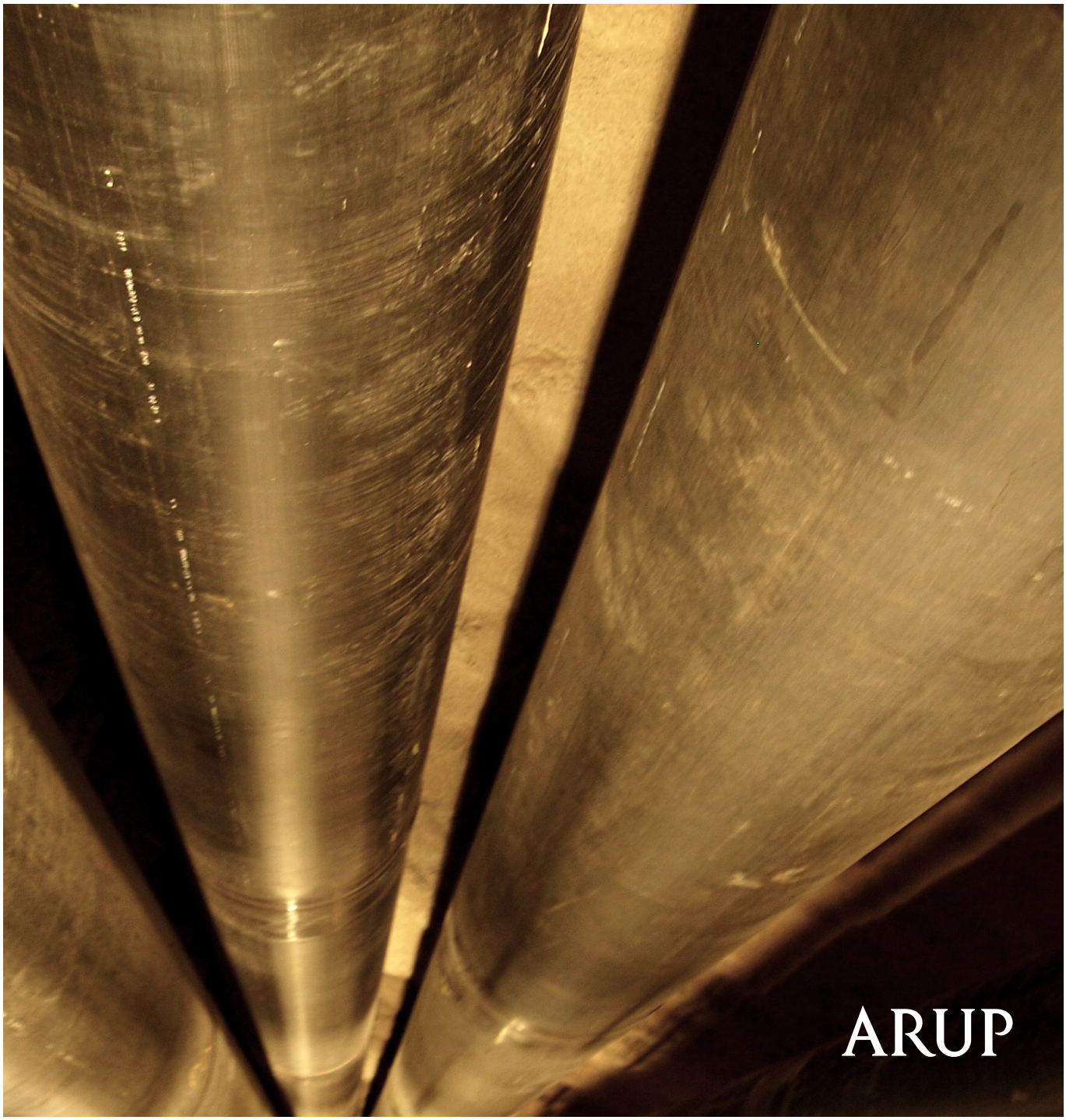
District Heating

Local knowledge, global expertise



Understanding the challenge

In the UK, electricity is typically generated at large power stations remote from the areas they supply. The remote location limits the possibility for heat to be recovered and used, whilst the long transmission distances result in further energy losses. Arup has a team of specialists working in the decentralised energy market, facilitating energy generation and distribution systems to supply heat via district heating and electricity via grid or private wire closer to the locations where energy is consumed.

Our team of district heating specialists help a wide variety of clients develop low to zero carbon district heating solutions. Our largest engagement saw us appointed by the GLA to support its Decentralised Energy for London programme to provide technical expertise to develop and bring decentralised energy projects to market. The programme is a major contributor to the Mayor's target of supplying 25% of London's energy from decentralised sources by 2025.

