



IDEA2016

*embracing
change*

107TH ANNUAL CONFERENCE & TRADE SHOW • ST. PAUL, MN • JUNE 20 – 23

Preliminary Program – 3.22.16
TIMES AND CONTENT SUBJECT TO CHANGE

Workshop: District Energy in Cities
Building Capacity for Climate Adaptation and Community Energy Planning

SHARPENING THE FOCUS & NARROWING THE FRAME

FIRST STEP IN ANALYZING DISTRICT ENERGY OPPORTUNITIES

AGENDA

- 1. Setting the scene – TRENDS & SHAPING LIVABLE CITIES**
- 2. The role of the City - ENERGY SUPPLY FRAMEWORK**
- 3. Advertising Cities - Examples**
- 4. The energy mapping process incl. GIS**
- 5. Another City Example**
- 6. Questions?**

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URBANISATION IS A MEGATREND



INCREASING ENERGY USAGE



Source: International
Energy Agency, 2012

INCREASING WASTE PROBLEMS



Source: McKinsey, 2012

THE HIDDEN BACKBONE OF THE LIVEABLE CITY



Surplus biomass for CHP plant



Surplus straw for CHP plant



Offshore wind farm



Large building



Residential building



Harbour, unloading of biomass



Wastewater treatment and biogas plant



Solar heating plant and heat storage



Distant building w/solar PV



Outskirt building w/ heat pump, solar PV and wind turbine



CHP plant fuelled by gas, straw, wood, city waste + heat storage



District heating/cooling plant + cold water storage



Industry with process energy and surplus heat



Electricity



District heating



District cooling



Gas

AGENDA

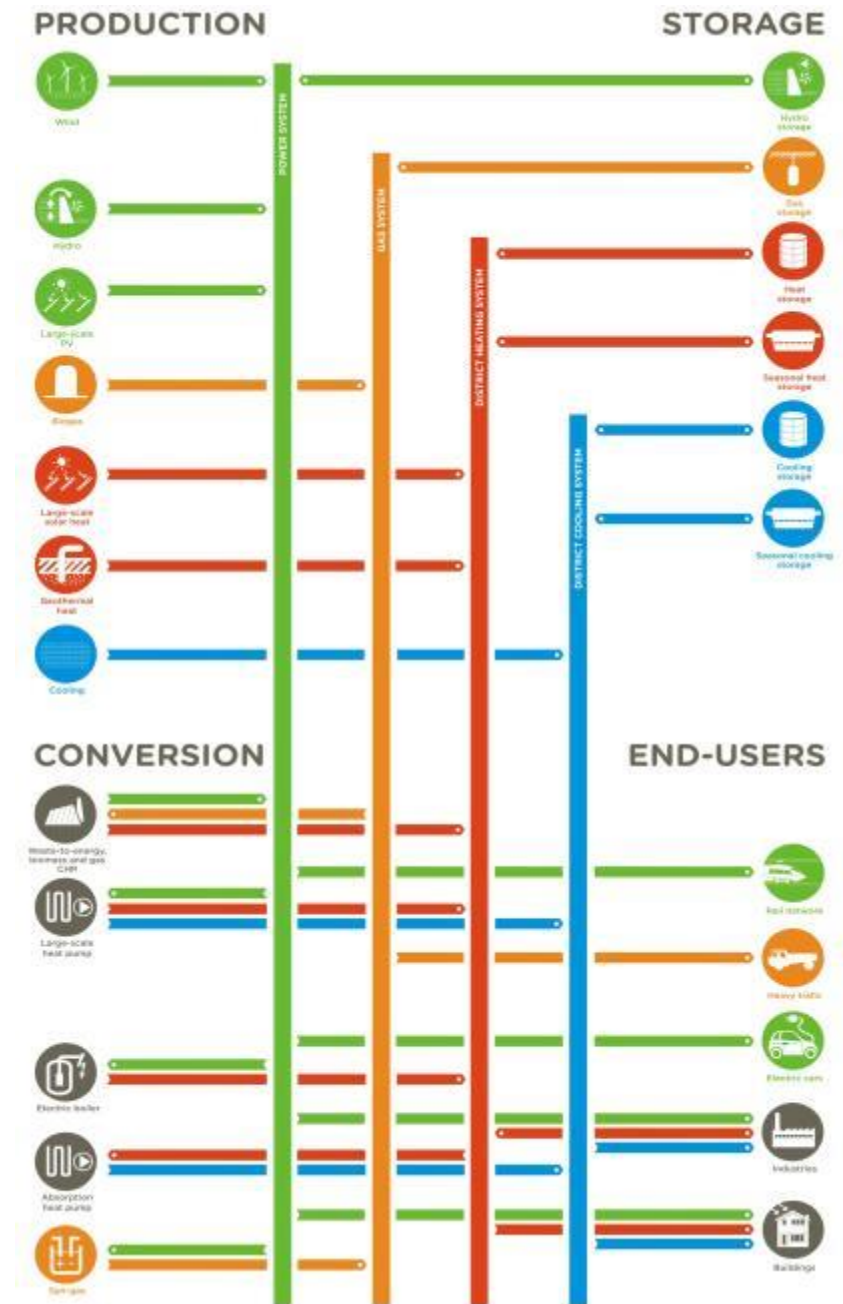
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HOW DISTRICT ENERGY ASSIST CITES AND ADD VALUE



