

DH in Greater Copenhagen 2050

Heat Highway Workshop

3rd March 2023, Austria

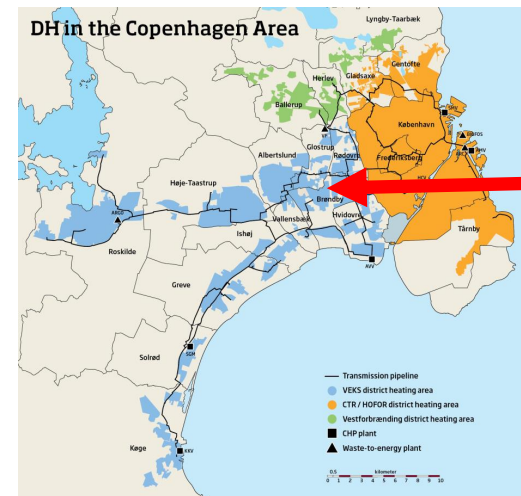


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Vice-chair, IEA DHC ExCo

Where are we – and who is VEKS ?

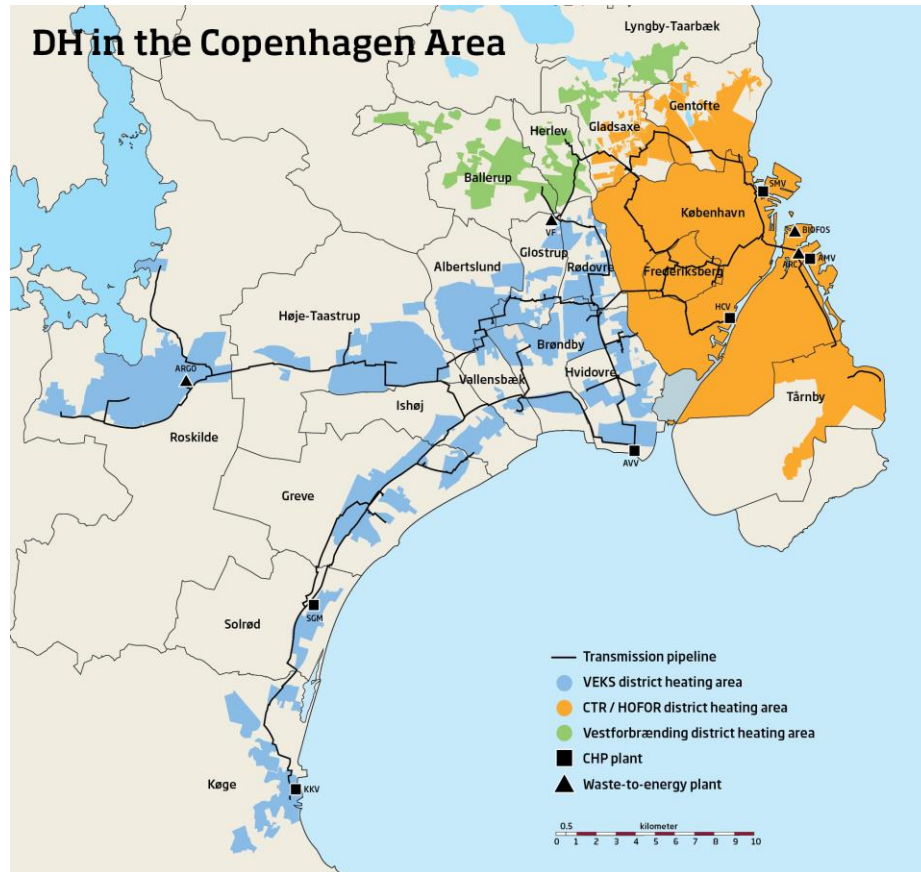
Vestegnens Kraftvarmeselskab I/S

- Established in 1984.
- District heating (DH) company with the purpose to utilize and distribute surplus heat from CHP plants and waste-to-energy plants.
- From 2012 involved in production, transmission and distribution of DH.
- Annual turnover: \$ 200 mill.



DH in Greater Copenhagen

VEKS, CTR and HOFOR



VEKS

- Partnership between 12 municipalities
- 350,000 tax-payers
- 170,000 end – users
- 9,000 TJ (2,500 GWh)

DH in Greater Copenhagen

- 19 municipalities
- 4 integrated systems
- 500,000 end – users
- 34,500 TJ (9,600 GWh)



→ 40 km ←

Grøn fjernvarme til dig

The basics...

Transmission

135 km twin pipes, 14 pumping stations, 56 heat exchange stations transmitting heat to the 19 local district heating companies.

Production

Køge CHP Plant produces electricity for the grid, steam for Junckers Industrier A/S and sells district heating to VEKS Transmission.

VEKS Gasmotor in Solrød produces electricity for the grid and district heating for VEKS Transmission based on biogas

