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## Ovingdean Decarbonisation Plan





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This report was funded by the Community Energy Fund administered by the Greater Southeast Net Zero Hub and Cambridgeshire and Peterborough Combined Authorities.

We would like to thank the contributors to this report and the reports that have informed our work, produced by the various authorities in the energy industry.



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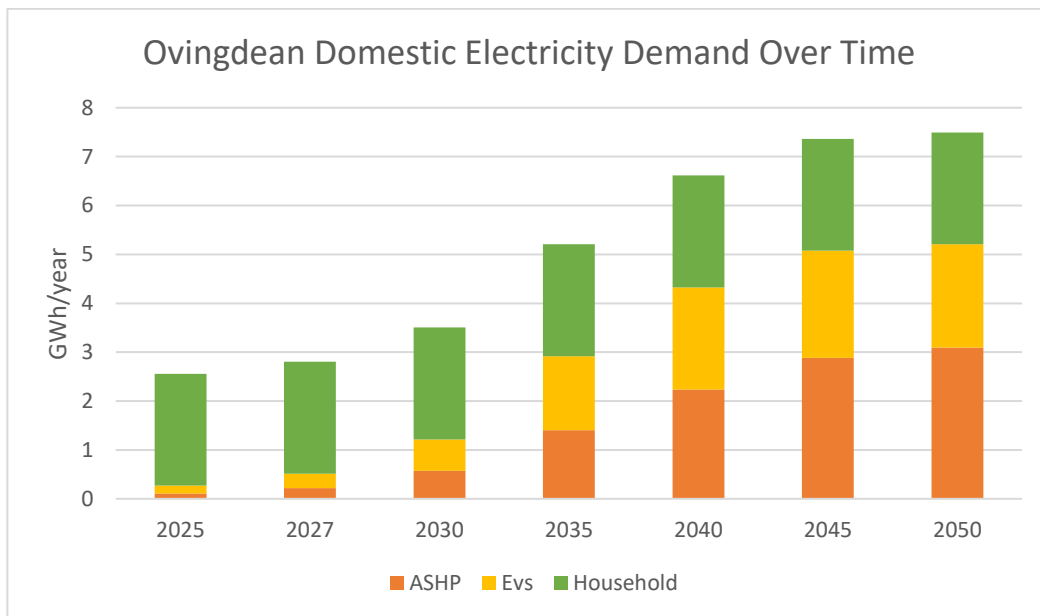
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## Executive Summary

This decarbonisation plan was commissioned by the people of Ovingdean as represented by the Ovingdean Community Energy group (OCE), to recommend the steps and actions to be taken by village residents to cut carbon emissions and meet the city's Carbon Neutral target. This report is designed to be included as the energy and climate change section of Ovingdean's Local Plan.

Our analysis found that the two main sources of CO<sub>2</sub> emissions in Ovingdean are transport and mains gas heating, both of which need to be electrified over time, primarily through a transition to electric vehicles (EVs) and air source heat pumps (ASHP), respectively. These two actions alone will address 73% of the carbon emissions in the village when carried out alongside the continued shift of electricity generation over to renewables.

The transition from technology powered by fossil fuels, such as mains gas and diesel/petrol, to renewable electricity at the pace anticipated and deemed necessary will increase electricity demand on the grid as shown in the table below:



**Figure 1: Graph showing the increase in predicted domestic electricity demand in Ovingdean between now and 2050**

To address this increase in a way that will be affordable while delivering long term energy security to the village, we recommend generating community owned power



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locally through the construction of a 2.5MW turbine, along with the installation of solar panels on suitable rooftops across the village and utility scale energy storage to overcome some of the anticipated electricity network constraints. These activities will generate significant community benefit and depending on residents' preferences, help finance the cost of developing wood land and other natural carbon emissions offsets or sinks for the remaining 12% of carbon emissions that are associated with activities for which reductions are more challenging to achieve.

To develop this plan, the National Grid Energy System Operators (NG ESO) 2021 Future Energy Scenarios (FES) have been scaled to the population of Ovingdean, to identify minimum targets that Ovingdean village needs to meet from 2024 to 2050 for the UK to meet its climate change targets. We have applied the NG ESO 'falling short' scenario as the UK is currently not forecast to meet a more ambitious target. Therefore, whilst the recommendations in this report may feel ambitious, they are actually the minimum necessary action. In addition to the infrastructure required to meet national targets, community generation has been proposed for the village to meet its own energy requirements to improve energy security and long-term affordability by avoiding the price hikes associated with volatile fossil fuel powered energy markets.

Table 1 shows a summary of the uptake of different measures required on a residential level to meet these climate targets. Action to be taken for commercial buildings is also detailed later in the report, however this is the bulk of change, and that which individuals and government can most easily begin to implement.

**Table 1: Table of domestic installations/uptake of each measure that residents need to implement to meet climate targets**

Transition (cumulative number)	2025	2027	2030	2035	2040	2045	2050
EVs	50	144	300	489	620	672	677
ASHP	18	35	92	226	374	465	500
EPC C+	163	192	228	285	342	396	457
Public EV Chargers	3	6	8	9	11	12	12
Home Ev Chargers	40	115	290	502	545	600	600
Solar PV (homes)	38	87	136	218	300	327	345
5kW home batteries	19	43	68	109	150	163	172



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With a concerted effort and some government support, Ovingdean could meet a carbon neutral target for an investment which we estimate will create about 20% savings on electricity bills and an estimated £2M of community benefit for local residents, while also improving air quality and wellbeing for village residents.

The total investment required to decarbonise the village is £14.5 million, excluding the cost of measuring and introducing carbon sinks through land management.

The table below shows the areas of investment required to 2050:

**Table 2: Table listing the approximate investment required to implement the full decarbonisation plan**

Install Type	Cost per year (£000s)									
	2024	2025	2026	2027	2028	2029	2030	2040	2050	Total
onshore wind	£40	£60	£100	£150	£150	£4,031				£4,531
Solar PV - domestic	£134	£274	£214	£219	£225	£230	£236	£2,265	£980	£4,778
Solar PV non-domestic	£0	£299	£152	£19	£0	£0	£0			£470
Solar PV Ground mounted	£0	£258	£134	£16	£0	£0	£0			£408
<b>Total</b>	<b>£174</b>	<b>£892</b>	<b>£600</b>	<b>£404</b>	<b>£375</b>	<b>£4,262</b>	<b>£236</b>	<b>£2,265</b>	<b>£980</b>	<b>£10,187</b>
Retrofit investment	£0	£82	£85	£87	£111	£148	£152	£1,588	£2,042	£4,297
<b>Total</b>	<b>£174</b>	<b>£974</b>	<b>£685</b>	<b>£491</b>	<b>£486</b>	<b>£4,410</b>	<b>£388</b>	<b>£3,853</b>	<b>£3,022</b>	<b>£14,483</b>

The costs will be paid through a combination of means, 2/3 of which will be invested by homeowners in their own properties over the next 26 years. We estimate that the gross value added created by these investments to improve the energy efficiency of homes in the community will be about £36 million.

## Carbon emissions in Ovingdean

For the purposes of this report, the boundaries of Ovingdean are outlined below



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**Figure 2: Map of Ovingdean village boundary**

Ovingdean is a village in the jurisdiction of Brighton and Hove. There are 545 households in the village. Approximately 1,290 people live here, based on the UK's average of 2.36 people per household according to national statistics (1).

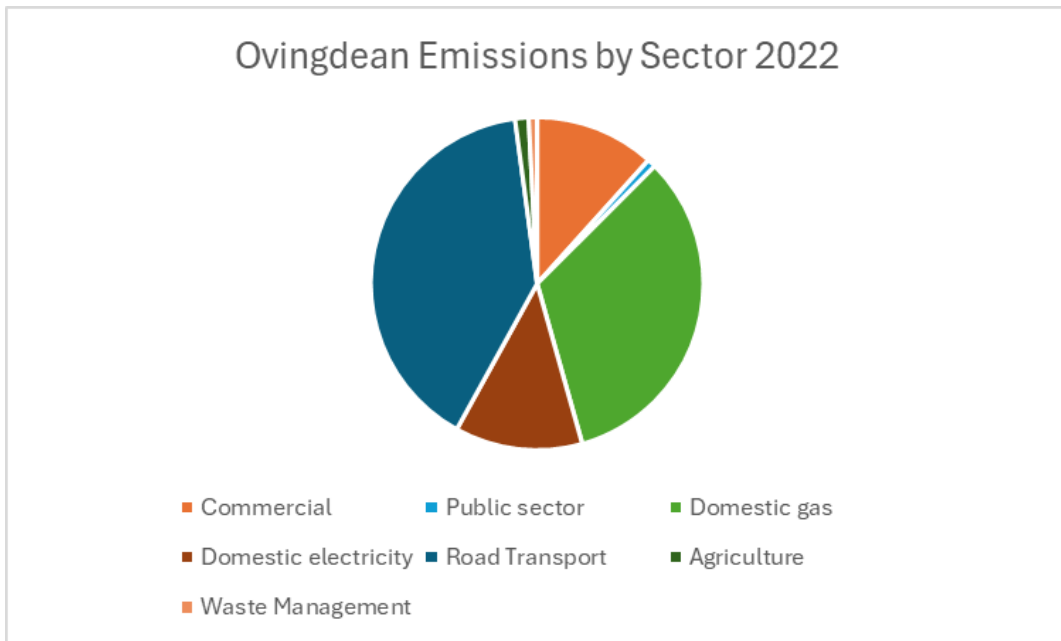
Total emissions are conservatively estimated at about 2,900 tonnes of carbon dioxide each year, based on Brighton and Hove emissions data. However, Ovingdean has larger homes than the average in Brighton, and a large boarding school. Specific emissions data from Ovingdean transport and heating is calculated later in the report, that indicates emissions closer to 4000 tonnes per year.

Figure 3 shows approximate carbon emissions by sector in Ovingdean village, according to Gov.uk. In 2022 40% of emissions originated from transport, 33% from home heating and 12% from domestic electricity. These three areas cover 85% of all emissions from the village (2). The commercial contribution consists almost entirely of emissions from Oxford International College.



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**Figure 3: Graph showing the approximate breakdown of Ovingdean emissions by sector in 2022, based on data for Brighton and Hove**

As these areas are within individual's control to change, they are the focus of this report. Although some emissions from agriculture are addressed, they are outside the scope as there is one operating farm in the village.

In 2022, road transport in Ovingdean produced approximately 1150 tonnes of CO<sub>2</sub>, whilst domestic gas produced roughly 960 tonnes according to this data, however due to the larger houses in the area we have calculated this to be higher, using analysis of Ovingdean EPC data.



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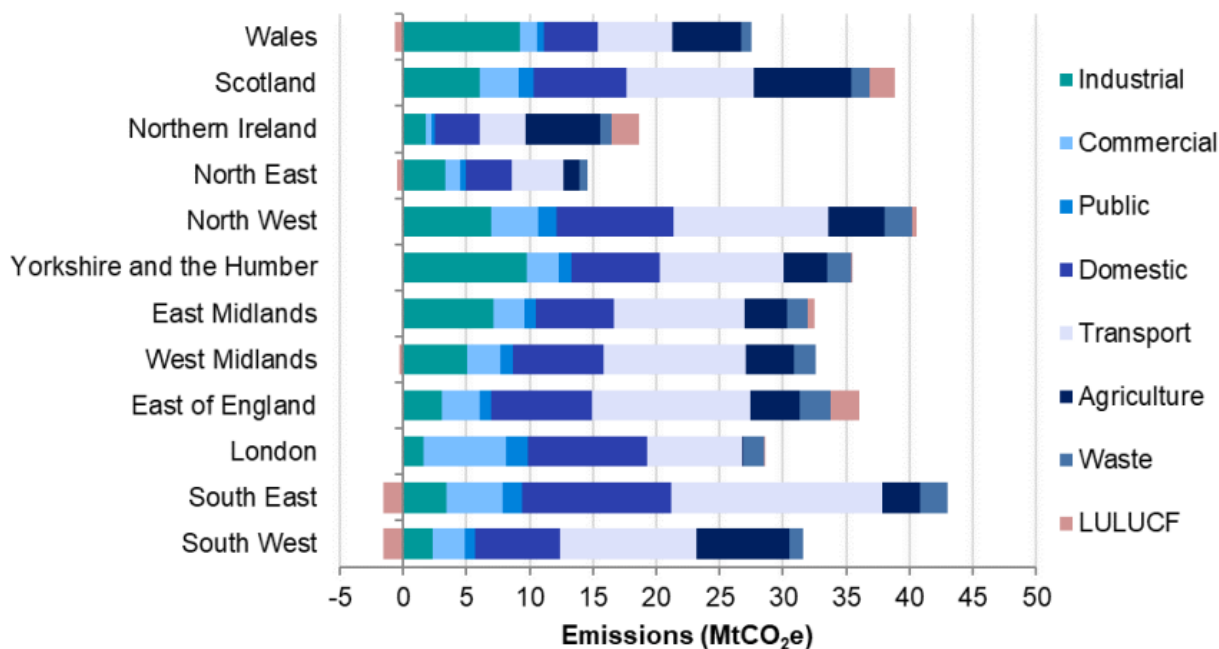


Figure 4: Graph produced by GOV.UK showing the quantity of emissions emitted by each sector for each area of the UK in 2022 (3)

Figure 4 above, which was produced by the Department for Energy Security and Net Zero (DESNZ) shows the Southeast of England produced the most emissions overall by region in 2022, and more from transport than any other region in the UK.

According to the same study, National Parks have different energy usage characteristics to other types of areas. Relative to their size they have lower levels of carbon emissions than built up areas, however they have higher emissions on average for the size of their population. Areas in national parks averaged 20.0tCO<sub>2</sub>e per capita in 2022 compared to the UK average of 5.6tCO<sub>2</sub>e per capita (3). This suggests, given that Ovingdean is situated within South Downs National Park (SDNP), that any scaling of the Southeast or Brighton and Hove's energy usage to Ovingdean is likely to be slightly conservative, however it is the best data available.

## Job Creation

The energy transition presents an opportunity for economic growth in the output of the region. It also presents a resource challenge, especially with regards to labour, and investment.



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Economic growth can be derived from the transition of labour from the archaic fossil fuel industry to clean energy trades. The following is a short list of the employment opportunities associated with the transition to a low carbon economy.

- Upskilling trades for improving the energy efficiency of properties,
- Increasing employment for offshore and onshore wind power site development and construction,
- Manufacturing of wind turbines and energy storage systems,
- Increasing employment for energy infrastructure planning and construction,
- Employment for heat pump installers,
- Employment for solar PV installers on homes, commercial premises, and ground mounted systems,
- Project developers and managers,
- Procurement
- EV manufacturing,
- EV charging installations,

We estimate that 17 jobs can be created from the recommendations in this report, for the development and installation of the onshore wind and solar generation activities, land management, retrofit of existing homes and energy services for oversight and monitoring of the community owned systems. Our recommendations for actions to be taken to create these jobs is included in the Next Steps section of this report.

## Energy Efficiency

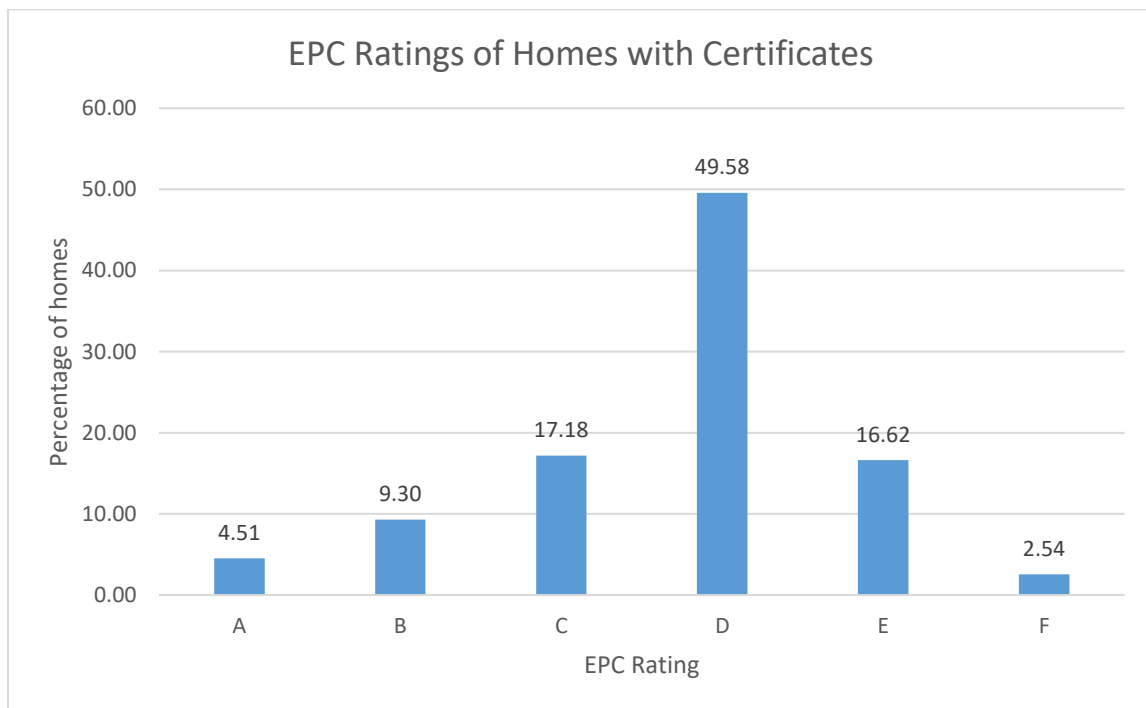
Energy Performance Certificates (EPCs) indicate the energy efficiency of dwellings. They are based on data about a building's energy features, for example, the building materials used, the heating systems and insulation. Property type and time of construction also influence this. EPC ratings are valid for 10 years from the time of issuing, and the rating and information used to calculate it are publicly available as open-source data, including details of insulation levels, floor area and energy consumption at the time of assessment. The EPC data of homes in Ovingdean has been analysed to make specific energy efficiency recommendations for Ovingdean's residential properties, considering their typical energy usage and house composition.

### 1.1 EPC Analysis



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Within Ovingdean, 65% of homes have valid EPC certificates. This is very close to the UK national average of 67% of homes with certificates (4). The percentage distribution of each rating from this data is shown in the figure below. A is the highest rating and F is the lowest. The UK average rating is a D.



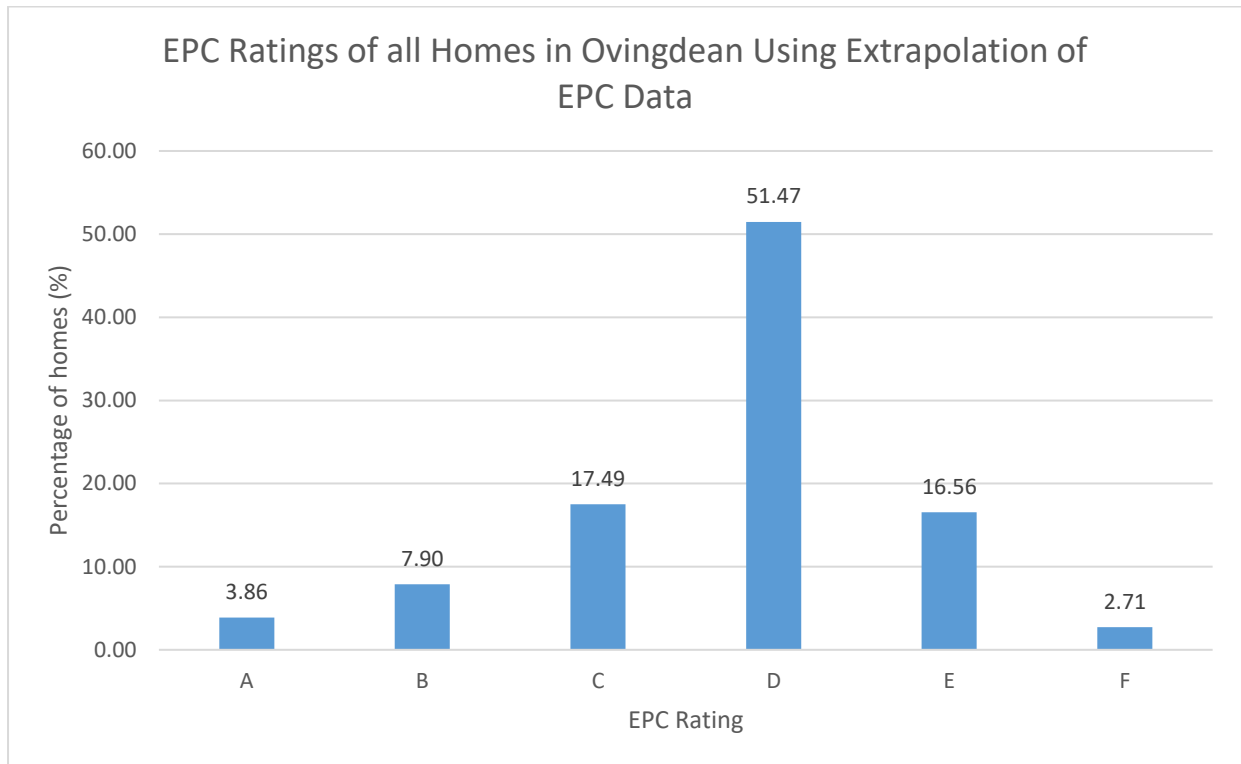
**Figure 5: Graph Showing EPC ratings of homes with certificates in Ovingdean (65% of properties)**

35% of homes in Ovingdean do not have valid EPC certificates, as they have not had the assessment in the past 10 years, which is necessary to sell a property. To include these 35% of homes in our analysis the addresses were obtained from open-source data. Homes without EPC certificates were assigned an EPC in the same distribution as the EPC rated homes on their street, as it was assumed that homes along the same road would be mostly similar in design, age and construction. Once this was completed, the following graph was plotted demonstrating the change in distribution including an allocation of the remaining 35% of properties.



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**Figure 6: Graphing showing the likely EPC rating of all the homes in Ovingdean extrapolating the available EPC data to the properties without EPCs.**

The change resulting from extrapolating the data is relatively minimal. The proportion of properties listed as A and B has decreased. This is partly because almost all the A rated properties are from Allingham Place, which is a new build and is not representative of the rest of the homes in Ovingdean. High ratings have been achieved because these homes have high levels of insulation. They also all have air source heat pumps (ASHP) although these are usually only given small consideration in an EPC assessment.

According to the Office of National Statistics, in England the EPC coverage of properties built before 1930 is 58%, while those built after 2011 have a coverage of 95%. The median energy efficiency rating in Southeast England is also a D.



