Kalundborg Symbiosis

Surplus from circular production

Kalundborg
SYMBIOSIS

Program for Facilitatorsamling den 15. marts 2024
Oplægsholder og facilitator:
Lisbeth Randers, sekretariatschef, Kalundborg Symbiose

9.00	**Velkommen** Gensidig præsentation af deltagerne i workshoppen og fælles tjek-in
9.20	**Præsentation af Kalundborg Symbiose –** verdens førende industrielle symbiose med en cirkulær tilgang til produktion
10.10	**Fælles refleksion:** hvordan kan erfaringer og inspiration fra Kalundborg bruges som afsæt for arbejdet med Grøn Region Vestland
10.30	**Oplæg om hvordan skaber man et lokalt samarbejde om energi?** Eksempel fra Kalundborg: Den grønne Energimotorvej
11.00	**Intro til Symbiosis Readiness Level** ved Lisbeth **Intro til interessentværktøj** ved Tor Martin Misund
11.30	**Lunsj**
12.15	**Workshop** Kortlæg interessenterne til industriel symbiose med energi som omdrejningspunkt
13.30	**Opsamling og tjek-ud**
14.00	**Tak for i dag**

Link to the explainer film

https://youtu.be/Ism7NdQe94I

The Kalundborg Symbiosis Administration

Lisbeth Randers,
Head of Administration
MA in communication
& Master in Public Management

Per Møller,
Senior Symbiosis Developer
PhD in Biochemistry

Nadejda Ulstrup-Hansen,
Administrative
Project Manager and Communicator
Master of Int. Business Communication

