



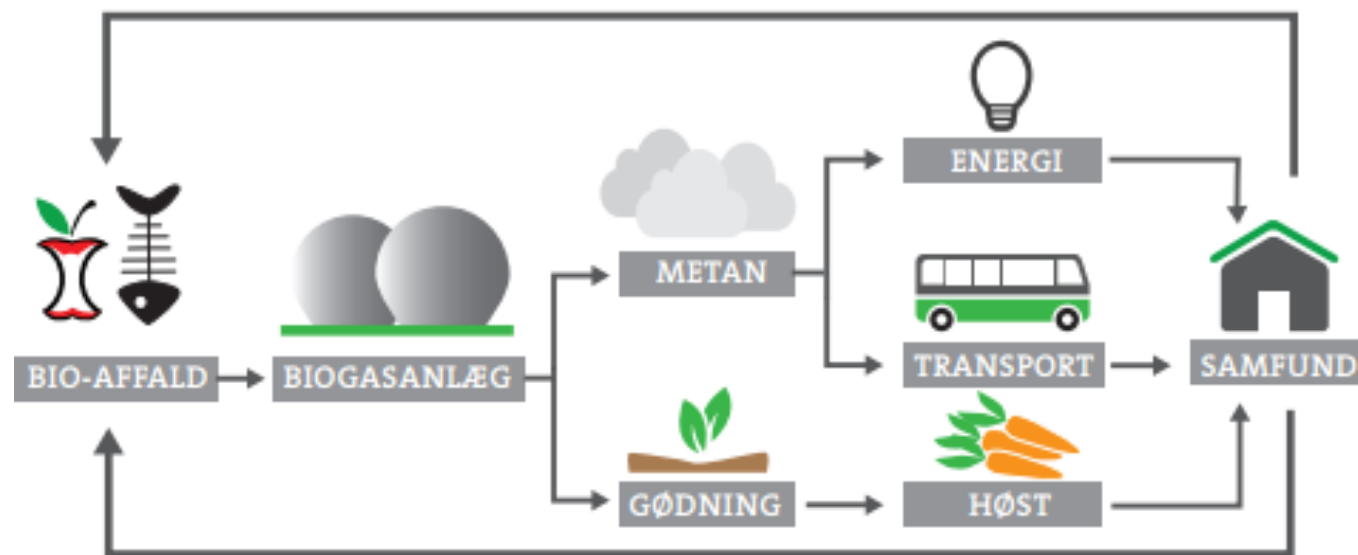
LNG/LBG small scale production

Workshop Zwolle

24.4.2019



We are engineers, so our circular economy is rectangular:





Local bioenergy solutions from Nærenergi

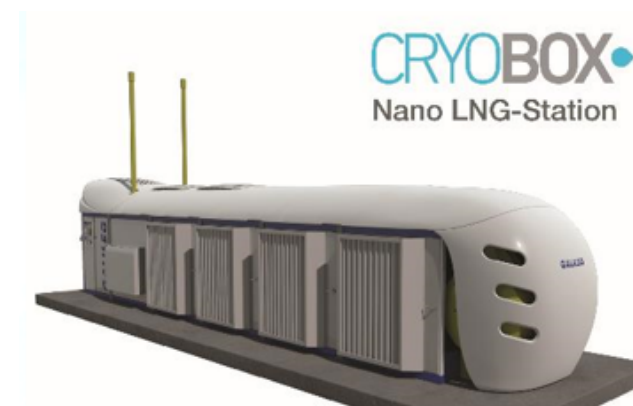
- Local focus: Bioenergy plants, nordic market.
- Offices in DK and NO: Copenhagen, Haugesund and Stavanger
- Founded 2006
- Local adaption of systems from OEM partners.
- 15 dedicated employees – Engineers and gas technicians.
- Strong track record





- **Business segments:**

- Biogas plants and equipment
- Biogas upgrading plants
- Liquification of methane/biomethane
- Refuelling stations CBG, LBG





Transport of LBG – example Trondheim NO





Filling station
biomethane and LCNG in
Trondheim. 90 buses
filled every night. LNG as
backup system





