Thurrock Council

Local Plan Evidence Base

Energy Strategy

Reference:

Issue | 7 July 2026

© Hawk Editions

Job number 312159-03

Ove Arup & Partners Limited
8 Fitzroy Street
London
W1T 4BJ
United Kingdom
arup.com

Contents

Executive Summary 1

Abbreviations and definitions 4

1. Introduction 5
1.1 Purpose of this strategy 5
1.2 Scope 5
1.3 Document structure 6
2. Context 7
2.1 Policy and legislation drivers 7
2.2 Local context 9
3. Assessing options for the future 11
3.1 Scope of analysis 11
3.2 Data sources used 13
3.3 Limitations 14
4. Intervention areas 15
4.1 Thurrock wide demand and consumption 15
4.2 Domestic buildings 16
4.3 Non-domestic buildings 21
4.4 Transport 25
4.5 Energy generation and supply infrastructure 28
5. Impacts of measures 34
5.1 Emissions 34
5.2 Intervention costs 37
5.3 Economic growth 39
5.4 Energy infrastructure in Thurrock 40
5.5 Policy implications 41
5.6 Co-benefits of the energy transition 42
6. Next steps 43
6.1 Interventions 43

Tables

Table 3.1 Demand sectors and sub-sectors considered 11
Table 3.2 Differences with the Essex LAEP 13
Table 3.3 Limitations of the analysis 14
Table 4.1 Retrofit potential 17
Table 4.2 Heating demand met via heat networks in 2050 33
Table 5.1 Jobs associated with the installation of new infrastructure 39
Table 5.2 Jobs associated with the operation and maintenance of new infrastructure 39
Table 6.1 Interventions list 43
Table 6.2 Updated building growth for Thurrock 45
Table 6.3 Fuel efficiency 46
Table 6.4 Vehicle efficiencies 47
Table 6.5 Emissions from different fuel types 47
Table 6.6 Costs used for wind and solar 49
Table 6.7 Job creation potential 50
Table 6.8 Assumed wind and solar capacity factors 50
Table 6.9 New jobs associated with non-domestic building growth 50

Figures

Figure 1.1 Energy demand by sector over time 2
Figure 1.2 Total fuel consumption by fuel type 2
Figure 2.1 Thurrock boundary 9
Figure 2.2 Existing renewable energy generation assets 10
Figure 3.1 Methodology flow chart 11
Figure 3.2 LSOA boundaries in Thurrock 12
Figure 4.1 Energy demand by sector 15
Figure 4.2 Total fuel consumption by fuel type 16
Figure 4.3 Domestic building energy demand 16
Figure 4.4 Thurrock Council vs. Essex LAEP housing growth trajectory 17
Figure 4.5 Domestic shallow retrofit potential 18
Figure 4.6 Domestic deep retrofit potential 18
Figure 4.7 Fuel consumption in domestic buildings 18
Figure 4.8 Fuel consumption by technology for space heating and hot water demands in domestic building 19
Figure 4.9 2022 domestic buildings electricity consumption by LSOA 20
Figure 4.10 Existing gas network in Thurrock 20
Figure 4.11 2050 domestic buildings electricity consumption by LSOA 20
Figure 4.12 Proposed domestic growth locations 21
Figure 4.13 Non-domestic energy demand 21
Figure 4.14 Fuel consumption in the non-domestic sector 22
Figure 4.15 Technologies utilised for demand in non-domestic buildings 23
Figure 4.16 2022 non-domestic buildings electricity demand 24
Figure 4.17 2050 non-domestic buildings electricity demand 24
Figure 4.18 Non-domestic building development locations 24
Figure 4.19 Transport energy demand 25
Figure 4.20 Fuel consumption in transport sector 25
Figure 4.21 2022 transport electricity demand 26
Figure 4.22 2050 transport electricity demand 26
Figure 4.23 Existing EV chargers in Thurrock 27
Figure 4.24 Renewable infrastructure deployment rate in Thurrock 28
Figure 4.25 Existing renewable energy generation assets 28
Figure 4.26 Existing and planned capacities of renewables in Thurrock 29
Figure 4.27 Alternative (non-wind and solar) renewable assets in Thurrock 29
Figure 4.28 Ground mounted PV deployment rate 30
Figure 4.29 Ground mounted PV (upper) potential by LSOA 30
Figure 4.30 Ground mounted PV (lower) potential by LSOA 30
Figure 4.31 Onshore wind deployment rate 31
Figure 4.32 Onshore wind potential land 31
Figure 4.33 Rooftop PV deployment rate 32
Figure 4.34 Heat network potential for Thurrock 32
Figure 4.35 Current grid infrastructure capacity 33
Figure 5.1 Projected CO_2e emissions in Thurrock 34
Figure 5.2 Projected carbon intensity of the UK electricity grid 35
Figure 5.3 Projected carbon emissions by sector 35
Figure 5.4 Projected carbon emissions in the transport sector 36
Figure 5.5 Total investment required for the energy transition 37
Figure 5.6 Renewable investment required to meet 2050 projections 37
Figure 5.7 Low carbon heating investment required to decarbonise heating in existing homes 38

Appendices

Appendix A Methodology 44

A.1 Overview 44

A.2 Domestic and non-domestic energy demand 45

A.3 Transport 46

A.4 Emissions 47

A.5 Large infrastructure 48

A.6 Costs 49

A.7 Jobs 50

Executive Summary

Thurrock Council is currently updating its Local Plan, scheduled for Regulation 19 consultation in 2026. This plan will guide development in the borough up to 2044, identifying land for new homes and employment, retail, and leisure activities.

With growth planned across Thurrock and major projects entering the planning pipeline, energy demand is set to rise significantly. This could result in strains on current energy infrastructure, making it essential for the Local Plan to include clear objectives to meet future energy demands.

To support development of a Local Plan, Thurrock Council commissioned Arup to produce an Energy Strategy that provides an evidence base for Local Plan policy development related to energy, and to identify opportunities to ensure local planning processes support energy demand reduction and adoption of renewable and low carbon energy generation.

Thurrock's strategic position has driven one of the fastest-growing economies in the UK, creating demand for new commercial and industrial land, housing and supporting infrastructure. Balancing this growth with environmental and sustainability objectives will be central to future planning.

Energy sits at the heart of the challenge. As the UK transitions to low-carbon and renewable energy sources, the energy system is undergoing profound change. While electricity generation has made significant progress, heating remains largely reliant on natural gas, and transport on petrol and diesel.

The analysis completed for this study draws on the outcomes of the Essex LAEP. Arup used the outcomes of the Essex LAEP and the associated assumptions to assess the impact of growth and transition in Thurrock on energy demands across the borough in the years to 2050.

The energy demands considered in this study include energy used in domestic buildings, non-domestic buildings and transport sectors, plus onshore wind, ground-mounted PV and rooftop PV for both domestic and non-domestic buildings.

The Essex LAEP considers two scenarios, Do Nothing and Balanced. The analysis completed for this strategy considers only the Balanced scenario.

The Essex LAEP covers the period to 2050 and many national energy targets are similarly set for 2050. Thurrock's growth plans include housing and commercial growth both within and beyond the plan period, which runs to 2044. To align with the Essex LAEP and national energy targets the analysis in this report covers the period to 2050. It uses the total growth figures from Thurrock (including growth beyond the plan period) and assumes that this growth takes place by 2050. The Balanced scenario acts as the ambition scenario, achieving renewable deployment that is consistent with national targets set out in the Climate Change Committee (CCC) 7th Carbon Budget (7CB)[1] including the widespread uptake of heat pumps, electric vehicles (EVs), and rooftop photovoltaics (PV).

The change in total projected energy demand in Thurrock, between 2022 and 2050, is shown in Figure 1.1.Overall estimated demand reduces by 13%, which is driven by the reduction in transport demand. Domestic building demands are

[1] The Seventh Carbon Budget - Climate Change Committee

projected to increase by 17%, while non-domestic building demands and transport demands reduce by 9% and 47%, respectively.

The increase in projected energy demand for domestic buildings is driven by the increase in the number of properties. In contrast, transport demand declines primarily due to uptake of electric vehicles, which operate at higher efficiencies than internal combustion engine (ICE) vehicles. This efficiency improvement reduces overall energy demand.

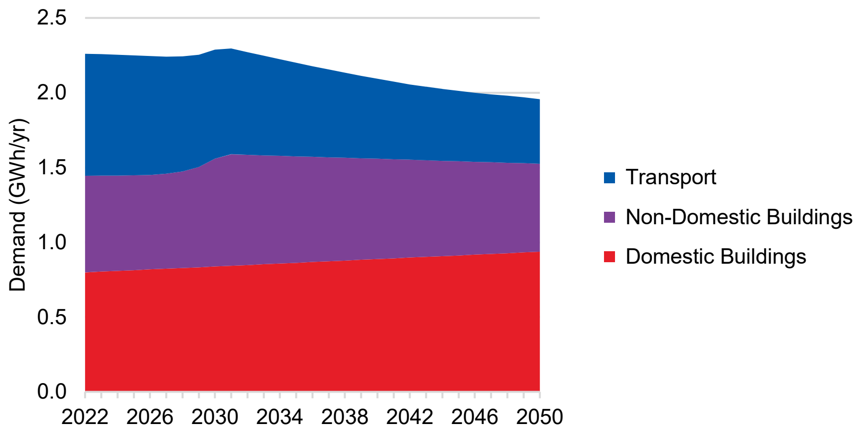

Figure 1.1 Energy demand by sector over time

Figure 1.2 shows total projected energy consumption by fuel type, with all demand being met through electricity by 2050. As systems decarbonise to achieve net zero, the consumption of petrol/diesel and gas declines, while electricity consumption increases. Due to this vector shift, and the higher conversion efficiency of low carbon heating technologies and electric vehicles, overall fuel consumption decreases by 40%.

The growth in electricity consumption is driven by increased domestic building demand, due to growth in the number of domestic buildings.

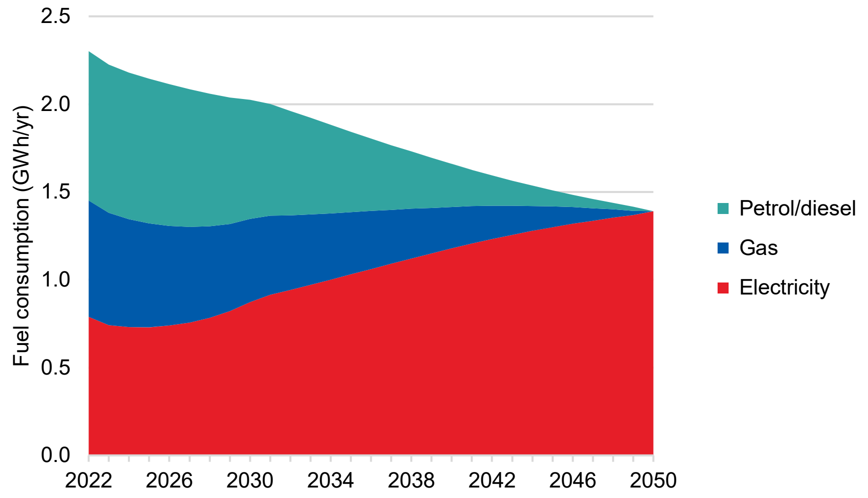

Figure 1.2 Total fuel consumption by fuel type

In Thurrock, between 620 and 2,800 MWp of potential ground mounted PV capacity is available. While there is adequate land available to meet the 2050 PV capacity, a detailed solar PV land availability assessment is recommended in order to prioritise the most suitable areas. This may be completed in the form of a Supplementary Planning Document.

According to the REPD, solar capacity approved or under construction is expected to deliver 184 MWp by 2027. In addition to the existing 105 MWp, the total ground-mounted PV capacity available in the near term is 289 MWp. This is ahead of the projected capacity for 2027, by 89MWp. This highlights Thurrock’s commitment towards increased energy security and economic growth through decarbonisation.

Operational carbon emissions are projected to reduce to 2% of 2022 emissions. In 2022, approximately 409kt CO_2e was emitted, primarily from petrol/diesel and natural gas consumption. This is projected to reduce to 8kt by 2050, with the only emissions occurring from grid electricity consumption.

The transport sector is currently the largest carbon emitter of the three. Within this sector, cars represent the largest volume of emissions, followed by LGVs and then HGVs. Transition from ICE vehicles to EVs presents the highest potential for emissions reduction in Thurrock.

The total estimated investment required for the energy transition in Thurrock is at least £1.44 billion. This includes the investment associated with renewables, shallow retrofit and deep retrofit but does not include new heat networks, grid upgrades and new grid infrastructure.

An estimated £716 million is required to fit heat pumps in all suitable buildings to decarbonise heating. The majority of this cost is associated with ASHP installation. An additional £200 million pounds is required for the retrofit of homes.

Although the total investment required to decarbonise Thurrock's energy system is £915 million, it is important to recognise that maintaining the current system also incurs significant costs. These include the expenses related to operating, maintaining, replacing, and fuelling existing technologies such as gas boilers. When these ongoing costs are considered as the baseline for the energy system, the incremental cost of transitioning to a net zero market is lower than the suggested £915 million.

The transition to net zero will require a large workforce to deliver the new infrastructure, in turn boosting overall economic growth in the borough. New jobs required for the installation and construction of the energy transition, assuming all buildings in Thurrock transition to heat pumps, and undergo some form of retrofit have been estimated. In total, 7,600 FTEs will be required for the installation of heat pumps, renewables and retrofits.

This Energy Strategy is based on the following high-level assumptions:

- All gas consumption for heating replaced by electrical sources by 2050
- All transport supplied by electricity by 2050
- Retrofit of existing properties where suitable by 2050
- All new build properties to be highly efficient and have minimal energy demands

To support these goals Essex Council have prepared policy documents that require all new developments to be net zero in operation for carbon and energy. (Links here and here) This will assist in delivering on the goals to reduce gas consumption and to ensure all new buildings have minimal energy demands.

Transitioning to clean energy can generate significant social and economic benefits. It ensures safe, reliable energy for fuel-poor areas, lowers household bills and stimulates local economic growth. Reduced reliance on gas in homes and on petrol and diesel for transport improves air quality in both homes and communities, leading to better health outcomes and an enhanced quality of life for residents.

Retrofit activities to improve efficiency, reduce demand and deliver energy cost savings for households and businesses. They also reduce overall energy consumption. This eases the strain on existing energy infrastructure and provides capacity for growth before new infrastructure upgrades are required.

Abbreviations and definitions

Abbreviation	Meaning
7CB	Seventh carbon budget
ASHP	Air source heat pump
BESS	Battery energy storage system
CCC	Climate Change Committee
DFES	Distribution Future Energy Scenario
ECR	Embedded Capacity Register
EPC	Energy Performance Certificate
ERF	Energy recovery facility
EV	Electric vehicle
FES	Future Energy Scenario
FTE	Full time equivalent (employee)
GSHP	Ground source heat pump
HGV	Heavy goods vehicle
ICE	Internal combustion engine
LAEP	Local Area Energy Plan
LGV	Light goods vehicle
LSOA	Lower super output area
MW, MWh, MWp	Megawatt, Megawatt hour, Megawatt peak
NESO	National Energy System Operator
PV	Photovoltaic
REPD	Renewable Energy Planning Database
WTG	Wind turbine generator

1. Introduction

1.1 Purpose of this strategy

Thurrock Council is currently updating its Local Plan, scheduled for Regulation 19 consultation in 2026. This plan will guide development in the borough up to 2044, identifying land for new homes, employment, retail, and leisure to support planned growth.

With growth planned across Thurrock and major projects entering the planning pipeline, energy demand is set to rise significantly. This could result in strains on current energy infrastructure, making it essential for the Local Plan to include clear objectives to meet future energy demands.

Transitioning to clean energy can generate significant social and economic benefits. It ensures safe, reliable energy for fuel-poor areas, lowers household bills and stimulates local economic growth. Additionally, reduced reliance on fossil fuels improves air quality, leading to better health outcomes and an enhanced quality of life.

Low-carbon technologies such as heat pumps offer significant efficiency advantages over traditional fossil-fuel systems. This reduces overall energy consumption, thereby easing the strain on existing energy infrastructure. This improved efficiency is especially valuable for supporting Thurrock's rising energy demand and growing population. Moreover, the shift toward cleaner technologies plays an essential role in meeting the UK's legally binding target of achieving net-zero emissions by 2050.

To support development of a Local Plan, Thurrock Council commissioned Arup to produce an Energy Strategy that provides an evidence base for Local Plan policy development related to energy.

1.2 Scope

This Energy Strategy has been commissioned to identify opportunities to ensure local planning processes support energy demand reduction and adoption of renewable and low carbon energy generation. It considers the following questions:

- How can Thurrock ensure that energy infrastructure is not a constraint to growth in the area?
- What is an appropriate pathway for Thurrock to align with the national energy transition ambition?
- How should energy considerations most appropriately be embedded in the long-term planning policy framework?

1.3 Document structure

This document consists of the following five chapters:

1.3.1 Context

Chapter two provides an overview of relevant policy and planning implications for Thurrock, as well as a high-level overview of the infrastructure in Thurrock.

1.3.2 Assessing options for the future

Chapter three details the methodology used for this study.

1.3.3 Intervention areas

Chapter four provides analysis of the sector specific outcomes of the study

1.3.4 Impacts of measure

Chapter five provides analysis of the overarching aspects of the energy transition. This includes emissions, investment, economic growth, new energy infrastructure in Thurrock and policy implications.

1.3.5 Next steps

Chapter six provides a concise list of interventions required to meet the energy transition, and some high level recommended next steps for Thurrock.

2. Context

Thurrock Council is a unitary authority in the East of England, located on the north bank of the River Thames, covering 16,340 hectares and home to a population of 176,000 (2021). The borough has 18 miles of river frontage and a diverse landscape, ranging from undeveloped farmland and marshland to densely populated urban and industrial areas. Thurrock sits at the heart of the Thames Gateway and hosts multiple international ports. This is supported by excellent road and rail connections, making the borough a key hub for trade and logistics.

Thurrock's strategic position has driven one of the fastest-growing economies in the UK, creating demand for new commercial and industrial land, housing and supporting infrastructure. Balancing this growth with environmental and sustainability objectives will be central to future planning.

Energy sits at the heart of this challenge. As the UK transitions to low-carbon and renewable energy sources, the energy system is undergoing profound change. While electricity generation has made significant progress, heating remains largely reliant on natural gas, and transport on petrol and diesel.

Policy and planning have played a critical role in moving the dial on decarbonisation. This chapter provides an overview of existing policies and plans in the UK, followed by an overview of the baseline context of Thurrock.

2.1 Policy and legislation drivers

Underpinning Thurrock's growth is the National Planning Policy Framework (NPPF)[2] and the National Planning Policy Guidance (NPPG)[3]. Recent updates to the NPPF introduce mandatory housing targets and require local authorities to prepare and regularly update Local Plans to meet the needs of their communities.

