The City of London Corporation

Environment Department

Utility Infrastructure Strategy

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Infrastructure Strategy Five Point Plan

Introduction

The City has a history of responding to the challenges of delivering the infrastructure necessary to facilitate the growth of the Square Mile and maintain its relevance at the heart of the UK economy.

The last 150 years has seen vast progress in utility infrastructure, from Bazalgette's sewers and Victorian-era pipe subways, through rebuilding after WWII, the deregulation of the telecommunications sector into today's digital e-enabled environment.

The future will be no less challenging for the utility sector as it must account for the rapidly evolving requirements of digital infrastructure, the need to address climate change and to ensure that capacity is sufficient to facilitate the City's plans for substantial growth in office workers and floorspace.

The City's commitment to Net Zero emissions by 2040, alongside its innovative Transport Strategy and the high expectations of its residents, workers and visitors set the bar high, making it essential that all parties work together to meet these goals.

With more renewable energy requirements, a shift to zero emission vehicles and the creation of local energy markets, the future of energy provision will require nothing less than a green revolution.

Innovation and change in telecommunications will be no less demanding, with fast, efficient and reliable connectivity a basic standard of living in today's modern world, whilst the City's water and sewer networks provide new opportunities to address the capacity constraints found underground.

By working collaboratively across all sectors of industry, government and in partnership with our stakeholders, this strategy seeks to ensure the City's utility infrastructure remains fit for purpose today and future proofed for tomorrow, enabling it to underpin the City's position as a sustainable, effective environment in which to live, work and visit.

Performance

Service Standards, Communications and Engagement

Given the City's various commercial, residential and visitor communities, the requirements for power, water, gas and telecommunications can vary quite markedly.

However, the City gathers information direct from a wide range of stakeholders, including individuals, residential working groups, Business Improvement Districts, developers and wider commercial interests, to enable it to challenge the major utility providers to deliver high quality levels of connectivity, service response standards and communications.

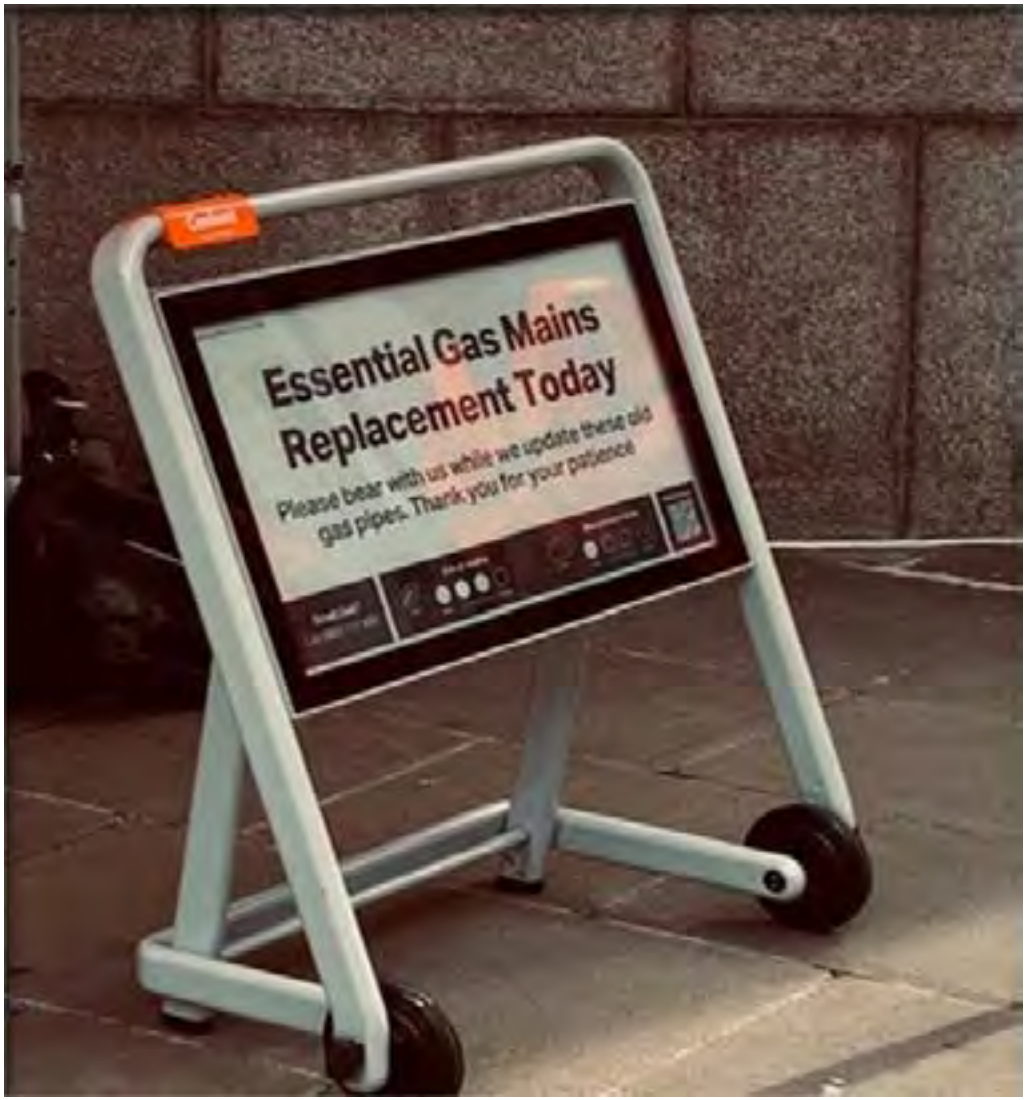
Highly effective working relationships have been established with utilities and their contractors, from senior levels down to operational supervisors who manage works on the ground, enabling City officers to address issues quickly and effectively for the benefit of our stakeholders.

