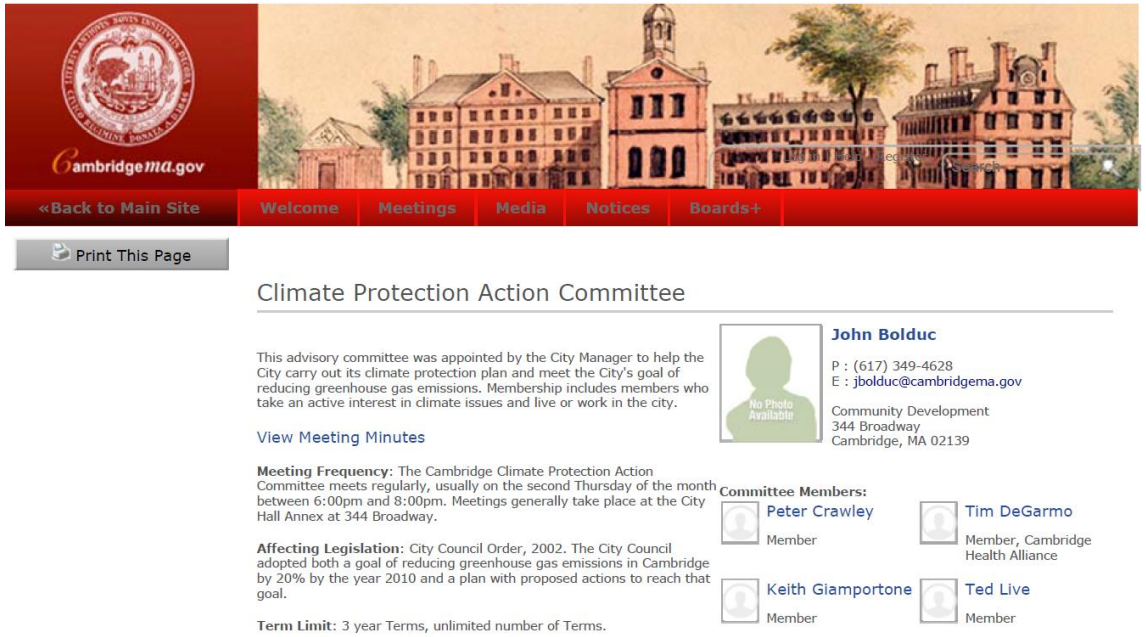
LOW CARBON ENERGY SUPPLY STRATEGY STUDY, CAMBRIDGE, MA
IDEA CONFERENCE ARIZONA

RAMBØLL

CITY OF CAMBRIDGE GOALS AND INITIATIVES

- 2002 Climate Protection Action Plan
  - 80% Reduction in GHG by 2050
- Continued monitoring and initiatives
- 2013 formed "Getting to Net Zero Task Force" based on community concerns
  - "net zero" is based on each building on an annual basis
  - Offset with carbon free energy production and energy efficiency programs
  - TF delivered a 25 year framework for being net zero



PROJECT OVERVIEW

Project Scope

Develop an energy supply strategy for the City of Cambridge that achieves a system-level transformation in order to support the goals of the Net Zero Action Plan (getting to net zero by 2040).

ROLE OF THE CITY OF CAMBRIDGE

The City of Cambridge:

- Agreed an **objective** with clear definition

  => Net Zero

- Developed an **Action Plan**
- Developed and launched a framework of projects to **implement the action plan** over 25 years
- Identified and agreed on the characteristics for the City's energy supply to meet (based on those outlined by the Carbon Neutral Cities Alliance)

Carbon Neutral Cities Alliance / Cambridge Energy Supply characteristics ambition:

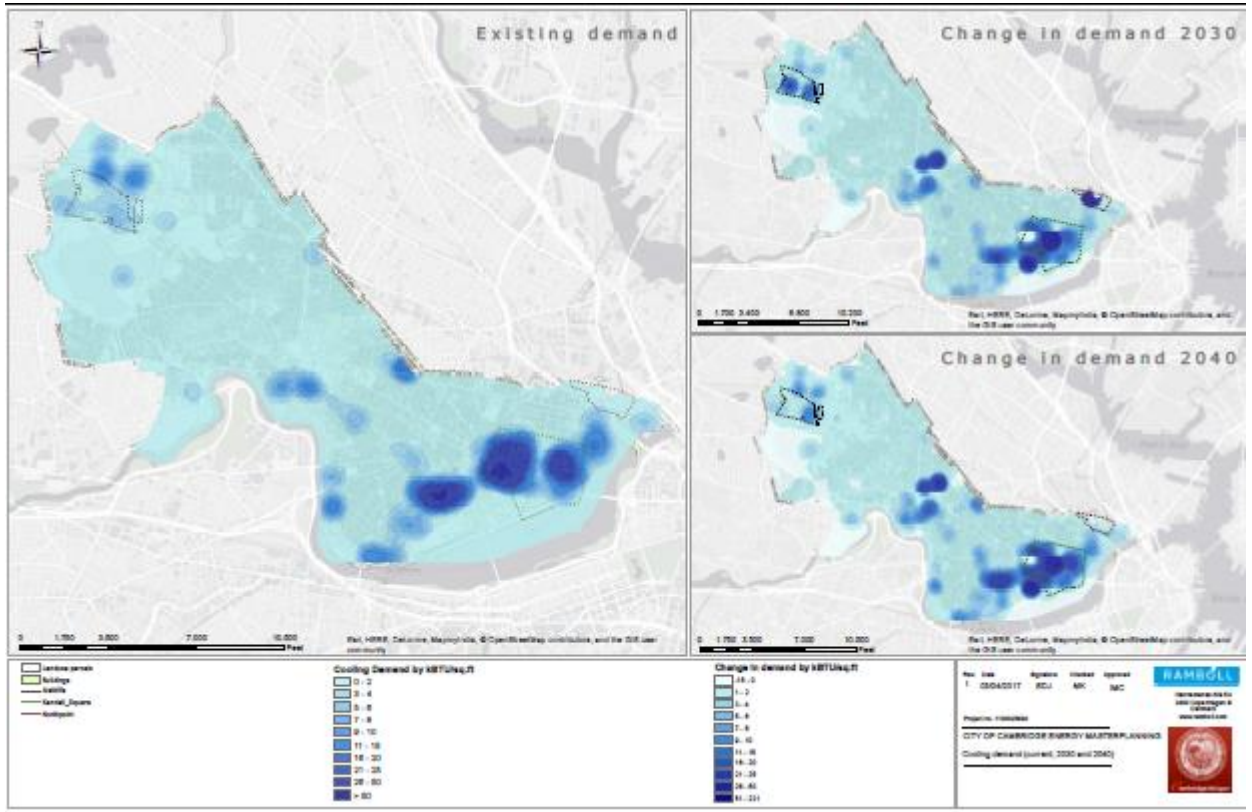
- **Clean**
- **Reliable**
- **Affordable**
- **Predictable**
- **Transparent**
- **Local Control**
- **Wealth Creating**
- **Innovative**
- **Just**

PROJECT COMPONENTS

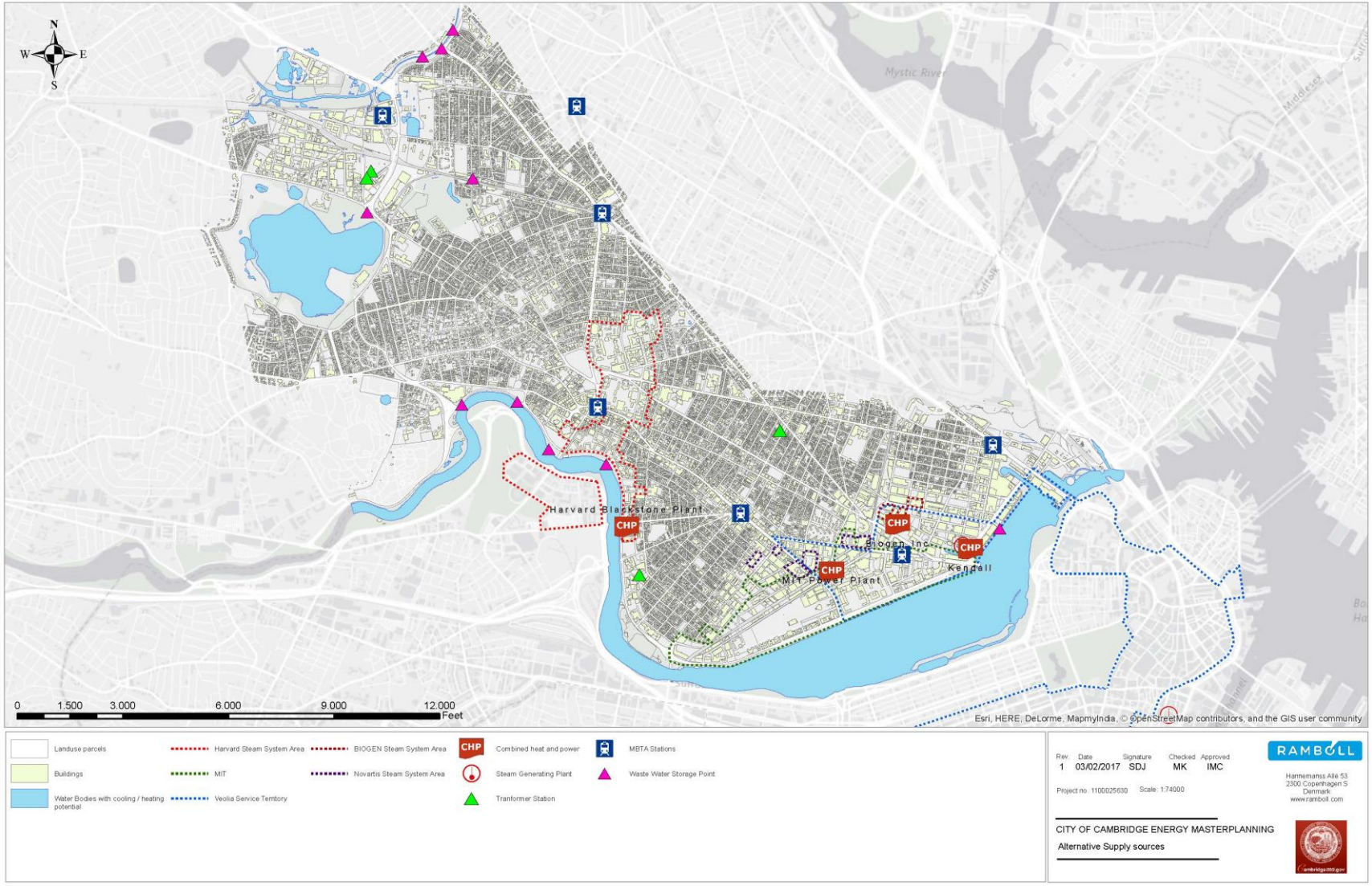
- Work package 1: Baseline situation assessment of City's current energy supply and barriers to low carbon
- Work Package 2: Low Carbon Scenarios Development
- Work Pacakge 3: Change and Benefit Management
- Work Package 4: Technical and economic viability assessment

