Finns det en fram-tid för olja och gas i Nordsjön?

A Danish Perspective with Focus on Gas

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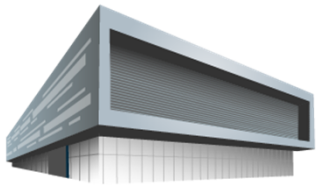
Our Company

Energinet.dk at a glance

About Energinet.dk

Energinet.dk is an independent public undertaking

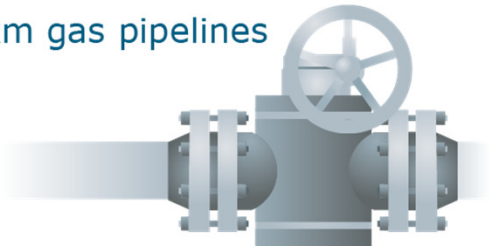


We are 800 employees

Our revenue is approx DKK 10 billion

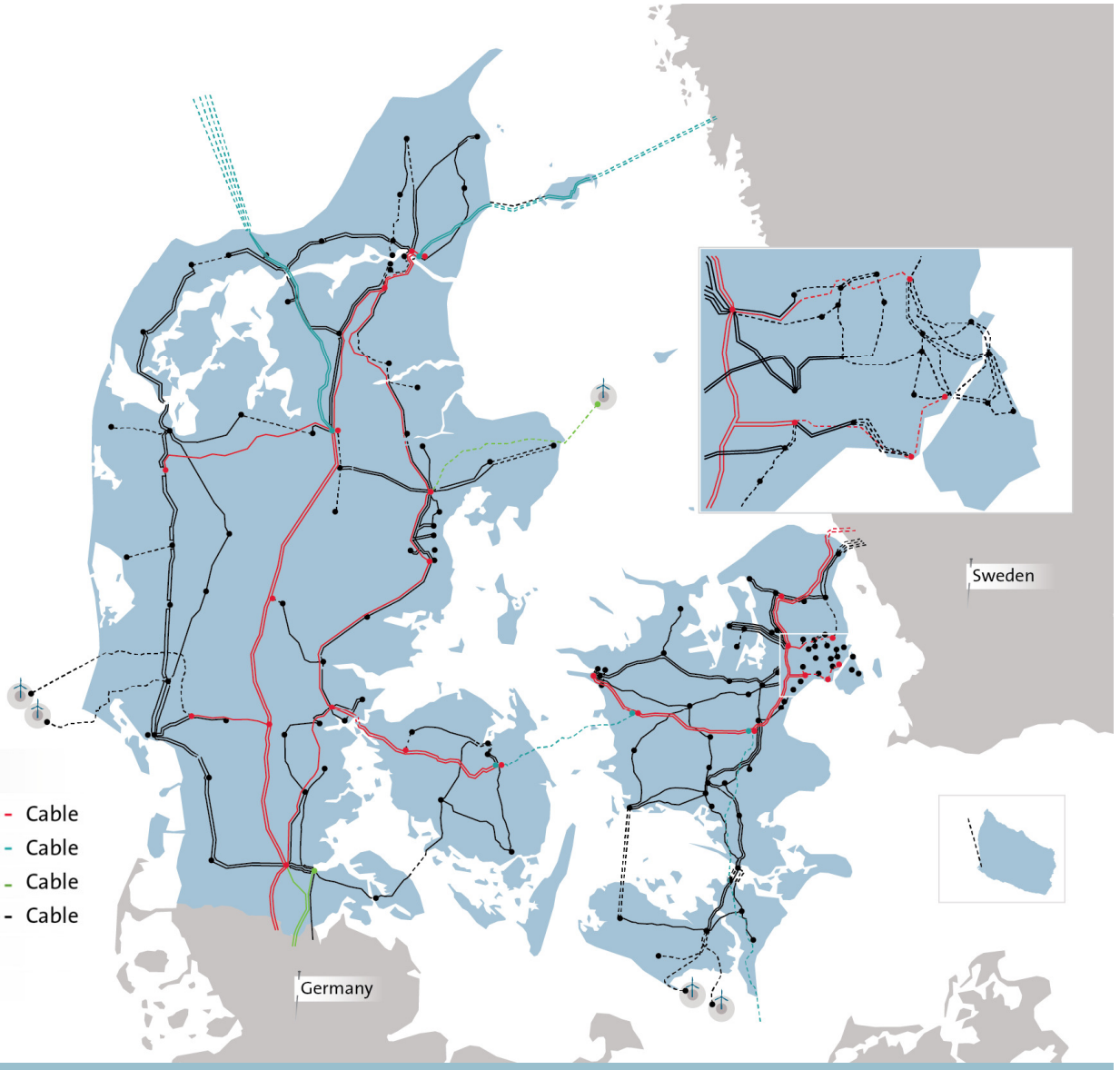
We own 6900 km transmission grid

We own 924 km km gas pipelines



We own two gas storage facilities

Energinet.dk's Electricity Transmission Grid



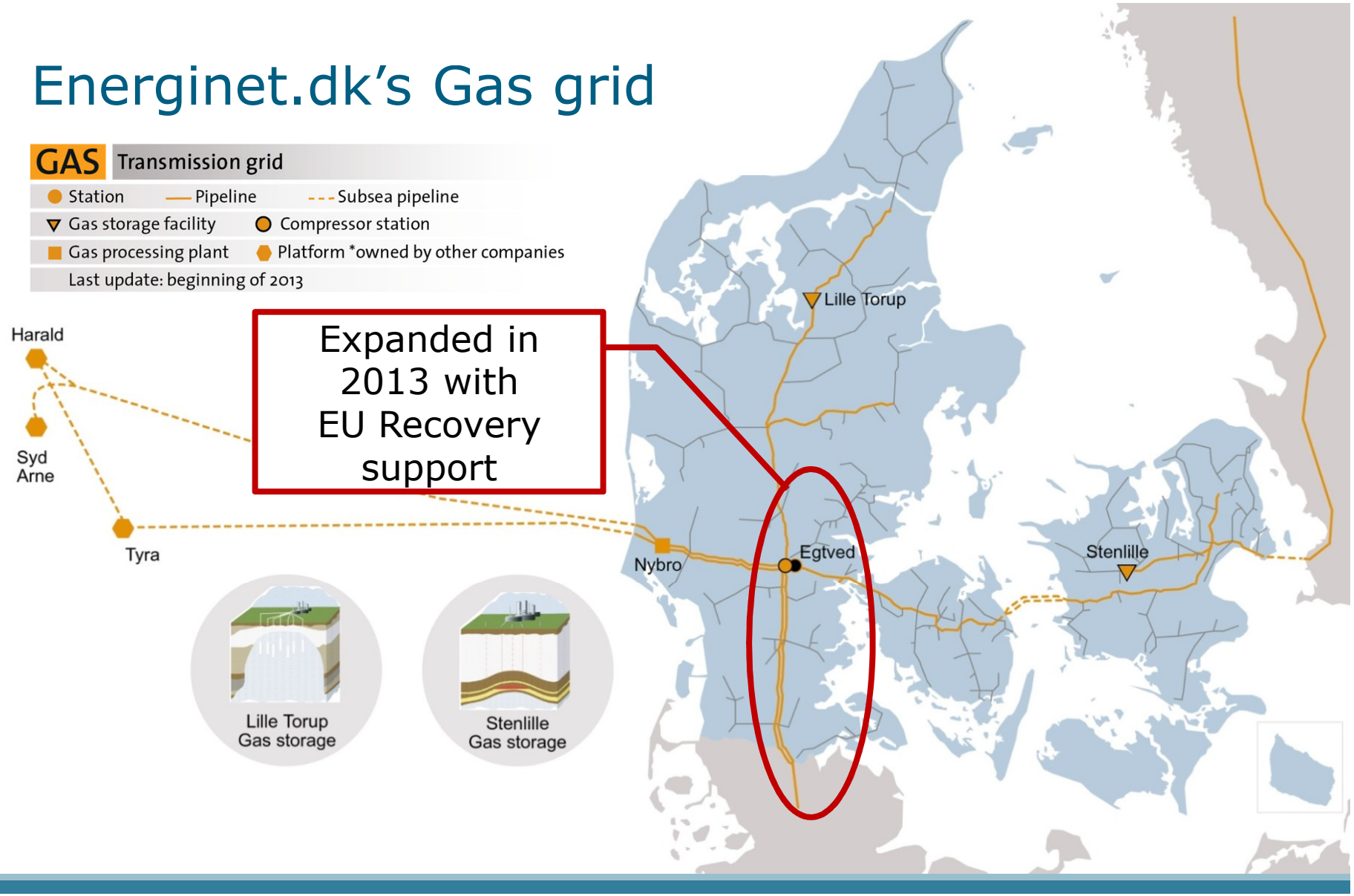
POWER Transmission grid

400 kV AC	Substation	Overhead line	Cable
400 kV DC	Converter station	Overhead line	Cable
220 kV AC	Substation	Overhead line	Cable
132/150 kV AC	Substation	Overhead line	Cable

Offshore wind farm (owned by other companies)

Last update: beginning of 2013

Energinet.dk's Gas grid



Future German Supplies

gasunie Home Werkzaamheden Projecten Hoe we werken Nieuws Contact

Leiding Fockbek-Ellund in bedrijf genomen

DELEN

26 augustus 2015

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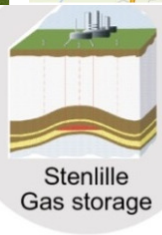
De bouw is uitgevoerd door de combinatie PPS Pipeline Systems en de firma Friedrich Vorwerk. De horizontaal gestuurde boringen (HDD's) zijn uitgevoerd door HAK Drillcon. De bouw werd begeleid door een opzichterteam uit Nederland en Duitsland.