Additionally, the NPPF requires Local Plans to address climate change mitigation and adaptation. Therefore, alongside the growth targets, climate change objectives should be implemented in planning. The NPPF is out for consultation in early 2026. If adopted it will strengthen national policies, encourage both housing and economic growth, and provide clearer policies for climate change mitigation and adaptation.

2.1.1 National level

At the national level, the UK has taken several steps towards its commitment to net zero by 2050. These steps include:

- The Climate Change Act (2008), which placed the net zero by 2050 commitment into law.
- The Climate Change Act also established the Climate Change Committee, an independent, expert body advising the government on reducing emissions
- The Planning and Energy Act (2008), which reflects the UKs climate change commitments and empowers local authorities to include climate change mitigation and adaptation in planning policy

[2] The government publishes the revised National Planning Policy Framework

[3] National Planning Policy Guidance (NPPG) | PlanningResource

- The Government has committed to phasing out the sale of all internal combustion engine (ICE) vehicles by 2030, and all new vehicles will be required to be zero-emissions by 2035.
- From 2026, Ofgem will also regulate heat networks for the first time, introducing consumer protections, fair pricing, and reliability standards. This is an important step towards scaling low-carbon heating solutions.
- The Future Homes and Building Standard was published in March 2026 and requires that, from 2027, all new homes be future proofed in relation to energy efficiency and low carbon heating.
- Strategic Spatial Energy Planning (SSEP) is being developed by the National Energy Systems Operator (NESO) and will provide a long-term plan for Great Britain's future energy system. The first GB-wide plan will identify zones for electricity and hydrogen generation and storage, define the required technologies, and recommend project for each zone. The initial version will focus on electricity generation and storage.[4,5] The Transitional Regional Energy Strategic Plan (tRESP), published in January 2026, provides guidance and data to help distribution network operators prepare for the next electricity distribution price control period. It gathers information from local authorities and stakeholders to support strategic investment planning. Together with Ofgem's business planning guidance, tRESP outputs inform plans for the third electricity distribution price control period.[6]
- This will be followed by the publication of the full Regional Energy Strategic Plan (RESP) in 2027. This been set up to develop regional plans that span across all energy vectors, as part of one integrated energy system. Its aim is to ensure that investment is targeted where it's needed and that progress towards net zero can be accelerated.[7]
- The Planning and Compulsory Purchase Act 2004 provides a foundation for embedding climate considerations in local planning. Section 19 requires Local Planning Authorities to include policies in their development plans to ensure new development mitigates and adapts to climate change. The implication of this Act is that local authorities must address net zero, embodied carbon and wider objectives.
- The Clean Power 2030 Action Plan, published in late 2024, sets out a pathway to a clean power system by 2030 to provide secure and affordable energy, create new industries and protect the environment from climate change.

2.1.2 Local level

At a local level, policies exist which plan for and further enforce energy transition commitments. These include:

- Essex Operational Energy & Carbon (Net Zero) planning policy statement, a recent policy that requires all new developments to be fossil fuel free and ultra-low energy in operation with on-site renewables to match predicted annual energy use. (Link here)
- Essex Embodied Carbon & Circular Economy planning policy statement, a recent policy that requires all developments to

[4] Strategic Spatial Energy Planning (SSEP) | National Energy System Operator

[5] Strategic Spatial Energy Plan: commission to NESO - GOV.UK

[6] transitional Regional Energy Strategic Plan (tRESP) Consultation | National Energy System Operator

[7] Regional Energy Strategic Planning (RESP) | National Energy System Operator

demonstrate measures taken to minimise embodied carbon. (Link here)

- Essex Local Area Energy Plan (LAEP), commissioned recently by the Essex County Council and delivered by City Science. This plan outlines the priority intervention areas for the energy transition in the Greater Essex area (which includes Thurrock).

2.2 Local context

Thurrock, located on the Thames Estuary to the east of London, is a major hub for ports and logistics, giving it a pivotal role in regional economic and energy planning.

2.2.1 Local geography

The major urban centres in Thurrock include Grays, Corringham, Tilbury, Purfleet-on-Thames and Stanford-le-Hope. Most of these centres are in the southwest of the borough, with Stanford-le-Hope and Corringham being the only urban centres in the east.

West Thurrock, located in the south-west of the borough, close to the Dartford Crossing, is the main industrial hub in Thurrock.

Thurrock has well-maintained Energy Performance Rating (EPC) information for the borough, with an average rating of D across the region. An EPC rating refers to the energy efficiency of a building, with a rating of A indicating the most efficient and G indicating the least efficient. A rating of D means that the average building has a moderate efficiency, with opportunity for energy savings upgrades.

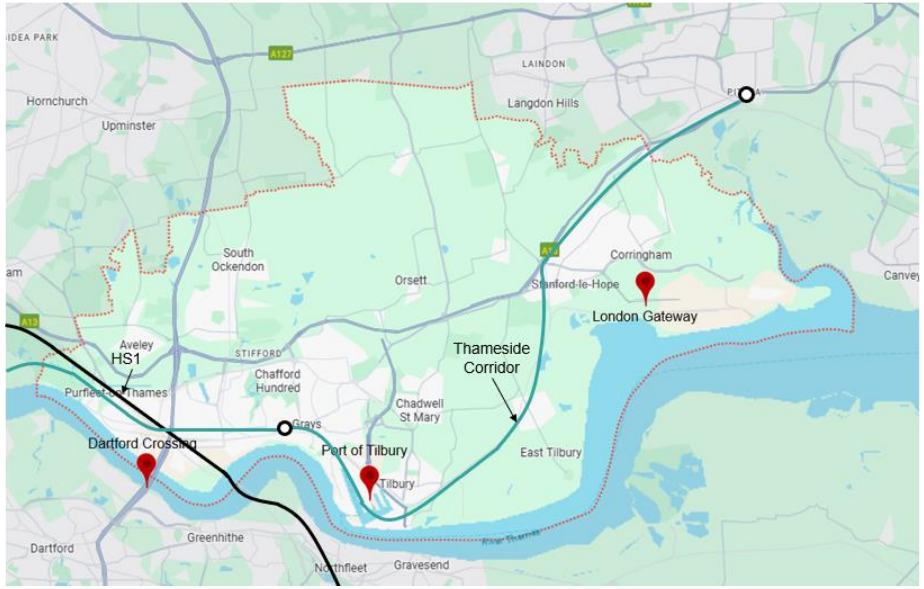

Figure 2.1 Thurrock boundary

2.2.2 Major infrastructure

Being a major hub for port and logistics, there is considerable large-scale infrastructure present in the borough, including:

- Multiple major ports, including Port of Tilbury and London Gateway.
- Large road networks including the M25 ring road, the Dartford crossing connecting Thurrock to Kent via a river crossing, and the A13 road connecting Thurrock to London.
- Major rail lines including the Thameside Corridor connection from London to south Essex and High Speed 1 running from London to Europe through Thurrock.

2.2.3 Energy generation

Thurrock is home to existing renewable energy generation installations including onshore wind farms, ground mounted solar farms, rooftop PV, battery energy storage systems (BESS), landfill gas fired electricity generation, energy from waste facilities, and thermal (biomass) steam turbines. At present the total renewable capacity in Thurrock is 149 MWp of generation.

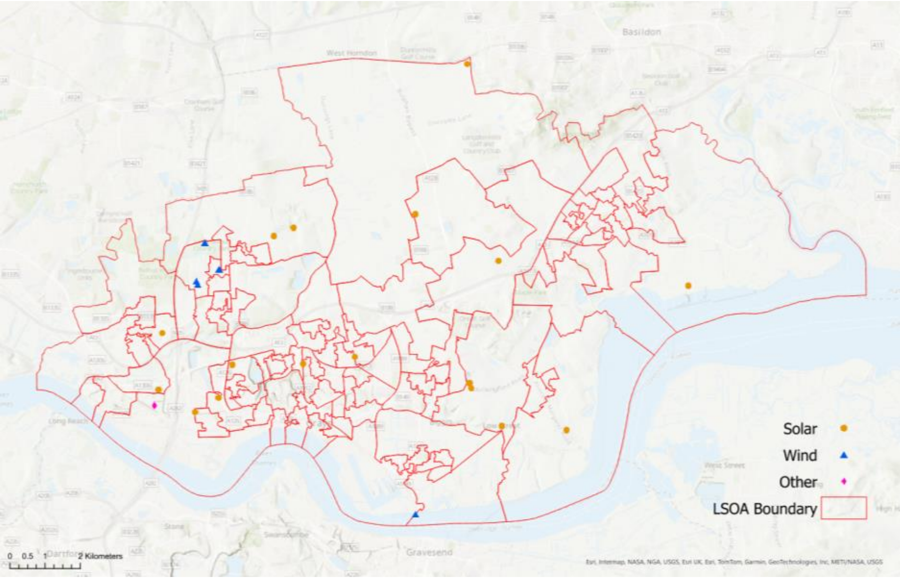

Figure 2.2 Existing renewable energy generation assets

2.2.4 Future plans

Several major projects are planned or underway in Thurrock, that may impact the energy needs of Thurrock:

- Lower Thames Crossing is a planned road tunnel, which will link the A2/M2 in Kent to the A13 in Thurrock. This river crossing aims to ease congestion and boost the local economy by improving connectivity for jobs, services, and freight movement.
- Thames Freeport is a planned economic zone which aims to increase jobs and growth by leveraging freeport benefits. This initiative leverages the existing Ford Dagenham port, Port of Tilbury and DP World London Gateway.
- Thames Enterprise Park is a planned manufacturing, logistics and energy hub, located on the former Coryton Oil Refinery site. This site is planned to be a sustainable "Next Generation" energy hub, aiming to boost the local economy.
- Thameside Energy Recovery Facility (ERF) is currently under construction and is aiming for commercial operation in 2028.

A planning application has been submitted for the development of a data centre in Thurrock and has been identified as a strategic site in the Local Plan. Data centres are major electricity consumers so this development will place additional pressure on the local electricity network. This is relevant in light of the Connection Accelerator Service announcement in Summer 2025[8], which confirmed that central government can reserve grid capacity for strategically important projects. Without significant upgrades to local infrastructure, this reserved capacity may constrain the area's ability to support planned growth.

[8] Powering Britain's future: Electricity bills to be slashed for over 7,000 businesses in major industry shake-up - GOV.UK

3. Assessing options for the future

The analysis completed for this study draws on the outcomes of the Essex LAEP (Figure 3.1). The outcomes of the LAEP outline the areas in each borough that local authorities can focus on to ensure progress to net zero by 2050. For example, the analysis identified Thurrock as a high-priority area for targeted action on rooftop solar, for integrated solar-HGV charging hubs, and heat networks~~.~~

As part of the analysis completed for the Essex LAEP, current (2022) and projected (2050) energy demands were identified.

While the Essex LAEP was completed for the entire county, outputs are available at local authority level. These local authority level outputs have been used to identify the projected energy transition requirements in Thurrock.

Figure 3.1 Methodology flow chart

3.1 Scope of analysis

Arup used the outcomes of the Essex LAEP and the associated assumptions to assess the impact of growth and transition in Thurrock on energy demands across the borough in the years to 2050.

The areas investigated in this study include the following:

- Changes in energy demand in building and transport sectors in Thurrock in the years to 2050
- Additional infrastructure required to facilitate changes in energy demands
- Spatial distribution of energy demand changes across Thurrock

Demand

The energy demands considered in this study include energy used in domestic buildings, non-domestic buildings and transport sectors. Table 3.1 lists the subsectors considered for each demand sector.

Table 3.1 Demand sectors and sub-sectors considered

Domestic buildings	Non-domestic buildings	Transport
Space heating	Space heating	Cars
Hot water	Hot water	Buses
Plug loads	Plug loads	Light goods vehicles (LGV)
-	-	Heavy goods vehicles (HGV)

Renewable infrastructure

Onshore wind, ground-mounted PV and rooftop PV for both domestic and non-domestic buildings were assessed in the Essex LAEP. The LAEP also considers the renewable potential for each borough and identifies specific implications for Thurrock. While additional renewable technologies were not included in the LAEP modelling, commentary on some options is provided in this report.

Geospatial granularity

All energy demand and renewable infrastructure capacities have been identified at a Lower Super Output Area (LSOA) level. An LSOA is a geographic area, typically used for statistical reporting. LSOAs have standardised boundaries, and a population of 1,000-3,000. The LSOAs in Thurrock are shown in Figure 3.2.

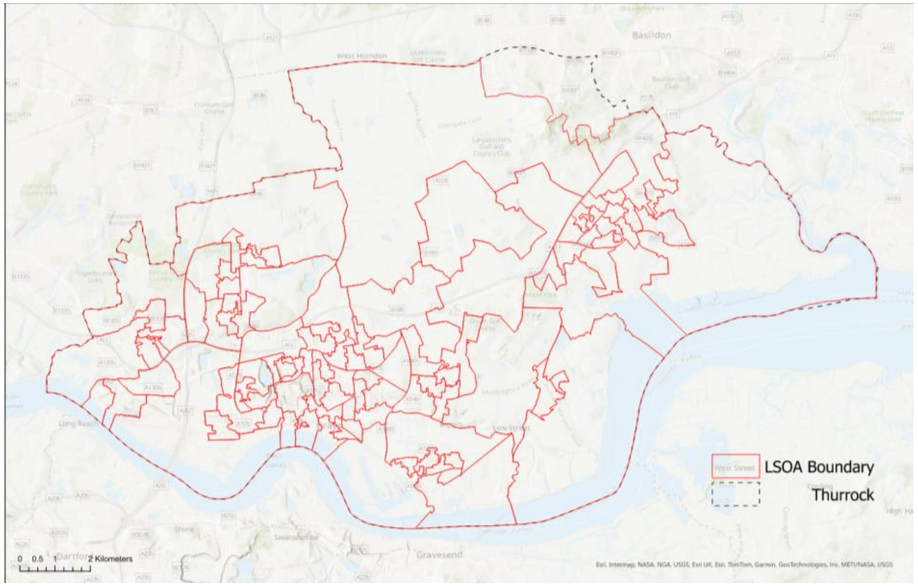

Figure 3.2 LSOA boundaries in Thurrock

Temporal granularity

The changes in energy demands and deployment of renewable infrastructure have been determined in the Essex LAEP at yearly granularity, from 2022 to 2050. Outcomes are presented over the same timeline in this study; however, it is acknowledged that four years of the analysis occurs in the past.

Scenarios considered

The Essex LAEP considers two scenarios, Do Nothing and Balanced.

The Do Nothing scenario acts as the counterfactual, presenting the future energy system with only existing decarbonisation pledges and current market trends, technology investments and uptakes. It excludes policies that are not tangible, and it does not guarantee a fully decarbonised economy by 2050.

The Balanced scenario acts as the ambition scenario, achieving renewable deployment that is consistent with national targets set out in the Climate Change Committee (CCC) 7th Carbon Budget (7CB)[9] including the widespread uptake of heat pumps, electric vehicles (EVs), and rooftop photovoltaics (PV).

For the analysis completed in this strategy, only the Balanced scenario has been considered.

Study period

The Essex LAEP covers the period to 2050 and many national energy targets are set for 2050. Thurrock's growth plans include housing and commercial growth both within and beyond the plan period, which runs to 2044. To align with the Essex LAEP and national energy targets the analysis in this report covers the period to 2050. It uses the total growth figures from Thurrock (including growth beyond the plan period) and assumes that this growth takes place by 2050.

[9] The Seventh Carbon Budget - Climate Change Committee

3.2 Data sources used

The following data sources have been used to complete this analysis. A more comprehensive overview of these is provided in Appendix A.

Essex LAEP

The main data source for this analysis is the Essex LAEP modelling outputs. However, as the LAEP was undergoing reviews and quality assurance checks while this study was being completed, an incomplete data library was provided. Where data gaps were present, other data layers from the UK Power Networks LAEP+ tool were used.

LAEP+ tool

The LAEP+ tool was used for additional information. The LAEP+ tool is a net zero planning tool, hosted by UK Power Networks. This tool hosts geospatial information associated with buildings, energy and infrastructure. (Link here)

Public data

Cost data from the LAEP+ tool and cost assumptions from the Essex LAEP were used to calculate costs presented in this report.

Where information was missing from the Essex LAEP and reasonable data could not be obtained from the LAEP+ tool, publicly available information was used.

3.2.1 Difference in data from Essex LAEP

Since the completion of the Essex LAEP, Thurrock City Council have revised their growth targets. Table 3.2 lists the previous and updated targets. To account for these changes, the total demand for each sector has been multiplied by a factor to adjust the demand figures to reflect the latest growth projections.

Table 3.2 Differences with the Essex LAEP

	Domestic buildings	Non-Domestic buildings
Essex LAEP assumption	30,200 new buildings	245 ha of new development
Updated Thurrock target	33,727 new buildings	203 ha of new development
Change	Increase of 12%	Decrease of 17%

3.3 Limitations

Limitations which are present within this assessment are summarised in Table 3.3.

Table 3.3 Limitations of the analysis

Theme	Description
Data availability from Essex LAEP	At the beginning of this study, the Essex LAEP was undergoing reviews and quality assurance checks. For this reason, a full data handover was not possible, which resulted in some data gaps.
Housing growth	Thurrock Council updated housing growth targets after completion of the Essex LAEP modelling. This study has applied factors to reflect the changes.
Location of housing growth	The Essex LAEP modelling assumes an even distribution of growth across all LSOAs. Thurrock have identified specific locations for new domestic and non-domestic developments. The modelling in this study is aligned with the Essex LAEP. As a result, the geospatial spread of energy demand associated with growth as shown in some of the maps in this study does not align with the spatial distribution of domestic and non-domestic building growth included in the Local Plan.
Growth rate	The Essex LAEP assumes linear housing growth, whereas the Thurrock growth projections show non-linear growth, with a steeper increase after 2044. The modelling in this study is aligned with the Essex LAEP. Therefore the growth trajectories shown in charts in this study do not reflect the non-linear growth included in the Local Plan.
Building demand split between fuel types	High level assumptions have been made to determine the split between demand met by petrol/diesel, gas and electricity. This may not align with the assumptions in the Essex LAEP.
Low carbon heating technology installed capacities	The projected installed capacities of low carbon heating technologies, for domestic and non-domestic buildings, were not available for this study.
Grid infrastructure capacities	The modelling outcomes for grid infrastructure capacity required in 2050 were not available for this study.
Heat network capacities	The Essex LAEP modelling outcomes for heat network capacity required in 2050 were not available for this study. Data from UK Power Network's LAEP+ tool indicating the current suitability of each LSOA for heat networks was used for heat network projections.
Costs	Costs were not provided for the infrastructure required in 2050. Costs have been estimated by combining various public datasets.

4. Intervention areas

This chapter is set out in five sections: Thurrock-wide demand analysis, domestic demand analysis, non-domestic demand analysis, transport demand analysis and renewable generation growth. The chapter is arranged in this manner to allow for analysis of each sector and identification of sector specific outcomes.

