



HMN Naturgas I/S

Biogas in the natural gas grid: status and development in Denmark

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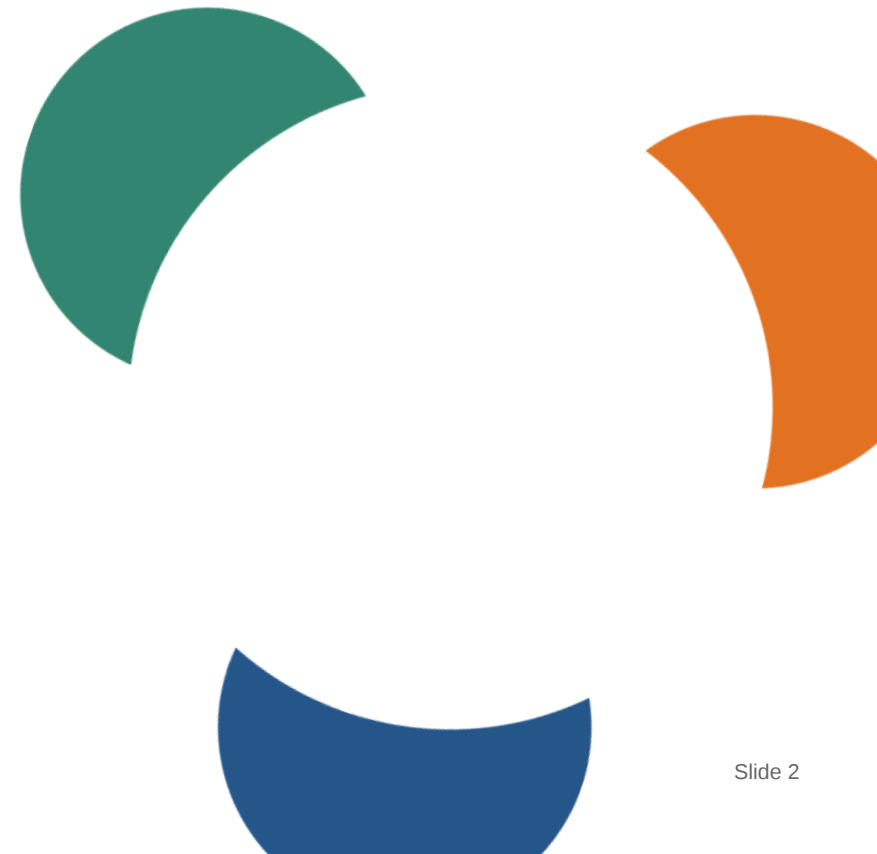
Agenda

HMN

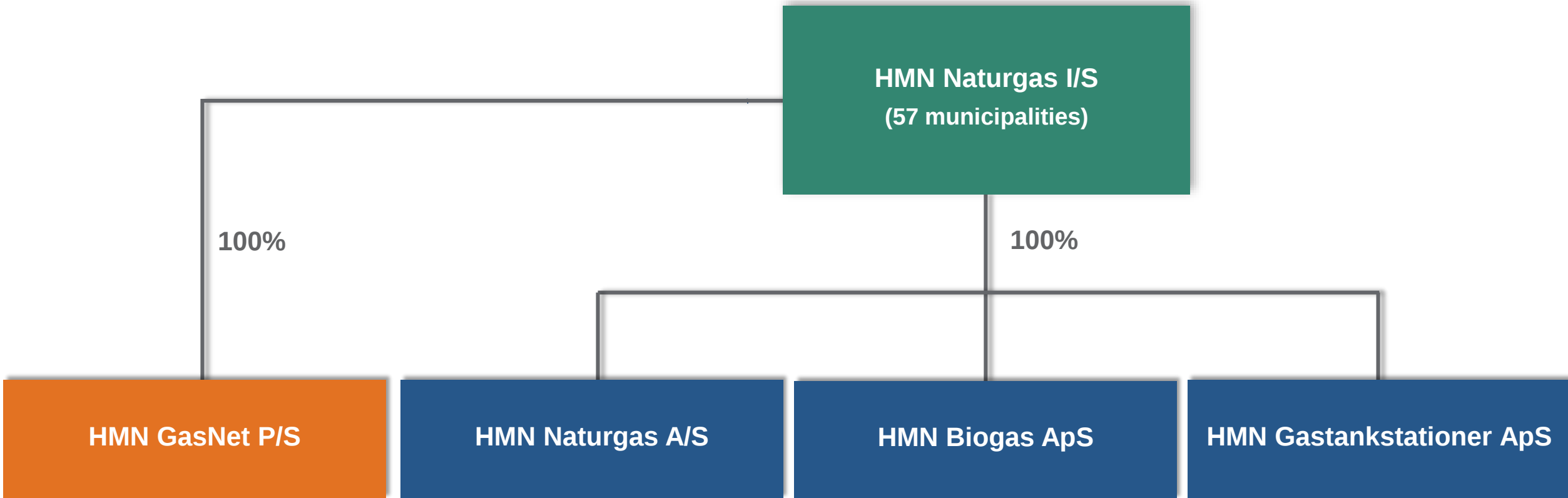
Biogas Status and Development in Denmark

- Biogas Production in Denmark
- Bio methane Grid Injection
- Bio methane production in HMN's distribution area
- 50 % bio methane in the grid in Nordjylland in 2018?
- Flotation in the bio methane production
- Gas quality from upgrading plants
- Bio methane and energy storage
- Gas transport in DK

