KALUNDBORG SYMBIOSIS

A NETWORK OF PUBLIC-PRIVATE PARTNERSHIPS

"SUCCESS STORY: INDUSTRY SYMBIOSIS IN DENMARK".

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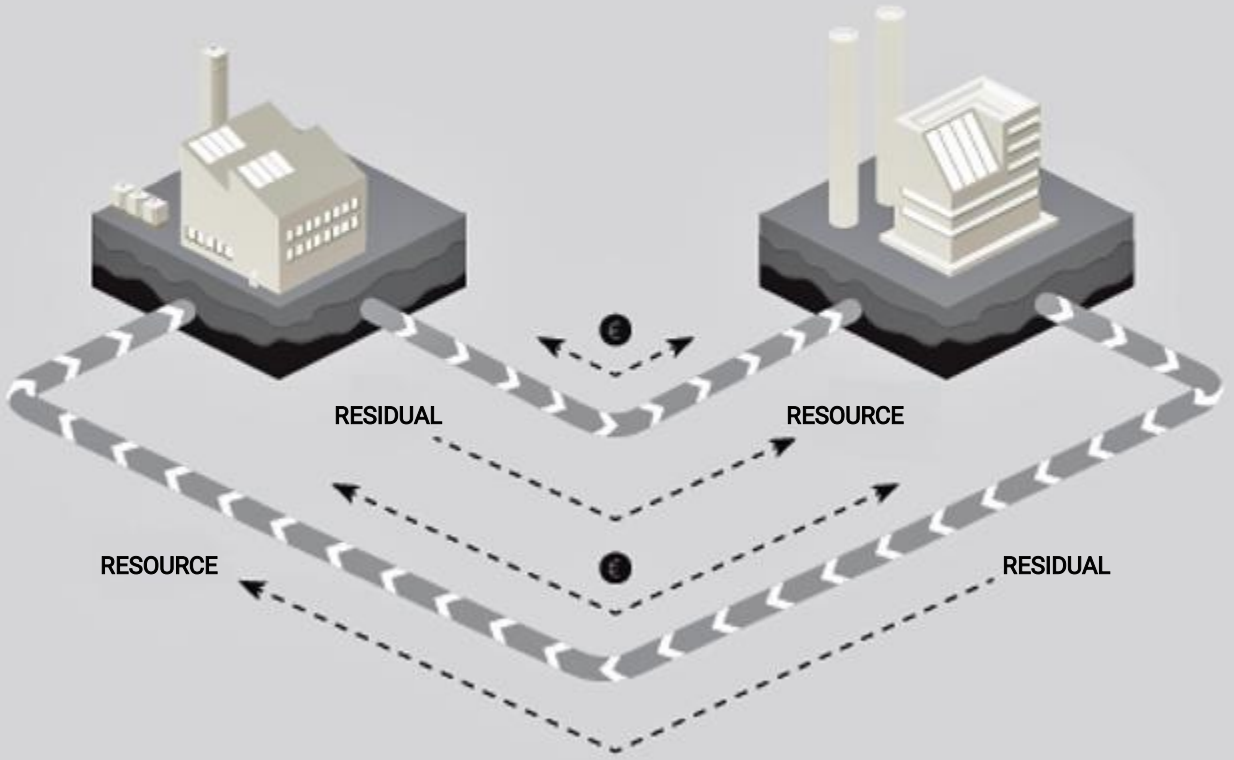
Head of Symbiosis Center Denmark

VILNIUS
2. APRIL 2019

KALUNDBORG SYMBIOSIS

INDUSTRIAL SYMBIOSIS FOR MUTUAL BENEFIT



Redefining “waste” as a secondary resource !

KALUNDBORG
SYMBIOSIS

Winner of the 2018

WIN GOTHENBURG SUSTAINABILITY AWARD

The Jury’s motivation:

As a pioneer within the field, the Kalundborg Symbiosis has shown the way for many other industrial clusters, inspiring businesses all around the world.

A brief presentation

REGION SJÆLLAND – vi er til for dig

Symbiosis Center Denmark is a national knowledge center working to identify and facilitate industrial symbiosis projects between industrial partners.

Activities

Company programs

- Identifying & implementing Industrial Symbiosis

Marketing

- Promoting green solutions
- Attracting investments

Training

- Educational programs

Knowledge platform

- Research activities
- Test & demonstration
- Triple helix collaboration

Our process of facilitation

- Industrial Symbiosis = effective green business model that reduce production costs and increase competitiveness and growth potential for industries.

- Takes time and resources and requires data, mutual trust and knowledge sharing between the partners as well as network relations, facilitation and support.

