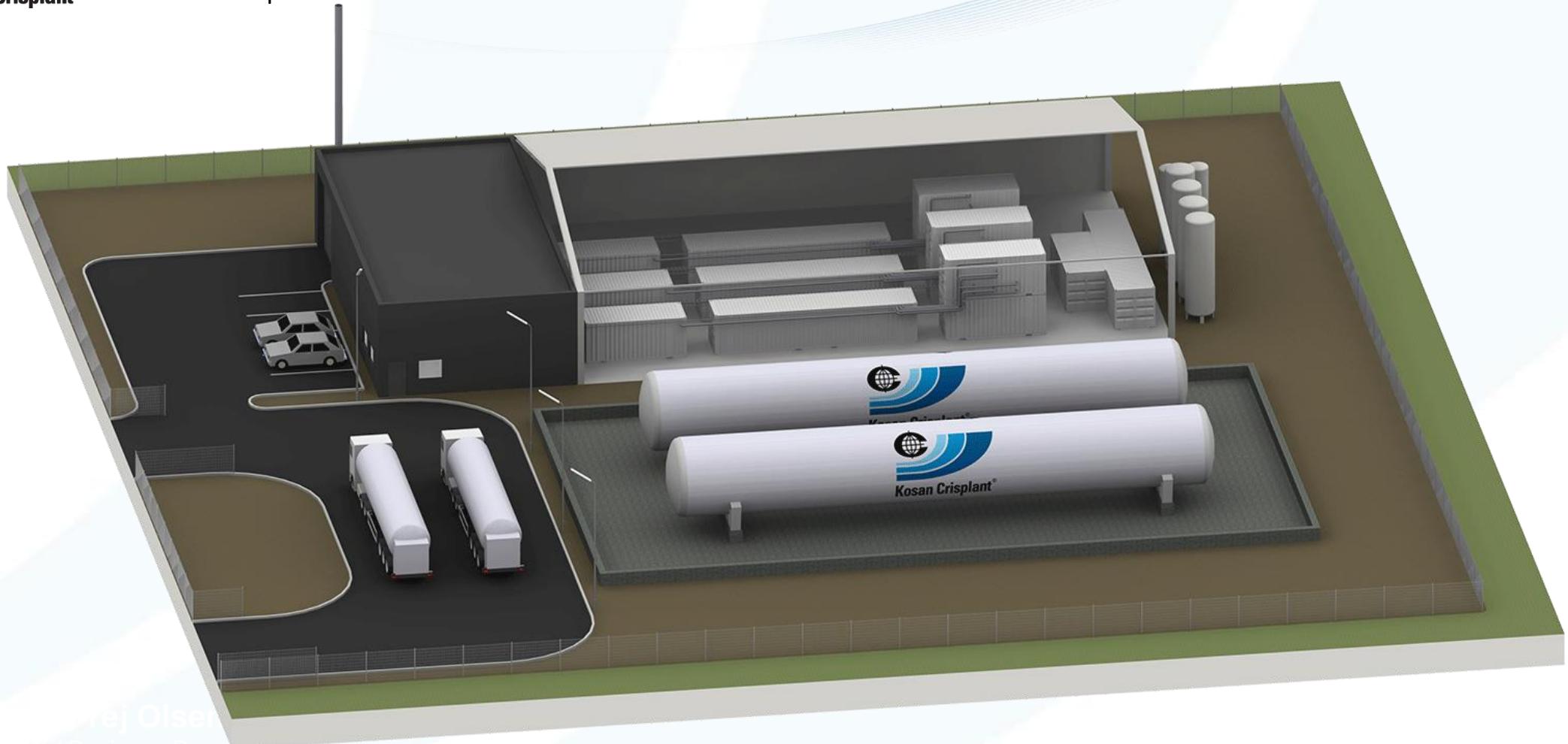


Small Scale Liquefaction



Larsen & Frej Olsen
G / Business Developer

Frej Olsen
Business Development Manager

65 years in the Gas Business



*"We deliver cleaner energy solutions –
good for people and the environment"*

Worldwide References

- More than 3,500 plants/larger installations supplied since 1951
- We deliver infrastructure and solutions
- **We do not sell gas**



