

THE DANISH BIOMETHANE SUCCESS

Austrian Gas Infrastructure Day

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WHAT IS ENERGINET?

Energinet is the Danish TSO for the gas and electricity systems

Energinet is a group of companies with a workforce of around 1,500 split between 11 locations.

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AGENDA



- Biomethane today
- Why biomethane is important and the Danish experience
- The future role of biomethane
- Energinet and renewable energy in general

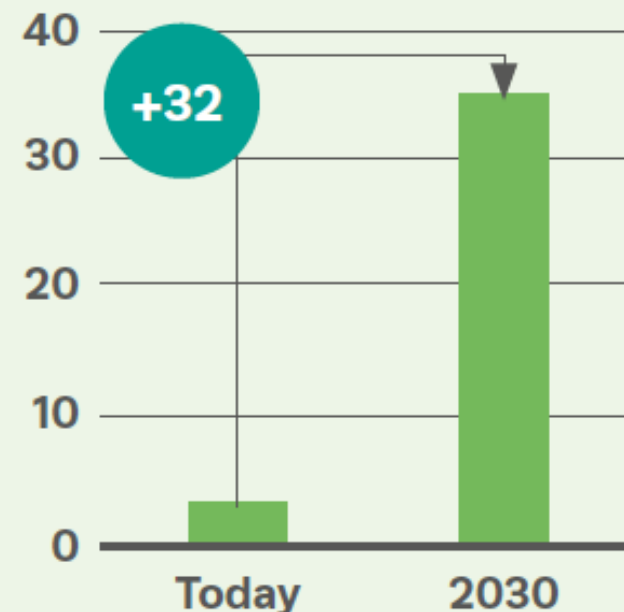
REPOWER EU WITH BIOMETHANE

In the REPowerEU plan to reduce dependence on Russian fossil fuels, the European Commission has set out a target to increase the current European biomethane production from 3 bcm (2020) up to 35 bcm by 2030. This represents more than 10x increase.

35 bcm represents 20-25 % of the European gas imports from Russia (pre Ukraine) and almost 10 % of all gas consumed in the EU.

By 2050, 30-40 % of Europe's total gas consumption can be covered by sustainable biomethane.

From 3 bcm biomethane
production today to 35 bcm
EU-27



Urgent need to diversify supply and reduce
dependence on external gas providers

35 bcm represent 20%
of current gas imports from Russia today



An aerial photograph of a rural landscape in Denmark. The foreground and middle ground are dominated by vibrant green agricultural fields. A long, narrow, brown earthen trench runs through the center of the image, containing several parallel blue pipes. In the background, there is a cluster of industrial buildings, likely a biogas production facility, surrounded by more green fields and a line of trees. The sky is bright blue with scattered white clouds.