We can support clients through all stages of decentralised energy infrastructure project development – from policy development, heat mapping and capacity building, feasibility and techno-economic modelling to detailed design, financial modelling, commercial structuring, procurement and contract advice and procurement management.

Arup is providing innovative solutions to the challenges of changing legislation, zero carbon homes and a decreasing grid carbon intensity. Our team also draws on Arup's wider building expertise to identify and develop integrated and optimised solutions for our clients' needs.

Delivering solutions

The unique working philosophy at Arup – founded on flexibility, transparency and ability to deliver – is ideally suited to delivering district heating and distributed energy projects. These projects incorporate a wide range of skills available within Arup, including engineering, planning, finance, commercialisation, environmental and planning, project management and stakeholder engagement.

Through our global knowledge management systems, we are able to harness ideas and precedent from projects worldwide.

Our district heating team has so far undertaken around 80 separate engagements across key groupings of energy masterplanning, feasibility studies, business case and commercialisation, procurement, capacity building, research and guidance.

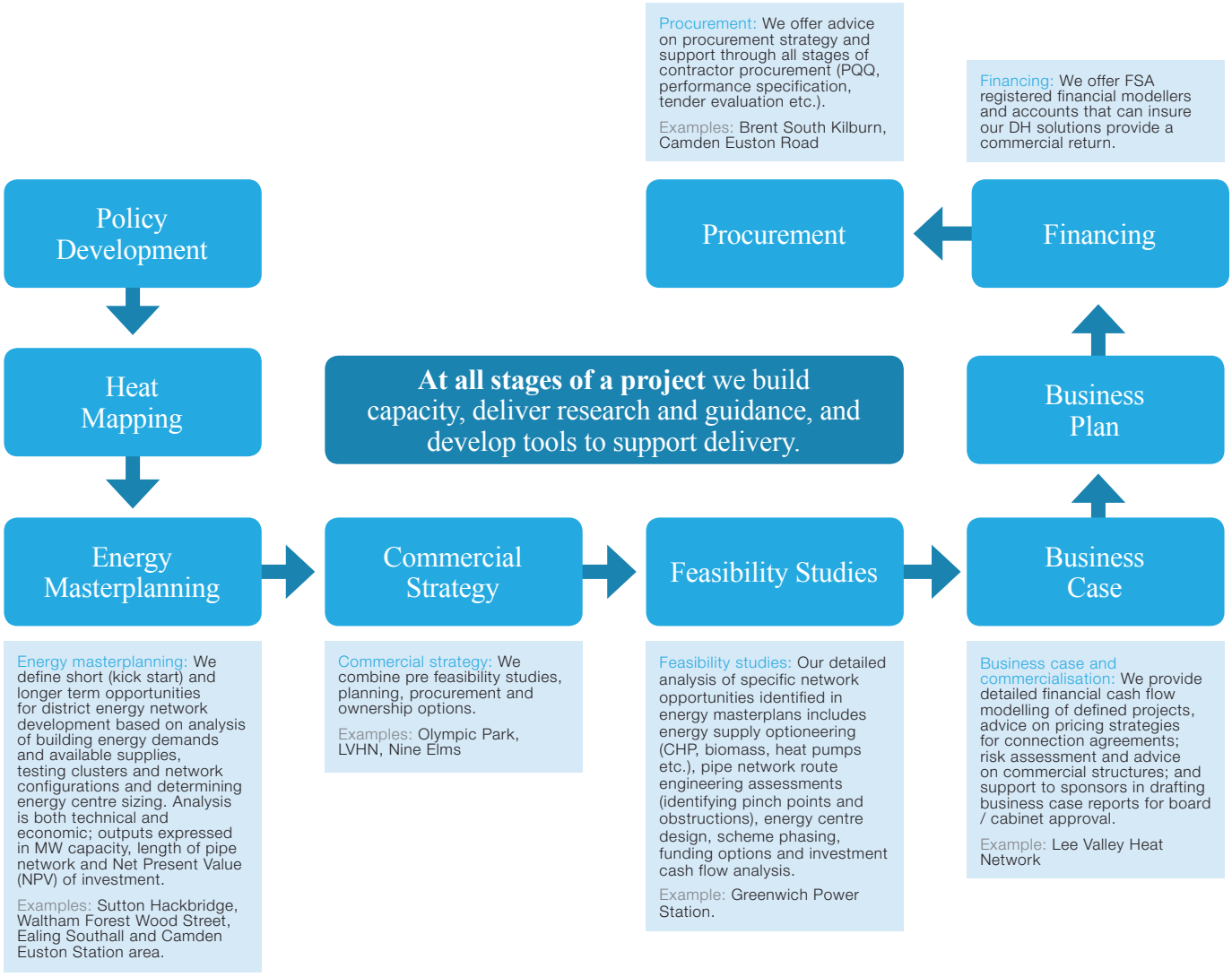
Specialist Skills

- Energy policy
- Pre-feasibility studies
- Detailed feasibility
- Route proving
- Capex assessments
- Financial modelling
- Techno-economic modelling
- Financial model review
- Detailed design
- Specification
- Commercial structuring
- Risk assessment and allocation
- Production of procurement documentation
- Technical advice to contract development