LNG Bunkering Unit



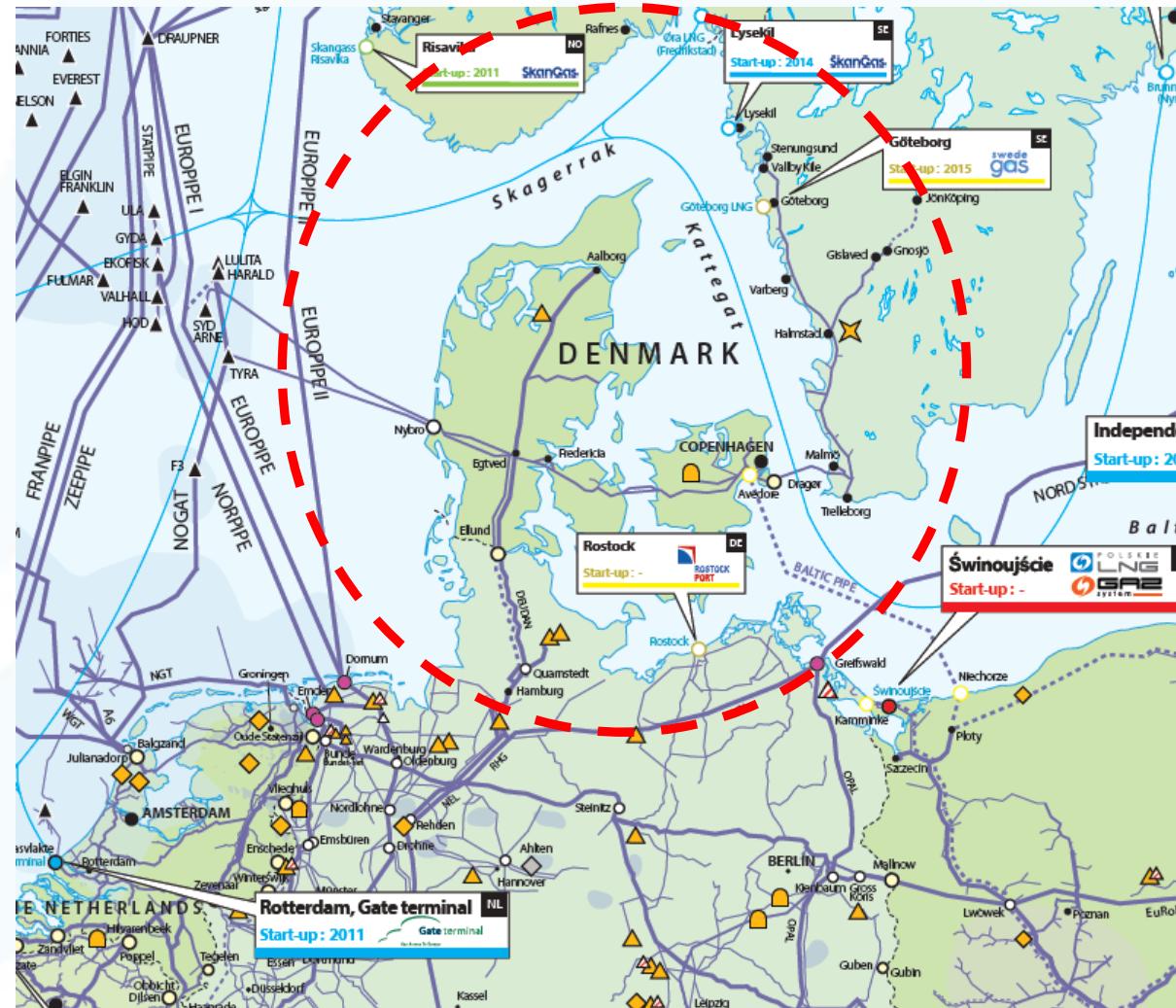
- Bunkering directly from one tank trailer
- Pump unit with one pump
- 40 - 60 m³/h bunkering flow
- Bunkering of 5-50 m³ per bunker operation.
- Fully automatic
- Zero emission bunkering

Project partners:



