

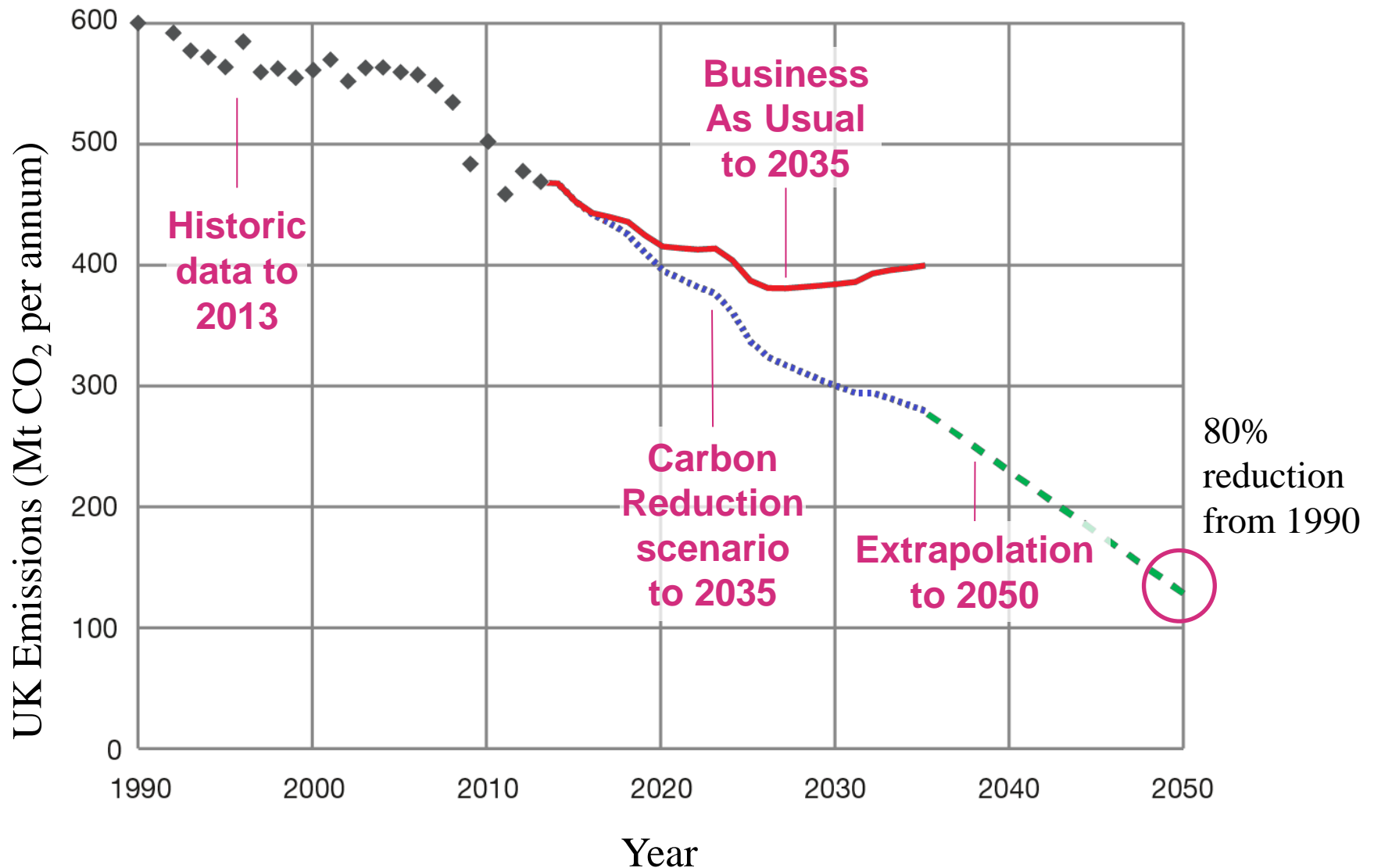
Getting it all Together:

