Kalundborg Symbiosis

Surplus from circular production


The Kalundborg Symbiosis Administration

Mission & Vision

Renew

Strengthening the partnership

Connect

Full resource utilization

Promote

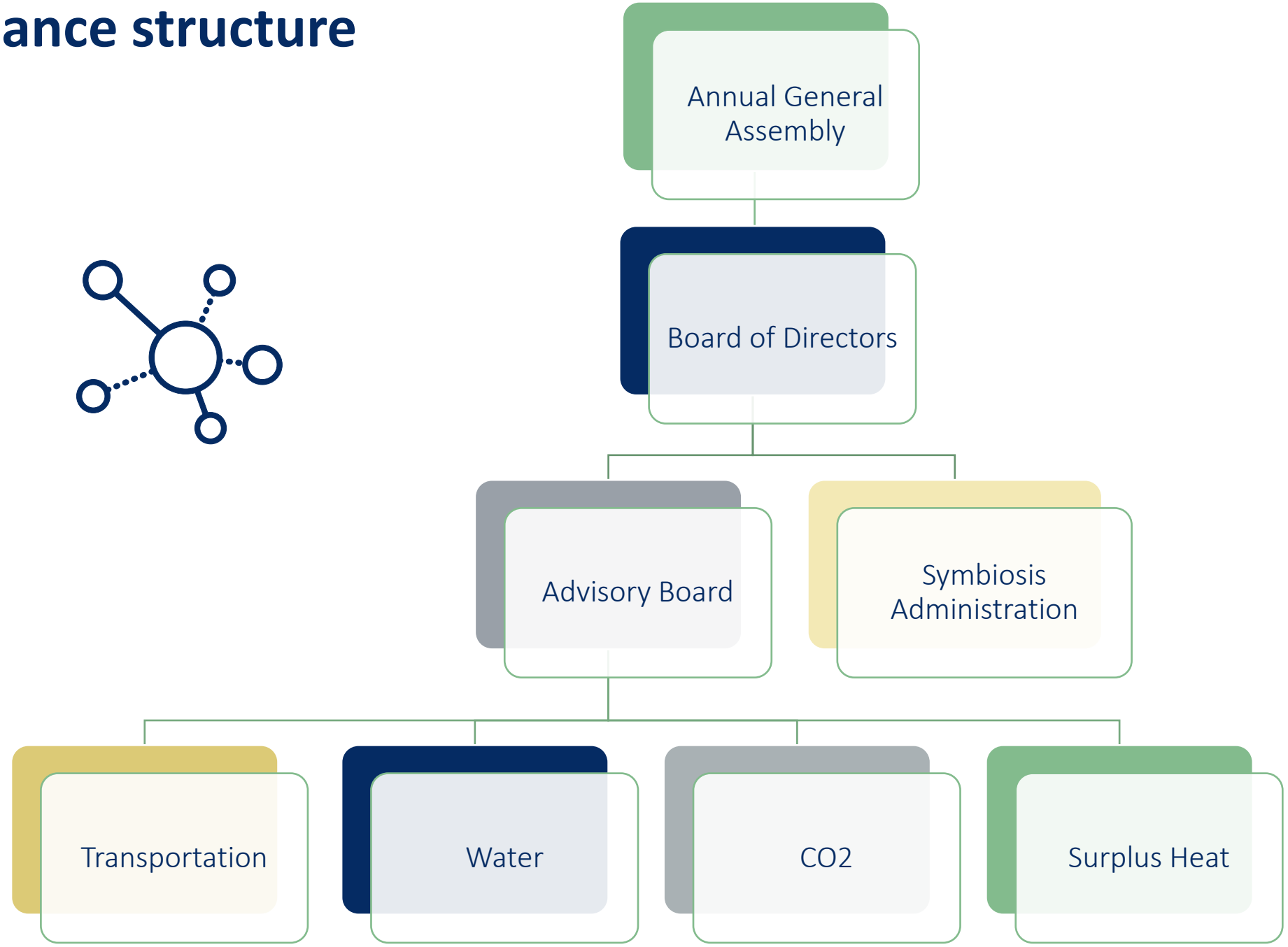
Sharing the symbiotic mindset

The worlds leading industrial symbiosis with a circular approach to production

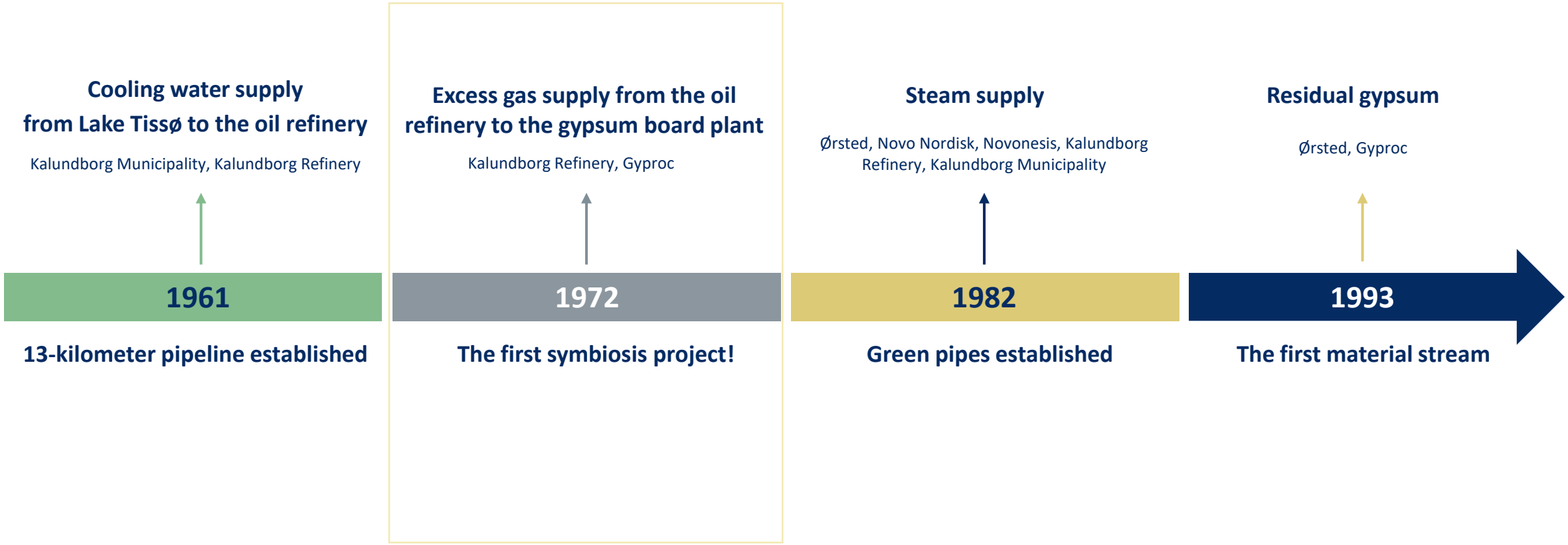
Kalundborg Symbiosis creates sustainable development in our companies through joint projects