Potential

- Screening
- Assessment

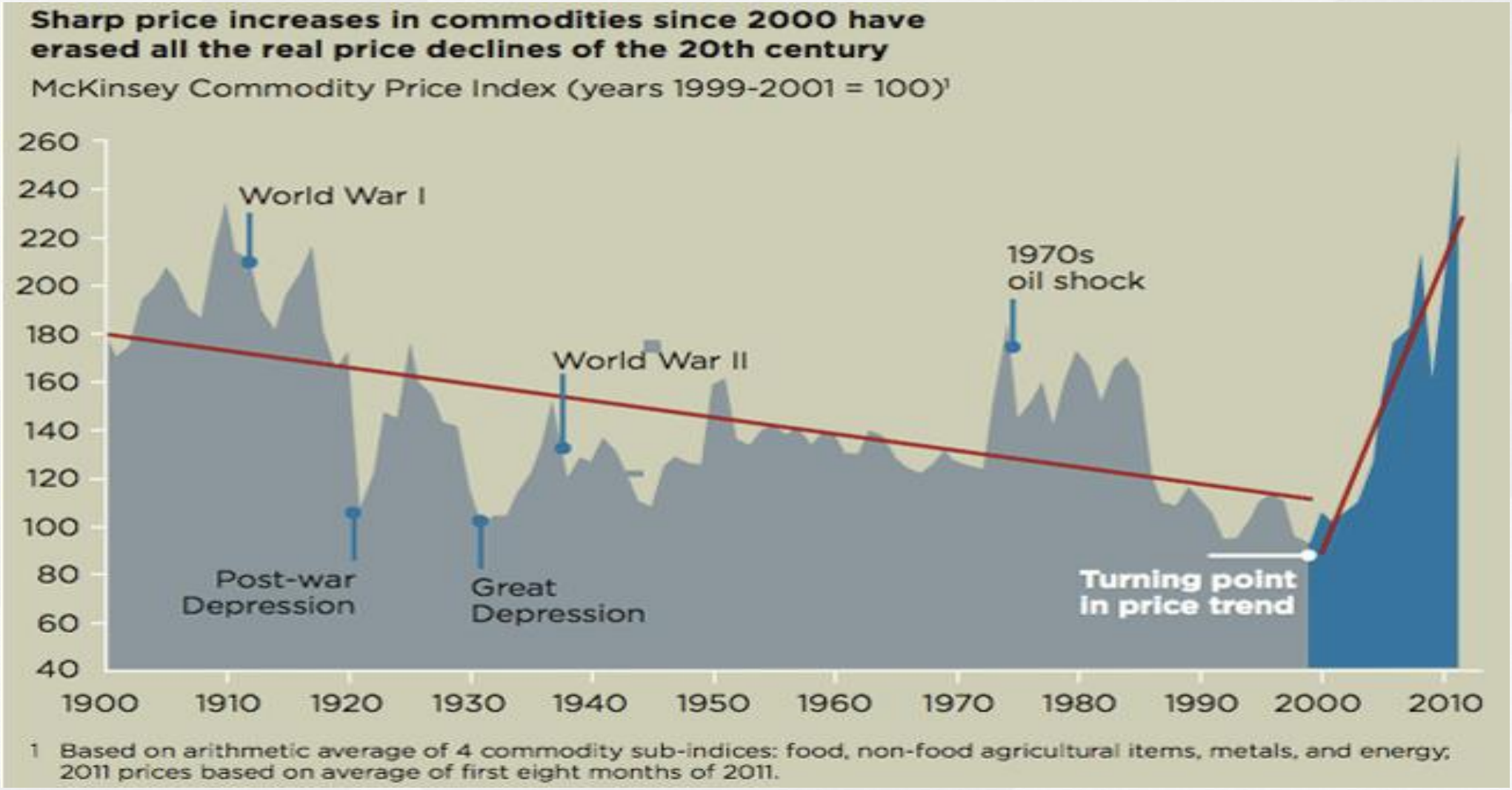
Match

- Business case

Anchoring

- Partnership
- Network

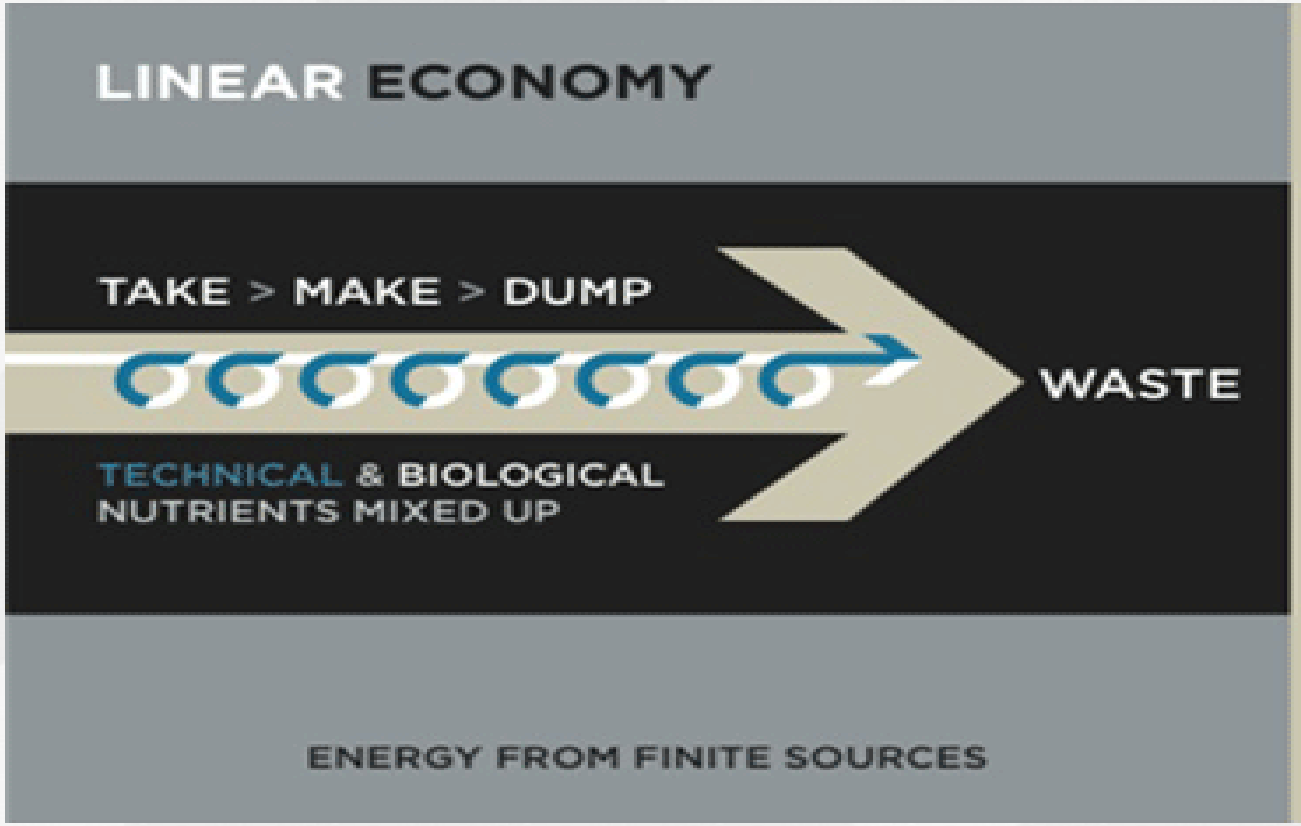
BURNING PLATFORM - DRAMATIC INCREASE IN COMMODITY PRICES

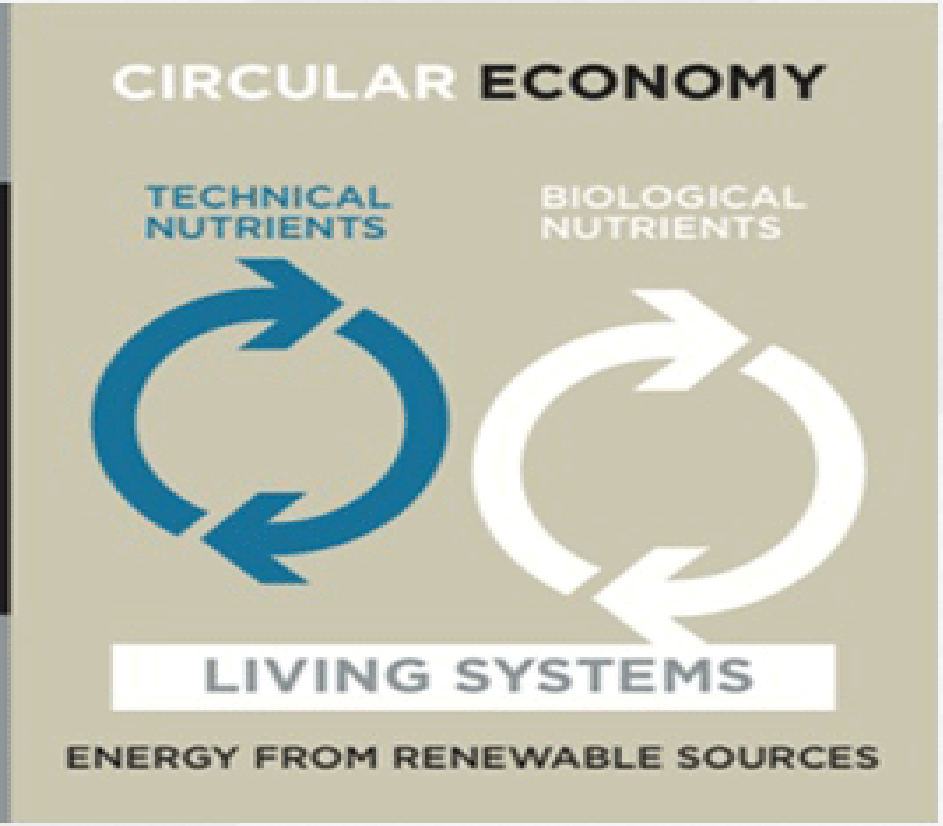


FROM LINEAR TO CIRCULAR ECONOMY

ELLEN MACARTHUR FOUNDATION

DELIVERING THE CIRCULAR ECONOMY
A TOOLKIT FOR POLICYMAKERS





CIRCULAR ECONOMY TRANSITION IN DENMARK BY 2035 COULD LEAD TO...

- ↑ GDP — An increase in GDP by 0.8–1.4%
- ↑ FTEs — 7,000 – 13,000 additional job equivalents
- ↑ EXPORT — Increase in net exports by 3-6%
- ↓ RESOURCE — Reduction of consumption of selected resources by 5-50%
- ↓ CO_2 — Reduction of the country's carbon footprint by 3-7%

NEXT STEPS TOWARDS CIRCULAR ECONOMY

—

27 RECOMMANDATIONS TO GOVERNMENT

Den cirkulære værdikæde

- **#1** Gøre cirkulær økonomi til en vækstmotor for danske virksomheder
- **#2** Etablere én indgang til det offentlige for virksomheder, der oplever barrierer for cirkulær omstilling
- **#3** Etablere cirkulære kommuner
- **#4** Indarbejde cirkularitet i de makroøkonomiske modeller og statistikker
- **#5** Udvikle standarder som understøtter cirkulær økonomi
- **#6** Indarbejde cirkulær økonomi i hele uddannelsessystemet
- **#7** Fremme forskning, udvikling, test, demonstration og markeds-modning af cirkulære løsninger og teknologier
- **#8** Styrke finansiering til acceleration af cirkulære virksomheder
- **#9** Udnytte den danske styrkeposition inden for digitalisering og ny teknologi til at understøtte den cirkulære omstilling

Design og produktion

- **#10** Styrke den cirkulære produktpolitik i bl.a. ecodesign-direktivet
- **#11** Indarbejde cirkulær økonomi i produktionsvirksomhedernes vilkår
- **#12** Udarbejde et cirkulært bygningsreglement
- **#13** Udvikle standardiserede bygnings- og produktpas
- **#14** Fremme rammevilkårene for bioraffinering
- **#15** Etablere nye værdikæder for landbrugsafgrøder, der udnytter fotosyntesen bedre
- **#16** Optimere udnyttelsen af animalske produkter

Forbrug

- **#17** Bygge og købe ind i det offentlige på baggrund af totaløkonomi og livscyklusberegninger
- **#18** Fremme cirkulær økonomi gennem virksomheders og det offentliges indkøb
- **#19** Udvikle de cirkulære aspekter ved relevante mærkningsordninger og udbrede brugen af dem
- **#20** Fremme udnyttelse af overskudskapacitet f.eks. gennem deleøkonomiske forretningsmodeller
- **#21** Forebygge madspild
- **#22** Fremme reparation og genbrug