Mette Wendel,
Senior Project Manager
Teacher degree in Science

Mission & Vision

Renew

Strengthening the partnership

Connect

Full resource utilization

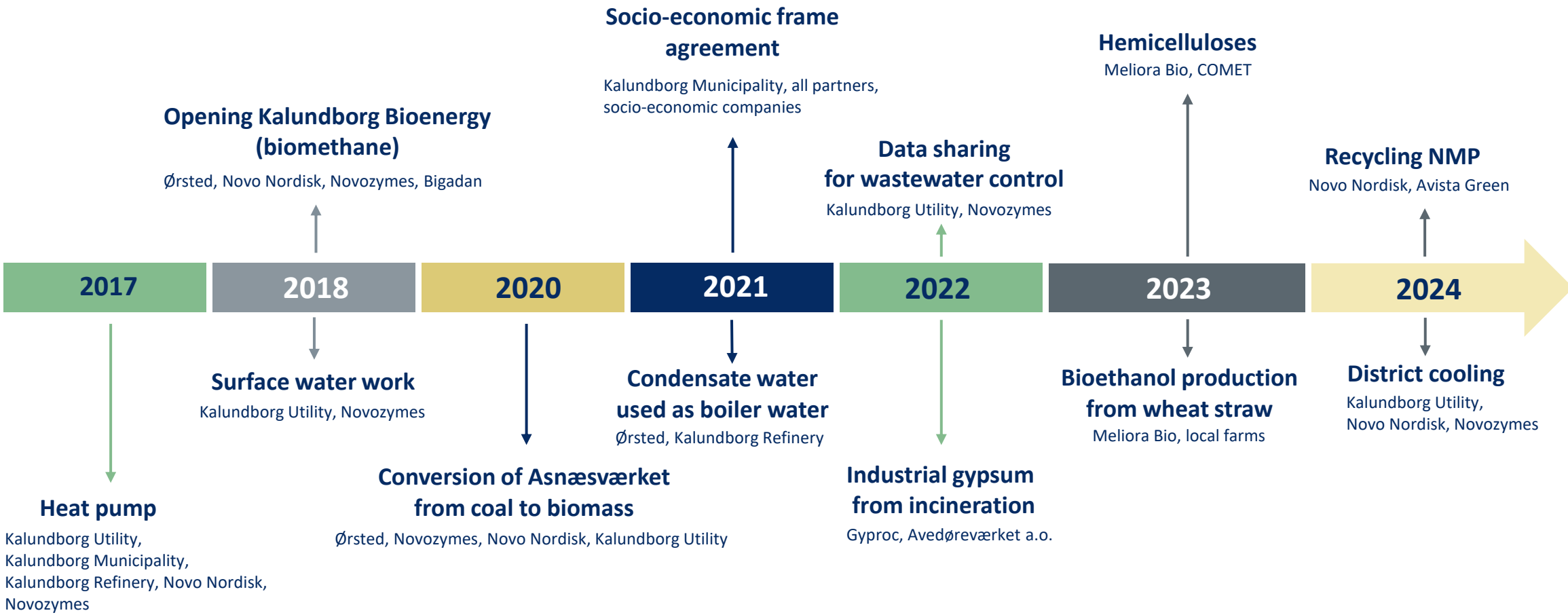
Promote

Sharing the symbiotic mindset

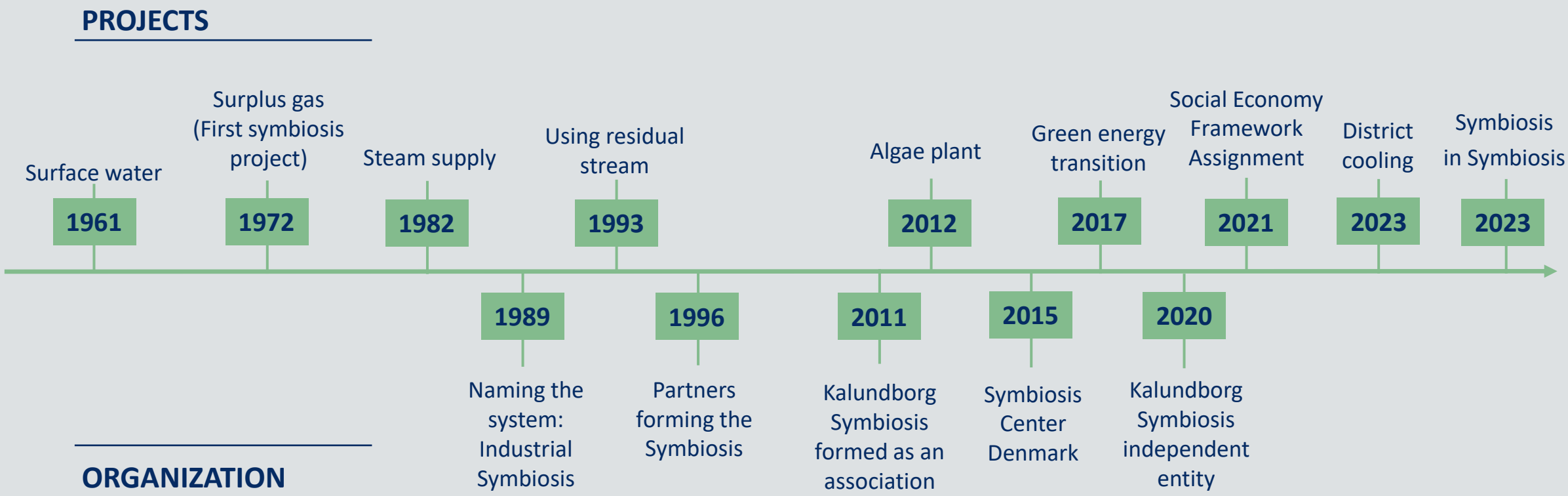
The worlds leading industrial symbiosis with a circular approach to production

Kalundborg Symbiosis creates sustainable development in our companies through joint projects

