solar Photovoltaic	No	No	Yes	Yes

Figure 3. Summary of Recommended Measures
* Where applicable

	Average Cost	**Average Saving**	**Payback**
Basic	€590	€105	5.6
Intermediate	€9,264	€743	12.5
Advanced	€22,958	€1,641	14.0
Deep	€38,538	€1,951	19.7

* Where applicable
Table 1. Recommended Improvements at selected representative residential dwellings

Commercial & Public Sector

Energy audits were carried out at two non-domestic sites: St Pauls CBS Secondary School and L. Mulligans Grocer. These include typical energy uses in the commercial and public sectors, that is primarily lighting and space heating. One of the sites audited had a significant refrigeration or cooling load which would be typical in, for example, the retail and hospitality sector.

Projects Identified		
Starter	Standard	Advanced
LED Lighting Heating Controls Energy Management	Boiler Upgrade	Solar PV

Table 2. Energy Control Measures Identified for Non Domestic

Energy Management Plan

Cosybatter SEC group has been very successful in promoting engagement with the local community. The group has already held a number of initiatives and plans to build on these. These include:

- Completed a community online and paper energy use survey - where five household responders received a free BER energy audit. The survey/questionnaire got about 20 responses from people in the community who provided information on their home and transport energy use.
- Stand and presentation at a sustainability event in TUD Grangegorman.

Cosybatter SEC plans to build on this success through, *inter alia*, the following measures:

- Engagement with householders and businesses.
- Awareness-raising activities within the community (Community newsletter articles, social media posts on Twitter, Facebook and Instagram, events and surveys)
- Promoting the inclusion of energy efficiency in refurbishment/extension projects planned in the community.
- Promoting interest in projects for SEAI Communities Grant Application (community schools and community buildings / halls etc).
- Publicising success stories on website and social media postings and at local public buildings (printed documentation for those who do not use electronic communications).
- Initiatives such as encouraging increased use of public transport, walking & cycling and switch off and turn down the thermostat campaigns.

2 Introduction

Arden Energy was appointed to develop a comprehensive Energy Master Plan (EMP) as well as generate an associated Register of Opportunities (RoO) for Cosybatter SEC.

The EMP and RoO include:

- A baseline analysis of energy consumption and uses in Stoneybatter and factors affecting consumption; e.g. age of houses.
- Energy audits of commercial and domestic buildings.
- A plan to improve efficiency and reduce CO_2 emissions.
- Opportunities to introduce renewable energy technologies for homes and small businesses.
- A Register of Opportunities.

3 Baseline Energy Balance

3.1 Overview of Cosybatter SEC

The boundary of Cosybatter SEC is defined by the boundary of 52 small areas (as defined by the CSO for the purposes of the census) as shown in Figure 4.

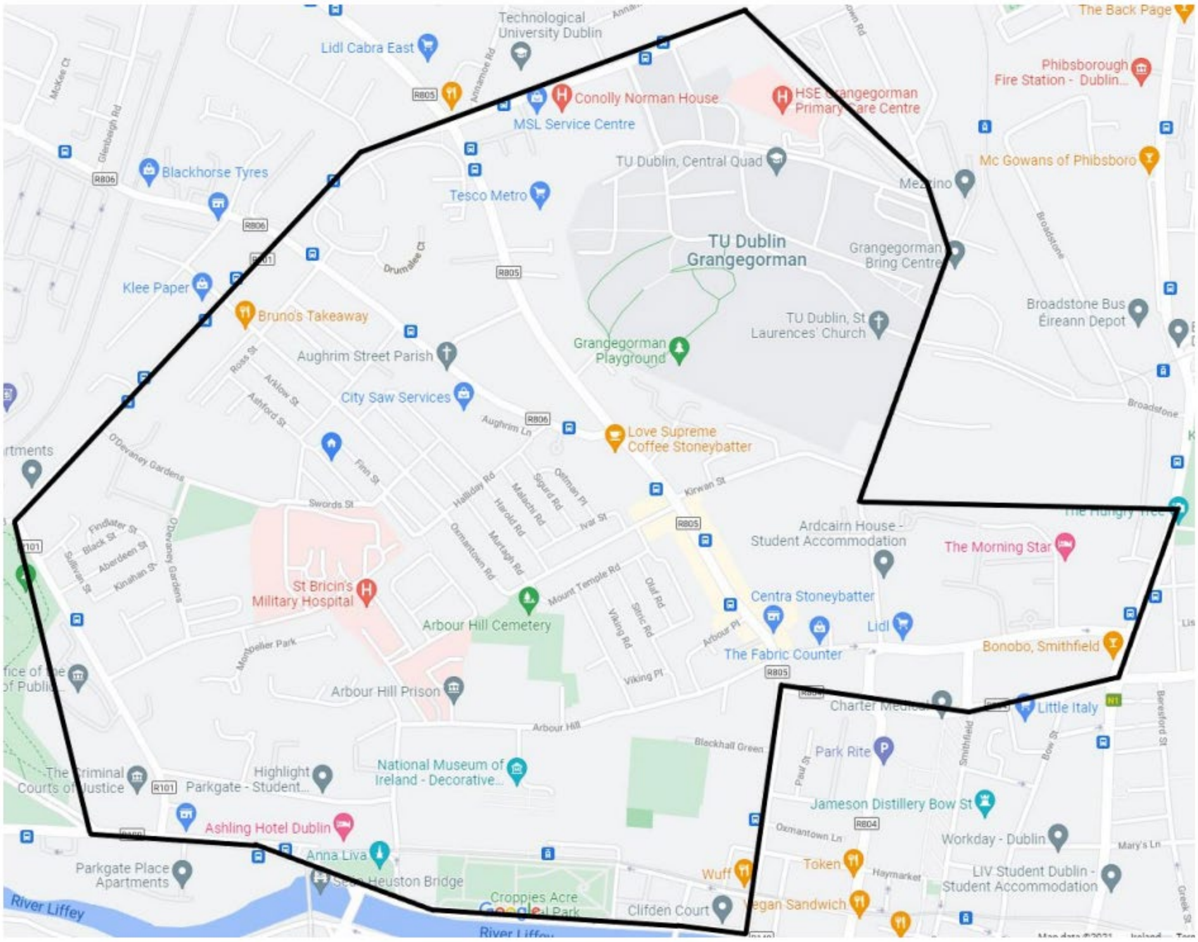


Figure 4. Map of Cosybatter SEC

3.2 Cosybatter SEC Energy Demand Analysis

The 2016 census data provides much information relevant to energy consumption and energy efficiency including age of dwellings, heating fuel type, house ownership and car ownership. The SEC area has a total of 4,681 dwellings.

3.3 Energy Consumption in Dwellings

SEAI has published the BER database by small area and BERs have been carried out and registered for 3,359 houses in the SEC area or 72% of the total housing stock. This is a reasonable sample of the housing stock and the data may be considered reasonably representative.

The BER database published by SEAI is used in this analysis for the calculation of energy consumption. The BER is an indication of the energy consumption of a house standardised for typical occupancy and comfort levels. It is calculated based on a Dwelling Energy Assessment Procedure (DEAP) model which calculates normal use of energy for space heating, hot water, ventilation and lighting per square metre of the area of a residential unit. The final energy rating given to a household is in kWh/m^2/year of primary energy and an energy efficiency scale from A

(<25) to G. (>450). The following chart displays the small area Identifiers and the corresponding Average BER rating, a table of this data is displayed in Appendix 3.

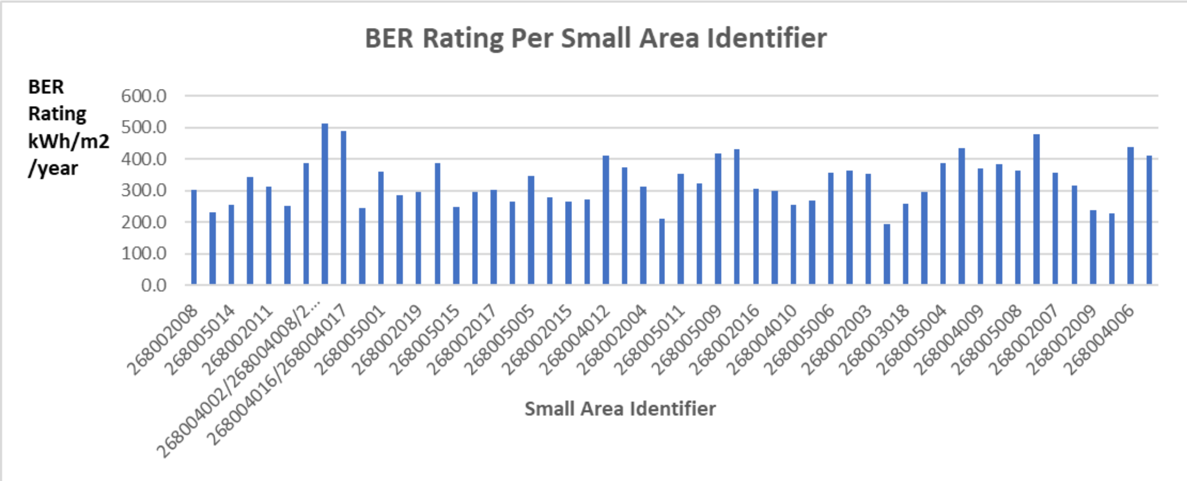


Figure 5. Distribution of Domestic BERs by small area within the Cosybatter boundary

Figure 6. Map of Domestic BERs in Cosybatter SEC

The BER does not account for electricity used for domestic appliances which is the largest consumer of electricity. The electricity baseline demand of the SEC is therefore based on the national average household electricity consumption.

	kWh/yr.	€/yr.	CO_2 T/yr.
Residential Electricity Demand	13,855,691	3,664,830	4,099
Residential Heat Demand	37,413,095	3,183,854	7,565
Total Residential	51,268,786	6,848,685	11,663
Commercial Electricity Demand	5,836,835	1,420,102	1,727
Commercial Heat Demand	9,728,058	690,692	1,967
Total Commercial	15,564,893	2,110,794	3,694
Transport Energy	13,152,967	1,972,945	3,354
Total	**79,986,646**	**10,932,424**	**18,711**

Table 3. Cosybatter SEC Baseline Energy Consumption

The data from SEAI shows that the average BER across the entire area is 330 kWh/m^2/yr. or a BER of E1. This reflects the older age profile of housing in the area and shows significant potential for improvement in the energy performance of dwellings. The primary factor, other than floor area, influencing energy consumption in houses is the year of construction.

The energy demand is stated in delivered energy which would be equivalent to metered energy consumption at a premise. Energy consumption in BERs is stated as primary energy which is the energy supply at a system level required to deliver that quantity of energy to the final consumer. A primary energy factor of 1.89 is applied for electricity and 1.1 for gas and other household fuels. The total residential energy use stated in primary energy is 67,341,660kWh/year.

SEAI's Energy in the Residential Sector 2019 report[2] details the efficiency and consumption patterns across the residential sector in Ireland. The national average 'non-electrical energy' (fossil fuel) consumption is 13,885 kWh/year and the average electricity consumption was 4,638 kWh/year per dwelling.

The consumption per household within the Cosybatter boundary is estimated by adjusting the national average household energy consumption according to differences between BER data within the Cosybatter SEC boundary vs national averages. The fossil fuel consumption is estimated at 17,146 kWh/dwelling/year, this is 24% higher than the SEAI national average of fossil fuel consumption. Figure 7 shows the average household energy consumption in Stoneybatter compared to the national average.

[2] Energy in the Residential Sector, https://www.seai.ie/resources/publications/Energy-in-the-Residential-Sector-2018-Final.pdf

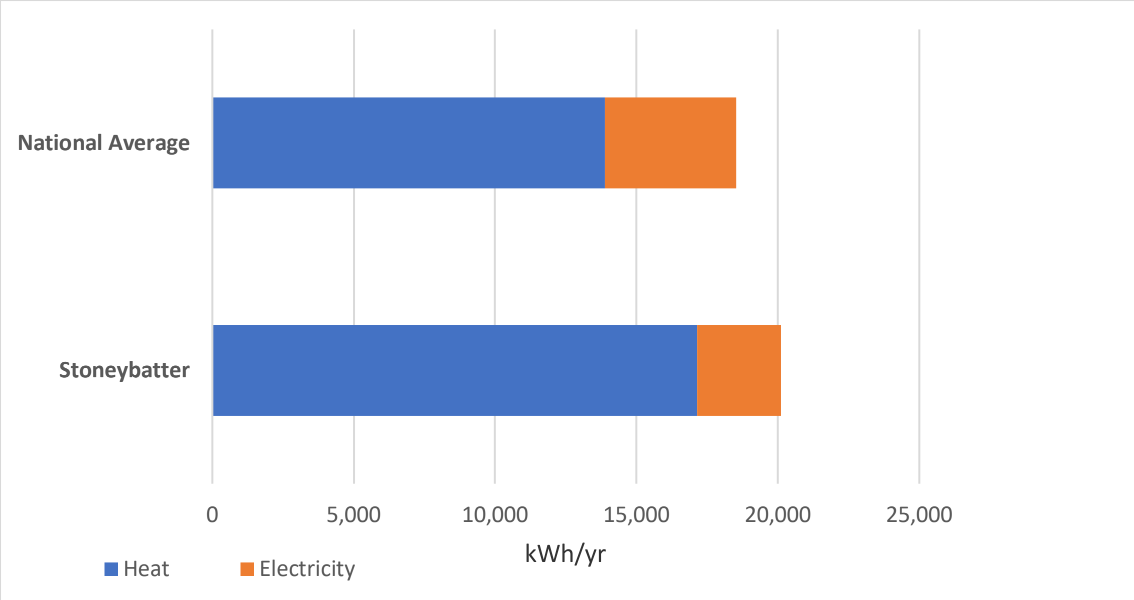


Figure 7. Cosybatter Household Energy Consumption vs National Average

4 Transport Sector

The transport sector is where we, as a nation, consume the most fossil fuels and where we emit the most CO_2. It is also the largest source of final energy demand in Ireland. Despite this, there has been no meaningful reduction in this consumption in the last 30 years according to energy balance reports from the SEAI. Private cars are the transport mode with the largest energy use. They accounted for 42% of transport's final energy demand in 2019. On the other hand, public and private bus or coach transport accounted for 2.6% of transport energy use in 2019 and rail accounted for less than 1%. The balance is largely accounted for by HGV, LGV and aviation with the sum of the three being 42.8%.