Genanvendelse

- **#23** Ensrette den kommunale indsamling af husholdningsaffald for at fremme genanvendelse
- **#24** Skabe klarhed om affaldssektorens rammevilkår og et bedre udbud af genanvendte råvarer
- **#25** Forbedre konkurrencevilkårene på markedet for affald og genanvendte råvarer gennem ensartet klassificering og et styrket risikobaseret affaldstilsyn
- **#26** Udbrede selektiv nedrivning af byggeri
- **#27** Indføre et mere cirkulært producentansvar for elektronikaffald

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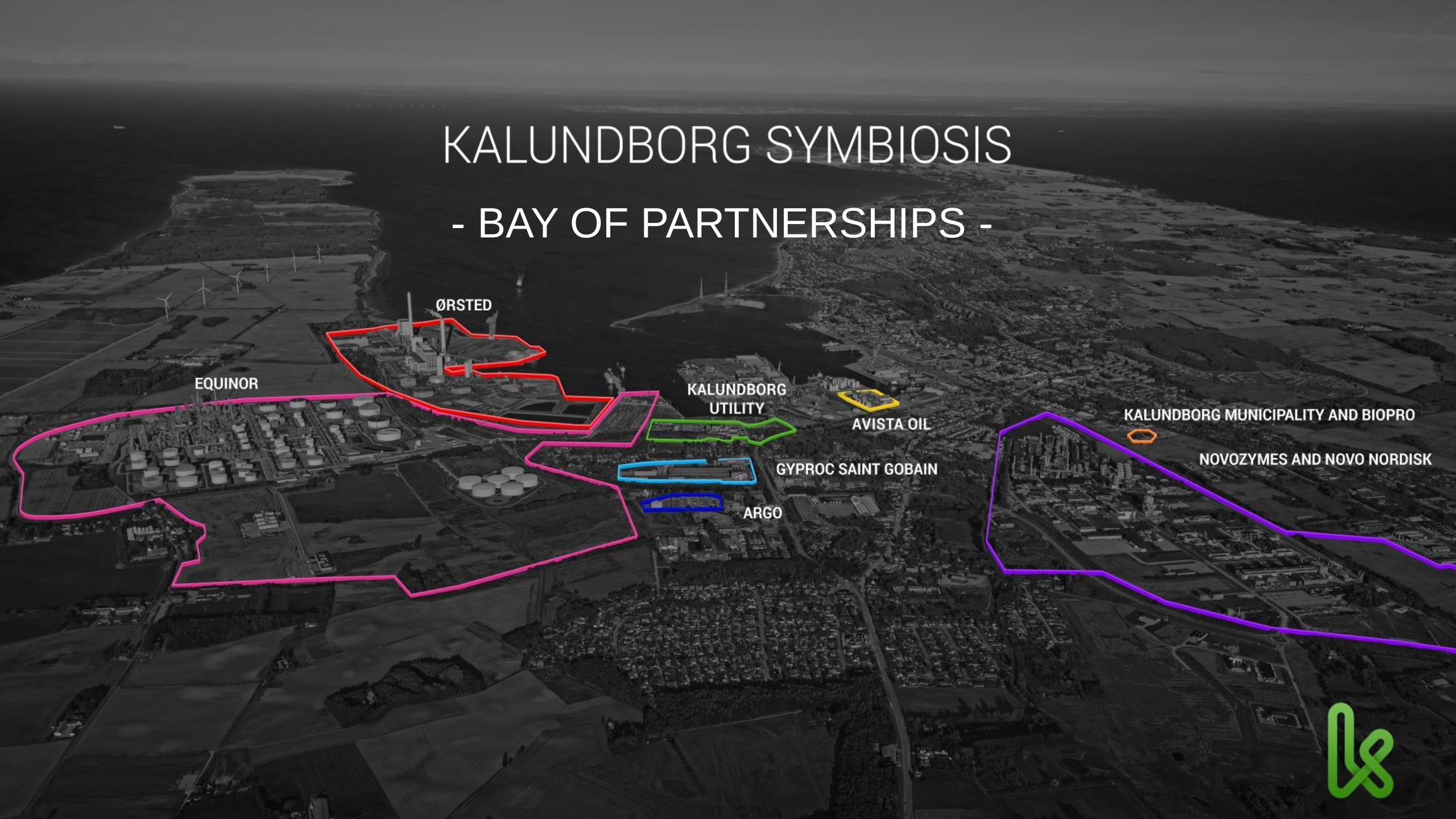
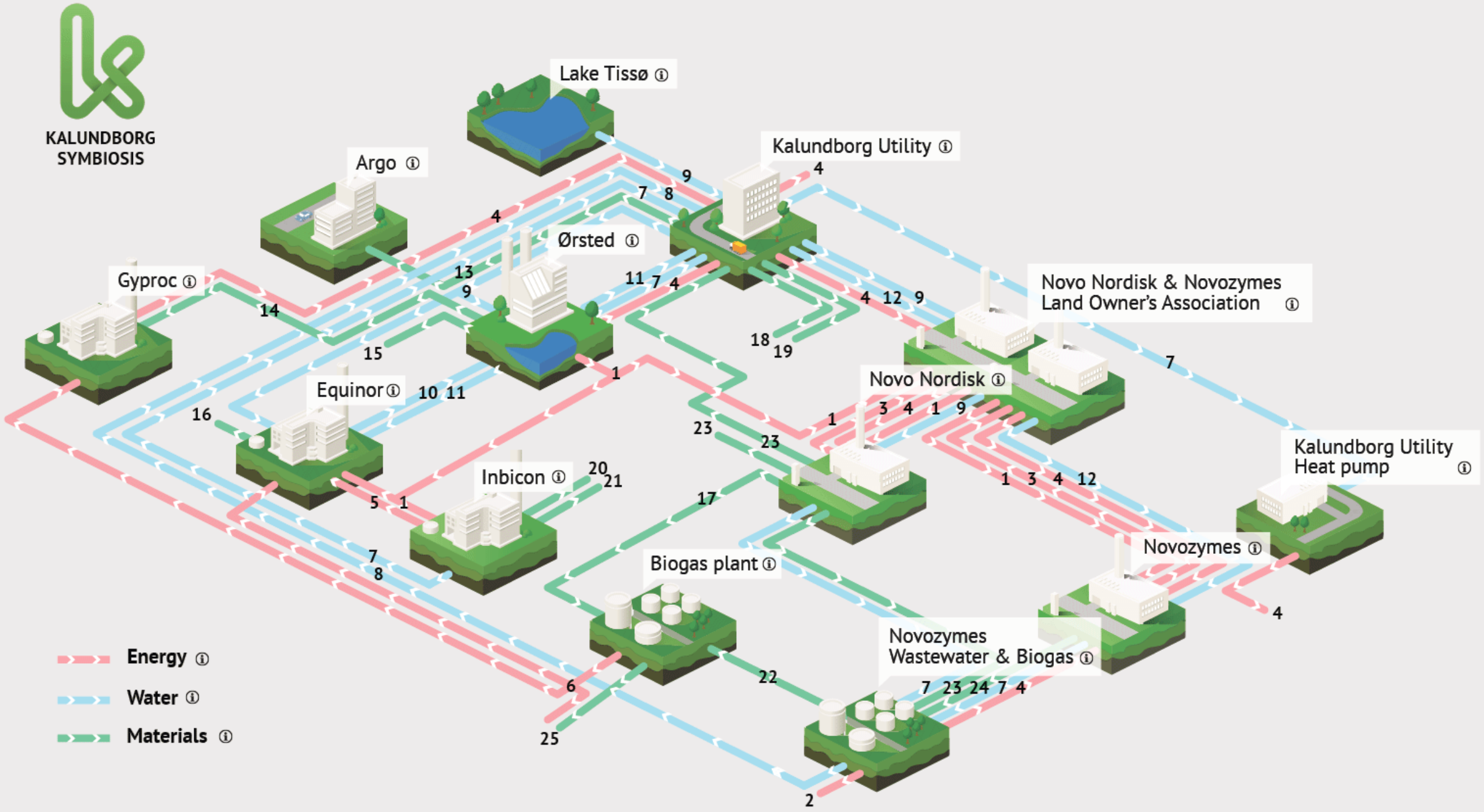
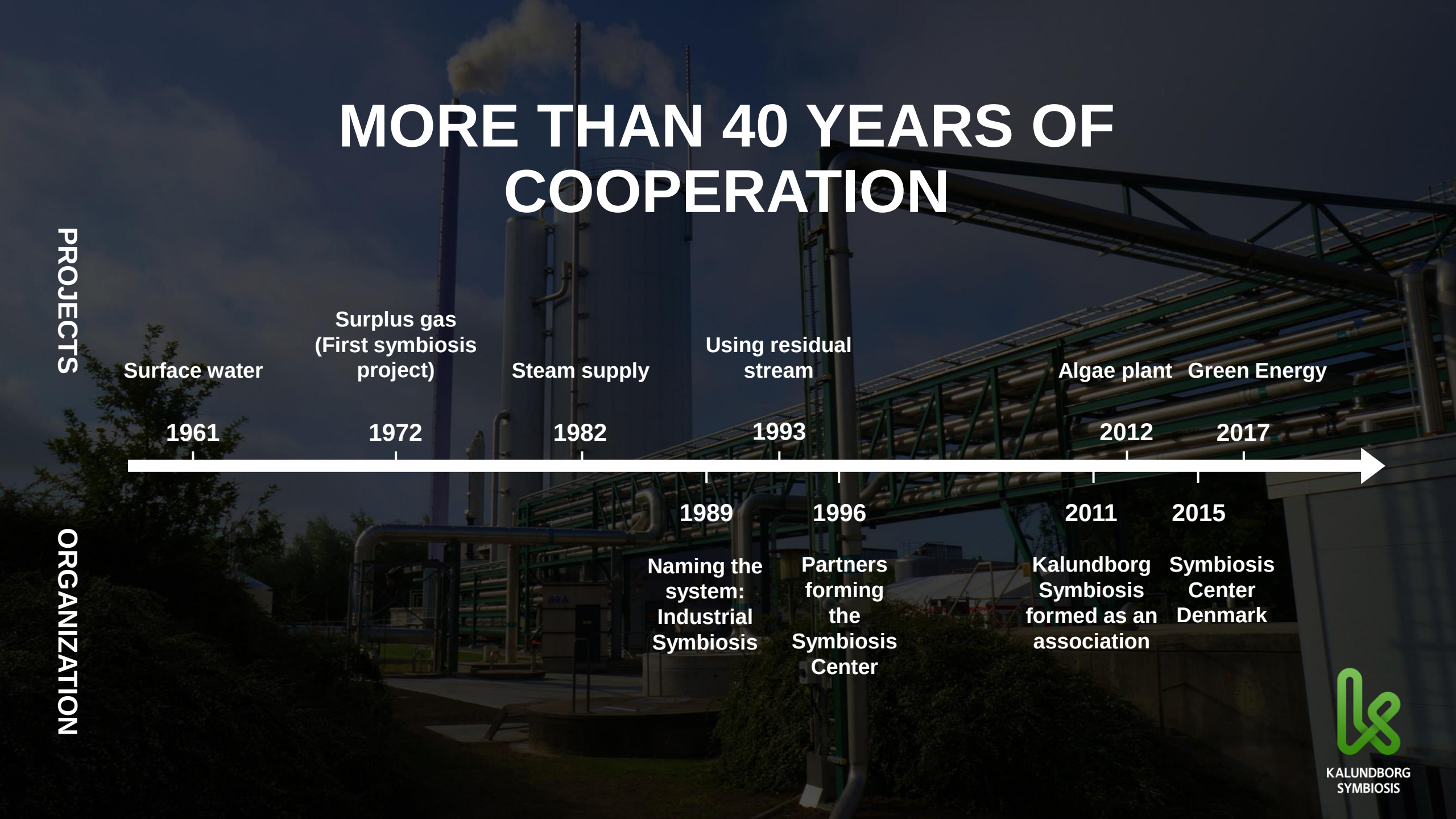
- BAY OF PARTNERSHIPS -