WORK PACKAGE 1: BASELINE SITUATION ASSESSMENT OF CITY'S CURRENT ENERGY SUPPLY AND BARRIERS TO LOW CARBON

- Data gathering and analysis
- Mapped the City’s current, medium (2030) and long (2040) term energy demand using GIS
- Heating, cooling and electricity demand maps generated showing location specific usage
- Cooling map on right: show cooling demand will increase moving towards 2040. By comparison the heat demand mapping shows heat demand will reduce by 2040



MAPPED ENERGY SUPPLY SOURCES: EXISTING AND POTENTIAL



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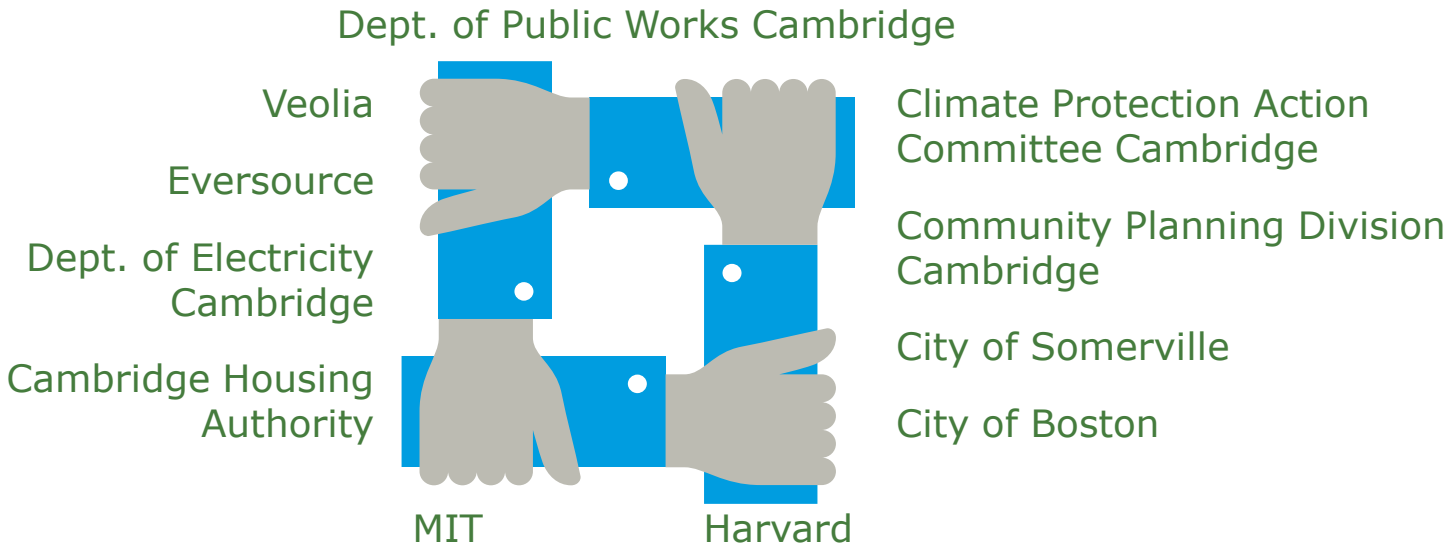
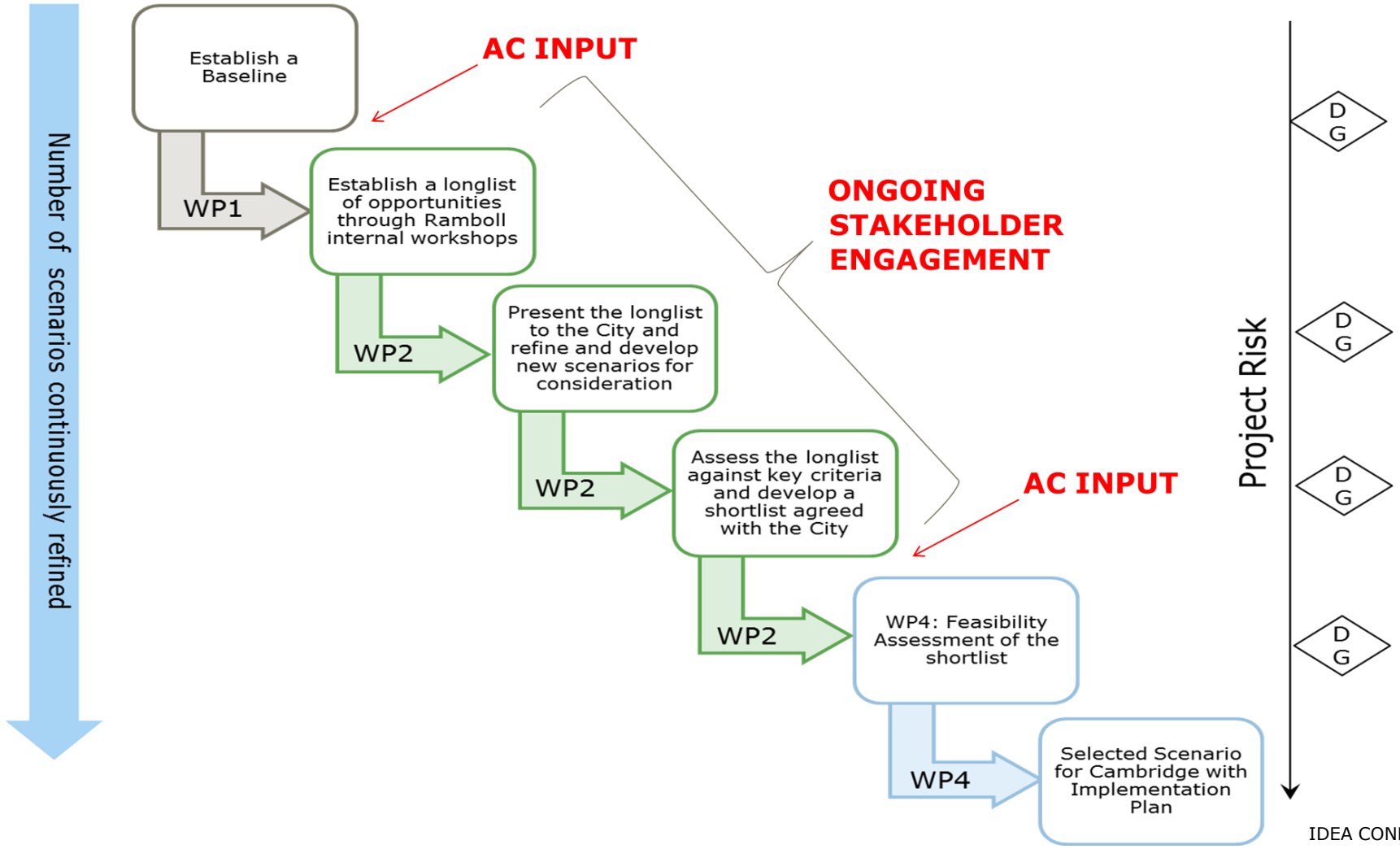
CITY ROLE: IMPORTANCE OF COLLABORATION

- Difficult City objective established
- Critically important to bring **ALL stakeholders** with process
- City established Advisory Committee with key stakeholders to build consensus throughout the process:

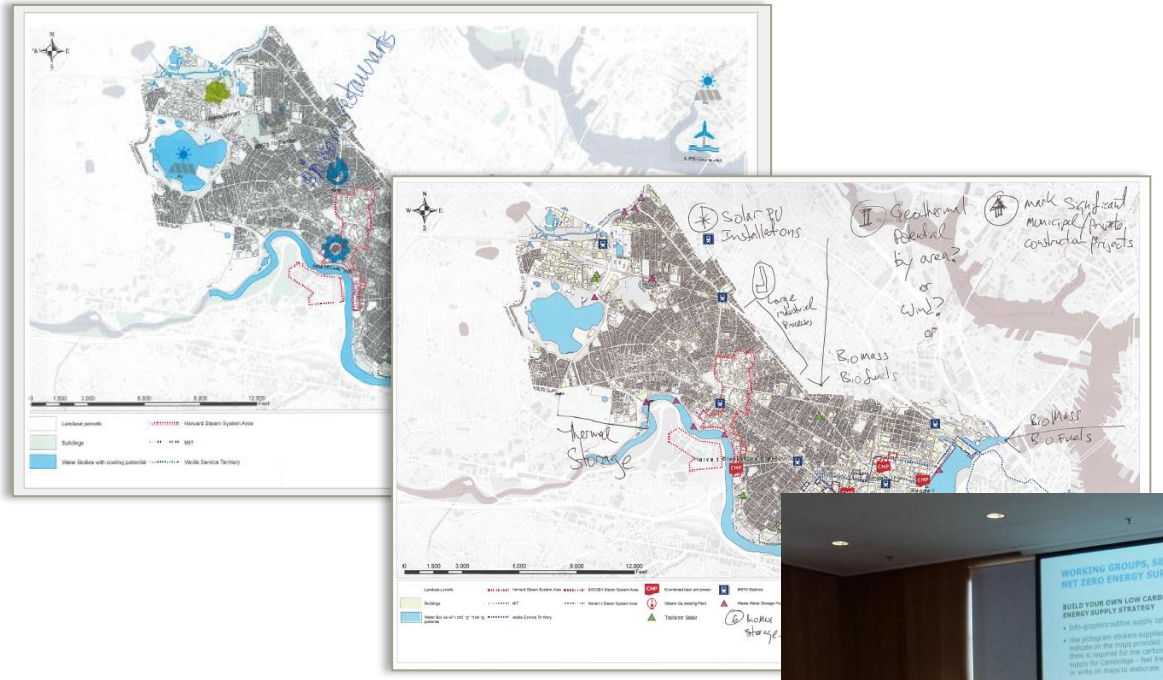


SCENARIO DEVELOPMENT PROCESS – ITERATIVE ENGAGEMENT AND EVOLVEMENT OF SCENARIOS



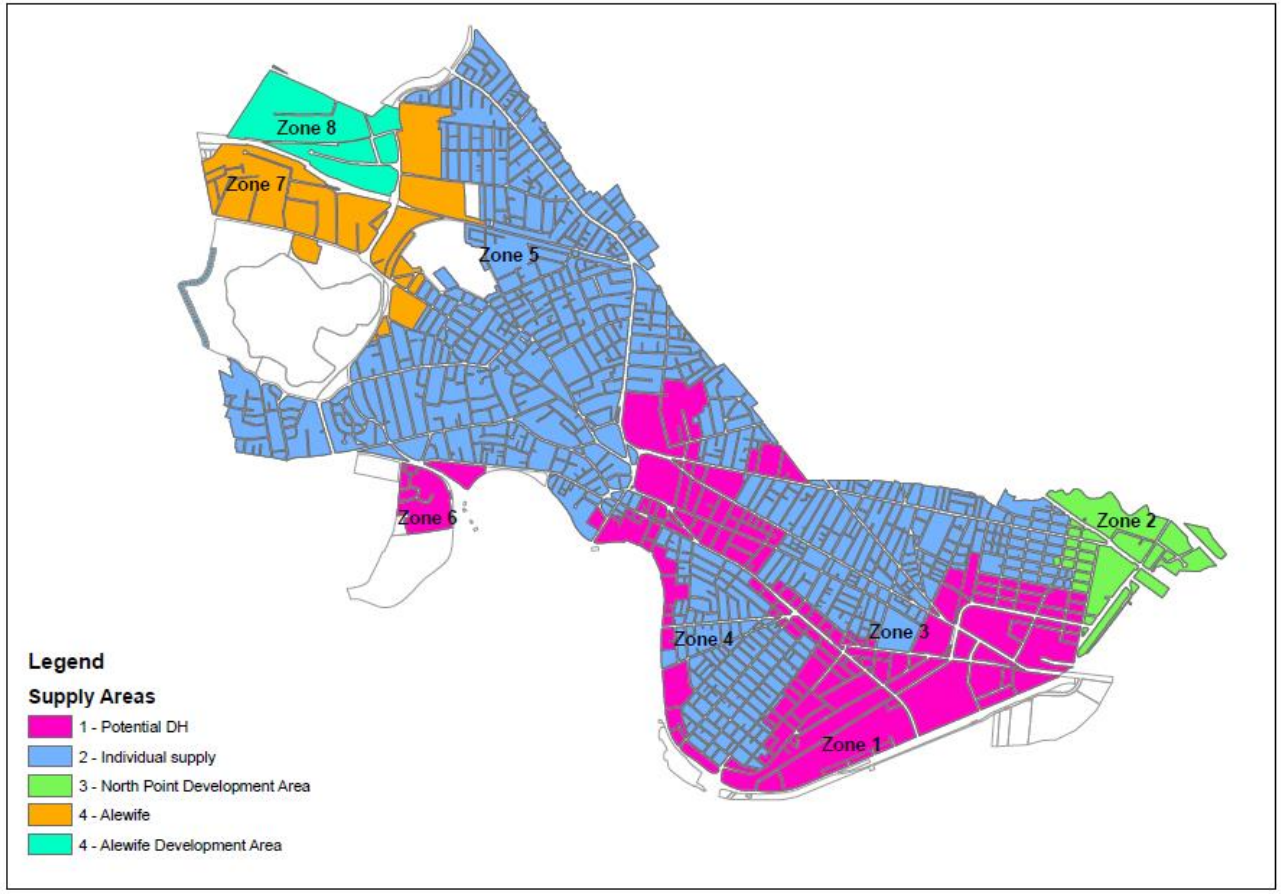
RAMBOLL FACILITATED WORKSHOPS WHERE AC TEAMS DEVELOPED THEIR OWN LOW CARBON SUPPLY STRATEGY

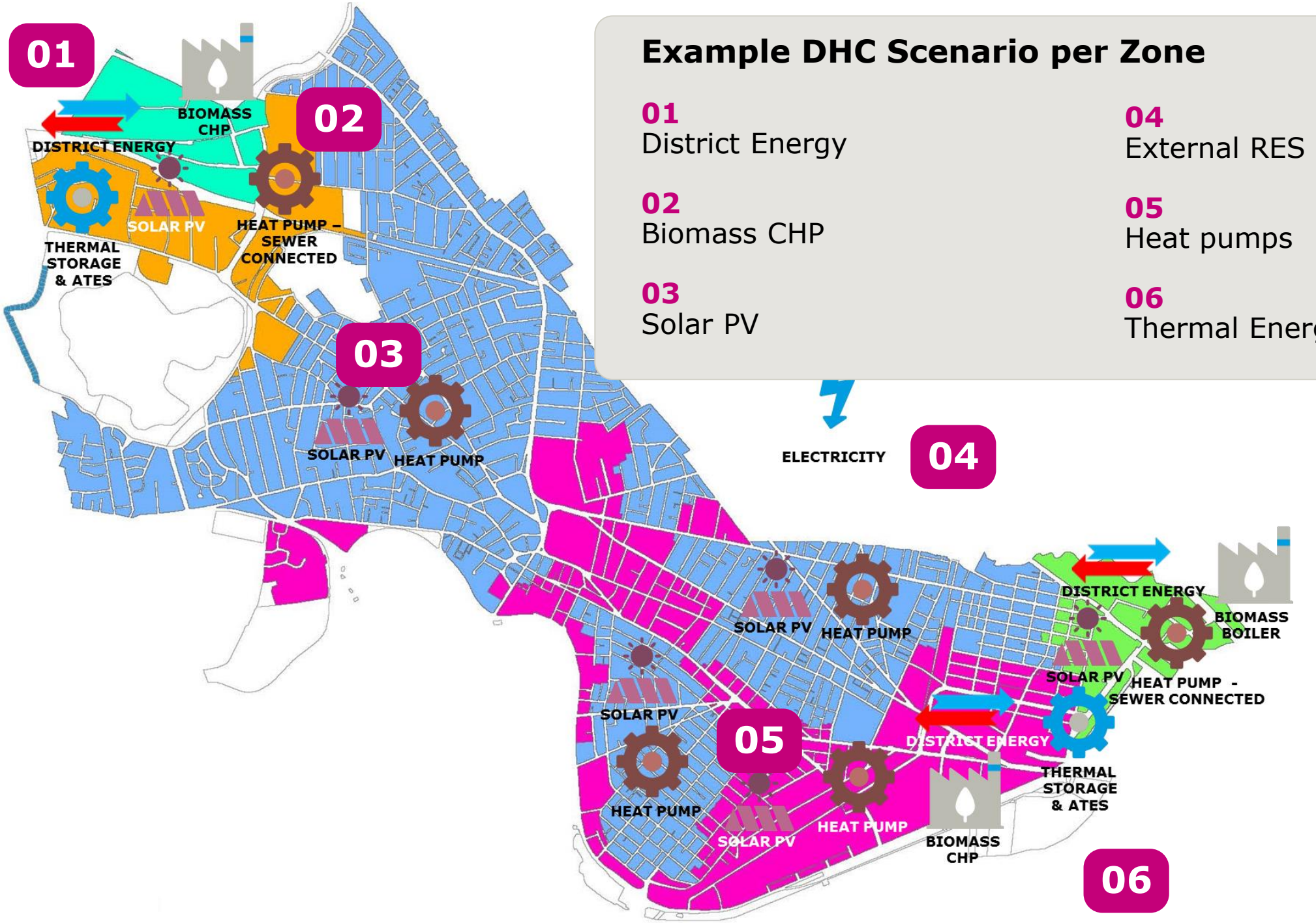
- Bring understanding of process to Advisory Committee
- Get buy in to whole process
- Become involved in process
- Understand the challenge
- Understand the need to address together



