

Zero Carbon Ashwell

Sustainable Energy System Options Appraisal

Energy Options Appraisal

June 2026



Scene Document Reference: Zero Carbon Ashwell – Sustainable Energy System Options Appraisal

Authors: Sandy Robinson, Elliott Price, Rhys Watkins, Ahmad Aldaker

Date: 23rd June 2026

Document Revisions:

Version 1.0 Zero Carbon Ashwell – Baseline Energy and Options Prioritisation Report

Version 2.0 Zero Carbon Ashwell – Energy Options Appraisal and Recommendations Report

Version 3.0 Zero Carbon Ashwell – Draft Final Report

Version 4.0 Zero Carbon Ashwell – Final Report

Version 5.0 Zero Carbon Ashwell – Final Report (*Revised*)

Scene Connect Ltd.

Address: Argyle House, 3 Lady Lawson Street, Edinburgh, EH3 9DR, Scotland

Email: info@scene.community

Telephone: +44 (0) 131 297 2955

Website: www.scene.community

Contents

Contents.....	3
1. Introduction	7
2. Baseline Energy Assessment	10
3. Energy Options Prioritisation Assessment.....	20
4. Technical Options Appraisal	22
5. Planning & Environmental Baseline	47
6. Community Engagement.....	61
7. Community Benefit	63
8. Financial Assessment	66
9. Operation, Legal Structures, and Governance.....	81
10. Scheduling	91
11. Conclusion	92
Appendix A – Data Collection Methods	94
Appendix B – Energy Options Prioritisation Assessment	95
Appendix C – Summary Tables	106
Appendix D – Future Opportunity Summaries.....	108

Tables and Figures

Figures

FIGURE 1.1 – MAP OF ASHWELL, AND THE ASHWELL PARISH BOUNDARY.	8
FIGURE 2.1 – ASHWELL ANNUAL HEAT ENERGY PROFILE (<i>DOMESTIC PROPERTIES</i>).	11
FIGURE 2.2 – TOTAL DOMESTIC HEAT ENERGY CONSUMPTION (<i>BY HEAT FUEL SOURCE</i>).	12
FIGURE 2.3 – TOTAL DOMESTIC CARBON EMISSIONS (<i>BY HEAT FUEL SOURCE</i>).	12
FIGURE 2.4 – TOTAL DOMESTIC ENERGY COSTS (<i>BY HEAT FUEL SOURCE</i>).	14
FIGURE 2.5 – DOMESTIC EPC RATINGS AND POTENTIAL RATINGS (<i>BASED ON 622 VALID EPCS</i>).	15
FIGURE 2.6 – ANNUAL NON-DOMESTIC ENERGY CONSUMPTION (<i>BY ORGANISATION TYPE</i>).	16
FIGURE 2.7 – ESTIMATED EXISTING SOLAR PV INSTALLATIONS ACROSS ASHWELL VILLAGE.	17
FIGURE 2.8 – DISTRIBUTED FUTURE ENERGY SCENARIOS FOR ELECTRICITY CONSUMPTION ACROSS ASHWELL.	18
FIGURE 2.9 – NATIONAL GRID GENERATION CAPACITY FORECAST	19
FIGURE 3.1 – SUMMARY OF POTENTIAL ENERGY DEVELOPMENT SITES ACROSS ASHWELL.	20

FIGURE 4.1 – UKPN SECONDARY SUBSTATIONS SURROUNDING ASHWELL.	23
FIGURE 4.2 – INDICATIVE WIND TURBINE LAYOUT AT NEWNHAM HILL, ASHWELL.	25
FIGURE 4.3 – INDICATIVE WIND TURBINE LAYOUT AT BLUEGATES FARM, ASHWELL	28
FIGURE 4.4 – INDICATIVE ROOFTOP PV ARRAY AT WOLVERLEY HOUSE, ASHWELL.	31
FIGURE 4.5 – ANNUAL GENERATION PROFILE FOR ROOFTOP PV AT WOLVERLEY HOUSE, ASHWELL.	32
FIGURE 4.6 – INDICATIVE GROUND-MOUNTED PV LAYOUT AT LOVE LANE, ASHWELL.	34
FIGURE 4.7 – ANNUAL GENERATION PROFILE FOR GROUND-MOUNTED PV AT LOVE LANE, ASHWELL	35
FIGURE 4.8 – INDICATIVE CLOSED-LOOP GSHP DHN LAYOUT AT DIXIES MEADOW, ASHWELL.	41
FIGURE 4.9 – ANNUAL HEAT ENERGY GENERATION PROFILE FOR A CLOSED-LOOP GSHP DHN AT DIXIES MEADOW, ASHWELL.	42
FIGURE 5.1 – ASHWELL CONSERVATION AREA AND LISTED BUILDINGS IN ASHWELL VILLAGE.	58
FIGURE 5.2 – AGRICULTURAL LAND CLASSIFICATION ACROSS ASHWELL PARISH.	60
FIGURE 8.1 – CUMULATIVE NET INCOME FOR 0.06 MW PV AT WOLVERLEY HOUSE, ASHWELL.	68
FIGURE 8.2 – HEAT NETWORK LIFETIME COSTS AT DIXIES MEADOW, ASHWELL.	78
FIGURE 9.1 – RELATIONSHIP OF CONTROL TO RISK	86
FIGURE 0.1 – ENERGY DATA HIERARCHY.	94
FIGURE 0.1 – SUMMARY OF POTENTIAL ENERGY DEVELOPMENT SITES ACROSS ASHWELL.	96
FIGURE 0.2 – POTENTIAL ROOFTOP PV SITE AT WOLVERLEY HOUSE, ASHWELL.	97
FIGURE 0.3 – POTENTIAL GROUND-MOUNTED PV SITE, SE OF LOVE LANE.	98
FIGURE 0.4 – POTENTIAL GROUND-MOUNTED PV SITE, SW OF CLAYBUSH HILL.	99
FIGURE 0.5 – POTENTIAL WIND TURBINE SITE, AT NEWNHAM HILL.	100
FIGURE 0.6 – POTENTIAL WIND TURBINE SITE, AT BLUEGATES FARM.	101
FIGURE 0.7 – COURSE OF THE RIVER CAM, IN ASHWELL PARISH.	102
FIGURE 0.8 – POTENTIAL DISTRICT HEAT NETWORK SITE AT DIXIES MEADOW, ASHWELL.	105

Tables

TABLE 2.1 – OVERVIEW OF ENERGY DEMAND.	10
TABLE 2.2 – SUMMARY ENERGY ASSESSMENT.	10
TABLE 2.3 – OVERVIEW OF DOMESTIC HEAT FUEL SOURCES ACROSS ASHWELL (<i>AVERAGES PER HOUSEHOLD</i>).	13
TABLE 2.4 – ASHWELL DOMESTIC ENERGY COSTS (<i>AVERAGES PER HOUSEHOLD</i>).	13
TABLE 2.5 – DOMESTIC ENERGY EFFICIENCY MEASURES (<i>BASED ON 622 VALID EPCS</i>).	15
TABLE 2.6 – ESTIMATE DISTRIBUTED ROOFTOP PV INSTALLATIONS ACROSS ASHWELL.	17
TABLE 4.1 – TECHNICAL SUMMARY OF TURBINE SCENARIOS AT NEWNHAM HILL.	25
TABLE 4.2 – WIND ENERGY TECHNICAL CONSTRAINTS AT NEWNHAM HILL.	26
TABLE 4.3 – TECHNICAL SUMMARY OF TURBINE SCENARIOS AT BLUEGATES FARM, ASHWELL.	27
TABLE 4.4 – WIND ENERGY TECHNICAL CONSTRAINTS AT BLUEGATES FARM, ASHWELL.	28
TABLE 4.5 – ROOFTOP SOLAR PV CAPACITY ACROSS ASHWELL.	30
TABLE 4.6 – SUMMARY OF SOLAR TECHNICAL OPPORTUNITIES ACROSS ASHWELL.	30
TABLE 4.7 – DESIGN METRICS FOR ROOFTOP PV AT WOLVERLEY HOUSE, ASHWELL.	32
TABLE 4.8 – ROOFTOP SOLAR PV TECHNICAL CONSTRAINTS AT WOLVERLEY HOUSE, ASHWELL.	33
TABLE 4.9 – TECHNICAL DESIGN METRIC FOR GROUND-MOUNTED PV AT LOVE LANE, ASHWELL.	35
TABLE 4.10 – GROUND-MOUNTED SOLAR PV TECHNICAL CONSTRAINTS AT LOVE LANE, ASHWELL.	36
TABLE 4.11 – HEAT NETWORK SPECIFICATIONS	37
TABLE 4.12 – APPROXIMATE THERMAL CONDUCTIVITIES OF CHALK ACROSS THE THAMES AND CHILTERN REGION (BUSBY, 2018).	39
TABLE 4.13 – DIXIES MEADOW DHN TECHNICAL SPECIFICATIONS.	41
TABLE 4.14 – DHN TECHNICAL CONSTRAINTS AT DIXIES MEADOW, ASHWELL.	42
TABLE 4.15 – ASHP UPTAKE TARGETS REQUIRED TO ACHIEVE ELECTRIC ENGAGEMENT SCENARIO.	44
TABLE 4.16 – PROSPECTIVE DOMESTIC ENERGY EFFICIENCY UPGRADES (<i>BASED ON 622 VALID EPCS</i>).	44
TABLE 5.1 – CULTURAL HERITAGE DESIGNATIONS ACROSS ASHWELL PARISH.	57
TABLE 6.1 – STAKEHOLDER ENGAGEMENT OUTCOMES AND NEXT STEPS.	62
TABLE 7.1 – POTENTIAL SOCIAL VALUE OF RECOMMENDED ENERGY DEVELOPMENTS.	64
TABLE 7.2 – MODELLED SOCIAL RETURN ON INVESTMENT OF RECOMMENDED ENERGY OPPORTUNITIES.	65
TABLE 8.1 - FINANCIAL ASSESSMENT FOR COMMUNITY-OWNED ROOFTOP PV AT WOLVERLEY HOUSE, ASHWELL.	68
TABLE 8.2 – FINANCIAL ASSESSMENT FOR COMMUNITY-LED ASHP ADOPTION ACROSS ASHWELL.	69
TABLE 8.3 – ASHP ANNUAL HOUSEHOLD BENEFITS	70
TABLE 8.4 – ASHP UPFRONT COSTS	71
TABLE 8.5 – SCALE OF ASHP OPPORTUNITY (ADDITIONAL IMPACTS COMPARED TO 2025 BASELINE)	71

TABLE 8.6 – RECOMMENDED PHASES FOR COMMUNITY-LED ASHP ADOPTION.	72
TABLE 8.7 – PHASE 1: ENERGY EFFICIENCY COST AND RESOURCE REQUIREMENT.	72
TABLE 8.8 – PHASE 2: ENERGY EFFICIENCY COST AND RESOURCE REQUIREMENT.	73
TABLE 8.9 – PHASE 3: ENERGY EFFICIENCY COST AND RESOURCE REQUIREMENT.	73
TABLE 8.10 – FINANCIAL ASSESSMENT OF WIND TURBINE SCENARIOS.	76
TABLE 8.11 – FINANCIAL ASSESSMENT OF ALTERNATIVE SOLAR PV OPPORTUNITIES.	77
TABLE 8.12 – FINANCIAL ASSUMPTIONS USED IN DHN FINANCIAL MODELLING.	78
TABLE 8.13 – FINANCIAL ASSESSMENT: HEAT NETWORK.	79
TABLE 8.14 – VIABILITY SCENARIOS: CLOSED-LOOP HEAT NETWORK	80
TABLE 9.1 – COMMUNITY GOVERNANCE OPTIONS	82
TABLE 10.1 - PROPOSED PROJECT ROADMAP TO IMPLEMENTATION.	91
TABLE 0.1 – SUMMARY OF SITE SELECTION CRITERIA USED IN PRIORITISATION ASSESSMENT.	95

Acronyms

AD	Anaerobic Digestion	kW	Kilowatt
ADE	Association for Decentralised Energy	kWh	Kilowatt Hour
ALC	Agricultural Land Classification	l	Litres
APC	Ashwell Parish Council	LCOH	Levelised Cost of Heat
ASHP	Air Source Heat Pump	l/s	Litres per Second
BESS	Battery Energy Storage System	LPA	Local Planning Authority
BUS	Boiler Upgrade Scheme	LCWO	Low Carbon West Oxford
CAPEX	Capital Expenditure	m	Metre
CBS	Community Benefit Society	m/s	Metres per Second
CCC	Climate Change Committee	MESS	Minimum Energy Efficiency Standard
CIC	Community Interest Company	MWh	Megawatt Hour
CLT	Community Land Trust	NESO	National Energy System Operator
CoP	Coefficient of Performance	NHDC	North Hertfordshire District Council
CAS	Climate Action Strathaven	NH ₃	Ammonia
CS	Countryside Stewardship	NPPF	National Planning Policy Framework
CWI	Cavity Wall Insulation	NPV	Net Present Value
dB	Decibel	NIA	Noise Impact Assessment
DECC	Department for Energy and Climate Change	ONS	Office of National Statistics
DEFRA	Department for Environment, Food & Rural Affairs	OPEX	Operating Expenditure
DESNZ	Department for Energy Security and Net Zero	PEC	Plymouth Community Energy
DHN	District Heat Network	PDR	Permitted Development Rights
DNO	Distribution Network Operator	PHI	Priority Habitat Inventory
EBIT	Earnings Before Interest & Tax	PM	Particulate Matter
ECA	Enhance Capital Allowance	PPA	Power Purchase Agreement
ECO	Energy Company Obligation	PRoW	Public Right of Way
EIA	Environmental Impact Assessment	PV	Photovoltaic
EPC	Energy Performance Certificate	REPEX	Replacement Expenditure
EPC	Energy Performance Contract	RHI	Renewable Heat Incentive
ESC	Energy Supply Contract	ROCE	Return on Capital Employed
ESCo	Energy Services Company	ROI	Return on Investment
EWI	External Wall Insulation	RPS	Regulatory Position Statement
FCA	Financial Conduct Authority	RS	Registered Society
FSA	Flood Risk Assessment	SAM	Scheduled Ancient Monument
GBE	Great British Energy	SCOP	Seasonal Coefficient of Performance
GBECF	Great British Energy Community Fund	SEG	Smart Export Guarantee
GHG	Greenhouse Gas	SPV	Special Purpose Vehicle
GHNF	Green Heat Network Fund	SROI	Social Return on Investment
GSENZH	Greater South East Net Zero Hub	SSSI	Site of Special Scientific Interest
GSHP	Ground Source Heat Pump	SO ₃	Sulfur trioxide
GSP	Grid Supply Point	SP	Strategic Priority
GW	Gigawatt	tCO ₂ e	Tonnes of Carbon Dioxide Equivalent
ha	Hectare	UKPN	UK Power Networks
HE	Historic England	VOC	Volatile Organic Compounds
HIU	Heat Interface Unit	WHF	Warm Home Fund
IEC	Integrated Energy Contracting	WSHP	Water Source Heat Pump
IRR	Internal Rate of Return	W/m.k	Watt per metre kelvin
IWI	Internal Wall Insulation	ZCA	Zero Carbon Ashwell
km	Kilometre		
kVA	Kilovolt-Ampere		

1. Introduction

This report feasibility study investigates the potential for a local, sustainable energy system in Ashwell, North Hertfordshire. The project is led by Zero Carbon Ashwell (ZCA) and funded through the UK Government's Great British Energy Community Fund (GBECF). The study assesses the viability of community-led low carbon heating and electricity systems within Ashwell, for the benefit of residents, businesses and visitors.

This study forms part of ZCA's ambitions to:

- 1) **Reduce greenhouse gas emissions from energy consumption in Ashwell**, by leading the transition from fossil fuel-based energy to low carbon energy solutions.
- 2) **Reduce energy costs for Ashwell residents and businesses** and reduce exposure to fluctuating fossil fuel prices.
- 3) **Provide cost effective low carbon energy** to meet local electrical and heat demands.

The study was undertaken between October 2025 – April 2026, to develop viable strategies towards a net zero Ashwell, with a particular focus on low carbon heat, local electrical generation and building energy efficiency. This report provides the outcomes of the feasibility process, including technical, financial, and commercial recommendations, as well as a project roadmap for onwards development.

This feasibility report is structured as follows:

1. Introduction
2. Baseline Energy Assessment
3. Energy Options Prioritisation Assessment
4. Technical Options Appraisal
5. Planning and Environmental
6. Community Engagement
7. Community Benefit
8. Financial Projections
9. Operation, Legal Structures and Governance
10. Scheduling
11. Conclusions and Next Steps

Further information, including graphical outputs, mapping and data resources can be found in the report appendices.

1.1. Site Overview

Ashwell is a village and civil parish in North Hertfordshire, 4 miles northeast of Baldock and 5 miles west of Royston. Covering 1,664 hectares, Ashwell Parish is predominantly rural, consisting of agricultural farmland and several small rural hamlets and isolated farms. Ashwell village is the parish's main settlement, with a population of ~1,980 (as of 2021).

Throughout history, Ashwell village was an important market town, as evidenced by the village's wealth in late Medieval, Tudor and Georgian architecture. Approximately 71 buildings in the village are listed, including St John's Guildhall (originally built in 1681), the 16th century Town House (now housing Ashwell Museum) and the Church of St Mary, a Grade I listed 14th century church. Nowadays, the village is largely residential and contains several local businesses and public amenities, including a bakery, butcher, three pubs, a primary school and a caravan campsite. Several large farms also surround the Ashwell, including one large dairy farm, but mostly arable. The village lies approximately 2.6 miles northwest of junction 10 of the A1(M) road.

Ashwell Parish itself is situated within the East Anglian Chalk landscape of North Hertfordshire. This is a wide region of southern England characterised by uninterrupted, rolling chalkland hills - with few trees and expansive views. The underlying chalk geology has thus given rise to a series of important aquifers and ecologically important chalk stream habitats – including Ashwell Springs, the source of the River Cam. Several fields and one isolated farmstead at the Parish's northern extremity fall within the Bedfordshire and Cambridgeshire Clayland landscape. Across Ashwell Parish, arable farming dominates land use. Cereal and general cropping farms are

found across the parish, and wider countryside. Ashwell village represent the sole built-up urban area, and no heavy or light industrial sites are present within the parish boundaries.

In terms of energy development, rooftop solar photovoltaic (PV) systems are the most widespread form of development across the parish. The greatest proportion of installations are installed on domestic properties, including homes on Angell's Meadow and Ashwell Street. Additionally, a new-build estate of ~30 homes clustered around Claybush Hill Meadow has been constructed including built-in rooftop PV systems. Larger solar installations are confined to non-domestic properties, such as at Ashwell Surgery, Ashwell Primary School and a large 180-panel system installed on a shed at Bluegates Dairy. Solar installations across Ashwell Parish are estimated to hold a cumulative total capacity of approximately 0.43 MW (megawatts).

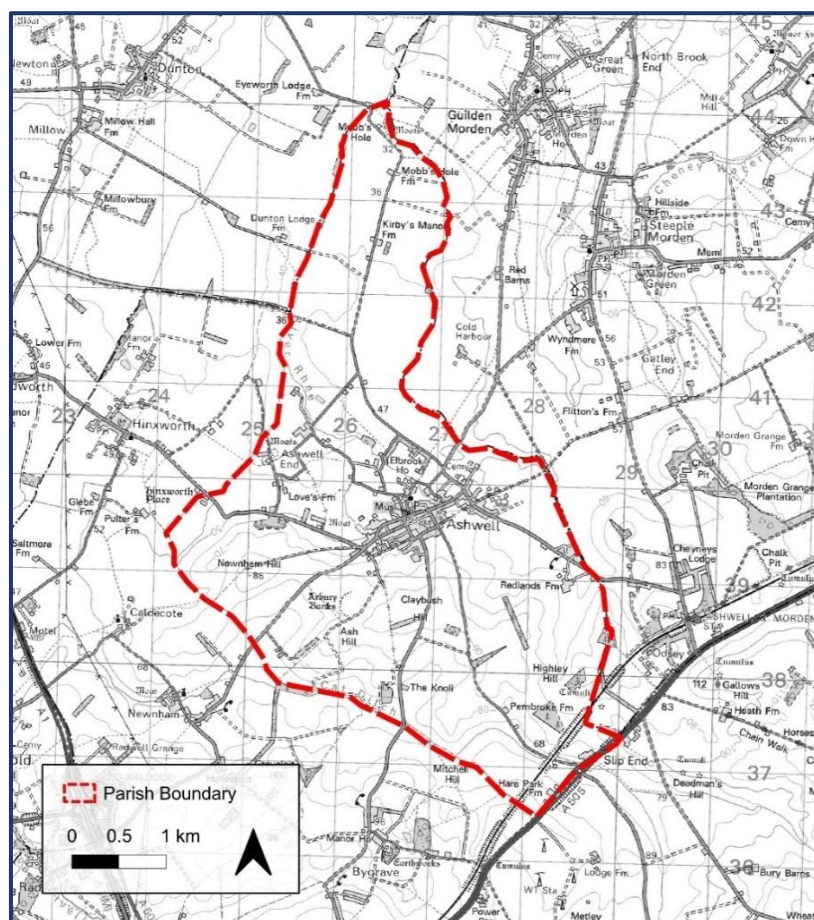


Figure 1.1 – Map of Ashwell, and the Ashwell Parish Boundary.

1.2. Organisations

The following organisations are relevant to the study and have played a role in supporting and creating this report.

Zero Carbon Ashwell

Zero Carbon Ashwell (ZCA) are a working group of Ashwell Parish Council (APC). ZCA was established in 2024 with the intention to improve the village's environmental sustainability and resilience through reducing Ashwell's carbon emissions and improving energy use. By 2040, ZCA intend to play a leading role in Ashwell's full transition from fossil fuels to renewable energy sources. In turn, this will improve energy efficiency and reduce energy billing costs and improve energy security for residents and local businesses. In Autumn 2025, ZCA received funding to undertake this feasibility study via the UK Government's 2025/26 Great British Energy Community Fund (GBECF).

Great British Energy Community Fund

The Great British Energy Community Fund (GBECF) is a £10 million programme which supports communities in England to develop renewable energy projects, which provide economic and social benefits to the community. The GBECF is administered by the Greater South East Net Zero Hub (GSENZH) and has provided funding for this feasibility study.

Scene

Scene Connect Ltd. (Scene) is a UK-based social enterprise established in 2011 with the intention of furthering the community energy sector across the UK through innovative partnership, grassroots development and use of land. The organisation works with landowners, developers, and community groups to further opportunities for a range of community developments, expanding from its initial focus on renewable energy, through benefits packages, joint ventures, and wholly owned projects. Scene are the technical consultants who have produced this feasibility study in partnership with ZCA.

2. Baseline Energy Assessment

This chapter provides an overview of the current energy situation (“baseline”) across Ashwell Parish. The information provided is an essential building block in understanding the energy, carbon, and economic impacts of developing a locally appropriate energy solution for Ashwell, providing the evidence base for low carbon feasibility assessments and system design.

Table 2-1 provides an overview of energy consumption across Ashwell, where heat energy usage greatly exceeds electrical energy demand. In turn, annual greenhouse gas emissions (GHG) arising from energy use amount to approximately 3,534 Tonnes of Carbon Dioxide Equivalent (tCO₂e).

Table 2-1 – Overview of Energy Demand.

Energy Type	Total
Annual Final Heat Demand	14,037 MWh
Annual Electricity Demand	5,247 MWh
Annual Greenhouse Gas Emissions	3,534 tCO ₂ e
Annual Energy Costs	£2,310,830

2.1. Summary of Energy Demand

The total annual energy usage from the 854 domestic and 24 non-domestic properties in the study area is estimated to be 17,710 Megawatt hours (MWh), emitting 3,534 tCO₂e. This energy usage is dominated by domestic properties, accounting for 87% of all usage.

The heating of domestic properties accounts for 91% of total domestic energy demand and 81% of domestic emissions. As a result, the decarbonisation of heating is a priority for this study. A summary of the heat and electrical demand assessment can be found in Table 2-2.

Table 2-2 – Summary Energy Assessment.

Energy Demand	Residential	Non-Domestic Organisations	Total
Final Heat Energy Consumption (MWh)	12,727	1,310	14,037
Final Electricity Consumption (MWh)	3,926	1,321	5,247
Total Energy Usage (MWh)	15,442	2,268	17,710
Total Carbon Emissions (tCO₂e)	3,087	447	3,534

2.2. Domestic Heat Demand

Domestic properties across Ashwell consume an estimated 12,727 MWh of energy annually for space and water heating, with an estimated thermal load of 11,450 MWh.

Thermal load is the raw amount of energy required for heating and does not include the energy consumed as a result of heating system delivery inefficiencies. It is the level of demand that any prospective heating solution should seek to meet.

Across all domestic properties in Ashwell, peak thermal load is approximately 6.6 Megawatts (MW).

Peak demand refers to the highest possible heat demand for the study area, at a single point in time. This is provided as a MW value and represents the highest load limit that any communal heating system (e.g., a heat network) should be capable of providing heat for.

Figure 2.1 provides an overview of energy demand in Ashwell over a typical year, demonstrating peak demand loads in winter months and comparatively low energy demand throughout the summer.

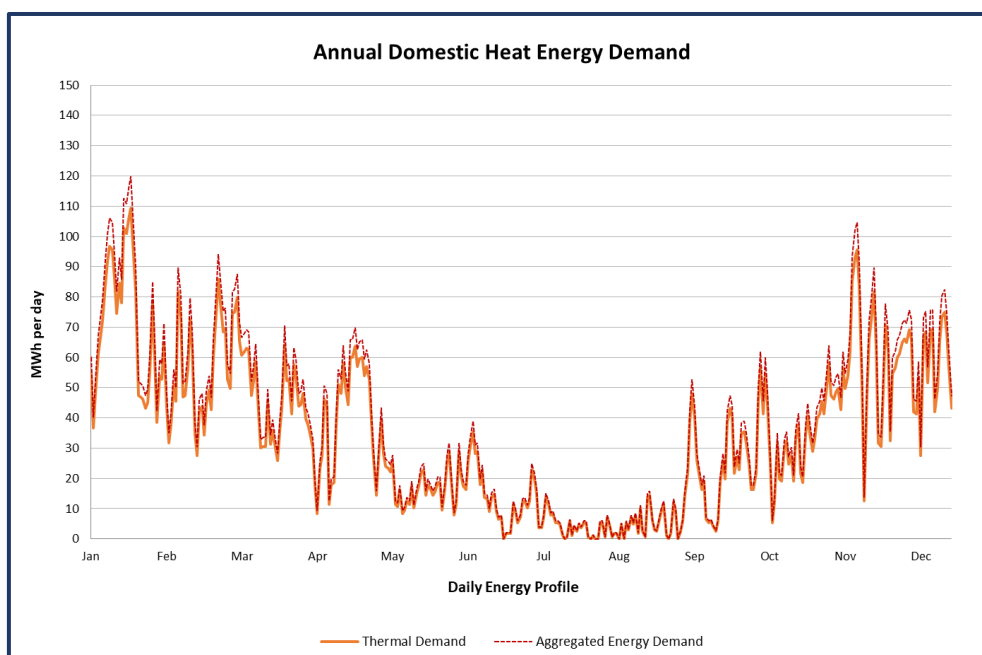


Figure 2.1 – Ashwell Annual Heat Energy Profile (Domestic Properties).

2.2.1. Domestic Heat Energy Sources

Understanding the distribution and composition of existing heating sources across Ashwell is key to estimate the potential energy usage and carbon emission output arising from heat energy use. In doing so, this allows for the identification of energy intervention priorities, levels of intervention required, potential upgrade costs, and the relative levels of disruption which may arise from future upgrades.

Analysis of available Energy Performance Certificates (EPCs) and census (2021) datum demonstrates that:

- Gas is the most common primary fuel source for heating (72%), followed by heating oil (18%).
- Gas and heating oil are responsible for 67% and 21% of the parish's total carbon emissions¹, respectively. Targeting these heating systems for decarbonisation is a priority for this study.
- Electricity is used as the primary heating source for 10% of properties across Ashwell, primarily via electric resistive heaters, storage heaters and Air-Source Heat Pumps (ASHPs).

An assessment of average heat energy consumption and carbon emissions per household, per heat fuel source are presented in Table 2.3.

Homes heated by electrical storage resistive or ASHPs have the lowest heating emissions, averaging 2 and 2.3 tCO₂e per annum, respectively. This trend is largely down to a combination of the relatively low carbon intensity of grid electricity, operational efficiency of heat pump systems and the lower average size of homes heated via electrical resistive heaters.

Homes that use heating systems powered by oil (5.5 tCO₂e per household) and coal (5.7 tCO₂e per household) have the highest heating emissions. There are 2 principal reasons for this:

- The carbon intensity of these fuels is high, with heating oil typically emitting 0.26 kg CO₂e / kWh and coal 0.35 kg CO₂e / kWh. This compares to the current grid carbon intensity of 0.211 kg CO₂e / kWh for electricity.
- Fossil fuel heating systems are less efficient than electric heating systems and so require greater energy inputs.

¹ Carbon emissions (tCO₂e) arising from the consumption of heat and electrical energy.

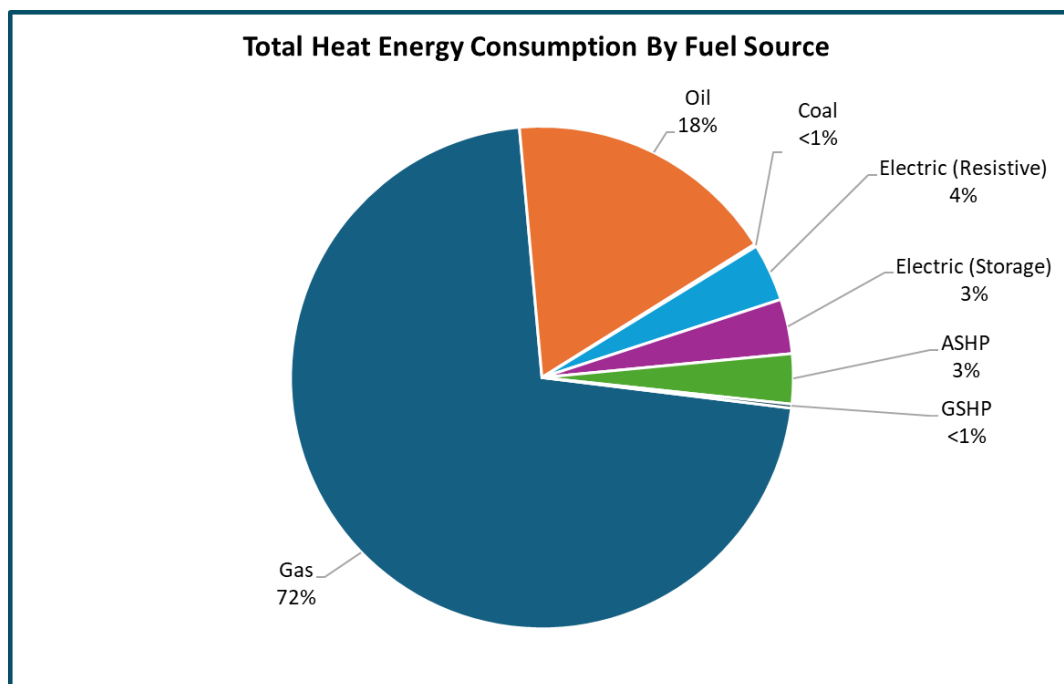


Figure 2.2 – Total Domestic Heat Energy Consumption (*by Heat Fuel Source*).

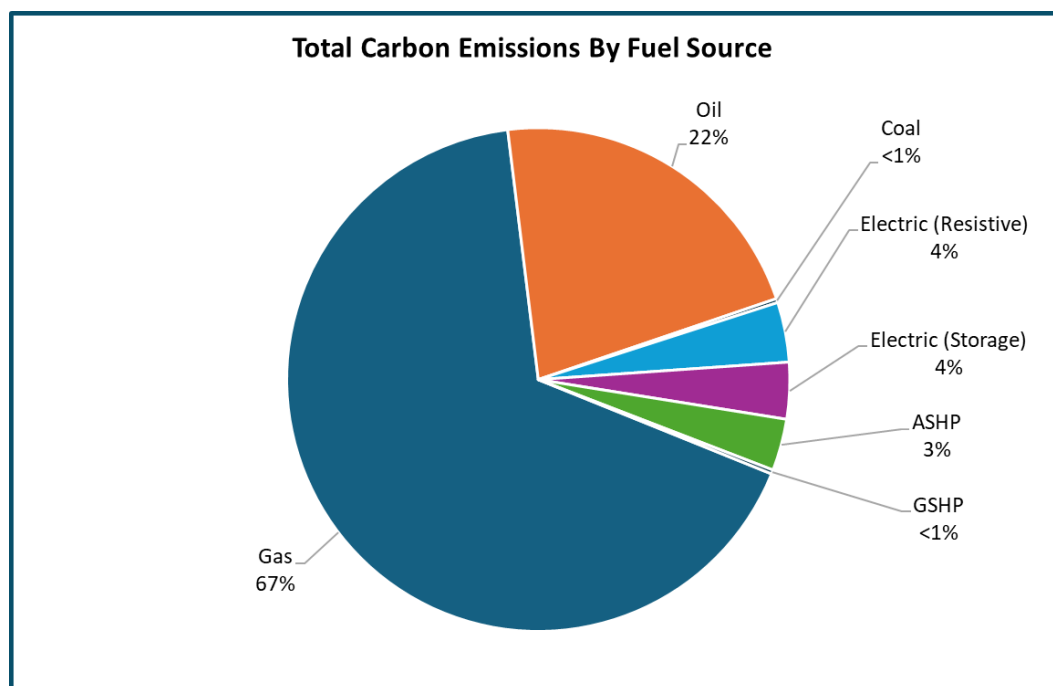


Figure 2.3 – Total Domestic Carbon Emissions (*by Heat Fuel Source*).

Table 2-3 – Overview of Domestic Heat Fuel Sources across Ashwell (averages per household).

Main Fuel Source	No. of Dwellings		Average dwelling size	Average Heat Energy Usage (per household)		Average Hot Water Demand (per household) ²
	Count	%	m ² floor area	MWh	tCO ₂ e	MWh
Gas	582	68%	117	19.0	3.55	3.4
Oil	122	14%	116	22.1	5.5	4.0
Coal	1	<1%	72	17.6	5.7	3.2
Electricity (resistive)	59	7%	63	9.7	2.01	1.7
Electricity (storage)	41	5%	82	13.1	2.72	2.4
ASHP	44	5%	170	11.3	2.34	2.0
GSHP	3	<1%	246	14.3	2.97	4.4
Average (per property)			115	15.3	3.5	3.0
Total (all properties)	854	100%	97,988	12,726	2,525	2,291

2.3. Domestic Energy Costs

Total energy costs for householders across Ashwell are an estimated £1,921,812 per year. Of this, heating usage accounts for £1,066,524 and electricity usage totals £855,288 (discounting electricity used for heating purposes).

Table 2-4 details indicative average energy costs for homes using different fuel types, demonstrating the relatively higher cost of electrical heating in comparison to fossil fuel-based heating systems. This is in part due to the “spark gap” between electricity and fossil fuel costs per kWh, with electricity significantly more expensive. High efficiency electrical systems – such as ASHP and GSHP systems – may overcome this gap, but fossil fuel systems are typically found to have lower operating costs as of 2025.

Table 2-4 – Ashwell Domestic Energy Costs (averages per household).

Main Fuel Source	Average Heating Cost (per household)	Average Electricity Cost (per household)	Average Energy Cost (per household)
Gas	£1,125	£992	£2,117
Oil	£1,340	£1,107	£2,447
Coal	£1,916	£875	£2,792
Electricity (resistive)	£1,863	£737	£2,600
Electricity (storage)	£1,255	£878	£2,133
ASHP	£1,727	£1,261	£2,988
GSHP	£2,000	£1,737	£3,737
All (average)	£1,249	£1,002	£2,250
All (total)	£1,066,524	£855,288	£1,921,812

² Assumes hot water demand accounts for 19% of total domestic heat energy demand (Domestic hot-water use, DESNZ, 2024)

Method

It is important to note that energy costs have been calculated using an assumptive approach to heating system performance and cost, including estimated Coefficients of Performance (CoP) and tariff rates (UK Price Cap, 2025). Data is therefore not directly comparable between fuel sources, as different fuel types are installed in houses of different types, ages and energy efficiency levels.

Total heating costs include the variable cost per kWh plus a fixed cost where appropriate, such as for tank rental fees and delivery fees. Total electricity consumption includes the cost per kWh (set to the current price cap rate) plus the fixed standing charge. Electricity savings from the self-supply of distributed generation (rooftop solar PV) are included in the total costs for electricity and electric heating sources.

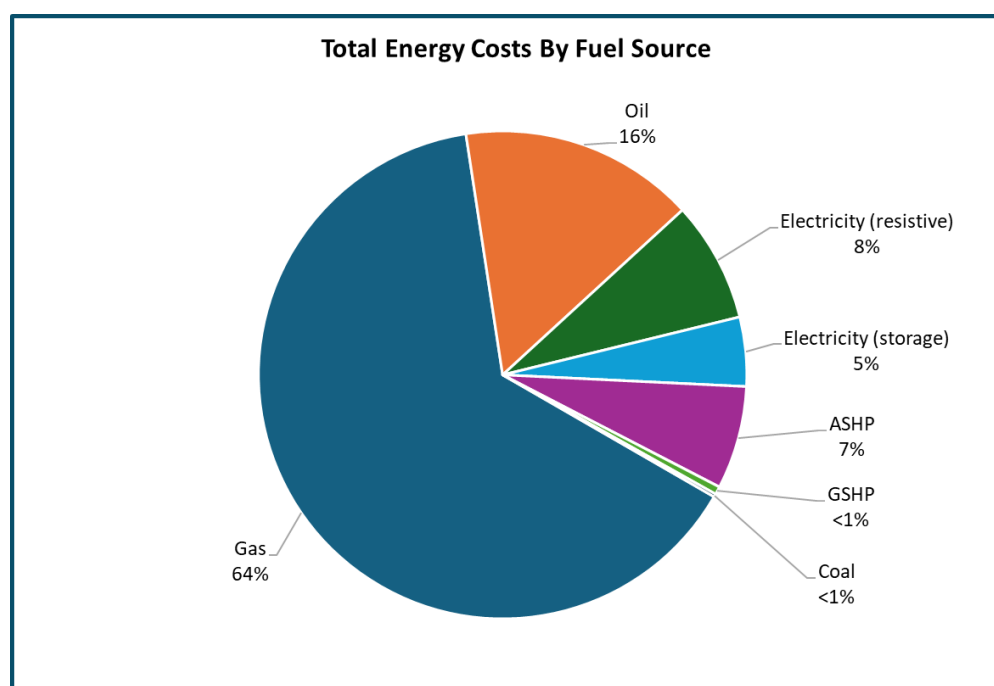


Figure 2.4 – Total Domestic Energy Costs (by Heat Fuel Source).

