

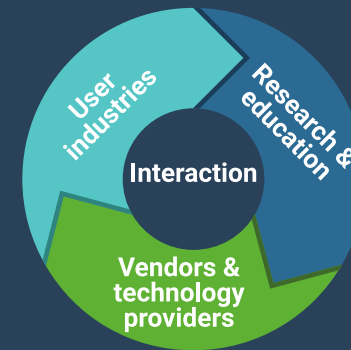


WORLD CLASS GREEN INDUSTRIAL PARK

Jan I. Gabor
VP property development

Centre for an Energy Efficient and Competitive Industry for the Future

Energy Efficiency in Industry



OBJECTIVE:

20-30 % reduction in specific energy use
10 % reduction in greenhouse gas emissions

INDUSTRY SECTORS:



FACTS:

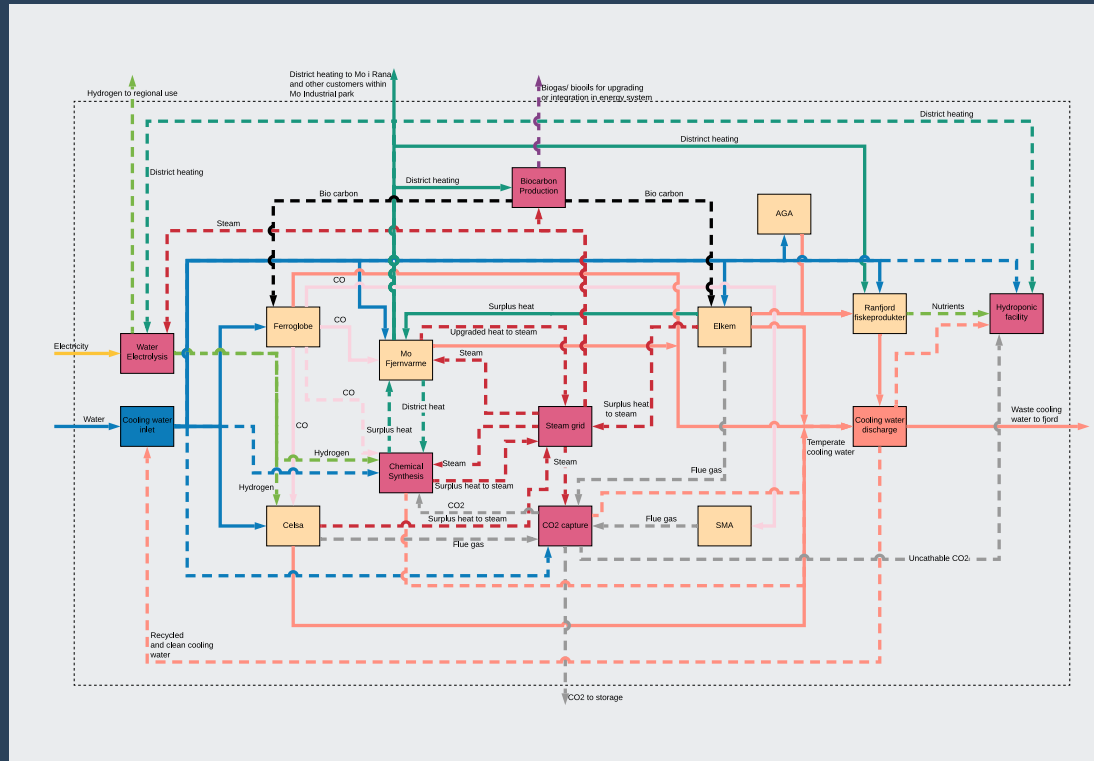
39 partners. Centre period 2016-2024. Budget 395 MNOK

CORNER STONES

- Energy Efficient Processing
- Surplus Heat Utilization
- Industrial Clusters
- Education and Training

RESEARCH AREAS:

- Methodologies
- Components
- Cycles
- Applications
- Society
- Case Studies



NOVEL EMERGING CONCEPT: Internal Spin-off project in FME HighEFF

RESOURCES: 1.2 MNOK

PERIOD: 2020-2021

CONTRIBUTORS: SINTEF Energi, SINTEF Helgeland, SINTEF Industri, MIP

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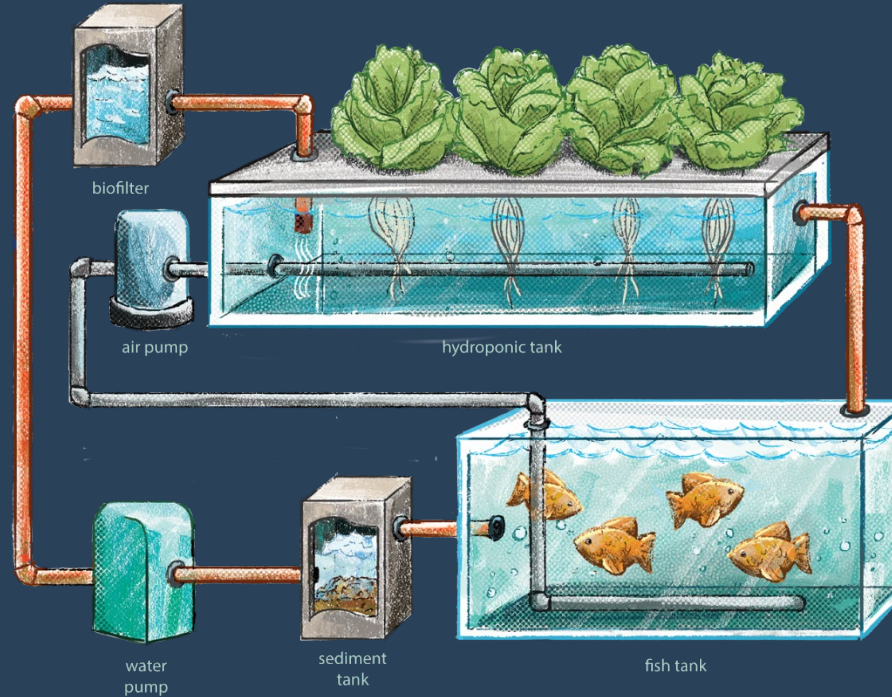
THE PRIMARY GOAL IS TO INVESTIGATE A POSSIBLE FUTURE INTEGRATED ENERGY SYSTEM AT MIP.

Modelling and optimization of integrated energy systems in industrial parks.

Utilization of surplus energy.

How can different energy carriers be utilized?

How can the energy and utility demand of existing and new processes/companies be optimized?



FEASIBILITY STUDY ON ESTABLISHING LARGE SCALE AQUAPONICS WITHIN MIP WITH THE GOAL OF:

Utilizing excess nutrients in water sludge from Kvarøy Smolt.

Utilizing excess industrial heat and CO₂.

Increasing self-sufficiency and quality on fresh greens in Northern Norway.

PROJECT OWNER:
Kvarøy Smolt

PROJECT LEADER:
SINTEF Helgeland

PROJECT PERIOD:
2020-2021

Project with financial support from Nordland Fylkeskommune through the MoFI FORREGION program by the Research Council of Norway.

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BioCirc



PROJECT OWNER:
Elkem Rana

PROJECT LEADER:
SINTEF Helgeland

PROJECT PERIOD:
2019-2021

Project with financial support from regional research funds in Northern Norway

Contacts:
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REDUCING THE PRICE OF BIOCARBON WITH A CIRCULAR ECONOMY APPROACH

Full utilization of main and biproduct flows

Energy integration

Local and efficient logistics



CO₂ HUB NORDLAND

– PROCESS INDUSTRY TOWARDS ZERO EMISSIONS

Support from Climit Demo granted on 17 April 2018, a total of NOK 9.8 million, 65% support