Conclusions



Corporate structure



HMN GasNet P/S

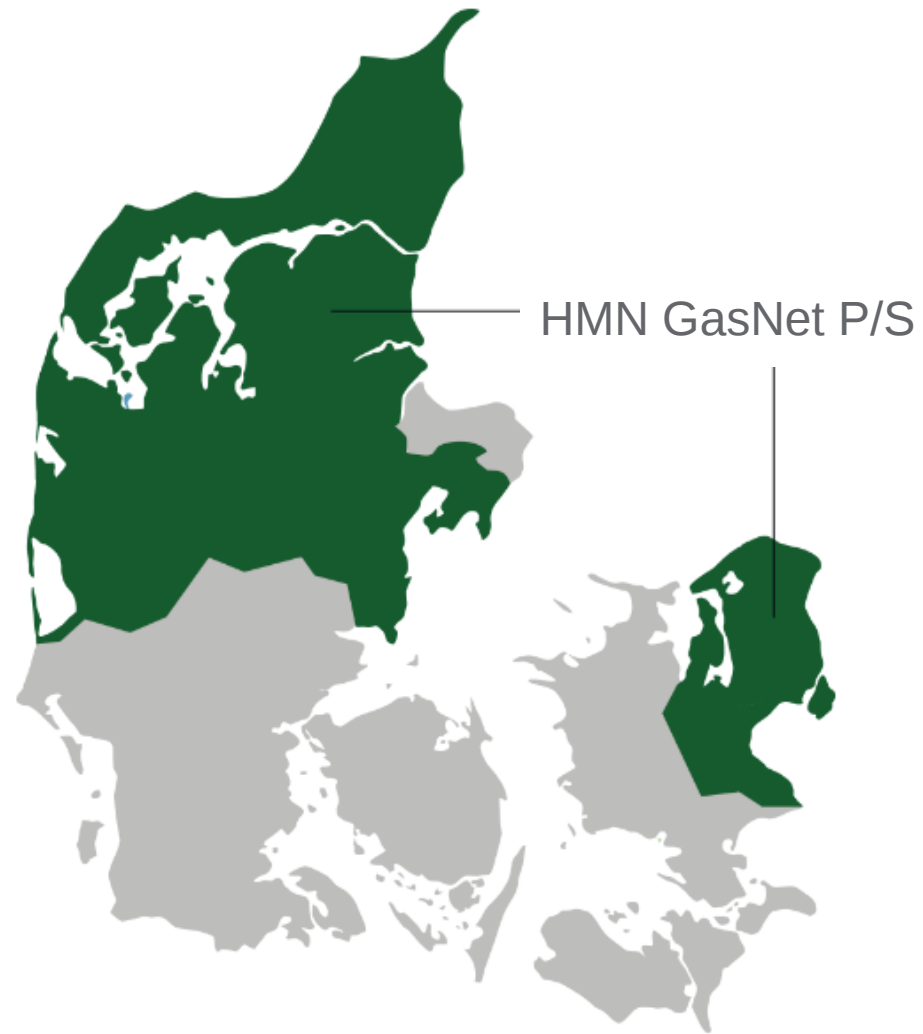


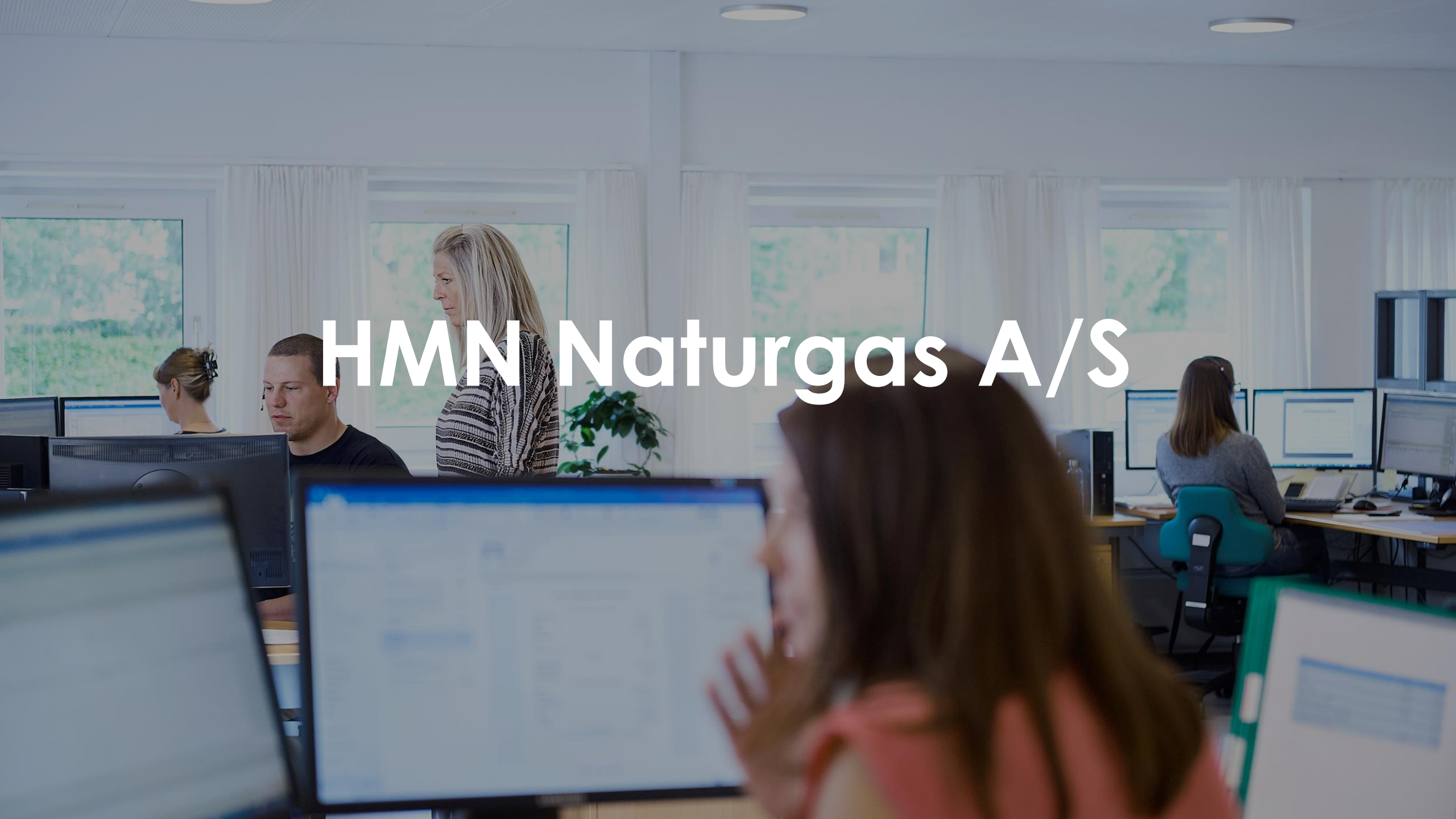
Duties

HMN GasNet P/S:

- Establishes, operates and maintains the gas distribution grid in the company's supply area.
 - Distributes gas to consumers in the company's supply area.
 - Connects biogas plants to the natural gas grid in the company's supply area.
 - Offers energy savings advice to all consumers. The company is obliged via the Energy Savings Agreement to help realise energy savings for Danish consumers.
 - Performs random safety checks of gas installations on behalf of the Danish Safety Technology Authority.
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Distribution area



A blurred office scene with several people working at computers. In the foreground, a person with long brown hair is seen from behind, gesturing with their hands. In the middle ground, a man and a woman are looking at a computer screen. In the background, another woman is working at a desk with multiple monitors. The office has large windows with white curtains and a potted plant on a desk.

HMN Naturgas A/S

Duties

HMN Naturgas A/S:

- Sells natural gas and biogas to private and business customers in competition with other gas suppliers.
 - Buys and sells biogas and green certificates.
 - Trades in natural gas on the European gas exchanges.
 - Provides service scheme for gas boilers to private consumers.
 - Offers financing for gas installations to private and business customers.
 - Provides advice on energy savings and gas boiler replacement through HMN Energicenter.
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HMN Biogas ApS



Bio methane upgrading plants



Total volume of upgraded biogas in the natural gas grid: 159 million cubic meters

Biogas accounts for 6.4 % of the total consumption of natural gas

Volumes are listed in million cubic meters per year.