2.3.1. Domestic Energy Efficiency

An assessment of energy efficiency was undertaken for Ashwell's domestic housing stock. The analysis relies on available EPC data and therefore only provides a partial, though representative, picture of energy efficiency across the parish. This assessment is based on the 622 properties (73%) with valid EPCs.

Figure 2.5 presents the current and potential energy efficiency ratings across Ashwell, demonstrating that 67% of properties in the area are rated C or higher. Households in the study area have moderate levels of energy efficiency, with an average EPC rating of 65, although just below the English median score of 68 (ONS, 2024). At this current level, there is significant scope to improve energy performance across Ashwell's domestic building stock. If all EPC recommendations are implanted at each property, approximately 44% of properties have the potential to reach EPC grade C or better.

Table 2-5 provides detail on the areas where building fabric efficiency in households can be improved. According to EPC assessments:

- There is full double glazing or high-performance glazing in 91% of households with EPCs.
- Most households also have some form of wall insulation, although 30% are currently uninsulated.
- Sizable improvements can be made in the levels of roof insulation, both by increasing the number of households that have insulation and upgrading existing insulation (25% of properties have less than 200mm insulation).
- 69% of households do not have any form of floor insulation.
- 75% of households have energy saving lighting in less than 25% of light fixtures.

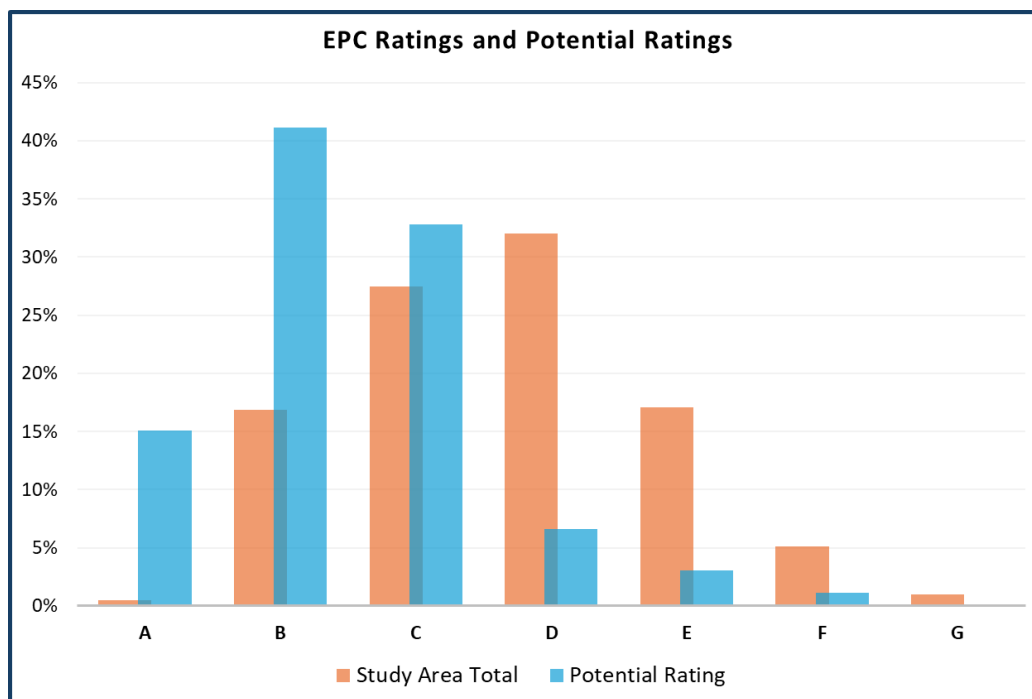


Figure 2.5 – Domestic EPC Ratings and Potential Ratings (based on 622 valid EPCs).

Table 2-5 – Domestic Energy Efficiency Measures (based on 622 valid EPCs).

Energy Efficiency Measures				
	High Performance	Double Glazing	Secondary Glazing	Single Glazing
No. Properties	105	450	17	45
%	17%	73%	3%	7%
	Floor Insulation	Floor Uninsulated	Unknown	
No. Properties	138	404	47	
%	23%	69%	8%	
	Cavity Wall Insulation	Solid Wall Insulation	Insulated (Unknown type)	Uninsulated
No. Properties	305	8	114	181
%	50%	1.3%	19%	30%
	Roof Insulated (>200mm)	Roof Insulated (<200mm)	Insulated (Unknown type)	No Insulation
No. Properties	232	148	96	55
%	40%	25%	16%	9%
	Advanced Thermostat	Thermostatic Radiator Valves	No Heating Controller	
No. Properties	543	41	17	
%	90%	7%	3%	
	50 – 70% Low Energy Lighting	25 - 50% Low Energy Lighting	<25% Low Energy Lighting	
No. Properties	102	55	465	
%	16%	9%	75%	

2.4. Non-Domestic Energy Demand

Non-domestic energy consumption in the study area is an estimated 2,631 MWh annually, split between electricity consumption (1,321 MWh) and heat consumption (1,310 MWh). This represents 12% of total energy usage from across Ashwell Parish. GHG emissions from non-domestic users total approximately 447 tCO₂e and energy costs total an estimated £389,018 per annum.

Hospitality businesses are responsible for the majority of non-domestic energy consumption across Ashwell. Here, major energy users include the village's three pubs (Bushel and Strike, The Rose and Crown, and The Three Tuns), local coffee shop (Rhubarb and Mustard) and Ashridge Farm Caravan Campsite. Ashwell Primary School is also a major energy user in the village, representing approximately 15% of demand. Here however, a rooftop solar PV system is used to offset the school's electrical demand (see Section 2.5).

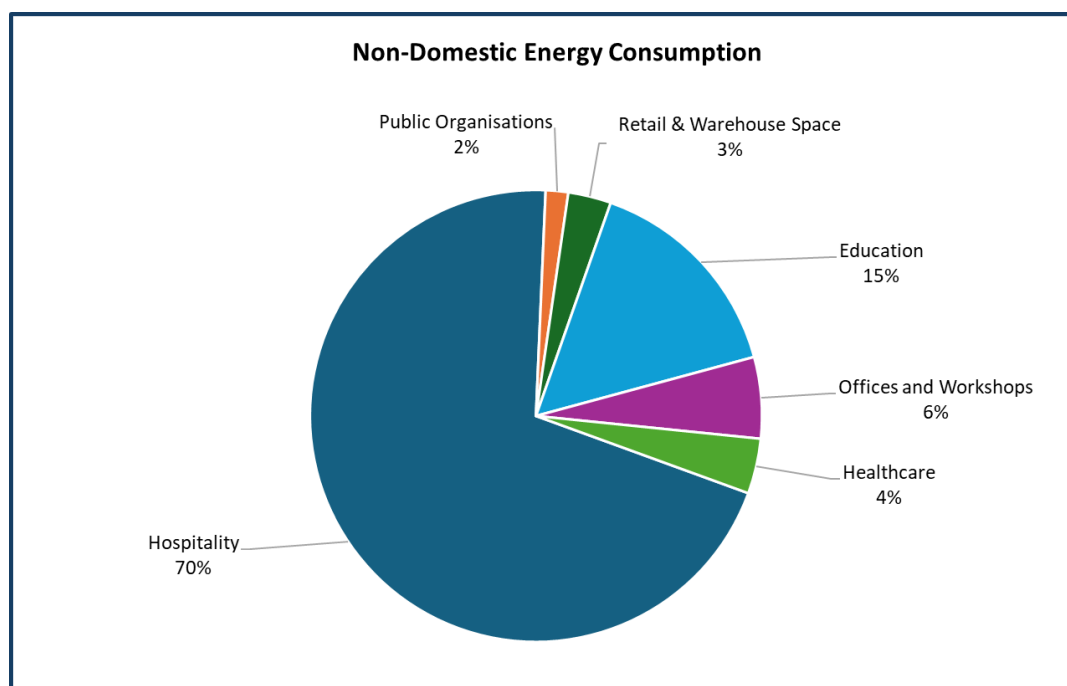


Figure 2.6 – Annual Non-Domestic Energy Consumption (by organisation type).

2.5. Energy Generation

Individual rooftop solar PV (photovoltaic) systems are the most common type of renewable generator found across Ashwell Parish. An estimated 64 distributed solar PV installations are present across the parish, amounting to an indicative combined capacity of approximately 0.43 MW, representing electrical generation of 410.8 MWh per year. This amounts to 7.8 % of Ashwell's current electricity consumption, and so there is considerable scope for increased distributed generation instalments across the parish. Current carbon savings from the renewable generation currently amount to approximately 80.7 tCO₂e per annum. Residential rooftop solar PV are dispersed throughout the nucleus of Ashwell village (see Figure 2.7), notably along Ashwell Street, at Angell's Meadow, and the Claybush Hill Meadow housing estate. Larger rooftop PV arrays are found on non-domestic sites, such as at Ashwell Primary School and on rooftops at Bluegates Dairy and Bluegates Farm.

Table 2-6 – Estimate Distributed Rooftop PV Installations across Ashwell³.

Distributed Generation Source	No. Arrays	Estimated Total Capacity (MW) ⁴	Total Generation (MWh) ⁵
Rooftop Solar PV (Domestic)	58	0.2	195.0
Ashwell Primary School ⁶	1	0.05	47.7
Ashwell Surgery	1	0.01	6.2
Ashwell Village Hall	1	0.01	6.2
Ashwell Garage ⁶	1	0.01	11.6
Bluegates Dairy	1	0.07	70.9
Bluegates Farm	1	0.07	73.2
Total	64	0.43	410.8

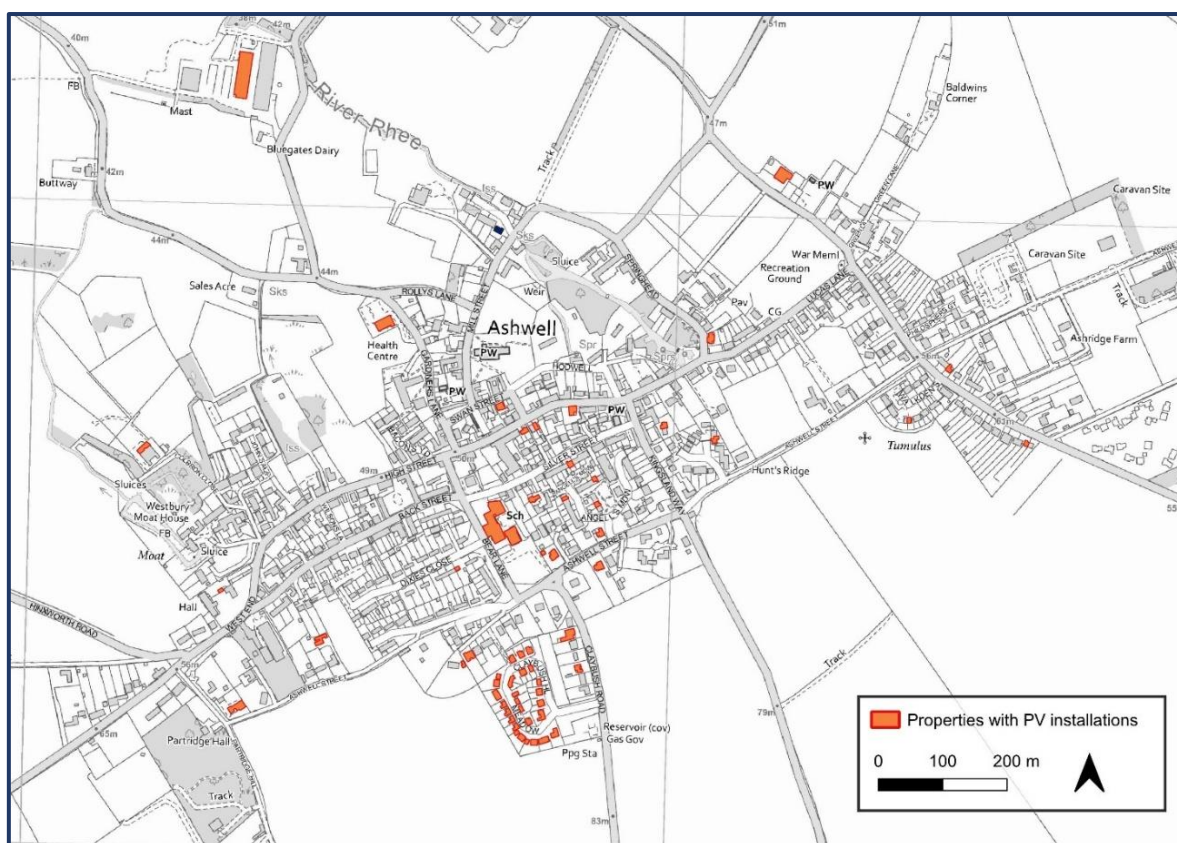


Figure 2.7 – Estimated Existing Solar PV Installations across Ashwell village.

³ The number of individual distributed rooftop PV arrays has been estimated using satellite mapping and observations from an on-site visit in November 2025. As a result, the information provided here is not exhaustive and intended to act as a high-level summary of energy generation capacity across the village.

⁴ This is the MW capacity, of all installed rooftop solar PV systems. This represents the maximum power output of all installed systems.

⁵ This is the amount of energy generated by each installation, per year in MWh (megawatt-hours). It is a standard metric to measure larger-scale electricity generation.

⁶ Rooftop PV installations at Ashwell Primary School and Ashwell Garage are dispersed across multiple rooftops but are counted as one single system for this assessment.

2.5.1. Future Energy Scenarios

This section provides projections for future electricity consumption in the area across four broad scenarios. It is important to forecast energy scenarios to understand how electricity demand and generation may increase in the future. This informs the strategy for how best to decarbonise and provides contextualisation for the roll-out of new generation, heating systems, and domestic low carbon technologies such as Electric Vehicles (EVs) and heat pumps.

The National Energy System Operator (NESO) produces yearly projections for the UK to 2050, with projections covering both the energy consumer and wider energy system (National Grid, 2024) – called the Distribution Future Energy Scenarios (DFES). Using the baseline already described for Ashwell parish, these projections have been applied and are presented in the figure below as indicative growth forecasts.

The National Grid lay out four future scenarios that underpin their projections:

1. **Falling Short:** This represents the slowest credible decarbonisation. There is minimal behaviour change. Decarbonisation occurs in power and transport but not in heat.
2. **Consumer Transformation:** Consumers are willing to change behaviour, resulting in electrified heating, high energy efficiency and demand side flexibility.
3. **System Transformation:** Consumers are less inclined to change behaviour, resulting in lower energy efficiency. Structural transformation results in increased use of hydrogen for heating.
4. **Leading the Way:** This represents the fastest credible decarbonisation pathway. Here, there is a significant lifestyle change, including a mixture of hydrogen and electrification for heating.

The *Consumer Transformation scenario* may act as a guiding aim for the decarbonisation of Ashwell, as this is the scenario most representative of locally centred action.

By 2050, annual electricity consumption across Ashwell is anticipated to rise up to 13,621 MWh. This is a net projection, anticipating large increases in electricity consumption forecast in the area. In the most ambitious scenario, the electrification of heating and transport may lead to a 26% in increase in domestic electricity consumption by 2030 and 166% increase by 2050. This will place a strain on the local and national electricity infrastructure and may offer opportunities for increased local generation and flexibility capabilities.

There will likely also be large increases in electricity demand from non-domestic properties, although the scale of this change in the study area is difficult to predict as most businesses are small scale. However, if Ashwell's non-domestic buildings follow the same trends as National Grid predicts across the UK level, non-domestic electricity consumption will likely increase by 18% – 49% by 2030 and more than double by 2050. This is caused by the electrification of heating and the transition to using electricity instead of using fossil fuels.

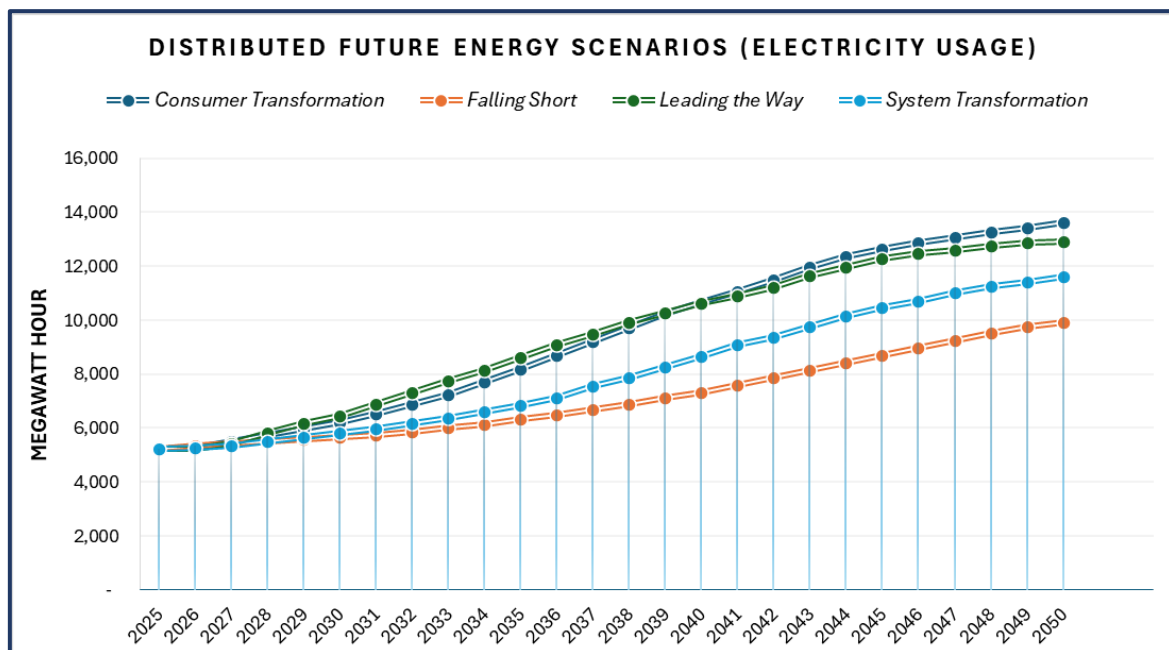


Figure 2.8 – Distributed Future Energy Scenarios for Electricity Consumption across Ashwell.

New Energy Demands

The National Grid DFES identifies two main load increases that lead to increased residential electricity demand – the electrification of heating via heat pumps, and transportation via electric vehicles (EVs). At present, the study area has more heat pumps than the national average – although this is still at a relatively low level of just 4% of all homes.

If Ashwell follows National Grid growth projections and reaches a similar peak penetration of heat pumps in 2050, this results in total heat pump (combined ASHP and GSHP) electricity consumption of 12,266 MWh in 2050 under the Consumer Transformation scenario, equivalent to 14.26 MWh per household.

The electricity demand from residential electric vehicles totals 1,801 MWh in 2050 under the Consumer Transformation scenario, equivalent to 2.11 MWh per household.

New Energy Generation

It is estimated that Ashwell parish currently annually generates 410.8 MWh/year (a total installed capacity of an estimated 0.43 MW) in residential distributed generation (see section 2.5). National Grid forecasts rapid increases in small scale generation throughout the UK, in particular rooftop solar PV. In Ashwell, an increase by 0.44 MW of additional generation capacity is expected to drive the total capacity to 0.87 MW by 2030, while a total of 2.7 MW is expected to be added to take the overall capacity to ~3.1 MW by 2050 in Ashwell.

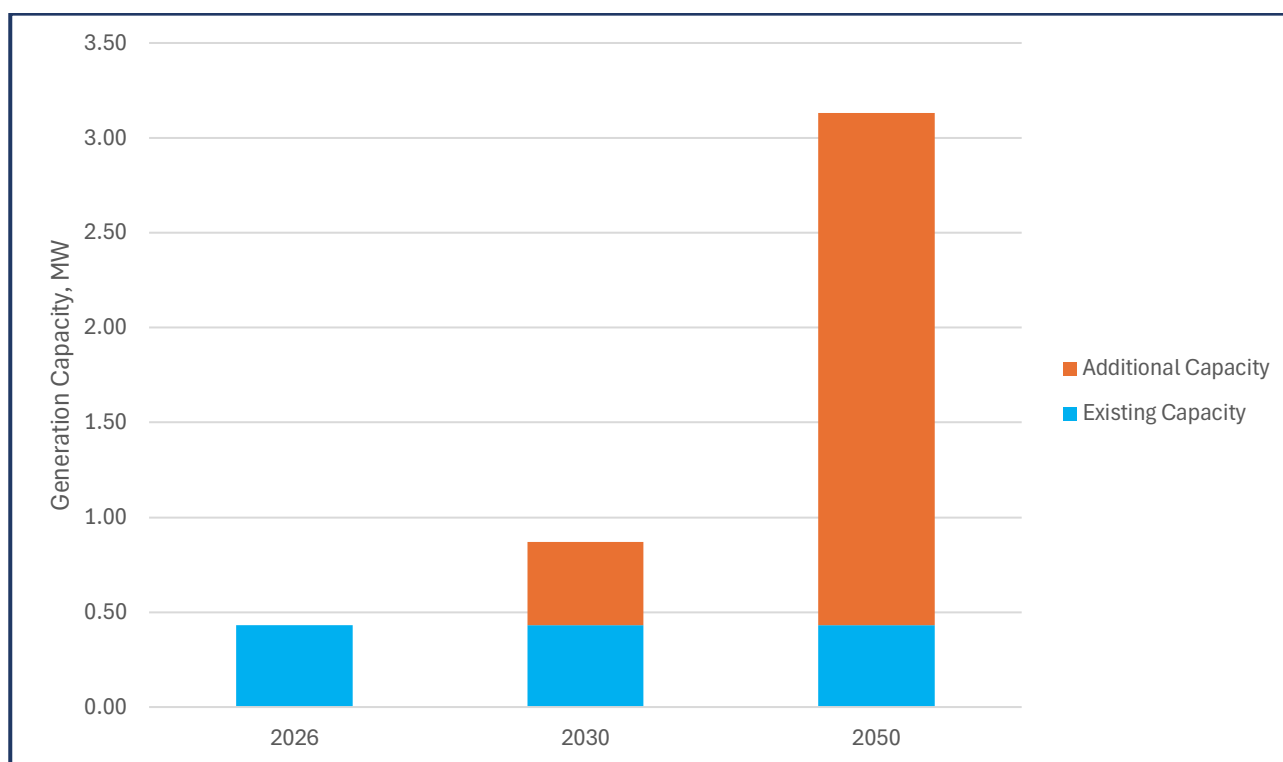


Figure 2.9 – National Grid Generation Capacity Forecast

3. Energy Options Prioritisation Assessment

This chapter provides an initial assessment of sites and technologies suitable for low-carbon energy development in Ashwell parish, covering both electricity generation and sustainable heating. Using defined selection criteria, a range of potential sites were shortlisted following a site visit in November 2025. Selected options will be taken forward to detailed techno-economic and planning analysis in later sections.

An overview of all sites shortlisted for full techno-economic feasibility are shown in Figure 3.1. Further detailed analysis of all development site options and the shortlisting process may be found in Appendix B.

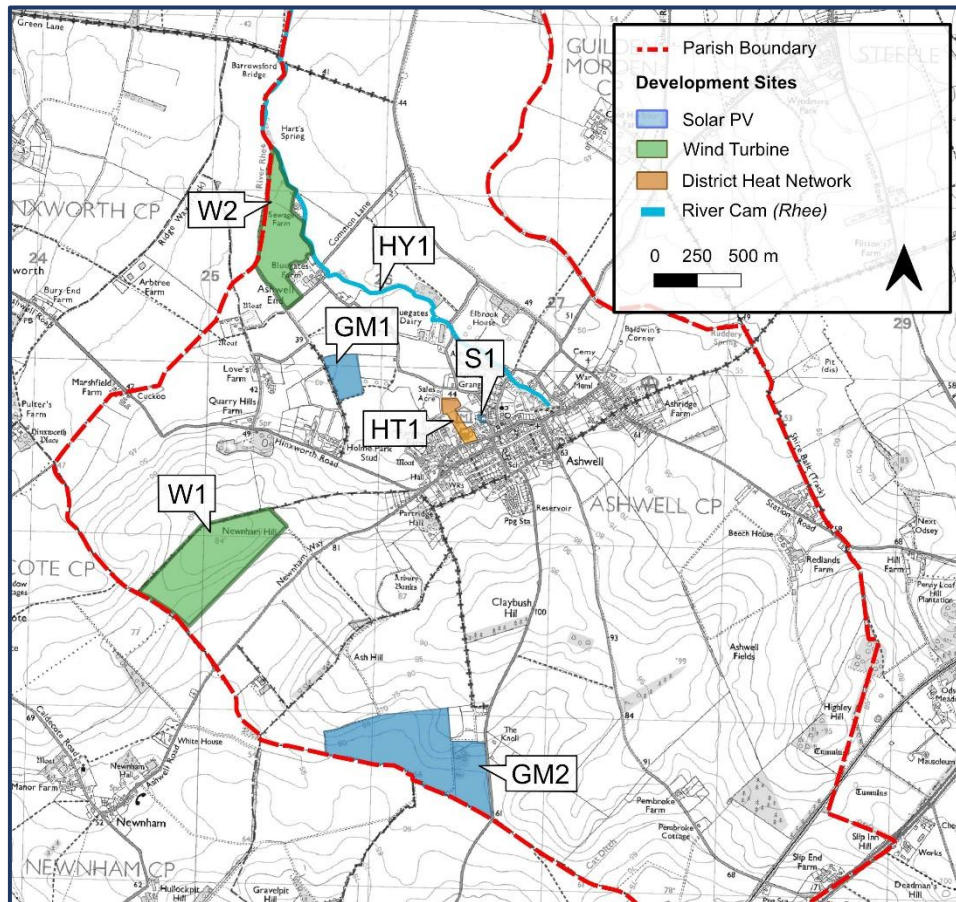


Figure 3.1 – Summary of Potential Energy Development Sites across Ashwell.

3.1. Electricity Generation

Ashwell's annual electricity demand is approximately 5,247 MWh, producing around 813 tCO₂e. Several community-owned electricity generation technologies were assessed, including rooftop and ground-mounted solar PV, small-scale wind, micro-hydro, anaerobic digestion (AD), and battery energy storage systems (BESS).

For **rooftop solar**, Wolverley House (a 77-flat assisted-living complex) was identified as a strong candidate due to suitable roof orientation, sufficient roof area, consistent local demand, and minimal planning constraints despite its conservation area setting. Rooftop PV here could support local supply with limited grid export.

Two **ground-mounted solar** sites were shortlisted. GM1 (SE of Love Lane) is a small, well-screened arable field with good isolation from residences, suitable for export-focused solar subject to landowner agreement. GM2 (SW of Claybush Hill) is a larger south-facing site near a consented commercial solar farm, offering potential shared infrastructure, though land ownership uncertainty and possible community opposition present challenges.

Two **wind turbine** sites were identified. W1 (Newnham Hill) benefits from elevation, screening, and low sensitivity, making export-only wind generation feasible. W2 (Bluegates Farm) is similarly well screened, close to agricultural and wastewater infrastructure, and suitable for export-led wind generation.

Hydroelectric generation on the River Cam was assessed and ruled out as unviable due to insufficient concentrated head height, lack of suitable control structures, and ecological constraints, despite the river's length and elevation change.

Anaerobic digestion was found to be technically feasible but not recommended. Local farm waste could support only a small-scale AD plant (~0.8 MW), which is economically marginal, logistically complex, and potentially redundant given the likelihood of existing or future farm-based AD systems.

Battery energy storage systems were assessed as enabling technologies rather than standalone solutions. Co-located or distributed batteries could improve the performance and value of local generation and electrified heating, but a strong standalone business case for community-scale BESS is currently lacking.

3.2. Heat Generation

Heat demand across the parish totals approximately 14,037 MWh per year, producing 2,773 tCO₂e. Two low-carbon heating pathways were considered.

A **district heat network** centred on Dixies Meadow (HT1) could serve nearby dense residential areas, benefiting from the site's central location and limited competing land use. This includes consideration of water-source, ground-source (open and closed loop variants), and air-source heat pump systems, as the preferred decarbonisation options for Ashwell. Biomass and other forms of heating (e.g., fossil fuel, heat from waste) are discounted based on high carbon emissions and / or high levels of local pollution, meaning they are incompatible with the aims of ZCA.

Alternatively, **distributed heat pumps** are proposed as a lower-risk, incremental transition driven by individual property upgrades. In this scenario, community energy groups can play a key role through education, support services, and practical implementation to accelerate uptake, rather than directly investing in or owning heating infrastructure. This scenario is typically referred to as the "low carbon counterfactual", representing the alternative low carbon transition should a communal heating system prove unviable.

3.3. Conclusion

The shortlisted sites identified through this preliminary assessment represent the most credible and deliverable opportunities for community-owned low-carbon energy infrastructure within Ashwell parish. Each site has been selected based on a balanced consideration of technical suitability, land use constraints, environmental sensitivity, proximity to demand, and potential community benefit. These sites are therefore designated as the preferred locations for further development. They are progressed to detailed feasibility, where technical and financial viability, planning and policy compliance, and environmental and social impacts are appraised. This next phase confirms which options can be practically and economically delivered, and how they can best contribute to Ashwell's long-term decarbonisation and community energy objectives.

4. Technical Options Appraisal

This section assesses the technical viability of low carbon technologies across Ashwell parish and provides recommendations for detailed technical designs and subsequent financial analysis. This chapter also provides context on the local electricity grid in the local region.

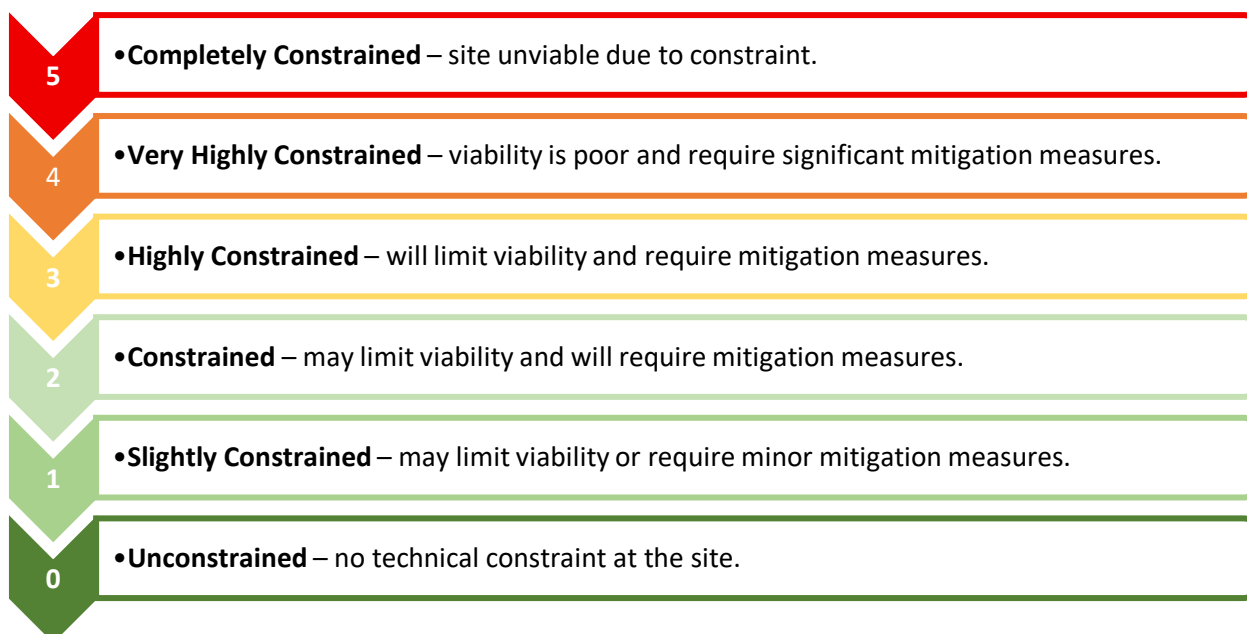
4.1. Recommendations

Based on the technical appraisal of electricity generation, low carbon heating and energy efficiency opportunities across Ashwell, the following opportunities are technically viable and are recommended to progress to financial appraisal.

1. **Installing a rooftop PV system at Wolverley House.** Whilst rooftop solar array at Wolverley House is a relatively small project, it would help to decarbonise one of the village's larger residential sites.
2. **Establishing a community-owned electrical generator which operates on an export-only basis.** Several scales of wind turbine or a large ground-mounted solar PV array would provide a significant source of revenue and offset a large proportion of parish GHG emissions.
3. **Establishing a community-owned DHN at Dixies Meadow, Ashwell.** Located in Dixies Meadow, a DHN could meet the space and water heating demand of residential properties at Wolverley House and Bacon's Yard.
4. **Developing a community-led programme for domestic decarbonisation across Ashwell,** targeting energy efficiency improvement and ASHP adoption. As an alternative to a DHN, community-led support could enable homeowners to install ASHPs individually across Ashwell. This support could also provide implementation advice and supplier references to help homeowners improve home energy efficiency across the parish.

4.1.1. Development Constraints

To determine technology and location suitability for development, several site-specific conditions, constraints and barriers to each technology type have been appraised in a desktop constraints assessment. This assessment has been guided by the following hierarchy:



Sites are categorised according to the impact developments will have upon statutory designations (e.g., ecological, environmental, archaeological and historic listings), social perception (e.g., community support) and other considerations (e.g., noise impact, ease of access or proximity to residences) at each respective location.

These considerations are noted throughout the technoeconomic assessment, and a full review of relevant statutory designations and planning policy is provided in Section 5.

4.1.2. Energy Networks

Electricity generation projects, particularly those with significant export to the national grid, require available capacity to enable energy export, called “headroom”. Establishing headroom is achieved through discussion with the local Distribution Network Operator (DNO). Across Ashwell and North Herts, the DNO is UK Power Networks (UKPN).

The principal grid supply point (GSP) that hosts the network surrounding Ashwell is situated at Wymondley, North Herts. GSPs are the principal connection points where the high-voltage (HV) transmission systems transfer to the localised low-voltage (LV) distribution networks. As Wymondley GSP lies 6.7 miles from Ashwell, this distance is too great to justify the logistics and cost of establishing a physical electrical connection here, particularly at the scale of development proposed in this report. Below GSPs, primary substations are responsible for regional electrical distribution and could host new electrical connections. Seven UKPN primary substations are situated in the region surrounding Ashwell, and evidence suggests that six are relatively unconstrained for new connections. However, Ashwell parish remains relatively geographically isolated from these connection points. Therefore, the physical distance, costs and logistics required to connect to these substations from Ashwell renders such a connection unviable.

Instead, connection to localised secondary substations is anticipated. Ashwell itself contains approximately 11 secondary substations, ranging between 100 – 500 kVA⁷. All substations range between 20 – 80% utilisation rates, displaying some limited capacity for new connection. Secondary substations deemed appropriate for connection are noted in each technical appraisal. For larger electrical connections engagement with UKPN was undertaken to understand infrastructure capacity and export limitations across Ashwell, based on recommended generator specifications. Indictive budget estimate costs were established during this engagement and are included in following technoeconomic analyses.

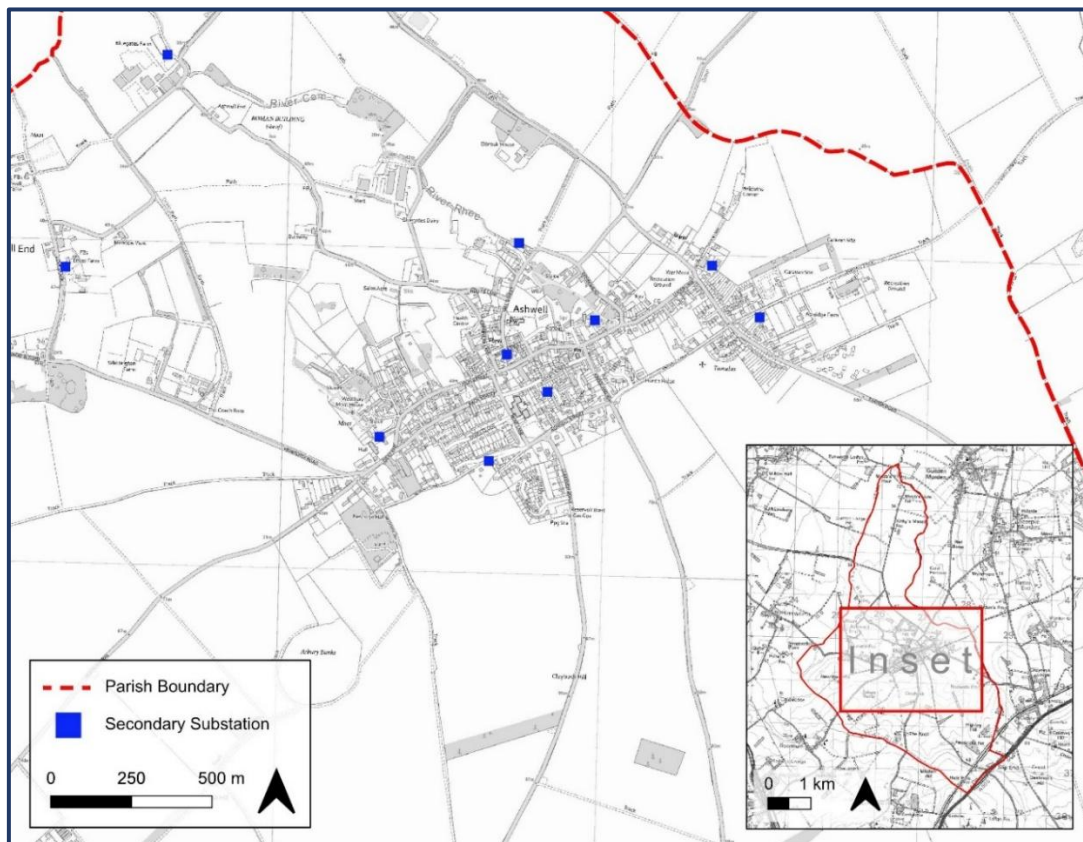


Figure 4.1 – UKPN Secondary Substations surrounding Ashwell.

⁷ Kilovolt-Amperes.

4.2. Wind Energy

Broadly, wind turbine developments need to balance generation output with the likelihood of obtaining planning consent, as well as the limitations of the electrical network for energy export. While smaller scales of development (e.g., < 0.2 MW) will have a far lesser impacts upon the local landscape, ecology (e.g. birds) and viewpoints, they have a far lower operational efficiency ('load factor') than larger variants. As a result, the financial and energy generation potential improves exponentially with turbine scale, which is a key issue to consider when determining the scale and extent of turbine development.

Development Context

Although renewable and low carbon energy developments are supported in both the North Herts Local Plan 2011 – 2031 (section 5.2.1) and Ashwell Neighbourhood Plan 2021 – 2031 (section 5.2.2), the importance of preserving the regional landscape's character and biodiversity are reflected in several policies. As a result, planning consent is most likely where turbine impact on the value of the landscape and residential amenity is minimal.