Planning and Delivery of a City District Energy Program

Stephen Cook
IDEA Workshop: District Energy in Cities
June 20, 2016

UK and London Policy Context

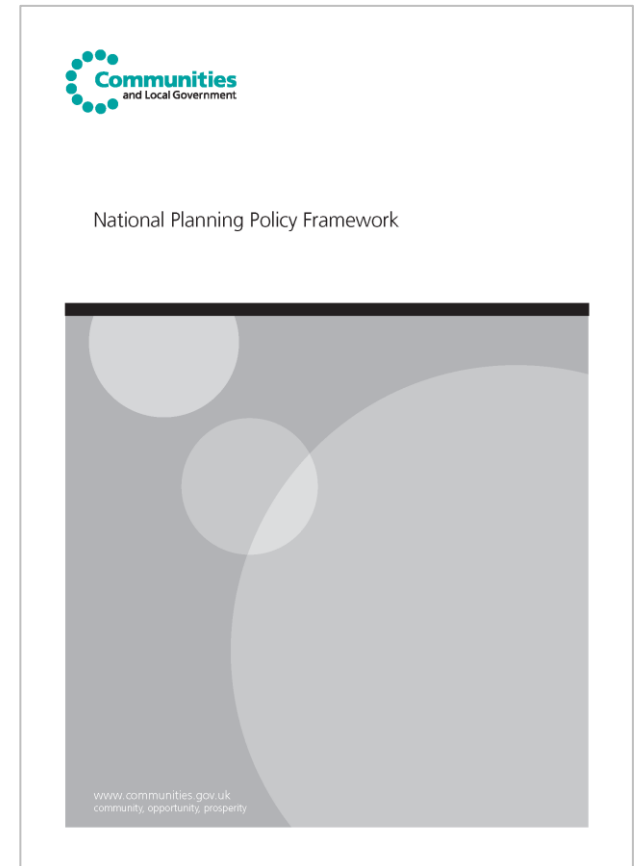
Carbon pathway for the UK



National scale: UK Government guidance to city governments

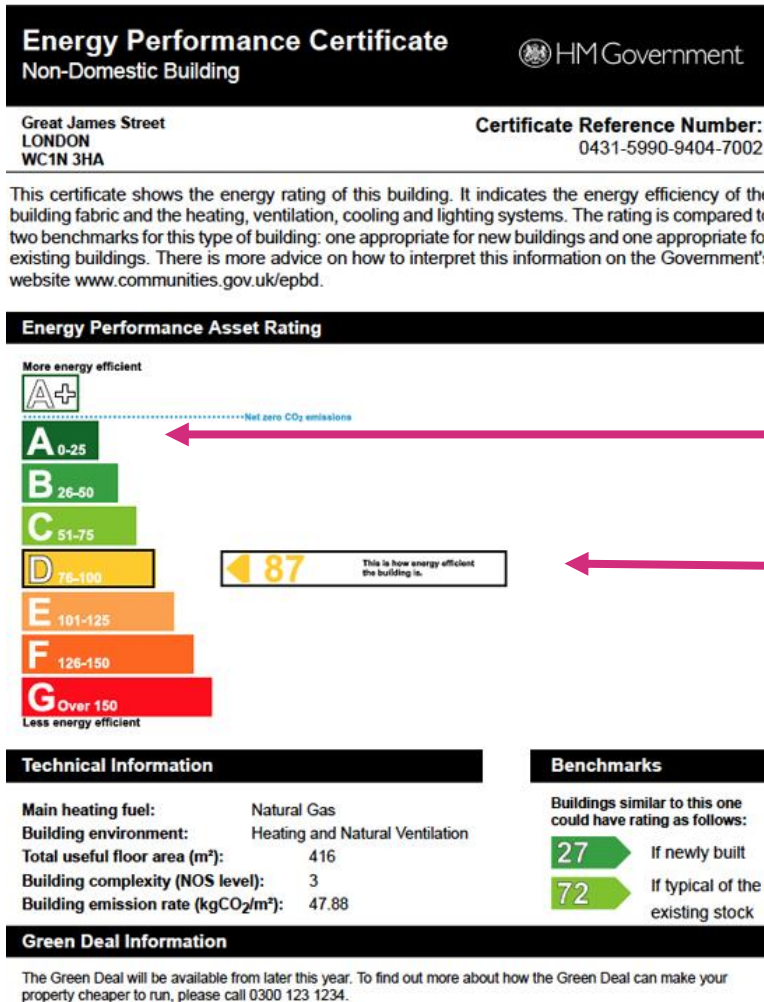
Local planning authorities should:

- **Plan for new development** in locations and ways which reduce greenhouse gas emissions
- **Actively support energy efficiency** improvements to existing buildings
- Be consistent with the **Government's zero carbon buildings policy** and adopt nationally described standards
- Identify **suitable areas for renewable and low carbon energy** sources, and supporting infrastructure



UK Government, National Planning Policy Framework, 2012

Energy Performance Certificates and Minimum Energy Efficiency Standards



By 2050 we need to get here

UK average building EE today

London Plan Energy Policy

Today:

- New development CO₂ emissions to be **35% below** current national building standards (Part L 2013)
- Strong policy preference for heat networks

From October 2016:

- 35% standard still in place
- “Zero carbon homes:” Offset payment of **£1800/tonne** [~\$2500/ton], or £60/tonne x 30 years

From 2019:

- “Zero carbon” non-domestic buildings



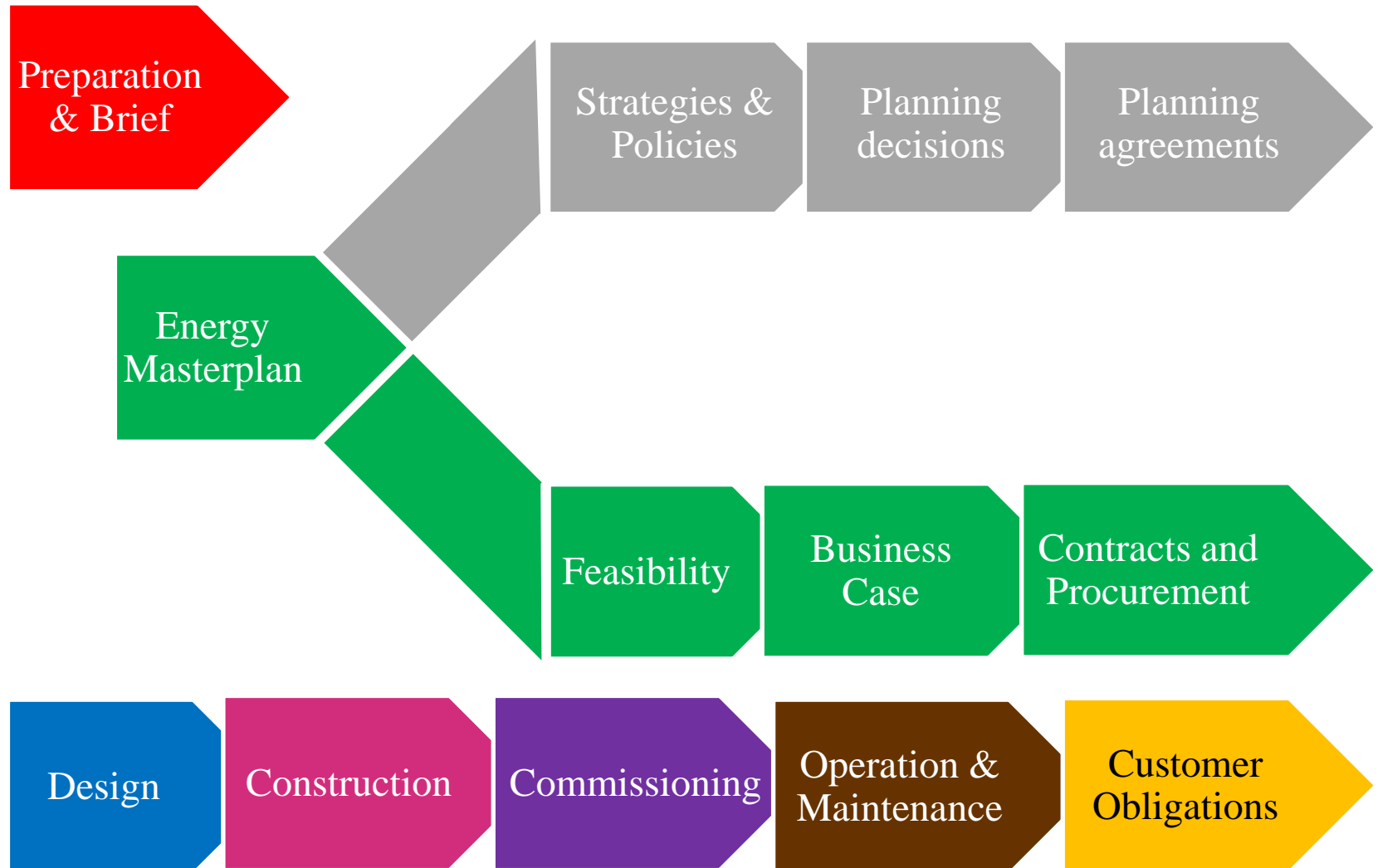
DELIVERING LONDON'S ENERGY FUTURE

THE MAYOR'S CLIMATE CHANGE MITIGATION AND ENERGY STRATEGY
OCTOBER 2011

MAYOR OF LONDON

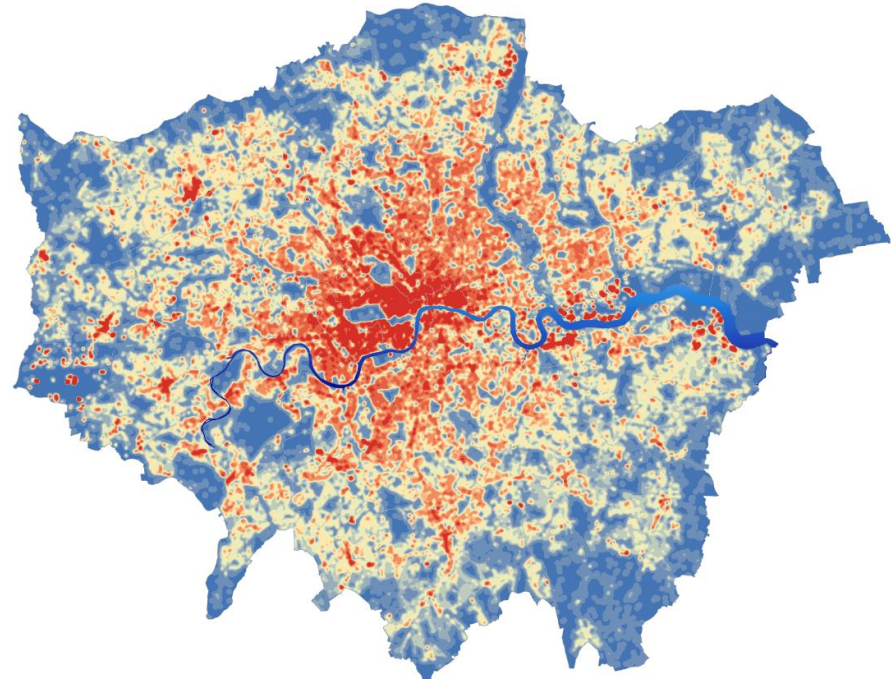
Experience of decentralised energy project delivery in London and UK

Decentralised Energy Delivery Pathways



DEMaP: London's Decentralised Energy Masterplanning Programme

- Boroughs given £15k to commission heat mapping
- DEMaP team provided technical support
- Total cost ca. £20k per heat map
- Training on energy masterplanning
- Significant capacity building



Greater London Authority, London Heat Map

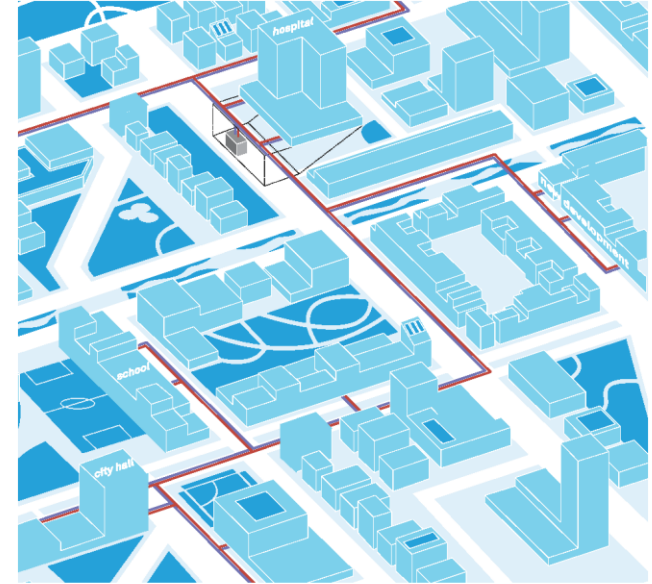
Outcomes of DEMaP

- **Corps of knowledgeable** local authority planners and energy officers
- **Guidance documents** on energy masterplanning and project delivery
- **Growing integration** between development planning and infrastructure investment
- A **pipeline** of decentralized energy projects



DEPDU: London Decentralised Energy Project Delivery Unit

- £3 million, 4-year **technical support programme**
- Focused on **DE project development** which is delivered as a free service to project sponsors.
- The programme operates through a **single delivery team** for the whole programme.
- Additional tasks for **standardizing practice** on heat networks in the UK



LONDON HEAT NETWORK MANUAL

MAYOR OF LONDON



Co-funded by the Intelligent Energy Europe
Programme of the European Union

Through project support

London Borough of Brent sought to **procure a heat network** and heat service for a 2500-home development site.

DEPDU support:

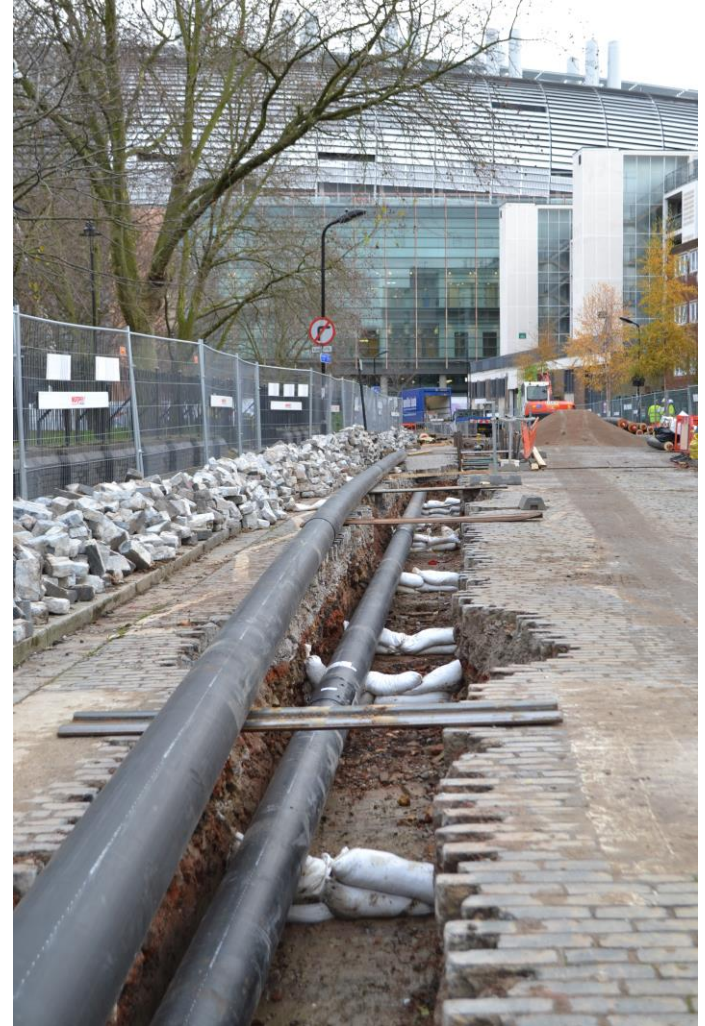
- Pre-feasibility
- Feasibility modelling
- Detailed technical advice
- Contractual advice
- Procurement support
- Drafting contract Heads of Terms