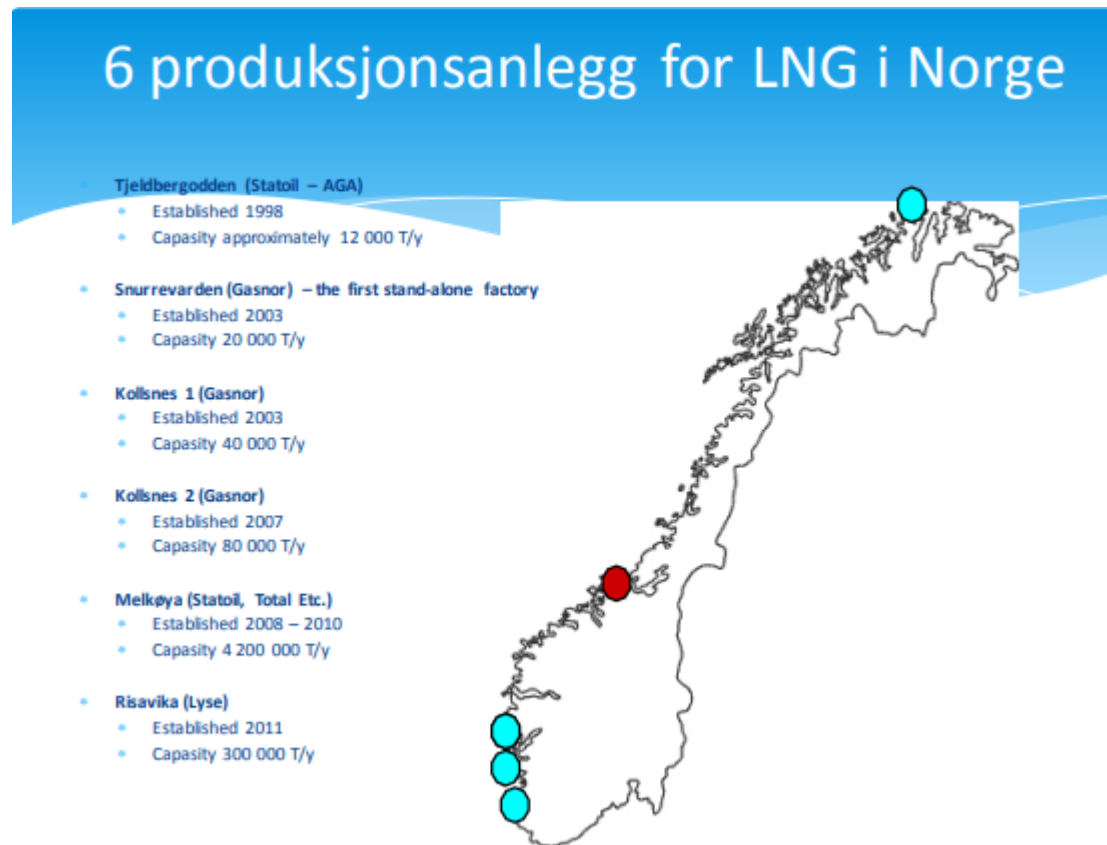
Worth noticing regarding biomethane

- Counts as advanced biofuel, when certified – Redcert as example.
- Double counting in accordance with EU directive
- Biotickets obtained, when used for transportation fuel.
- Market for biotickets expected to grow, as liquid fuels like palm-oil are being banned.
- Heavy transport climate impact under pressure – i.e. demand for biomethane as biofuel is increasing.

- EU demands are getting stricter – goal is 10% biofuels in transportation by 2020. (Today 5,75% in Denmark as example)



LNG production plants in Norway since 1998.