Several wind turbine developments exist in the landscape surrounding Ashwell, providing a precedent for potential scales of development deemed acceptable in the region, including:

20 MW Biggleswade Wind Farm (Biggleswade, Bedfordshire): A 20-MW wind farm south of Biggleswade comprising 10 turbines, each with a maximum hub height of 80 m. This site was commissioned in 2013 and lies 4.5 miles to the northwest of Ashwell. These turbines are sited in flat agricultural land west of the A1 Road, and west of the village of Langford, Bedfordshire.

0.5 MW Wind Turbine at Hill Farm (Langford, Bedfordshire): A single 0.5 MW turbine at Hill Farm, Langford. Situated in flat agricultural land 4.3 miles west of Ashwell, this turbine was constructed in 2014/15 and has a hub height of 60 m.

0.33 MW Wind Turbine at Gamlingay (Gamlingay, South Cambridgeshire): Installed and operated by a local community group in Gamlingay, this turbine has been in operation since 2013. The turbine has an approximate hub height of 40 m and lies on an exposed, gently sloping hill to the southeast of the village.

Whilst these existing turbine developments are situated within neighbouring local authorities (and are thus under the jurisdiction of different planning authorities, they do provide some context and a precedent for wind development within similar landscapes.

4.3. Site 1, Newnham Hill

Site 1 is a 26-ha arable field centred around the summit (~84m) of Newnham Hill, and therefore has relatively high wind resource, and suitable topography for a wind turbine. The distance to the nearest dwelling (600 m) and screening effect of the topography from Ashwell village would minimise noise and visual impact on residential areas. Whilst the hill occupies a prominent position within the parish, the summit itself is not visible from the neighbouring Newnham Way Road by the field's southern slope. The field is currently used for arable farming and is designated as grade 2 agricultural land. Although the field itself is not publicly accessible, two Public Rights of Way (PRoW) pass the field on its western and northern boundaries. A local nature reserve, Ashwell Quarry and Quarry Springs, lies at the base of the hill's northern slope beside Hinxworth Road. This is a small reserve maintained by the Herts and Middlesex Wildlife Trust and is not directly visible from the summit of Newnham Hill.

A technical summary of the two scales of development, and an indicative turbine layout are provided in Table 4-1 and Figure 4.2, respectively. Due to the exposure and prominent location of the hill's summit, smaller scales of development are anticipated to be more acceptable here.

Recommendation

Wind turbine development on the summit of Newnham Hill is not recommended. Whilst a turbine is technically feasible here, the summit's prominent position within a low-lying and expansive landscape would mean a turbine would be visible from southern and western viewpoints. The site's proximity to the local nature reserve may impact on local wildlife and therefore detailed assessment of ecological impact, clear and robust mitigation measures, and careful communication with local people are required due to the sensitivity of the site.

Table 4-1 – Technical Summary of Turbine Scenarios at Newnham Hill.

Scenario	Turbine Height (m)	Average Wind Speed (m/s) ⁸	Capacity Factor (%) ⁹	Annual Generation (MWh)	Homes Powered per year ¹⁰	Annual Carbon Savings (tCO ₂ e)
1x 0.1 MW turbine	24	5.7 (25 m)	27.9%	244.2	90	42.7
1x 1 MW turbine	70	7.0 (70 m)	34%	2,975.3	1,102	520.3

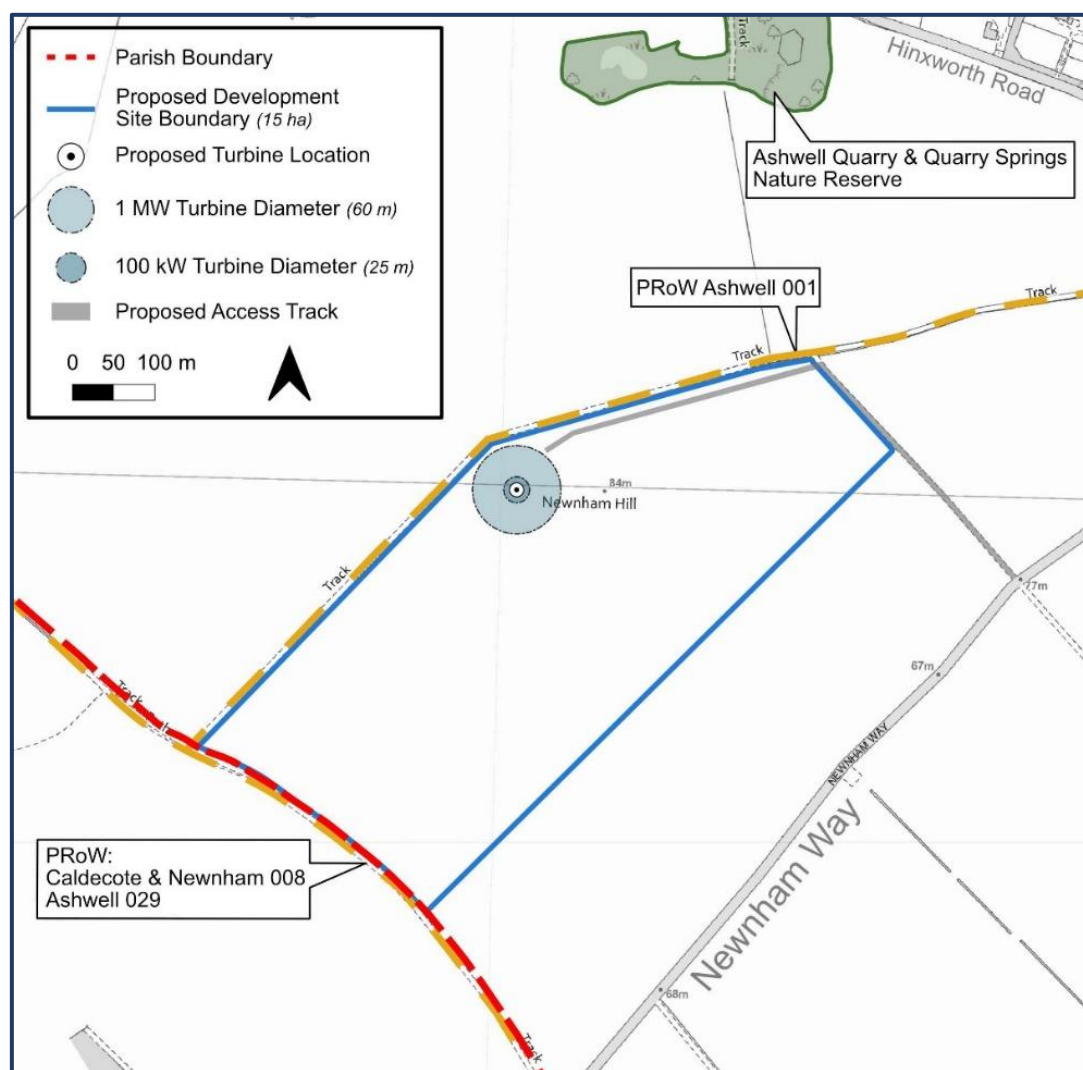


Figure 4.2 – Indicative Wind Turbine Layout at Newnham Hill, Ashwell.

⁸ NOABL wind speed database, 2008.

⁹ Capacity factor is a measurement of how much a system is used compared to its maximum electrical capacity.

¹⁰ Assumes an average UK residence consumes ~0.27 MW per year.

Development Constraints

Specific constraints facing wind turbine development at Newnham Hill are set out below. Key issues include establishing landowner and community support and minimising adverse visual impact upon the landscape. Smaller scales of turbine development (< 1 MW) will be able to best overcome these issues.

Table 4-2 – Wind Energy Technical Constraints at Newnham Hill.

Constraint	Description	Constraint Level
Landscape	Newnham Hill provides expansive views of the regional landscape. A turbine here could affect local scenic views, potentially drawing opposition from residents and visitors.	4
Land use	Newnham Hill lies within actively farmed grade 2 agricultural land. Although the field can be retained for farming once a turbine is installed, site land ownership and intensity of use should be established prior to scheduling land for development.	1
Community perception	Due to Newnham Hill's prominence within the local landscape, and close proximity to a local nature reserve, local opposition may delay or wholly block turbine development here.	4
Shadow Flicker	Rotating wind turbine blades can cause brightness levels to vary periodically when they obstruct the sun's rays, causing a nuisance when the shadow is cast over the windows of residential properties. Notably, this effect is experienced only within <1.5km from the turbine (depending upon blade size). For a 0.1 MW turbine, shadow flickering is not anticipated to impact any residential dwellings in Ashwell, Newnham or Caldecote. A 1-MW turbine may affect some dwellings on the western edge of Ashwell (~1km away) may be affected. A Shadow Flicker Assessment may be required before planning permission can be granted.	2
Noise	Newnham Hill is situated approximately 650 m from the nearest residential dwelling. For noise-sensitive locations (e.g., residential areas), noise generated from turbines must not exceed 37-40 dB during the day. At such a distance, lower scale turbines (< 1 MW) typically exhibit noise levels lower than this limit, while larger scale turbines (> 1 MW) may approach or exceed the 37-40 dB limit. A Noise Impact Assessment (NIA) may be required to better understand background sound levels and derive site-specific noise limits before larger scales of development proceed.	2
Wildlife & Ecology	Whilst the Ashwell Quarry and Quarry Springs nature reserve is not visible from the summit of Newnham Hill, the ecological impact of a turbine here should be understood in full before commencing development. Broadly, the wider region hosts a range of diverse and protected wildlife species. Any future development may require on-site assessments to ascertain potential levels of disruption to minimise harm to habitats.	3
Drainage & Flood Risk	No flood risk zones exist on, or near Newnham Hill.	0
Environmental Heritage	No statutory environmental designations exist on Newnham Hill.	0
Cultural Heritage	Although no cultural designations exist at Newnham Hill, the site lies directly north-west of Arbury Banks, a scheduled ancient monument. Although this not expected to directly constrain wind development at Newnham Hill, prospective turbines should minimise visual impact in this direction.	1

Constraint	Description	Constraint Level
Grid Connection Feasibility	While both scales of turbine could connect to the existing overhead LV/HV network, engagement with UKPN engineers confirmed that an energy power export limitation of up to 0.2 MW will be in place for all turbines in this region. Larger turbines (i.e., >0.2 MW) looking to circumnavigate this export limitation constraint will incur considerable network reinforcement works, due to localised grid capacity issues.	4
Access for Construction & Maintenance	Newnham Hill lies near two busy travel routes (Newnham Way and Hinxworth Road), which can be used to transport construction materials and equipment.	0

4.3.1. Site 2, Bluegates Farm

A 15-ha arable field adjacent to Bluegates Farm, in the northwest of the parish is also considered for turbine development. Whilst average wind speeds in this flat, agricultural region of the parish are marginally lower than at Newnham Hill, this is a discreet site and would not adversely affect the immediate landscape's visual appearance. The field itself is bounded by an unnamed stream, and the River Cam on its western and eastern boundaries, respectively. In turn, these waterways are themselves screened by trees and other neighbouring fields. The field is accessed via Common Lane, and Love Lane, which provide vehicular access to Bluegates Farm. The field is adjacent to Bluegates Farm and a small sewage treatment plant. Proximity to an operational farm, pre-existing energy infrastructure and relative isolation from Ashwell's main transport and residential areas means a turbine here would have relatively minimal noise and visual impact.

A technical summary of the two scales of development, and an indicative turbine layout are provided in Table 4-3 and Figure 4.3 respectively. Actual turbine layout and specification may differ following a detailed design process by a specialist designer or engineer.

Recommendation

Establishing landowner support and understanding the business case for a community-owned wind turbine at Bluegates Farm is recommended. A turbine here is technically feasible and is anticipated to have low impact on the wider local landscape and the immediate site's agricultural use. Following precedents set by other turbines in the region, Bluegates Farm provides an appropriate, secluded setting for a community-owned turbine in this landscape, secluded from local settlements and vantage points.

Table 4-3 – Technical Summary of Turbine Scenarios at Bluegates Farm, Ashwell.

Scenario	Turbine Height (m)	Average Wind Speed (m/s) * ⁸	Capacity Factor (%) ⁹	Annual Generation (kWh)	Homes Powered per Year ¹⁰	Annual Carbon Savings (tCO ₂ e)
1x 0.1 MW turbine	24	5.4 (25 m)	27.9%	244.2	90	42.7
1x 1 MW turbine	70	6.4 (70 m)	28.2%	2,472.6	916	432.4

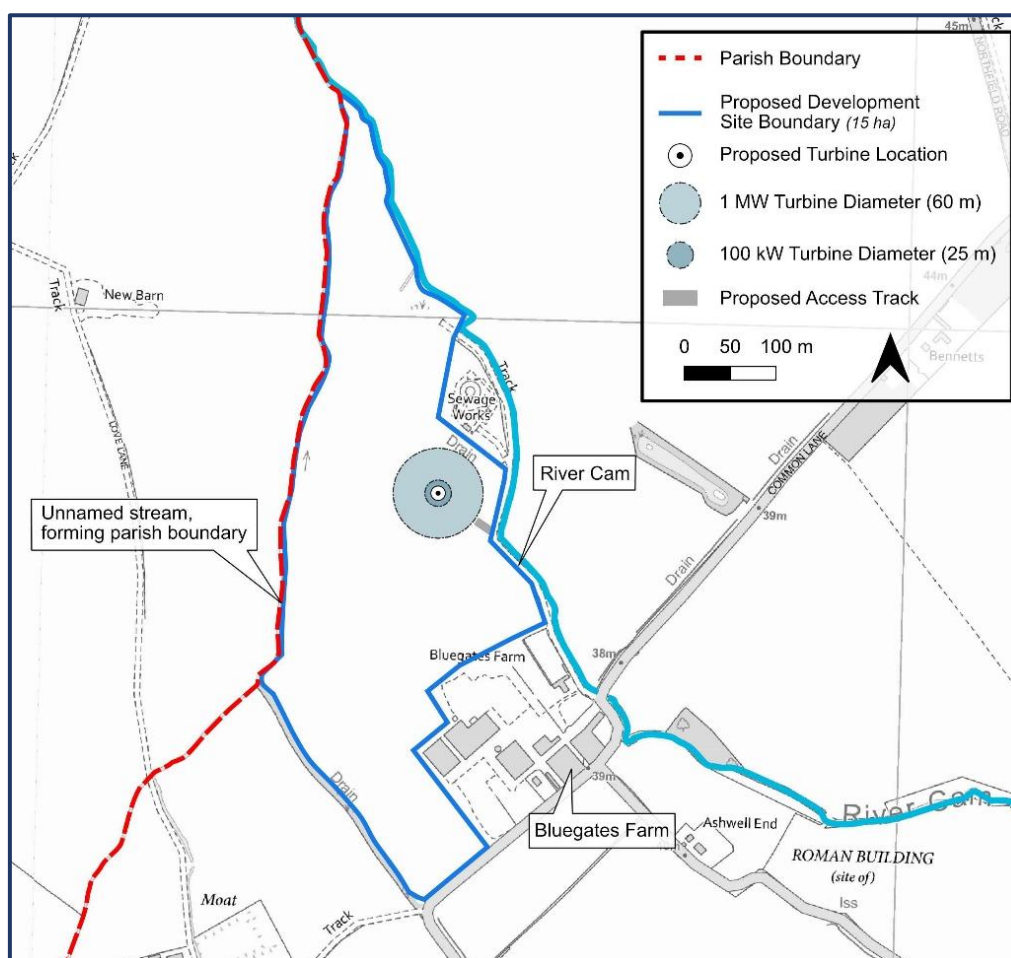


Figure 4.3 – Indicative Wind Turbine Layout at Bluegates Farm, Ashwell

Development Constraints

Specific constraints facing wind turbine development at Bluegates Farm are set out below.

Table 4-4 – Wind Energy Technical Constraints at Bluegates Farm, Ashwell.

Constraint	Description	Constraint Level
Topography & Site Suitability	Bluegates Farm is a low-lying (< 40 m) and secluded site. Wind resource could support turbine energy generation at this location.	1
Landscape	A wind turbine here will have minor impacts on the immediate landscape, character and viewpoints.	2
Land use	Bluegates Farm lies within actively farmed grade 3 agricultural land. Although a turbine development will still allow the field to be farmed, land ownership and intensity of farming use should be established prior to scheduling land for development.	2
Community perception	Although the site is relatively secluded, local opposition delay or wholly block turbine development here.	3
Shadow Flicker	Rotating wind turbine blades can cause brightness levels to vary periodically when they obstruct the sun's rays, causing a nuisance when the shadow is cast over the windows of residential properties. Notably, this effect is experienced only within a certain distance from the turbine. For both scales of turbines assessed, shadow flickering	2

Constraint	Description	Constraint Level
	may impact Bluegates Farm itself. As a Shadow Flicker Assessment may be required before planning permission can be granted.	
Noise	The proposed turbine location situated approximately 520 m to the north of Bluegates Farm. For noise-sensitive locations (e.g., residential areas), noise generated from turbines must not exceed 37-40 dB during the day. At such a distance, lower scale turbines (< 1 MW) typically exhibit noise levels lower than this limit, while larger scale turbines (> 1 MW) may approach or even exceed the 37-40 dB limit. A NIA may be required to better understand background sound levels and derive site-specific noise limits before larger scales of development proceed.	2
Drainage & Flood Risk	The River Cam, and an unnamed waterway lie on the site's eastern and western boundaries respectively. Land adjacent to both waterways is designated zone 2 and 3 flood zones. A Flood Risk Assessment will be required to obtain planning consent here and to identify mitigation strategies.	4
Environmental Heritage	No statutory environmental designations exist on site.	0
Cultural Heritage	No statutory cultural designations exist on site.	0
Grid Connection Feasibility	In March 2026, a UKPN budget estimate confirmed that a 0.1 MW turbine can connect to the existing network fed pole-mount transformer at Bluegates Farm, subject to minor connection upgrades and accessibility requirements. For larger turbines (i.e., >0.2 MW), a power export limitation of up to 0.2 MW will be in place here. To circumvent export limitations, complex local network reinforcement works at significant capital cost will be required.	4
Access for Construction & Maintenance	Bluegates Farm lies adjacent to two country lanes - Common Lane and Love Lane. Both roads can be used to transport construction materials and equipment.	0

4.4. Solar Energy

Solar Photovoltaics (PV) currently are one of the cheapest and most accessible forms of low carbon energy generation widely implemented across the UK. The technology is highly modular, and two principal typologies are considered appropriate for consideration across Ashwell:

- **Rooftop PV:** The installation of roof-mounted panels on suitable pitched or flat rooftops.
- **Ground-Mounted PV:** The installation of fixed-ground mounted panel arrays using pitched mounting hardware and either secured to the ground or ballasted using concrete blocks.

Following the preliminary energy options appraisal assessment, two sites are put forward for detailed techno-economic appraisal:

Scenario 1: A rooftop solar PV installation at Wolverley House, Ashwell.

Scenario 2: A ground-mounted PV array in an agricultural field near Love Lane, Ashwell.

Current Rooftop PV Distribution & Future Capacity

As of 2026, there are approximately 61 rooftop solar PV installations in Ashwell Parish, with a capacity of 0.43 MW, generating 410.8 MWh per year. This amounts to ~7.4 % of Ashwell's annual electricity requirement.

Following an assessment of the parish's potential future energy scenarios (Section 2.5.1), a high-level calculation of the parish's maximum rooftop PV capacity was undertaken. Here, 936 existing vacant rooftops across the parish were identified, totalling 50,365 m² of prospective rooftop PV development space (see Table 4-5).

Development of all existing rooftop space is an extremely ambitious target and is not projected in NESO's current future energy projections (see 2.5.1). The calculation of Ashwell's undeveloped rooftop space is therefore provided as a theoretical indication of potential rooftop PV capacity. In total, undeveloped rooftops could accommodate approximately 8.1 MW of rooftop solar capacity, with annual generation of approximately 7.8 GWh and carbon saving of 1,358 tCO₂e.

Most properties (525) are located within the Ashwell Conservation Area, meaning many of these properties may not be suitable for solar PV installation. 60 of these properties are also listed buildings, further constraining development. Rooftop PV is even more controlled here and will need to evidence conformity and preservation of listed building appearance, viewpoints and character. Since the building stock across the parish is a mixture of historic townhouses, traditional farmsteads and post-war housing, the retention of traditional building characteristics is a key feature of the local planning and development policy. For further information on planning consents and permissibility, see Section 5.2.

Based on the above constraints, it is proposed that approximately 411 properties would be suitable for rooftop solar PV, with a combined generation capacity of 3.8 MW, generating 3.6 GWh / year and reducing emissions by 626 tCO₂e/year. This equates to 65% of Ashwell's 2025/26 annual electricity demand.

Table 4-5 – Rooftop Solar PV Capacity across Ashwell.

	Number	Indicative Capacity (MW)	Potential Annual Generation (MWh)
Properties <u>with</u> Rooftop Solar PV	61	0.43	414,109
Properties <u>without</u> Rooftop Solar PV	936	8.06	7,762,136
<i>Properties in Ashwell Conservation Area</i>	525	3.75	3,611,416
<i>Properties <u>not</u> in Ashwell Conservation Area</i>	411	3.78	3,640,307

4.4.1. Detailed Solar PV Designs

Based upon the appraisal of high prospect sites across the parish, two indicative solar PV development opportunities are presented. A summary of the two proposed solar PV scenarios is provided below.

Table 4-6 – Summary of Solar Technical Opportunities across Ashwell.

	Rooftop PV (Wolverley House)	Ground-Mounted PV (Field, Love Lane)
Total Installed Capacity (MW)	0.06 (61.5 kW)	2.21 (2,214 kW)
Annual Generation (MWh)	60.52	2,361.56
Homes Powered per Year	22	875
Number of Modules	123	4,428
Panel Area	272.5 m ²	9,811.7 m ²
Indicative Capital Cost (£)	£83,324	£2,386,387
Cost per kW	£1,355	£1,078
Carbon Saving (tCO ₂ e)	10.2	413

Scenario 1: Rooftop Solar PV at Wolverley House, Ashwell.

Wolverley House is a large assisted-living residential complex located on Gardiners Lane, near the centre of Ashwell. Wolverley House was constructed in the 1970s, and contains approximately 77, self-contained flats.

Comprised of three main wings, the property contains several large, vacant pitched rooftops which could host solar PV infrastructure.

A technical summary and design metrics of the PV system are provided in and Table 4-7. Figure 4.4 displays an indicative module layout, utilising the site's east and south-facing pitched rooftops.

Recommendation

It is recommended that the ZCA investigate the financial case for this opportunity. A 0.06 MW rooftop PV array at Wolverley House represents an achievable and relatively low-risk undertaking for a community-led solar PV development. Contingent on securing site owner, resident and planning consent, energy generated by a system here could be used to supplement on-site domestic electrical demand at Wolverley House. This would provide residents with energy bill savings, offset site emissions and provide ZCA with a consistent stream of income (through energy supply). Although direct supply to Wolverley House residents is preferred, the energy generated by a solar PV array here could offset the annual electrical demand of approximately 22 homes each year.



Figure 4.4 – Indicative Rooftop PV Array at Wolverley House, Ashwell.

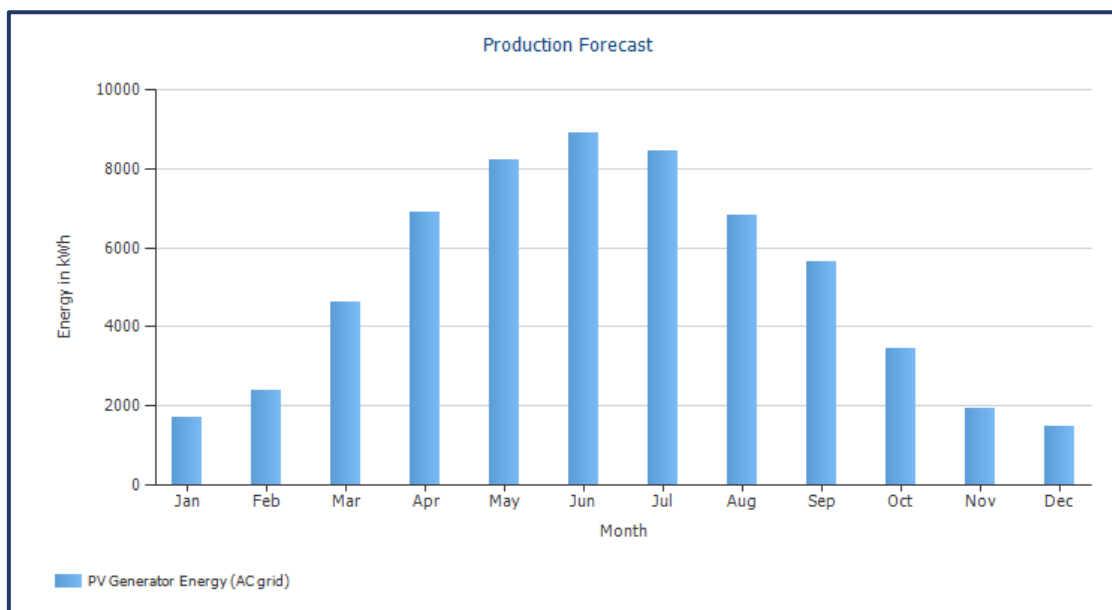


Figure 4.5 – Annual Generation Profile for Rooftop PV at Wolverley House, Ashwell.

Table 4-7 – Design Metrics for Rooftop PV at Wolverley House, Ashwell.

Design Metrics	
General	
Latitude / longitude	52.041400, -0.15579182
Site Area	0.14 ha (430 m2 generator surface)
Annual global Irradiation	1.1 MWh/m ²
Annual average temperature	10.4 °C
Electrical phases	3-phase
Connection Type & Point	Connected to existing building meter
Electrical Capacity	
Total Installed Capacity (TIC)	0.06 MW
Annual Generation (MWh)	60.52 MWh
Annual Export (MWh)	28.4 MWh (46.9%)
Annual Local Supply (MWh)	35.34 MWh (53.1%) ¹¹
Cable Losses	0.5% (0.3 MW)
Solar Modules	
Candidate Solar Module	AIKO-A500-MAH60Mb
Number of Modules	123
Module Rated Capacity (W)	500 W
Environmental	
Carbon Emission Reduction (tCO ₂ e)	10.2

Development Constraints

Specific constraints facing rooftop PV development at Wolverley House are set out below.

¹¹ Based upon 2026 estimate of annual electrical demand at Wolverley House.

Table 4-8 – Rooftop Solar PV Technical Constraints at Wolverley House, Ashwell.

Constraint	Description	Constraint Level
Site Suitability	Wolverley House dates from the latter half of the 20th century and represents one of the newer constructions near the centre of Ashwell. The building's exterior and three tiled rooftops all appear to be in good condition, suitable for rooftop access and panel installation. All selected rooftops also contain preferable south, and east-facing orientations and slopes for PV installation and optimum energy generation. Due to the rooftop's size, slope and composition, railed mounting is the preferred PV module mounting solution here. Here, a set of metal rails are attached to the rooftop, anchored by bolt fixings.	1
Cultural Heritage	Wolverley House resides within the Ashwell Conservation Area, and within view of several listed properties – including the Grade I listed parish church. The perimeter wall ('cob wall') on Gardiners Lane is also a grade II listed feature. However, the property's rooftops do not impede this feature and are not overly visible from Gardiners Lane. Existing tree cover provides additional screening for any prospective rooftop system here. To mitigate visual impacts here, the guidelines set out by the Ashwell Conservation Area Character Appraisal and Management Plan should be followed to ensure rooftop solar PV can demonstrate a negligible visual impact here. Engagement with NHDC planning department in March 2026 established informal support for a rooftop solar development at Wolverley House.	2
Grid Connection Feasibility	A rooftop PV installation at Wolverley House could connect to the site's existing electrical metering point, which would come at no additional cost or upgrade works.	0
Access for Construction & Maintenance	The grounds of Wolverley House contain suitable space to erect scaffolding to allow safe and unimpeded access to the roof. Rooftops at Wolverley House are expansive and unimpeded by external features or overhanging structures (e.g., buildings or trees).	0

Scenario 2: Ground-Mounted Solar Array at Love Lane, Ashwell.

A large-scale ground-mounted solar PV installation has also been appraised at a site southeast of Love Lane, Ashwell. The land is currently used for arable farming and lies approximately 1 km to the west of Ashwell village, in a sparsely habited area of the parish, surrounded by large farms and isolated residences. The site's large area and relative seclusion from residences and public viewpoints provide suitable scale for development and minimise local impact. Due to a lack of suitable energy off-takers in this area of the parish, this scenario is proposed as an export-only development.

A summary of technical design parameters and design metrics is provided in Table 4-7 and Table 4-9, representing a maximised development scenario at this location. In reality, the scale and layout of a ground-mounted array may differ, particularly following consultation with local landowners, UKPN and North Herts District Council (NHDC).

Recommendation

Establishing landowner support and a full understanding of the financial case for ground-mounted PV development at Love Lane is recommended. Whilst a 2.2-MW ground-mounted PV array is technically viable at this location, securing landowner and wider community support alongside planning consent are critical to enable development at this scale here.

Community-wide engagement should then follow to garner additional support and buy-in for the proposal. Due to a lack of singular large-scale energy users close to the site, a ground-mounted PV system at this location would operate on an export-only basis. However, the energy generated by a 2.2 MW solar PV installation here could offset the annual electrical demand of up to 875 homes across Ashwell.



Figure 4.6 – Indicative Ground-Mounted PV layout at Love Lane, Ashwell.

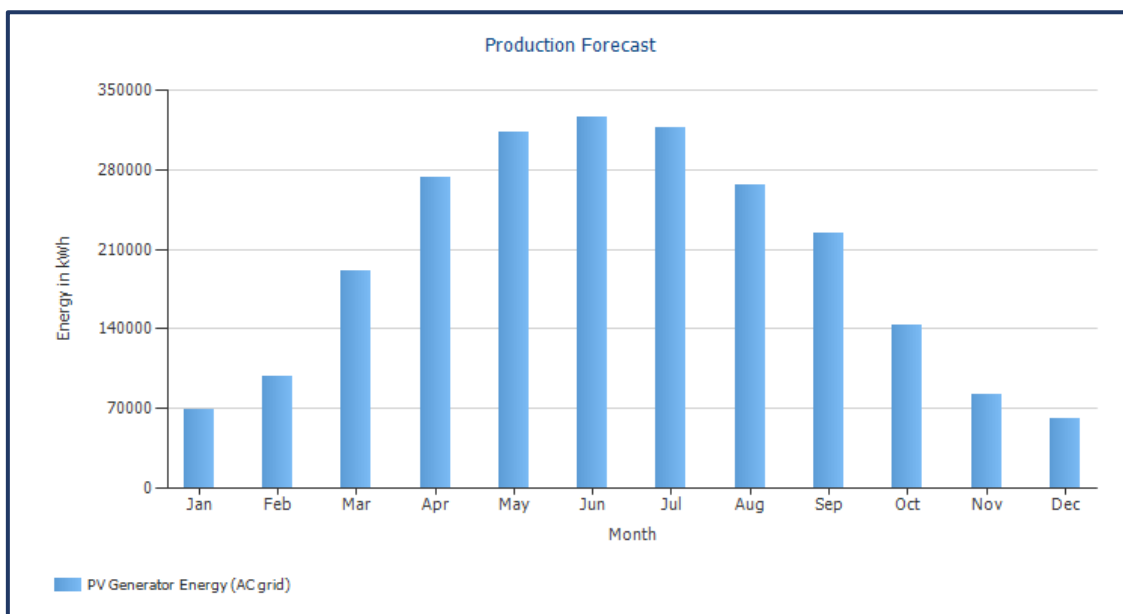


Figure 4.7 – Annual Generation Profile for Ground-Mounted PV at Love Lane, Ashwell

Table 4-9 – Technical Design Metric for Ground-Mounted PV at Love Lane, Ashwell.

Design Metrics	
General	
Latitude / longitude	52.043847, -0.16732049
Site Area	4.2 ha (9,811.7 m ² generator surface)
Annual global Irradiation	1.1 MWh/m ²
Annual average temperature	10.4 °C
Electrical phases	3-phase
Connection Type and Point	LV/HV on-site pole connected to primary substation
Electrical Capacity	
Total Installed Capacity (TIC)	2.2 MW
Annual Generation (MWh)	2,361.56 MWh
Annual Export (MWh)	2,361.56 MWh (100%)
Annual Local Supply (MWh)	0 MWh (0%) ¹²
Cable Losses	0.5% (11.81 MW)
Solar Modules	
Candidate Solar Module	AIKO-A500-MAH60Mb
Number of Modules	4,428
Module Rated Capacity (W)	500 W
Environmental	
Carbon Emission Reduction (tCO ₂ e)	413

Development Constraints

Specific constraints facing rooftop PV development at Love Lane are set out below.

¹² Due to a lack of large-scale energy users close to the site, this scenario is modelled on an export-only basis.

Table 4-10 – Ground-Mounted Solar PV Technical Constraints at Love Lane, Ashwell.

Constraint	Description	Constraint Level
Topography & Site Suitability	This field lies within low-lying (<40 m), flat farmland to the west of Ashwell village. The site would allow for panels to be mounted on preferential south-facing orientations to maximise solar generation. This field is surrounded on three sides by trees and dense hedgerows. Whilst the panel rows can be set back away from boundaries to avoid shading, some minor shading losses will still be expected from this vegetation. Generation outputs provided include losses from shading and it is not considered a major constraint to development.	1
Landscape	As this site is low-lying, the field is secluded from the main village, surrounding roads and local viewpoints. The field is also bounded on three sides by dense vegetation and trees, providing additional screening. A PRoW passes the field on the western boundary. Although a ground-mounted array will not directly infringe on the PRoW, care should be taken to ensure designs maintain public access.	2
Land use	The field lies within an ALC Grade 3 region and is actively used for arable farming. Engagement with the local landowner and wider community should be undertaken to secure consensus and support for the development.	3
Community perception	Although the field is relatively secluded and will not adversely affect scenic viewpoints or residences directly, the loss of agricultural land may incur some local opposition.	3
Wildlife & Ecology	The wider region hosts diverse and protected wildlife species. Any future development here may require on-site assessments to ascertain potential levels of disruption to minimise harm to habitats.	1
Drainage & Flood Risk	This area falls within a level 1 flood zone, which means that it has an extremely low probability of flooding. This means in any year the land has a less than 0.1% chance of flooding from rivers.	0
Environmental Heritage	No statutory environmental designations exist on site.	0
Cultural Heritage	No statutory cultural designations exist on site.	0
Grid Connection Feasibility	UKPN engineers confirmed that a solar PV array here could connect to an existing three-phase 11 kV pole, in the field's northwestern corner. Solar PV installations at this location will be subject to a power export limitation, up to a maximum of 0.2 MW. For installations greater than 0.2 MW, sizeable grid reinforcement works will be required to circumnavigate this limitation, at considerable logistical and capital cost. As of March 2026, a budget estimate to UKPN is being compiled.	4
Access for Construction & Maintenance	The site is accessed via a 300 m unpaved farm trackway from the south, which leads onto Hinxworth Road.	0

4.5. Heat Supply

As of 2025, 73% of energy usage is used for heating purposes, leading to greenhouse gas emissions of approximately 2,525 tCO₂e and £1,066,524 in heating costs per year (Section 2.2). As a result, the decarbonisation of heating across Ashwell is a significant opportunity to achieve net zero emissions and should become a priority for the region.

Two development scenarios for heat decarbonisation across Ashwell are presented here, including:

1. **Installation of a district heat network (DHN)**, using centralised ground-source (GSHPs) or air-source heat pumps (ASHPs).
2. **Installation of distributed ASHPs** by individual property owners across Ashwell.

4.5.1. District Heat Networks

A District Heat Network (DHN) is a system that supplies heat and hot water to multiple buildings from a central source via a network of pipes. Heat is generated at an energy centre to supply the community, which is transferred along insulated piping to a heat interface unit at each property.

There are several options to provide heat to the DHN, including

- **Air-source systems**, capturing heat from air;
- **Ground-source systems**, using either closed or open-loop boreholes to collect heat from the subsurface;
- **Water-source systems**, using waterbodies such as rivers and lakes;
- **Waste-source systems**, using waste heat from existing facilities such as sewage or water treatment works.

This study focuses on air and ground-source systems only. No water sources in Ashwell are considered viable for heat collection, due to the low flow rate of the watercourses identified, and there are no suitable waste-heat sites identified within the study area.

Biomass and fossil fuel heating opportunities have also not been assessed within this study as these technologies are inconsistent with ZCA's decarbonisation aims as well as having notable impacts on the local environment due to emissions from burning fuel.

In terms of heat supply, there are two types of heat network which utilise different configurations to deliver heat, each with its own pros and cons. Table 4-11 provides an overview of the two variants assessed within this study. The recommended approach is a 4th generation network, based on greater compatibility with properties in Ashwell. This is due to property age and size, which is variable and therefore complex, as well as the relatively poor levels of thermal performance in Ashwell properties. This means that a heat network which is compatible with properties with minimal improvement to energy efficiency works, hot water systems and heat emitters is preferred. This leads to the selection of centralised DHN systems capable of providing high temperature heat supply (55 – 70°C) rather than low temperature heat (40 – 55°C).

Table 4-11 – Heat Network Specifications

4th Generation Heat Network (Centralised, High Temperature)	4th generation heat networks are supplied by a centralised energy centre but differ significantly from previous generations in having lower operating temperatures. Heat is supplied at or below 70°C, which generally improves efficiency across all heat networks, but especially those energised by heat pumps, which perform better at low temperatures. Highly insulated pipework is used, with large, centralised thermal storage to smooth energy demand and aid heating efficiency.
--	---

5th Generation Heat Network (Distributed, Low Temperature)	5th Generation Heat Networks are notably different from previous generations. Heat production is decentralised – using heat pumps – in each property. They operate at low temperatures and often require supplementary heating and thermal storage at the property level. There are two main types: • Those that use <i>ambient</i> temperature heat (i.e., the natural temperature of water as it comes out the ground), which is then distributed to individual heat pumps in each property. • Those that use <i>< 25°C heat</i>, where a central heat pump is used to maintain the distribution system at around 20°C followed by a second lift in temperature by individual heat pumps in each property. 5th generation schemes may require supplementary hot water cylinders and immersion heaters, which can present space issues in some property types. It also involves purchasing power from the grid, exposing system users to relatively volatile electricity tariff pricing and removing the ability to benefit from aggregate purchasing of electricity.
--	--

Heat Generation Options

There are several types of heat pump technologies which may power a heat network, including:

- **Centralised Closed-Loop GSHP:** A collection (or array) of boreholes is drilled and connected at the surface. Uninsulated pipes transfer a carrier fluid to and from the boreholes, collecting heat from the subsurface (~8°C). This heated fluid feeds into one or multiple heat pump units, where temperatures are then elevated for end-users. Hot water is then distributed through a network of insulated pipework to the individual buildings, interfacing with properties via a heat interface unit (HIU) to provide space and hot water heating.
- **Centralised Open-Loop GSHP:** An open loop geothermal system utilises the collection of boreholes to draw and pipe ground water directly from an underground aquifer to a centralised or decentralised geothermal heat pump. After the water returns from the heat pump interface, it is reinjected into the aquifer via a reinjection well, which is located a suitable distance from the original extraction location. Open loop systems can provide higher flow rate and extract greater temperature than closed-loop systems, and therefore typically require far fewer boreholes. Hot water is then distributed through a network of insulated pipework to the individual buildings, interfacing with properties via an HIU to provide space and hot water heating.
- **Centralised ASHP:** One or multiple large heat pump units extract heat from the outside air which is used to elevate temperatures for a centralised system. Hot water is then distributed through a network of insulated pipework to the individual buildings, interfacing with properties via an HIU to provide space and hot water heating.