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**Table 3 - Overview of domestic EPC coverage across Ovingdean and England**

County	No. Homes	With EPCs			Without EPCs		
		No. homes	% homes	Average SAP	No. homes	% homes	Assumed SAP
<b>Ovingdean</b>	535	355	65%	65 (D)	190	35%	D (62)
<b>England</b>	-	16.75 million	67%	67 (D)	-	33%	-

Energy efficient homes offer potentially large savings for households; a reasonable target for most homes is an EPC rating of C. EPC rating can be improved through various measures, most commonly insulation to reduce heat loss but also by installing solar PV and improvements to heating and hot water systems. An EPC rating of C is also the focus of UK targets, as the UK aims for 85% of homes to reach EPC C or above by 2050.

Heat pumps offer the greatest single carbon reducing measure for heating and hot water. Homes which have upgraded insulation will generally be easier to install a heat pump into, with fewer radiator upgrades required. Where insulation cannot be installed or is prohibitively expensive a heat pump installation is likely to require radiator upgrades, but good efficiency and low operating costs can still be achieved, particularly if the heat pump installation is combined with solar PV.

Table 3 below lists some heat efficiency measures, next to the percentage of homes that could benefit from an increase the type of insulation, based on how much their EPC certificate states they have. Next to this is the approximate percentage of homes in Ovingdean without EPC certificates that could benefit from this type of insulation<sup>1</sup> The numbers from the EPC and non-EPC homes were then combined to get an overall figure for the village of Ovingdean.

<sup>1</sup> This was calculated by removing Allingham Place from the EPC dataset (as it is a new build containing nearly all the villages A-rated homes and is not representative of any other part of Ovingdean) and applying this percentage to the homes without EPC ratings.



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**Table 4: Table showing the percentage of homes in Ovingdean that could benefit from different types of insulation, according to available opensource EPC data.**

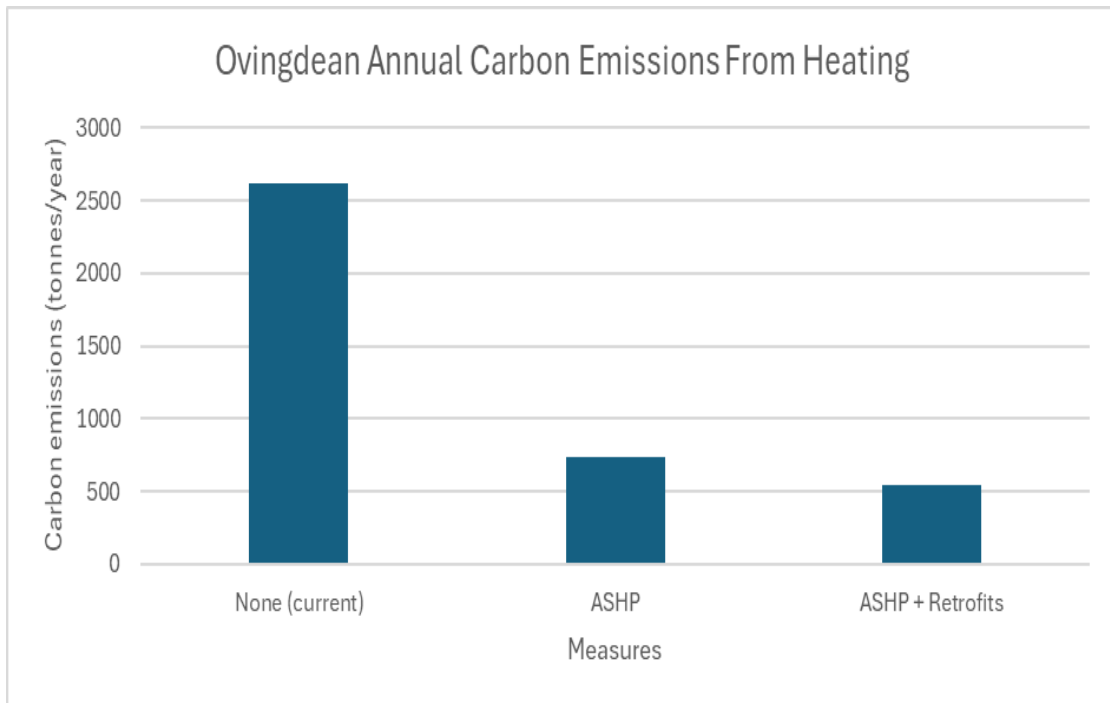
<i>Heat efficiency measure</i>	<i>% EPC certificate homes needing improvements</i>	<i>% Homes without EPC certificates needing improvements</i>	<i>% All Ovingdean homes needing improvements</i>
Loft Insulation	57	62	58
Wall Insulation	54	60	56
Floor Insulation	83	90	85

The EPC data also contains home-specific values for the potential reduction in energy usage from heating, should retrofit measures be installed. The graph below shows the reduction in carbon emissions for the whole of Ovingdean should every home install an air source heat pump (ASHP), as well as the reduction in carbon emissions arising from retrofit insulation measures and ASHP installation combined.



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**Figure 7: Graph showing the potential reduction in CO2 emissions if all the homes in Ovingdean transitioned to ASHP from gas boilers and undertook retrofits**

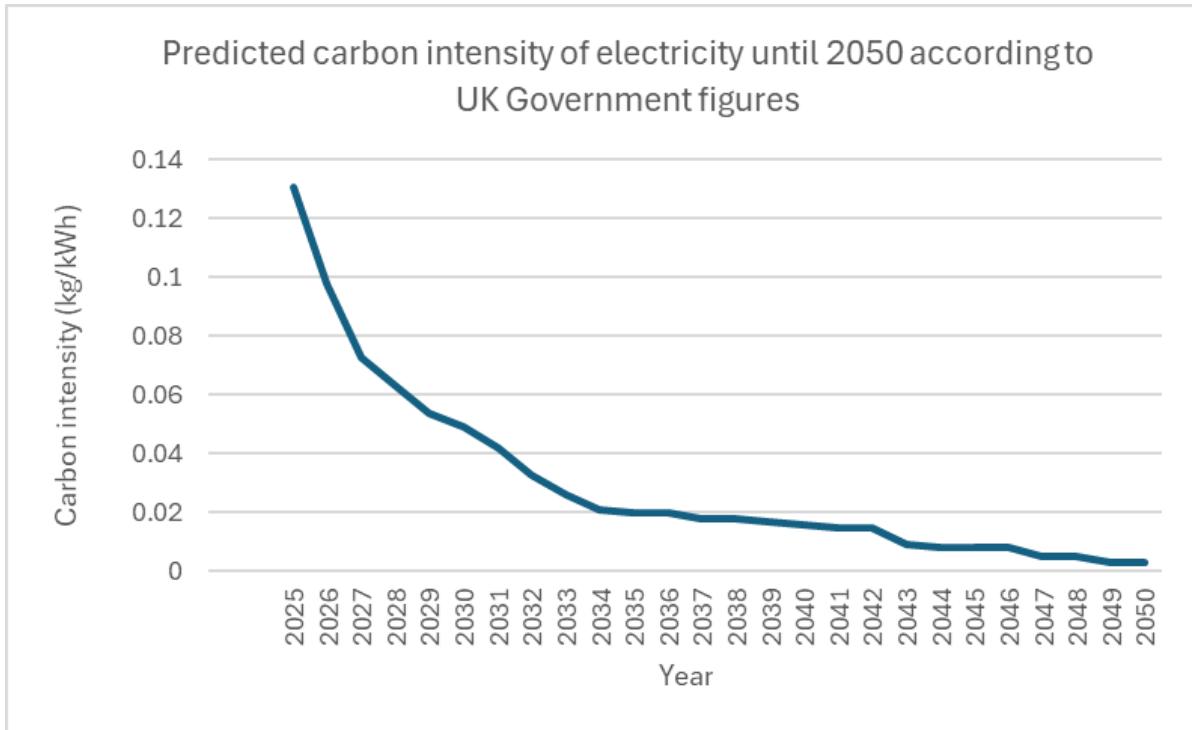
To calculate the reduction in carbon emissions, a conservative figure of 0.163kg/kWh was used for electricity from the grid, which reflects the composition of the UK's electricity supply as of 2023, which was 33% fossil fuels on average (Carbon Brief, 2024). This is the lowest ever carbon intensity and will gradually continue to drop into the future as the UK invests in more large-scale renewable generation, which is discussed below, however the graph plots a worst-case scenario based on the 2023 carbon intensity. The value for gas used was 0.183kg/kWh, which will not decrease over time.

Figure 7 illustrates a potential reduction in carbon emissions of 2070 tonnes, or 79% by implementing retrofitting measures and transitioning from gas to electric heating - specifically air source heat pumps as they are the most efficient and have government funding, which is discussed later in the report. The remaining carbon emission reductions can be achieved by generating the power locally -refer to the Renewable Electricity section of this report. As the percentage of grid electricity supplied by renewable energy increases, the carbon intensity of electricity will also drop in accordance with projections shown in Figure 8. However, this is dependent on national policy incentivising suppliers to migrate away from gas powered plants. The emissions from heating can be reduced to zero by producing the electricity required from renewable sources.



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**Figure 8: Graph showing the predicted carbon intensity of electricity from the national grid (kg/kWh) until 2050 according to government forecasts**

In addition to the significant potential reduction in carbon emissions, according to a 2023 Greener Homes Report by Rightmove, improving the EPC rating of one's home correlates with a higher market value, as shown in table 4. This is important as raising EPC of homes to a majority C or above will require significant investment from residents.



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**Table 5: Table from Rightmove Greener Homes report detailing the average increase in value of homes by transitioning up EPC ratings (5)**

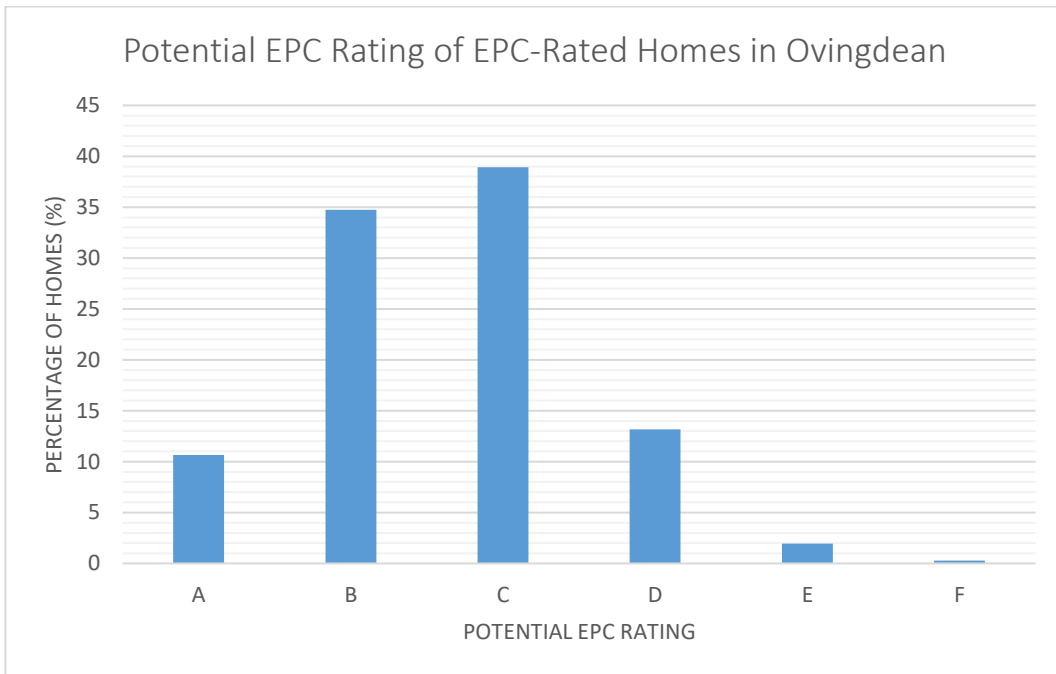
Improved EPC rating	Average increase in value
From D to C	+3%, or £11,157
From E to C	+7%, or £26,033
From F to C	+15%, or £55,786

Figure 9 below shows the distribution of potential EPC ratings in homes with EPC certificates in Ovingdean. This is an official potential rating given on every EPC certificate, based on the nature of the individual building, and indicates what rating the home could achieve should it implement the recommended measures. These clarify that taking simple steps could elevate the homes in Ovingdean above the UK average of band D to C, reducing energy consumption, costs and making installation of an ASHP easier.



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**Figure 9: Graph displaying the 'potential EPC' given in the EPC data for homes in Ovingdean with certificates**

### 1.1.1 Retrofitting Advice

Energy surveys are available to generate a home-specific plan for lowering energy costs, while creating a more comfortable, healthy home. They also provide home-specific estimate costs for each retrofitting measure and estimate annual savings on bills. However, for those who choose not to take this route a general strategy is outlined below to guide steps forward. More detailed advice has also been distributed to residents.

The industry consensus is that roof/loft and cavity wall insulation are the two insulating retrofits that are the most cost-effective way of reducing heat loss from UK homes and should therefore be prioritised and implemented first where appropriate. These would have the greatest effect in reducing energy usage and costs for the residents of Ovingdean for the least installation cost and disruption.

Most heat loss occurs in buildings that have little or no wall insulation, which in a worst-case scenario can account for 35% of heat loss (6). Homes built from 1930 onwards



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should have a wall cavity that can be filled. In coastal areas, where damp sea air can cause issues inside walls, cavity wall insulation can only be installed where the cavity width is at least 75mm and brickwork pointing is flush with brickwork, there are no other issues with the cavity, and it is installed by a CIGA registered installer. This is because the higher rainfall in these areas can cause moisture issues if these precautions are not taken. For properties which are not suitable, external wall insulation is recommended. Good quality external wall insulation should be breathable, eliminating any risk of mould and damp, and will also improve the resilience of the property to wind and rain.

Loft insulation is also very effective and should be undertaken as a priority. Current advice is that even if properties have some level of loft insulation, if this is less than 200mm, the property can benefit from a top-up to 350mm.

Double glazing is also a high impact retrofit, however upon analysis of the EPC data in Ovingdean only a handful of the homes did not already have some form of double glazing and so this has not been given significant consideration.

Older houses are generally less energy efficient than more modern houses, and Brighton and Hove City Council estimate that pre-1919 houses emit on average 9 tonnes CO<sub>2</sub> per year, whereas a post 1930 house emits on average half of that. This suggests that any retrofit strategy should prioritise older homes by default. While some general advice has been given, the council also note that traditionally constructed buildings often are made with fabrics that need to 'breathe', so that moisture within the walls can be released through evaporation. It's advisable therefore that older homes seek surveys specific to their homes to optimise a retrofit solution.

Finally, whilst this will not apply to most homes in Ovingdean, the village has a disproportionately high number of personal swimming pools. The use of a pool cover will reduce evaporation and heat loss significantly, and swimming pools can be heated very effectively using air source heat pumps, which as will be discussed later in the report use less than a third of the energy that gas heating does. In the solar PV section of this report, the particular benefits of solar to those who own pools is discussed.

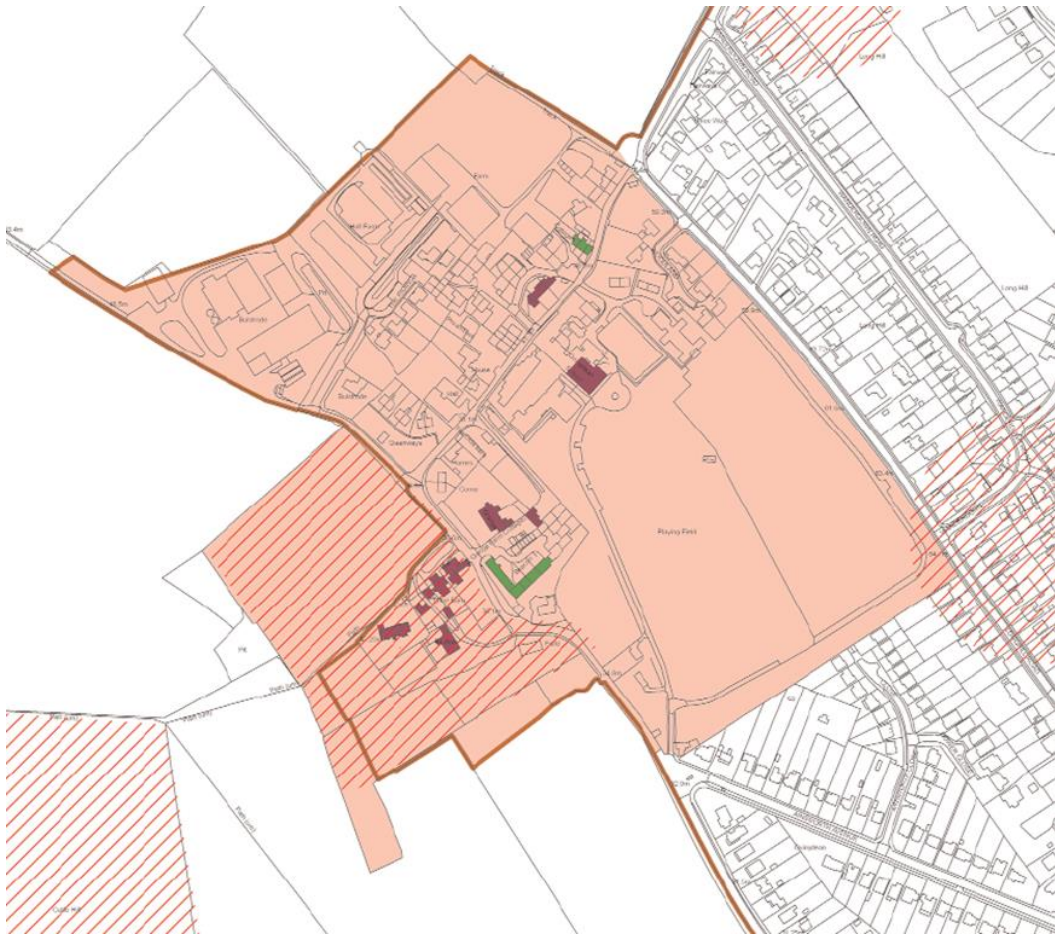
## 1.2 Planning Permission – Retrofitting

For houses outside of the conservation area in Ovingdean, which is shown below and will be discussed throughout the report, planning permission is not generally needed for any retrofitting measures as it is considered permitted development.



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**Figure 10: BHCC map showing Ovingdean conservation area (shaded red)**

For buildings within the conservation area (except for listed buildings which have different restrictions again), planning permission is required for many retrofit measures.

Figure 10 is a table produced by Brighton & Hove City Council, detailing the current rules on planning inside of conservations areas. It is worth noting that while it has been included for planning information, the prices are out of date and would vary significantly depending on size of home. Where the table indicates a measure 'maybe' requires planning permission, this likely refers to the fact there are certain subcategories of conservation areas. Ovingdean's conservation area is an article 4 conservation area, which means it has more restrictions than most, and therefore



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the 'maybe's in this table likely mean planning permission will be required. This is the case for solar panels as is discussed later in the report.

Page	Energy efficiency measure	Estimated cost <sup>4</sup> for the whole house	Estimated annual energy bill saving	Is planning permission needed?	Do Building Regulations apply?
<b>All windows and doors</b>					
11 & 17	Draught proofing (all windows and doors)	Up to £1K	Up to £50	No	No
11 & 17	Secondary glazing (all windows and doors)	£1-3K	£100-300	No	No
<b>Windows</b>					
12	Replacement frames and single glazing (low-E) (all windows)	Over £3K	Up to £50	No	No
12 & 18	Slim profile double glazing (all windows and doors)	Over £3K	£50-100	Maybe	Yes
13	Replacement double and triple glazed	Over £3K	£100-300	Maybe	Yes
<b>Doors</b>					
18	Replacement Doors	£1-3K	Up to £50	Maybe	Yes
<b>Insulation</b>					
21	External Wall Insulation	Over £5K	Over £300	Yes	Yes
22	Flat roof insulation (whole roof)	Over £5K	£100-300	Maybe	Yes
<b>Renewable technologies (estimated energy bill savings exclude FIT and RHI payments)</b>					
23	Biomass Heating	Over £5K	Depends on fuel cost	Maybe for store & flue	Yes
26	Solar photovoltaic panels 4kW	Over £3K	£50-100	Maybe	Yes
26	Solar thermal hot water panels	Over £3K	£50-100	Maybe	Yes
27	Solar photovoltaic roof slates 4kW	Over £5K	£50-100	Maybe	Yes
28	Air source heat pumps	Over £3K	£100-300	Maybe	Yes

**Figure 11: Table from Brighton & Hove City Council on planning for buildings in conservation areas, not including listed buildings which are considered separately (7)**

The BHCC site the replacement of windows as one of their main concerns, indicating that the material and structure of the original windows should be retained, however secondary glazing which sits behind the existing windows is acceptable (7).

The council also state that planning permission for external wall insulation is unlikely to be granted for any walls facing the street in a conservation area, however, should be fine for walls facing away from the road. Internal wall insulation does not require planning permission as it is not considered to affect the historic façade. Loft and internal roof insulation do not affect the exterior of homes and are therefore permitted.



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Listed buildings are those which are considered to have national importance, due to their special architectural or historic interest, and are compiled by the Department of Culture Media and Sport (DCMS), not the council. There are different grades of listed buildings, with grade I being of the most exceptional interest and grade III being of the least interest, which 92% of listed building account for. Several of Ovingdean's listed buildings are grade I, including St Wulfran's Church, and therefore will likely face significant challenge to make any retrofits. The restrictions on listed buildings apply to buildings of every grade, and unlike in conservation areas apply to the interior and exterior of the building, as well as any curtilage structures. Brighton & Hove City Council states that any measures to improve energy efficiency of listed buildings should be reversible and avoid the loss of historic fabrics and features.

### 1.3 Grant Support and other funding

Investing in energy efficiency is a sensible way of retaining the value of one's property and future proofing it for changes in weather, geopolitical changes and its market attractiveness. However, not everyone has savings to invest. A few banks offer preferential mortgage rates for new buyers on homes with EPC ratings of C or better, making buying these homes more attractive. Some lenders will also offer an interest free loan for a period of time for renewable energy such as solar panels alongside new mortgages.

To reach Net Zero, it is crucial that a long-term, reliable energy efficiency programme is rolled out to residents by an empowered authority, setting the eligibility criteria while reducing the administrative burden as much as possible by streamlining processes. An effective energy efficiency programme would boost the local economy, by putting money back in people's pockets, while reducing the running cost and carbon footprint of domestic properties.

As discussed in Section 1, the two primary sources of carbon emissions under individuals' control are derived from mains gas used for heating and cars.

The Home Upgrade Grant is a useful tool for helping these households upgrade to an ASHP. In many cases, homeowners can borrow money from their mortgage lenders at an advantageous rate through a home equity loan or home equity line of credit. Each of these are secured loans meaning that the borrowing rate is lower because the risk to the bank is lower.



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The boiler upgrade scheme is also available which offers £7500 to every home that upgrades from a boiler, or direct electric heating, to an air source heat pump. The remaining amount is then paid by the homeowner.