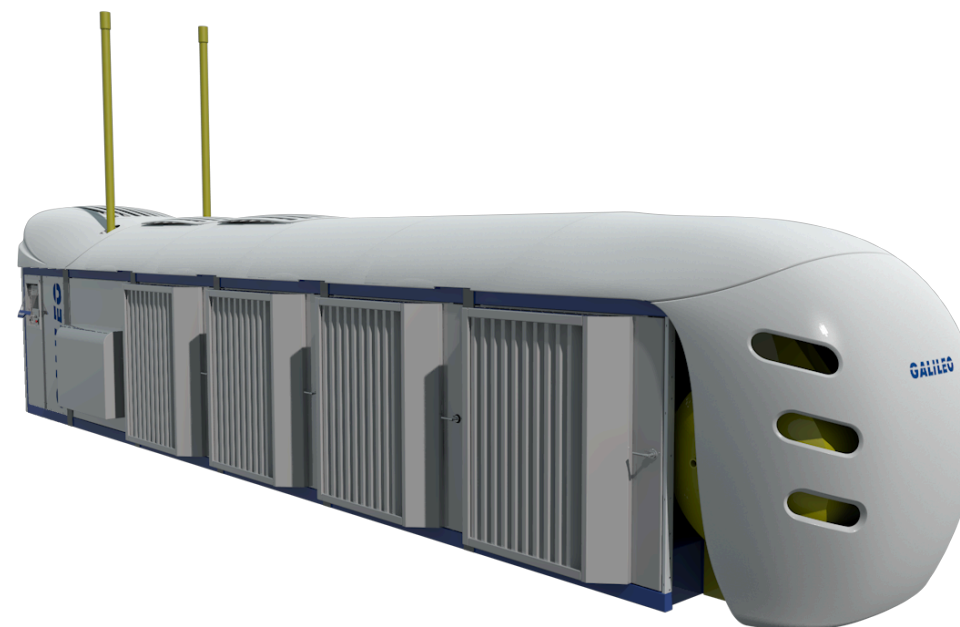




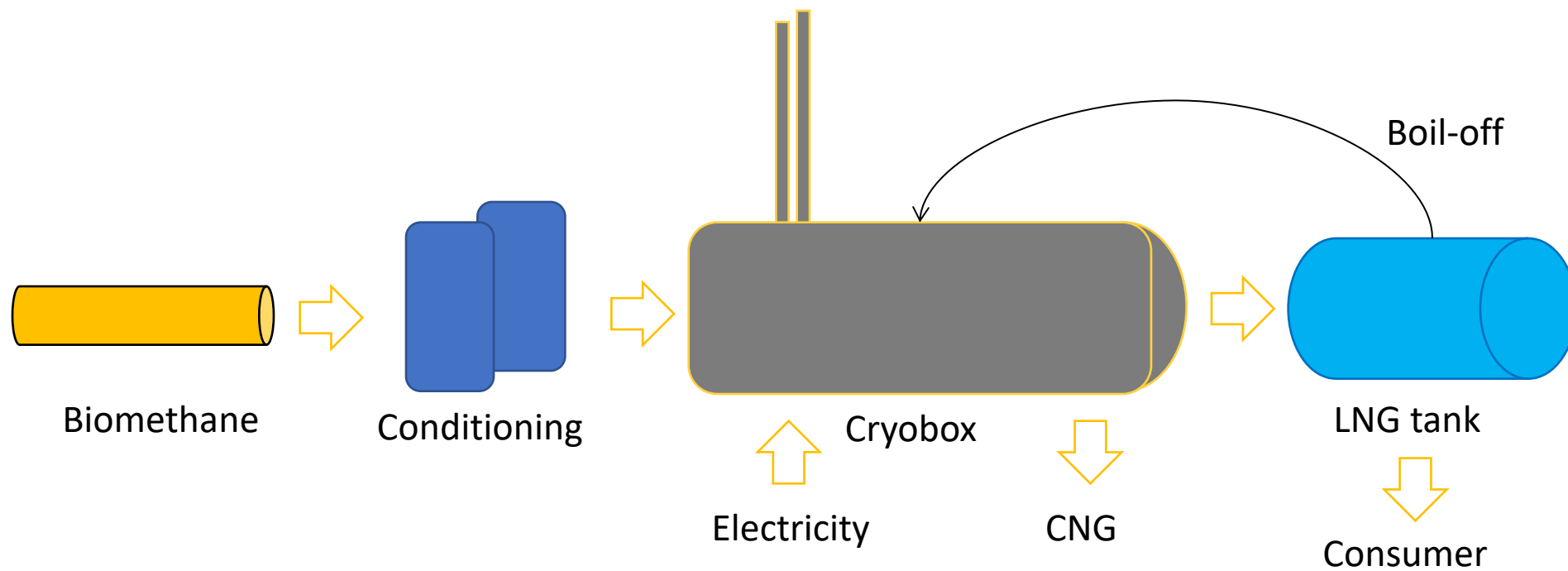
Liquid Biomethane - LBM

GALILEO

Natural Gas Technologies