Geology

Local bedrock and superficial geology greatly determine the extent and availability of ground thermal resource. Heat abstraction in superficial deposits (e.g., fluvial, glacial or aeolian material) is often difficult due to their unpredictable thermal characteristics. These generally arise due to the complex mixture of mineral and organic particles in these deposits – resulting in conductivity ranging from 1.5 up to 3.5 W/m.K¹³. Such wide variation thus limits the availability of ground-abstracted heat in these deposits. Thermal characteristics generally stabilise with depth – thus, bedrock geology is typically targeted for ground-source heating. Broadly, limestones and sandstones are generally regarded as the most effective bedrocks for ground-source heating, with conductivities generally averaging between 2.4 – 3.8 W/m.K (limestone) and 2.2 – 2.6 W/m.K (sandstone). Ashwell and the surrounding North Hertfordshire region lie in a diverse region of chalk bedrock sequences – dating from the Cretaceous geological period. The dominant local chalk formations include the West Melbury Marly, Zig Zag (both Lower Chalks) and Holywell Nodular (Middle Chalk) types. Superficial geology is sparse across Ashwell parish, typically characterised by fluvial clays, silts and gravels, dating from the Quaternary period.

¹³ Watt per metre-kelvin.

Although chalk provides relatively stable ground temperatures and robust heat transfer compared with other geologies (such as clays and silts), chalk thermal conductivity can still vary across the UK. Thermal conductivity is determined when fractured bedrock allows naturally occurring groundwater to circulate, which helps percolate heat through the rock. Geological thermal conductivity is a key parameter of underground heat generation and is an important step in heat network design and can greatly improve the efficiency of borehole heat exchangers.

Across Southern England, Lower Chalks (West Melbury Marl and Zig Zag Chalks) typically display thermal conductivities averaging 2.02 W/m.K. Middle Chalks demonstrate similar conductivity of approximately 2.01 W/m.K (Busby, 2018)¹⁴ (Table 4-12).

At these assumed geological thermal conductivities, the difference between the pipework fluid temperature (the medium in which heat is supplied to connected properties), and the undisturbed ground temperature may lie outside of recommended DHN design guidelines (e.g., VDI 4640 Blatt 2:2001-09)¹⁵. A full geological assessment will be required to establish actual geothermal conditions and confirm design parameters.

Table 4-12 – Approximate Thermal Conductivities of Chalk across the Thames and Chilterns Region (Busby, 2018).

Chalk Stratigraphy	Formation	Thermal Conductivity (W/m.K)		
		Min	Mid	Max
Middle Chalk	Holywell Nodular Chalk	1.77	2.02	2.32
Lower Chalk	West Melbury Chalk	1.75	2.01	2.40
	Zig Zag Chalk			

Hydrogeology

Determining the suitability of local hydrogeological conditions is critical to determine the volume of heat available from underlying aquifers and groundwater resources for open loop borehole systems. Local conditions must ensure groundwater can be extracted at sufficient high temperatures and flow rates to support an economically viable and sustainable heat generation installation. Chalk bedrock found across Ashwell forms a designated ‘*principal aquifer*’ region – a designation noted for providing significant amounts of drinking water and supporting local rivers and wetlands (i.e., Ashwell Springs SSSI). *Principal aquifers* are the most productive type of aquifer, and are generally preferred for domestic, industrial and agricultural abstraction uses.

Flow rate is proportional to the permeability of the aquifer, which in turn is determined by the local bedrock composition. In hydrogeological terms, permeability is classified as either primary permeability, or secondary permeability. *Primary permeability* describes the interconnectivity of pore spaces that naturally occur within the rock. This can include the connectivity of pore spaces between grains and other void spaces that develop during the rock’s formation. *Secondary permeability* is created by geological processes experienced by the rock after it has formed (e.g., post-deposition physical fractures or fissures).

Based upon an assessment of bedrock geology across Ashwell, groundwater flow is primarily along fissures and fractures (i.e., secondary permeability) in Middle and Lower Chalks. Typical abstraction yields amounting from ~1.0 l/s (150 mm diameter borehole) are recorded across the region¹⁶, suggesting sufficient groundwater resource does exist to support heat generation. However, relying solely on secondary permeability to provide the required flow rate for a heat generation project will incur greater technical complexity and economic risk. The presence of naturally formed fractures is highly dependent on local geological conditions, which are inherently complex and variable. Due to the absence of in-situ data in proximity to Dixies Meadow, an exploration borehole would be required to verify the presence, and geological characteristics of secondary permeability here.

¹⁴ Busby, J. (2018) A modelling study of the variation of thermal conductivity of the English Chalk. *Quarterly Journal of Engineering Geology and Hydrogeology*, 51, 417-423.

¹⁵ Verlag des Vereins Deutscher Ingenieure (2019) Thermal Use of the Underground – Ground Source Heat Pumps.

¹⁶ Hydrogeological Map of The Area Between Cambridge and Maidenhead, British Geological Society (1984).

4.5.2. Detailed DHN Design

Dixies Meadow is a 2-ha field adjacent to High Street, one of Ashwell's main roadways. The field lies close to the centre of Ashwell and is surrounded by private homes and several smaller fields. Although the site lies within grade 3 agricultural farmland, the site is seldom used for farming and is vacant throughout the year, containing several wildflower and shrub species. The southern half of Dixies Meadow lies within the Ashwell Conservation Area. Dixies Meadow is owned under freehold by a local landowner. Several residential neighbourhoods, which may be suitable customers for a DHN here, lie close to Dixies Meadow. This includes Wolverley House, semi-detached homes at Bacon's Yard, John Sale Close, Colbron Close and terraced housing along the High Street.

Recommendation

Based on a technical appraisal of the site and prospective DHN configurations, a **closed-loop GSHP system is the most appropriate arrangement for a DHN solution at Dixies Meadow, Ashwell**. This configuration is preferred for several reasons:

- A closed-loop GSHP system will operate at a higher efficiency than ASHP alternatives.
- Local hydrogeological conditions at Dixies Meadow are currently unknown, introducing some uncertainty for open-loop GSHP viability. Whilst hydrogeological evidence suggests that open-loop GSHPs are viable across the wider region, the localised conditions of an aquifer at Dixies Meadow are currently unknown.
- Little to no noise is generated from closed-loop GSHP operation. As Dixies Meadow lies close to several residential neighbourhoods and within the Ashwell Conservation Area, noise impact is a critical issue and lower noise solutions are preferred.

DHN Appraisal

The supply area includes 93 domestic residences at Wolverley House and Bacon's Yard (Figure 4.8). Across the 81 flats and 12 semi-detached properties, there is an annual heat energy demand of 635 MWh¹⁷. Peak heat demand is estimated to be 0.42 MW. To meet the thermal demand of the DHN supply area three DHN configurations are considered:

1. **A centralised closed-loop GSHP system** using boreholes to obtain heat from the subsurface, located within Dixies Meadow. This scenario would require an above-ground energy centre (approximately 70 m² footprint), 40 boreholes (each up to 200 m depth), and heat supply pipes from the energy centre to each connected property (amounting to approximately 330 m of total pipework length).
2. **A centralised open-loop GSHP system** using boreholes to abstract groundwater from the subsurface, located in Dixies Meadow. This configuration would require an above-ground energy centre (approximately 50 m² footprint), 25 abstraction boreholes (each up to 200 m depth), and heat supply pipes from the energy centre to each connected property. An additional 25 discharge boreholes will also be required to reinject the groundwater back to the aquifer following use. As a result, this configuration would require pipework amounting to approximately 480 m.
3. **A centralised ASHP system**, generating heat from the air would be housed within an above-ground energy centre located in Dixies Meadow. This energy centre would have a similar building footprint (50 m²) and pipe layout (330 m) to the closed-loop system but would operate without the need for subsurface boreholes.

A technical comparison of potential DHN configurations at Dixies Meadow is provided in Table 4-13. An optimisation exercise was undertaken to appropriately size each system to the end-user heat demand. This exercise included an appraisal of hot water and thermal storage calculations, improving system efficiency and ensuring the end-system was not unnecessarily over-sized. Additionally, high-temperature flow systems have been preferred in this assessment, as they are more likely to be compatible with existing home heat delivery infrastructure. This means no additional retrofit or internal upgrade works are required, avoiding additional cost, disruption and reducing installation complexity.

¹⁷ This includes 551 MWh for space heating, and 84 MWh for domestic hot water demand.

Table 4-13 – Dixies Meadow DHN Technical Specifications.

DHN Development Scenario	Open-Loop GSHP	Closed-Loop GSHP	ASHP
Energy:			
Useful Heat Generation (MWh)	635		
Heat Pump Capacity (MW) ¹⁸	0.45 (452 kW)	0.45 (452 kW)	0.45 (454 kW)
Electrical Capacity (MW)	0.11	0.14	0.18
Annual Electricity Requirement (MWh)	157	197	251
System Efficiency (COP)	4.0	3.2	2.5
Utilisation Factor	16.0 %	16.0 %	15.9%
Full Load Hours	1,569 h / year		1,561 h / year
Network:			
Number of Boreholes	x22 Abstraction x22 Discharge (200 m depth)	x45 (200 m depth)	N/A
Borehole Array Area (ha)	1.5	0.7	N/A
Indicative Network Length (m)	480	330	
Energy Centre Size (m ²)	50		
Thermal Storage Capacity (l)	5,500		



Figure 4.8 – Indicative Closed-Loop GSHP DHN Layout at Dixies Meadow, Ashwell.

¹⁸ Heat Pump capacities are calculated to accommodate peak heat feed-in at energy hub (~0.45 MW).

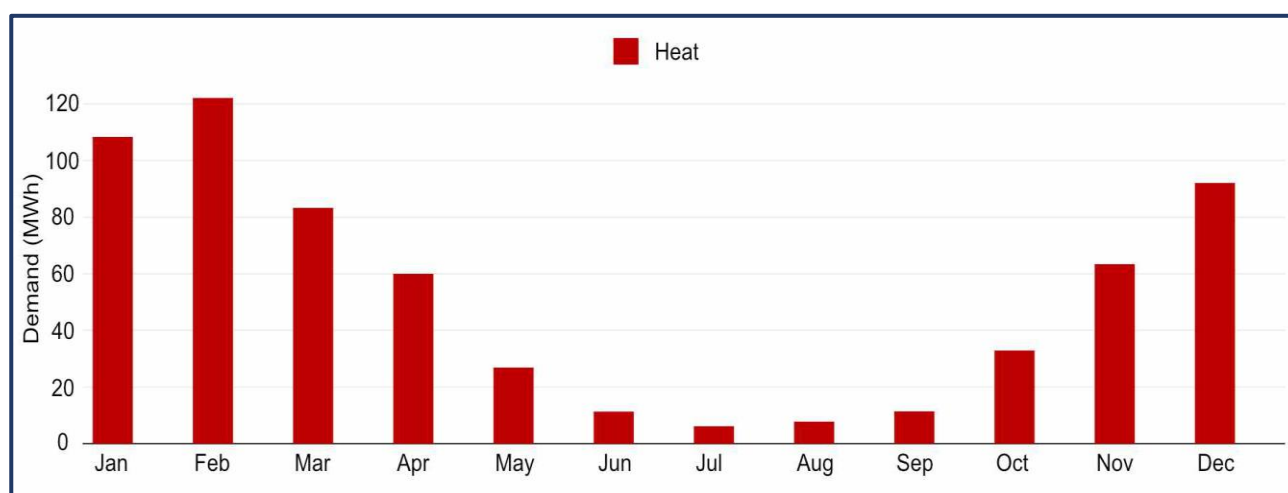


Figure 4.9 – Annual Heat Energy Generation Profile for a Closed-Loop GSHP DHN at Dixies Meadow, Ashwell.

Development Constraints

Specific constraints facing DHN development at Dixies Meadow are set out below.

Table 4-14 – DHN Technical Constraints at Dixies Meadow, Ashwell.

Constraint	Description	Constraint Level
Topography & Site Suitability	Dixies Meadow is a flat, 2-ha vacant field situated close to the centre of Ashwell. The site is surrounded by residential housing and bounded by the High Street to the south. Low-carbon heat generated by a DHN could supply these neighbouring residences. Local geological conditions support ground-source heat generation.	1
Landscape	Dixies Meadow is located at a prominent location adjacent to High Street and partially within the conservation area. While subsurface infrastructure is non-visible, an above-ground energy centre will alter the appearance of the site's setting. However, the energy centre can be constructed to match local buildings and neighbourhood characteristics, minimising visual impact.	2
Land use	Dixies Meadow falls within an ALC grade 3 region that covers the centre of Ashwell village. However, the site is largely left vacant and is only occasionally used for livestock grazing, which can be continued after borehole installation.	2
Access for Subsurface Works	As the indicative layout utilises both private land and public highways (i.e., Bacon's Yard) for pipe routing, developers must gain access and permission from all respective owners, including the NHDC as the owner and operator of Highways. Negotiating access agreements may delay development or incur unforeseen costs, complicating project implementation.	3
Community perception	Although Dixies Meadow remains largely vacant throughout the year, it is a prominent green space within the village and is known locally as an ecologically important wildflower meadow. As a result, several members of the local community have opposed historic development here and are unlikely to support	4

Constraint	Description	Constraint Level
	DHN development. Whilst several members of ZCA support DHN development here, wider community opposition may delay or wholly block further progression.	
Wildlife & Ecology	Dixies Meadow is home to several native wildlife, wildflower and fungi species. Future development here may require on-site ecological assessments to ascertain potential levels of disruption, and to minimise harm to biodiversity. Use of the site for energy infrastructure may protect the site from other forms of future development and therefore lead to a net benefit in respect to wildlife and ecology.	2
Drainage & Flood Risk	Dixies Meadow is at low to medium risk of future surface flooding. Low risk and medium risk sites have between 0.1 to 1% and 1% to 3.3% chance of flooding each year, respectively. A flood risk assessment should be undertaken to identify suitable mitigation strategies to minimise flood impacts.	1
Environmental Heritage	No statutory environmental designations exist on site.	0
Cultural Heritage	Dixies Meadow lies within the Ashwell Conservation Area, and within view of several listed properties. Although most DHN infrastructure is underground, external installations (i.e., energy centres) should minimise visual impact to the site and village character.	3
End-User Demand(s)	Dixies Meadow lies adjacent to several residential areas and housing clusters, including Wolverley House, Bacon's Yard and High Street.	0
Access for Construction & Maintenance	Dixies Meadow lies directly adjacent to the High Street and therefore is easily accessible from the main road.	0

4.5.3. Distributed Heat Decarbonisation

ASHPs extract heat from the outside air to provide heat and hot water to a property. The external heat pump uses a refrigeration system containing a compressor, condenser, expansion valve, and evaporator. These change the state of a refrigerant between liquid and gas states to provide heat supply. Broadly, there are two main types of ASHP. **Air-to-water** systems feeding heat into the central heating system, while **air-to-air** systems transfer heat via fans. ASHPs function more efficiently at lower flow temperatures than conventional fossil fuel boilers, working best with underfloor heating or radiators with a larger surface area. ASHPs have a life expectancy of approximately 20 years and a typical COP of between 2.5 – 3.5.

Distributed ASHP Scenario

Developing community access to local decarbonisation resources, advice, shared experiences and local engineers via a community delivery body can greatly help facilitate the decarbonisation of homes and increase the penetration of individual, 'distributed' ASHPs across Ashwell. This represents an alternative pathway to encourage local heat decarbonisation in a communal and organic approach. This scenario also provides a "low carbon counterfactual" against which heat network viability may be assessed.

It is viable for Ashwell to follow the NESO Electric Engagement scenario for achieving net zero (Section 2.5.1). This scenario requires significant changes in consumer behaviour as a core factor towards achieving national net zero emissions by 2050 and is an appropriate target for community action across Ashwell. This would require

heat pump installations in 294 homes by 2035 and 670 homes by 2050. Achieving this ambitious target would reduce Ashwell energy usage by an estimated 6,877 MWh per year and lead to a carbon saving of approximately 1,309 tCO₂e per year (Table 4-15).

Although most homes are suitable for heat pumps, it is beneficial to first conduct improvements to the energy efficiency of the building fabric to size the heating infrastructure effectively (see section 4.6).

Table 4-15 – ASHP uptake targets required to achieve Electric Engagement Scenario.

ASHP Recommended Targets	2025/26 (Current Baseline)	2035 (Target)	2050 (Target)
Number of homes with ASHP	44	294	670
% of Homes with ASHP	5.1%	30%	78%
Total Energy Reduction compared to 2025/26 baseline (MWh)	N/A	2,751	6,877
Total Net Energy Demand (MWh) ¹⁹	N/A	12,691	8,565
Annual Carbon Savings compared to 2025/26 baseline (tCO ₂ e)	N/A	524	1,309

4.6. Energy Efficiency

An assessment of 622 valid domestic EPCs was undertaken to establish the scale of prospective energy efficiency upgrades which could be undertaken across Ashwell parish. This analysis provides an overview of potential energy efficiency improvements that could be implemented within Ashwell and their associated aggregate cost (Table 4-16). Actions are broken down into three distinct types:

- Low Complexity:** low cost and low regrets actions, and therefore the first efficiency improvements to be implemented. These actions are typically easy to implement and have very short payback times (< 2 years).
- Moderate Complexity:** requiring greater levels of investment and technical knowledge but often viable without significant expertise. These actions typically have short payback times (< 5 years).
- High Complexity:** requiring significant investment and external expertise to implement. These actions are typically challenging to implement and vary significantly across property types and ages. These actions can have moderate to long payback times (5 - 15 years), with large variability depending on the solution and property.

Table 4-16 – Prospective Domestic Energy Efficiency Upgrades (based on 622 valid EPCs²⁰).

Complexity	Recommendation	Number of Properties	Indicative Cost
Low	Thermostatic Controls	17	£3,400
	Low Energy Lighting	465	£116,250
Moderate	Roof Insulation	55	£63,250
High	Glazing Upgrade	45	£540,000
	Floor Insulation	451	£1,127,500

¹⁹ Total net energy (heat and electric) demand across Ashwell. Accounts for reductions in fossil fuels and an increase in electrical demand as a result of increasing ASHP uptake.

²⁰ Whilst EPCs are the most widely available and accessible resource to summarise building energy performance, they do not wholly reflect actual building condition and structure. Each individual EPC may date from differing times, be filed by differing surveyors or to differing levels of detail and accuracy. As a result, information here should be taken as a high-level indication of building energy efficiency across Ashwell.

	Wall Insulation	181	£2,081,500
--	-----------------	-----	------------

Thermostatic Controls

At present, 17 homes in Ashwell do not contain any thermostatic heating controls. Installing a basic central thermostat or thermostatic radiator valves is a simple solution to improve the efficiency of heating systems, providing energy saving between 10-12% each year for an average UK household. On average across Ashwell, installing basic thermostats could save households 1.6 MWh per year, an energy bill reduction of £150 and 0.4 tCO₂e on average.

Development Considerations: Whilst care must be taken to ensure the thermostats are compatible with the respective property's heating system, they are a relatively low-risk, low-cost and discreet technology. Across Ashwell this is key, allowing for compatibility with the parish's many historic properties.

Cost: At an average unit cost of £200, installing smart thermostat controls in the remaining 17 properties would amount to approximately £3,400 in total.

Low Energy Lighting

Most lighting (>75%) in 465 homes in Ashwell is supplied energy inefficient or outdated units (e.g., fluorescent or incandescent bulbs). This is energy inefficient and could be rectified by installing modern, energy efficient units. Consuming between 75 - 90% less energy than traditional fluorescent or incandescent lighting units, light upgrade is an effective and inexpensive measure to target on a community-wide scale. On average, upgrading lighting could save households 0.55 MWh per year, reduce bills energy bills by £162 and emissions by 0.1 tCO₂e each year.

Development Considerations: The simplicity, low cost and low disruption associated with upgrading lighting means they can be widely adopted throughout Ashwell's housing stock, regardless of property type and condition.

Cost: At an average cost of £250 per home, upgrading all 465 homes across Ashwell with modern, energy efficient lighting could cost approximately £116,250 to achieve.

Roof Insulation

55 properties in Ashwell contain no roof insulation. This is energy inefficient as uninsulated homes typically lose up to 25% of heat through roof space. Insulation, located in roof or loft spaces improves thermal energy retention and reduce heat loss, improving resident comfort and providing energy and financial savings. On average across Ashwell, installing roof insulation could save households up to 3.7 MWh per year, reduce energy bills by £312 and save 0.7 tCO₂e each year.

Development Considerations: As Ashwell contains a mixture of historic and modern properties, actual roof insulation type will be heavily dependent upon respective building structure (e.g., external or internal), listed status and rooftop material. Historic or listed properties may incur some additional costs and complexity. Internal building features (e.g., historic roof beams or trusses) or rooftop materials (e.g., thatching) may need to be accommodated, at higher expense to the homeowner.

Cost: Roof insulation across all 55 remaining properties in Ashwell could cost up to £63,250 to install. Cost-effectiveness could be further improved from aggregate purchasing (e.g., buying materials and services across all properties to reduce overall expenditure).

Floor Insulation

451 properties across Ashwell do not contain any form of floor insulation. Floor insulation adds a thermal barrier to ensure heat is retained within a property and can reduce thermal losses by up to 20% each year. Where appropriate, floor insulation can also be coupled alongside underfloor heating. In suitable homes across Ashwell, installing floor insulation could save households 2.98 MWh per year, reduce energy bills by £250 and emissions by 0.6 tCO₂e on average each year.

Development Considerations: Floor insulation will only be suitable in properties with suspended floors (i.e., wooden floors with a cavity underneath). This is typical in many older properties and are likely to exist in many historic properties across Ashwell. Whilst floor insulation material itself is moderately inexpensive, the labour required to remove and reinstate floor coverings (e.g., carpet or laminate flooring) or wooden floorboards

makes this a relatively disruptive and costly measure. Here, the recommended approach is to screen and prioritise properties for insulation upgrade (e.g., suitable properties or properties where flooring is being replaced).

Cost: At an average cost of £2,500 per property, installing floor insulation across all 451 homes could cost approximately £1,125,500.

Glazing Upgrade

Windows at 45 properties in Ashwell are single glazed. To improve heat retention and reduce thermal losses, double or triple glazing is preferred. Double and triple glazed windows each contain two and three panes of glass, respectively. This creates a barrier to improve the window's insulation and to allow a controlled flow of air during warmer months. Whilst glazing upgrades could considerably improve domestic energy efficiency across Ashwell, building heritage and Conservation Area restrictions may limit certain forms of glazing in some properties. In this instance, secondary glazing may be a suitable alternative, though with a lesser impact on building energy efficiency. Installing A+ rated glazing upgrades in suitable homes could save households 2.68 MWh, reduce energy bills by £225 and emissions by 0.5 tCO₂e on average each year.

Development Considerations: Glazing upgrades are a moderately complex and high-cost measure. Costs will greatly vary according to the size, type and number of windows requiring replacement. Properties within the Ashwell Conservation Area or the parish's 75 listed properties will also be required to meet specific preservation standards, potentially requiring planning permission and / or a listed building consent. To mitigate visual impacts, the guidelines set out by the Ashwell Conservation Area Character Appraisal and Management Plan should be followed. For constrained properties, an assessment of secondary glazing should be undertaken as an acceptable substitute.

Costs: Average costs for full double-glazing install are anticipated to be £12,000 per property. Costs will vary significantly between homes due to number of windows requiring upgrade, conservation status, and homeowner preference.

Wall Insulation

181 homes in Ashwell do not contain any form of wall insulation. As up to 33% of all heat lost in uninsulated homes escapes from walls, upgrading wall insulation should be a priority for suitable homes across Ashwell. There are several types of wall insulation, each requiring certain building conditions and structure types. Cavity wall insulation (CWI) is best suited to Ashwell's modern (post-1950) buildings, whereas internal, and external wall insulations (IWI & EXI) are best suited to older buildings with solid structural compositions. On average across Ashwell, installing suitable wall insulation could save households up to 4.47 MWh per year, reduce energy bills by £375 and save 0.9 tCO₂e each year.

Development Considerations: Although effective at mitigating heat loss, wall insulation upgrades are a particularly disruptive and high-cost measure to undertake. Since insulation type heavily depends upon building typology, condition and age, a variety of wall insulation types will be required across Ashwell's housing stock. As a result, CWI is unlikely to be suitable across most historic properties in Ashwell due to the absence of wall cavities. Additionally, EWI may be highly constrained across Ashwell due to heritage restrictions. The loss of internal space and disruption associated with IWI may also dissuade some homeowners from taking measures. To understand wall insulation viability across homes in Ashwell, the proposed community-led approach is to:

- a) Identify modern (post-war) properties and survey these properties for CWI suitability. This is typically the lowest cost and least disruptive measure.
- b) Discuss IWI with prospective homeowners to gauge the level of interest and ability to accept disruption within their homes. Prior to installation, an IWI assessment should be undertaken to demonstrate cost-benefit value for homeowners.
- c) Review remaining properties to understand the viability of EWI. As EWI insulation would have the greatest visual impact and may negatively impact on the breathability of the building – surveys and recommendations should be sought from accredited installers and building conservation experts.

Costs: Upgrading 181 homes across Ashwell with suitable forms of wall insulation is anticipated to cost up to £2.08 million to achieve, representing a significant investment and logistical undertaking.

5. Planning & Environmental Baseline

A review of relevant environmental and planning policy and regulation in relation to each technology type and scale considered has been carried out. The following reference sources are of relevance:

- The Climate Change Act 2008 (UK Government, 2008)
- Clean Power 2030 Action Plan (UK Government, 2024)
- Warm Homes Plan (UK Government, 2026)
- National Planning Policy Framework (UK Government, 2024)
- Planning Policy Framework (2021)
- North Hertfordshire Local Plan 2011-2031 (2011)
- Ashwell Neighbourhood Plan 2021-2031 (2021)

5.1. National Policy

There are numerous relevant UK Government policies and strategies which underpin the UK's ambitions and progress in relation to electrical generation, low carbon heating and carbon reduction. ZCA's ambitions to minimise carbon emissions throughout the village align closely with these policies, suggesting development proposals are likely to start with a presumption of support from planning authorities and policies.

The UK Government aims to reduce emissions to net zero by 2050. This is to be achieved across multiple different sectors, focusing on low carbon innovation, the green economy and supply chains, low carbon technologies and services, warm and comfortable homes powered by clean and affordable energy, zero emissions vehicles, and protection of the natural environment. Specifically in relation to heat in buildings, national goals aim to improve the energy efficiency of all homes to EPC band C by 2030 and to grow the market in heat pumps to 600,000 installations per year by 2028²¹.

Climate Change

The UK is a leading country in terms of climate change policy and action. It has made considerable progress, reducing emissions by 48% on 1990 levels, including a reduction of 3% between 2018-2019 (CCC, 2019). This has largely been driven by renewable power deployment and a large reduction in coal use. The UK also benefits from a strong policy framework for climate commitments in the form of the **Climate Change Act (2008)**.

Energy Policy

The **Clean Power 2030 Action Plan** aims to accelerate the transition to renewable energy and reduce carbon emissions, investing an estimated £40 billion per year between 2025-2030. Key goals include expanding offshore wind (43-50 GW), solar (47 GW), wind (29 GW) and hydro capacity, energy storage (31 GW), nuclear power, modernising energy grids, and phasing out other high-emission sources. It prioritises energy efficiency, clean technology innovation, and electrification of transport and industries.

The policy focuses on encouraging investment in electricity generation infrastructure and network infrastructure, including investment in energy network upgrades and smart energy infrastructure, as well as reforms to the planning and consenting process, ensuring projects can progress through the planning and grid connections systems more smoothly. Lastly, the action plan seeks to deliver electricity market reform, proposing greater levels of storage capacity and flexible connections, as well as reforming how network use costs are determined and applied. In turn, this may allow for local energy supply and management within the UK power grid. In turn, the publicly owned National Energy System Operator (NESO) was officially launched in October 2024 to unify electricity and gas network planning under a single entity. As a result, the NESO will collaborate with Great British Energy (GBE) to integrate new generation projects into the electricity grid.

GBE is anticipated to be the delivery vehicle for this investment and / or implementation, including policy measures which specifically support community-led renewable capacity and other forms of local energy development, via the Local Power Plan. As part of the plan, GBE will provide up to £600 million in funding for

²¹ <https://www.gov.uk/government/publications/energy-security-bill-factsheets/energy-security-bill-factsheet-low-carbon-heat-scheme>

local authorities and up to £400 million in low-interest loans annually for communities. It will also collaborate with energy companies, local authorities and cooperatives to develop up to 20,000 renewable power projects and generate up to 8 GW of renewable energy by 2030. While the plan is yet to be finalised, the outlined commitments are highly promising for the community energy sector. It recognises the crucial role of local energy in achieving climate goals, lowering energy costs, accelerating clean energy adoption, and enhancing energy security at both local and national levels.

The UK Government's **Warm Homes Plan**, announced in January 2026, will become the principal driver and delivery body for wholesale domestic decarbonisation and energy efficiency improvement across the UK. Through public investment and a series of government grants packages, the £15 billion plan aims to treat up to 5 million homes by 2030, improving home energy efficiency and stimulating the proliferation of domestic renewable energy.

The plan will provide support to eligible homeowners, landlords and tenants to tackle energy efficiency, reduce energy bills and eradicate fuel poverty to improve living conditions across the UK. Low-income families and neighbourhoods are expected to benefit from a series of fully funded upgrade packages, stimulated by the UK Government's capital investment programmes and delivered by local authorities. The plan also sets out a social housing upgrade strategy, detailing how social housing will be targeted for simultaneous energy upgrade works. The plan also allocates a total of £5 billion to the Warm Home Fund (WHF), designed to support the home energy supply chain. The fund will support low and zero-interest consumer loans as well as innovative investments in the home upgrade sector. The WHF is expected to cover the costs of clean heating systems (e.g., ASHPs) and a series of low-cost finance to cover the upfront costs of solar or battery installations.

By 2030, this strategy aims to lift 1 million households out of fuel poverty and lead to the creation of 180,000 jobs in the UK energy efficiency and clean heating sector.

ZCA's ambitions align closely with national energy generation and efficiency targets, with the government's commitment to local and community energy demonstrating a need for organisations such as ZCA to deliver energy projects leading to significant local benefit.

National Planning Policy Framework (NPPF)

The current National Planning Policy Framework (NPPF) was approved by Parliament in December 2024 and is the UK Government's flagship policy document - outlining planning policies across England, and how they should be applied. It provides a clear framework whereby locally prepared plans can provide sustainable development and "*must be taken into account in preparing the development plan and is a material consideration in planning decisions*" (NPPF, para 2).

Importantly in North Herts, the NPPF post-dates the North Herts Local Plan (adopted in 2019, see below) – thus increasing its weight as a material consideration. The NPPF contains a presumption in favour of renewable development, particularly those that are community-led and scaled energy projects.

Although the NPPF is intended to be an all-encompassing document to guide development, there are several key sections that are directly relevant to energy development. Whilst these sections provide the justification, guidance and policy base for energy planning, all sections of the NPPF must also be considered in respect to any planned development.

Key sections include:

2. Sustainable Development

"7. The purpose of the planning system is to contribute to the achievement of sustainable development. At a very high level the objective of sustainable development can be summarised as meeting the needs of the present without compromising the ability of future generations to meet their own needs..."

"8. Achieving sustainable development means that the planning system has three overarching objectives, which are interdependent and need to be pursued in mutually supportive ways (so that opportunities can be taken to secure net gains across each of the different objectives):

c) an environmental objective – to protect and enhance our natural, built and historic environment, including making effective use of land, improving biodiversity, using natural resources prudently,

minimising waste and pollution, and mitigating and adapting to climate change, including moving to a low carbon economy”.

11. Making effective use of land

“124. Planning policies and decisions should promote an effective use of land... while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously developed or ‘brownfield’ land”.

12. Achieving well-designed places

“131. The creation of high quality, beautiful and sustainable buildings and places is fundamental... Good design is a key aspect of sustainable development, creates better places in which to live and work and helps make development acceptable to communities. Being clear about design expectations, and how these will be tested, is essential for achieving this. So too is effective engagement between applicants, communities, local planning authorities and other interests throughout the process.

14. Meeting the challenge of climate change, flooding and coastal change

“161. The planning should support the transition to net zero by 2050 and take full account of all climate impacts... It should help to: shape places in ways that contribute to radical reductions in greenhouse gas emissions, minimise vulnerability and improve resilience, encourage the reuse of existing resources... and support renewable and low carbon energy and associated infrastructure”.

“165. To help increase the use and supply of renewable and low carbon energy and heat, plans should:

- a) Provide a positive strategy for energy from these sources...
- b) Consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure their development
- c) Identify opportunities for development to draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co- locating potential heat customers and suppliers.

“166. In determining planning applications, local planning authorities should expect new development to:

- a) Comply with any development plan policies on local requirements for decentralised energy supply...

“167. Local planning authorities should also give significant weight to the need to support energy efficiency and low carbon heating improvements to existing buildings, both domestic and non-domestic (including through installation of heat pumps and solar panels where these do not already benefit from permitted development rights).

“168. When determining planning applications for all forms of renewable and low carbon energy developments and their associated infrastructure, local planning authorities should:

- a) Not require applicants to demonstrate the overall need for renewable or low carbon energy, and give significant weight to the benefits associated with renewable and low carbon energy generation and the proposal’s contribution to a net zero future;
- b) Recognise that small-scale and community-led projects provide a valuable contribution to cutting greenhouse gas emissions;
- c) In the case of applications for the repowering and life-extension of existing renewable sites, give significant weight to the benefits of utilising an established site.

5.2. Regional Policy

North Hertfordshire District Council (NHDC) is the unitary authority area which covers Ashwell parish and the surrounding area. It is the local authority and local planning authority (LPA) for the area, including the proposed development sites. The planning context is therefore defined and upheld by NHDC.

Planning permission(s) will be required for the scale of ground-mounted solar PV, wind turbines and heat networks under consideration in this report. Planning law requires that applications for planning permission be determined in accordance with the Local Plan²², unless material considerations indicate otherwise. The relative weight to be given to material considerations will depend upon a range of factors assessed by the local planning authority, with a key factor being how up to date the Local Plan is relative to the material considerations.

5.2.1. North Hertfordshire Local Plan 2011 – 2031

The North Hertfordshire (Herts) Local Plan is a set of policies, proposals and land use allocations which sets out how development will be managed across the region. The current iteration of the plan was adopted in 2022 and contains several policies supportive of renewable and low-carbon energy generation, including ground-mounted solar, wind turbines and low carbon heating technologies. The North Herts Local Plan forms part of the overarching statutory Development Plan for the district, which contains several individual Neighbourhood Plans, including one for Ashwell.

The North Herts Local Plan sets out several strategic objectives and policies consistent with ZCA's aims and ambitions. Where energy developments evidence they meet the needs of local communities, whilst simultaneously preserving regional character, ecological and historical heritage, they will be encouraged and supported. As a result, all proposed development locations are consistent with the plan's aims and objectives and could expect support from local policy makers.

Several **strategic priorities (SPs)** provide guidance on the main issues the plan seeks to address. SPs of relevance to ZCA include:

SP1: Sustainable development in North Hertfordshire

'This Plan supports the principles of sustainable development within North Hertfordshire. We will:

- b) Ensure the long-term viability of the district's villages by supporting growth which provides opportunities for existing and new residents and sustains key facilities.
- c) Grant planning permission for proposals that...
 - iii) Provide the necessary infrastructure required to support an increasing population.
 - v) Secure any necessary mitigation measures that reduced the impact of development, including on climate change...

SP9: Design and Sustainability

'The council considers good design to be a key aspect of sustainable development. We will:

- a) Support new development where it is well designed and located and responds positively to its local context.
- d) Ensure Strategic Masterplans are informed by a technical and design evidence base and include the following...
 - vi) Sustainability and Energy Framework identifying site-wide and building scale opportunities for low and zero carbon.

²² The UK Government requires every local authority has a Local Plan in place. Local plans outline the strategy for ensuring sustainable housing, energy, infrastructure and economic growth in each respective region.

SP11: Natural resources and sustainability

'This plan seeks to meet the challenges of climate change and flooding. We will:

- a) Support proposals for renewable and low carbon energy development in appropriate locations.

...

SP11: Natural resources and sustainability

'Planning permission will be granted provided that development proposals:

- b) Take all reasonable opportunities... to:
 - iii) Reduce energy consumption and waste.
 - vi) Future proof for changes in technology and lifestyle.

The plan also contains **development management policies**. These policies set out the detailed requirements that new developments must meet to be granted planning permission. For low carbon development across Ashwell parish – the following policies are of relevance:

Policy CGB1: Rural Areas beyond the Green Belt

'In the Rural Areas beyond the Green Belt, as shown on the Policies Map, planning permission will be granted provided the development:

- b) Meets a proven local need for community facilities or services in an appropriate location.

Policy D1: Sustainable Design

'This plan seeks to meet the challenges of climate change and flooding. We will:

- a) Support proposals for renewable and low carbon energy development in appropriate locations.

...

Policy NE12: Renewable and low carbon energy development

'Proposals for solar farms involving the best and most versatile agricultural land and proposals for wind turbines will be determined in accordance with national policy. Proposals for other renewable and low carbon energy development which would contribute to towards reducing greenhouse gas emissions will be permitted subject to an assessment of the impacts upon:

- i. Landscape quality, landscape character and visual amenity, including consideration of cumulative impacts of development.
- ii. Environmental assets.
- iii. The historic environment, including the impact on the setting of historic assets.
- iv. The transport network.
- v. Air quality.
- vi. Aviation interests.
- vii. The amenity of residents.

In assessing renewable and low carbon energy proposals against the above criteria the Council will give significant weight to their local and wider benefits, particularly the potential to reduce greenhouse gas and other harmful emissions, and the social benefits of community owned schemes where this is relevant.

Proposals for decentralised energy schemes associated with development of the strategic sites allocated in the Plan will be encouraged subject to an assessment of the impacts.

5.2.2. Ashwell Neighborhood Plan 2021-2031

The Ashwell Neighbourhood Plan sets out a series of policies which ensures future developments align with local needs, strategic goals and national policy. The plan is a legal part of the local development plan and is used as a reference to guide planning decisions across the parish. The current plan was adopted by APC in 2021, following a local referendum.