One of the City's key initiatives in this area is the Digital Infrastructure Toolkit, developed with the support of developers, landlords, broadband operators, property managers, government, legal firms and key trade associations.

This national award winning concept sets out a series of tools to make it easier and faster to agree digital connections, including a common standard for wayleave agreements to quicken the process of agreeing consents to cable broadband through buildings.

Alongside close working relationships with the Department for Transport, GLA, TfL and London Councils, officers remain closely involved in shaping industry guidance and driving best practice through JAG (the Joint Authorities Group representing all highway authorities in the UK) and HAUC (Highway Authorities and Utilities Committee).

This includes preparing for new inspection codes of practice for street works before the end of 2023 and the development of Streetmanager, the industry IT tool for permitting and coordinating all utility works.



Considerate Contractor Streetworks Scheme

The Considerate Contractor Streetworks Scheme (CCSS) was pioneered by the City in 1990 and was the first scheme of its kind to be introduced in the UK.

The Scheme aims specifically to tackle the problems associated with street works on our highly congested streets, and its objective remains to encourage and promote the highest of standards for utilities and their contractors working in the Square Mile.

It looks to instil a spirit of pride and excellence in those who work on the highway, create a safer and cleaner environment for everyone who uses our streets and enhance the perception of the street works industry and those who work in it.

The scheme comprises:

- A Code of Conduct that aims to reduce work durations, minimise disruption, improve signage, enhance communication and ensure continuous improvement
- Regular inspection and monitoring by City officers
- A formal awards ceremony recognising high performing utilities and their contractors

The scheme remains highly prestigious and drives improvement, creating competition between participants and a mindset to ensure works are safe, well managed and expeditious.

Throughout its long history, the scheme has evolved to include the introduction of an Innovation Award for utilities and the use of sponsorship to make the awards self-funding.

It remains highly effective in encouraging and enabling collaborative working (such as trench sharing) and the coordination of infrastructure works with City projects and highway maintenance, minimising disruption to the public, improving accessibility and driving safety.

The CCSS also promotes good communications and advance warning, and supports the coordination of works by different utilities, minimising the risk of re-excavating the same street multiple times.

Superfast Broadband

The City's unusual social mix of major financial services and residential properties has historically led to some unique challenges in connecting the City with effective broadband, particularly for our SMEs, residential estates and residential buildings spread across the Square Mile.

With the City's largest commercial enterprises able to procure their own direct requirements from multiple suppliers across diverse routes, the remaining market has typically fallen short of Openreach's business case test for proactively connecting the City to superfast broadband.

Given the status of the Square Mile, this has been consistently raised at a senior level with Openreach and has been addressed through a series of initiatives to enable everyone in the City to have access to an essential part of modern life.

By 2020 90% of the City had superfast broadband enabled by various initiatives including:

- Working with Openreach to improve capacity and their fibre to the premises network
- Facilitating wayleave agreements to bring additional fibre providers to the City's major residential estates
- Identifying and addressing 'not-spot' areas within the Square Mile where network connectivity is not sufficient
- Supporting new fibre providers such as Vorboss to increase network capacity

Demand & Connectivity

Wireless Concession

Alongside the steps being taken to address broadband requirements, the City also set itself the challenge of creating a world leading public access Wi-fi network as well as facilitating the requirements of the mobile telecommunications companies to deliver comprehensive and effective 4G (and now 5G) coverage across the Square Mile.

The first step towards this was the installation of free public Wi-Fi infrastructure, delivered in conjunction with partner Cornerstone and their contractor Freshwave. This award-winning connectivity delivered download speeds of up to 100mbs, with installations typically utilising existing street furniture, extended in height to reach the optimum 'broadcast' point.