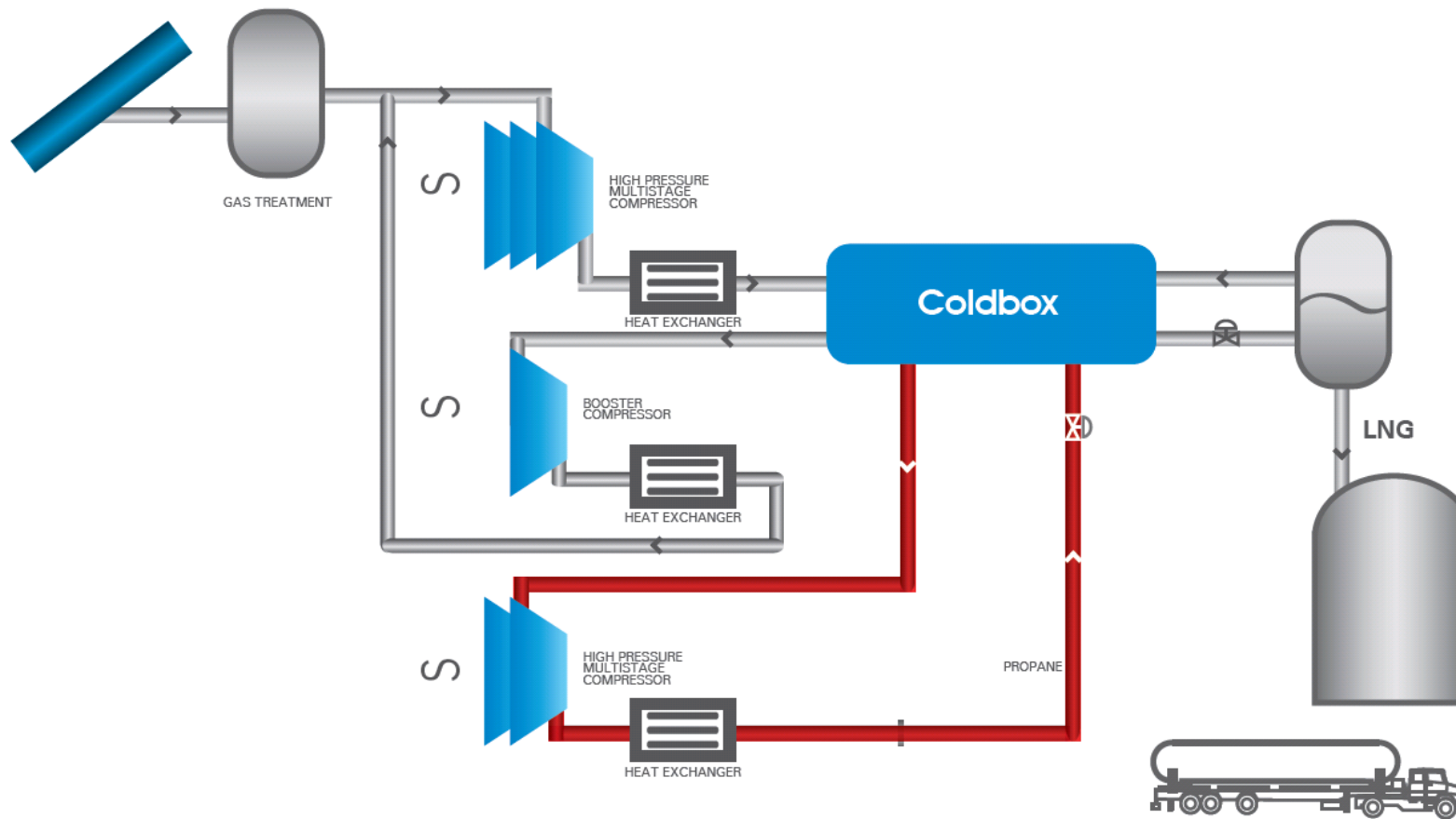


Overview LBM – Liquid Biomethane



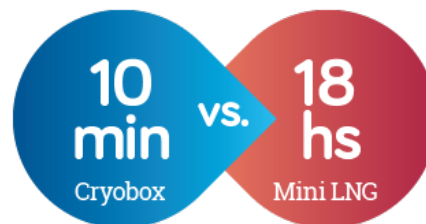
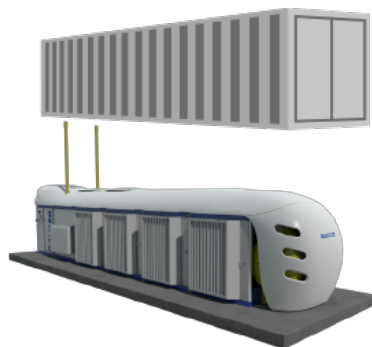


How it works?





