

GREENING THE DANISH GAS INFRASTRUCTURE

i-SUSTAIN visit to Energinet 12-09-2023

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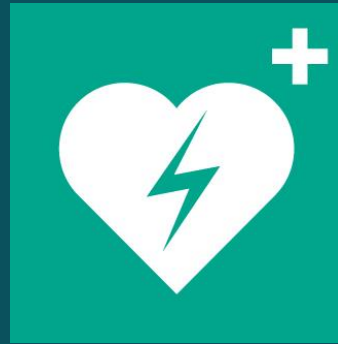
Agenda



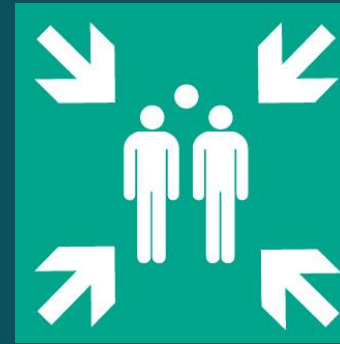
1. Who are we?
2. Danish Biomethane Experiences
3. Future Danish Hydrogen Backbone
4. EU Developments and Regulation
5. Creating value through Hydrogen storage
6. Plans for onshore CO2 storage in Stenlille



EMERGENCY EXITS



DEFIBRILLATORS



RALLYING GROUND

ENERGINET

WHO ARE WE?

ENERGINET

THE ENERGY BACKBONE

We operate and develop the transmission systems for gas and electricity in Denmark.

ENSURE BALANCE

We have the day-to-day and long-term responsibility for the overall electricity and gas system in Denmark.

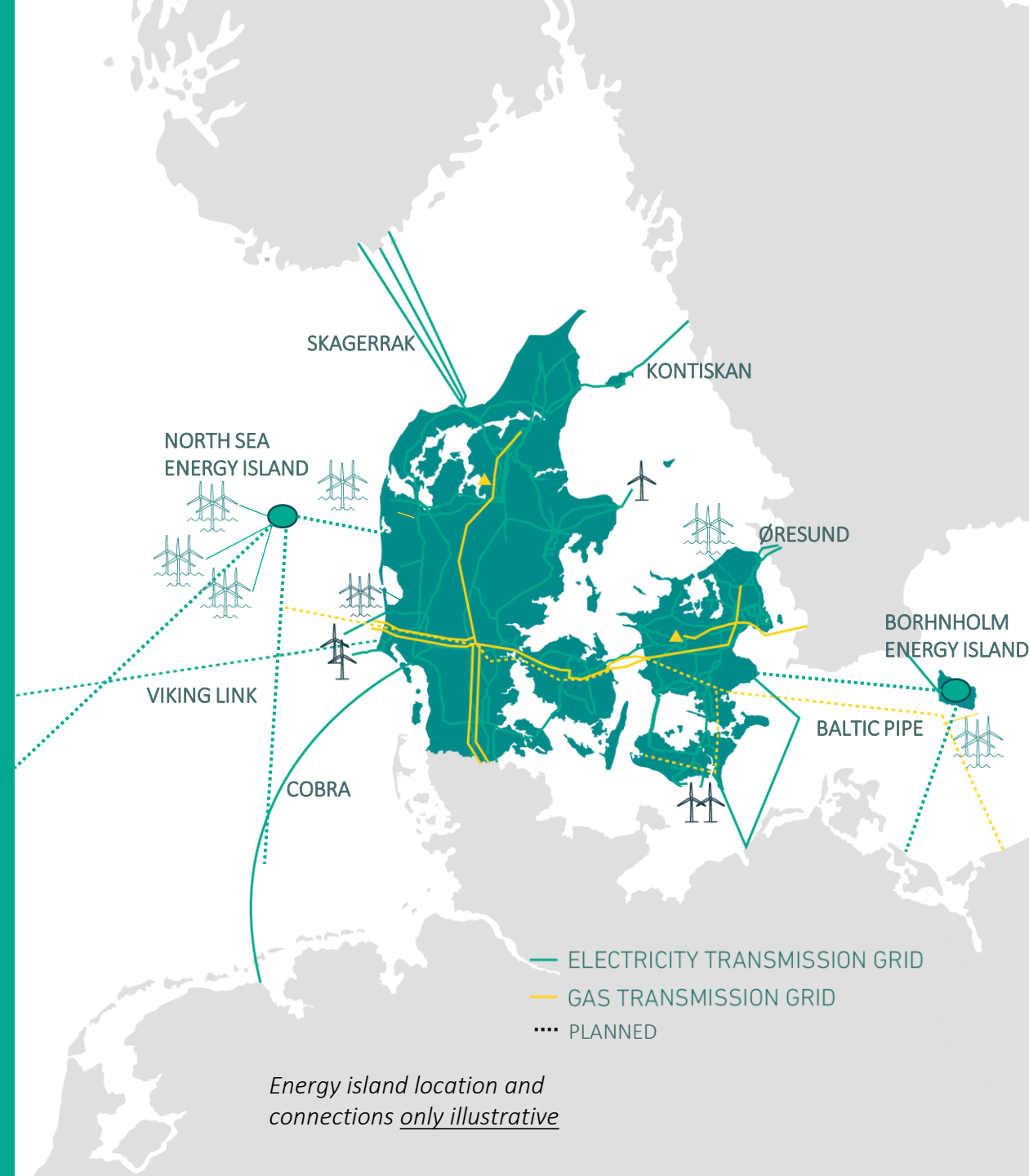
WORKING FOR THE SOCIETY

Owned by the Danish Ministry of Climate, Energy and Utilities we safeguard society's interests as we move to a 100% green energy system.