KALUNDBORG SYMBIOSIS
Lake Tissø
Argo
Kalundborg Utility
Ørsted
Gyproc
Novo Nordisk & Novozymes Land Owner's Association
Novo Nordisk
Equinor
Inbicon
Kalundborg Utility Heat pump
Novozymes
Biogas plant
Novozymes Wastewater & Biogas
Energy
Water
Materials

MORE THAN 40 YEARS OF COOPERATION



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WORKING TOGETHER:
SURFACE WATER SPRINGS IN 1961

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GOOD BUSINESS CASE: FROM FIRST STREAM IN 1972

ADAPTABLE: NEW BUSINESS MODEL GAINING STEAM FROM 1982

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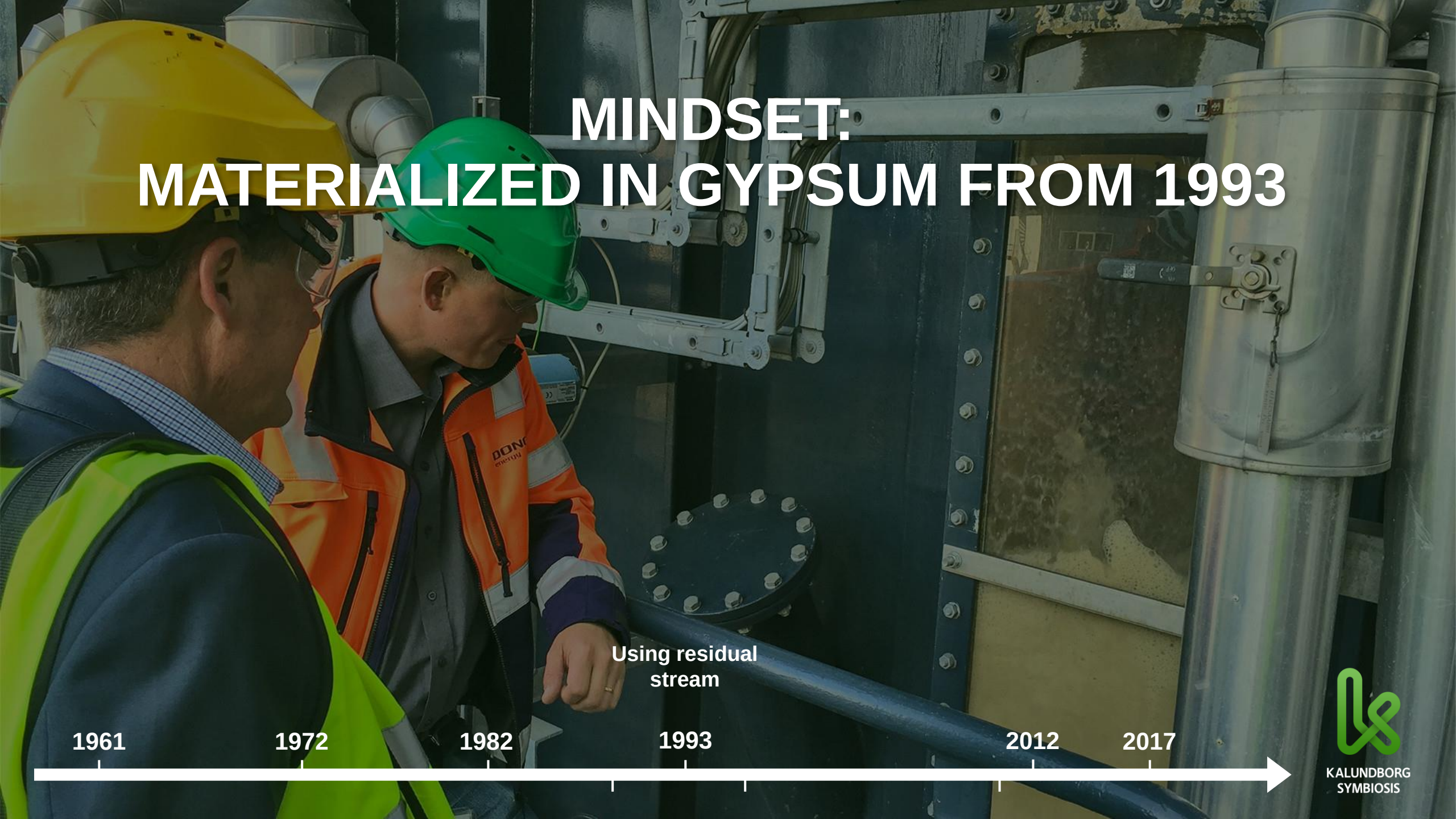
MINDSET:
MATERIALIZED IN GYPSUM FROM 1993



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TEST & DEMONSTRATION: ALGAE PLANT 2012