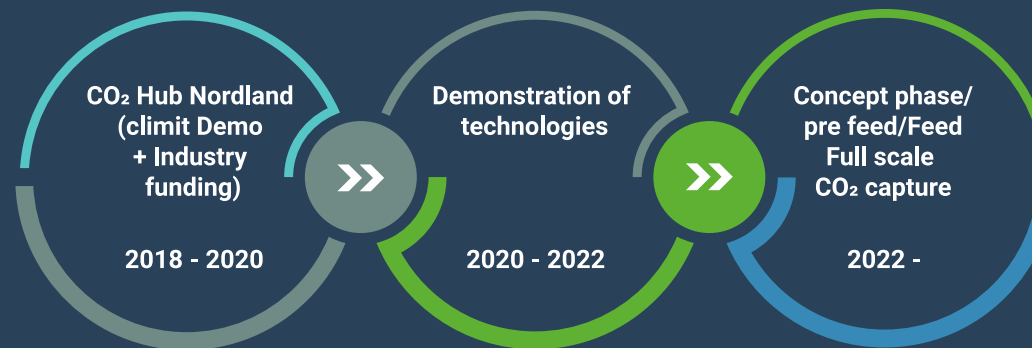
LEVERANSER:

Location-specific assessment of alternative technologies, degree of capture and partial capture.

Design of capture facilities at selected locations

Concretization of a common solution for the region in the form of a "CO₂-Hub" intermediate storage and shipping - logistics.

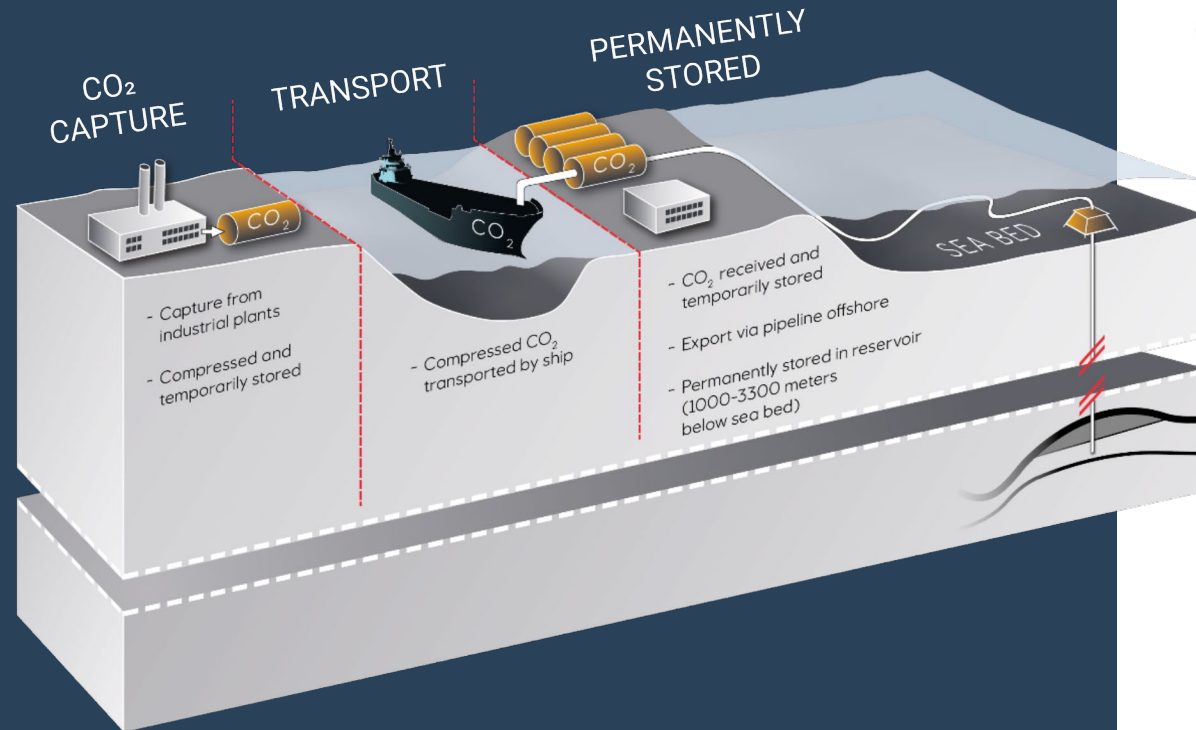
Location-specific evaluation of CCU opportunities