VISION

GREEN ENERGY FOR A
BETTER WORLD



A BALANCING ACT

We work to make sure that the green transition is carried out in an economically responsible way without compromising on Denmark's already very high security of supply.

Electricity 99,996 %
of the time

Gas always on tap

49,9% wind and
solar power

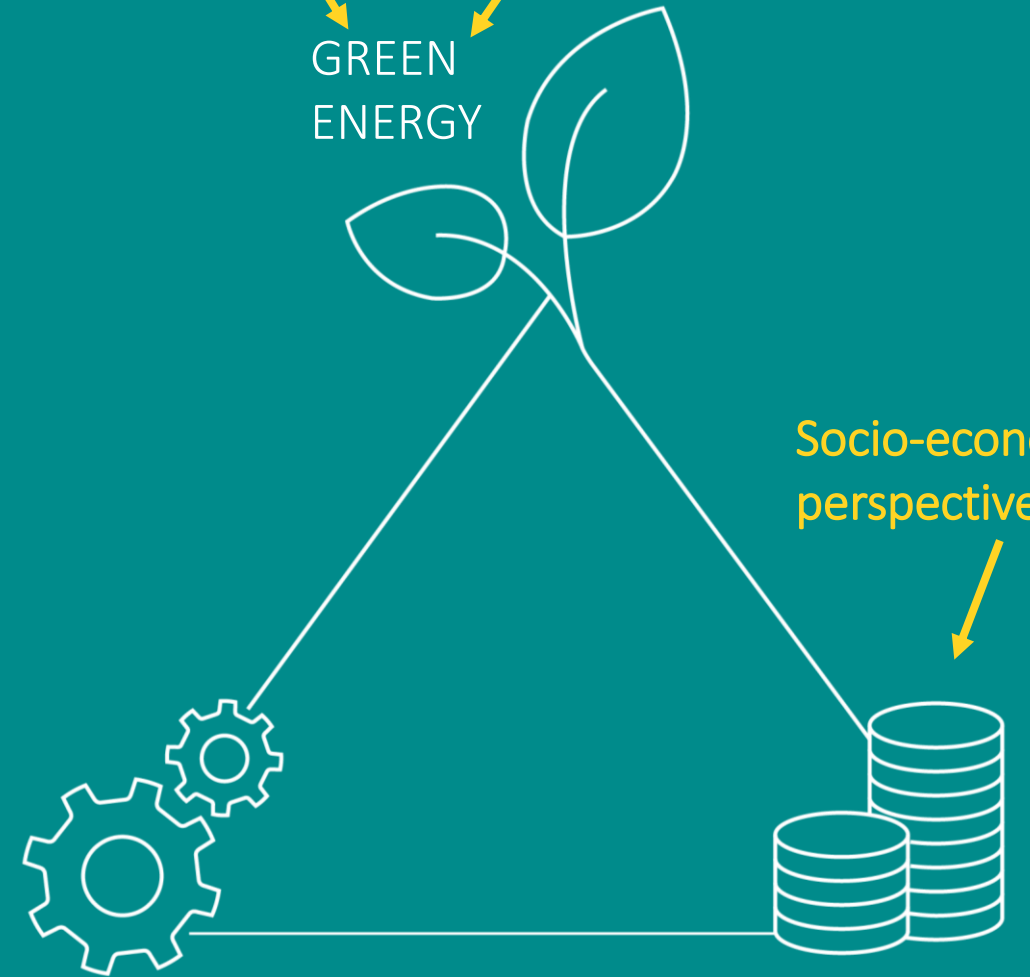
~40% biomethane

GREEN
ENERGY

Socio-economic
perspective

SECURITY OF SUPPLY

AFFORDABILITY

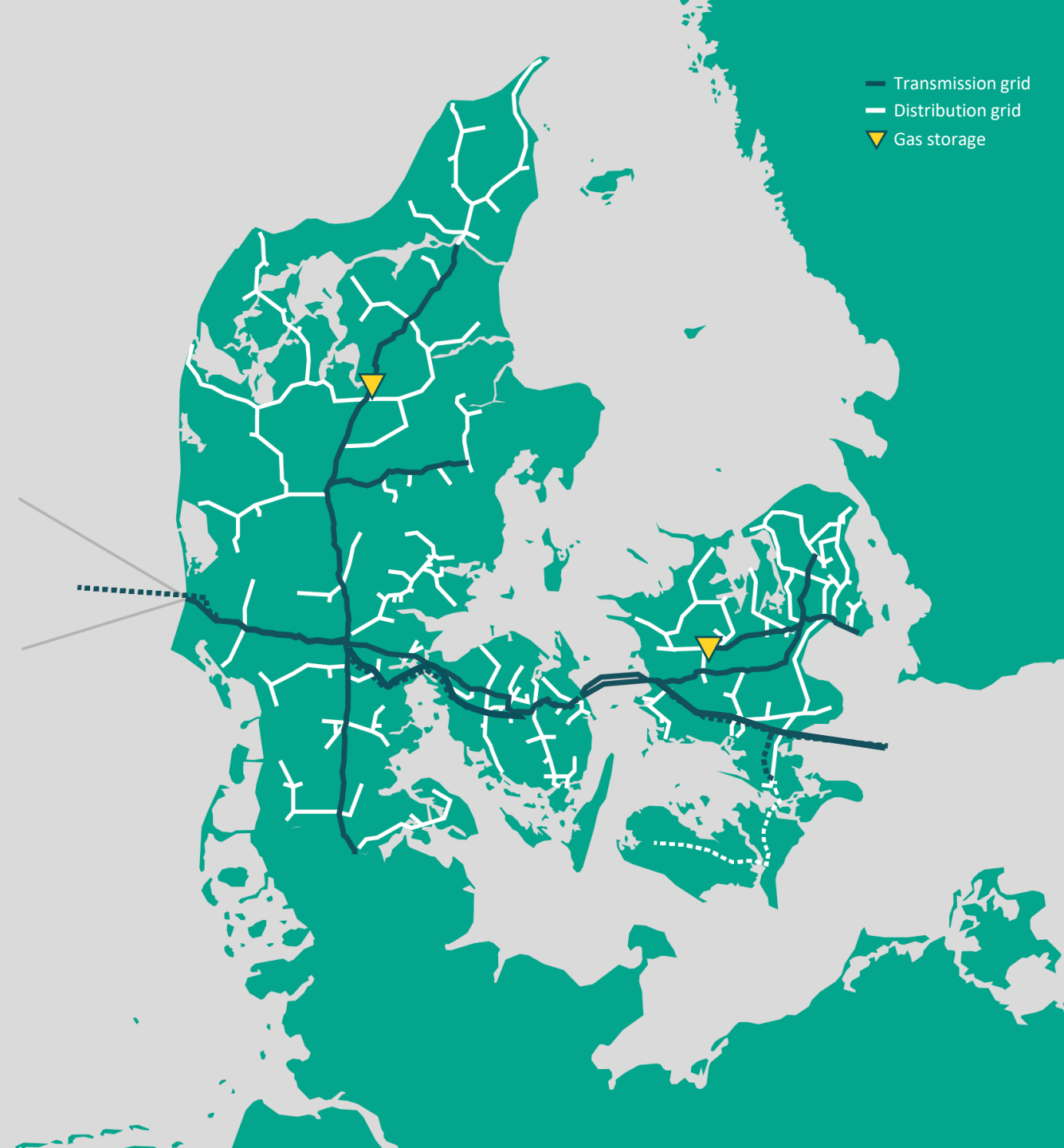




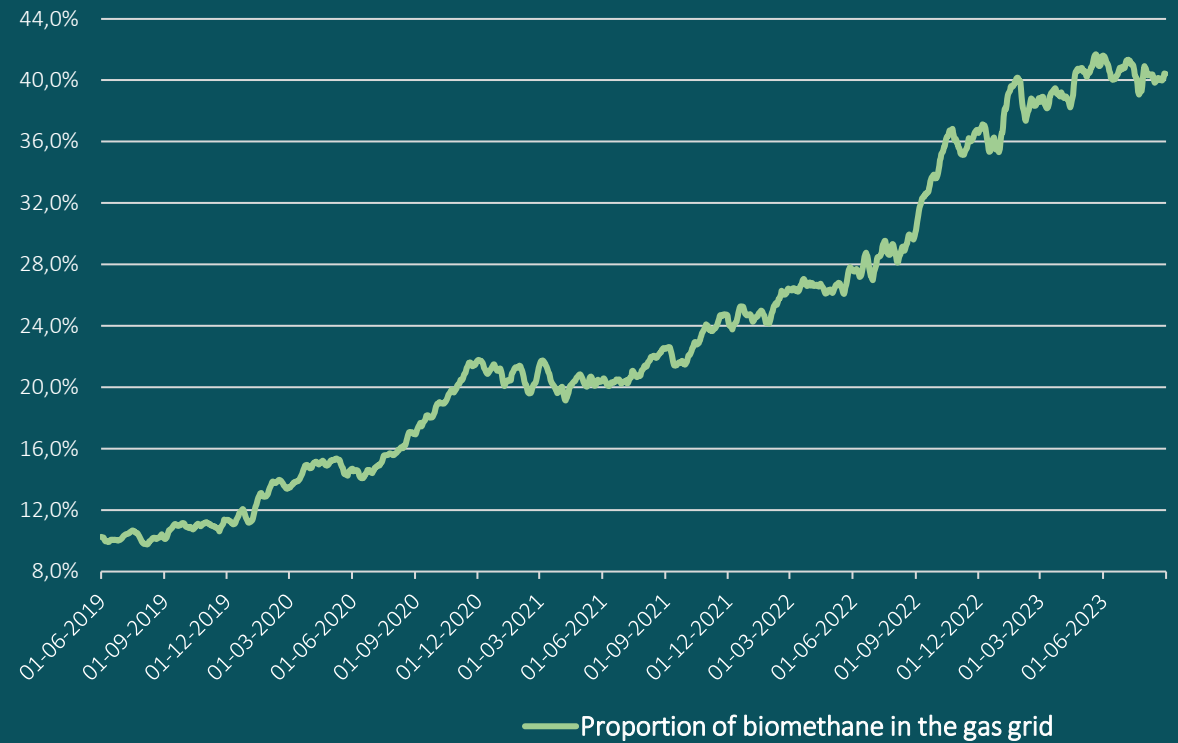
DANISH BIOMETHANE EXPERIENCES

THE DANISH GAS SYSTEM

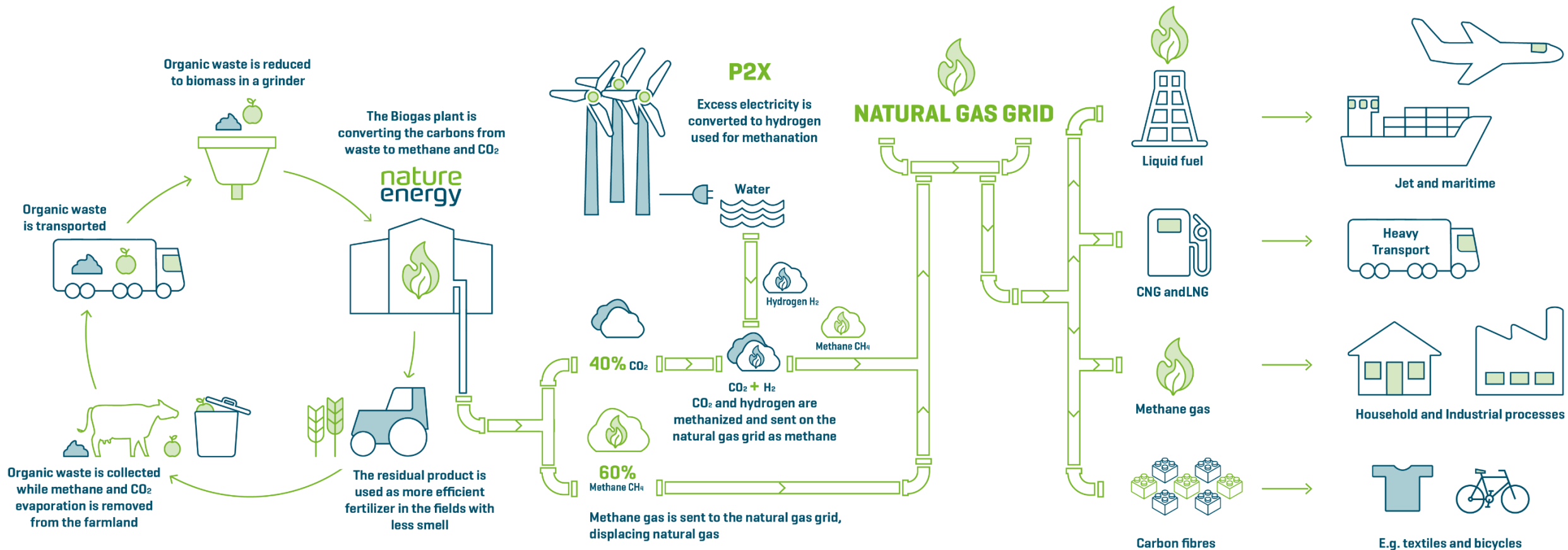