Municipal energy company delivery model

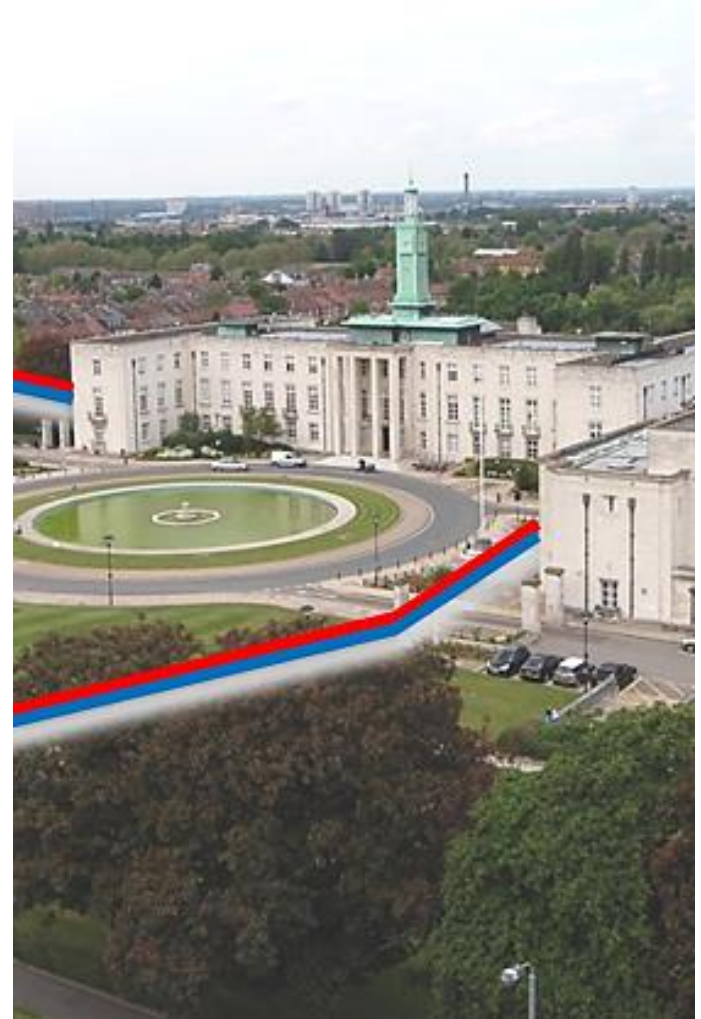
London Borough of Camden seeks to develop a heat network to connect its own existing apartment blocks.

- Planning powers were key for catalyzing scheme.
- Camden elected to directly procure advice to complete the delivery of the project.

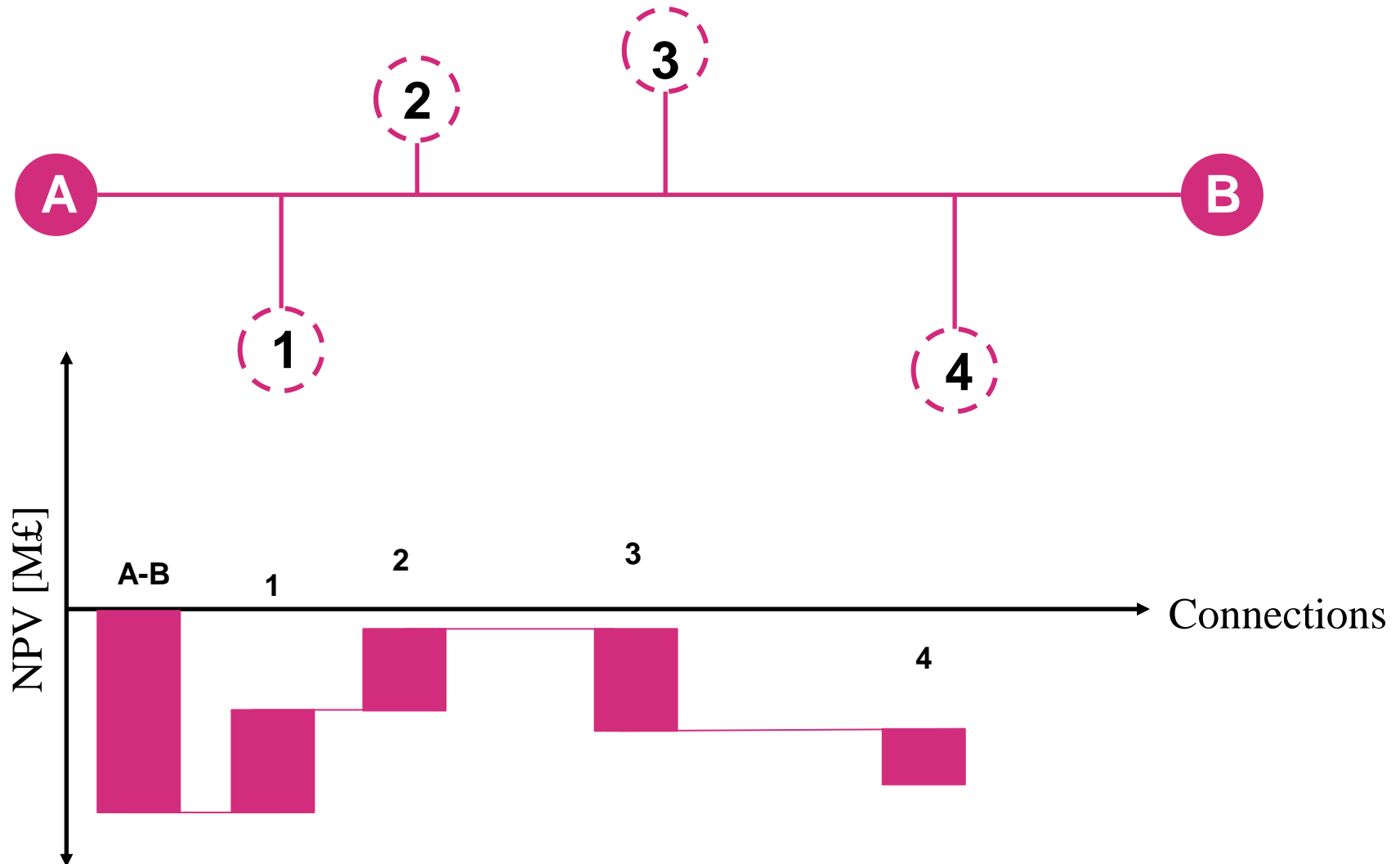


Challenges of suburban densities

- DEPDU analysed several opportunities in Waltham Forest in NE London.
- The area also provides limited potential for low carbon heat.
- Returns on investment tended to erode as the scheme grew due to relatively low densities of demand.
- A small network is being developed around a housing estate regeneration project.

