nature energy

Scaling of Biogas production for replacing fossil natural gas

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Let’s talk about the elephant in the room

Leading Biomethane Producer Nature Energy Biogas to be Acquired By Shell

Huibert Vigeveno, Shell’s Downstream Director, commented:

*“Acquiring Nature Energy will **add a European production platform and growth pipeline to Shell’s existing RNG** projects in the United States. We will use this acquisition to **build an integrated RNG value chain at global scale**, at a time when energy transition policies and customer preferences are signaling strong growth in demand in the years ahead.”*

https://nature-energy.com/nature-energy-biogas-to-be-acquired-by-shell

Sun, wind and biowaste

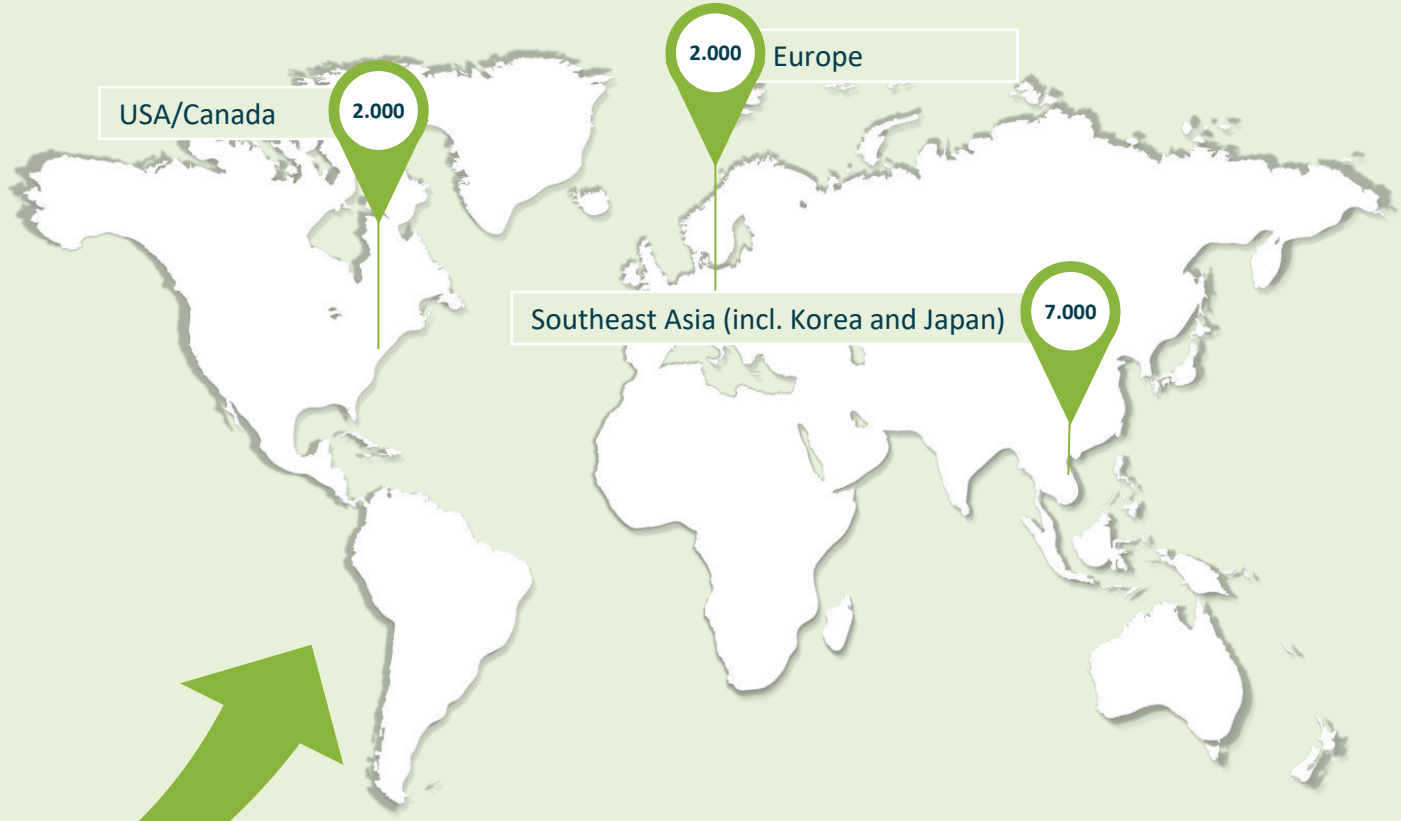
Are the three natural resources for the production of green energy