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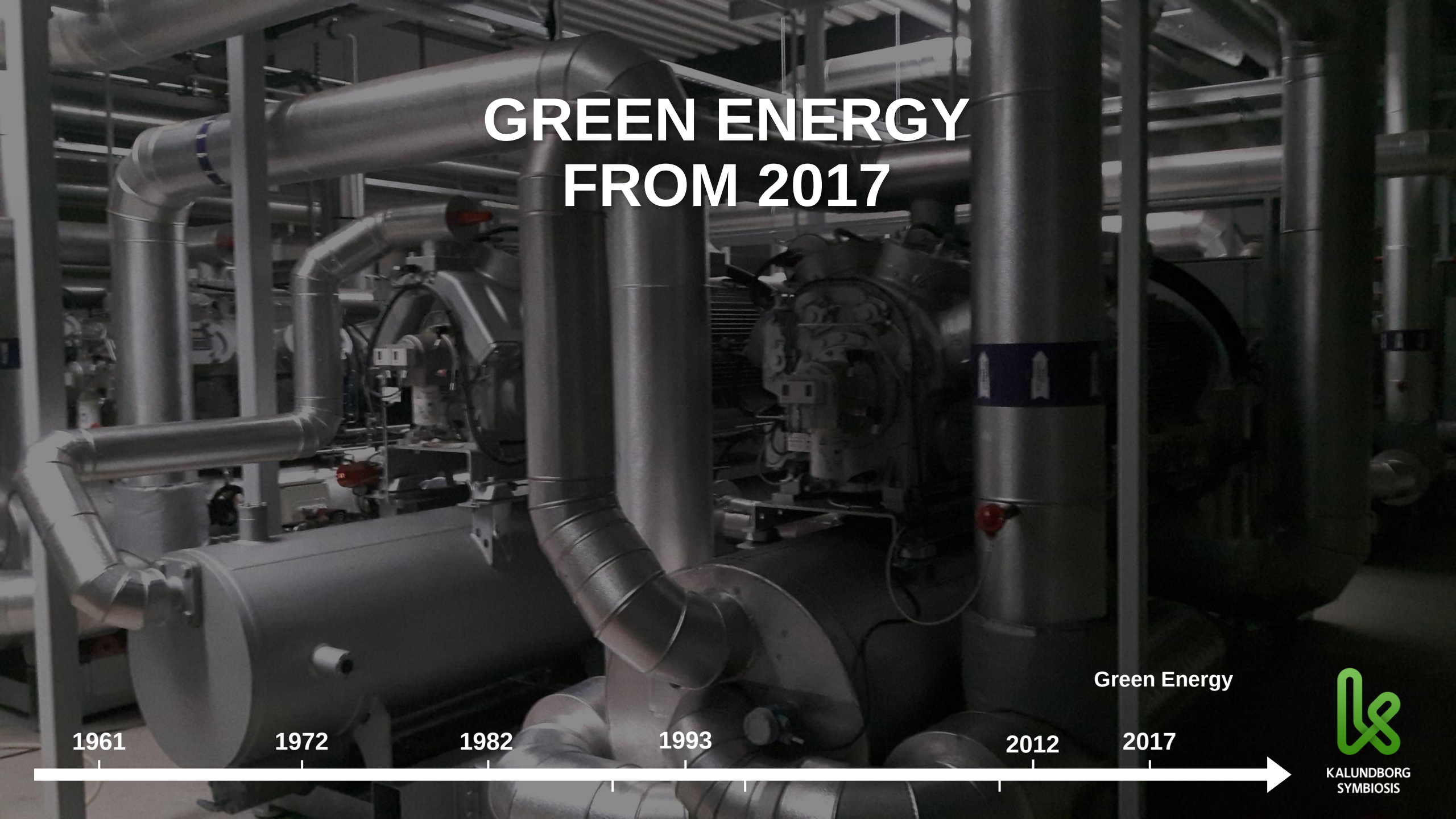

GREEN ENERGY
FROM 2017
Green Energy
1961
1972
1982
1993
2012
2017
KALUNDBORG
SYMBIOSIS

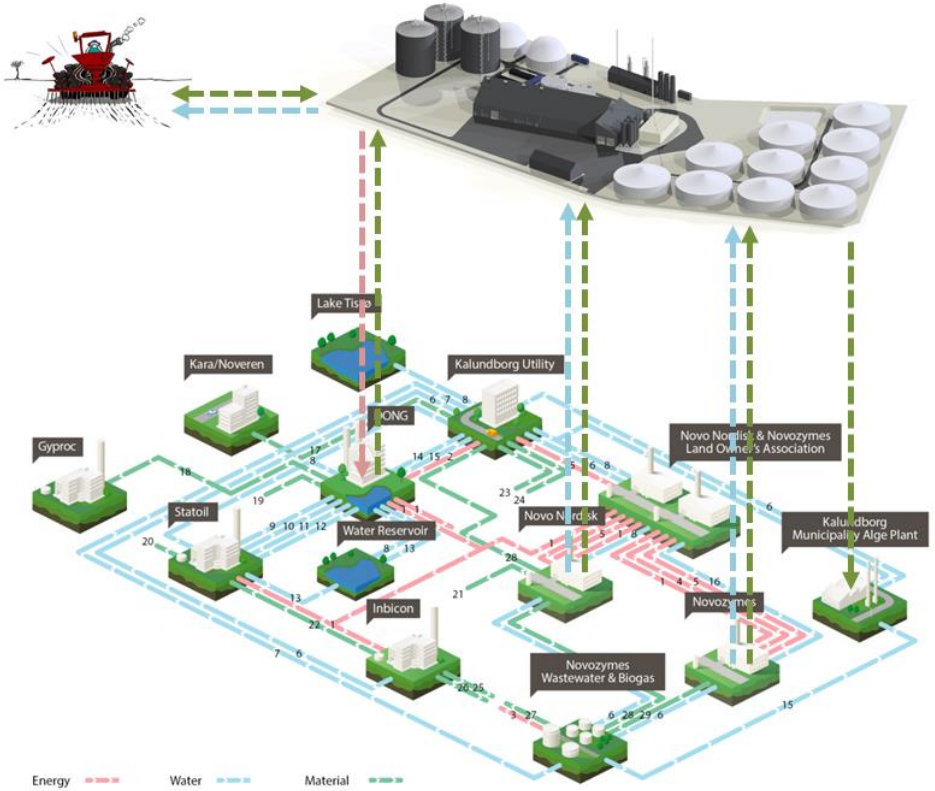
BIOMASS BASED POWERPLANT (2019)

- Wood chips replacing coal
- Yearly saving: 800.000 ton CO_2 (400.000 cars)
- Green steam, electricity and heat

KALUNDBORG SYMBIOSIS

FROM BIOMASS TO NATURAL GAS (2018)

- Biogas plant (Kalundborg Bioenergi)
- Will treat 300.000 ton biomass pr year
- Natural gas (upgraded biogas) and fertiliser
- Energy = 4.000 households
- CO_2 savings = 17.000 tons/y