SAMSØ REDERI 

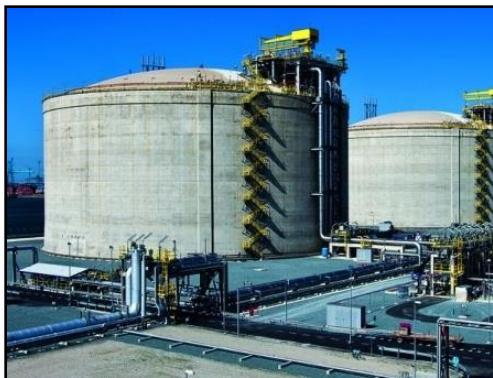
Lack of LNG Supply



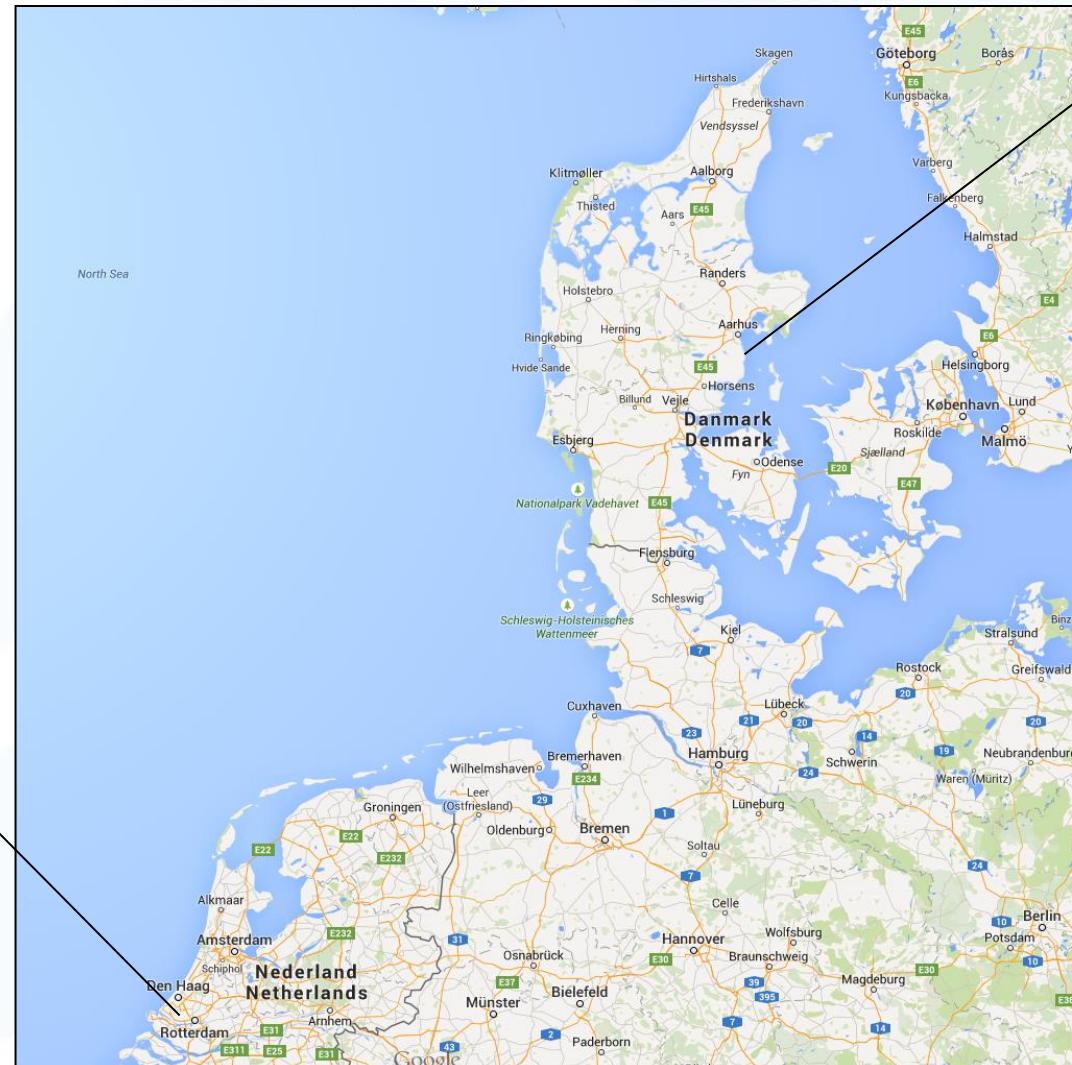
Logistic Supply Chain



The need for smarter thinking



GATE Terminal



Bunkering Unit
"Samsoe Solution"

Denmark - Natural gas grid



Development of an efficient small scale liquefaction unit that locally will be able to liquefy natural gas as well as bio gas