CO₂ HUB NORDLAND

– Carbon capture and storage

«Longship»-project
«Northern Lights»-prosjektet

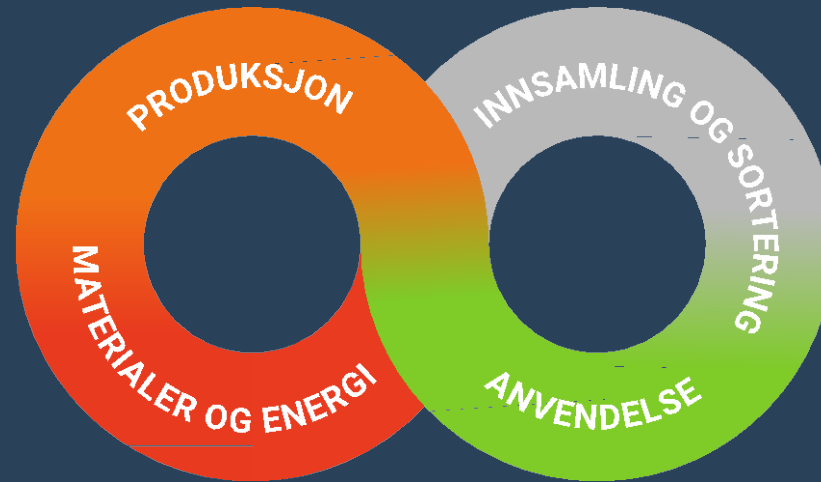


Elkem Rana

– In Mo Industrial park



Carbon capture at Elkem



KARBONFANGST

Carbon capture is a possible route to climate-neutral production.

Elkem is conducting a feasibility study on carbon capture supported by Gassnova.

Biogenic CO₂ and Hydrogen enable the production of electric fuel - collaboration with MIP / SLF.

Great technological and financial risk and will require comprehensive support to be realized.

Norway has the prerequisites - and can with investment Carbon capture take a leading position on sustainability.

Sustainability

For Elkem, waste is basically unused value - Elkem Rana is a partner in Enova - supported project for **briquetting** for reuse of other people's / own waste.

Elkem Rana has granted support for the **reduction of Nox**.

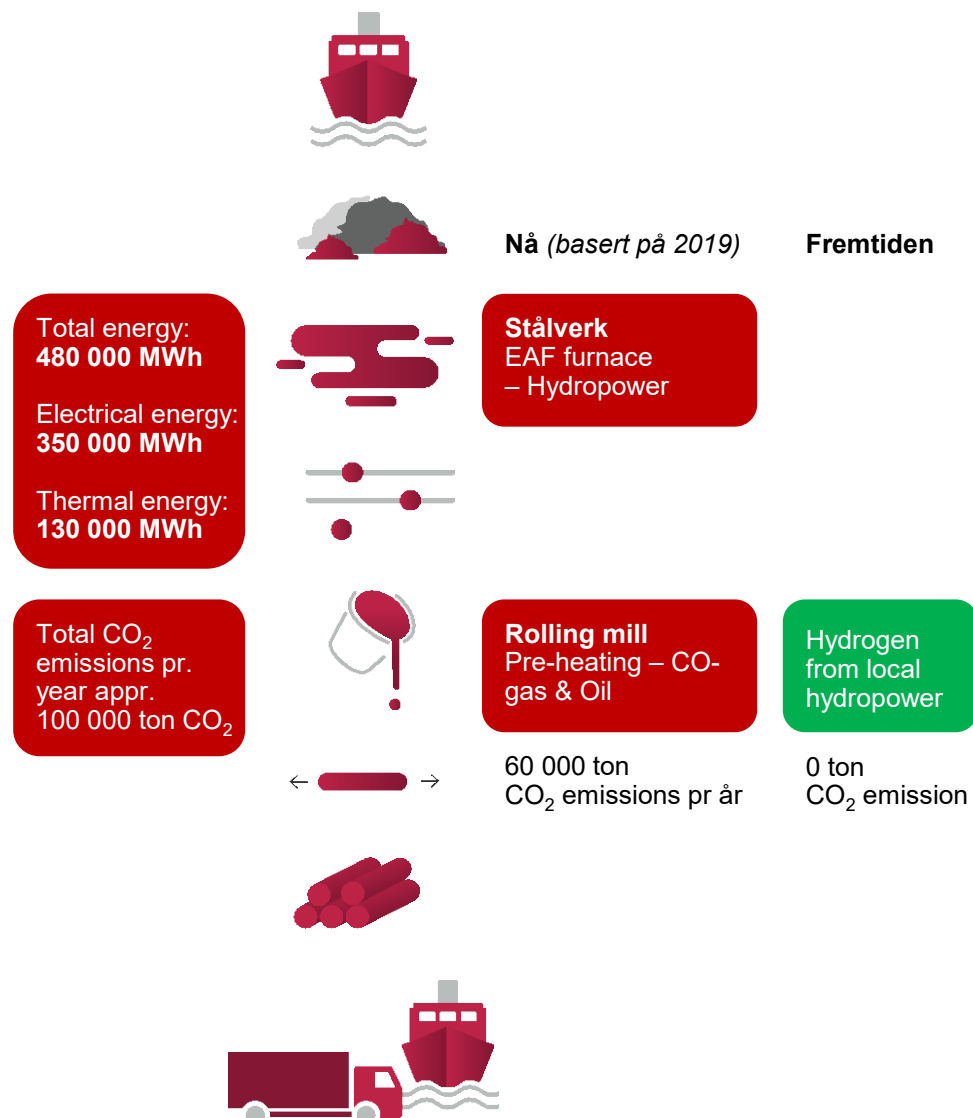
ACT Cluster – **cluster collaboration** for the development of new sustainable solutions and industrial lifts.

