

# Bio natural gas into the Danish natural gas grid

Biomethane Regions – Copenhagen, 24th November 2011



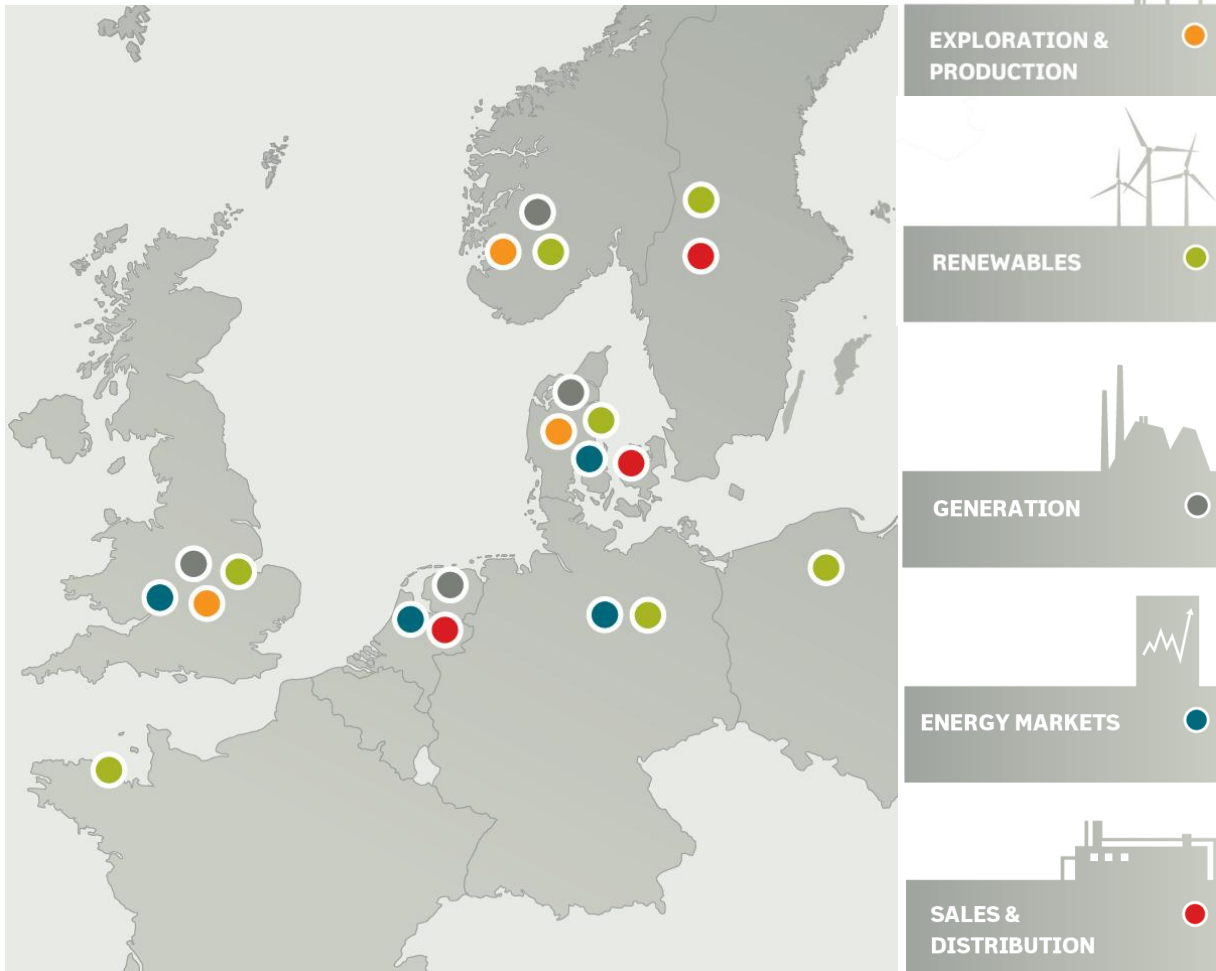
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**DONG**  
energy

# Agenda

- Short introduction to DONG Energy
- Denmark's first biomethane plant
- Other biogas activities in DONG Energy