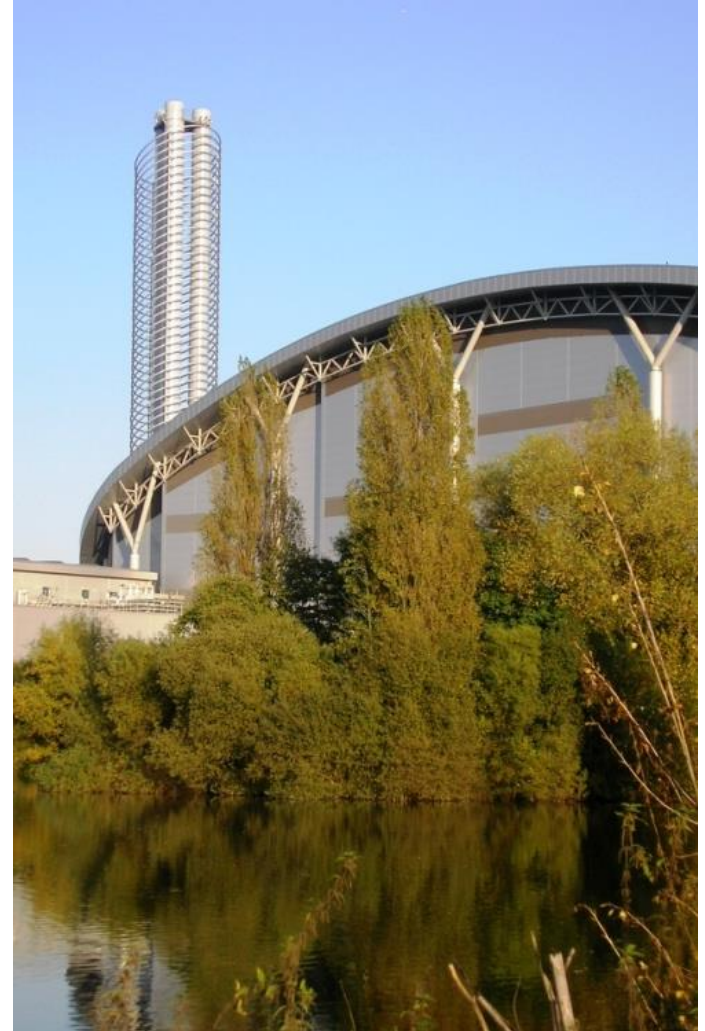


Project viability tipping point



Programme challenges

- Incentives for **cost-effective project** delivery could be better aligned between partners
- No **fund recovery** from successful projects
- **Programme support and project finance** could have been more closely linked.
- Success depended on sponsor's **capacity and commitment**
- Some projects supported in spite of evidence of **weak potential**



Successful programme features

- Over **£100 million** in project delivery secured
- Production of **Heat Network Manual**
- **Consistency of approach** to individual projects achieved through overarching programme and delivery manager
- Programme has **low transaction costs** for task instructions and allows for flexibility during task delivery



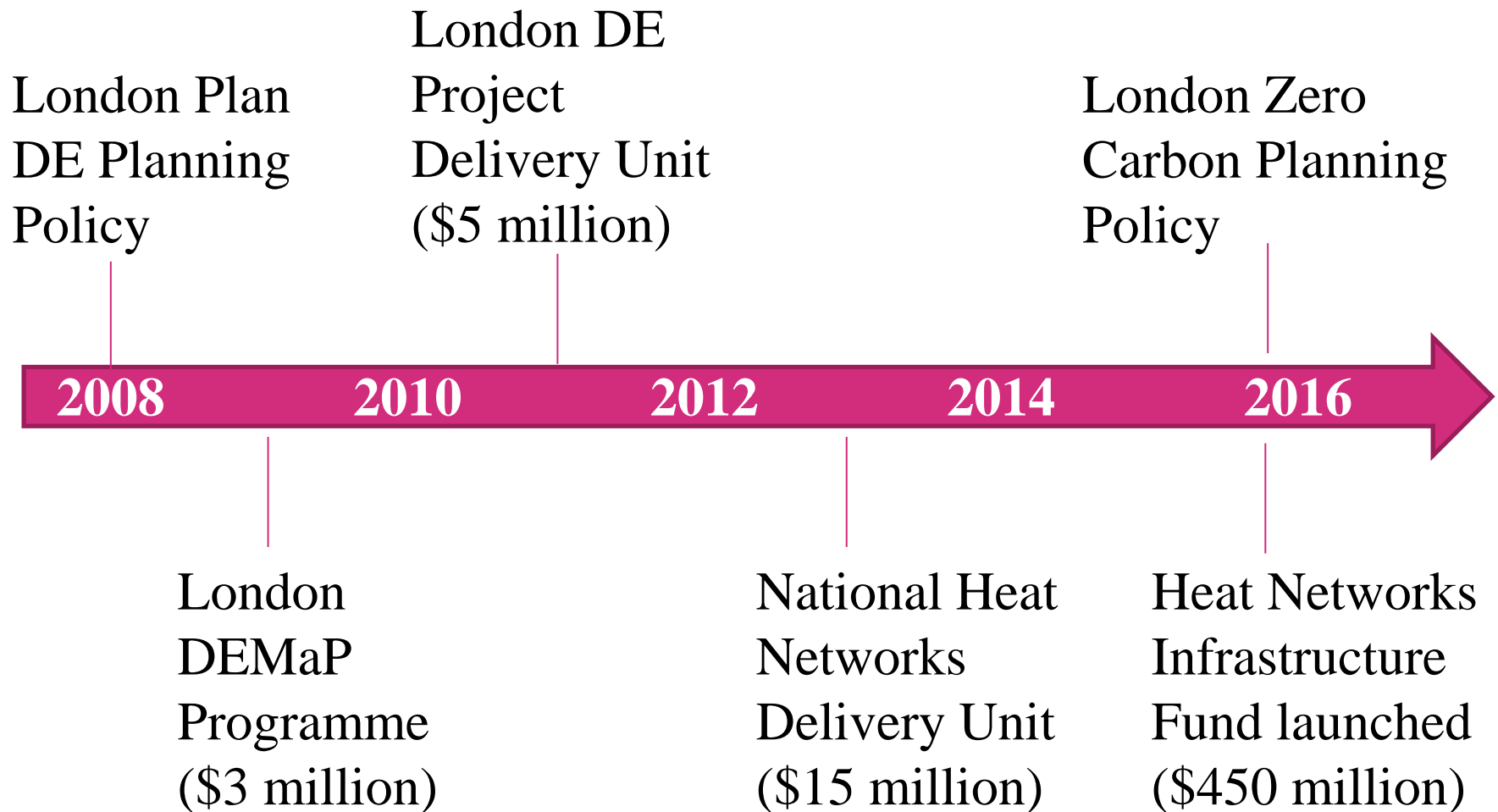
National Heat Network Delivery Unit (HNDU)