Lille Torup
Gas storage



Stenlille
Gas storage

Germany and DK storages can now also supply DK-S 100%

In dialogue with all parts of the value chain

Offshore Forum

Focus on recovery maximisation

- North Sea Producers
- System Operators
- Stakeholders
- Authorities

Shippers' Forum

Focus on whole sale gas market function

- Shippers
- Gas Suppliers
- Authorities and interest organisations

Retail Market

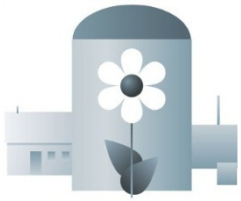
Focus on retail gas market function

- Distribution companies
- Interest organisations
- Authorities

Industri Forum

Focus on large consumers

- Industry users
- Large consumers
- Authorities and interest organisations



Grøn Gas Forum (Green Gas Forum)

Focus on making gas part of a more renewable Danish energy future

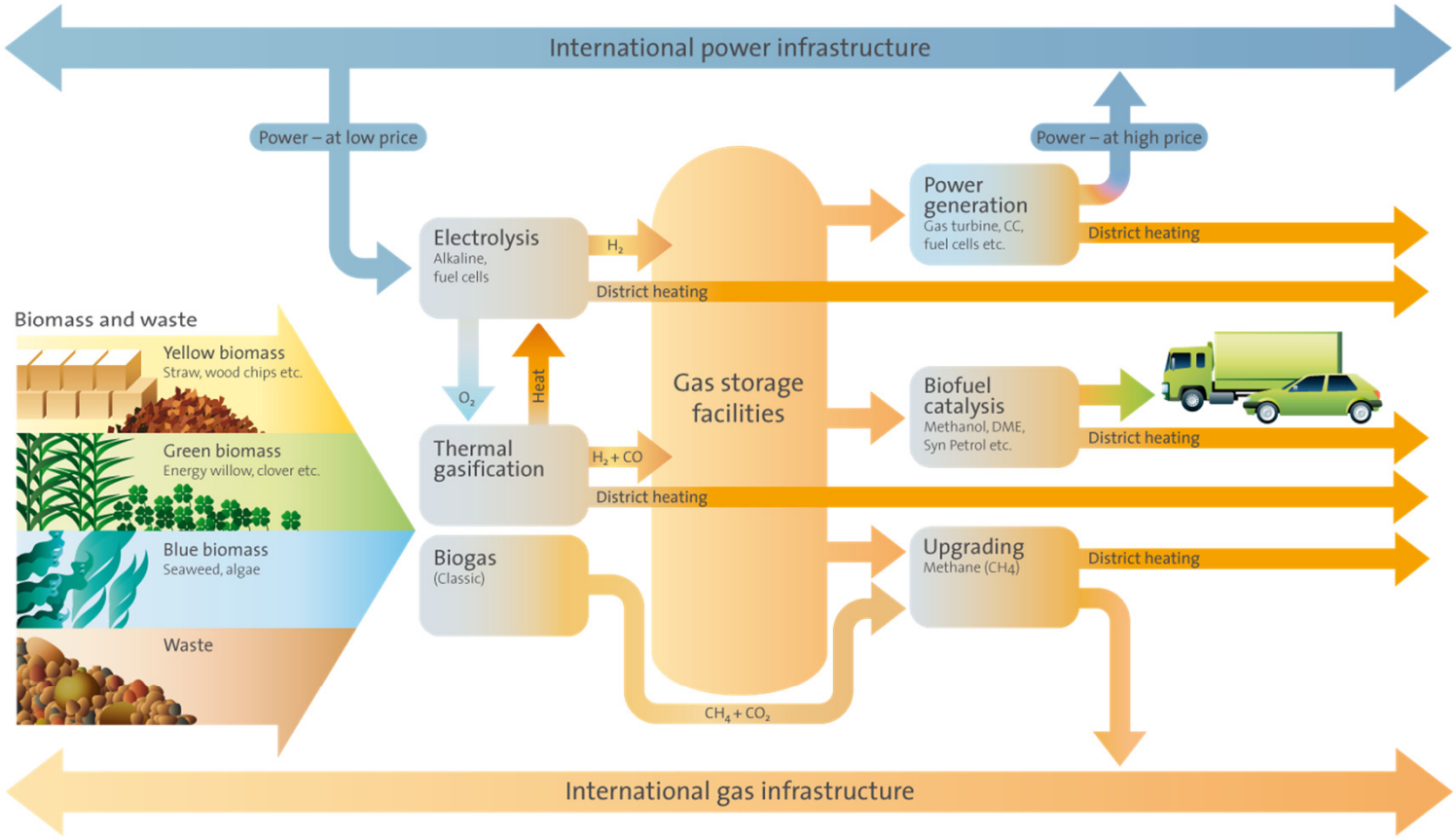
- Biogas producers
- Certificate holders
- Gas suppliers and distribution companies
- Authorities and interest organisations

Our Visions

From Fossils to Renewables

(but not in 1 day)

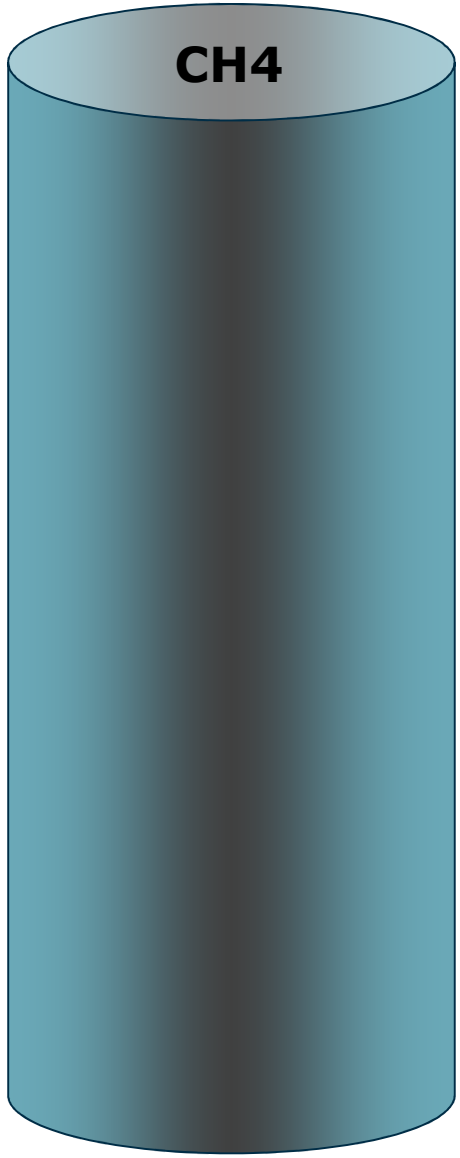
To make gas supply 100% renewable by 2050



Making gas green

We have a CH4+ gas system …

… not just a natural gas system



Making gas green

We have a CH4+ gas system …

… not just a natural gas system

Biogas based on manure and waste is mature technology …

… and is subsidised and injected into many gas systems

Gasification of e.g. wood is on the way back …

… and based on more and more sophisticated technologies

(Examples are AU-VUT (Güssing+Oberwart), F-GAYA, D-ZSW and Blue Tower, NL-ECN (Milena+Olga), US-Great Point Energy, SF-Carbona, S-Chalmers, GOBIGAS, CORTUS-WoodRoll and E.ON-Bio2G, US-GreatPoint Energy, DK-Pyroneer and Haldor Topsoe)

Next is gas based on H2 from renewable electricity and the CO2 we remove from biogas or from CCS …

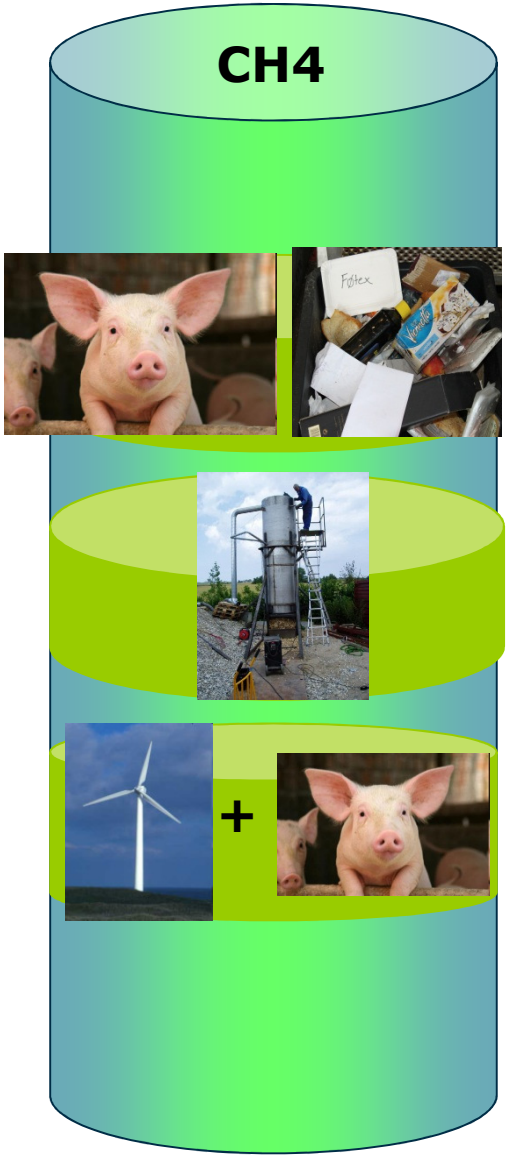
… demonstration is ongoing

(D-RH2-WKA, Audi, E.ON, Power2Gas Werlte, Power2Gas Morbach, juwi, Solarfuel, Fraunhofer IWES, ZSW, EWE, Enertrag Hybridkraftwerk, Total, Vattenfall, Deutsche Bahn, H-tec, DVGW, IOLITEC, Outotec, Engler-Bunte-Institut, EnBW Energie, US-Electrochaea, DK-Electrochaea.DK, Haldor Topsoe, HIRC, DTU, GreenHydorgen)