Blaa-Inno+ Project partners:



Product partners:

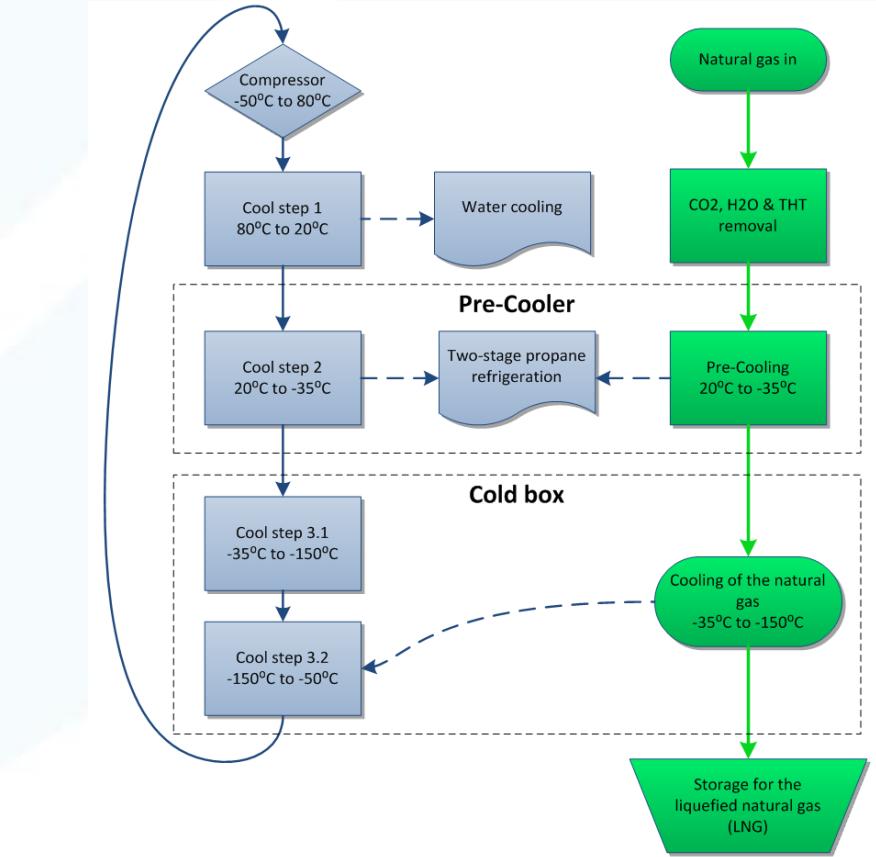


Development of optimized liquefaction plant

The technology used is the MCR (Multi Component Refrigerant) and consist of 4 different circuits

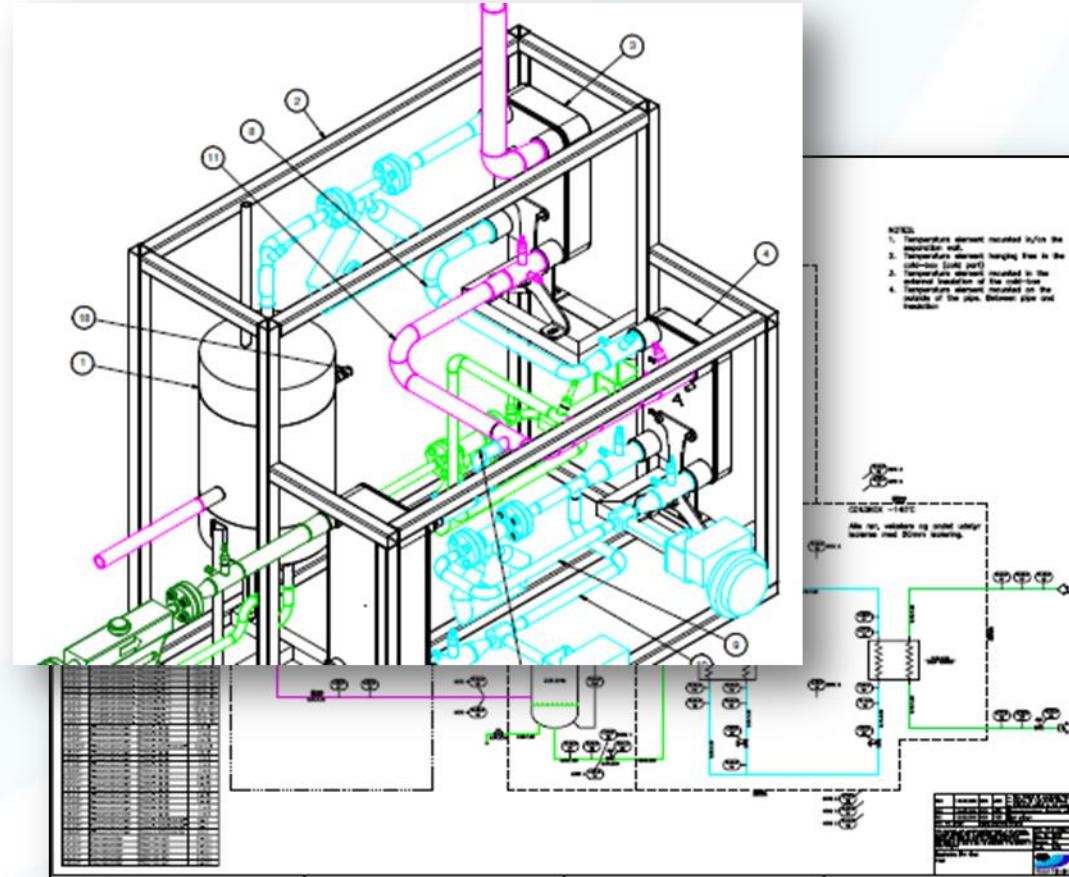
Facts:

1. Connected to 40/80 bar NG grid.
2. Removal of THT
3. Separation of CO²
2. Normal conventional cooling system
3. The condensation plant where a cooling system with multicomponent refrigerants where the natural is cooled down to the last point for liquefaction.
4. Stored in semi pressured tanks
5. Distributed by tank-trucks to consumers



Design & Construction of the Micro Liquefaction plant

Design of Micro plant



System optimizing

Optimization/analysing areas

- Start-up time
- Process controlling
- Exchanger dimension
- Mix composition
- Flow regulations
- Stress test

Mass of data from May 23rd to Nov 1rd 2016

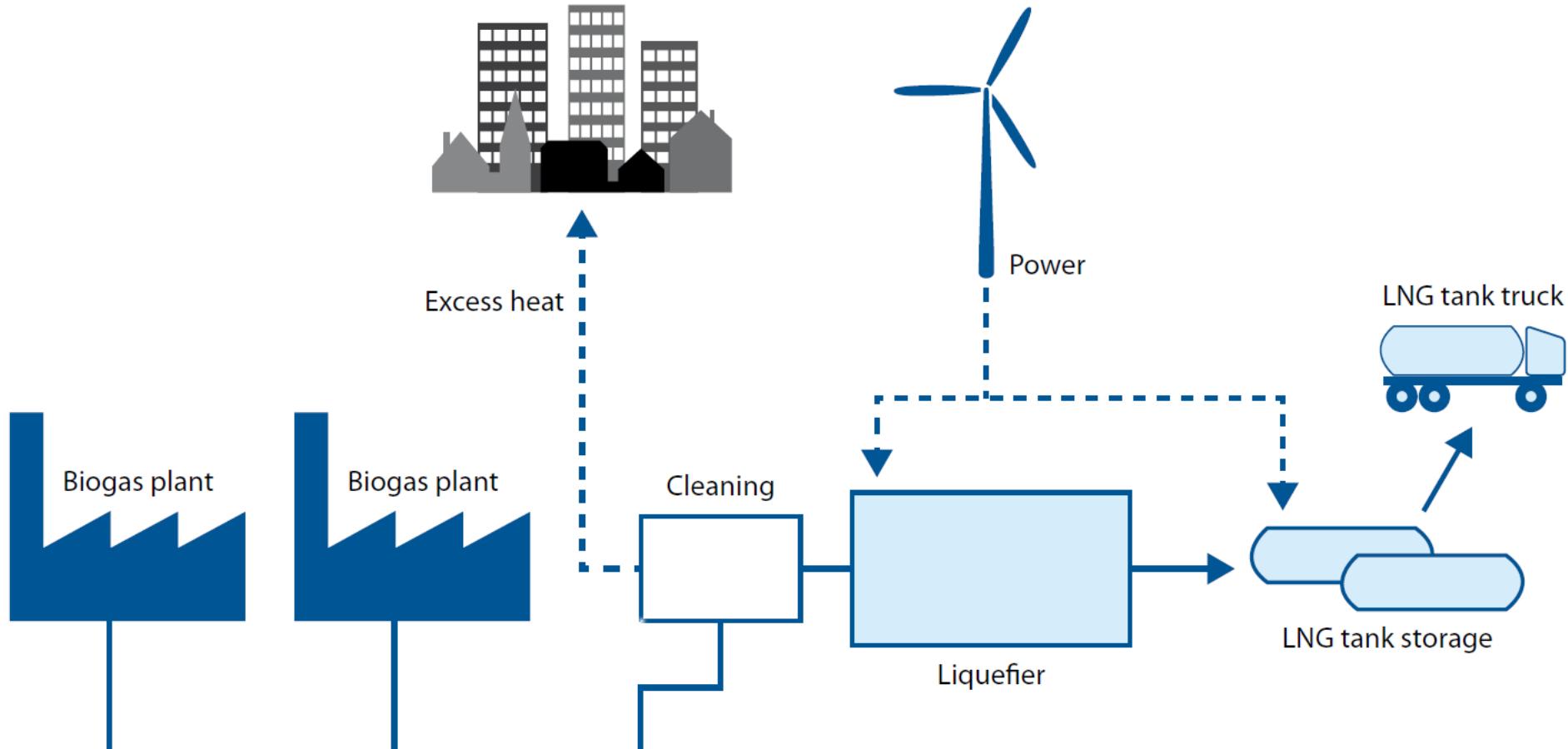
- 186 Testing hours
- 84.554.786 Measurement values
- 63.273.938 is operation data

Nitrogen at minus 146°C

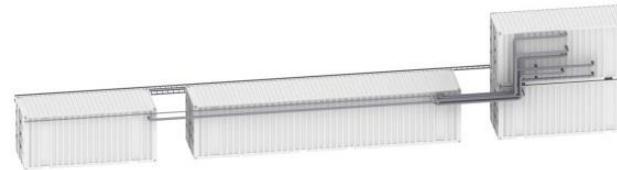


Nitrogen is used instead of NG to have the same condition throughout the exchanger.