Energy efficiency - 90% of energy today goes unused in exhaust gas. We need a continuation of Enova's support scheme for **energy recovery**.

Better support schemes for **circular economic projects** are needed to stimulate this work.

HYDROGEN HUB MO





MOTIVATION:

Miljøvennlig bærekraft på lang sikt

Reduserte utslipp:
CO₂, Nox, støv, olje

Langsiktig konkurransekraft

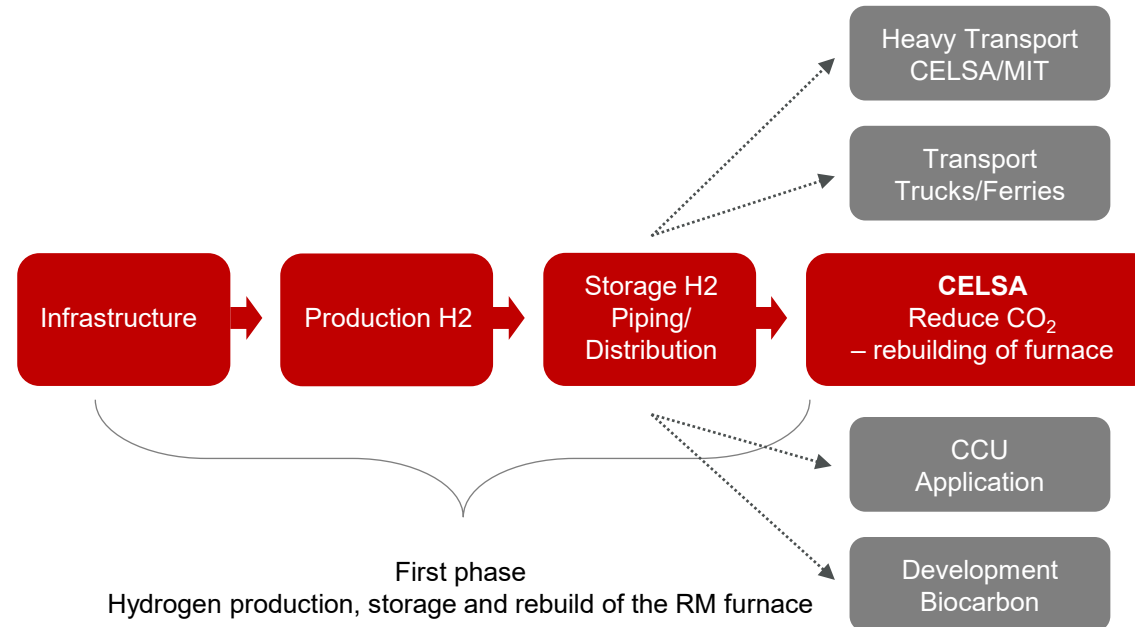
Teknologi, grønt stål, effektivitet

Energibesparelse

Opptil 16 GWh / år energibesparelser (~ 27 kWh/t)