# DONG Energy is one of the leading energy groups in Northern Europe



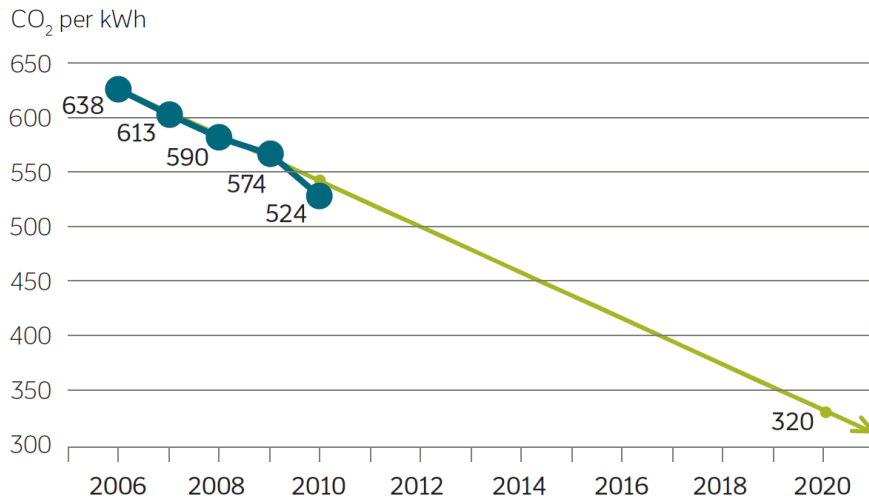
- We are headquartered in Denmark
- Our business is based on procuring, producing, distributing and trading in energy and related products in Northern Europe