WORK PACKAGE 2: LOW CARBON SCENARIOS DEVELOPMENT

- Heating and cooling consume 60% of the City's energy demand
- To consider alternative methods of supplying this demand, need to know where it is
- Heat demand zones developed
- Scenarios developed per zone dependent on their demand





Example DHC Scenario per Zone

01
District Energy

02
Biomass CHP

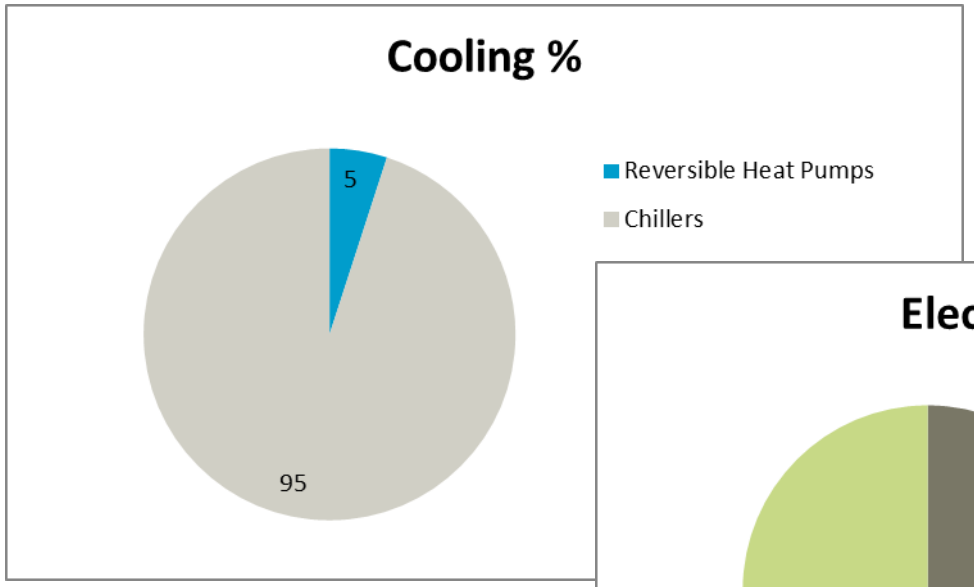
03
Solar PV

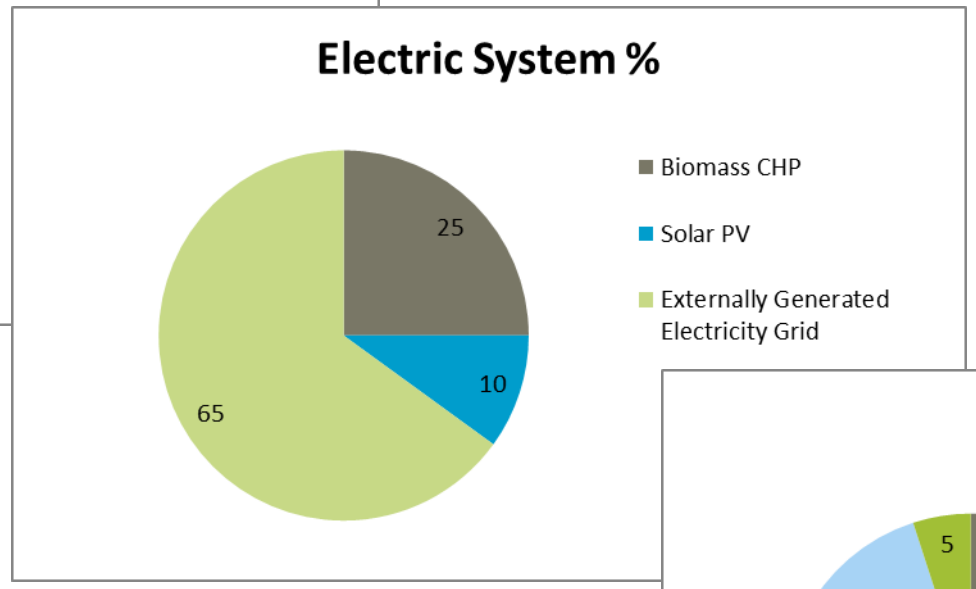
04
External RES generation supply

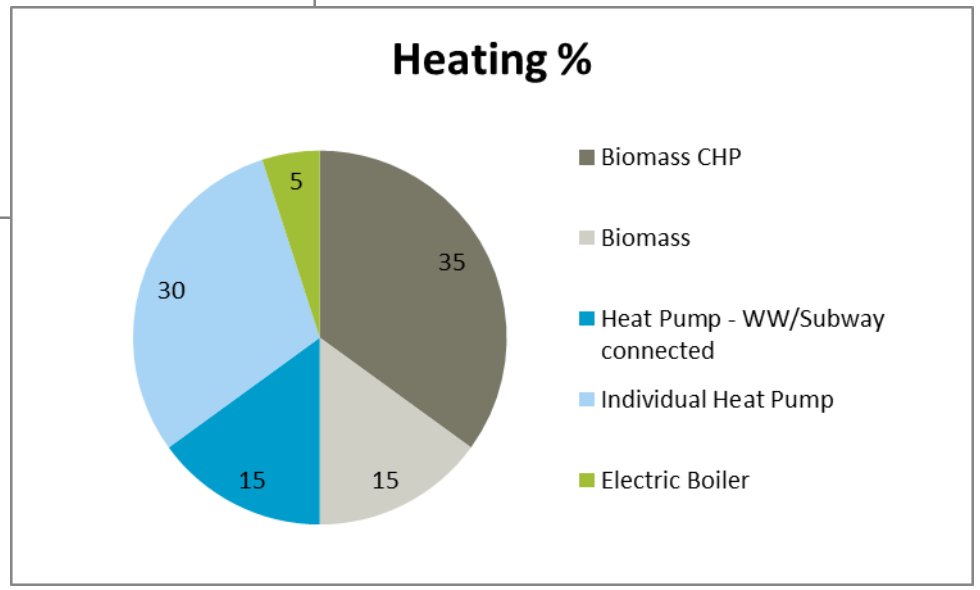
05
Heat pumps

06
Thermal Energy Storage

EXAMPLE SUPPLY SCENARIO BREAKDOWN







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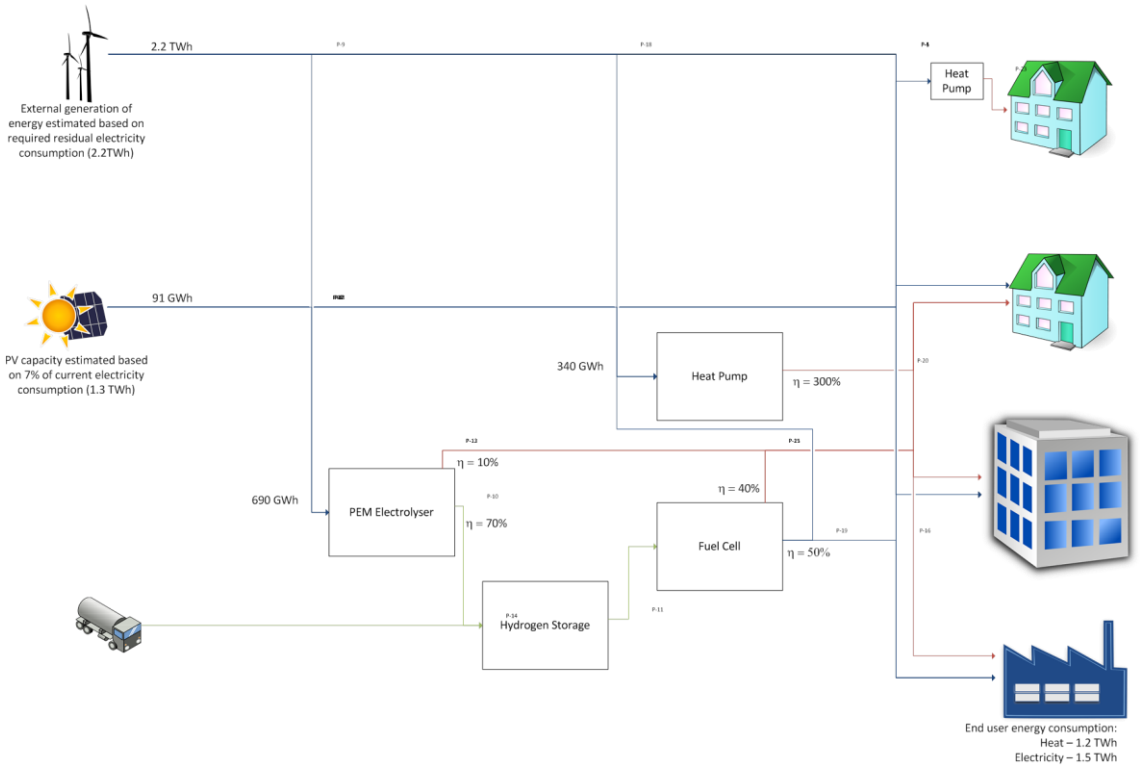
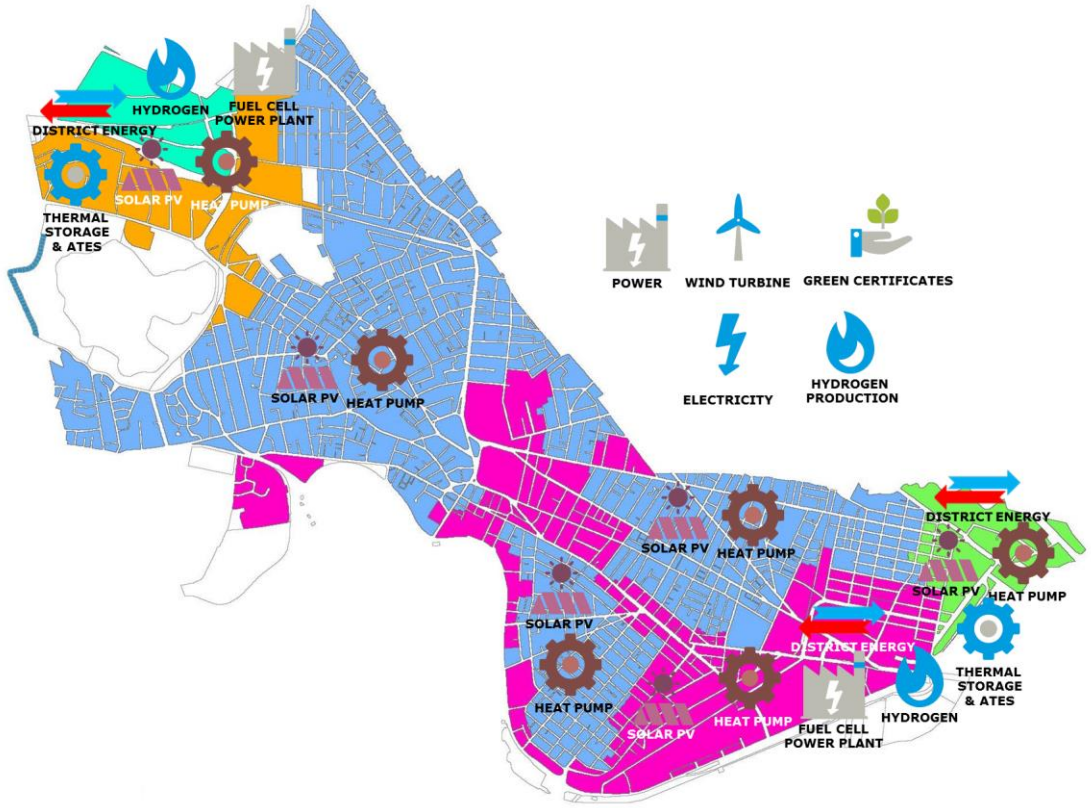
HYDROGEN FUELED SCENARIOS





WORK PACKAGE 3: CHANGE AND BENEFIT MANAGEMENT

- Public and stakeholder buy-in is critical to success of the strategy implementation
- Ramboll working with City on public engagement to facilitate their buy in
- Roll up designed for Science Week and other similar events in Cambridge to educate the public on energy and the need for transition
- Implementation strategy will be developed as part of this task once Scenario is selected

RAMBOLL WORKING WITH CITY ON ALTERNATIVE PUBLIC ENGAGEMENT EVENTS TO SPREAD UNDERSTANDING OF ENERGY SUPPLY