#### 1.4 Modelling Energy Efficiency Measures at Scale

The government committed in its "Build back Greener" strategy and net zero target to raising energy efficiency further. The new Labour government has recently re-instated policy that all tenancies must have at least EPC C by 2030.

The government's English National Housing Survey (2019-2020) estimated that it would cost landlords £7,646 on average to upgrade to an EPC rating band C. Breaking this down further, it predicts that almost a third of the relevant properties could be bumped up to the required rating for under £5,000, while 26% would need to spend more than £10,000 to upgrade (8). The price of retrofitting varies significantly based on property size, as materials are generally charged per meter square.

NG ESO Future Energy Scenarios (FES) state that to meet UK climate targets 85% of homes need to be EPC C or higher by 2050 (9). The table below shows the necessary transition to get approximately 84% of homes to an EPC of C or above by 2050. Whilst it would be beneficial for homes at EPC of C to also make improvements to an EPC B or A, this has not been considered or costed as this is a minimum investment to meet UK targets and prepare households for heat pumps.

**Table 6: Table showing the percentage of homes in Ovingdean with each EPC rating until 2050 necessary to achieve NG ESO net zero targets.**

% Homes in Ovingdean with EPC rating									
EPC	2024	2026	2028	2032	2036	2040	2044	2048	2050
A	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9	3.9
B	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9
C	17.5	21.7	25.9	34.3	42.7	51.1	59.5	67.9	72.1
D	51.5	51.5	51.5	51.5	45.5	37.1	28.7	20.3	16.1
E	16.6	15.1	10.9	2.5	0	0	0	0	0
F	2.7	0	0	0	0	0	0	0	0
<b>EPC C+</b>	<b>29.3%</b>	<b>33.5%</b>	<b>37.7%</b>	<b>46.1%</b>	<b>54.5%</b>	<b>62.9%</b>	<b>71.3%</b>	<b>79.7%</b>	<b>83.9%</b>



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The analysis in Table 5 has assumed that homes will transition up 1 rating at a time to alleviate the impact of costs and that the percentage of people who will make the transition between F-E, E-D and D-C every 2 years is 4.2%. This rate was the lowest that would meet the goals set out by 2050. 4.2% every two years is equivalent to 12 homes every year in Ovingdean upgrading from a D to a C, as well as 12 homes per year transitioning from E to a D until 2032. The 2.7% of properties currently at EPC F would ideally become E by 2026.

**Table 7: Table showing the estimate investment required between 2024 and 2050 to get every home in Ovingdean to EPC C or above for a large home**

EPC upgrade required	No. homes	Cost per upgrade (£)	Total cost (£1000's)
D-C	281	15,000	4,215
E-C	91	19,000	1,729
F-C	15	23,000	345
		<b>Total</b>	<b>6,289</b>

## Low-Carbon Heating

Heating, specifically domestic gas, is responsible for approximately 33% of carbon emissions across Ovingdean.

Eventually, all properties in the region must transition from fossil fuel heating systems to electric heating, as electricity can be produced with zero carbon emissions whereas natural gas carbon emissions cannot be reduced. Heating will be delivered through a variety of renewably powered systems, namely: air source heat pumps (ASHPs), ground or water source heat pumps (G(W)SHPs); and where appropriate, electric resistive heating. This inevitable transition is recognised by the government, who have set a target of installing 600,000 heat pumps every year by 2028.

It should be noted that, in comparison to ASHPs, GSHPs generally provide larger incremental savings over their lifespan. This is due to their higher coefficient of performance (CoP), meaning that they deliver the same amount of heat while using less electricity. In comparison to GSHPs, ASHPs are easier, quicker, cheaper, and less disruptive to install. In addition, ASHPs do not have the same outdoor space requirements as GSHPs, making them more suitable for most environments. ASHP technology is also evolving rapidly. Previous concerns surrounding their noise levels are reducing with the development of increasingly quiet models such as the Bosch



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7400i, which boasts a sound power level of just 50 db(A), the equivalent of a quiet refrigerator.

Heat pumps are extremely efficient and will deliver much more heat energy than the electrical energy they consume. The delivery of heat compared to electricity consumption is termed the coefficient of performance (CoP) with GSHPs often achieving COPs of 4.0, i.e. 4 kWh of heat for every 1 kWh of electricity used.

ASHPs usually have lower CoPs, typically around 3.0. Currently, as the cost of electricity in the UK 4x the price of gas per unit, this still makes them more expensive to operate. There is pressure on the government to alter the price ratio of gas and electricity to financially incentivise the switch to electric heating and this will hopefully come into place soon. Given that fossil fuel boilers are, at best, only around 90% efficient, a price ratio of 3.3 would give parity in operating costs for a COP of 3.0.

We recommend transitioning such properties to air source heat pumps (ASHP) as an efficient way to reduce carbon emissions, based on our own experience that GSHP's higher upfront cost cannot be recouped by the incremental savings achieved through their running costs in the long-term. This transition is in line with government strategy which proposed in 2021 to phase out installation of new oil and LPG boilers from 2026<sup>1</sup>.

Replacing fossil fuel boilers with ASHPs will bring an immediate large reduction in carbon emissions and will be lower cost to operate for many homes if installed correctly and particularly if combined with solar PV and/or replacing an older, low efficiency boiler.

Fabric improvements to reduce heat losses should be made first as these will reduce operating costs, radiator upgrade requirements and heat pump installation costs. Other improvements such as improvements to glazing can be difficult in older homes, particularly if they are in AONB areas or listed properties.

High temperature heat pumps are now available which can be installed into existing heating systems without replacing radiators or hot water cylinders. These will be more expensive to operate but allow for progressive improvements after installation and will suit some homeowners better as they can retain period radiators, for example.



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## 1.5 Air Source Heat Pumps

Air source heat pumps run off electricity as supposed to gas and are much more efficient than direct electric heating, being storage or fan heaters for example. They absorb heat from the air at a low temperature and convert this to high temperature internally before transferring this higher temperature heat to the heating and hot water circuits throughout the home. NG ESO has forecast the rollout of ASHP specifically needed to meet national targets.

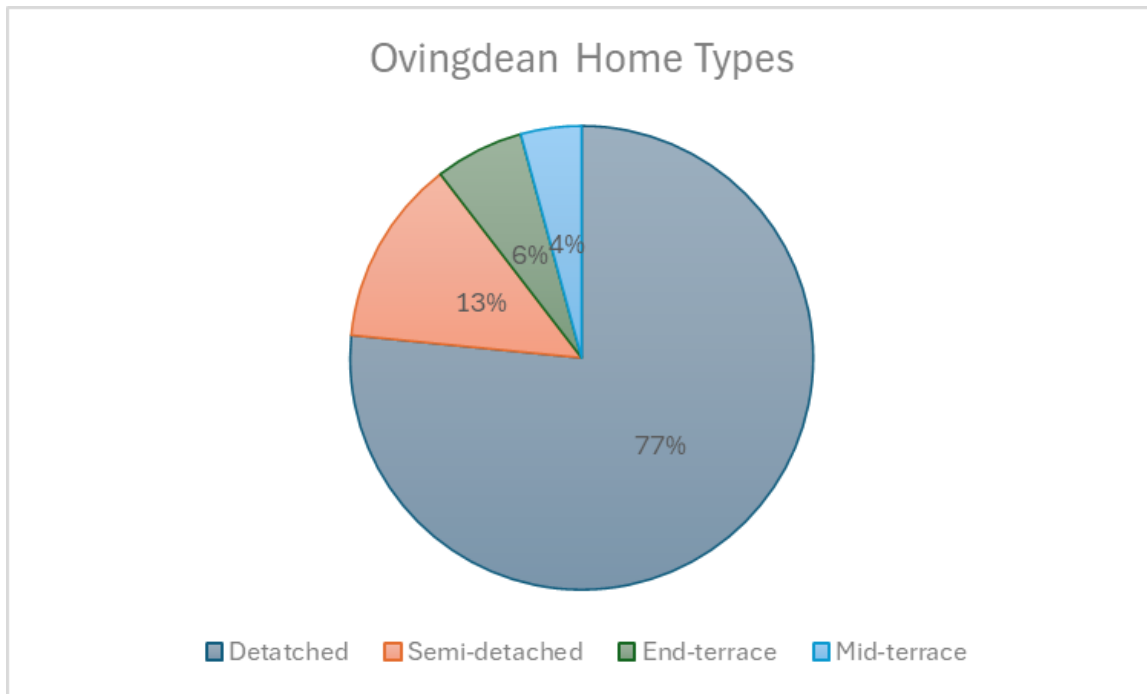
The new Labour government is likely to restore the ban on gas boilers in all new homes built after 2025. In Ovingdean, the newest build, Allingham Place, has these systems already. The government's "Future Homes Standard 2025" will require all new builds to have low-carbon systems, such as electric heat pumps, which are relatively easy and undistruptive to implement in Ovingdean.

The total cost to install is generally £8000 - £16,000 depending on the size and model, however a £7,500 government grant is available per home (called the BUS grant).



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**Figure 12: Graph showing percentage of different types of homes in Ovingdean according to EPC data of homes with EPC certificates**

ASHP need outdoor space to be fitted, which detached, semi-detached and end-terrace homes are likely to have sufficient space for. Figure 12, constructed from EPC data, shows that 96% of properties in Ovingdean are these types of homes, which makes it a promising candidate for a mass transition to ASHP.

To implement Air Source Heat Pumps, it is advised that straightforward insulation measures have already been carried out and efficiency has been optimised. Government grants for the installation of ASHP previously required loft or cavity wall insulation to be installed first due to this, however they have recently removed this precondition to increase the uptake of the pumps.

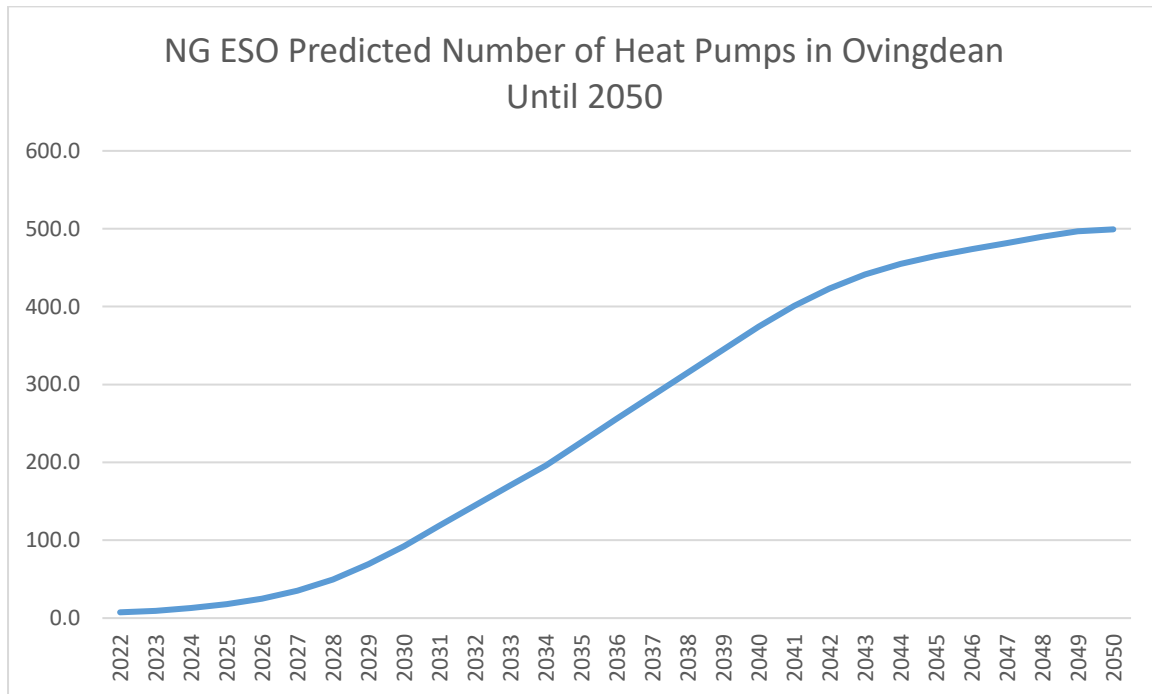
According to the National Audit Office, whilst the government has set targets to install 600,000 ASHP every year until 2028, they would need to accelerate the pace of installation 11-fold to meet these targets. It is therefore difficult to estimate how implementation should be expected to go in Ovingdean as there are clearly barriers.



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The below graph and table show the predicted uptake of ASHP for Brighton & Hove scaled to the village of Ovingdean, according to future scenarios data from NG ESO (falling short scenario).

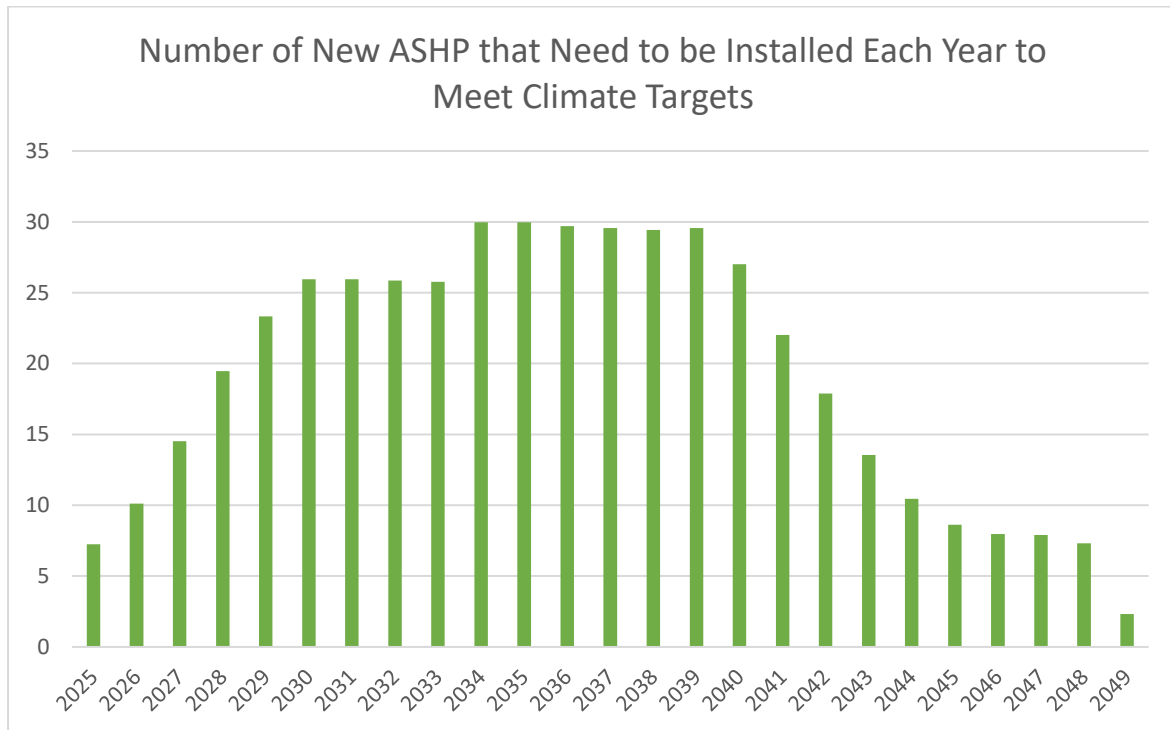


**Figure 13: graph showing the NG ESO falling short scenario FES rollout of air source heat pumps until 2050, scaled to the population of Ovingdean.**



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**Figure 14:** Graph showing the number of new ASHP that would need to be installed in Ovingdean each year to meet the cumulative NG ESO targets in figure 12

Table 7 shows the NG ESO's anticipated rollout rate of ASHP's and how many this would mean necessary for Ovingdean until 2050.

**Table 8:** Table showing the ASHP rate of installation in Ovingdean to meet national targets and the annual electricity demand incurred, according to NG ESO data and Ovingdean EPC data

Year	2025	2027	2030	2035	2040	2045	2050
Number of ASHP installed	18	35	92	226	374	465	500
Percentage homes (%)	3.3	6.5	17.0	41.5	66.7	85.3	91.6
Annual Electricity demand (GWh/year) (NG ESO)	0.146	0.234	0.447	0.859	1.314	1.542	1.636



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Annual Electricity demand with retrofits (GWh/year) <b>(EPC)</b>	0.111	0.220	0.574	1.40	2.252	2.88	3.09
Annual Electricity demand without retrofits (GWh/year) <b>(EPC)</b>	0.149	0.295	0.770	1.881	3.023	3.865	4.151
Approximate cumulative cost of installation (£1000's)	347	674	1,773	4,355	7,207	8,961	9,635
Approximate cumulative cost with BUS grant (£1000's)	212	412	1,083	2661	4,403	5,575	5,887

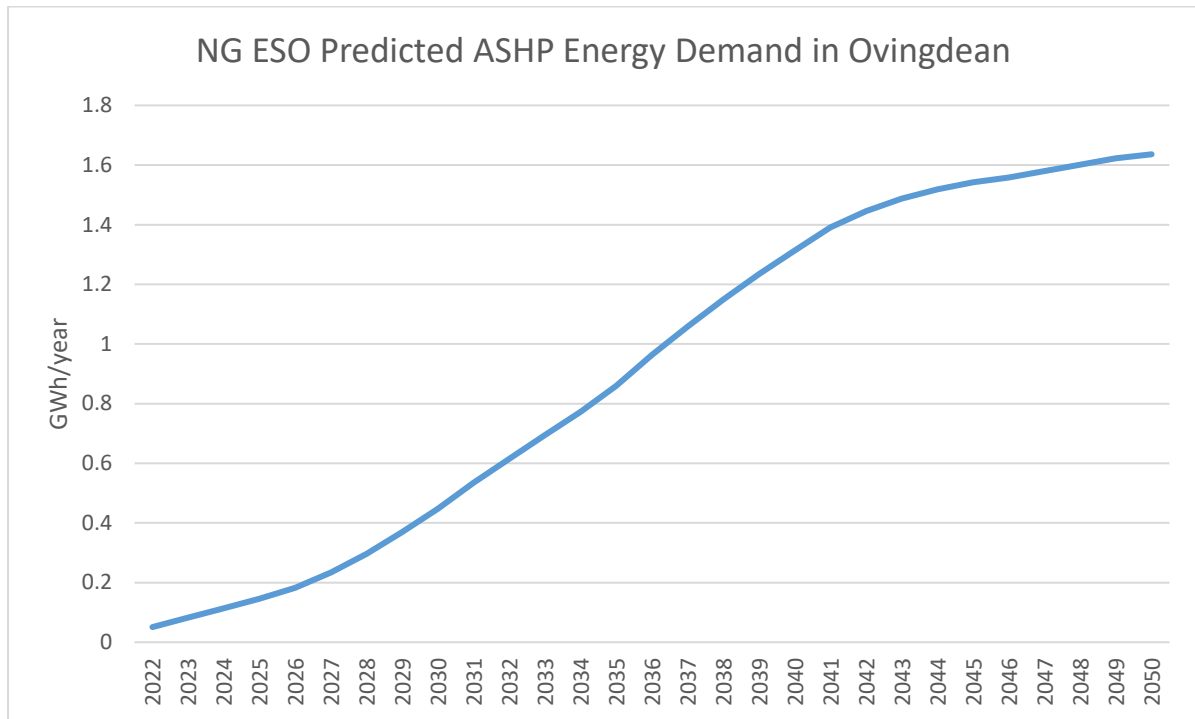
The average cost of a heat pump installation according to 2024 government statistics was £13,318 (10). However, the average floor area of a home in the UK is 94m<sup>2</sup> (11), whereas the average floor area of a home in Ovingdean according to EPC data is 136m<sup>2</sup>. The cost of an installation depends on the size of a home and this number has therefore been scaled to an average of £19,270, which has been used for costing in table 7. The BUS grant provides about a 40% reduction in cost in this case, at a set £7500 per household.

This increased home size in Ovingdean is also the reason for the discrepancy between the NG ESO annual ASHP electricity demand figures in table 7 and those calculated from EPC data for the same annual rollout numbers. The NG ESO demand figures are scaled from data about the entirety of Brighton & Hove, which has smaller homes on average than Ovingdean, whereas the EPC values are based specifically on Ovingdean home energy usages and is therefore more accurate.



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**Figure 15: Graph showing NG ESO estimate of grid demand due to ASHP until 2050 from Ovingdean based on data about Brighton & Hove**

## 1.6 Availability of Skilled Labour

One of the significant barriers to meeting a Net Zero 2050 target is the availability of skilled labour to carry out the extent of the specialist work required. Unfortunately, the inconsistent application of policy and prohibitive costs of compliance, as well as the ever-changing regulation from central government, have had a detrimental impact on the supply of skilled labour.

The skills gap is more than just training and qualifications, it is also about the creation of consumer demand needed to provide these newly skilled labourers with gainful employment.

In the area around Ovingdean, there are tradespeople who are likely to be interested in participating in a structured programme for installing the retrofit measures required to meet an EPC C rating, as well as acquiring the necessary skills to accomplish a high-quality air source heat pump installation.



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The action plan outlined here provides the basis to plan for growth in the trades required to meet the village decarbonisation target. By including this plan in the Neighbourhood Plan and linking it with the citywide Decarbonisation Pathways Study prepared by Brighton and Hove City Council, a layer of accountability can be created that supports the development of skills required.

## Transport

In section 1 of this report, transport was identified as being the largest contributor to carbon emissions (40%) in Ovingdean, at approximately 1100 tonnes per year based on Brighton and Hove emissions data from Gov.uk. According to government statistics 0.75 billion vehicle miles were travelled on roads in Brighton and Hove in 2022 (12).

### 1.7 Reducing emissions

To estimate the number of cars owned by residents of Ovingdean (as this information is not openly accessible), government statistics on vehicle ownership in different areas of the UK have been used for analysis.

