

City of London Corporation

# City of London Local Area Energy Plan

July 2023



## Contents

---

|  |    |   |     |
|--|----|---|-----|
| Executive Summary  | 3  | • Introduction                                      | 53  |
| 1. Introduction  | 7  | • Pathways  | 54  |
| • Overview   | 7  | • Future energy system mix                          | 60  |
| • Context  | 8  | 6. Priority intervention areas                      | 64  |
| • Methodology overview                                   | 12 | • Introduction                                      | 64  |
| • City of London Local Area Energy Plan report structure | 17 | • Priority investment areas                         | 65  |
| 2. Current energy system baselining                      | 18 | • Investment required                               | 69  |
| • Introduction   | 18 | • Uncertainty risk analysis                         | 70  |
| • Electricity  | 19 | • Costing considerations                            | 71  |
| • Energy networks  | 22 | 7. Route map and proposed actions                   | 72  |
| • Heating  | 23 | • Introduction                                      | 72  |
| • Transport  | 25 | • Medium term route map                             | 73  |
| • Aggregated baseline characterisation                   | 27 | • Long term route map and high level targets        | 76  |
| 3. Future energy system                                  | 28 | • Action priority matrix                            | 77  |
| • Introduction   | 28 | • Delivery Actions                                  | 78  |
| • Existing buildings and transport                       | 29 | 8. Governance, monitoring and review                | 96  |
| • Growth and development projections                     | 30 |   |     |
| • Aggregated future demand: all scenarios                | 33 | Bibliography  | 97  |
| • Aggregated future demand: Green Growth scenario        | 34 | Appendices  | 98  |
| 4. Meeting future demand                                 | 35 | A. Modelling methodology                            | 99  |
| • Introduction   | 33 | B. Modelling zones information                      | 107 |
| • Low carbon cooling and heating                         | 36 | C. Retrofit intervention mapping and classification | 109 |
| • Renewable energy generation                            | 42 | D. New development distribution across the KAOC     | 113 |
| • Optimisation modelling scenarios                       | 44 | E. Waste heat sources                               | 115 |
| • Optimisation modelling results                         | 45 | F. Modelling Assumptions                            | 120 |
| 5. Energy Transition Pathways                            | 53 | G. 2040 scenarios - End use electricity demand      | 124 |
|  |    | H. SkenarioLabs baseline energy demand methodology  | 126 |

## Executive summary

In 2020 the City of London Corporation published its Climate Action Strategy that detailed its commitments to reach net zero carbon emissions within its own operations by 2027, and net zero across the Square Mile and the City Corporation’s supply chain by 2040.

This Local Area Energy Plan for the City of London sets out the details of what the future energy system could look like in the Square Mile, combining robust technical analysis with stakeholder engagement to develop priority action areas that should be focussed on by the City Corporation and wider stakeholders within the City, as summarised in Figure 0.1

The following technical analysis has been carried out:

- Baseline current demand and infrastructure for provision of heat, cooling, power and transport.
- Estimations of future energy demands, accounting for climate change, building energy efficiency improvements and the effects of new development
- Modelling of key decarbonisation scenarios including heat pumps, heat networks and waste heat, renewable energy generation, transport electrification and the future role of hydrogen
- Carbon emissions and energy pathways analysis and high level costing.

