

Towards a Low Carbon Society in Denmark

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The presentation

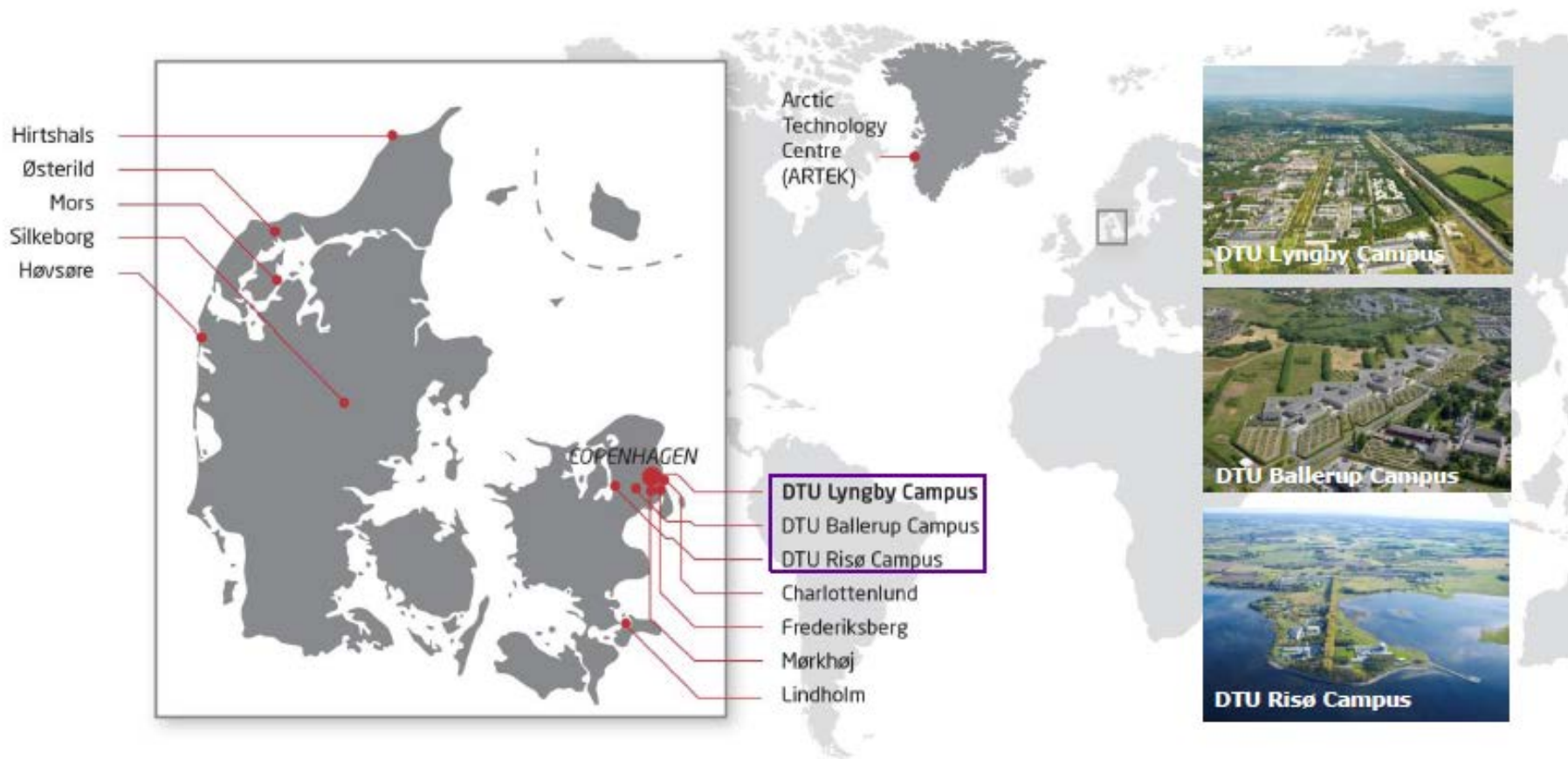
- The Danish aim of becoming fossil fuel free in 2050
- The plans of the new Danish Energy Agreement 2020-2024 in achieving the goal.
- Copenhagen city with 600.000 people aims at being carbon neutral in 2025:
<https://cphsolutionslab.dk/en>

Technical University of Denmark

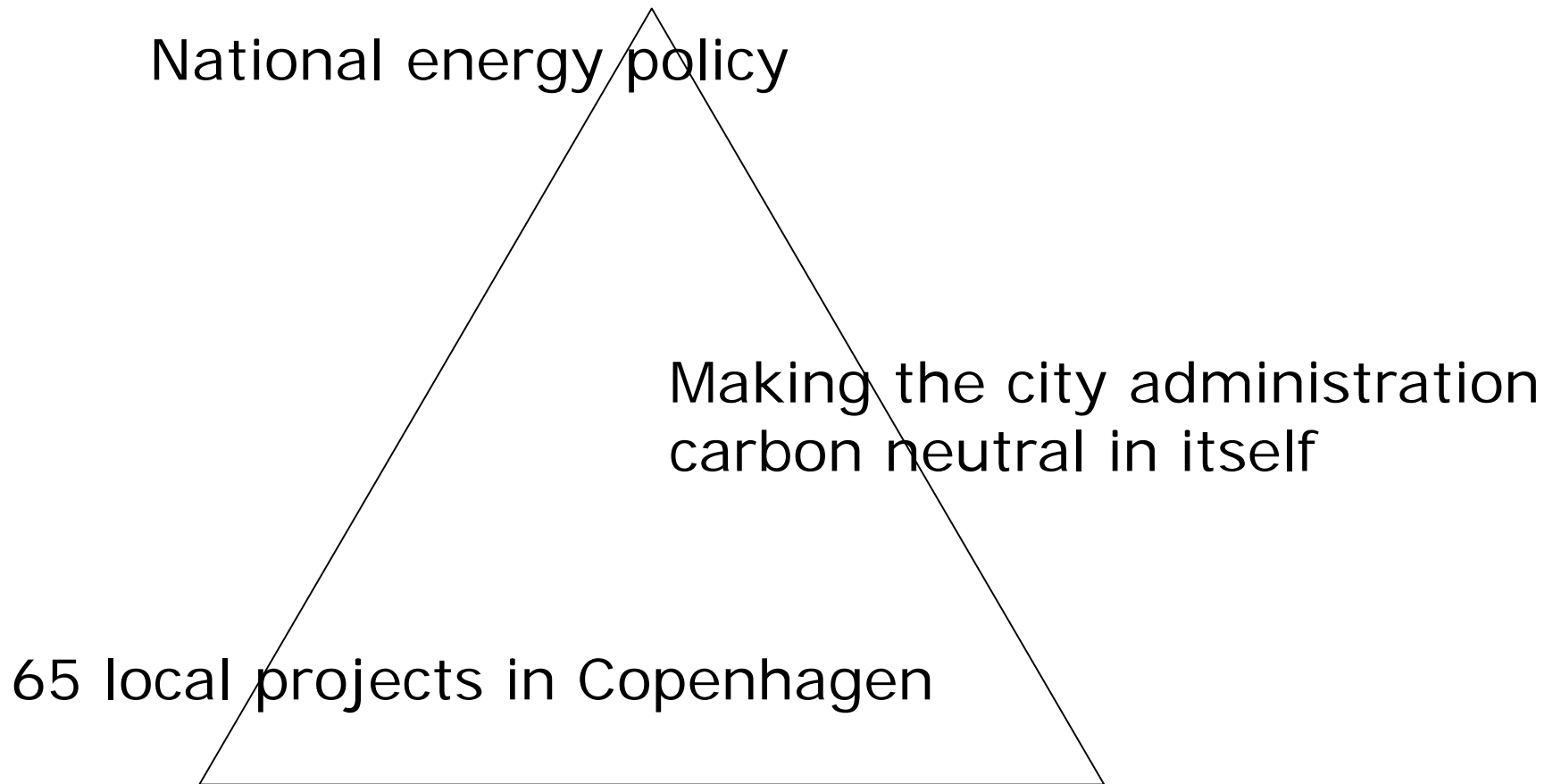
- DTU employs more than **5,000** faculty and staff, including more than 2,100 assistant professors, researchers, and postdoctoral fellows and over 1,200 PhD students.
- With 1,200 international employees of **88 different nationalities** as many as 35% of the researchers employed at DTU are of another nationality than Danish.
- Research is carried out in **21 Departments** and 19 PhD-schools, for instance in the fields of energy, material and nanoscience, bio- and life science, climate and environment research.
- DTU is ranked among Europe's leading engineering institutions, and the highest ranked engineering university in the Nordic countries.