- Transmission grid → 80 bar
- Distribution grid → 40/20 bar
- 2 gas storage facilities
 - 1 Aquifer
 - 1 Salt cavern



GAS GETS GREEN



CIRCULAR ECONOMY



FROM FARM TO INDUSTRIAL SCALE

From 5 mill. m³ biomethane in 2015...



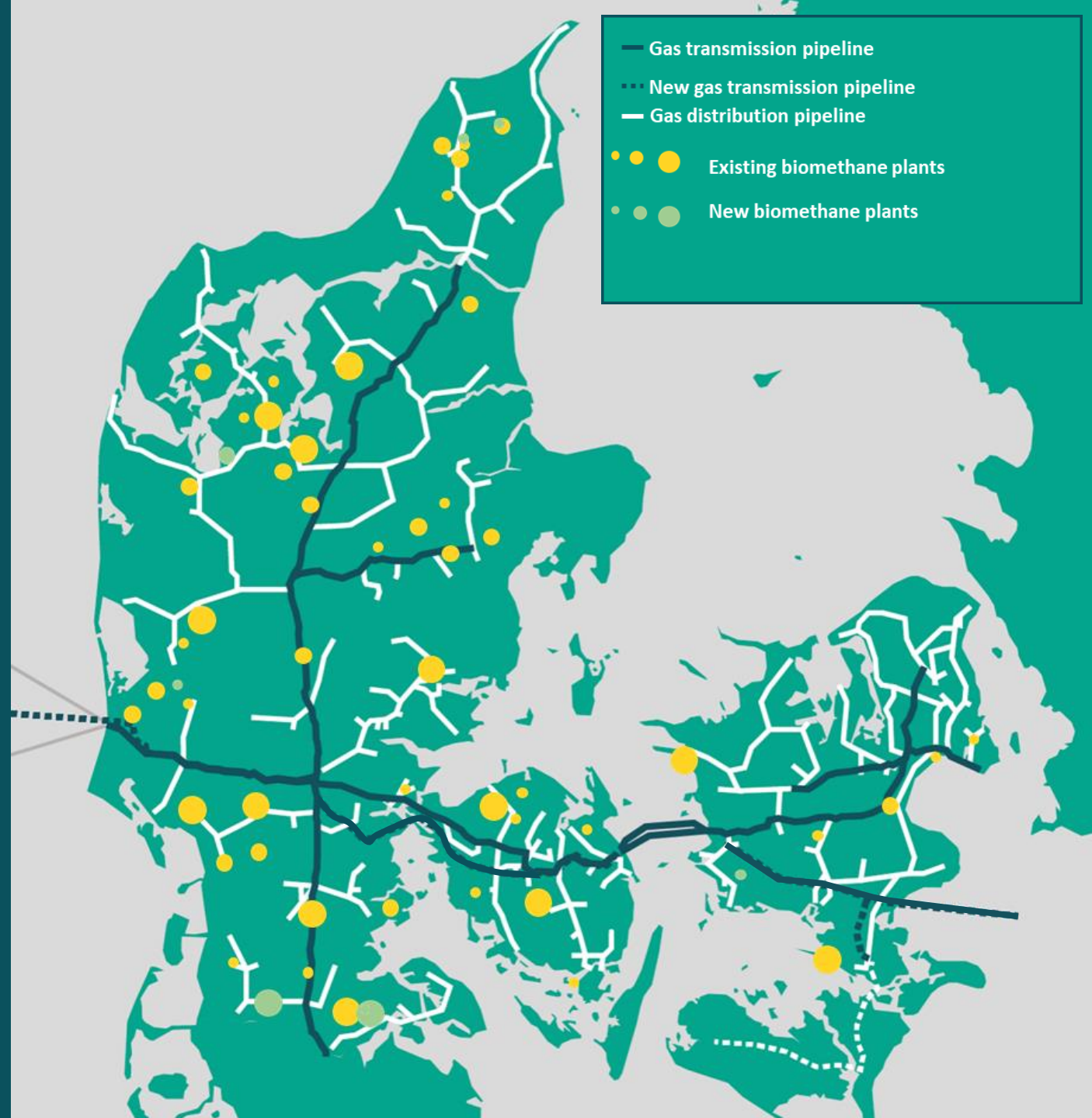
...to 22-25 mill. m³ biomethane in 2022.