However, to deliver the requisite 4G/5G connectivity, a solution was needed that avoided the potential for each of the four main mobile network providers deploying their own columns, cabinets and equipment that would otherwise fill the City's congested streets.

The City's innovative concession contract with Cornerstone facilitated the rollout of over 200 4G cells, with Cornerstone and Freshwave promoting, developing and maintaining common user technology at no cost to the City.

Suitable sites are now being trialed that help deliver high capacity, highly reliable 5G mobile networks that the telecommunications sector need to keep the City connected. Full 5G coverage is expected by 2025 with an appropriate communications campaign working alongside to raise public awareness and promote its use.

Pipe Subway Capacity

The City has over 6km of pipe subway built underneath its roads, designed and constructed specifically to hold utility infrastructure of all shapes and sizes.

Mostly built by the forward thinking Victorians, utilities are required to use these subways to carry their plant rather than dig up the road, reducing the disruption above ground whilst allowing their equipment to be installed, managed and repaired by physical inspection.

The cost of expanding the network today into new streets can be prohibitively expensive given the disruption required to relocate existing infrastructure, but the City has been able to amend and add to the network in recent times as part of major infrastructure projects such as Thameslink, Crossrail and Tideway.

Safe access to these facilities is managed by the City given their confined space nature, and future initiatives to ensure these unique facilities remain fit for purpose include major structural maintenance work, measures to ensure they are resilient to climate change and smoke sensors to check for safety issues.

Moving forward, the City is seeking to work with the utilities to remove redundant plant such as BT's copper cabling, ensuring sufficient space is available to accommodate the City's future requirements.

Citigen

By working with the utility e.on, the City leads the way in low carbon decentralised energy networks by making use of the Citigen decentralised power plant based within the City that produces enough power to heat the equivalent of 11,300 homes.

Hidden behind the Port of London Authority facade at Smithfield, Citigen not only generates power but also heating and cooling, delivered via 10.5km of underground piping to business and residential properties across the Square Mile.

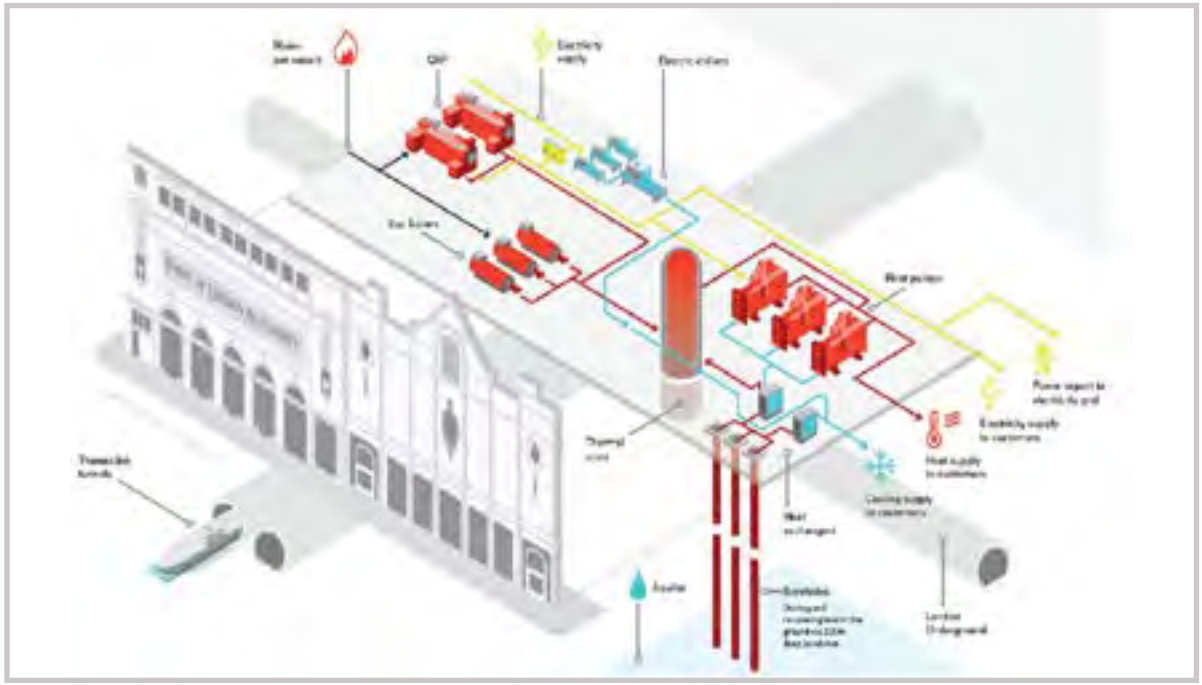
Whilst seeking opportunities to expand its capacity and network, Citigen also makes a significant contribution to the City's environmental goals through its decentralised district heating approach.

