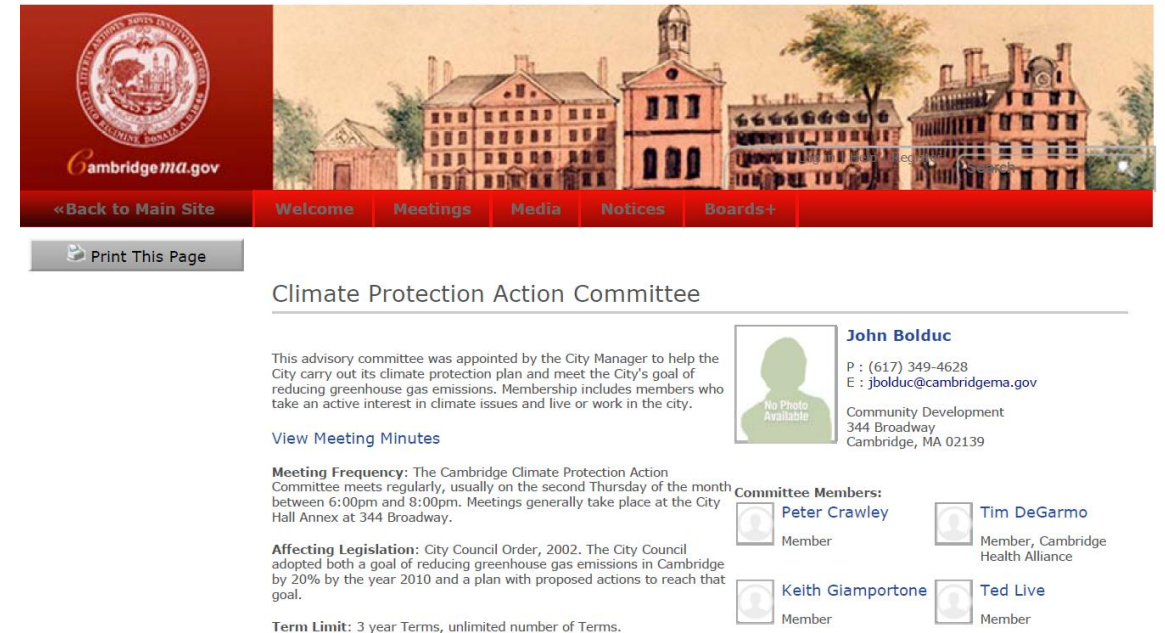




# LOW CARBON ENERGY SUPPLY STRATEGY STUDY, CAMBRIDGE, MA **IDEA CONFERENCE ARIZONA**

# 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



The screenshot shows the City of Cambridge website. The header features the city seal and a navigation bar with links: «Back to Main Site», Welcome, Meetings, Media, Notices, and Boards+. Below the header is a "Print This Page" button. The main content area is titled "Climate Protection Action Committee". It includes a description of the committee's purpose, contact information for John Bolduc, and a list of committee members: Peter Crawley, Keith Giamportone, Tim DeGarmo, and Ted Live. The page also mentions the meeting frequency and the affecting legislation.

**Climate Protection Action Committee**

This advisory committee was appointed by the City Manager to help the City carry out its climate protection plan and meet the City's goal of reducing greenhouse gas emissions. Membership includes members who take an active interest in climate issues and live or work in the city.

**John Bolduc**  
P : (617) 349-4628  
E : jbolduc@cambridgema.gov  
Community Development  
344 Broadway  
Cambridge, MA 02139





[View Meeting Minutes](#)

**Meeting Frequency:** The Cambridge Climate Protection Action Committee meets regularly, usually on the second Thursday of the month between 6:00pm and 8:00pm. Meetings generally take place at the City Hall Annex at 344 Broadway.

**Affecting Legislation:** City Council Order, 2002. The City Council adopted both a goal of reducing greenhouse gas emissions in Cambridge by 20% by the year 2010 and a plan with proposed actions to reach that goal.

**Term Limit:** 3 year Terms, unlimited number of Terms.

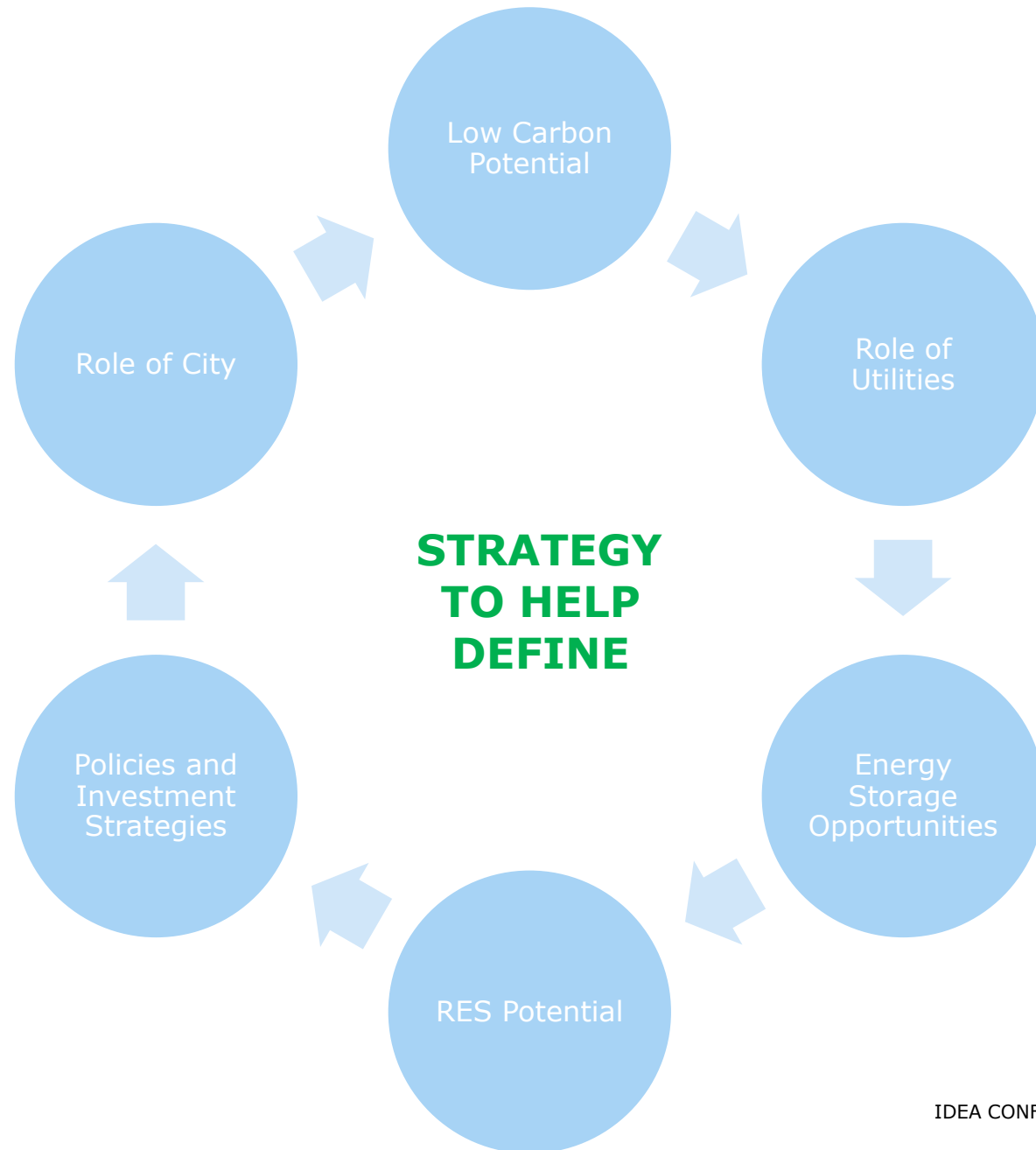
**Committee Members:**

 Peter Crawley Member	 Tim DeGarmo Member, Cambridge Health Alliance
 Keith Giamportone Member	 Ted Live Member