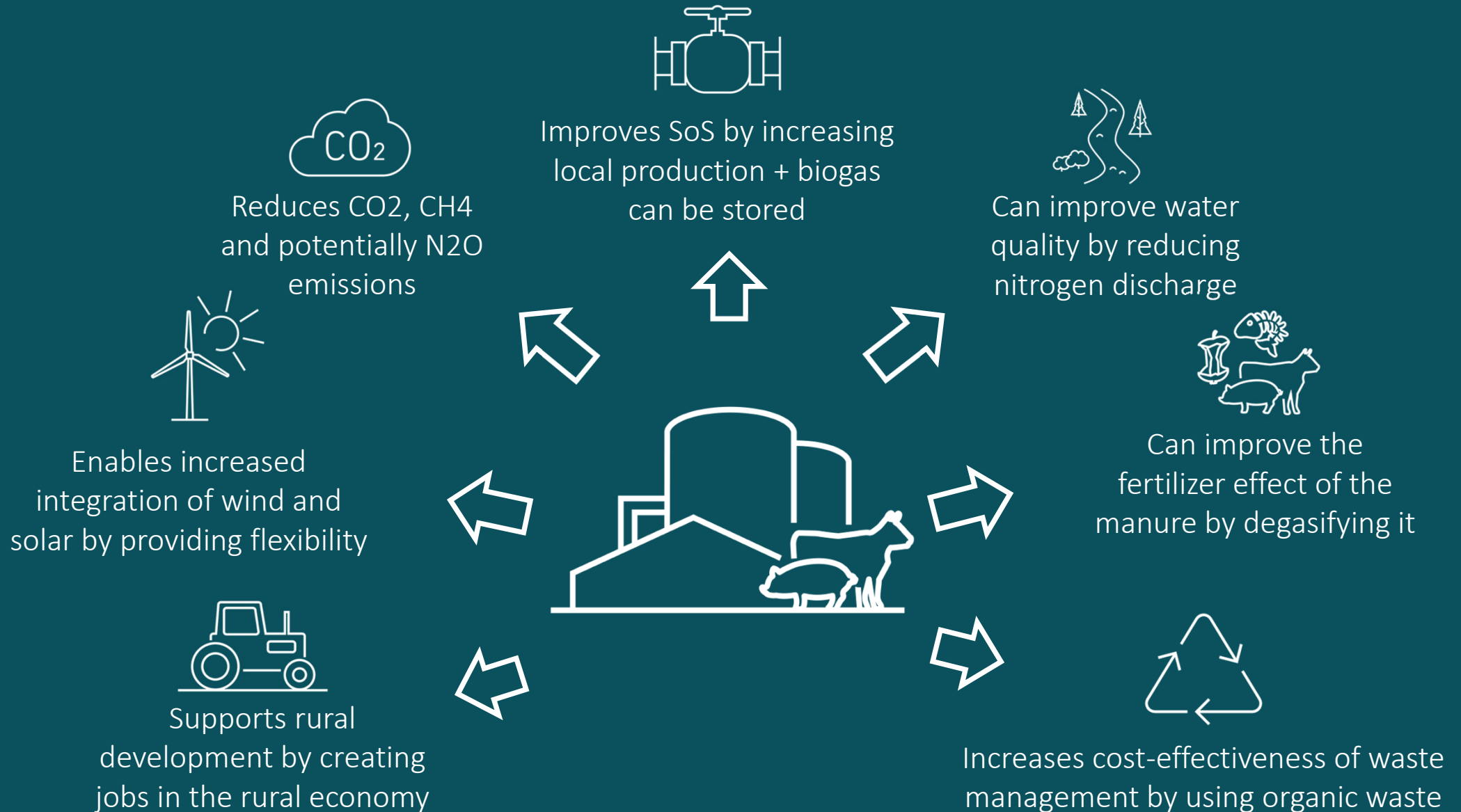
BIOMETHANE IN DENMARK

Biogas helps to ensure security of supply, as this can make us independent from Russian gas.

The production of biogas will help us achieve our goal of being CO₂-neutral in 2045.

The production of biogas with residual and waste products is green energy, in contrast to the natural gas that we have until recently imported on a large scale from Russia to Europe.

BIOMETHANE IS A 'SWISS ARMY KNIFE' CONTAINING SEVERAL ADVANTAGES



A large, leafy tree stands in a green field under a clear blue sky. The tree is the central focus of the image, with its branches spreading out. The field is a vibrant green, and the sky is a clear, bright blue. In the background, there are rolling hills and a line of trees.

BIOMETHANE IN DENMARK

Today, 34 % of domestic gas consumption is covered by the Danish biogas production.

Due to increase in production of biogas the consumption of fossil natural gas has fallen by 37 %.

The increase is due to fall in gas consumption, but the production has increased as well.