Its large thermal store allows the system to hold excess renewable energy before reusing it at peak times, and by drawing on the natural warmth from the London Aquifer 200m below the City, Citigen are now able to commission a new 4MW heat pump that will reduce carbon emissions by 30%.

This infrastructure will allow the City to build on the future decarbonisation of the electricity network as the proportion of renewable energy sources on the grid increases, further reducing heating and cooling associated carbon emissions.

The City's supply agreements with Citigen currently run to 2027, with Citigen obliged to deliver a 20% reduction in carbon during that period.

The challenge for Citigen is to develop and deliver a sustainable and attractive long term energy solution for both its existing and potential new customers within the Square Mile.



Innovation Test Bed

All utilities remain focused on finding ways to improve the resilience of their respective networks, increase the efficiency of their operations, minimise disruption and improve the service to their customers.

The last 10 years has seen major capital investment from both Thames Water and Cadent Gas to upgrade their aging networks using new materials to address what were significant levels of leakage from their pipelines. Thames Water in particular had to address failing pipes which in some places had almost completely eroded away.

We continue to see investment and innovation from all quarters, such as:

- robots to survey and repair pipelines from the inside
- use of the existing sewer network to carry new telecommunications cabling
- vacuum technology to increase the speed of removing materials from excavations
- utility covers that safely vent gas leaks without closing footways
- deployment of denser fibre cables to increase capacity

The degree of innovation is not confined to the commercial sector, with the City itself having just completed its rollout of an innovative street lighting system that enables direct control of individual lighting units in real time via a low frequency mesh network.

Combined with an investment in LED technology and aligned to an industry leading Lighting Strategy, this has resulted in a reduction in energy for street lighting of over 50%.

This mesh network is also capable of carrying other Smart City data, enabling the potential for further development of e-enabled smart technology. As an example, the City is using the same network to generate warnings when lifebelts are removed from the riverside, making the Thames safer by ensuring that those that are removed are quickly replaced.

It is this strategy's ambition for the City to be seen as an effective test bed for new technology, allowing utilities the opportunity to trial new ways of working that make operations quicker, easier and more effective for everyone involved.

Underground Capacity

The space beneath our feet plays host to all number of utility cables, pipes and operating plant, but given these networks have grown over time without a statutory requirement for strategic coordination, successive utilities have installed their own plant wherever space is available.

The first networks to be laid related to sewerage, water and gas, meaning these large pipe networks are typically the deepest underground, with power cables next in line above them. The highest sets of services are usually telecommunications cables which sit just below the surface.

Telecommunications saw a massive expansion in the 1990s and 2000s as a result of government deregulation, meaning the space under most of our footways and roads is now reaching capacity.

That means when new networks are required, significant amounts of time, cost and disruption are incurred just to establish viable routes over, under and around existing networks.

To address this issue, the City is currently working with the GLA and the utility sector to consider how GIS record keeping can help, and for the City in particular, it is proposed to undertake ground penetrating radar surveys to comprehensively map the Square Mile, enabling the City to identify which streets are still available for network expansion.

Meanwhile, the Physical Infrastructure Access scheme enables third party utility companies to rent the Openreach network in order to build their own networks without taking up more space underground, saving time, effort and cost. This is being actively progressed by seven telecom utilities in the City and more are expected to follow, driving competition and improving connectivity

Planning and Innovation

Planning Process

Much of the City's expanding utility need is driven by major development, particularly when it is clustered together and requires a step change in supply that exceeds current capacity.

In the recent past, this has been most noticeable in the Eastern Cluster, where successive large developments have required expansions to the power supply load for that area. Such uplifts are fed from UK Power Network's major City-based substation near Ludgate Hill, the last time being around 10 years ago when many of the City's key streets had to be excavated for new power cables over a two year period.

The City can best address these issues by proactively working with the utility sector and developers to identify specific requirements ahead of time, facilitate advance planning to reduce disruption to the general public, and ensuring long term plans are in place to ensure sufficient capacity is available to meet future demand.

Other initiatives linked to the planning process include a planning condition that major developments must share with the City their utility requirements at an early stage to enable advance discussions around available supplies, customer connections and potential network expansion.

One particular issue can also arise when the needs of a new building occupier only emerge at the very end of the development, significantly adding to the number of connections and utility chambers required, sometimes well after the City's public realm construction works have finished.

To address this, the City promotes a communal entry chamber scheme whereby one utility chamber is constructed to facilitate the requirements of multiple utilities and their respective connections into the new building, allowing last minute supplies to be installed without the need for further major excavations.

Climate Action

Local Area Energy Plan

The City of London has recently developed and adopted a Climate Action Strategy aimed at setting a pathway to net zero, building climate resilience and championing sustainable growth.