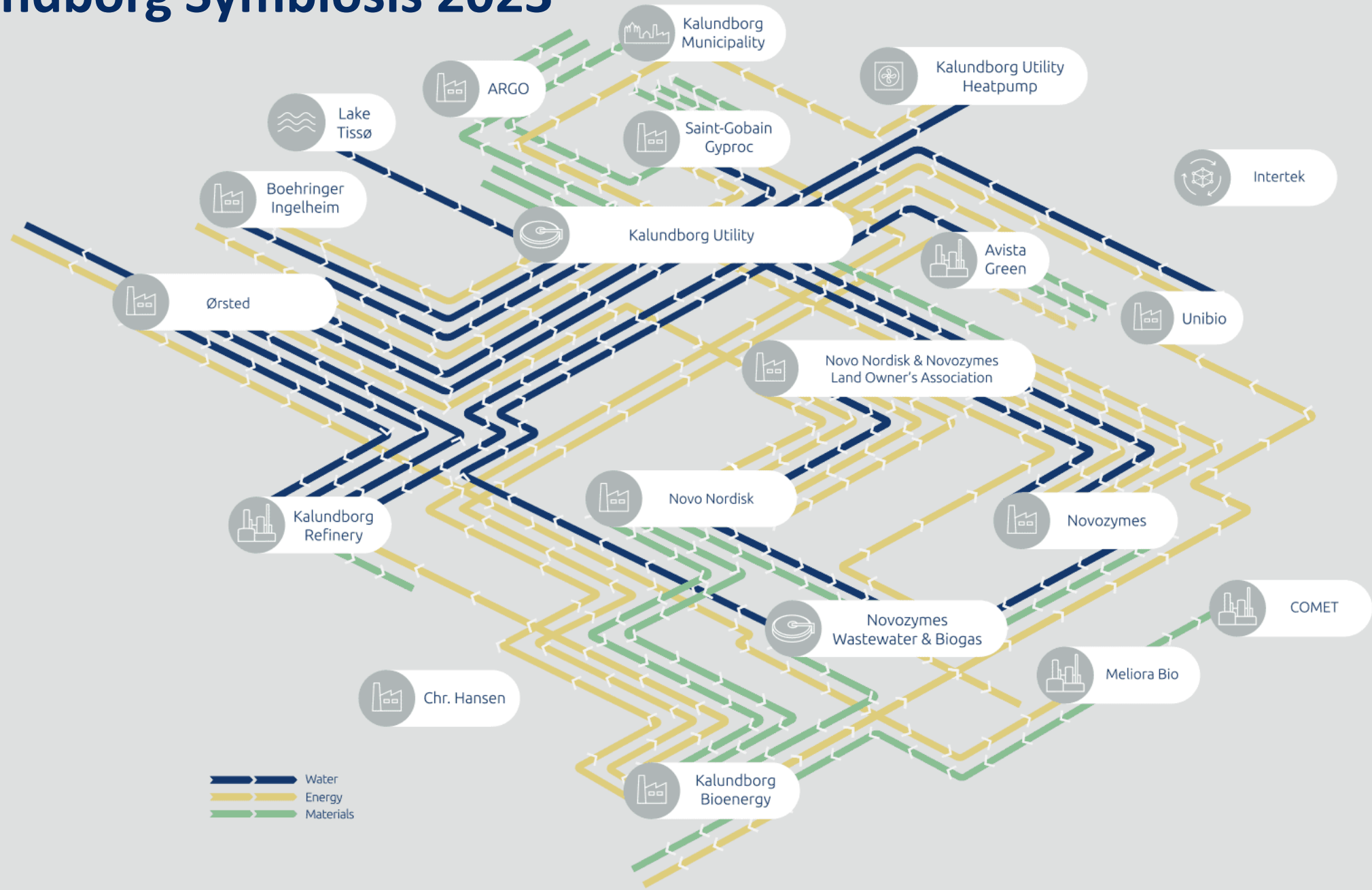
10 new streams before 2025



More than 50 years of cooperation



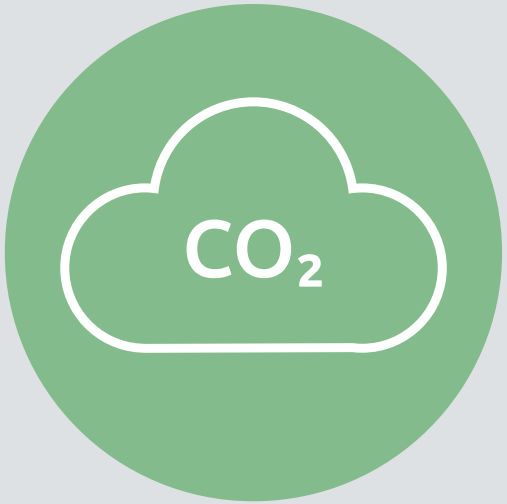
Kalundborg Symbiosis 2023




Kalundborg Municipality
Kalundborg Symbiosis
Novozymes
Avista Green
Novo Nordisk
Chr. Hansen
Boehringer Ingelheim
Kalundborg Utility
Unibio
Intertek
Saint-Gobain Gyproc
COMET
ARGO
Meliora Bio
APM Terminals
Ørsted
Kalundborg Bioenergy
Schultz Shipping Group
Kalundborg Refinery

Kalundborg Symbiosis 2023

Annual savings (by LCA)