Adding pure Hydrogen (H2) and using gas in fuel cells …

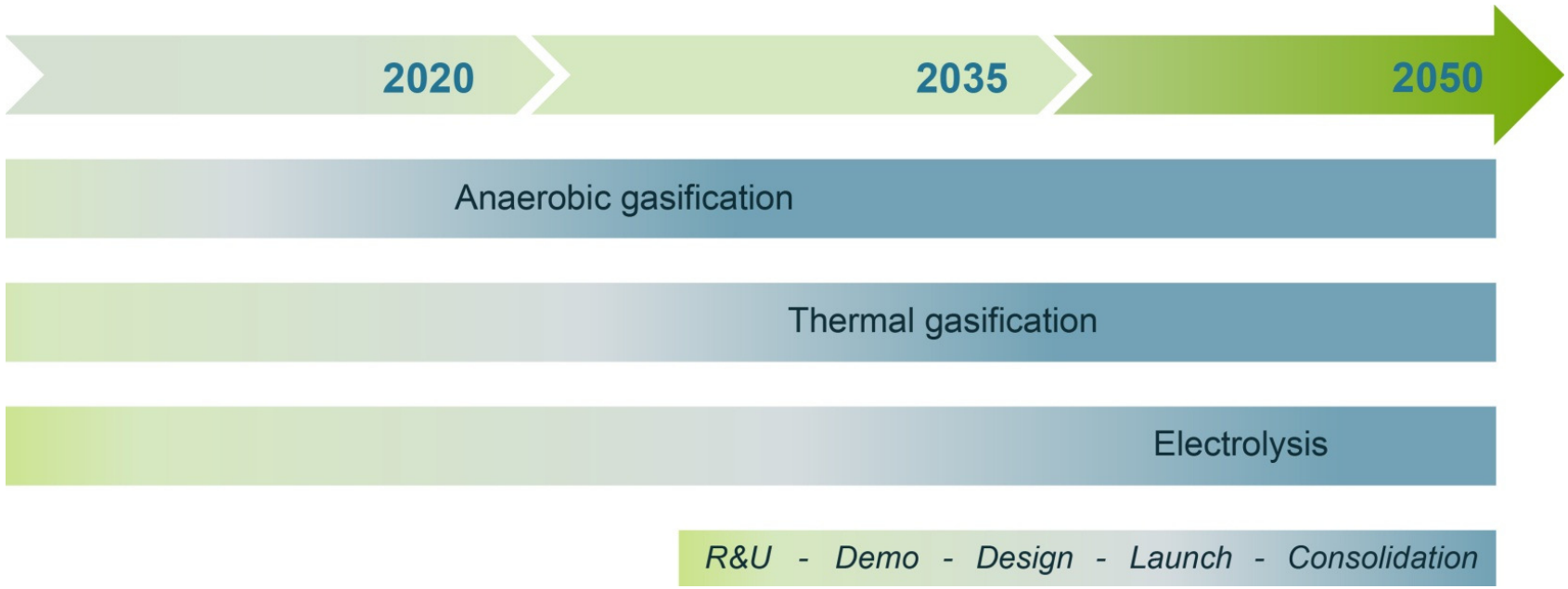
… demonstration is ongoing and it can make gas more low-cabon

(Nl-Greenpeace-Gasunie, F-GRTGaz, …)



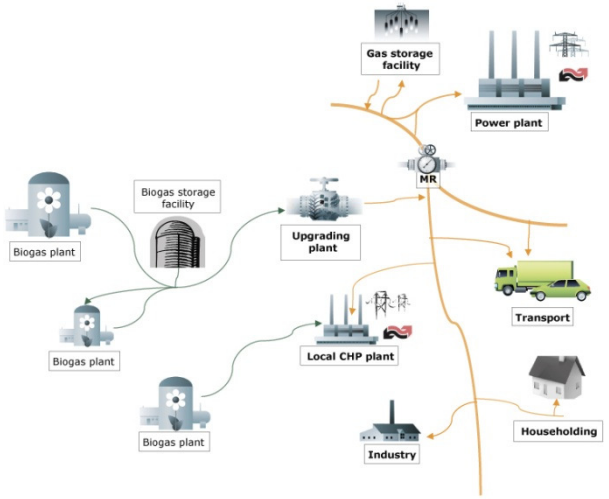
Green Actions

I: Explore renewable gas potential and initiate realisation

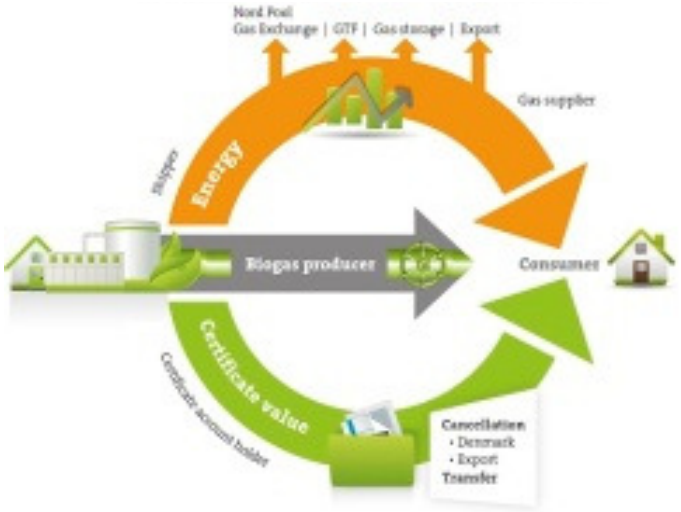


Green Actions

II: Integrate renewable gas



III: Add green gas certificate value



Not just a Danish Perspective …

Four most important areas for the Green Gas Commitment TSOs' collaboration to achieve the vision targets:

1. Support integrated European market for biomethane trade

2. Develop policy frameworks

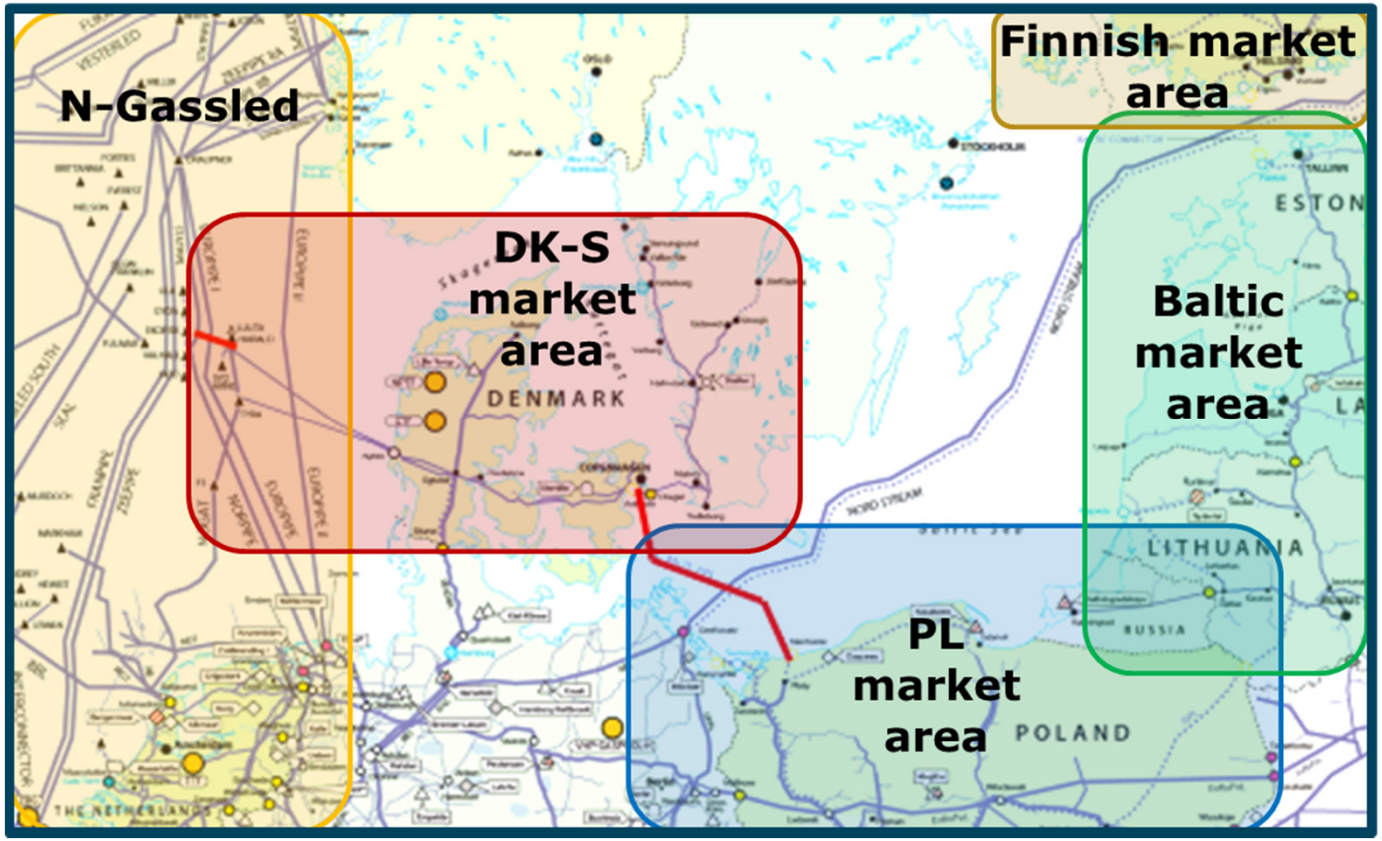
3. Reduce costs and ensure best practise in biomethane injection and grid operation

4. Improve the biomethane business case for biogas producers

Green gas in e.g. transport

- Go visit Malmö and other European cities

The Polish-Baltic-Nordic Gas Market Vision



Bridging Visions with Todays' Realities

Former Foreign and Climate & Energy Minister Martin Lidegaard on Energy Policy

Oil Gas Summit, Oil and Gas Denmark, Copenhagen, Denmark, September 10, 2013

*… **In Denmark we have broad political backing for using the Danish resources of oil and gas to the largest possible extent. Denmark is an oil and gas producing country and we will use that to benefit the Danish society** and the green transition we have begun. …*

*… **we will** … **make a strategy for oil and gas**. It is still too early to say anything about the content of the strategy, but I can elaborate on my thoughts at the moment. **Infrastructure; we need to look at the old facilities with increasing maintenance in a time of decreasing production. We have to look at energy efficiency. We need to make sure that we focus on technology development to increase the recovery factor of oil and gas.** …*

A few personal perspectives on Oil …

- Fossil oil is a truly global commodity
- In our region, we will probably still demand oil towards 2050 ?
  - Other regions may demand it until 2100 ?