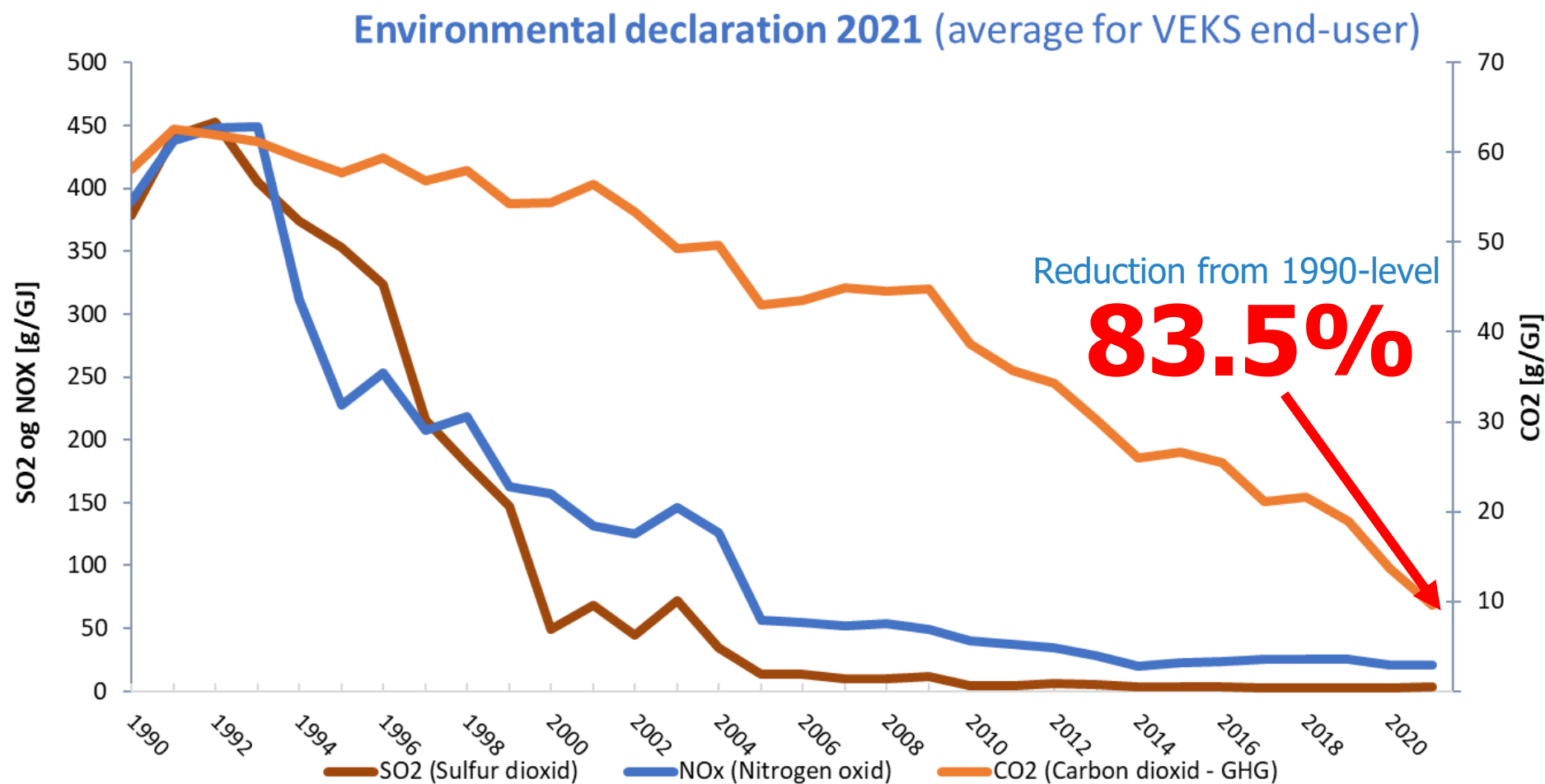
Distribution

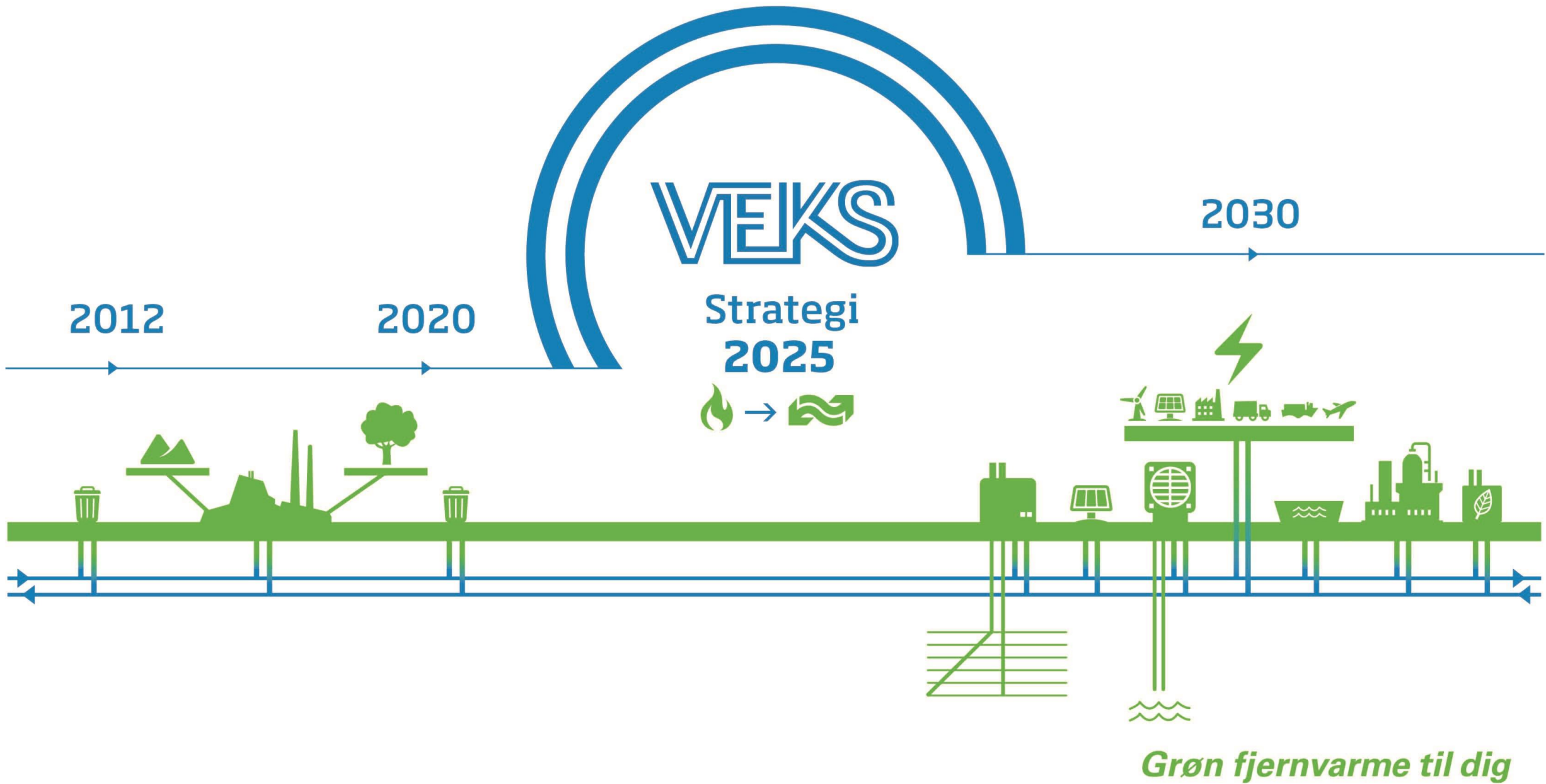
Køge District Heating handles the distribution of district heating to private consumers, business customers and institutions in Køge.

Tranegilde District Heating (TFV) handles the distribution of district heating to customers in Tranegilde's industrial area in Ishøj and Greve.