# New assets in operation 2010-2014



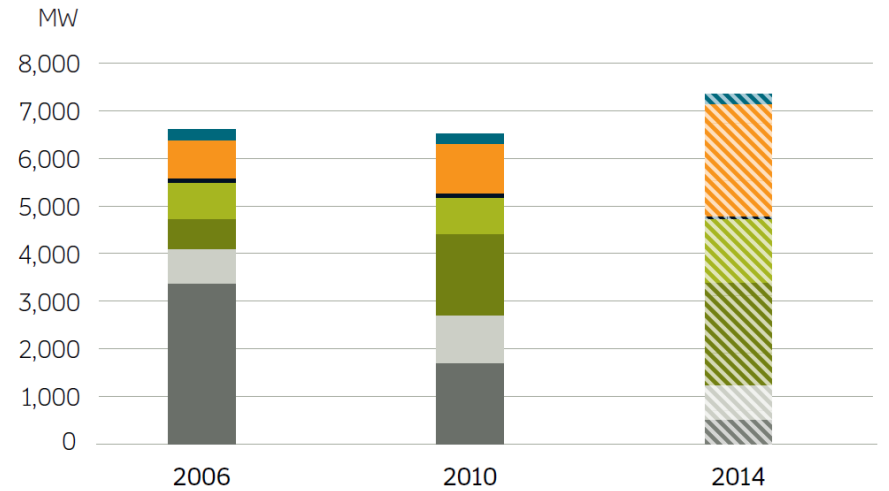
# Moving towards a greener future

## CO<sub>2</sub> REDUCTION TARGET



■ Achieved ■ Target

## THERMAL AND RENEWABLE ENERGY CAPACITY

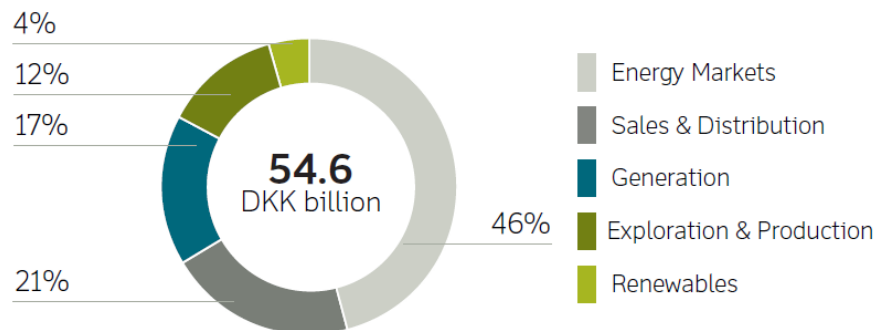


■ Coal ■ Oil ■ Gas ■ Biomass ■ Waste ■ Wind ■ Hydro

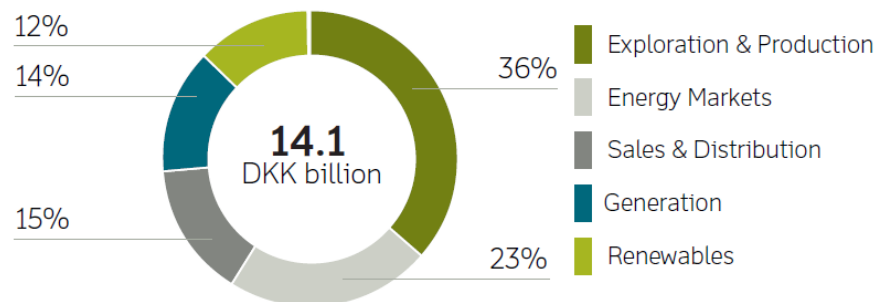
Note: Hatched column denotes estimate

# Revenue and EBITDA by business unit

## REVENUE 2010

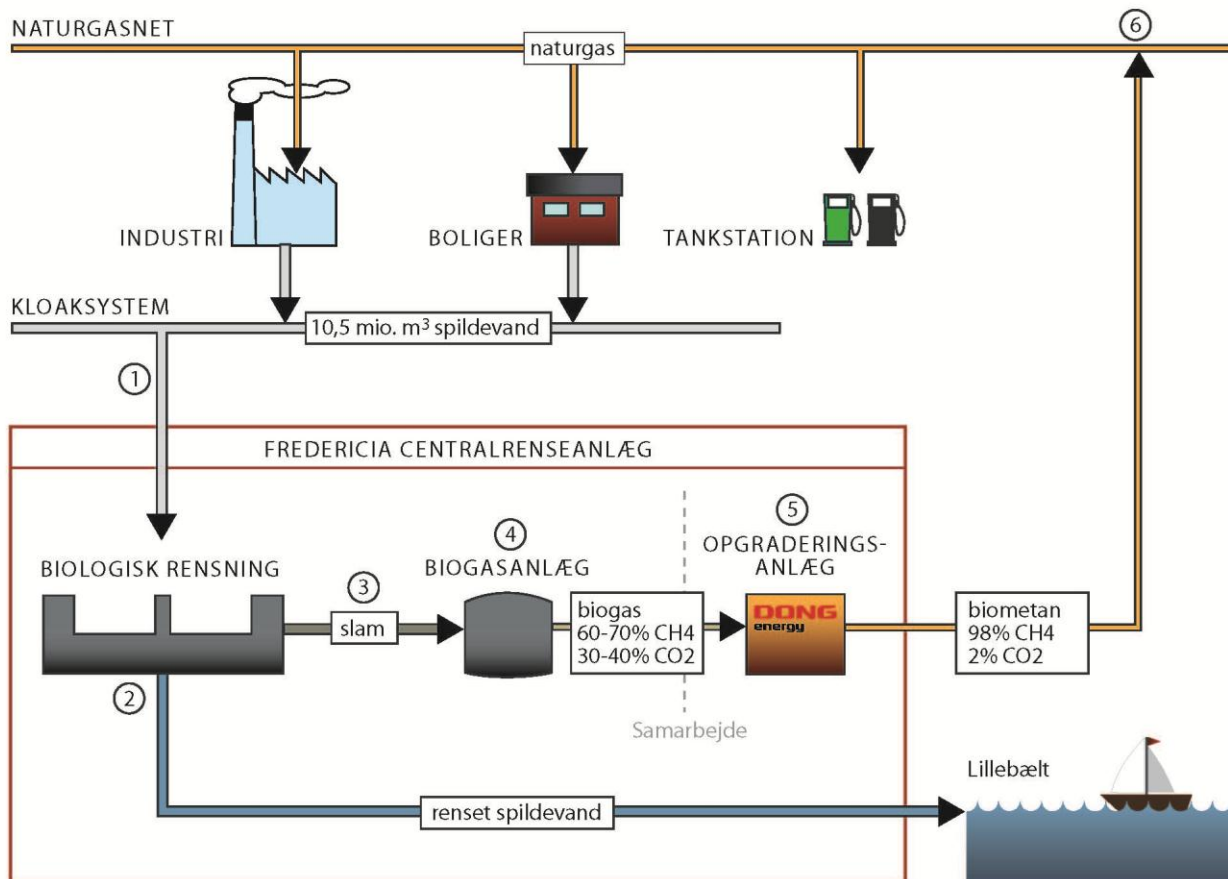