So questions may be?

- How do we secure the most sustainable and diversified production of oil for ourselves towards 2050 ?

- Stone age did not stop due to lack of stones, and fossil age will not stop due to lack of fossils.
  - So how do we:
    - Secure development of the renewable alternatives ?
    - Secure the most sustainable fossils for remaining users ?

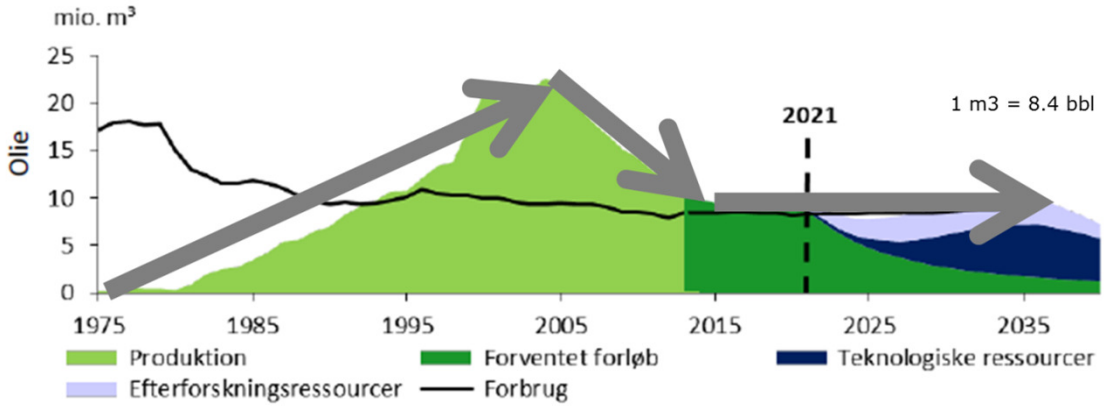
… and a few personal perspectives on Gas

- Gas – and especially the most cost efficient pipeline gas – is a regional traded commodity
  - E.g. DK-S is part of a NWE region with uniform prices …
    … and with LNG and BNG, it becomes global

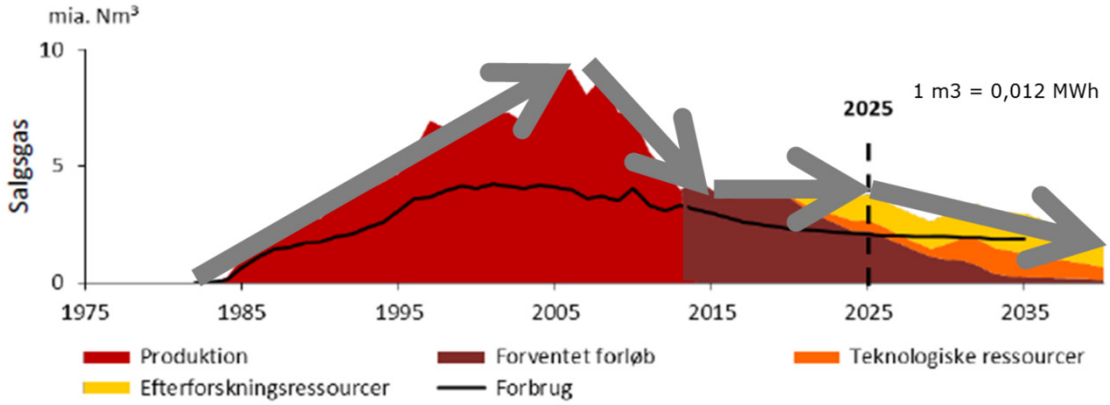
- Sweden and Denmark are located on a potential silk route between:
  - current fossil North Sea and Russian gas
  - possible future renewable gas from e.g. biomass and wind

Possibly self-sufficient with gas beyond 2035 ?

DK OIL



DK GAS



Dias nummer 21

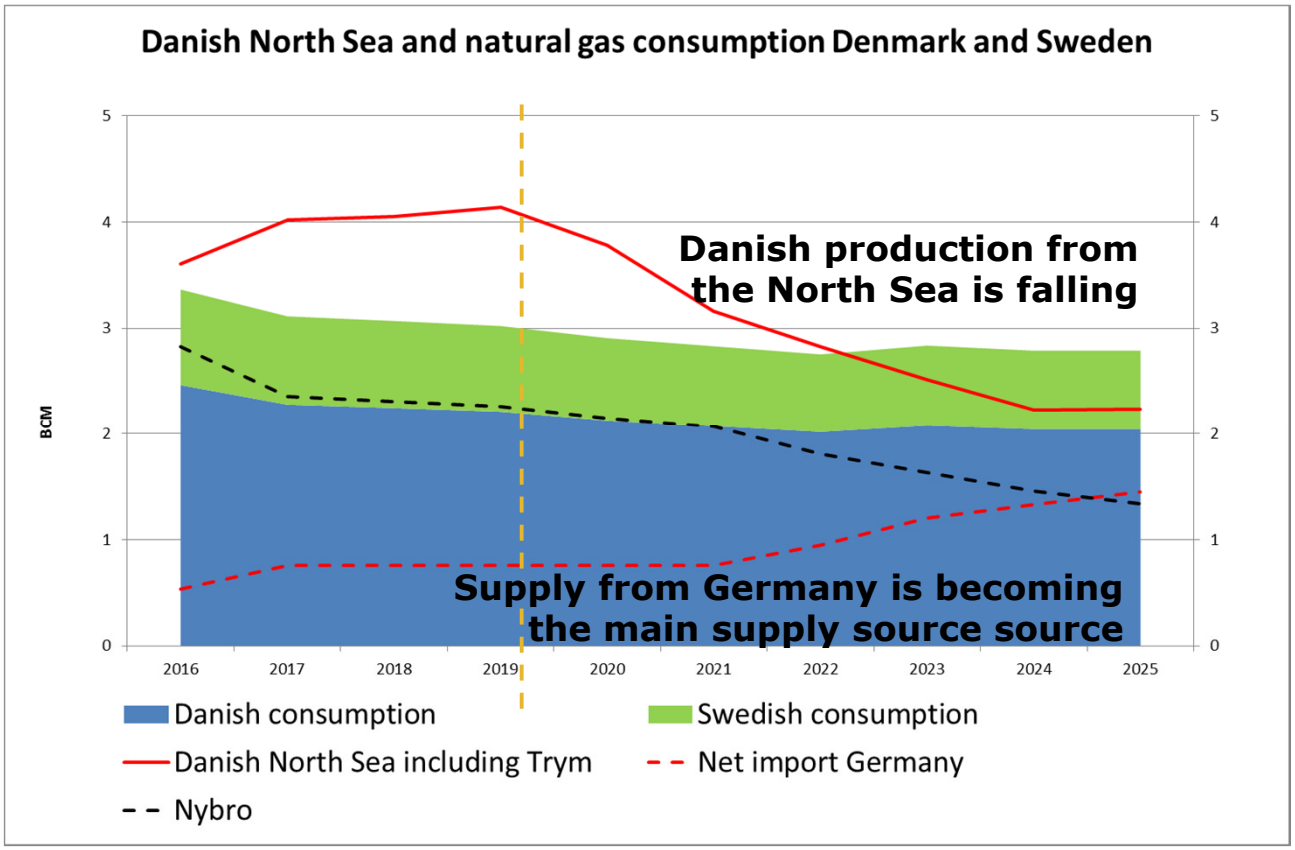
F1

Hvem er modtager af pengene?
Staten? Skatter?
Samlet samfundsøkonomi?

Måske noget med antal ansatte?

Forfatter; 05-08-2015

But DK–S Gas Supply Challenge after 2020



N-1 criteria:
The EU Security of Supply (SoS) Regulation requires that in case the supplies from Germany fails another source must be able to substitute the missing supply – and the North Sea can't alone

A Norwegian connection can solve the SoS challenge after 2020

The Swedish-Danish 2018 Tyra Perspective

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Future solution for Tyra field to be identified this year

04-Apr-2016 07:15

Maersk Oil has today issued a notification to the Danish gas market. The notification announces that production from Tyra East and Tyra West in the Danish North Sea will cease on 1 October 2018, if an economically viable solution for continued operations is not identified during 2016. Under EU regulatory requirements, a decision to end production must be notified to the market in a timely manner.

The Tyra facilities are approaching the end of their operational life due to a combination of more than 30 years of production and subsidence of the underground chalk reservoir, reducing the gap between the facilities and the sea.