The projected estimates presented in this chapter have been determined using the methodology presented in Section 3 and Appendix A.

All results are derived from the Balanced scenario modelling completed for the Essex LAEP.

4.1 Thurrock wide demand and consumption

4.1.1 Overview

The energy demands considered in this study include energy demands in domestic and non-domestic buildings, and transport demands.

The change in total projected energy demand in Thurrock, between 2022 and 2050, is shown in Figure 4.1. Overall estimated demand reduces by 13%, which is driven by the reduction in transport demand. Domestic building demands are projected to increase by 17%, while non-domestic building demands and transport demands reduce by 9% and 47%, respectively.

The increase in projected energy demand for domestic buildings is driven by the increase in the number of properties. In contrast, transport demand declines primarily due to uptake of electric vehicles, which operate at higher efficiencies than internal combustion engine (ICE) vehicles. This efficiency improvement reduces overall energy demand.

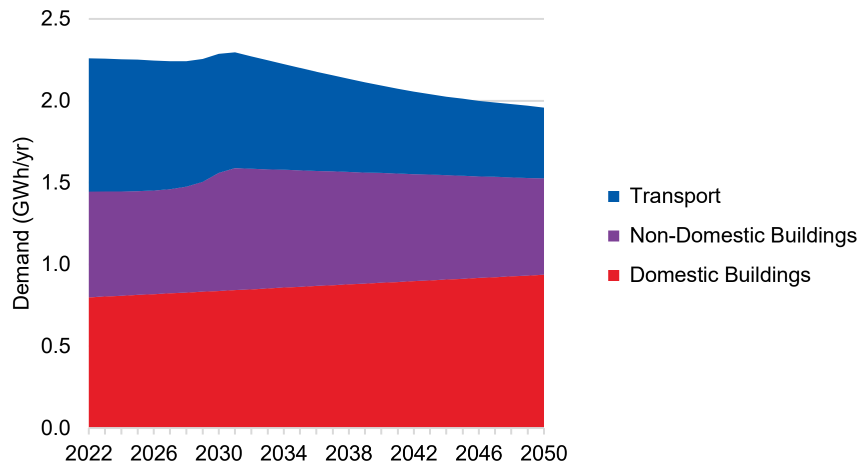

Figure 4.1 Energy demand by sector

4.1.2 Fuel consumption in Thurrock

Figure 4.2 shows total projected energy consumption by fuel type, with all demand being met through electricity by 2050. As systems decarbonise to achieve net zero, petrol/diesel and gas decline, while electricity consumption increases. Due to this vector shift, and the generally high conversion efficiency of low carbon heating technologies, and electric vehicles, overall fuel consumption decreases by 40%.

The growth in electricity consumption is driven by increased domestic building demand, due to growth in the number of domestic buildings. These changes are further discussed in Section 4.2, and Section 4.3.

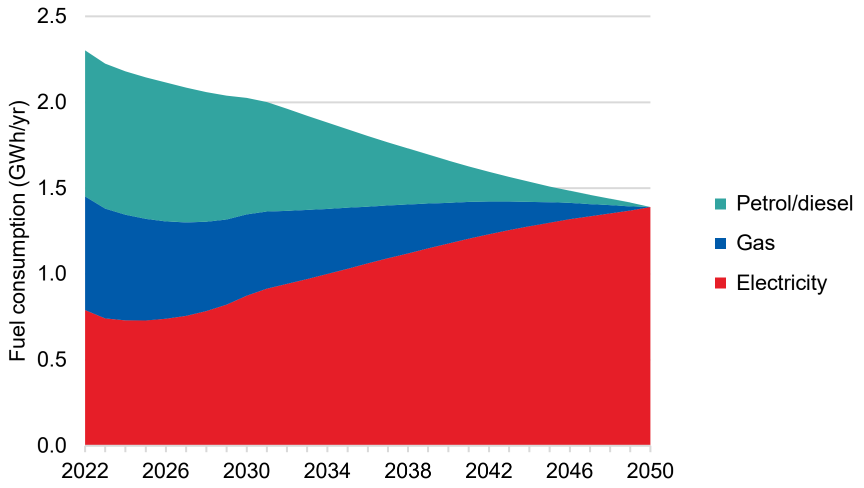

Figure 4.2 Total fuel consumption by fuel type

4.2 Domestic buildings

4.2.1 Overview

Domestic building energy consumption comprises space heating, hot water and electrical power (plug loads). As shown in Figure 4.3, projected domestic building demand increases by 17% by 2050, with each of the components increasing as well.

Plug loads are projected to increase the most out of the three demand components, with a 37% increase, followed by hot water demands by 22% and space heating by 10%.

The two factors driving the change in demand are housing growth and retrofit of existing buildings. Although building retrofit measures will deliver overall heating demand reduction, adoption of low carbon technologies will drive an increase in electricity consumption, and a corresponding reduction in gas consumption. More detail regarding the change in fuel consumption is provided in Section 4.2.4.

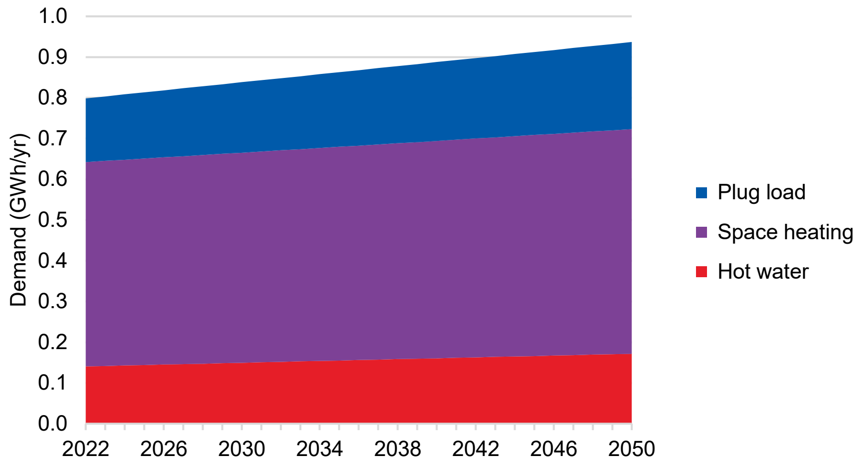

Figure 4.3 Domestic building energy demand

4.2.2 Housing growth in Thurrock

As of 2022, Thurrock consisted of 69,716 domestic buildings. The Essex LAEP modelling assumes housing growth of 30,200 with a linear growth from 2022-2050. The Thurrock Council Local Plan now targets 33,727 new homes by 2050, following the growth trajectory shown in Figure 4.4. This will result in an increase in domestic buildings of 48%, and a total of 103,443 domestic buildings by 2050. This growth is the driver for the projected increase in demand in the domestic building sector.

Energy demand and growth presented in this section are based on the modelled outputs from the Essex LAEP, which made use of the earlier housing growth targets. To account for the difference, the total demand for domestic housing growth in the modelling for this report has been scaled to match the updated targets. As shown in Figure 4.4 the growth trajectories also differ. The modelling for this report assumes the Essex LAEP trajectory.

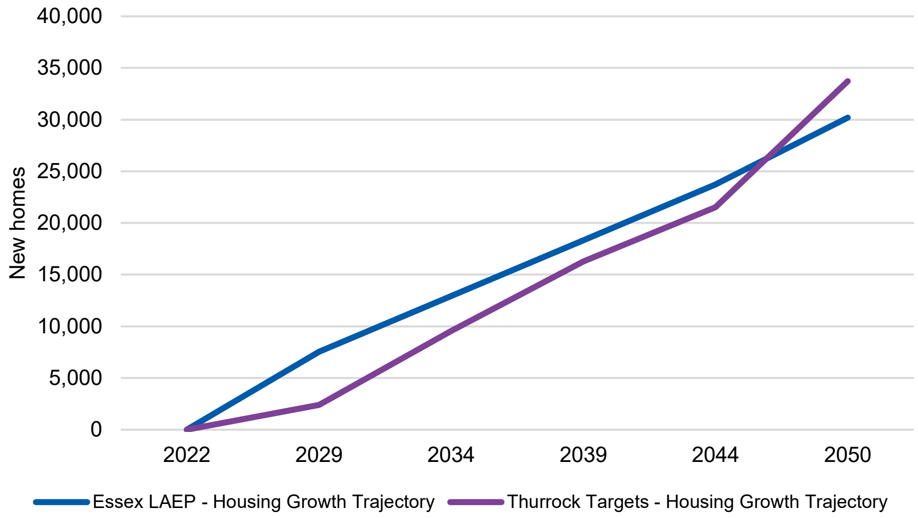

Figure 4.4 Thurrock Council vs. Essex LAEP housing growth trajectory

These projected energy demands are modelled on the assumption that new buildings will be constructed to be highly efficient, in line with the Future Homes Standard. Less efficient new builds would result in higher energy needs than projected. Efficiency measures for new builds include insulation, and efficient heating.

4.2.3 Retrofit potential

Retrofit measures are measures which reduce existing building energy demands, and in turn reduce energy costs.

Shallow retrofits typically comprise loft insulation top-ups, draft-proofing, lighting upgrades, smart thermostats, insulation of hot water and heating pipes and water cylinders, and cavity wall insulation.

Deep retrofits typically comprise the above measures plus external wall and/or floor insulation, high performance windows and doors and integrating smart controls.

Table 4.1 presents the retrofit potential in Thurrock. In total, 23,271 homes were deemed suitable for some form of retrofit, (approx. 33% of existing homes).

Suitability was assessed in the Essex LAEP by mapping he latest EPC data to each property and identifying the level of retrofit measures which could be applied. Where EPC data was not available for a building, the average EPC for the region was assumed.

Table 4.1 Retrofit potential

Retrofit type	No. of properties
Deep retrofit	11,426
Shallow retrofit	11,845

Figure 4.5 and Figure 4.6 show the shallow and deep retrofit potential across Thurrock. There is a high concentration of properties with shallow retrofit potential in the east, from East Tilbury to Corringham and Fobbing. There is also high concentration in the Kenningtons region. Deep retrofits, on the other hand, are more balanced across the entire local authority area with areas of high concentration across the borough.

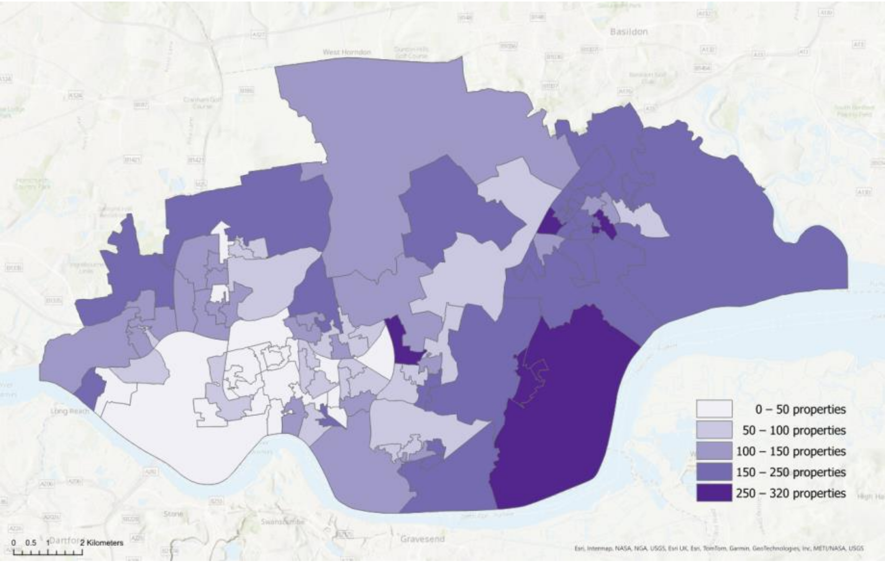

Figure 4.5 Domestic shallow retrofit potential

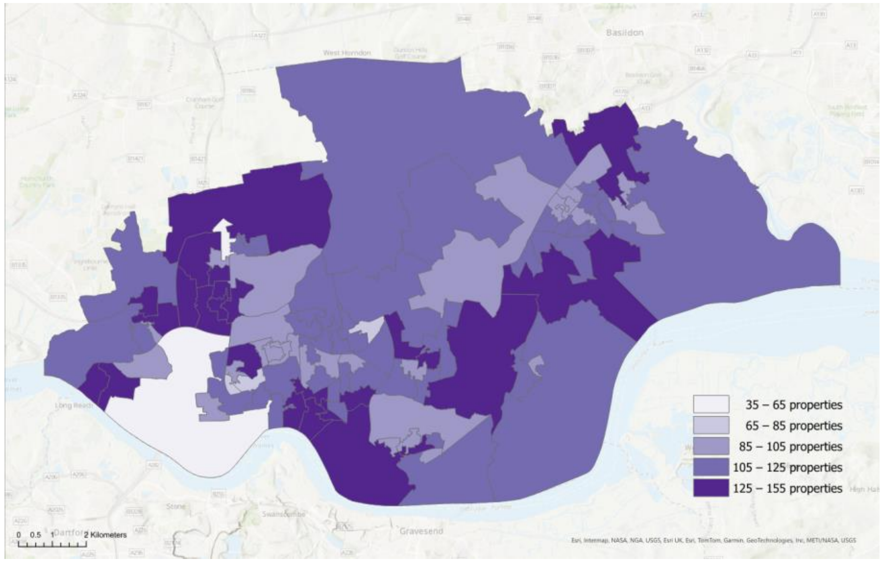

Figure 4.6 Domestic deep retrofit potential

4.2.4 Fuel consumption for domestic buildings

The fuels currently consumed in Thurrock in domestic buildings include electricity, gas and oil, as shown in Figure 4.7. Electricity consumption accounts for approximately 60% of total fuel consumption in 2022. Similar volumes of gas and electricity are used for heating purposes, while grid supplied electricity is used for power needs. A small amount of oil consumption is also present, accounting for areas in Thurrock without gas connections. By 2050, all domestic buildings demand is assumed to be met by electricity.

To decarbonise the heating aspect of building demands, low carbon technologies are assumed to be responsible for meeting all heating demands by 2050. These technologies include air-sourced heat pumps (ASHP), ground-sourced heat pumps (GSHP), direct electric heating and heat networks, and each requires electricity as a supply to operate. For this reason, all energy consumption in 2050 is via electricity.

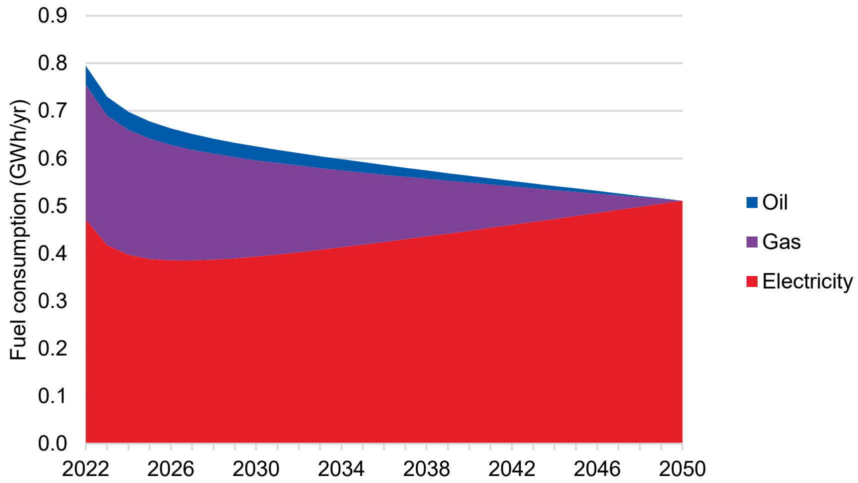

Figure 4.7 Fuel consumption in domestic buildings

The initial drop in electricity consumption is due to a switch from direct electric heating to heat pumps which consume significantly less electricity due their higher efficiency. Electricity consumption then increases to reflect the growth in housing. These observations are also visible in Figure 4.8.

Figure 4.8 presents the assumed change in fuel consumption of heating technologies, over time, for space heating and hot water demands. ASHPs becomes the primary heating technology, with smaller capacities of GSHPs, direct electric heating and heat networks.

While the Essex LAEP modelling suggests a mix of low carbon heating technologies, the assumed installed capacities for each technology are not available. Alternative data sets indicate that 99.9% of homes in Thurrock are suitable for an ASHP and 0.1% are suitable for a GSHP. A total of 17 homes were identified as unsuitable for either, indicating these would require an alternative method of heating, such as direct electric. The total domestic heating related energy consumption for Thurrock, based on this information, is approximately 323 MW.

Figure 4.8 also identifies some heating demand to be supplied via heat networks. Certain areas in Thurrock have been deemed to have the potential for a heat network. This is further discussed in Section 4.5.2.

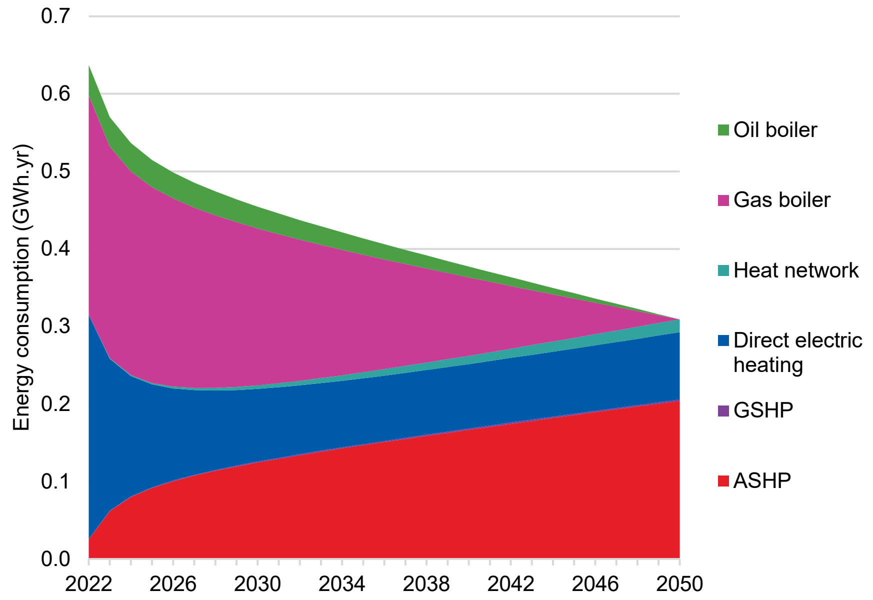

Figure 4.8 Fuel consumption by technology for space heating and hot water demands in domestic building

4.2.5 Priority regions for future infrastructure

As all heating and electricity demand is projected to be met by electricity in 2050, total electricity demand is projected to increase across the borough. Figure 4.9 and Figure 4.11 show annual projected electricity consumption in 2022 and 2050.