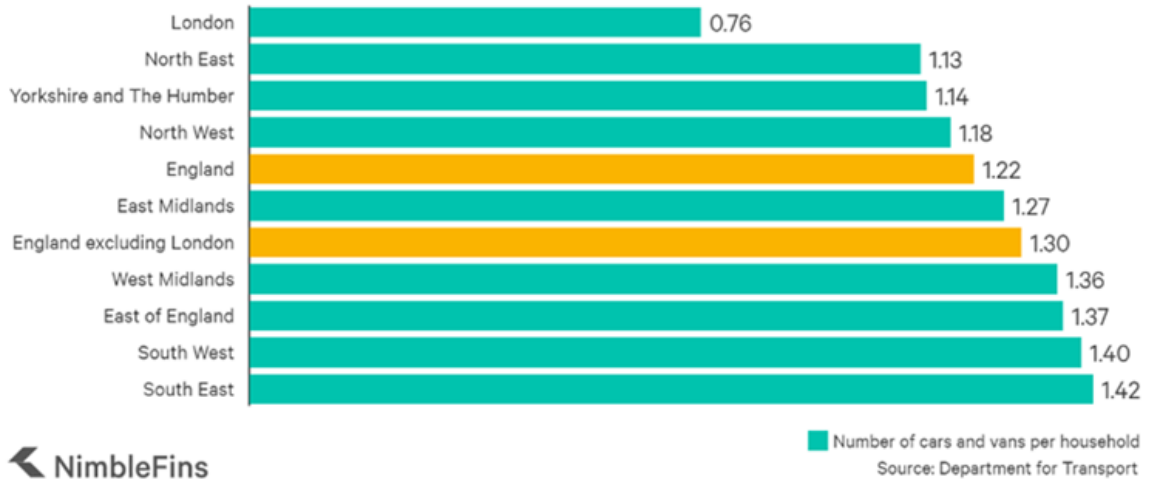


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### Number of Cars per Household

2022



NimbleFins

**Figure 16: Graph showing the average number of cars per household in different areas of the England in 2022 (13)**

Figure 16 shows the average number of vehicles per household in 2022 in different areas of the UK, of which South-East England has the highest number, at 1.42 cars per household. If we assume Ovingdean is in line with the average car ownership in East Sussex, the village residents would own 749 vehicles collectively. This value has been used throughout the report when considering the rollout of more efficient vehicles, however as the miles driven by a car has the biggest impact on its emissions, the average number of miles driven per year, shown in Figure 16, has been used to calculate fuel and emissions savings overall.

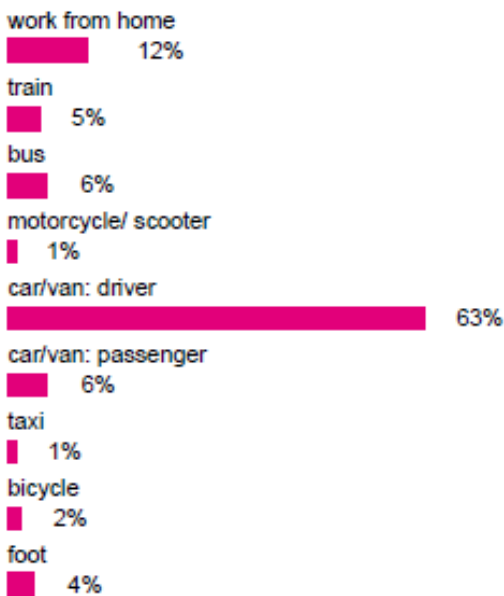


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Statistics illustrating methods of travel to work.

Source: City Stats, Census 2001



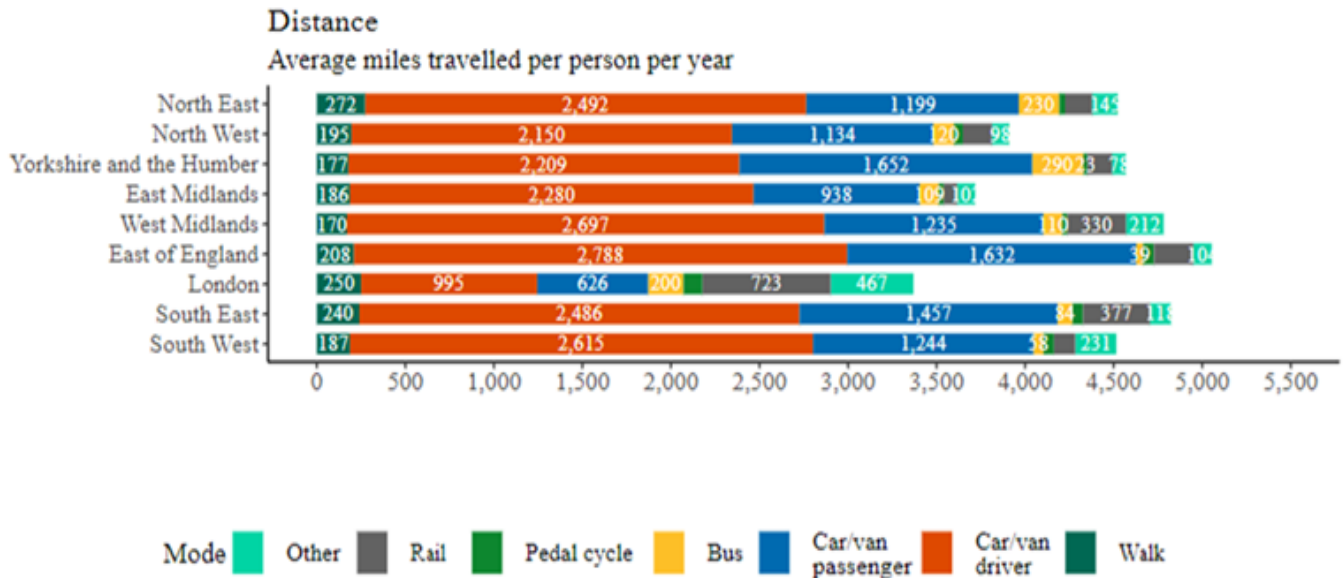
**Figure 17: Graph produced by BHCC showing how resident of Ovingdean commute to work, based on 2001 consensus data (14)**

Figure 17, which was constructed from 2001 consensus data specifically in Ovingdean, shows that at the time 63% of residents drove to work (14). This same document stated that the Ovingdean population at the time was 1121, which supports the 2024 estimate of 1290 as Brighton & Hove has experienced population growth in the past 23 years.



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**Figure 18: Gov.UK graph showing the average amount of miles travelled per person in different regions of the UK in 2022**

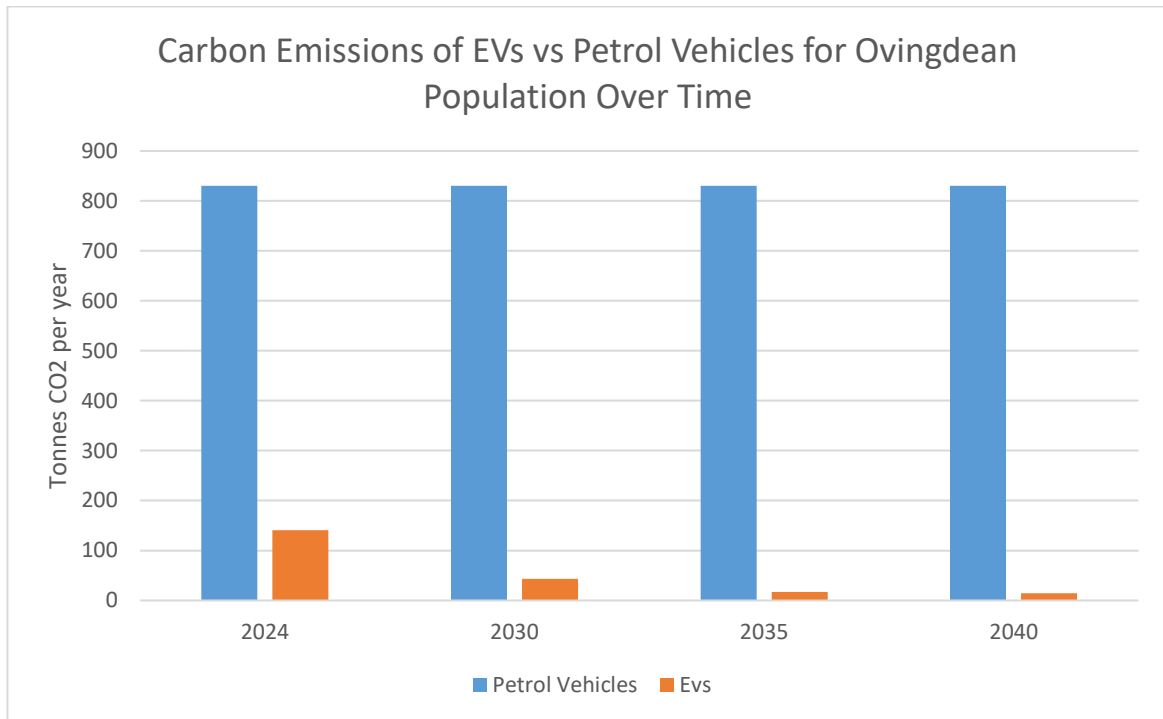
For this analysis, the amount of car driver miles has been used, not passenger, so that the same vehicle is not being considered twice, which is 2,486 miles per person on average according to figure 18. Considering that there are approximately 1,290 people in Ovingdean, this comes to 3,206,940 yearly miles for the village. The average car in the UK produces 259g/mile<sup>2</sup> (15) of CO<sub>2</sub> and therefore, the overall total emissions released by personal vehicles in Ovingdean alone is likely to be around 830 tonnes of CO<sub>2</sub> per year.

Using a figure of 0.163kg/kWh for carbon intensity (16) of electricity in 2024, based on these figures if the village transitioned entirely to electric vehicles in 2024 the total transport carbon emissions would be 140 tonnes of CO<sub>2</sub>. However, this would slowly decrease to 17.3 tonnes by 2040 according to figure 7 which shows the governments predicted decrease in carbon intensity of grid electricity down to a theoretical 0.02kg/kWh, whereas the emissions produced by petrol vehicles will remain largely the same. If the village were to use renewable energy to charge their vehicles this would decrease much faster.



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**Figure 19: Graph showing the reduction in carbon emissions produced by vehicles in Ovingdean if everyone transitioned to EVs**

It is clear from Figure 19 that a transition to EVs will from petrol vehicles will lead to an immediate and significant drop in carbon dioxide emissions, and this benefit will only increase over time as the carbon intensity of electricity from the grid decreases over time.

Additionally, while the main intention of this transition is to minimise carbon emissions in this context, transitioning to EVs will significantly improve local air quality for residents. According to a paper by the Climate Change Committee, air pollution is the top environmental risk to human health in the UK, and in the UK alone in 2016 exposure to toxic NOx and particulate matter from car exhaust was responsible for 40,000 premature deaths. Taking these measures to reduce the emissions from transport is therefore also specifically in the interest of the health of the community.

The uptake of electric vehicles (EVs) will depend on how public funding is allocated to address the two main barriers to the accelerated uptake of EVs:



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1. the higher cost to acquire an EV; and
2. the prohibitive impact of range anxiety, the fear that an EV won't have sufficient battery charge to reach the intended destination, leaving the motorist stranded.

The Labour Party is committed to phasing out the sale of petrol and diesel vehicles by 2030<sup>3</sup>. Finally, whilst it is clear that transitioning to EVs is the best step forward to eliminate the use of petrol and diesel vehicles, an obvious improvement could be made if some drivers were to switch to public transport as an alternative. Currently the bus service from Brighton, the nearest city and nearest large supermarkets, is very poor. This could be improved upon to encourage those who only make these small journeys to abandon personal vehicles altogether.

## 1.8 Cost of EVs

According to a 2020 study by Direct Line insurance company, an electric vehicle's lifetime ownership cost is £52,133 compared to £53,625 for an equivalent ICE car<sup>ii</sup>. EVs also incur approximately 50% less in maintenance costs each year and 60% less in fuel costs annually.

**Table 9: Table explaining the cost consideration of owning an EV vs petrol vehicle according to Octopus energy (17)**

Metric	Electric Vehicle	Petrol Vehicle
Purchasing price	£17,000 - £80,000 new	£13,000 +
Road Tax	£0	£190
Fuel Price (fluctuates)	8-15p per mile (depending on charger type)	14-20p per mile
Maintenance	£227 per year average	£443 per year average
Clean Air Zones	£0	£12.50 daily

According to Octopus Energy the price of charging an EV can be further reduced to 20% of the cost of fuelling a petrol car by using an EV smart tariff. It is generally accepted that EVs will be cheaper than Internal combustion engines by 2027<sup>4</sup>

<sup>3</sup> [https://labour.org.uk/wp-content/uploads/2023/10/WR-797\\_23-Automotive-strategy-v8.pdf](https://labour.org.uk/wp-content/uploads/2023/10/WR-797_23-Automotive-strategy-v8.pdf)

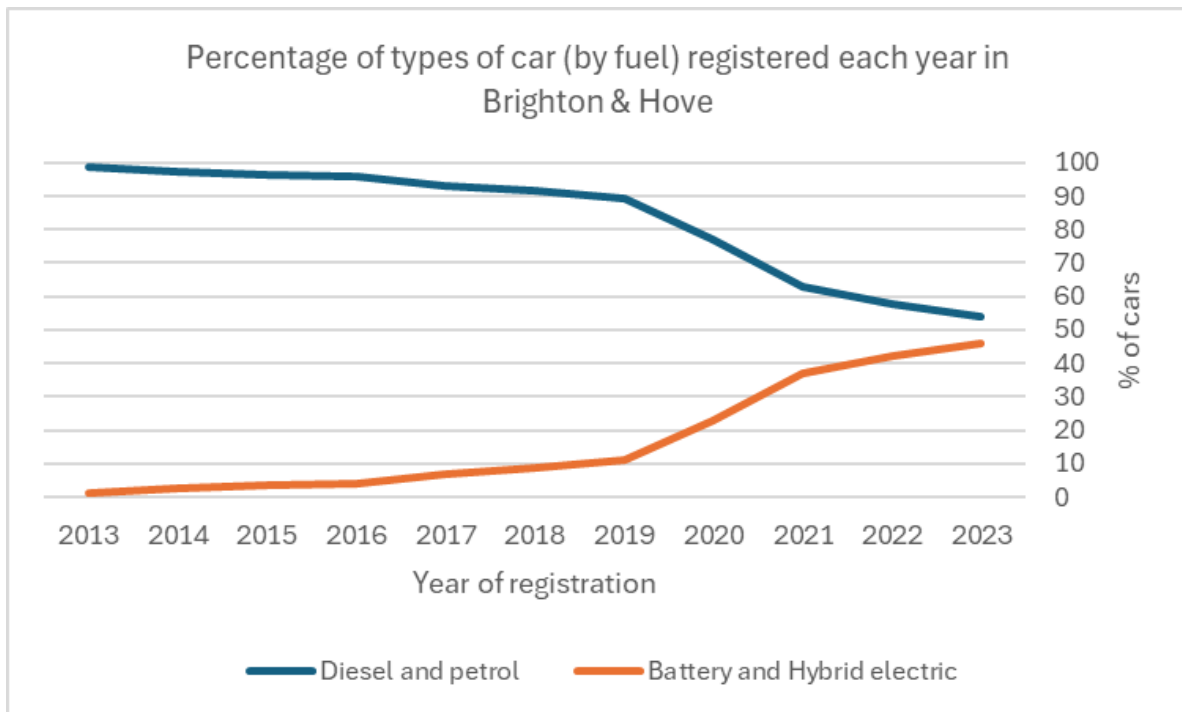
<sup>4</sup> [https://www.reuters.com/business/autos-transportation/evs-will-be-cheaper-produce-than-gas-powered-vehicles-by-2027-gartner-says-2024-03-07/#:~:text=March%20%20\(Reuters\)%20%2D%20Battery,firm%20Gartner%20said%20on%20Thursday.](https://www.reuters.com/business/autos-transportation/evs-will-be-cheaper-produce-than-gas-powered-vehicles-by-2027-gartner-says-2024-03-07/#:~:text=March%20%20(Reuters)%20%2D%20Battery,firm%20Gartner%20said%20on%20Thursday.)



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## 1.9 EV Rollout



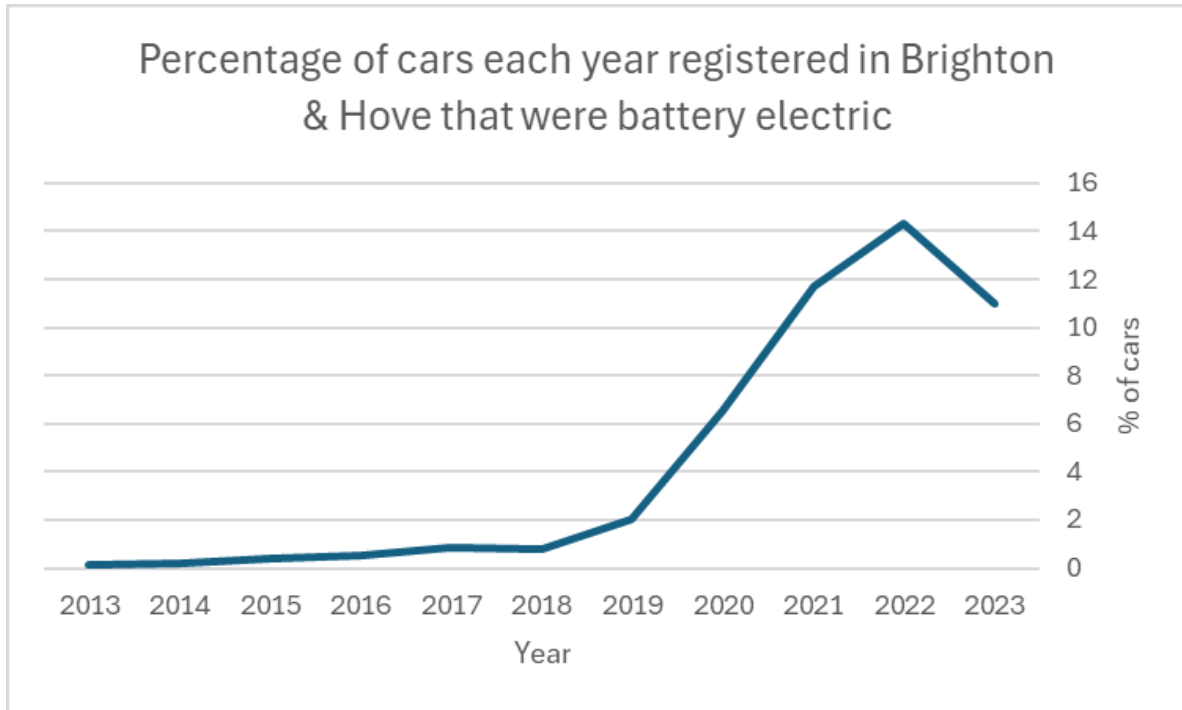
**Figure 20: Graph showing the percentage of cars that were registered each year since 2013 that were petrol or battery and hybrid electric**

The above graph shows the percentage of cars each year between 2013 and 2023 which were registered in Brighton and Hove that were diesel- or petrol-powered vs battery or hybrid electric. This data shows a clear and dramatic transition in consumer choices, particularly between 2019 and 2023, during which time the percentage of cars powered at least to some extent by electricity transitioned from a small minority of registrations to nearly half in 2023. Figure 20 below shows the percentage of vehicles that were specifically battery electric as these have the lowest carbon emissions. There is a significant upward trend before a slight dip in 2023, which could potentially be attributed to the 2023 cost of living crisis.



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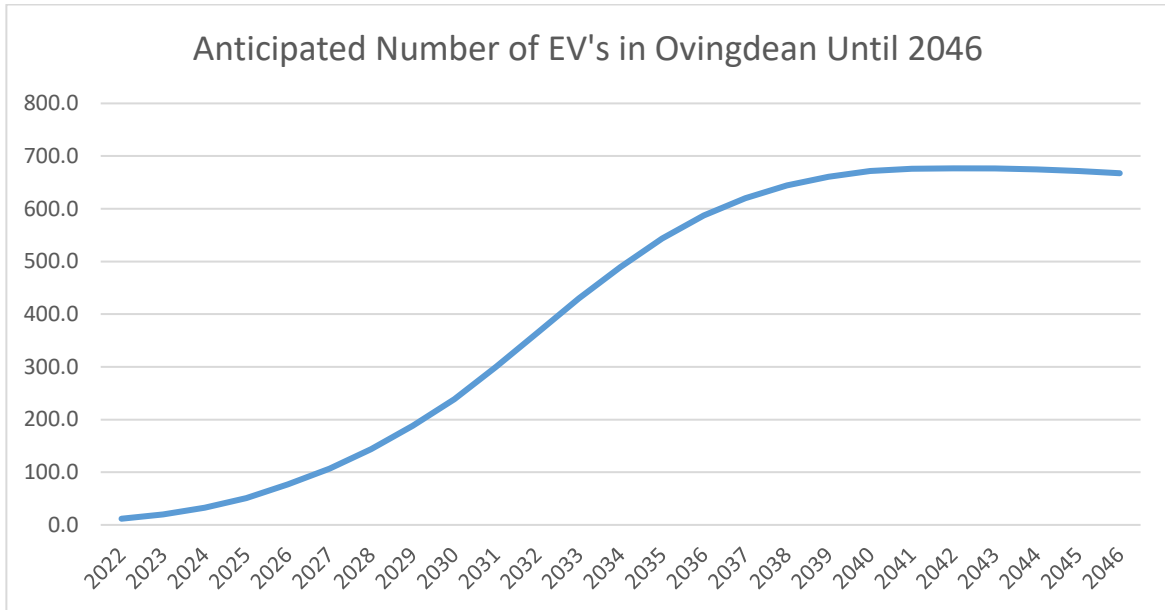
**Figure 21: Graph showing the percentage of cars registered in Brighton and Hove each year since 2013 that were battery electric**

NG ESO, the UK's energy system operator, modelled several future energy scenarios for decarbonising the UK by 2050. Across all future scenarios, cars are primarily electrified, increasing electricity demand and requiring strategies to manage how they are charged and peak demand. It will also require current challenges to be addressed, such as the slow rollout of charging infrastructure. Their 'falling short' scenario, which is the worst-case scenario for the UK estimates 37 million battery electric cars and vehicles by 2040.

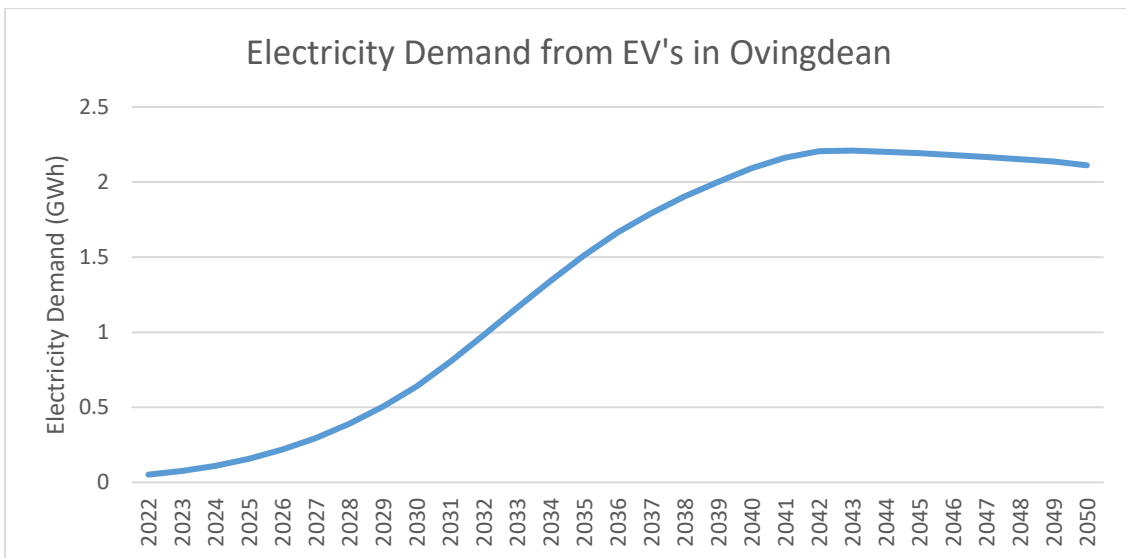


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**Figure 22: Graph showing the number of EVs in Ovingdean each year required to meet UK targets, according to NG ESO Future Energy Scenarios (FES)**



**Figure 23: Graph showing NG ESO predicted electricity demand from EVs until 2050**



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The table below shows the necessary transition to electric vehicles in Ovingdean to meet minimum UK energy targets, according to NG ESO. This should therefore be the target rate of transition for residents to meet net zero. The UK's electric vehicle targets are set earlier than net zero targets, at 2040.