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

9,3 mia €
investment

The investments create
1,300+ new, permanent jobs

12 new educational programs
in Kalundborg

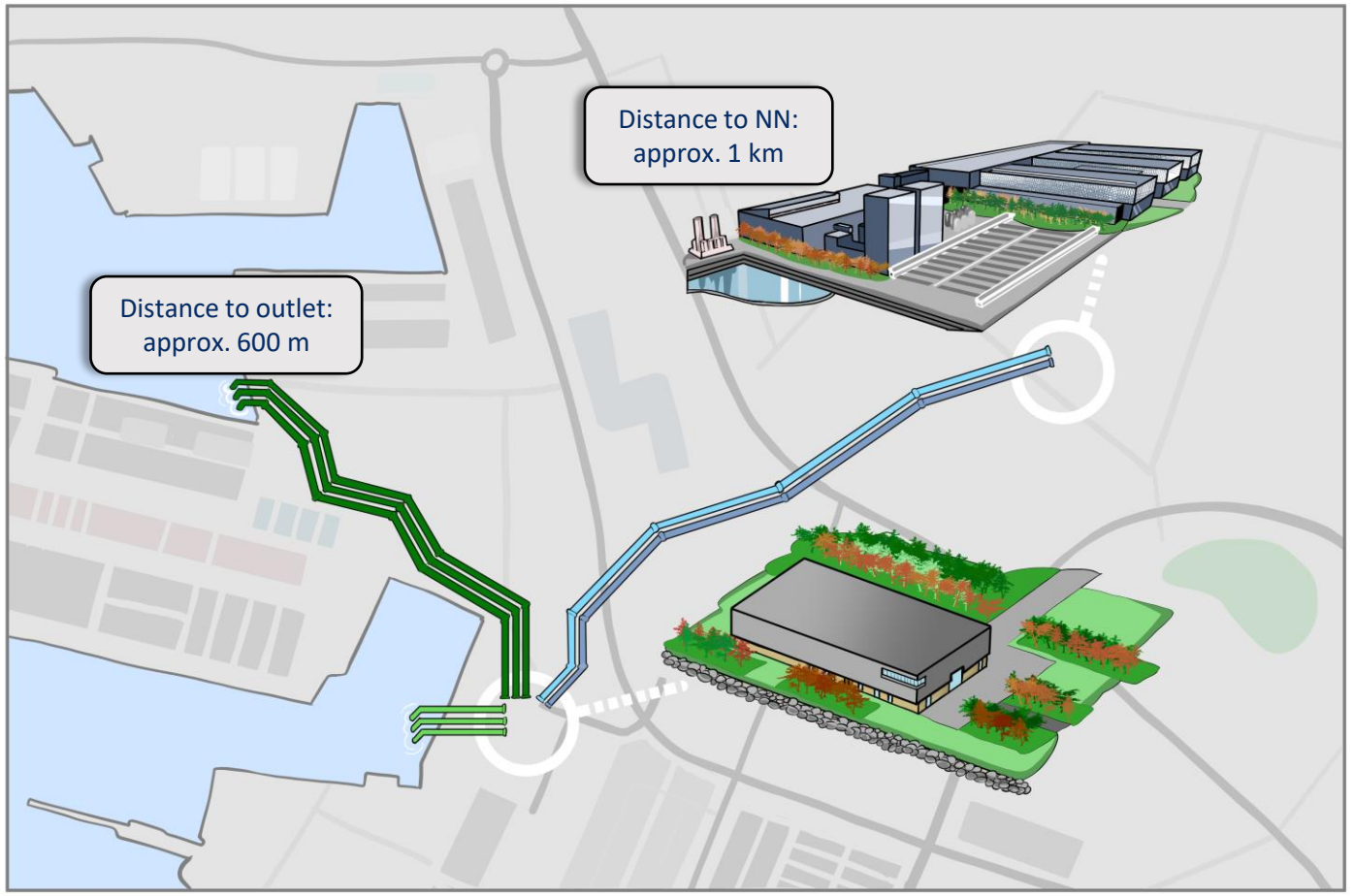
New energy projects

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 / Novozymes: 22,5^0 C
  - Heating from Novo Nordisk / Novozymes: 31,5^{0}C
- Back-up chillers: 10 MW

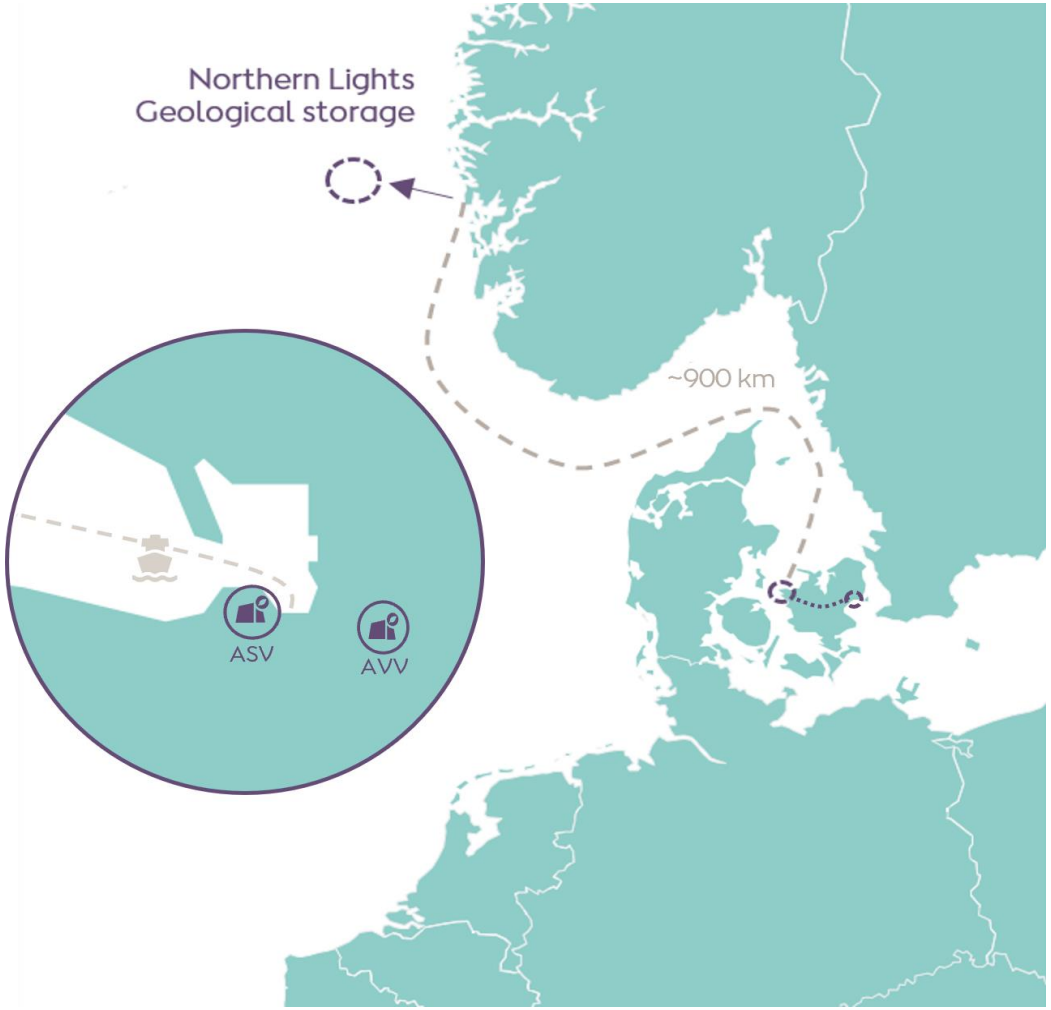


More info here: Nordeuropas største industrielle fjernkøl- og varmecentral | Kalundborg Forsyning (kalfor.dk)

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

Is Kalundborg Symbiose really globally known

– or is it just Danish overrating?