Fun fact:

Average danish household uses approx. 1.550 m³ per year. A modern biomethane plant can therefore supply up to 16.000 danish households with renewable biomethane

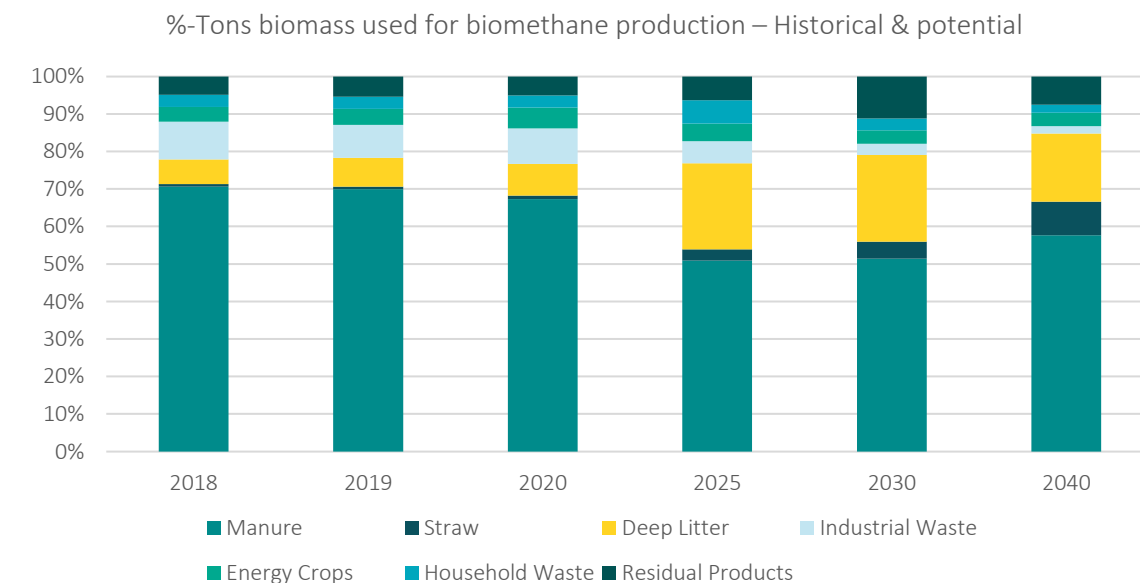
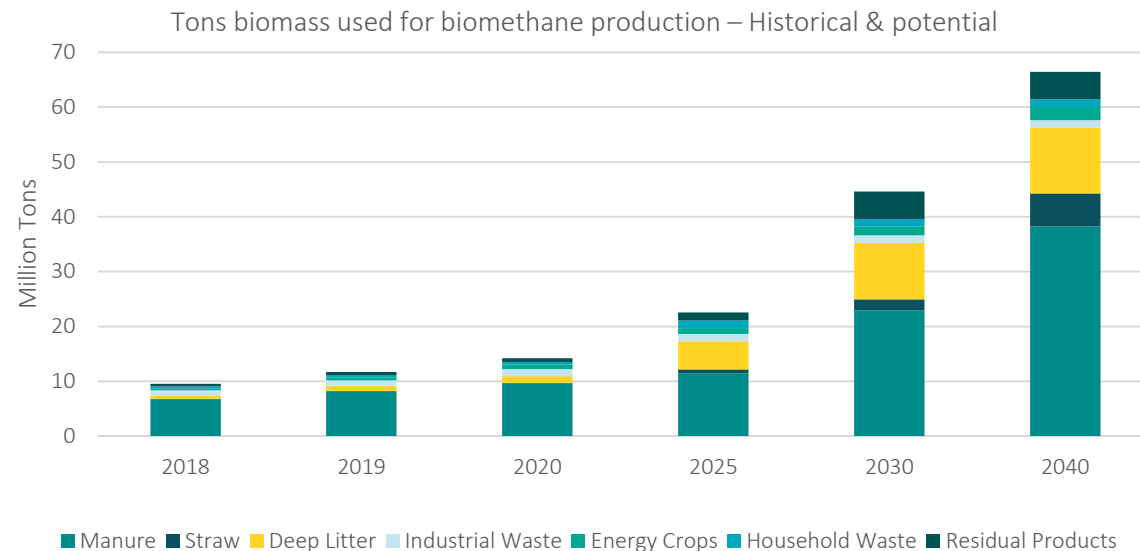
GAS GETS GREEN

- 56 biomethane facilities
- Numerous potential/rumoured biomethane facilities in pipeline
- Improvement of security of supply by decentralising supply



HOW MUCH BIOMASS IS USED?