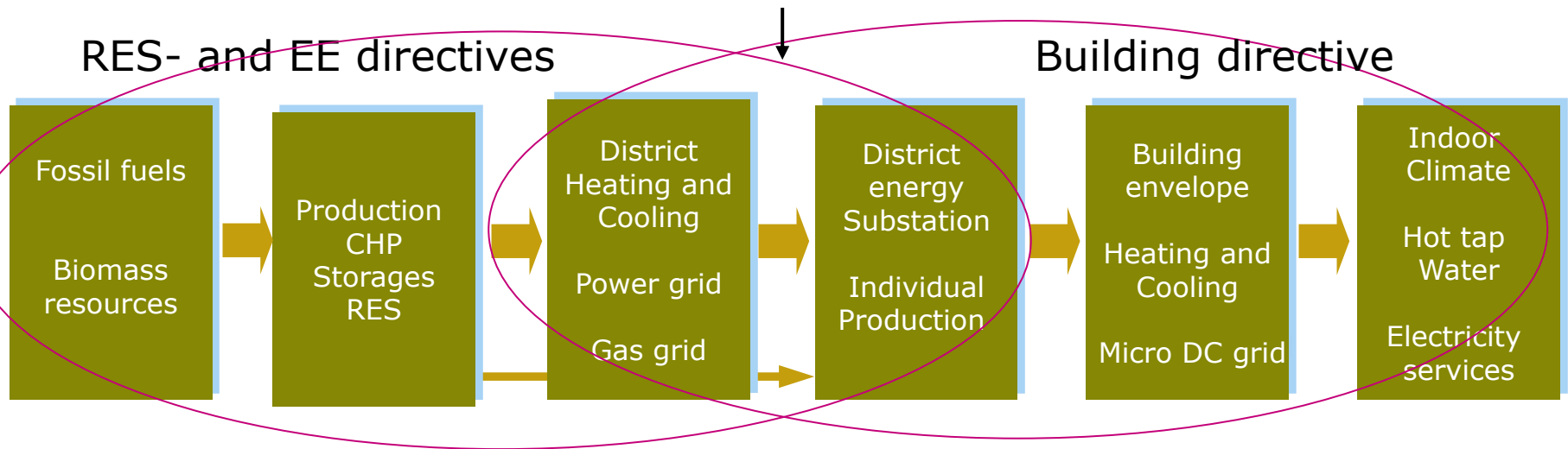
SMART ENERGY SYSTEMS

- National power grid
- City-wide district heating grid
 - storage for CHP and RES
- City district cooling grid
 - storage and optimal cooling
- National natural gas grid
 - storage, CHP and small houses
- Buildings and other end-users
 - Optimized building envelope
 - Low temperature heating
 - High temperature cooling
 - Micro DC grid electronics
 - Adjust consumption to dynamic prices



SMART CITIES AND GRIDS

- **Same criteria for cost effectiveness** for all investments
- Interaction between **smart grids, buildings and end-use**
- Energy depends on **time and quality**



PLANNING AND REGULATION NEEDED TO OVERCOME MARKET CHALLENGES



STICK 'N' CARROT - INCENTIVISE DESIRABLE ACTIONS



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COPENHAGEN CARBON NEUTRAL BY 2025