## EBITDA 2010



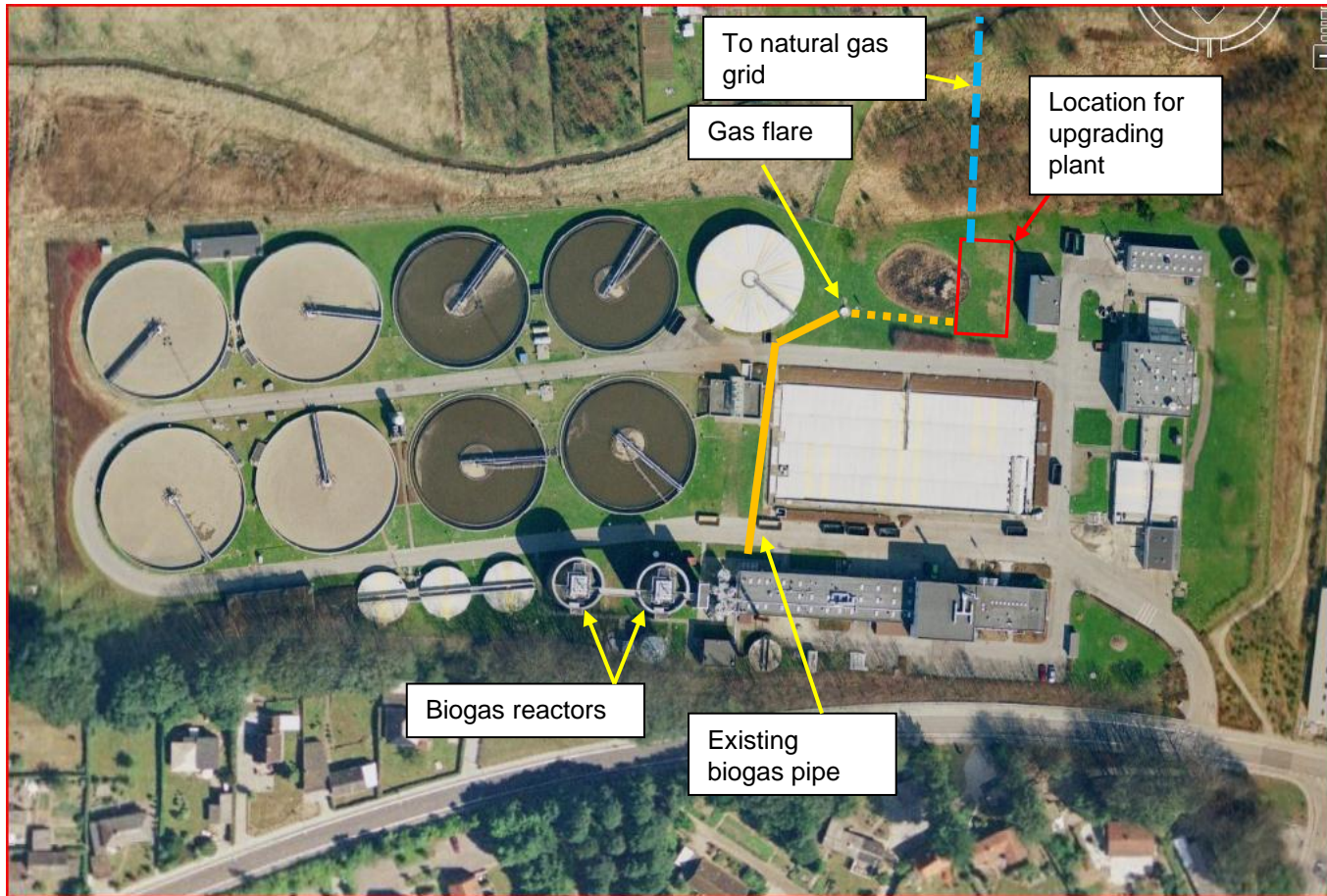
# DONG Energy now distributes biogas through the natural gas grid for the first time in Denmark

- In operation from 15th September 2011
- Expected production: 8-10 GWh/year
- Based on biogas from wastewater treatment plant





# Fredericia Waste Water Treatment Plant





# Upgrading technology

- Water scrubber
- Additional cleaning of waste gas
- Supplier: Greenlane AB
- Capacity: 300 Nm<sup>3</sup>/h biogas