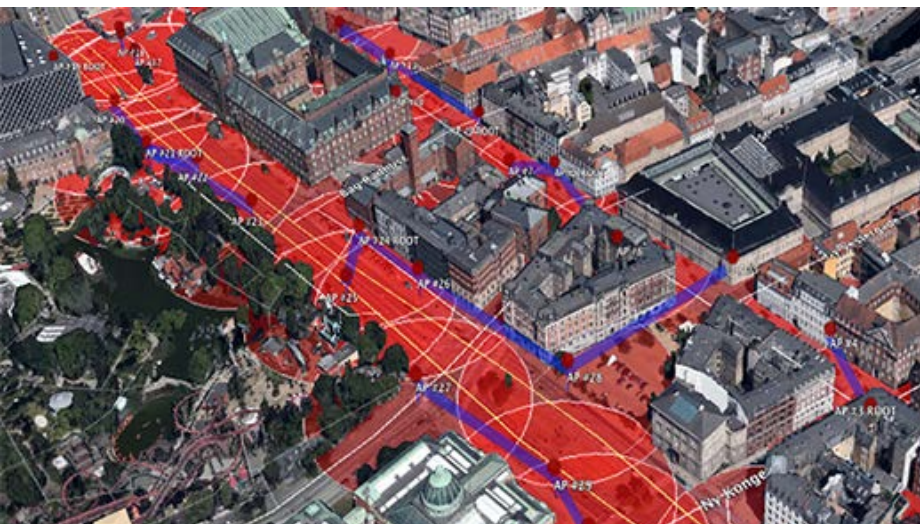
University locations across the kingdom

- centered in the capital region



How Copenhagen is doing it





Key elements of the Danish energy policy

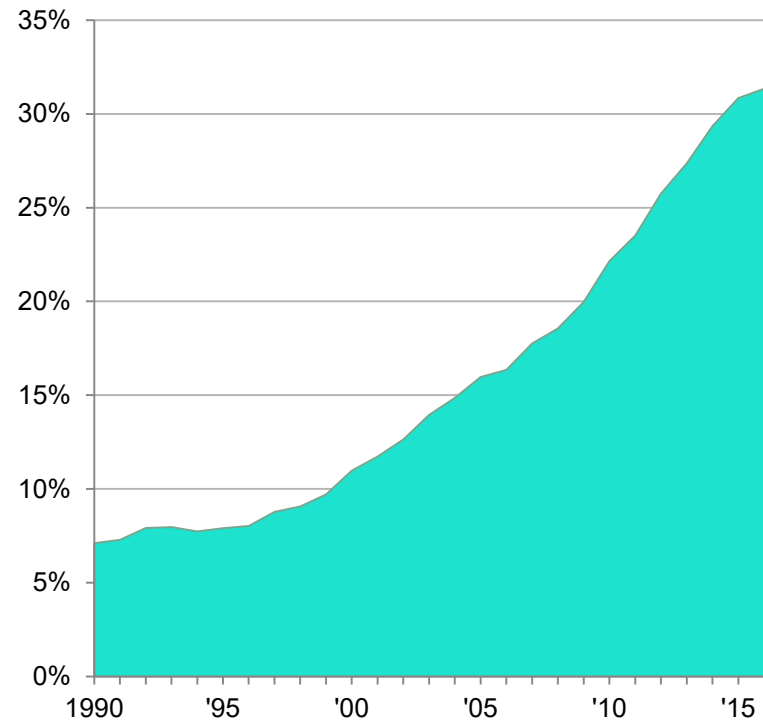
Policy Elements

- Cost-effective renewable energy subsidy schemes
- Energy taxes on fossil fuels
- Support for RD&D (EUDP, etc.)

Energy Policy Agreements

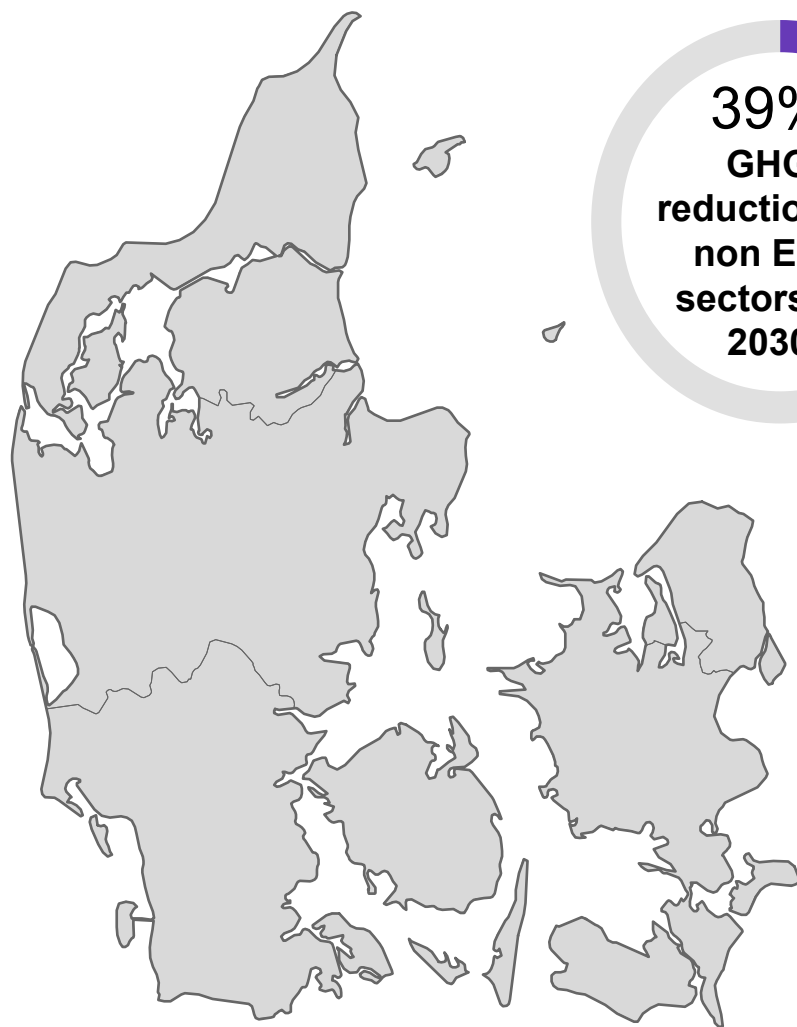
- Broad political consensus
- Long-term energy strategies and agreements
- Dialogue with sector stakeholders
- A stable framework to secure investment graded/bankable renewable energy projects