International collaboration

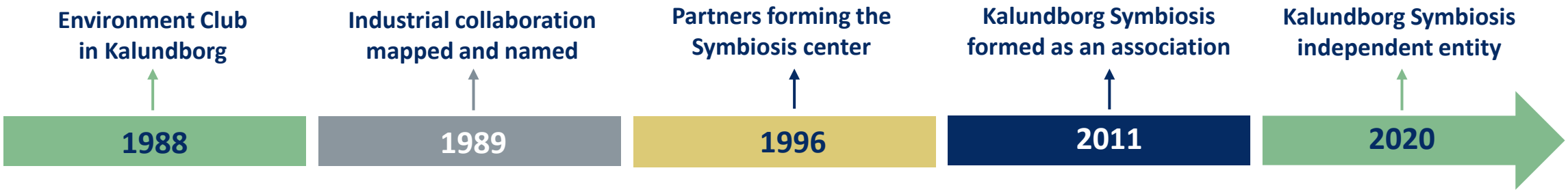
Governance structure



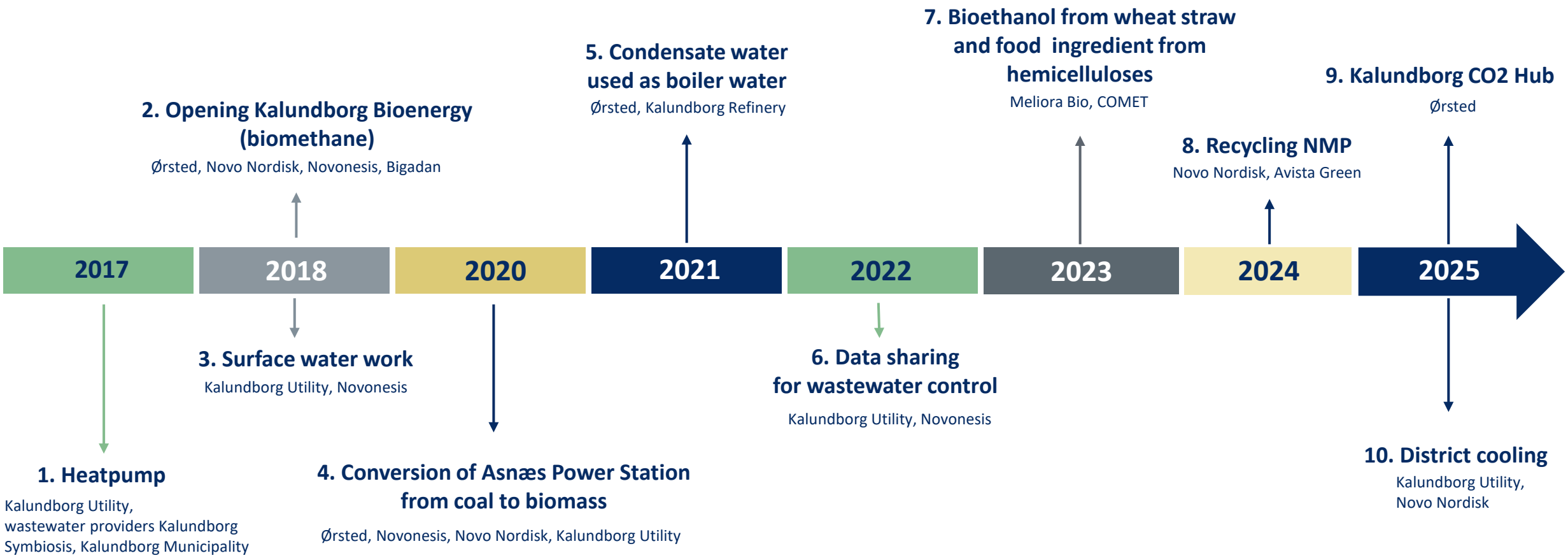
How it all started



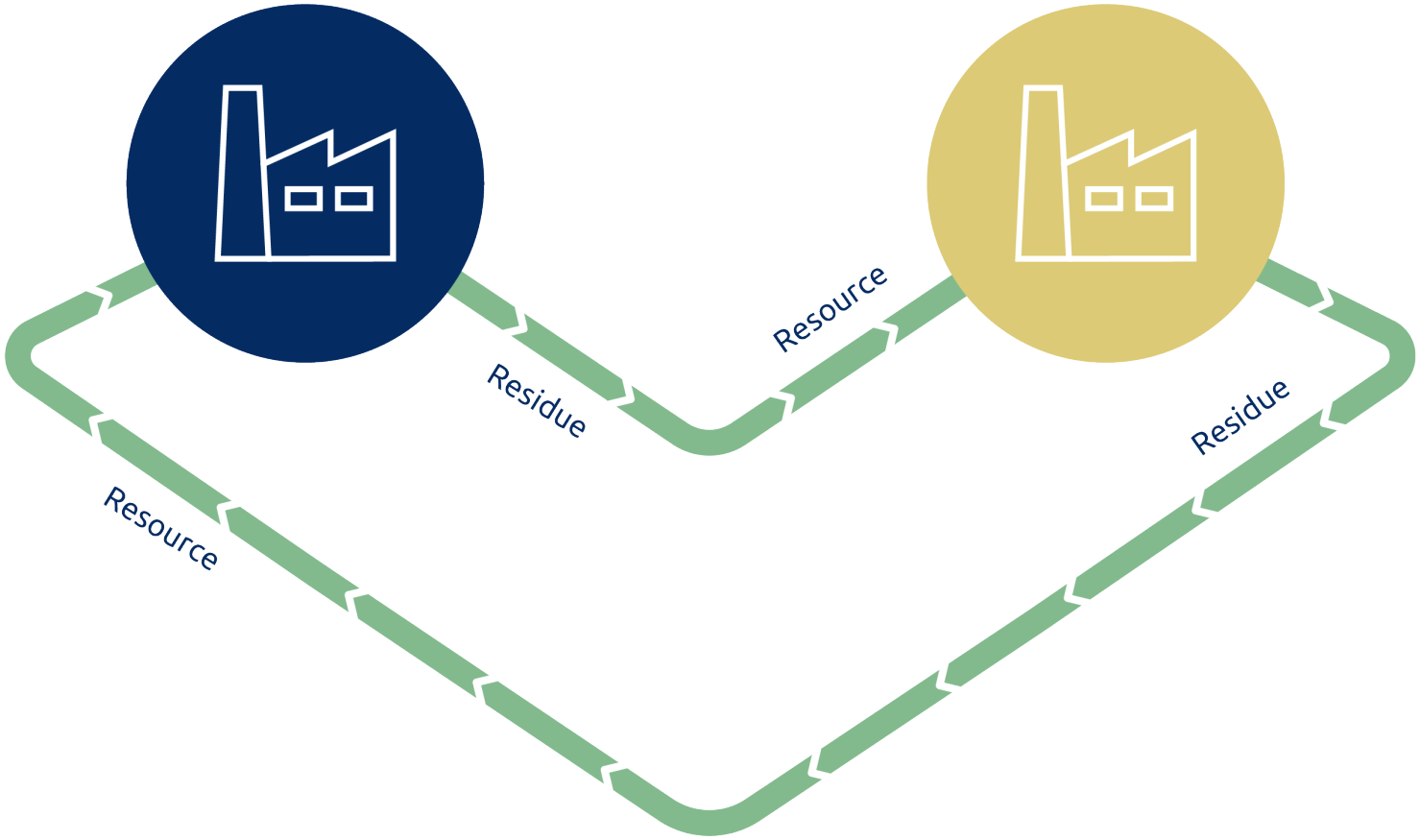
Organizational evolution



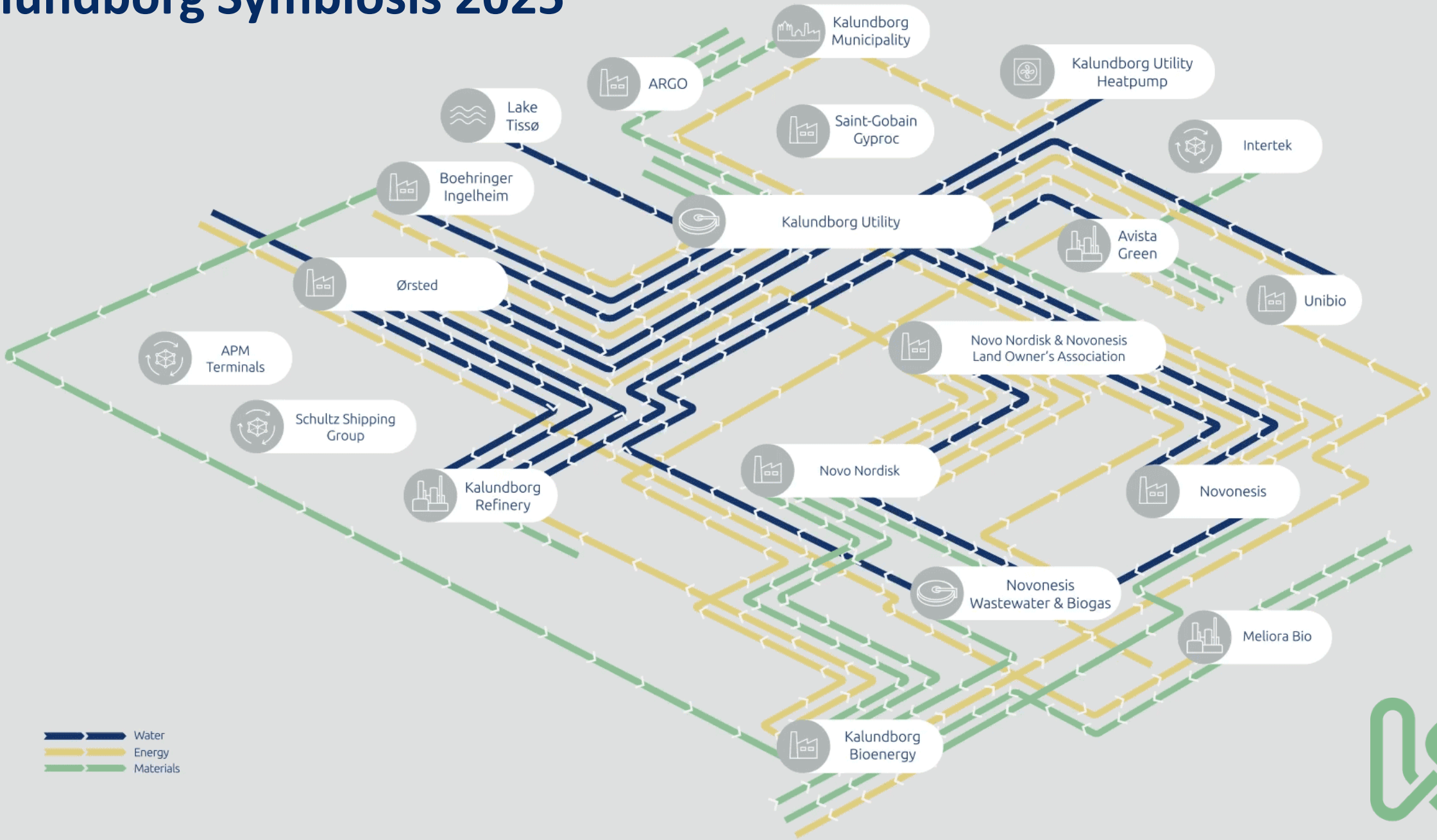
10 new streams by 2025



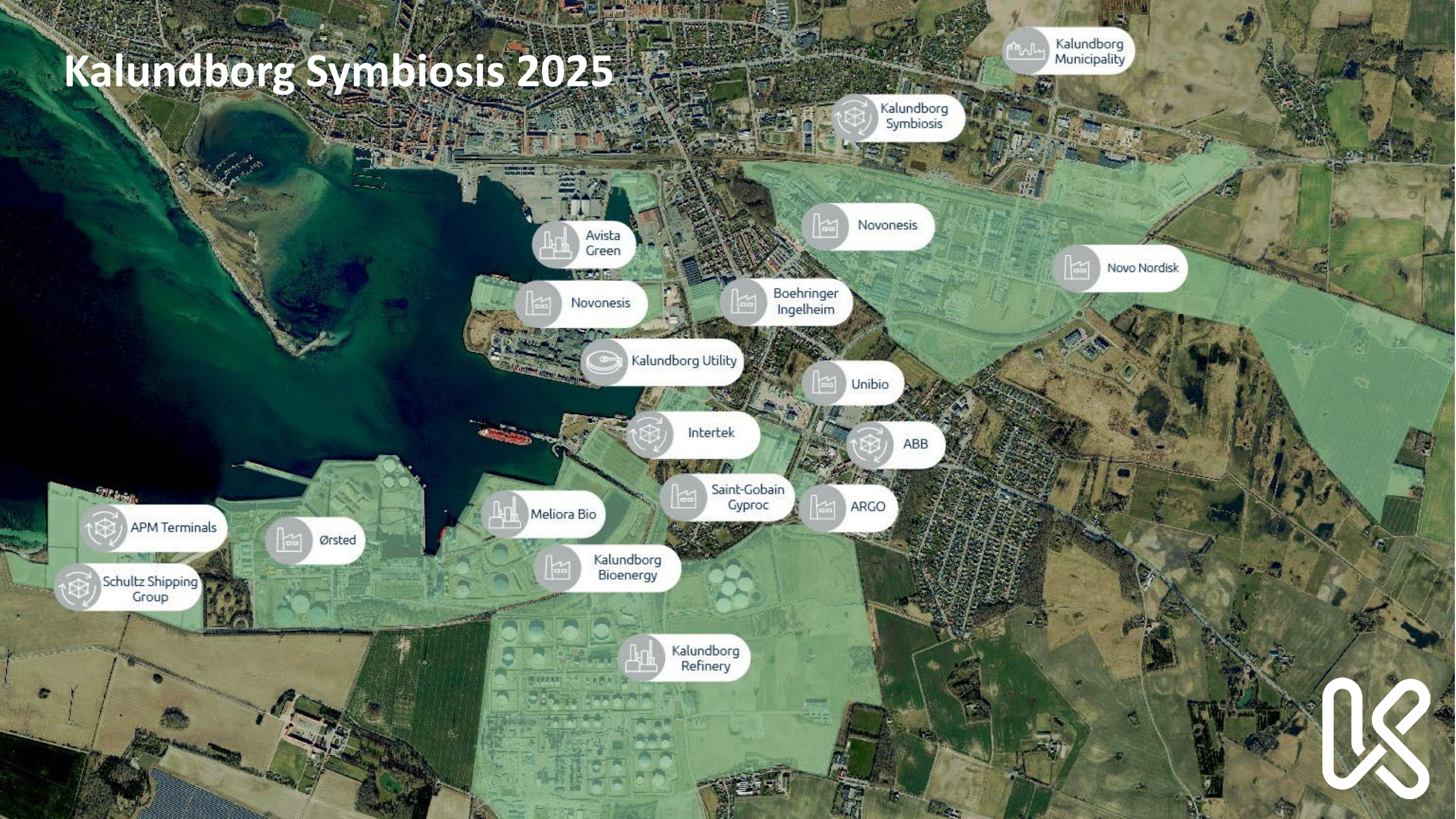