The Tyra field is valuable for Denmark and for the Danish Underground Consortium (DUC), with significant gas resources that remain to be extracted. Over the last 15 years DUC has spent more than DKK 1 billion on reinforcing the structures to prolong production.

"Together with our partners in DUC we are now evaluating long term economically viable solutions for recovery of the remaining resources. As part of this, we will consider the terms under which a rebuild of the facilities could take place. The basis for a decision needs to be in place by the end of 2016 to ensure future production from the field," says Martin Rune Pedersen, Managing Director for Maersk Oil Denmark.

Tyra is Denmark's largest gas field and the facilities are the processing and export centre for all gas produced by the Danish Underground Consortium (DUC). More than 90% of Denmark's gas production is processed through the facilities.

Tyra East and Tyra West are also the hub for a number of smaller facilities in the Tyra field, which will be part of the evaluation. This includes the neighbouring unmanned facility, Tyra Southeast, which was extended in 2015.

The Tyra field is operated by Maersk Oil on behalf of the DUC, a partnership between A.P. Moller – Maersk (31.2%), Shell (36.8%), Nordsøfonden (20%) and Chevron (12.0%).

Published on 20 April 2016 14.56

Possible closure of Tyra: The supply to Danish and Swedish customers can be maintained

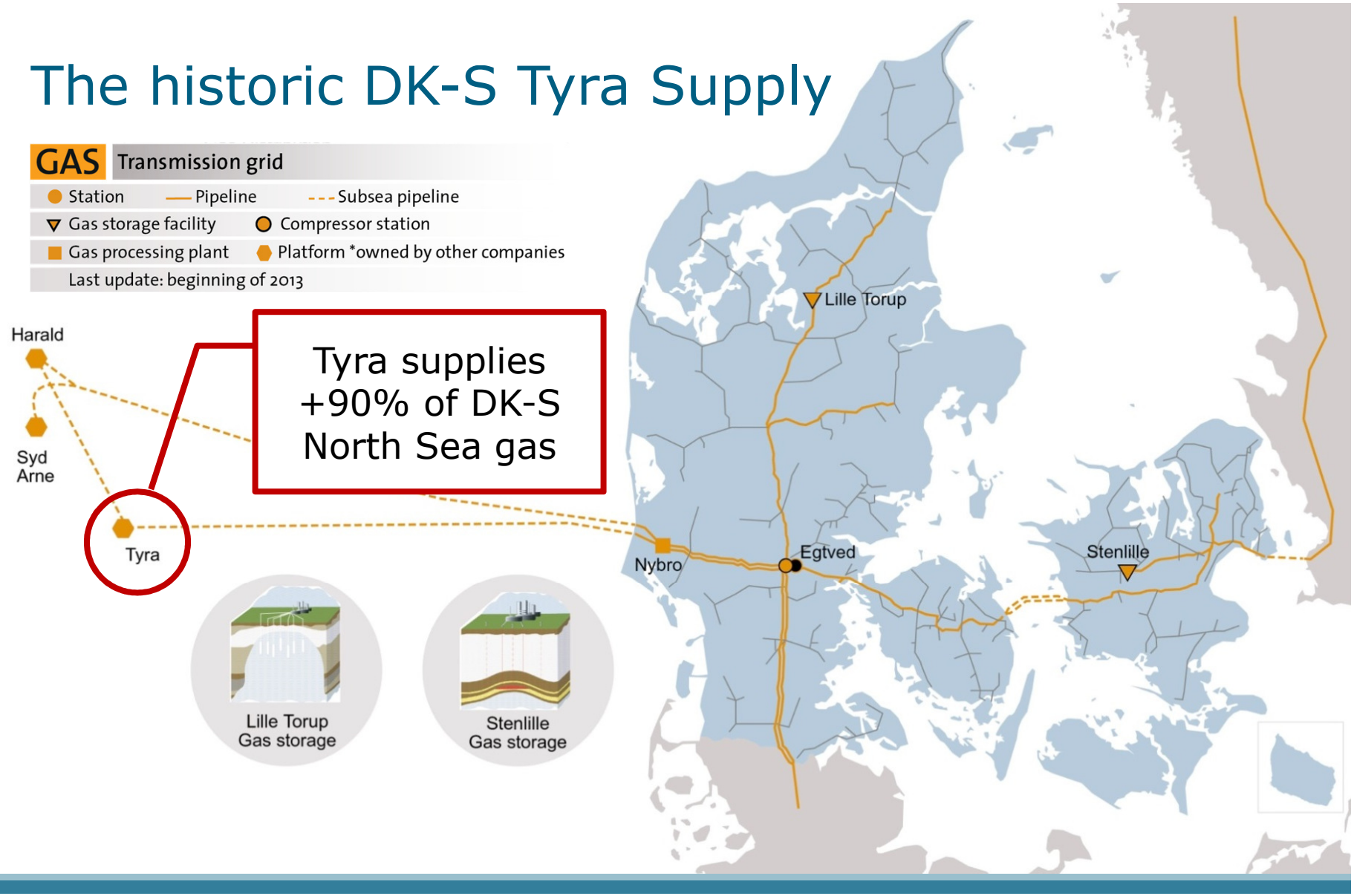
Denmark has a well-developed gas network and can provide gas to Danish and Swedish customers through the pipeline from Germany, which connects us to the European gas market, and the Danish gas storage facilities.

After 2018, gas customers in Denmark and Sweden will still have the gas they need. This is made clear by Torben Brabo, Senior Vice President, Gas Market at Energinet.dk, following Maersk Oil's announcement Monday 4 April on behalf of DUC that it is considering closing the Tyra platform in the North Sea, thus cutting off by far the majority of the gas which currently is retrieved from the Danish part of the North Sea.

The Danish gas network is well developed and has in addition to pipes from the North Sea also a large connection to Germany and thus the European gas market. Therefore, Danish homes and businesses – and the Swedish consumers purchasing their gas through the Danish pipe network – will also be supplied with gas in future.

Investigating alternatives

The historic DK-S Tyra Supply



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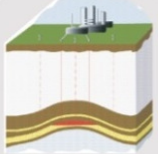

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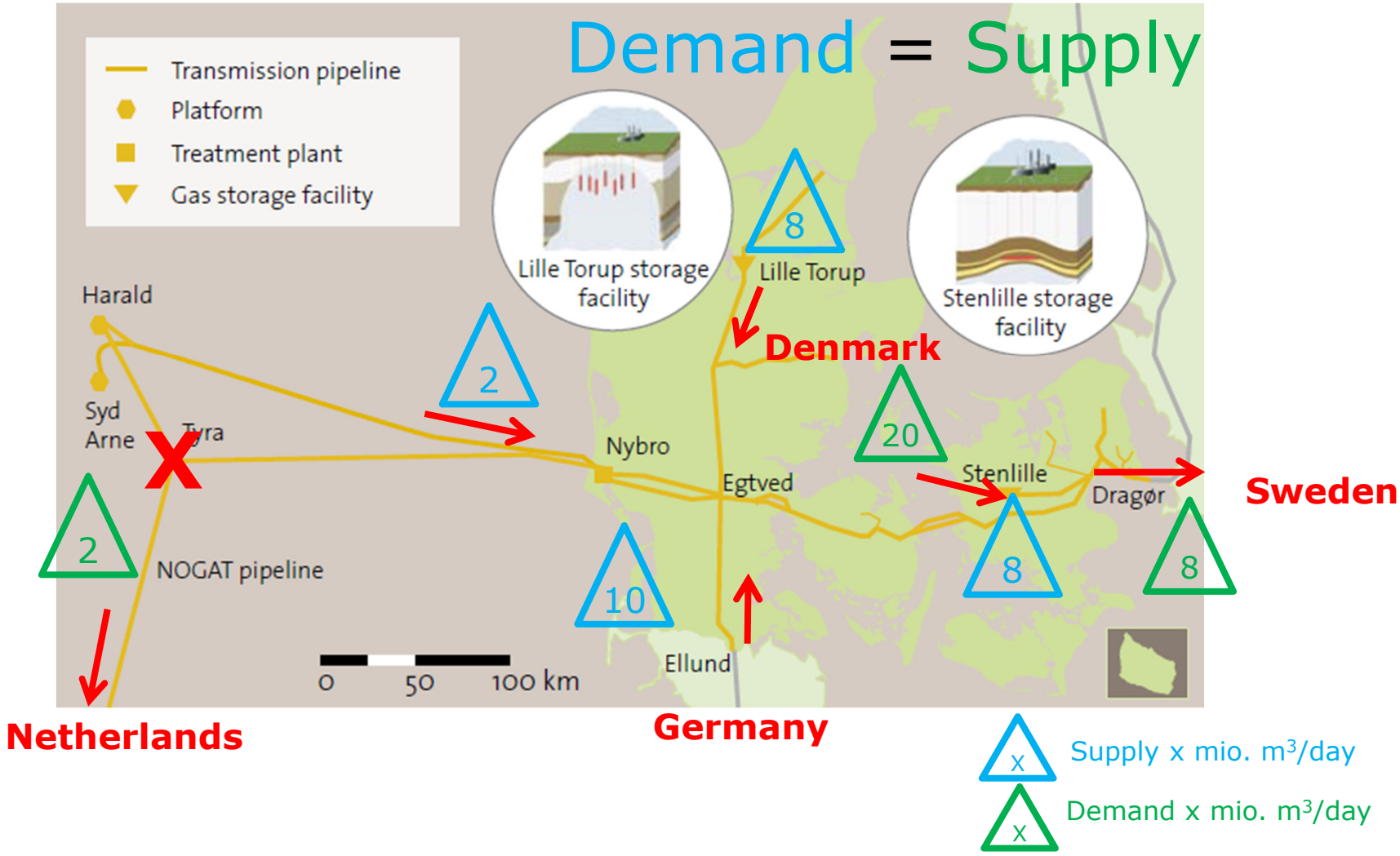
Possible Supply Situation at -13^{0}C