# 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



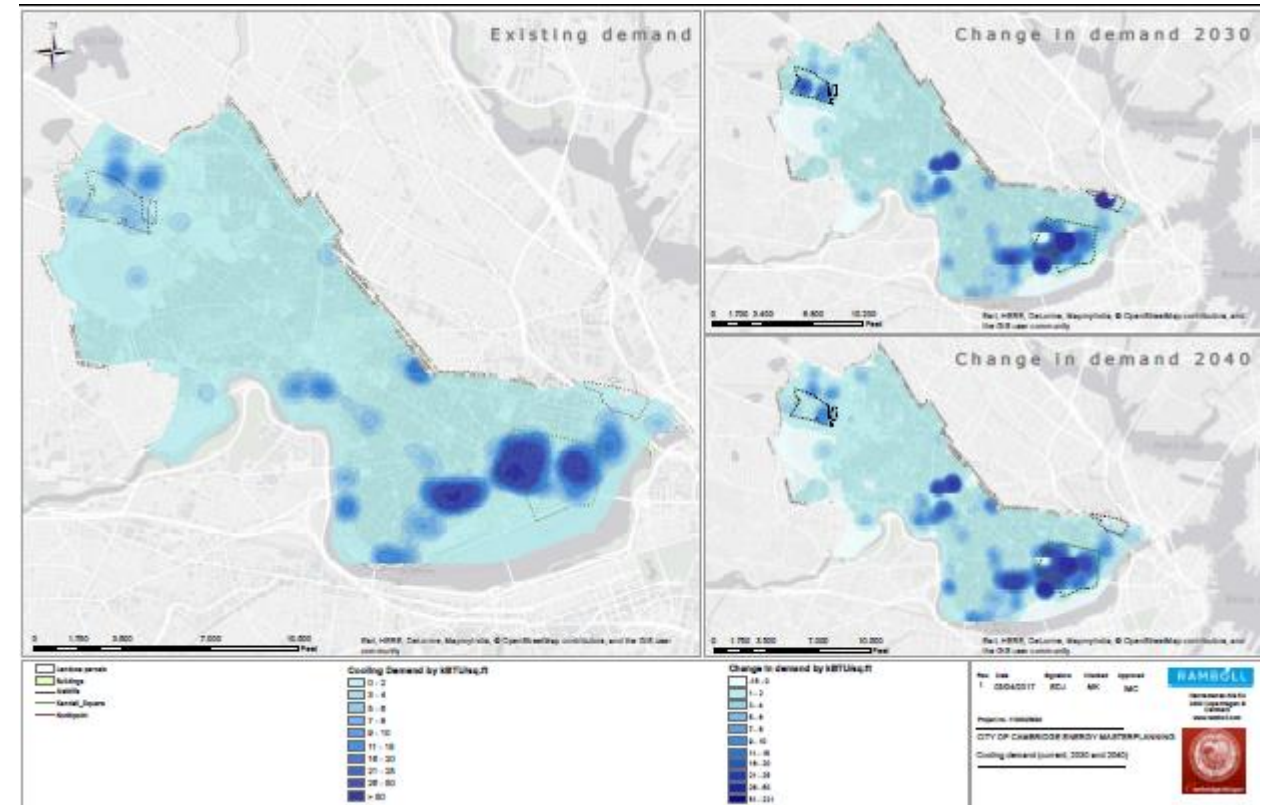
# PROJECT COMPONENTS



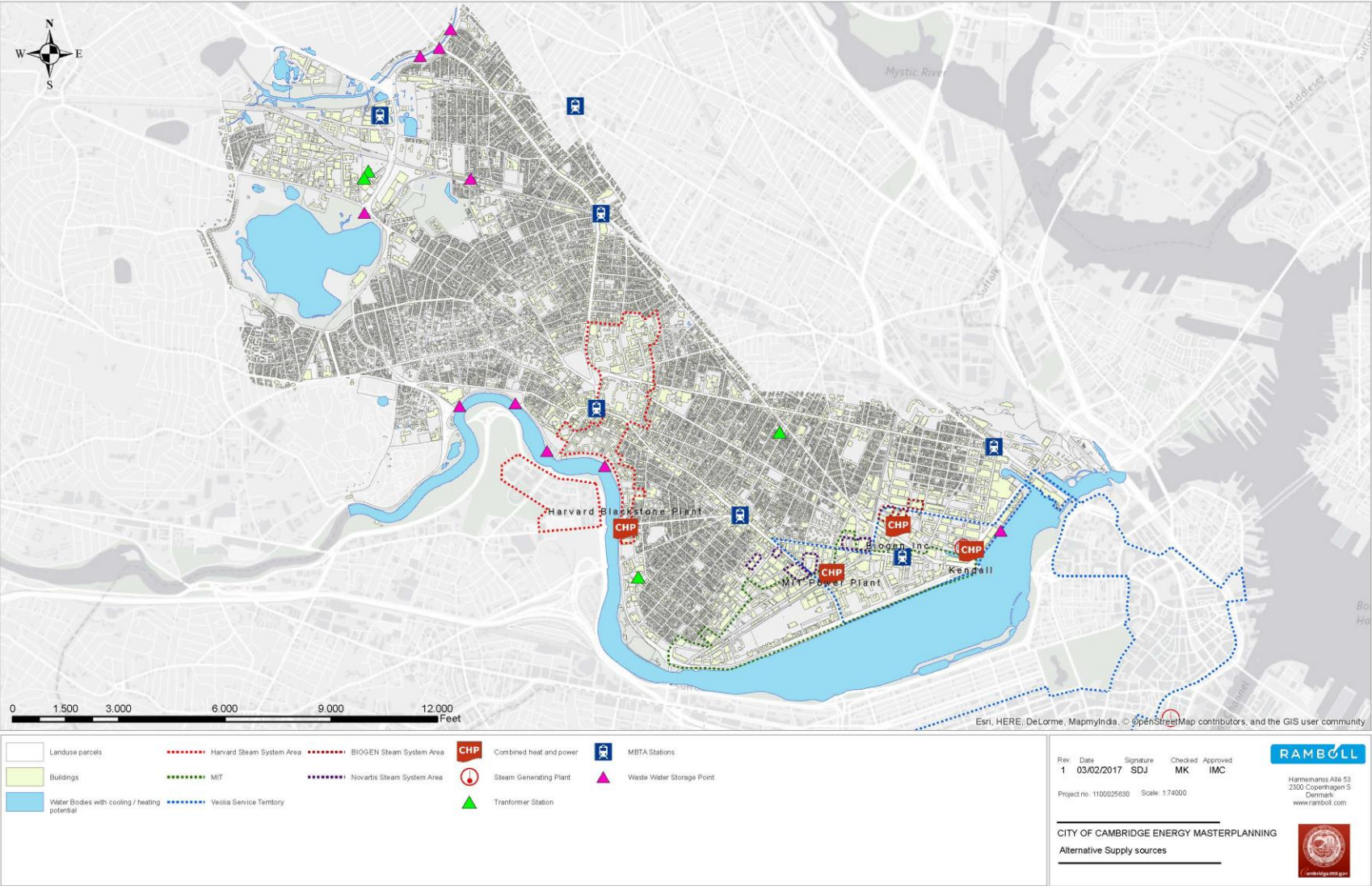
- Work package 1: Baseline situation assessment of City's current energy supply and barriers to low carbon
- Work Package 2: Low Carbon Scenarios Development
- Work Package 3: Change and Benefit Management
- Work Package 4: Technical and economic viability assessment