Industrial Symbiosis



Kalundborg Symbiosis 2025

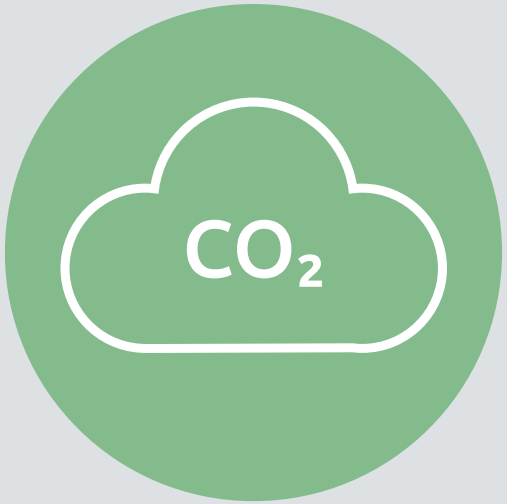


Kalundborg Symbiosis 2025



Kalundborg Symbiosis 2025

Annual savings since 2015



586,000 tons CO_2
The local energy production is now CO_2 neutral

4 million m3
of groundwater

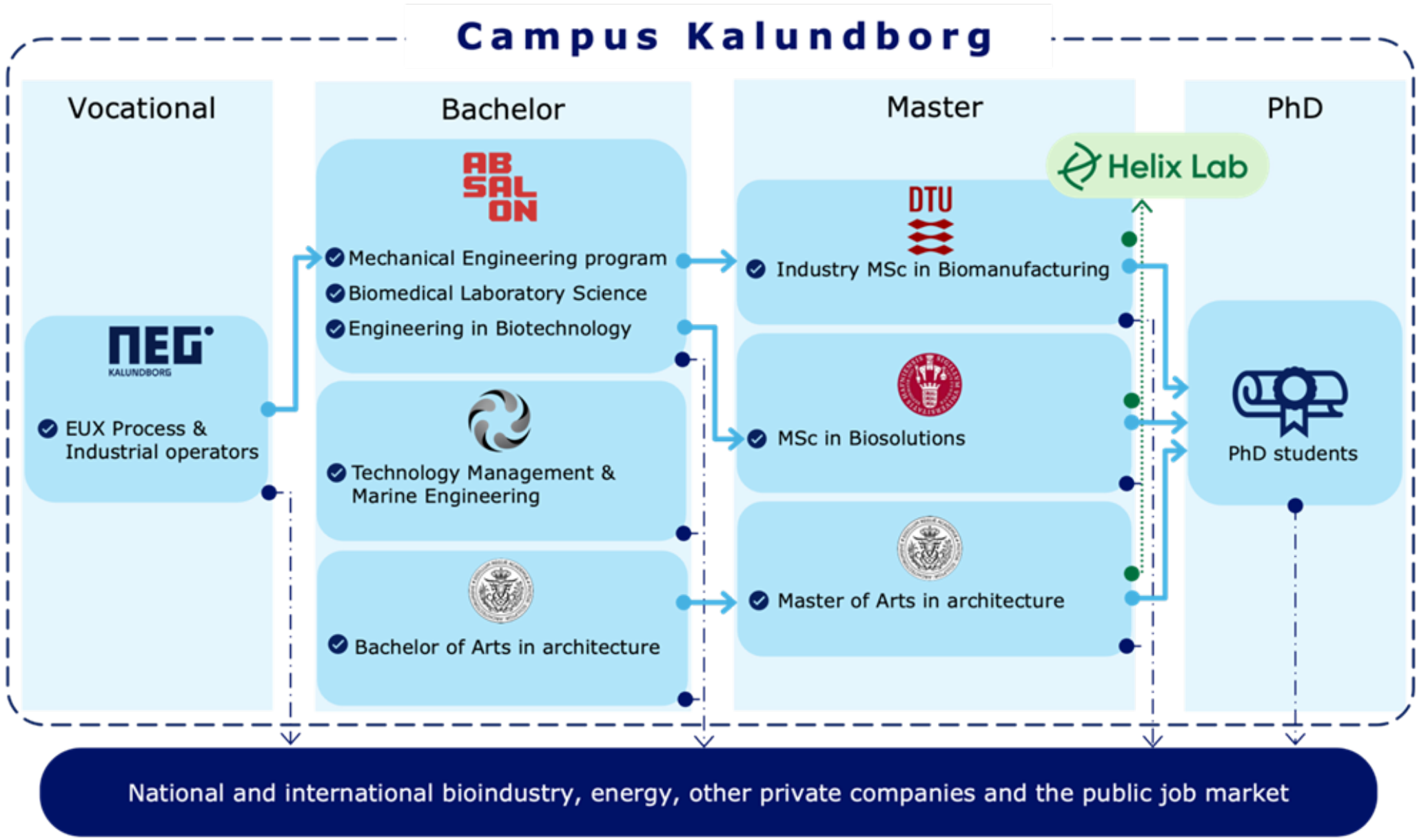
62,000 tons
of residual materials recycled

Examples of local growth

€10 bn
investment

The investments create **1,300+ new, permanent jobs**

12 new educational programs in Kalundborg


Campus Kalundborg
Vocational
Bachelor
Master
PhD
Helix Lab
EUX Process & Industrial operators
Mechanical Engineering program
Biomedical Laboratory Science
Engineering in Biotechnology
Technology Management & Marine Engineering
Bachelor of Arts in architecture
Industry MSc in Biomanufacturing
MSc in Biosolutions
Master of Arts in architecture
PhD students
National and international bioindustry, energy, other private companies and the public job market