The average CO_2 emissions per kilometre per car in Ireland is 112 g CO_2/km. In comparison, a passenger on a dart only contributes 11 g CO_2/km and a passenger on an intercity bus, 15 g CO_2/km.

Renewable transport fuels grew by 0.6% between 2018 and 2019 to 3.6%. This is almost all from biofuels blended with petrol and diesel. Electricity increased to 0.3% of transport's final energy demand in 2019. Most of this was from Luas and DART, but electric vehicles are growing strongly from a low base. As shown in Figure 10, there is a relatively low percentage of commuters utilising Cars as their main mode of transport to School/Work.

There are many environmental benefits to owning an electric car. There are no tailpipe emissions from an electric car, thus it produces less than half the CO_2 per km compared to a diesel or petrol car. In terms of cost, EV's have the lowest rate of motor tax per annum at €120 and can have a 74% reduction in transport costs compared to a comparable new diesel engine car. Barriers to EV adoption include cost, range limitation and limited charging infrastructure. For example, the majority of houses don't have a private driveway in Stoneybatter precluding the installation of household EV chargers. As shown in the map (Figure 11) in section 4.4, there are only two EV charging point options currently within the Cosybatter boundary.

Figure 8. Active Travel Infrastructure

Of course, there are plenty of other options to reduce your energy usage from travel and the best option is to minimise passenger car use. The number of cycling lanes in Dublin is growing as well as the number of public bikes (see figure 8, which shows DCC Public Bike stations). Cosybatter has already seen a shift towards active travel. The through road from Grangegorman Upper to Grangegorman Lower which bisects the Grangegorman Development Agency (GDA) campus, has been closed off to vehicular traffic. This provides a safer pedestrian and cycling route, which benefits local schools, the campus as well as those commuting to the city centre. The proposed improved cycleway from Grangegorman to Thomas Street would connect this to the wider city cycleway network.

Dublin City Council have installed bike bunkers in some streets in Stoneybatter. This facility is particularly important to Stoneybatter cyclists because many homes have a small amount of external or internal space. Dublin City Council note this service is 'in beta' but Cosybatter would like to see a roll-out of further bike bunkers in the area. The Cosybatter team point out that demand for bike bunker parking spaces was high in Stoneybatter. There's a map on the website (www.bikebunkers.ie) showing registrations of interest and where they are currently installed.

Public transport can also have a major impact on reducing your carbon footprint. Encouraging signs have come from recent reductions in the price of trips using LEAP cards.

In addition to reduced environmental impact, walking and cycling have health benefits. Active travel like walking or cycling helps to reduce pollution and it's better for your health. Being active is important for maintaining and improving our physical and mental health. According to the HSE, adults should aim for at least 30 minutes a day of moderate activity, five days a week. A positive finding from analysing the census data was that 30% of Stoneybatter residents travel to school or work by foot.

Recently, the Cosybatter group did a survey/Questionnaire which sought information from Stoneybatter residents about their home and transport energy use. This provided valuable information about the types and distances of commutes and trips being completed by individual residents in the Cosybatter SEC area, e.g. to school, work and college.

4.1 Car Ownership

Figure 9 displays the car ownership of each household. 50% of households have no car, 36.5% of households have one car, 7.2% have two cars, 0.6% have three cars and 0.2% of households have four or more cars. As expected Stoneybatter car ownership is considerably lower than the national average, according to the 2016 Irish census data, the percentage of households in Ireland that owned at least one car was 69.7%. Figure 10 displays the means of travelling to work, school or college. Stoneybatter has relatively good public transport including the Luas, train and bus routes. The use of public transport services was the second most popular method of travelling to work according to the 2016 census.

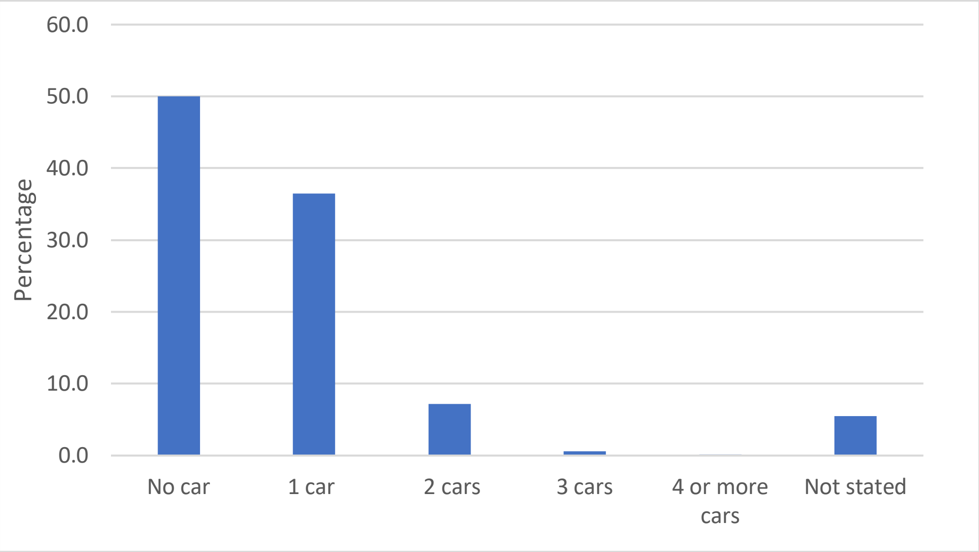


Figure 9. Car Ownership

4.2 Means of Travelling to work, school or college

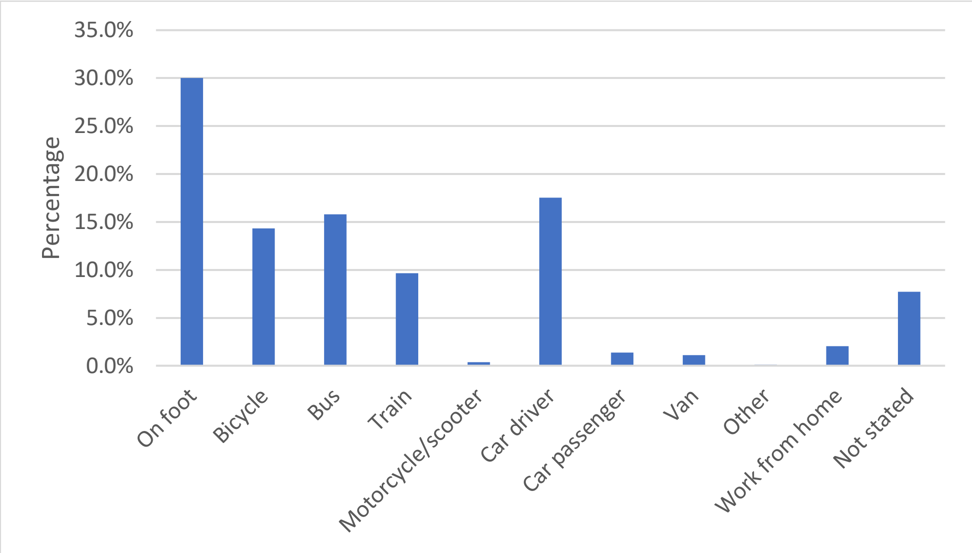
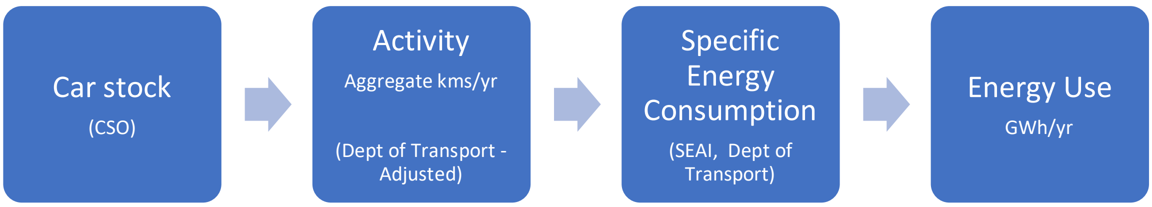


Figure 10. Means of travelling to work, school or college

From the 2016 census data, 17.5% of residents travelled to work by car and 1.4% of students travelled to school or college as a car passenger. As mentioned previously Stoneybatter has relatively good public transport connections. This could be why the Luas and bus was the second most popular method of transport to work or school with 25% of residents using public transport to travel to work, school, or college.

4.3 Baseline Emissions

We have evaluated transport energy consumption based on car ownership, activity and emission factors. This method is aligned with the methodologies suggested by the European Commission (EC) and used for national reporting and is designed to be compatible with ex-post reporting on the basis of currently collated and reported statistics. The statistics used to evaluate the energy consumption in the transport sector include:



Number of Cars	2505
Cars per household	0.54
Transport Energy Consumption (kWh/yr.)	13,152,967
Transport Energy Spend (€/yr.)	1,972,945
CO_2 T/yr.	3,354

Table 4. Transport Data

4.4 EV Charging and Mobility Hubs

The supply of electric vehicles EVs has been increasing annually faster than demand. In 2022 there was a high purchase level of EVs at 15,678 up 81% on 2021 and accounting for approximately 15% of all new car purchases in Ireland. With this increase in demand there is an urgent need for charging infrastructure in the country. The Electric Vehicle Charging Infrastructure Strategy 2022 – 2025 published by the Department of Transport outlines four main categories of infrastructure to serve different user needs according to where, when and how drivers need to charge their EV's. These are home charging, residential neighbourhood charging (including on-street and co-charging), destination charging (e.g. sports facilities, shops, hotels, tourist locations) and motorway/ en route charging (ultra-rapid charging).

The map below displays the two current EV Charging facilities within the Cosybatter boundary, to the north is the ECAR charger facility (Type2, 22kW Charger, 2 charge points) and ESB EV Charger(Type2, 22kW Charger, 2 charge points) positioned to the south-east of the map.

Figure 11. Active Travel Infrastructure (EV Charging Infrastructure)

There are potentially several areas in Stoneybatter where destination charging would be useful and, if implemented, would encourage the purchase of EV's in the community. It is the government's ambition to have a charging network to support up to 194,000 electric cars and vans by 2025. However, the framework to specify national EV charge points has yet to be published. Home charging currently accounts for 80% of charging points in Ireland. It is the most cost effective and convenient charging method. There are many schemes for financial support for EVs available at the moment which also cover charging installation. One such scheme is the EV Home Charge Point Grant Scheme which provides up to €600 towards the installation cost of a domestic charge point. Home charging allows electric vehicles to be parked, plugged in and left to charge overnight, with the possibility of benefiting from lower night-rate electricity prices. Although the impact of this scheme would be limited in Stoneybatter due to a significant proportion of dwellings being without front gardens.

Figure 12 shows possible locations for mobility hubs within the Cosybatter SEC. One of the key benefits of these Larger mobility or "gateway" hubs and "smaller mobility hubs" could be to encourage people to reduce the use of cars for the 1 or 2 mile trips to work, schools, commuter stations and shops by using bike/e-bike rentals, cargo bikes or e-cargo bikes. It would also have the positive benefit of reducing traffic congestion in Cabra, Phibsborough and Stoneybatter villages and improving air quality. It may also have the benefit of encouraging younger people in the community to help collect and deliver shopping to people with mobility issues.

A mobility hub needs space for parking vehicles and bikes and a network connection and therefore needs a landowner to provide the space and co-operation with an organisation that has or will fund and apply for a network connection. Partnerships between Dublin City Council, ESB Networks and EV charger providers are needed. We note Tesco have already been active in providing an EV charging station.

The locations identified as potential "Larger gateway mobility hubs" with Dublin bikes, private bike rental points, electric bikes, scooters and cargo bikes along with EV car charging stations are listed below:

Potential Locations	Suitability
O'Devany Gardens	Considerable vacant space would require planning by both Local Authorities and third parties EV Charging Integrators. ESBN Demand Capacity Maps would need to be reviewed and Consultation with ESB Networks required. Would need commitment from Dublin City Council. There is a planning application through Bord Pleanála 310327: Former O'Devaney Gardens Site and lands previously part of St. Bricin's Military Hospital, Dublin 7. Electric Vehicle Charging Provision Facilities for the charging of battery electric vehicles (BEVs) shall be provided at no.24 internal (undercroft) parking spaces, **representing 10% of the development's internal car parking provision.** All remaining internal car parking spaces within the development shall be 'future-proofed' by the inclusion of ducting and/or cabling to permit the rapid future installation of BEV charging points, as defined in the ESB ecars specification document no. 18017
Car Park Shopping Centre, Prussia St, Dublin	The Car park and existing electrical network connections need to be reviewed. This would require planning by both Local Authorities and third parties EV Charging Integrators. ESBN Demand Capacity Maps would need to be reviewed and Consultation with ESB Networks required. There is a planning permission application (reference: SHD0007/21, Dublin City Council, Planning Enquiry System (PES)) for the site, application site: registered. There is a plan for car parking for 111 no. cars, light van deliveries and bicycle parking (North Building). So, further investigation into EV charging facilities could be made.
Defence force Gardens, 53°20'58.9"N 6°17'42.0"W	Considerable space of unused land, no existing Car park. This would require planning by both Local Authorities and third parties EV Charging Integrators. ESBN Demand Capacity Maps would need to be reviewed and Consultation with ESB Networks required.
Grangegorman Carpark	Considerable space of unused land, no existing Car park. This would require planning by both Local Authorities and third parties EV Charging Integrators. ESBN Demand Capacity Maps would need to be reviewed and Consultation with ESB Networks required.