Considering
byproducts from
the agricultural
sector as a
resource

Subsidizing
biomethane to
ramp up
production

Cost-sharing
framework to
maximize
injection

Accepting a
higher level of
oxygen content

Documenting the
green value of
biomethane

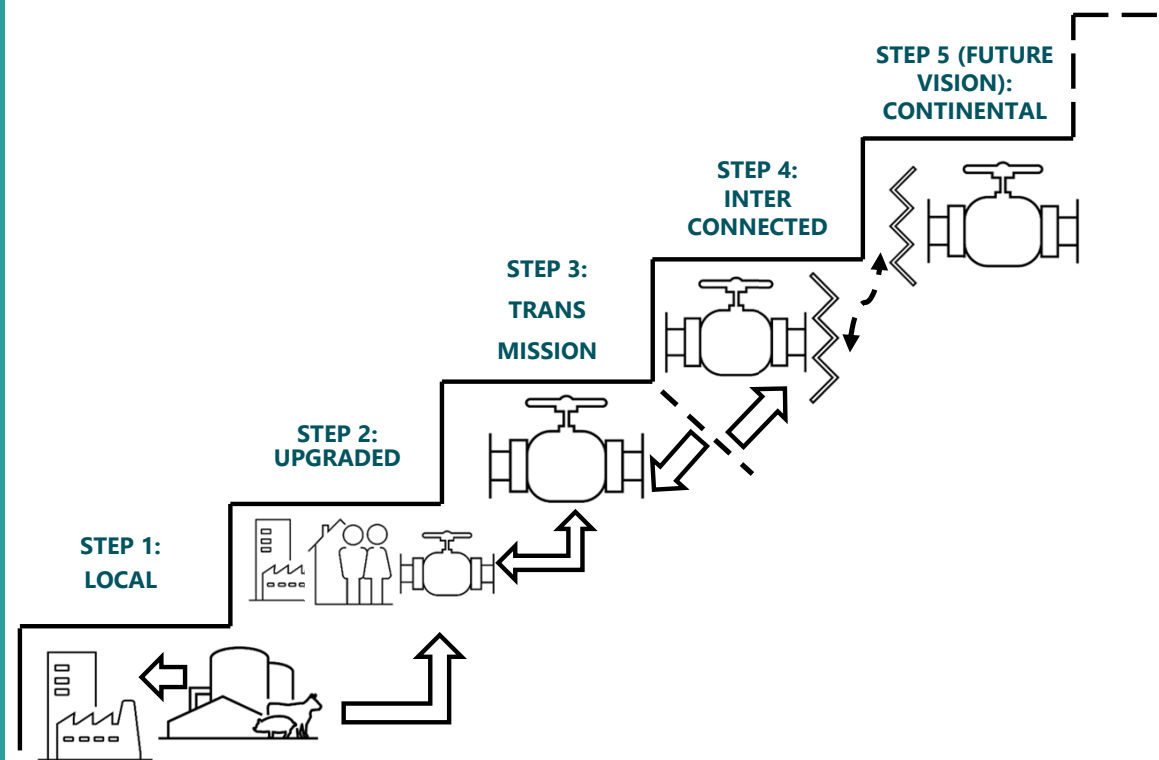
Consumers/
Industry take the
lead

THE DANISH EXAMPLE

Each step, structured according to 6 parameters, which have been essential for the Danish biomethane development:

- Infrastructure
- Market
- Green value
- Regulation
- Subsidy scheme
- Operating economy

5 STEPS, BASED ON MILESTONES IN THE GAS INFRASTRUCTURE DEVELOPMENT



THE DANISH BIOMETHANE DEVELOPMENT – 5 STEPS

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STEP 1 "LOCAL"

The Danish biomethane development can be divided into 5 steps, based on milestones in the gas infrastructure development, which have enabled the penetration of biomethane over (increasingly) larger and contiguous areas. Step 1 "Local", Step 2 "Upgraded", Step 3 "Transmission", Step 4 "Interconnected" and Step 5 "Continental".

Below you will find a condensed description of the actions taken and developments made for each step, structured according to 6 parameters, which have been essential for the Danish biomethane development: Infrastructure, market, green value, regulation, subsidy scheme and operating economy.

We have not yet taken all 5 steps in Denmark. Currently, we are on step 4 where further action is needed before progressing to the next step. It means that the actions and developments described in step 4 and 5, which we have not yet been through, are not actual experiences but rather potentials for further developments, which can contribute to achieving 100% biomethane coverage.

STEP 1 "LOCAL"

- Direct connection between production and consumption at a very small scale
- Subsidizing use of biogas in CH₄ generation
- Well waste and residue resource from large agricultural sector used as feedstock. Considered a resource and not waste

STEP 2 "UPGRADED"

- Upgrading plants connected to distribution network as biogas is captured to biomethane
- Inclusion of biomethane in natural gas market model
- Establishment of a national certificate register
- Right to inject, policy
- Subsidizing all uses of biogas
- Transparent cost sharing framework involving injection

STEP 3 "TRANSMISSION"

- Reverse flow from DNO to TSO network
- Co-fundable for existing subsidy scheme
- Coherence with surrounding legislation
- Need for finding new feedstocks sources
- Demanded pull-certificates and sustainability schemes enables use in fuel quota regulation – a ETR and biofuel quota

STEP 4 "INTERCONNECTED"

- Cross-border flow of biomethane
- Updating the quality standard for cross-border gas flows to allow for unhindered cross-border flow of biomethane
- National green value exchange
- Subsidies granted through technology neutral public tenders
- Bilateral agreements on cross-border trade of certificates

STEP 5 "CONTINENTAL" (FUTURE VISION)

- Connection between regional transmission networks via transmission pipelines and ISO coupling
- Continental ISO standard and scheme
- Continental green value exchange
- Changing the green value where the gas is used
- Subsidizing biomethane is not longer necessary in certain countries
- Security of land area and large dependence on the agricultural sector

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STEP 2 "UPGRADED"

Upgrading plants connected to distribution network as biogas is captured to biomethane

Inclusion of biomethane in natural gas market model

Establishment of a national certificate register

Right to inject, policy

Subsidizing all uses of biogas

Transparent cost sharing framework involving injection

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STEP 3 "TRANSMISSION"