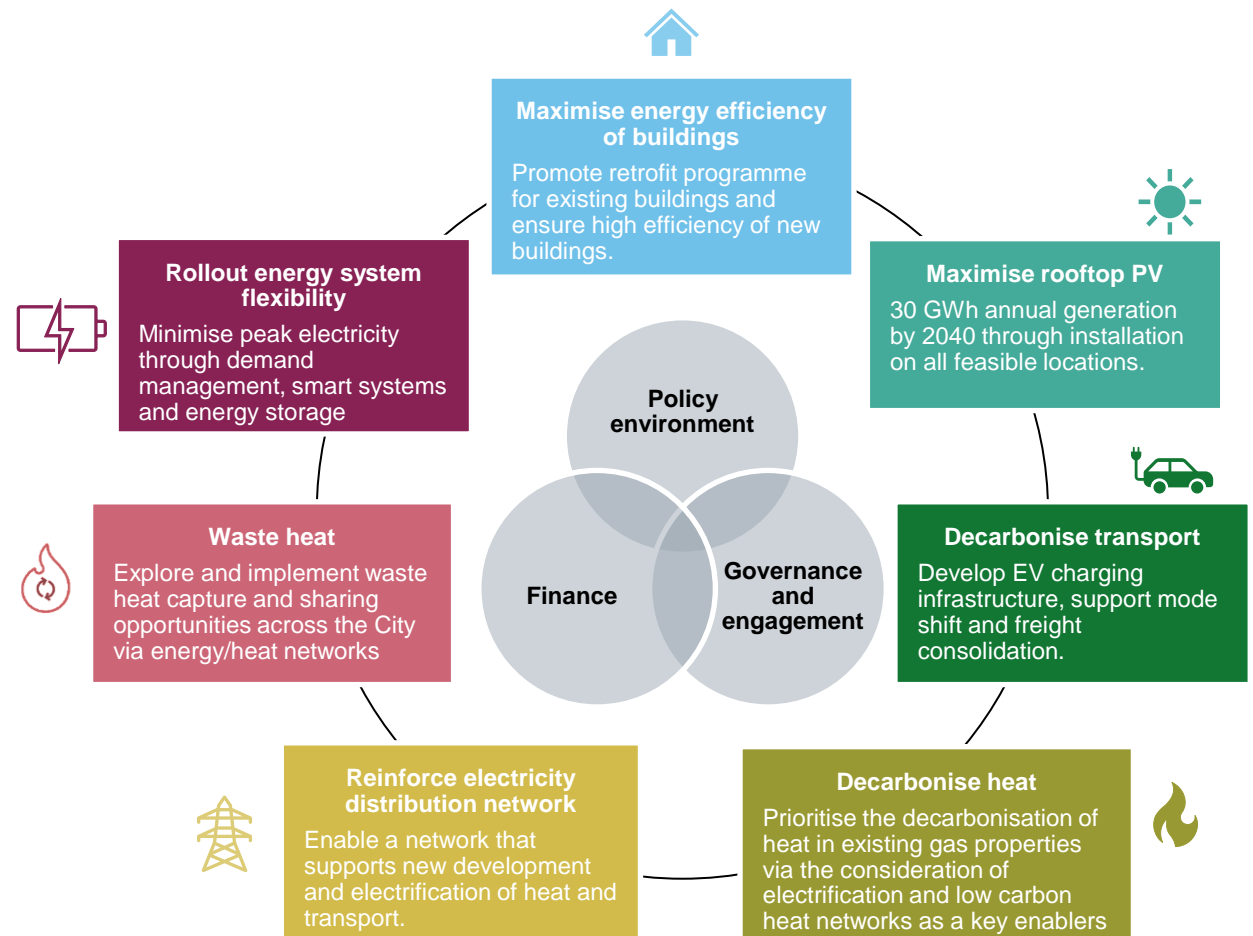


Figure 0.1: The City of London LAEP priority intervention areas.

## Executive summary

### Emissions pathways

An examination of the current energy consumption and associated emissions across the City has produced the definition of an energy baseline, from which this study builds upon. Future energy demands have then been projected out to 2040 accounting for the development of new buildings, retrofit of existing buildings and future transport projections and associated decarbonisation. Variations in these inputs were combined with energy system components to test future energy scenarios and pathways:

- **High Energy Demand** - tests the potential maximum system demand and resulting electricity grid capacity/upgrades.

- **Low Energy Demand** - tests the synergies of both centralised (heat networks) and decentralised (building-level) heat pump deployment.
- **Green Growth** - tests an ‘ideal’ low carbon future demand scenario regarding new development and efficient energy consumption reduction via considerable retrofit of the existing building stock. Within green growth, three pathways are analysed:
  - Individual building – decentralised electrification of heat on a building-by-building basis
  - Heat Network – maximum heat network deployment

- **Hydrogen** – conversion of the current gas grid to low carbon hydrogen

Figure 0.2 displays this series of future pathways that demonstrate how the City’s carbon emissions could change between now and 2040. The business as usual curve shows the current trajectory, whilst the green growth curves reduce emissions through deeper building energy efficiency improvement, and deeper electrification, hydrogen or heat network rollout, representing the scale of the opportunity to reduce carbon. The 2040 carbon emissions for the 5 optimised scenario pathways can be seen in further detail in table 0.1 overleaf.