The Strategy outlines the City's commitment to reaching 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.

To support this Strategy, the City is developing a Local Area Energy Plan for the Square Mile to improve understanding of the nature, scale, rate and timings of the changes necessary to transition to a net zero energy system.

The LAEP process combines robust technical analysis with comprehensive stakeholder engagement to create a route map for delivering decarbonisation as effectively as possible.

It will identify the actions required by local and national government, energy providers, regulators, industry and residents to achieve this,

increase local stakeholder awareness in the Square Mile, and inform credible commitments and better buy-in for these changes.

Priority intervention areas include:

- Maximising the energy efficiency of buildings
- Exploring waste heat capture and sharing opportunities
- Prioritising decarbonisation of heat networks
- Rolling out renewable energy systems
- Driving rooftop solar energy

The pathway to an LAEP is currently under development in conjunction with public bodies (GLA, London Councils, Transport for London), key utilities (UKPN, Cadent, e.on), Ofgem and Arup , with a wider stakeholder engagement stage about to commence.

Heat Zoning Regulations

The Government's proposed Energy Security Bill (intended to become law by 2024) seeks to introduce a new regulatory framework for heating, intended to define and designate zones where heat networks can provide the lowest cost low carbon solutions.

As Citigen has shown, local district heating networks can be a cost-effective way of providing reliable, efficient, low carbon heat, even though heat networks themselves do not enjoy the same statutory powers as other forms of utilities such as gas, water and power.

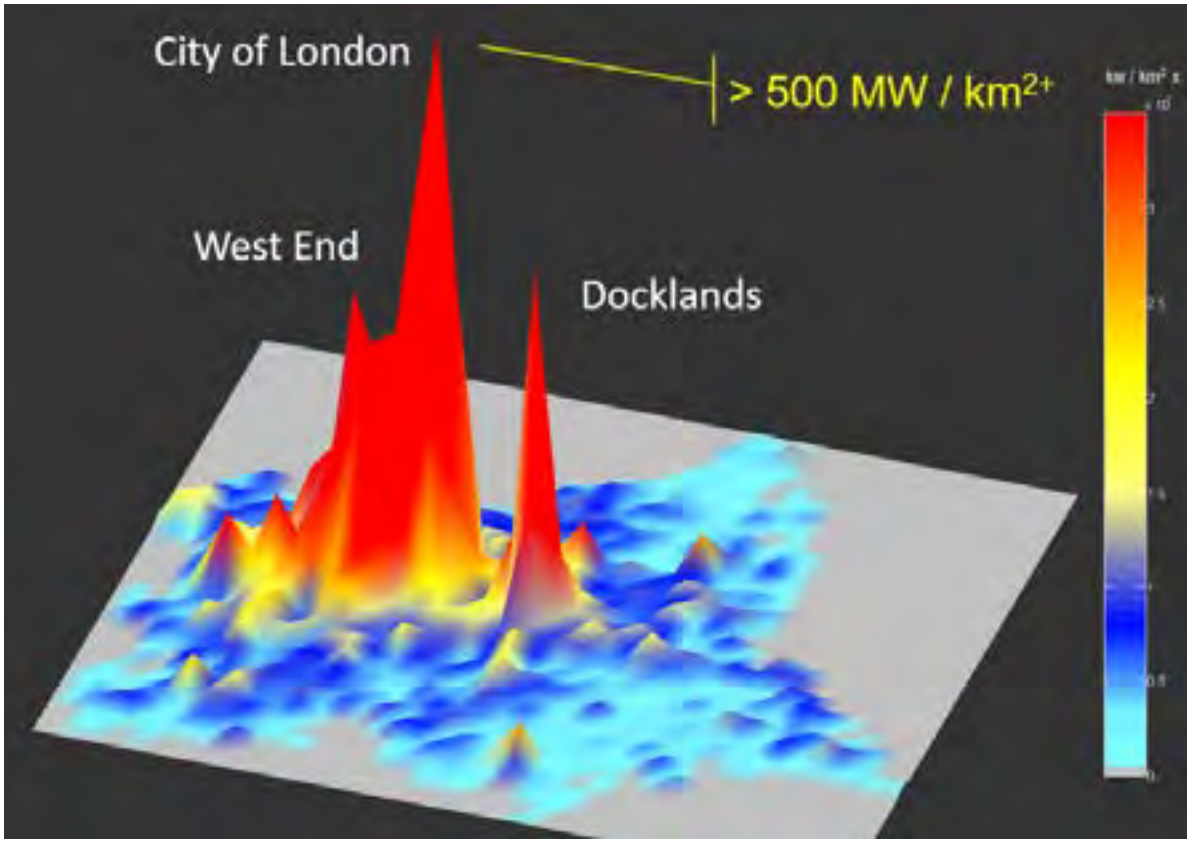
The Bill intends to resolve this by granting heat networks statutory powers, bringing local heat networks under the Ofgem umbrella, regulating prices, promoting technical standards and introducing limits on carbon emissions.