(based on EU regulation requirements)



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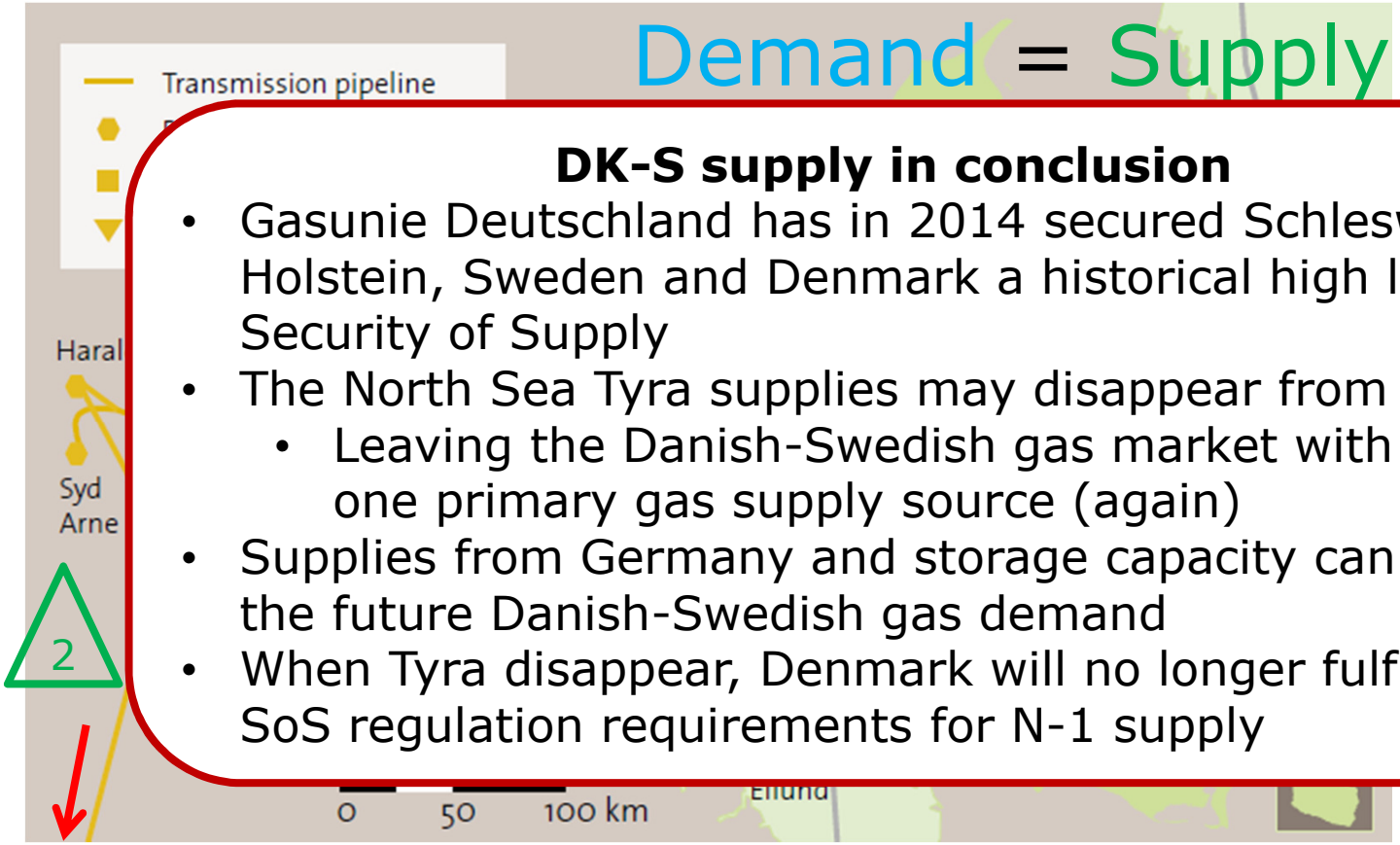
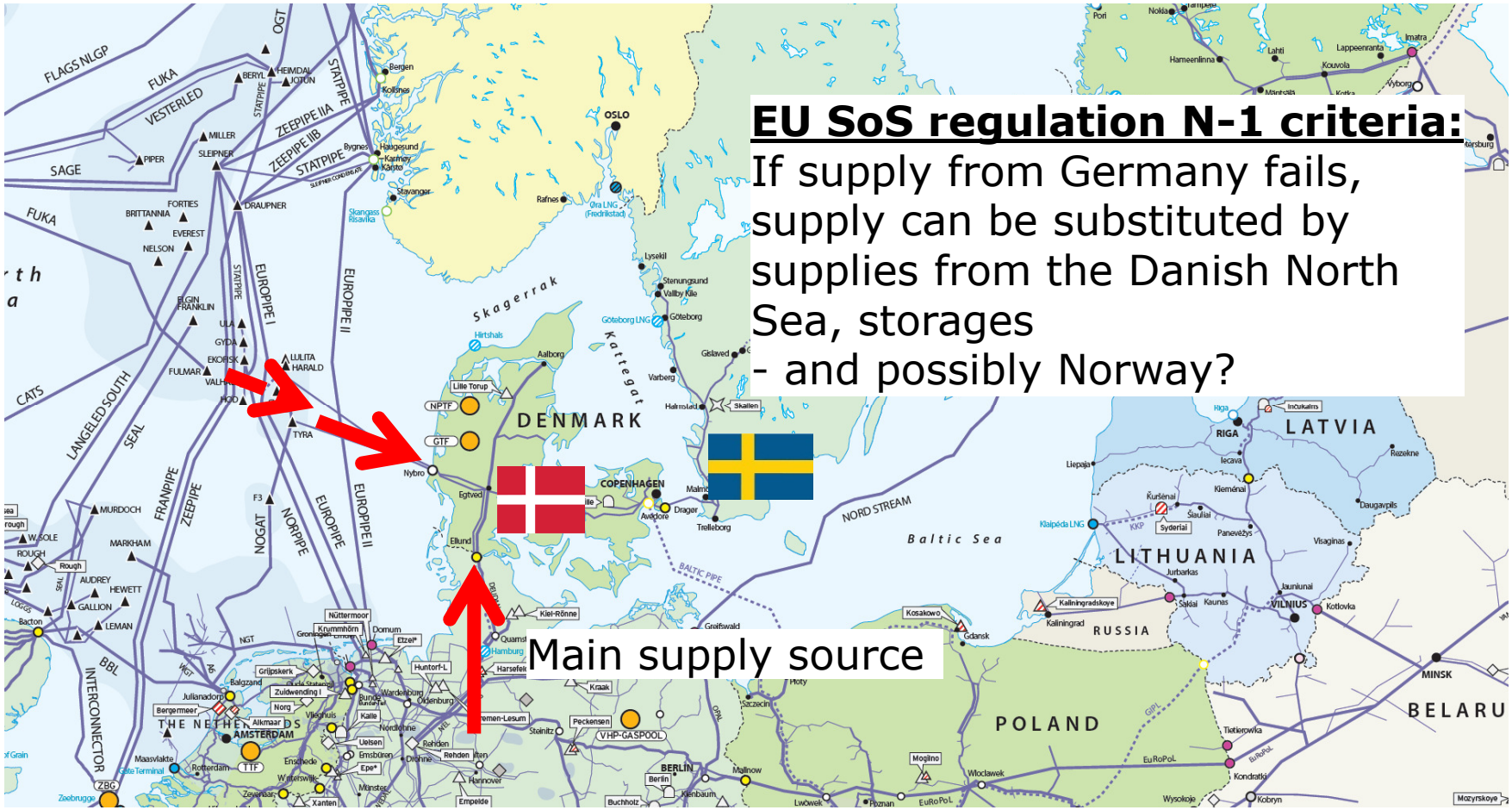