# 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

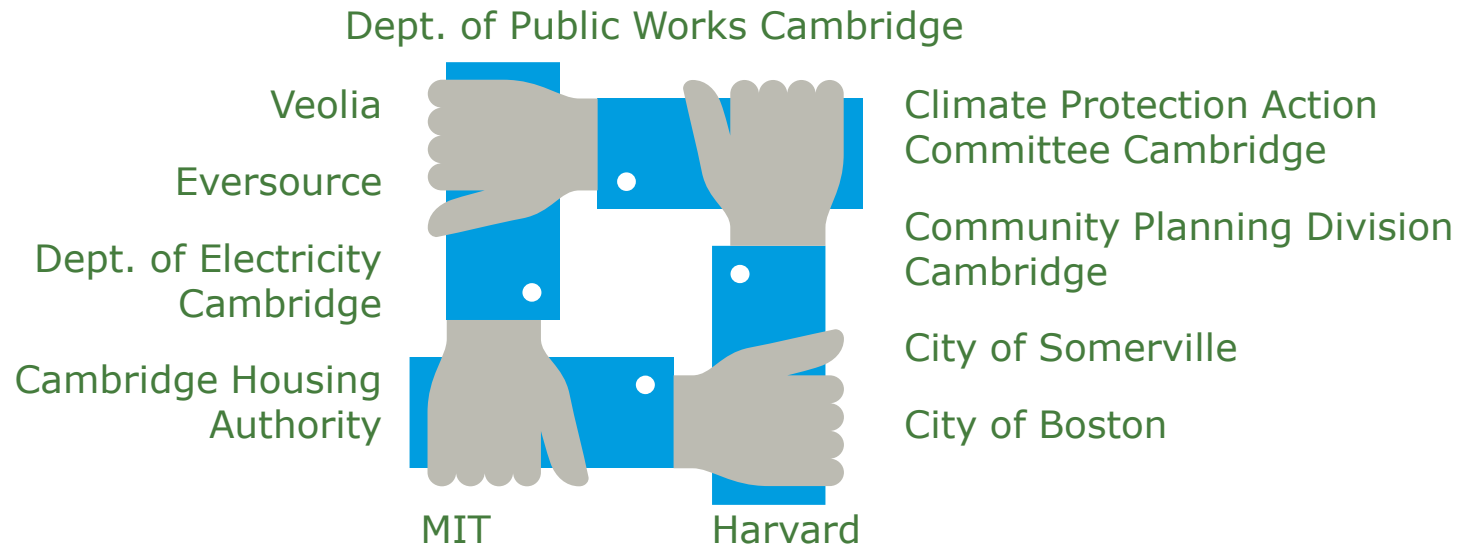


# MAPPED ENERGY SUPPLY SOURCES: EXISTING AND POTENTIAL



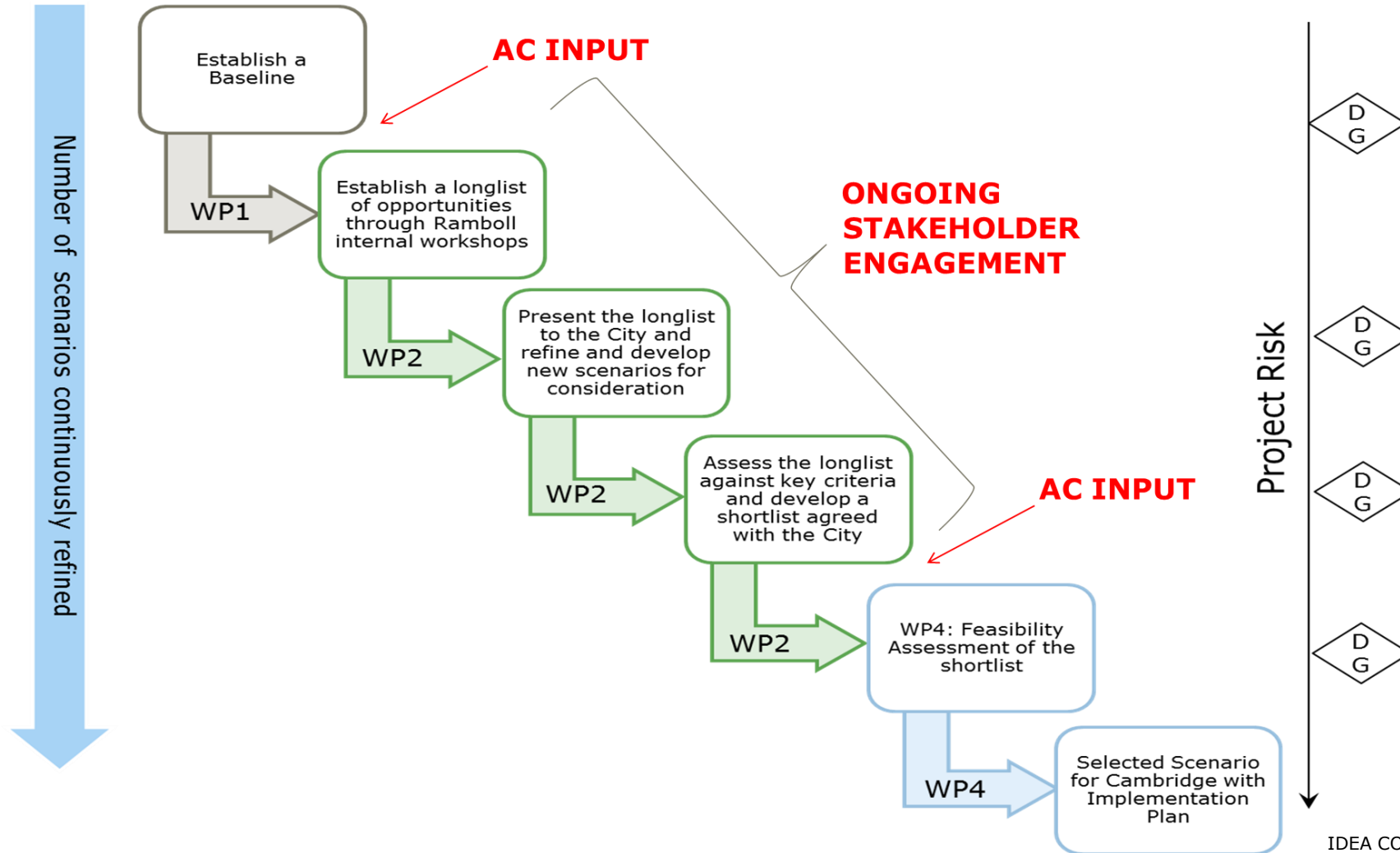
# CITY ROLE: IMPORTANCE OF COLLABORATION

- 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:



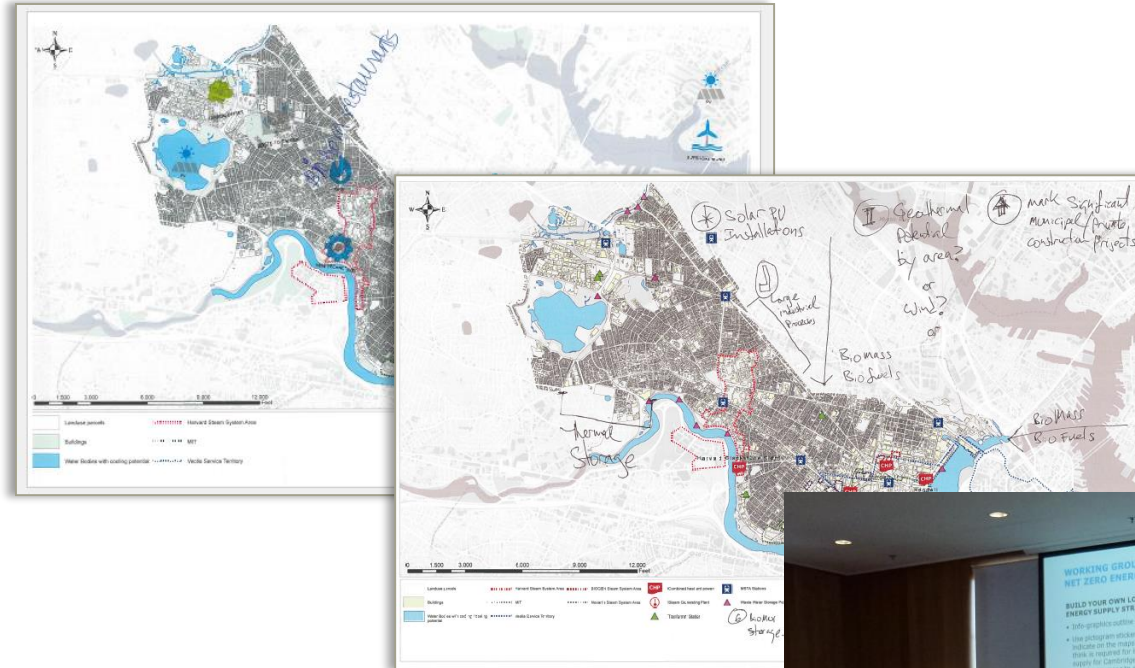


# SCENARIO DEVELOPMENT PROCESS – ITERATIVE ENGAGEMENT AND EVOLVEMENT OF SCENARIOS



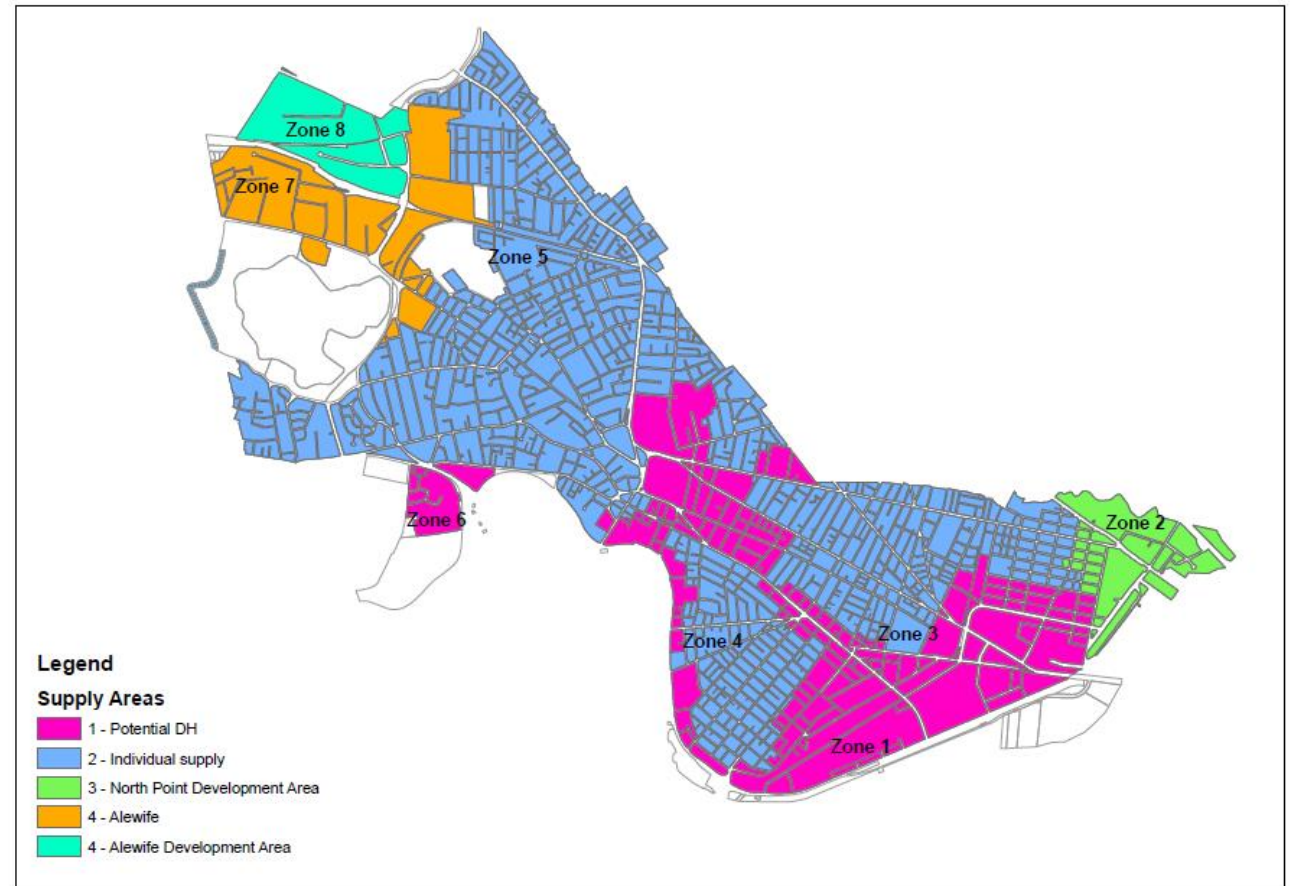
# RAMBOLL FACILITATED WORKSHOPS WHERE AC TEAMS DEVELOPED THEIR OWN LOW CARBON SUPPLY STRATEGY