Local solutions – global attention / business

February 2023
The Food & Bio Forum, Residence of Denmark, New York, hosted by Ambassador Berit Basse

May 2023: French bank managers, organized by the Danish-French Chamber of Commerce at Helix Lab

June 2023: Delegation from the United States, Mexico, and Brazil at Meliora Bio

Local solutions – global attention / policy makers

June 2023: European Parliament's Committee on Industry, Research and Energy (ITRE) at Novo Nordisk

April 2023: Kenya´s Environmental Minister Soipan Tuya at Helix Lab

April 2022: HRH Crown Prince Frederik and Climate Minister Dan Jørgensen, at Chr. Hansen

June 2023: Secretary of Development Rio de Janeiro State Government, Vinícius Farah signing the MoU with Kalundborg Symbiosis

September 2023: California Energy Commission, Commissioner Andrew McAllister

Local solutions – global attention / talents

2023: Playing the Symbiosis game with pupils, Ph.D. students, and employees

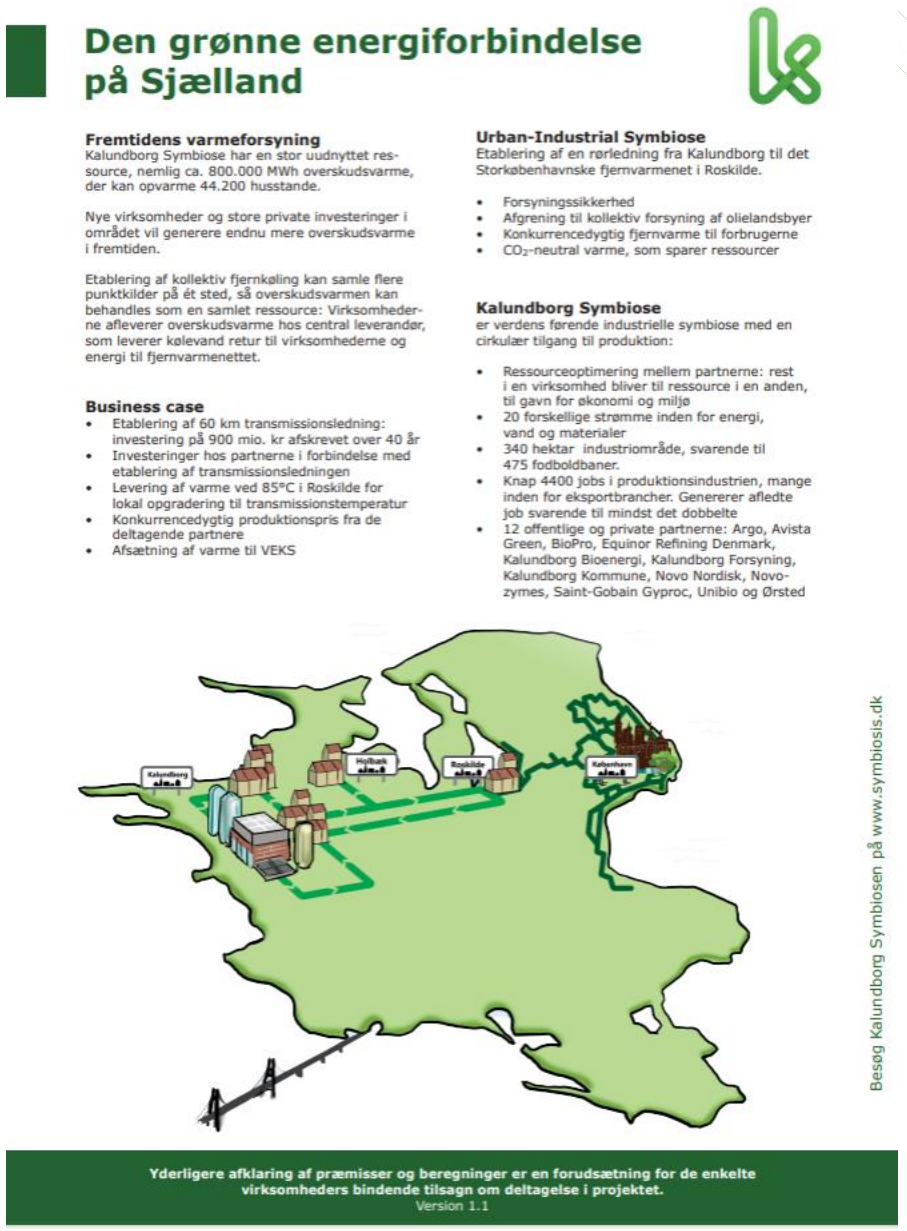
February 2023: Vocational teachers, Münster at Kalundborg Utility

August 2023: NYU Stern Business School, organized by Copenhagen Business School at Helix Lab

Lunsj

Potentiale 2020

- 800.000 MWh exess heat, enough to heat appr. 42.000 houses
- Infrastructure needed: 60 km tailpipe
- Investment needed: 900 mill. Dkr.
- CO2 reduction: appr. 40.000 t



Den grønne energiforbindelse på Sjælland

Fremtidens varmeforsyning
Kalundborg Symbiose har en stor uudnyttet ressource, nemlig ca. 800.000 MWh overskudsvarme, der kan opvarme 44.200 husstande.

Nye virksomheder og store private investeringer i området vil generere endnu mere overskudsvarme i fremtiden.

Etablering af kollektiv fjernkøling kan samle flere punktkilder på ét sted, så overskudsvarmen kan behandles som en samlet ressource: Virksomhederne afleverer overskudsvarme hos central leverandør, som leverer kølevand retur til virksomhederne og energi til fjernvarmenettet.