# Water scrubber process

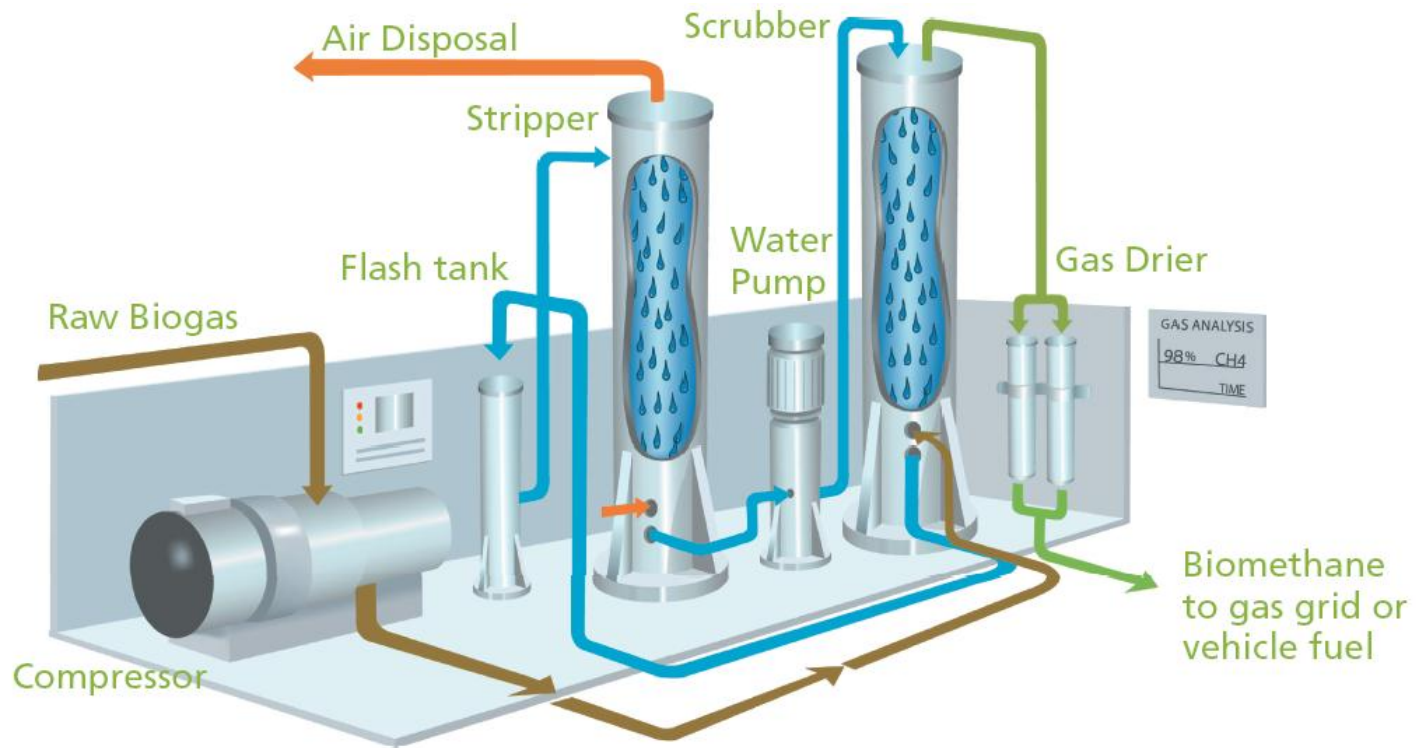