In 2022, electricity demand density is highest in areas where there is low penetration of gas infrastructure. This is visible when comparing the domestic electricity demand in Figure 4.9, with the map of gas infrastructure in Thurrock, shown in Figure 4.10.

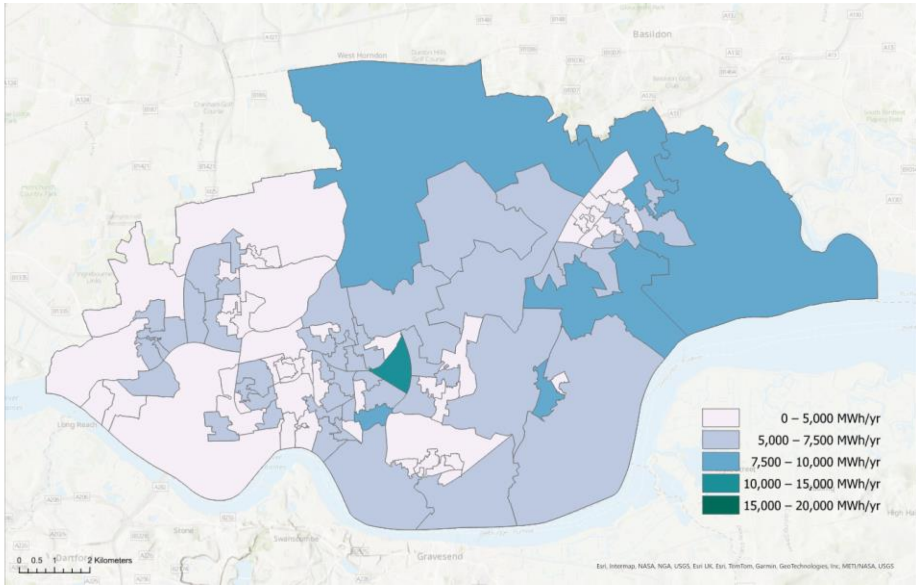

Figure 4.9 2022 domestic buildings electricity consumption by LSOA

As Figure 4.11 shows, by 2050, electricity consumption has increased across the borough.

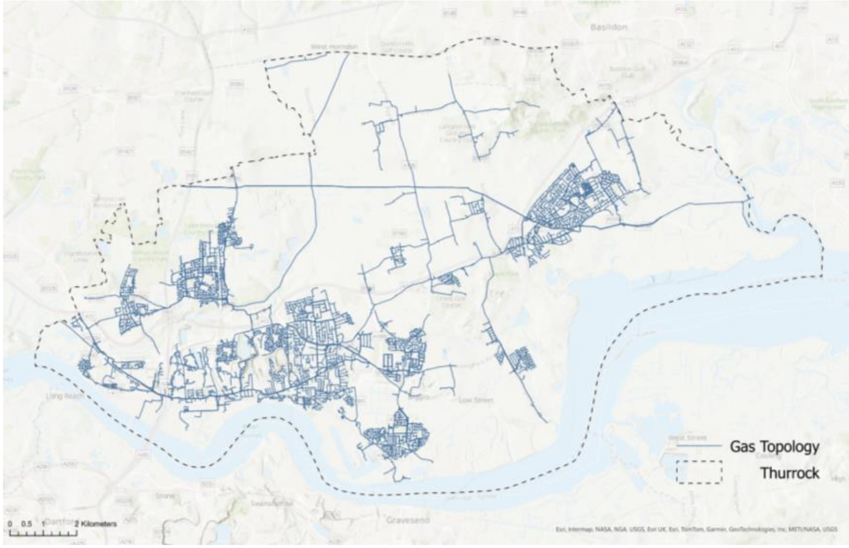

Figure 4.10 Existing gas network in Thurrock

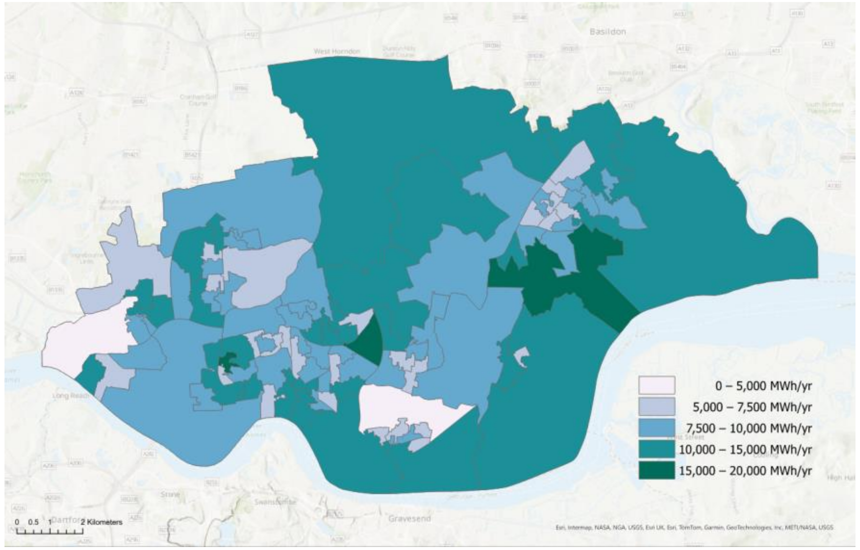

Figure 4.11 2050 domestic buildings electricity consumption by LSOA

As noted in Section 3.3 above, the Essex LAEP modelling assumes even distribution of growth across the borough. The actual planned developments proposed by Thurrock are shown in Figure 4.12.

Projected growth in electricity demand is in part due to the electrification of heating supplies, and in part due to new developments. Growth due to electrification will be distributed across the borough. Growth due to new developments will be specific to the areas outlined in red in Figure 4.12

Further modelling would be required to estimate future energy demands that reflect both the electrification transition as well as the spatial distribution of proposed development areas. If carried out this would show a different distribution of demand across the borough compared with the Essex LAEP modelling outcomes.

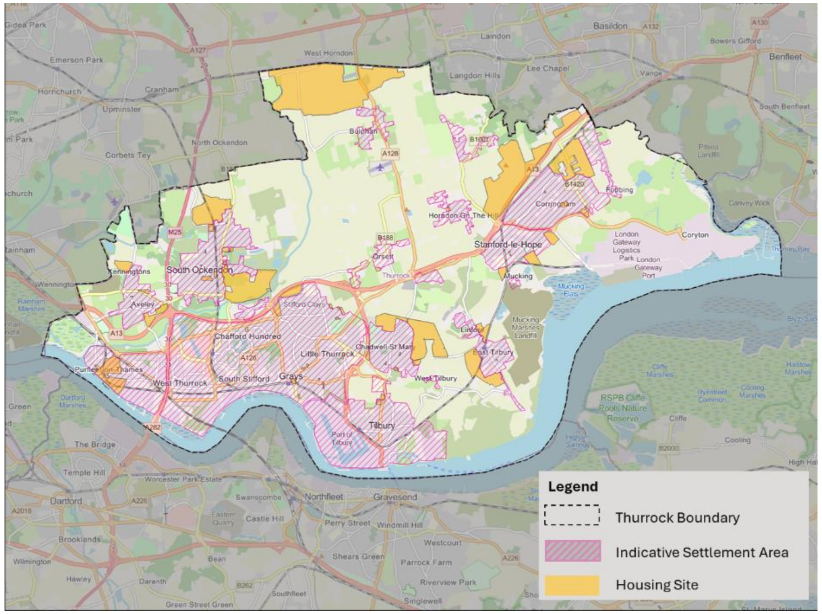

Figure 4.12 Proposed domestic growth locations

4.3 Non-domestic buildings

4.3.1 Overview

Modelling for non-domestic buildings suggests that overall energy demand will decrease by 9% between 2022 and 2050 as shown in Figure 4.13.

Space heating shows the largest decrease at 21%, followed by hot water at 11%. Plug loads (i.e. electrical power) marginally increases at 3%. Compared to domestic buildings, hot water represents a much smaller share of total energy demand in non-domestic buildings. The primary driver of the decrease in demand is the efficiency gains in space heating.

Non-domestic building retrofit measures were included in the modelling and also contribute to the decrease in demand.

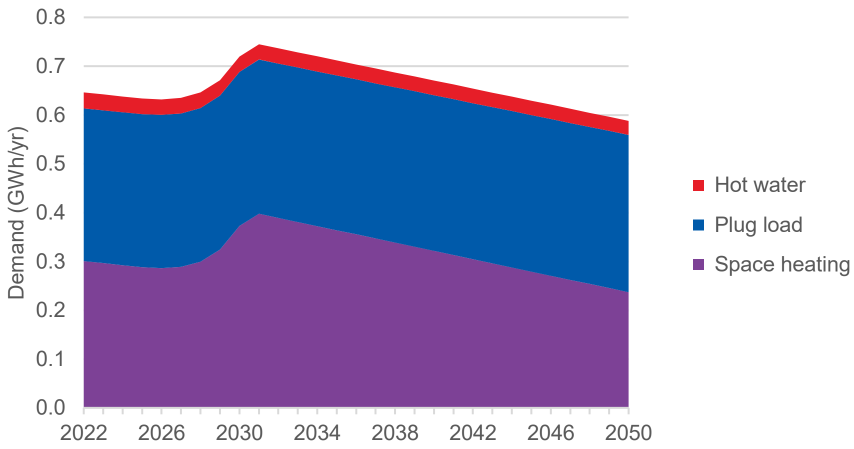

Figure 4.13 Non-domestic energy demand

4.3.2 Non-domestic building growth in Thurrock

As of 2022, there were 4,107 non-domestic buildings in Thurrock, with planned growth of 40 new buildings, an increase of 0.97%. Based on this, demands related to non-domestic building are not expected to greatly increase.

It should be noted that the current growth targets do not include high energy consumption sectors, such as data centres. Introduction of data centres could result in non-domestic demand greatly increasing compared to what has been modelled in the Balanced scenario.

4.3.3 Fuel consumption for non-domestic demand

Demand in the non-domestic building sector is predominantly met by electricity and gas, with a negligible amount by oil, as shown in Figure 4.14. In 2022, electricity made up 66% of demand, while gas accounted for 31% and oil for 3%. By 2050, all demand is assumed to be supplied by electricity.

Similar decarbonisation pathways exist for non-domestic buildings as for domestic buildings. Heating will need to be met by low carbon technologies such as ASHP, GSHP, direct electric heating and heat networks. As these technologies require electricity, electricity consumption increases as heating supplied are decarbonised.

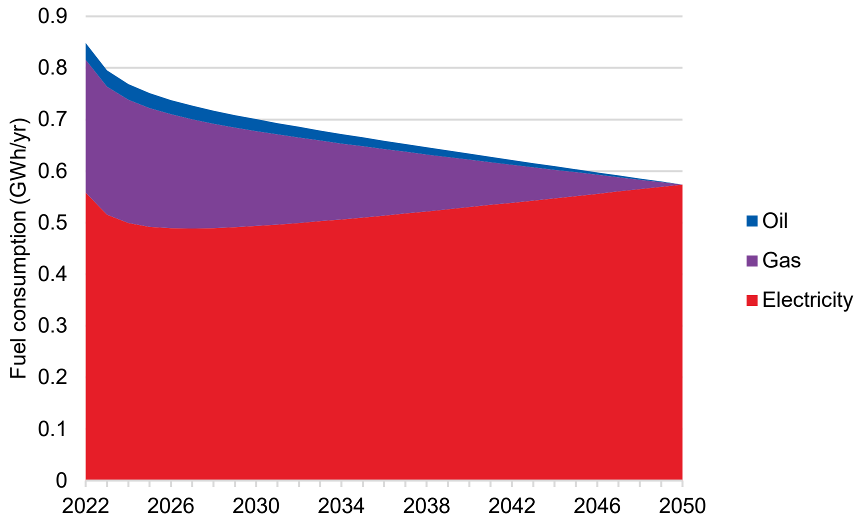

Figure 4.14 Fuel consumption in the non-domestic sector

Figure 4.15 illustrates the energy consumption of each technology in non-domestic buildings. Similar to domestic buildings, ASHPs become the primary heat generation technology, with direct electric heating, and heat networks providing heat as well. Although GSHPs are part of the heating mix, their contribution remains marginal. This is largely due to their lower suitability when compared to ASHPs, driven by the higher installation costs and greater complexity in installation. GSHPs require extensive ground area for piping systems and/or involve drilling boreholes, which can be disruptive and impractical for many buildings.

Similar to the fuel consumption in the domestic building sector, the modelling suggests a mix of different low carbon heating technologies to be deployed by 2050. The assumed installed capacities of each technology are not available. Alternative data sets indicate that 74% of non-domestic buildings in Thurrock are suitable for an ASHP. The remaining 26% of buildings have not been identified suitable for an alternative heat pump, indicating that direct electric heating, or another technology may be required.

The peak fuel consumption for heating for buildings deemed suitable for an ASHP is approximately 95 MW. Further studies are required to understand the heating arrangements for the remaining 26% of non-domestic buildings.

Heat networks have also been identified as an option for certain non-domestic buildings, in areas where heat networks have been deemed viable. This is discussed further in Section 4.5.2.

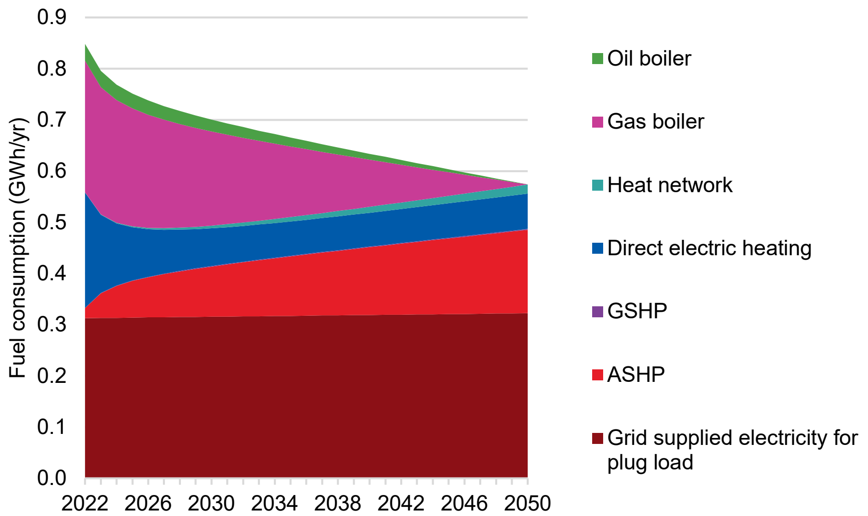

Figure 4.15 Technologies utilised for demand in non-domestic buildings

4.3.4 Priority regions for future infrastructure

Under the Balanced modelling scenario, all heating demands in non-domestic buildings are assumed to be met by electricity in 2050. As a result, electrical demands of non-domestic buildings are projected to increase by 2050. Figure 4.16 and Figure 4.17 show the electricity demand by LSOA, for 2022 and 2050.

The dark area in the southwest of these two figures relates to the West Thurrock area. There is also minor demand growth in the southern parts, near the Port of Tilbury. It should be noted that the modelling does not account for demand from high energy use sectors, such as data centres. If any such projects come forward these will have a significant impact on future electricity demand distribution in the borough.

Only a small number of new non-domestic buildings are currently projected in Thurrock by 2050, indicating that while demands are expected to increase, the projected increase in demand will primarily be associated with electrification, rather than new build.

As previously noted, the Essex LAEP modelling assumes even distribution of growth across all LSOAs in the borough. Therefore, projected increase in electricity demand due to new development reflects the locations of existing non-domestic loads rather than planned non-domestic development sites.

When comparing the locations of planned developments shown in Figure 4.18 against the modelled 2050 demand shown in Figure 4.17 it is evident that some non-domestic growth will take place in areas that are not highlighted for increased demand, in particular in the far east of the borough.

Further modelling would be required to estimate future energy demands that reflect both the electrification transition as well as the spatial distribution of proposed development areas, If carried out, this would show a different distribution of demand across the borough compared with the Essex LAEP modelling outcomes.

Therefore, while the overall total increase in demand is correct, the distribution across the borough shown in Figure 4.17 does not match the planned growth distribution.