Renewable energy share of final energy consumption in Denmark



Source: Danish Energy Agency

Ambitions and climate targets



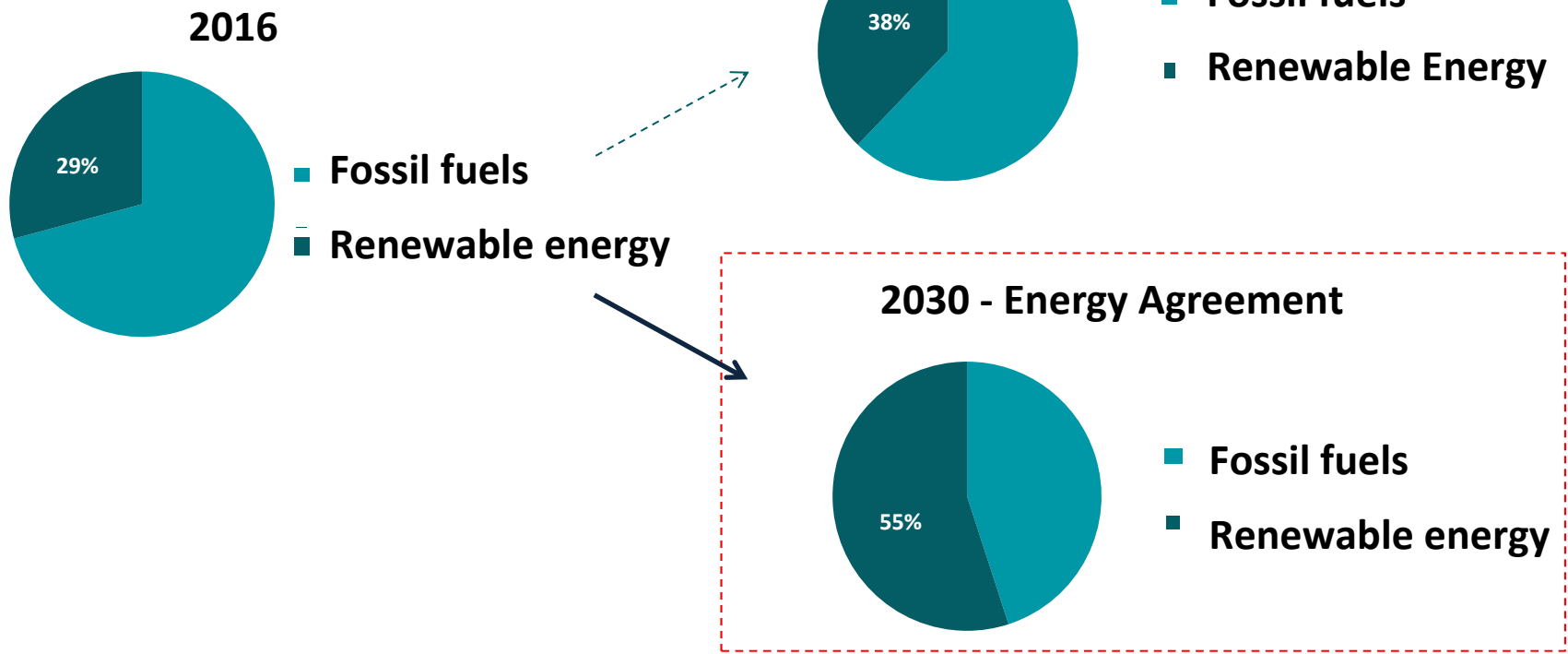
39%
GHG
reduction in
non ETS
sectors by
2030