Table 5. Information on Potential EV Facilities

The map below provides locations for potential EV Charging hubs. They could also facilitate regular bike, cargo and e-cargo bike rentals (these may only require 4-5 public bicycle lock spaces in concrete with 2-3 charging ports for smaller EV bicycle/E-Cargo bikes).

Figure 12. Potential EV Charging facilities locations

5 Characterization of the Domestic Sector

5.1 Age Profile of Dwellings

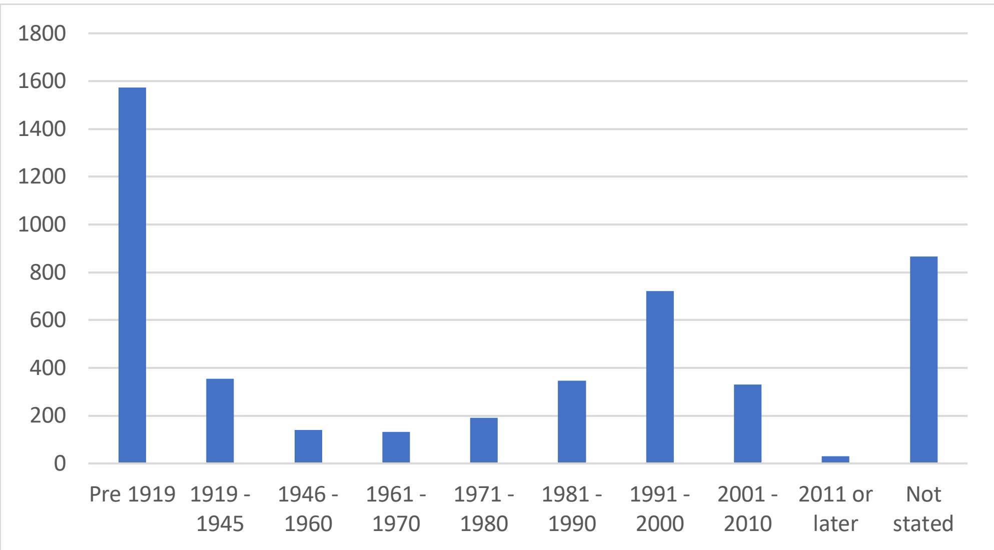


Figure 13. Summary of Age Profile of Dwellings

The age profile of domestic dwellings is shown in Figure 13, 41.2% of the 4,681 dwellings were constructed pre-1945, while 22.4% of dwellings were built between 1991 and 2010. The data concludes that a considerable proportion of the buildings were constructed pre-1945. This aligns with Stoneybatter being well known to have a rich built heritage, housing that is of historical interest, and many protected structures. A defining characteristic of the area is the housing developments, a large proportion of which were built by the Dublin Artisan's Dwellings Company. Cosybatter plans to provide further links to useful information on the website. Dublin City Council will soon launch their 'Built to Last' project. Other institutional bodies' resources will be utilised, notably the Irish Georgian Society, which provides information on retrofitting heritage-based properties.

5.2 Dwelling Type and Ownership

Figure 14 shows the distribution of dwelling ownership with the majority being rented from private landlord. 51% of households are rented from a private landlords, 28.9% of residents own their home in Stoneybatter, while 11% of households are rented from the Local Authority.

The ownership profile has a bearing on the potential for energy efficient retrofits, especially in the privately rented sector where there is little incentive for a property owner to invest in energy efficiency while the benefit of reduced energy costs and increased comfort is accrued to the tenant. This may effectively rule out the privately rented dwellings as candidates for energy efficient retrofits. A Local Authority is more likely to invest in energy efficiency than a private landlord.

52.5% of dwellings are houses/bungalows and 45% of dwellings are apartments/flats. This may have impacts on the scope for energy efficient retrofits considering the practicality of certain measures (e.g. fabric upgrades, solar PV, heat pumps) in apartments and flats and other packages of measures need to be considered.

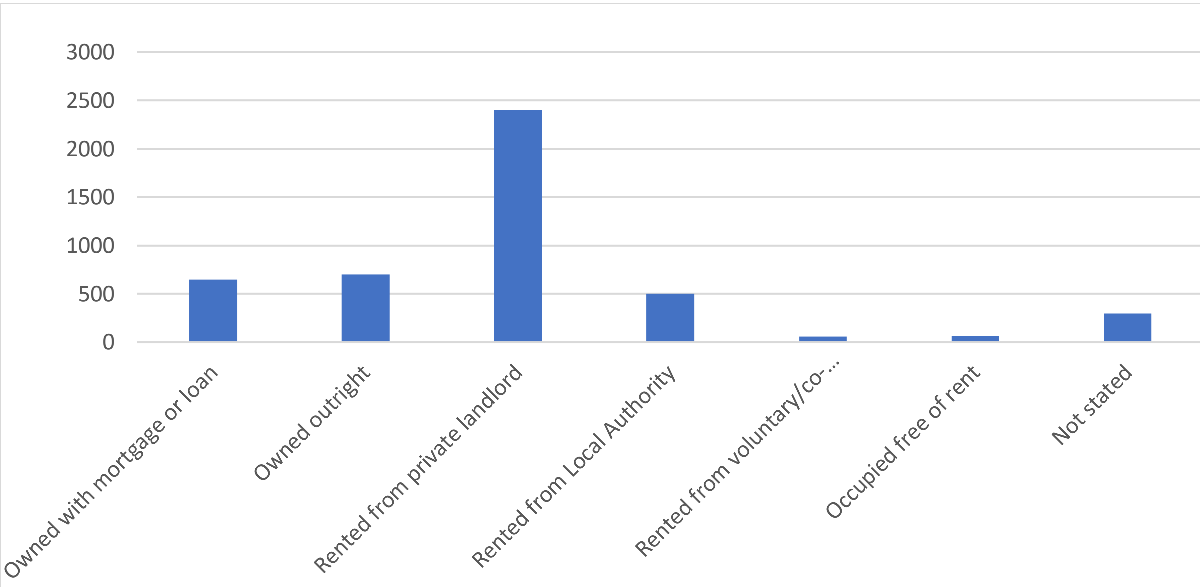


Figure 14. Summary of Dwelling Ownership

5.3 Heating Type

As displayed in Figure 15, the predominant means of heating is natural gas accounting for 49% of the heating (Gas National Average: 30%). 38% of households use Electric heating (Electrical heating National Average:7%), solid fuels (coal, peat and wood) account for 1% (Solid fuels National Average:11%) and 3% of households use oil (oil National Average:48%) as their primary source of heating. There is a correlation between dwelling type and the prime heating sources utilised. For 12 small areas (1187 dwellings) in Stoneybatter whereby Houses/bungalows account for 98.8% of total dwellings, it was found that 82.6% utilise Natural gas as the prime heating source. For three small areas in Stoneybatter (388 Dwellings) whereby apartments account for 99.7% of total dwellings, 61% utilise Electric Heating as the prime heating source.

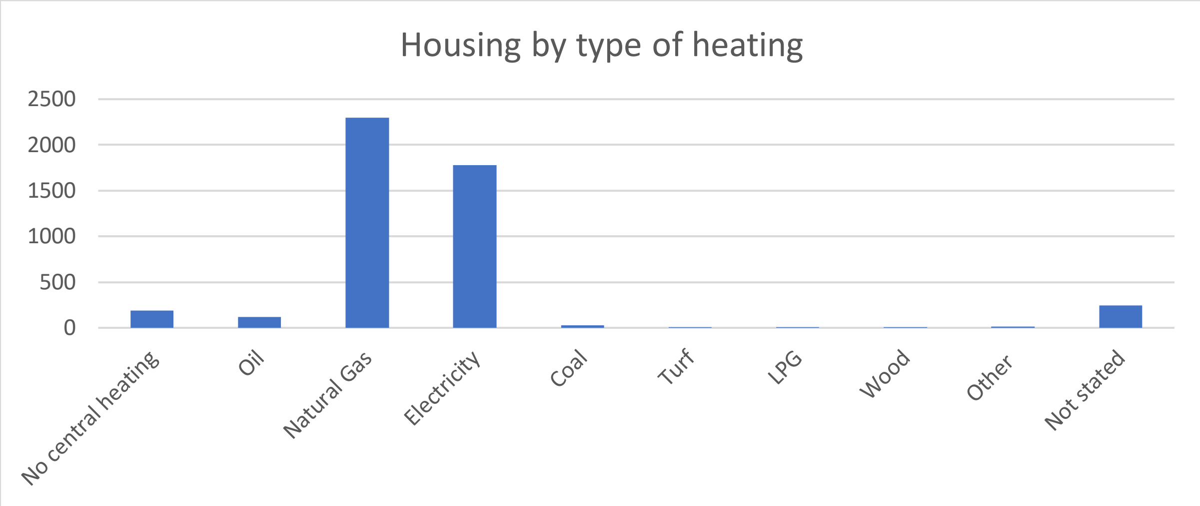


Figure 15. Distribution of heating Type

6 Community Survey

Cosybatter SEC carried out a survey of residents with 23 respondents. The survey served a dual function of capturing information on attitudes and behaviours in relation to sustainable energy and engaging with and recruiting households and individuals to the SEC. 19 of these provided contact details and expressed support and an interest in taking part in future Communities' energy efficiency grants.

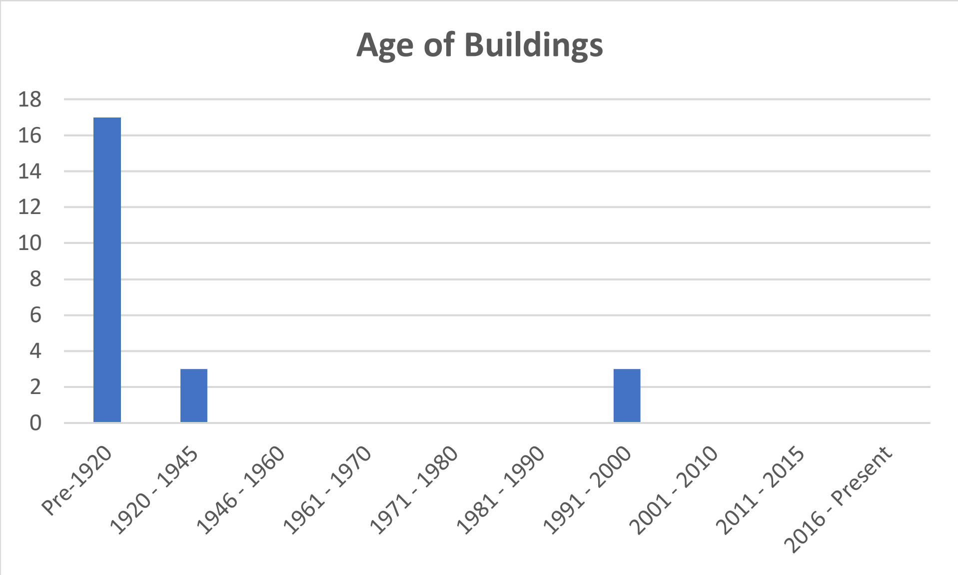


Figure 16. Year of construction of dwellings surveyed

Figure 16 shows the age distribution of the houses surveyed. The profile does not match that of the whole SEC exactly but 87% of the houses are pre-1945 compared to 41% of all dwellings in the Cosybatter SEC, in both this was the majority. As with the entire SEC, this indicates a good scope for potential energy efficiency upgrades. 10 respondents provided a BER rating for their house. 10 had a rating of C or worse and 7 had a rating of E1 or worse. 8 respondents said they did not have a BER. Based on SEAI data, the average BER in the SEC is E1, so the BER of the respondent sample is similar to that in the entire SEC. However, the BER distribution of the survey still indicates a good potential for energy efficiency gains.

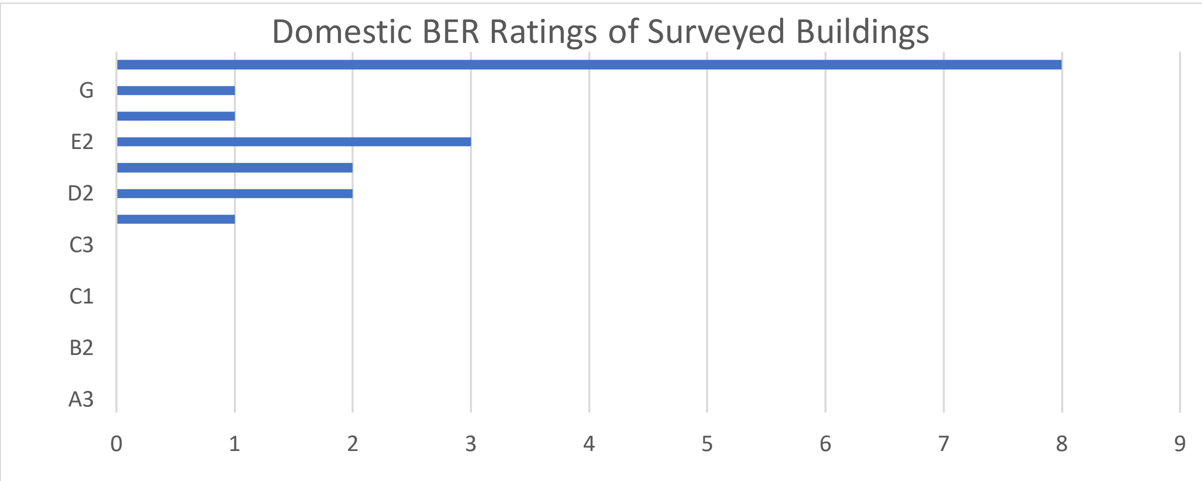


Figure 17. Distribution of BERs

Respondents are generally satisfied with comfort levels in their homes with 26% being quite comfortable or extremely comfortable, but, notwithstanding this, 91% think that improving energy efficiency would improve comfort levels. 87% think that energy efficiency upgrades would increase their home's value. This follows through to the potential to invest in energy efficiency with 87.0% of respondents being very likely or extremely likely to invest in energy efficiency.