**Table 10: Table showing NG ESO falling short scenario rollout of electric vehicles over time and associated grid demand**

Year	2025	2028	2031	2034	2037	2040	2043
% EV rollout (NG ESO)	6.7%	19.2%	40.0%	65.4%	82.8%	89.7%	90.3%
Number EV Vehicles in Ovingdean (cumulative) (NG ESO)	50	144	300	489	620	672	677
Grid demand (GWh)	0.158	0.391	0.802	1.342	1.792	2.092	2.210

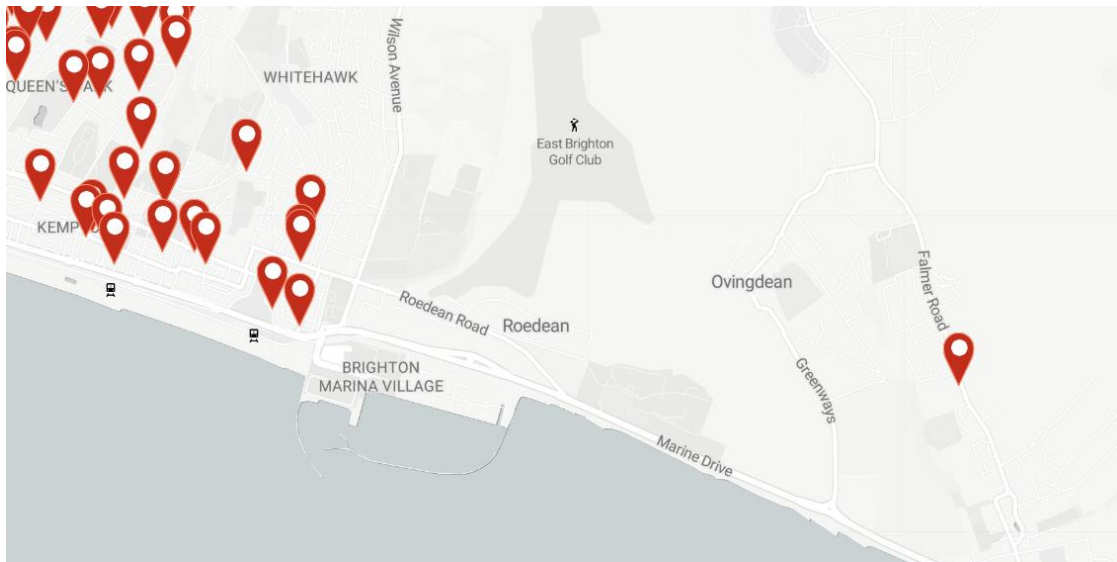
### 1.10 EV Charging Infrastructure

Currently, Ovingdean has no public chargers, as is shown in figure 24, which is a UKPN map of public EV chargers in the area. The closest charger is on Falmer road.

It is the UK Government's intention for there to be 300,000 EV chargers in the UK by 2030. If these were distributed evenly among homes UK wide that would mean Ovingdean would aspire to have about 5 by 2030. Ovingdean has a high proportion of detached homes with driveways and so will likely need less public street chargers than the average residential area for every car to be able to charge frequently enough, although 5 is still likely insufficient.



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**Figure 24: Map of publicly available EV charging appoints around Ovingdean generated by UKPN using information from the National Charge Point Register**

Whilst they are more expensive to charge a vehicle on, public chargers are essential to alleviate range anxiety and for those who don't have off-street parking or cannot afford a home charger.

Brighton & Hove City Council recently received funding to install at least 1,650 new lamppost EV chargers between 2024 and 2027. These are being funded in part by a central government grant of over £440,000 from OZEV (Office for Zero Emission Vehicles), called the Local EV Infrastructure (LEVI) fund, which is covering 60% of the cost, whilst the other 40% is being funded by EV charging operator Blink Charging. Residents of Brighton and Hove can request a charger near their home through an online portal. Priority is given to those who own an EV already and do not have chargers on their street, which none of the streets in Ovingdean do. A good first step in this process would be Ovingdean residents with EVs requesting these chargers from the council.

However, whilst public chargers will be necessary to ease range anxiety and accommodate vehicles visiting the village, according to a report by the Climate Change Committee (18), as of 2020 80% of EV users charge their vehicles at home overnight, which means there will likely also be a preference for home charging in Ovingdean. Additionally, home charging is significantly cheaper when available. For example, Ionity ultra-rapid EV charging costs 63.29p per kWh, which is more than four times as much as home charging. In May 2024 Blink is charging 55p per kWh at public chargers, however this fluctuates with electricity prices. This is roughly equivalent to the cost of driving a diesel vehicle and slightly less than driving a petrol vehicle. In



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comparison, in the best-case scenario (using an EV energy tariff for a home charger, for example Octopus' intelligent home charging overnight), the cost can be as low as 7.5p/kWh, which is around 2.5p per mile.

The price of installing a home charger for the homeowner of a house is around £1,000. For renters, landlords, or those living in a flat, there are EV charging grants available. The grant will offer 75% of the cost to buy and install a socket, up to a maximum of £350. To be eligible you must have adequate on-street parking and permission from local planning and highways authority to install a cross-pavement charging solution. You also must own an eligible vehicle electric.

Infrastructure grants are available for businesses hoping to install multiple chargers, who therefore might have extra costs associated with wiring and charging posts. For even smaller businesses the government will provide £500 per parking space with EV charging and cover 75% of infrastructure costs up to £15,000. Oxford International College and the Village Hall should consider these grants for installing chargers in their communal car parks.

A combination of lamppost chargers (8-10 hour charging time), fast chargers (4-5 hours) and rapid chargers (30 minutes for a full charge) will still be needed in the village to address range anxiety that switching to electric vehicles is likely to cause.

Good specific information on the number of public chargers required to support the number of electric vehicles is not easy to find, however some informed estimates have been made in the table below.

**Table 11: Table proposing a suitable rollout of public and home EV chargers between 2025 and 2040**

Year	2025	2028	2031	2034	2040
Lamppost chargers	3	6	8	9	11
Home chargers	40	145	304	497	545

Supplying these chargers with locally generated electricity would address the price volatility of charging.

As discussed in the battery section of this report, electric vehicle charging is expected to play a significant role in balancing the grid in future energy scenarios, and to help



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this process along bi-directional chargers and compatible vehicles should be considered when making this transition.

## Biofuel

There is insufficient feed stock from the farm in Ovingdean to support any plan around the manufacture of biomethane from the organic matter produced by livestock. Nor is there a designated waste site in the vicinity of the village or a waste site that has been identified by Brighton and Hove City Council as suitable to produce biomethane through the anaerobic digestion process. As such, biomethane to grid is not feasible as a transition fuel for the village.

## Renewable Electricity

Should Heat pumps and EV's be rolled out across Ovingdean, it is evident that to match this rising electricity consumption and reach net-zero carbon emissions by 2050, a rapid transition to renewable energy is required alongside the continual upgrading of grid infrastructure. In the following sections, we outline our actionable recommendations for implementing renewable energy solutions across Ovingdean, based on its specific natural features.

In this report, we focused on solar PV and onshore wind as they represent the most cost-effective forms of electricity and make the best use of the amount of wind in the Ovingdean area. Additionally, as heating has been identified as being responsible for a third of emissions in Ovingdean, and is primarily used in the winter, wind turbines could supply energy when it has the most impact, at a time of year when solar generation does not perform well in the UK.

Our preference for producing home-grown electricity stems from an aim to enhance affordability for residents and ensure security of supply.

### 1.11 Electricity Demand

The table below shows the NG ESO predicted demand due to heat pumps and EVs as previously stated in this report, so that the total required electricity demand for residential homes can be calculated. A row has been included for household electricity consumption excluding heating, calculated from the floor area of homes in Ovingdean given in EPC data, to account for household energy usage such as charging laptops and running a kettle, which has been assumed to stay approximately the same.



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**Table 12: Table showing the electricity required per year in Ovingdean for residential homes until 2050**

	Year	2025	2027	2030	2035	2040	2045	2050
Electricity required (GWh/year)	ASHP	0.111	0.220	0.574	1.402	2.253	2.881	3.094
	EVs	0.158	0.296	0.639	1.514	2.092	2.193	2.112
	Household	2.29	2.29	2.29	2.29	2.29	2.29	2.29
	<b>Total</b>	<b>2.56</b>	<b>2.81</b>	<b>3.50</b>	<b>5.21</b>	<b>6.64</b>	<b>7.36</b>	<b>7.50</b>

Whilst contact has not been made with Oxford International College to request their electricity usage, an estimate has been made based on the carbon dioxide emission given in the buildings' EPC data from 2014. This is a crude estimate as they have likely undertaken some works since then and it's unclear if all the buildings are used in the same capacity, however an estimate is necessary as it's such a large site relative to the village size. It was assumed that full retrofitting could reduce the energy used for heating by 25%, however this will depend on how much retrofitting has already been done and could be higher or lower. To verify calculation, we compared it to the average amounts schools use per square metre, and then took into consideration that the college has boarding students.

**Table 13: Table listing the approximate annual energy usage of Oxford International College based on 2014 EPC data, and subject to different retrofit measures**

Energy usage	Current estimate (kWh/year)	With ASHP replacing gas (kWh/year)	With ASHP and retrofits (kWh/year)
Appliances	410,420	410,420	410,420
Heating	1,608,980	536,327	402,244
<b>Total</b>	<b>2,019,400</b>	<b>946,747</b>	<b>812,665</b>

The total electricity demand has been given below to be matched with renewable generation. We have assumed the college would retrofit by 2027.

**Table 14: Table listing the total anticipated electricity demand of Ovingdean every 5 years**

Usage (GWh/year)	2025	2027	2030	2035	2040	2045	2050

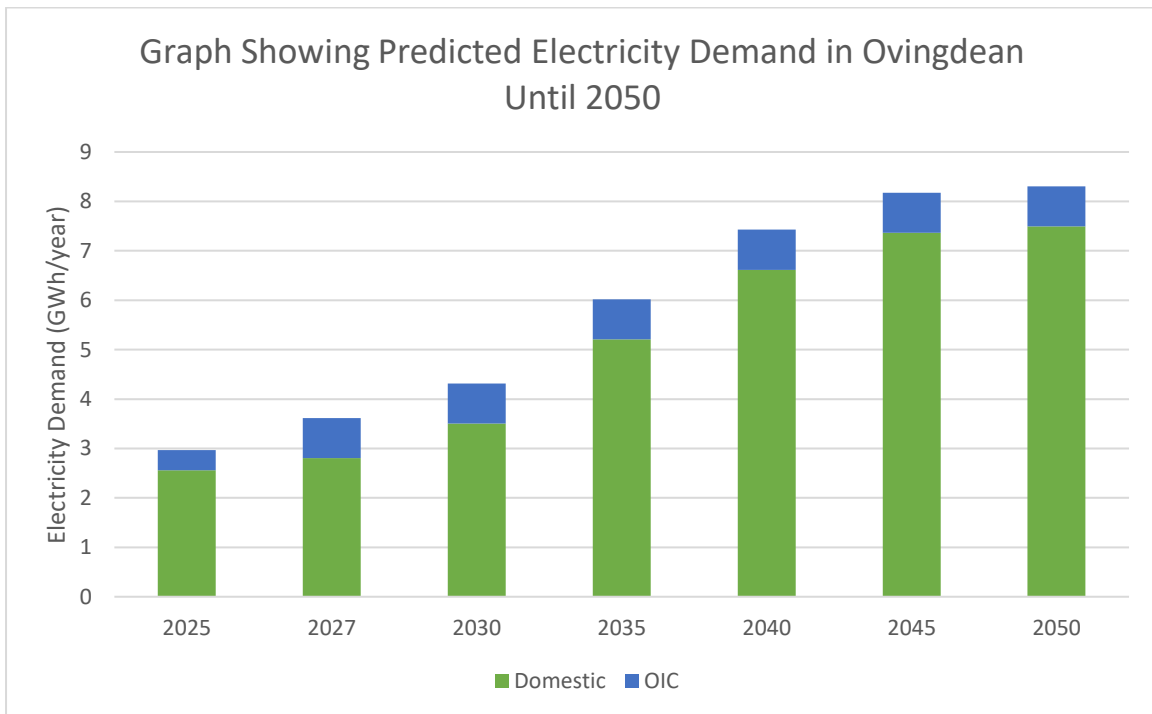


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Domestic (housing)	2.56	2.81	3.5	5.21	6.64	7.36	7.50
Oxford International College	0.41	0.81	0.81	0.81	0.81	0.81	0.81
Total	2.97	3.62	4.31	6.02	7.45	8.17	8.31

This has been plotted below. Whilst the switch of OIC from gas boilers to ASHPs would make total energy usage and emissions go down, the electricity consumption would go up as electricity would be used for heating instead of gas.



**Figure 25: Graph showing the total electricity demand in Ovingdean between 2025 and 2050**

In terms of land use efficiency, onshore wind surpasses solar PV, generating nearly 9 times the electricity per hectare. Regarding costs, solar PV costs are projected to decrease by 73% by 2050, driven by improvements in module capacity and declining production costs<sup>iii</sup>. In the National Grid FES, local distributed energy is underscored as an important component of the nation's future heat and power supply.



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The primary obstacle facing the development of renewable energy generation in Ovingdean is its border with the South Downs National Park, and that a significant part of the village is inside a conservation area, as shown in figure X.



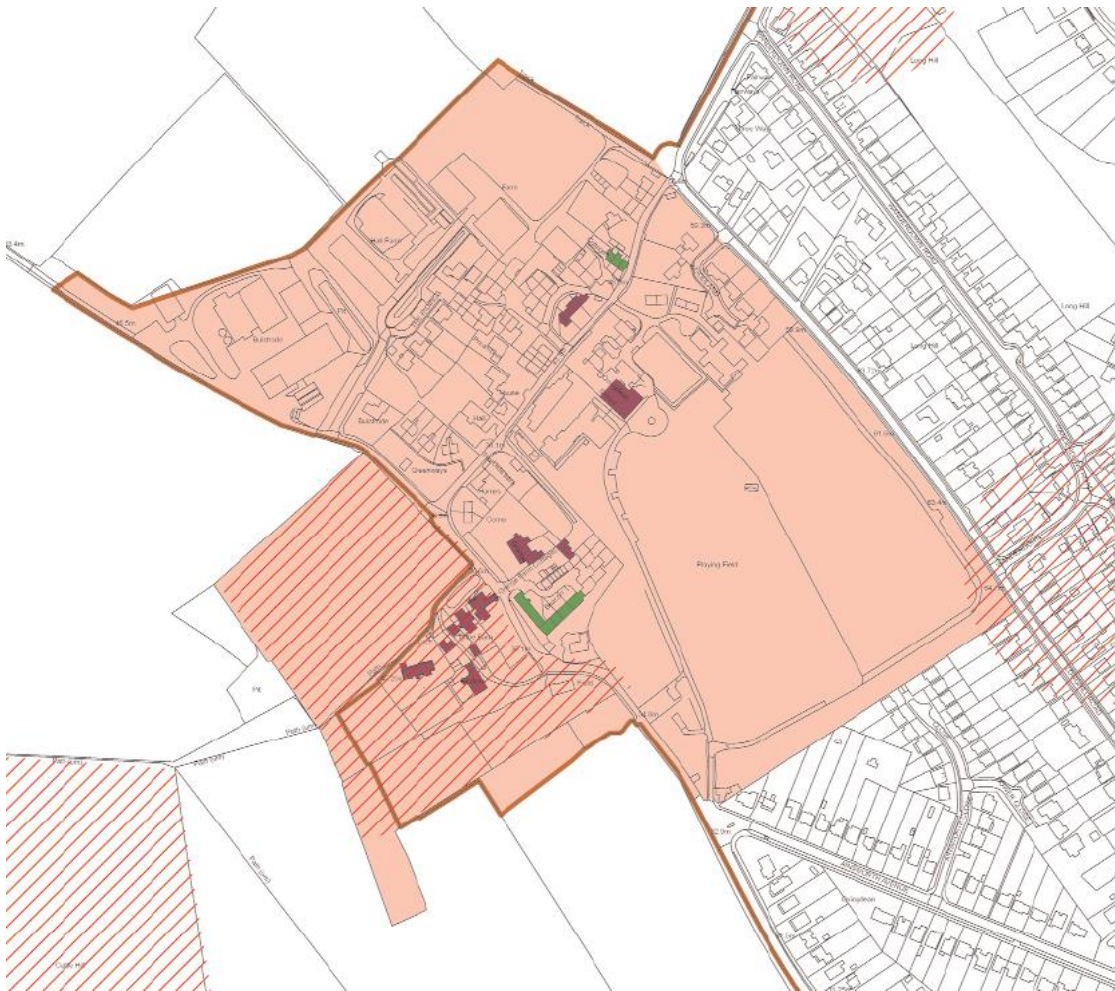
**Figure 26: Map of Brighton & Hove showing the South Downs National Park (yellow) and the conservation areas (brown)**

The South Downs National Park encompasses the village entirely such that any use of land for energy generation would need to be approved by the national park, who have stricter considerations than other areas due to their primary concern of preserving the natural landscape.



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**Figure 27: Map of part of Ovingdean by Brighton & Hove City Council, in which the red area is conservation area, and the purple buildings are listed buildings. (19)**

Figure 27 above shows a map of one area of Ovingdean produced by Brighton & Hove City council, in which the red shaded area represents the conservation area. The green and purple buildings are locally listed and listed buildings respectively.



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Whilst this presents some challenges, in planning advice from the SDNP they site, under 'Developing Community Energy schemes within the National Park', a "Focus on communities that are ready to move fast – and keen to make rapid transition to a low-carbon future i.e. in terms of shifting away from oil fired heating to local scale renewable.". Under pressure from climate change the SDNP have expressed their intention to encourage the take up of micro-generation and community-based renewable projects that 'minimise the impact on the South Downs'.

The SDNPA is offering free pre-application advice for community-led renewable energy proposals.

To develop an approach to meet Ovingdean's electricity requirements until 2050, domestic solar PV has first been considered, as this is the easiest to implement and can be addressed on an individual level. Ground mounted solar and commercial rooftop solar has then been considered as this is second most challenging to implement. Finally, once the maximum generation from solar has been calculated, the remaining amount of electricity that must be generated has been forecast, so that the necessary amount of wind generation can be calculated. This approach ensures that progress is being made as quickly as possible, and also verifies that the proposed amount of wind energy is necessary to supplement solar and meet this challenge.

## 1.12 Solar PV - Domestic

The Climate Change Committee's scenarios for future electricity generation require 22-29 GW of onshore wind capacity and 23-43 GW of solar by 2030, compared to onshore wind and solar capacity of around 13 GW each today (20). If the UK were to aim 43 GW by 2030 this would make Ovingdean's share, proportional to the UK population, around 830KW. Considering the size of the homes in Ovingdean this is very reasonable.

Our approach to investment in solar PV for the region is characterised by the landscape and land characteristics.

An uptake in solar PV from residents of Ovingdean will be important in reducing the emissions from electricity usage, even if planning permission for a turbine is successful, as the planning and construction would likely take multiple years. The uptake in solar panels will also make a switch to heat pumps and EVs more affordable for individuals and frequency of high loads on the grid will be reduced.

Installing solar panels will be particularly important and beneficial for those with EV's, heat pumps or swimming pools. Normally, excess energy will be generated from solar



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panels in the summer as the heating is not being used and the sun's intensity is the greatest, and this extra electricity is sent to the grid for a relatively low compensation. However, for those who have switched to EVs or have pools, this excess can be consumed by charging their vehicles and heating their pools and therefore incur much larger savings, whilst also decarbonising the process.

Individuals with South facing roofs, with few obstructions such as chimneys, will experience the greatest gain.

Outside of a conservation area, solar panels are considered 'permitted development' and do not require planning permission, if they fit standard requirements. Generally speaking, in a conservation area, solar panels are now permitted as long as they do not face a highway, however, the conservation area in Ovingdean is also an article 4 area and is therefore covered by article 4 directions, which remove permitted development rights for solar panels and a planning application is therefore required for solar panels within the conservation area.



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**Figure 28: Google Earth image of the conservation area in Ovingdean**

The figure above shows the google earth view of the conservation area in Ovingdean where the aforementioned planning restrictions would apply. Outside of this area planning permission is not required.

For listed buildings see the planning section for retrofits.



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**Figure 29: Google maps image of part of Wanderdown Road in Ovingdean where some homes already have solar panels**



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**Figure 30: Google Earth image of Wanderdown Way in Ovingdean, where some homes have solar panels in different layouts**

The solar potential of Ovingdean was calculated by averaging the solar potential of a number of broadly representative houses and bungalows and scaling this. Flats were assumed to have none as the sharing of solar energy among multiple tenants of a building is at this point difficult. This could be given more consideration in the future, however as there are only approximately 30 flats in Ovingdean they've been left out of this analysis at this point.



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**Table 15: Estimation of total solar PV potential in Ovingdean using samples of homes and EPC scaling**

Home type	Number (scaled)	Total potential (GWh/year)
House	349	4.4
Bungalow	163	1.96
<b>Total</b>	<b>512</b>	<b>6.4</b>

The table above estimates that if every single home in Ovingdean installed their full solar capacity on the roof, the total generation could be 6.36 GWh/year. This is very unlikely to happen, however it gives an indication of the maximum amount of generation that could be met with domestic solar in a best-case scenario, which still falls short of the 7.5GWh/year demand calculated in the beginning of the renewable generation section.

Although there are not yearly national targets for domestic solar PV, some suggested targets have been laid out in table below. These have been decided based on the anticipated ASHP and EV rollout as the systems will become more valuable at this point and prevent stress on the grid. ASHP rollout has been given more significance as EV's generally charge overnight. If 65% of homes were to install solar PV the village could be generating over half of the electricity it requires each year, including increased demand for ASHP and EV charging.

The figures in the table below assume an average system size of 12kWp.