At least
55%
RE-share in
total energy
consumption
by 2030

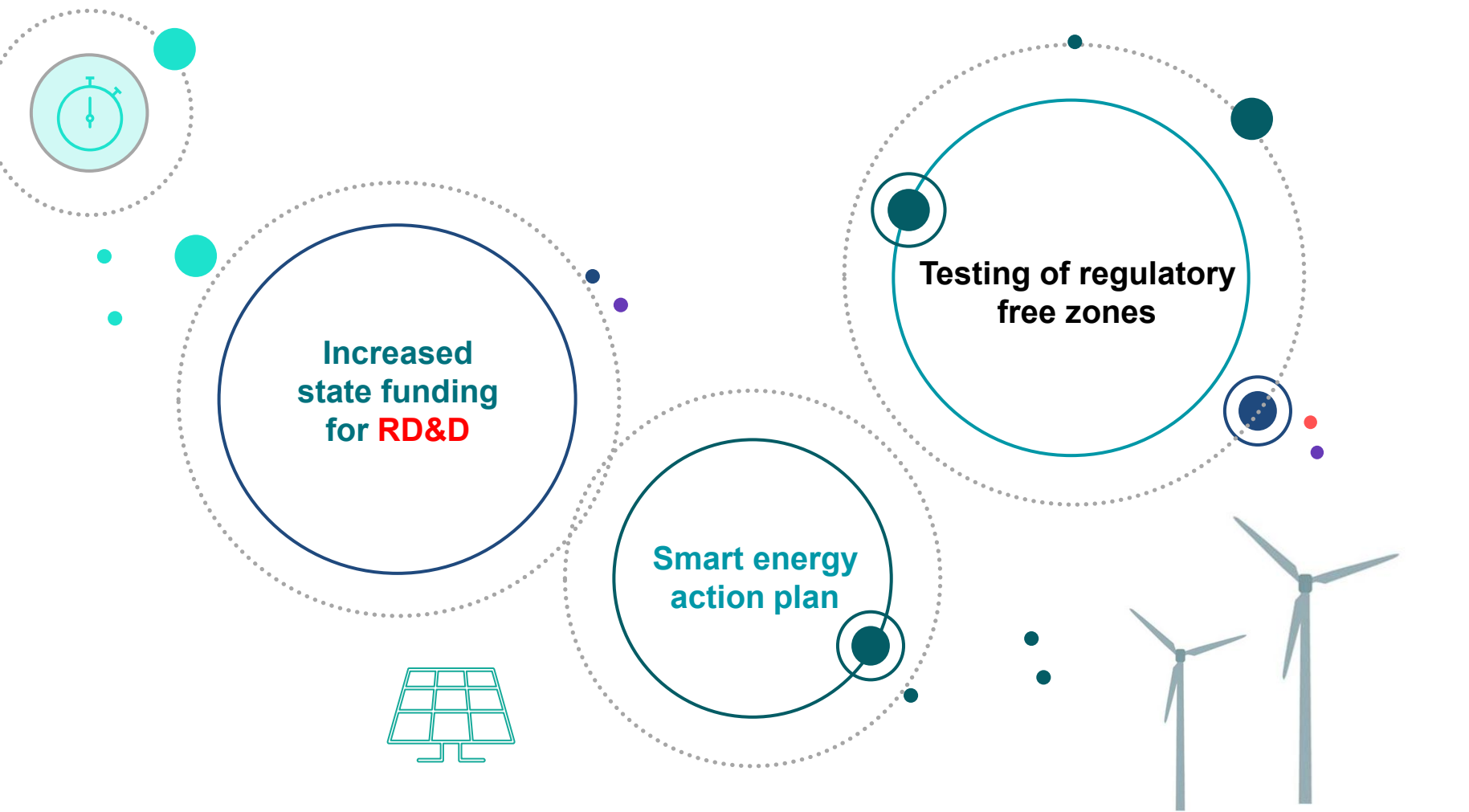
100%
Green
electricity
by 2030

Target of **net
zero emissions**
in the EU and
Denmark by
2050 at the latest

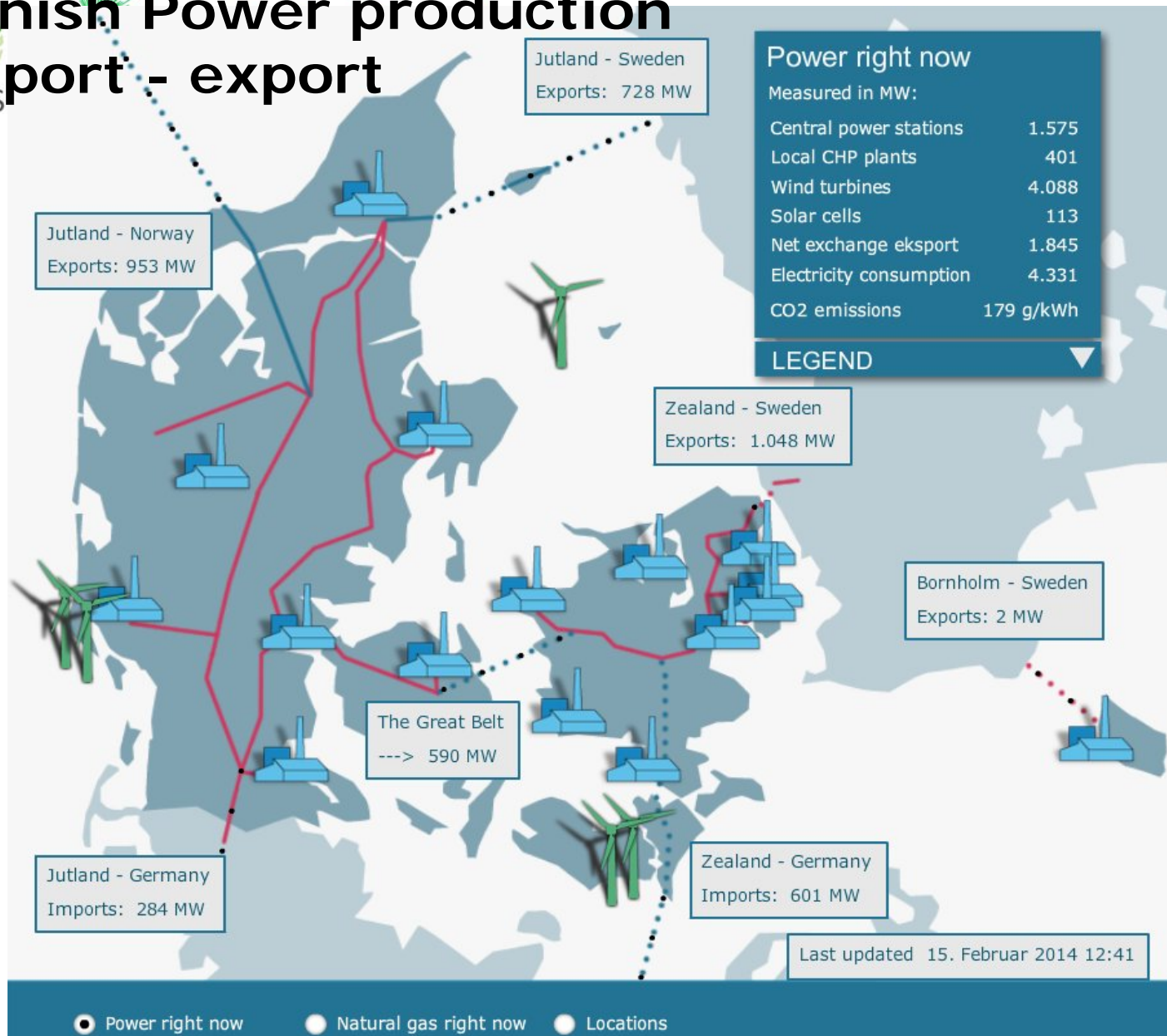
Energy mix in Denmark – now and in the future



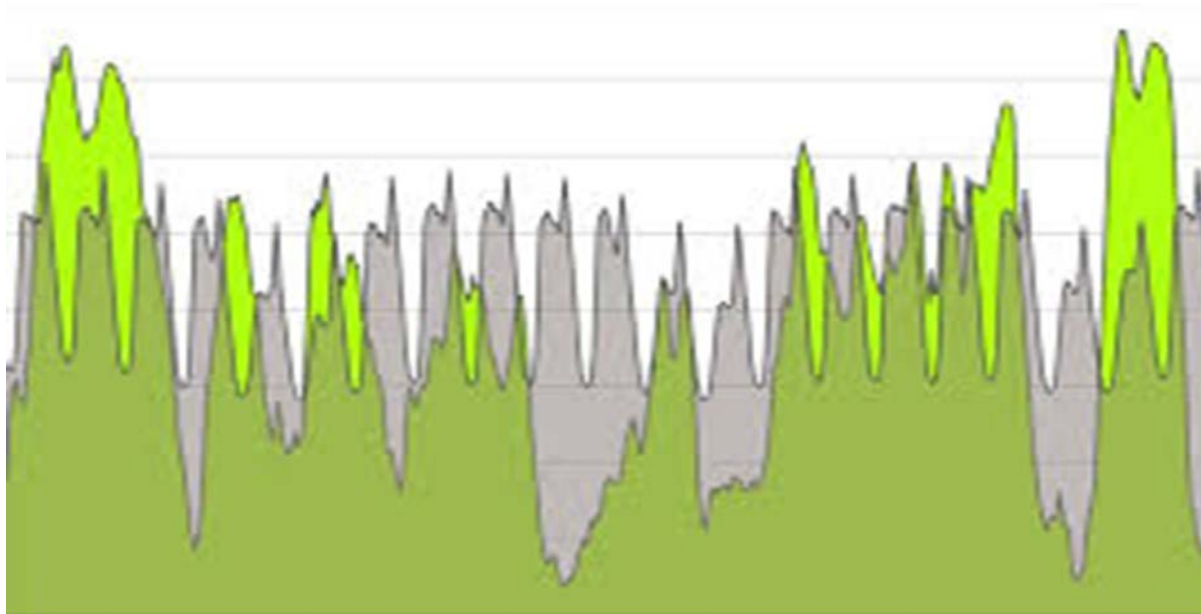
Strengthened energy and climate research