Cryobox – Advantages



Containerised design
Easy to install and relocate.
From order to commissioning in only 6-7 months.

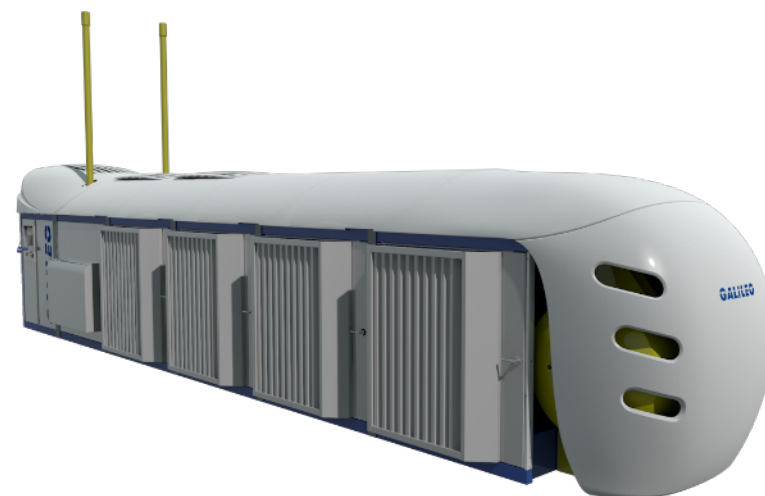
Fast startup, without energy losses or inefficiencies, the maximum production level is reached in only 10 minutes. A clear advantage when compared to medium or large-sized plants which require 12 to 18 hours to start production.

Boil-off gas is captured and recirculated within the Cryobox



LBM Production

	Cryobox 500/600	Cryobox 200	
Inlet pressure	4-15	12-15	Bar g
LBM output	520-660 12-16	170-200 4-4,5	Kg/h Ton/day
Installed power	450-550	132	KW
Driver	Electric Motor	Electric Motor	
Relative powerconsumption (Depending on inlet pressure)	0,66 – 0,85		kWh/Kg LBM





Success Cases Galileo

Cryobox® Nano LNG-Station bringing LNG to the service of transport

Galileo have created Cryobox®, the first Nano LNG-Station that has brought LNG to the transport industry. Seven Cryobox® units supply LNG to the "Francisco", the first high-speed ferry powered by LNG fueled turbines.



Transforming the problem of flaring into an opportunity

In Bakken, North Dakota, Galileo integrated flare gas capture and liquefied natural gas LNG production right at the wellhead. Thus, LNG can be transported and consumed as a fuel for drill-rig power generation and frac-water heating.





Well-head gas rescue - Argentina





Budget estimate Cryobox 600

Cryobox 600 – 610 kg/h LNG/LBG (Depending on supply to the system)

Inlet pressure min. 15 barg.

Installed power: 500 KW

Relative energy consumption 0,82 KWH/kg LNG/LBG

Budgetprice 4,5-5,0 mio EUR depending on exact location and scope.

Service, spareparts etc. 0,012 – 0,015 EUR/Kg LNG/LBG in a service agreement

Based on danish location and 8.300 hours/year operation.

In addition, LNG/LBG storage- and loading facilities must be established (Not included in above estimate).



Microscale LNG/LBG production





Budget estimate – Micro systems

Capacity output (KgLNG/h)	Investment estimate	Energyconsumption KWh/KgLNG	Servicecost EUR/KgLNG
40	1 mio EUR	1,0	0,020
120	2,2 mio EUR	0,95	0,018
200	2,8 mio EUR	0,90	0,016

Typically connected to biogas upgrading system with limited capacity. Inlet pressure minimum 12 bar g. Delivery containerized. No civil works included.



Nærenergi as local partner

- Local adaption to authority requirements.
- Engineering, planning, installation works
- Service partner 24/7

- Financing with external partner is being investigated.



Thanks for your attention

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