This represents a significant potential pipeline of projects and Cosybatter SEC will maintain contact with the respondents who provided contact details to encourage and facilitate projects.

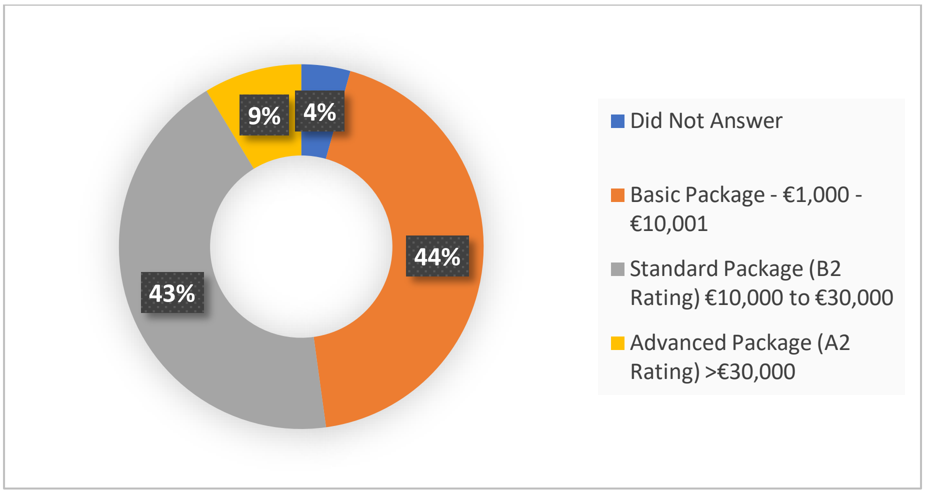


Figure 18. Likely budget for investment in energy efficiency in the next year or so

7 Register of Opportunities

The Register of Opportunities (RoO) primarily is designed to record potential projects through identification, commitment, and implementation.

The register of opportunities for residential has been developed as a template for specific houses and projects with a general register of opportunities for the sector. The register should be populated with households committed to and implementing energy efficiency projects as they are identified.

The RoO for non-residential sites records potential projects identified through energy audits and similarly allows tracking from identification to completion.

Appendix 2 contains the RoO.

7.1 Residential Register of Opportunities

The housing within the Cosybatter boundary is mainly rented accommodation with 2400 (51%) of households are rented from a private landlord. 1354 households are home owner (29% of total households) and 500 are managed by local authorities (10.7% of total households). The main targets for energy efficient upgrades are owner occupied and local authority housing.

For owner occupied dwellings, the engagement of householders and recruitment for deeper engagement will be on an individual basis. Each householder will personally fund the works in their house and the recommended actions must be flexible and avoid being too prescriptive. A suite of measures from which householders may choose, depending on their budget and personal preferences, will assist householders in making informed decisions and in meeting the objectives of the Cosybatter SEC.

As noted from the CSO data, a considerable proportion of houses are privately owned rented accommodation where the split incentive is a significant barrier. The Local authority housing is the responsibility of the County Council and privately owned accommodations will require the owners to make investments, this would be significantly assisted through incentives.

Engagement with the community and recruitment of householders planning upgrades are essential to achieving these goals.

A householder may choose to implement a starter package of measures without major cost and disruption. However, a standard or advanced package is a bigger investment and a bigger more complex project and could be carried out as part of a general refurbishment or an extension project than as standalone measures.

It is important therefore to capture houses where refurbishment work is planned to provide the option of grant aided energy efficiency measures. This could be done through general engagement and awareness, estate agents and planning searches.

In summary:

- The ambition to reduce energy consumption in owner occupied and local authority housing in line with national goals over the next ten years is challenging and entails, on average, a standard measure of packages.
- Engagement and recruitment of householders is key to achieving the targeted savings as is capturing interest and activity (e.g., works carried out under Better Energy Homes).
- Packages of measures must be flexible and must be adaptable to householders' preferences and budgets.

There are ambitious National targets for retrofits in dwellings including the plan to retrofit 500,000 dwellings to B2 by 2030 stated in the Climate Action Plan. This equates to approximately 25% of the National housing stock. Applied to Cosybatter SEC it equates to about 1170 dwellings in total.

7.1.1 Domestic Audits

To ensure that domestic audits are impactful, it is imperative to select buildings which are representative of the most prevalent building type. Therefore, an exercise was undertaken whereby a count of the building stock types was conducted. Figure 19 below shows the areas utilised as part of the exercise. Figure 20 displays the most prevalent building types within the selected areas, there were 941 Terraced houses and 647 Cottages counted.

Figure 19. Building Type Count Exercise

Figure 20. Prevalent Building Types within Cosybatter SEC

Audits of 5 households were carried out to determine the Building Energy Rating (BER) and to demonstrate measures and packages of measures as a pathway to improving energy efficiency. Several terrace houses and a cottage were audited which are representative of typical house types in the area. They are referred from SB1 to SB5 to preserve anonymity. The average BER of the houses surveyed is a D1, which is better than the average BER in the wider SEC which is E1. Figure 21 shows the BER bands in kWh/ m2/yr.

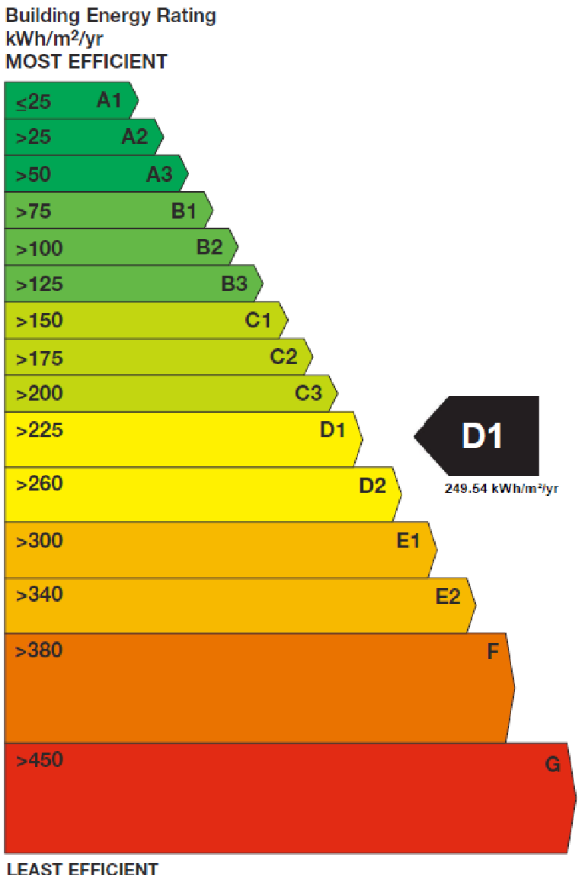


Figure 21. BER grade ranges.

The domestic energy audit reports are intended to provide a generic template for representative audits. So, for example, a house built in the 1930s may be likely to have had upgrades at some stage including the installation of central heating, double glazing and a degree of roof insulation. The houses do not typically have substantial levels of existing wall insulation or solar PV or heat pumps. In all cases pathways to improved energy performance are laid out in the energy audit reports.

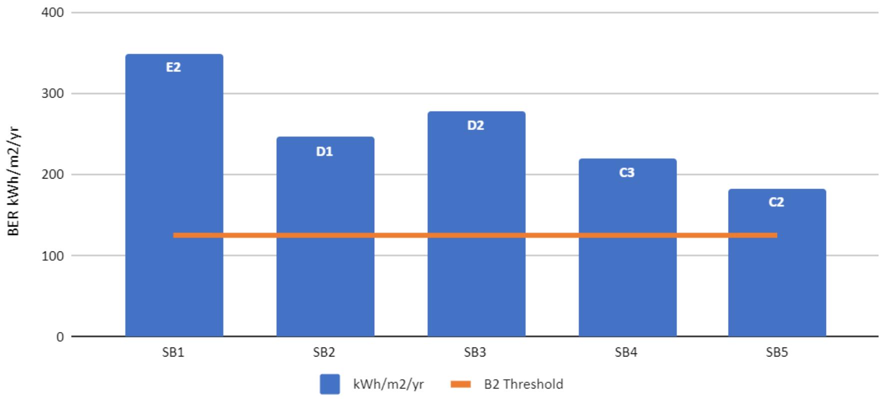


Figure 22. BERs of Houses Surveyed.

Figure 25 summarises the measures recommended for intermediate, advanced, and deep packages in the house types surveyed. Cells coloured green indicate recommendations for all house types, red where it's not recommended, and orange were recommended for some house types. Figure 23 shows the percentage improvement in energy performance for the intermediate packages. The average saving for the deep package across all five houses is 78% with a 26% average saving for intermediate.

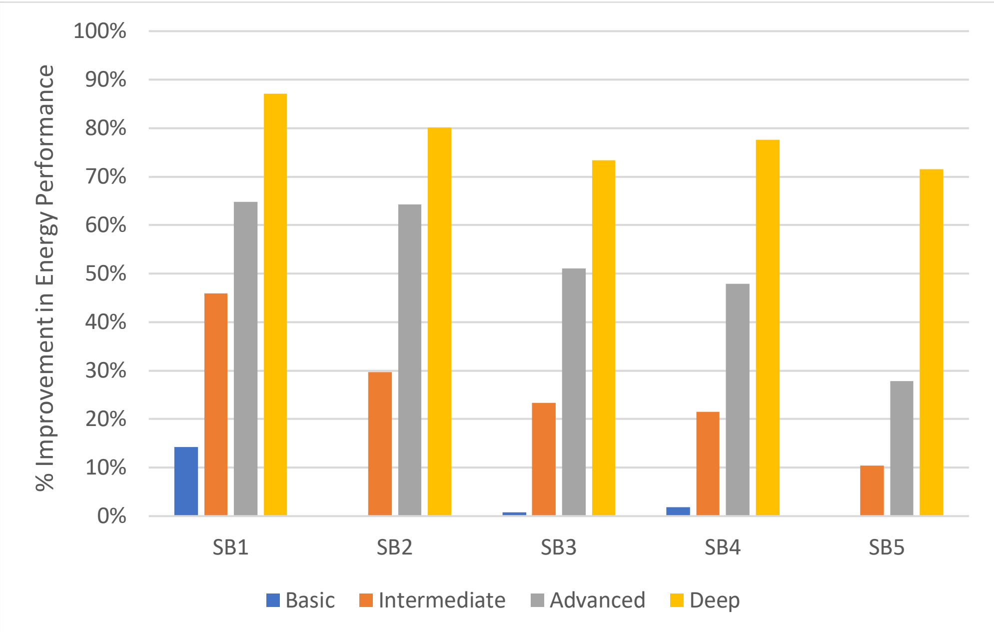


Figure 23. Energy performance improvement for retrofit options.

The individual house's energy control measures will tend to be bespoke. There is a brief discussion on some of the measures following and more information is available in SEAI's Upgrading to an A-Rated Home Guide.

Heating controls are recommended for some houses and heat pumps for all houses in deep packages. Up to three sets of measures are shown for each. The basic package typically includes lower cost measures such as low energy lighting and measures that don't conflict with additional deeper measures that might be implemented at a later stage. The standard package includes wall insulation, a condensing boiler and heating controls. Due to the Dwellings having a low BER score rating, there were many energy control measures identified for each building type. Understandably, the apartment has less potential to improve, particularly for certain fabric-based energy control measures such as roof and floor insulation.

House ID	SB1				SB2				SB3				SB4				SB5			
Measure	Basic	Intermediate	Advanced	Deep	Basic	Intermediate	Advanced	Deep	Basic	Intermediate	Advanced	Deep	Basic	Intermediate	Advanced	Deep	Basic	Intermediate	Advanced	Deep
Low energy lights	Y				Y								Y				Y			
Roof Insulation	Y	Y			Y	Y			Y	Y			Y	Y						
Draught Proofing	Y																Y			
Heating Controls	Y				Y				Y				Y					Y		
Internal Insulation		Y												Y						
External wall insulation		Y				Y				Y									Y	
Windows				Y						Y									Y	
Floor Insulation			Y				Y				Y				Y					
A/W Heat Pump				Y				Y				Y				Y				Y
Solar Photovoltaic			Y				Y				Y				Y					Y

Figure 24. Recommended Measures and Packages (SB5 Apartment, SB2,SB4 Terraced Bungalows SB1 ,SB3 Terraced Houses.)

	Level of Domestic Retrofit			
Measure Implemented	Basic	Intermediate	Advanced	Deep
Low energy lights	Yes	Yes	Yes	Yes
Roof Insulation & Draught Proofing	Yes	Yes	Yes	Yes
Heating Controls	Yes*	Yes*	Yes*	No
Internal Insulation	No	Yes*	Yes*	Yes*
External wall insulation	No	Yes*	Yes*	Yes*
Windows	No	Yes*	Yes*	Yes*
Floor Insulation	No	No	Yes*	Yes*
A/W Heat Pump	No	No	No	Yes
Solar Photovoltaic	No	No	Yes	Yes

Figure 25. Summary of Recommended Measures

7.1.2 Residential Costs and Incentives

The average investment cost and savings for the households surveyed are listed in Table 6. The basic and intermediate packages attract fixed rate grants through the Better Energy Homes and the advanced and deep packages attract grants through the Communities or National Retrofit One Stop Shop programmes (excluding those measures that are not grant aided).