- National Heat Strategy highlights importance of heat networks to reducing CO₂ emissions
- National Heat Map produced
- Government unit provides grant funding and technical support to local authorities in deployment of heat networks
- Studies are procured by each local authority
- 180 projects, 115 cities and towns, \$15 million of grant funding



Department
of Energy &
Climate Change

Timeline of DE Delivery in the UK



Drivers of action on energy networks

Drivers of heat networks

Environmental

Economic &
financial

Technical

Social

Political

Legal

Circumstantial

Preparation & Brief Stage:

- Define drivers & assets

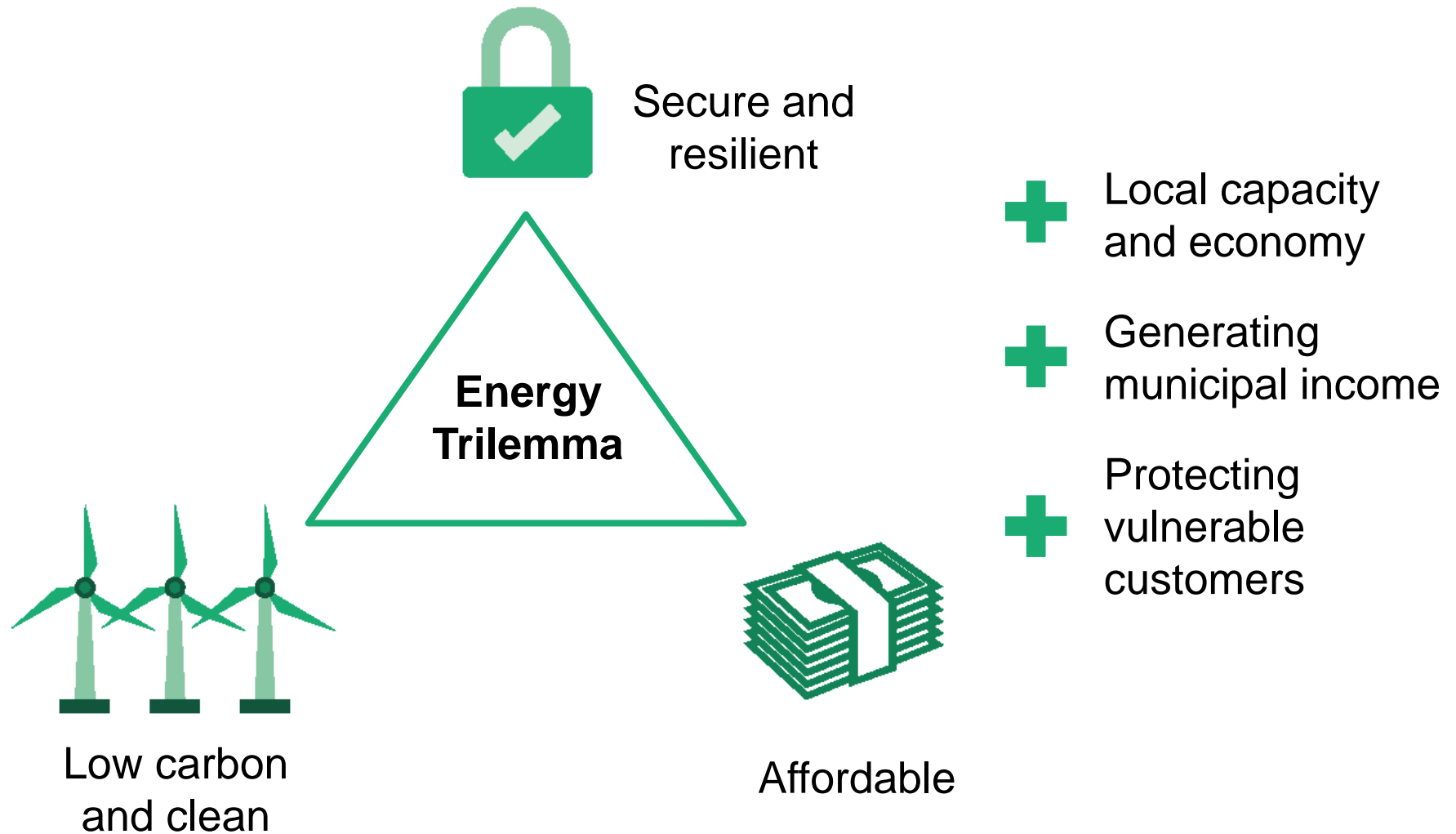
Feasibility and Business Case Stages:

- Evaluate options against driver metrics (KPIs) and embed into decisions on funding, delivery vehicle etc.

Procurement, Delivery and Operation Stages:

- Embed drivers in contract documentation including service level agreements and other obligations. Incorporate performance KPIs and guarantees in payment and penalty mechanisms

Multiple drivers, balanced in a political context



Heat network in London



Low carbon ✓
Resilient ✓
Lower cost ✓

Heat network extension options

Option A: Technical-commercial optimisation


• Residents connected to network	1,300
• Return on investment	6%
• Annual CO ₂ emissions savings	850 tonnes


Option B: Social-political optimisation

• Residents connected to network	1,400
• Return on investment	5%
• Annual CO ₂ emissions savings	700 tonnes

Difference

8% 

17% 

18% 

Thank you

Stephen Cook

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ARUP

Enablers

Leadership

Knowledge and evidence

Technology

Governance and roles

Leadership



New Orleans Mayor Mitchell J. Landrieu

“Leadership is a key ingredient in encouraging individuals and communities to take action during challenging times.”