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**Table 16: Table listing the target uptake of domestic solar PV in Ovingdean until 2050 and corresponding electricity demand**

Year	2025	2030	2035	2040	2045	2050
Domestic GWh/year required in Ovingdean	3.0	4.3	6.0	7.4	8.2	8.3
% of homes with solar PV	7	25	40	55	60	65
Number of homes with solar PV	38	136	218	299	327	354
GWh/year met by domestic solar PV	0.445	1.6	2.56	3.52	3.84	4.16
GWh/year met by non-domestic solar PV	0.74	0.74	0.74	0.74	0.74	0.74
Remainder to be met by larger installations (GWh/year)	1.78	1.97	2.72	3.17	3.60	3.41

Domestic rooftop solar can be rolled out using three channels:

1. **Community Energy:** Existing community energy groups or interested champions can be recruited to work directly with local installers.
2. **Energy suppliers:** Octopus Energy offer a solar PV home installation service. The difference between the offerings will be the community benefits available as Octopus Energy is a commercial enterprise.
3. **Commercial contractors.**

BHESCO recommends undertaking a co-ordinated effort, based on the properties identified as suitable for solar in this study, to roll out the installation of solar panels in



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Ovingdean. If this were to be coordinated on a collective purchasing basis, it is likely that the installation cost per household would decline.

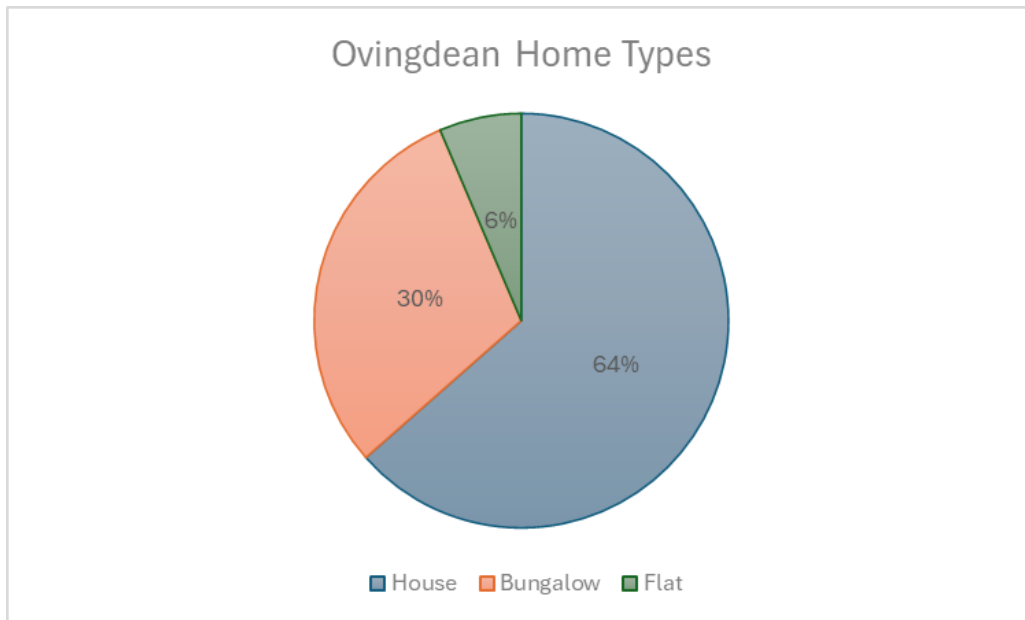


Figure 31: Graph showing the distribution of types of homes in Ovingdean according to EPC data

Solar arrays are currently complicated on flats or buildings where there are multiple occupancies under the same roof. However, solar energy sharing technology and schemes are being developed and in the future this will become more feasible for flats and renting tenants.

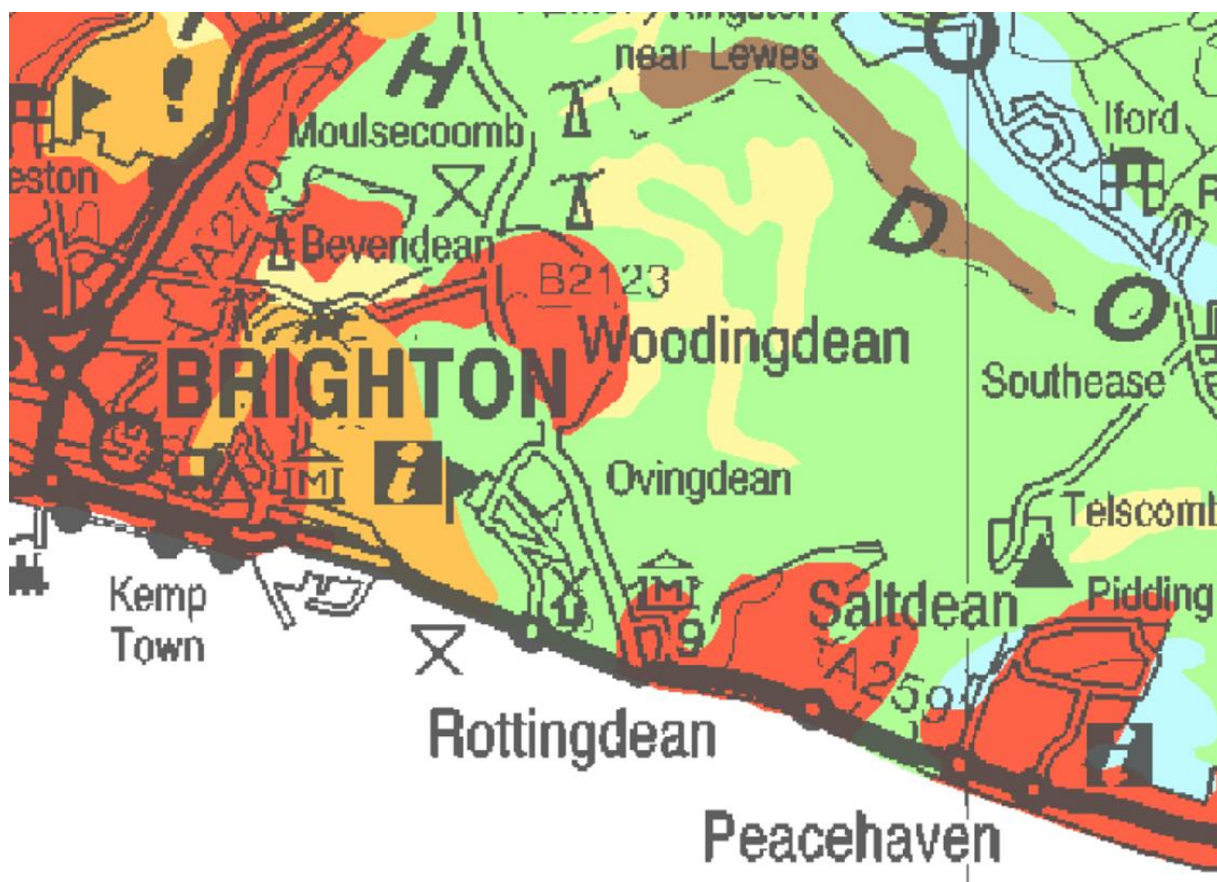
### 1.12.1 Ground Mounted Solar

Ground mounted solar is an alternative to rooftop solar, in which panels can be mounted on angled frames on unused land or grazing land. The angle is usually 10 to 40 degrees, depending on the position of the area and how much sun or shade it gets.



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**Figure 32: Map of different agricultural land grades in Ovingdean, in which green denotes good/moderate**

For ground-mounted solar there is a strong preference in planning for land to be used that is not high enough quality to be used for agriculture. In the above image, green signifies good to moderate agricultural land grade, which is deemed 'acceptable' for ground-mounted solar. Light blue would suggest the land was most suitable for farming and therefore unlikely to be considered as a location for ground-mounted solar panels. Red is land in predominantly urban use. According to the council the entirety of Ovingdean is grade 3 farmland, and the SDNP rates the open grassland that surrounds Ovingdean as amber for ground mounted solar. These considerations combined suggest that an attempt install ground mounted solar farm in Ovingdean would not be immediately discounted but would face some reasonable push back.

In the TAN advice published by the SDNP, there is mention that ground mounted solar farms can also create habitats on the same piece of land, for example by turning it into a wildflower meadow, as there are significant spaces between and around the



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panels to prevent them casting shade on the panel behind. This could make the farm more appealing and impactful for very minimal cost, whilst also offering value to local farmers and farmland.

St Wulfran's church have indicated that they would be interested in utilizing spare land for this should they receive permission from the diocese and Brighton and Hove City Council.



**Figure 33: Map of Ovingdean generated by UKPN identifying areas (red) which they consider unsuitable for PV developments**



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**Figure 34: Land owned by St Wulfran's Church that the church has shown interest in using for ground-mounted solar**



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**Figure 35: Land owned by Oxford International College that could be suitable for ground mounted solar as it's not used as playing fields**

Oxford International College in Ovingdean has spare land that could be turned into a solar farm to help negate its very significant energy usage (currently around 2GWh/year approximated from EPC data). They have not yet been approached about this, however a potential area of unused land has been identified in figure 34. Should they insulate and switch from gas to ASHP their total energy usage is expected to decrease, but still be a very significant 0.81GWh/year.



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### 1.12.2 Rooftop Solar – Nondomestic properties

The following section identifies a best-case scenario for uptake of solar PV on commercial roofs. None of the building owners have at this point been propositioned or agreed to install a solar system.

The main commercial building in Ovingdean is the Oxford International College. Estimates of solar capacity have been done building by building as its unclear which roofs would be suitable or unsuitable without a full assessment of the site. The Ovingdean Hall itself has not been considered as it's a listed building.



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Figure 36: Google maps image of Oxford International College with labelled buildings corresponding to table 17.

Table 17: Table listing the estimated solar PV capacity and annual generation of the buildings labelled in figure 36

Building Number	Estimate kWp	Estimated Annual Generation (kWh)
1	31.3	29,891
2	31.3	29,891



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3	17.8	16,999
4	6.1	5,825
5	16.5	15,758
6	17.8	16,999
7	28.9	27,599
<b>Total</b>	<b>149.7</b>	<b>142,962</b>

The farm has also been considered, however BHESCO are aware that the roof is asbestos and as such this would be a more complicated installation with potentially higher cost.



**Figure 37: Google earth image of Ovingdean farm building roofs, labelled for solar potential analysis**



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**Table 18: table listing the estimate solar PV capacity and annual generation of the roofs labelled in figure 37**

Building Number	Estimate kWp	Estimate Annual Generation (kWh)
1	434	414,470
2	174	166,170
<b>Total</b>	<b>608</b>	<b>580,640</b>



**Figure 38: Google earth image of Ovingdean Village Hall**

Finally, Ovingdean Village Hall has been considered, which has one roof with a capacity of 18.3kWp. The total potential of these buildings has been summarised in the table below.



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**Table 19: Table listing the estimate solar PV potential and annual generation of the commercial roofs in Ovingdean**

Site	Estimate kWp	kWh/year
Farm Buildings	608	580,640
Oxford International College	149.7	142,963
Ovingdean Village Hall	18.3	17,448
<b>Total</b>	<b>775.97</b>	<b>741,051</b>

The total commercial solar potential is 0.74 GWh/year, although this is a maximum as it's unlikely the building owners would agree to this quantity of panels or that all the roofs would be suitable. This could only be determined with a survey and full site assessment.

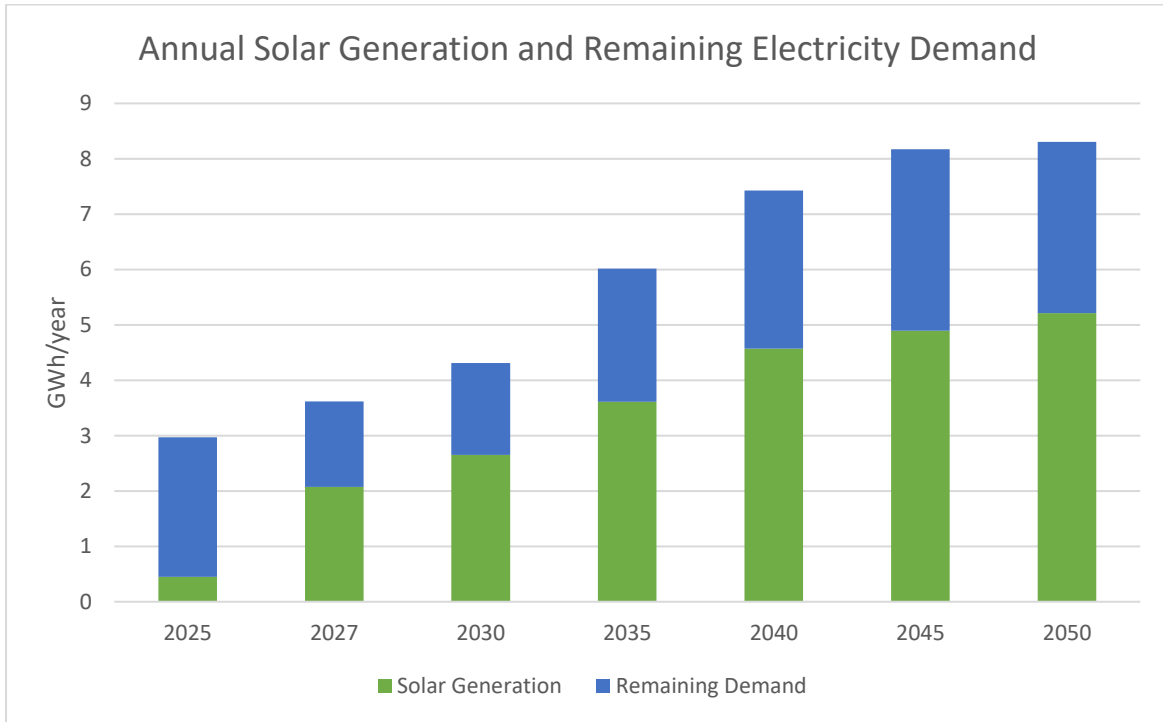
### 1.13 Onshore Wind Energy

Once the maximum plausible generation from solar PV was calculated, the remaining requirement was forecast so that a wind turbine size could be proposed.



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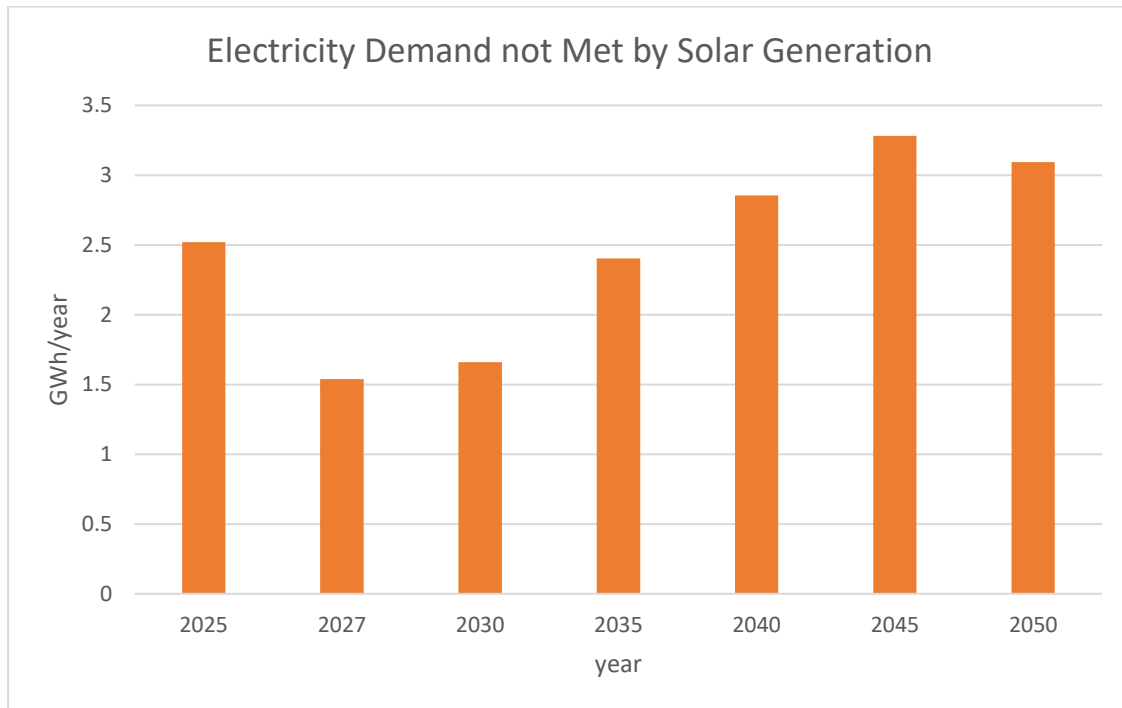


**Figure 39: Graph showing the total proposed solar generation each year and remaining electricity demand to be met by other means of generation**



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**Figure 40: Graph of remaining electricity demand to be met by wind power, in GWh/year**

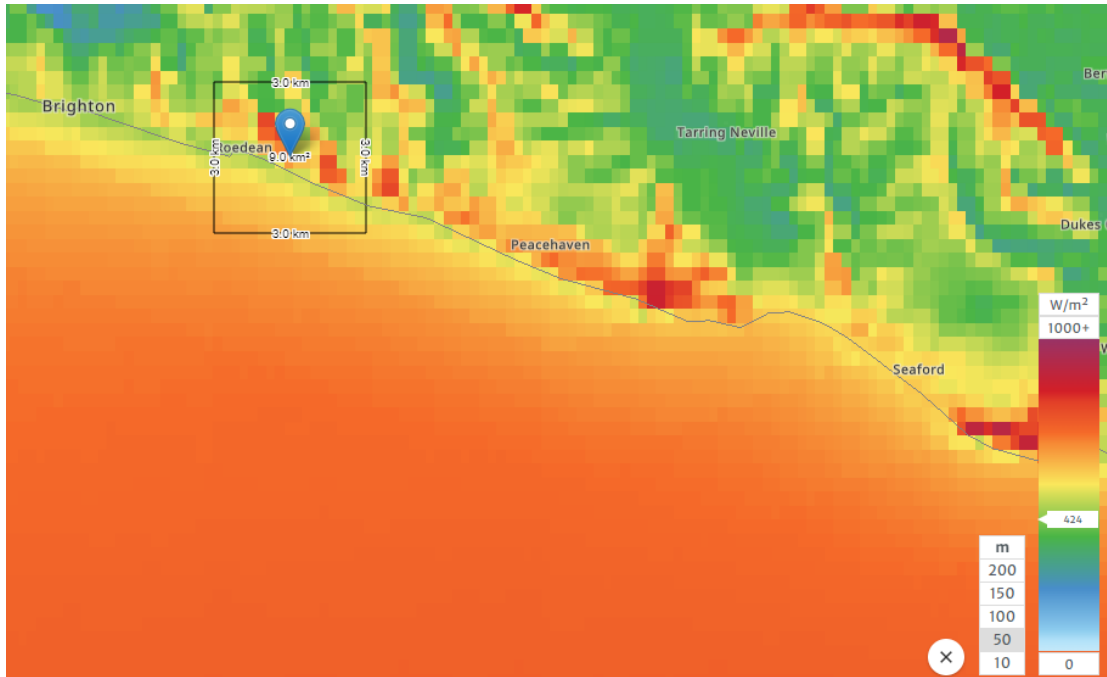
As can be seen from the graph, this number varies as different technologies are adapted in different years, however a minimum additional 3 GWh/year will need to be generated as 2050 approaches for Ovingdean to be net zero, even if the ambitious solar targets laid out are met.

We suggest an assertive approach to onshore wind development in areas where it is economically and socially sensible for the community by including proposed sites for development in the local plan. Onshore wind is the cheapest form of electricity<sup>iv</sup>, The larger the turbine, the more economical the construction and consequently, the lower the electricity price to the consumer. When the economics of onshore wind are optimised, so is the benefit derived. For this reason, we are proposing a 2.5MW turbine, as based on consultation with other onshore wind developers, any smaller capacity would not be economically attractive. To obtain the wind speeds required, a smaller turbine would have to be moved up onto a hill to become financially feasible, where it would be more of an intrusion on the inland landscape views, making it less likely to obtain planning permission from the South Downs National Park.



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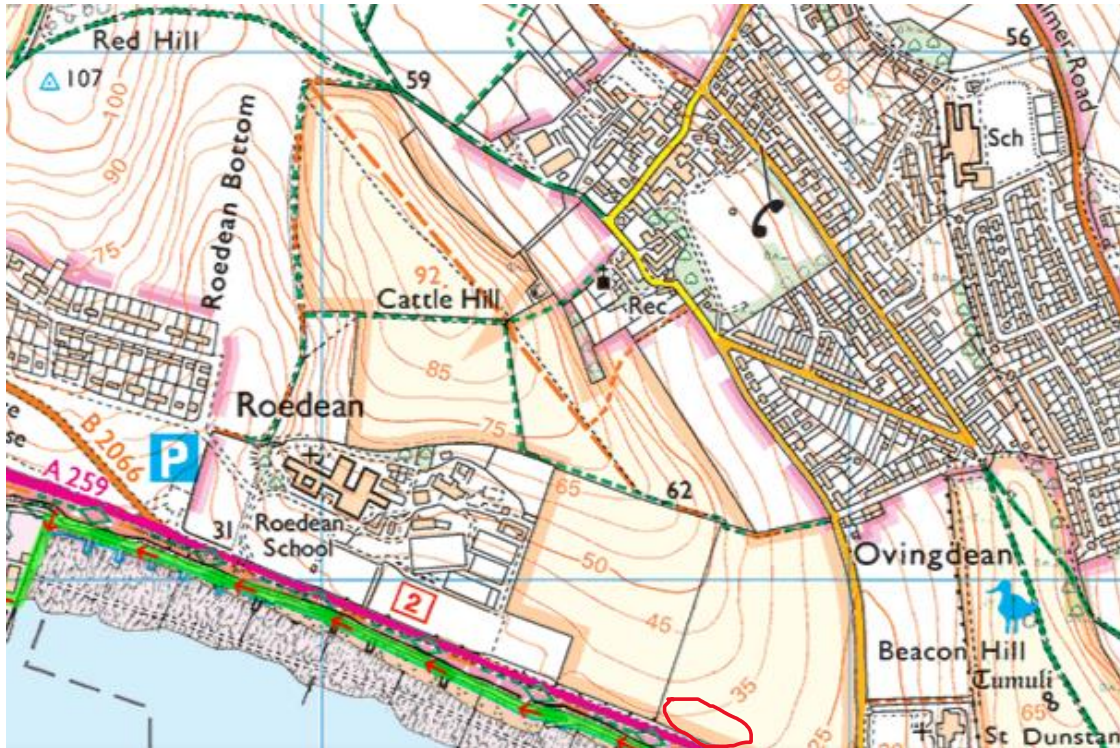
**Figure 41: Windmap from Globalwinds model of Brighton and Hove at 50m height**

An important factor regarding size is that the turbine blades must be transported whole to the site, making good access and logistics a requirement to assemble turbines of a certain size. As the proposed site is located near a main road by the sea, it is anticipated that it would lend itself to good access for installation of the turbine blades.