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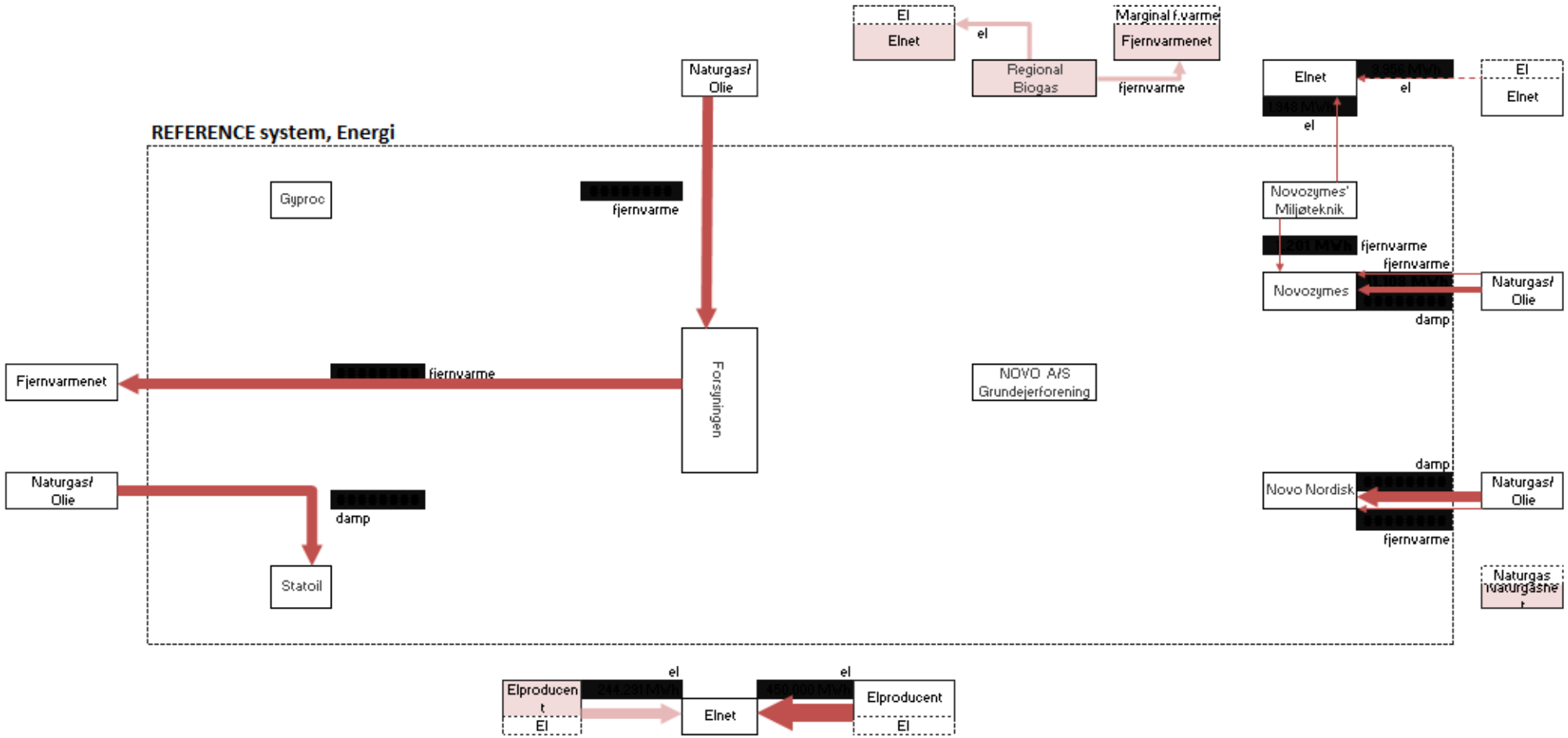
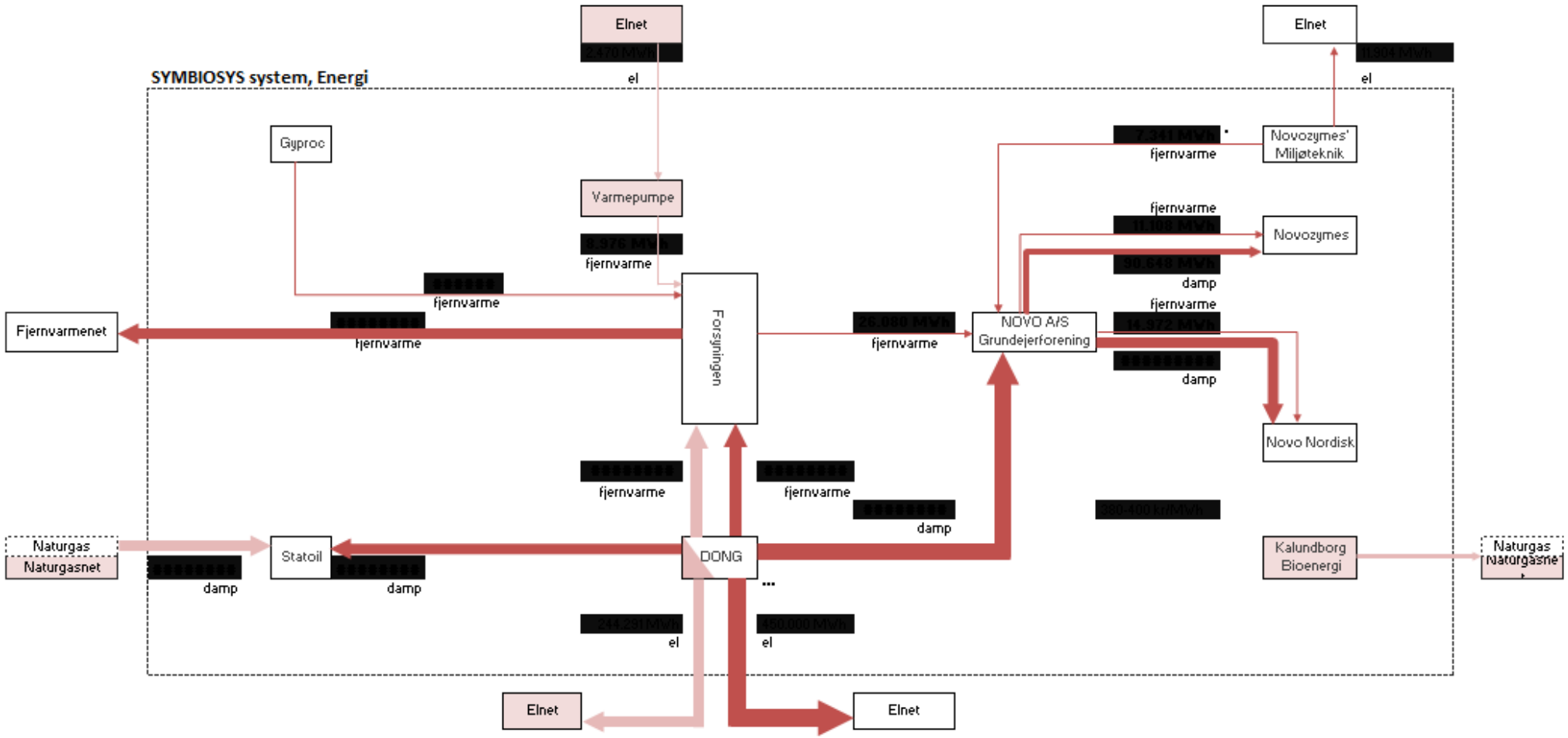
LCA: ENERGY BASELINE