Reverse flow from DNO to TSO network

Co-fundable for existing subsidy scheme

Coherence with surrounding legislation

Need for finding new feedstocks sources

Demanded pull-certificates and sustainability schemes enables use in fuel quota regulation – a ETR and biofuel quota

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STEP 4 "INTERCONNECTED"

Cross-border flow of biomethane

Updating the quality standard for cross-border gas flows to allow for unhindered cross-border flow of biomethane

National green value exchange

Subsidies granted through technology neutral public tenders

Bilateral agreements on cross-border trade of certificates

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STEP 5 "CONTINENTAL" (NEXT STEP / FUTURE VISION)

Connection between regional transmission networks via transmission pipelines and ISO coupling

Continental ISO standard and scheme

Continental green value exchange

Changing the green value where the gas is used

Subsidizing biomethane is not longer necessary in certain countries

Security of land area and large dependence on the agricultural sector

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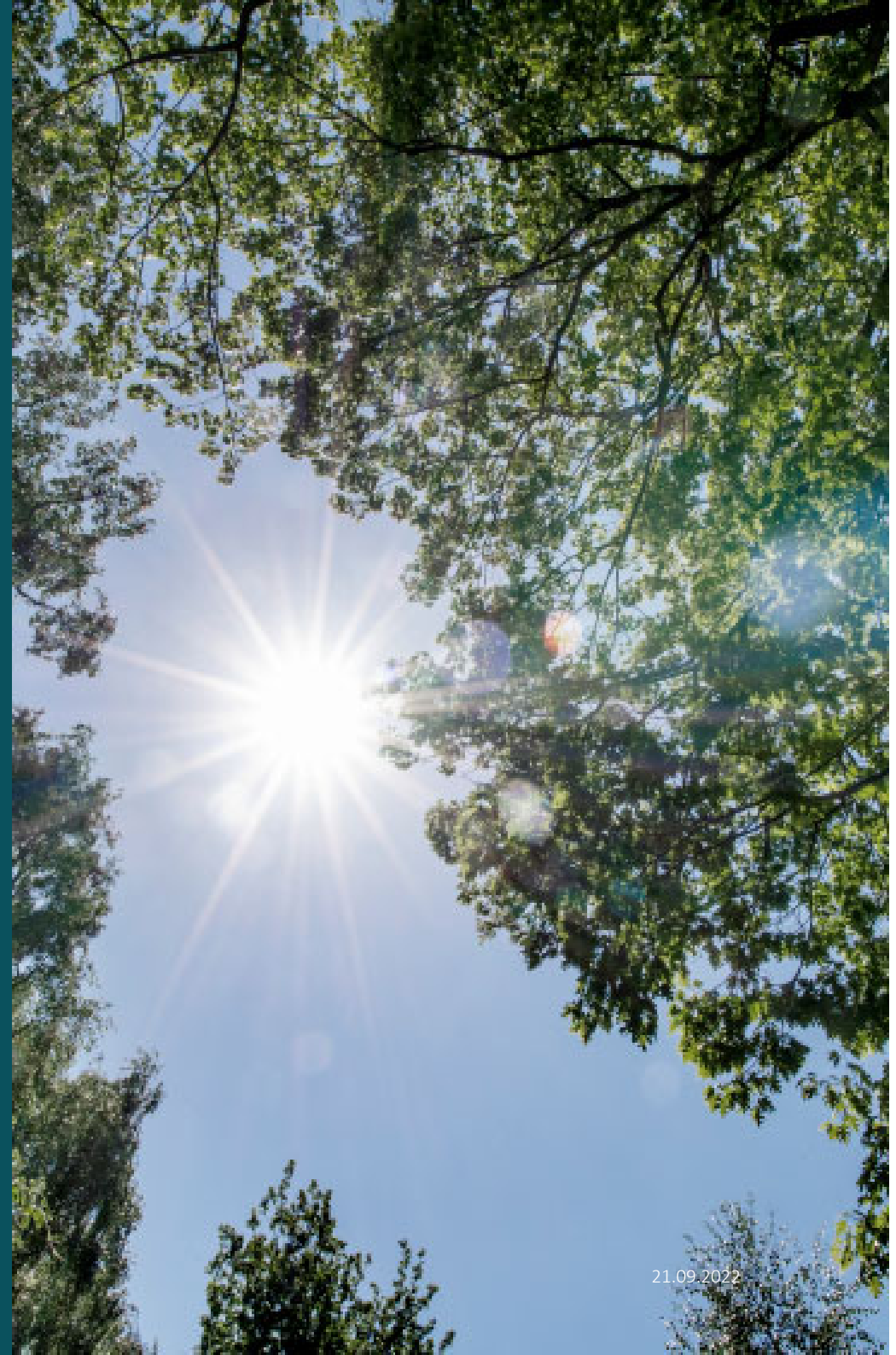
Link to Energinet's full presentation on "Danish Biomethane Experiences": <https://en.energinet.dk/Gas/Biomethane/Danish-Biomethane-Experience>

100 % BIOMETHANE BEFORE 2030

In Denmark, biomethane plays an essential role in the green transition of the gas system and for security of supply.