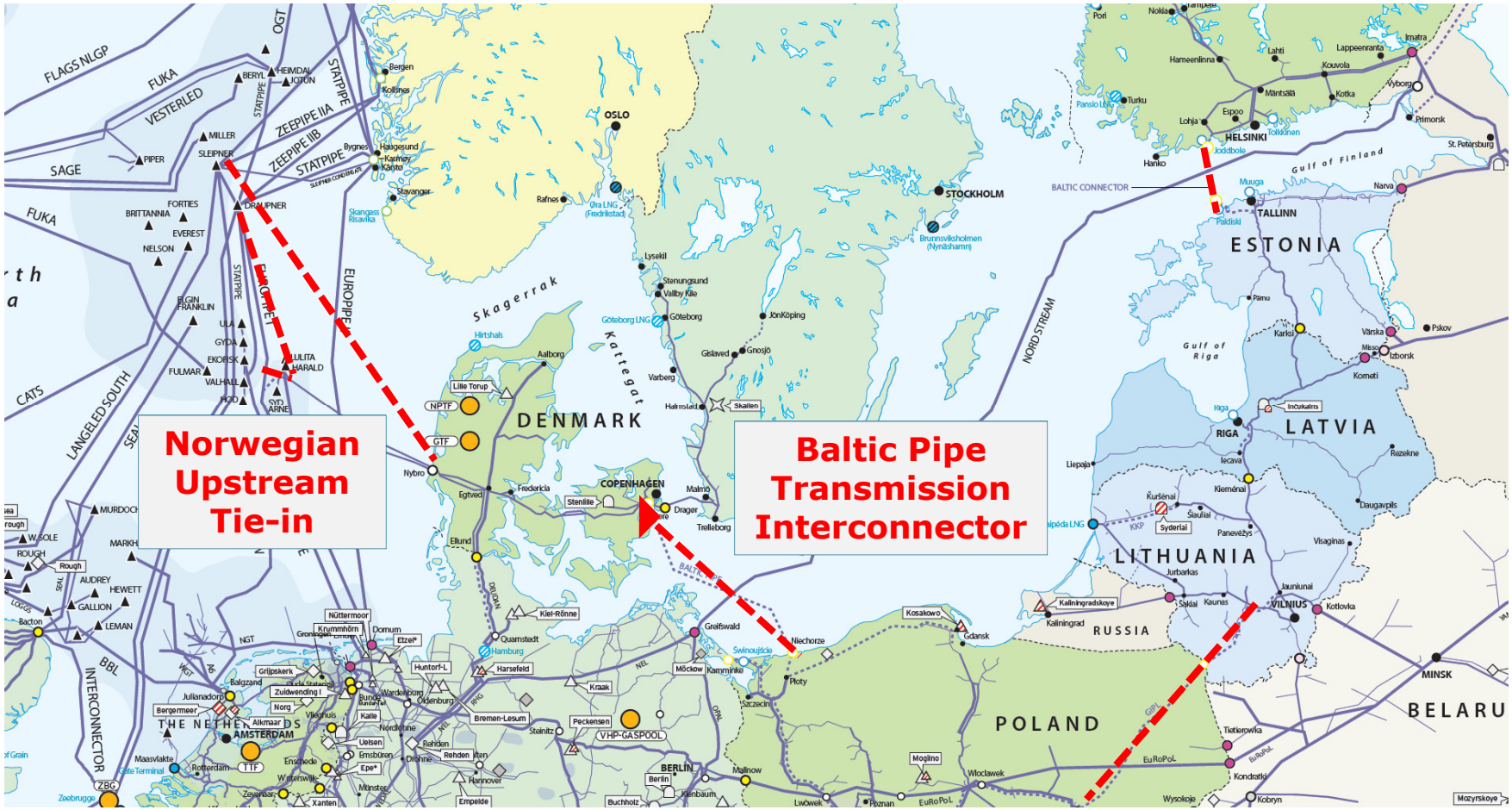
DK-S supply in conclusion

- Gasunie Deutschland has in 2014 secured Schleswig-Holstein, Sweden and Denmark a historical high level of Security of Supply
- The North Sea Tyra supplies may disappear from 2018
  - Leaving the Danish-Swedish gas market with only one primary gas supply source (again)
- Supplies from Germany and storage capacity can meet the future Danish-Swedish gas demand
- When Tyra disappear, Denmark will no longer fulfil the EU SoS regulation requirements for N-1 supply

Possible 2020 N-1 supplies to Denmark and Sweden



Taking a more regional integration perspective



EU CEF support for a N-DK-PL feasibility

Gaz System and Energinet.dk perform a feasibility study in 2015/16

Applied with the national Polish TSO in 2015

Supported by EU CEF programme

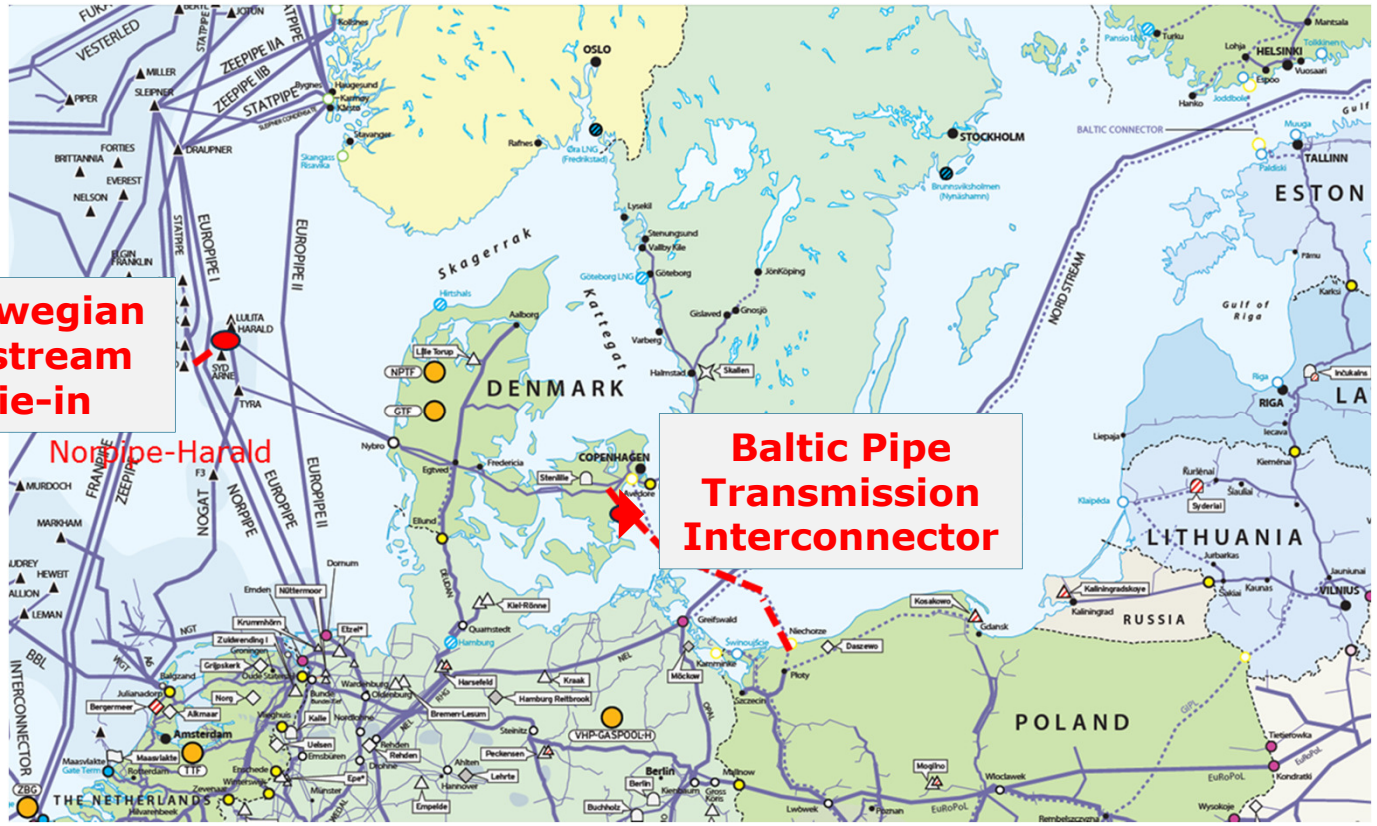
Possible Mile stones, **IF** feasible

- Feasibility study period 2015 - 16
- Business case development in 2016 – 20??
- Norwegian connection possible before 2020?
- Baltic Pipe possible before 2022?

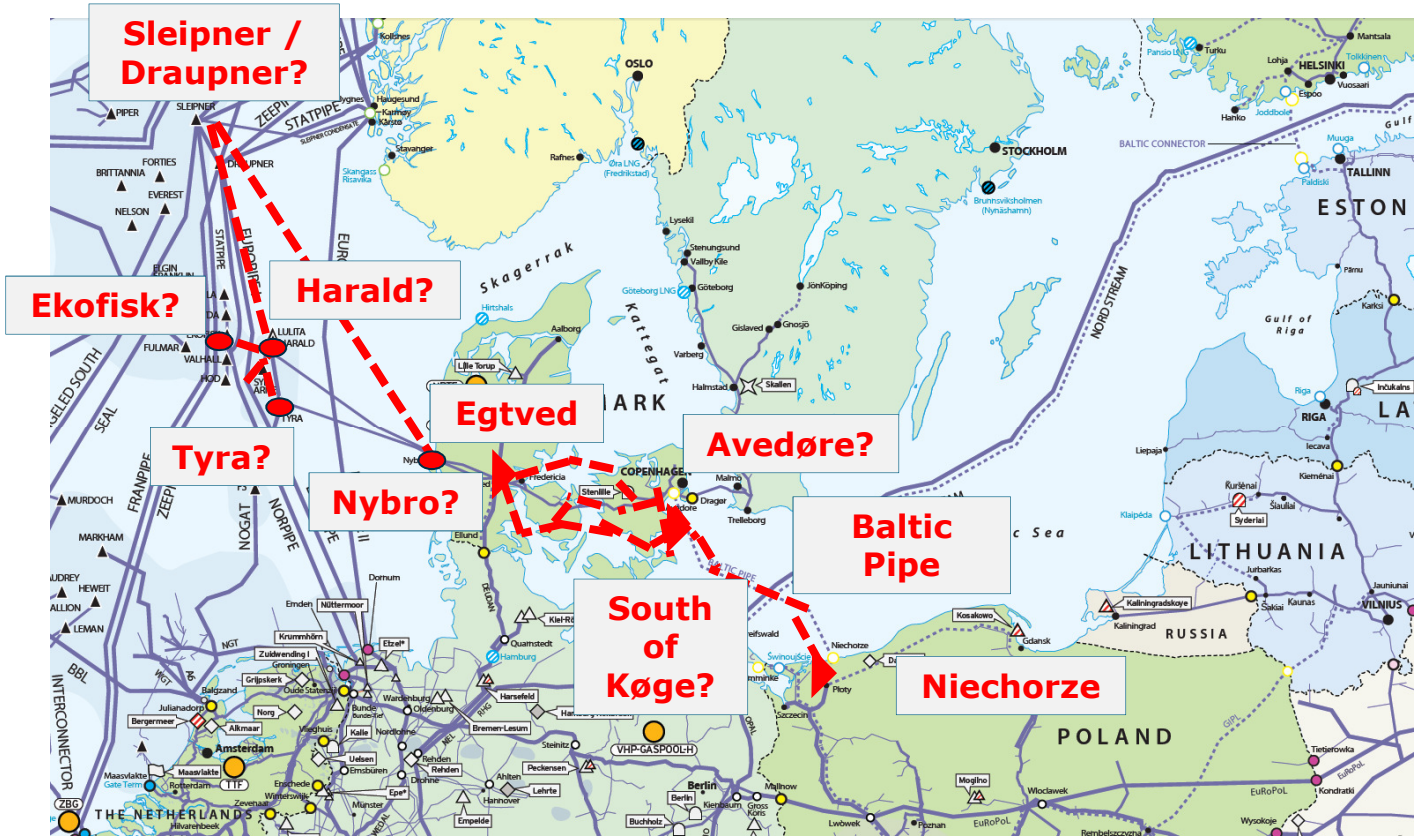
5 Feasibility Study Activities

1. Market model analysis
   - What is required?
   - What can be achieved with a N-DK-PL?
2. Economic analysis
   - Security of Supply effects?
   - Price and market effects?
3. Technical solutions to Baltic Pipe and reinforcements
   - 3 alternatives ranging from app. 3 – 10 bcm/y
4. Technical solutions to upstream tie-in (not supported by CEF)
5. Introductory dialogue with environmental agencies and stakeholders