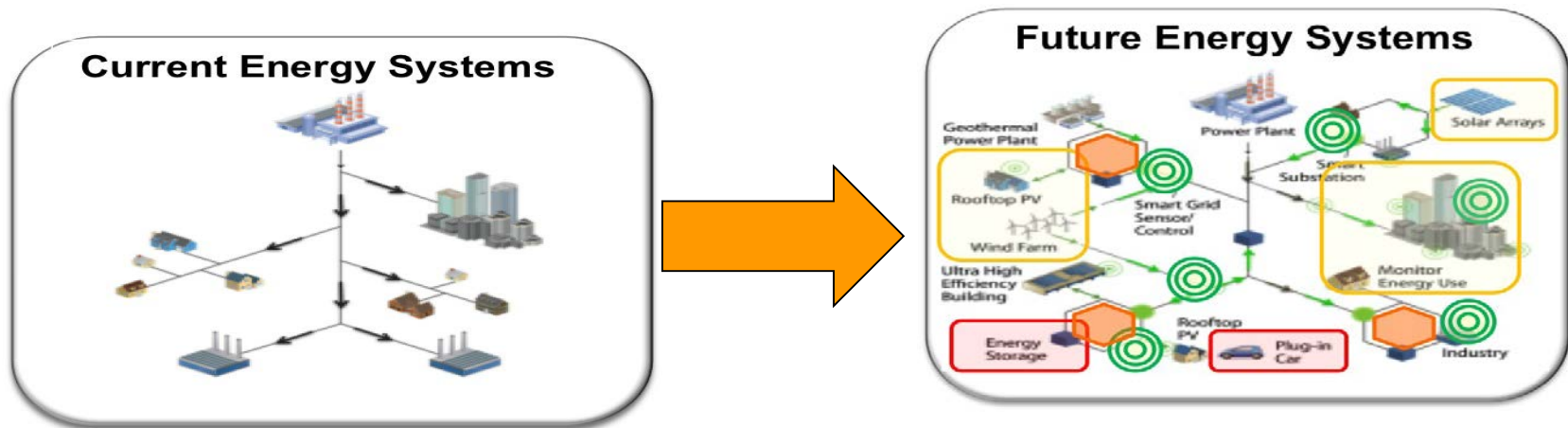
Danish Power production Import - export



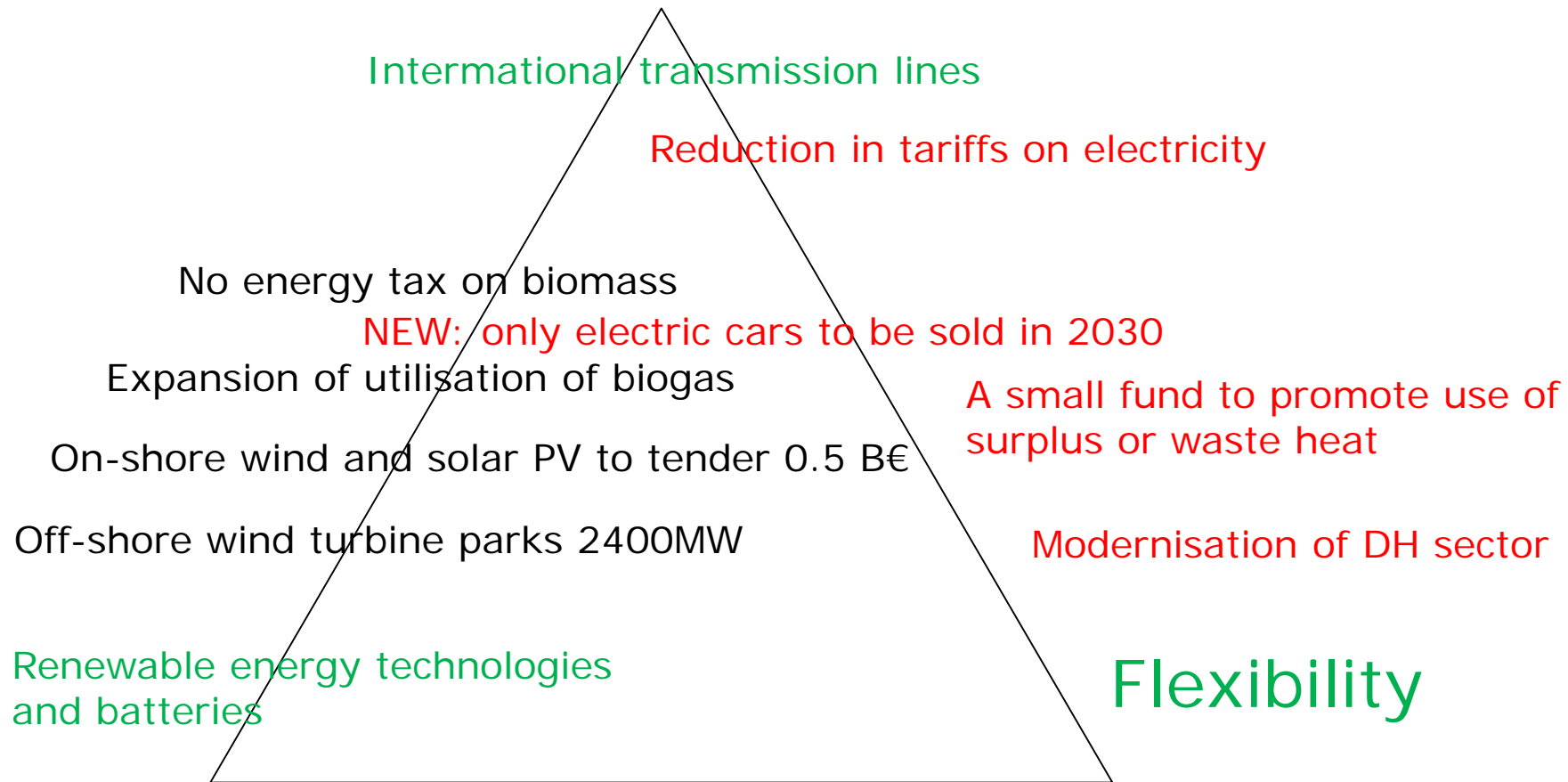
Electricity production (green) and electricity consumption (grey) over **three weeks** in Denmark