- 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

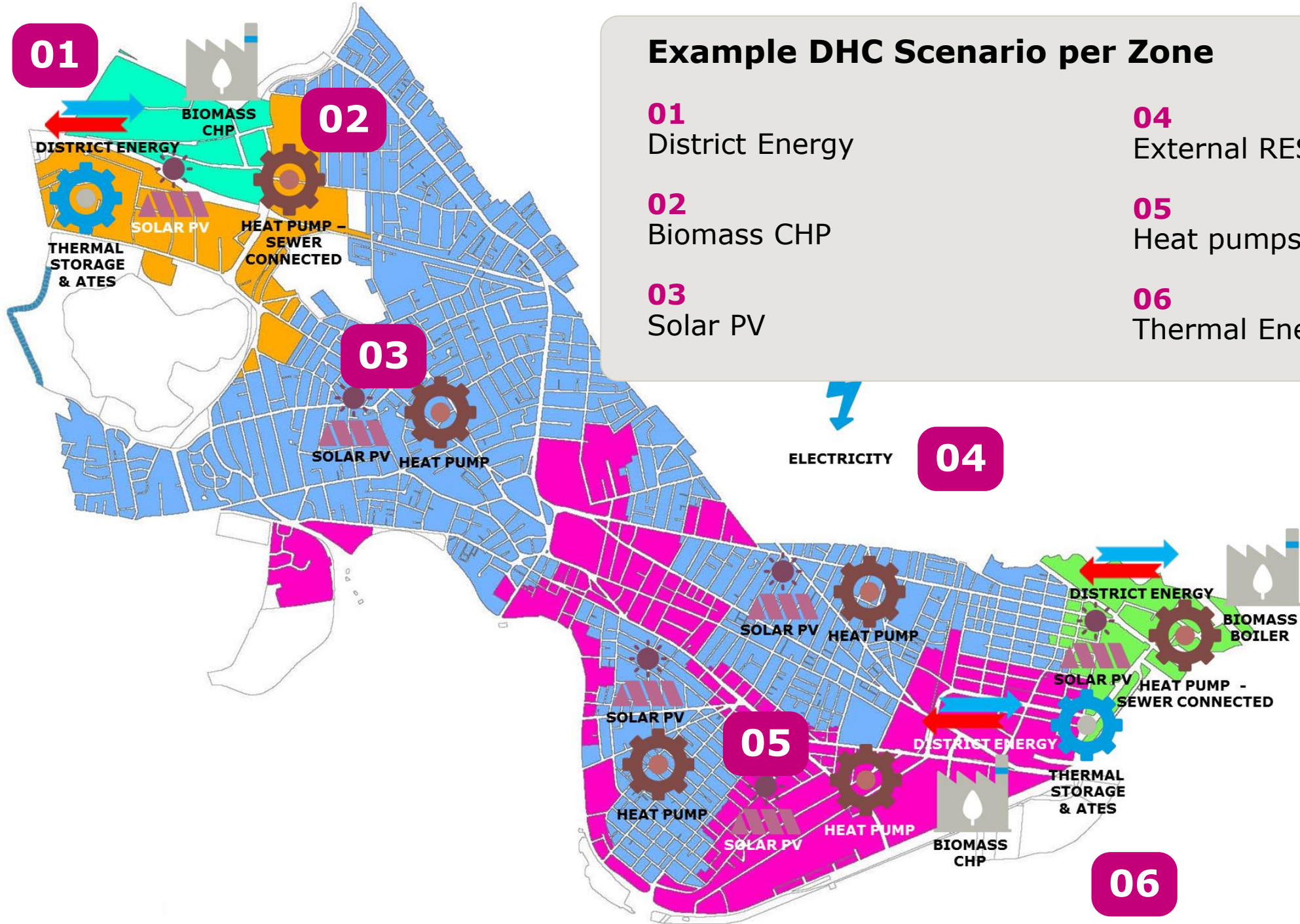


# WORK PACKAGE 2: LOW CARBON SCENARIOS DEVELOPMENT

- 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

ELECTRICITY

**04**

DISTRICT ENERGY

BIOMASS  
BOILER

SOLAR PV

HEAT PUMP -  
SEWER CONNECTED

DISTRICT ENERGY

THERMAL  
STORAGE  
& ATEs

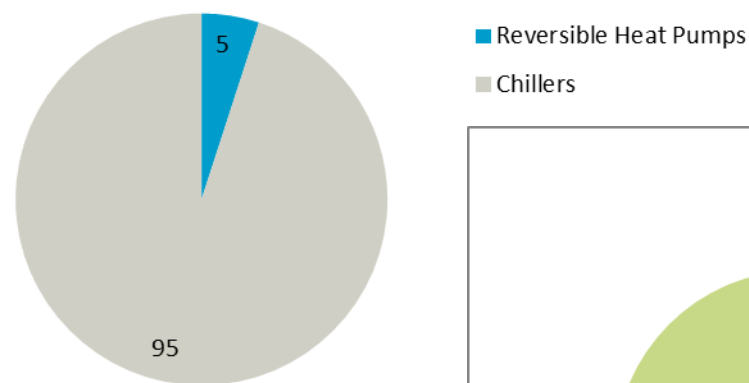
BIOMASS  
CHP

**06**

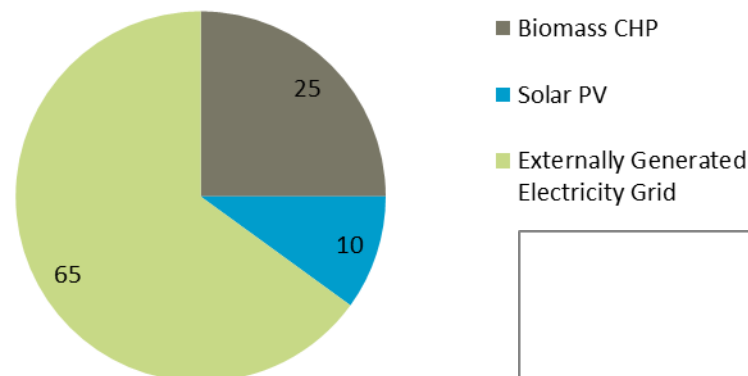


# EXAMPLE SUPPLY SCENARIO BREAKDOWN

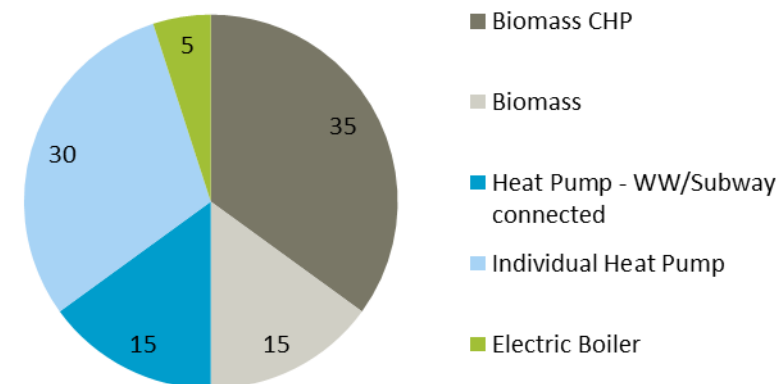
Cooling %



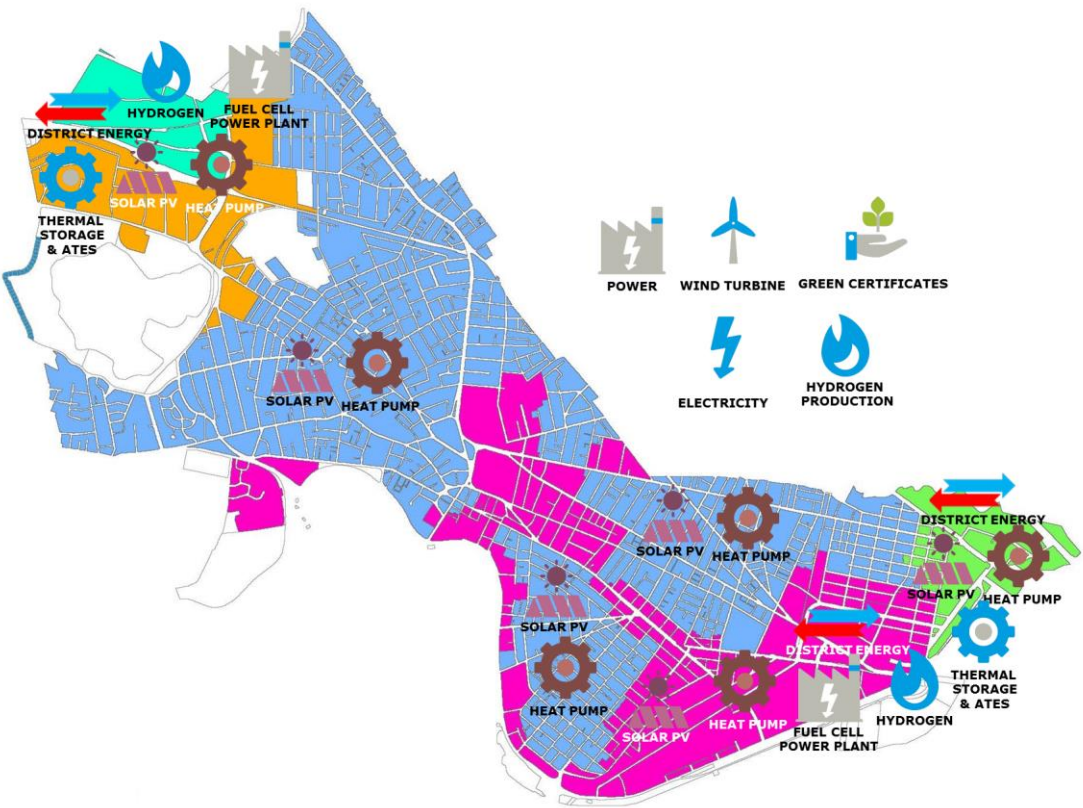
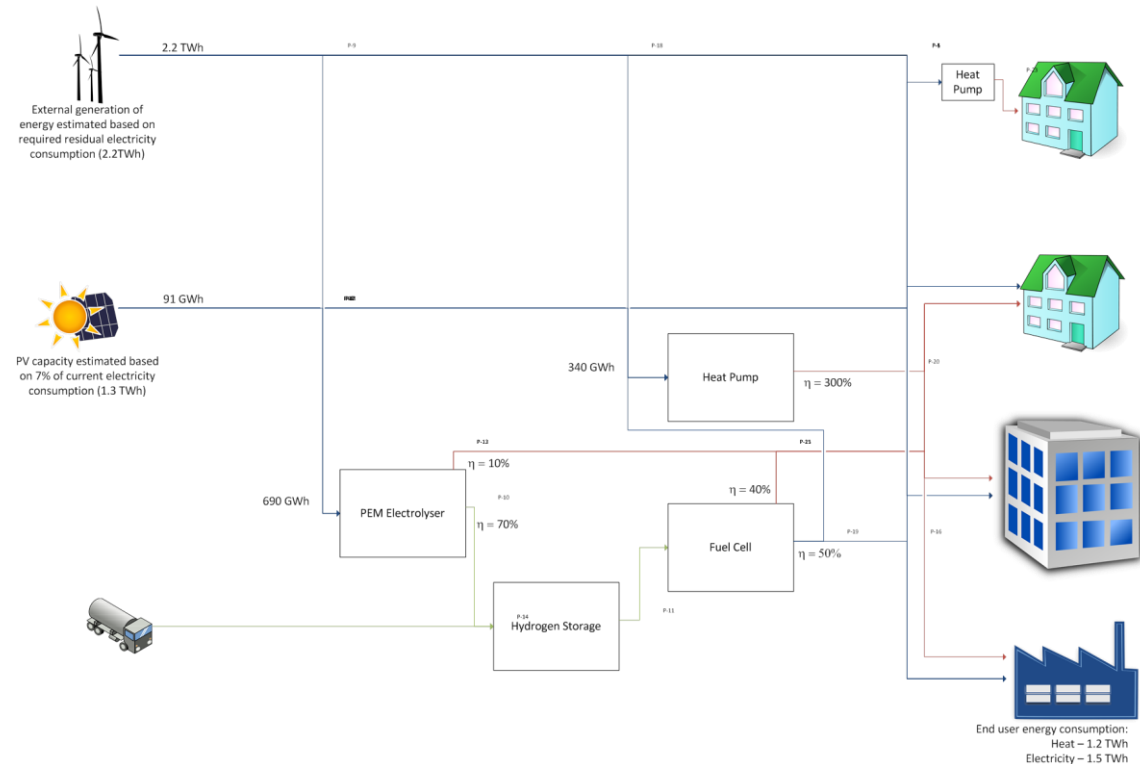
Electric System %