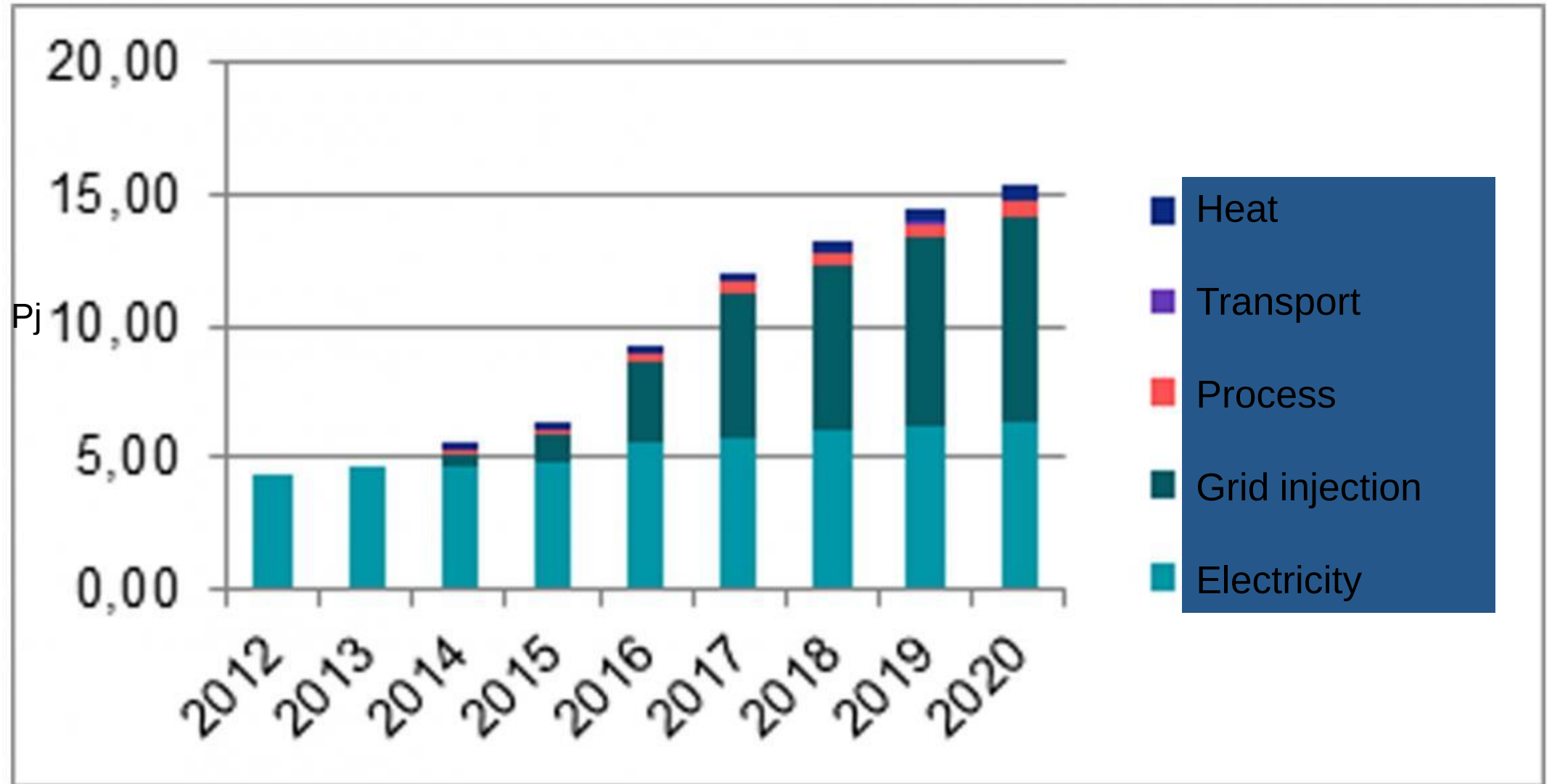
HMN Gastankstationer ApS



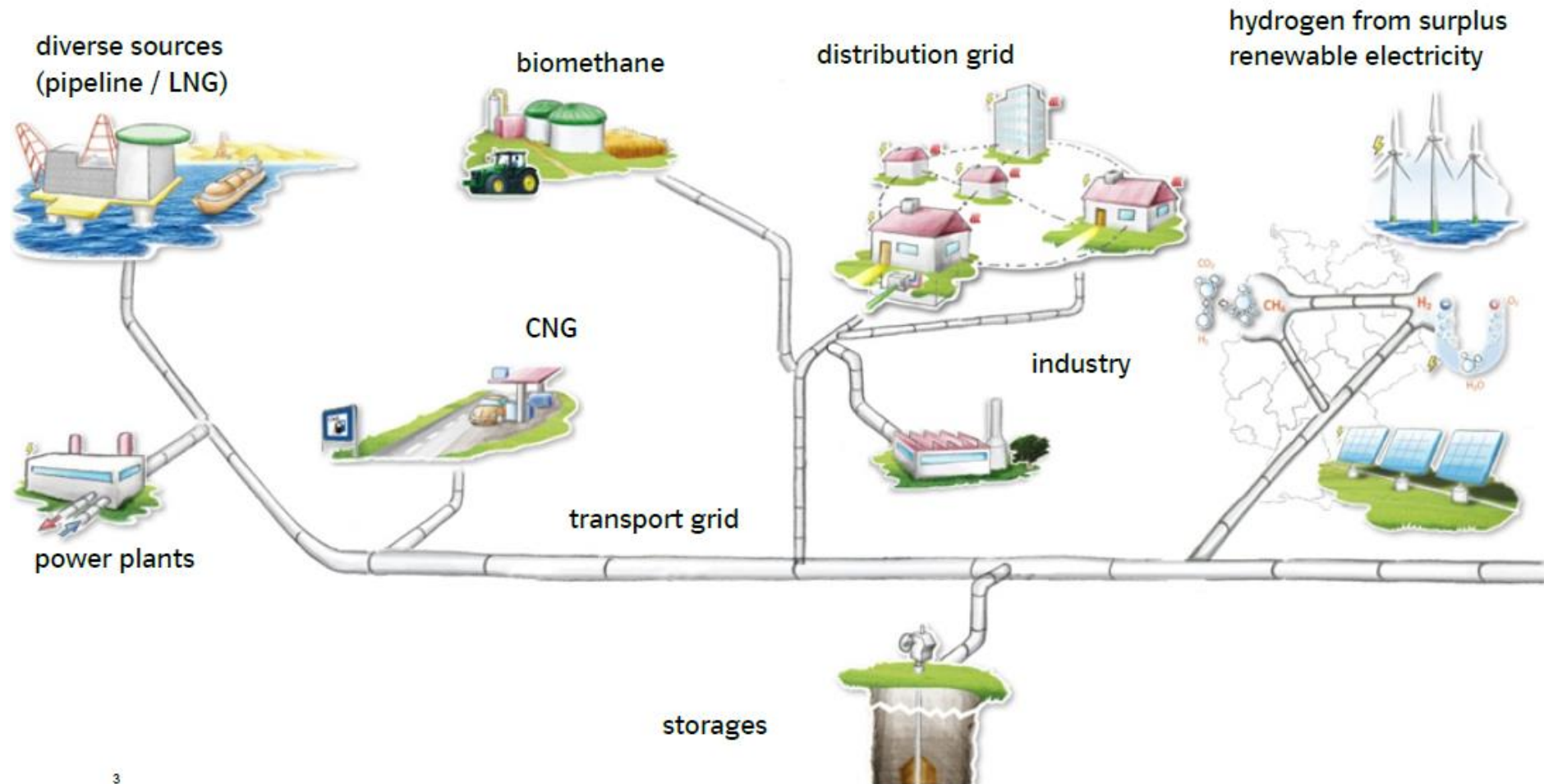
Gas filling stations



Danish Biogas production and forecast



Gas infrastructure