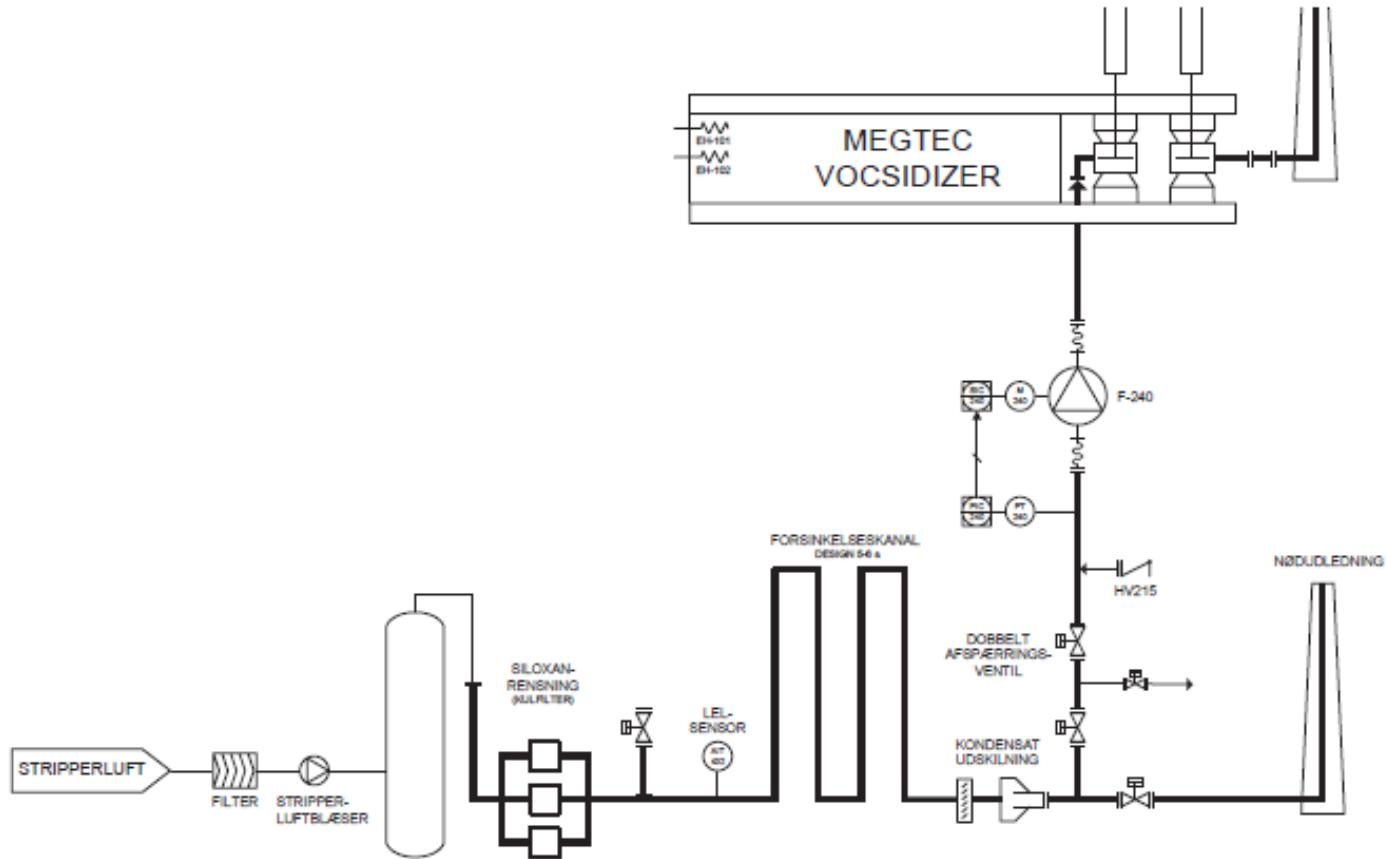