Change towards smart networks and decentral solutions



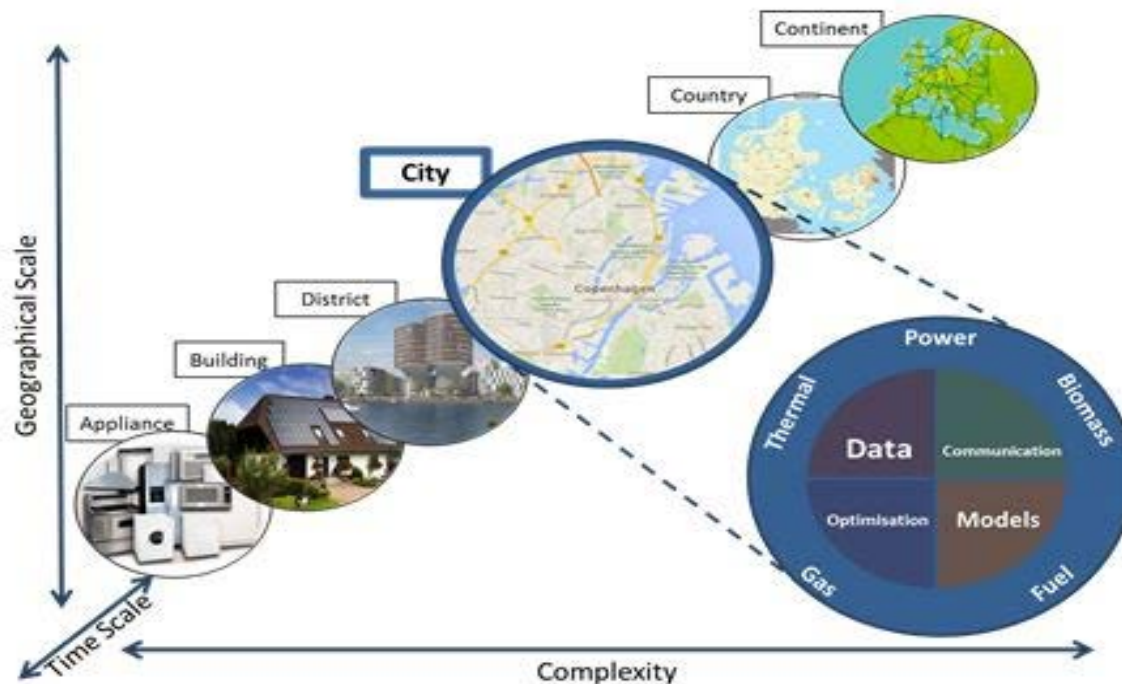
Major investment decisions in the Energy Agreement 2020-2024



Centre for IT Intelligent Energy Systems - CITIES

Scientific Objective

To establish **methodologies and ICT solutions** for **design and operation** of integrated electrical, thermal, fuel pathways at all scales.



Centre for IT Intelligent Energy Systems in Cities – Funded by Innovation Fund DK

- 45 partners including
- 5 DTU Departments and AAU
- 35 commercial partners

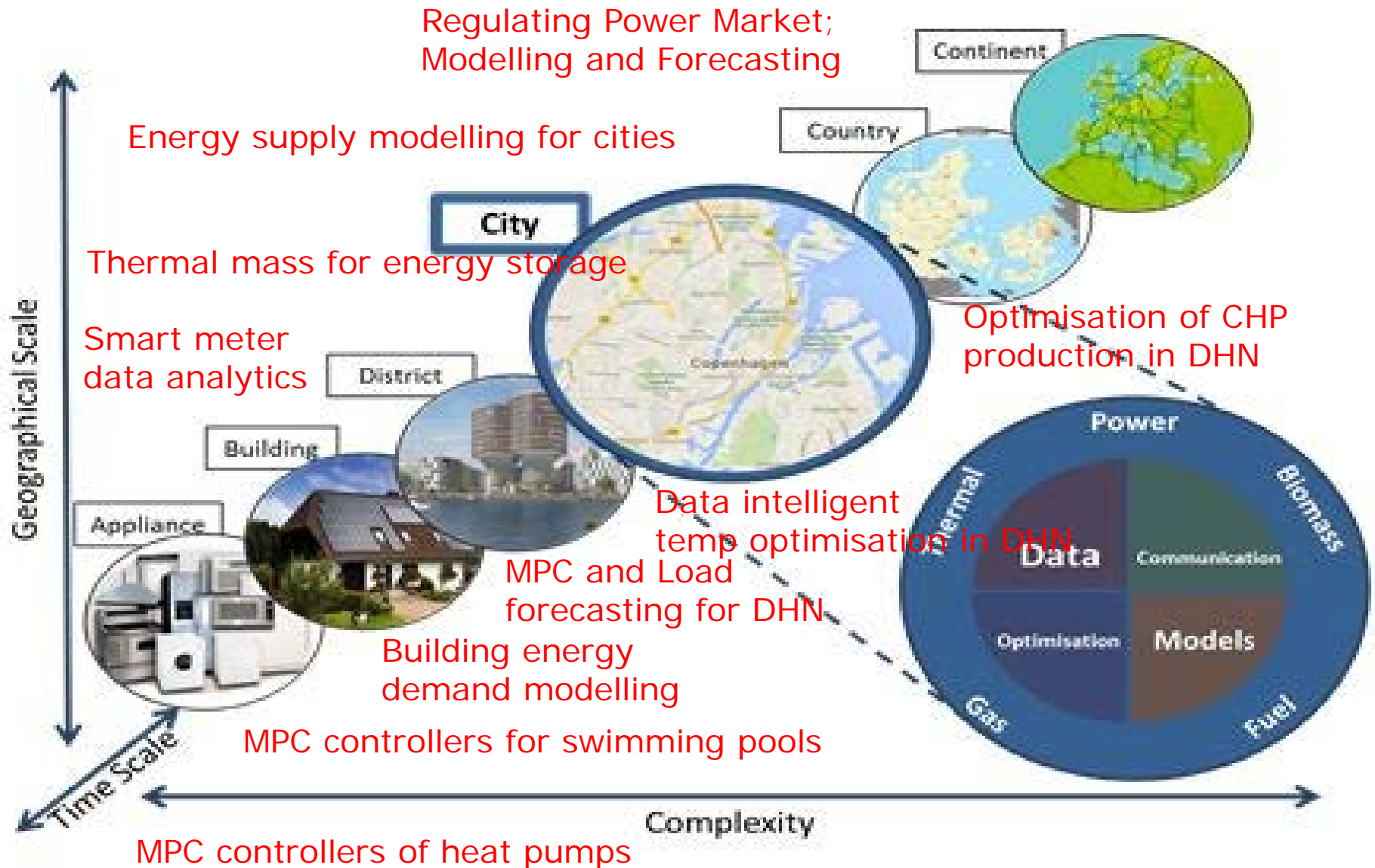
- 2014-2020 (6+1 years)
- Total budget: 75 mio Dkr