Liquefaction system overview



Modular design

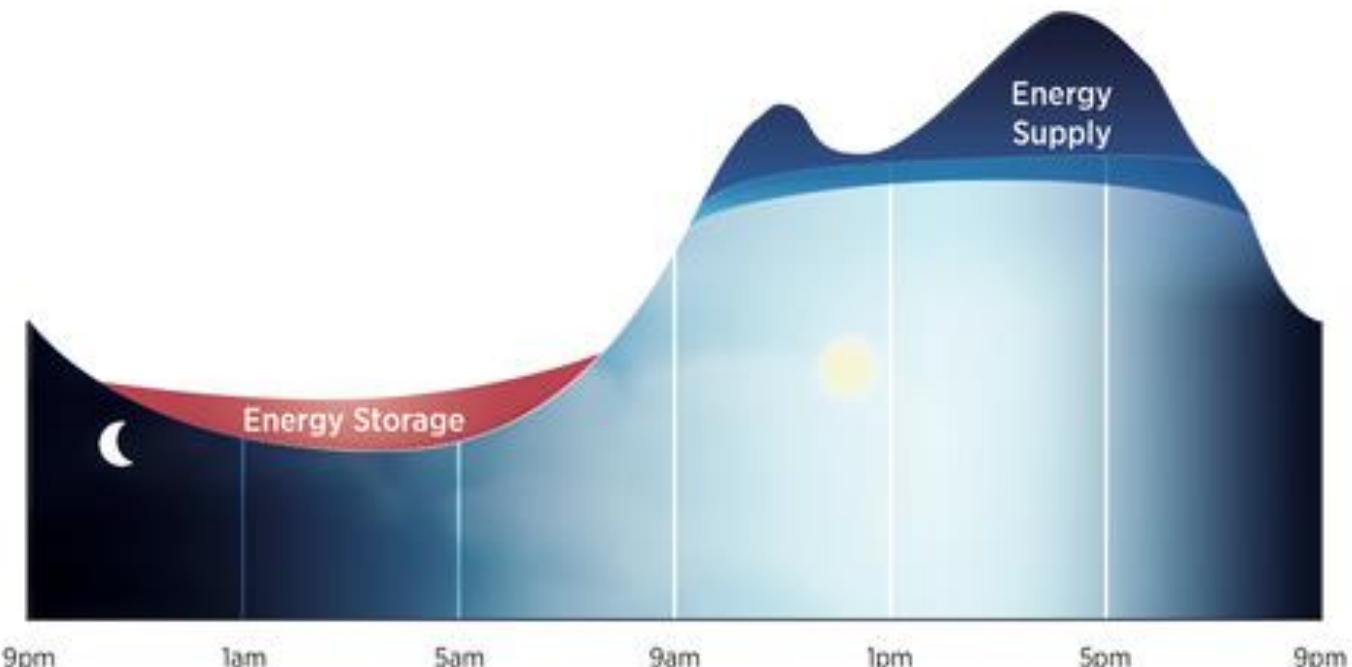


50TPD

Peak Shaving

Possibilities from Peak Shaving:

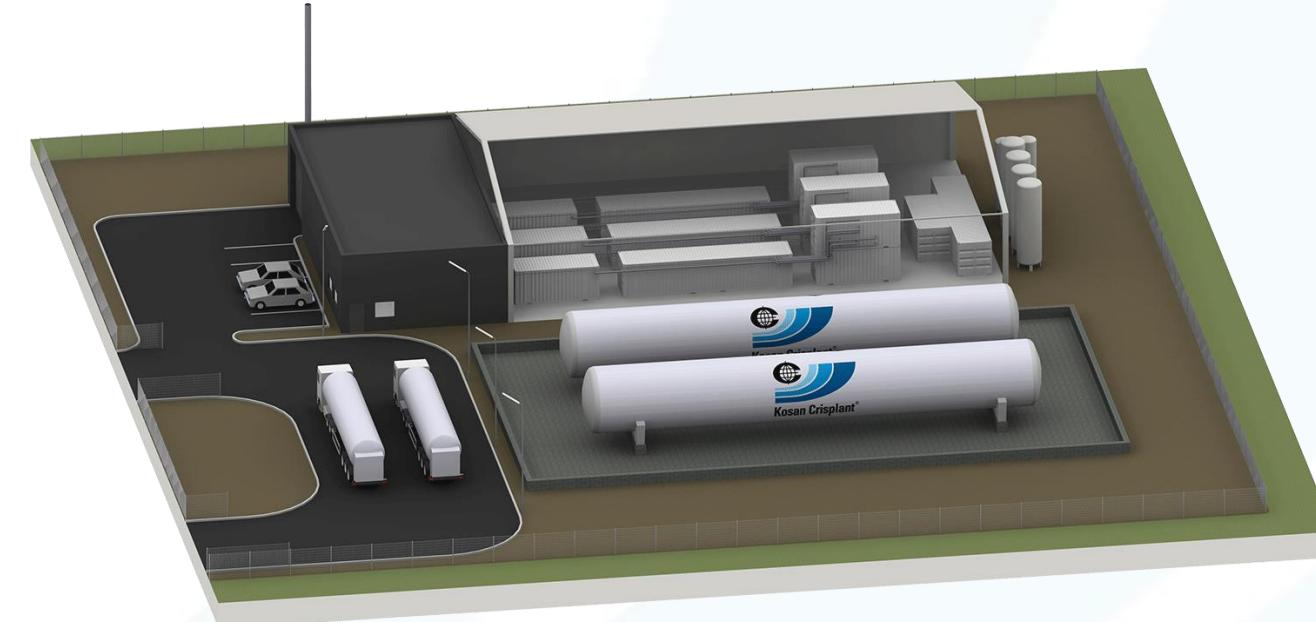
1. Produce LNG when electric pries are low
 - Power from windmills
2. Produce LNG/LBG when gas prices are low
 - Oversupply of biogas
3. Hedging
 - Reduce the risk of adverse price movements
 - Produce to stock