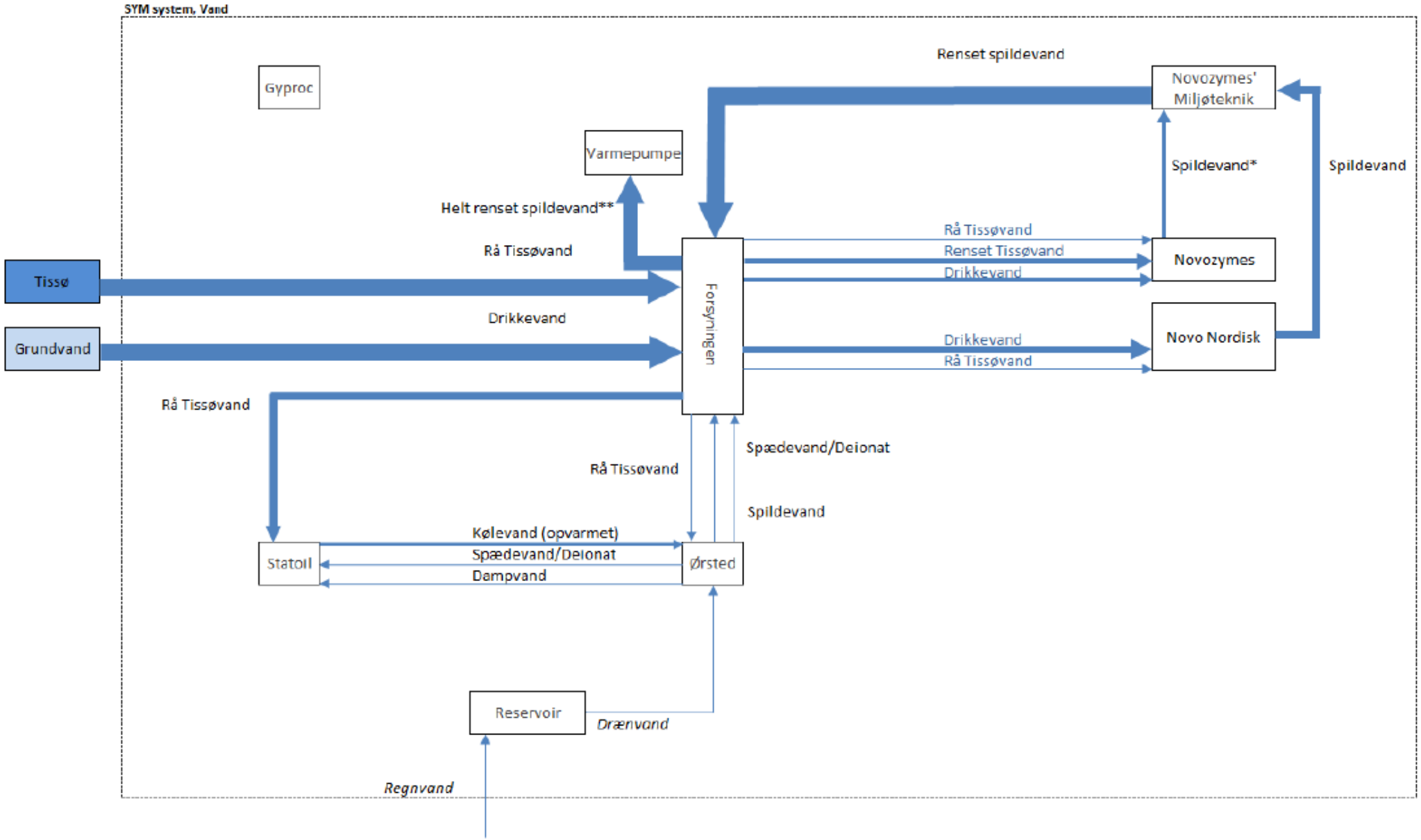


LCA: ENERGY SYMBIOSIS



LCA: Water Symbiosis

DANSK SYMBIOSECENTER
SYMBIOSIS CENTER DENMARK

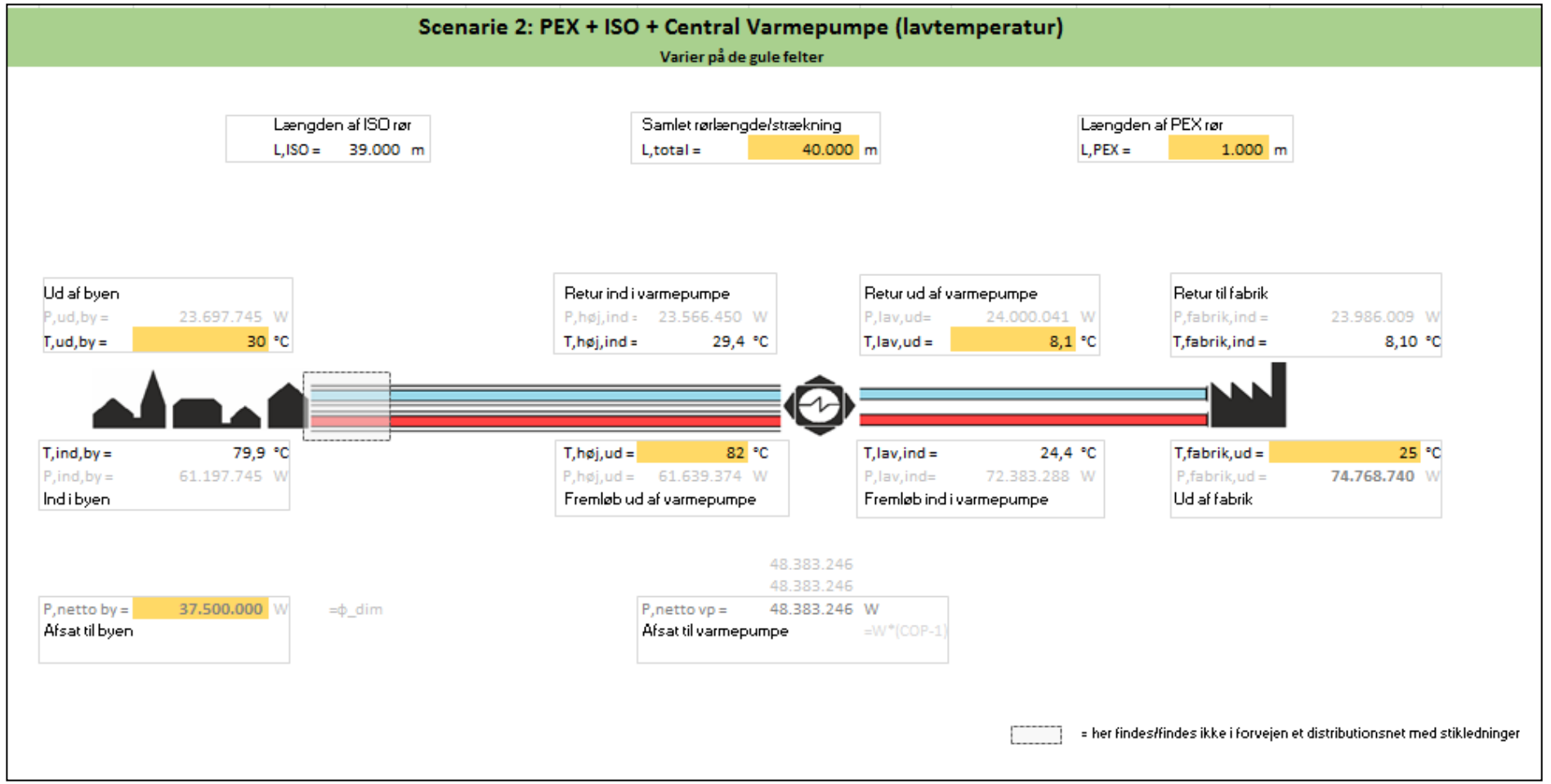


*Består af to delstrømme, både spildevand fra Novozymes' produktion samt dræn fra afvandet Biomasse/SBM

**Med en temperatur på ca. 23°c er denne vandstrøm energibærer og leverer varme til varmepumpen, der vha. el booster energien til at levere fjernvarme. Denne varme fra spildevandsstrømmen er "gratis" og afbelaster dermed Ørsted

Det formodes, at Statoils kølevand hentet fra Fjorden er det samme i SYM og REF og at mængderne dermed opvejes

GENERIC MODELS



KALUNDBORG SYMBIOSIS WILL BE THE WORLD LEADING INDUSTRIAL SYMBIOSIS WITH A CIRCULAR APPROACH TO PRODUCTION.

Renew
Strengthening of the partnership

Connect
Full resource utilization

Promote
Sharing of the symbiotic mindset

KALUNDBORG SYMBIOSIS

KALUNDBORG SYMBIOSIS

ANNUAL SAVINGS

BY LIFE CYCLE ASSESSMENT (LCA)

635.000 ton

CO_2 (environmental)

14 mill.

Euro (socioeconomic)

24 mill.

Euro (business economic)

The same amount of CO_2 used on average over a year by **37.352 Danes**

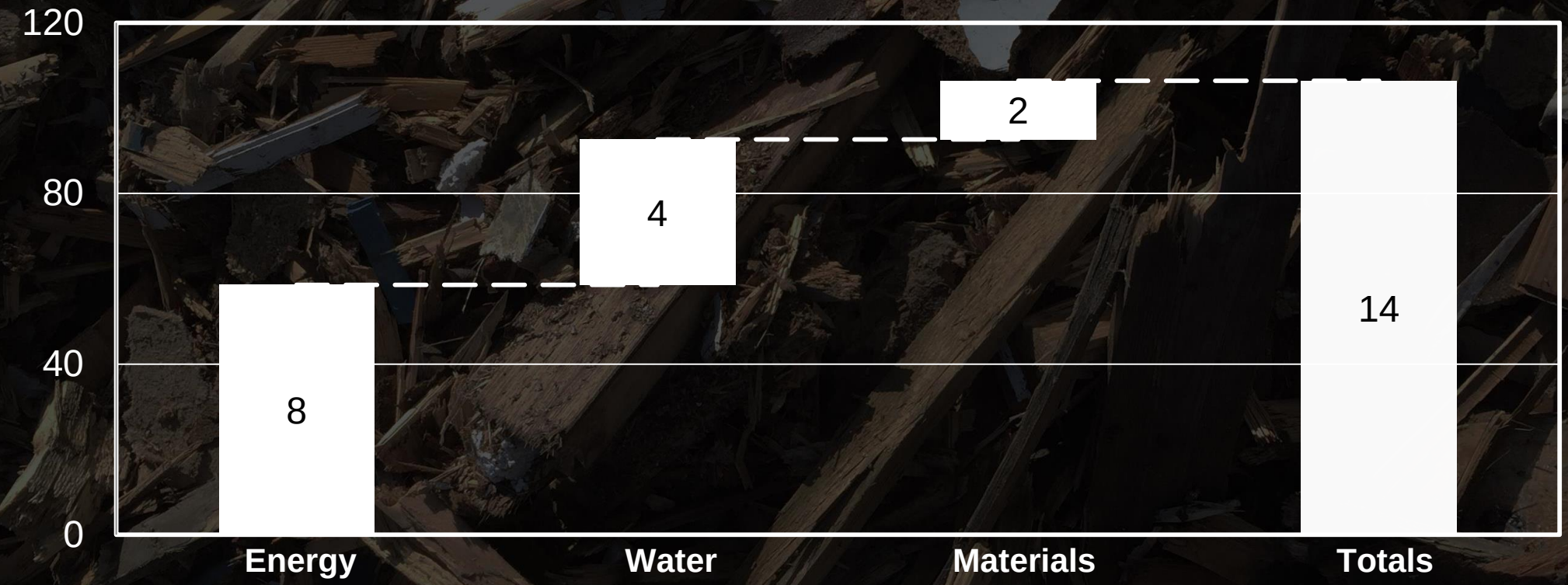
Enough to buy **354 brand new** electric powered cars