Idea
To give people an understanding of how much energy it takes to sustain a city we suggest an open air cinema where the screen runs on power generated by people riding bicycles. The event is designed to create awareness about the Low Carbon Energy Supply Strategy and could be realized with the help from local partners and communicated through relevant channels.

Bicycle powered open air cinema

Human powered dancefloor

Idea
The human powered dancefloor is a platform and interactive experience for the people of Cambridge to meet and move together. Again the experience is powered by human movement and allows the user to partake in alternative ways to generate energy.

WORK PACKAGE 4: TECHNICAL AND ECONOMIC VIABILITY ASSESSMENT – THE EASY PART!

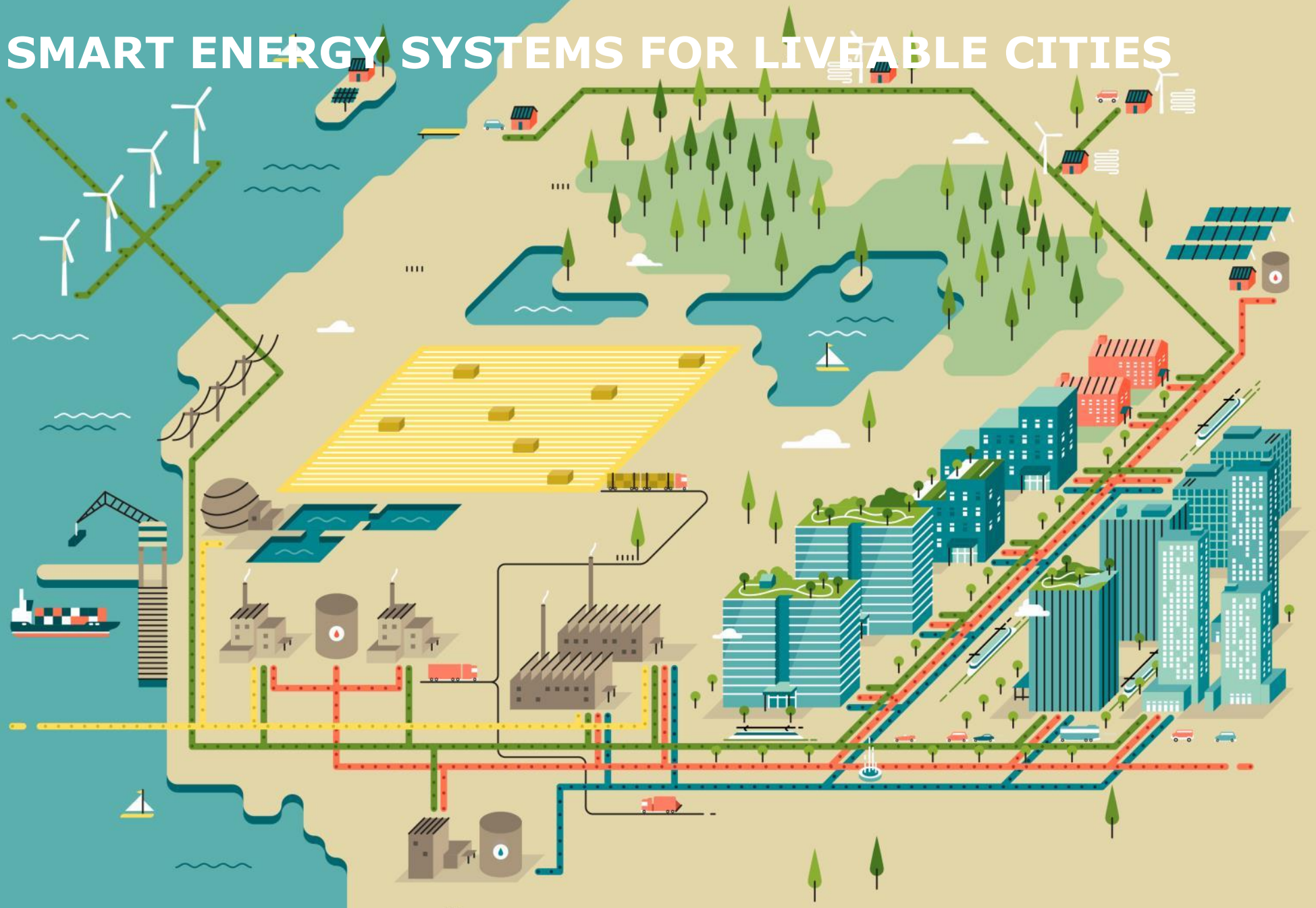
- >40 years energy planning experience
- >200 Engineers working with district energy and energy planning
- Use experience of working with over 200 utilities, and Cities worldwide, to develop city specific solutions to meet their objectives

Work Package 4 : Viability Assessment

Objective: The objective of this work package is to conclude the technical and economic feasibility of the top 3 Scenarios selected by the City.

Key deliverables: We will produce an overall report with feasibility conclusions.