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**Figure 42: Map showing elevation above sea level at different parts of the proposed turbine site**

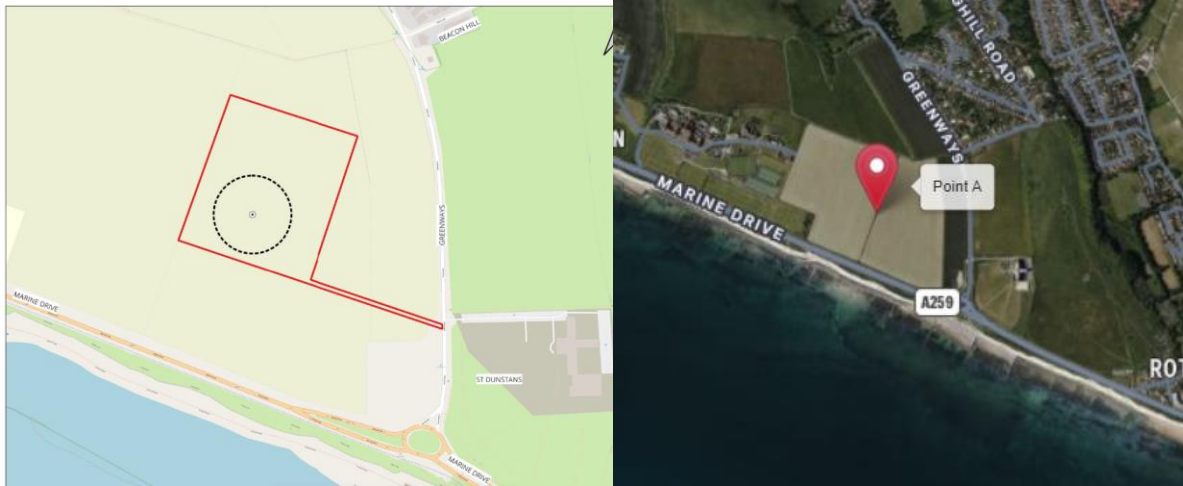
The proposed turbine location has been selected to give the community the greatest chance of a successful planning application. It is hoped that by positioning it away from the hills, beside the road in view of Rampion wind farm, the impact on the landscape of the park will be considered minimal. According to general UK advice the turbine should be at least its 'topple distance' from any roads for safety reasons, which is its total height. This plan adds 50m to this as a precaution.

Initial investigation has been carried out into the presence of pipes under the ground in the area, which would obstruct the foundations of a turbine. It was found that there are no major gas mains in the area, according to the Southern gas Networks, or ESP utilities. A concern was raised by a resident about Southern Water pipes in this region however none are present on available maps. A more thorough check will need to be carried out should this go ahead for verification, although the turbines ground diameter will be minimal so this should not pose a significant placement challenge.



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**Figure 43: Site location plan (left) and Google Earth image (right) of the proposed turbine site, BN2, (50.809, -0.076)**

BHESCo are proposing a 2.5MW turbine, with a hub height of approximately 85 metres. Current SDNP legislation is that wind turbines should be maximum 100kW, unless a strong case can be made for an exception. 100kW for wind is not feasible economically and it is virtually impossible to find a supplier and installer for this size wind turbine. Only one wind turbine will fit on the land available to site it.

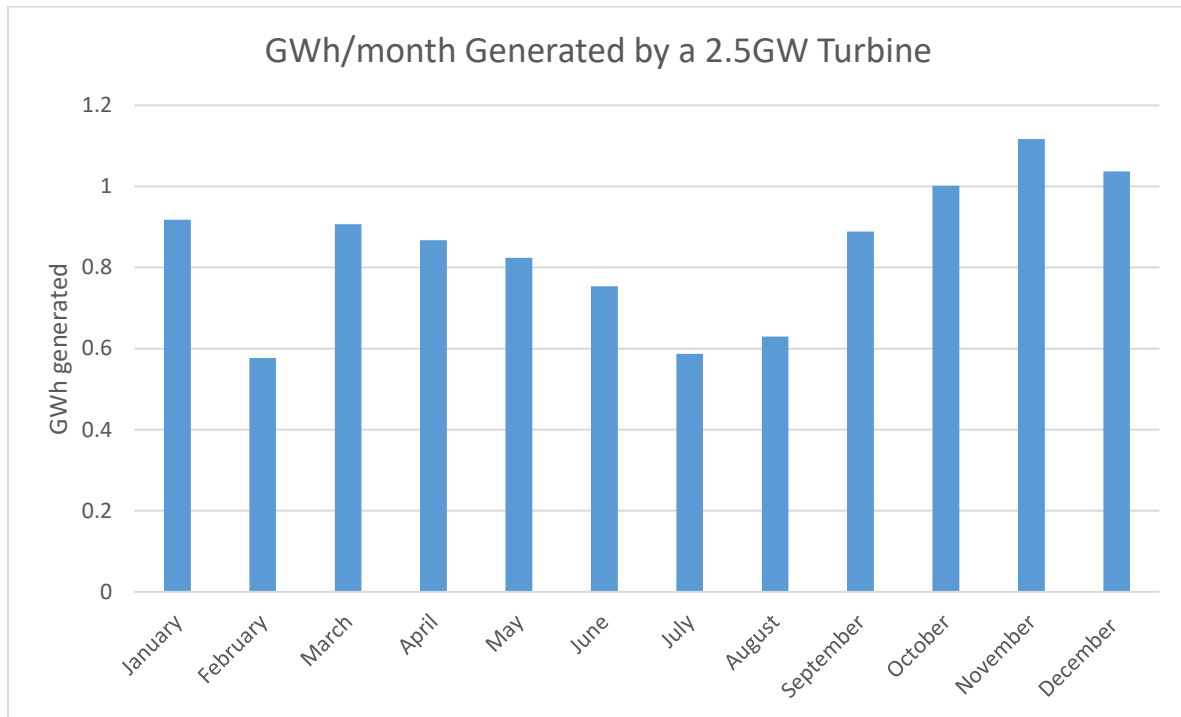
**Table 20: Dimensions and generation of a 2.5MW wind turbine**

Size Turbine	Total height (m)	Approximate annual generation (GWh/year)
2.5MW	135	10



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**Figure 44: Estimated monthly generation of a 2.5MW wind turbine in the proposed location (GWh/month)**

Figure 44 shows the approximate monthly generation of the proposed wind turbine, . This graph demonstrates how the generation of wind turbines in the UK approximately matches when electricity demand will be highest due to domestic heating. Therefore, whilst the turbine produces more than is required annually, this is beneficial as the demand is not consistent over the year, and more electricity will be needed in the winter months.

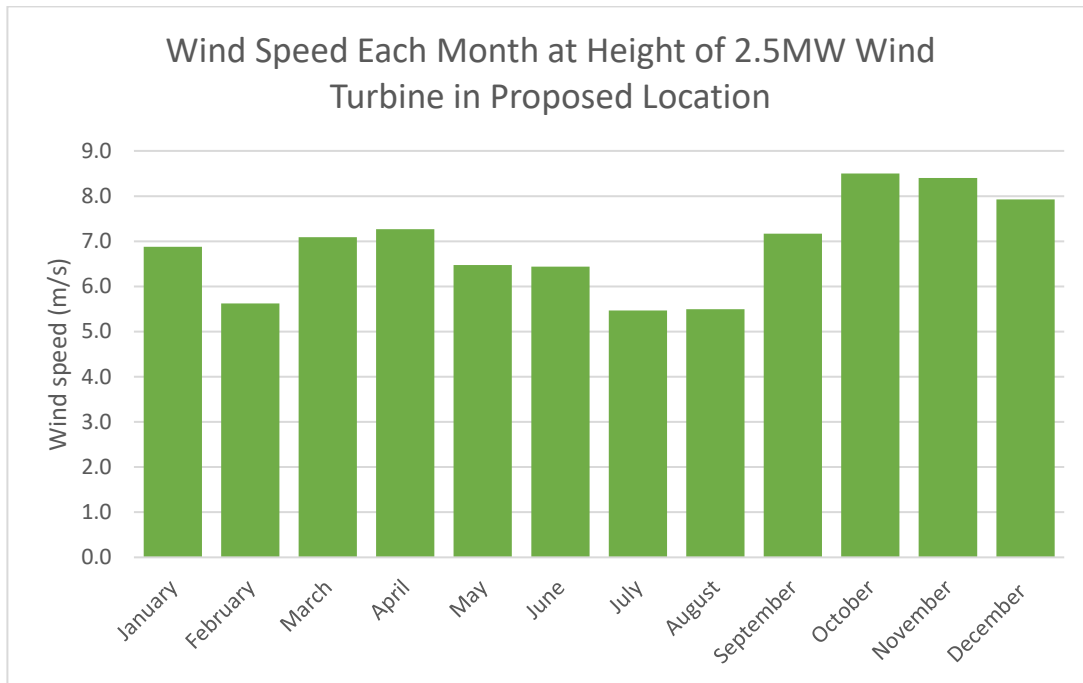
Windspeeds were checked using RenSMART and GlobalWinds, which are publicly available models that predict wind speeds at different heights in specific locations based on the topography of the land and other parameters. These were then checked using available measured wind data at Newhaven. This is an appropriate estimate for initial economic modelling; before a planning application is made measurements need to be taken on site over the course of a year, at the chosen turbine hub height, using either a mast and anemometer or a LiDAR system. LiDARs don't require planning permission to install as they just sit on the ground, however, may require a battery and generation system if the site is too far from mains electricity. Both will incur significant cost, as the anemometer must be on a specially made mast, and



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the LiDAR must be rented and monitored for a year. For this reason, measurements have not been taken at this stage.



**Figure 45: Graph showing the approximate wind speed in each month of the year at the hub height of a 2.5MW turbine at the proposed location**

With a 2.5MW turbine the needs of Ovingdean could be met, as well as additional exporting of electricity to local areas in an attempt to tackle fuel poverty. We see this as a particular benefit to neighbouring communities in Saltdean and Whitehawk.

### 1.13.1 Planning permission – Wind Turbine

According to BHCC and SDNP planning authorities, all onshore wind turbines except for small-scale domestic turbines require planning permission.

When it comes to planning permission for wind power, particularly in the national park, there are a wide range of considerations. Whilst many of these are technical, which will be discussed, the SDNP has in recent years indicated a strong interest in community lead renewable energy generation proposed by residents based near the development site, projects lead by co-operatives, and projects which help address fuel poverty, for which it claims it will make certain allowances. As such, we are including provision for neighbouring communities where energy affordability



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presents more of a challenge. SDNP is updating its local plan, where guidelines concerning planning regulation for onshore wind turbines is explicitly detailed.

Any application will be strengthened significantly if it is in the Neighbourhood or Local Plan, which this proposition intends to be, as opposed to being pursued commercially creating our expectation of some lenience. We would also make the case of economic benefit to override any perceived landscape impingement, as we have numerous examples of flexible application of the regulation depending on the importance of structure and the opinion of the viewer.

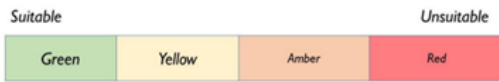
Community support will play a very significant role. In September 2023, the government updated the NPPF to provide that local planning authorities should approve planning applications for an onshore wind farm if, alongside other considerations, the proposal has community support, and the community are aware of and accept the implications of the turbine.

With these considerations in mind, the figure below produced by SDNP presents the primary obstacle that must be overcome or outweighed for a successful planning application in this circumstance.



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Key:



Landscape Character Type	Key Sensitivities for this landscape type	Rooftop solar	Free-standing solar array	Air Source Heat pump	Ground source heat pump	Biomass heating (wood fuel)	Farm-scale anaerobic digestion	Hydro-electric power	Wind turbine
A. Open Downland	Open uninterrupted skylines Iconic views Sense of tranquillity and remoteness Unimproved chalk grassland and chalk heath	Green	Amber	Green	Green	Amber	Green	Red	Red
B. Wooded Estate Downland	Large areas of ancient woodland Intact hedgerow network Chalk grassland	Green	Yellow	Green	Yellow	Yellow	Green	Red	Yellow
C. Clay Plateau	Deciduous woodlands Intact hedgerow network Historic parklands	Green	Yellow	Green	Yellow	Yellow	Green	Red	Yellow
D. Downland Mosaic	Prominent skyline of open ridge Chalk grassland Deciduous woodland Intact hedgerow network	Green	Amber	Green	Yellow	Yellow	Green	Red	Red
E. Chalk Valley Systems	Chalk rivers and associated springs, meanders riffle and pools Floodplain meadows and areas of wet woodland	Green	Amber	Green	Green	Yellow	Green	Yellow	Red
F. Major Chalk River Floodplains	Flat open valley floors Meandering channels Floodplain meadows, trees ponds and other wetland habitats	Green	Amber	Green	Green	Yellow	Green	Yellow	Red
G. Major Chalk Valley Sides	Steep valley sides, in some areas cliffs An upper slope of chalk grassland and lower slope woodland and hedgerows	Green	Red	Green	Green	Yellow	Green	Red	Amber

8

**Figure 46: Table showing the classification of land in the South Downs National Park and their stance on its suitability for different renewable energy technologies (21)**

The table above shows the suitability of different kinds of land in the South Downs National Park for different methods of renewable energy generation. The area surrounding Ovingdean is classified as 'A, Open Downland' which means that without arguments made to overcome this barrier, it is classified as unsuitable for wind turbines, due to its supposed impact on the "long views" across the landscape.

Regarding landscape impact, the SDNP say the following, in their 'TAN' planning advice, which provides guidance on small-scale energy schemes for individual building, or larger schemes if they are 'part of a project designed and lead by the local community'.

"All forms of development are expected to conserve and enhance the landscape character in the National Park. To achieve this, development is required to take a landscape-led approach to design, which for renewable energy projects means using an understanding of landscape (which includes buildings) to inform the choice of renewables, the location and the design of technology proposed."



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The exact impact on the landscape will be assessed by a Landscape Visual Impact Assessment (LVIA), which will be required with reference to SDNP A View Characterisation & Analysis Study. This assessment is necessary to apply for planning permission and assesses the location for any important views or landmark it might impact. Consideration will need to be given as well in this case to the impact on the view from listed or conservation areas in and around Ovingdean.

Whilst the landscape assessment presents an important barrier, by situating the turbine nearer the road within view of Rampion wind park, Roedean School and Blind veterans UK (formally St Dunstan's), any concerns of impact to the landscape could be negated, if not outweighed by the economic, social and environmental benefits to be derived.

In addition to the landscape impact, evidence will be required on the ecological impacts on bats and birds. If the turbine is situated near the road, glint from the blades will need to be considered to prove that this will not cause harm to drivers. It may also be necessary to consult with the MoD and nearby airport authorities to ensure there are no aeronautical, telecommunications or defence impacts.

Alongside these necessary assessments, a strong social argument must be made, which details the way in which the turbine has been designed to meet community energy needs, and the way in which overflow energy could benefit the community through a fund, potentially supporting those experiencing fuel poverty, or as we propose, to enhance woodlands and other carbon sinks. The support of residents must be evident, as well as emphasis of support from Ovingdean Community Energy group and management by BHESCo, a mutual society/co-operative. Additionally, the carbon emissions saved by using wind power over energy from the grid must be detailed, specifying the benefits of this solution over alternative renewable energies, such as solar power must be proven and explained, as the park shows a strong preference for these alternatives.

## 1.14 Grid Constraints



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**Figure 47: Ovingdean's nearest primary substation, named Rottingdean 33kV (22)**

According to UKPN, the Rottingdean 33kV substation, which serves Ovingdean, currently supports 1.385MW of solar generation.

The graph below shows the capacity of this substation as well as the amount of unused capacity UKPN predict there will be between now and 2050. As can be seen from the graph, it's expected to become insufficient by 2045 for their anticipated consumer transformation scenario.



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### Capacity for demand in Future Scenarios <sup>1</sup>

Note: Unused substation capacity (headroom) is indicative and may be already contractually-committed to specific customers.

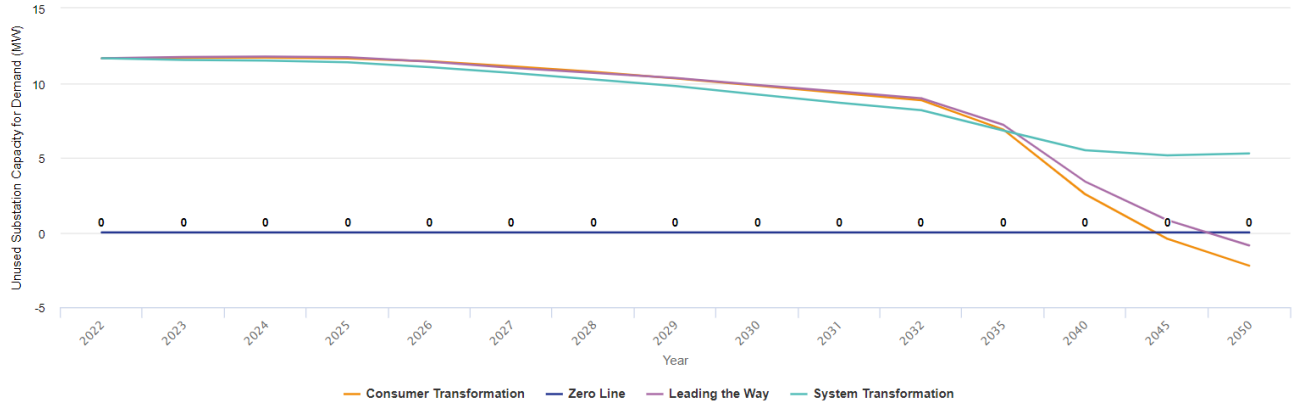


Figure 48: UKPN graph of forecast capacity of Rottingdean 33kV substation until 2050 (22)

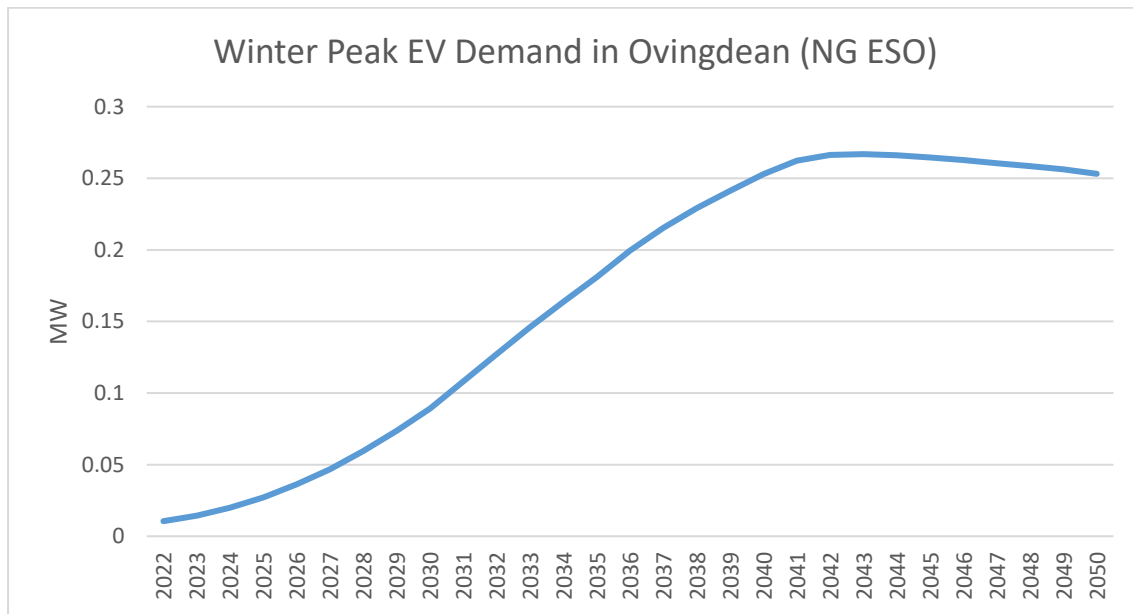


Figure 49: Graph showing the winter peak EV demand in Ovingdean according to NG ESO FES falling short scenario



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## 1.15 Energy Storage

Local storage can be used to achieve three aims:

- 1) to overcome grid constraints,
- 2) to mitigate the expense of grid reinforcement,
- 3) to provide flexibility on the distribution network.

Battery storage at the distribution network level can be a way of storing generation supplied locally using a “behind the meter” business model, a straightforward way to avoid costly reinforcement associated with grid constraints. This means that the power generation is connected to the battery and not to the grid supply to ensure that the power does not impact the grid. By working collaboratively with battery storage aggregators, applicants looking to connect clean energy generation at their sites can determine the economic benefit of such a business model.

Depending on the storage capacity and if there is some headroom at grid level, batteries could be used to provide a source of flexibility at the distribution level.

Some amount of battery storage in homes will also be necessary, however there are upcoming technologies which will factor into this. One consideration that is presumed to reduce the need for battery storage in Ovingdean is vehicle-to-grid (V2G) charging, which is a technology that allows for electric vehicles to discharge power from their batteries back to the grid when there is high demand, and recharge later when grid demand is lower for better stability. The technology enables bi-directional charging. This means of storing energy is by far the most cost-efficient as it does not require additional investments in hardware (23).

V2G has enormous potential to help stabilize the grid in future and reduce the need for alternative battery storage, however at the present only a very limited number of cars and chargers are available to participate. According to Octopus Energy, who currently offer the first V2G charging tariff, the only compatible vehicles at the moment are the Nissan Leaf, Nissan e-NV200 and Mitsubishi Outlander PHEV. Octopus Energy also specifies a bi-directional charger necessary for functionality. Every participating home would need a smart meter (24).

It is assumed by NG ESO that this technology will play a significant role in future energy scenarios. We have included it in our modelling, due to the financial attractiveness of this storage option, to determine what additional battery storage will be necessary.



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We have looked at three cases to explore the need for battery storage:

- Case 1 - Providing sufficient storage to mitigate peak loads from ASHPs in the evening peak period.
- Case 2 – an optimal storage size, based on analysis at a half-hourly resolution over a calendar year.
- Case 3 – storage required to mitigate the effects of excess wind energy on the distribution network.