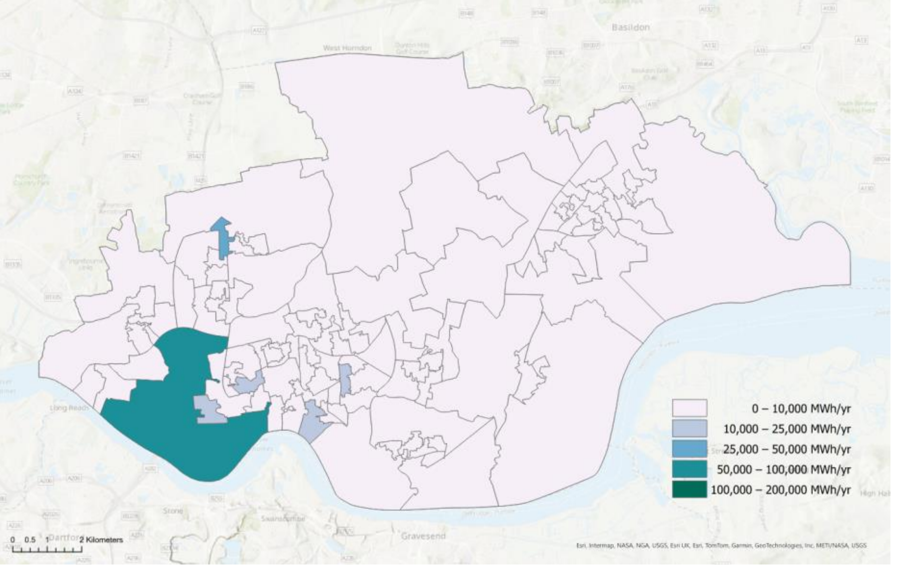

Figure 4.16 2022 non-domestic buildings electricity demand

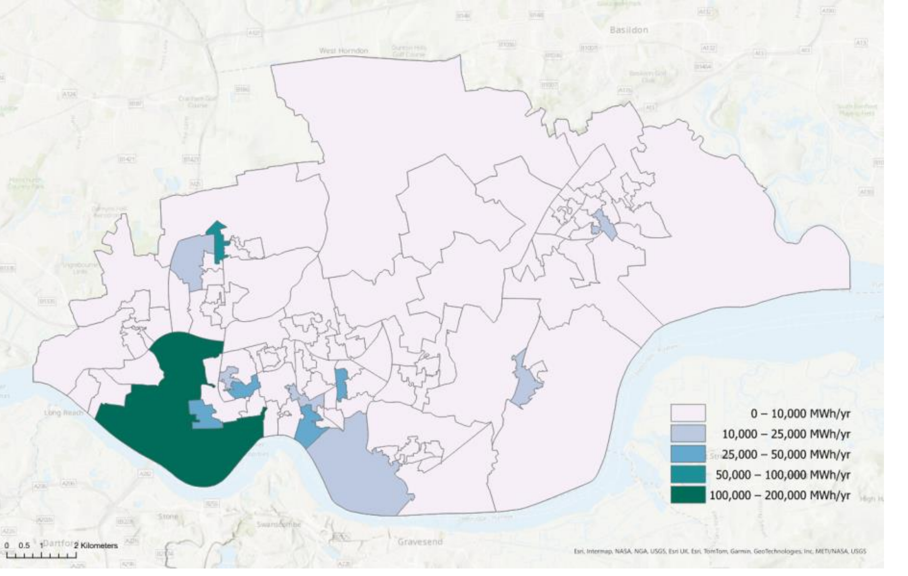

Figure 4.17 2050 non-domestic buildings electricity demand

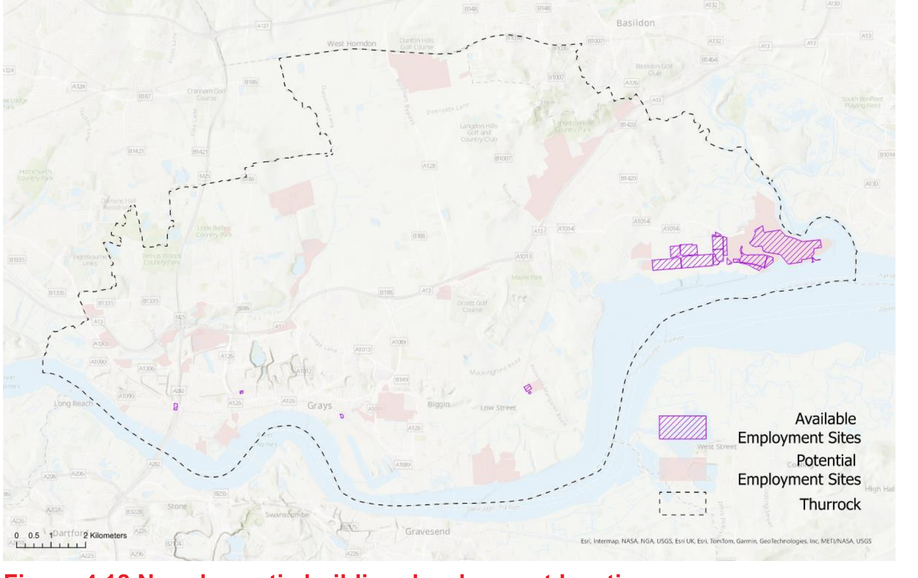

Figure 4.18 Non-domestic building development locations

4.4 Transport

4.4.1 Overview

The transport sector consists of energy demand associated with cars, buses, light goods vehicles (LGV) and heavy goods vehicles (HGV). Figure 4.19 illustrates the projected change in energy demand for transport in Thurrock between 2022 and 2050. Overall, a 47% reduction in demand is projected, with the largest decrease occurring in energy for car use.

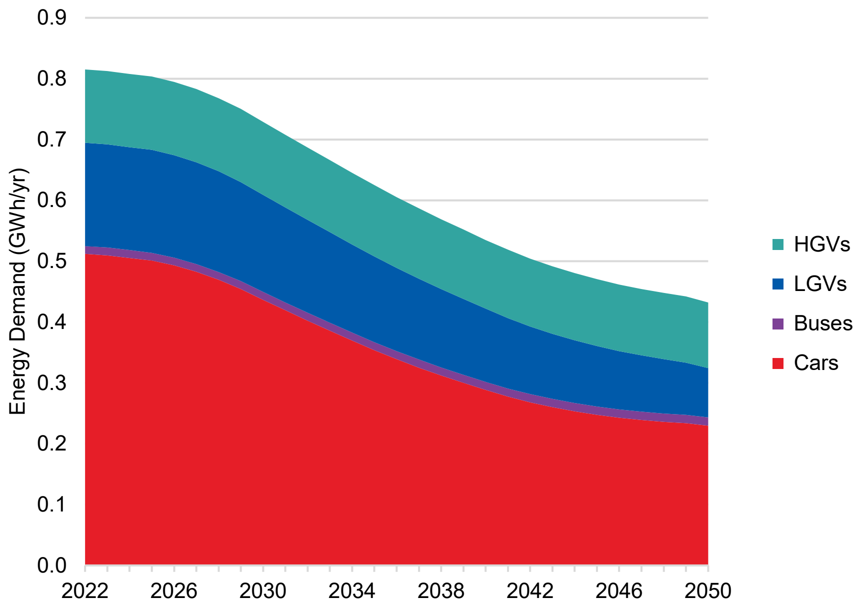

Figure 4.19 Transport energy demand

4.4.2 Fuel consumption

Figure 4.20 shows the projected change in fuel consumption mix in the transport sector between 2022 and 2050. Electricity consumption is marginal in 2022, at less than 1% of total transport demand, however all demand is met by electricity by 2050.

The modelling completed as part of the Essex LAEP assumes full electrification of the transport sector by 2050. This assumption is in line with the Carbon Change Committee's 7th Carbon Budget. While this is a viable method for decarbonisation, there are alternative fuels which may also assist in decarbonising the transport sector. For example, in Thurrock, several hydrogen studies and pilot projects are underway exploring the viability of hydrogen use for transport. Hydrogen may play a role in fleet vehicles (HGVs and LGVs) due to the longer driving range, faster refuelling time and lighter weight that is offered.

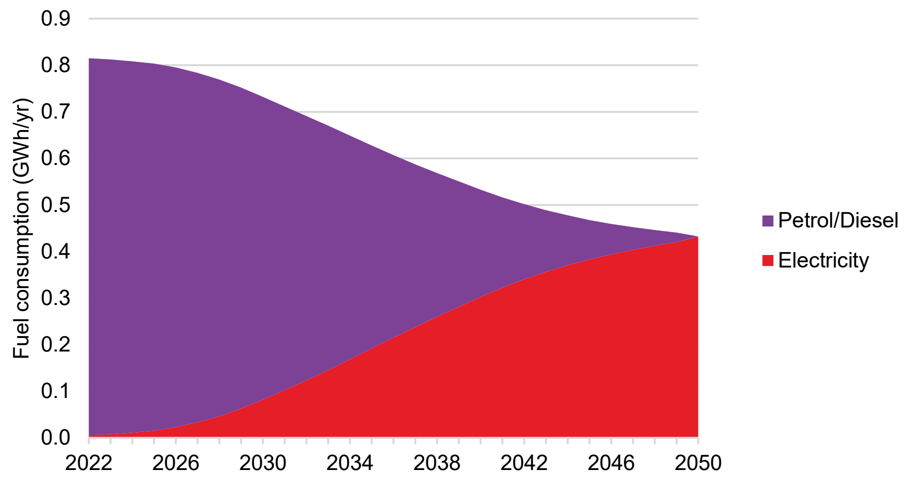

Figure 4.20 Fuel consumption in transport sector

4.4.3 Priority locations for EV chargers

New EV charging stations will be critical infrastructure to decarbonisation of the transport sector. The placement of this infrastructure is also important as access to EV charging will further incentivise the uptake of EVs. In support of this goal, Thurrock Council have received a grant from the Local EV Infrastructure Fund (LEVI) to install more on-street EV chargers across the borough.

2022 electricity demands were calculated in the Essex LAEP using sector level fuel consumption numbers, which were then estimated at LSOA level on the basis of census data. Projected electricity demands were then calculated by applying a percentage uplift to each LSOA, based on growth projects published by Department for Transport.

Figure 4.21 and Figure 4.22 show the projected electricity demand density for transport for each LSOA. The areas where electricity demand for transport is located are not expected to change between 2022 and 2050, however the magnitude of demand is projected to increase.

EV charging infrastructure could be placed at these locations, as well as at service stations along the route, to assist in the switch to electrified vehicles.

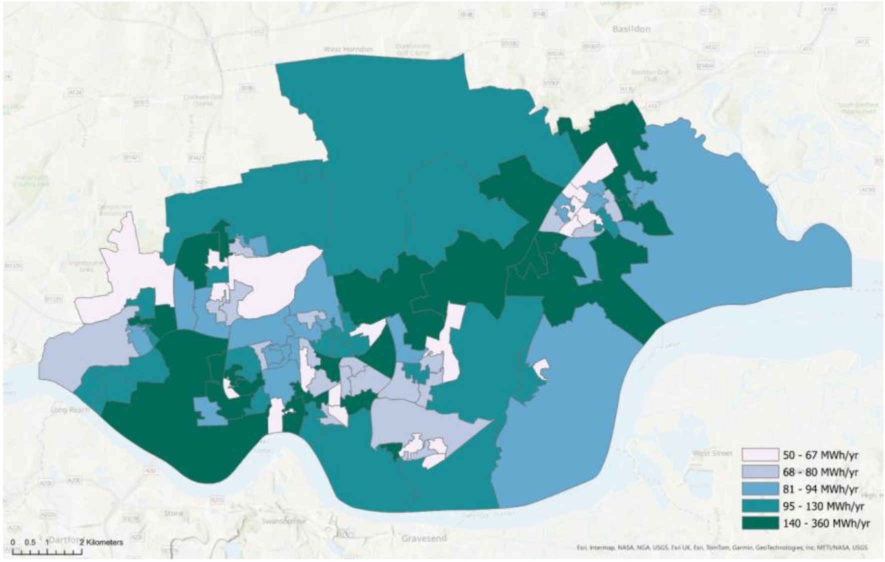

Figure 4.21 2022 transport electricity demand

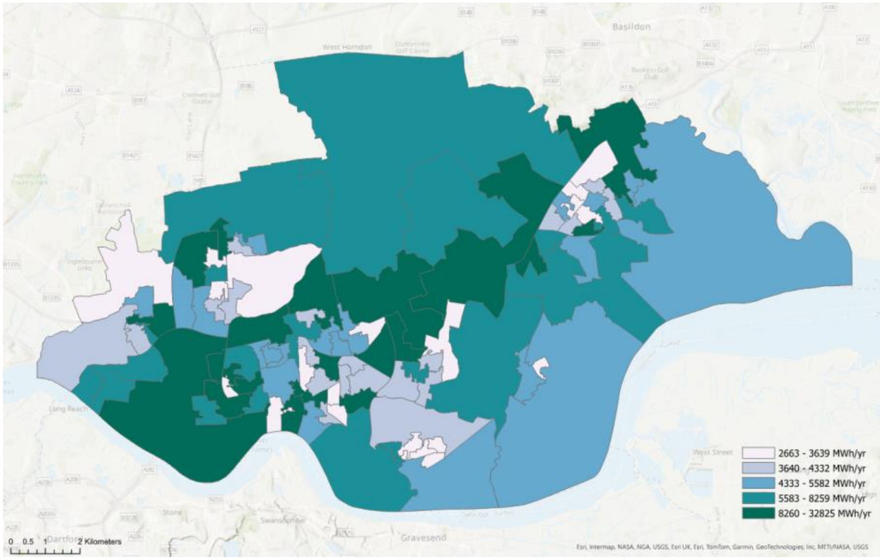

Figure 4.22 2050 transport electricity demand

Figure 4.23 shows the locations of existing public EV charging points in Thurrock. The majority of charge points exist in the west Thurrock region, with a single charge point in Stanford-le-Hope.

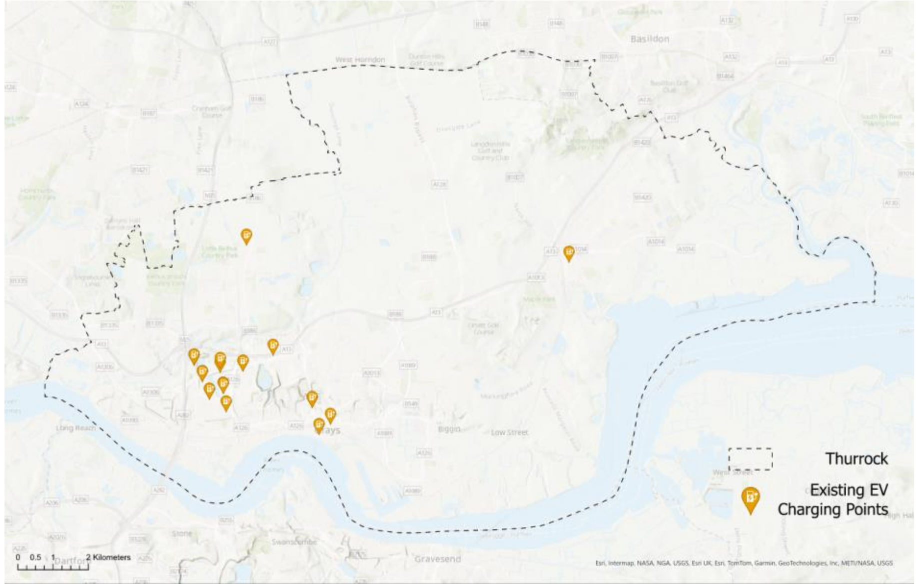

Figure 4.23 Existing EV chargers in Thurrock

Thurrock Council have a recently completed study that identifies priority locations for new residential and commercial public EV charging points. Residential (at home) charging demand is forecast to be highest in Chafford Hundred, Greys, Purfleet-on-Thames and Tilbury. Locations for commercial charging include Grays Multi-storey Car Park, Lakeside Shopping Centre, Tilbury industrial zones, Purfleet Docks and London Gateway. (Link here to the full report).

The recently approved Lower Thames Crossing will increase journeys through Thurrock and any electricity charging stations along this route will increase energy demand in the borough. This was not included in the Essex LAEP modelling and is therefore not reflected in this study, however the overall impact is likely to be small.

4.5 Energy generation and supply infrastructure

4.5.1 Renewables

The Essex LAEP modelling identifies the capacity of renewable infrastructure required to meet the targets set out in the CCC 7th Carbon Budget. In addition, analysis of the land available was also carried out to ensure that the modelling outcomes are viable in the local context, as discussed below. This modelling considered rooftop PV on domestic and non-domestic buildings, ground mounted solar PV and onshore wind.

As shown in Figure 4.24, renewable capacities in Thurrock are projected to increase by a factor of around 30. Ground mounted PV is projected to account for 82% of total capacity, while onshore wind and rooftop PV will be present in smaller capacities.

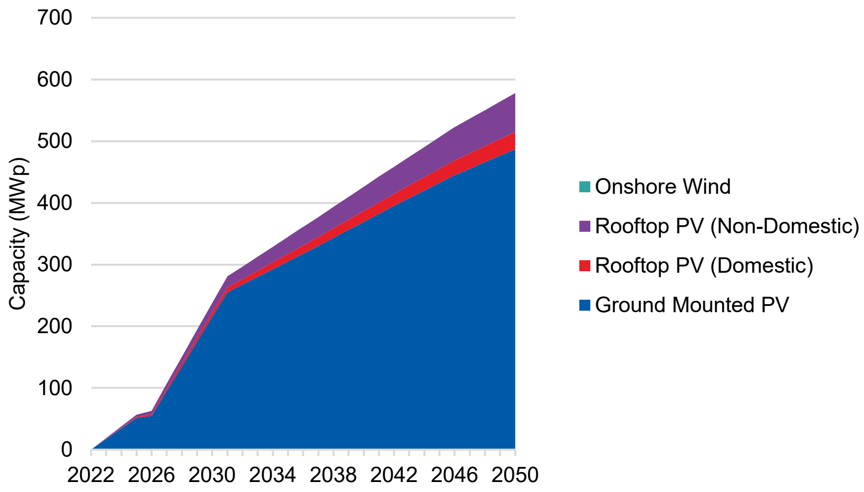

Figure 4.24 Renewable infrastructure deployment rate in Thurrock

Existing capacity

Currently, less than 32 MWp of rooftop PV capacity exists on domestic and non-domestic buildings across Thurrock. This is projected to grow to 123 MWp by 2050. Ground-mounted PV is projected to grow from 105 MWp to 592 MWp, and 9 MWp of onshore wind installations are projected for Thurrock by 2050, with 11.7 MWp of capacity already present.

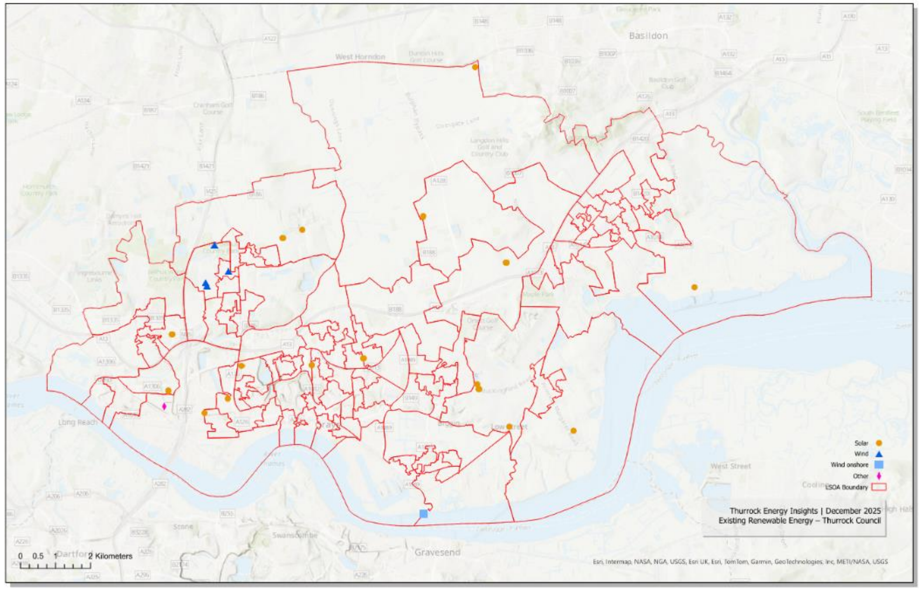

Figure 4.25 Existing renewable energy generation assets

Short term renewable capacity plans

Currently 184 MWp of ground mounted and rooftop PV projects exist in the planning stage. This includes projects which have been granted planning permission and are awaiting construction, or planning permission is awaiting approval. No onshore wind projects are in this database, while this does not present as a major issue due to the low capacity required, additional capacity should be encouraged.

Figure 4.25 illustrates the existing capacity of renewables and the projects currently in the planning database, over the next few years. The largest of these projects is 49.5 MWp. Assuming these are operational within 3 years, renewable deployment in Thurrock is ahead of the deployment rate identified in the modelling. However, further renewable incentivisation should be implemented to ensure this remains true.