There is clearly a substantial investment from the householder, but the grant levels assist financially and provide an opportunity to improve comfort, reduce energy costs and enhance the value of houses. Funding through credit union loans or other financing mechanisms may also be available. Details on grants are contained in Section 9.

It should be noted that these costs are only indicative, and it is difficult to estimate costs in the current inflationary environment. Homeowners considering retrofits should contact potential service providers for 2-3 quotes and discuss with neighbours who have completed similar projects before making a final decision.

	Average Cost	Average Saving	Payback
Basic	€590	€105	5.6ven
Intermediate	€9,264	€743	12.5
Advanced	€22,958	€1,641	14.0
Deep	€38,538	€1,951	19.7

Table 6. Average Costs and Savings for Retrofit Packages

As indicated in Section 5.2, there exists a substantial proportion of apartments in the Stoneybatter area, accounting for 45% of the total residential units. The resources provided by Codema and SEAI, which are outlined in the subsequent paragraph, are specifically applicable to proprietors of apartments. Notably, the energy conservation measures detailed in Section 7.2.3, such as the upgrade to LED lighting systems and the implementation of heating controls, are potential considerations for apartment owners. However, as previously mentioned, generally apartments have less potential to upgrade certain fabric-based energy control measures such as roof and floor insulation. Given that a significant number of apartment owners rely on electric heating, the installation of Air-Air heat pumps emerges as an intriguing possibility. However, the viability of such an installation necessitates a comprehensive site survey to determine its feasibility.

Additionally, Section 5.2 sheds light on the distribution of dwelling ownership, revealing that a significant portion of dwellings in the area are rented from private landlords. This ownership profile plays a crucial role in determining the feasibility of implementing energy-efficient retrofits, particularly within the private rented sector. In this sector, property owners often lack the motivation to invest in energy efficiency measures, as the resulting benefits of reduced energy costs and enhanced comfort primarily accrue to the tenants.

The following are excellent resources to assist tenants to reduce their energy bill.

The Codema Home Energy Saving Kit is a valuable resource that helps homeowners and tenants understand their energy consumption and identify areas in their homes that can benefit from energy upgrades. With practical tools and exercises, users can conduct their own energy audit to pinpoint effective areas for energy reduction. By implementing simple energy-saving measures, such as those provided in the kit, users can reduce energy bills by up to 20% while enhancing home comfort and contributing to environmental sustainability. The user-friendly tools make energy awareness accessible to all, enabling families to actively participate in energy efficiency. The kit is available for borrowing at over 170 locations in Ireland, including various libraries in Dublin and other regions.

The SEAI website is a valuable resource for tenants who are looking for effective ways to reduce their energy consumption and lower their energy costs. On the SEAI website, tenants can find a wide range of energy-saving tips specifically tailored for homes. These tips cover various aspects of energy efficiency, such as heating, insulation, lighting, and appliances. By following these tips, tenants can make informed choices and take practical steps to improve the energy efficiency of their homes, leading to energy savings and a more sustainable living environment Energy Saving Tips | Home Energy | SEAI.

7.2 Commercial and Public Sector

7.2.1 Overview

The tertiary industry is the segment of the economy that provides services to consumers.

Stoneybatter comprises many hospitality-based companies such as pubs, restaurants, takeaways and cafes. As a result, deliveries for hospitality-based companies and Groceries/Supermarkets pose a significant challenge in developing a sustainable transport system. The bar chart displays a classification of tertiary sector entities within the Cosybatter Boundary.

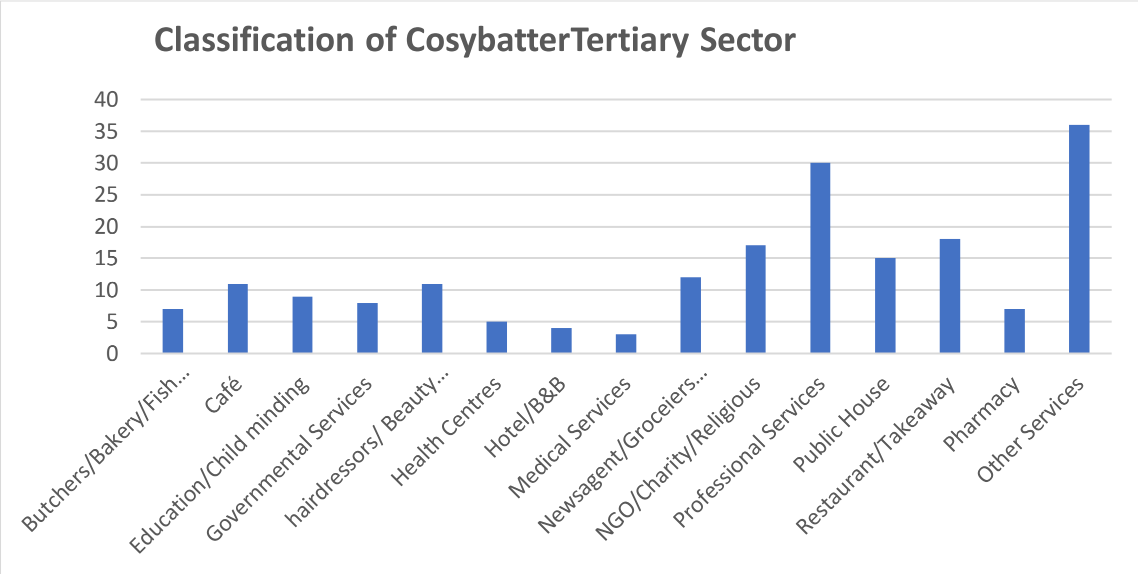


Figure 26. Classification of Cosybatter Tertiary Sector

The Register of Opportunities could be extended by carrying out Energy Audits of these or other businesses; Arden Energy will carry out audits of additional businesses within Cosybatter that are interested in audits.

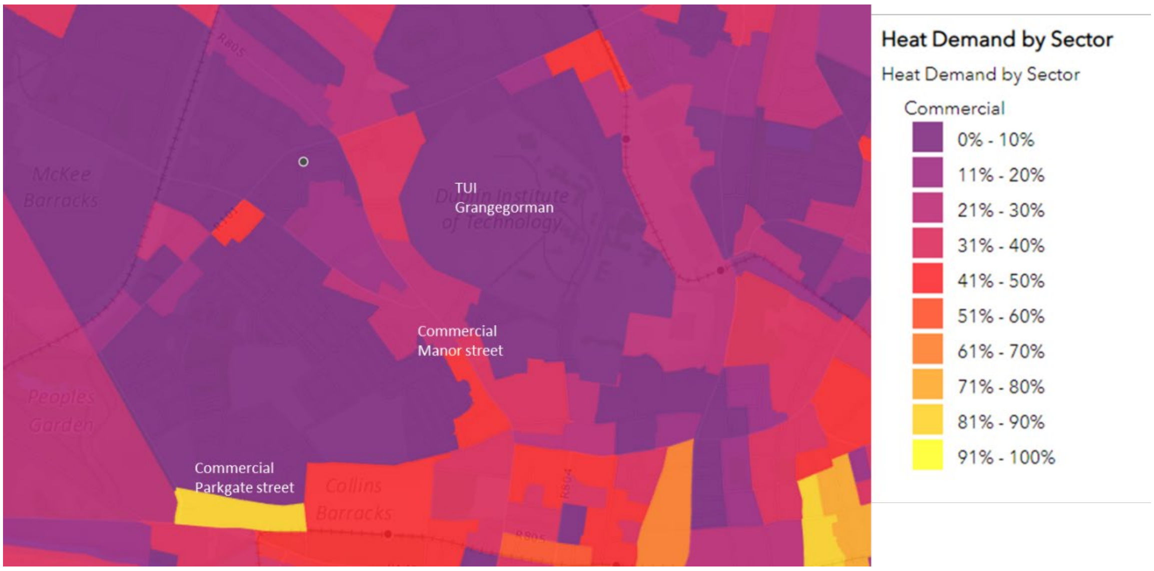


Figure 27. Heat Map (Commercial)

Figure 28. Heat Map (Public)

The combined tertiary sector accounts for just over 20% of total energy consumption in the SEC area. Figure 27 and Figure 28 show the proportion of heat demand accounted for by the commercial and public sectors, respectively. The SEC area has a limited concentration of high heat demand (signified by yellow). However, the area-coloured orange to the centre of the map (Figure28), this area represents TU Dublin, Grangegorman, which has a relatively high heat demand per unit area. Understandably, the public sector displays a higher demand in that area. As per the public sector heat map, several small areas have considerable heat demand due to the concentration of local authority housing. As expected, as displayed in the commercial heat map (figure 27) Parkgate Street and Manor Street display a high commercial-based heat demand.

St Pauls CBS Secondary School has had an energy retrofit as part of this Energy Master Plan programme. The school is in the process of implementing renewable energy measures through the installation of solar photovoltaic panels.

Engagement with commercial operations should be considered as the commercial sector provides opportunities for significant energy savings with fewer sites and can improve the value for money assessment in an SEAI Communities grant application.

Community organisations such as sports clubs are valuable demonstrators, where energy efficiency projects promote awareness of the SEC and of energy efficiency in the community. Likewise, schools act as educators and promote the concept of energy efficiency. Projects in these types of organisations, therefore, have a multiplier effect and are encouraged in SEAI's community programme.

During the development of the EMP and RoO, we sought to identify and engage with commercial and public sector organisations that might be suitable for energy efficient retrofits. Commercial and Public Sector buildings were identified through the Valuation Office and through local knowledge.

Site surveys of the following sites were carried out:

- St Pauls CBS Secondary School
- L. Mulligan Grocer

7.2.2 Energy Consumption in Sites Surveyed.

Table 7 summarises the annual electricity and gas consumption for CBS Secondary School and Mulligans. The estimates are based on actual bills over 2019 and into early 2020 prior to the introduction of COVID related restrictions. (Note: L. Mulligans Grocer has been contacted by Arden Energy regarding their current rates for Gas which is considerably high)

Site	Energy Source	kWh/yr.	€/yr.
St Pauls CBS Secondary School	Electricity Imported	49,923	7,288
	Natural gas	229,690	9,606
L. Mulligans Grocer	Electricity Imported	65,061	27,537
	Natural gas	41,984	8,464

Table 7. – Energy Consumption in Tertiary Sites Audited

7.2.3 Energy Uses and Retrofit Opportunities

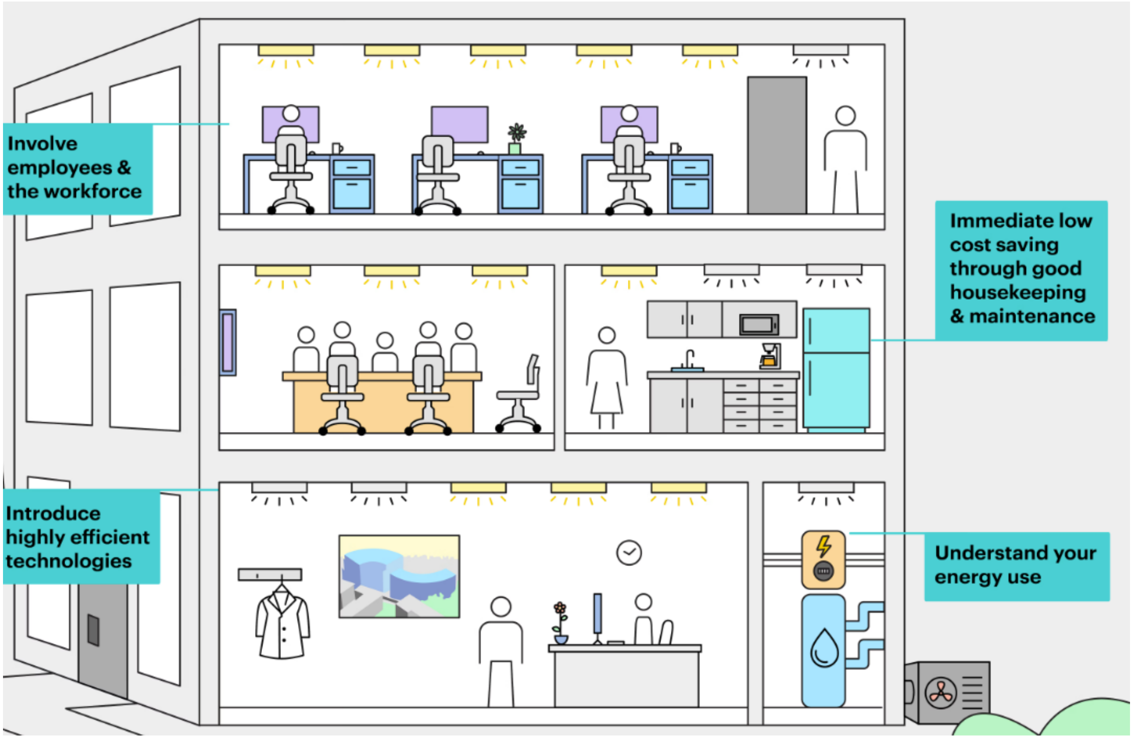


Figure 29. Opportunities for Energy Efficiency (International Energy Agency (IEA))

Low Energy Lights

Lighting is a significant energy use in all buildings. Switching to lower energy lighting such as LEDs will lower bills. For example, switching a typical double linear fluorescent fitting (139W) with a 60W equivalent LED fitting would reduce electricity consumption by 57% and replacing a 50W halogen lamp with a 6W equivalent LED would save almost 90%. In general LEDs use approximately a 20-40% of the energy of alternatives thus also reducing your carbon footprint. Furthermore, LEDs last up to ten times longer than halogen bulbs.