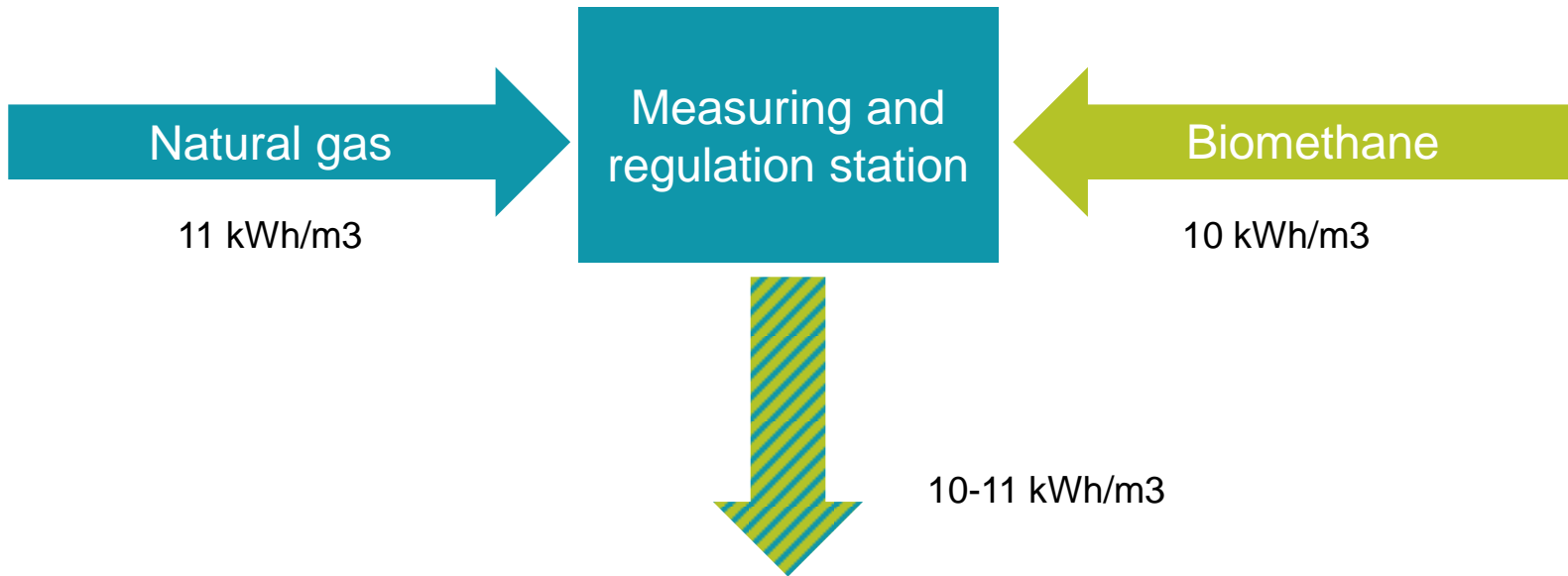
Illustration authorised by Greenlane AB

# Effluent gas cleaning



# Propane addition is avoided

- Disadvantages by propane addition:
  - High costs (upgrading costs increases approximately 25%)
  - Compromising the sustainability of the biomethane product
  - Reduces the grid capacity for delivery of biomethane
- An average calorific value is applied to customers on a monthly basis



# Potential added value from DONG Energy to biogas producers



- Inbicon:
  - C5 melasse
  - Based on straw
- REnescience
  - Liquid fraction
  - Based on municipal waste



Biogas plant

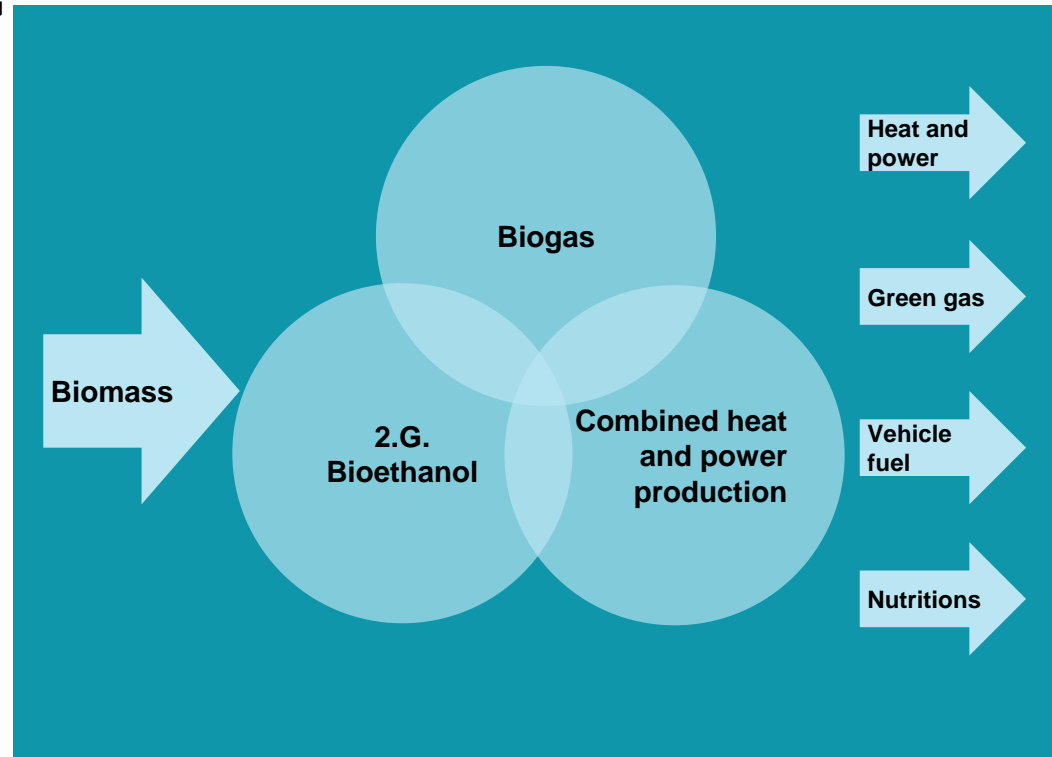


- Upgrading
- Distribution and sales
- Financial products (e.g. fixed price for biogas)