Carbon footprint





2020-25

- Large heat pumps
- Thermal heat storage
- Surplus heat from datacentres
- Low temperature
- Test, geothermal energy

2020

- Sustainable biomass
- Waste-to-heat
- Test, large scale heat pumps
- Test, thermal heat storage

2025-28

- AI and AM
- Large heat pumps
- Surplus heat from datacentres and industry
- CHP (AVV2)
- Geothermal
- Low temperature

2028-30

- Large heat pumps
- Surplus heat from datacentres and industry
- Decommissioning CHP (AVV)
- Geothermal
- Low temperature
- Power to X and Carbon capture
- Decentralised heat production

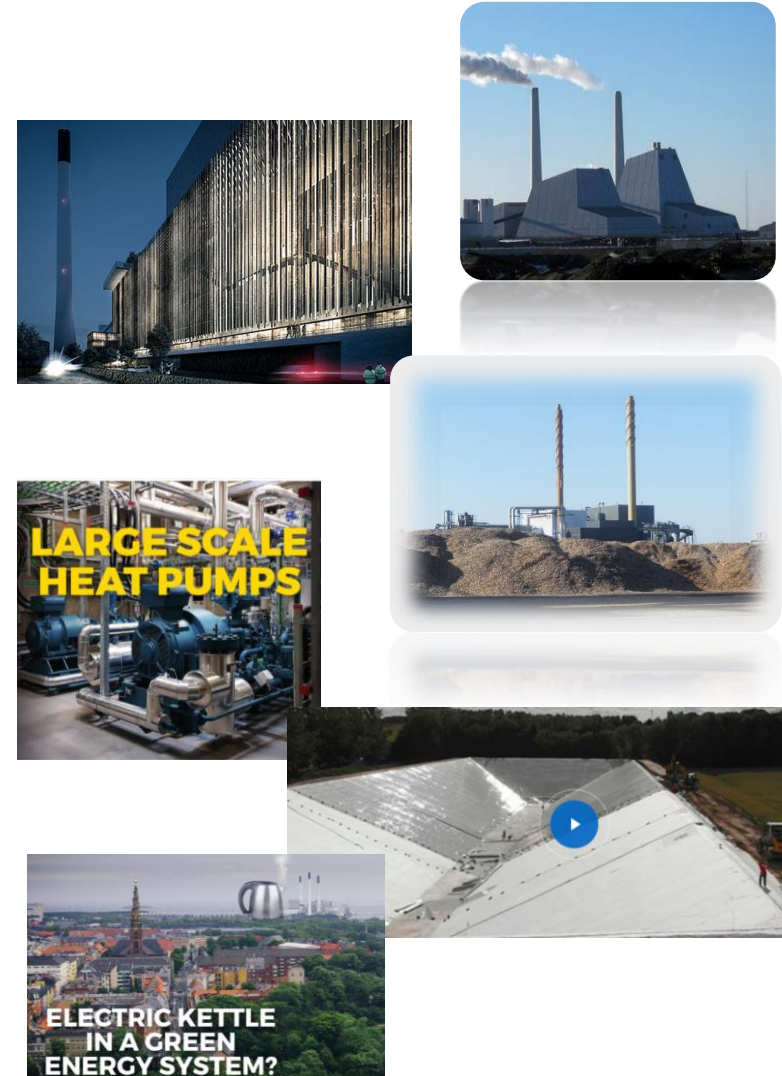
VEKS Strategi

Grøn fjernvarme til dig

Brief intro...

HPGC = Heat Plan Greater Copenhagen

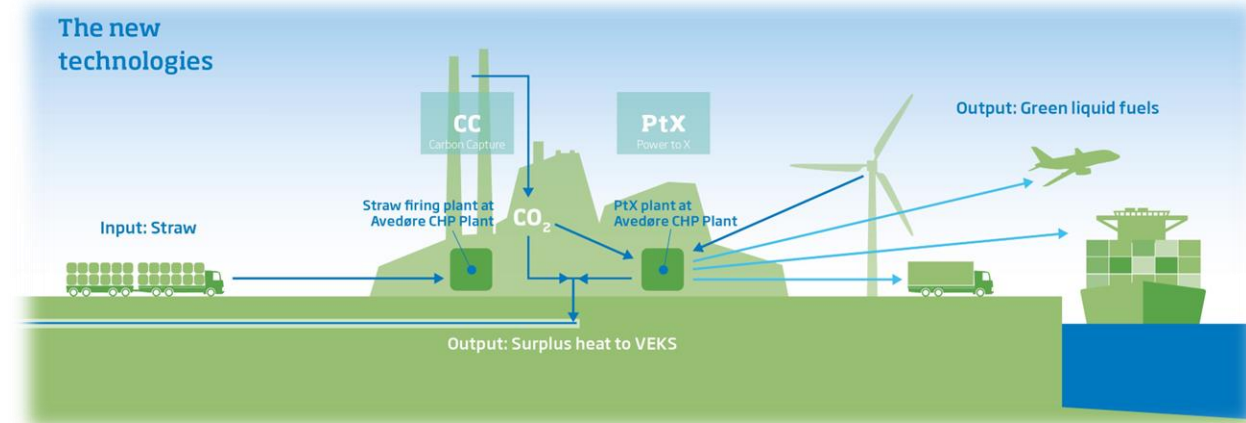
- CTR, HOFOR and VEKS has worked with strategic heat planning in Greater Copenhagen for more than 10 years:
- **HPGC 1** (2008-09): Achieving a 70 % CO₂ reduction (1990-level) without additional cost to the system. Good business case in converting the large scale CHP plant from coal to biomass (subsidy on electricity produced from biomass).
- **HPGC 2:** (2010-11) Possible to achieve 100 % CO₂-neutral DH with limited additional cost.
- **HPGC 3:** (2012-2015) Analysed and coordinated large investments in net and production facilities for the next 10-15 years. Interaction between the DH system and increasing amounts of wind power. Analyses indicated a future need for biomass and waste based CHP, but also indicated that heat-pumps would take on an increasingly important role as the large CHP units would become de-commissioned. More flexibility and storage would be important elements to test and introduce.



Future DH in Greater Copenhagen 2050

What do we want to achieve?

- Establish a **vision** of the framework in 2050 in which **DH** supports a competitive, **green** and sustainable heat supply.
- Establish a **common idea** and **perception** of the potential actions, which will support and the **vision** towards 2025, 2030 and 2050.
- Develop a **common understanding** across the four companies - CTR, HOFOR, Vestforbrænding and VEKS – which **supports** the **decisions** which the companies face in the coming years
- Ensure that **decisions** are made in a **common understanding** with the main stakeholders (owners, municipalities, customers, etc.)