Heating Controls

Space heating is the largest energy use in most buildings. Upgrading the heating controls of a building results in a warmer, more energy efficient structure. By installing heating controls energy usage can be reduced by up to 20% and save money on your heating bills. For example, zoned controls with independent time and temperature control allows heat supply to be targeted to only those areas that need heating, thus cutting out unnecessary energy usage.

Heat Pump

For buildings with existing direct electric heating (e.g., storage heaters) installing an air to air heat pump, sometimes called a split system air conditioner, would improve efficiency. A heat pump would have a typical efficiency of up to 500% compared to the efficiency of less than 100% for storage heaters. It would also be easier to control and more responsive to demands and would improve comfort.

Typical Indoor Unit for Air to Air Heat Pump

Alternatively, for buildings with existing wet based heating systems, installing an air to water heat pump would significantly improve efficiency. Like split units, air to water heat pumps would have a typical efficiency of up to 500% compared to the efficiency of less than 100% for Gas based Boilers.

Heat pumps for residential use in Ireland typically fall into the range of 6-20 kilowatts (kW) in capacity. The size of the outdoor unit is usually proportionate to the capacity of the heat pump. A typical size for a 6 kW residential heat pump system in Ireland would usually require an outdoor unit with dimensions around 80 cm (height) x 60 cm (width) x 40 cm (depth). However, it's important to note that these dimensions can vary depending on the manufacturer and specific model of the heat pump. In the context of housing types, it is generally expected that the majority of terraced houses and bungalows in Stoneybatter have sufficient space in their backyards to accommodate the outdoor units of heat pumps. For apartments, the outside units are typically installed on any available space on the roof area.

However, there are challenges with installing Heat pumps in existing buildings. The OPW submitted a report (see the report[3] "OPW Report on Phasing Out Fossil Fuel Heating from Public Service Buildings") which outlined the significant challenges of using decentralised RES Heat technology to phase out fossil fuel in existing public buildings. A central point in the report is the challenge of integrating renewable heat-based technologies; neither heat pumps nor biomass are drop-in solutions for existing fossil-based boilers. Heat pumps, in particular, can generally only be installed in existing buildings as part of an extensive building upgrade project which in many cases is not financially feasible.

[3] Climate Action Plan (Action 57a): Phasing out of fossil-fuel heating from public buildings Office of Public Works Published on 6 July 2022

8 Renewable Energy and Active Consumers

8.1 Renewable Energy Sources

Renewable sources of energy are the cleanest source we can produce in terms of greenhouse gas emissions and increasing the proportion of energy sourced from renewable sources is central to national and EU energy and climate change policy. Renewable Energy Sources include:

- **Solar Photovoltaic**
  Solar PV panels convert energy from light directly into electricity. The cost of solar PV panels has fallen by around 90% in the past 10-15 years making the business case for solar PV a reasonable investment.

- **Solar Thermal**
  Solar thermal panels convert the energy from sunlight into heat, usually for domestic hot water. It is a proven and reliable technology but possibly has a longer payback than solar PV. It is also slightly more complicated to install in existing buildings.

- **Wind**
  Wind turbines convert energy from the wind into electricity. Larger 'utility scale' wind turbines are common. There are small scale wind turbines available, but these work best in rural areas with uninterrupted wind flows. Turbulence from building and other obstacles reduces the yield from small wind turbines significantly and they are not suitable for urban areas.

- **District Heating**
  District heating systems deliver space and water heating through a network of insulated pipes. Energy in the form of heat is produced in large, centralised plants (Energy sources include Geothermal, heat pump, Biofuel based plants, and Waste-Heat). District heating systems are widely used in Europe and provide 90% of the heat in Sustainable cities such as Copenhagen and Stockholm. In Ireland, district heating systems have a relatively low level of adoption, but recently, there is a greater interest in District heating with a scheme recently established in Tallaght and a long-planned scheme supplying waste heat from the waste incinerator to buildings in the Dublin docklands and surrounding areas.

8.2 Solar Photovoltaic

Solar PV panels are those that generate electricity when exposed to light. They are the rooftop solar you see on roofs and businesses. There are numerous benefits to switching to a solar PV system. These benefits include lower electricity bills and an improved BER. Thus, when it comes to selling your home, a higher BER will add value and help you achieve a higher sale price, as well as reducing your energy waste. Using a solar PV system means you are generating your own renewable energy. This has great benefits for our environment and lowers your greenhouse gas emissions.

Solar PV panels are rated in kWp (kW peak). By definition, 1 kWp generates 1 kWh of electricity per kWh/m2/yr of solar insolation. The average solar insolation in Ireland is 962 kWh/m^2/yr.

The electricity produced by the PV module in kWh/year is

Solar Output (kWh/yr) = 0.80 x kWp x S x ZPV[4]

where S is the annual solar radiation (kWh/m2/yr), ZPV is the overshading factor and 0.8 is a factor accounting for system losses.

[4] SEAI Dwelling Energy Assessment Procedure

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

Table 8. Annual solar radiation (insolation) for different orientations and tilt (SEAI)

The European Commission has developed a simple online PV calculation PVGIS. According to PVGIS, the yield for a 1 kW south facing, 30-degree tilt solar PV installation in Stoneybatter would be 930 kWh/yr.

Typically, in the SolarPV industry, a reasonable rule of thumb would be around 900 kWh per annum for a 1 kW solar PV system in Ireland. As a rough estimate, in Ireland, a south-facing panel may generate around 10-15% more electricity per year than a southeast-facing panel, assuming all other factors are equal. However, this percentage can vary significantly depending on the specific location, shading, and other factors that can impact solar panel performance. Sustainable Energy Authority of Ireland (SEAI) conducted a study in 2015, which estimated that a south-facing panel in Dublin would generate around 10% more electricity per year than a southeast-facing panel, assuming all other factors are equal.

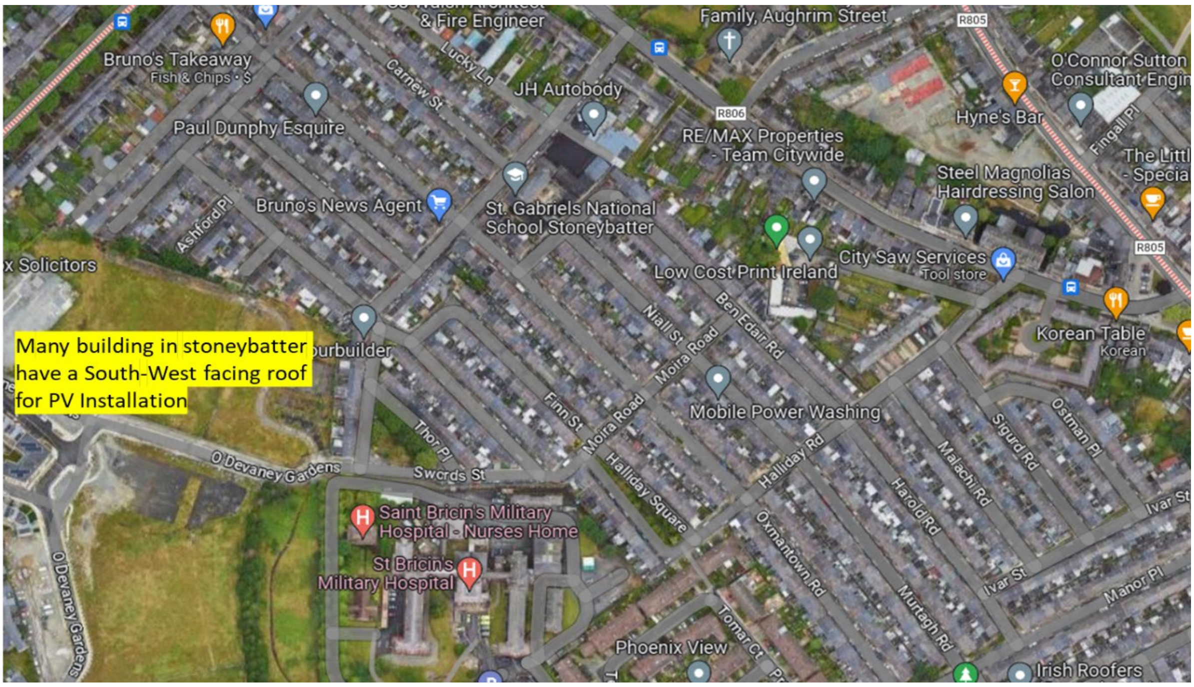


Figure 30. Orientation of Terraced Housing/Cottages in Stoneybatter

The value of this electricity is the marginal cost of electricity, that is the daytime unit rate paid. Solar PV could have a significant impact on Cosybatter. Installing 2 MW of solar PV would provide 1.5 million kWh per annum (accounting for non-ideal roof orientation losses), this would require 10,000m2 of roof space. There is considerable roof space within the Cosybatter SEC, the house/bungalows have a combined area of 113,068m2. As a general guideline, most installers aim to cover between 30% to 60% of the roof with solar PV panels. However, the exact percentage will depend on the specific characteristics of the roof and the desired output of the solar system. Within the Cosybatter SEC boundary, there are many sites which could accommodate sizable commercial scale PV systems. The figure below displays several apartments/warehouses that have a roof space in excess of 5000m2, there is potential to integrate significant capacity of Commercial scale PV systems.

Figure 31. Potential for Commercial Scale PV Systems

Cost-Benefit and Supports

Solar PV installations can cost from €2,200/kW to €1,000/kW depending on size. A 3kW system would cost around €6,000 while a 6kW system would cost around €9,000, so there are economies of scale. A solar system has generally been designed around on site demands and to avoid excessive export in the absence of an export tariff. The following picture (Figure 32) a PV system of 1.52kW (four 380-Watt panels) each installed on a cottage. The main constraint for small residential system PV systems is the relatively poor payback, typical payback for small residential systems is displayed in Table 9.

Figure 32. PV Installation of Cottage within the Cosybatter Boundary

A Microgeneration Support Scheme which provides an export tariff was recently established. The scheme provides a Clean Export Guarantee tariff offered by electricity suppliers at around the wholesale market rate for electricity. A Clean Export Premium set at a level to incentivise solar PV further is also mooted. Furthermore, the government has recently agreed to reduce the VAT rate on the supply and installation of solar panels to zero for private dwellings from 1 May 2023.

At present, the installation of solar photovoltaic (PV) panels can be funded through the SEAI community grant or the domestic Solar PV grant.

In order to be eligible for the SEAI's solar PV grant the dwelling must be built and occupied before 2011 and must have a BER rating of C or greater. As part of the advanced package, the solar PV grant would be included. For a solar PV grant, one would receive €900 per kWp up to 2 kWp and €300 for every additional kWp up to 4kWp if you get a battery. For example, you will receive €1,800 for 2kWp solar panels (i.e. 6/7 solar panels). Battery energy storage systems are generally used more for larger solar PV systems, so that the excess electricity generated during daytime hours can be used at another time.

	Indicative Cost	Grant	Cost after grant	Annual Generation (kWh)	Value of Electricity (€/yr)	Payback
2 KW Solar	€4,400.00	€900.00	€3,500.00	1,800	€385.20	9
4 kW Solar	€7,000.00	€2,400.00	€4,600.00	3,600	€770.40	6

Table .9 Solar PV Cost Benefit Summary

8.2.1 Planning Requirements

New planning permission exemptions for rooftop solar panels on homes and other buildings were published on Friday 7th October 2022. Planning permission is no longer required for solar PV installations.

8.2.2 Heat Pumps

An alternative to fossil fuel heating systems is an air source (AS) heat pump which would offer lower running costs and reduced carbon emissions. Heat-pumps are electrical devices which convert energy from the air outside of your home into useful heat. They are an extremely efficient supplementary system in retrofit situations to reduce reliance on oil, gas, solid fuel and electric home heating systems and thereby reduce your carbon footprint.

One of the requirements for a dwelling to qualify for a heat pump system grant is that the dwelling has low heat loss.

This requires buildings to be correctly insulated to a high standard The efficiency performance of the heat pump depends on buildings having a Heat Loss Indicator (HLI) of at least 2.0 or under. This is to ensure your heat pump system performs well and does not adversely affect your electricity bills. Once again this is why it is recommended in the advanced package of domestic retrofit measures. The grant for an air source heat pump through the SEAI is €3,500. The insulation required is also grant aided.

8.3 Energy Communities and Active Consumers

The Clean Energy for all Europeans Package (CEP) contains provisions for the empowerment of individuals and groups of consumers seeking to participate in the electricity sector.

The Commission for the Regulation of Utilities (CRU), which is responsible for regulation of energy and water supply, recently published a paper titled “Energy Communities and Active Consumers”. The CRU defines a ‘citizen energy community’ as a legal entity that is based on voluntary and open participation and is effectively controlled by members or shareholders and has for its primary purpose to provide environmental, economic, or social community benefits to its members or shareholders or to the local areas where it operates, rather than to generate financial profits; and, may engage in generation, including from renewable sources, distribution, supply, consumption, aggregation, energy storage, energy efficiency services or charging services for electric vehicles or provide other energy services to its members or shareholders.

When appropriate market and regulatory arrangements are instituted, this will give communities such as Stoneybatter the opportunity to become energy independent. This has already been achieved by Samso, an island in Denmark. They managed to become 100% green by working on community projects such as solar and wind farms.

Supports are available for Community Energy initiatives including the following.

- Renewable Electricity Support Scheme (RESS)

  The Renewable Electricity Support Scheme (RESS) has been set up by the government to promote investment in renewable energy generation in Ireland. RESS is a competitive auction-based framework will help achieve Ireland’s targets for electricity generation from renewable sources by 2030. RESS is designed to help deliver community participation through community-led projects and community benefit funds.