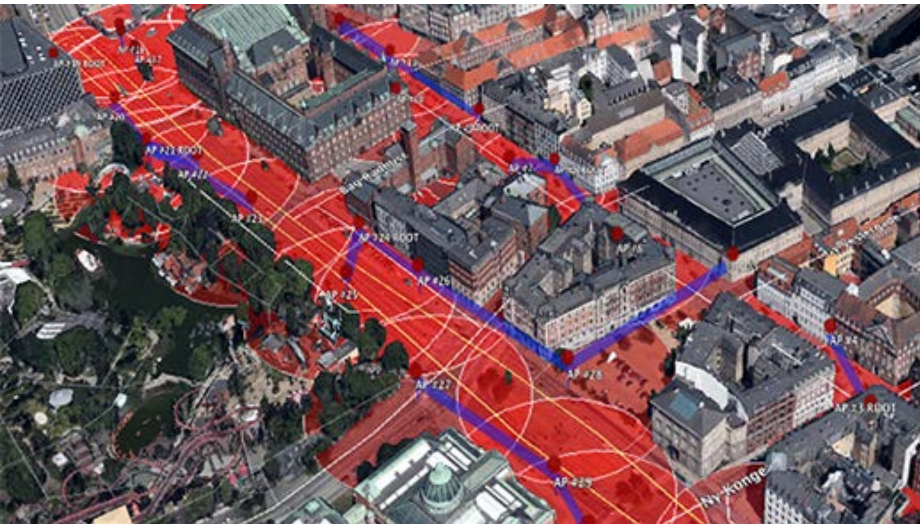
- > 100 journal and conference papers
- > 20 workshops
- > 20 solutions

Key Outcomes

- Modular **forecasting and control models/tools** for a variety of energy system components, including their interactions
- **Market structures** that support energy systems integration
- **Data driven solutions** for optimising energy consumption when RES are available (increasing flexibility in the energy system)
- Operational **methods and scenarios** for energy systems integration and management, scenarios towards a fossil free future (Power and heating sectors fossil fuel free in year 2035)