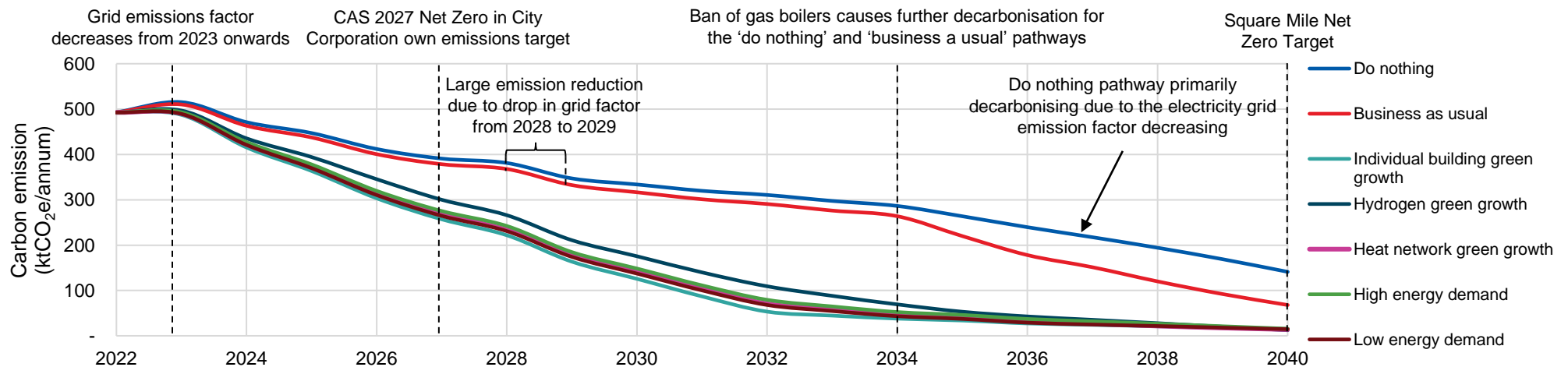


Figure 0.2: The City of London projected annual carbon emissions based of energy transition pathways.

## Executive summary

### Recommended pathway

Figure 0.3 displays the modelled cumulative emissions of each pathway from 2022 to both 2027 and 2040.

This indicates that the lowest cumulative carbon emissions are associated with the individual building green growth pathway. The low energy demand scenario is associated with a lower level of building development and hence is not reflective of the City Corporation’s ambition regarding growth – it is therefore not included within the recommend future pathway.

In addition to the analysis undertaken for energy, carbon and infrastructure of the future energy system a **multi-criteria assessment** has been used to identify and compare other criteria that are important to the City and the City Corporation. This resulted in a **recommended pathway** which is a blend of the heat network and individual building green growth pathways. Hydrogen was discounted due to the lack of credible plans to supply hydrogen into the City within the timeframes required.

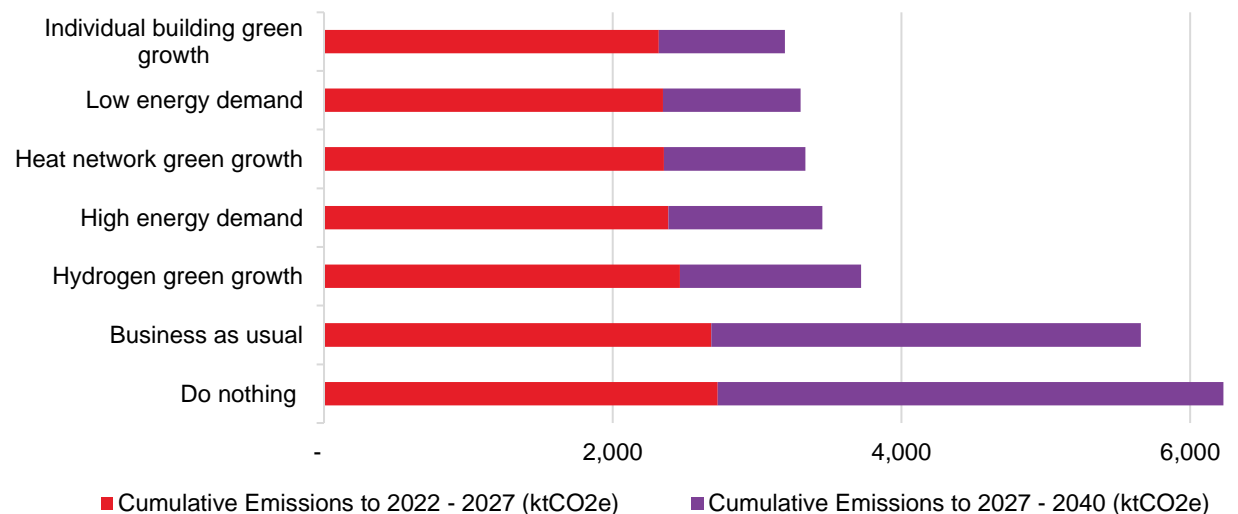
It is expected that the level of heat network deployment will be driven by up-coming Heat Network Zoning policy, currently under development by DESNZ. The City is already participating in the Advanced Zoning Pilot.