New projects 2024-25

New production facilities & infrastructure

- District cooling and usage of excess heat
- Carbon Capture & Storage
- Co-management of Novonesis wastewater plant and Kalundborg Utility

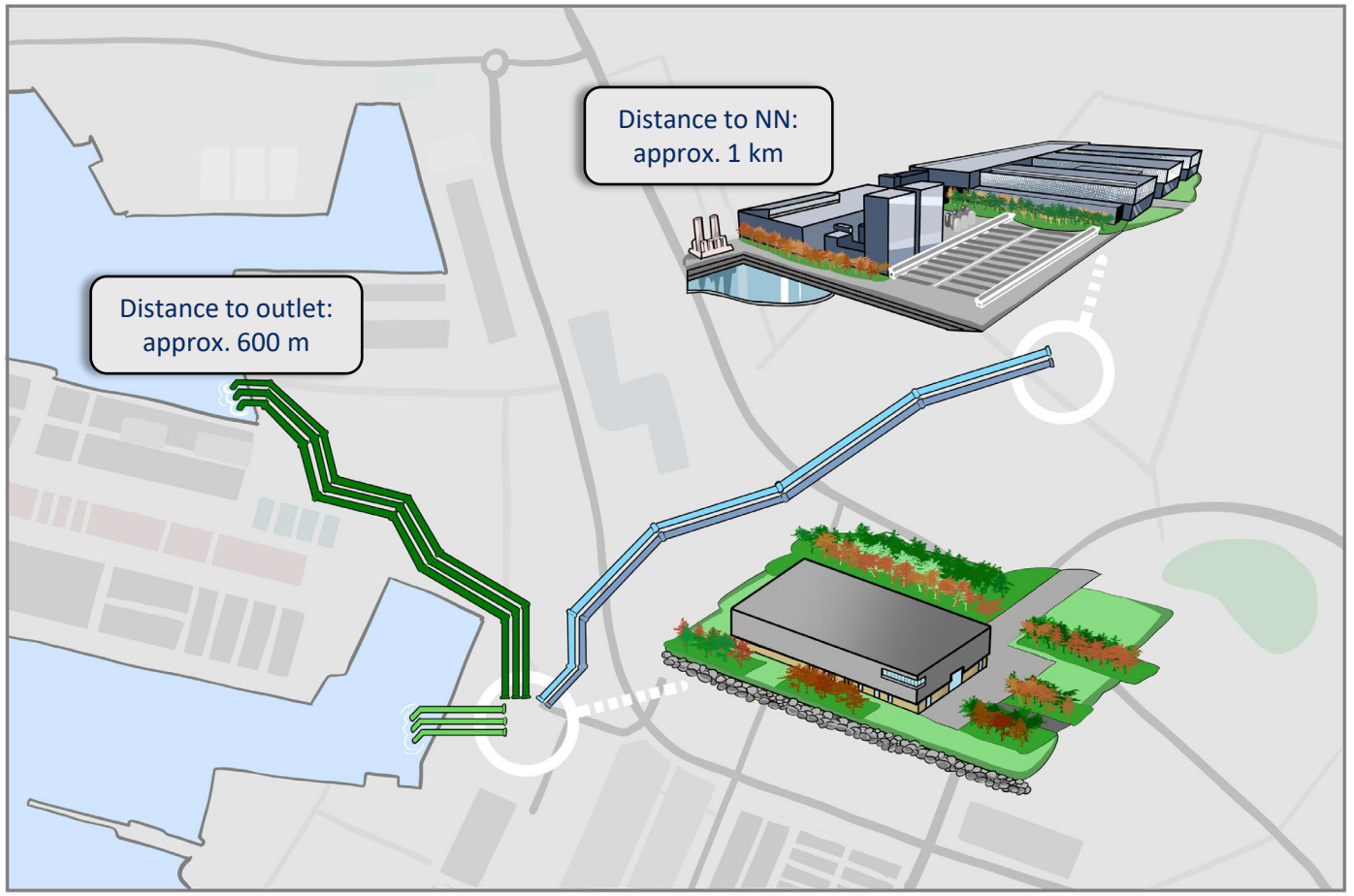
Site visit for the Board of Directors, April 2024

The biggest industrial combined cooling and heating central in Northern Europa

Saving water and chemicals, utilizing the potentials of excess heat

Key numbers behind the closed loop facility:

- Investments: 188 mil €
- Approx. 2 X 1 km underground pipes, Ø2 m
- Operating in 2025
- Capacity: 166 MW cooling
- Sea water intake: 18.000 m^3/h (max)
- Temperatures on the water flows:
  - Cooling for Novo Nordisk / Novonesis: 22,5^0 C
  - Heating from Novo Nordisk / Novonesis: 31,5^{0}C
- Back-up chillers: 10 MW