Heat zoning regulations are expected to support the growth and decarbonisation of existing networks such as Citigen and are intended to accelerate the transition towards net zero heat, enabling cities to adopt a common energy strategy.

Local heat networks are particularly suited to locations such as the Square Mile with its building density and available heat sources.

In such areas, the potential for Heat Network Zoning will be considered where certain buildings would be required to connect to such networks as the lowest cost solution for decarbonised heat.

As part of these initiatives, the City may also be able to benefit from the Green Heat Networks Fund, a three year (2022-2025) £288m capital grant fund intended to support (amongst other things) the expansion of existing heat networks.



Open Energy Networks for the Smart Grid

With new smart technologies challenging the traditional way we generate, consume and manage electricity, the Open Networks programme has brought together the nine electricity grid operators in the UK and Ireland to work together to align processes to make connecting these networks as easy as possible and to bring renewable energy resources, including wind and solar panels, to the local electricity grid.

One of their initiatives is the concept of flexible technology that can store energy using periods of low demand, releasing it back to the grid during peak periods. This will become increasingly important in order to address local peaks and troughs of demand given that local supply grids are typically designed to meet average loads.

Working with the industry regulator and the distribution network operators, UK Power Networks are currently facilitating this marketplace by paying flexible energy suppliers (typically at this point large commercial buildings) both an availability fee and a utilisation fee to store energy and push it back into the grid at peak times through their building energy management system.

All the grid providers have committed to offer quicker connections to properties making this commitment, and given the City's demographic, there are clear opportunities where the City and the Energy Networks Association can work together with the City Business Improvement Districts, large commercial properties and residential estates to explore these opportunities.

In the future, it may be possible to consolidate infrastructure installations and harness synergies between developments, enabling both heat and cooling to be provided in a more efficient way to residents and other stakeholders. This will likely drive innovation in terms of energy storage facilities and cooperation between adjacent properties to create a local eco-system for heating and cooling.

Transport Strategy: Electric Vehicle Charging

Under the direction of its innovative Transport Strategy and the need to support the transition to zero emission capable vehicles, the City has recently increased the amount of electric vehicle charging infrastructure available for use in the Square Mile, delivering facilities sufficient to meet the current needs of residents and vehicles serving the City.

There are publicly accessible electric vehicle charging points in all the City's public car parks, one rapid charging point on-street for taxis and a rapid charging hub in Baynard House car park with six rapid charge points and space for a further four in the future.

This number of facilities needs to balance potential demand with the need to avoid drawing unnecessary traffic into the City just to recharge, potentially adding congestion to our streets, whilst changes in battery and recharging technology will also change these requirements over time.

Alongside this, the City has delivered on its own commitment to zero-emission vehicles by making its Cleansing fleet fully electric, installing the necessary infrastructure at its Walbrook Wharf depot and working with contractor Veolia to transition its fleet of vehicles.

Progress has also be made through the Planning process, whereby new developments with off-street loading can be required to install rapid charge points, whilst we can also encourage the owners, managers and occupiers of existing buildings with loading bays to install rapid charge points.