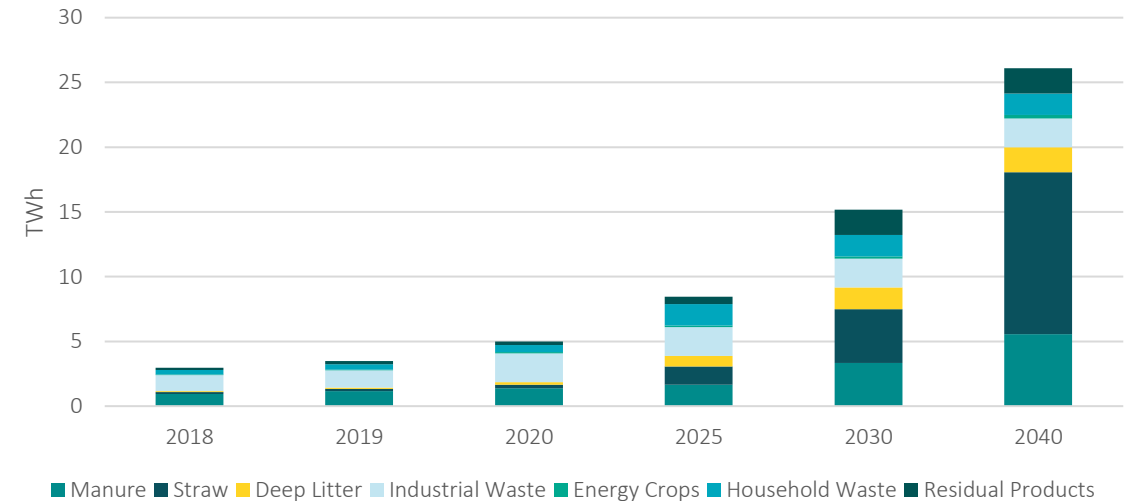
- **Manure** is currently, and in future, Denmark's largest source of biomass for biomethane
- Further potential for use of **deep litter** and **straw** in biomass energy mix



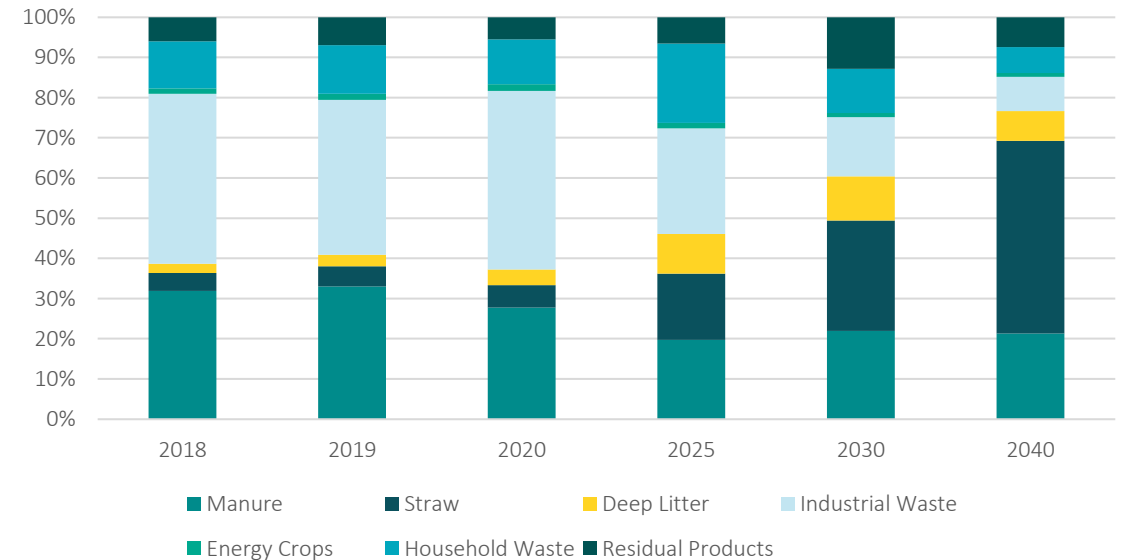
WHAT IS THE BIOMETHANE POTENTIAL?

- Low energy output from **manure** relative to Tons input
- High energy potential in using **deep litter** and **straw** for biomethane production compared to Tons input.

Biomethane production based on biomass type – Historical & potential



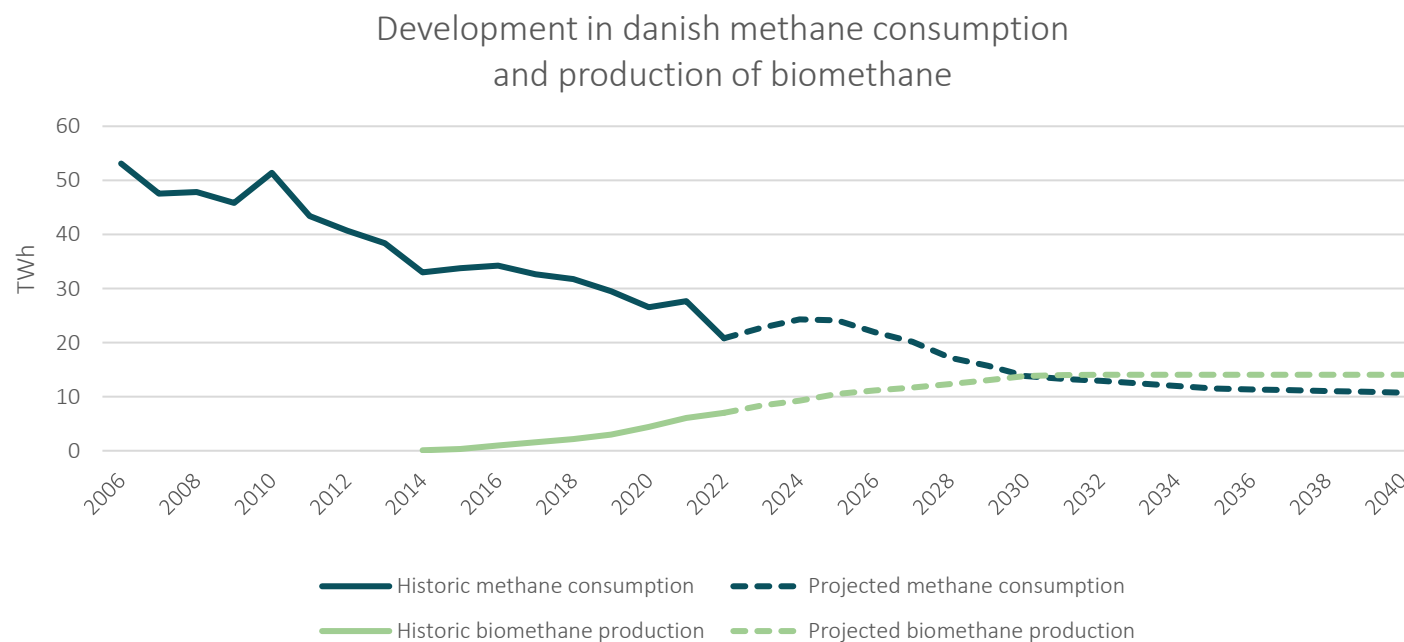
%-Biomethane production based on biomass type – Historical & potential