SMART ENERGY SYSTEMS FOR LIVEABLE CITIES



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

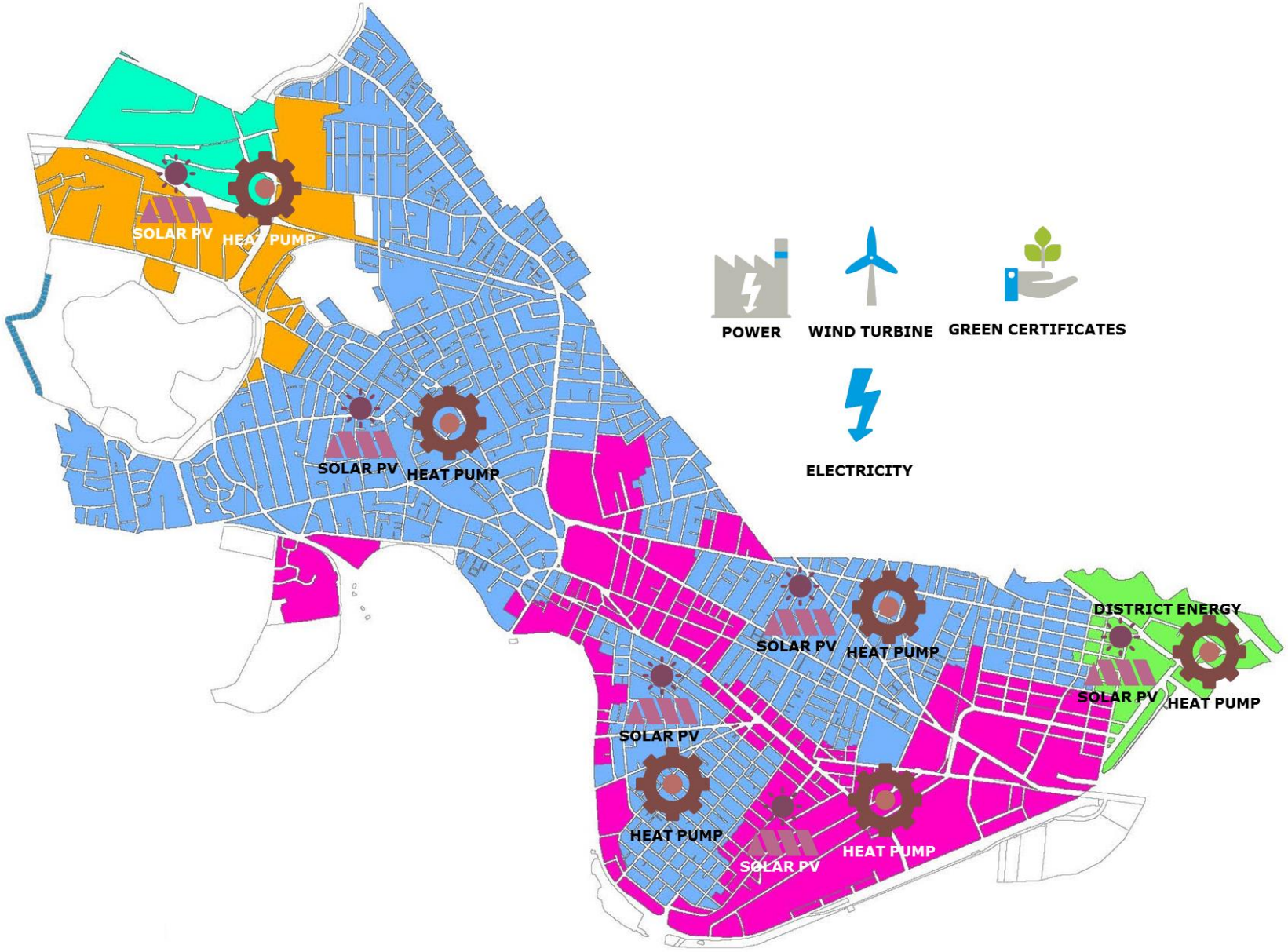
CHP plant fuelled by gas, straw, wood, city waste + heat storage

District heating/ cooling plant + cold water storage

Industry with process energy and surplus heat

Electricity
District heating
District cooling
Gas

SC1 – ELECTRIFICATION



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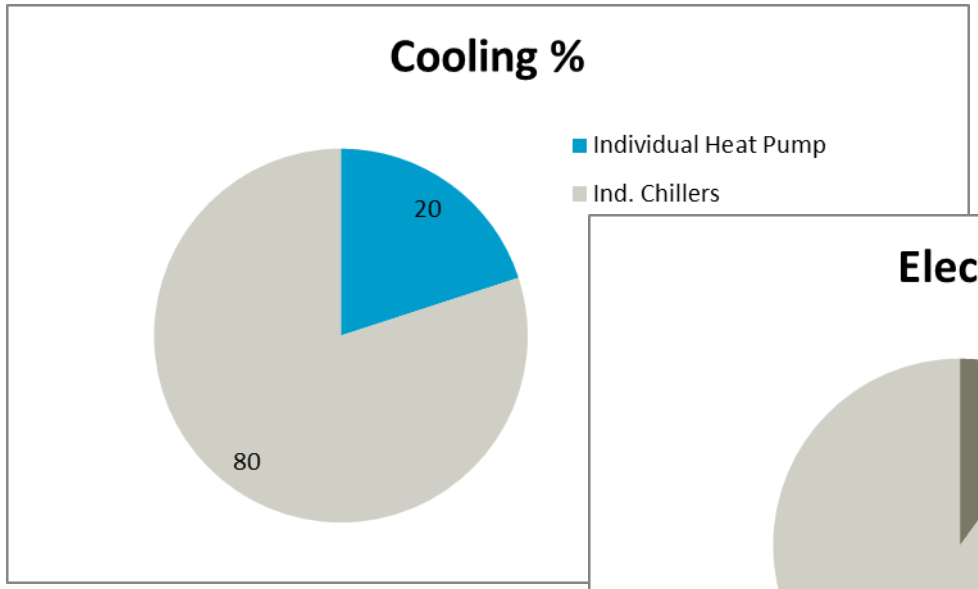
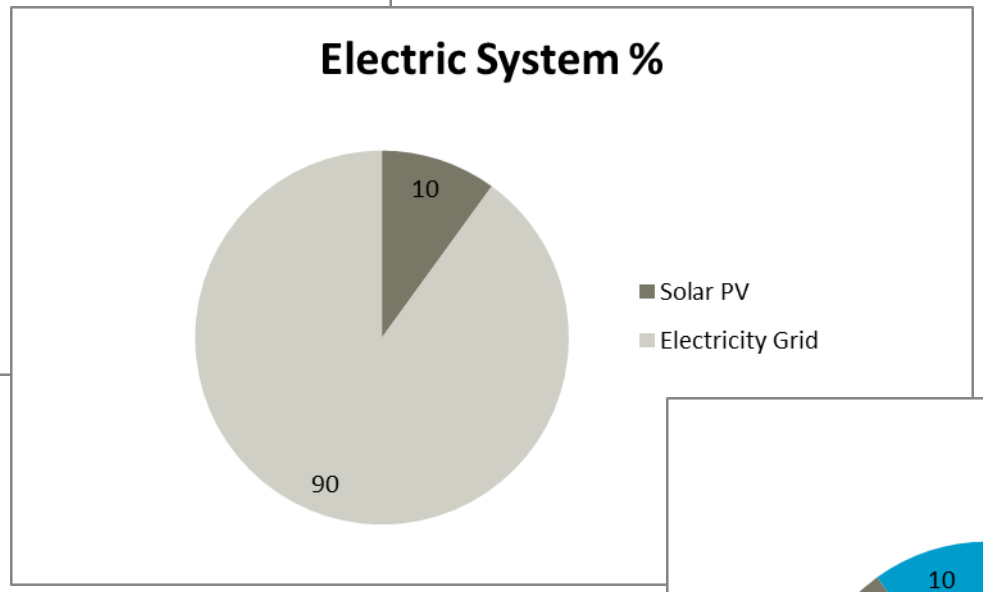
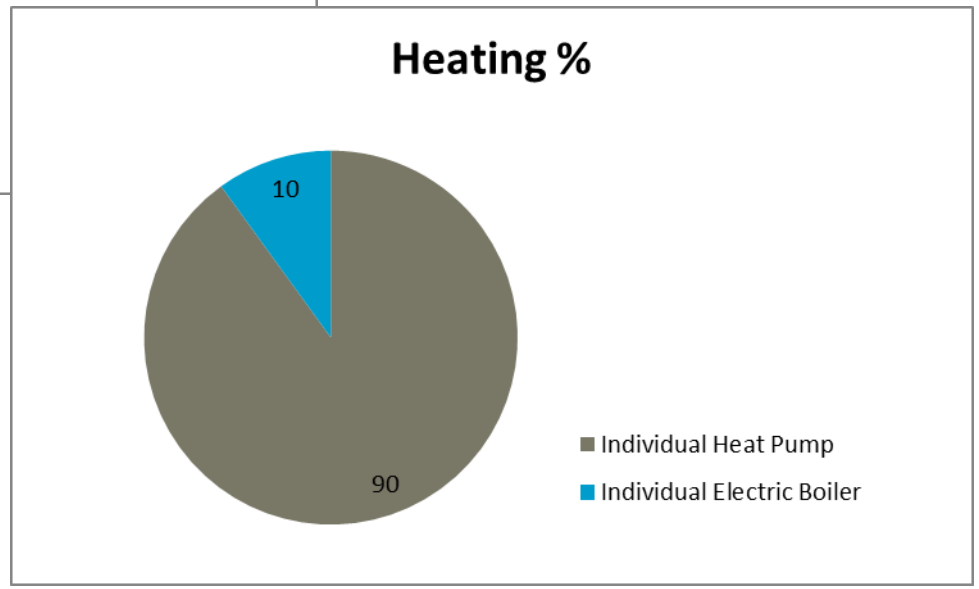
SC. 1 SUPPLY SCENARIO BREAKDOWN