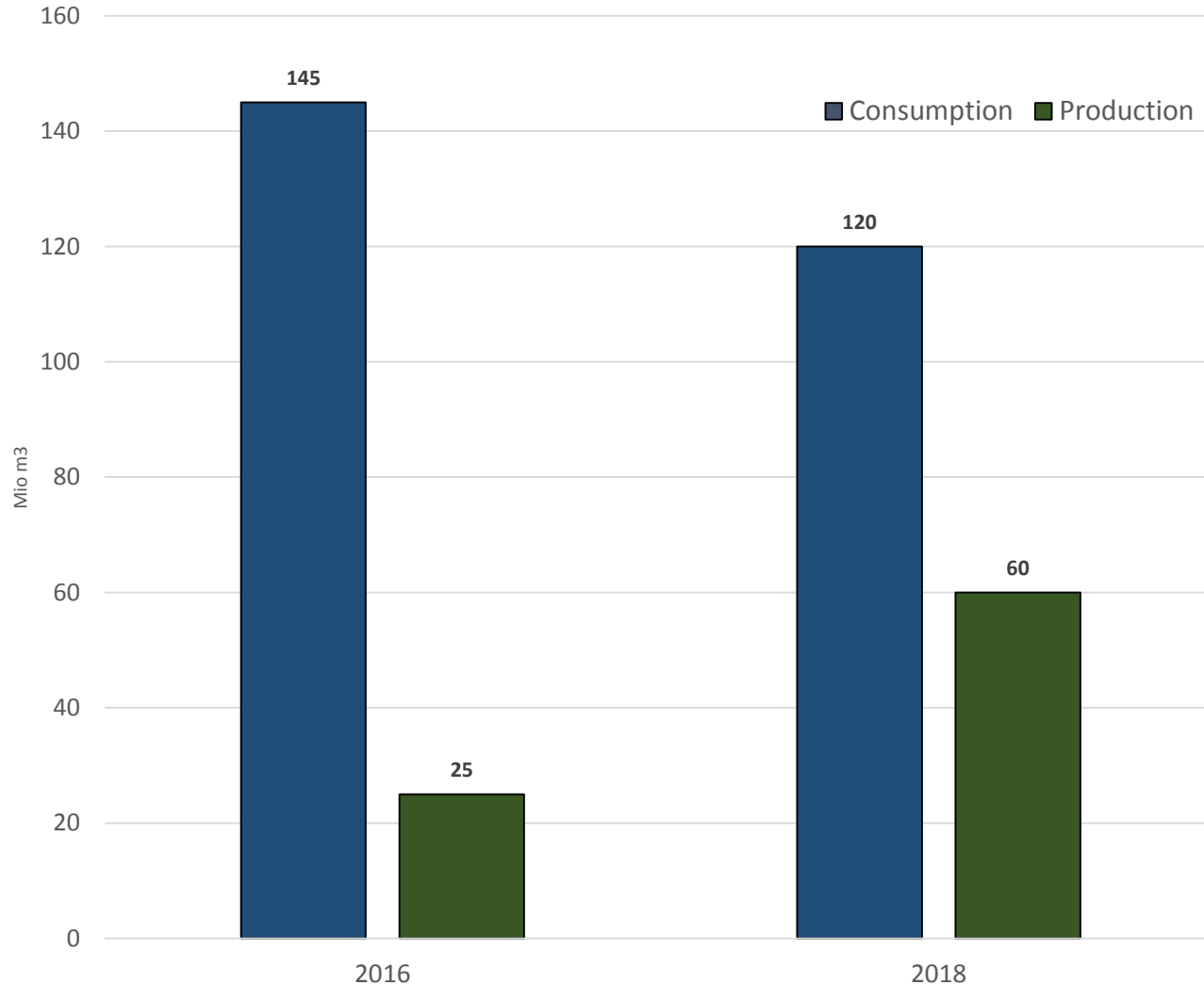
Grid Connection Biomethane 2017 03

- Annual max capacity

Grid Area	In operation Mio. m ³	Under planning/ construction Mio. m ³	Total, Mio m ³	2018 Bio methane in Gas Grid %