World largest Biogas producer with great global growth potential

Operating plants

Projects under construction

Pipeline projects



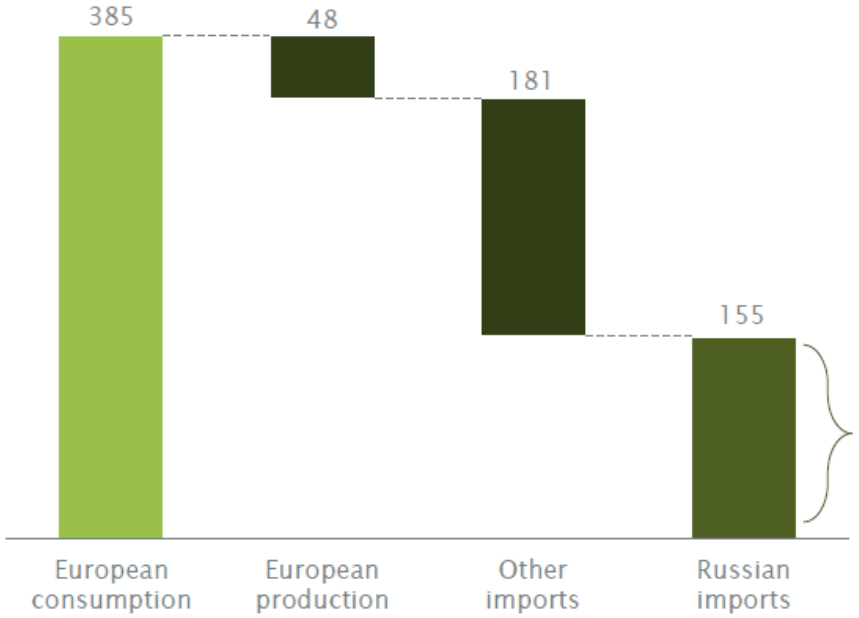
In 2020 Nature Energy turned **3.5 mil. tonnes of biowaste into 125 mil. m^3 green biogas**, which corresponded to around **25 % of the total amount of green gas** in the Danish gas grid.

In 2021 we **increased the biogas production by a third**. This means that we provide the Danish gas grid with **30 % of the total amount of biogas**.

Russian gas leaves a significant supply gap in Europe

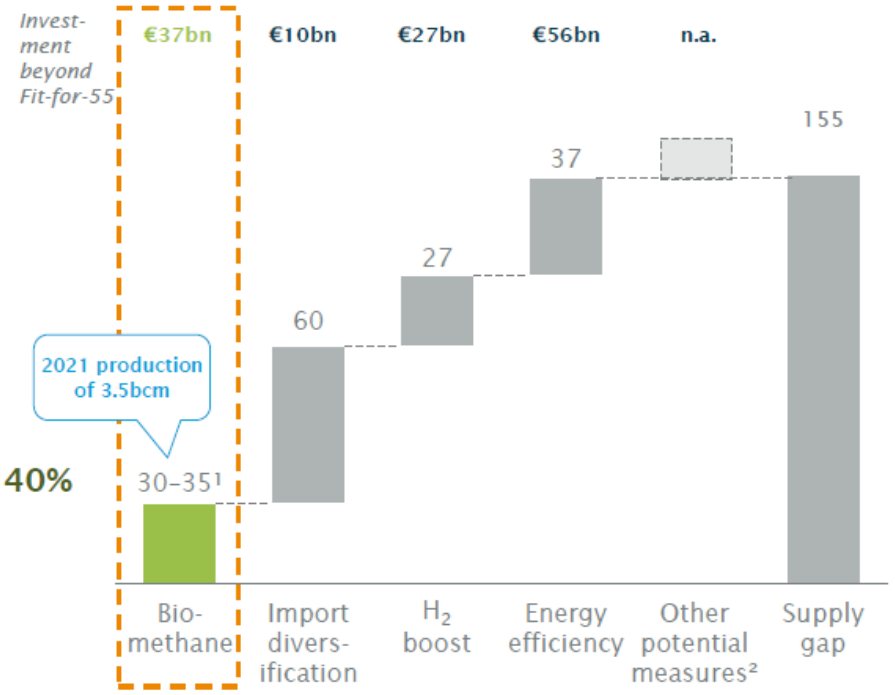
Exit from RU gas leaves supply gap of 155bcm

European natural gas consumption, 2020 (Bcm)



EU to address gap with 35bcm (385 TWh) biomethane

REPowerEU and Fit for 55 levers to meet supply gap by 2030 (bcm)