  Community-led projects can apply for RESS if they meet the following criteria[5]:

  1. Application must be made in conjunction with a Sustainable Energy Community (SEC) such as Cosybatter;
  2. Project size must be between 0.5 and 5MW;
  3. The Community group must be based on open and voluntary participation; and,
  4. Participation to be based on local domicile.

  This latter criterion limits participation based on proximity so the renewable energy project would need to be close to Cosybatter to qualify[6].There are presently proposals to open up for citizen and community participation in renewable energy projects and Cosybatter is monitoring these developments in the hope of being able to participate in community power initiatives.

  The main limitation for Cosybatter is the availability of land for a solar farm. A 5 MW solar farm occupies about 25 acres or more of land. It is not possible to aggregate rooftop solar for the purposes of RESS.

- Community Benefit Funds

[5]In February 2021 it was announced that Community-led projects seeking to apply to future RESS auctions, must be 100% owned by the community (to gain 15-year support from Government in the form of a premium on top of the market price), as opposed to being majority owned as for RESS-1.

[6] RESS requires that Community projects must be owned by a Renewable Energy Community. The exact definition of a Renewable Energy Community is part of a wider consultation on Energy Communities and Active Consumers. One proposal is based on connection to the same 38 kVA substation.

A mandatory Community Benefit Fund must be provided by all projects successful in a RESS auction. The contribution is to be set at €2/MWh generated by successful projects. The Fund will be targeted at encouraging investment in local renewable energy, energy efficiency measures and climate action initiatives. The community benefit fund under RESS-1 will deliver approximately €4.5million a year to sustainable community initiatives targeted at those communities living in close proximity to the RESS-1 Projects.

Given its urban location, this scheme is unlikely to benefit Cosybatter. .

The results of RESS-1 (the first auction under the new regime) will be announced in the near future and the level of funding being made available to communities should become more visible.

8.4 District Heating

District heating provides a local-level solution to enable Communities to decarbonise heat while integrating more renewable electricity. District heating systems deliver space and water heating through a network of insulated pipes. In much the same manner as electricity is delivered to residential and commercial buildings, energy in the form of heat is produced in large, centralised plants (Energy sources include Geothermal, heat pump, Biofuel based plants, and Waste-Heat).

District heating systems are widely used in Europe and provide 90% of the heat in Sustainable cities such as Copenhagen and Stockholm. In Ireland, district heating systems have a relatively low level of adaption, but recently, the Irish authorities have developed a greater interest in District heating. Codema, tasked with energy planning for the Dublin Local Authorities, have developed exciting heat mapping tools that analyse the correlation between heat load and potential sources. Codema claims that District heating represents the most feasible low-carbon heating option for 87% of heat demand in Dublin by 2050; this equates to 538,983 homes and 41,394 businesses being heated by DH. Heat pumps are the most feasible option for 13% of the heat demand in Dublin by 2050 serving 72,528 homes and 5,600 businesses. The figure below demonstrates the potential for District heat in greater Dublin by analysing the Renewable/Waste potential and areas suitable for district heating.

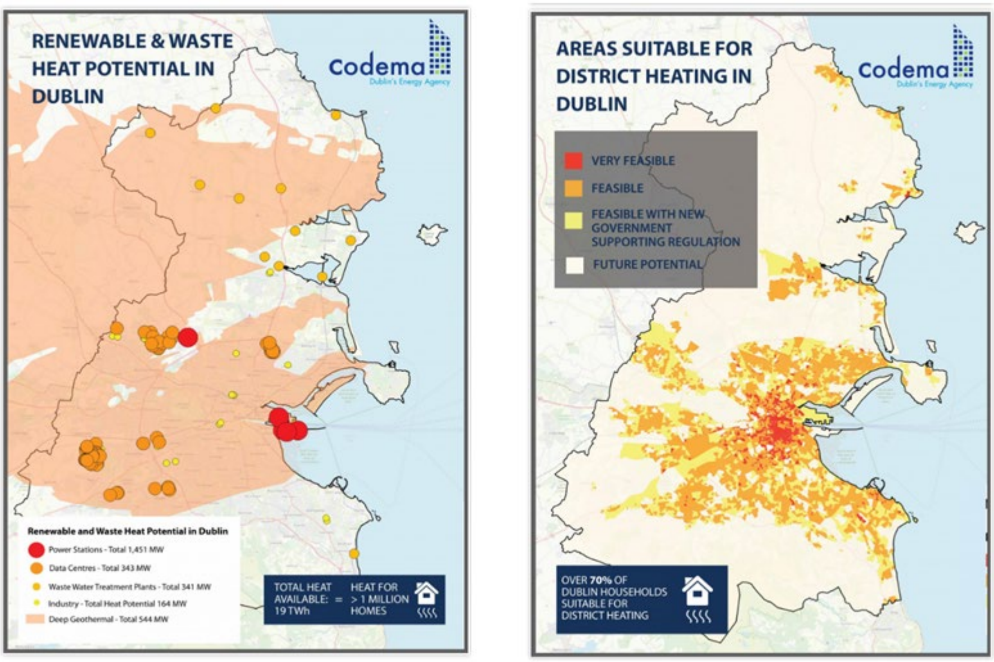


Figure 33. Dublin Renewable/Waste heat potential and Areas of suitability (SEAI)

District Heating may resolve many issues of phasing out fossil fuel in existing buildings. As discussed under the heat pumps heading in Section 6.2.3, Heat pumps, in particular, can generally only be installed in existing buildings as part of an extensive building upgrade project which in many cases is not financially feasible. Bio-fuel-based technology requires space for plant integration and access to fuel delivery, the lack of which in an urban setting provides a significant challenge. However, district heating systems which utilise a large centralised plant/or local waste heat source provide an interesting solution.

Recently, there have been several District heating R&D initiatives and demonstrations in the greater Dublin area. The most notable demonstration is the Tallaght District Heating Scheme (TDHS), which will be the first large-scale district heating network of its kind in Ireland. The Tallaght area was identified as having a high heat demand density, a key indicator for district heating viability; statistics were made available through SEAI Heat Map tool. Harnessing the waste heat and passing it through a large-scale heat pump can achieve far greater efficiencies than air-source heat pumps, even when supplying at high temperatures. Supplying hot water up to 85°C through the district heating network makes the system fully compatible with existing building heating systems. In addition, the Tallaght District Heating Scheme (TDHS) was developed by forming an Energy Community, which aligns with the EU's Clean Energy Package ambition for Community Ownership of the local RES Plant.

8.5 TU Dublin Geothermal Research and Potential for District Heating in Stoneybatter

Recently, there has also been a significant breakthrough in using Geothermal Energy for district heating in the Dublin City Area. TU Dublin has partnered with Geological Survey Ireland to explore the geothermal resource beneath Dublin City Centre. In 2021, a temperature of 38° degrees Celsius was measured in an exploratory borehole at a depth of 1km beneath the surface. Given that there should be a constant increase in temperature with an increase in depth, these results indicate that the high energy capacity required for district heating (Op temperature~ 80-90°degrees), may be located at drilling depths of 2km and 3km.

District heating schemes are high capital expenditure projects and almost certainly have to be led by local authorities. Should the long-planned Dublin District Heating scheme be developed it could provide a template for replication in other district heating schemes in Dublin City.

Figure 34. Borehole at TUD

8.6 Smart Meters

A Smart Meter measures electricity usage, similar to a traditional meter, without the need for estimated meter readings. With Smart Meters, you no longer have to submit readings or have someone read the meter. Smart meters will help people understand better the way electricity is consumed in their homes and about the sources of electricity. Smart digital meters will give people control and more choice when it comes to their energy practice.

For example, a smart meter allows a person to change their energy use to a time when the grid is not under pressure or supplied mostly with renewable energy and therefore has lower electricity tariffs and cleaner energy. The installation of smart digital metering has already commenced across Europe and internationally.

The phased rollout in Ireland started in 2020 and will continue for four years to 2024. It is expected that around 2.3 million electricity smart digital meters will be installed in homes and businesses nationwide, replacing old mechanical meters. You can contact your supplier to see when you are in line to have your smart meter installed. If you have already had a smart meter installed, you should contact your supplier to enquire about time of use tariffs and smart data services available.

9 SEAI Grants

When considering retrofitting your home, it can be difficult to determine the most financially beneficial method. Today SEAI have three main grant schemes to help with the cost taken on by homeowners when trying to make their premises more energy efficient:

1. Community Grants Scheme
2. One Stop Shop Service
3. Individual Grants

9.1 Communities Grant

SEAI's Communities grant is generally open for applications on a first come first served basis each year. It tends to be launched for applications in the latter part of the year for delivery of projects the following year. The grant gives preferential treatment to applications with a strong SEC participation.

The SEAI Community Grant supports energy efficiency community projects through capital funding, partnerships, and technical support. To successfully apply for a community grant there are several requirements the proposal must meet. Firstly, projects are required to demonstrate a building fabric first approach meaning that they must be as energy efficient as possible, decarbonise heat considering and utilising renewables where feasible, improve ventilation and adopt smart technologies as appropriate. Projects should prioritise the delivery of homes to a minimum BER of B2 (homes constructed after 2011 can't be included). A minimum of 10 homes must be included in the proposal and an SEC should also be involved. All homes require a pre- and post-works Building Energy Rating (BER) to be completed and published. Local Authority Homes are exempt from publishing a pre-BER. The domestic grant rates are identical to the grant offerings under the One Stop Shop scheme, see Table 10.

Cosybatter and interested householders should contact project co-ordinators[7] and one-stop shops[8] to discuss potential projects and the possibility of including projects in Stoneybatter in a grant application.

Main points of the grant schemes include:

- Fossil fuel boilers are not grant aided,
- The minimum post works BER for dwellings is B2 (<125 kWh/m^2/yr)
- Community Grant levels are 30% for non-domestic. Higher grant levels are available for fuel poor households and for voluntary community organisations as well as schools and some other non-domestics which may qualify for a 50% grant. See SEAI's website for further details.
- A project co-ordinator needs to assemble various projects and submit an application which when aggregated, meets the schemes criteria.

For the SEAI Community grant, the minimum post works BER is B2. (Building Regulations also require a minimum BER of B2 where >25% of the total building fabric is upgraded). Individual measures can still be funded through the Better Energy Homes scheme. Cosybatter has hopes to apply for a communities grant in the future. This will require commitment from businesses and householders. As that commitment is achieved the RoO should be updated and an application form and workbook completed.

[7] https://www.seai.ie/grants/community-grants/project-coordinator/

[8] https://www.seai.ie/grants/national-home-retrofit/one-stop-shops/

9.2 One Stop Shop

The idea behind the One Stop Shop service is to offer homeowners all the services required for a complete energy upgrade. A One Stop Shop is a registered private operator who manages the entire process of a home energy upgrade from the initial BER assessment to the post-works assessment. Other benefits unique to the One Stop Shop service include a wider range of grants offered and grant values are deducted from the cost of the works up front.

Here is a brief summary of the process if you chose to carry out retrofits through a One Stop Shop:

- After contacting a One Stop Shop, you will be asked some basic questions to determine if your home is suitable for an energy upgrade and what supports are available.
- Onsite review carried out by One Stop Shop
- A BER assessor will visit your home and carry out a BER and technical assessment, energy bills will be requested (SEAI grant available of €350 towards the cost of a Home Energy Assessment)
- If you are happy with the assessment and recommendations, the One Stop Shop will apply and accept all SEAI grants for your project and deduct the values upfront from the cost of your works.

	Private Homes			
Measure	**Detached**	**Semi-Detached / End Terrace**	**Mid Terrace**	**Apartment**
Heat Pump	€6,500			€4,500
Central Heating System for Heat Pump	€2,000			€1,000
Heat Pump Air-to-Air	€3,500			
Heating Controls only	€700			
Launch bonus for reaching B2 with a Heat Pump	€2,000			
Ceiling Insulation	€1,500	€1,300	€1,200	€800
Rafter Insulation	€3,000	€3,000	€2,000	€1,500
Cavity Wall Insulation	€1,700	€1,200	€800	€700
External Wall Insulation	€8,000	€6,000	€3,500	€3,000
Internal Wall Insulation	€4,500	€3,500	€2,000	€1,500
Windows (Complete Upgrade)	€4,000	€3,000	€1,800	€1,500
External Doors (max. 2)	€800 per door			
Floor Insulation	€3,500			
Solar Thermal	€1,200			
Solar PV	0 to 2 kWp €900/kWp 2 to 4 kWp €300/kWp			
Mechanical Ventilation	€1,500			
Air Tightness	€1,000			
Home Energy Assessment	€350			
Project Management	€2,000	€1,600	€1,200	€800

Table 10. Grant amounts available under One Stop Shop and Community Grant Scheme

9.3 Better Energy Homes Grant

SEAI's Better Energy Homes Grants provide grants for selected individual measures as an alternative to the combined measures approach in the Communities and National Retrofit grants.

Homeowners are well within their right to choose to manage their own energy upgrades. These upgrades can still receive grant funding if they fall under certain criteria. This option is suitable if you are looking to carry out individual upgrades. If you are selecting this option you must manage your own project and pay for full cost of works and claim grants after. To qualify for funding, a BER assessment must be carried out and the contractor you employ must be from the SEAI register who must be registered for the type of work that they are carrying out and put a contract for works in place with you before work begins. Finally, you must have grant approval before you begin works. The specific works for which you can receive funding can be seen in Tale 2.