### 1.15.1 Case 1 – ASHPs in the Evening Peak

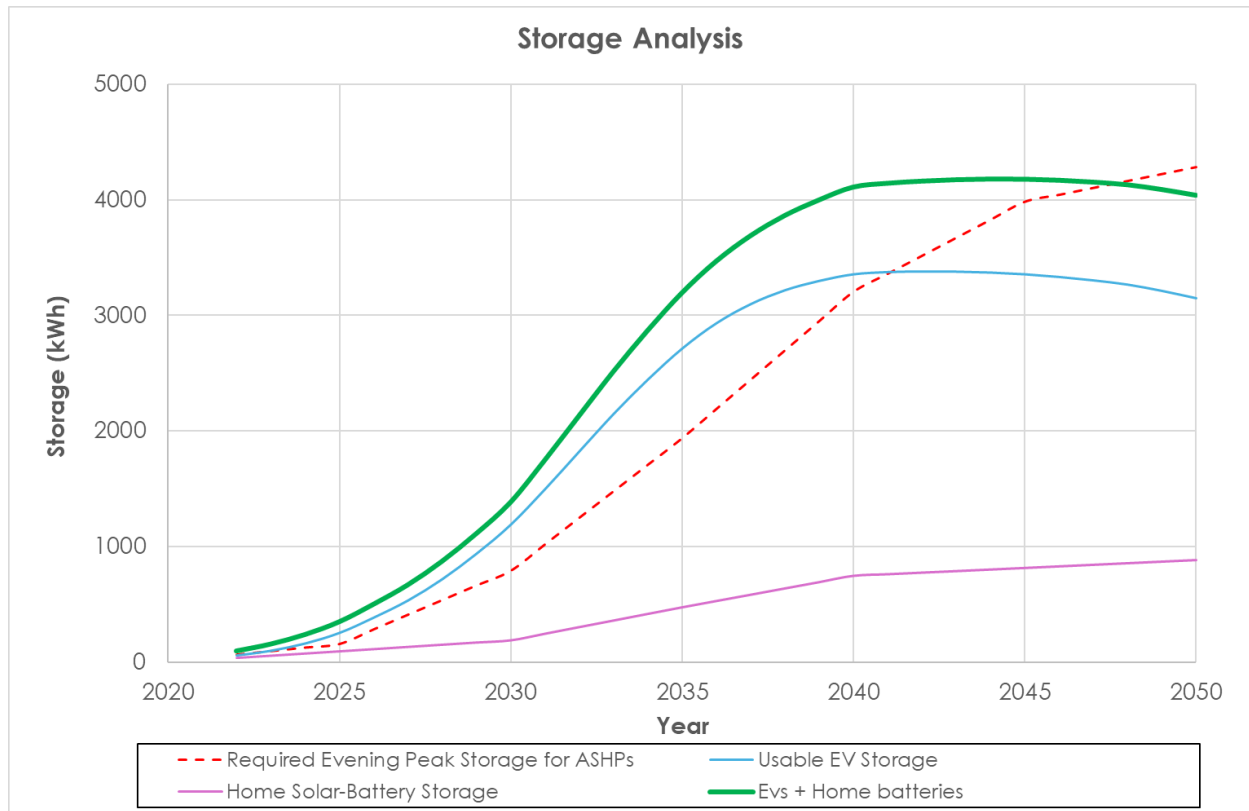
For this first case the amount of storage required to run ASHPs for three hours through the evening peak was determined. This is to minimise electricity imports from the grid. The graph below illustrates this case, and makes the following assumptions:

- The yearly uptake of EV vehicles given in the EV section of this report is met, and they are not charged during the early evening, when electricity is most in demand and expensive.
- It was assumed that 50% of EVs would be able to discharge during the evening peak, i.e. sufficiently charged and connected to the grid. It is also unlikely that vehicle owners would allow their batteries to be fully discharged, in case they wished to make a journey later in the evening. Hence, it was conservatively assumed that owners would allow 25% of the batteries' capacity to be discharged.
- The yearly uptake of domestic solar PV systems given in the domestic PV section of the report in the village is met.
- The yearly uptake of ASHP given in the ASHP section of the report is met, and the average size of the ASHP is 10kW, which is standard for a 4-bed home.
- 50% of people who install a solar PV system install a 5kWh battery as part of the system.



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**Figure 50: Graph showing the amount of battery storage required to meet peak heating electricity demands until 2050 and how much of this can be met by EV batteries and home batteries, assuming 50% of solar PV systems include a 5kWh battery**

It is also noteworthy that the available EV storage capacity decreases after 2043. This is because NG ESO forecast that the number of EVs in the village slightly decrease between then and 2050. However, the graph shows that, should the aforementioned criteria be met, no additional battery storage would be required to prevent problems with demand on the grid until 2047. The storage required would be met by EV batteries and home batteries in half of homes with PV systems, which has been given as a conservative estimate, as although batteries in PV systems are beneficial to the home, they do increase upfront cost and so some people will likely opt out. The storage deficit after 2047 is minimal and far enough in the future that it will be subject to many shifts in technology that cannot be anticipated within the context of this report. This graph has been plotted to estimate the battery storage needed to ensure ASHP in every home can be powered at peak hours in the evening. The demand could be further reduced if people at home earlier in the day could pre-heat their homes for the evening a bit earlier than peak times. We anticipate that default settings for smart



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energy management will be standard features of future technology. Additionally, the average size of an EV battery has been assumed to be 40kWh which is the current average – this will likely increase in future and further reduce the problem.

Once batteries have discharged over the evening where there is peak usage, they can be recharged overnight when there is additional wind energy being generated.

### 1.15.2 Case 2 – Optimal Storage Size

Analysis has been undertaken to optimise the storage required for the village. Analysis was performed at a half-hourly resolution. Consumption profiles were developed using the following sources:

- Heat pump heating and hot water profiles, (25).
- Electricity consumption for appliances was used to develop an electricity consumption for the village, with a different daily profile for each season. (26)
- The EV charging profile assumed a future time-of-use tariff system would discourage charging in the morning and evening peaks. Hence only 10% of charging was assumed to occur in these peak periods, with the remaining 90% of charging occurring between 11am-4pm and 11pm-6am periods. This would encourage the use of excess renewable energy.

Energy generated from the wind turbine was determined using the previously mentioned wind speed sources, plus hourly wind speed data from the nearest weather station at Newhaven (27). This data was corrected for the Ovingdean location and turbine hub height. Hourly solar generation data was obtained from PVGIS (28). BHESCo then modelled the consumption and generation data at a 30-minute resolution, and estimated the energy that would be stored with different battery sizes. The analysis was run over one calendar year.

**Table 21** summarises the proportions of consumption that would be met from wind and solar power with and without battery storage under different scenarios. There are different means of defining battery storage. An economic method could be used. However, at this stage, the optimal storage volume was defined as the point where adding a further 1MWh of storage capacity allowed less than 1% more of the village's annual consumption to be met by the renewable sources. This suggested that circa 4 MWh of battery storage would be required at 2050, assuming that solar installations provide 4.9 GWh/year, and EVs are deployed as forecast previously (Scenario 4). In an alternate scenario (scenario 2) where there is no EV charging in the village, and no solar generation, the storage requirement would be around 7 MW. The optimal storage requirement is higher in scenario 2, mainly because there is excess wind generation overnight which would not be used by EV charging.



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**Table 21 Optimal storage size under different scenarios**

Scenario description	Year	% of consumption met by generation		Optimal Storage Size (kWh)	Equivalent storage per house (kWh)
		Without storage	With Storage		
1; Current consumption + Wind	2024	78%	94%	5200	9.5
2A; Current consumption + Solar + ASHPs	2050	31%	46%	5200	9.5
2B; Current consumption + Wind + ASHPs	2050	69%	81%	7280	13.4
3; Current consumption + Wind + ASHPs + solar	2050	78%	89%	5200	9.5
4; Current consumption + Wind + ASHPs + solar + Evs	2050	76%	91%	4160	7.6

As noted previously, the storage requirement to avoid evening ASHP demand exceeding grid capacity was around 4.2 MWh – which aligns well with the storage requirement calculated under scenario 4. Should the provision of EVs and solar home batteries be lower than forecast, additional storage could be provided at the wind turbine. The above analysis was based on optimising the storage requirement over a year. However, there will be points in time where a far larger storage capacity is required, to avoid the energy generation exceeding the grid capacity – this is discussed in the subsequent section.

### 1.15.3 Case 3 - Excess Wind Energy

Connecting a 2.5MW wind turbine to the grid could risk overloading the distribution network. *Figure 51* shows the difference in wind generation versus consumption over a 24-hour day in October. (October has the highest average wind speed, and hence high energy generation). The greatest difference between generation and consumption typically occurs at nighttime, when demands are low. In future EV charging and heat pump electrical use would help use excess wind energy overnight, reducing the gap between generation and consumption. Hence for winter months, the critical situation in terms of the grid is likely to be in the early years after the wind turbine is installed, when there are limited numbers of heat pumps and EVs.



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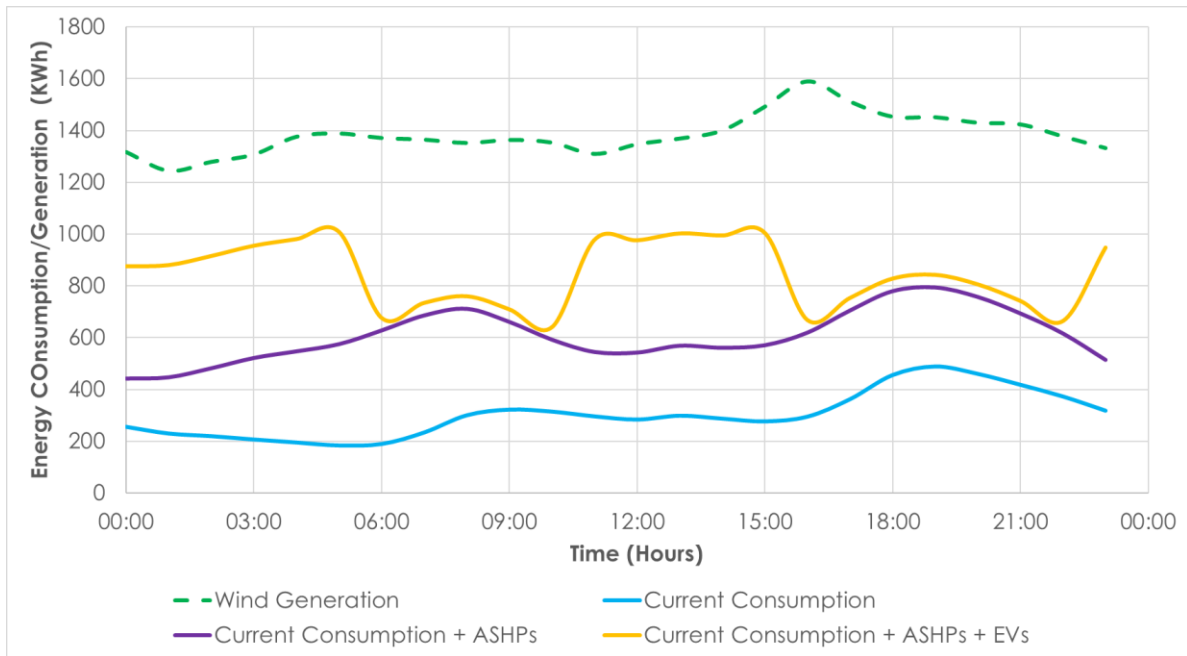


Figure 51 Hourly wind generation versus consumption under different scenarios (average for October). EV and ASHP consumption is based on the Year 2050.

**Table 22** summarises the estimated storage requirements for an 8-hour period overnight. The average requirements reflect what would be required on a typical day, whereas the peak requirement reflects what would be needed during nights with higher generation (generally relatively high wind speeds). The peak storage requirements are slightly higher once wind and solar generation are both in operation. This is because in summer months there are nights when a high wind speed coincides with generating some excess solar energy in the 5am – 6am period.

**Table 22: 2050 Storage requirement in MWh to limit discharges to the grid, based on the month with the greatest energy exports.**

	Average storage requirement (10pm-6am)	Peak storage requirement (10pm-6am)
Current consumption + Wind + ASHPs	7.9	14.6
Current consumption + Wind + ASHPs + solar + EVs	5.6	17.4

The above storage requirements were calculated assuming there was no available capacity in the distribution network. Some further dialogue is recommended with the



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grid operator to explore how much capacity is available, and to confirm the critical design scenarios. This would help refine the estimated storage requirement.

## Carbon Sequestration

Creation, restoration, and improved management of natural habitats will contribute to offset the 12% of carbon emissions, or 338 tonnes per year, that are more challenging to reduce. Setting a deployable carbon capture and storage target by improving biodiversity net gain can be helpful in creating some headroom, especially where action is constrained by factors out of an individual's control. Dying trees, primarily Ash, must be replaced by heartier species. Carbon storage in natural habitats, including lowland raised bog, woodlands, hedges, heathland, healthy soils and grassland are all sources of carbon sinks that not only serve towards meeting the Net Zero target, but also improve the quality of life for people living in area by encouraging and nurturing the natural environment. It presents a tangible means of bringing communities together in efforts that bring increased wellbeing. As the Woodland Trust expects 80% of Ash trees to die, with the biggest impact in the Southeast, it is important to create a plan that takes into consideration replacement of existing, vulnerable trees. 83% of carbon sequestered by the City Downland Estate is in woodlands and forests<sup>5</sup>.

To offset 338 tonnes, 5,590 trees must be planted. We suggest that a carbon sequestration plan that includes tree planting is included in the local plan which would act as a carbon sink, as well as engage the local community in the planning, design and execution of improving wildlife areas. To put the Ovingdean target into perspective, the UK must plant 1.5 million hectares of additional woodland by 2050 to meet its carbon neutral target.

The Woodland Trust has funding available to support communities to plant trees. The scale to which Ovingdean must roll out a tree planting programme would qualify for such funding. In 2016, the Ovingdean Residents Preservation Society proposed biodiversity corridors at the boundary between Ovingdean and Rottingdean. We understand that the Council will be planting 12 trees along the verges in the Autumn. There is the potential for tree planting to replace dying Ash trees on the Oxford International College estate. There is also evidence that demonstrates that planting trees on farms supports crops preventing soil erosion and nutrient loss, offers shade for livestock improves water quality and reducing the risk of flooding.

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<sup>5</sup> City Downland Estate Plan, Brighton and Hove City Council, February 2023 p.23



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It is also noted that the redevelopment at St Dunstan's has the potential expansion of the boundary woodland on the 12-acre site.

## Community Benefit

Community benefit is derived from a variety of sources: an increase in jobs will bring more prosperity to a region creating increased local spending power, increased local investment and improved economic conditions for residents. We have estimated that our recommendations will generate 17 jobs attributed to efforts to build local generation, energy management services and retrofit installations.

Should a 2.5MW wind turbine be made operational, we estimate that a total of £2M over the life of the project, or an average of £80,000 per year could be allocated to supporting Ovingdean to invest in charitable activities like biodiversity improvements, support for people unable to pay their heating bills, youth groups or other community-based activities, like support for the village hall. Initiatives like tree planting could be funded to help the region meet carbon sequestration goals. Additional benefits to investors would be derived from an proposed investment return of 5% on the community owned wind turbine or an average of £181,000 over its useful life.

## Financing the plan

The new Labour Government has proposed to support infrastructural investments of the sort contemplated in our report to the tune of £8.3 Billion. The funding mechanism to support this level of investment is currently being established. We envision preparing to ensure the investment required qualifies for this funding route.

It may be that government plans to work through the UK infrastructure Bank. They will lend a minimum of £5million to local authorities or community energy groups with an attractive business plan for building clean energy infrastructure. The total investment required for the community to achieve the aspirations of this plan are presented in the Table below:



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**Table 23: Estimated investment required to implement plan**

Install Type	Cost per year (£000s)									Total
	2024	2025	2026	2027	2028	2029	2030	2040	2050	
onshore wind	£40	£60	£100	£150	£150	£4,031				£4,531
Solar PV - domestic	£134	£274	£214	£219	£225	£230	£236	£2,265	£980	£4,778
Solar PV non-domestic	£0	£299	£152	£19	£0	£0	£0			£470
Solar PV Ground mounted	£0	£258	£134	£16	£0	£0	£0			£408
<b>Total</b>	<b>£174</b>	<b>£892</b>	<b>£600</b>	<b>£404</b>	<b>£375</b>	<b>£4,262</b>	<b>£236</b>	<b>£2,265</b>	<b>£980</b>	<b>£10,187</b>
Retrofit investment	£0	£82	£85	£87	£111	£148	£152	£1,588	£2,042	£4,297
<b>Total</b>	<b>£174</b>	<b>£974</b>	<b>£685</b>	<b>£491</b>	<b>£486</b>	<b>£4,410</b>	<b>£388</b>	<b>£3,853</b>	<b>£3,022</b>	<b>£14,483</b>

The investment in onshore wind could be funded entirely by the funding available through central government. Residents will likely need to contribute to solar PV and retrofitting installations. However, in doing so the value of their homes will increase and energy bills will be reduced, and so this money is not sunk cost. It may be that a community solar PV or community retrofit programme could be introduced that could be financed by central government as well. The community solar PV plan will become more attractive as legislation changes to allow a community group to sell or share the solar electricity generated through the programme.

As each activity delivers significant value for the Ovingdean community, we expect there will be an appetite for investment by central government as the funds could be repaid under the lending terms and conditions initiated by the infrastructural investment programme. We suggest that this plan be used as the basis for preparing a fundable business plan to be submitted to the UK Infrastructure bank for finance.

Although onshore wind costs more per GWh of electricity generated, the technology creates more value by generating more power more quickly than solar PV. It also generates more electricity per hectare of land, so is a more productive use of land. It will be impossible to generate the clean electricity requirement locally without onshore wind.

Moving to a local generation model ensures equity and fairness in access to and benefits from renewable energy generation as demonstrated in the Community Benefit section above.



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## Next Steps

The funding for this report was limited to its preparation and the community engagement associated with the introduction of the plan to the Ovingdean Community. The following provides a guideline as to the steps that will need to be taken to advance the aims of this report.

A governance system with overall responsibility for achievement of the village target should be appointed. This informal committee would oversee the plan's rollout. The committee would establish baselines to monitor annual progress on targets. Champions for each street can be the liaison between the steering committee and residents communicating important information concerning the age of gas boilers and the thermal efficiency of homes to ensure that they have adequate ventilation and thermal efficiency to affordably run a heat pump when the gas boiler is due to be replaced. Case studies highlighting progress made by individuals towards the target would be promoted and hailed as best practice, providing examples for others.

A wind turbine developer should be appointed to undertake the preparatory work required to submit the planning application for the wind turbine to SDNP. The developer will be responsible for funding the required investment in the development and installation of the wind turbine. The developer would appoint the supplier, project manage the installation, then own and operate the turbine on behalf of the Ovingdean community. The Ovingdean committee would be responsible for allocation of the finance directed to activities identified by local residents.

A rollout programme would be established by appointing suitable EV charge point suppliers for the community. This collective purchasing approach would be designed to deliver maximum benefit to residents in the installation of EV charge points at individual properties.

Non-domestic residents would be required to deliver plans that demonstrate their progress on meeting targets to reach the village decarbonisation target.

## Appendix A1 - List of Consultees

We would like to thank the following people who made the time available to us to prepare this report:

Amy Tyler- Jones – South Downs National Park Authority

Stella New – South Downs National Park Authority



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Kirsten Firth – Brighton and Hove City Council  
Residents of Ovingdean

## Appendix A2 – Glossary of Key Terms

£bn	Billion pounds (£1,000,000,000)
£M	Million pounds (£1,000,000)
AD	Anaerobic Digestion
AONB	Area of Outstanding Natural Beauty
ASHP	Air Source Heat Pump
BEIS	Department for Business, Energy & Industrial Strategy
BHESCo	Brighton and Hove Energy Services Co-operative
Bio-CNG	Bio-Compressed Natural Gas
BUS	Boiler Upgrade Scheme
CO2	Carbon Dioxide
CAPEX	Capital Expenditure
CHP	Combined Heat and Power
CoP	Coefficient of Performance
DEFRA	Department for Environment Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DNO / DSO	Distribution Network Operation / Distribution System Operator
ECO4	Energy Company Obligation (scheme number 4)
EPC	Energy Performance Certificate
EV	Electric Vehicle
FES	Future Energy Scenarios
GHG	Greenhouse Gas
GSHP	Ground Source Heat Pump
GVA	Gross Value Added



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GW	Gigawatt (1,000,000,000 watts)
GWh	A unit of energy that is equal to the energy provided by 1 Gigawatt in one hour
Hectare	Ten thousand square metres (10,000 m <sup>2</sup> )
HGV	Heavy Goods Vehicle
ICE	Internal Combustion Engine
Kt	Kilo-tonne (1,000,000 kg)
kW	Kilowatt (1,000 watts)
kWh	A unit of energy that is equal to the energy provided by a thousand watts in one hour
LA	Local Authority
LDV	Light Duty Vehicle
LEP	Local Enterprise Partnership
LPG	Liquid Petroleum Gas
LSOA	Lower Super Output Area
m/s	Metres per second
m <sup>3</sup>	Cubic metres
MCS	Microgeneration Certification Scheme
MEES	Minimum Energy Efficiency Standards
MVA	Megavolt-amperes - the unit used to measure the apparent power in a circuit.
MW	Megawatt (1,000,000 watts)
MWh	A unit of energy that is equal to the energy provided by 1 Megawatt in one hour
NGED	National Grid Electricity Distribution
PV	Photovoltaic - solar electricity panels, which convert the sun's energy into electricity
REPD	Renewable Energy Planning Database
SAP	Standard Assessment Procedure
SPEN	Scottish Power Energy Networks
t	tonne
T&W	Telford and Wrekin
Tonne	1,000 kg
TW	Terawatt (1,000,000,000,000 watts)
TWh	A unit of energy that is equal to the energy provided by 1 Terawatt in one hour
UKERC	UK Energy Research Centre
VFRB	Vanadium Redox Flow Batteries
WPD	Wester Power Distribution



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## Appendix A3 – List of Assumptions

A full list of technical and financial assumptions utilised in the production of this report are shown below.

<b>Energy Efficiency</b>	
Assumed SAP of domestic homes without EPCs	55 (D)
Assumed SAP of non-domestic properties without EPCs	61 (D)
<b>Heat pump modelling</b>	
ASHP CoP	3.1
Number of domestic heat pumps currently installed	0
Biomass boiler efficiency	80%
Gas boiler efficiency	90%
Oil boiler efficiency	90%
Electric boiler efficiency	100%
<b>Electric vehicle modelling</b>	
Number of electric HGVs active in the Marches	0
Typical diesel engine CO <sub>2</sub> emissions	680 g/kWh <sup>v</sup>
Loss of energy in charging/recovery	80% <sup>vi</sup>
<b>Solar PV</b>	
Irradiation factor (kWh/kWp)	954.74
<b>Onshore Wind</b>	

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Wind availability	90%
Mast height (m)	90
Average wind speed (meters per second)	6
Wholesale price of electricity (in pence)	10.24
Electricity generation per hectare (kWh/annum)	13,723
<b>Anaerobic Digestion</b>	
Wholesale price of gas (in pence)	5.5
Average gas consumption per household (kWh)	11,000
Biogas yield per hour (Nm <sup>3</sup> )	744

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