Based on the objectives and policies of the Ashwell Neighbourhood Plan, the proposed development sites are consistent with the neighbourhood plan's intentions to encourage and support sustainable development, renewable energy and the preservation of the Ashwell's unique character. As a result, proposed sites and scales of development are designed to best complement the neighbourhood's features, historic assets and natural landscape.

The plan states that the vision for Ashwell is:

...to ensure Ashwell continues to thrive and grow as a community, whilst safeguarding the village's character. We want to ensure that growth is sustainable and the village continues to meet the needs of its people.

We want to enhance the facilities of the village to meet the challenges and changing needs of the community, to ensure that the parish remains sustainable and cohesive. Our village also needs a strong local economy and well-maintained infrastructure that supports its needs and connects the parish to the wider community.

Encouraging locally appropriate growth and development through the reduction of greenhouse gas emissions and encouragement of renewable and low carbon technologies are both key objectives within the plan:

Objective 1: *To encourage sustainable development that reflects the needs of the village and ensures the community can develop and evolve in an appropriate way.*

Objective 10: *To reduce greenhouse gas emissions by using renewable and low carbon energy technologies in new housing and infrastructure developments.*

Policies which are of relevance to ZCA include:

Policy ASH3: Character of Development

A large part of Ashwell village lies inside a Conservation Area, and it has five Local Character Areas. Development must preserve and complement the features that make this place special. Subject to that, innovative design will be supported where it clearly enhances its surroundings.

Policy ASH5: Flood Risk

Parts of Ashwell are liable to flooding. Planning applications are expected to observe standards that help manage this.

Policy ASH7: Protecting Historic Assets

Development will not normally be allowed if it eliminates or damages historic structures, buildings or structures of local interest or their immediate setting.

Policy ASH8: Locally Significant Views

Ashwell has significant views that make an important contribution to the area's attractive rural character. Developments may not have a detrimental impact on them.

Policy ASH9: Natural Landscape and Rural Character

Other than single householder applications, developments should fit into the landscape, minimise damaging impacts on its ecology and protect existing natural features (e.g., trees and hedgerows). Development should also provide open space, accessible to the general public.

5.3. Planning & Permitting

This section provides an overview of planning rules which affect the technologies considered within this study. Whilst the UK Government determines national policy, the English planning system is currently plan-led, with decisions determined by the respective LPA.

5.3.1. Low Carbon Heat

The policy and regulations which apply to low carbon heat development are dependent on the scale of development. This section assesses two scales of development – individual low carbon heating system implementation at the property level (e.g., installing a heat pump) and communal development of heat infrastructure (e.g., installing a heat network). Across Ashwell, fossil fuels are predominantly used for heating, with 72% of homes heated by natural gas and 17% from heating oil (see section 2.2). Transitioning to low-carbon heating systems is essential for meeting climate targets, reducing dependency on fossil fuels, and enhancing energy security.

Warm Homes Plan

Announced in January 2026, the UK Government’s upcoming **Warm Home Plan** (UK Government, 2026) outlines a comprehensive strategy improve heat energy performance and decarbonise homes across the UK. The plan will deliver £15 billion of public investment to up to 5 million homes by 2030, prioritising energy efficiency upgrades and renewable technologies to improve thermal comfort, lower energy bills and reduce fuel poverty. Key aspects of the plan include:

- **The establishment of a Warm Homes Agency**, to simplify user experience associated with home upgrade. The agency will bring together existing functions and bodies under one umbrella organisation, providing simplified and accessible consumer support.
- **A government-backed, zero and low interest loans programme, the Warm Homes Fund**. A £2.7 billion fund will stimulate energy efficiency upgrades across the UK. Upgrades available under the plan include solar (PV and thermal), heat pumps (ASHP and GSHP), BESS, smart controls, insulation (CWI, IWI, EXI) and draught proofing.
- **Free-of-charge upgrade packages for low-income families**. This will be backed by £5 billion of public investment and aim to ensure families receive fully funded installations for solar PV and batteries, up to the full average cost (as of 2026, £9,000 – £12,000).
- **For social housing residents, entire streets could be upgraded concurrently**, providing cumulative energy bill savings, improve building condition and comfort for entire neighbourhoods in one go.
- **Protections for people living in rented accommodation (private or social)**. The plan will require and support landlords to pro-actively implement energy efficiency upgrades to improve living conditions for renters. In doing so, this will lift an estimated 500,000 families out of fuel poverty by 2030.

Additionally, there are several other mechanisms which support heat decarbonisation, in both domestic and non-domestic buildings:

- Replacing the Renewable Heat Incentive (RHI) in 2022, the **Boiler Upgrade Scheme (BUS)** is a heat pump grant which aims to encourage homeowners and businesses in England and Wales to install a low-carbon heating system in place of their existing fossil fuel boiler. The UK Government initiative offers homeowners a fixed grant of £7,500 towards the installation of air-, water- or ground-source heat pumps. It also offers £5,000 towards the installation of biomass boilers - such as a wood pellet boiler. As part of the 2026 Warm Homes Plan, the BUS was extended until 2029/30 and was allocated additional funding totalling £2.7 billion.
- The **Enhanced Capital Allowance (ECA)** scheme allows businesses to claim 100% first-year capital allowances on investments in energy-saving equipment, including heating systems. This tax relief helps reduce the initial cost burden of adopting low-carbon technologies, making it more financially viable for businesses.

District Heat Networks

Heat networks are subject to several specific and emerging planning and permitting conditions. These conditions are dependent on the size and extent of, and technologies used within, the network, as well as the local area in which the network is located.

The below statements provide context regarding planning and permitting activities which *may* be required for a heat network in Ashwell. Due to the expected scale of development, an Environmental Impact Assessment (EIA) is not expected to be required, but engagement with, and seeking screening opinions from, regulators will be a necessary step in the permitting process.

1. The Heat Network (Market Framework) (Great Britain) Regulations 2025 have been published and designate Ofgem as the regulator for heat networks as of February 2026, introducing heat network zoning to encourage the expansion of heat networks (UK Parliament, 2025). Ashwell is not within a designated heat network zone and therefore is unlikely to benefit from priority support or funding from the UK government.
2. Planning of geothermal energy schemes is determined by the LPA. Planning consent is required for the development of large GSHP systems and for deep geothermal projects, in some cases including an EIA.
3. In England and Wales, GSHP systems that utilise groundwater (open-loop systems) are subject to groundwater licensing (UK Government, 1991) and environmental permitting (DEFRA, 2016) regulations issued by the Environment Agency as environmental regulator. Some larger schemes (open-loop and closed-loop) may also require planning permission.
4. WSHP (Water Source Heat Pump) is currently regulated slightly differently to open-loop borehole systems. Systems which meet standard rules: environmental permitting (2014), can typically be deemed acceptable. This includes limitations on abstraction levels ($20\text{m}^3 - 1000\text{m}^3/\text{day}$) and temperature differential ($\Delta T < 8^\circ\text{C}$), which small scale heat networks typically fall within.
5. The development of open-loop GSHP systems in England is regulated by the Environment Agency through the provision of consents, licences and permits. Developers must usually obtain groundwater investigation consent before drilling, an abstraction licence if abstracting more than $20\text{m}^3/\text{day}$, and an environmental permit to discharge water (unless the activity qualifies as a registered low-risk exemption) as of October 2023. Additional permits or consents are required for works near watercourses, flood defences or the coast, and all boreholes must be designed and decommissioned to prevent groundwater pollution. While exemptions from discharge permits exist for smaller-scale systems, these must still be formally registered and operated within strict volume thresholds.
6. It can take 6 – 18 months for the pre-application consent(s) and another 9 – 12 months for the licences and permits. As of 2022, the Environment Agency introduced a new banded charging structure for open-loop for open-loop GSHPs, where the fees for water abstraction license applications depends on the volume of water to be extracted. This ranges from £2,159 for smaller abstractions (up to 50 ML/year) to £10,796 for larger volumes (over 120 ML/year).
7. As of October 2023, the Environmental Permitting (England and Wales) Regulations 2016 have been amended to establish a framework for closed-loop schemes. Under these amendments, new systems may be exempt from requiring an environmental permit if they meet exemption conditions for systems in low environmental risk settings. If a system cannot meet these exemption conditions, it must either comply with the conditions specified in Regulatory Position Statement (RPS) 307 or obtain an environmental permit (Environment Agency, 2024).
8. In England and Wales, heat network developers currently do not have the statutory right to access private land for construction or maintenance purposes. Instead, they must negotiate these arrangements on a voluntary basis which can slow down project development or increase project costs.
9. Abstraction licences for open-loop systems are time limited and typically last between 6 – 18 years. Renewals must be sought after this point, typically for a further 12-year period.

5.3.2. Solar PV

Whilst rooftop solar PV on some residential housing may fall under Permitted Development Rights (PDR), some pre-requisites and conditions for solar PV development elsewhere should be signposted. Rooftop solar PV and solar thermal are covered by the same planning rules.

Part 14 of the ***Town and Country Planning (General Permitted Development) (England) Order 2015*** (UK Government, 2015) provides details regarding the development constraints and conditions for the development of solar equipment. In general, developments are assumed to be permitted on residential homes and blocks of flats, except when the proposed solar array does not meet the requirements of size, spacing, and natural or cultural constraints. The document should be consulted thoroughly before a rooftop-mounted solar PV development is considered.

Across Ashwell parish, there are several constraints to solar PV array development in some areas of the parish. Including 76 listed buildings within parish, the Ashwell village Conservation Area, several Priority Habitat Inventory (PHI) areas, and 14 Scheduled Ancient Monuments (SAMs) within or directly adjacent to the parish. When installed, solar panels should be situated in a way that minimises impact on the external appearance and character of the property and / or landscape. In practice, this may mean placement of panels facing away from roadways and public-facing orientations, where possible. If solar panels are to be installed on a listed building - "listed building consent" will be required and can be obtained from the local council. A full review of cultural and environmental constraints across the parish is provided in section 5.4.

For non-domestic systems and large-scale systems, planning permission must be obtained. For installations with a capacity exceeding 50 MW, the project will be classified as a Nationally Significant Project under the Planning Act 2008. This means it will require a Development Consent Order from the UK Government, following a comprehensive public consultation and process of environmental and impact assessments. For installations with a capacity less than 50 MW planning permission must be obtained from the LPA, NHDC. In this instance, NHDC will assess applications based on local development plans, alongside on-site material considerations such as visual impact, land use, and local community consensus.

Solar PV development is supported at both a national and local policy level. Ashwell parish, and surrounding regions contains numerous scales and types of solar PV installations, evidencing that solar PV development can expect to receive both local support and LPA consent.

5.3.3. Wind Energy

The UK Government is committed to doubling onshore wind capacity by 2030. This was originally encouraged by removing the de-facto ban on onshore wind in England in 2024, and there are ongoing revisions to the NPPF to place wind energy on the same footing as other energy developments within the planning system. At the local level, wind energy developments are only permitted in sites designated as suitable for wind development in the Local Plan and / or any supporting energy development strategy. Any scale of wind energy development in the North Herts landscape is expected to require full planning permission, with the most notable constraints on development being:

Visual impact: Turbines must minimise detrimental impacts on the local landscape (both natural and historic). Mitigating the cumulative impact of existing turbines (e.g., wind farms) on the landscape is also key.

Noise Impact: Impact on local receptors must be avoided or minimised, particularly on nearby residential areas and businesses. To obtain planning consent, this often requires a noise assessment to ensure noise levels are <45 dB at specific receptors, or no more than 15 dB above natural background levels.

Ecological Impact: Turbine developments must demonstrate they have minimal impact on local ecology and, specifically, on ornithology in the area.

Several wind turbine developments (including multi-turbine wind farms, and standalone installations) exist in the landscape surrounding North Herts, Bedfordshire and South Cambridgeshire (see section 4.2). The physical siting, layout and scales of these developments can be used to guide potential wind turbine developments that may be deemed permissible by the LPA around Ashwell.

Wind turbines are supported at a national and local policy level, and several wind turbine developments are present in the landscape surrounding Ashwell. If turbine proposals can be evidenced to minimise local visual,

noise and ecological impacts they can expect support from the LPA and can form the basis of a feasible community-led energy initiative.

5.3.4. Building Energy Efficiency

The UK's energy efficiency policy is central to its efforts to reduce carbon emissions and achieve net-zero by 2050. Through a combination of regulatory measures, financial incentives, and public sector leadership, the UK aims to significantly improve the energy performance of its building stock. Addressing challenges related to funding, awareness, and skills development will be key to the successful implementation of these policies. Relevant policy mechanisms include:

- First implemented in 2018, the **Minimum Energy Efficiency Standards (MEES)** has required all rented properties to meet a minimum Energy Performance Certificate (EPC) rating. By 2030, new tenancies and all tenancies must demonstrate EPC ratings of C. This policy aims to improve the energy performance of the private rental sector and encourage landlords to invest in energy efficiency improvements.
- The **Energy Company Obligation (ECO) scheme** requires large energy suppliers to help households improve energy efficiency. First launched in 2013, ECO focuses on low-income and vulnerable households, providing funding for insulation, heating improvements, and other energy-saving measures. The current iteration, ECO4, started in 2022 but will end in March 2026. Following the conclusion of ECO4 a proposed expansion, ECO5, was proposed by successive UK Governments but has since not been officially announced or launched.
- The **Future Homes Standard** is a key component of the UK's strategy to reduce carbon emissions from new homes and move towards its 2050 net-zero target. Due to be published in early 2026, this standard is designed to ensure that new homes are constructed with significantly higher energy efficiency and utilize low-carbon heating systems, thereby drastically reducing their carbon footprint. The Future Homes Standard aims to make new homes more energy-efficient, with a goal of producing 75-80% fewer carbon emissions than those built under current regulations. This includes improvements in building fabric standards to reduce heat loss through walls, roofs, windows, and floors. Homes built to this standard will be better insulated and more airtight, minimizing the need for heating.

The improvement of building energy efficiency is a core aim of national and local governmental policy. As a result, a community-led energy efficiency programme can be expected to receive and utilise local and national governmental support and resources to enable domestic decarbonisation across Ashwell.

5.4. Natural & Cultural Heritage

Issues of natural and cultural heritage sensitivity must also be addressed to satisfy the LPA to avoid or minimise any negative impacts arising from technology implementation on natural and cultural assets across Ashwell parish and the surrounding landscape.

5.4.1. Cultural Heritage

Where development sites are located adjacent to or near culturally sensitive monuments, zones or buildings, mitigation strategies will be required to ensure the proposed development do not incur adverse impacts. In energy development, close proximity to cultural designations may affect the installation of generation infrastructure (e.g., solar PV, turbines, boreholes), supply routes (e.g., cabling and pipework routing) and internal works (e.g., energy efficiency or heat system upgrades).

Cultural heritage designations and features found across Ashwell parish include:

Table 5-1 – Cultural Heritage Designations across Ashwell Parish.

Designation	Name	Notes	
Scheduled Ancient Monuments (SAMs)	Moated Enclosures E and W of Love Lane, Ashwell.	ID: 1012208	Two medieval moated sites, adjacent to Love Lane.
	Arbury Banks Iron Age Hillfort.	ID: 1008981	Iron Age hillfort, situated on an elevated spur SE of Ashwell village.
	Crop Marks of five Ring Ditches W of Station Road, Ashwell.	ID: 1451703	Remnants of five Bronze Age barrows in a field SE of Ashwell village.
	Ring ditches and enclosures at Slip End.	ID: 1003549	Multi-phase crop marks identified through aerial photography.
	Highley Hill bowl barrow.	ID: 1009428	Bronze Age barrow SE of the summit of Highley Hill.
	Mobbs Hole moated site and decoy pond, Ashwell.	ID: 1012306	Medieval moated site with adjoining duck decoy pond.
Listed Buildings²³	Church of St Mary, Mill Lane.	Grade I	Parish Church completed in 1381.
	75 buildings in parish	Grades II* - II	Properties dating from the late medieval (c.15 th century) to early 20 th century.
Conservation Area²³	Ashwell Conservation Area	A 50-ha area of special architectural and historic interest, covering the centre of Ashwell village.	

Ashwell Conservation Area and Listed Building Control(s)

Additionally, the *Ashwell Conservation Area Character Appraisal and Management Plan* (2023) states that any alterations and extensions to existing buildings should be sympathetic to the character of the building and the village, including continuity of building materials and period feature detailing.

Alongside this, NHDC have also enacted some additional planning controls in conservation areas, including:

- Reduced PDR, in accordance with the Article 4 Direction²⁴.
- Requirement for rooftop solar PV to project no more than 0.2m from the roof planes.
- Certain restrictions on the size and location of ASHPs.
- Requirement for rooftop solar PV to not face a roadway or are within curtilage of Listed Buildings.

Listed buildings are also less likely to be suitable for modern energy infrastructure that will alter their external appearance (e.g., rooftop solar panels or ASHPs). However, these may be deemed acceptable if infrastructure is not readily visible from ground level or facades. Internal building works may also be viable (e.g., energy efficiency measures) if they are deemed unintrusive and complement internal period features (e.g., timber beams or stonework). Engagement with Historic England (HE) is a requirement for alteration to any heritage assets, and listed building consent would typically be an additional requirement to obtain planning permission. This can be obtained from the LPA.

Site Review

No proposed development site is located within a SAM designation.

²³ See Figure 5.1.

²⁴ Article 4 Directions are applied by LPAs to restrict or outright remove Permitted Development Rights in a certain area (e.g., Conservation Areas).

Whilst Dixies Meadow, put forward for potential DHN development, lies within the Ashwell Conservation Area, no obstructive features are anticipated to arise from this development that will adversely affect this area of the conservation area. Here, the site's original condition and appearance can be reinstated once subsurface installation works conclude.

Due to the location and anticipated scale of PV development at Wolverley House, development here will be subject to conservation area requirements and will require a planning application. In line with the guidelines set out by the Ashwell Conservation Area Character Appraisal and Management Plan, proposals should evidence minimal visual impact, including panel mounting 0.2 m from rooftop edges, module placement away from public-facing views and materials sympathetic to Wolverley House's appearance. An assessment of glint and glare and visual impacts may also be required to reduce the likelihood of this development impacting neighboring properties.

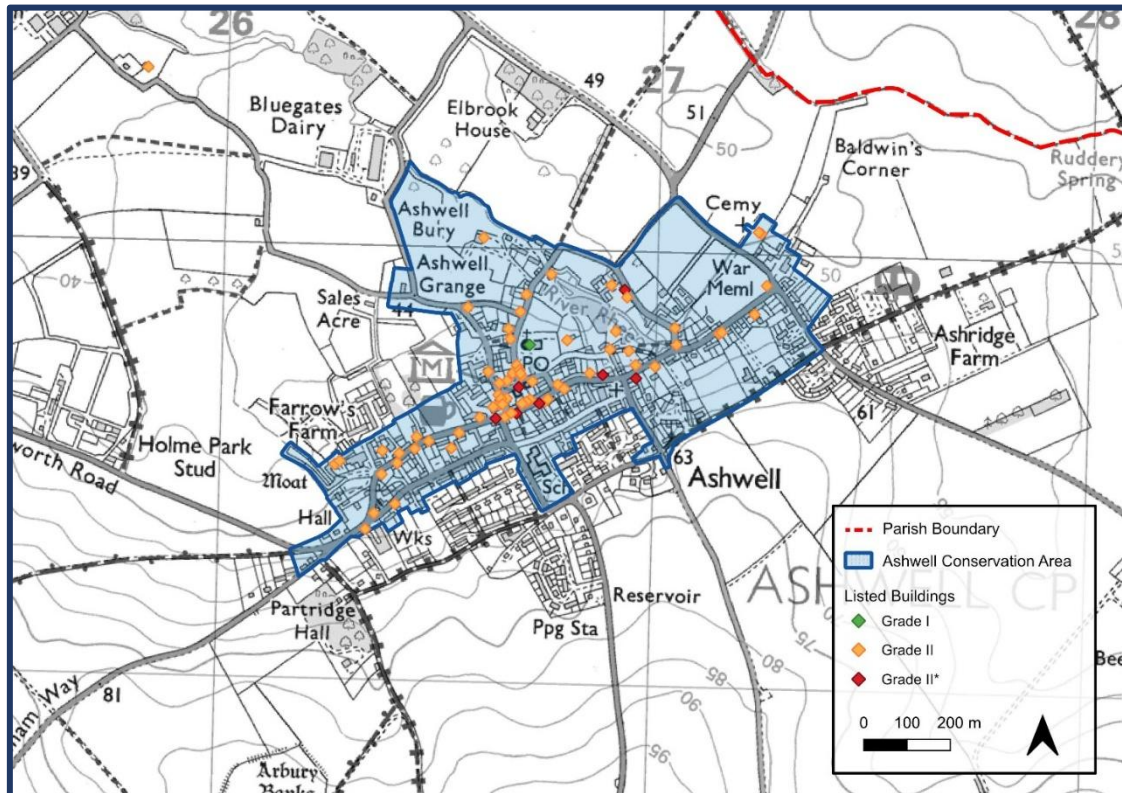


Figure 5.1 – Ashwell Conservation Area and Listed Buildings in Ashwell village.

5.4.2. Natural Heritage

Although energy developments across Ashwell are unlikely to significantly affect natural heritage when installed within the 'built' environment (i.e., urban areas), where existing terrestrial habitats and settings are disturbed – it is necessary to assess the environmental and ecological impacts.

In this instance, environmental sensitivity increases when energy developments result in a long-term change of land use (e.g., ground-mounted solar PV on agricultural land) or when they directly impact wildlife. There is a statutory obligation on the LPA to ensure that the impact on protected species and habitats is fully considered prior to approving a development. Depending on the species and habitat types concerned, this can sometimes require significant ecological surveying to collect sufficient evidence – with associated cost and resource for doing so borne by the developer. Following technology and site selection, advice and consultation should be sought from a variety of relevant national and regional regulators including the EA, Natural England and local conservation bodies.

International and National Designations

No international natural heritage designations (e.g., UNESCO World Heritage Sites) are present across Ashwell Parish. One *Site of Special Scientific Interest (SSSI)* is present - Ashwell Springs SSSI. This 0.2-ha site lies at the centre of Ashwell village and is the natural source of the River Cam / Rhee. A small local nature reserve – Ashwell Quarry and Quarry Springs – lies adjacent to Hinxworth Road, at the northern base of Newnham Hill. This 4.1-ha reserve is maintained by the Herts and Middlesex Wildlife Trust and supports a variety of chalk grassland species and migratory birds. No other national statutory designations are present within the parish.

Landscapes, Habitats and Species Biodiversity

Several habitats identified within the *Priority Habitat Inventory (PHI)* can be found across Ashwell Parish (Deciduous Woodland, Good Quality Semi-Improved Grassland, Lowland Calcareous Grassland and Traditional Orchards). Habitats listed in this inventory are scheduled as being of principal importance to conserve and enhance biodiversity. Several bird species listed for *Priority Species for Countryside Stewardship (CS) Targeting* are also present across Ashwell Parish. Due to the region's extensive arable and horticultural landscape, Corn Bunting (*Emberiza calandra*) and Lapwing (*Vanellus vanellus*) populations are protected across much of the parish.

No PHI sites exist on, or adjacent to, any proposed development site. Whilst some regions designated under the CS targeting lie across proposed development sites, individual ecological assessments at each location alongside mitigation strategies will be able to reduce the risk of impact.

Wider Constraints

Several flood zones can be found across Ashwell parish, adjacent to small natural river channels and agricultural culverts. Flood risk levels are categorised by the Environment Agency and range from zone 1 (low probability of flooding) to zone 3 (high probability). Land adjacent to the River Cam, Cat Ditch and two unnamed streams at Ashwell End, and on the parish's north-eastern periphery are designated 2 and 3 flood zones. Proposed developments in flood zones 2 and 3 require a flood risk assessment (FSA) and can be restricted for certain developments or would require inclusion of flood-resilient measures (UK Government, 2024). Energy infrastructure can be sensitive to flooding and it is crucial to assess and mitigate flood risks, regarding access routes to the project site, safety of infrastructure (e.g. battery energy storage), and impact on energy performance (e.g. heat cluster infrastructure). Where possible, prospective energy developments in areas of flood risk should be avoided.

The field at Bluegates Farm (identified for wind turbine development) is adjacent to a flood risk zone. Whilst flood risk is not expected to present a definitive barrier to turbine development here, an FSA (or suitable mitigation strategies) should be conducted. Flood risk does not pose a risk to any other development proposal.

Agricultural Land Classification

The *Agricultural Land Classification (ALC)* categorises land across the UK based upon its quality and potential for agricultural use, ranging from Grade 1 (excellent) to Grade 5 (very poor). This classification system assesses factors like soil quality, climate, and topography. ALC impacts energy developments, as higher-grade agricultural land (Grades 1 – 3a) is typically protected to preserve its agricultural value. Consequently, energy projects, such as solar farms or wind turbines, are often only suitable on lower-grade land (Grades 3b – 5) to minimise the impact on prime agricultural resources and ensure sustainable land use practice.

Classified land throughout Ashwell Parish is either Grade 2 (*Very Good Quality*) or Grade 3 (*Good to Moderate Quality*) (see Figure 5.2). Land which is graded 3 (or worse) is typically preferred for energy development. Developments are not typically justified where they lie within land graded 2 or better.

All proposed development sites reside within grade 3 ALC farmland. This means that prospective developments are more likely to gain consent and public support as they do not infringe upon the most valuable or productive areas of farmland across Ashwell. Certain technologies (e.g., wind turbines due to low land take and solar arrays with grazing or limited cropping) are also compatible with farming and can allow for the site to continue farming once installation works conclude.

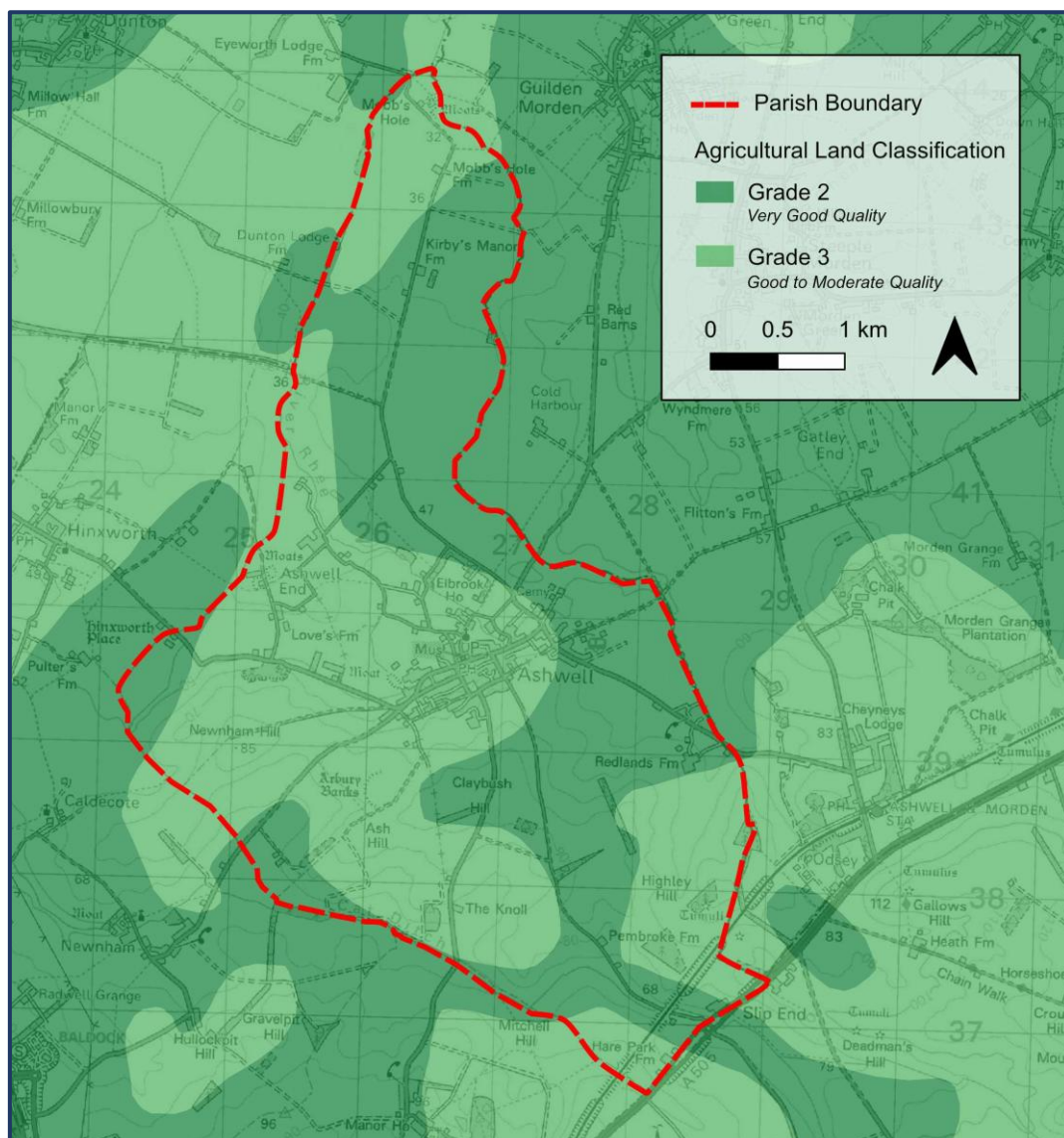


Figure 5.2 – Agricultural Land Classification across Ashwell Parish.

6. Community Engagement

This section details the community engagement strategy undertaken, outcomes over the course of the study and recommendations for next steps engaging with landowners, residents and users. This includes:

1. Local energy customer(s), including all potential energy off takers from recommended opportunities.
2. UKPN, as the regional grid operator.
3. Regional regulators and infrastructure operators, including NHDC.
4. Potential investors, financial partners and landowners.

Stakeholder engagement within a feasibility study is a staged process with several aims:

1. Awareness Raising

The focus of this stage is on building support in the local area from potential scheme participants (i.e., electricity or heat off takers). Engagement with regulators, network operators, etc., was conducted following baseline demand and resource assessments.

Works conducted included:

- A. A site visit conducted in November 2025 to view sites and gather input from ZCA members and several Ashwell residents.
- B. Development of briefing for stakeholders, setting out project ambition, objectives, and outputs for onward engagement.

2. Developing Dialogue

The purpose of this stage is to identify opportunities for electricity and heat generation, transmission, and use, and to further discussions with stakeholders relevant to these areas. Where potential barriers to development were identified at this stage (e.g., regulatory, non-supportive stakeholders), transparent dialogue can help to mitigate and reduce these challenges. Engagement included:

- A. Discussing each development opportunity in terms of scale, level of opportunity, local benefit potential, and assessing key risks and constraints.
- B. Engagement with UKPN to obtain grid connection cost estimates and understand local grid constraints in detail.

3. Building Support

The purpose of this stage is to secure the in-principle support of landowners, residents and users, and is a vital step to underpin project viability. Engagement included:

- A. Direct conversations to communicate specific activities, outcomes and benefits relevant to landowners to gauge level of support for recommended development options and secure in-principle support.
- B. Engaging NHDC planning department for informal planning advice and resources. This was undertaken to establish NHDC's reception to community-led development across Ashwell.
- C. An in-person public presentation and media release of all final reporting documents, project outcomes and a bespoke development roadmap in Summer 2026.

6.1. Stakeholder Summary

Engagement with the community, regulators, network operator and third-parties conducted throughout the duration of the project are provided in Table 6-1.

Table 6-1 – Stakeholder Engagement Outcomes and Next Steps.

Stakeholder	Level of Support	Outcome(s)	Next Steps
Zero Carbon Ashwell	High	ZCA is the project lead and grant recipient. ZCA is committed to developing a community-owned energy project to provide tangible environmental, financial and social benefits to the Ashwell community.	Encourage local support via disseminating report. Secure further development funding. Develop next steps.
Local Landowners	High	Local landowners at proposed development have expressed interest and support for community-led energy initiatives across Ashwell.	Maintain clear and effective dialogue with landowners, providing regular updates surrounding
Ashwell Residents	High	Whilst initial resident support for community-led development and ZCA's ambition has been established, continued clear and effective communication channels will be essential to maintain and grow community consensus for any proposed development(s).	ZCA to maintain open dialogue with Ashwell residents during feasibility study and subsequent project development phases. ZCA to undertake pro-active engagement with individual residents adjacent to development site(s) prior to any prospective planning submission and construction phases.
North Herts District Council	High	NHDC planning department have shown interest and informal support for community-led energy developments across Ashwell. Whilst formal pre-application advice has not been sought at this stage, NHDC have provided several resources demonstrating their support for similar developments as those proposed across Ashwell.	Once a financially viable solution with large-scale community consensus is in place, seek formal pre-application advice from NHDC.
UKPN	Moderate	Virtual engagement with UKPN technical design team was conducted in March 2026. Engagement established local grid conditions and capacity for new low voltage connections. A selection of budget estimates was submitted in February 2026 to establish financial and technical requirements required to enable new connections to the local grid.	Share detailed system generation and demand specifications. This will allow UKPN to undertake a detailed connections offer and LV grid constraints assessment for the proposed development site.
Prospective End Energy Users	Unknown	As of March 2026, no engagement with potential energy off takers (e.g., Wolverley House) has been undertaken.	ZCA to engage with and secure support of potential energy off takers. This will improve likelihood of project progression.

7. Community Benefit

This section introduces the concept of community benefit, which encompasses both economic and non-economic community benefits. For progressed development opportunities, economic impacts are identified via detailed financial analysis. Alternatively, a Social Return on Investment (SROI) assessment is used to assess the non-economic value of the development(s).

7.1. Community Benefit

There are several prevailing forms of ‘community benefit’ which are apparent in the UK, including:

Community Funds

Annual Contributions: Many renewable energy projects provide annual financial contributions to local community funds. In turn, these funds are used to stimulate and support further community projects, environmental initiatives, local businesses and services, and educational facilities.

One-Time Payments: Some energy projects offer a one-time lump sum payment to communities. This can then be used to initiate local projects, services, or infrastructure improvements.

Energy Discounts and Subsidies

Discounted Energy Rates: Some energy projects offer discounts on energy bills for local households, particularly for those in proximity to the project, as compensation for any perceived impact.

Subsidised Energy Supply: In some cases, Energy projects or organisations may offer subsidies to local and / or vulnerable households to reduce fuel poverty and promote affordable energy access in the community. This is often a key strategy in socially disadvantaged or isolated, rural communities.

Community Ownership and Shares

Community Shares: Energy projects may offer communities the chance to buy shares, giving them a stake in the project and a portion of the profits.

Joint Ownership: Some energy developments, especially renewables, are orientated to promote community ownership. This allows local residents and communities to co-own the energy project, gaining both financial returns and a voice in management decisions and strategy.

Local Employment and Training Opportunities

Job Creation: Energy developments often create jobs during the construction and operational phases. These jobs can range from pre-construction surveys, construction roles and technical positions in operations and maintenance. Appointing local suppliers in these roles also initiates local collaboration and benefits the local economy.

Apprenticeships and Training: Community-driven energy projects or bodies can provide apprenticeships, internships, and training programs to develop local skills in renewable energy, engineering, and environmental management. This can directly benefit residents by helping to build a skilled, multi-disciplined local workforce.

Infrastructure and Environmental Enhancements

Infrastructure Investments: Local infrastructure can be upgraded as a result of community energy projects, including as roads, community buildings and facilities, and broadband access, which benefit the broader community.

Environmental Improvements: Energy projects or organisations can also fund or undertake initiatives to improve and conserve local biodiversity, including reforestation schemes, habitat restoration works, or the establishment of wildlife corridors.

Educational Programs and Awareness Campaigns

School and Community Programs: Educational programs are a key offshoot benefit from locally driven energy action. Educational outreach can teach local students and communities about renewable energy, climate change, and grassroots sustainability action.

Energy Efficiency Campaigns: An accompanying energy efficiency awareness campaign could be offered alongside the energy development. This could include interactive workshops, and accessible resources to encourage the local community to adopt sustainable day-to-day practices.

Resilience and Sustainability Projects

Climate Resilience: Financial benefits arising from community-led energy projects can also be put towards community resilience projects. In rural areas, flood defence, sustainable agriculture, and renewable energy storage solutions are key initiatives to improve local resilience and maximise the local benefit of the installed energy technology.

Local Sustainability Initiatives: Energy projects or organisations can sponsor projects that promote similar values and ambitions. Supporting other local sustainable initiatives could result in the establishment of community gardens or waste reduction and recycling initiatives.

7.2. Social Value Assessment

Social value is the positive impact that organisations, projects, or policies create for communities, beyond financial returns. It encompasses improvements in well-being, social cohesion, environmental sustainability, and economic resilience. Social value benefits might include better health, job opportunities, education, community empowerment, or environmental enhancements that uplift overall quality of life.

Table 7-1 provides an overview of annual and lifetime social value of key social impact metrics, alongside calculation methodologies.

Table 7-1 – Potential Social Value of Recommended Energy Developments.

Outcome	Valuation Approach	Annual Social Value		
		<i>Wolverley House Solar</i>	<i>Community-led ASHP Adoption</i>	<i>Community-led Energy Efficiency Programme</i>
Carbon emission reduction	UK central carbon price (£49.41) applied to carbon equivalent emissions savings (tCO ₂ e).	£529	£6,226	£578
Job creation	Costing of days to install against number of staff and average salaries in the sector. (Over project lifetime)	£5,520	£11,620	£22,500
Air pollution reduction	Price of air pollution (NH ₃ , SO ₂ , VOC, PM2.5) and kWh reduced from fossil fuel boilers	N/A	£722	N/A
ZCA members and community volunteers upskilled	Number of 'community energy leaders' and average cost of upskilling courses.	£3,500	£5,600	£7,000
Energy bill reduction	Estimated energy bill reduction for local businesses.	£3,434	£2,842	£5,626

Outcome	Valuation Approach	Annual Social Value		
		Wolverley House Solar	Community-led ASHP Adoption	Community-led Energy Efficiency Programme
Community investment revenue generation	Net Income average over 30 years	£4,324	N/A	N/A
Education of Ashwell residents and property owners	Attendance at community energy events and average cost of carbon literacy classes. (Over project lifetime)	N/A	£1,425	£2,850

7.2.1. Social Return on Investment

Social Return on Investment (SROI) measures social, environmental, and economic value created by investments or activities. It is defined as a social valuation in comparison to the initial costs of an energy project, for example a social impact of £1,000 derived from an energy project with a capital cost of £500, would lead to a SROI of 2.0. The higher the SROI figure, the greater the socio-economic benefits of implementation.

Table 7-2 presents the lifetime social value of each of the preferred development scenarios alongside an estimated SROI metric. All development scenarios provide a positive SROI within a 30-year project lifetime.

Table 7-2 – Modelled Social Return on Investment of Recommended Energy Opportunities.