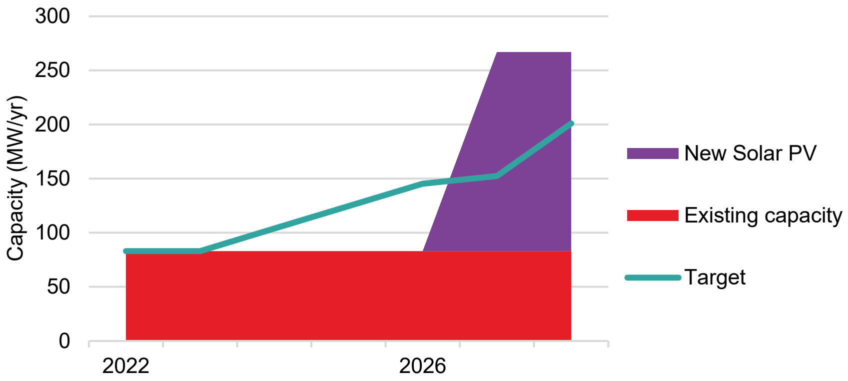

Figure 4.26 Existing and planned capacities of renewables in Thurrock

Alternative renewable technologies

Two separate datasets are available which present existing and planned electricity generation, and storage assets in Thurrock, as shown in Figure 4.27. These are the Renewable Energy Planning Database (REPD) and the Embedded Capacity Register (ECR). These datasets identify several operational and planned renewable electricity generation assets including over 100MW of biofuel-based electricity generation capacity, and 250MW of BESS capacity in operation. A further 630MW of BESS is under construction or awaiting approval.

While the Essex LAEP did not consider alternative renewable assets, such as biofuels, diversifying the renewable mix by including these can increase the resilience of power supply in Thurrock. The large-scale BESS capacity in planning also allows for further flexibility of electricity supply, especially for assets such as solar. Inclusion of BESS can reduce the amount of curtailment that occurs from renewable sources such as solar and wind.

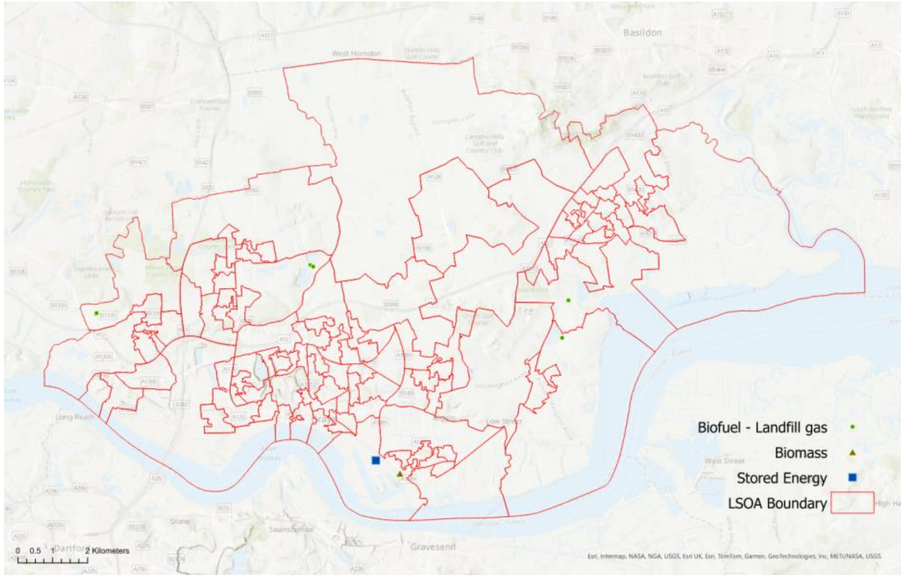

Figure 4.27 Alternative (non-wind and solar) renewable assets in Thurrock

Ground mounted PV

The rate of deployment for ground mounted PV, as determined by the Balanced scenario modelling, is shown in Figure 4.28. 590 MWp of ground mounted PV is projected by 2050. The deployment rate for solar is relatively even, with a slightly faster increase in capacity between 2026 and 2032.

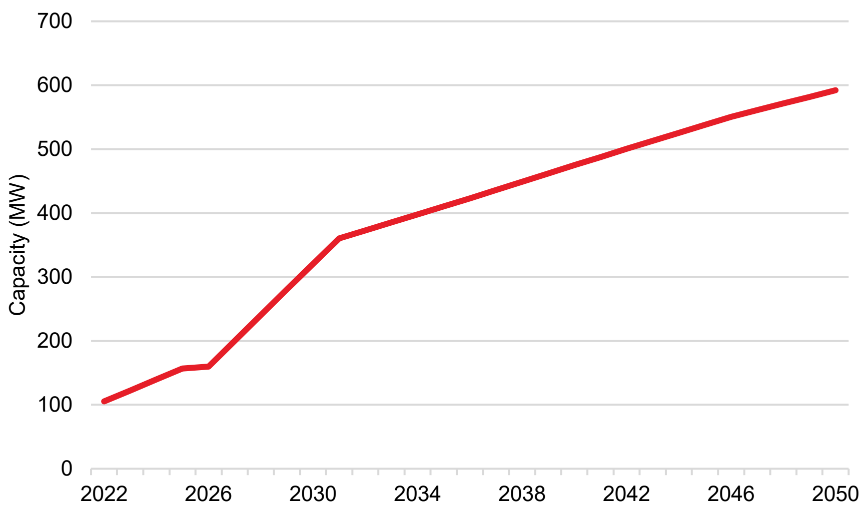

Figure 4.28 Ground mounted PV deployment rate

In Thurrock, between 620 and 2,800 MWp of potential ground mounted PV capacity is available. While there is adequate land available to meet the 2050 PV capacity, a detailed solar PV land availability assessment is recommended in order to prioritise the most suitable areas. This may be completed in the form of a Supplementary Planning Document.

Figure 4.29 shows the upper limit of potential capacity by LSOA, while Figure 4.30 shows the lower limit of potential capacity by LSOA. As these two figures identify, the highly suitable land is in the east and west of Thurrock.

According to the REPD, solar capacity approved or under construction is expected to deliver 184 MWp by 2027. In addition to the existing 105 MWp, the total ground-mounted PV capacity available in the near term is 289 MWp. This is ahead of the projected capacity for 2027, by 89MWp. This highlights Thurrock's commitment towards increased energy security and economic growth through decarbonisation.

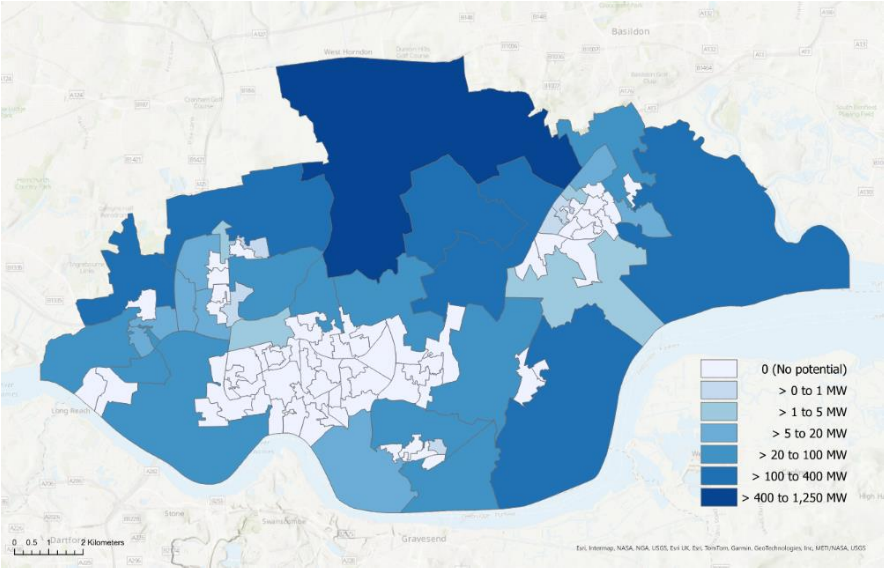

Figure 4.29 Ground mounted PV (upper) potential by LSOA

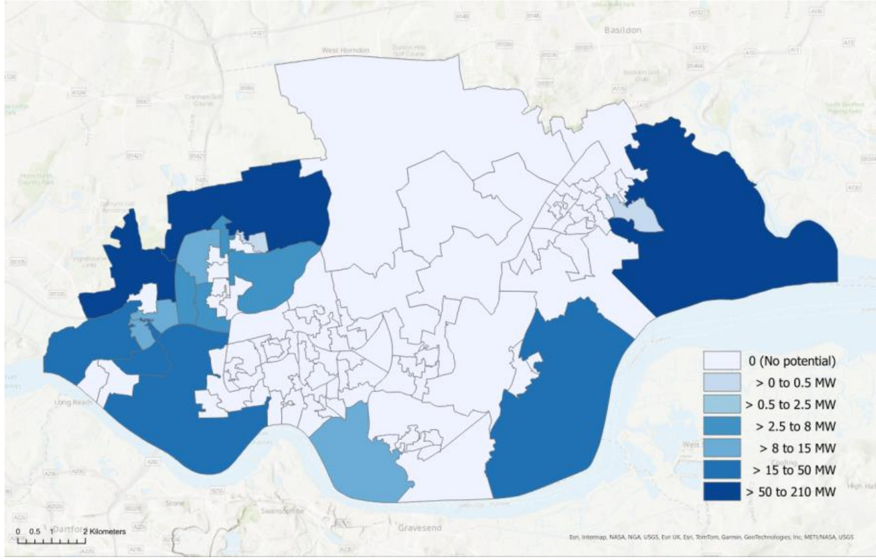

Figure 4.30 Ground mounted PV (lower) potential by LSOA

Onshore wind

A total of around 9.4 MW of onshore wind capacity has been modelled for Thurrock, by 2050, as shown in Figure 4.31. However, 11.7 MW of onshore wind capacity currently exists in Thurrock, which exceeds the required capacity. The existing wind farms were commissioned in 2012 and are expected to be decommissioned in late 2020s or early 2030s. Therefore, incentivisation of new wind turbines in the area should still be considered to maintain capacity beyond that point. Currently, there are no onshore wind projects in the planning database, for Thurrock.

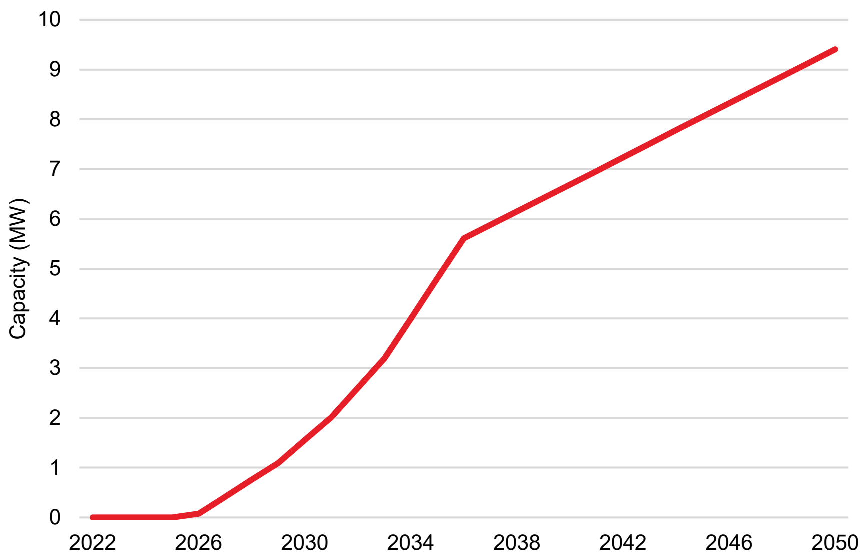

Figure 4.31 Onshore wind deployment rate

Figure 4.32 illustrates the potential for onshore wind development within Thurrock. There is availability for 84 MW of onshore wind potential across Thurrock. The areas in the north and east of the borough are the most viable regions, likely due to the availability of land. While there is a limited amount of capacity available for onshore wind in Thurrock, this is not a major issue. The projected capacity of 9.4 MW of onshore wind by 2050 equates to approximately 2-3 turbines at current day wind turbine generator (WTG) capacities. This is a minor capacity which should not present major issues.

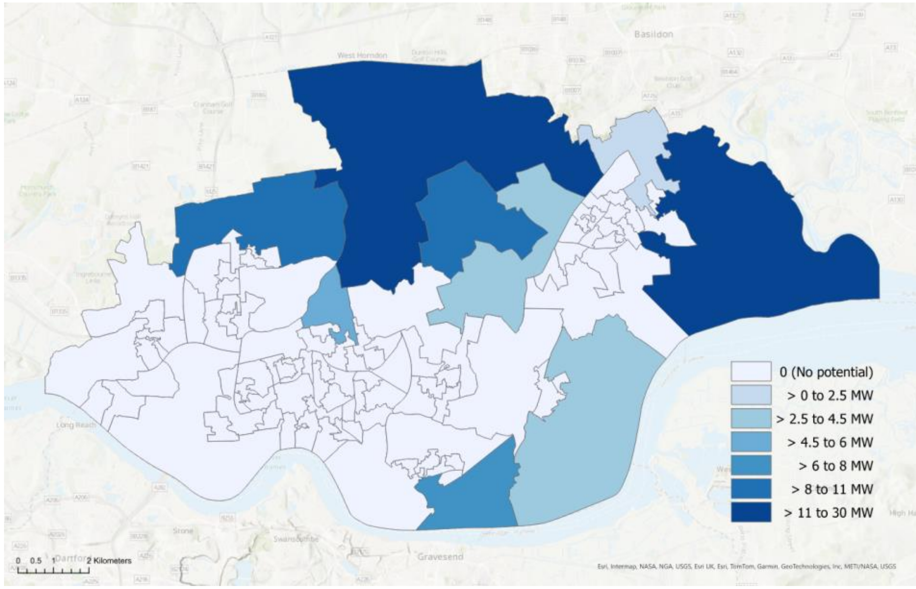

Figure 4.32 Onshore wind potential land

Rooftop PV

The modelled capacity of rooftop PV in Thurrock, by 2050, is 105 MWp, split between rooftop PV on domestic and non-domestic buildings. The majority of installations occur on non-domestic buildings. The uptake of rooftop PV is relatively linear over time, with a marginal increase in pace in the mid-2020s, as shown in Figure 4.33.

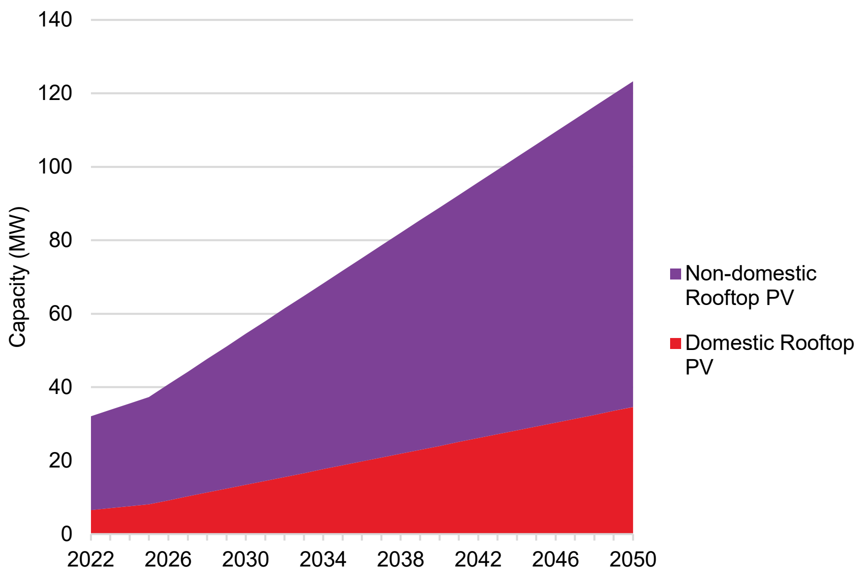

Figure 4.33 Rooftop PV deployment rate

The modelling has identified 44,872 existing buildings, a mix of domestic and non-domestic, as suitable, representing a combined peak capacity of 335MWp. The rooftop PV capacity required to meet 2050 projections is 35 MWp on domestic buildings, and 89 MWp on non-domestic buildings. This total capacity represents 37% of the existing potential. This equates to approximately 16,500 homes to meet the projected 2050 target.

A small percentage of buildings were deemed unsuitable for rooftop PV. Buildings may not be suitable for PV for a wide array of issues, such as if they are listed, if structural issues are present or if there are negative visual impacts. The greatest concentration of suitable buildings is in Grays, Chadwell St Mary, Stanford-le-Hope, and Corringham, making these priority areas for deployment.

4.5.2 Heat networks

Thurrock was highlighted in the Essex LAEP as having significantly greater potential for heat network development than other local authority areas in the county. Consequently, it is expected to meet a larger share of its heat demand through heat networks.

Two studies have been completed which assess the viability of a heat network in Thurrock. The Element Energy dataset was used in this study due to its completeness and consistency. The LSOAs where a heat network was deemed viable are highlighted in Figure 4.34. Potential future heat networks are concentrated in the west of Thurrock and Purfleet, making these priority areas for development.

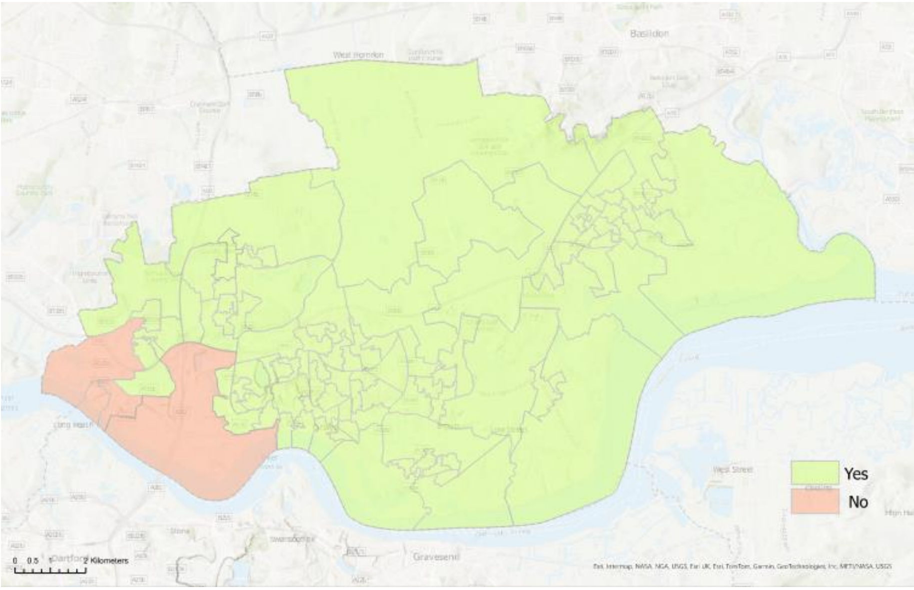

Figure 4.34 Heat network potential for Thurrock

Assuming heat networks meet all heat demand within the LSOAs identified as suitable, the estimated capacity suggests that 17% of Thurrock's total heat demand could be supplied by heat networks. A breakdown of demand met by heat networks is presented in Table 4.2. It is unlikely this coverage would be achieved; therefore this represents the upper limit of potential for heat network adoption.