Technology

- Combined heat and power (CHP)
- District heating
- Waste heat
- Low temperature heat
- Biomass boilers
- Biomass CHP
- Lake loop cooling
- Ground source heat pumps
- Air source heat pumps

Project stages



Throughout a project

Capacity building

We deliver informal training and ongoing support to staff within project sponsor organisation. By working through project sponsors rather than taking direct responsibility for project delivery, the DEPDU service has delivered significant informal training benefits to Council and other public sector energy, planning and housing staff across London.

Research

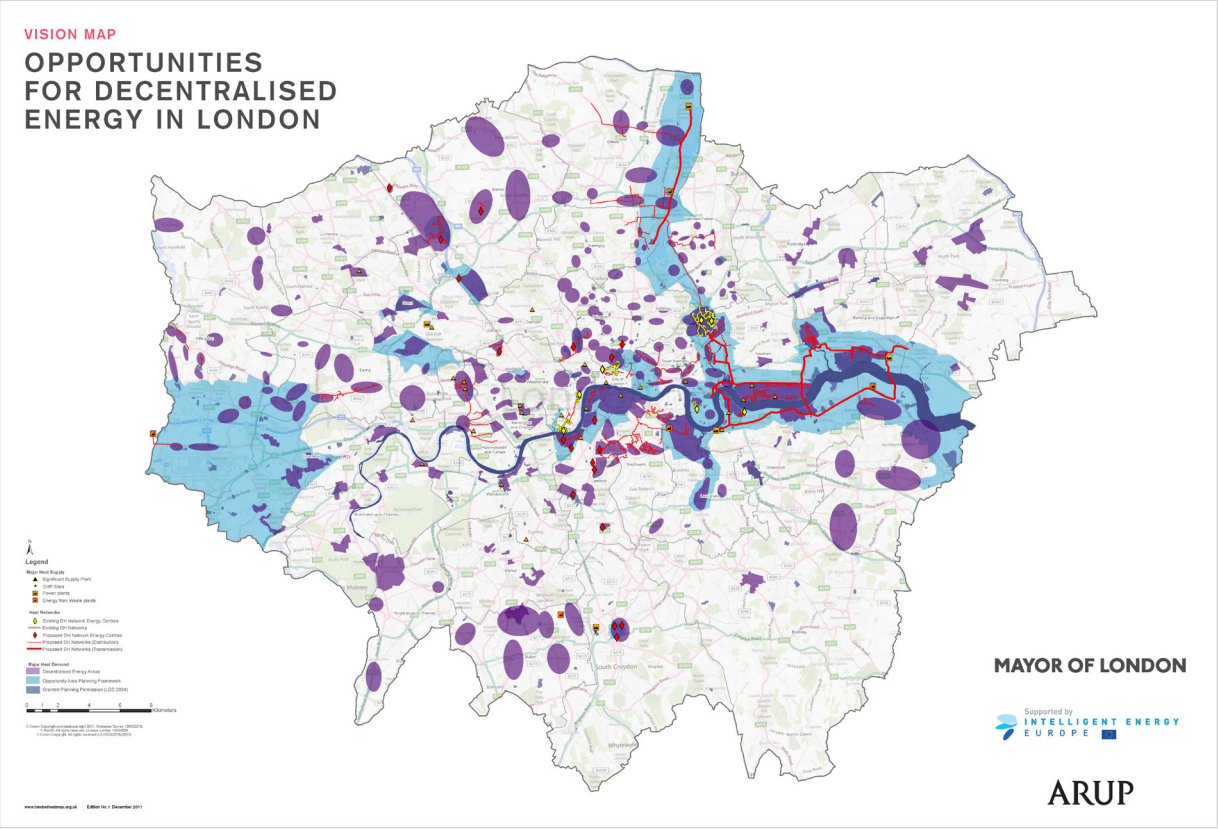
The team has undertaken focused research to address key technical and commercial challenges which arise on projects. Examples include identifying funding sources and financing options for district heating investments; modelling the potential use of "Licence Lite" to increase revenue from CHP electricity sales; the price of heat; and the potential for low carbon heat networks using alternative heat sources and low temperature networks.