Energy Option	Capital Cost	Lifetime Social Value	SROI
Wolverley House Solar	£70,592	£178,015	2.5
Community-led ASHP Adoption	£1,320,125	£962,305	0.3
Community-led Energy Efficiency Programme	£156,000	£333,505	3.1

8. Financial Assessment

Based on a detailed financial assessment, there are 3 recommended community development opportunities across Ashwell:

1. 0.06 MW (60 kW) rooftop PV system at Wolverley House, Ashwell.
2. Community-led ASHP adoption across Ashwell.
3. Community-led Energy Efficiency Programme.

Other technologies appraised, but not recommended at present:

4. Medium (1 MW) and small-scale (0.1 MW) wind turbine at Bluegates Farm, Ashwell.
5. Medium (2.2 MW) and small-scale (0.2 MW) ground-mounted PV at Love Lane, Ashwell.
6. Ground-source District Heat Network at Dixies Meadow, Ashwell.

Bespoke 25-year financial assessment is provided electrical generation opportunities across Ashwell and 60-year assessments for heat development opportunities, reflecting the typical lifetimes of such assets. A development is recommended as viable if it meets the following financial thresholds:

- A Project Internal Rate of Return (IRR) greater than 7.0 %.
- A positive Net Present Value (NPV) by year 25.

Financial Terminology

A full summary of the financial metrics used to determine financial viability is provided below:

Project Internal Rate of Return (IRR): The expected internal rate of return generated by project cash flows before financing costs, over the project lifetime. This acts as a profitability indicator accounting for the cash flow timings of a project.

Lifetime Net Present Value (NPV): The present value of the cumulative net income over the project lifetime. The present value uses a discount rate to account for the time value of money.

Self-Supply Revenue: The revenue accrued from direct supply of the self-generated electricity to the demand user, equal either to the direct financial savings or agreed community tariff.

Export Income: The revenue generated by exporting generated electricity to the grid, such as via the Smart Export Guarantee (SEG) or an agreed Power Purchase Agreement (PPA) rate.

Operating Cash Flow: The balance of cash in and cash out over a given year. This includes all financial savings and revenues, and all costs (e.g., OPEX, capital repayments or interest repayments).

Cumulative Net Income: Accumulated net income over the project lifetime. Includes self-supply and export revenue, CAPEX, cumulative OPEX and debt interest.

Breakeven Year: When cumulative net income becomes positive (i.e., when accrued profits surpass capital costs).

Return on Investment (ROI): A profitability metric that compares the lifetime cumulative net income (including interest and taxes) to the initial costs. Compounded to an annualised growth rate.

Return on Capital Employed (ROCE): Measures the efficiency with which capital is employed. Compares lifetime earnings before interest and taxes (EBIT) to the initial costs. Annualised growth rate.

Carbon Emissions Reduction: Greenhouse gas emissions (tonnes CO₂e) reduction from producing zero carbon electricity here. Compared to current grid or fuel carbon intensity.

8.1. Recommended Opportunities

1. 0.06 MW Rooftop PV (*Wolverley House, Ashwell*).

A community-owned rooftop PV system at Wolverley House displays **moderate financial viability**, based on:

Technical viability: A 0.06 MW rooftop PV system at Wolverley House could generate 60.5 MWh each year. With approximately 53% of this supplying residential demand at Wolverley House itself, the remaining 37% can be exported, to the grid. This configuration can provide carbon savings of up to 10.7 tCO₂e each year.

Financial viability: A 0.06 MW rooftop PV system at Wolverley House meets recommendation criteria. Across a project lifetime of 25 years, a rooftop PV development has a positive project IRR (10.7%), a positive NPV (£36,505 NPV), and breaks even in year 15.

Community Benefit: Providing a return on investment in year 15, a rooftop PV system here could provide up to £108,105 in profit for community investment. This would lead to a cumulative energy bill saving of £63,956 and 400 tCO₂e annual carbon reduction for residents across Ashwell by 2050.

2. Community-led ASHP adoption (*Ashwell-wide*)

Technical viability: A targeted, community-led approach to support homeowners transition to ASHPs can be successfully implemented across Ashwell. Grassroots community action, including energy advice cafes, awareness events, and bespoke home assessments could enable an additional 72 ASHP installations by 2035, and 179 by 2050.

Financial viability: In this approach, homeowners will be responsible for financing each ASHP installation themselves. This means ZCA are not responsible for financing or overseeing final installation works. Whilst this arrangement would not generate direct revenue for ZCA, it does generate considerable social and environmental benefits, consistent with ZCA's organisational ambition.

Community Benefit: Whilst no revenue is directly generated for the community, by 2050 this approach could help to save £63,956 across Ashwell each year. In turn, this would result in an annual carbon reduction of 400 tCO₂e by 2050.

3. Community-led Energy Efficiency Programme (*Ashwell-wide*)

Technical Viability: A phased approach, consisting of three distinct phases of community action are recommended, each phase incurring varying levels of cost, staff capacity and external resource to deliver. Cumulatively, all three phases could result in saving up to 292 tCO₂e across Ashwell homes.

Financial Viability: Whilst these programmes will incur varying levels of cost to deliver, it will not incur large technical installation or external connection costs to achieve. This simplifies implementation and minimises financial outlay and risk for ZCA. Whilst this approach will not generate direct revenue for ZCA, it instead provides it will generate considerable social and environmental benefit across Ashwell, consistent with ZCA's core mission.

Community Viability: A phased approach ensures ZCA build knowledge, skillset and operational capacity early, allowing the organisation to diversify and improve energy efficiency service with recommended each phase. This approach encourages local upskilling, knowledge sharing and facilitates local networking, ultimately increasing ZCA's operational capacity.

8.1.1. Solar PV (*Wolverley House, Ashwell*)

A community-owned rooftop PV installation at Wolverley House has moderate financial viability and is the recommended solar PV development opportunity across Ashwell. Contingent on securing Wolverley House as an end energy user, supplementing on-site residential energy demand through a PPA represents a consistent, and financially viable business case for community-owned solar. Any generated energy not consumed on-site could be exported to the grid, providing an additional revenue stream for the community.

Financially, a rooftop PV system here provides a low-risk and robust opportunity, resilient to future operating, capital, electrical tariff and energy export price fluctuations. Due to the scale of proposed PV development, no additional connection costs or local grid reinforcement works would be required to enable development, strengthening financial performance and greatly simplifying the connection process. A PV system of this scale is

best funded via 100% private debt, to avoid the unnecessary cost and logistical requirements of a community share raise. In doing so, this approach could provide a return on investment by year 15 and could generate up to £108,105 for the community over a 25-year period. Full financial metrics are presented in Table 8-1, and projected lifetime cumulative net income is presented in Figure 8.1.

Table 8-1 - Financial Assessment for Community-Owned Rooftop PV at Wolverley House, Ashwell.

0.06 MW, Wolverley House	
Capital Cost (CAPEX) (inc. grid connection)	-£70,592
Budgeted Grid Connection Costs	£0 ²⁵
Year 1	
Local Supply Income	£5,461
Export Income	£2,556
Operational Cost (OPEX)	-£769
Carbon Emissions Reduction (tCO ₂ e)	10.7
Lifetime (25-years)	
Local Supply Income	£180,003
Export Income	£84,235
Operational Cost (OPEX)	-£38,950
Debt Service (Principal & Interest)	-£93,747
Carbon Emissions Reduction (tCO ₂ e)	259.3
Cumulative Net Income	£108,105
Performance (25-years, real terms)	
Annualised Return on Investment (ROI)	3.8%
Annualised Return on Capital Employed (ROCE)	5.9%
Project Internal Rate of Return (IRR)	10.7%
Net Present Value (NPV)	£36,505
Breakeven Year	15

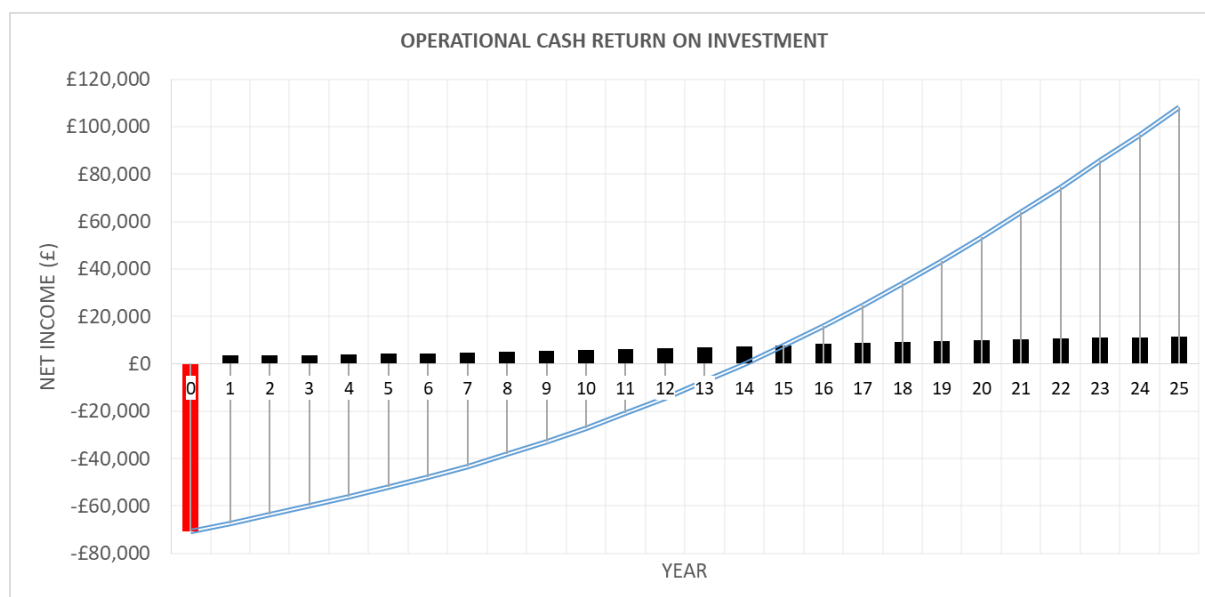


Figure 8.1 – Cumulative Net Income for 0.06 MW PV at Wolverley House, Ashwell.

²⁵ Approximate connection cost provided by UKPN, March 2026.

8.1.2. Community-led ASHP adoption (*Ashwell-wide*)

A community energy hub can enable increased adoption of ASHPs across Ashwell, helping to build towards local heat decarbonisation. A community-led hub is recommended to deliver and support this programme, and could provide services including access to decarbonisation resources, the sharing of experiences and lessons learned, and the facilitation of connections to local suppliers. Without the need for a physical location, complex technology installation or external permissions (e.g., landowner, grid connection or planning permission) to develop, this approach provides an alternative and effective way for the community to work towards decarbonising heat supply across Ashwell, on a broad scale. The financial benefits of a community-led ASHP adoption programme are set out in Table 8-2.

Table 8-2 – Financial Assessment for community-led ASHP adoption across Ashwell.

	Community-led ASHP adoption
Capital Cost (CAPEX) ²⁶	-£1,038,642
Grant Funding	£519,321
Year 1	
Annual Revenue (heat sales and service fee)	£0
Annual OPEX: Electricity costs	-£61,971
Annual OPEX: Maintenance, metering and billing	-£17,670
Annual Debt Service	-£552,642
Annualised REPEX ²⁷	-£20,301
Free Cash Flow	-£73,703
Carbon Savings (t CO ₂ e)	126
Lifetime Performance (60-year, real prices)	
Net lifetime costs ²⁸	-£6,852,953
Net levelized cost of heat (LCOH, £ / kWh)	£0.20
Lifetime Carbon Savings (t CO ₂ e)	9,654
Cumulative Net Income for Community	-£3,044,860
Net Present Value (NPV)	-£2,574,944
Project Internal Rate of Return (IRR)	N/A

Financial Benefit

Table 8-3 provides an overview of the annual benefit of ASHP installations for typical property types in Ashwell. Installation of an ASHP can lead to energy bill savings thanks to the increased heat system efficiency and the removal of the standing charge or delivery costs of maintaining fossil fuel systems.

For properties currently on gas or oil heating (82% of all properties), air-source heat pumps do not currently provide energy bill savings if users remain on electricity price cap rates. However, savings of around £200 per year are likely if residents switch to an optimal time-of-use electricity tariff designed for heat pump usage (e.g. Octopus Agile) and use this passively. This assessment was made before the price spike caused by the Iran war in March 2026. A 10% increase in the price of heating oil compared to electricity is sufficient for a heat pump (on price cap tariff) to reach cost parity.

²⁶ Includes capital costs for energy centre, thermal resource development works, network development works, procurement, design and project management costs and contingency. Also includes internal works at individual properties with installation of heat interface units and removal of existing heat system.

²⁷ Replacement Expenditure (REPEX), accounting for replacements of all internal and external equipment over the 60-year time horizon in line with expected product lifetimes.

²⁸ Includes CAPEX, OPEX, REPEX, debt service, and electricity costs, with no double counting and net of grant funding, over the full project lifetime.

The 13% of properties using electric heaters (both storage and resistive types) would financially benefit the most from switching to an ASHP, with annual savings of over £1,300 per year for the average resistive heated home, and over £900 per year for storage heated homes.

The 15% of Ashwell properties currently heated by oil would provide the largest carbon benefit (3.6 tCO₂e / year), but with significant carbon benefit for all other properties.

Table 8-3 – ASHP Annual Household Benefits

Average Ashwell Properties		Current Heating Systems		Prospective ASHP Benefits, Annual			
Current Heating Source	Average Floor Area (m ²)	Average Heat Usage (MWh)	Average Cost of Heating (£)	ASHP Energy Usage ²⁹ (MWh)	Cost Savings (Fixed tariff, £)	Cost Savings (Dynamic tariff, £) ³⁰	Carbon Savings (tCO ₂ e)
Mains Gas	117	15.8	£1,125	4.8	-£211	£163	1.9
Oil	116	18.5	£1,340	5.3	-£133	£279	3.6
Electric (storage)	82	10.5	£1,255	3.8	£946	£1,238	1.4
Electric (resistive)	63	7.6	£1,863	2.7	£1,348	£1,560	1.0

Domestic ASHP efficiency and operating costs can also be optimised alongside domestic solar PV systems. Coupled with an average UK domestic rooftop solar installation (approximately 4 kWp), ASHPs can achieve self-sufficiencies up to approximately 25%. In turn, this helps to reduce ASHP operating costs, most lucratively for homes currently using electric (storage) heating systems. **A community-led support programme could help support and encourage domestic rooftop solar PV installations across Ashwell**, increasing rooftop solar penetration across Ashwell from 7% (2026) to 47% (see section 4.4).

Table 8-4 – Rooftop Solar PV / ASHP Benefits

Average Ashwell Properties	New ASHP System		Prospective Solar Benefits, Annual		
Current Heating Source	ASHP Capacity (kWp)	Annual ASHP Demand (MWh)	Rooftop PV Capacity (kWp)	ASHP Self Sufficiency ³¹	ASHP Cost Savings ³²
Mains Gas	10.9	4.8	4	21%	£63
Oil	12.1	5.3		20%	£69
Electric (storage)	8.5	3.8		23%	£212
Electric (resistive)	6.2	2.7		25%	£82

Capital Costs

The estimated costs of installing a new ASHP systems are provided in Table 8-5. The Boiler Upgrade Scheme (BUS) provides up to £7,500 grant funding for the cost and installation of an ASHP or GSHP units. Utilising the

²⁹ Assumes a SCOP of 2.78, in line with the results of the Electrification of Heat Demonstrator Project (DESNZ, 2024)

³⁰ Based on Octopus Agile 2024 data and passive management of the heat pump system, electricity costs are 28% lower than a fixed price tariff.

³¹ Percentage of ASHP electrical demand derived from rooftop solar PV generation.

³² Annual cost savings resulting from the consumption of solar energy.

BUS and any other regional equivalent schemes is a recommended approach to enable large-scale ASHP uptake across Ashwell.

The post-grant cost to householders is estimated at between £2,000 and £12,000 depending on the house type and size of system. There is a relatively short payback time for householders currently using electric heating, indicating that immediate installation is financially beneficial. For oil and gas homes, the payback times are longer and thus installation should be at the end of life of the existing systems.

Table 8-5 – ASHP Upfront Costs

Average Ashwell Properties	New ASHP system		Prospective ASHP Benefits, Annual		
Current Heating Source	Estimated ASHP Capacity (kW)	Estimated ASHP Cost (£)	Cost with grant (£)	Payback time (inc. grant & fixed tariff)	Payback time (inc. grant & dynamic tariff)
Mains Gas	10.9	£17,250	£9,750	N/A	60 years
Oil	12.1	£19,000	£11,500	N/A	41 years
Electric (storage)	8.5	£13,500	£6,000	6 years	5 years
Electric (resistive)	6.2	£9,750	£2,250	2 years	2 years

Impact Assessment

Table 8-6 quantifies the potential impact of community-led action on ASHP uptake in Ashwell, using assumptions derived from the National Grid's Future Energy Scenarios:

No Action: No community action may result in the “*Business as Usual*” scenario for heat pump growth, meaning significant heat pump penetration (>50%) does not occur until ~2047.

Community Action: A high degree of community action transitions the village into the “*Electric Engagement*” scenario, where net zero is achieved thanks to considerable grassroots engagement and action. Community action is forecast to have a large impact, particularly in the short to medium term. In this scenario, community action could support up to 72 ASHPs across Ashwell by 2035. At this rate of growth, significant heat pump penetration (>50% homes) would occur by 2041.

Table 8-6 – Scale of ASHP Opportunity (Additional Impacts Compared To 2025 Baseline)

Future Energy Scenario	2035			2050		
	Total ASHPs	Annual Additional Carbon Saving	Annual Additional Financial Benefit	Total ASHPs	Annual Additional Carbon Saving	Annual Additional Financial Benefit
Business as Usual	223	339 t CO ₂ e	£79,503	491	997 t CO ₂ e	£175,201
Electric Engagement	294	559 t CO ₂ e	£105,086	670	1,397 t CO ₂ e	£239,157
Net Community Impact	72	160 t CO₂e	£25,582	179	400 t CO₂e	£63,956

Phases of community action:

To maximise financial and carbon savings, community action should be structured into three phases, prioritising cost-effectiveness and feasibility:

Table 8-7 – Recommended Phases for Community-led ASHP Adoption.

Phase 1 (2026 – 2030): Driving early adoption through awareness and support 1. Develop clear, accessible information campaigns to increase awareness of ASHP benefits and the available financial support, demonstrating the cost savings and available grant funding. 2. Engage private landlords and social housing providers to facilitate ASHP adoption in rental properties. Expected impact: <i>Rapid uptake, quick financial returns, and early success stories that build trust and visibility within the community.</i>
Phase 2 (2026-2035): Establishing viable pathways for transition 1. Support proactive gas and oil boiler replacement planning by assisting homeowners to develop an ASHP adoption plan well before their existing systems reach end-of-life. 2. Utilise local knowledge and case studies, showcasing early adopters to build confidence and accelerate uptake. Expected impact: <i>A steady uptake as structured pathways and financial feasibility are established, and demonstrated to the wider community.</i>
Phase 3 (2030-2040): Transitioning high-energy users 1. Target larger homes, where ASHP adoption presents greater technical and financial challenges. Leverage the expected technology improvements and falling costs that will likely improve feasibility. 2. Repeating successful phase 1 and 2 strategies tailored to high-energy users can be successful here. Ensure ASHP adoption is simultaneously linked with support for energy efficiency upgrades, these will reduce required system sizes and overall costs. 3. Maintain engagement with new financial incentives and policy developments to maximise affordability for late adopters. Expected impact: <i>Slower take-up during final phase of transition, with whole-home energy approach driving long-term savings and emissions reductions.</i>

8.1.3. Community-led Energy Efficiency (Ashwell-wide)

A community-led energy efficiency advisory and support service, to support home energy efficiency upgrades across Ashwell is recommended. As an opportunity that does not require a physical site, complex technology installation or external permissions (e.g., grid or planning permission), this opportunity is an easily achievable and effective way to encourage energy efficiency improvements across Ashwell. Possible at varying levels of ambition, technical complexity, a community-led energy efficiency programme could also provide a tangible opportunity to upskill ZCA members and volunteers, further increasing organisational capacity for further initiatives.

To support the delivery of domestic energy efficiency improvements across Ashwell, this financial appraisal outlines a phased approach to implementation. Structured into 3 phases – *low ambition*, *moderate ambition*, and *high ambition* – each phase requires distinct actions, each with varying cost and staffing requirements. The phased approach ensures that community engagement and capacity-building are established early on, before progressing to more active community led retrofit measures. The tables below provide a breakdown of the key activities, associated costs, and resource needs for each phase.

Assuming 10% of Ashwell homes (85 homes) are engaged and actions arising from the programme lead to energy efficiency improvements of up to 5%, energy bill savings totalling £6,268 could be made. This represents a carbon emission reduction of approximately 13.9 tCO₂e across Ashwell.

Table 8-8 – Phase 1: Energy Efficiency Cost and Resource Requirement.

Phase	Key Actions	Estimated Costs	Resource Requirements
Phase 1: Low Ambition	Community workshops on energy efficiency and funding options	£250 per event × 4 events £1,000	2 volunteers per event.
	Development of a Community Action Plan	10 days at £450/day (consultant) £4,500	Consultant for plan development. Volunteers to organise action plan workshop.
	Initial thermal imaging assessments with volunteer support	£1,000 for camera lease £1,000 for volunteer training 10 volunteer days at £100/day for expense £3,000	Volunteer coordinator / community energy champions. 2 x 1 day training course attendance. 10 days thermal imaging.
	Supporting Role	£7,500	Consultant and volunteer team

A phase 2 programme, targeting up to 20% of homes across Ashwell (171 homes) could lead to energy efficient improvements of up to 10%. This could save up to £25,070 each year in energy bills, and lead to a carbon emission reduction of approximately 55.7 tCO₂e.

Table 8-9 – Phase 2: Energy Efficiency Cost and Resource Requirement.

Phase	Key Actions	Estimated Costs	Resource Requirements
Phase 2: Moderate Ambition	Establishment of a volunteer-led energy efficiency advisory service (Energy Café)	Training for advisory service volunteers £1,500	2 trained volunteers. 2 days per month.
	Recruitment of a part-time community development officer for energy	£18,000 / year.	One part-time officer, responsible for delivering regular information events and workshops.
	Expansion of thermal imaging service	£500 x 10 days for trained assessor. £5,000	One assessor, 10 days.
	Enabling Role	£24,500	Part-time officer, trained volunteers, paid assessor

A detailed phase 3 programme could engage up to 40% of homes across Ashwell (342 homes), and result in 20% improvement in energy efficiency. This represents a total energy bill saving of £100,281, and an Ashwell-wide carbon emission reduction of 222.8 tCO₂e.

Table 8-10 – Phase 3: Energy Efficiency Cost and Resource Requirement.

Phase	Key Actions	Estimated Costs	Resource Requirements
Phase 3: High Ambition	Delivery of professionalised energy efficiency advisory service	£250 per session x 26 sessions per year £6,500	Paid energy advisor.
	Provision of Home Retrofit Plans	£900 per home x 20 £18,000	Paid retrofit assessors. Development officer admin support.

Phase	Key Actions	Estimated Costs	Resource Requirements
	Recruitment of a full-time community development officer for energy	£36,000 / year.	One full-time officer.
	Co-ordination and delivery of energy efficiency works	2 full time staff £70,000 / year	Specialist retrofit coordinators and installers.
	Delivery Role	£124,000	Retrofit coordinators, paid assessors, specialist installers

8.2. Opportunities Not Recommended

The below options have been modelled based on current energy market pricing and economic conditions and have been found to not be financially viable as of 2026.

8.2.1. Wind Turbines

A summary of the financial performance of both scenarios is provided below.

1. 0.1 MW Wind Turbine (*Bluegates Farm, Ashwell*).

A 0.1 MW turbine at Bluegates Farm displays **poor financial viability**, determined by:

Technical viability: At this location, a 0.1 MW turbine can generate up to 244.2 MWh each year. Due to the lack of a large on-site energy demand, this turbine is anticipated to operate on an 100% export-only basis. This would provide a carbon savings of 43.2 tCO₂e each year.

Financial viability: The financial performance of a 0.1 MW does not meet the recommendation thresholds. Over a 25-year period, a 0.1 MW turbine has a poor IRR (3%) and negative NPV (-£145,233).

Community Benefit: As there is no return on investment within the modelled 25-year period, this means no profit is generated for community benefit and no returns are provided to community shareholders.

2. 1 MW Wind Turbine (*Bluegates Farm, Ashwell*).

A community-owned 1 MW wind turbine at Bluegates Farm is also **financially unviable**. Operating on an export-to-grid revenue model, a 1 MW turbine would require considerable grid connection and reinforcement costs to install, greatly reducing financial viability.

Technical viability: A 1 MW turbine at Bluegates Farm could generate 2,472.6 MWh annually. Operating within an energy export limitation of 200 kW, carbon savings of 437.7 tCO₂e each year are anticipated.

Financial viability: The financial performance of a 1 MW turbine does not meet the recommendation thresholds. Over a 25-year period, a 1 MW turbine has a negative IRR (-2.9%) and negative NPV (-£9.3m).

Community Benefit: Over a 25-year period, a 1 MW turbine does not provide a return on investment. In turn, this means no profit is generated for community benefit and no returns are provided to community shareholders.

Financial Appraisal: Wind Turbine

Neither turbine scenario is recommended for development, with both scales of development displaying poor financial prospects across a 25-year lifetime period. Financial performance is particularly affected by high grid connection costs, which reflect the region's limited grid capacity and underdeveloped grid infrastructure. A financial summary of both turbine scenarios is presented in Table 8-11.

Table 8-11 – Financial Assessment of Wind Turbine Scenarios.

Wind Turbine	0.1 MW (Not Recommended)	1 MW (Not Recommended)
Capital Cost (CAPEX) (inc. grid connection)	-£267,575	-£8,646,800
Grid Connection Cost	-£42,000	-£6,400,000 ³³
Year 1		
Export Income	£21,974	£222,534
Operational Cost (OPEX)	-£9,000	-£44,500
Carbon Emissions Reduction (tCO ₂ e)	43.2	437.7
Lifetime (25-year)		
Export Income	£724,262	£7,344,635
Operational Cost (OPEX)	-£328,056	-£1,726,377
Debt Service (Principal & Interest)	-£436,179	-£14,095,301
Carbon Emissions Reduction (tCO ₂ e)	1,046	10,594
Cumulative Net Income ³⁴	-£39,973	-£8,487,043
Performance (25-year, real terms)		
Annualised Return on Investment (ROI)	-0.6%	-14.8%
Annualised Return on Capital Employed (ROCE)	3.7%	2.0%
Project Internal Rate of Return (IRR)	3.0%	-2.9%
Net Present Value (NPV)	-£145,233	-£9,304,556
Breakeven Year	N/A	>25

8.3. Solar PV

A summary of the financial performance of both scenarios is provided below.

1. 2.2 MW Ground-Mounted PV (Love Lane, Ashwell).

A 2.2 MW ground-mounted solar PV array at Love Lane is **financially unviable**, based on:

Technical viability: A 2.2 MW ground-mounted PV array could generate approximately 2,361.6 MWh annually. Due to a lack of local supply opportunities, a 2.2 MW array is anticipated to operate at 100% energy export (limited to 200 kW due to regional grid capacity constraints). This could provide savings of up to 121 tCO₂e each year.

Financial viability: A 2.2 MW array, constrained by export limitations, does not meet recommendation criteria. It has a negative project IRR (-9.3%), negative NPV (-£4.9m) and does not provide a return on investment within a 25-year period.

Community Benefit: As the array would not provide a return on investment within a 25-year period, it is unable to provide any income for the community and could not provide returns for community shareholders or investors.

4. 0.2 MW Ground Mounted PV (Love Lane, Ashwell).

Whilst operating within the local grid export constraint, a 0.2 MW ground mounted solar PV array is also **financially unviable**. This is based on:

Technical viability: A 0.2 MW ground-mounted PV array generating 212.6 MWh annually, operating on a 100% energy export basis (limited to 200 kW). This could provide carbon savings of 37.6 tCO₂e each year.

³³ Constrained grid connection, limited to 1 MW export.

³⁴ Distributable surplus from project profits (i.e., community income).

Financial viability: Whilst operating within energy export constraints, this scenario also fails to meet recommendation criteria. Failing provide a return on investment, a 0.2 MW array has a poor project IRR (2.5%) and negative NPV in year 25 (-£217,419).

Community Benefit: This alternative array also fails to provide a return on investment within a 25-year period. This means no surplus income is available for community benefit, and no returns are provided to community shareholders or investors.

8.3.1. Financial Appraisal: Solar PV

A 2.2 MW ground-mounted solar PV development is not financially viable and is not recommended. Based upon large upfront connection costs and a 0.2 MW power export limitation once in operation, a 2.2 MW array would incur losses exceeding £5.1 m over a 25-year period.

An optimised, 0.2 MW ground-mounted array at Love Lane is also financially unviable. Although a 0.2 MW array would operate within the limits of local export limitations, the initial high connection costs greatly restrict financial profitability. Over a 25-year period, this configuration would incur a loss of approximately £86,362 and would not break even. A financial summary of both solar PV scenarios is presented in Table 8-12.

Table 8-12 – Financial Assessment of Alternative Solar PV Opportunities.

Solar PV	2.2 MW, Love Lane (Not Recommended)	0.2 MW, Love Lane (Not Recommended)
Capital Cost (CAPEX) (inc. grid connection)	-£3,653,947	-£362,328
Budgeted Grid Connection Costs	£1,650,000 ³⁵	£150,000 ³⁵
Local Supply Income	N/A	N/A
Year 1		
Export Income	£61,503 ³⁶	£19,129 ³⁶
Operational Cost (OPEX)	-£22,140	-£2,491
Carbon Emissions Reduction (tCO ₂ e)	121.0	37.6
Local Supply Income	N/A	N/A
Lifetime (25-year)		
Export Income	£2,027,101	£630,472
Operational Cost (OPEX)	-£1,213,126	-£126,197
Debt Service (Principal & Interest)	-£5,956,363	-£590,637
Carbon Emissions Reduction (tCO ₂ e)	2,927.9	910.6
Cumulative Net Income	-£5,142,388	-£86,362
Performance (25-year, real terms)		
Annualised Return on Investment (ROI)	-196.2%	-1.1%
Annualised Return on Capital Employed (ROCE)	0.8%	3.5%
Project Internal Rate of Return (IRR)	-9.3%	2.5%
Net Present Value (NPV)	-£4,898,661	-£217,419
Breakeven Year	N/A	N/A

8.4. District Heat Network

Based on a financial appraisal of multiple technology options for a heat network in Ashwell, given current conditions, a heat network is not financially viable. Viability requires a significant reduction in electricity prices,

³⁵ Indicative connection cost, scaled up from known UKPN estimates. A budget estimate, submitted in spring 2026 will supersede this estimate.

³⁶ Constrained grid connection, limited to 0.2 MW export.

an increase in energy costs for residents, or significantly improved system efficiency. The financial appraisal of the site is summarised below, and is based on the following financial assumptions:

Table 8-13 – Financial Assumptions used in DHN Financial Modelling.

	Assumption	Notes
Customer Heat Tariff	£59.3 / MWh + £128 standing charge	Ensures parity with current gas price cap.
Electricity Price	£21 / MWh	Assumes negotiated PPA price at a 20% discount to current electricity price cap.
Grant Funding	50 % of capital costs	(via Green Heat Network Fund, GHNF).
Debt Funding	30-year term	5.5% interest rate.
Inflation	2.5 %	Applied to all operating costs and revenue.

8.4.1. Dixies Meadow – Closed-loop network

The proposed technical DHN solution at Ashwell is a closed-loop centralised heat network, utilising ground-source heat. This configuration would require 40 boreholes in Dixies Meadow and would serve 93 properties at Wolverley House and Bacon's Yard. At these properties, this solution provides a peak thermal demand of 0.45 MW and an annual space heat supply totalling 635 MWh via a distribution network totalling 330m in length.

Given current conditions, this project is not financially viable (Table 8-14). The upfront capital cost is anticipated to be £1.7m. At time of writing, a customer heat tariff of £59.3 / MWh is required for connection to the network to be cost neutral for the households in the heat network zone that currently use gas or oil heating (i.e., leading to no increase in customer costs). This tariff is too low to recoup costs over the project lifetime and therefore the scheme would operate at a loss or lead to higher end user costs to deliver a financially viable scheme.

A comparison of DHN lifetime costs, including all CAPEX, OPEX, REPEX, and debt service over a long-term time horizon (60 years) is provided in Figure 8.2. A comparison is also made with a counterfactual scenario of installing individual ASHP in each property (see Section 8.1.2).

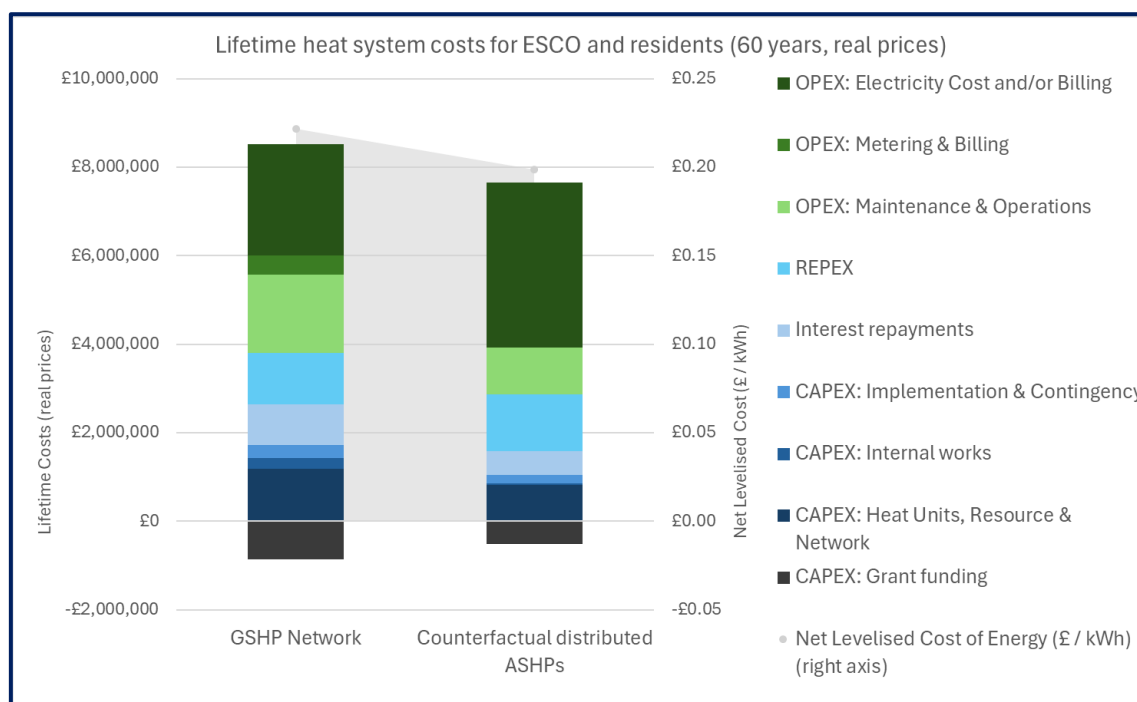


Figure 8.2 – Heat Network Lifetime Costs at Dixies Meadow, Ashwell.

Table 8-14 – Financial Assessment: Heat Network.

	Closed-Loop GSHP Network (Not recommended)
Capital Cost (CAPEX) ³⁷	-£1,724,868
Grant Funding	£862,434
Year 1	
Annual Revenue (heat sales and service fee)	£49,560
Annual OPEX: Electricity costs	-£41,831
Annual OPEX: Maintenance, metering and billing	-£36,864
Annual Debt Service	-£917,769
Annualised REPEX ³⁸	-£18,345
Free Cash Flow	-£106,820
Carbon Savings (t CO ₂ e)	132
Lifetime Performance (60-year, real prices)	
Net lifetime costs ³⁹	-£7,244,569
Net levelized cost of heat (LCOH, £ / kWh)	£0.22
Lifetime Carbon Savings (t CO ₂ e)	9,686
Cumulative Net Income for Community	-£4,121,844
Net Present Value (NPV)	-£3,588,360
Project Internal Rate of Return (IRR)	N/A

Viability Scenarios

Table 8-15 sets out the future scenarios that would be required for the project to become financially viable. Project viability is mainly contingent on the relationship between electricity input prices and the revenue generated by the heat energy tariff of the proposed network.

In a greatly improved financial scenario, a self-sustaining project is viable. In this instance, the development would provide a secure and accessible heat service and provide tangible socio-economic benefits for end-users at Wolverley House and Bacon's Yard. Whilst this scenario does not generate sizable profits, it does provide tangible energy bill savings, decarbonises heat supply and strengthens local resilience to fossil fuel price and supply fluctuations.

This idealised scenario is contingent on several external market conditions. A heat network tariff up to 200% higher than the current (February 2026) heat oil unit cost is critical (£150 / MWh). However, this is unlikely to occur in the short-term and would require external controls to alter the current electricity-to-fossil fuel price ratio (e.g., through future subsidies or tax policy changes). A reduction in DHN operating costs (to approximately £12 / MWh) would considerably improve financial performance. Whilst this is unlikely to be forthcoming in the short term (< 5 years), a preferential PPA with a large local energy generator would improve prospects. Additionally, a reduction of project CAPEX (~25%) could enable development. This could be achieved by negotiating lower installation costs or securing additional funding support.

³⁷ Includes capital costs for energy centre, thermal resource development works, network development works, procurement, design and project management costs and contingency. Also includes internal works at individual properties with installation of heat interface units and removal of existing heat system.

³⁸ Includes replacements of all internal and external equipment over the 60-year time horizon in line with expected product lifetimes.

³⁹ Includes CAPEX, OPEX, REPEX, debt service, and electricity costs, with no double counting and net of grant funding, over the full project lifetime.

Table 8-15 – Viability Scenarios: Closed-loop heat network

	Free Cash Flow (Year 1)	Levelised Cost of Heat (£ / kWh)	Net Present Value (60 years)
Central Scenario	-£106,820	0.22	-£3.6m
Alternative Scenarios: Heat Tariffs			
1. Heat Tariff: £100 / MWh	-£80,975	0.22	-£2.0m
2. Heat Tariff: £150 / MWh	-£49,225	0.22	-£1.0m
3. Heat Tariff: £200 / MWh	-£17,475	0.22	£0.4m
Alternative Scenarios: Electricity Price			
4. Electricity Price: £16 / MWh	-£96,728	0.21	-£3.1m
5. Electricity Price: £12 / MWh	-£88,780	0.19	-£2.8m
Alternative Scenarios: Capital Costs			
6. Capital Costs: 10% reduction	-£99,051	0.21	-£3.4m
7. Capital Costs: 25% reduction	-£87,399	0.20	-£3.0m
Alternative Scenario: Technical Performance			
8. Technical Performance: SPF 4.5.	-£94,736	0.20	-£3.1m
Combined Scenarios			
Moderately improved financial outlook (A + D + F)	-£63,115	0.20	-£1.7m
Greatly improved financial outlook (B + E + G)	-£11,765	0.17	£0.3m

9. Operation, Legal Structures, and Governance

This chapter provides an appraisal of the available options for community governance, ownership and operation of the proposed energy system(s). It is written from the perspective of ZCA and weighs the relative risks and benefits of different forms of community ownership.