Table 4.2 Heating demand met via heat networks in 2050

Demand type	Demand met	Unit
Domestic buildings	49.0	GWh/year
Non-domestic buildings	121.9	GWh/year
Percentage of total	17%	percent

4.5.3 Grid infrastructure

As the energy market transitions to net zero, and sectors move towards electrification, there is likely to be a need for new and additional grid infrastructure. Figure 4.35 shows the current available headroom in the electrical network in Thurrock. There is sufficient capacity currently, but as the move towards low carbon technologies and EV vehicles increases, it is expected that this may become constrained.

Future estimated peak electricity demand was not available for this study and therefore 2050 substation capacities have not been assessed. However, UKPN undertake long term planning that includes consideration of energy transition activities such as the Essex LAEP and is working with Homes England and local stakeholders to incorporate housing growth plans from published local authority Local Plans. This should allow UKPN to plan for efficient network development in the medium to longer term.

Existing headroom on the distribution network suggests that there will be few constraints to electrification in the short term.

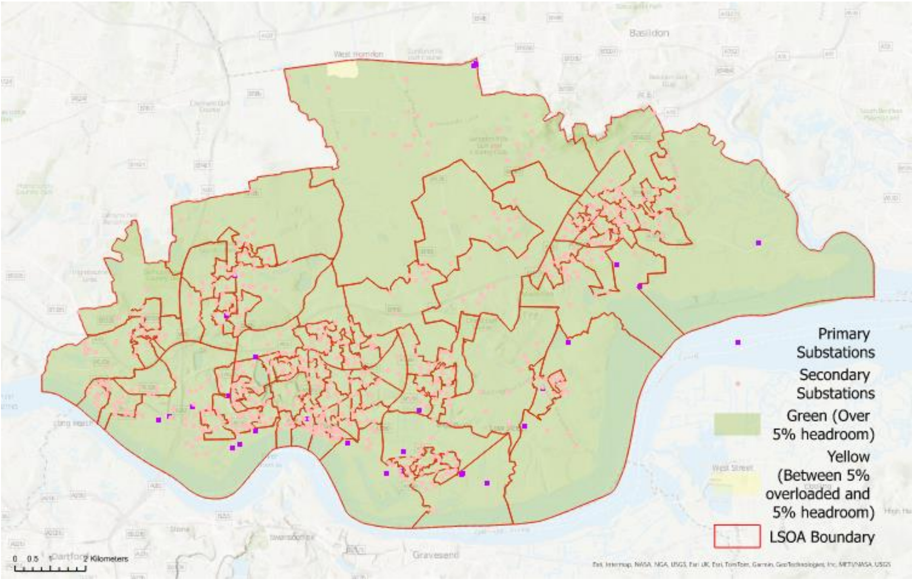

Figure 4.35 Current grid infrastructure capacity

5. Impacts of measures

As mentioned previously, the modelling carried out for this study aimed to identify the change required to transition the energy system to meet future demand sustainably and affordably. This section reviews larger scale impacts of this change.

5.1 Emissions

5.1.1 Total system operational emissions

Operational carbon emissions refer to emissions generated during the operation of a building, infrastructure, or system. In this context, operational emissions relate to the emissions associated with the generation of energy. This includes emissions associated with generation of grid electricity, consuming natural gas from the gas network, petrol/diesel consumption from vehicles and oil consumption for heat or electricity generation.

Operational carbon emissions are projected to reduce to 2% of 2022 emissions as shown in Figure 5.1. In 2022, approximately 409kt CO_2e was emitted, primarily from petrol/diesel and natural gas consumption. This is projected to reduce to 8kt by 2050, with the only emissions occurring from grid electricity consumption.

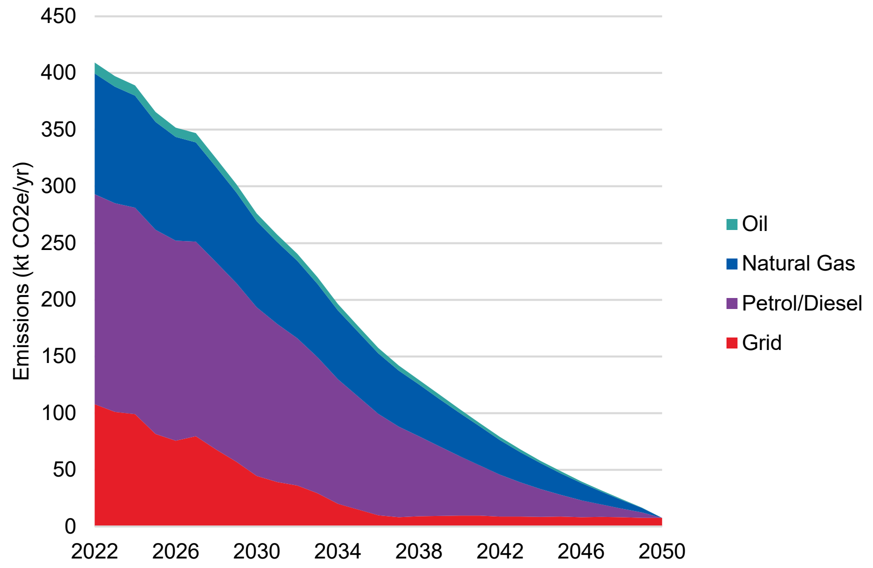

Figure 5.1 Projected CO_2e emissions in Thurrock

Figure 5.1 shows an initial increase in emissions from grid electricity, between 2022 and 2026, even though carbon intensity of the grid is consistently decreasing (Figure 5.2). This is due to electrification of heating in the domestic and non-domestic sectors. As grid is projected to decarbonise the associate emissions from energy consumption drop sharply.

A full transition to electric systems by 2050 still results in residual emissions due to the remaining carbon intensity of grid electricity. Figure 5.2 illustrates the projected decarbonisation of the electricity grid to 2050, as estimated by the National Energy Systems Operator (NESO). Residual emissions persist from around 2035 onwards, primarily associated with dispatchable generation sources such as gas-fired power, which prevent total grid related CO_2 emissions from reaching zero.

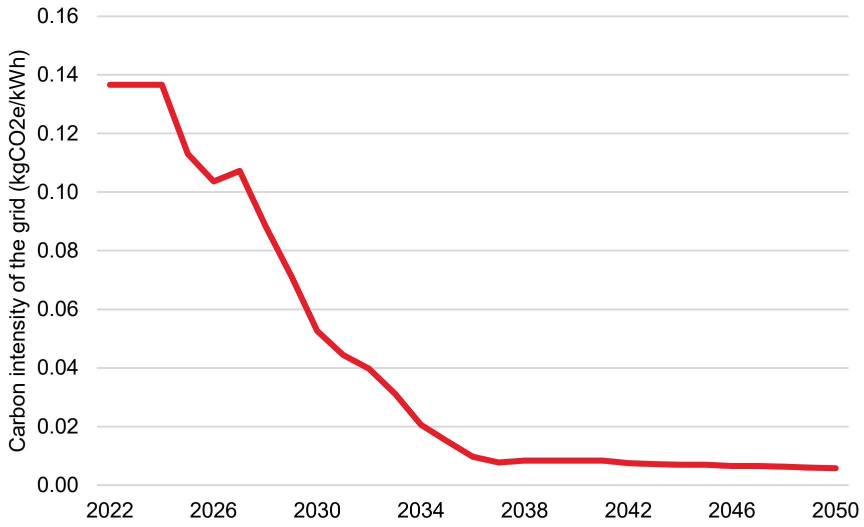

Figure 5.2 Projected carbon intensity of the UK electricity grid

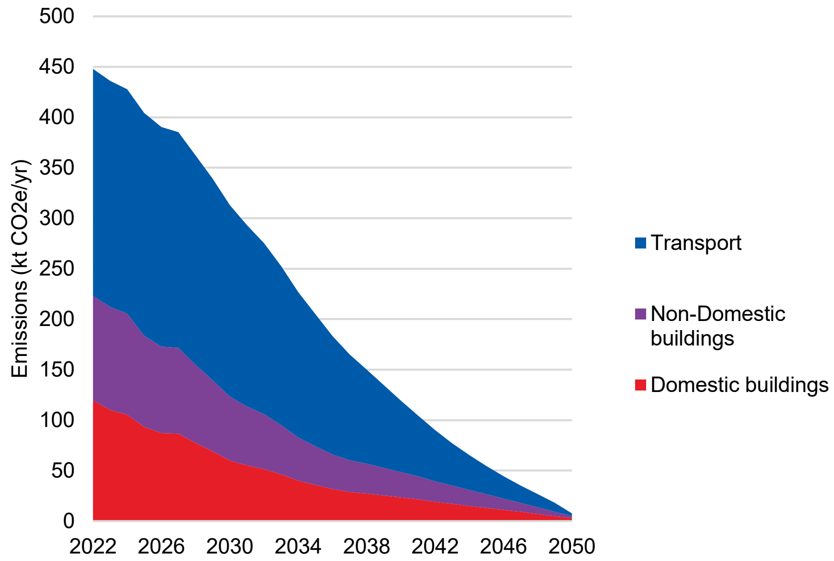

Figure 5.3 Projected carbon emissions by sector

5.1.2 Operational emissions by sector

Figure 5.3 represents the total emissions from each sector, over time. The largest emitter is the transport sector, contributing to 66% of all emissions in 2022. Non-domestic and domestic buildings account for similar emissions, making up 18% and 17% of all emissions in 2022, respectively.

All three sectors still have remaining emissions in 2050, albeit at marginal amounts. Each sector reduces to less than 5% of 2022 emissions, with the residual amount being due to electricity consumption from the grid.

The transport sector is currently the largest carbon emitter of the three. Within this sector, cars present the largest volume of emissions, followed by LGVs and then HGVs, as shown in Figure 5.4. Transition from ICE vehicles to EVs presents the highest potential for emissions reduction in Thurrock.

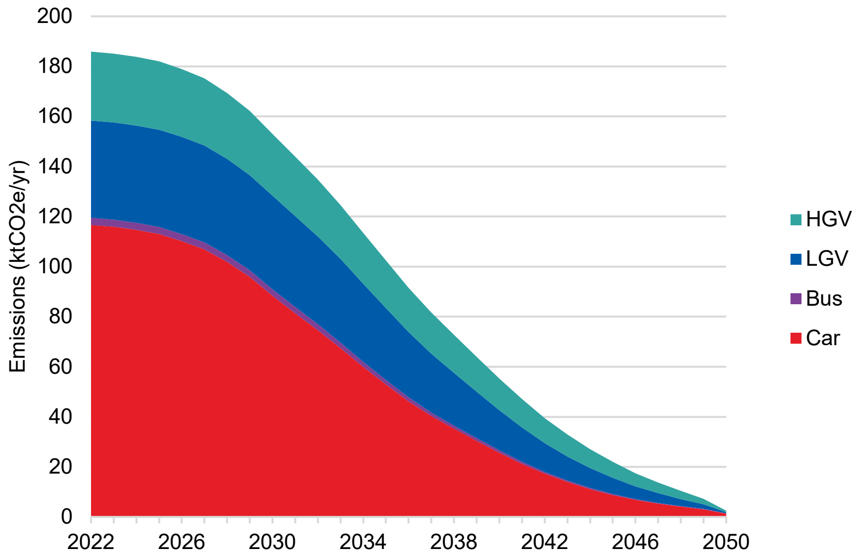

Figure 5.4 Projected carbon emissions in the transport sector

5.1.3 Embodied carbon

Embodied carbon emissions are emissions associated with the raw materials extraction, manufacturing and processing, transportation and logistics, construction and installation and decommissioning of buildings and infrastructure.

An embodied carbon analysis has not been completed for this study due to the lack of standardised calculation methods, limited information and complexity in emissions tracking over supply chains.

While there is complexity in calculating embodied emissions, a growing number of UK local planning authorities have begun focusing on this. For example, the Greater London Authority (GLA) has published guidance for the preparation of whole life-cycle carbon (WLC) assessments. WLC assessments are now required for strategic developments in the Greater London area.

Essex County Council have recently published the Embodied Carbon & Circular Economy Planning Policy Statement (October 2025) (link here). This policy statement sets out requirements that all new buildings must demonstrate how design and construction will use materials and resources efficiently, minimise waste, and use high quality, natural and locally sourced, low carbon materials where possible.

A study providing the technical evidence that underpins the policy is available here.

5.2 Intervention costs

This section covers the magnitude of investment required to deliver the energy transition. It should be noted that this is not the investment which will be required by the council, rather the cost of the entire energy transition. Also, costs are related to energy transition and retrofit activities. Costs associated with new developments are not included.

The base information for costs is in 2023 prices. As such, all prices presented are also in 2023 prices.

The total estimated investment required for the energy transition in Thurrock is at least £1.44 billion, as shown in Figure 5.5. This includes the investment associated with renewables, shallow retrofit and deep retrofit but does not include new heat networks, grid upgrades and new grid infrastructure.

The methodology for the development of the costs is presented in Section 3.2.

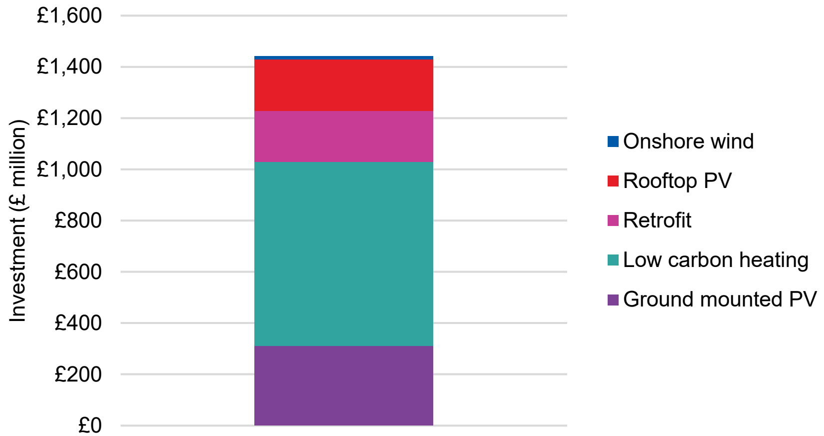

Figure 5.5 Total investment required for the energy transition

5.2.1 Renewables

The total system costs for the different renewable electricity generation technologies are presented in Figure 5.6. The total investment required for 725 MWp of renewables, across rooftop PV, ground mounted PV and onshore wind is estimated as £527 million.

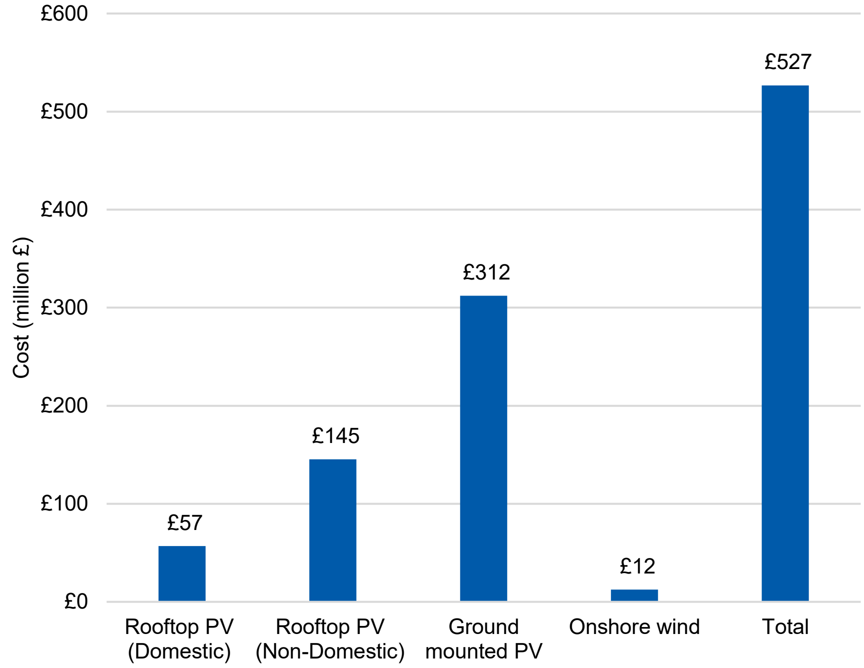

Figure 5.6 Renewable investment required to meet 2050 projections

5.2.2 Low carbon heating and retrofit

The Essex LAEP modelling indicates that heat decarbonisation of buildings would occur via ASHPs, GSHPS and direct electric heating. However, no information has been provided regarding costs relative to this. In the absence of cost information, data from the LAEP+ tool has been used, which indicates the heat pump suitability of each home in Thurrock. This data suggests that 98% of homes can be decarbonised via a heat pump. This has been used as the basis to estimate investment costs for low carbon heating in Thurrock.

The total investment required to decarbonise heating in buildings, and retrofit suitable homes is estimated to be £915 million, as shown in Figure 5.7.

An estimated £716 million is required to fit heat pumps in all suitable buildings to decarbonise heating. Most of this cost is associated with ASHP installation. An additional £200 million pounds is required for the retrofit of homes.

Although the total investment required to decarbonise Thurrock's energy system is £915 million, it is important to recognise that maintaining the current system also incurs significant costs. These include the expenses related to operating, maintaining, replacing, and fuelling existing technologies such as gas boilers. When these ongoing costs are considered as the baseline for the energy system, the incremental cost of transitioning to a net zero market is lower than the suggested £915 million.

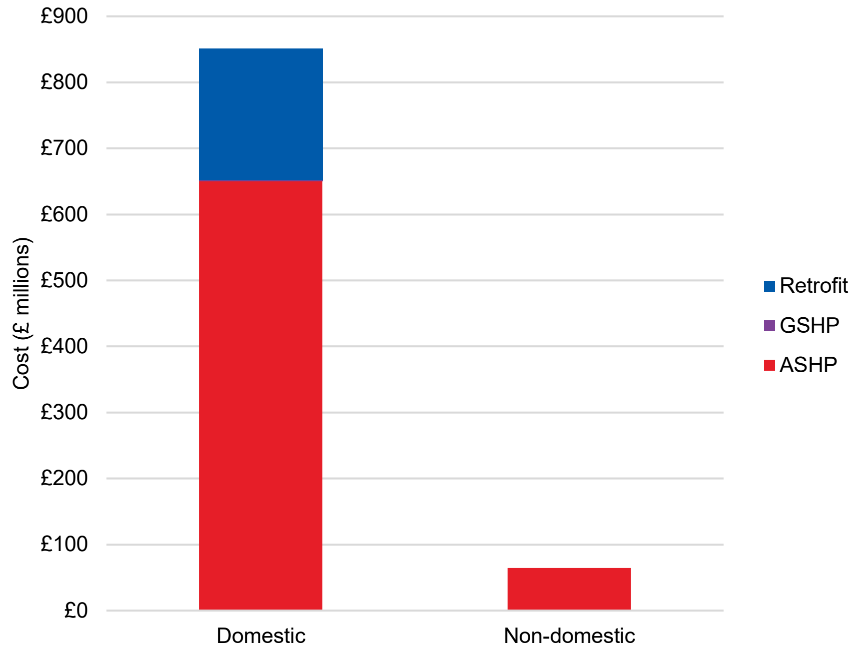

Figure 5.7 Low carbon heating investment required to decarbonise heating in existing homes

5.2.3 Missing costs

While the investment costs presented includes a large portion of infrastructure required to meet the projected energy transition, there are major gaps. For example, the cost of new and upgraded grid infrastructure and new heat networks have not been included.