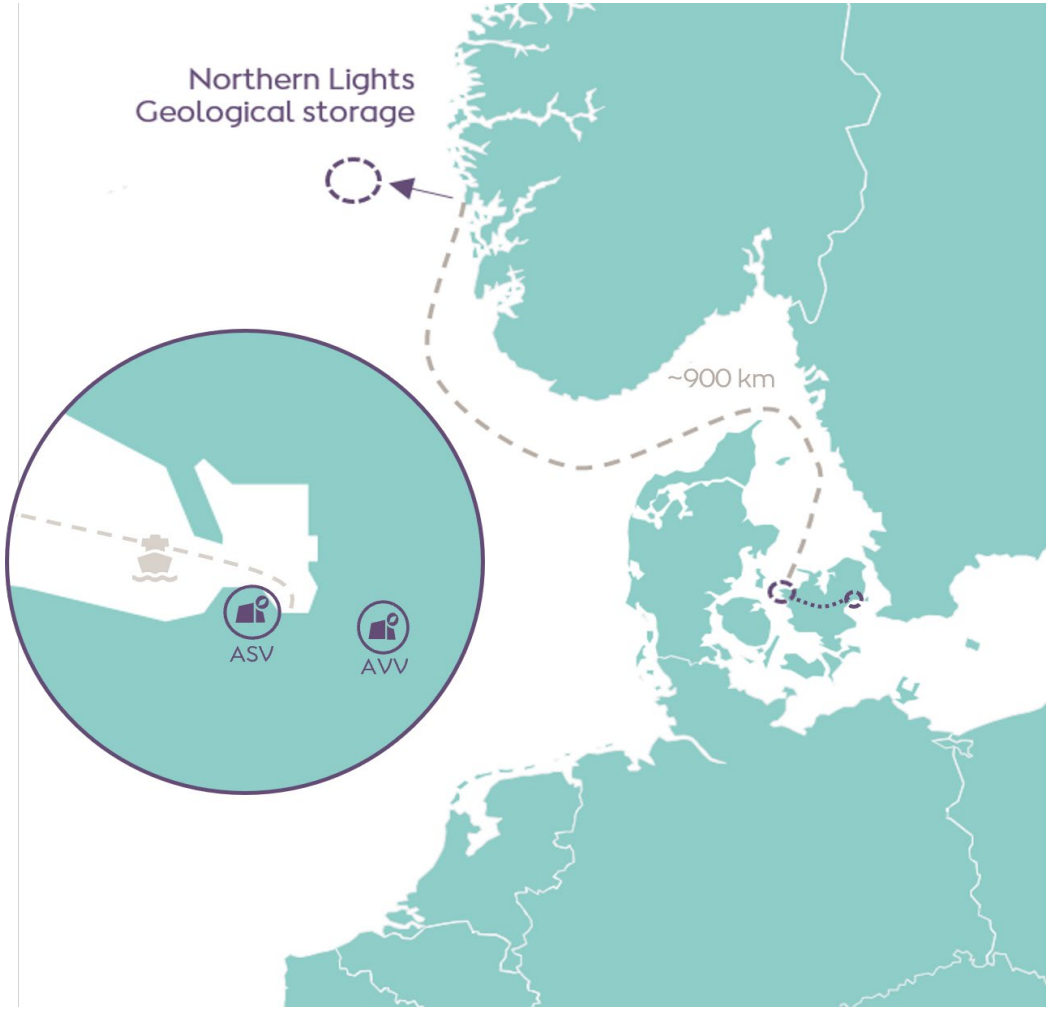


More info here: Nordeuropas største industrielle fjernkøl- og varmecentral | Kalundborg Forsyning (kalfor.dk)

The Ørsted Kalundborg CO2 Hub establishes a key starting point for CO2 infrastructure centrally in Denmark, capturing & storing 430,000 tonnes CO2 annually

Key numbers behind the CO2 infrastructure:

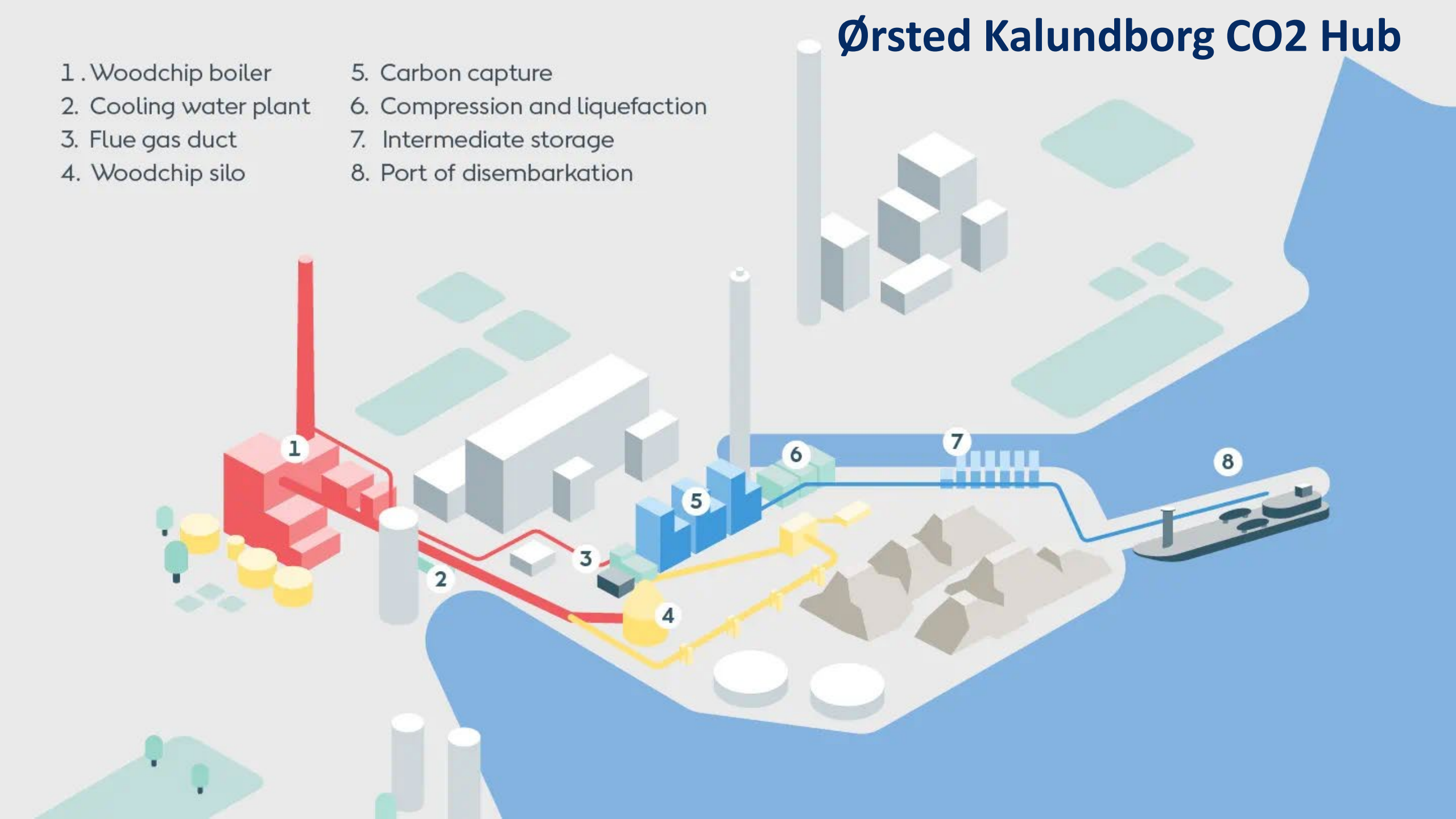
- Project is based on a portfolio of two-point sources to deliver the contracted CO_2 quantity of 430,000 tonnes annually:
  - Asnæs Power Station (ASV) with ~280,000 tonnes/annually
  - Avedøre Power Station (AVV) with ~150,000 tonnes/annually
- Commencement of operations end of 2025
- Total funding pool of ~8 bn DKK