Business case
- Etablering af 60 km transmissionsledning: investering på 900 mio. kr afskrevet over 40 år
- Investeringer hos partnerne i forbindelse med etablering af transmissionsledningen
- Levering af varme ved 85°C i Roskilde for lokal opgradering til transmissionstemperatur
- Konkurrencedygtig produktionspris fra de deltagende partnere
- Afsætning af varme til VEKS

Urban-Industrial Symbiose
Etablering af en rørledning fra Kalundborg til det Storkøbenhavnske fjernvarmenet i Roskilde.

- Forsyningssikkerhed
- Afgrening til kollektiv forsyning af olielandsbyer
- Konkurrencedygtig fjernvarme til forbrugerne
- CO_2-neutral varme, som sparer ressourcer

Kalundborg Symbiose
er verdens førende industrielle symbiose med en cirkulær tilgang til produktion:

- Ressourceoptimering mellem partnerne: rest i en virksomhed bliver til ressource i en anden, til gavn for økonomi og miljø
- 20 forskellige strømme inden for energi, vand og materialer
- 340 hektar industriområde, svarende til 475 fodboldbaner.
- Knap 4400 jobs i produktionsindustrien, mange inden for eksportbrancher. Genererer afledte job svarende til mindst det dobbelte
- 12 offentlige og private partnerne: Argo, Avista Green, BioPro, Equinor Refining Denmark, Kalundborg Bioenergi, Kalundborg Forsyning, Kalundborg Kommune, Novo Nordisk, Novozymes, Saint-Gobain Gyproc, Unibio og Ørsted

Yderligere afklaring af præmisser og beregninger er en forudsætning for de enkelte virksomheders bindende tilsagn om deltagelse i projektet.
Version 1.1

Besøg Kalundborg Symbiosen på www.symbiosis.dk

District cooling/excess heat

The biggest industrial combined cooling and heating central in Northern Europa

Saving water and chemicals, utilizing the potentials of excess heat

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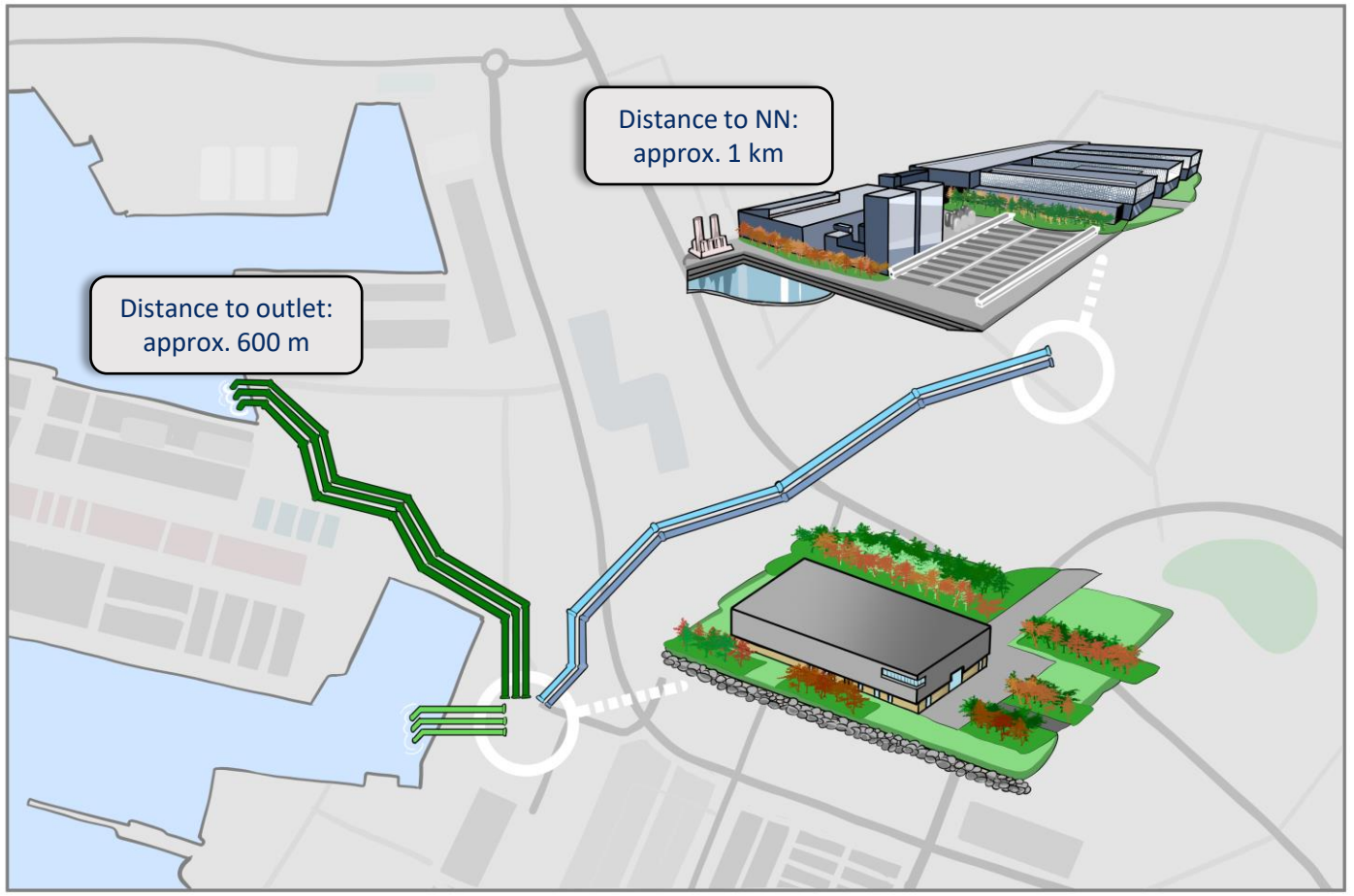