The Danish Government aims for a 100 % green gas coverage already in 2030 – a target which might very well be achieved even before.

The current record for biomethane coverage of the total Danish gas consumption measured over 24 hours is 98.2 %.





CONSIDERATIONS FOR THE FUTURE

DEVELOPING THE GRID FOR BIOMETHANE

- ✓ Economical incentives for injecting biomethane
- ✓ Support European green transition with interconnectors
 - Support new end users
 - Unilateral agreements to document green value?
 - Handle local surplus of biogas by balancing the system
 - Handle varying gas quality



HIGHER SHARE OF BIOMETHANE

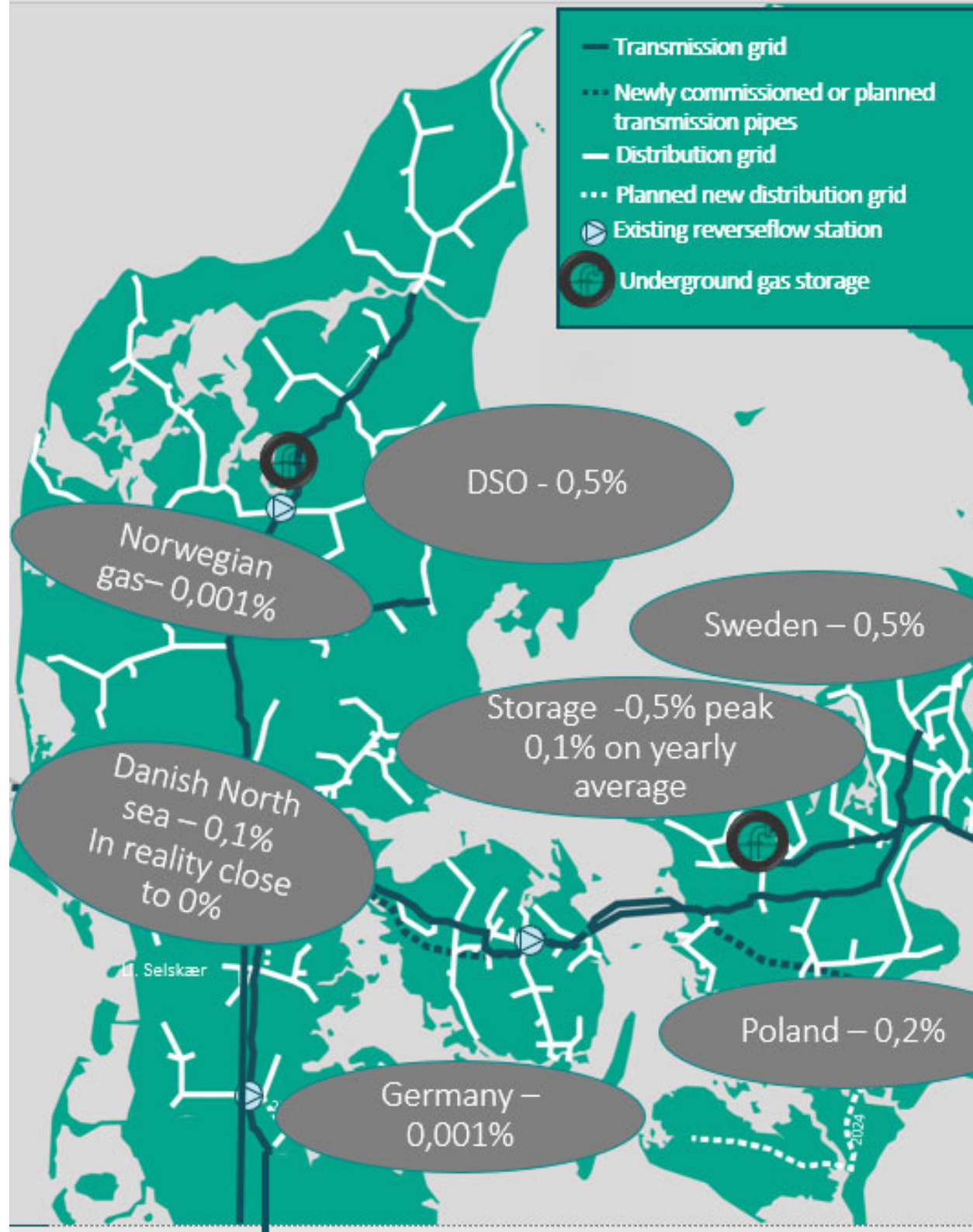
- A shift from upstream production to downstream production can lead to balancing issues
- Seven new reverse flow units under preparation
- Odorant added for gas to DSO-grid – needs to be removed before transmission grid