Arup’s City Resilience Framework, 2014

Funded by:
THE
ROCKEFELLER
FOUNDATION

Five minute guide: Energy in Cities

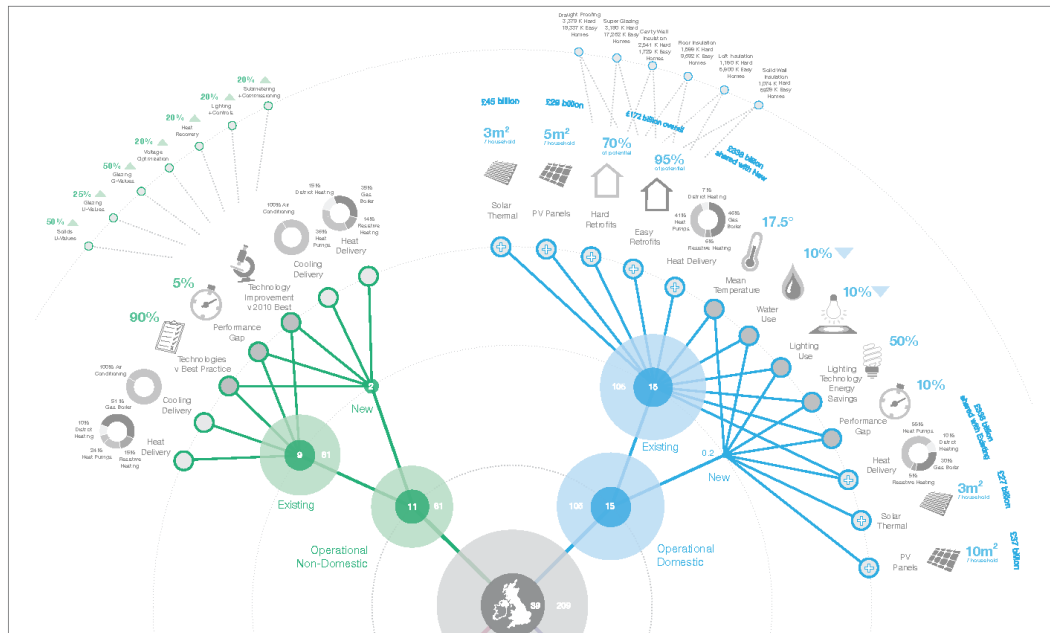
Energy Transition Planning in Cities

Cities have a key role to play in the shift towards a sustainable energy future.

The energy transition will not happen overnight. For the foreseeable future, cities will continue to rely on legacy systems and fossil fuels to help meet basic energy services including heating and transport. The transition process needs to be well thought-out to guide the change, helping us go from where we are now to where we want to get to.

Modelling and Scenario Planning

Energy modelling and scenario planning will help cities set out targets and create realistic plans and programmes to transition to a low carbon future.

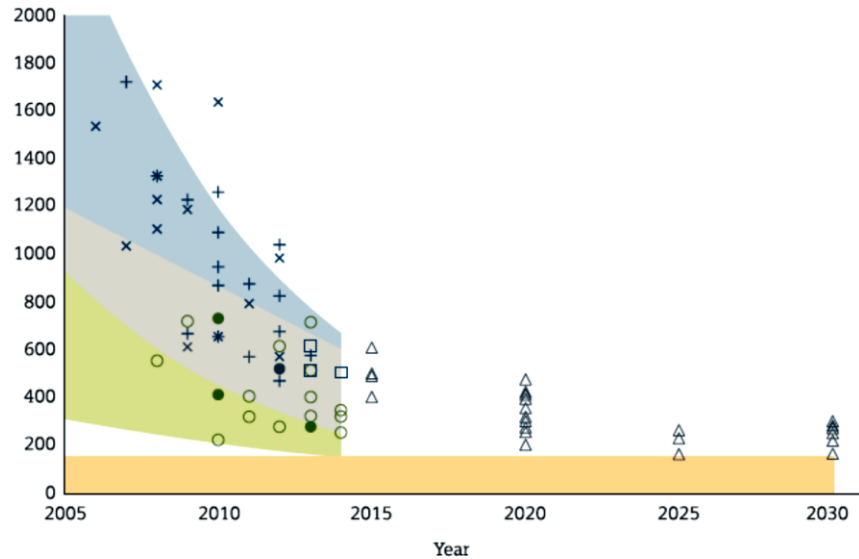


» The Low Carbon Routemap uses scenario modelling to illustrate the policies, targets and actions required for the built environment to meet the UK government's targets to deliver an 80% reduction in greenhouse gas emissions by 2050.

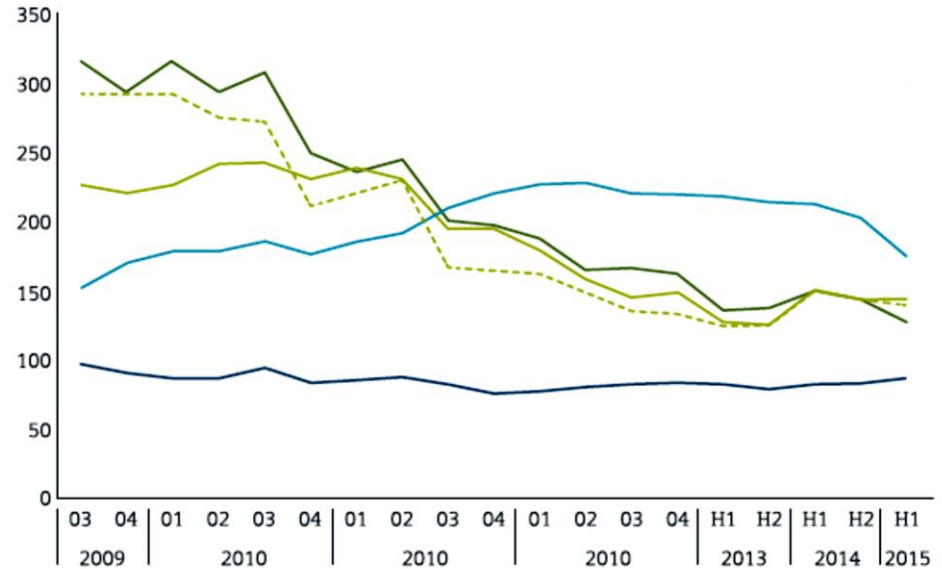
ARUP

Arup's Zero carbon route map for the built environment, for the Green Construction Board

Technology costs are falling



Cost of Li-ion batteries for electric vehicles



Wind and solar levelised cost per kWh

Images from Arup and Siemens' forthcoming report on Distributed Energy Systems.