Future DH in Greater Copenhagen 2050



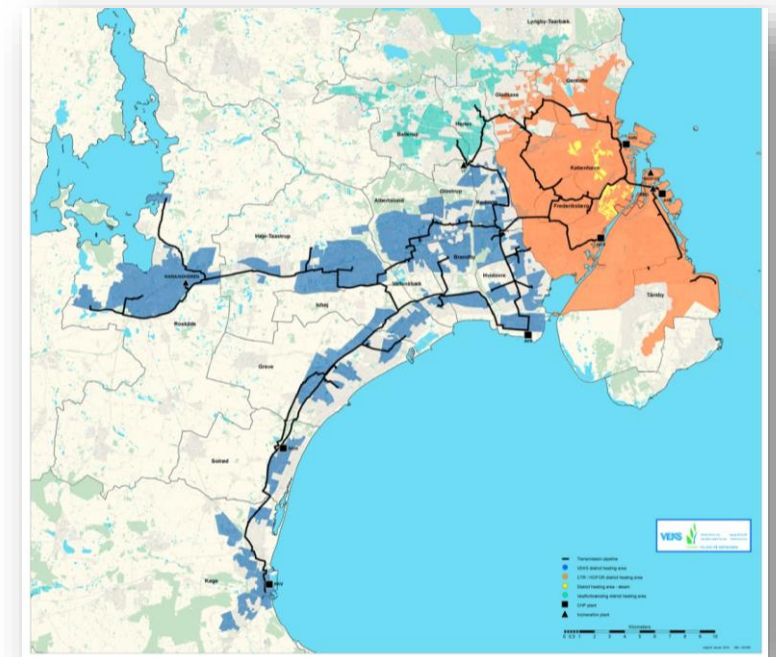
Future system and technology

Low temperature and intelligent control
Technology and system
Interconnections of systems
Sector interconnection



Future customers

Competitiveness – individual heating
New customers from natural gas and new buildings
New products and services



Impact point

Carbon Capture



What is C4 (Carbon Capture Cluster Copenhagen)?

A consortium of nine companies established December 2020

- Waste-to energy plants
 - ARC, ARGO and Vestforbrænding
- Watertreatment plant
 - BIOFOS
- Biomassbased CHP plants
 - HOFOR (BIO4-plant) and Ørsted (AVV)
- DH transmission companies
 - CTR and VEKS
- Port
 - CMP (Copenhagen and Malmö Port)



Grøn fjernvarme til dig

What is the goal for C4?

- To make carbon capture (CC) a crucial element in the green transition in Denmark.
- CO₂ reductions of around 3 million tons/year are possible among the partners of C4.
- 3 million tons are approx. 15% of the total Danish target for reduction of 70% by the year 2030 and could be one of the largest single contributions to the green transition in Denmark.



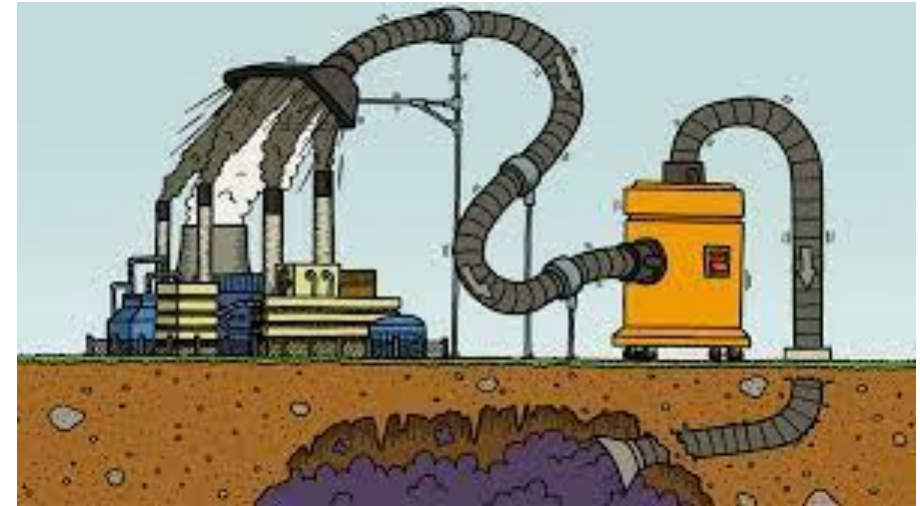
Why invest in the capture of CO₂?

- Carbon capture and storage (CCS) is an important contribution and, above all, an available technology to meet the Danish climate targets of 70% reduction in CO₂ by year 2030.
- CC also contributes to the Paris Agreement's goal of reducing global temperature rises to 1.5°C.
- UN Intergovernmental Panel on Climate Change (IPCC), European Commission and the International Energy Agency (IEA) all state that CC is central to achieving the Paris Agreement's goals.



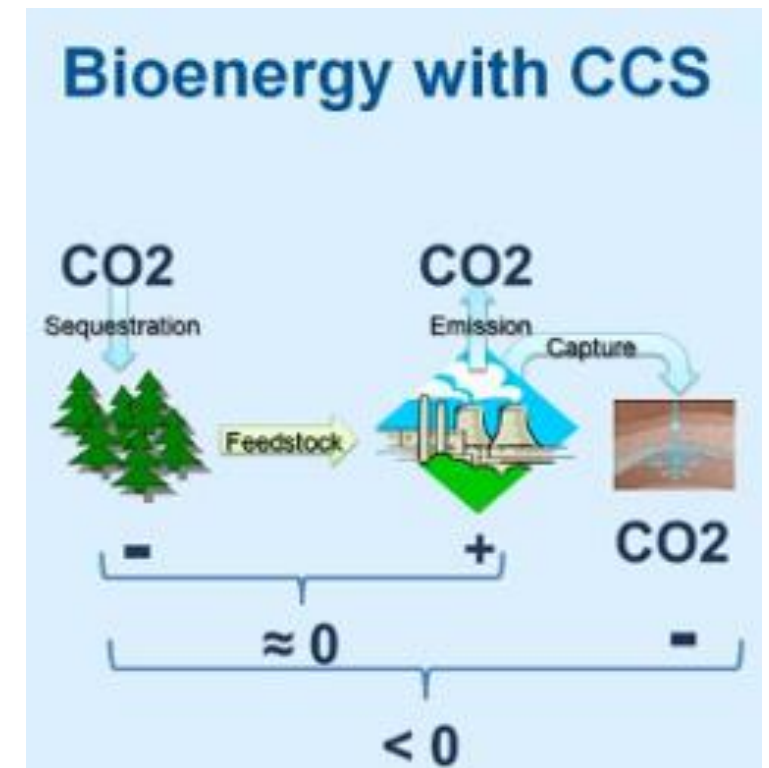
What is Carbon Capture (CC)?