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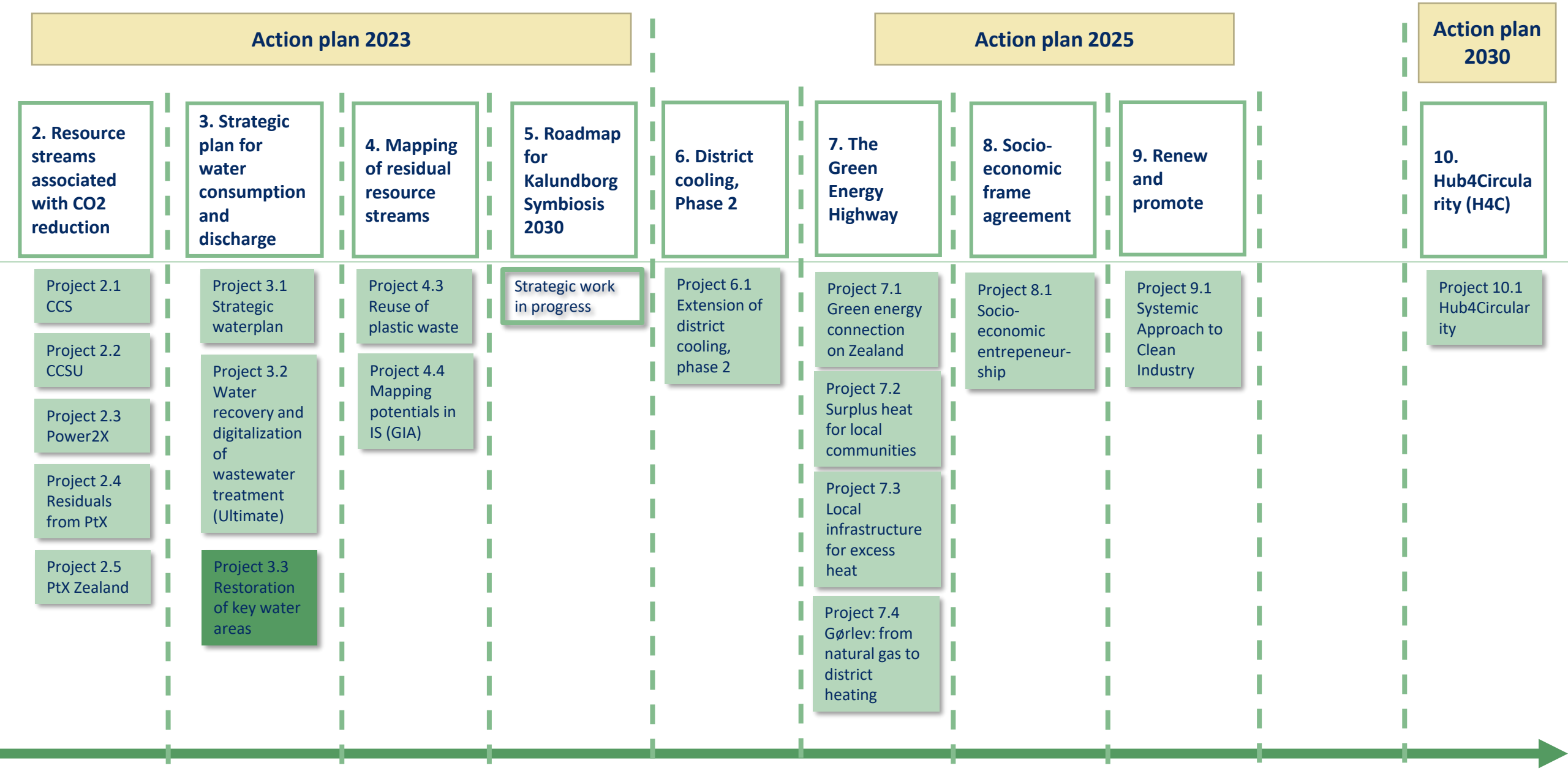
Roadmap for Kalundborg Symbiosis version 2 / 2023



Project 5.1 Date: 2020.11.24

Green energy connection on Zealand

Kalundborg SYMBIOSIS

Background & strategic rationale incl. risks & benefits

Appr. 800.000 MWh/y exces heat is avaible in Kalundborg Symbiosis, temperatures vary between 25°C og 110°C. With the conversion of Asnæsværket and the heat pump at Kalundborg Utility, there is not a demand for extra district heating locally, but new technologies like low temperature district heating could make an attractive business case to use the surplus heat outside Kalundborg Municipality.

- Opportunity: Holbæk Municipality is about to redesign energy supply for Holbæk city, as a transition from natural gas to renewable sources. Extension to Roskilde is also an opportunity.
- Benefit: Usage of excess heat will reduce CO2 emission in Holbæk (natural gas). Note: Surplus heat is CO2-neutral
- Risk: Political ownership, across several municipalities and utilities.

Measurable benefits

To be analysed precisely, in terms of saved CO2 both for companies and municipalities involved.