DENMARK

Challenge

Desire to cut carbon emissions

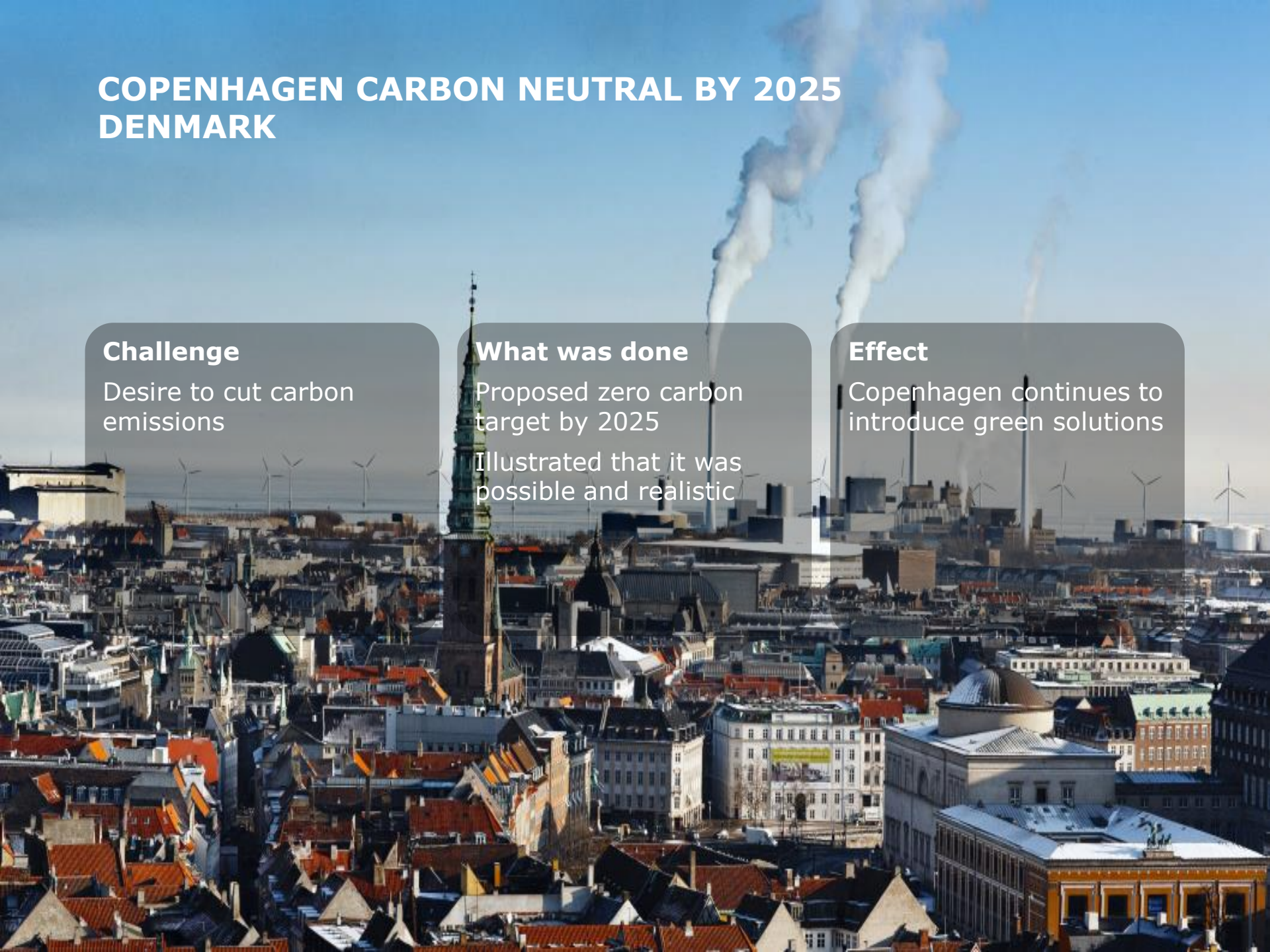
What was done

Proposed zero carbon target by 2025

Illustrated that it was possible and realistic

Effect

Copenhagen continues to introduce green solutions



COPENHAGEN DISTRICT HEATING SYSTEM

DENMARK

Challenge

Utilization of all available heat sources in the Copenhagen region in the most efficient way