HMN vest	68	48	116	15
HMN øst	0	2,5	2,5	0,3
DGD	40	33	73	10
ENDK direkte	21	0	21	11
NGF	30	3,5	33	20
Total	159	87	245,5	9

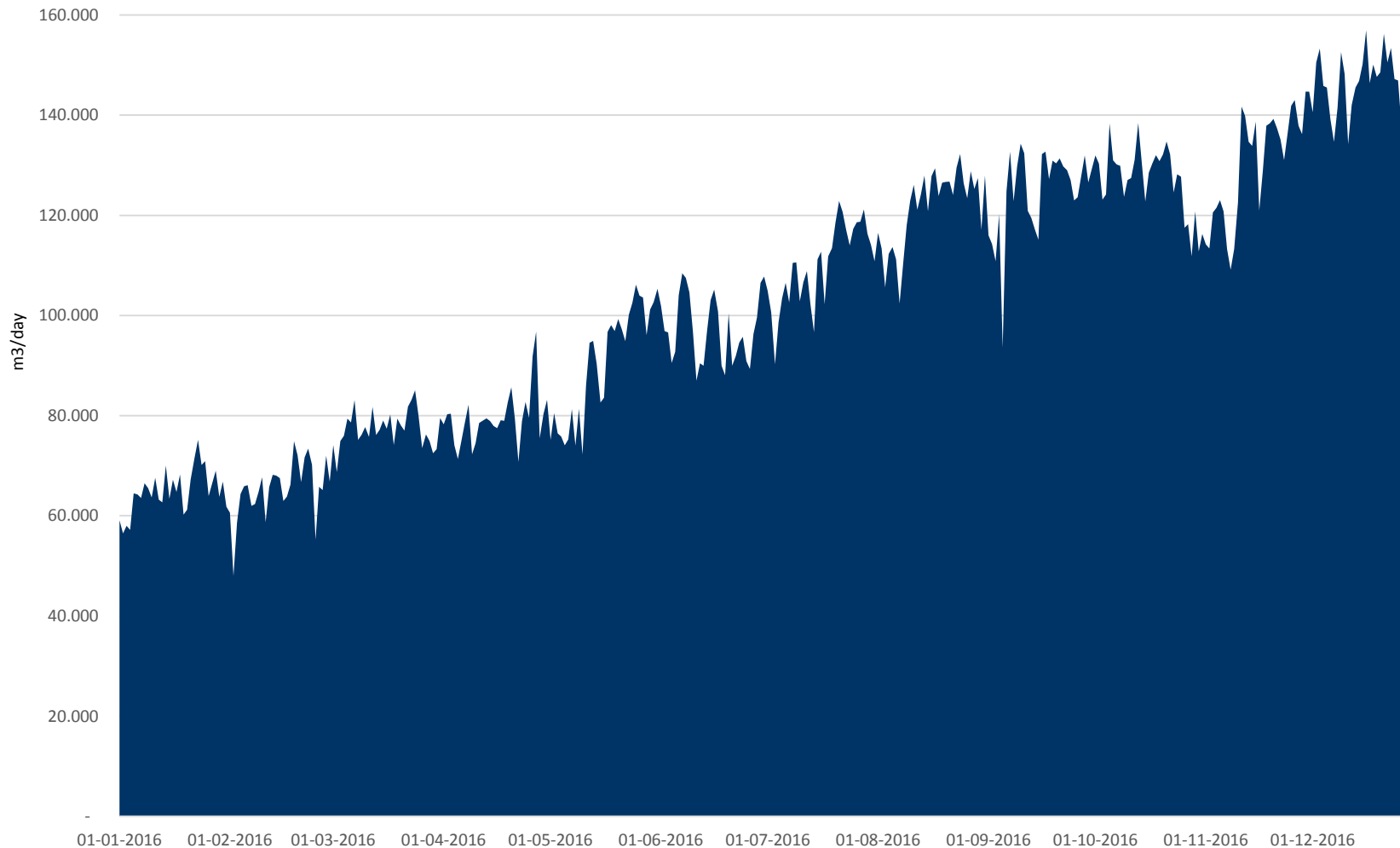
50 % green gas i Northern Jutland 2018?