Priority
High

Risk level
High

Vision paper

Internal and external partners involved in the project

Participant list:

A proposal, estimating the societal value for municipalities involved must be made to seek political consensus about the idea.

Dialogue with Holbæk Municipality about their future heat plans.

Project organisation

Owner:
Kalundborg Utility and Municipality

Funding:
To be found

Project manager:
Hans-Martin Friis Møller

External Spokesperson:
Hans-Martin Friis Møller

Project description

Loop Connection:
The proposal is to transfer surplus heat from the industry in Kalundborg to Holbæk and deliver district heating to villages along the route. The conduit could advantageously be established as "cold district heating", laid as a water pipe without significant heat loss. The temperature of the conveyed water is boosted by heat pumps, decentrally located.

The route could conceivably be laid along the upcoming highway (route 23) and could be established in connection with it. Such a connection has the potential to halve the costs compared to the previous studies that have been drawn up as traditional district heating solution.

Strategic goal
Connect

SDG
7

Milestone plan, key deliverables incl. gate approval dates

- Consultation on Strategisk energiplan Holbæk: 2022, Q2
- Political chartre: 2020, Q3
- Contribution to heating plan for Holbæk: 2021, Q1-3
- Societal analysis on benefits as a project application (ELENA first draft): 2020, Q4
- End of project: 2021, Q4
- Application for Innovation Fund on cold district heating infra structure: 2022, Q1
- Expected date of announcement: 2022, Q3
- Operational; 2025

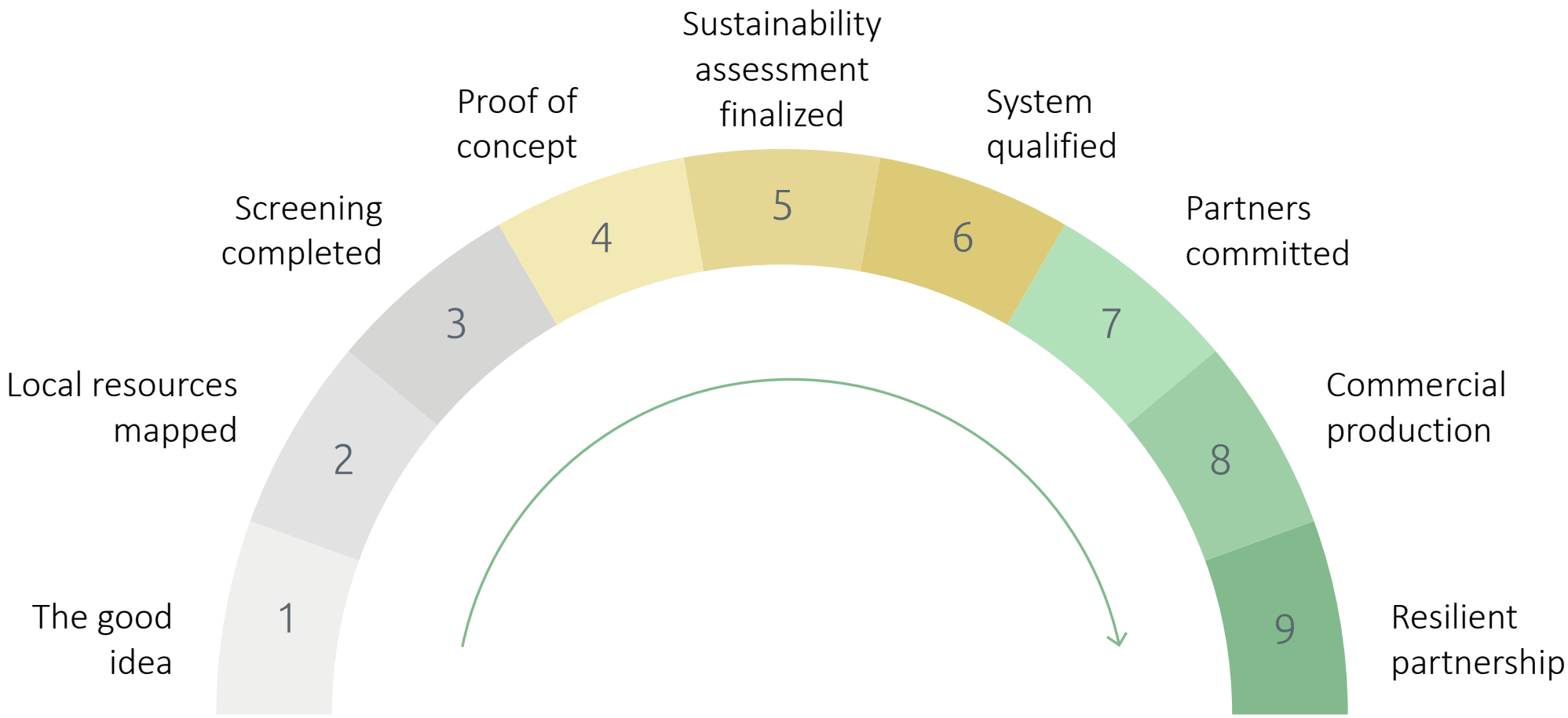
Link to Roadmap

(in order of priority)

7. The green energy highway
3. Strategic water plan

Resilient partnership – taking one step at a time

Symbiosis Readiness Level



Kalundborg Symbiosis

Surplus from circular production

For more information please contact:

symbiosecenter@kalundborg.dk