9.1. Recommendations

It is recommended that ZCA:

1. Select the existing Ashwell Community Land Trust body to raise funds and finance, own energy assets, and deliver energy services across Ashwell.
2. Investigate suitable structures to finance, develop and operate prospective renewable energy developments, such as a Special Purpose Vehicle (SPV) for energy generation installations. This structure would simplify technology ownership and simultaneously guarantee a robust operational structure to enable the supply and consumption of local-produced energy.
3. Establish a form of governance to enable a community-led programme of domestic decarbonisation, including using ZCA as the delivery entity. This organisation may provide energy-saving advice to homeowners, or a detailed service to design and install energy systems.
4. Conduct engagement across Ashwell to raise awareness of the community organisation and its intentions, as well as to recruit new members. This process will demonstrate a support base for the organisation's goals and identify which of the recommended community developments should be prioritised.

9.2. Zero Carbon Ashwell

ZCA, as a working group of Ashwell Parish Council (APC), is anticipated to play a leading role in governance, administration, and delivery of any future local renewable energy projects. However, the ownership of energy assets and the delivery of energy services is typically delivered by a separate organisational entity.

Parish and Town Councils eligible to use the General Power of Competence under the Localism Act can invest in and establish community co-operatives or community benefit societies, or form partnerships for these purposes. They may choose to invest directly in a scheme, either managing it themselves or through another organisation or community group, or they may establish or support a registered community organisation.

An existing organisation, the **Ashwell Community Land Trust (CLT)** will be the principal delivery body for any future community-led energy incentive across the parish. Originally established by APC in response to the Localism Act (2011) in 2022, the trust provides the administrative and legal structure required to deliver future community commercial ventures. The trust was also registered with the FCA and is now a member-owned and operated organisation. With the pre-requisite governance tools and framework already in place, Ashwell CLT is recommended as the organisation by which the community can own and operate future energy installations across the region.

Whilst a CLT is recommended as the delivery body, several other alternative forms of community governance frequently utilised in the UK energy sector can be found in Table 9-1.

Table 9-1 – Community Governance Options

Governance Type	Description
Community Land Trust (CLT)	A CLT is a non-profit, community-based organisation committed to the stewardship and affordability of land, housing and other buildings used for community benefit in perpetuity. CLTs are usually constituted as Industrial & Provident Societies (IPS), or Companies limited by Guarantee and have charitable status. They typically provide affordable homes, community gardens, civic buildings, pubs, shops, shared workspace, energy schemes and conservation landscapes. CLTs have been used to deliver and manage heat networks in the UK, including the Swaffham Prior heat network in which the Swaffham Prior CLT has developed a joint venture heat network with Cambridgeshire County Council (the landowner).
Registered Society (RS) / Community Co-operative	There are various forms of RS which provide a social or community benefit which include a co-operative, a company limited by guarantee and a community benefit trust or BenCom). RS are registered under the Co-operative and Community Benefit Societies Act 2014. They are all forms of body corporate. The co-operative and BenCom structure both have a share capital and are owned and controlled by the stakeholders who become members upon acquiring a share. Each member will have one vote. An RS is registered with the Financial Conduct Authority and not under the Companies Acts.
Community Interest Company (CIC)	A CIC is a body corporate which can take the form of a company limited by guarantee or with a share capital or even a RS structure. A CIC is designed either to trade for a social purpose, or to carry out activities which will benefit the wider community. A CIC must therefore pass a community interest test and satisfy the CIC Regulator that it will provide some form of community benefit. A CIC, as a company limited by shares, can raise equity finance. The assets of a CIC however are protected by means of an asset lock. In general terms, an asset lock will restrict profits being distributed to the members or shareholders to ensure that they are applied in accordance with the CIC's purposes. Dividends for investors are also capped, which can make it an unattractive investment for investors seeking a higher rate of return on their investment. A CIC cannot be a charity. Whilst this has the advantage that the purposes of a CIC are not restricted to the approved categories of charitable purposes set out in the 2005 Act with the result that they can be much wider in their application, it does mean that a CIC does not receive favourable tax treatment.
Community Benefit Society (CBS)	A CBS is designed to benefit the wider community, within the scope of its' defined purposes. Unlike an Industrial and Provident Society (IPS), it is not necessary to be a member of the BenCom to benefit from it. So, a CBS will provide a wide level of public benefit within the defined community. CBS's have several benefits, including: • Every member has an interest in the running of the BenCom owing to their shareholding and will therefore have a greater say in the community benefits that it will provide. Every member has one vote. • Limited liability protection for members. • They can raise funds through the issue of share capital. • It can become a charitable body with favourable tax treatment.

9.3. Grid-Connected Energy Generation

A community organisational structure, such as a CBS or CIC, are best suited to manage and operate community-owned energy generation developments (“grid-connected renewables”, such as solar PV, wind turbines or hydroelectric installations). CBS and CICs are effective structures, ensuring the respective community organisation operates in several ways:

1. As the **owner / operator** of the energy asset, acting in its capacity as a limited company with profits managed for the benefit of the community and organisation members.
2. As the **project financier**, raising capital to invest in an asset which may ultimately be owned and operated by a project special purpose vehicle (SPV).
3. As the **parent charity**, requiring charitable status to be secured, accepting donations from the subsidiary ownership and operation entity (e.g., an SPV) and disbursing funds for the benefit of its community.

Case Study: Plymouth Community Energy

As of 2026, Plymouth Community Energy (PEC) has raised £2.5 million through three share offers to fund the installation of a 4.1 MW solar array, alongside smaller solar systems on schools and non-domestic buildings in Plymouth and the surrounding area.

Since 2014, PEC has used a CBS, ‘PEC Renewables’ as the operational vehicle to fund, install, and manage each installation. PEC Renewables is owned by its members on a one-member, one-vote basis, with Member rights outlined in the society's rules. It operates under the regulation of the Financial Conduct Authority (FCA), and all profits generated by PEC Renewables are donated to PEC, as the parent charity.

In this arrangement, PEC remains the principal charitable organisation responsible for day-to-day operation, supported by PEC Renewables and alongside other working entities, such as PEC Homes.

Special Purpose Vehicles (SPV)

A SPV in the context of community energy is a legal entity created to finance, develop, own, and / or operate renewable energy projects. An SPV structure helps to:

1. **Limit Liability:** By isolating financial risks to the SPV, the parent organisation and community investors are protected from potential financial losses.
2. **Attract Investment:** It provides a clear framework for community members, private investors, and public funds to invest in renewable energy projects.
3. **Simplify Governance and Operations:** An SPV can streamline management and operational processes, ensuring that the project's focus remains on energy generation and community benefits.
4. **Facilitate Revenue Distribution:** Profits from energy sales or savings are distributed to investors or reinvested into the community, promoting local economic development.
5. **Simplify administration:** including decoupling accounting and taxation from the parent community organisation.

This is often the recommended approach to energy development, providing the benefits listed above as well as being compatible for shared ownership or joint venture approaches to energy asset development and ownership.

9.4. District Heat Networks

Whilst community-owned DHNs are not recommended in this study, DHNs ownership and management is significantly more complex than other forms of energy development. The models and approaches that entail DHN development and operation must be well understood before proceeding. This chapter is included for ZCA's future reference, in the event that changes to financial conditions improve DHN viability.

9.4.1. Ownership Structures

Across Ashwell, there are three possible approaches for ZCA to develop and operate a DHN:

1. Via a community-owned and operated **Energy Services Company (ESCO)**.
2. As a **shared ownership project** alongside a commercial partner.
3. In partnership with a **third-party owner** and operator.

The above options have differing benefits and limitations and may be applied variably throughout stages of the project (development, construction, operation). Each of the options will have a different resourcing, responsibility, and risk level for ZCA and any subsequent community entity.

1. Energy Services Company

The UK energy regulator, Ofgem define an ESCo as “an entity that provides a commitment to deliver the benefits of energy to a specified level of performance and reliability”⁴⁰. As a result, an ESCo may operate across several aspects of development, ranging from energy utility (e.g., installing renewable technologies), energy supplier (e.g., operating a heat network) or energy performance improvement (e.g., providing energy efficiency works).

There are two features that further specify the role of an ESCo beyond the very general definition mentioned above:

- ESCos inherently to improve and / or provide energy cost savings, which may include the provision of lower-cost energy services but can also include to improve energy efficiency and/or provide higher quality energy services.
- ESCos generally take on some or all the risk associated with the delivery of energy service(s).

In most heat network cases, an ESCo would operate within the energy supply domain, and would operate as the organisation responsible for heat energy supply and provision. Whilst establishing and operating a fully community-owned and administered ESCo has the highest human and capital resource requirements of the three options presented here, in practice much of the operational resource burden may be outsourced to third party operators (e.g., metering and billing, maintenance contracts), incurring additional logistical and administrative requirement in itself. *As a result, an ESCo model is recommended as the delivery approach for a DHN at Ashwell.*

2. Shared Ownership

A shared ownership approach may be beneficial where community resourcing, reasonability and risk reduction is a primary objective of ZCA. In practice a project vehicle (e.g., a SPV) would be set up and an agreement made with a third-party commercial or public partner (e.g., NHDC, HCC) to enable investment and simplify operation of the DHN.

Shared ownership can provide:

- Access to development funding and capital finance.
- Human resources and expertise to enable project delivery and operation.
- Risk reduction, through sharing of the project liabilities and access to more secure resources.
- Lasting local collaboration and partnerships, which may provide a vehicle for future low carbon projects across Ashwell, or wider North Herts.

The other side of this arrangement is that the needs and requirements of the partner organisation(s) must also be accommodated. This could include financial incentives (i.e., shared distribution of income) from the project or encompass wider priorities, such as prioritisation of specific buildings or assets within the DHN. Whilst theoretically a risk-free option for DHN delivery and operation, shared ownership may directly impinge on the economic returns of the project, end-user energy bill savings, and diminish the project’s wider socio-economic impact.

Based on the above statement, shared ownership is not the recommended approach to community DHN delivery at Ashwell but should be considered where a willing and supportive project partner can operate within the community’s parameters and requirements.

3. Third-Party Ownership

⁴⁰ This definition is also referenced in the EU’s 2006/32/EC Energy Service Directive.

The final option is for the community, is to forgo an ownership role in the end project. An example of this may be a community develop the basic feasibility and site selection work and passing the project onto a commercial or public entity to progress the opportunity, including technical designs, financing, installation, and operating the network.

This is the lowest risk option on the part of the community, as the community would not directly own any elements of the network and may have input into the terms and conditions of heat supply agreements. This model also enables the appointment of an experienced organisation to progress and operate the development, particularly if the organisation can unlock alternative project finance opportunities. Third party ownership may be suitable in some circumstances, such as where most properties within the proposed network are owned by a single entity (e.g., housing association or local authority) and that party is willing to take the project forward, or where there is no other clear route forward for the project in terms of both governance and / or financing.

However, there are negative consequences of shared ownership approaches, particularly the loss of community control and ownership. This greatly reduces the role the community can play in DHN development (designs, extents, etc.), operational protocol, and tariff setting. Furthermore, the third party would seek to benefit from the network financially, either through returns or prioritisation of their owned assets.

Based on the above statement, third-party ownership is not the recommended approach to community DHN delivery at Ashwell but should be considered where an appropriate third-party is willing to take ownership, contingent on community acquiescence and support.

9.4.2. ESCo Financing Structures

As described above, the ownership and financing structure options for the ESCo model range from wholly-owned and operated by the community, to a joint venture between community and private sector, to one in which a private sector partner assumes greater responsibility for finance, metering and administration.

Each of these structures has a different risk profile. To identify the most appropriate structure for ZCA, it is important to acknowledge that risk generally goes hand in hand with control: the more control desired by the community over a heat network, the more risk must be taken on. Conversely, a risk-averse approach is likely to result in some loss of control over the community's ability to achieve its strategic objectives for the network. For example, if the goal is to maximise reduction in heating costs, this may not be possible considering the private sector partner's requirement to ensure commercial returns for its investment. Alternatively, it may not be financially possible for the community to fully finance a heat network independently.

Figure 9.1 has been adapted from the Department of Energy and Climate Change (DECC) Investor guide to Heat Networks⁴¹ (2015), illustrating the relationship between control and risk. A direct relationship exists between the level of control over the entity and its aims and functions, and the level of risk assumed by the controlling party. This means decision-making must balance the prospective aims and outcomes of the ESCo against an 'acceptable level' of risk. The risks are dependent on many factors, not least the capacity and willingness of the community to take on risk and assume control of the project(s), or the availability of suitable and experienced partners to deliver some or all the project(s) successfully.

⁴¹ DECC (2015). Investing in the UK's Heat Infrastructure: Heat Networks.

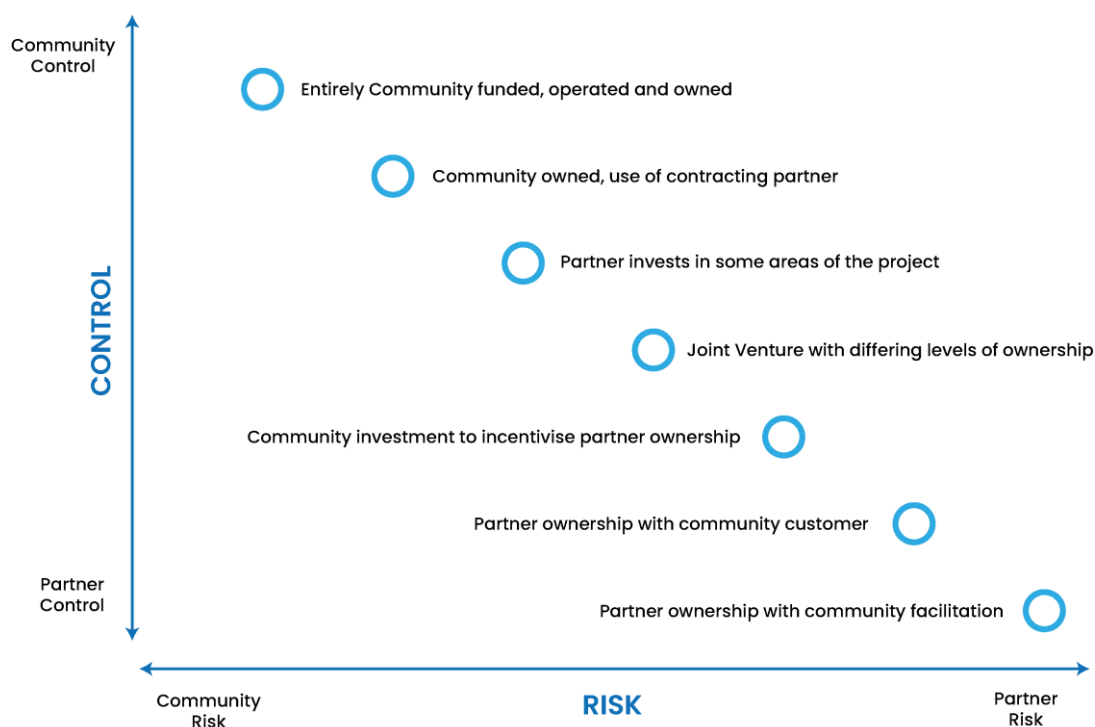


Figure 9.1 – Relationship of Control to Risk

9.4.3. ESCo Business Models

In the UK, there are two principal business models that an ESCo can follow. These are Energy Performance Contracts (EPC), and Energy Supply Contracts (ESC). Both forms can be utilised independently or in conjunction with one another. A third model, most often used in continental Europe, are Chauffage contracts.

Energy Performance Contracting (EPC)

There are two common forms of EPC, guaranteed savings, and shared savings. Under the guaranteed savings model, the customer finances the project and the ESCo will guarantee a minimum energy savings level. Any savings exceeding this level are then split between the ESCo and the customer. With shared savings, the ESCo finances the project, and the savings are then split between the customer and ESCo according to a predetermined split. EPCs are more commonly employed in large-scale, strategic projects, particularly in the public sector, because the savings guarantee makes it a safe investment. In many cases, EPC projects generate 20 - 30% energy savings and the contract times are generally range between 10-15 years. The EPC is a complex contract with high transaction costs, which in many ways make them less suitable for smaller, grassroots projects. In addition, the often-long payback times make it less attractive for community-led initiatives.

Energy Supply Contracting (ESC)

Energy Supply Contracting (ESC) ensures the delivery of 'useful energy'⁴² to a customer. Here, the ESCo is responsible for everything needed to deliver useful energy to the customer. For a DHN, this could include the planning and installation of heat interface units (HIUs), energy distribution, operation and maintenance or production facilities and the procurement of fuel. ESCs are often oriented toward decentralised power supply. In most cases ESC is investment free for the customer and the contracts typically run for 10-15 years. The energy efficiency measures are taken on the supply side to ensure lower cost of operation, which often amount to 10-20%.

Chauffage Contracts

Chauffage contracts, also referred to as 'comfort contracting', are used quite frequently used in continental Europe and are a more extreme form of energy management outsourcing. It is a contract form that revolves around providing a function, with the ESCo typically taking complete responsibility for the provision of an agreed

⁴² Energy that a customer has 'practical' end-use for, such as heat, cooling, or steam.

set of energy services (e.g., space heat supply). The function can be related to temperature, lighting level, air quality etc. A common example is providing a certain (or relative) temperature of a building, for example maintaining a temperature of 21°C. Compared to EPCs, Chauffage contracts are less complex with lower transaction costs and come without the need for costly measurement and verification certificate. The EPCs may have more comprehensive demand side energy efficiency measures reaching a wider range of areas and may be better suited for larger building pools. The Chauffage model works especially well in the commercial buildings sector.

Integrated Energy Contracting (IEC)

Integrated Energy Contracting (IEC) is a business model that combines elements from both ESC and EPC, with the aim being to involve both supply side and demand side energy efficiency measures. The business model of integrated energy contracting is normally based upon the standard ESC model, whereby the ESCo will get remuneration for the useful energy delivered, as well as a flat rate service remuneration for operation and maintenance.

9.4.4. Metering and Tariff Options

Metering

Heat metering and billing regulations have been introduced to implement the requirements of the European Energy Efficiency Directive in the UK. All new heat networks are required to install meters and controls so that customers can manage their heating. There are also requirements to provide customers with transparent billing information.

The heat network is fundamentally different to the gas or electricity markets, in that as a closed loop network, rather than a national grid, there is only one 'supplier'. As a result, appropriate governance structures need to be put in place for all heat customers to provide safeguards that the heat tariff is equivalent, if not discounted, against external forms of energy supply. This is also critical to provide the incentive for heat users to sign up in the first place – particularly given the potential for up-front connection costs, and the inevitability of construction disturbance caused by the implementation of building efficiency measures, internal wet system upgrades (upsized radiators), and boiler replacement – with Heat Interface Units to enable connection to a low temperature network or individual heat pumps. Voluntary guidance on heat networks is contained in the Heat Networks: Code of Practice for the UK (2020), prepared jointly by the Association for Decentralised Energy (ADE) and the Chartered Institution of Building Services Engineers (CIBSE). Amongst the areas covered is heat metering, to inform choices on how to select metering, prepayment and billing systems that are accurate and cost effective.

Tariffs

Revenue modelling from heat sales should account for current and future predicted energy tariffs, providing levelised⁴³ cost savings across the community where appropriate. This cost often includes the capital cost of internal building works as necessary. At a more detailed design stage, the proportion of the charge relating to heat supply (applicable across all connected buildings in the network), and the proportion relating to repaying internal energy efficiency and heating system upgrades (building-specific) can be defined. Specific decisions on heat prices must be made to enable detailed financial and revenue modelling, including:

- How investment cost of HIU and property connection are shared between the network operator and the customer.
- Standing/capacity charges for heat (£/kW) supplied to customers, and whether this cost varies between customers.
- Unit cost of heat (£/kWh) supplied to customers.
- Whether this cost varies between different types of off takers.
- Whether or not tariff rates varies with time of day, season, etc.
- Whether or not the tariff rates be linked to gas-prices, for instance through a % discount.

⁴³ The average cost of energy to all users across the project lifetime.

The unit cost of heat is not the only consideration. For example, if the network operator provides financial support for the investment in energy efficiency improvements to customer properties, then these should result in an overall reduction in heat demand. It may then be reasonable to consider a higher unit cost than the Business-as-Usual alternative while offering customers a reduction in their annual energy bill.

9.5. Land Ownership

Where community landownership overlaps and impacts energy development, three key legal documents are typically considered. Securing a lease agreement with the respective landowner(s) is anticipated to encompass all steps detailed below. These steps are conducted with the intention to secure an in-principle agreement with the landowner, particularly in instances where the future of the energy development is uncertain.

To secure this, a combined approach is recommended. This approach would seek to secure Heads of Terms in sufficient detail to enable an Option Agreement to be formalised once the project's prospects are better understood. Such an agreement would be contingent upon the scheme securing planning permission, which is a required milestone in project development and one which is unlikely to be undertaken without technical or commercial viability.

Exclusivity Rights

This is a preliminary contract that would give ZCA the exclusive right to lease or purchase the land for energy development, typically for a specific period (i.e., 12 months). During this time, additional feasibility studies, permitting, and grid connection assessments can be undertaken without competition from other developers. This is often a first step in derisking the site and securing written commitment from the landowner and should be sought for all viable sites.

Heads of Terms

This is a preliminary document that outlines the main points of the agreement between the landowner and the prospective developer. Whilst Heads of Terms are not legally binding and do not reduce the risk of the landowner pulling out of the agreement in future, they do provide the basis of any future legal agreements. Key components include:

- Identification of the parties involved;
- Description of the land area;
- Proposed lease duration and rent terms;
- Development milestones and timelines;
- Responsibilities for planning permissions and costs;
- Conditions for terminating the agreement.

Option Agreement

This grants the developer the right (but not the obligation) to lease the land once certain conditions are met, usually contingent on securing planning permission. Important elements include:

- Option fee (a non-refundable payment for securing the right);
- Option period (duration of the option, typically 2-5 years);
- Conditions for exercising the option, such as obtaining planning consent;
- Terms for termination if conditions aren't met;
- Obligations for site surveys and investigations.

Lease Agreement

If the option is exercised, the lease agreement comes into effect, granting the developer the right to construct and operate the solar installation. Essential terms are:

- Lease duration (commonly 25-40 years);
- Rent structure (fixed rent, percentage of revenue, or a combination);
- Maintenance, access, and operational responsibilities;
- Decommissioning obligations at the end of the lease;
- Insurance and liability clauses;
- Community benefits, if applicable.

9.6. Property-Based Energy Development

Property-based energy development refers to energy systems which are installed on or within domestic or non-domestic properties. This would encompass rooftop solar, heating systems (e.g., ASHPs), and energy efficiency upgrades. Across Ashwell, this could encompass several opportunities:

1. Rooftop solar PV development at Wolverley House.
2. Rooftop solar PV on privately-owned domestic properties.
3. Distributed ASHPs in privately-owned domestic properties.
4. Energy efficiency improvements in privately-owned domestic properties.

Due to the wide range of technologies considered and the many varied approaches to development and operation of such assets, this section provides several examples from the UK community energy sector to demonstrate potential governance and operational approaches that could be replicated in Ashwell.

Solar Schools

Community ownership of solar PV systems on third-party rooftops is a viable business model in the UK, with several possible commercial models which could be employed. Including:

- **Roof leases** with the respective building owners, whereby the community pays a flat rate to use the roof to generate electricity and revenues.
- **Power Purchase Agreements (PPA)** with building owners, supplying electricity to the property at a lower cost than conventional grid-supplied energy. This generates revenue for the project owner (i.e., the community organisation) in the process.
- **Export payments**, including the Smart Export Guarantee (SEG) or PPAs with energy suppliers or other local off-takers, generating revenue for the project owner (i.e., the community organisation).
- **Solar loans**, raising finance as a community organisation (e.g., via a share offer) and offering low-cost loan finance to property owners to deliver solar PV (or other energy infrastructure).

Case Study: Schools Energy Co-Operative

The [Schools Energy Co-Operative](#) was launched in 2014 to provide community funding for solar panel systems on schools across England. The main premise is that the co-op installs rooftop solar systems onto schools free of charge, once installed the co-op is responsible for system management and maintenance of the panels. The energy generated by the panels is then provided to the respective school under a long-term PPA. This mutually beneficial arrangement allows schools to gain access to clean energy sources and benefit from low-cost energy.

Following its flagship project, a 150-kWp solar panel system on a primary school in East Sussex, the co-op has since gone on to install over 4 MW in solar capacity, collaborating with over 110 schools across England. Income generated from the installations is then used to support further environmental initiatives led by the schools. Funds raised can also contribute to the investment in solar arrays for new schools joining the program. Community engagement also plays a strong role, particularly through the community share offer stage. Since 2014, over £4 million has been raised via a combination of community share raises and grant awards.

Community Action

Community-led and communal action can support Ashwell residents and businesses to decarbonise and invest in local energy infrastructure. Actions could include assisting homeowners to install rooftop solar panels, heat pumps or conduct internal energy efficiency upgrades. There is limited scope for community ownership within such actions, but significant community benefits and GHG emissions can still be achieved.

Generally, there is no requirement for a set governance or commercial structure to deliver community action projects. This means constituted organisations are able to conduct and lead such initiatives. However, where significant money is raised, investments made, or staff are employed, a constituted organisational structure is recommended. In the simplest form, this would be a private limited company (by shares) but would extend to all forms of limited by guarantee, social enterprises, charities, or cooperative organisations.

Specific examples of community action commonly seen within the UK community energy sector, alongside relevant governance and commercial structuring requirements are detailed below:

Community Advice: *providing advice, support and guidance to community stakeholders to decarbonise.*

This would take the form of energy cafes, provide advice and assessment tools, or provide support for grant applications. This would be viable as an unconstituted organisation as the resource requirements are low and there is little liability on the part of the community organisation. In most cases, a constituted organisations (such as a CBS) is an appropriate form to deliver such projects, enabling grant funding to be secured and staff to be employed in the future.

Case Study: Low Carbon West Oxford

[Low Carbon West Oxford](#) (LCWO) is a volunteer-run organisation which offers expert advice to homeowners. LCWO is limited by guarantee and a charity, enabling it to receive funding from partner organisations (e.g., West Oxford Community Renewables), related community energy projects and grant funding, as well as to employ staff members. Since 2007, LCWO have hosted regular events focused on mobilising action to tackle climate change, improve energy use and encourage environmental conservation. LCWO's typical energy-related events include informal café and energy advice sessions, home open days, and guest speaker events. LCWO are a well-established, and effective facilitator for localised community energy action across West Oxford.

Adopting a similar organisational and implementation approach as LCWO is an effective, and attainable way for ZCA to mobilise community-led action across Ashwell. Requiring minimal technical or financial expertise, a community-led body would be viewed as a locally reliable source of information and support, providing a variety of informal services, including upskilling workshops, information events and accessible funding and advice support.

Community Action: *Working directly with community stakeholders to design and install energy systems.*

This would take the form of an energy service being provided to those in the local community, and could include building energy surveys, developing design specifications for solar or energy efficiency measures, installing measures and / or raising significant finance. In this instance, a constituted community organisation is required due to the finance raising needs, staff requirements and levels of liability associated with the works undertaken. This would be appropriate as a private limited company, but social enterprise structures such as CBS or a CIC are typical as they ensure resources are managed and distributed to the benefit of the community.

There are many governance and commercial structures ZCA could adopt to deliver community energy action, with a sliding scale of requirements from the least resource intense and lower risk to the more involved and higher risk approach. In nearly all instances covered above, ZCA (as a working group of APC), would be an appropriate body to provide community advice, action and manage community-wide energy developments.

Case Study: Climate Action Strathaven

[Climate Action Strathaven](#) (CAS) is a community organisation that directs local energy initiatives and a bespoke retrofit programme across Strathaven, South Lanarkshire. As a registered charity, CAS directly employs and trains residents to help and deliver energy efficiency works. To date, they have developed projects across a range of areas, including a community fridge, EV car club, bike repair shop, e-bike hire and a bespoke retrofit service. In 2023, CAS won the Climate Conscious award at the 2023 Scottish Charity Awards.

As part of CAS' retrofit programme, provide residents with tangible cost savings compared to external installers is a key ambition. Due to CAS' status as a charity, no financial benefit or profit can be extracted from their work and instead all financial benefits are returned to residents and the wider Strathaven community. Considering their recent success, CAS are currently in the process of achieving TrustMark accreditation. In turn, this would make them an approved retrofit supplier for Home Energy Scotland grants and loans.

10. Scheduling

A project roadmap has been set out below (Table 10-1), demonstrating the scope of works required to develop the preferred energy systems to the point of operation. This covers two recommended actions:

- a) **Community Investment in Solar** for a rooftop PV system at Wolverley House, Ashwell.
- b) **Community-Led Programme** for domestic decarbonisation across Ashwell. This programme includes energy advice services, awareness events, and in-person household assessments to encourage energy efficiency and ASHP adoption across Ashwell.

Table 10-1 - Proposed Project Roadmap to Implementation.

Phase	Task	Community Investment in Solar	Community-Led Programme
1	Community & Stakeholder Engagement	Secure support of and partnership with site owner.	Community action plan and energy cafes. Recruit local volunteer energy champions and/or expert partners.
2	Detailed Design	Detailed solar layouts, specification, confirmation of grid connection, and access design.	Confirm programme scope and framework.
3	Financial Appraisal	Develop full solar business case.	Develop home energy strategic plan and external services required (e.g., thermal imaging).
4	Funding Routes & Governance Models	Develop Funding Application(s), confirm debt and equity financing contributions. Mobilise Ashwell CLT as the lead organisation.	
5	Planning and Grid	Complete grid connection application(s). Undertake engagement with NHDC planning department.	N/A
6	Implementation Roadmap	Complete full project programming. Undertake and actively update (as required) risk assessments. Procure contractors. Appoint contractors.	
7	Construction and Implementation	Install solar array.	Enact programme. Conduct home energy assessments, educational events, and support individual homeowner ASHP installations.
8	Operation	Monitoring & Evaluation.	
		Ongoing monitoring & maintenance of PV system.	Review, expand & refine programmes and offerings

11. Conclusion

The key findings from this study highlight two opportunities for immediate action:

1. 0.06 MW community-owned rooftop PV at Wolverley House, Ashwell.

Establishing a community-owned rooftop solar PV installation at Wolverley House is a feasible and financially viable opportunity. A 0.06 MW kW PV array could generate community revenue through direct energy supply to Wolverley House and export excess energy to the grid.

Technically, a rooftop solar PV system is a technically viable, and acceptable proposal at Wolverley House. Utilising Wolverley House's extensive vacant rooftop space, a rooftop PV system here would also minimise the visual impact to the Ashwell Conservation Area and several neighbouring listed buildings. Engagement with NHDC, and UKPN has suggested this arrangement is both locally acceptable and viable within local planning policy and grid network.

Costing approximately £70,000 to install, and incurring an annual operating cost of £769, a rooftop PV system would provide a return on investment in year 15. Throughout the system's lifetime, revenue would be generated through a direct supply PPA arrangement to Wolverley House and energy export to grid. The project is viable contingent on a direct supply PPA rate of 27.69p / kWh to be secured alongside an export PPA rate of 9.0p / kWh.

Due to the size and scale of this opportunity, finance via 100% private debt is recommended. Over the project lifetime, £46,591 is repaid in interest repayments to private debt financiers. Generating a net community income of £108,105 over 25 years, this could be reinvested locally as part of an Ashwell community benefit fund.

Over a 25-year period, this configuration could provide carbon savings totalling 259.3 tCO₂e. Annually, this would represent a carbon reduction amounting to 0.3% of Ashwell's current 2025/26 heat and electricity carbon emissions.

2. Community-led programme for domestic decarbonisation and ASHP installation.

A targeted approach to supporting households in reducing carbon emissions and energy costs can be successfully implemented across Ashwell. Grassroots community action, including energy advice cafes, awareness events, and bespoke home assessments could enable an additional 72 ASHP installations by 2035, and 179 by 2050. This would lead to a cumulative energy saving of £63,956 and 400 tCO₂e annual carbon reduction for residents across Ashwell by 2050.

The following actions, listed in order of increasing level of ambition can accelerate community heat decarbonisation and energy efficiency across Ashwell:

Home Energy Events: Public information sessions covering the benefits, costs, and practicalities of installing low-carbon technologies. *This increases public awareness, understanding, and uptake of energy-saving measures.*

Energy Café: A regular event where trained volunteers or experts provide tailored advice on home energy efficiency, grants, and home upgrades. *This provides direct, informal and accessible support to meet resident needs.*

Thermal Imaging Camera Service: Free or low-cost home heat loss surveys, helping residents identify areas for insulation upgrade and other retrofit opportunities. *This makes energy saving opportunities tangible for residents, providing real-time evidence on where upgrades will prove most effective.*

Home Energy Assessment Scheme: Bespoke building energy surveys and retrofit plans. *This provides detailed guidance, demonstrating to residents the benefits and costs associated with building upgrades. Recommendations identified through surveying can support resident-led decision making and ambition.*

Other Conclusions

All scales of turbine appraised in this assessment are not currently financially viable. Due to localised power export limitations and the significant upfront grid reinforcement costs required to circumnavigate these limitations, large scales of turbine (>0.2 MW) are not financially viable at present. Although turbines <0.2 MW can technically operate within export limitations; they are also financially unviable operating on an export-only basis. While improvements in export tariffs, or the identification of a large local energy user may marginally

improve financial performance, continued high upfront connection costs are expected to constrain turbine development across Ashwell.

A 2.2 MW ground-mounted PV array at Love Lane is technically feasible, but financially unviable under present conditions. Operating on an export-only basis, a 2.2 MW array here is considerably restrained by localised power export limitations. A 0.2 MW alternative opportunity, operating within export limitations is also financially unviable.

A centralised DHN using ground-source heat at Dixies Meadow is technically feasible, capable of supplying low carbon heat to 93 properties at Wolverley House and Bacon's Yard. However, a DHN is not financially viable under current conditions due to the high price of electricity compared to fossil fuels, and the need for a high customer heat tariff to achieve parity with current oil and gas fuel prices.

Appendix A – Data Collection Methods

Data was collected between October – December 2025 in collaboration between Scene, ZCA and wider members of the Ashwell community.

When modelling energy demand, the most accurate form of data is billing and metering data as this shows actual energy consumption of specific buildings. Where this is not available, Energy Performance Certificates (EPC) provide useful information on the energy consumption of buildings as well as other data such as built form and age. CIBSE benchmarking practices also provide a robust mechanism to provide estimations of energy consumption and are based on the floor area and building usage.

Mapping software is also utilised to model the energy consumption of buildings without EPC certificates as this provides an accurate property footprint from which to base benchmarking calculations on. It is worth noting that due to taking data from a combination of sources different techniques may have been used to calculate heat demand, and this introduces a degree of uncertainty into the modelling, reflecting the feasibility stage of the project.

A hierarchy of data sources has been used to ensure the greatest level of detail and accuracy possible, whilst ensuring the full coverage of town assets required to form an accurate energy baseline (Figure 0.1). Where real data (smart metering, energy billing) is not available or obtainable, prior EPC data has been used and applied to standardised domestic and non-domestic energy demand profiles to generate demand profiles. Where EPCs are unavailable or out of date, energy modelling based on building size, type, age, and use was used to generate demand profiles.



Figure 0.1 – Energy Data Hierarchy.

Appendix B – Energy Options Prioritisation Assessment

This chapter presents a preliminary review of sites suitable for selected low carbon technologies across Ashwell parish. Options for both renewable electricity generation (for both local supply and grid export) and sustainable heating scenarios are explored here.

A summary of the selection criteria used to shortlist potential development sites is displayed in Table 0-1. Following this shortlisting exercise, a selection of sites and technologies will be ‘progressed’ to full techno-economic analysis in section 4. A full planning policy and statutory designation assessment for each progressed site and technology type is provided in section 5.

Table 0-1 – Summary of Site Selection Criteria used in Prioritisation Assessment.

Criteria	Notes
Resource Potential	Locations with suitable natural resource to support energy generation are preferred: • <i>Suitable exposure and orientation to sunlight, to support solar PV generation.</i> • <i>Suitable wind resource and topography to support wind turbine generation.</i> • <i>Suitable hydrological resource to support micro-hydro generation.</i> • <i>Suitable geothermal resource to support ground-source heat generation.</i>
Grid Infrastructure	Locations close to local grid infrastructure and supply lines (<i>e.g., grid supply points, secondary substations or supply lines</i>) are preferred.
Environmental Constraints	Locations that do not impact or infringe upon environmental, ecological or landscape designations (<i>e.g., National Parks or SSSIs</i>) are preferred.
Cultural Constraints	Locations that do not impact or infringe upon cultural, historic or archaeological features (<i>e.g., listed buildings or scheduled ancient monuments</i>) are preferred.
Other Considerations	• Land ownership. ○ <i>Local landowners known to and receptive to ZCA are preferred. However, unknown landowners are not discounted at this stage.</i> • Locations where technology will have minimal visual impact are preferred. • Locations where technology will have minimal noise impact are preferred. • Location with suitable access (vehicular / foot) are preferred.

Electricity Generation

Annual electricity consumption from domestic and non-domestic users across Ashwell Parish totals approximately 5,247 MWh, emitting 813 tCO₂e per year. Across the parish several technology opportunities for the development of community-owned electricity generation are considered:

- **Roof-top solar PV generation**: Designed to meet individual property electrical demand (e.g., supply of local homes or businesses) and to export electricity within the limitations of the local grid.
- **Ground-mounted solar PV generation**: Designed to meet a single electrical demand load (e.g., private wire arrangements) and to export electricity within the limitations of the local grid.
- **Small-scale wind generation**: Designed to meet a single electrical demand load (e.g., private wire arrangements) and to export electricity within the limitations of the local grid, in accordance with local planning constraints and policy.
- **Micro-hydroelectrical generation**: Designed to meet a single electrical demand (e.g., private wire arrangements) and to export electricity within the limitations of the local grid and local hydrological conditions.
- **Anaerobic Digestion generation**: Designed to meet a single electrical demand (e.g., private wire arrangements) and to export electricity within the limitations of the local grid and feedstock availability.
- **Battery Energy Storage Systems**: Auxiliary technologies used in tandem with energy generation technologies to maximise the resource, financial and social benefit of locally generated energy. Several examples of centralised battery storage are provided, for reference.

Following an in-person site visit in November 2025, seven locations were shortlisted for consideration (see Figure 0.1).