- Min.60 mio. m³ bio methane in 2018
- Summer production higher than local consumption (need of transmission South)



Bio methane injection in HMN grid 2016

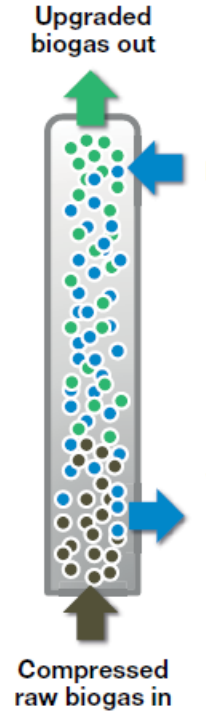
- From 60.000 m³/day to 150.000 m³/day in a year 1 år
- Stable production- despite variations for each plant – Not like wind power or sun



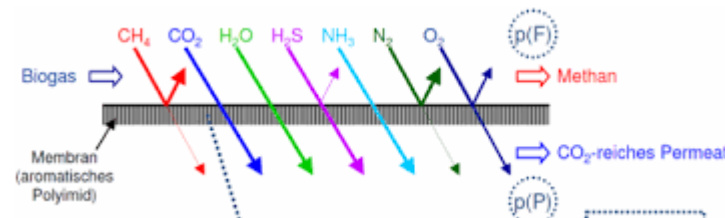
Upgrading technologies

Production of bio methane in a quality for grid injection