Biomethane is **ideally positioned to partially address the supply gap** due to

- **Lack of logistical constraints** vs LNG (limited gasification capacity, imports concentrated in few European ports, etc.)
- Possibility of **even production** across Europe and
- Possibility to **leverage the existing gas grid network** vs. necessary readiness of H_2

EU's 35bcm biomethane target is expected to result in undersupply, which is being addressed by €37bn investment in biomethane by the EU

Source: European commission; Eurostat; Global tier-1 management consulting firm analysis

[1] Target is 35bcm but incremental demand is 31bcm; includes existing Fit for 55 target

[2] The European Commission identified various potential measures that in combination could lead to over 155bcm worth of gas import savings from Russia (2021 import level); in addition to accelerating Fit for 55, these measures could include: delayed phase-out and increased operating hours for coal, abandoned phase out of nuclear plants, price-driven fuel switch, biomass use and reduced use in industry

Industrializing Biogas

Biogas 1.0

Size:
5-25
GWh/yr[1]

Yield:

- Small farm-based facilities or manure lagoons generating biogas for local power/heat
- Large share of feedstock is energy crop
- Moderate CO_2e abatement

Biogas 2.0

Size:
150-300
GWh/yr[2]

Yield[3]:

- Industrial scale, high-yield facilities that upgrade biogas to biomethane
- Mainly treats waste & residue feedstocks, non-reliant on energy crop
- Very high CO_2e abatement

Nature Energy today

Biogas 3.0

Size:
250-500
GWh/yr[4]

Yield[4]:

- Integrated, sustainable energy hubs which produce biomethane and monetize CO_2, biofiber, fertilizers
- Significantly higher yield
- Only treats waste & residue feedstocks
- Even better CO_2e abatement vs 2.0

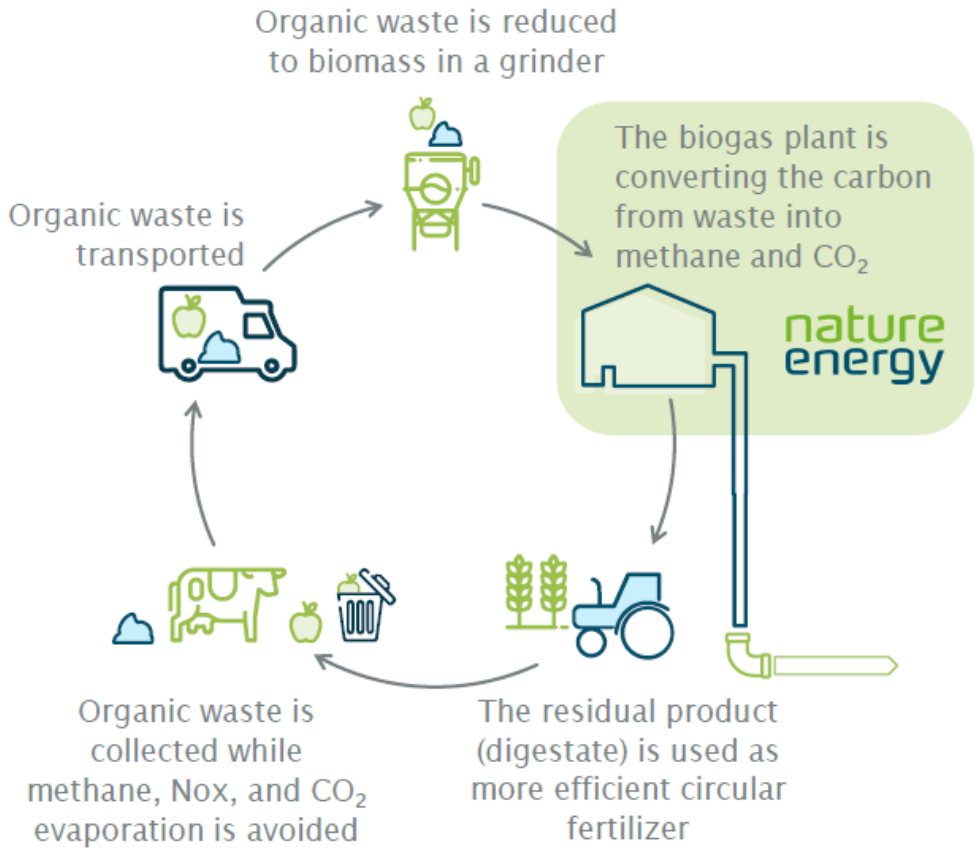
Nature Energy 2027

Increase in size up to 60x in GWh/yr

Source: Global tier-1 management consulting firm; PtX stands for Power-to-X
[1] The average European biogas plant today is c. 10 GWh per year
[2] 150-300 GWh range represents c. top 5% of largest biomethane plants
[3] Higher degree of biomethane extraction vs Biogas 1.0 when using the same feedstock and other resources (incl. energy and time)
[4] 75% higher energy extraction vs Biogas 2.0 by also converting CO2 and biofibers to fuels