Heating %



# 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.





















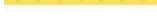
# WORK PACKAGE 4: TECHNICAL AND ECONOMIC VIABILITY ASSESSMENT – THE EASY PART!

- >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

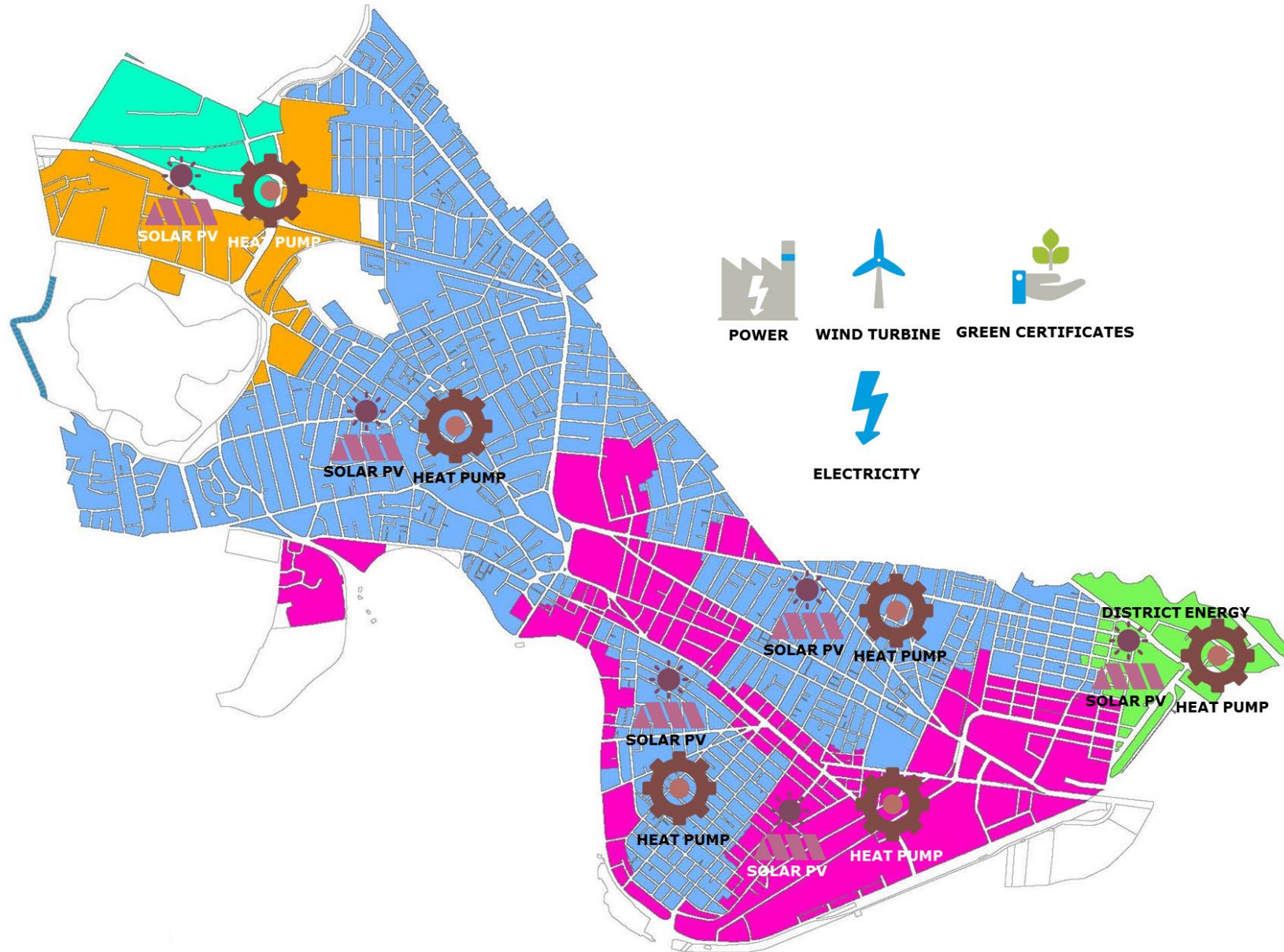
## Work Package 4 : Viability Assessment

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

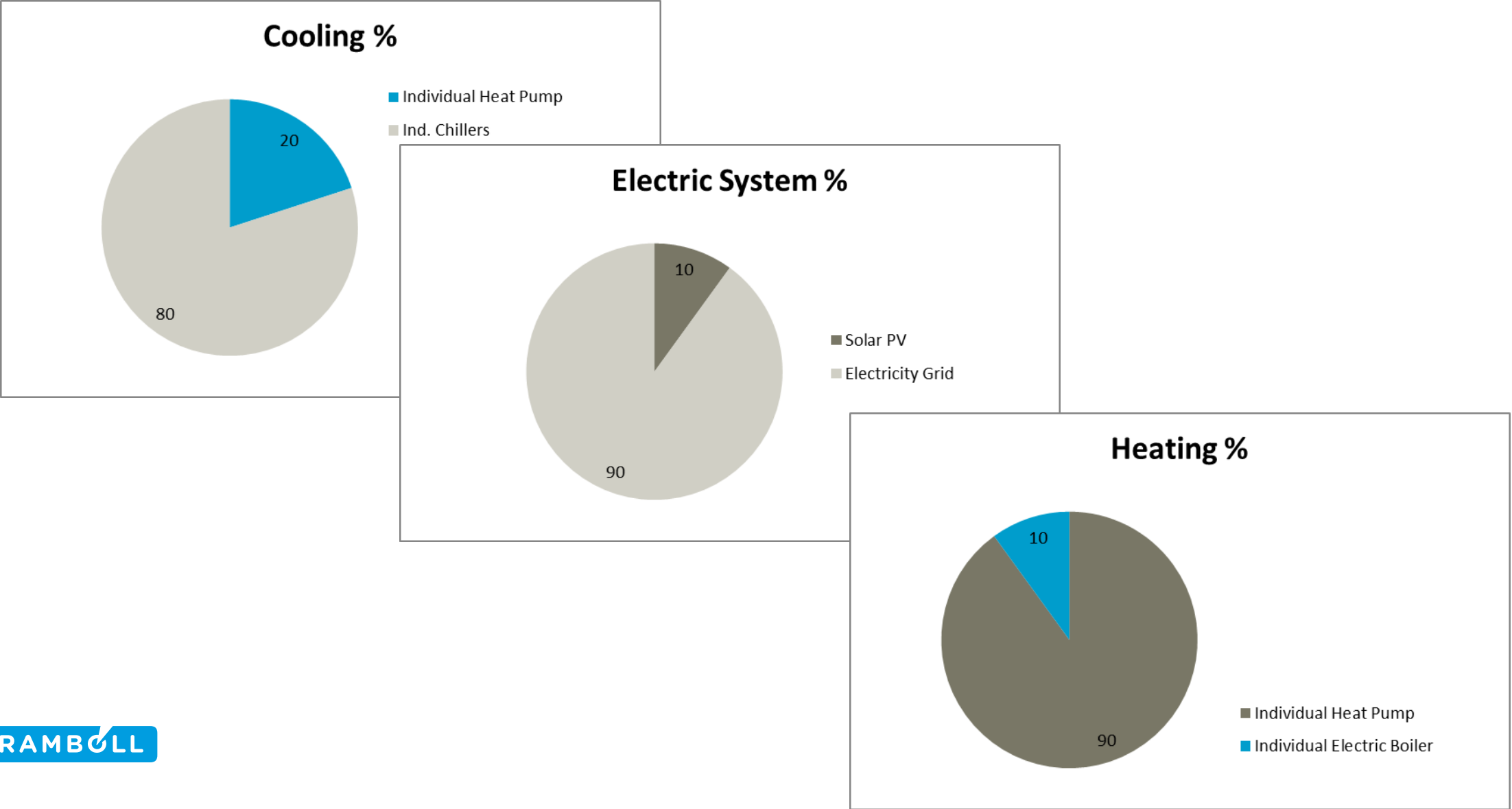
**Key deliverables:** We will produce an overall report with feasibility conclusions.