Sources: (L) Björn Nykvist and Måns Nilsson, 2015. (R) FS-UNEP Collaborating Centre for Climate Change & Sustainable Energy Finance, 2015

Monitoring, communications and control

3 Smart Grids

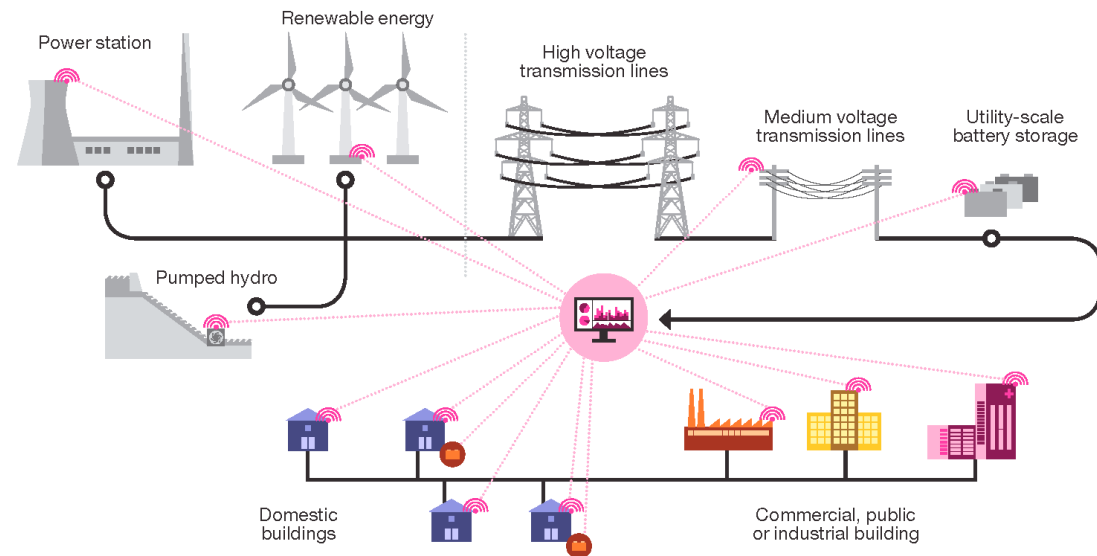
Smart grids enable responsive energy distribution that is better able to cope with growing demand and new supply technologies.

A smart grid is an electricity network incorporating electricity and communications systems that can intelligently respond to nodes connected to it. Smart grids can also include storage and decentralised generation but their salient feature is the integration of high-speed bi-directional communications between systems and the grid.

Why are smart grids important for cities?

Cities are driving increases in electricity demand against the existing, aged and congested grid infrastructure.

It is critical that communication-enabled controls are integrated into urban networks to improve their operation and realise a more sustainable interaction with the power end users.

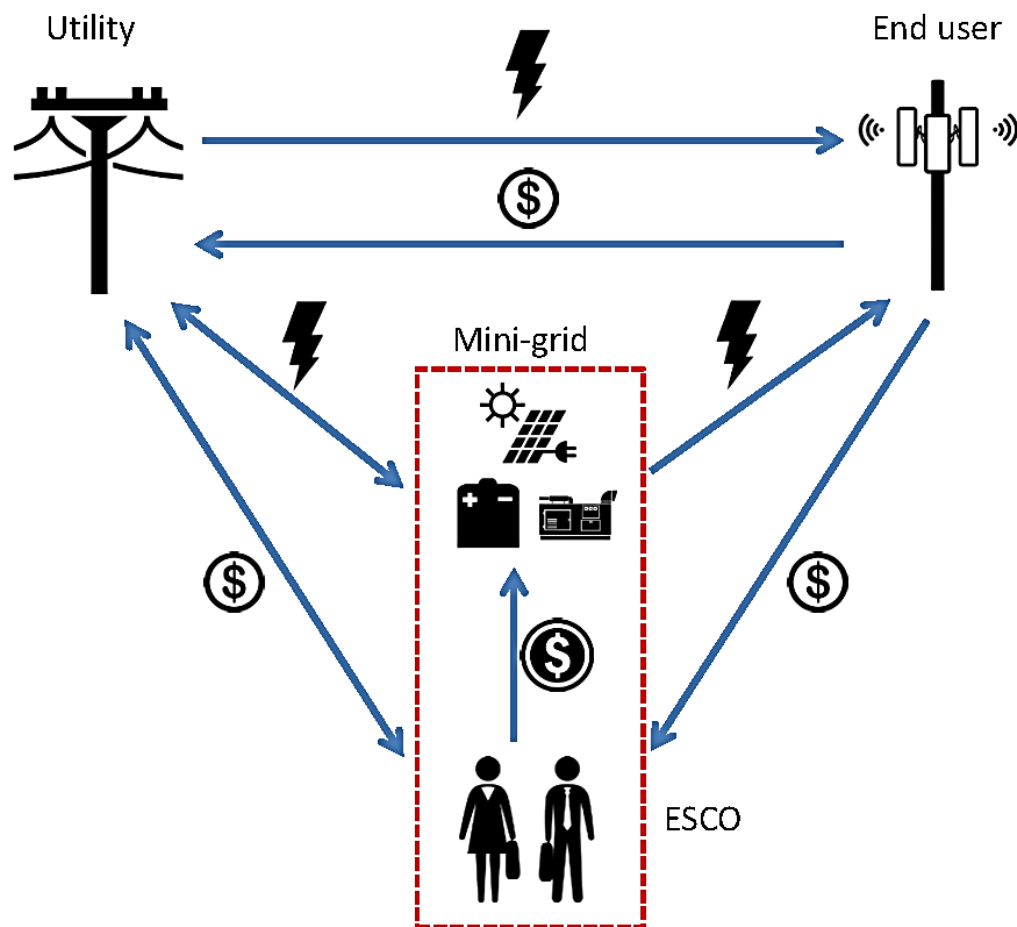


- » Potential to better predict electricity supply and demand at specific locations.
- » Monitor condition of grid and major assets.
- » More efficiently utilise labour and materials.
- » Interact with users to actively manage demand.

ARUP

Image from Arup's Five Minute Guide: Energy in Cities

New governance models for new energy solutions



- Who will own?
- Who will fund?
- Who will regulate?
- Who will operate?
- How will risks be allocated?

Image from Vivid Economics and Arup, "Opportunities to enhance electricity network efficiency," report for UK Department for International Development, 2015

Recap: Energy planning in cities

Integration

- National
- City
- Project

Drivers

- Secure and resilient
- Clean and low carbon
- Affordable
- Grow local capacity and economy
- Manage urbanisation
- Extend access

Enablers

- Leadership
- Knowledge and evidence
- Technology
- Governance and roles