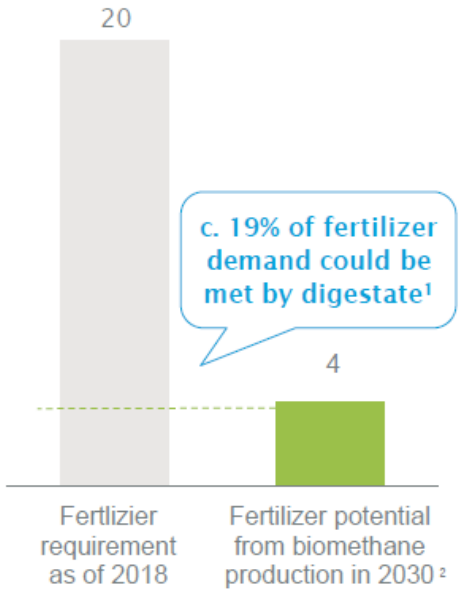
Digestate fertilizer enables sustainable agriculture and food security

Biomethane recycles waste nutrients into high quality fertilizer



Biomethane (digestate) fertilizer has many important benefits

mm tonnes fertilizer



- **Uniquely enables nutrient recycling from wastes**
- **Contributes to food security**
- **Reduces GHG emission by preventing synthetic fertilizer**
- **Improves agricultural soil carbon content**
- **Prevents methane and NOx from being released from manure**

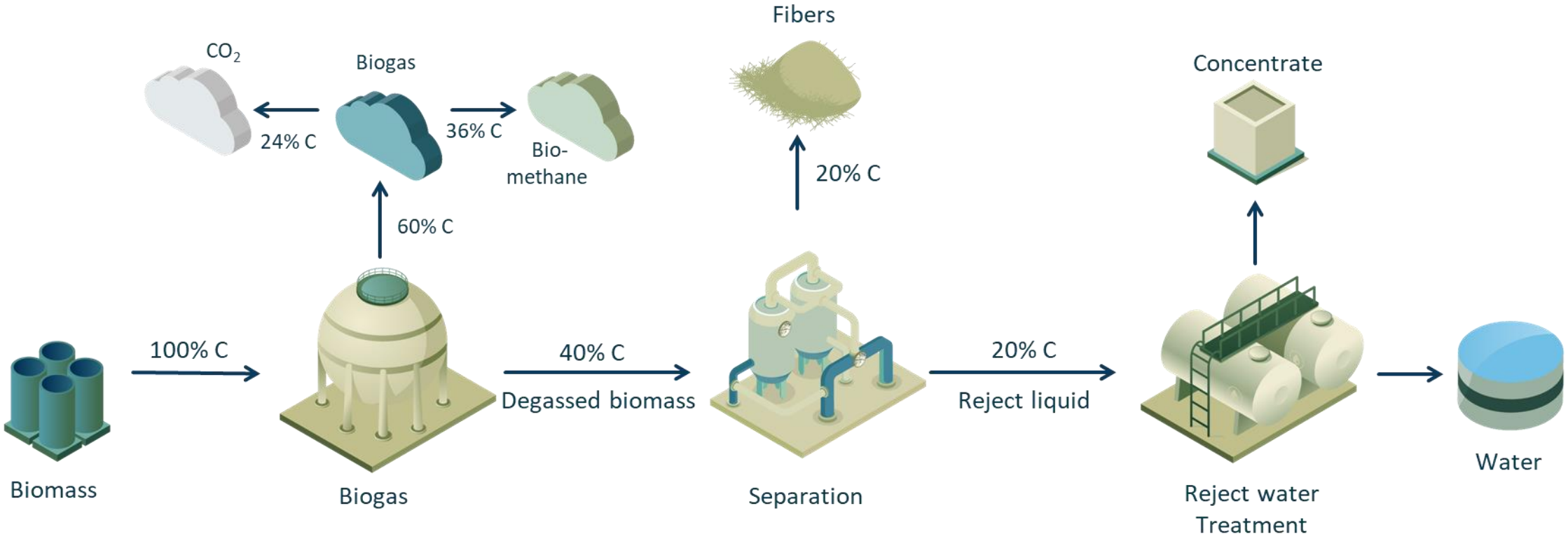
Source: UN FAO; Nature Energy; Global tier-1 management consulting firm