OXYGEN

Biomethane complies to almost the same specs as natural gas

- Biogas contains a higher level of oxygen
- No reported issues by consumers
- Higher allowable O₂ content: up to 0,5% vol is an issue at borders
- The REPower 35 bcm target on biomethane makes this a subject for all TSOs in Europe





HOW TO DELIVER 35 BCM BIOMETHANE

- Innovative workshop to meet the REPowerEU 35 bcm biomethane objective by 2030 sustainably
- Identifying obstacles and possible solutions
- Networking across nations with different solutions

Kickstarted a cooperation on biomethane towards the goal

GIE BIOMETHANE WORKING GROUP

- European gas infrastructure operators sharing experiences on biomethane infrastructure and market design
- Created under GIE's Natural Gas Area with administrative support from the GIE secretariat
- Energinet is represented
- Two chairmen (Gas Network Ireland and GRZgaz)

MAIN GOALS

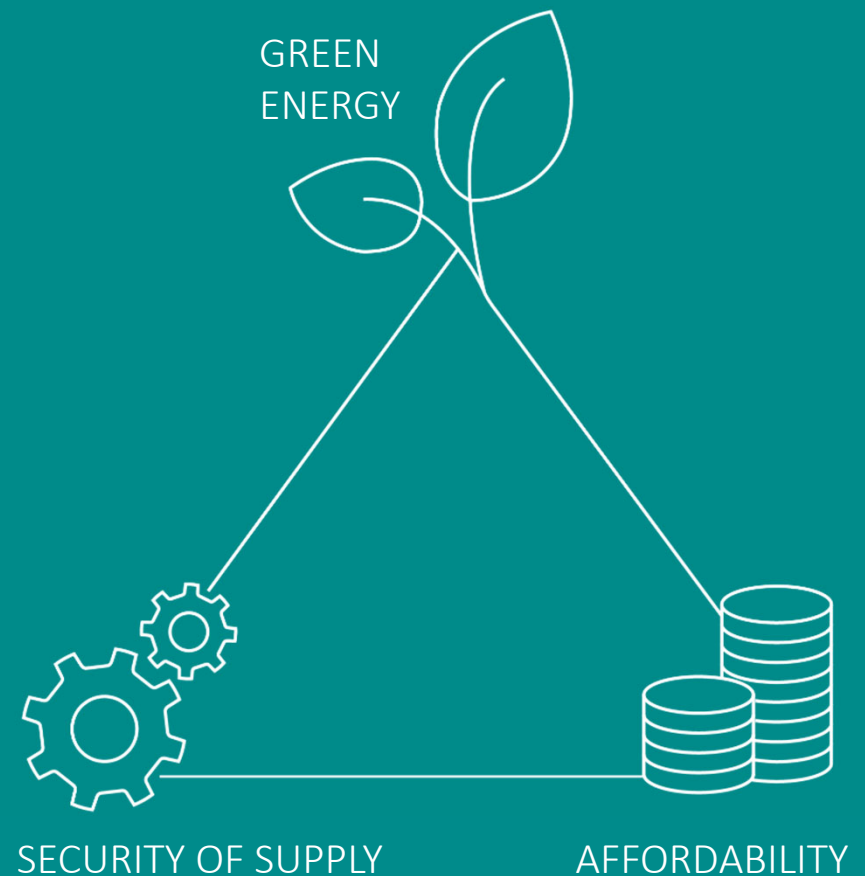
- Identify barriers in reaching the 35 bcm target → Transforming the biomethane market from a local market to a national and European level
- Presenting the role of biomethane in the future energy system
- Identifying the right economic incentives
- Better understanding of end users
- Incentivize barriers for free flow of biomethane within and across borders



RENEWABLE ENERGY IN GENERAL

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.



Energinet's vision, operation and strategy must be seen in the light of political ambitions in Denmark and Europe, including, in particular, the ambitions to ensure 100% renewable energy in the electricity and gas systems in 2030 and to achieve a climate-neutral society in 2050.