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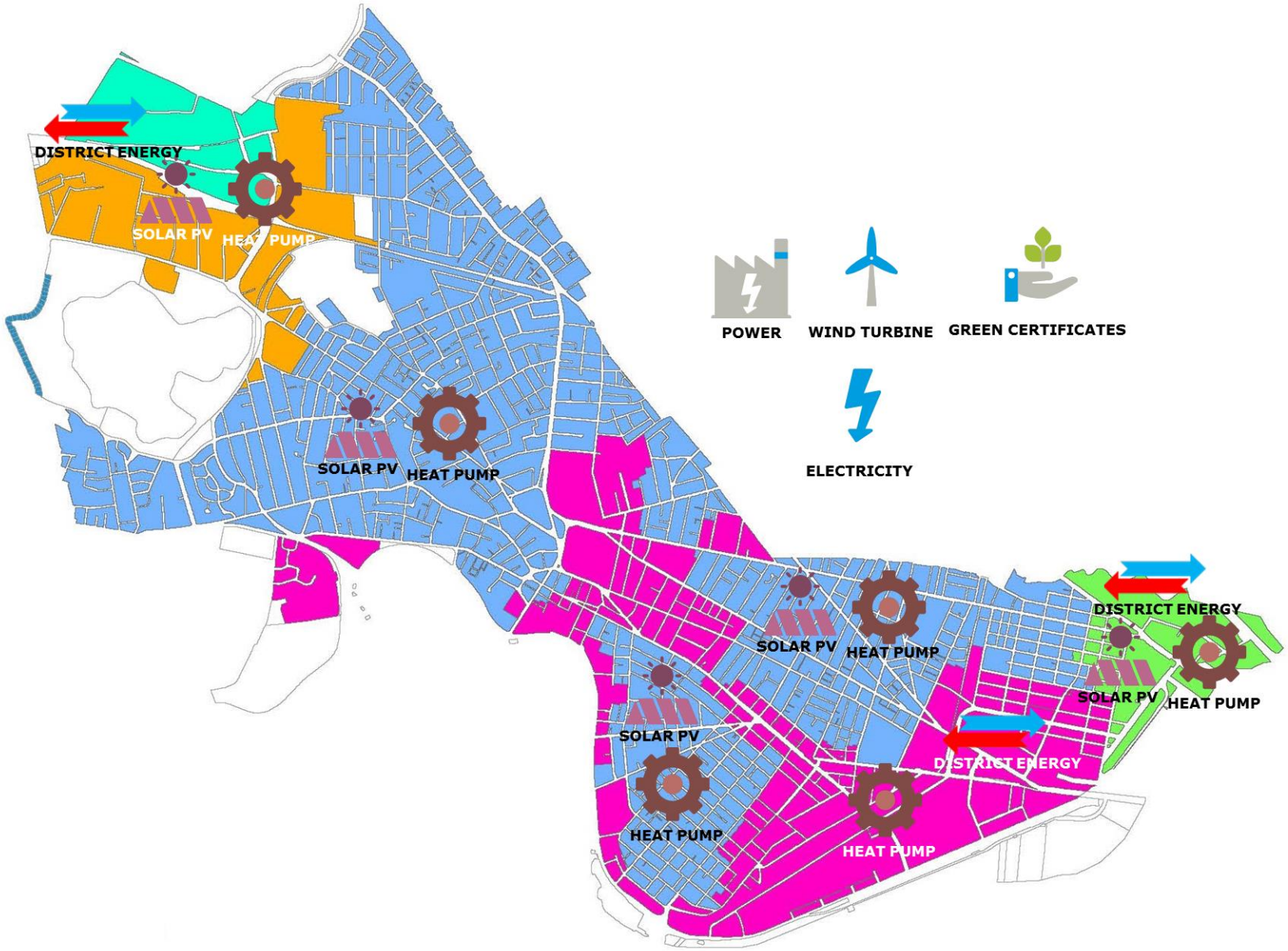
SC2 – ELECTRIFICATION WITH CENTRALIZED DHC



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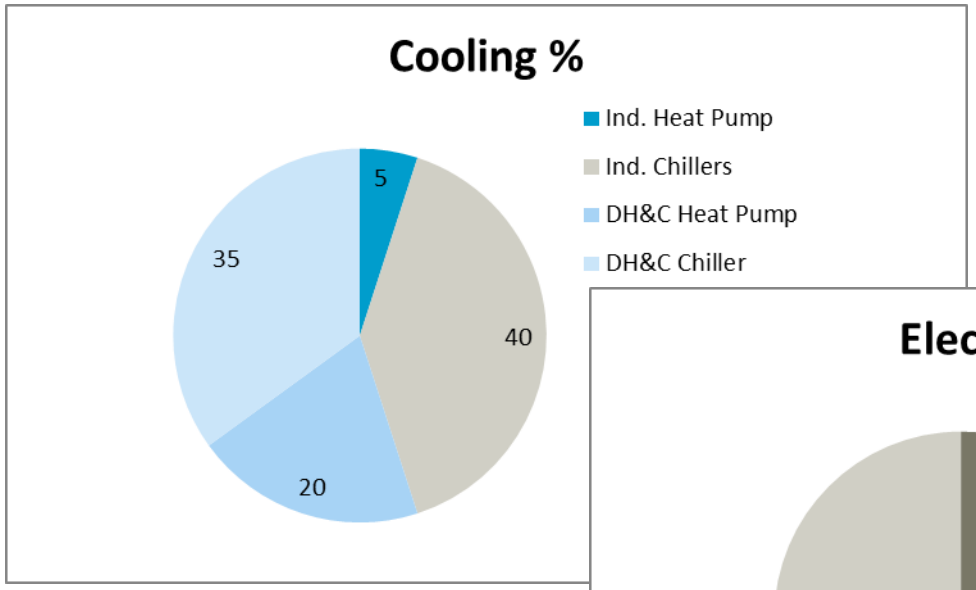
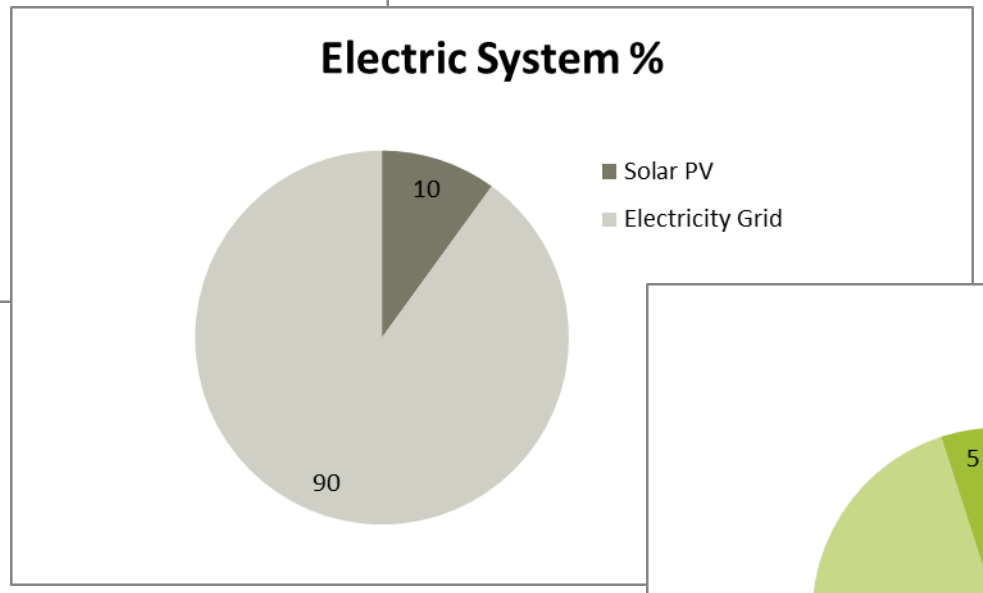
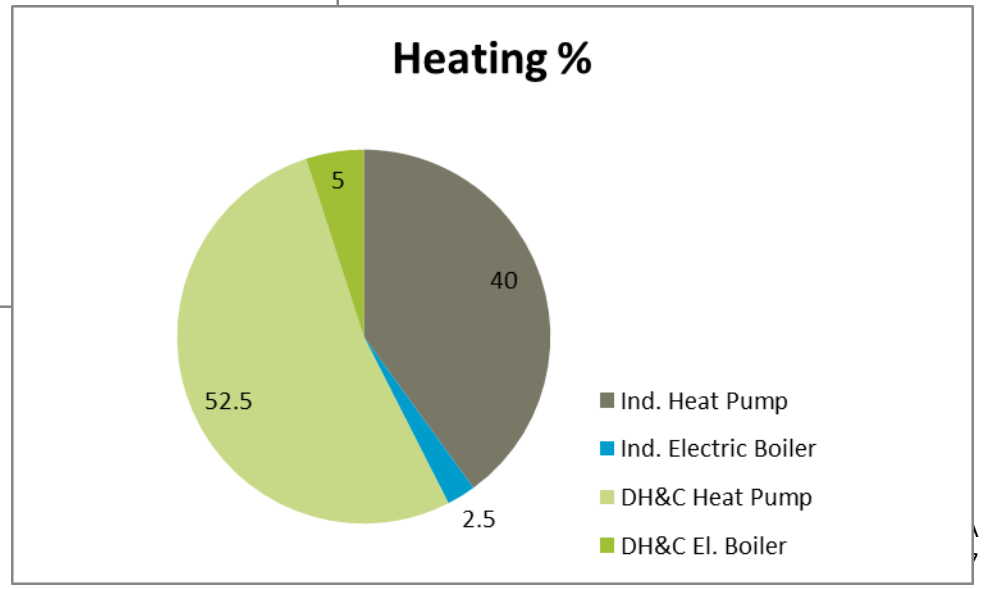
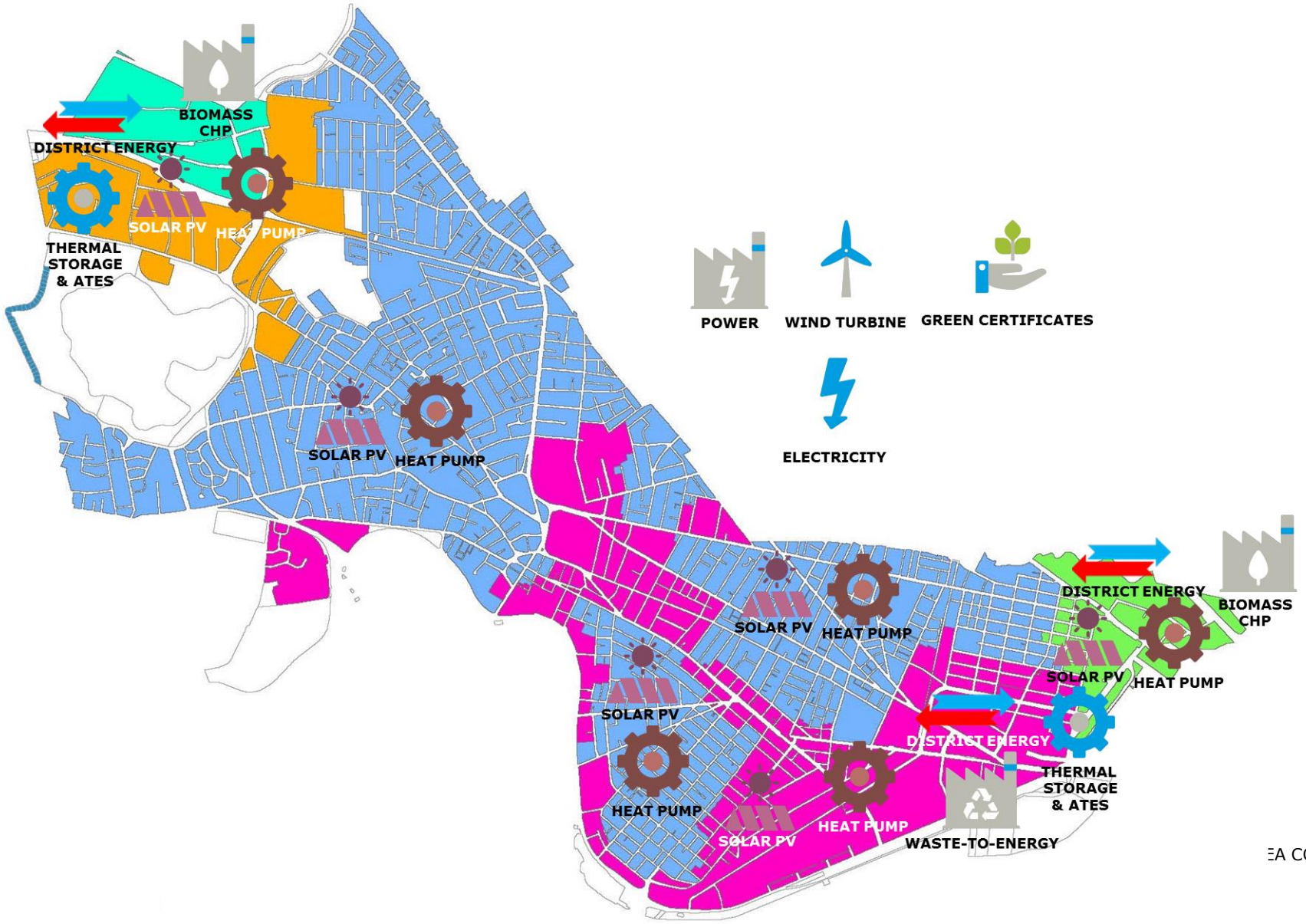
SC.2 SUPPLY SCENARIO BREAKDOWN