More info here: Carbon Capture & Storage (CCS) | Ørsted (orsted.com)

Ørsted Kalundborg CO2 Hub

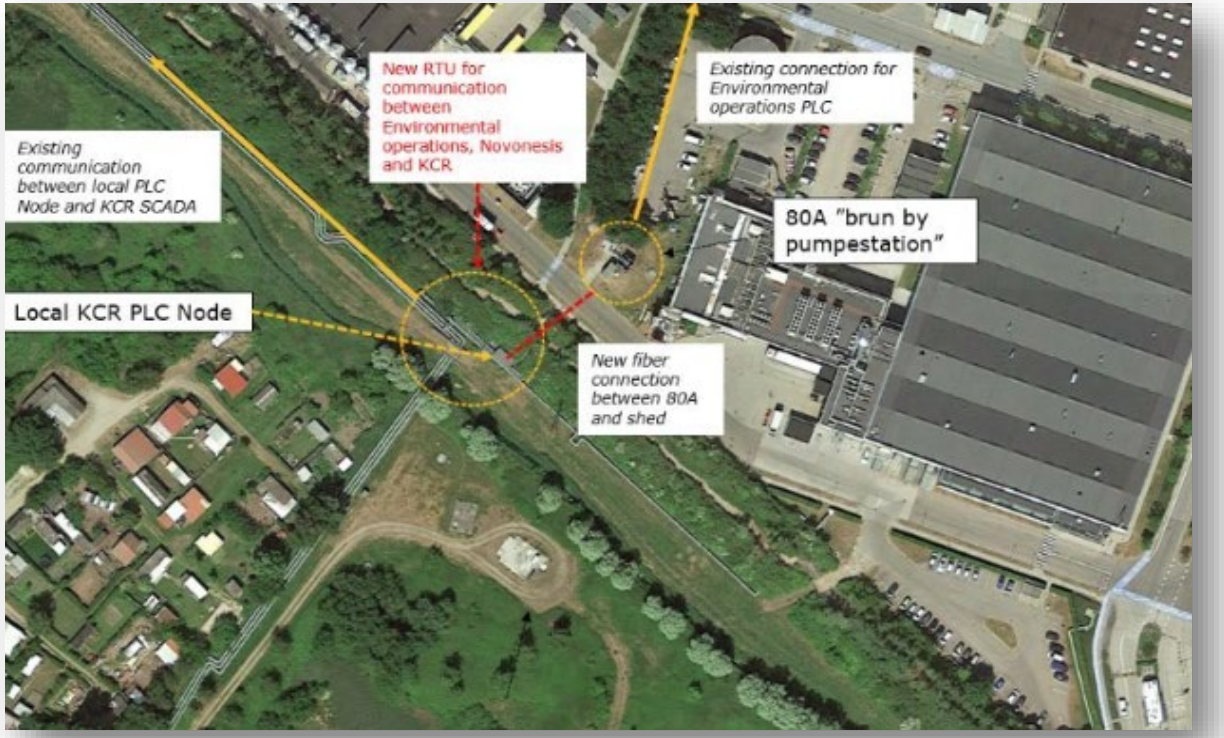
1 . Woodchip boiler
2. Cooling water plant
3. Flue gas duct
4. Woodchip silo
5. Carbon capture
6. Compression and liquefaction
7. Intermediate storage
8. Port of disembarkation



Co-management of Novonesis wastewater plant and Kalundborg Utility

Key objectives:

- Adapt to supply variations
- Guarantee quality for recipients
- Utilise spare capacity at Kalundborg Wastewater Treatment Plant
- Optimize aeration energy at varying oxygen needs
- Minimize chemical use for precipitation
- Implement ´early warning´ system for Kalundborg Utility



Next steps:

- Modelling calculations in SIMBA
- Installation of Biotector on the inlet to measure TN, TOC, TP

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For more information please contact:

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