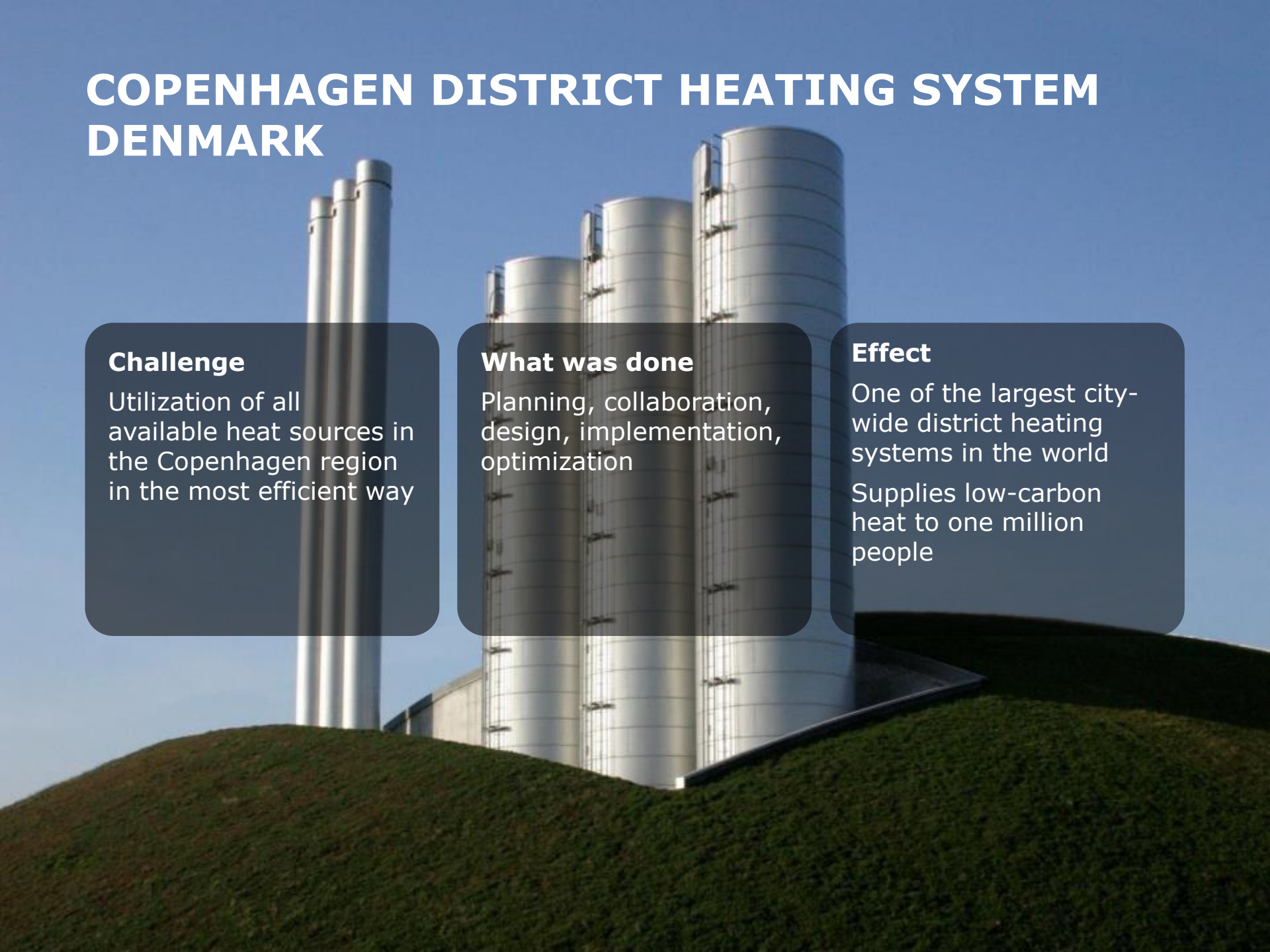
What was done

Planning, collaboration, design, implementation, optimization

Effect

One of the largest city-wide district heating systems in the world

Supplies low-carbon heat to one million people



THE LONDON HEAT MAP

Challenge

Provide a basis for new district energy scheme planning.

Data gathering across all boroughs in the Greater London Area

What was done

Demand information was gathered across the GLA as heat mapping reports.

Data then collated into the heat map by a central body.

Effect

Provides a basis for masterplanning and feasibility work.

Platform for recording data regarding existing and planned energy networks

"The London Heat Map has helped in the successful development of district energy projects in the city and ensure that new developments to either connect to local heat networks or future-proof to connect to envisaged networks. The London Heat Map represents the first step in the DE development process that will contribute towards us achieving our goals of delivering 25 % of London's Energy Supply by 2025."

– Peter North, Senior Manager, Programme Delivery, GLA, 2016

CHICAGO LAKESIDE – THE FUTURE OF URBAN DESIGN CHICAGO, US



Challenge

Vision to breathe new life into South Chicago
How to create a liveable and sustainable city for future generations

What was done

Prepared design concept for sustainable energy, water management and waste management

Fossil fuel reduction of 90%, CHP & District Energy

Effect

New way of living
Urban design strategy is key differentiator
Winner of Sustainia Community Award

ENERGY MASTERPLAN FOR THE GREATER MANCHESTER AREA, UK

An aerial photograph of the Greater Manchester area in the UK, showing a dense urban landscape with a mix of historic and modern architecture. In the foreground, a large brick building with a curved roof is visible, with the text 'GREAT NORTHERN RAILWAY COMPANY'S GOODS WAREHOUSE' on its facade. The city extends to the horizon under a blue sky with scattered clouds.