SC4 DHC WITH WTE / AD / BIOMASS CHP



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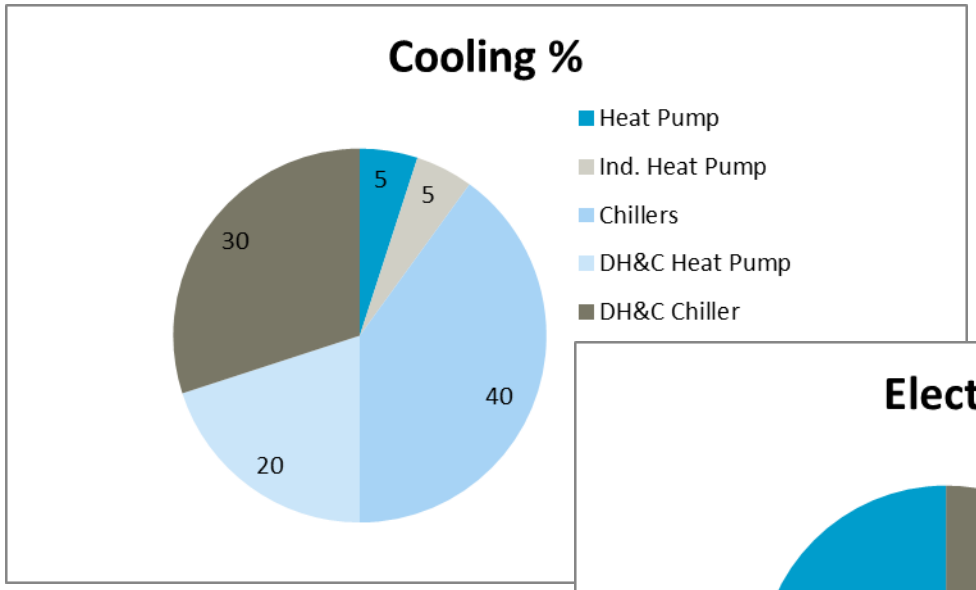
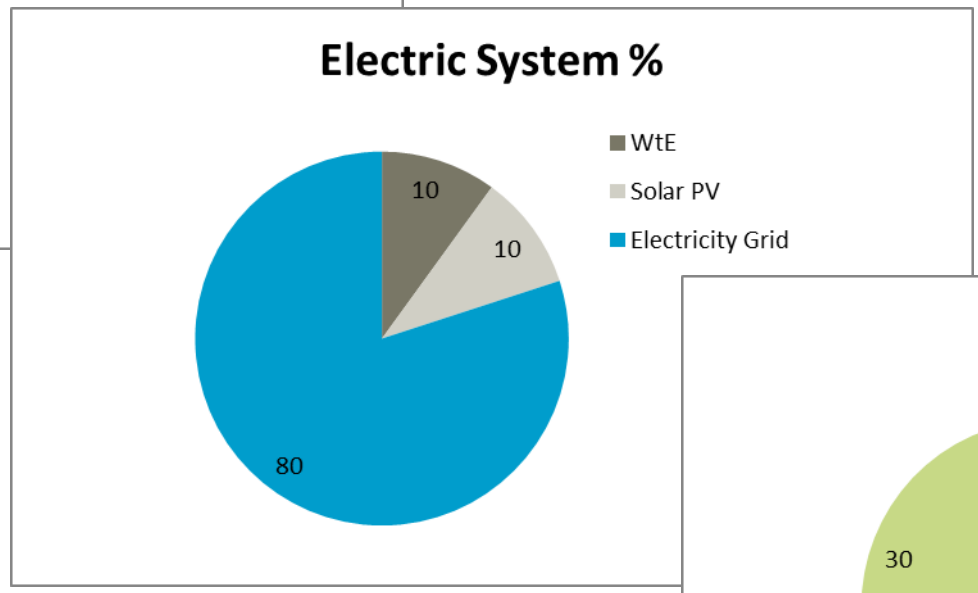
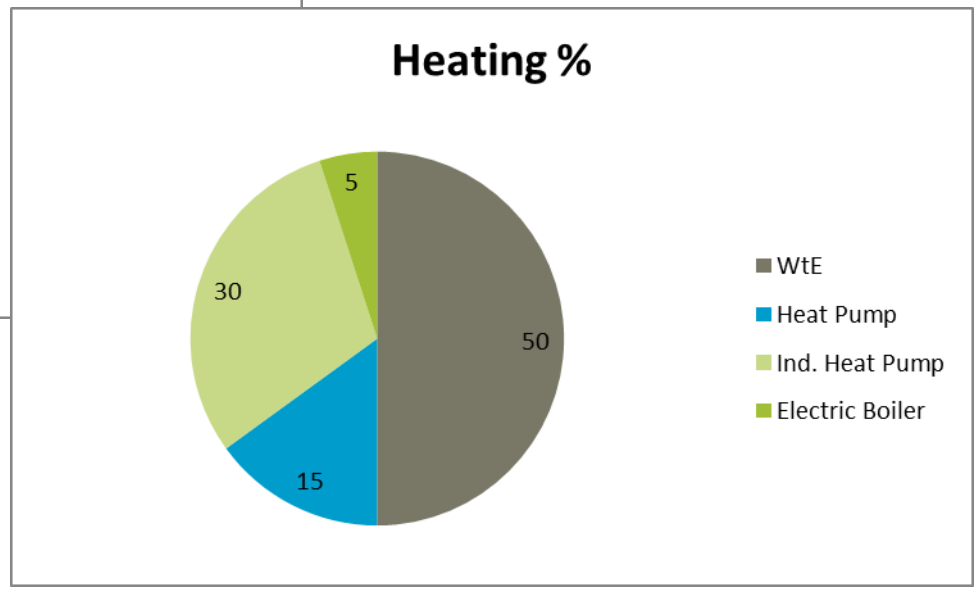
SC.4 SUPPLY SCENARIO BREAKDOWN







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THANK YOU

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