- CC is the capture of CO₂ in gaseous form.
- Done by a chemical reaction, where the smoke from an industrial chimney, for example, is passed through a liquid that binds with or absorbs the CO₂.
- The liquid can then be heated to release the CO₂ into a closed container, from which it can be collected.
- The collected CO₂ can either be stored (CCS) or used to produce fuel (Power-to-X).

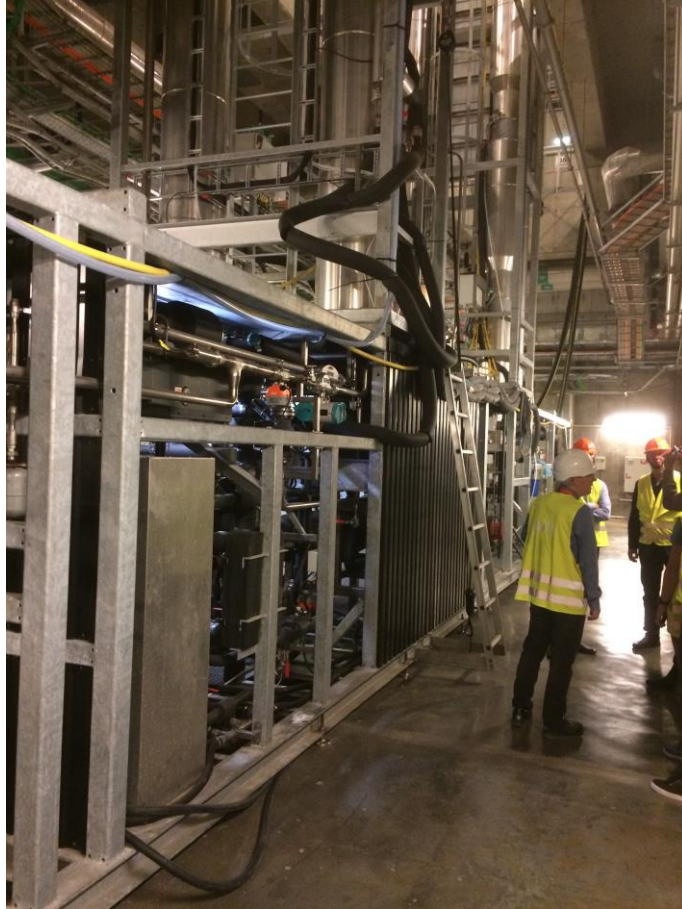


How is it that Carbon Capture from biogenic sources produce negative emissions?

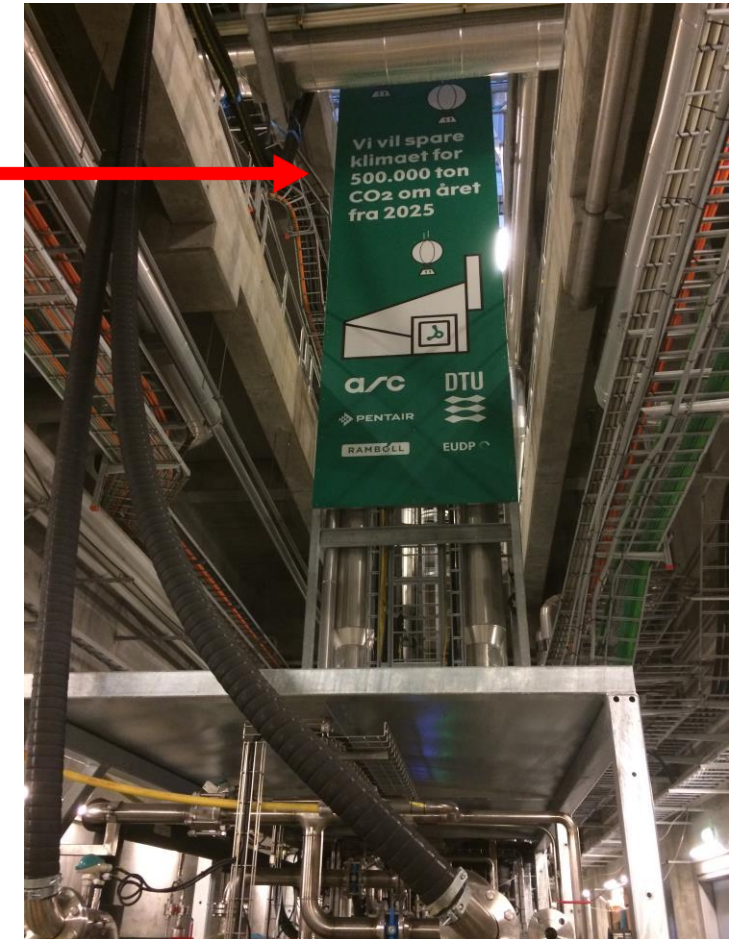
- This is due to that biogenic sources have absorbed CO_2 from the atmosphere in its lifetime. This can be, for instance, wood and straw.
- When biogenic material is burned, releases the same amount of CO_2 into the atmosphere that the material has absorbed during its lifetime in that form.
- When the majority of the CO_2 is caught in relation to combustion and subsequently stored underground, CO_2 is effectively removed from the atmosphere.



CC test at ARC – (Waste-to-energy plant)



We will save the climate for
500,000 tons CO₂/year from 2025



Why is it obvious to establish C4 in the Copenhagen metropolitan area?

- We can build knowledge together in community, and explore and identify possibilities for solutions, along with jointly demanding facilities for the storage of CO₂ underground.
- In addition, it is obvious to establish C4 because:
 - Our energy plants have extensive operating hours annually, a high CO₂ concentration from the specific sources, long lifespans and significant emissions of CO₂.
 - We are all in close proximity to each other, and thus can be connected via a pipeline to, for instance the port in Copenhagen, from where the CO₂ can be shipped.
 - We are connected to the district heating network, to which we can provide the excess heat from the CC.