Centre for IT intelligent Energy Systems in Cities - CITIES

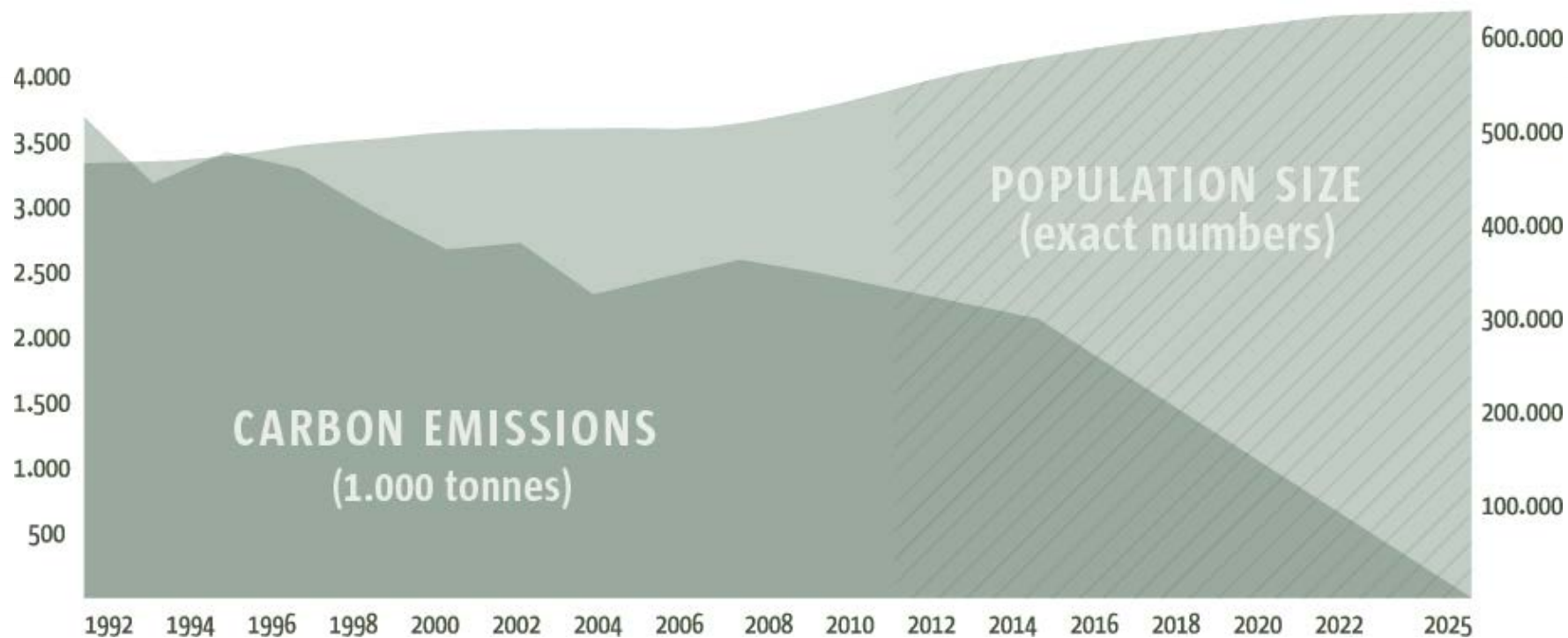




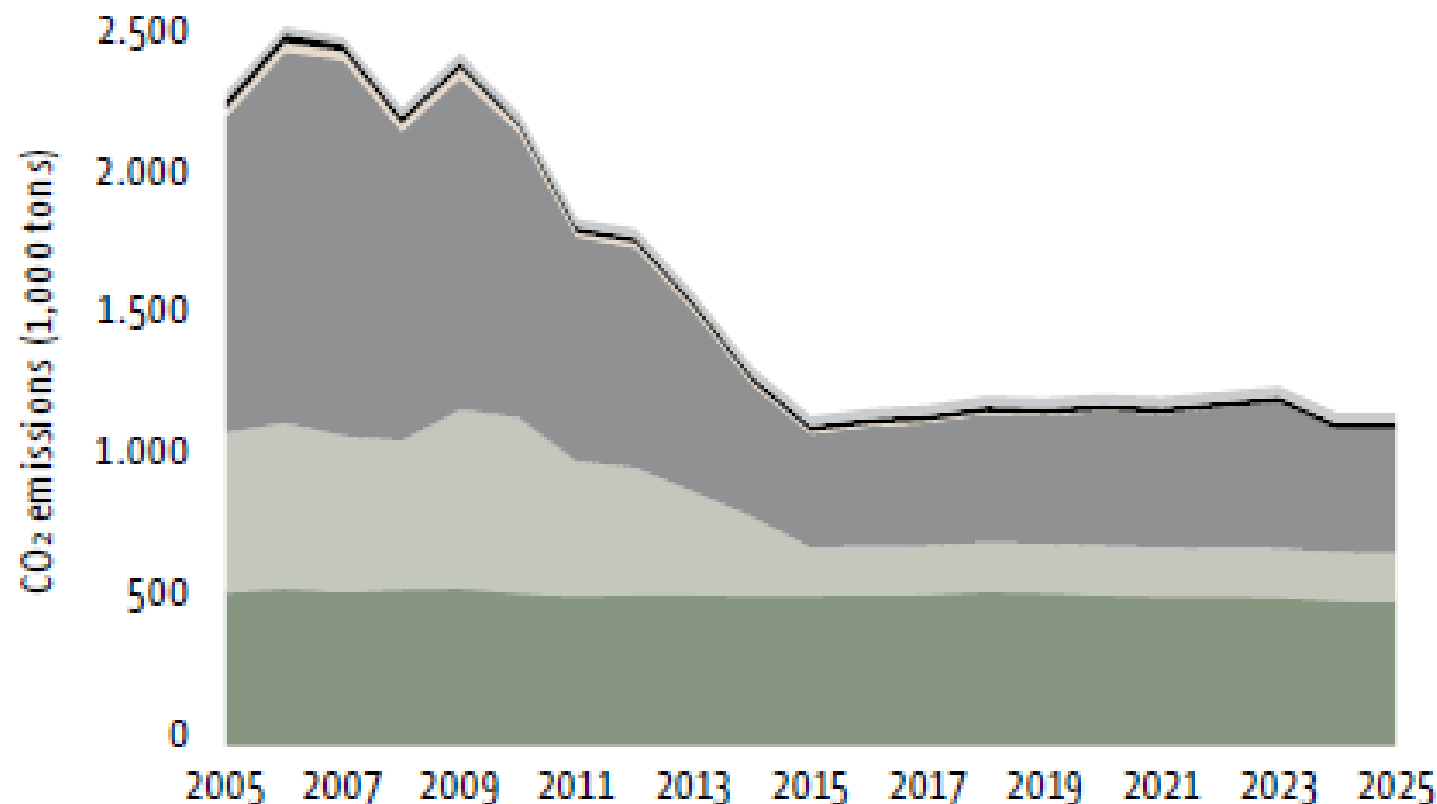
Background and Status of CPH 2015

- Copenhagen City's ambition to become the **world's first carbon neutral capital by 2025**. The current status (as of 2016) is that overall the City is well on track.
- The current climate plan: A total of **2.7 billion DKK (€ 363 million)** public money was agreed for the entire period of CPH 2025, that is, from 2012 to 2025.
- The roadmap for CPH 2025 includes **65 specific projects**, and it includes budgets, time-horizons and desired impact.

More Copenhageners - less carbon emissions



Development of CO₂ emissions up to 2025 – no further initiatives (CPH Climate Plan 2025)



Other sectors


Town gas and process
heat consumption

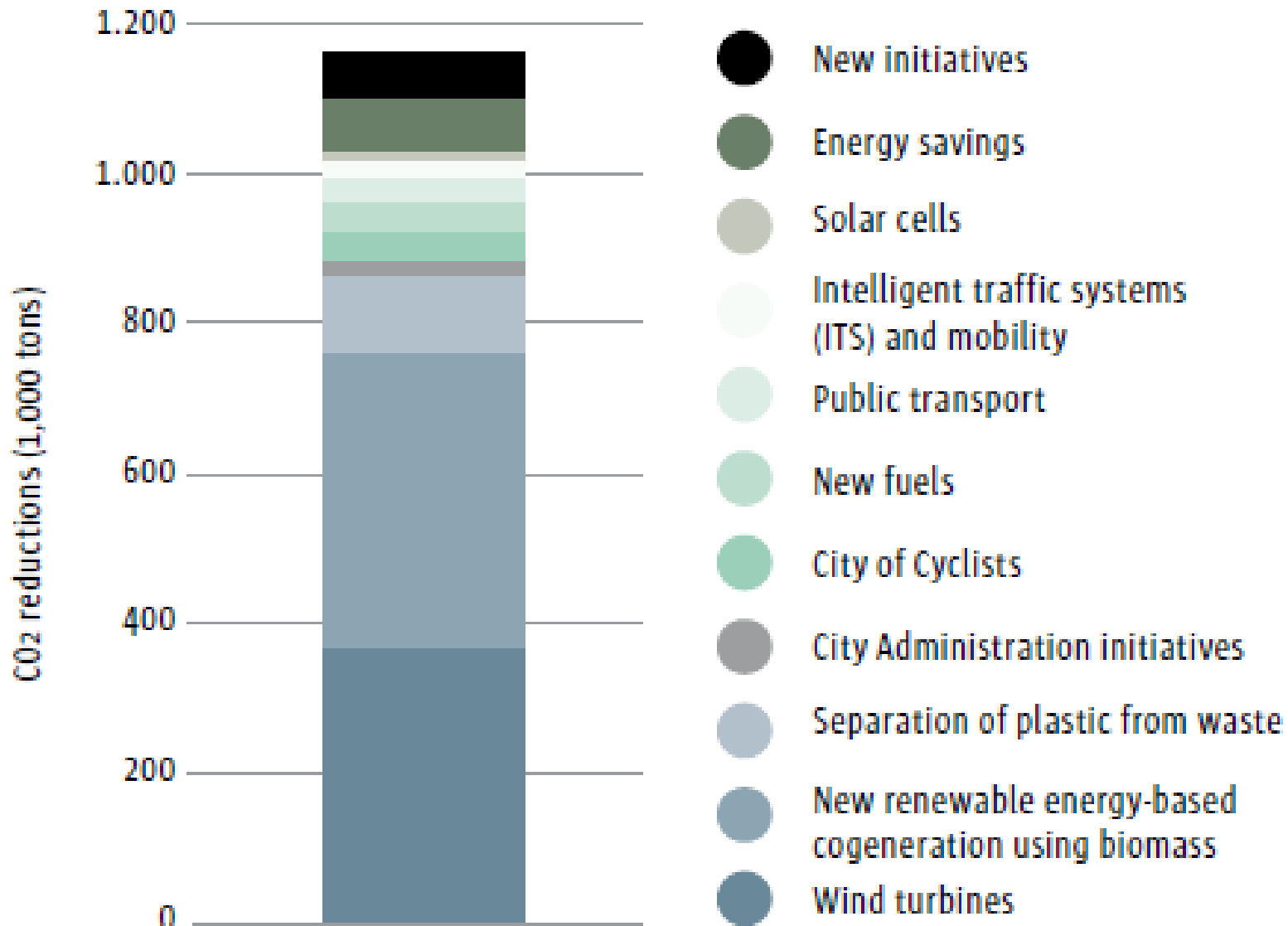

Individual heating


Electricity
consumption

District heating
consumption

Traffic and other
mobile sources

CO₂ reductions resulting from initiative in the CPH 2025 Climate Plan



Summing up

- Danes need to **use energy** when **the wind is blowing** and/or when **the sun is shining**
- The energy agreement is a step towards the Danish political goal of becoming fossil fuel free. BUT
- **politically motivated** and not based on sufficient scientific technical as well as economic analysis.
- We need to be able to evaluate the **benefits of an intelligent energy system**, which is not only focussing on providing more RE supply. We are just postponing the real challenge of transitioning to a sustainable energy system for Denmark.
- Copenhagen shows **how divers** the solutions will have to be to make a **full transition** to a sustainable energy system. But Copenhagen is still relying on the national government to carry through the national policy.