WORLD'S FIRST ENERGY ISLANDS

The North Sea:
3 GW offshore wind by 2033, later 10 GW.

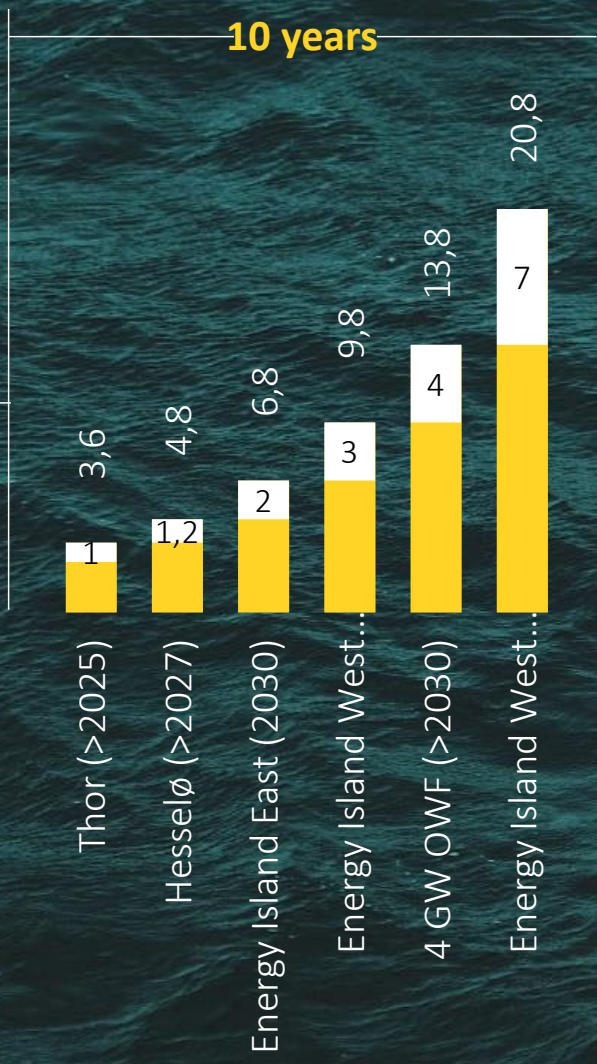
The Baltic Sea:
3 GW offshore wind by 2030.