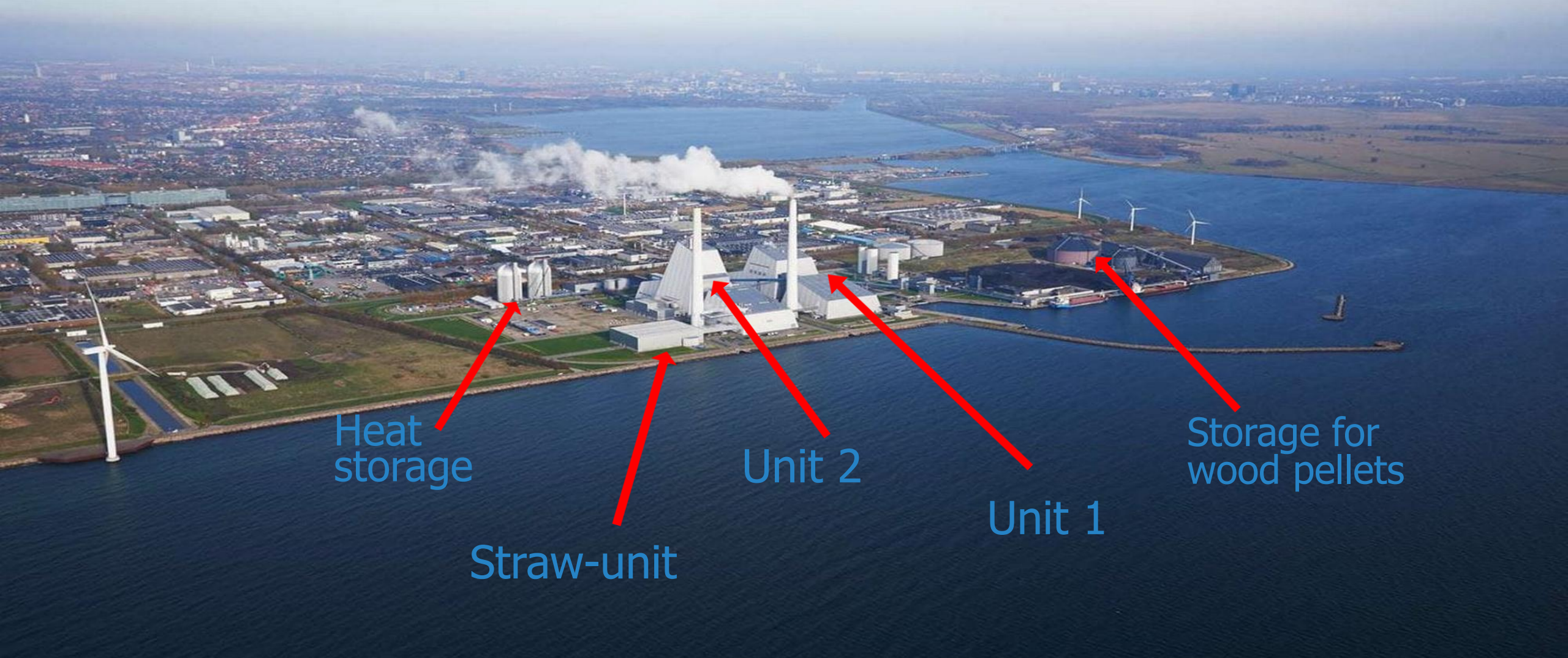
What is the plan for C4 in terms of timing?

- There is **currently no fixed schedule**, as the C4 consortium is in an **initial phase** of exploring the possibilities for large-scale CC.
- The **implementation** depends on the extent of the **political will** among the politicians in the Danish Parliament.
- With the **right conditions**, it is not unlikely that the majority of the potential of around **3 million** tons of CO₂ reduction/year can be realized, within **10-12 years**.



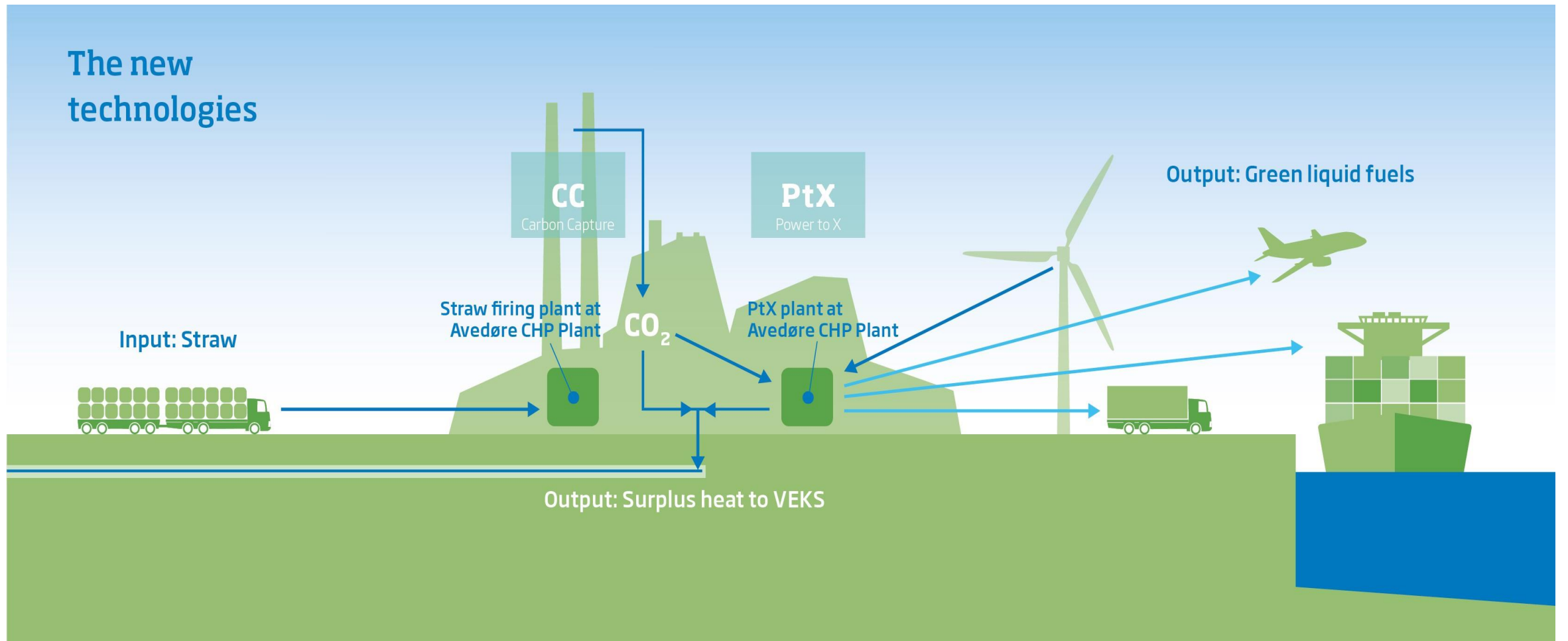
Avedøre CHP Plant, Copenhagen DK

Unit 1 (1990/2016) and unit 2 (2001/2014)