[1] Fertilizer potency from biomethane production in 2030 compared to fertilizer requirement in 2018; as per Global tier-1 management consulting firm

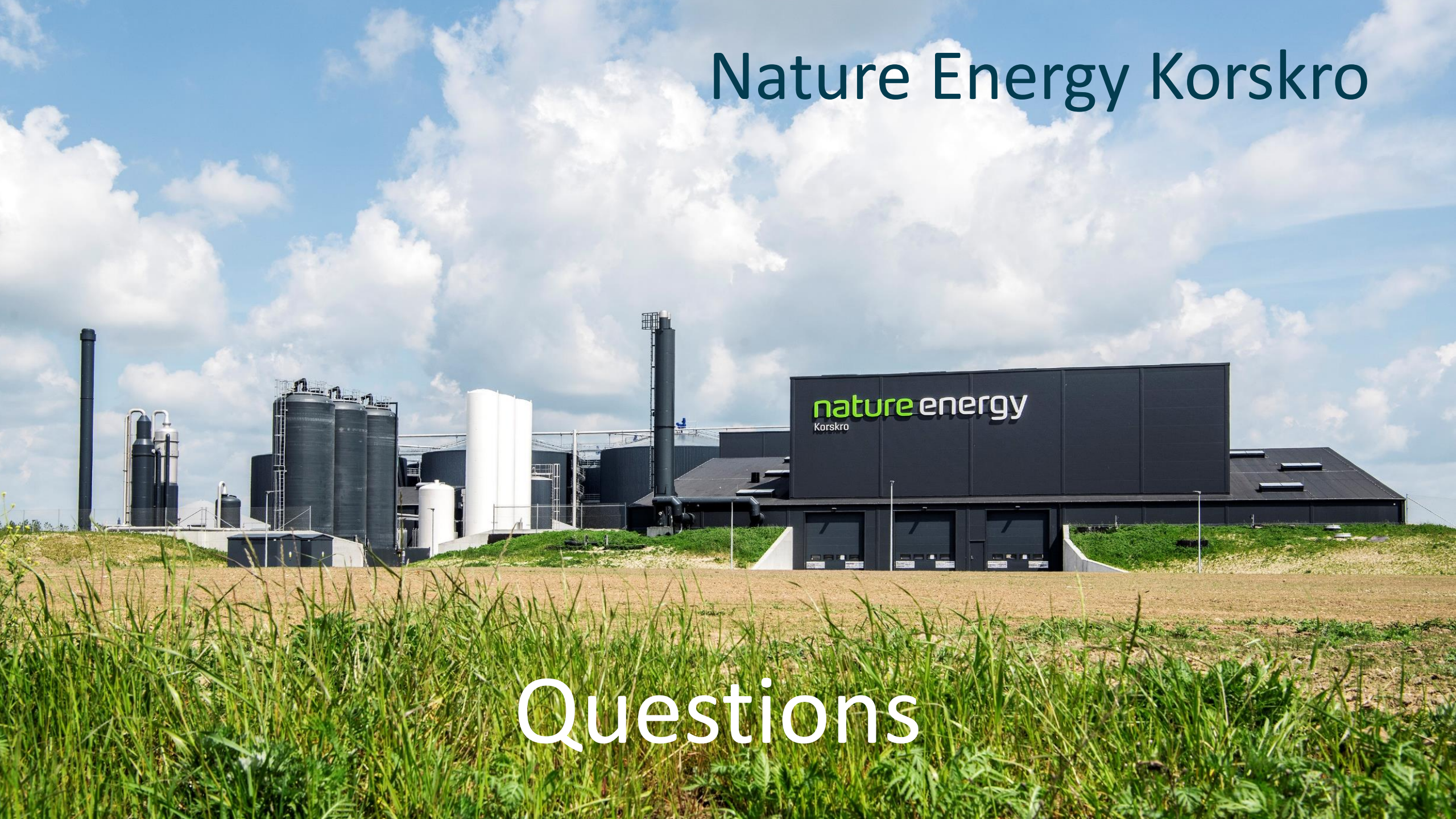
[2] Degassed biomass from biomethane production, as per Global tier-1 management consulting firm

[3] Healthy and biodiverse soils are paramount to agricultural production and climate change mitigation according to the UN FAO

Nature Energy is exploring new technologies to increase carbon utilization



Nature Energy Korskro



Questions

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Our purpose

Pioneering a sustainable future by turning waste into value