Challenge

New carbon and energy policy commitments
Need for efficient, cost-effective heat

What was done

Developed a district heating energy masterplan across ten authorities

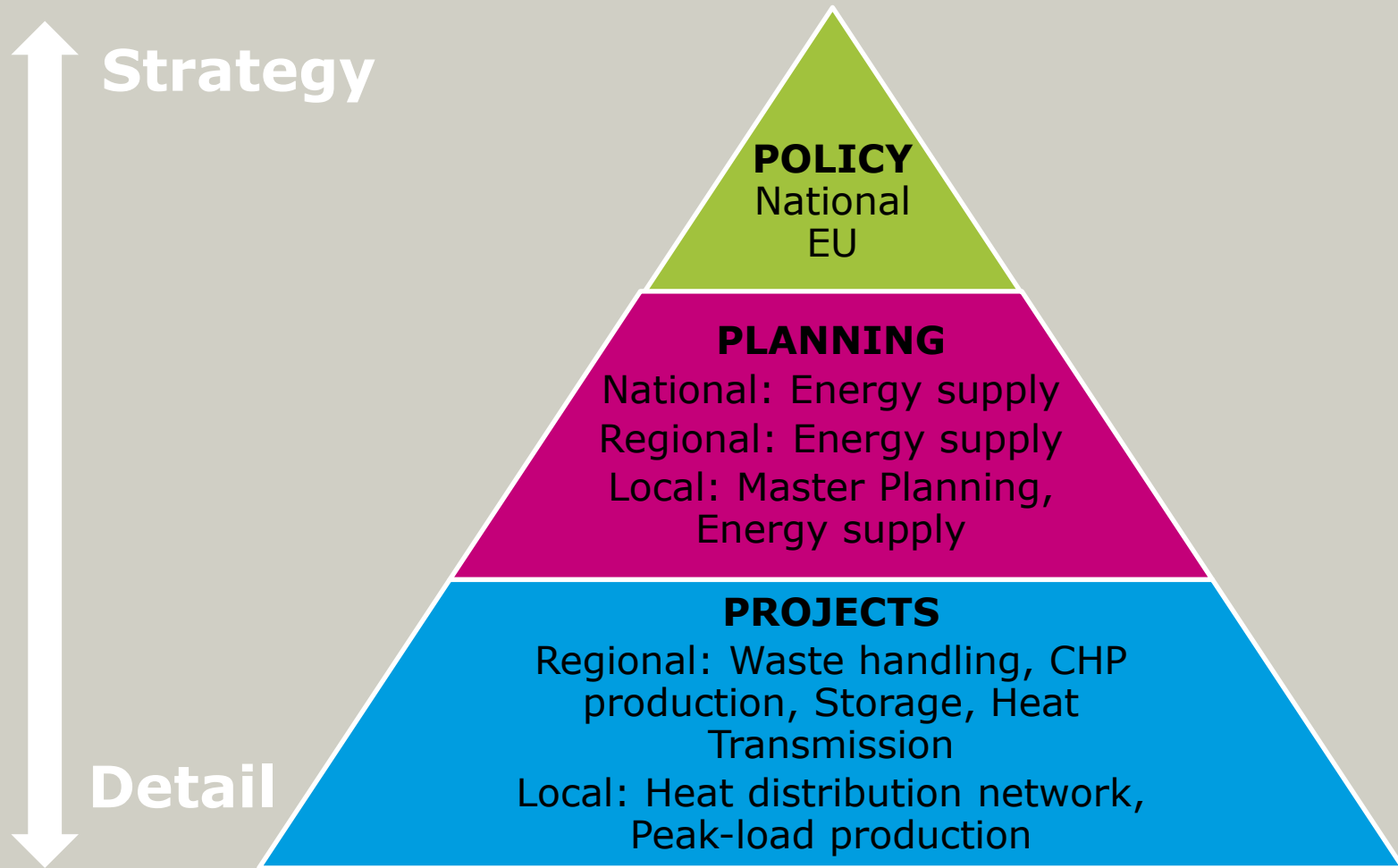
Effect

Provides a basis for decisions about specific projects to be initiated

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(DANISH) ENERGY STRUCTURE



METHODOLOGY FOR (DISTRICT) ENERGY PLANNING

Data Collection

- Develop heat demand and supply map and database

Strategy

- Identify opportunities, scenarios and networks

Technical design

- Energy Modelling, plant selection etc

Financial Assessment

- Whole Life Costing

Comparative Assessment of the Scenarios

- Selection Criteria and Ranking

Project Reporting

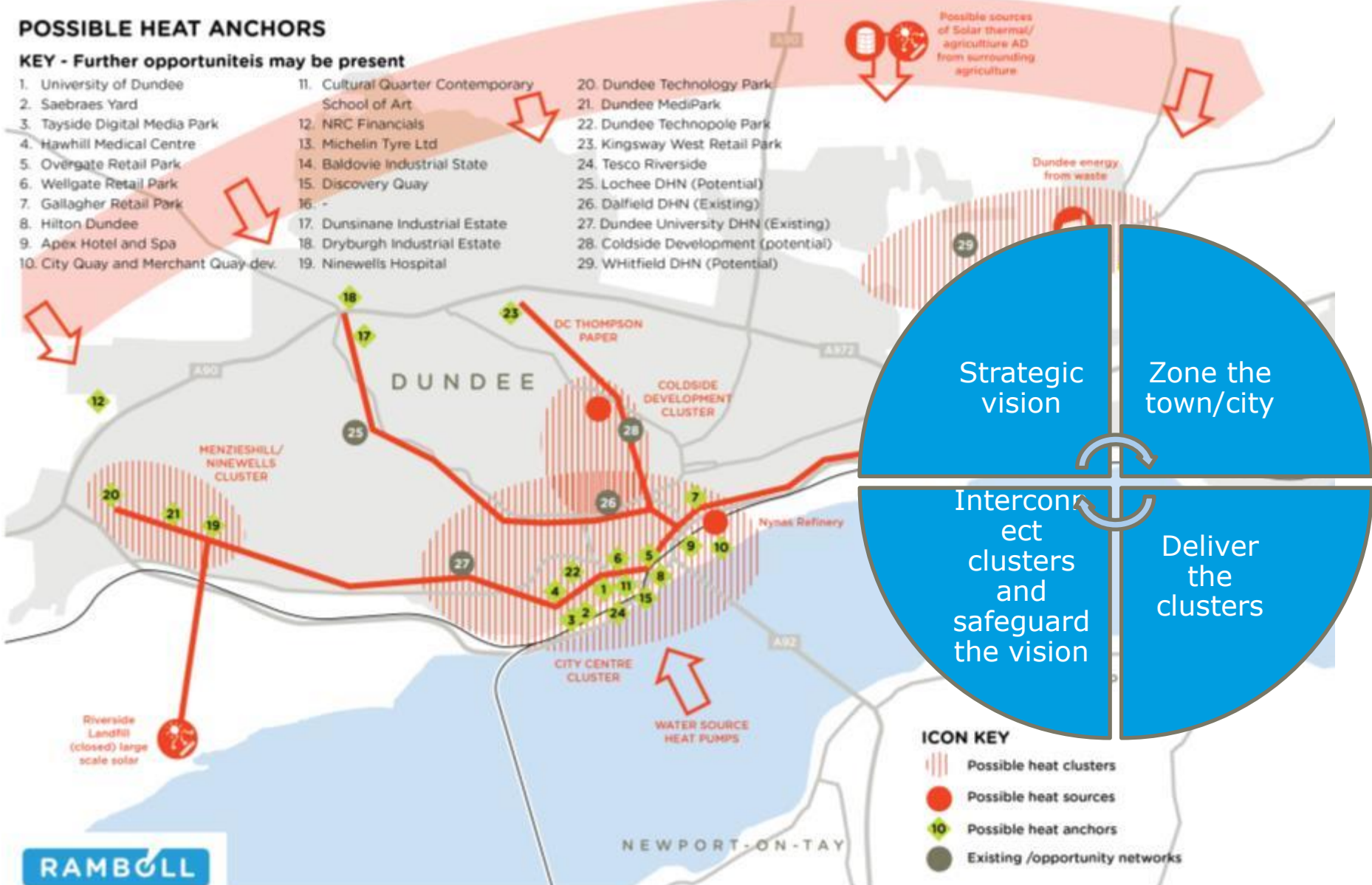
- Risks and Recommendations

PLANNING AND DELIVERING DH OVER TIME

POSSIBLE HEAT ANCHORS

KEY - Further opportunities may be present

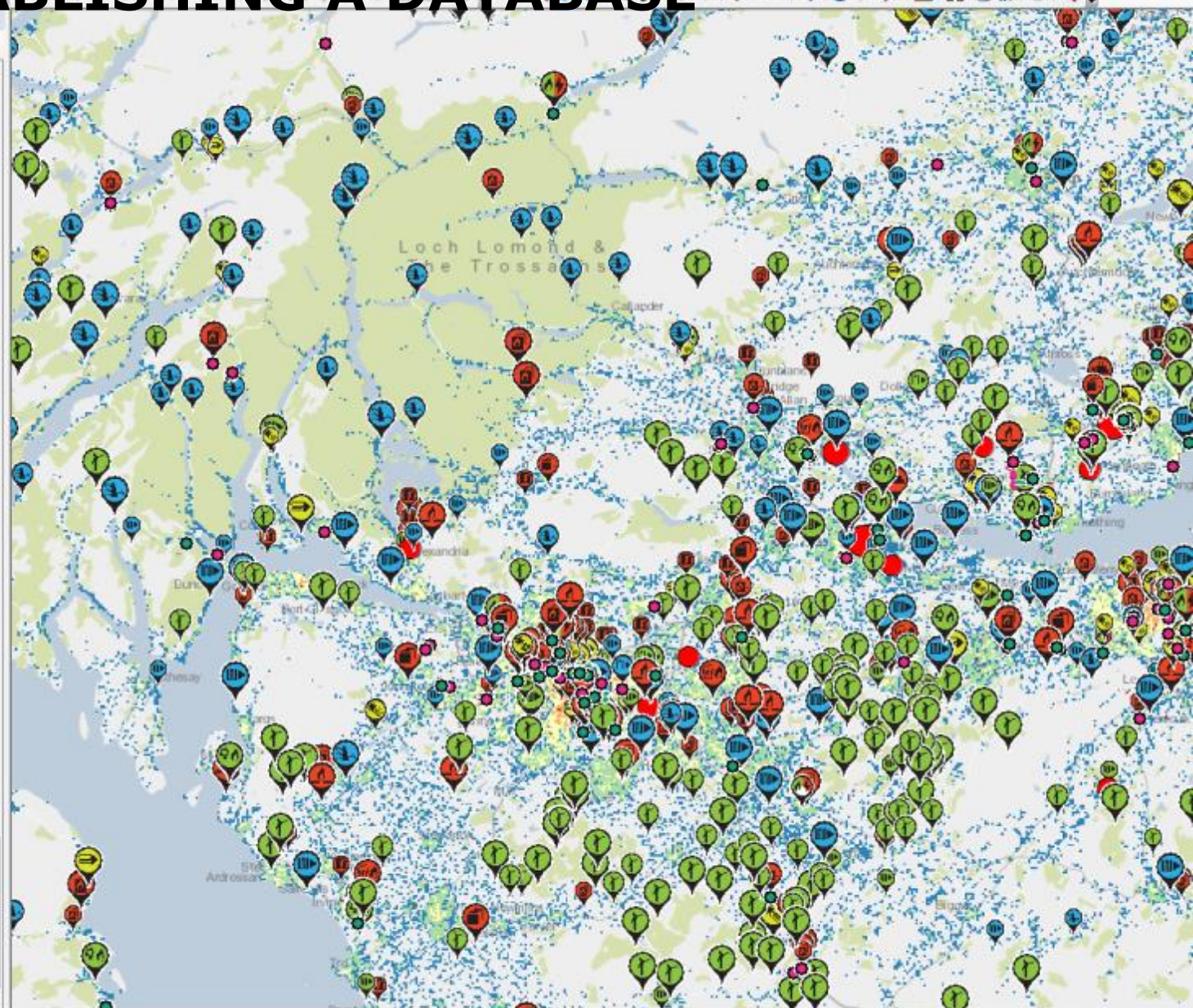
- | | | |
|--------------------------------------|---|--------------------------------------|
| 1. University of Dundee | 11. Cultural Quarter Contemporary School of Art | 20. Dundee Technology Park |
| 2. Saebræs Yard | 12. NRC Financials | 21. Dundee MediPark |
| 3. Tayside Digital Media Park | 13. Michelin Tyre Ltd | 22. Dundee Technopole Park |
| 4. Hawhill Medical Centre | 14. Baldovie Industrial State | 23. Kingsway West Retail Park |
| 5. Overgate Retail Park | 15. Discovery Quay | 24. Tesco Riverside |
| 6. Wellgate Retail Park | 16. - | 25. Lochee DHN (Potential) |
| 7. Gallagher Retail Park | 17. Dunsinane Industrial Estate | 26. Dalfield DHN (Existing) |
| 8. Hilton Dundee | 18. Dryburgh Industrial Estate | 27. Dundee University DHN (Existing) |
| 9. Apex Hotel and Spa | 19. Ninewells Hospital | 28. Coldside Development (potential) |
| 10. City Quay and Merchant Quay dev. | | 29. Whitfield DHN (Potential) |