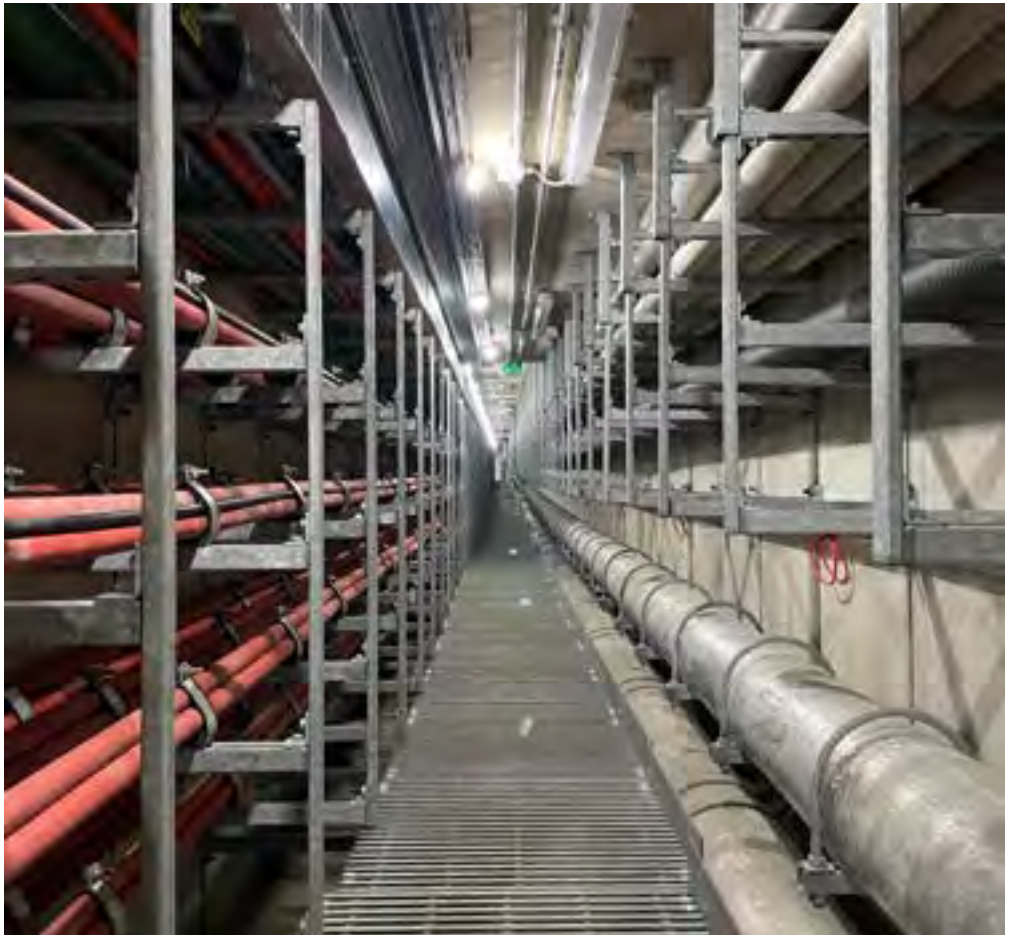
It's clear that demand for top up charging for vehicles servicing the City, alongside reliable and available recharging facilities for our residents, remains a growing requirement, and as such we are currently working with colleagues in Community and Children's Services to expand recharging facilities in our residential estates, promoting the newly opened recharging hub and looking to increase the number of top up rapid recharging units.

Future Proofing

The City has to continue to work with its stakeholders, the utility sector, government and the industry regulator to ensure its utility infrastructure remains fit for purpose, meeting the needs of today as well as addressing the challenges of the future.

With that in mind, future proofing the City already has some specific early challenges:

- Given deregulation of the supplier market, companies such as UK Power Networks are prevented from investing ahead of need. However, longterm expansions in demand will undoubtedly require an uplift in capacity, needing the City to work with UKPN and others in the electricity sector to consider strategic investment opportunities to grow supply capacity.
- Development activity in the Square Mile continues apace, so it is essential that the City engage with the development community to understand
- Despite the complexity and cost of expanding the City's underground pipe subway network, it must look to maximise the opportunities when they arise to connect or lengthen existing parts of this essential infrastructure network future demand.
- In one of the biggest changes in telecommunications history, Openreach intend withdrawing all copper-based voice telephone lines from the UK's network at the end of 2025. This will enable Openreach to focus on maintaining and enhancing its fibre network and consider opportunities from decommissioning but this will impact anyone still using copper based lines.
- Changes are planned to the UK's 284km of gas pipeline network to transition it from methane-based natural gas to zero-carbon hydrogen and biomethane. Cadent has upgraded 92% of the City's low pressure network to distribute natural gas to hydrogen in the future, and other green gas projects would be expected should Government decide in 2026 to allow hydrogen for domestic use.
- As part of the opportunities opened up by forthcoming legislative changes promoting heat networks, the City could be in position to work with a strategic energy partner to take a leading role in creating such a network across much of the Square Mile.



Stakeholder Engagement

Stakeholder Engagement

To consult on this strategy and raise awareness of the issues and challenges it seeks to address, it's intended to undertake a series of engagement sessions and publicity activities, from face to face meetings and public forums to on-line promotion.

The key groups to be engaged with will include:

- Senior level utility representatives
- Business Improvement Districts
- City businesses & SMEs
- Resident groups
- Industry Regulators
- Energy Networks Association
- Greater London Authority
- Transport for London
- Adjacent Local Authorities
- HAUC (Highway Authority and Utilities Committee)
- Members and appropriate City Corporation Committees

To ensure this strategy remains a live document, it is intended the dialogue established through its creation remains in place to drive forward the essential changes it seeks to make.