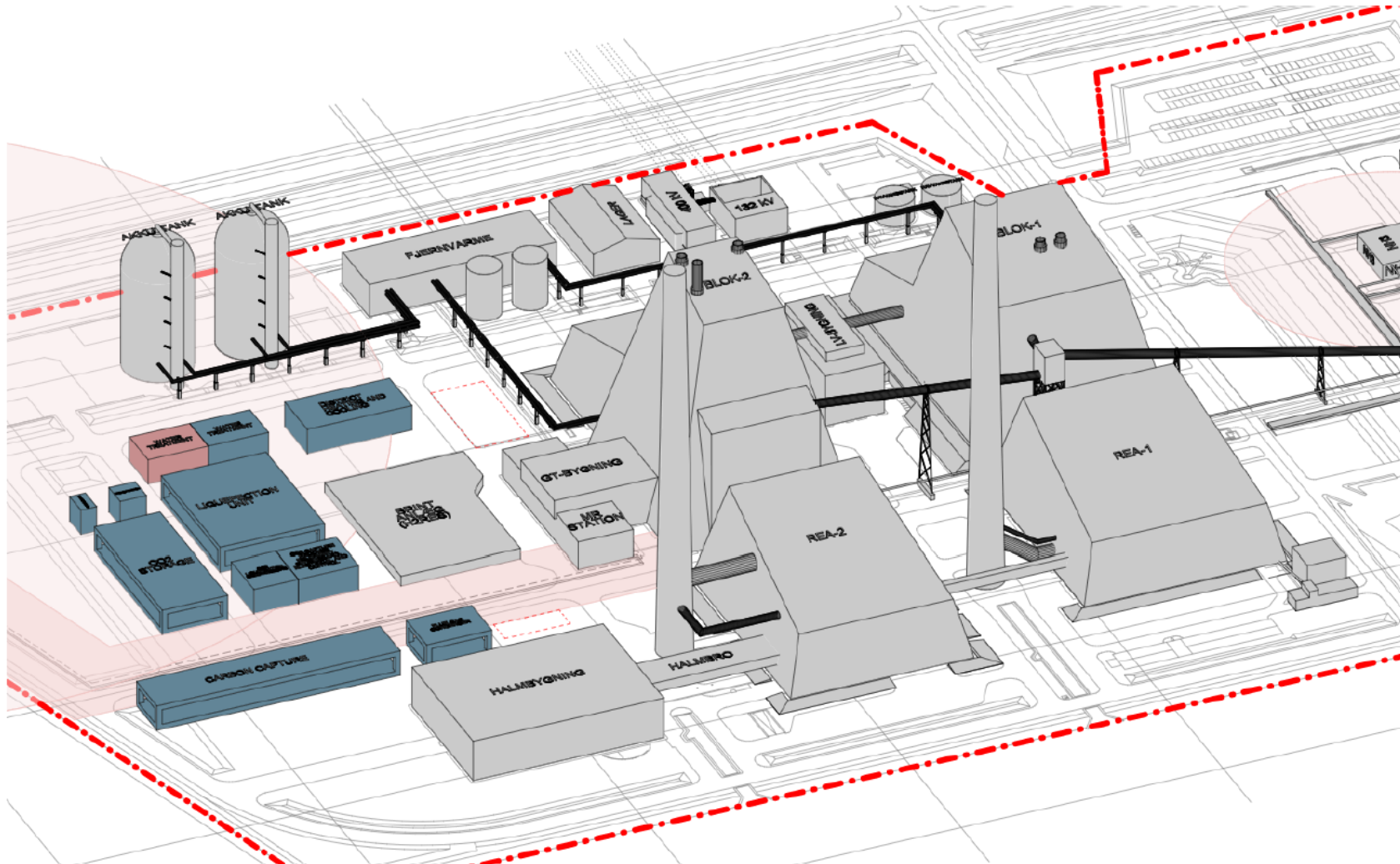


100 % sustainable biomass - 856 MJ/s heat

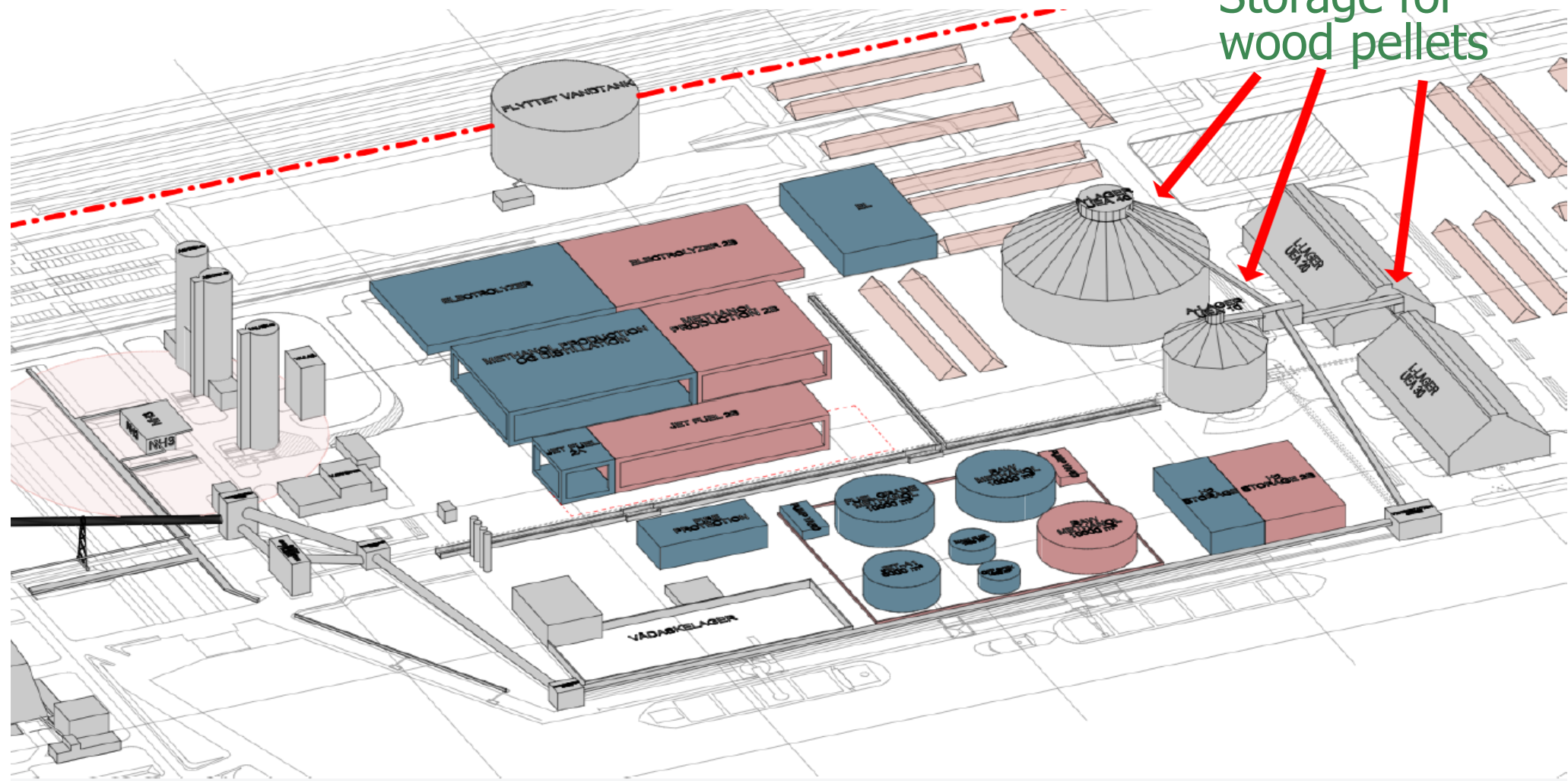
Avedøre CHP Plant – Surplus heat from CC and PtX

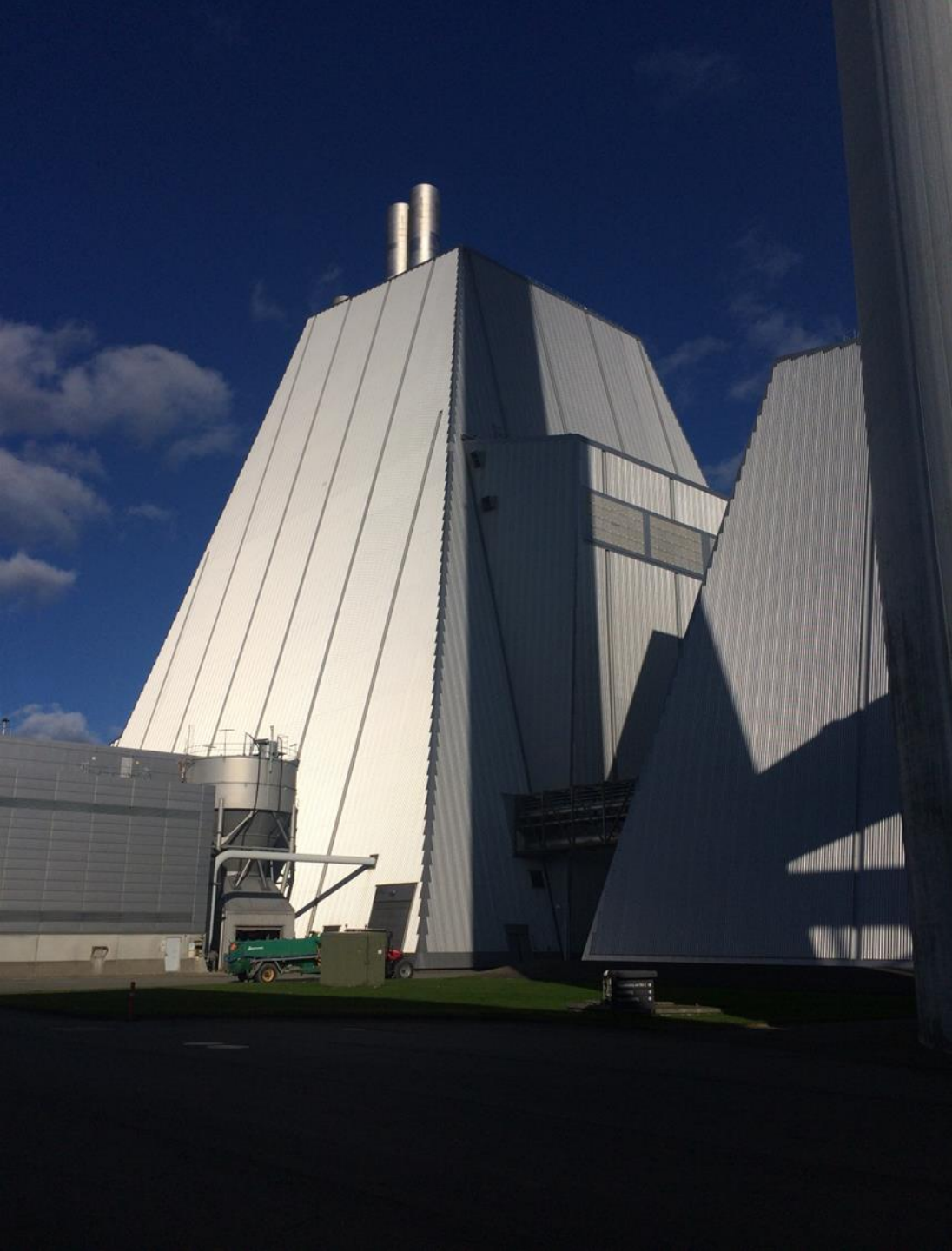


Carbon Capture at AVV



Power-to-X (PtX) at AVV





Summary

- Both the Carbon Capture process and the Power-to-X process generate large amounts of excess heat....

Grøn fjernvarme til dig



Summary

- Only a society with a well-functioning district heating system can make optimal use of the energy resources of the future.
- Without DH the resources would be lost for the society.

Grøn fjernvarme til dig



a/c

Thank you

Further information:

www.veks.dk

lg@veks.dk



Grøn fjernvarme til dig