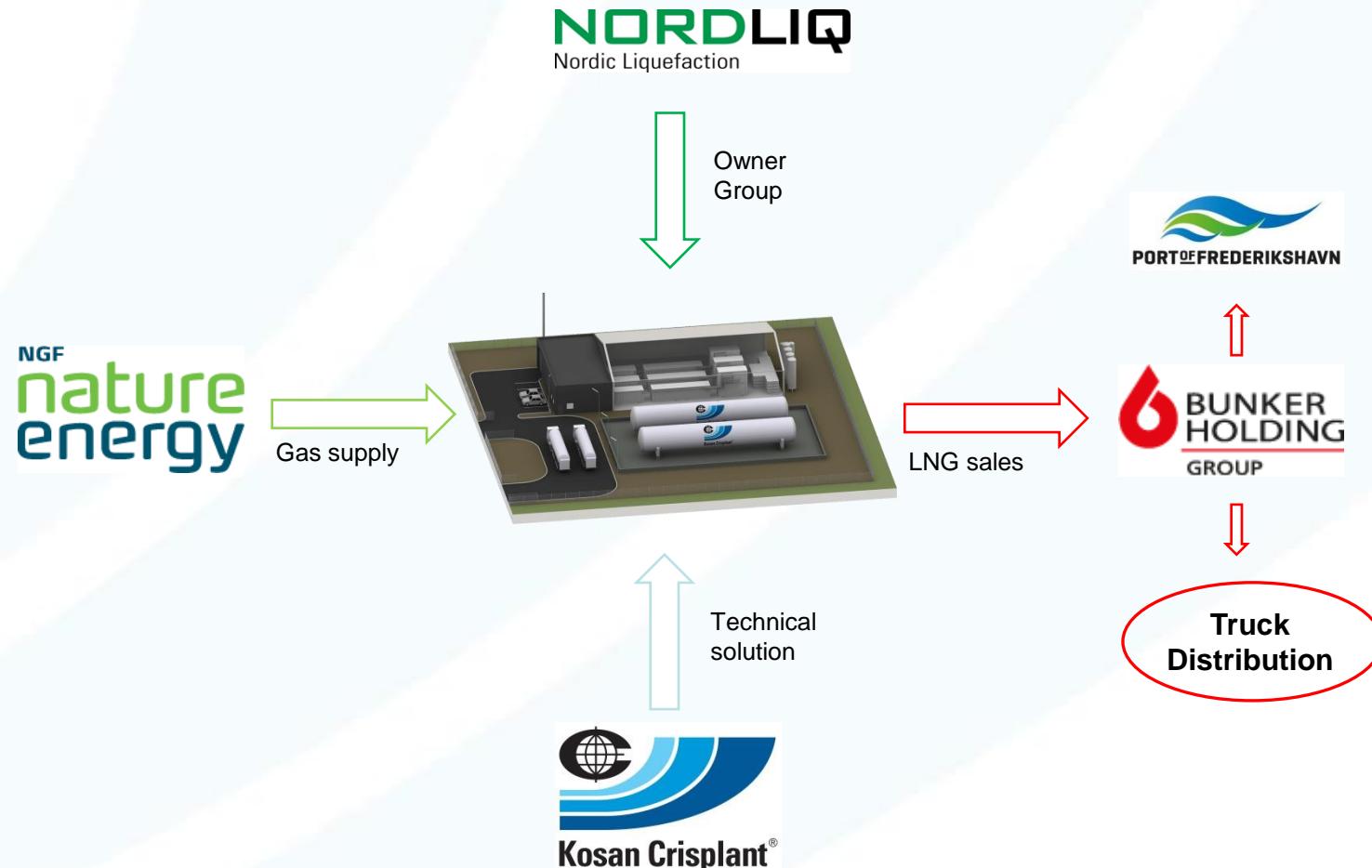
The Liquefaction plant



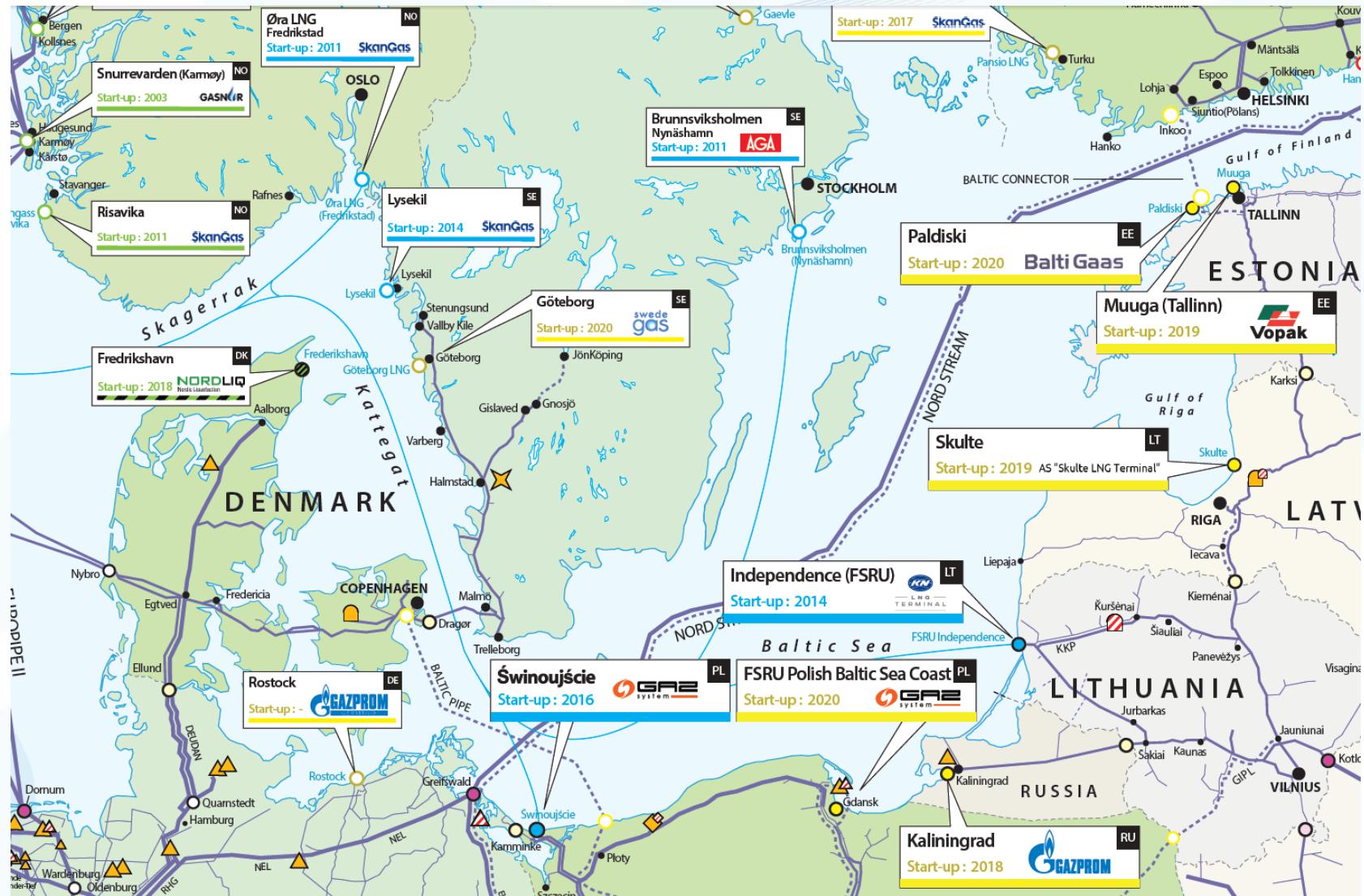
- Production of LNG & LBG
- 160 ton production capacity
- Built in modules of 50 tons
- Possibility to expand to 300 tons production.

	LNG			Natural gas consumption
	Qty Ton	Vol m³	Energy MWh	Nm³
Year production max	52.800	125.714	778.976	64.155.529
Year production min	17.600	41.905	259.652	21.385.176