Development of tools

At the start of the project, a standard techno-economic modelling tool was developed to enable the team to generate efficient and consistent results at the energy masterplanning stage. A more detailed energy network modelling tool was later developed to support more complex and detailed project analysis.

Guidance

Arup authored the recently issued London Heat Network Manual. The Manual is intended to support the industry by providing authoritative guidance, building on user feedback from the previous version of the manual including technical design principles and concepts for the physical infrastructure of a heat network; contract and procurement; tariff structures and customer service standards; and metering arrangements.



Projects

UK-wide

AP Salads, Europa Nurseries, Kent

We were appointed as Client's Engineer by P3P Partners to provide technical and commercial advice on all aspects of design, installation, commissioning and operation of this distributed energy project, which comprised the construction and development of a new energy centre. We were able to provide an innovative solution that not only provided heat and power but captured and used CO2 for one of the UK's largest horticultural growers.

Distributed Energy, Knowsley

We undertook a techno-economic assessment for developing distributed energy infrastructure in the form of energy centres and heat network(s) to provide commercially viable low and zero carbon energy in Knowsley Business Park and Knowsley Industrial Park (KIP) - one of Europe's largest industrial parks. The project involves market testing of the KIP commercial case (also produced by Arup) resulting in excellent early signs of interest from potential strategic partners in the business of delivering design, build, finance, operate and maintain service offerings. We provided an invaluable service to the client and became a trusted advisor retained to provide project management and technical services to support the procurement of the planning, design, construction, commissioning, operation and maintenance of heat networks.

London

DEPDU Programme, London

Arup supports the GLA as part of the Decentralised Energy Project Delivery Unit (DEPDU), which aims to facilitate over £95m of distributed energy projects. Arup provided assistance during the prospecting and project framework stages of the projects, and continues to provide support through to the feasibility, procurement and commercialisation processes.

Through our engagement Arup is considering the alternative structures and approaches to the delivery of DE projects, providing innovative solutions in a variety of different contexts. This includes the costs, benefits and the risks associated with full public, private or a mixture of ownership. Arup's analysis is allowing DEPDU to establish the most appropriate commercial models for these projects and to identify common elements in SPV delivery structure for DE.

"The London Development Agency has established thought leadership in London on decentralised energy and Arup has played a fundamental role in shaping that thinking. We wouldn't have developed our current strategic vision without Arup. They understand our business, know what we want and have adapted their people and skills to integrate with and support our team to deliver our requirements."

Peter North, Head of Project Delivery - Environment, GLA

Kings Cross Central CHP and Energy Strategy, London

Arup worked on the procurement of independent electricity and district heating networks for the Kings Cross development, including a central plant with CHP and renewable energy sources. We completed an appraisal of energy options, developed the reference scheme design, produced procurement and contract documentation and acted as the Client's Engineer. Our innovative approach led the client to keep us involved during the tender process, leading the technical aspects of the tender evaluation and Energy Services Company partner selection process.

Goldsmiths College, Lewisham

We worked closely with the GLA's RE:FIT project delivery unit to bring a project to market for Goldsmiths College which combined procuring a series of building improvement measures with provision of a new heat network. The role included the use of Arup-developed performance specification for the design, build, operation and maintenance of the network. Arup became a trusted part of the team and provided procurement assistance to the College in subsequently interviewing shortlisted tenderers and selecting a preferred contractor to undertake the district heating improvement works.

Lee Valley Heat Network, Enfield

The Lee Valley Heat Network is London's largest heat network development project. The project encompasses a strategic heat network connecting more than 5,000 homes in Enfield with heat recovered from the Enfield EcoPark Energy from Waste power station. Arup has completed a series of design and feasibility studies, capex assessment, route proving studies, route optimisation investigations and financial modelling for the scheme, the connected sites and a number of satellite heat network projects. We provided a wide variety of technical and financial support provided to Enfield including the completion of wider vision mapping and support in the development of the business plan for the scheme. The satellite projects include the Alma Estate project utilising heat recovered from a lake loop to supply the housing estate; analysis of a potential steam connection from Kedco to Coca-Cola Enterprises; and a biomass boiler led development at New Avenue Estate.

Greenwich Power Station (GPS)

As part of a range of options to decarbonise its electricity supply, Transport for London (TfL) are exploring the redevelopment of GPS, which is an oil and gas-fired power station operated by TfL as a back-up electricity source for the London Underground. The first Arup study specified and evaluated the energy and cost parameters of a district heating main to facilitate transfer of heat generated within the existing GPS building to the Greenwich Peninsula. Arup is also working on a second study evaluating the potential for a new GPS to support a low carbon district heating system, and for lower carbon options for continuing operation of the existing GPS.

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