Source: Danish Energy Agency

100% BIOMETHANE BY 2030

- Historically high – peak in 2005
- First biomethane plant connected in 2013
- Biomethane production expected to grow until 2030 – tender for increased production from 2023



2012-2018: SUBSIDY SCHEME

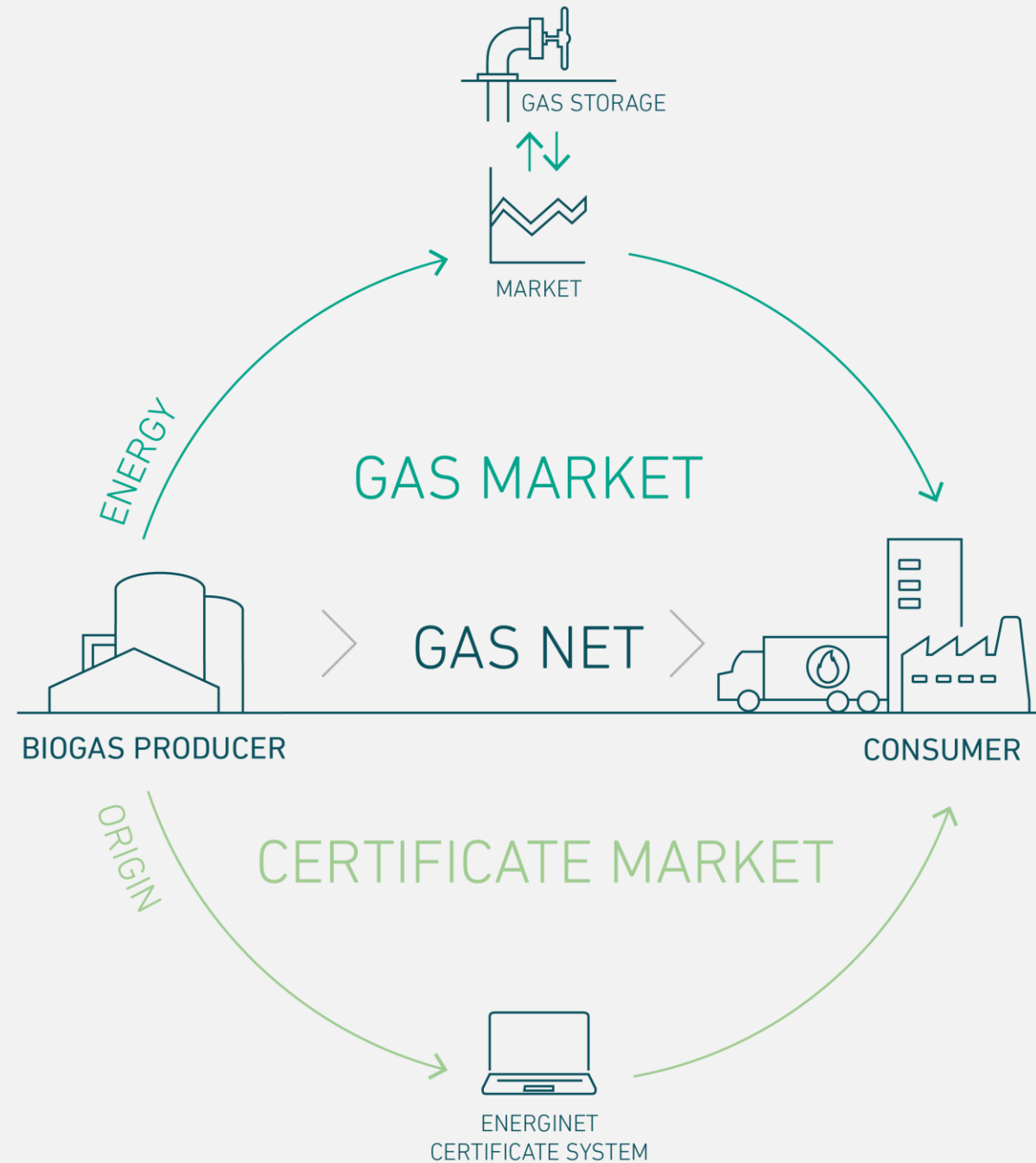
- A subsidy for biogas for either power, industry or biomethane
- Anyone could apply
- Feed in subsidy 55 USD/MWh – on top of natural gas price
- Officially closed in 2018
- Plants receiving the subsidy need to come online before 1/1/2023