Route Map

Performance Actions:

- Ensure effective relationships are maintained within each utility sector and work with stakeholders across the City to bring issues to their attention
- Promote the Digital Infrastructure Toolkit and standard wayleave agreement
- To maintain the commitment embodied by the Considerate Contractor Streetworks Scheme for safe, considerate and cooperative working practices
- Establish performance measure for this strategy

Connectivity Actions:

- Supporting Openreach in achieving their target to deliver fibre broadband to 25 million premises, including both businesses and residents, by end of 2026.
- Highlighting 'not-spot' areas within the Square Mile where there is greater demand for faster fibre connectivity.
- Supporting new fibre providers such as Vorboss to increase network capacity
- Complete the 5G network rollout in conjunction with Cornerstone & Freshwave
- Ensure effective maintenance and resilience for the existing Wi-Fi and 4G networks
    - Capital investment in repairs to Snow Hiill and Holborn Viaduct pipe subways
    - Trial smoke sensors to ensure the subways remain safe for both utility plant and workers
- Review opportunities for the removal of redundant plant, making space for new cabling
    - Identify further opportunities to invest in & expand Citigen network
    - Consider opportunities from Govt heat zoning regulations and consider requirements to connect to heat networks

Route Map

Planning & Innovation Actions:

- Promote the opportunity for the City to be seen as a test bed for new ideas and innovations
- Explore the opportunities provided by the City-wide mesh network to carry smart data
- Undertake ground penetration radar mapping of the City's streets
- Work with the GLA and key utilities to establish the potential to map utility networks as part of the National Underground Asset Register initiative

Climate Actions:

- Work with the City's consultants and key stakeholders to identify the route towards implementing a Local Area Energy Plan for the Square Mile
- Continue to work with e.on to identify opportunities to expand the Citigen network
- Seek to make further progress in decarbonising Citigen's operation
- Work with Govt and Ofgem to review implications & options from heat network zoning and the Green Heat Networks Fund
- Engage with the Energy Networks Association to develop opportunities for flexible energy networks
- Review requirements for on-street and off-street charging points, including within our public car parks and residential estates
- Promote and publicise access to the recharging hub at Baynard House car park
- Work within the Planning process and with the BID engagement team to require & promote the installation of recharging facilities within commercial premises for servicing vehicles

Future Proofing Actions:

- Identify long term energy and telecom requirements and supply constraints for future development
- Consider opportunities for future pipe subway expansion
- Address the impact of the withdrawal off copper-based telecoms
- Assess the challenge represented by the transition of gas networks to hydrogen & biomethane

Route Map

Route Map

Contacts

Ian Hughes – City Operations Director

Ian is the City Operations Director. He has strategic responsibility for all the operational activities on the City's streets, including the key front line services of street cleansing, highway maintenance, domestic waste collection and parking enforcement. Ian also has overarching responsibility for road safety, transportation & public realm schemes, maintaining the Square Mile's trees & green spaces and supporting the City's major on-street events such as the Lord Mayor's Show.
He is Deputy Senior Responsible Officer for the Secure City programme with the City Police.

Sye Thevathas – Strategic Infrastructure and Asset Manager

Sye Thevathas is the Strategic Infrastructure & Highways Asset Manager. He is the key contact within the Corporation for all matters relating to network infrastructure, supporting elected Members, City of London departments, City businesses, property owners, developers, utility and fibre broadband providers, to ensure that the Square Mile is provided with world leading utility network infrastructure.

Michelle Ross – Traffic Manager

Michelle leads, manages and directs the three specialist teams responsible for coordination of Street works (permitting), Special Events (on the highway) & Traffic Management (road closures, hoarding licences & major projects)

Darran Gowdy - Streetworks Manager

Darran has over 35 years of experience in engineering, technical services, utility works, highways activities, streetworks permitting and inspections, compliance and highway management, Darran manages the Streetworks Team for the City of London.

Giles Radford – Assistant Director Highways

Giles is the Assistant Director for Highways. He is responsible for managing highway maintenance and construction, street lighting, drainage and the City's pipe subway network.
Giles is also responsible for highway licensing, temporary road closures, special events, utility works, the City's 4G infrastructure and the Considerate Contractor Scheme.

Graeme Low – Assistant Director of Energy and Sustanability

Graeme is Assistant Director, Head of Energy and Sustainability for the City Surveyors Department. His team leads on the supply of energy to our buildings including electricity, gas and heat and coolth supplied via Heat Networks such as Citigen. He is responsible for ensuring our buildings energy and operational carbon performance improves to meet the challenge of our Climate Action Targets for 2027.

Mark Donaldson - Senior Energy Engineer

Mark leads the City Corporation's support for the development of heat networks within the Square Mile. This includes working with E.On to support the growth and decarbonisation of the existing Citigen heat network, developing opportunities for new low carbon heat networks in the Square Mile, and preparing the City Corporation for the forthcoming Heat Zoning regulations.

Rob McNicol - Head of Policy and Strategy

Rob is the Assistant Director for policy and strategy in the planning division. His team is responsible for delivering the City Plan, Supplementary Planning Documents and other planning guidance; monitoring and data relating to the Built Environment; and delivering a number of Climate Action Strategy projects that will embed sustainable approaches to development in the Square Mile.