Some homeowners can avail of free energy upgrades. This scheme targets homes built and occupied before 1993 and have a pre-works BER of E, F or G. The specific criteria you must meet to be eligible for a free energy upgrade is as follows:

- You must own and live in your own home
- Your home was built and occupied before 2006
- You receive one of the following welfare payments.
    - Fuel Allowance as part of the National Fuel Scheme.
    - Job Seekers Allowance for over six months and have a child under seven years of age.
    - Working Family Payment

The upgrades offered under this scheme include:

- Attic insulation
- Cavity wall insulation
- External wall insulation
- Internal wall insulation
- Secondary work such as lagging jackets, draught proofing and energy efficient lighting
- New heating systems and windows are occasionally recommended.

Measure	**Detached House**	**Semi-Detached/ End Terrace**	**Mid Terrace House**	**Apartment**
Heat Pump Systems	_	€6,500	_	€4,500
Heat Pump Air to Air	_	€3,500	_	_
Heating Controls	_	€700	_	_
Solar Hot Water	_	€1,200	_	_
Attic Insulation	€1,500	€1,300	€1,200	€800
Cavity Wall Insulation	€1,700	€1,200	€800	€700

Internal Insulation (Dry Lining)	€4,500	€3,500	€2,000	€1,500
External Wall Insulation	€8,000	€6,000	€3,500	€3,000
BER	€50			
Technical Assessment	€200			

Table 11. Grant amounts for individual home energy upgrades

9.4 Solar PV Grants

Homeowners can also avail of individual grants for solar PV. All homes built and occupied prior to 2021 can apply. The process is very similar to the other individual grants. Firstly, appoint a registered SEAI solar PV company. Apply for the grant, installer applies to ESB networks then install the PV. A post works BER must be carried out again which the cost for is included in the grant.

The breakdown for the solar PV grant is as follows:

- €900 per kWp up to 2kWp
- €300 for every additional kWp up to 4kWp
- Total Solar PV grant capped at €2,400

9.5 EXEED Grant Scheme (Commercial)

The EXEED grant scheme is appropriate for larger energy users and is designed for organisations who are planning an energy investment project. Grant support of up to €1,000,000 per project is available. SEAI provide grant support for projects which are following the EXEED Certified standard for Excellence in Energy Efficient Design. The EXEED standard encourages innovation in design projects to help future-proof the investment, by optimising energy performance, reducing operational energy costs and carbon emissions, improving competitiveness and demonstrating commitment to sustainability, which could also bring a reputational boost. The percentage of funding received is based on the size of the company with large companies receiving up to 30%, medium up to 40% and small up to 50%.

9.6 Project Assistance Grants

For a company spending over €250,000 per year on energy bills, SEAI offers grants to develop energy saving projects. The aim of these projects should be to achieve significant energy savings and build good procurement practices. Applications are taken from the public and private sector. A business can first get up to 50% funding for a feasibility study of up to €15,000. A grant of up to 75% can be attained for the final business case and project delivery.

10 Energy Management Action Plan

Community Engagement

Community Engagement on sustainability in Stoneybatter is the cornerstone of success of the initiative to achieve behavioural change that can result in energy and environmental gains within the community.

Generic Energy Audits

The approach in the EMP has been to develop energy audits that provide examples of energy audits for typical dwellings, community buildings and businesses in the area. This will then be a source of information for residents considering energy retrofits and will provide a path to action. It also helps to spread the message of the benefits of sustainable retrofits in the community.

Website & Social Media

The website "www.cosybatter.ie" will be used to promote the Cosybatter as more initiatives are taken, more projects are completed, and the SEC expands and develops.

Following completion of the EMP and energy audits and delivery of the first exemplar SEC projects, the dissemination of the SEC results via social media and other routes will be accelerated. The social media campaigns will build on existing community social media groups on Facebook and Twitter. As with other areas, the specialist expertise of community members will be utilised in social media campaigns.

Register of Opportunities

Through the workshops, promotional activity and dissemination of exemplar projects the SEC will continue to build and develop the pipeline of projects for the Register of Opportunities. Cosybatter will continue to engage with organisations in the area such as local businesses, other community groups, schools, local sports clubs, etc.

The 5 dwellings for which residential audits were carried out and the 23 community members who responded to the survey is a significant start to a register of opportunities that has the potential to lead to projects and exemplar case studies.

Path to Sustainable Energy

Figure 35 shows pathways to sustainable energy within the Cosybattter SEC boundary. As noted previously, the predominant energy use is in the residential sector and the main opportunity is for improved efficiency in the residential sector through retrofits. For example carrying out a deep retrofit in all houses in stoneybatter would save over 42 million kWh per annum. In comparison, installing 2 MW of solar PV would provide 1.5 million kWh per annum, this would require 10,000m2 of roof area. The house/bungalows have a combined area of 113,068m2. As a general guideline, most installers aim to cover between 30% to 60% of the roof with solar PV panels. However, the exact percentage will depend on the specific characteristics of the roof and the desired output of the solar system. Within the Cosybatter SEC, there are many sites whereby sizable commercial scale systems may be installed which could provide significant capacity. Solar PV could have a significant impact.

In order to meet the objectives of decarbonising the energy consumption in Stoneybatter these gains in energy efficiency must happen in parallel with decarbonisation of energy supply. Government policy is to retrofit housing and to electrify heat and transport energy demands while decarbonising the supply of electricity. Aligning plans with this policy is most likely to achieve success in the Cosybatter SEC area.

Other options for decarbonising energy supply in the area would include a district heating scheme connected to a geothermal/heat pump system. This would require significant investment and buy in from National and Local Government.

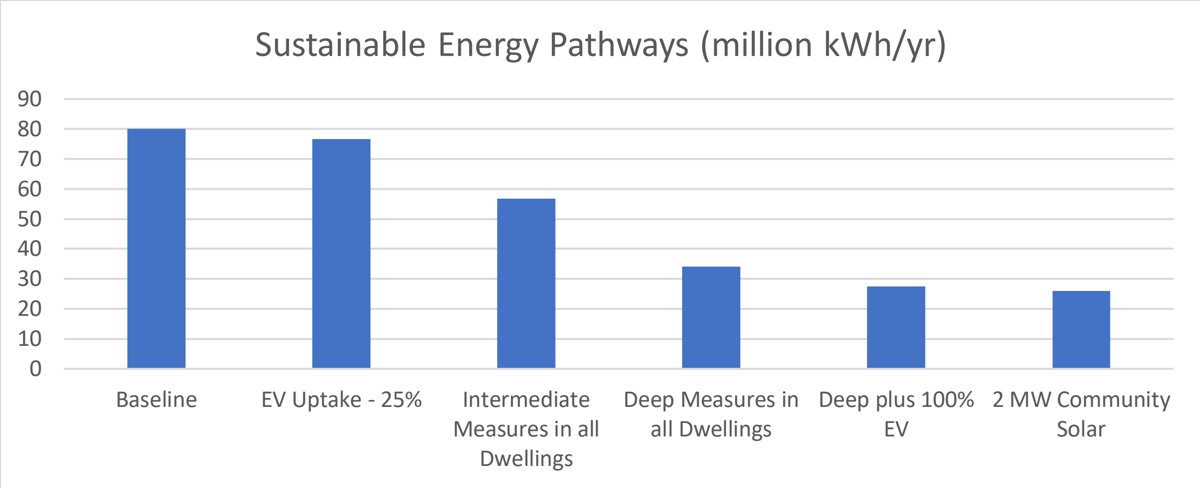


Figure 35 Sustainable Energy Pathways for Cosybatter SEC

Appendix 1 Glossary of Terms

Term	Definition
Delivered Energy	Delivered energy is the amount of energy consumed at the point of sale (e.g., that enters the home, building, or establishment) without adjustment for any energy loss in the generation, transmission, and distribution of that energy.
Dwelling Energy Assessment Procedure (DEAP)	The Dwelling Energy Assessment Procedure (DEAP) is Ireland's official method for calculating the Building Energy Rating of new and existing dwellings.
Energy Master Plan (EMP)	The aim of an EMP is to allow a community or business to understand its current and future energy needs (in electricity, heat and transport) in order for the community or business to make informed decisions and prioritise actions.
Feed in Tariff	A payment for excess electricity generated and exported to the network. Arrangements for a feed in tariff are currently being finalised under the microgeneration scheme which launched February 2022.
Kilowatt-Hour (kWh)	The kilowatt-hour is a unit used by energy companies to determine how much you are charged. It is equivalent to the energy used in a single bar electric heater in one hour.
Kilowatt-Peak (kWp)	kWp is the peak power of a PV system or panel.
LED Lighting	LED stands for light emitting diode. LED lights are more efficient than traditional lamps (incandescent and fluorescent) and also have a longer lifespan.
Level 1 Audit	The Level 1 audit is alternatively called a simple audit, screening audit or walk-through audit and is the most basic. It involves minimal interviews with site operating personnel, a brief review of facility utility bills and other operating data, and a walk-through of the facility, all geared toward the identification of glaring areas of energy waste or inefficiency. The data compiled is then used for the preliminary energy use analysis and a report detailing low-cost/no-cost measures and potential capital improvements for further study. Typically, a Level 1 audit will only uncover major problem areas. Corrective measures are briefly described, and quick estimates of implementation costs, potential operating cost savings, and simple payback periods are provided. This level of detail, while not sufficient for reaching a final decision on implementing proposed measures, is adequate to prioritise energy efficiency projects and to assess the need for a more detailed investigation.

Primary Energy	Primary energy is an energy form found in nature that has not been subjected to any human engineered conversion process. It is energy contained in raw fuels, and other forms of energy received as input to a system.
Register of Opportunities (RoO)	A RoO is for recording all opportunities for energy savings at a facility or in a community.
Smart Meter	A Smart Meter offers the client more detailed information on their energy consumption as well as reducing the need for estimated electricity bills. Smart Meters provide 1/2 hourly consumption data and allow for time of use tariffs. ESB Networks started a 4 year program to install smart meters at every connection point in 2020. It is scheduled to finish in 2024. Refer to ESB Networks for more information. https://www.esbnetworks.ie/existing-connection/meters-readings/smart-meter-upgrade
Smart Meter Device	A device, other than an ESB Networks Smart Meter, installed to provide smart metering data.
Solar PV	A solar photovoltaic (Solar PV) system is one which converts light into electricity.

Appendix 2 Register of Opportunities

Residential	Total Savings
Status	Primary Energy Saving ($kWh/m^2/yr.$)
Identified	67,967
Discussed with site	0
Owner committed	0
In progress	0
Complete	0

Non-Residential	Total Savings	
Status	Electrical (kWh/yr)	Thermal (kWh/yr)
Identified	55015	63285
Discussed with site	0	0
Under consideration - short term	0	0
Under consideration - long term	0	0
Not under consideration	0	0
In progress	0	0
Complete	0	0

Ref	Type	BER Before (kWh/m'/yr)	BER After (kWh/m2/yr)	Floor Area (m2)	Primary Energy Saving (kWh/yr)	Energy Cost Saving (€/yr)
SB1	2 Bed, Mid Terrace House	350	45	71	21,649	2,831
SB2	3 Bed, Mid Terrace Bungalow	246	49	46	9,062	694

SB3	2 Bed, Mid Terrace House	278	74	74	15,096	777
SB4	2 Bed, Mid Terrace Bungalow	219	49	61	10,370	348
SB5	3 Bed, Top Floor Apartment	183	52	90	11,790	5,107

Organisation	Opportunity	Electrical Savings kWh	Thermal Savings kWh	Value of Savings (€)	C02 Savings	Cost of Action (€)
St Pauls CBS Secondary School	PV installation	27.000		5400	8.8	38500
St Pauls CBS Secondary School	TRVs in New Building (located to RHS - Brunswick Entrance) & Piping Improved Insulation		22,969	961	4.7	3000
St Pauls CBS Secondary School	Smart Plugs/Timers (i.e. Electric Water heaters)	2,471		328	0.8	1000
St Pauls CBS Secondary School	Energy Awareness Campaign	4,992		729	1.6	500
St Pauls CBS Secondary School	Energy Awareness Campaign		22,969	962	4.7	500
L. Mulligan Grocer	PV Installation	10,800		2,160	3.5	16,000
L. Mulligan Grocer	Upgrade Boiler		11,049	2,228	2.2	5000
L. Mulligan Grocer	Energy Monitoring system (Electrical)	4,876		2,065	1.6	500
L. Mulligan Grocer	Energy Awareness Campaign (Electrical)	4,876		2,065	1.6	500

L. Mulligan Grocer	Energy Awareness Campaign (Natural Gas)		3,149	635	0.6	500
L. Mulligan Grocer	Energy Monitoring system (Natural Gas)		3,149	635	0.6	500

Appendix 3. Average BER Rating per Small Areas

Small Area Stats	**BER(Avg.)**	**Small Area Stats**	**BER Data(Avg.)**
268002008	302.4	**268005011**	354.0
268004007	231.7	**268005012**	323.5
268005014	256.4	**268005009**	418.2
268004005	343.7	**268005002**	432.6

268002011	313.8	**268002016**	307.0
268003012	252.2	**268004001**	298.2
268004002/268004008/268004013	388.0	**268004010**	255.4
268004011	514.3	**268003016**	268.2
268004016/268004017	490.0	**268005006**	357.9
268003019	246.8	**268005007**	363.5
268005001	361.0	**268002003**	352.8
268003013	285.5	**268004004**	194.8
268002019	294.7	**268003018**	258.7
268004003	386.1	**268002020**	294.9
268005015	249.2	**268005004**	386.4
268002018	294.5	**268005003**	435.0
268002017	303.4	**268004009**	371.5
268002006	264.0	**268005013**	384.6
268005005	346.2	**268005008**	365.6
268002014	279.3	**268002002**	479.2
268002015	267.0	**268002007**	355.8
268002001	272.2	**268002010**	317.7
268004012	410.7	**268002009**	239.4
268005010	372.8	**268005016**	229.2
268002004	314.3	**268004006**	438.5
268005017	211.8	**268004014/268004015**	411.1