Where buildings are not mandated to connect, it is recommended that individual heat pumps are used to decarbonise heat. Office buildings should also participate in wider City heat networks where possible as heat suppliers, sharing rejected thermal energy from their cooling systems.

Due to the quantum of office buildings present, there may also be opportunities for the area to become a net heat exporter, where heat rejected is supplied into surrounding areas like Islington, where residential heat demands are higher.

**Table 0.1: Final annual 2040 emissions for 5 optimised pathways.**

| Pathway                          | 2040 emissions (ktCO <sub>2</sub> e) |
|----------------------------------|--------------------------------------|
| High energy demand               | 16.02                                |
| Low energy demand                | 14.64                                |
| Individual building green growth | 14.15                                |
| Heat network green growth        | 14.01                                |
| Hydrogen green growth            | 12.64                                |



**Figure 0.3: Cumulative emissions for the energy system pathways.**

## Executive summary

### Actions, governance, monitoring and review

A significant aspect of developing this plan was undertaken through engaging with the following local and wider energy system stakeholders:

- City of London Corporation departments such as climate, energy, transport and planning.
- Utilities and ESCos: UKPN, Cadent, E.ON
- The four City of London Business Improvement Districts
- The City Property Association
- Other energy stakeholders like Ofgem and TfL

This engagement process has been utilised to both collate and verify data used within the modelling, and enable the development of actions for both the City Corporation and wider stakeholders, which accompany the recommended pathway.

Meeting the Green Growth trajectories is highly dependent on a number of factors outside of the City Corporation's control, or at least heavily reliant on action from others, such as delivering significant energy efficiency improvements in commercial buildings, grid reinforcement at scale, heat network deployment, maximising solar generation and capturing waste heat. The City Corporation will play a key role in enabling and influencing others to ensure this plan and the recommended actions are undertaken.

This LAEP and its implementation is to be governed under the Square Mile workstream of the Climate Action Strategy, within which two new management posts are proposed:

- Project & Partnerships – additional resource to support the delivery of the LAEP
- Investment & Delivery – role to aid in the development of financing and delivery mechanism for LAEP-related actions

These posts represent the initial steps towards creating a Net Zero Delivery Unit (NZDU), a defined group responsible for facilitating the LAEP implementation. The NZDU should set up and facilitate a City of London LAEP Steering Group, that includes third parties like the BIDs, CPA, utilities like UKPN and E.ON, and major land owners .

To support the delivery of the actions defined within this LAEP the following additional initiatives are recommended:

- 1. Establishment of a London LAEP committee.** To include key parties from the wider stakeholder group including the NZDU, equivalent groups from neighbouring boroughs, representatives from the GLA, TfL, UKPN and Cadent.
- 2. Sustainable City Charter.** A business-led group to support the decarbonisation of commercial buildings.

- 3. Procurement of a strategic energy partner.** To unlock opportunities regarding the scaling and implementation of some of the actions.

#### Monitoring and review

The City Corporation should identify a set of indicators against which to measure progress in meeting the LAEP objectives, summarising these in an Annual Monitoring Report. This should include establishing specific indicators and monitoring frameworks to measure progress towards objectives, such as monitoring building decarbonisation / retrofit, or the rollout of flexibility in the City. This would provide supporting evidence of progress alongside policy specific indicators to understand how the measures are supporting the City Corporation's climate change targets.

Progress and actions should be reviewed and revised on a 3- to 5-yearly basis. This process should also ensure that additional information and studies undertaken in neighbouring boroughs are considered and integrated into future plans as cross-LAEP collaboration will help to accelerate shared goals of areas and authorities.