Industrialization for H2

Value Chain Industrial H2 in MO



CELSA reduserer sine direkte utslipp med 60%, dvs, 100% fra valseverket og totalt nærmere 60.000 tonn CO2 per år

600 MNOK (CAPEX og OPEX)
Fase 1 -10 nye arbeidsplasser
Fase 2- 100++ nye arbeidsplasser
Fullskala produksjon innen januar 2024, (elektrolysør og valseverk)

Mo Industrial E-fuel AS

Above EUR 100 Mio. invested by SLF last decade | ready to roll out
In Nordland for Norway, up to 94 % reduction in CO₂ emission compared to gasoline

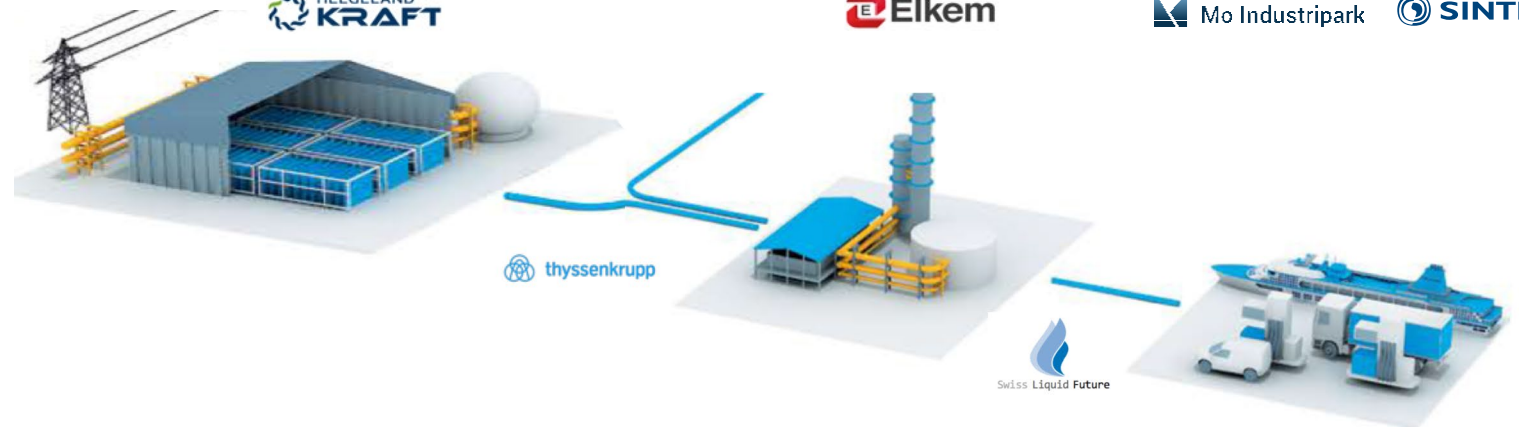
Nordland
Hydropower
Conversion into H₂



Nordland CO₂ feedstock



Nordland infrastructure
Local storage and usage
International shipment



Hydrogen usage and storage via e-fuel plants

Capacities and Rollout

Train 1 in Mo Industriepark

HYDROGEN PRODUCTION

- 15'000 t p.a.
- 91 MW / 760 GWh
- 120'000 t p.a. oxygen, by-product for usage in Mo Industriepark circular economy
- CAPEX € 120 - 140 Mio.
- OPEX € 23 – 26 Mio., 90% of that are power costs
- 10-15 employees

CARBON CAPTURE

- 120'000t CO₂ out of biocarbon from Elkem silicon plant
- First large-scale carbon capture plant from metal industry globally

E-METHANOL PRODUCTION / HYDROGEN STORAGE

- 100 Mio. Liter / 80'000 t e-methanol
- 4 MW
- 94% GHG reduction vs. fossil gasoline, means 160'000t CO₂ savings p.a.
- 1 Billion km equivalent of green car transportation p.a.

- CAPEX € 120 - 150 Mio.
- OPEX € 11 - 14 Mio. p.a.
- 15-25 employees including administration