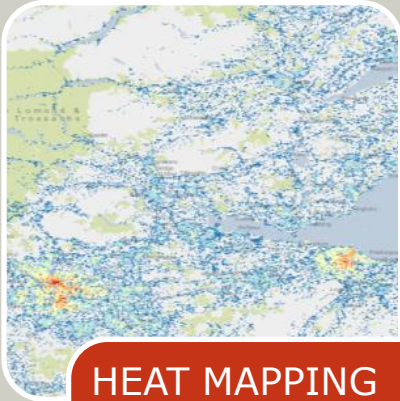
GIS - ESTABLISHING A DATABASE

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 - 625,000 -
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 - 625,000 - 2,500,000
 - 2,500,000 - 6,250,000
 - 6,250,000 - 15,625,000
 - 15,625,000 -
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 - ☐ AdditionalLayers
- ☒ OS Open Background



HEAT MAP USES



HEAT MAPPING

- Energy Demand
- Energy Resources
- Prevailing Fuel Sources
- Existing and Planned Networks



IDENTIFICATION OF OPPORTUNITIES

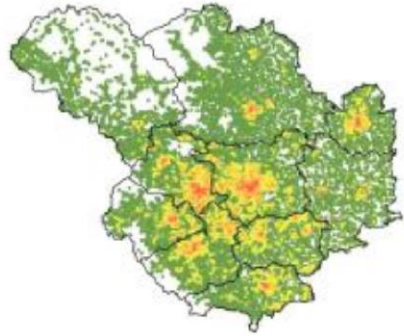
- Geographical proximity of resources/demand
- Fuel poverty
- Future Development