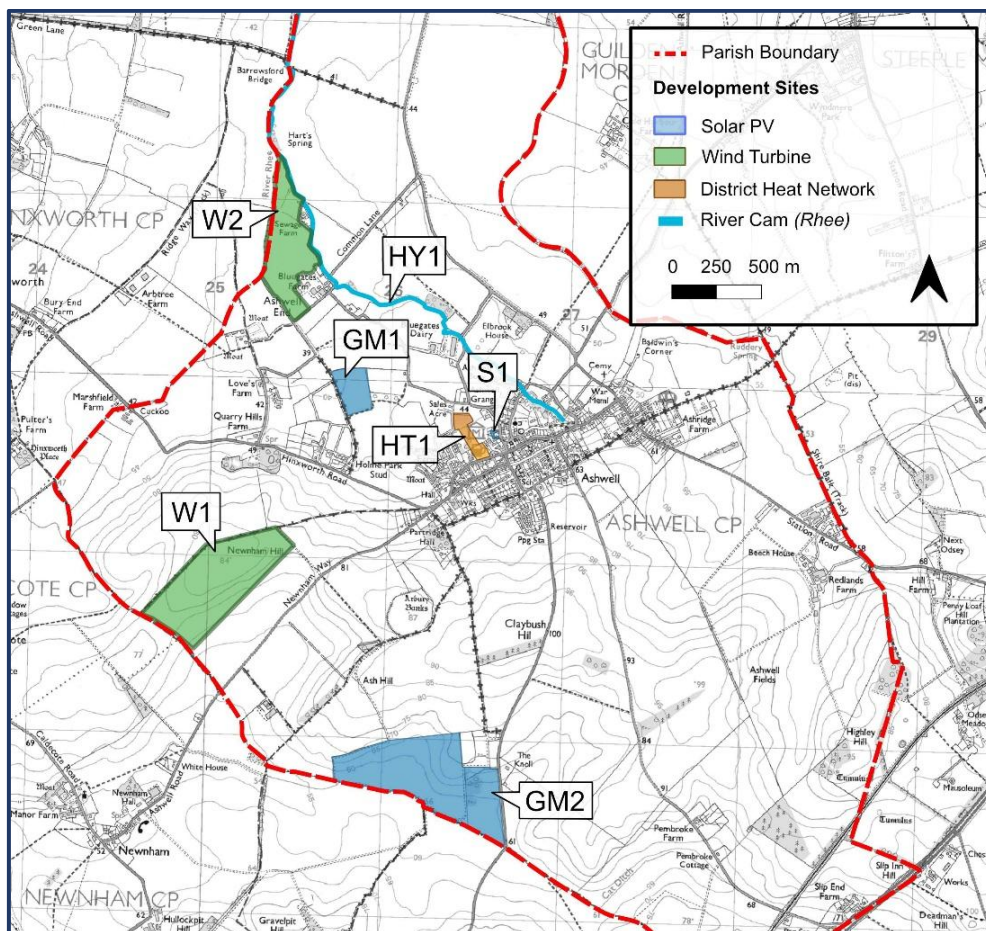


Figure 0.1 – Summary of Potential Energy Development Sites across Ashwell.

Rooftop Solar Opportunity Sites

S1 – Wolverley House, Ashwell

Wolverley House is a 77-flat residential complex on Gardiners Lane, near the centre of Ashwell (Figure 0.2). Wolverley House is an assisted-living complex and is owned and operated by a regional housing provider, SettleParadigm.

Wolverley House contains two east and south-facing rooftops amounting to approximately 240 m². The site was originally constructed in the 1980s and contains pitched tiled rooftops. Although the site lies within the Ashwell Conservation Area, the house and its grounds are not listed. Although Wolverley House lies within a region of grade 3 farmland, the site is an active residential building set within an urban settlement. As a result, no land use changes or loss of farmland will occur from rooftop PV development here.

Wolverley House has ample roof space and rooftop orientations **suitable for rooftop solar energy generation**. Since the site contains a concentration of localised and consistent electrical demand, local energy supply could be supported here. On this basis, investigating the potential for a community-owned solar array at this site is of interest.

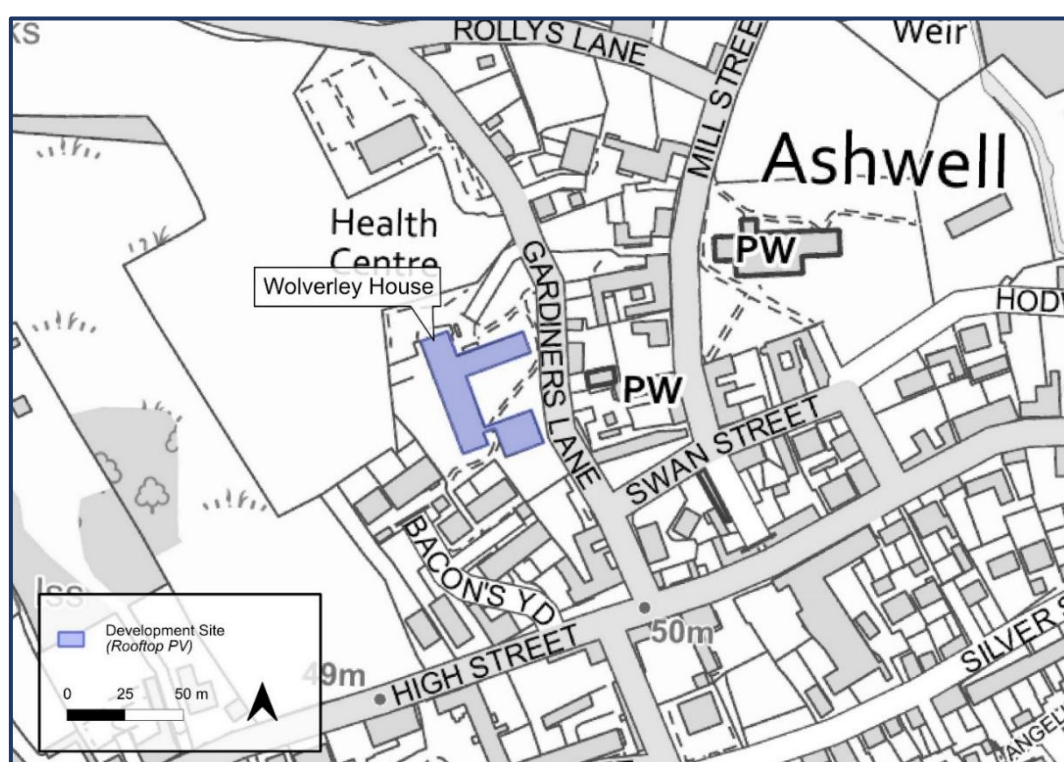


Figure 0.2 – Potential Rooftop PV Site at Wolverley House, Ashwell.

Ground-mounted Solar Opportunity Sites

Site GM1– Agricultural Field, SE of Love Lane

This 4-hectare (ha) unnamed field lies adjacent to Love Lane, a small country lane (Figure 0.3). The field lies within a region of grade 2 farmland and is actively used for arable farming. Vehicle access is made from the field to the south, which itself is accessed by an unpaved trackway leading onto Hinxworth Road. Dense hedgerows and copses form the eastern, northern and western boundaries, providing screening from the road. A public rights of way (PRoW) footpath passes the field on the western boundary. No known environmental, cultural or flood risk designations exist at this location. The field is owned and farmed by the Sheppard family – who also own Bluegates Dairy (itself 400 m to the northeast). Whilst previous renewable developments at Bluegates Dairy suggest that they may be receptive to other forms of low carbon development, landowner support is a key prerequisite of development here and should be confirmed.

Due to the secluded setting, expansive space and relative isolation from nearby residences, **ground-mounted solar PV development is possible here**. Whilst the field lies close to several large farms and just < 800 m from the centre of Ashwell, the anticipated scale of solar here would operate best on an export-only basis.

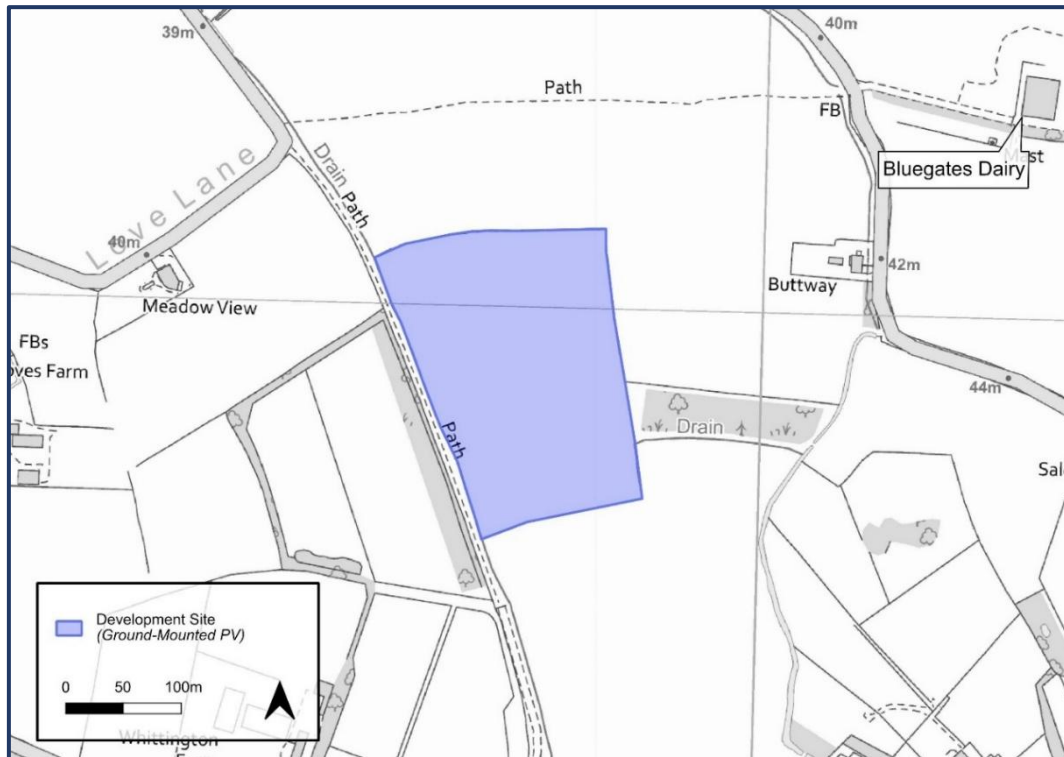


Figure 0.3 – Potential Ground-Mounted PV Site, SE of Love Lane.

Site GM2 – Agricultural Field, SW of Claybush Hill

This 30-ha site sits on south-facing farmland on the southern slopes of Claybush Hill (Figure 0.4). The western field of the site is used for arable farming and is owned by the local Mack family. Ownership of the smaller enclosure to the east is unknown and is not actively used for farming. The entirety of the eastern enclosure and majority of the larger western field lie within grade 3 farmland. The larger field's south-western periphery lies within grade 2 farmland.

Claybush Hill and Ashwell Road bound the site to the east, and a public right of way can be found on the southern boundary. Dense hedgerows provide some screening on the field's eastern, southern and western boundaries. A small stream, Cat Ditch, also lies beyond the site's southern boundary. The land immediately adjacent to the stream is designated grade 2 and 3 flood zones. No other known environmental or cultural heritage designations exist directly on the site.

A 40-MW solar farm has been consented by North Hertfordshire District Council (NHDC) in the field directly to the south of this location. Whilst initiating a neighboring development may incur some community opposition, this presents a unique opportunity for community-owned solar to benefit from shared grid connections and infrastructure with the neighboring commercial development. If community-owned solar was established at this location, the site's relative isolation from large-scale energy users means energy export is preferred here.

Due to the preferable orientation, availability of space and proximity to a consented PV development, **community-owned ground-mounted solar PV is possible here**. Whilst a community-owned solar array at this location could utilise shared infrastructure with the neighbouring commercial solar farm – the site's unknown land ownership, use and potential community opposition to another solar development here may prove challenging to overcome.

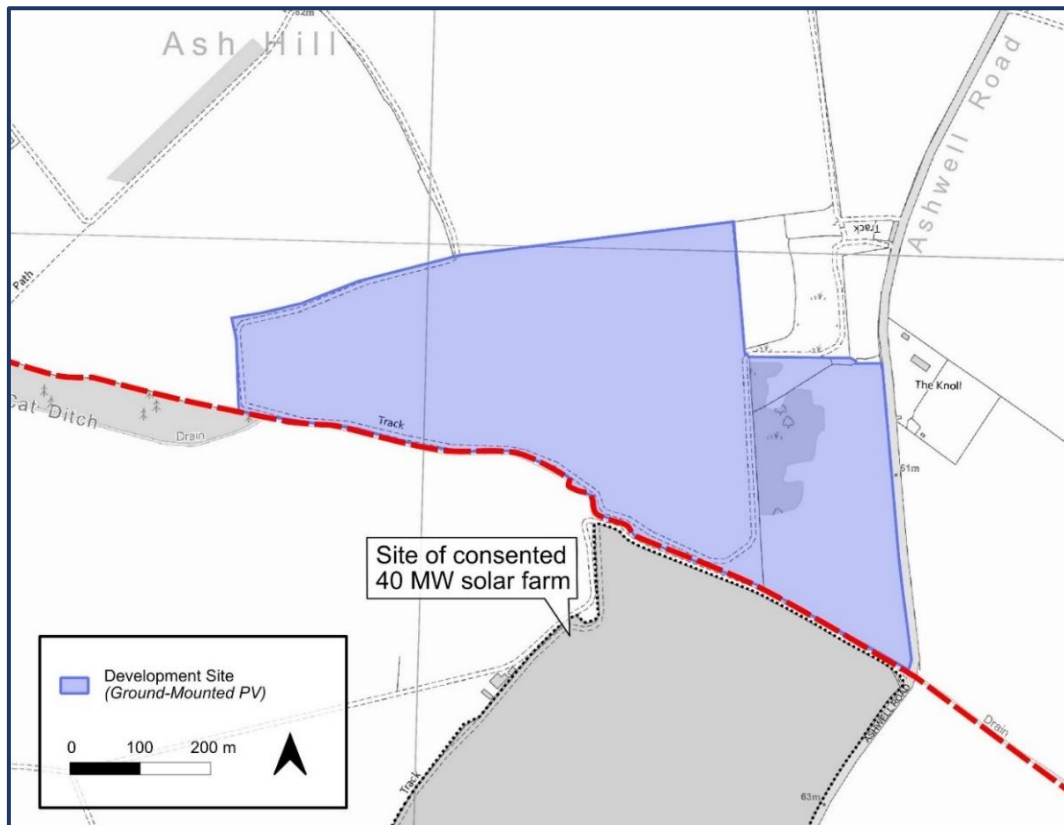


Figure 0.4 – Potential Ground-Mounted PV Site, SW of Claybush Hill.

Site W1 – Agricultural Field, summit of Newnham Hill

This 26-ha field lies on the south and south-east faces of the summit of Newnham Hill (85 m) (Figure 0.5). Classified as grade 3 farmland, this field is currently used for cereal and other seasonal arable farming. The field is buffered from roads by other agricultural fields on all sides. A public bridleway, providing the field's only vehicular access, lies on the south-western boundary. This unpaved trackway joins Newnham Way approximately 280 m to the southeast from the hill's summit.

The summit's northern boundary is screened by a thin line of trees and shrubs, masking any viewpoints to and from the north (in the direction of Hinxworth Road). To the south, the contours of the landscape and high roadside shrubs screen the Hill's summit from Newnham Way, in both east and west directions, respectively. Whilst a local nature reserve lies at the base of the hill's northern slope (Ashwell Quarry and Quarry Springs nature reserve, on Hinxworth Road), no environmental or cultural designations are present directly on the site.

Due to the field's elevated position, and relatively secluded location, **wind turbine development is suitable here**. Whilst no large-scale energy users exist directly on or adjacent to Newnham Hill, the scale of turbine generation here would operate best on an export-only basis.



Figure 0.5 – Potential Wind Turbine Site, at Newnham Hill.

Site W2 – Agricultural Field, Bluegates Farm

This 15-ha field lies directly adjacent to Bluegates Farm, in the northwest of the parish (Figure 0.6). The field is bounded by an unnamed stream, and the River Cam on its western and eastern boundaries, respectively. In turn, these waterways are themselves screened by trees and other neighbouring fields. Bluegates Farm, a large operational farm lies on the field's southern boundary. Additionally, a small sewage treatment plant can be found on the field's eastern side.

The field lies within a region of low-lying, grade 3 farmland which is actively used for arable farming and livestock pasture. No statutory environmental or cultural designations are present or adjacent to this site. Two small country lanes, Common Lane and Love Lane provide vehicular access to and from the field and Bluegates Farm.

The field's secluded setting, wind resource availability and proximity to existing agriculture and water treatment infrastructure **support wind turbine development here**. Whilst several farms exist in the immediate vicinity, the scale of turbine generation at this location suggest it will operate best on an export-only basis here.

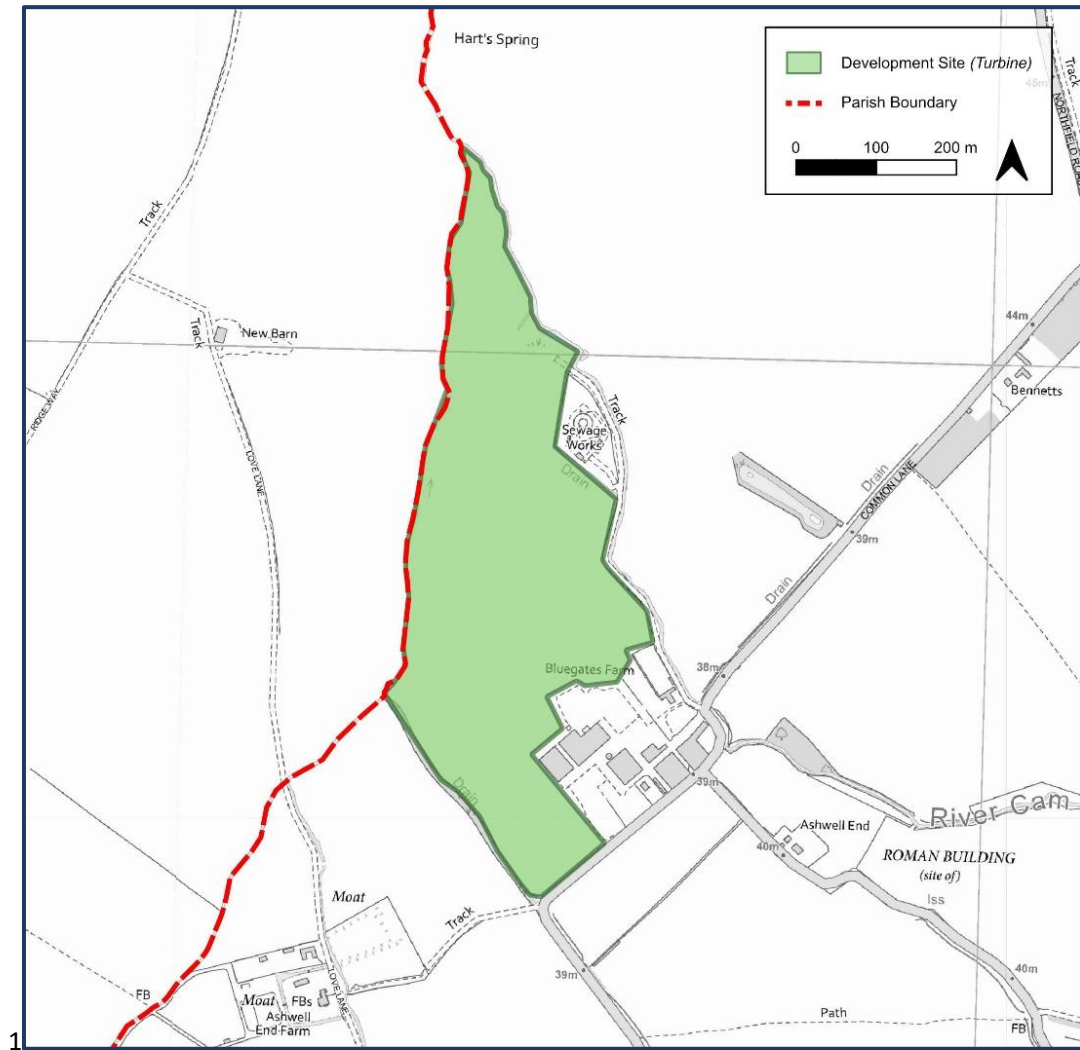


Figure 0.6 – Potential Wind Turbine Site, at Bluegates Farm.

Site HY1 – River Cam

The source of the River Cam (also referred to as the River Rhee) originates from Ashwell Springs, a natural spring located in the centre of Ashwell village. From here, the river flows approximately 5.4 km north-west (whereby it represents the boundary with neighboring Hinxworth Parish), eventually exiting Ashwell Parish close to Guilden Morden, in neighboring Cambridgeshire. The River Cam is a lowland chalk stream, flowing through generally flat, agricultural landscapes north of Ashwell. Sections of the river in Ashwell village have been channelised and are actively managed, to prevent minor flooding. Ashwell Springs is a Site of Special Scientific Interest (SSSI), recognised for its ecological value as a rare chalk stream habitat.

The River Cam does not have the hydrological resource to sustain a community-scale hydroelectrical system. Typical of waterways in this region, the River Cam has a low head height, not preferable for hydrological development. Although the waterway has a head height difference of ~20m throughout the 5 km stretch within Ashwell Parish, this is not concentrated in one location. As a result, there are no obvious locations for hydro installations with the required head height. While head height can be artificially created using weirs built across river channels, the lack of weirs and sluices capable of controlling water flow levels on the River Cam render this option unfeasible.

As a result, establishing a viable micro-hydropower installation on the River Cam is considered **unviable**.

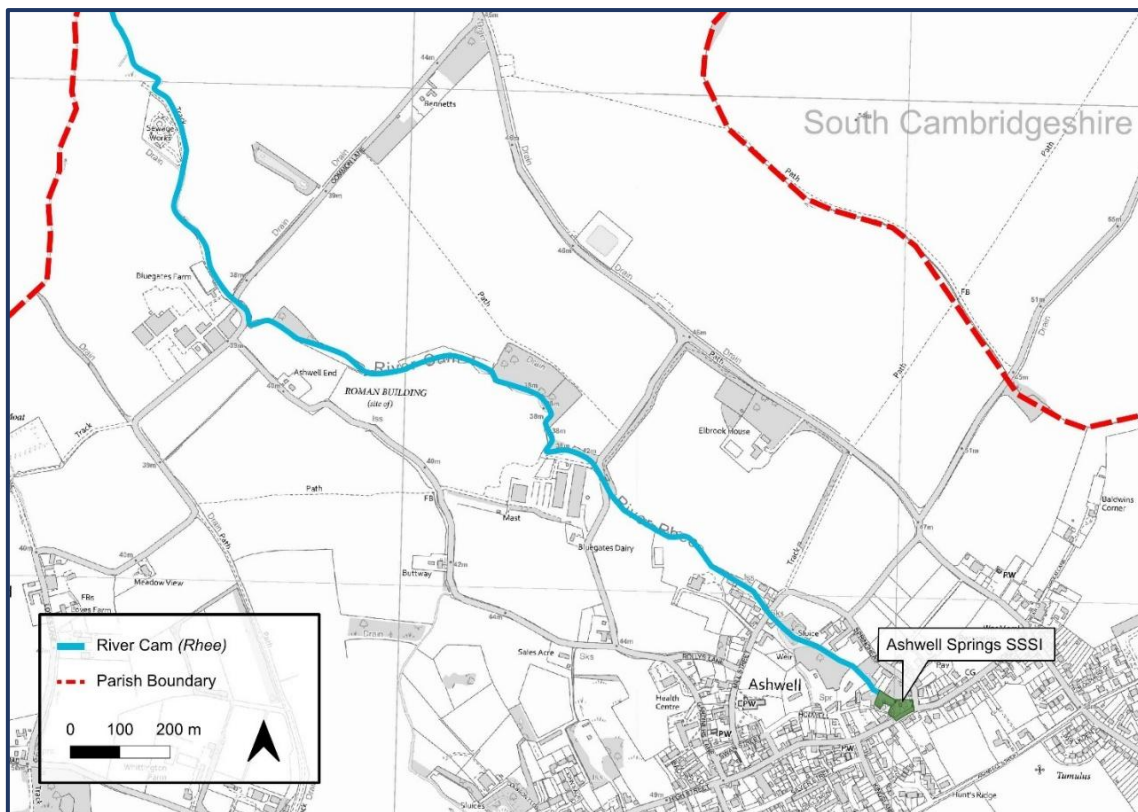


Figure 0.7 – Course of the River Cam, in Ashwell Parish.

Anaerobic Digestion

Anaerobic digestion (AD) is a naturally occurring process in which micro-organisms break down the organic matter to produce biogas and biofertiliser. This process occurs in the absence of oxygen in a sealed, oxygen-free tank – called an anaerobic digester. AD is also an effective method of recycling food waste, farm waste and sewage sludge.

A high-level resource availability assessment was undertaken to ascertain the viability of community-owned AD across Ashwell. Here, the scale, density and availability of waste by-products from local farms is critical to support consistent and economically viable AD installations. As the surrounding countryside hosts both livestock and arable farms, ‘Wet’ feedstocks (e.g., livestock manure and slurry) and ‘dry’ feedstocks (e.g., crop and plant residue) could be used contingent on securing consistent waste supply. Although dry feedstock provides greater generation yields than livestock waste and slurry⁴⁴, the seasonality of arable farming (and subsequent limited availability of waste products) may restrict AD generation at various times of the year (i.e., winter). Instead, wet feedstocks are preferred for AD, representing a consistent, year-round available resource.

Based upon average herd size and waste production estimates from UK cattle farms⁴⁵, waste from the parish’s two large dairy farms could support a 76-kWp anaerobic digester, capable of generating approximately 670,000 kWh of electricity per year. Whilst technically viable, an AD of this scale represents a relatively small scale of AD development in the UK and are not recommended for community development on economic or logistical grounds. Such a system would be highly risky, based on the logistical complexity of fuel sourcing, reliance on 3rd parties for the consistent supply of low cost or no cost fuel, and liabilities associated with waste processing and pollution control.

Whilst a community-owned AD could provide the dual benefit of providing low carbon energy generation and a consistent waste disposal function, **it is not recommended at present**. Although technically feasible across Ashwell, the anticipated scale of development is relatively small and therefore financial viability is expected to be marginal. Coupled with the high risk associated with system operation and lack of precedent for community-owned AD plants in the UK, this would be a challenging and ultimately low impact opportunity for ZCA.

Battery Energy Storage Systems

Battery energy storage systems (BESS) are not inherently low carbon but can complement other low carbon technologies and systems. Electrical batteries are frequently used from the domestic to the utility scale alongside low carbon generators (e.g., solar PV or wind turbines), to store electricity either for when it’s needed most or when the greatest benefits from electricity may be derived.

Across Ashwell two BESS approaches are worth exploring:

1. **Optimisation of local electricity generators:** Here, BESS are co-located alongside local generators (e.g., solar PV or wind turbines) and are used to store excess energy at times when energy generation outstrips demand. The stored energy can then be used at a later period for when local demand increases or exceeds generation.
2. **Distributed BESS:** In this instance, individual BESS installed at properties (e.g., homes or businesses) is used to store excess energy and release it during periods of peak electrical demand or reduced generation... Storing locally generated energy in this manner greatly reduces reliance on grid-supplied energy, improving the efficiency and cost-effectiveness of local generators (e.g., domestic rooftop solar PV) and electrified heating solutions (e.g., ASHPs).

BESS are best assessed as a means of unlocking other forms of low carbon development, such as electricity generation or providing grid headroom for new demand loads (e.g., heat pumps). A full financial appraisal of BESS inclusion alongside electrical generation technologies across Ashwell will be provided in the financial appraisal (TBD March 2026).

⁴⁴ Campbell, J., and Boyd, I. (2023) Farm Advisory Service, Anaerobic Digestion (AD) – Farm Scale.

⁴⁵ Average cattle herd size of 150, where each animal produces 12 tons of waste per year (*Farming and Water Scotland, 2026*).

Heat Generation Opportunity Sites

Combined domestic and non-domestic heat demand across the parish amounts to 14,037 MWh per year. This represents emissions totaling 2,773 tCO₂e each year, the majority arising from fossil fuel usage (see sections 2.2 and 2.4). Implementing and encouraging the uptake of low carbon heating technologies is therefore key to reducing regional energy use and emissions. Here, two options for low carbon heating are considered:

- **District Heat Network (DHN):** A DHN utilising ground-source or air-source heat pumps to supply connections (e.g., households or businesses). Providing a communal low carbon heating solution.
- **Distributed Heat Pumps:** Large-scale uptake of heat pumps at individual properties across Ashwell.

Heat Development Sites

Scenario HT1 – Dixies Meadow, High Street (Heat Network)

Dixies Meadow, a 2-ha field, lies adjacent to Ashwell's main thoroughfare, the High Street (Figure 0.8). The site is currently owned by a local landowner held under a freehold. In the past, housing developments here have been objected to, due to concerns that the village's historic character may be adversely affected. As a result, the field is only periodically used for light livestock grazing and often remains vacant throughout the year. Private gardens and residences border the field to the west and east, and neighboring meadows lie to the north. Vehicle access via a small gateway on High Street, to the south. The field is grade 3 farmland and lies within the Ashwell Conservation Area. No other statutory environmental, flood risk or cultural designations are present here.

Dixies Meadow lies adjacent to several residential neighbourhoods, including homes on Bacon's Yard, John Sale Close and the 77-flat Wolverley House complex. Proximity to these locations provides several possible options for local heat supply. Although some disruption will arise from installing subsurface infrastructure (e.g., boreholes and pipework) and above-ground features (e.g., energy centre), these can be discreetly installed to retain the meadow's original agricultural value and the picturesque aesthetic.

Dixies Meadow's central location and relatively inconsistent land use **support district heat network development**. The site's proximity to several dense residential neighbourhoods is also a key factor supporting heat network viability here, providing several residential neighbourhoods for local heat supply.

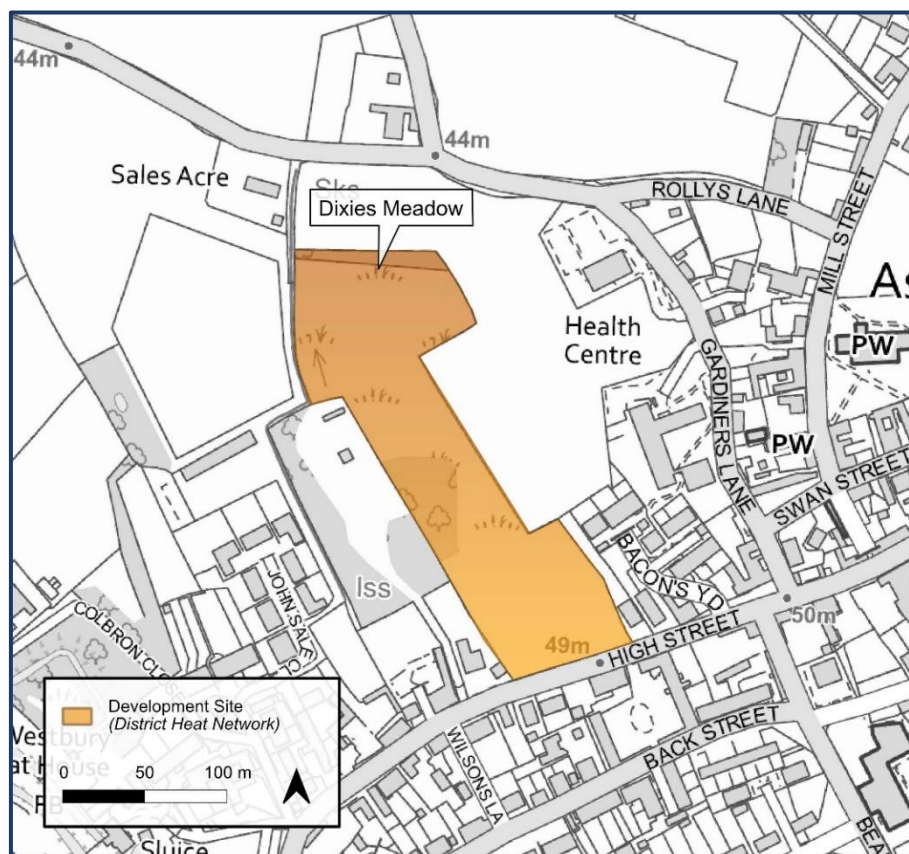


Figure 0.8 – Potential District Heat Network Site at Dixies Meadow, Ashwell.

Scenario H2 – Distributed Heat Development

An alternative scenario to communal heating infrastructure (i.e., a heat network) is the development of low-carbon heating systems distributed across Ashwell. This is expected to include individual ASHP and GSHP heating systems for properties. This approach has the benefit of being a more organic transition to net zero, which does not incur the high capital costs and complexity associated with heat network development, and enables a community role in supporting this transition to low carbon heating. Conversely, this approach leads to a potentially slower transition to net zero, as it requires property owners to progress individually rather than as a collective and reduces the potential for the system efficiencies and community control possible with heat networks (e.g., higher system performance, greater control over energy costs).

This scenario is a natural transition to low carbon heating and is therefore investigated as a potential route to community-led decarbonisation of heating as well as the “low carbon counterfactual” against which heat network development can be appraised.

Community energy organisations can influence the uptake of these types of technology in three principal ways:

1. **Enablement:** Raising awareness and educating residents so they can better understand and implement low carbon heating in their own homes and businesses (e.g., information events and workshops).
2. **Support:** Providing access to key services and advice, such as trusted installer directories or grant-funded home audits. These embed the skills and pre-requisite awareness needed for residents to undergo low carbon heating upgrade.
3. **Implementation⁴⁶:** Actively delivering energy audits, heating system assessments and other supporting services (e.g., thermal camera assessments). These actively ensure low carbon heating systems operate to the best of their ability, to ensure residents receive tangible energy, environmental and financial benefit from their implementation.

Community-led action is anticipated to become a key enabler of domestic ASHP uptake across Ashwell. Through a series of targeted enablement, support and implementation services, a community group can provide bespoke support to homeowners across the parish to help decarbonise heat supply.

⁴⁶ Note that this requires a significant level of human resource, including specialist training and operational management capabilities. This means few communities can provide implementation services without support from specific grant funding, external training providers or revenue from existing projects.

Appendix C – Summary Tables

Current and Projected Energy Demand:

	2025/26	2050 Projection ⁴⁷
Total Energy Demand (MWh)⁴⁸	17,710	10,833
Total Greenhouse Gas Emissions (tCO₂e)⁴⁸	3,534	2,162
Renewable Energy Generation (MWh)	411	3,237

Individual Opportunity Effect:

Technology	Energy Generated (MWh)	Annual Carbon Emission Reduction (tCO ₂ e)	Ashwell Carbon Emissions Offset (% p/a) ⁴⁹
0.1 MW Turbine (NH)	244.2	42.7	1.2
1 MW Turbine (NH)	2,975.3	530.3	15
0.1 MW Turbine (BF)	244.2	42.7	1.2
1 MW Turbine (BF)	2,472.6	432.4	12.2
0.06 MW Solar PV (WH)	60.5	10.2	0.3
2.2 MW Solar PV (LL)	2,361.6	121	3.4
0.2 MW Solar PV (LL)	212.6	37.6	1.1
DHN (DM)	N/A	132	3.7
Distributed ASHPs	N/A	126	3.6
Community-Led Energy Efficiency	N/A	TBD ⁵⁰	

Newnham Hill (NH), Bluegates Farm (BF), Wolverley House (WH), Love Lane (LL), Dixies Meadow (DM).

⁴⁷ Following NESO 'Consumer Transformation' scenario.

⁴⁸ Domestic and commercial heat and electrical energy.

⁴⁹ Compared to total GHG emission across Ashwell in 2025/26.

⁵⁰ Determined by actual level of action (see Section 8.1.3).

Cumulative Opportunity Effects:

Scenario	Technologies	Current Status (2026)	Annual Carbon Emission Reduction (tCO ₂ e)	Ashwell Carbon Emissions Offset (% p/a)
1	0.06 MW Solar PV (WH)	Viable	136.2	3.9
	Distributed ASHPs			
	Community-Led Energy Efficiency			
2	0.1 MW Wind (BF)	Unviable	300.7	8.5
	DHN (DM)			
	Distributed ASHPs			
	Community-Led Energy Efficiency			
3	0.2 MW Solar (LL)	Unviable	295.6	8.4
	DHN (DM)			
	Distributed ASHPs			
	Community-Led Energy Efficiency			
4	0.1 MW Wind (BF)	Unviable	338.3	9.6
	0.2 MW Solar (LL)			
	DHN (DM)			
	Distributed ASHPs			
	Community-Led Energy Efficiency			

Bluegates Farm (BF), Wolverley House (WH), Love Lane (LL), Dixies Meadow (DM).

Appendix D – Future Opportunity Summaries

The following scenarios assume that current (2026) regional grid constraints are alleviated by future reinforcement and upgrade works. Future reinforcement and infrastructure upgrades will strengthen local grid capacity, remove complex and costly grid connection works in the process, simplifying the connection process and accessibility for local generation developments.

Wind-Turbine Opportunities (Bluegates Farm, Ashwell)

Wind Turbine	0.1 MW	1 MW
Capital Cost (CAPEX) (inc. grid connection)	-£244,475	-£2,136,800
Grid Connection Cost	£20,000	£200,000
Export Income	£21,974	£222,534
Operational Cost (OPEX)	-£9,000	-£44,500
Carbon Emissions Reduction (tCO ₂ e)	43.2	437.7
Export Income	£724,262	£7,334,635
Operational Cost (OPEX)	-£328,056	-£1,726,377
Debt Service (Principal & Interest)	-£398,523	-£3,483,235
Carbon Emissions Reduction (tCO ₂ e)	1,046	10,594
Cumulative Net Income	-£2,317	£2,125,023
Annualised Return on Investment (ROI)	-0.04%	2.8%
Annualised Return on Capital Employed (ROCE)	3.9%	5.3%
Project Internal Rate of Return (IRR)	3.8%	8.4%
Net Present Value (NPV)	-£110,836	£389,092
Breakeven Year	26	17

Ground-Mounted Solar PV Opportunities (Love Lane, Ashwell)

Solar PV	0.2 MW	2.2 MW
Capital Cost (CAPEX) (inc. grid connection)	-£229,844	-£1,925,385
Budgeted Grid Connection Costs	-£44,280	-£398,520
Year 1		
Export Income	£21,254	£212,540
Operational Cost (OPEX)	-£3,830	-£32,767
Carbon Emissions Reduction (tCO ₂ e)	41.8	418
Lifetime (25-year)		
Export Income	£700,524	£7,005,242
Operational Cost (OPEX)	-£176,518	-£1,576,120
Debt Service (Principal & Interest)	-£381,540	-£3,196,138
Carbon Emissions Reduction (tCO ₂ e)	1,011.8	10,118.2
Cumulative Net Income	£142,466	£2,232,983
Performance (25-year, real terms)		
Annualised Return on Investment (ROI)	1.9%	3.1%
Annualised Return on Capital Employed (ROCE)	4.9%	5.5%
Project Internal Rate of Return (IRR)	7.0%	9.3%
Net Present Value (NPV)	-£13,604	£549,036
Breakeven Year	20	16