- |   |  |
|---|--|
|      | 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

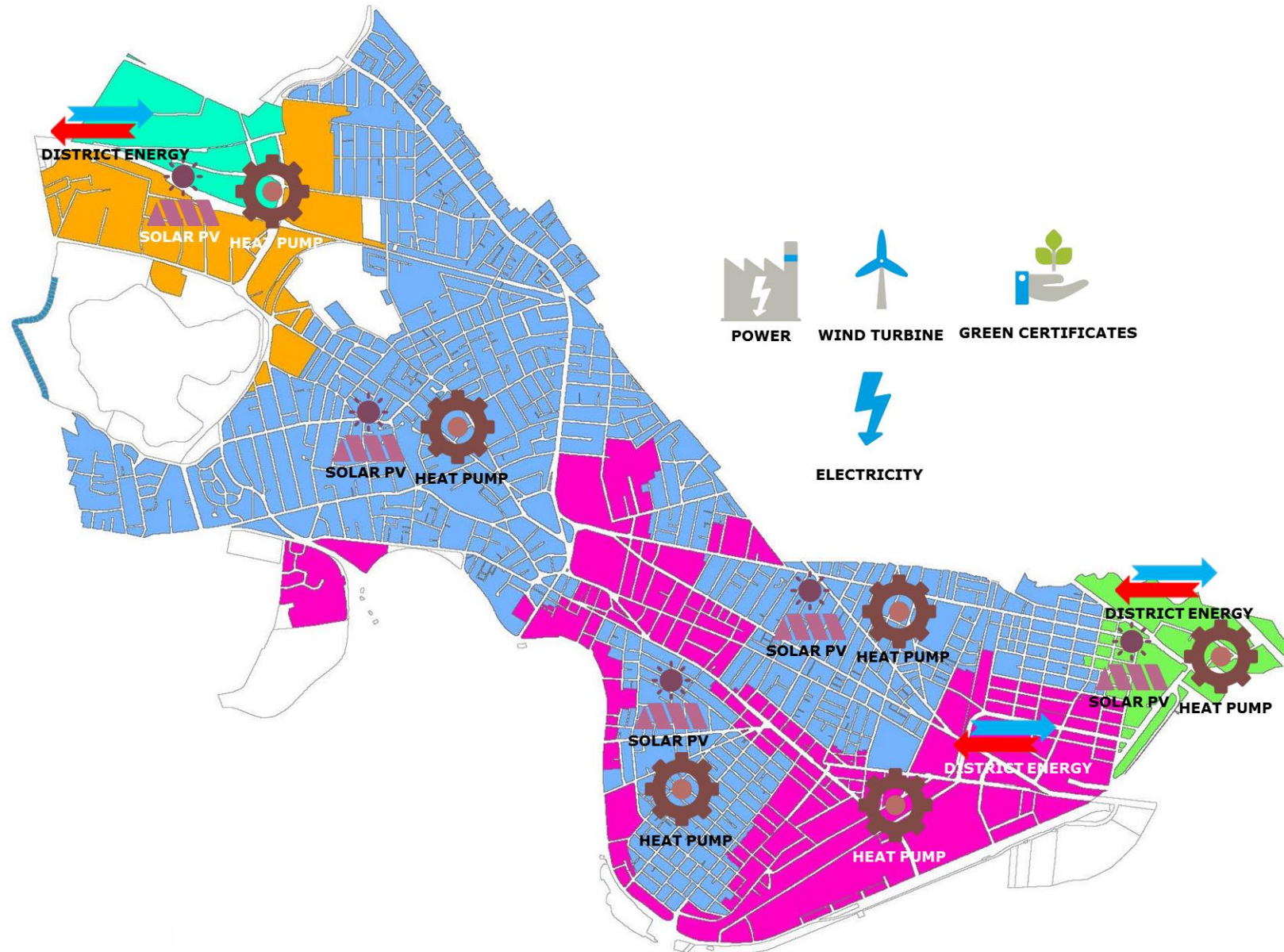


# SC. 1 SUPPLY SCENARIO BREAKDOWN



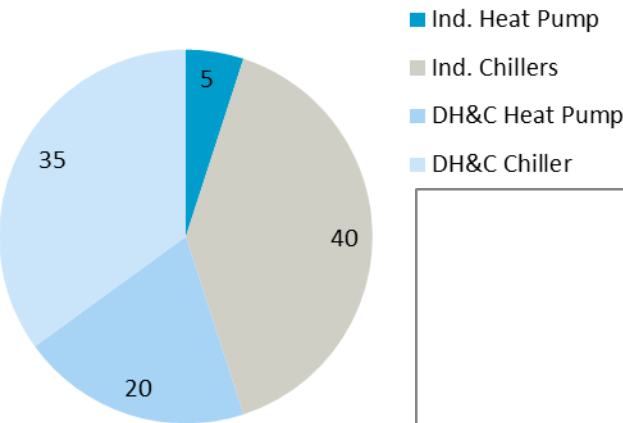


# SC2 – ELECTRIFICATION WITH CENTRALIZED DHC

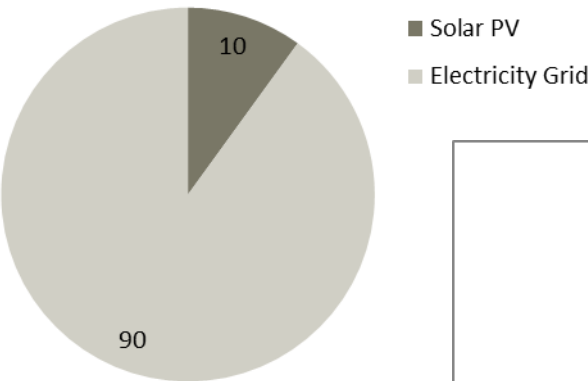


# SC.2 SUPPLY SCENARIO BREAKDOWN

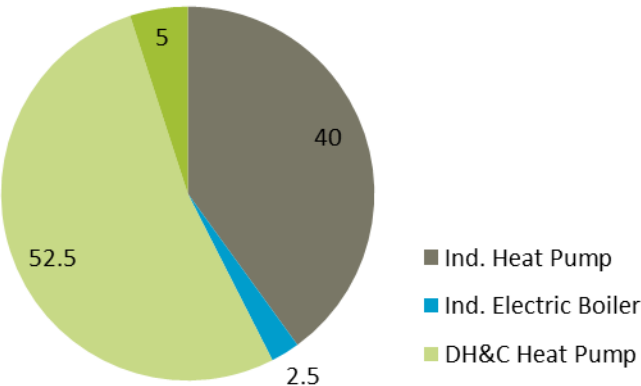
Cooling %



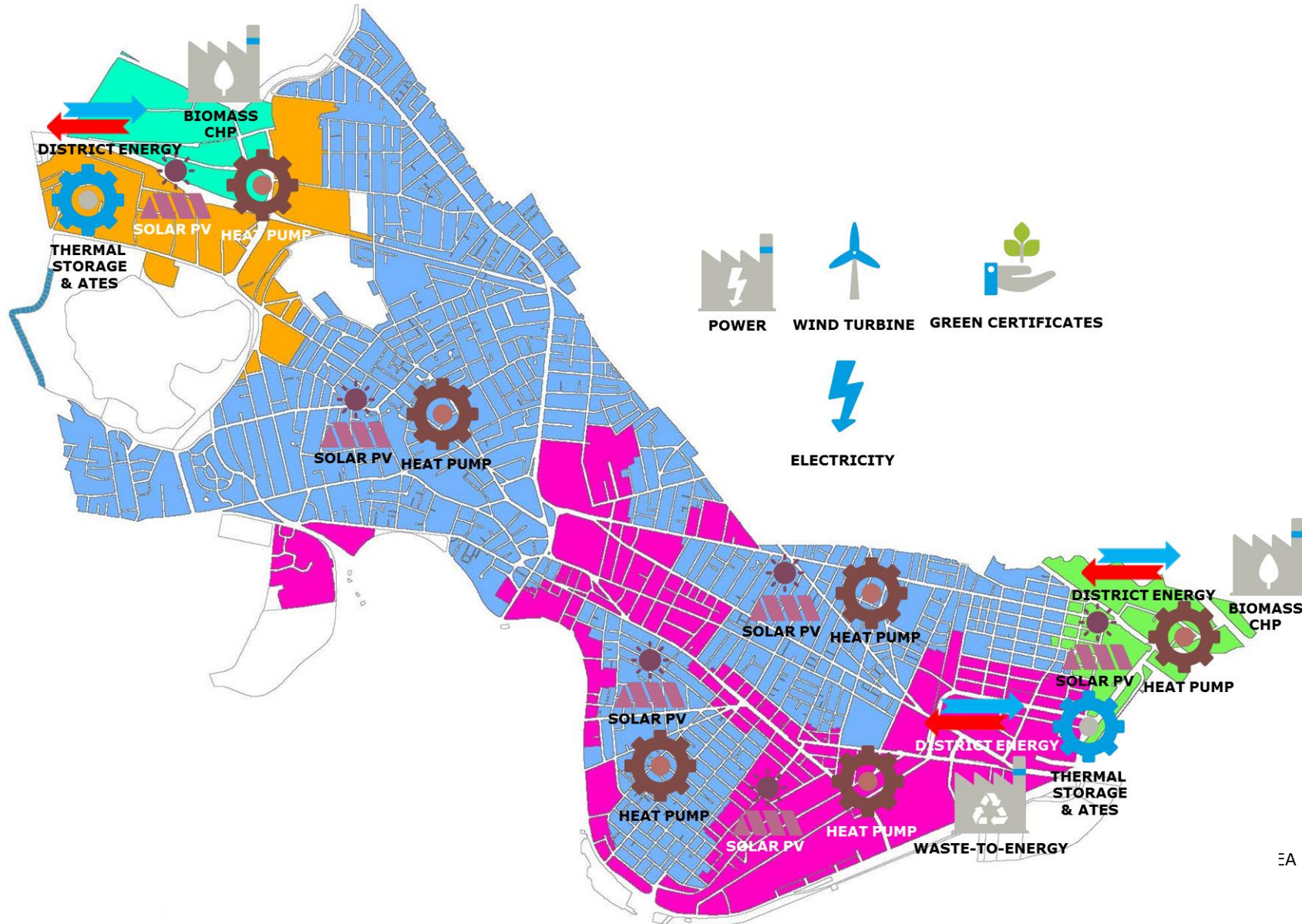
Electric System %



Heating %

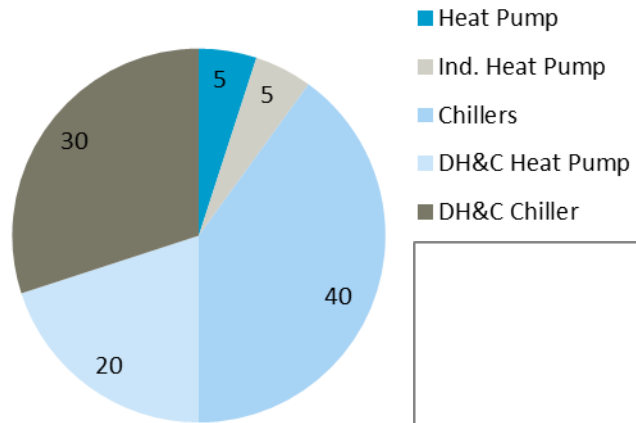


# SC4 DHC WITH WTE / AD / BIOMASS CHP

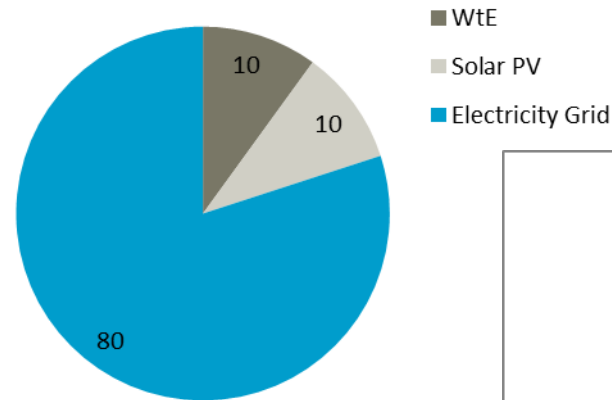