5.3 Economic growth

The energy transition to net zero will require a large workforce to deliver the new infrastructure, in turn boosting overall economic growth in the borough. Additional full-time employees (FTE) associated with the energy transition have been calculated, based on the methodology outline in Appendix A.

Table 5.1 presents the new jobs required for the installation and construction of the energy transition, assuming all buildings in Thurrock transition to heat pumps, and undergo some form of retrofit. In total, 7,600 FTEs will be required for the installation of heat pumps, renewables and retrofits. FTEs required for heat networks and grid infrastructure is unknown due to a lack of information.

Table 5.1 Jobs associated with the installation of new infrastructure

Sector	Number of jobs (FTE)
Deployment of heat pumps	3,200
Retrofit of domestic and non-domestic buildings	2,800
Deployment of renewables	1,600
Deployment of heat networks	unknown
Upgrade of grid infrastructure	unknown
Known total	**7,600**

Table 5.2 presents the new FTE opportunities associated with construction of new buildings and infrastructure to be deployed in Thurrock by 2050. New non-domestic buildings will unlock potential for 16,900 new FTE. More FTEs will be required for the operation and maintenance of new heat networks and additional grid infrastructure; however, data available for this project does not cover these aspects so they remain unknown.

Table 5.2 Jobs associated with the operation and maintenance of new infrastructure

Sector	Number of jobs (FTE)
New builds: Warehouses	9,600
New builds: Industrial plants	4,900
New builds: Offices	2,400
Operation and maintenance of heat networks	unknown
Operation and maintenance of grid infrastructure	unknown
Known total	**16,900**

5.4 Energy infrastructure in Thurrock

5.4.1 Gas network

Cadent operates the gas network in Thurrock. This is currently used to deliver gas for heating to 91% of properties across Thurrock.

Implementation of the Essex Operational Energy & Carbon (Net Zero) Planning Policy will mean that future developments in Thurrock will not require a gas connection. Therefore, delivery of growth in Thurrock will not be reliant on any investment in the existing gas network.

Cadent confirmed in an engagement workshop that they do not anticipate any challenges to delivery of the projected growth, even if gas connections were indeed required for new properties.

Cadent are also involved in the development of the Capital Hydrogen programme which is working in partnership to support transition from a natural gas network to a hydrogen network in London, the East of England and the Southeast. Part of this project would deliver a hydrogen pipeline across Thurrock (the East London Hydrogen Pipeline) to pipe hydrogen from production sites near where offshore wind power generation lands onshore, to potential demand sites in Thurrock and east London[10].

Hydrogen was not considered in the Essex LAEP so has not been modelled in this study. However, if the hydrogen transmission line were to go ahead there could be new commercial development opportunities in Thurrock.

5.4.2 Electricity network

UK Power Networks (UKPN) is the distribution network operator (DNO) in Thurrock.

Many existing substations in Thurrock have spare capacity, however the proposed growth in Thurrock, plus the electrification of heat and transport will greatly increase electricity needs in the borough. Annual electricity consumption is projected to increase from 789 GWh/yr in 2022 to 1,350 GWh/yr in 2050, an increase of 71.6%.

The modelling carried out for this study does not consider peak electricity demand so it is not possible to determine when or where existing electricity capacity will be exceeded. However, UKPN confirmed in an engagement workshop that the projected increases in demand outlined by the Essex LAEP have been incorporated into their DFES projections. Therefore, all necessary investment to reinforce the existing electricity network should be visible to UKPN and can be accommodated in investment planning.

5.4.3 Other energy infrastructure

Other energy infrastructure in Thurrock includes small and large scale renewable generation installations, landfill gas installations, energy from waste facilities and national gas and electricity infrastructure.

Renewable generation installations are discussed elsewhere in this report and there is nothing to add here.

There are seven existing landfill gas sites in Thurrock, with a total capacity of 27 MW_e. No additional sites are anticipated, and

[10] www.capitalhydrogen.co.uk

it is assumed that these existing sites will be decommissioned when the landfill sites cease operation.

There is one energy from waste site in operation in Thurrock, Tilbury Green Power which processes waste wood and has a capacity of around 40MW_e, and a second one, Thameside ERF, currently under construction with operation set for 2028.

As discussed above in Section 6.4.1, there is a gas network in Thurrock and discussion around the potential for a hydrogen transmission pipeline across the borough. However, in general, future development of the gas network is assumed to be unlikely given that continued combustion of natural gas contributes substantially to carbon emissions and this strategy assumes near zero gas consumption by 2050. This will make decommissioning of the gas network much more likely than further development of the network.

In contrast the electricity network will have to undergo significant reinforcement to enable the increased electricity demand that will result from electrification of heat and transport, and the connection to the grid of substantial new renewable generation sources.

Some of this work is already underway through the Great Grid Upgrade project being delivered by National Grid. There are projects within this programme of renewal that will cross Thurrock, in particular the Norwich to Tilbury upgrade.

Though this project will cross Thurrock it will not have a direct impact on electricity capacity in the borough as businesses and residents connect to the grid through the distribution network operated by UKPN, rather than directly to the national grid, operated by National Grid.

5.5 Policy implications

This Energy Strategy is based on the following high-level assumptions:

- All gas consumption for heating replaced by electrical sources by 2050
- All transport supplied by electricity by 2050
- Retrofit of existing properties where suitable by 2050
- All new build properties to be highly efficient and have minimal energy demands

To support these goals Essex Council have prepared policy documents that require all new developments to be net zero in operation for carbon and energy. (Links here and here) This will assist in delivering on the goals to reduce gas consumption and to ensure all new buildings have minimal energy demands.

Therefore, all new properties will need to be designed to accommodate a suitable electrical source of heating, after minimising the need for heat at all.

5.6 Co-benefits of the energy transition

As discussed in the introduction to this Strategy, transitioning to clean energy can generate significant social and economic benefits. It ensures safe, reliable energy for fuel-poor areas, lowers household bills and stimulates local economic growth. Reduced reliance on gas in homes and on petrol and diesel for transport improves air quality in both homes and communities, leading to better health outcomes and an enhanced quality of life for local residents.

Retrofit activities to improve efficiency, reduce demand and deliver energy cost savings for households and businesses. They also reduce overall energy consumption. This eases the strain on existing energy infrastructure and provides capacity for growth before new infrastructure upgrades are required

New developments, including energy developments, can generate opposition among communities. One way to respond to concerns about the impact on communities can be through community benefit funds. Requirements for such funds will be included in Thurrock's Development Management policy for renewable and low carbon development to ensure that new developments deliver support for such activities as fuel poverty and retrofit programmes, local energy hubs, heat network engagement and community-led rooftop solar programmes.

6. Next steps

6.1 Interventions

The key interventions identified in this study are listed in Table 6.1.

Table 6.1 Interventions list

Theme	Interventions
Domestic and non-domestic buildings	Complete shallow retrofits on all suitable buildings (11,845 homes)
	Complete deep retrofits on all suitable buildings (11,426 homes)
	Deploy 35 MWp rooftop PV on domestic buildings
	Deploy 89 MWp rooftop PV on non-domestic buildings
	Ensure all new buildings are constructed to deliver high energy efficiency and are carbon neutral
Transport	Increase uptake of EVs
	Increase EV charging points throughout Thurrock to incentivise cars and buses to transition
	Increase EV charging points at locations near ports and fleet vehicle depots to incentivise HGV and LGV transition to EVs
Renewables	Deploy of a minimum 400 MWp of solar PV. This may be in the form of streamlining planning.
	Deploy of a minimum 9.4 MWp of onshore wind. This may be in the form of streamlining planning.
	Ensure that existing onshore wind capacity is replaced once existing assets are decommissioned.
	Further investigation into land availability assessments where land is deemed potentially viable
Heat networks	Complete feasibility studies to progress heat networks in regions deemed suitable
Grid infrastructure	Investigate the magnitude of grid upgrades required

Appendix A Methodology

A.1 Overview

To provide insight into Thurrock's future energy infrastructure needs, a modelling exercise was undertaken using data from the Essex LAEP to describe the current energy system and projected changes in energy use.

A.1.1 Data sets used

Thurrock-specific data was extracted from this data and supplemented with national-scale datasets from the LAEP+ tool, developed by Advanced Infrastructure, with additional data provided by UK Power Networks.

The Essex LAEP identified the energy transition required to meet future demand, while also meeting the Climate Change Committee's national targets. Two demand scenarios were considered in the LAEP, a do-nothing scenario and a balanced pathway scenario combining multiple decarbonisation options. The outcomes of the LAEP balanced pathway scenario have been used as the basis for this analysis.

A.1.2 Scope of analysis

This study focuses on the change and infrastructure requirements associated with the major demand sectors in Thurrock, as well as review of necessary future renewables.

The analysis reviewed the following three demand sectors:

- **Domestic buildings demand:** The total energy required by households for everyday activities within residential buildings.
- **Non-domestic buildings demand:** The total energy consumed by the commercial, industrial, public, and institutional facilities.
- **Transport energy demand:** The total energy required to move people and goods, encompassing fuel for vehicles and supporting infrastructure.

A.2 Domestic and non-domestic energy demand

Domestic and non-domestic buildings demand volumes were taken from the Essex LAEP. The demand sectors encompassing buildings include space heating, hot water and plug loads.

A.2.1 Essex LAEP data

Domestic and non-domestic demand specific to Thurrock, was taken from the Essex LAEP outcomes. The data available included demand in 2022 and projected demand in 2050.

The rate of change for annual demand was not available specifically for Thurrock. This data was available for Essex's overall demand. As such, the Essex domestic and non-domestic building demand rate of change was applied to Thurrock's domestic and non-domestic building demand.

A.2.2 Planned development and growth

Since the Essex LAEP was completed, Thurrock have revised their projected growth figures. Following consultation with Thurrock Council, up-to-date growth projections were obtained and adopted. These revised projections have been provided in Table 6.2.

To adopt the change, a ratio was calculated representing the increase or decrease in the number of buildings. This ratio was then applied to the demand growth to adjust Thurrock's future demand estimates.

Table 6.2 Updated building growth for Thurrock

	Domestic buildings	Non-domestic buildings
Essex LAEP assumption	30,200 new buildings	245 ha of new development
Updated Thurrock target	33,727 new buildings	203 ha of new development
Change	Increase of 12%	Decrease of 17%

A.2.3 Domestic and non-domestic fuel consumption

Once demand was identified, the fuel required to meet this demand was calculated. To do this, the following two steps were taken:

1. Identify percentage of demand met by each technology
2. Calculate fuel consumption to meet demand, based on technology efficiencies.

Step 1: Percentage of demand met by each technology

The Essex LAEP provided a graph indicating the rate of change for domestic building demand met by each technology. This graph included oil fired boiler, gas fired boiler, direct electric heating, ground source heat pumps, air source heat pumps and heat networks. This graph was processed, and the curves were utilised to estimate the uptake in each technology. This information provided the volume of demand met by each technology, for each year between 2022 and 2050.

As information regarding uptake of technologies in the non-domestic demand sector was not available during modelling, the domestic methodology was adopted for non-domestic buildings.

Step 2: Fuel consumption calculations

Once the percentage uptake for technologies was identified, efficiencies for each technology were applied and the input fuel required was calculated. The efficiencies implemented are shown in Table 6.3.

Table 6.3 Fuel efficiency

	Oil	Gas	ASHP	GSHP	Direct electric	Heat network
Efficiency	86%	88%	280%	340%	99%	100%

A.2.4 Domestic building retrofit

The number of homes suitable for a shallow or deep retrofit, specifically in Thurrock, has been provided as part of the Essex LAEP data. While this information has been used to provide further analysis, the numbers were not directly used in any calculations.

A.3 Transport

Energy demand data from the following vehicle types was made available from the Essex LAEP data: cars, buses, heavy goods vehicles (HGVs) and light good vehicles (LGVs).

A.3.1 Essex LAEP data

The data provided from the Essex LAEP included electricity consumption in the transport sector, for 2022 and 2050. Current fuel consumption was not provided.

Electricity transport demand change over time was also provided, for Essex. It was assumed that this rate was consistent with that of Thurrock.

A.3.2 Public data leveraged

To estimate the total mileage in 2022, public data for Thurrock was used to determine the share of petrol/diesel and electricity for each vehicle type. The specific dataset used was the road traffic estimates, as published by the Department for Transport.

This data set provided the annual average number of movements between measurement points. This data was utilised to calculate the total mileage in Thurrock, in 2022.

A.3.3 Fuel consumption

The information provided by the Essex LAEP was given in energy units (kWh/year). Therefore, it was assumed this was the energy required. No additional efficiency measures were applied.

The total mileage dataset provided the transport demand in Thurrock in miles. This was then converted to energy based on the efficiencies provided in Table 6.4.

Table 6.4 Vehicle efficiencies

Vehicle	Efficiency	Unit
Petrol/diesel car	0.95	kWh/mile
Petrol/diesel bus	7.89	kWh/mile
Petrol/diesel LGV/HGV	1.12	kWh/mile

A.3.4 Demand change

Demand change in the transport sector was calculated based on the information provided. This analysis showed the volume of demand in the transport sector each year, as well as the volume of demand met by petrol/diesel and electricity.

The electricity demand was estimated based on the 2022 and 2050 demand numbers from the Essex LAEP, and the rate of change for Essex.

As there was no information supplied for the change of petrol/diesel consumption, the inverse of the electricity consumption rate was applied.

A.4 Emissions

A bottom-up emissions calculation has been carried out for this analysis. Essex LAEP information relating to emissions has not been used. The emissions information has been mapped at an annual granularity.

To calculate Thurrock's emissions, the fuel consumption from each sector was multiplied against the carbon emission intensity of each fuel. The emissions were calculated for natural gas, oil, petrol/diesel and electricity consumption.

A.4.1 Data

The gas, oil and petrol/diesel emissions information was obtained from the Greenhouse Gas Report, published by DESNZ. These are presented in Table 6.5.

Table 6.5 Emissions from different fuel types

Fuel	Emissions	Unit
Petrol/diesel	229	kg CO_2e / kWh
Oil	285	kg CO_2e / kWh
Natural gas	183	kg CO_2e / kWh

All electricity consumption was assumed to occur through the electricity grid. As such, all electricity consumption is associated with emissions as published in NESOs FES report. Emissions per year, associated with electricity consumption from the grid, are shown in Figure 5.2.

A.5 Large infrastructure

Onshore wind, ground mounted PV, rooftop PV and heat network infrastructure was identified in the Essex LAEP and assessed in this study.

A.5.1 Essex LAEP data

Renewables

The Essex LAEP calculated the required onshore wind, ground mounted PV and rooftop PV capacities required in Thurrock by 2050. In addition to this, the annual uptake of renewables in Essex was also provided.

Heat networks

Two sets of data were available for heat network suitability in Thurrock. These were:

1. Element Energy dataset, which provided a binary analysis
2. NESTA dataset, which calculated a suitability score

The Element Energy dataset was used in this study due to its completeness.

A.5.2 Renewable deployment rates

To calculate the rate of renewable deployment, 2022 and 2050 renewable capacities in Thurrock were required. 2022 renewable capacities were taken from the LAEP+ tool, while the 2050 projected number were obtained from the Essex LAEP, as mentioned. The deployment rate for renewables in Essex was then applied to identify the capacity required each year.

A.5.3 Heat networks

The Element Energy data sat was used for heat network potential in Thurrock. All heating demand (space heating and hot water) in LSOAs which are located in a heat network area are assumed to be met by the heat network.

It has been assumed that an ASHP will be the source of heat in these networks. As such, the fuel required has been calculated on this basis.

A.6 Costs

Costs for major infrastructure were calculated using installed capacities of infrastructure as determined by the Essex LAEP and alternative LAEP+ data sets. Costs for these items have been estimated using costs from LAEP+ or provided by Essex County Council.

A.6.1 Onshore wind, ground mounted and rooftop PV

Essex County Council provided costs for major infrastructure. This data set has been used to calculate the costs associated with onshore wind and ground mounted PV. Table 6.6 provides the values used.

Table 6.6 Costs used for wind and solar

Item	Cost (£/kW)	Reference
Onshore wind	1,323	Renewable generation costs 2023, DESNZ
Ground mounted PV	523	Renewable generation costs 2023, DESNZ
Rooftop PV	1,639	Renewable generation costs 2023, DESNZ

A.6.2 Low carbon heating and retrofit

Data was not provided from the Essex LAEP in relation to the installed capacities required for heating in domestic and non-domestic buildings, or costs related to retrofit.

In LAEP+, data was available in relation to suitability of different heat pumps or retrofit for each domestic and non-domestic building in Thurrock. These datasets were used to calculate the cost of installing heat pumps and retrofits.

For heat pumps, certain buildings were deemed suitable for both ASHPs and GSHPs. To calculate the overall cost. The following hierarchy of costing was applied:

1. Where a building was suitable for an ASHP, this cost was taken. If the building was suitable for an ASHP and GSHP, the ASHP was taken due to its lower upfront cost
2. If the building was suitable for GSHP, but not ASHP, the cost of the GSHP was taken
3. If neither ASHP nor GSHP was suitable, it was deemed that an alternative technology would be required. Costs for this were not accounted for.

A.7 Jobs

The potential jobs growth was calculated as part of this analysis. Standard factors for job growth were used for different activities.

A.7.1 Energy transition related jobs

The Essex LAEP included factors for job growth based on per million invested or per GWh generated based on Welsh Government figures from 2021. These are jobs primarily associated with the establishment of this infrastructure. These figures are presented in Table 6.7.

Table 6.7 Job creation potential

Item	job	Unit
Retrofit	14	Per million £ invested
Heat pump installation	4.47	Per million £ turnover
Onshore wind	0.5	Per GWh generated
Ground or rooftop mounted PV	1.75	Per GWh generated

To calculate the energy (GWh) generated from solar and wind, publicly available capacity factor benchmarks were used. These are shown in Table 6.8.

Table 6.8 Assumed wind and solar capacity factors

Item	Capacity factor
Wind	40%
Solar	14%

A.7.2 Non-domestic growth related jobs

Thurrock Council provided new jobs related to the growth in the non-domestic building sector. This includes new warehouses, new industry and new offices. These jobs represent ongoing new jobs located in Thurrock. New jobs from non-domestic growth are shown in Table 6.9.

Table 6.9 New jobs associated with non-domestic building growth

Item	Jobs
Warehouses	9,635
Industrial	4,924
Offices	2,417