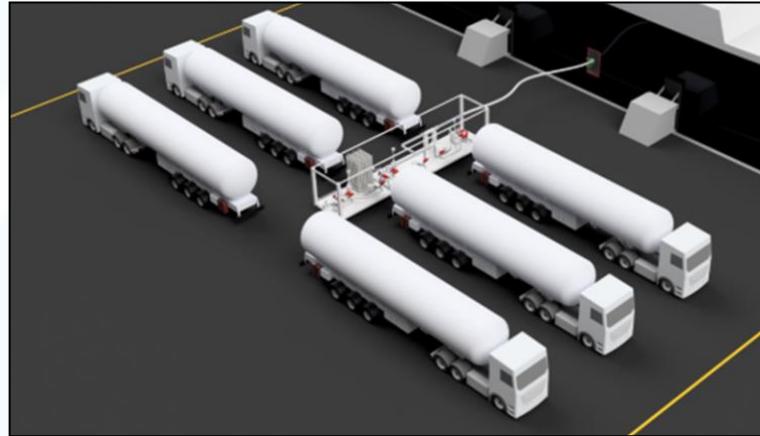
Main project partners



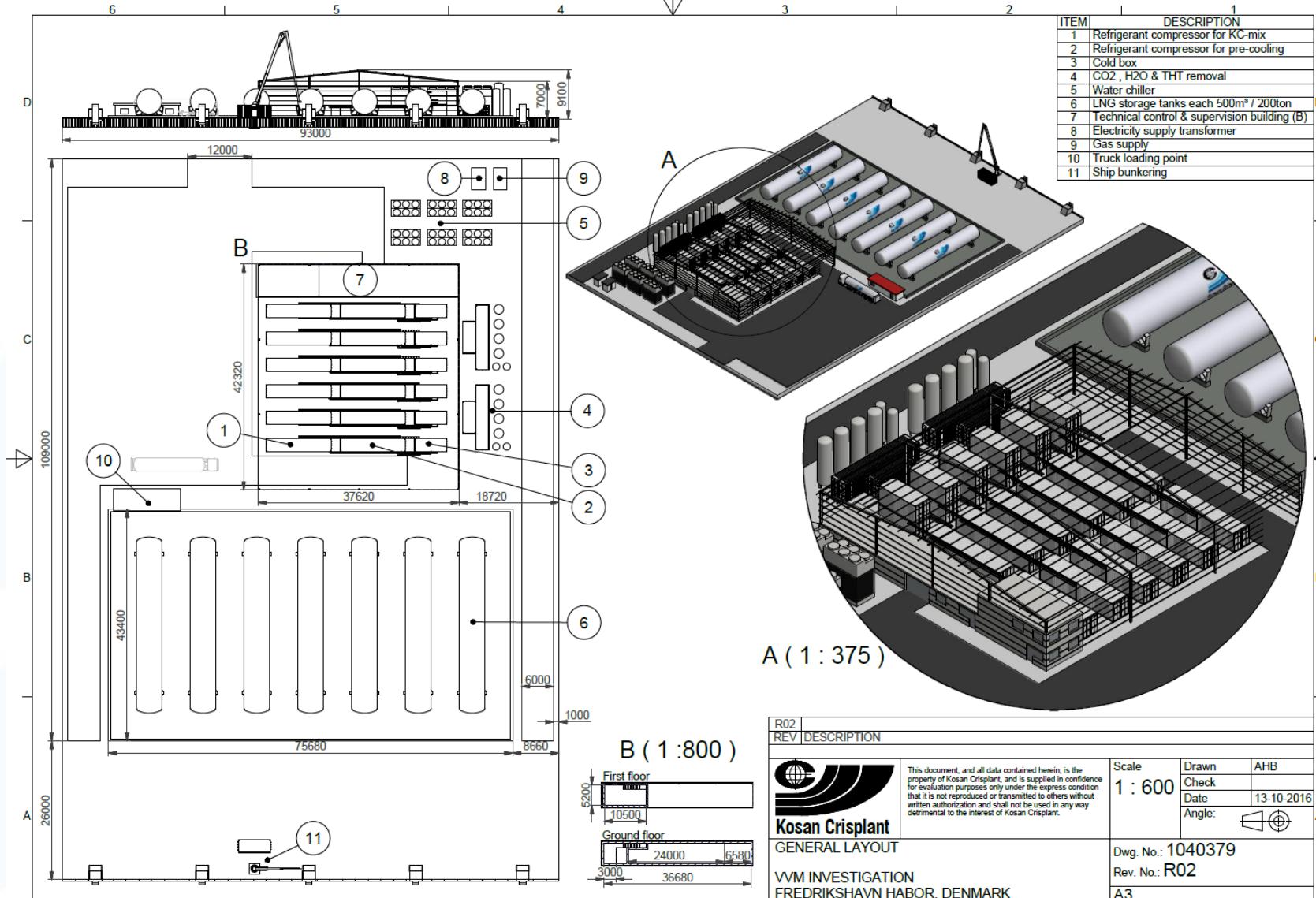
Placement - NORDLIQ



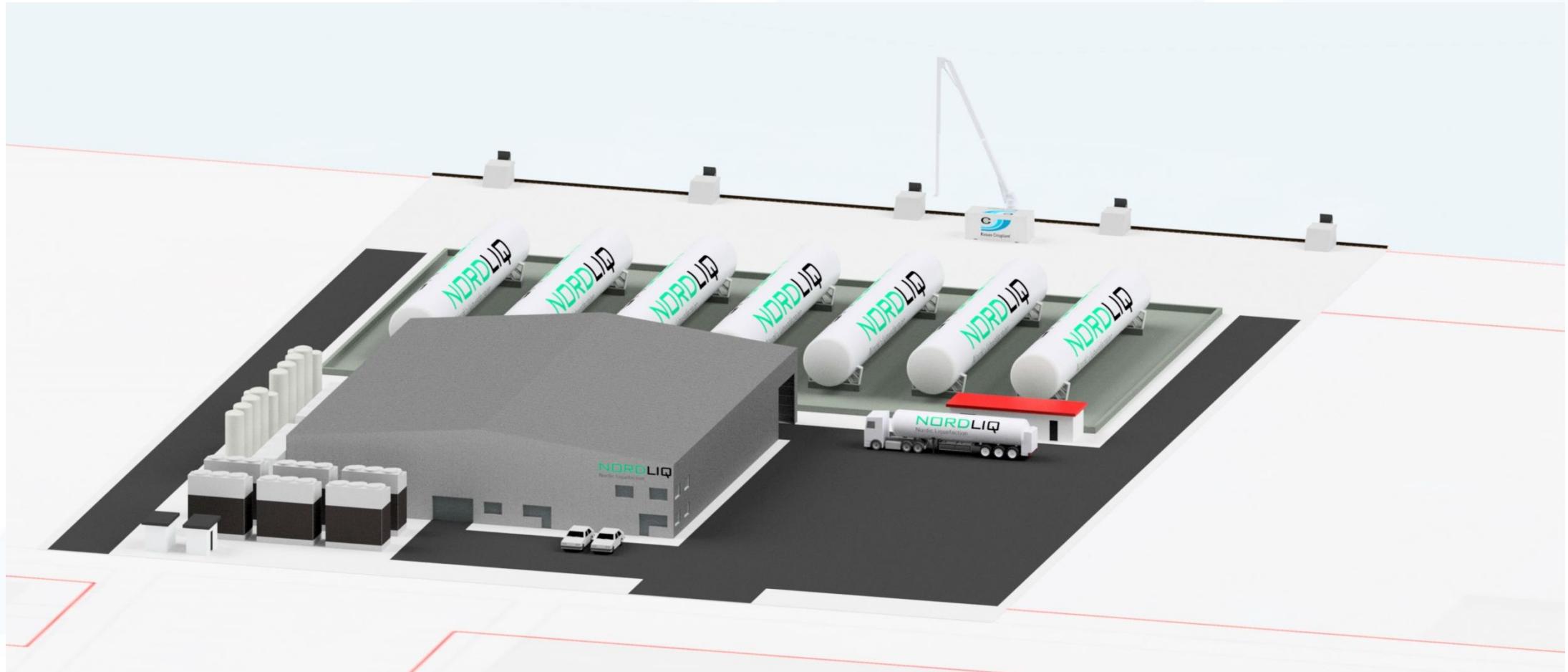
Supply possibilities from NORDLIQ



The complete plant – 300 tons/day



The complete plant – 300 tons/day





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