-  ENERGY ISLAND
-  ONSHORE CONNECTIONS, ALTERNATIVES
-  NEW OFFSHORE WIND FARMS



BUILD-OUT OF DANISH OFFSHORE WIND

Accumulated capacity of production in GW



HYDROGEN HAS BECOME A POLITICAL FOCUS

REGULATION

Transitional
regulation that fits
with the Hydrogen
and Gas Package

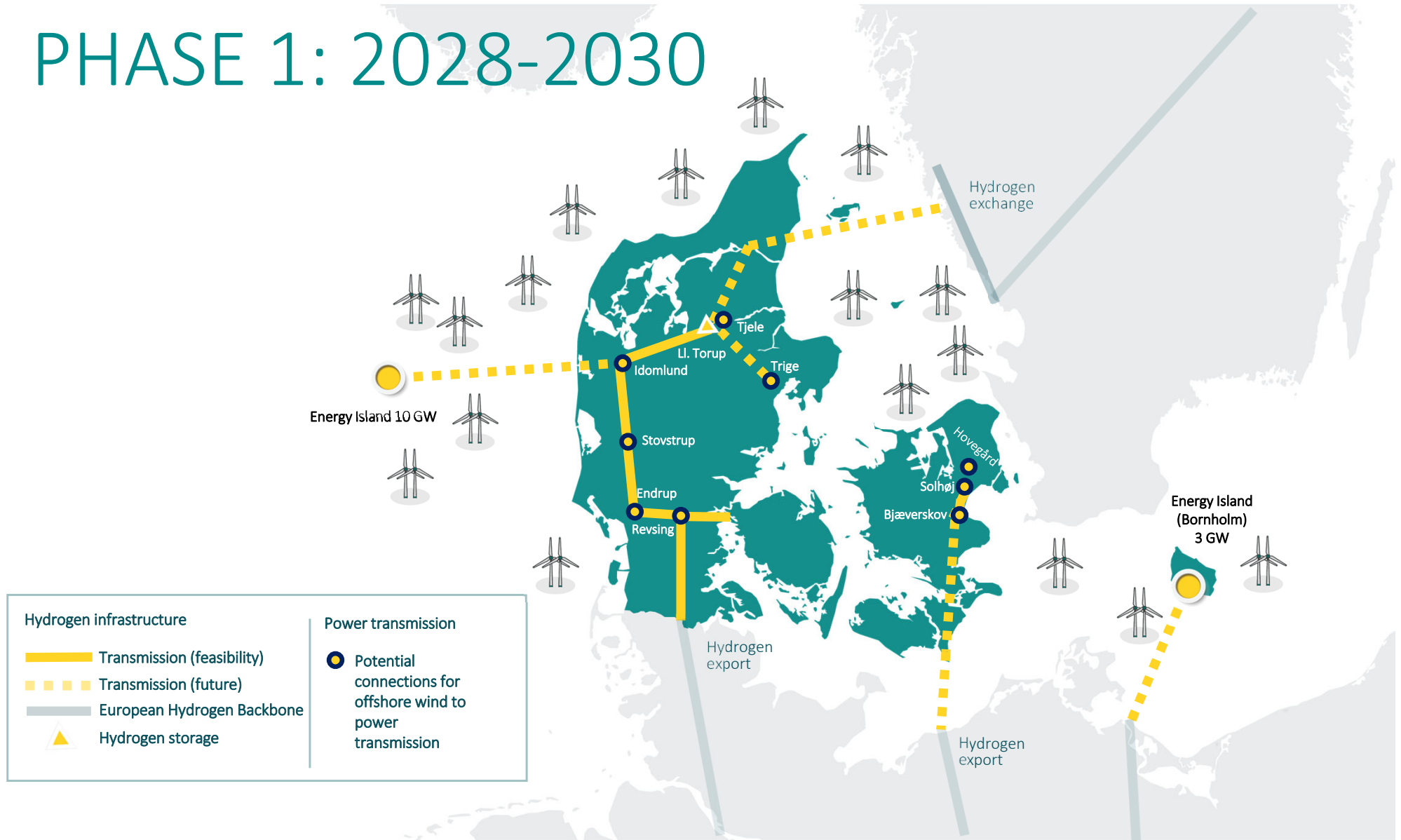
RESPONSIBILITY

Not decided yet...

WHO BEARS THE RISK

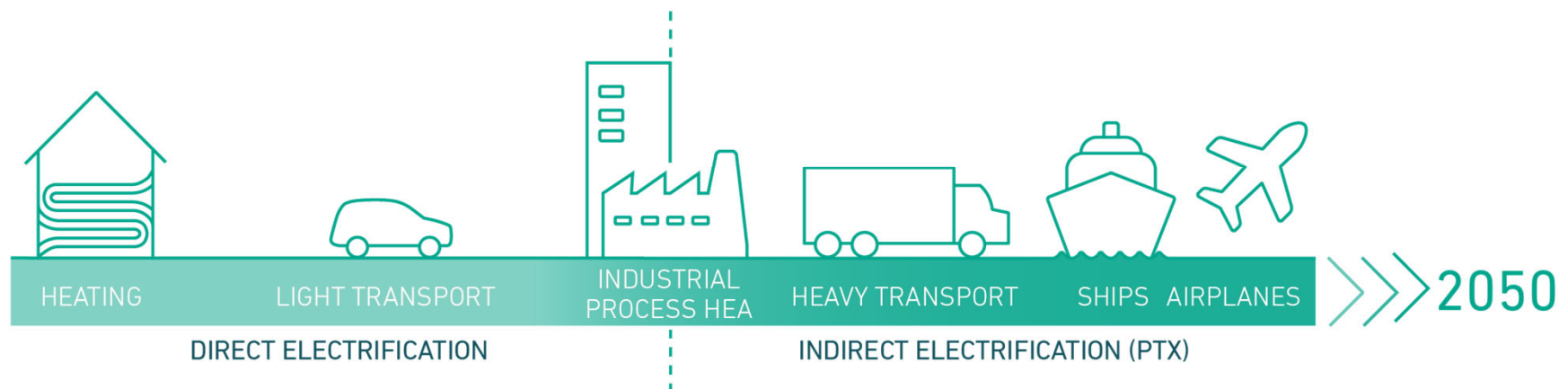
That will be decided
at a later date.

PHASE 1: 2028-2030



WHAT DOES THE FUTURE HOLD

- Continued growth of biomethane – with and without subsidies
- Understanding the future consumption (increased usage of gas for production of fuels: Gas to liquid, Power to X – reduces the need for balancing)
- Less capacity needed – parts of the grid may not be needed for methane transport? Hydrogen conversion?
- New regulation can speed up or slow down the transition (e.g. tariff discounts for renewable gases in the hydrogen and gas package)



THANK YOU FOR
YOUR ATTENTION

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