# SC.4 SUPPLY SCENARIO BREAKDOWN

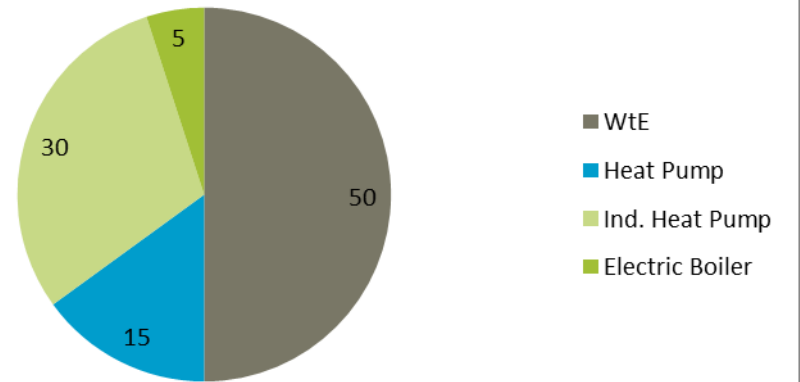
## Cooling %



## Electric System %



## Heating %





# THANK YOU

## **Dan Kelley**

General Manager,  
Energy Systems North America

M 207.956.1131  
dkelley@ramboll.com

---

Ramboll  
136 Commercial Street  
Suite 402  
Portland, ME 04101  
USA

## **Isidore McCormack**

Project Manager / Sr. Consultant  
Energy Systems – District Energy

W +45 51618918  
IMC@ramboll.com

---

Ramboll Energy  
Hannemanns Allé 53  
København S 2300  
dk