The simplest solution

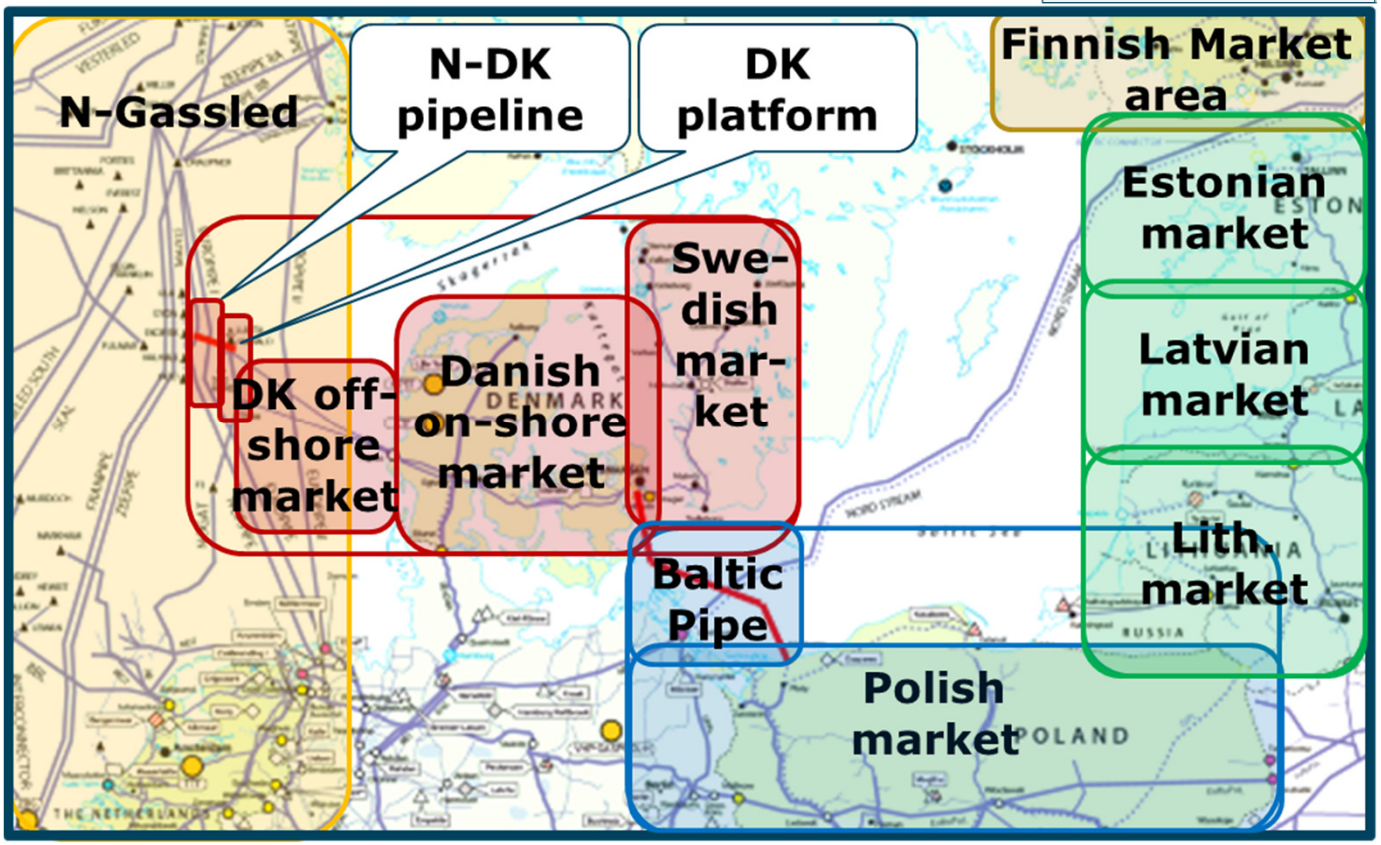


Many alternatives
– ranging from 3 – 10 bcm/y

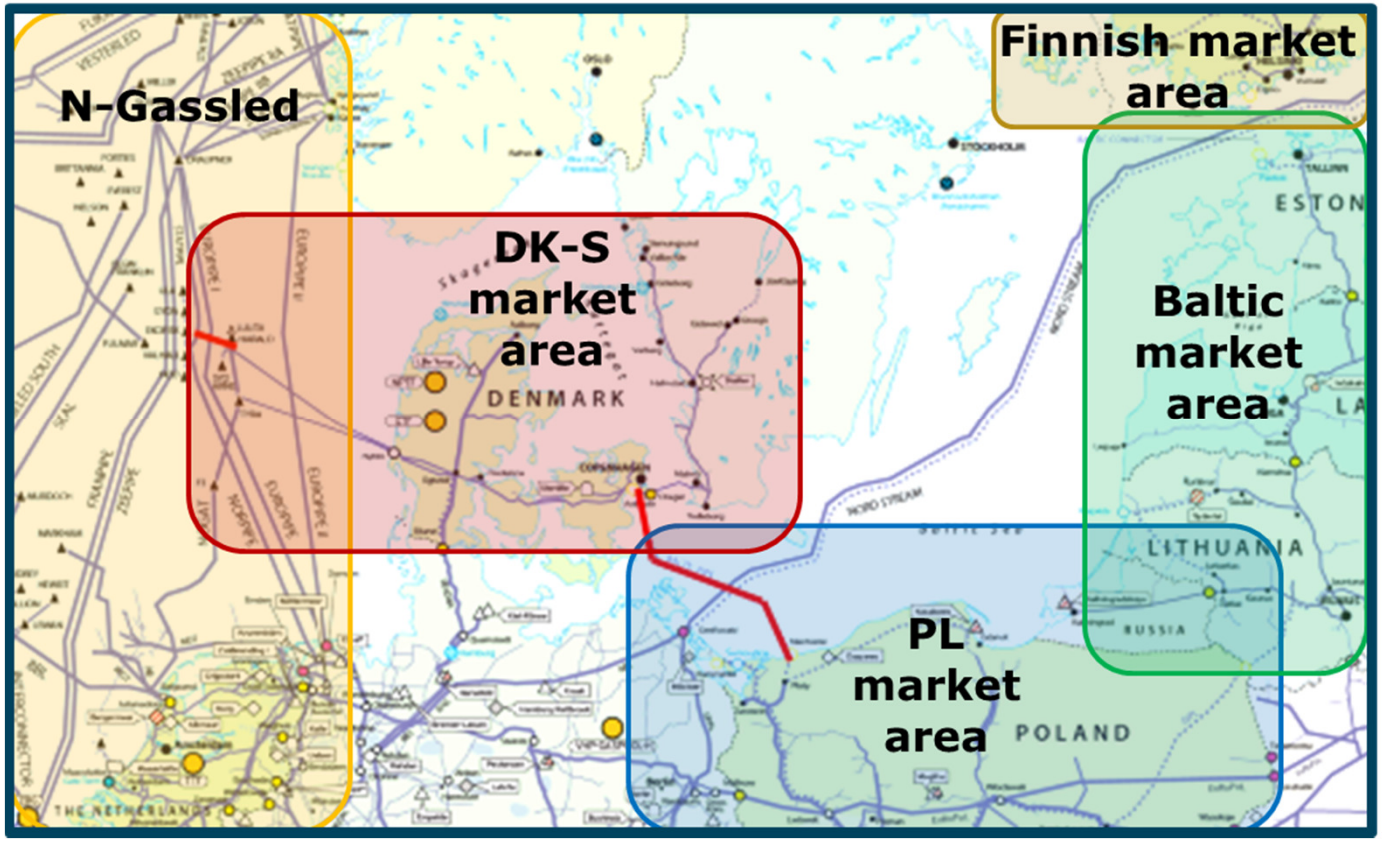


The Tariff Pancaking Death

R.i.P. †
Baltic Pipe
1998 - 2016



The Market Zone Alternative



In conclusion

There is a future for North Sea oil & gas

- But just like regional fossil demand, regional fossil production will decline
- Sweden and Denmark can be supplied without Tyra
- Denmark will launch a new offshore strategy in 2016

- Moreover:
  - We need to bridge for a renewable future where both renewable gas and oil will be needed
    - We need to make the North Sea more efficient
    - We need to integrate markets more to obtain full value
    - Transport, lng, green gas certificates, Nordic-Baltic, …