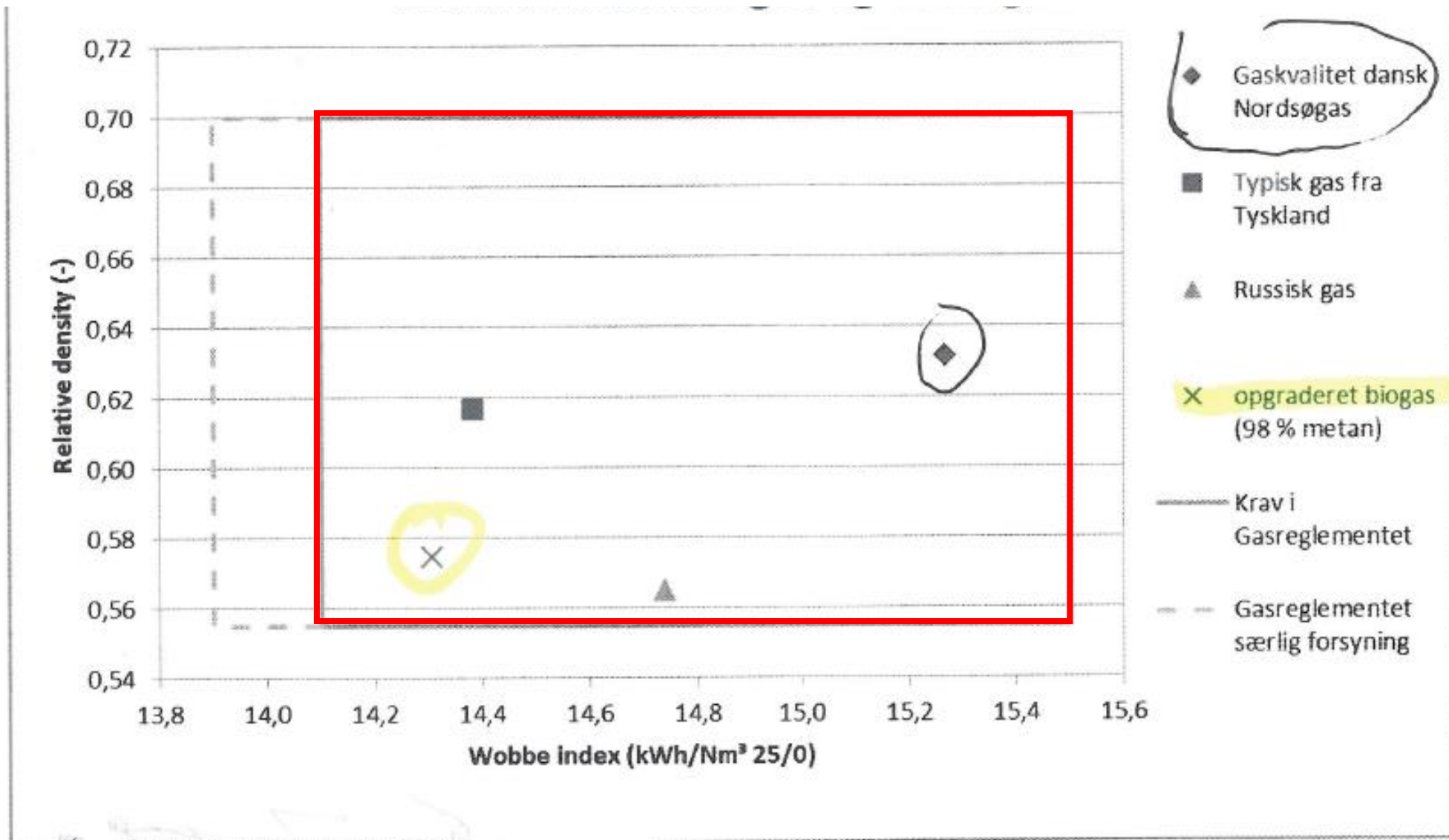
- In operation in Denmark



	Number of plants	capacity m ³ /year	% of capacity
Water Scrubber	10	92	58%
Amine Scrubber	4	51	32%
Membranes	4	15,8	10%



Different gas qualities



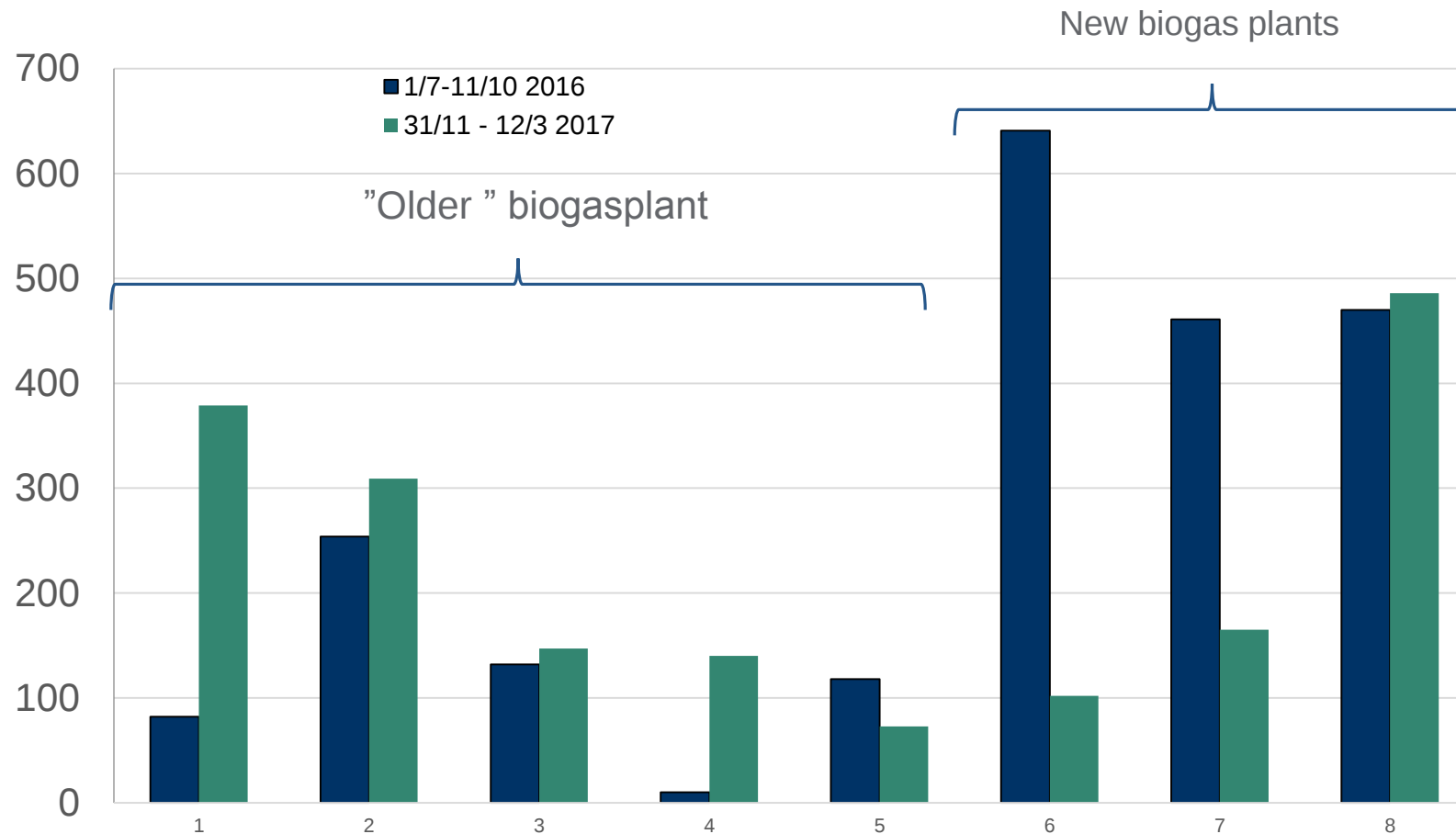
Bio methane quality The criteria for gas Injection

The currently effective rules of C12 and the Danish Working Environment Authority and Danish Safety Technology Authority's decisions.