Equivalent to having **252 academics** employed for a year

KALUNDBORG SYMBIOSIS

SOCIOECONOMIC BENEFITS

Mio. euro. / year



KALUNDBORG SYMBIOSIS

BENEFITS

Increased growth and competitiveness

- Lower production costs with fewer expenses for purchasing and disposal
- Income from by-products

Decoupling of growth and resource consumption

- Growth, with improved resource efficiency and reduction in waste
- Lower CO_2 emissions

BENEFITS

Better control and adaptability

- Wider choice of suppliers and increased energy security with multi-pronged strategy (by creating and utilising one’s own local resources, one obtains less dependence on imports and world markets)

- Increased resilience by acting in partnerships that, for example, secure local resources in the long term and are less exposed to the instability and fluctuations of world markets

- Increased control and management of the flow of resources and materials

BENEFITS

Better innovation and business development

- Development and innovation strength achieved by connecting different competences both internally at the companies and between companies
- Increased possibility of employee innovation. Development of new products, customer groups and markets
- New business models based on the utilisation of resources in the residual flows
- New export opportunities

BENEFITS

Increased motivation and market value

- Increased PR and CSR value locally and globally
- Opportunity for shared marketing and investor efforts
- Increased motivation, job satisfaction and pride among the employees involved

BENEFITS

- **Increased growth and competitiveness**
- **Decoupling of growth and resource consumption**
- **Better control and adaptability**
- **Better innovation and business development**
- **Increased motivation and market value**

NEXT STEP

- Realizing 10 new symbiosis streams by 2025
- Symbiosis - Ground Zero Approach
- Improving screening tools and data for matching up

  Support system export
- Improving international collaboration and networks
- Support start-ups/SME’s and educational initiatives
- IS value proposition – attracting industry

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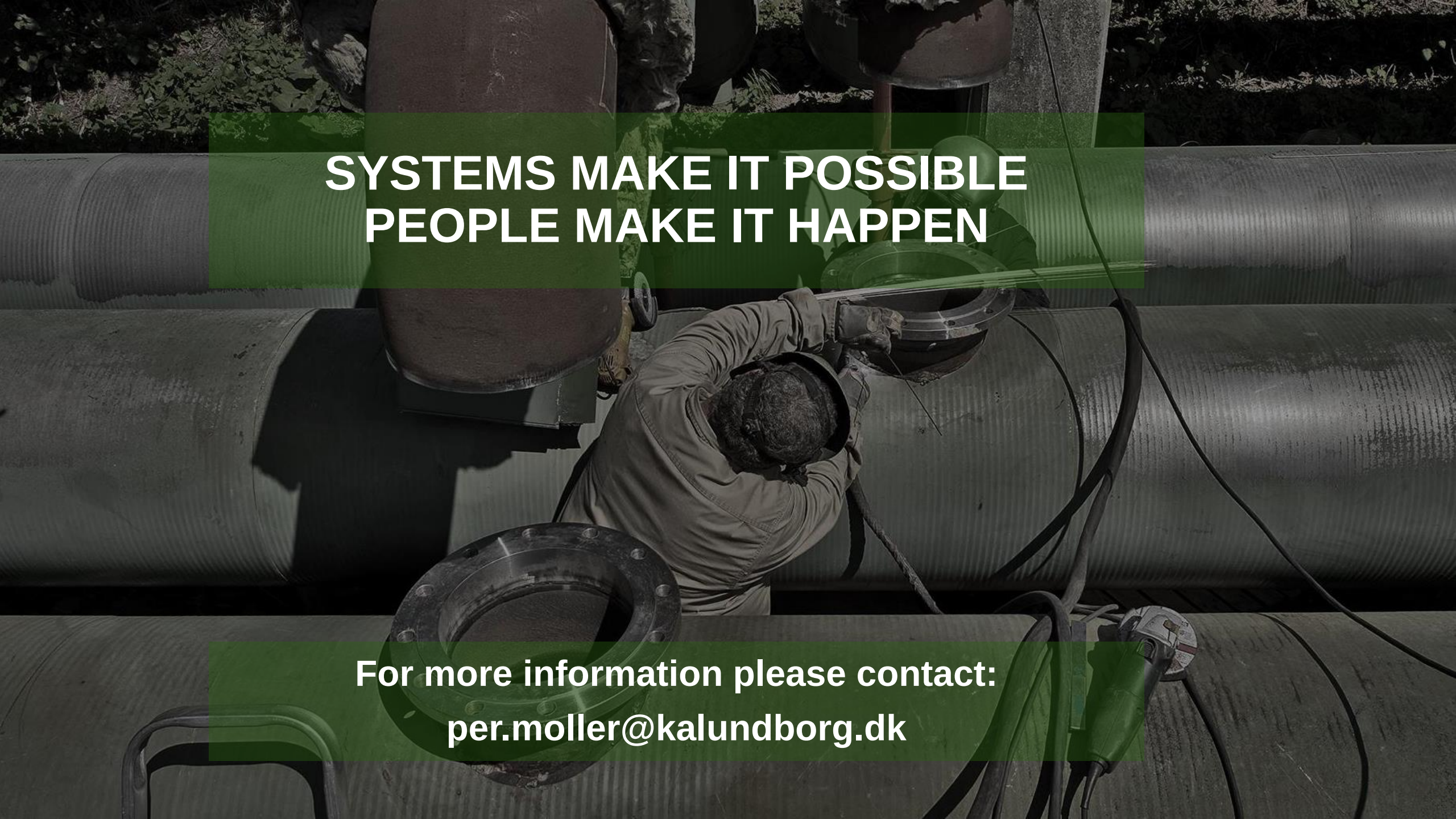
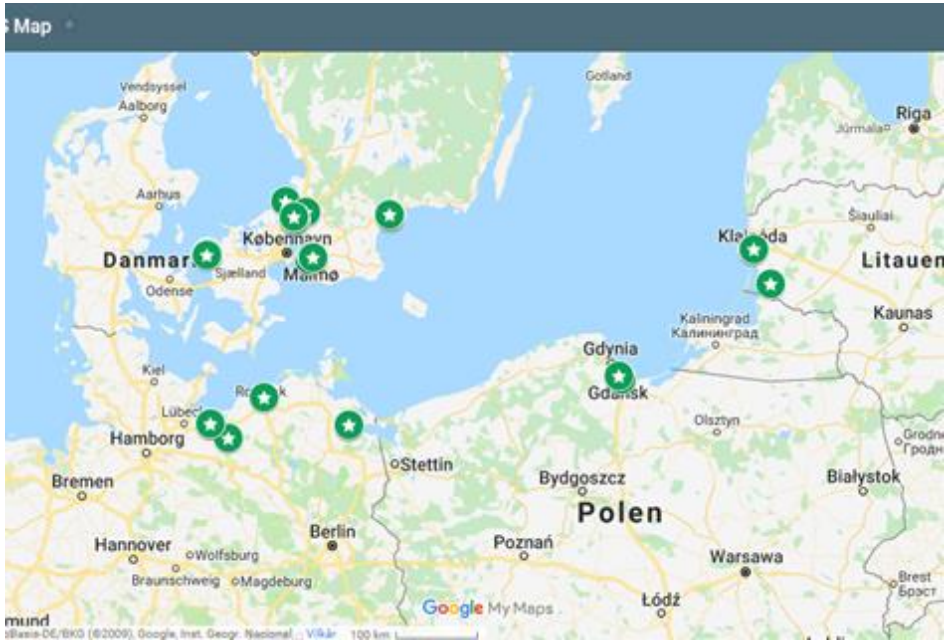

SYSTEMS MAKE IT POSSIBLE
PEOPLE MAKE IT HAPPEN
For more information please contact:
per.moller@kalundborg.dk

CAPACITY BUILDING IN THE BALTIC

- Knowledge transfer from symbiosis practitioners
- Pilots, test and demonstration



Urban Baltic Industrial Symbiosis

Interreg South Baltic

EUROPEAN UNION

European Regional Development Fund

CAPACITY BUILDING IN THE BALTIC

"Baltic Industrial Symbiosis"

Funded by:	Interreg BSR
Project period:	2019-2021 (30mdr)
Budget:	ca. 2.3 mio Euro (incl. Norway)
Lead-partner:	Symbiosis Center Denmark(0.27 mio) Kalundborg Symbiosis (0.29 mio)

Interreg
Baltic Sea Region
funding cooperation