2023-FUTURE: SUBSIDY SCHEME

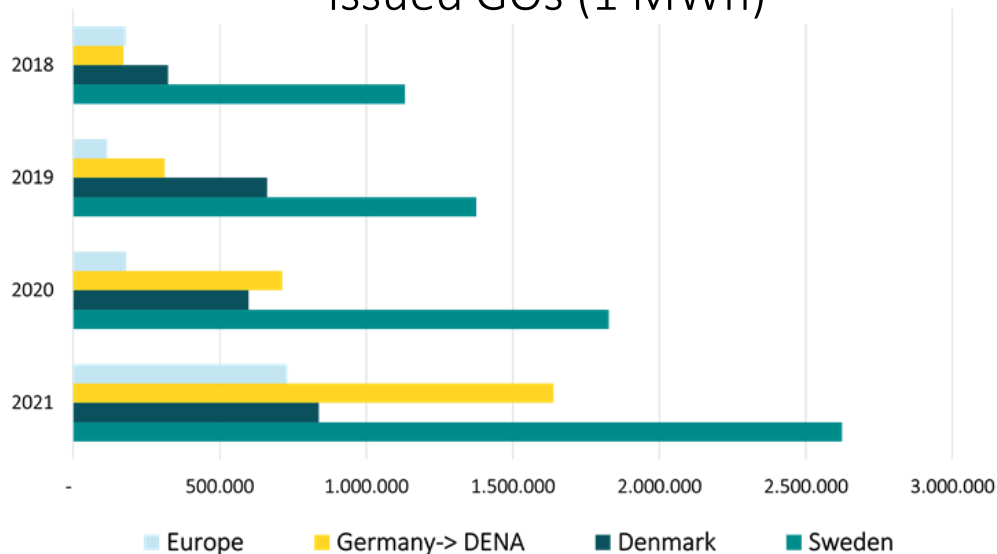
- Expected ready in 2023
- Fixed subsidy for 20 years based on technology neutral open public tendering
- Use of biogas in cogeneration is no longer subsidized
- Applicants with lowest bid for subsidy wins
- Capped at a natural gas market price of 62 USD/MWh

GAS MARKET AND GUARANTEE OF ORIGIN

- Annual audit of biomass reports from plant owners
- Annual audit of total sale per account holders
- Guarantees of origin issued for all injected gas
- Most GOs are currently exported



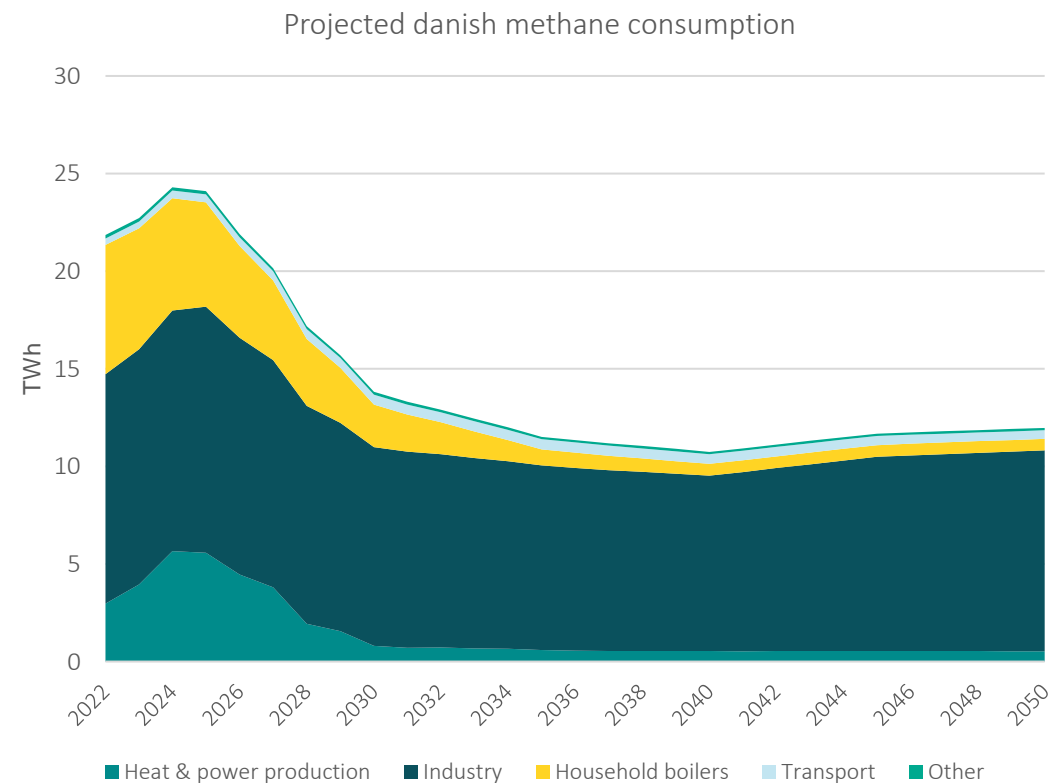
Issued GOs (1 MWh)



THE DEMAND FOR METHANE IS CHANGING

The Danish Energy Agency project the production and consumption of gas based on political ambitions

- Phasing out gas consumption for household and district heating
- Converting industry to green gas supply to reduce emissions from use of coal and oil.
- Growth in production of green gas – towards +100%



NOT EVERYTHING IS GREEN GAS...

... but Baltic Pipe is important for the European security of supply

- Benefits consumers with lower tariffs
- Strengthens security of supply across Europe
- Reduces energy dependency
- Reduces polish CO₂ emissions