PROJECT PRIORITIES

- List of DH Network opportunities
- Hierarchy of potential projects

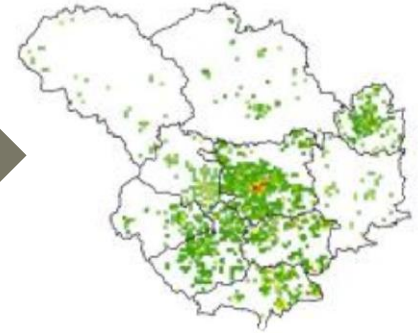
GIS – BUILDING BLOCKS



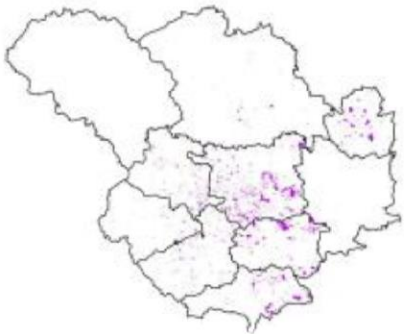
Filtering



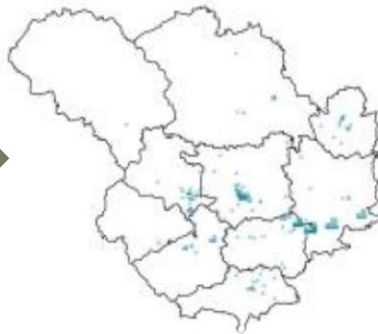
Analysis



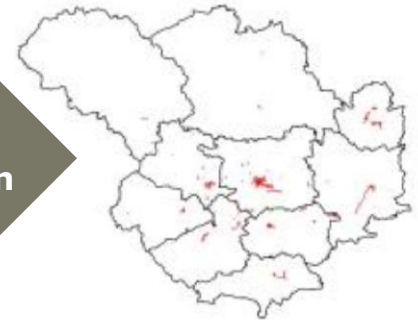
Planned Development Layers



Supply



Opportunity Identification



GIS – PLANNING TO IMPLEMENTATION

INITIAL MAPPING

DE PROJECT IDENTIFICATION

NETWORK ROUTING AND
OPTIMIZATION

NETWORK DESIGN

CHANGES TO NETWORK
THROUGH DESIGN PROCESS

CONSTRUCTION DRAWINGS

RECORD “AS BUILT”
DRAWINGS

OPERATION AND
MAINTENANCE



WHAT TO BE AWARE OF – REDUCE RISK

Planning and future proofing

Scale of scheme

Heat density in the supplied area

Rate of connection to the network

Complexity of scheme

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FORD SITE – ST PAUL



FORD SITE ENERGY STUDY



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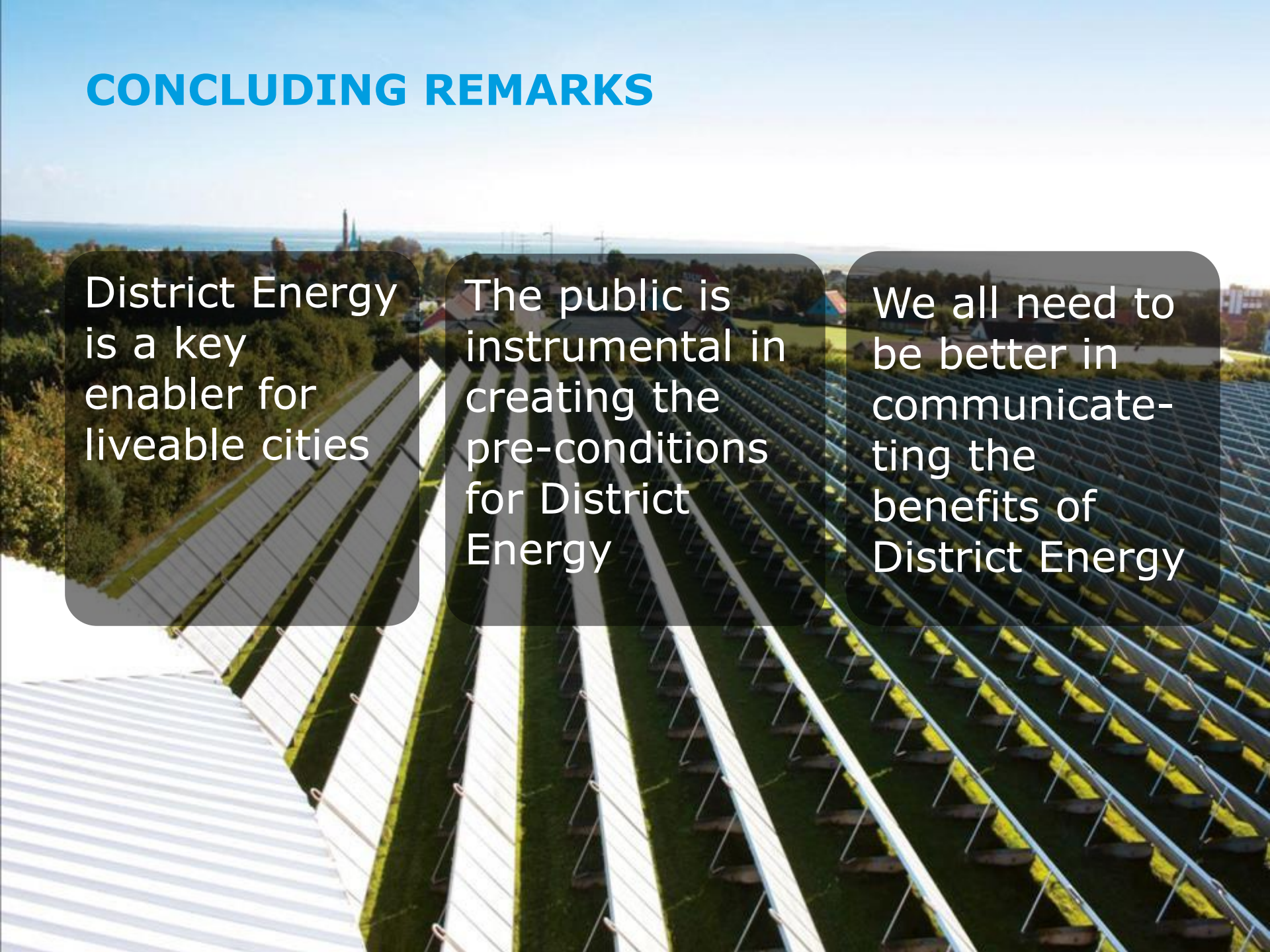
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CONCLUDING REMARKS

District Energy is a key enabler for liveable cities

The public is instrumental in creating the pre-conditions for District Energy

We all need to be better in communicating the benefits of District Energy



THANK YOU

Pernille M. Overbye

PMO@RAMBOLL.COM

+1 289 834 4426

Mairead Kennedy

MAIREAD.KENNEDY@RAMBOLL.COM

+1 226 979 1721

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WWW.RAMBOLL.COM/ENERGY**