Measurement	Limit value	Regulatory requirements	C12 demands continues/ periodical	Measurement Grid Owner	Measurement Upgrading Owner
Wobbe index upper MJ/ m _n ³	50,76 – 55,8	C12 section 5.1	Continues	GC	
Relative Density	0,555 – 0,7	C12 section 5.1	Periodical	GC	
CO2 mole % (Carbon dioxide)	Max. 3,0 (max 2,5 if the gas must be on the transmission grid)	C12 section 7.1	Periodical	GC	
Methane mole %	Min 97	Grid Owners security for the Wobbe index	Continues	GC	x
O ₂ mole % (Oxygen)	Max 0,5	C12 section 7.1	Periodical	GC	
H ₂ S (Hydrogen Sulphide) mg/ m _n ³	Max. 5	C12 section 3.4.1	Continues	GC	x
Water dew point °C	-8 at 70 bars (recalculations to actual operating pressure can be informed if requested)	C12 section 3.2	Continues	Dew point meter	x
Temperature °C	Max +20	AT F.0.1 192.123		Pt100	x
Signal	Errors in the communication between PLC and Flow computer	Grid Owners security for satisfying C12			
NH ₃ Ammonia mg/m _n ³	Max 3	C12 section 7.1	Periodical	Extern analysis	
Siloxanes mg/m _n ³	Max 1	C12 section 7.1	Periodical	Extern analysis	

Number of rejections due to gas quality issues

- Number of rejection 1. juli – 11. oktober 2016 & 31. nov. – 12 marts 2017
- Plug-and-play? New plants needs your attention...



Drivers for development of bio methane production

New production subsidy scheme from 2012 and Construction grants:

- **Construction grants:**



- **Electricity from biogas:** 1,15 kr./kWh (0,15 €) + heat sale with out tax
- **Gas Grid Injection:** 0,62 øre/kWh (0,08 €) + value of green certificates.

Drivers for new biogas production?

- Plenty of biomass (Manure, waste, straw, energy crops)

Future increase in biogas production:

- **More competitive methods and technics**
- **Expansion of existing plants**

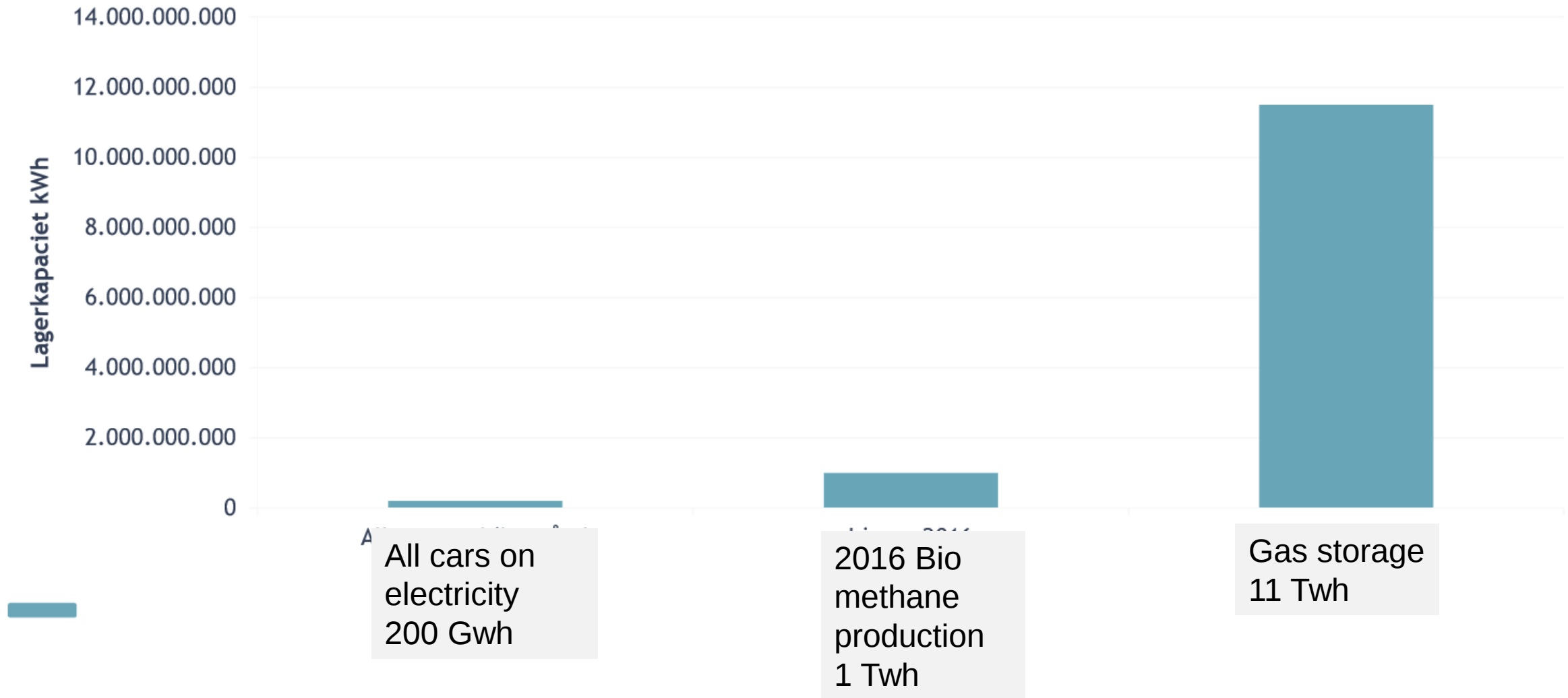
New schemes and markets can initiate higher biogas production

- Certificates
- New and better technology for production
- 2. generation/advanced biofuel for the transport sector (Biotickets)
- The value of bio methane green fuel that can be stored



Energy Storage

- Gas Grid vs Electric cars



Conclusion

- Bio methane is a important part of the energy In the Danish GasGrid
- Bio methane can be a major contributor to reach the Climate goals in Denmark and help fulfill climate goals in Paris Agreement
- Bio methane can be stored in the current facilities and help to balance other green energy productions. At no extra cost
- Certificate system can help adding marked value of bio methane. Especially as transport fuel.
- Regulation and subsidies are important regulators for the biogas production.

Thank You for your attention

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Thank you for your attention

Name and title

Contact details