# Maabjerg Energy Concept

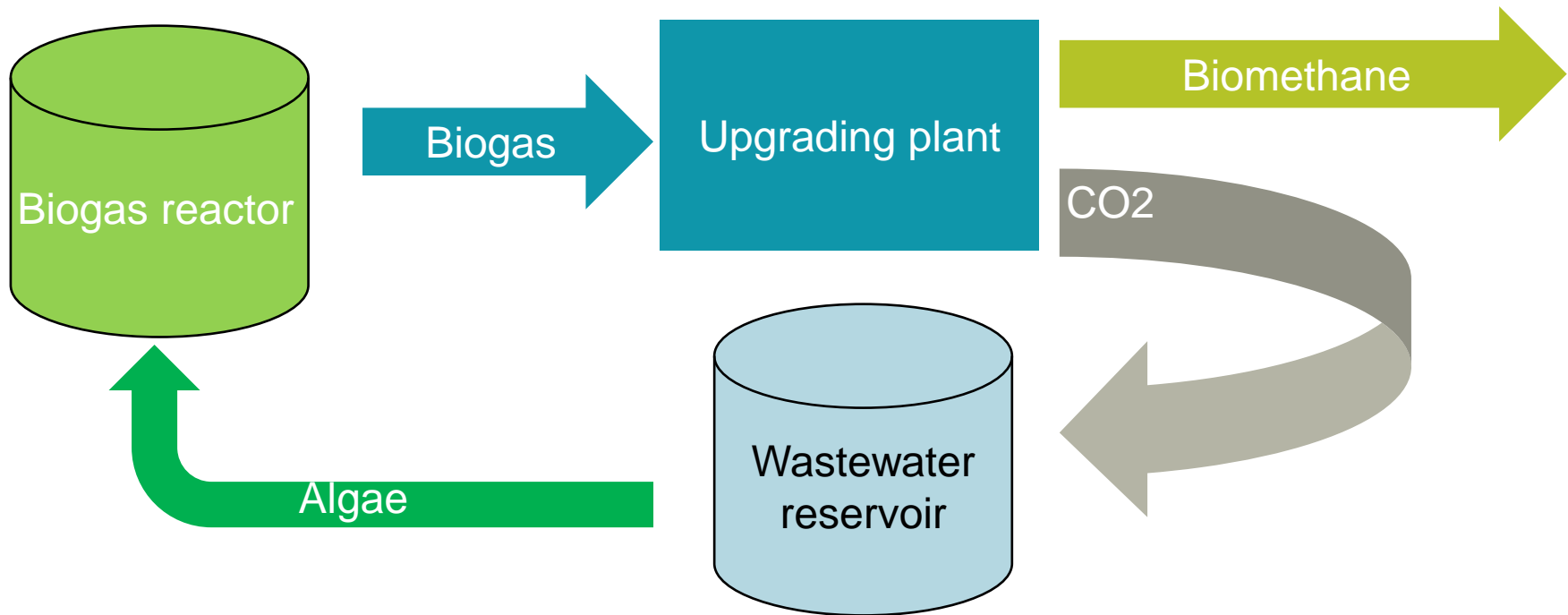
- Consortium of Vestforsyning, Struer Forsyning, Nomi og DONG Energy (including subsidiaries Renescience og Inbicon).
- Expected Annual production:
  - 50-70 million litres of bioethanol
  - 44 million m3 biogas
  - District heating of 20,000 houses
  - Power consumption of several thousands houses
- Treatment of:
  - 300.000 - 400.000 tonnes straw
  - 500.000 tonnes of biomass (primarily manure)
- Final decision on establishment dependent on further analysis





# Algae production and CO2 reduction from upgrading plant in Fredericia

- Potential RTD project with Fredericia Spildevand as project manager
- CO2 from the upgrading process will be used to stimulate algae production
- Improved CO2 reduction effect of the biomethane



# Biogas as a vehicle fuel

- DONG Energy holds 50% of the shares of Fordonsgas Sverige AB, the leading Swedish supplier of biomethane to vehicles
- Participates in demonstration project for heavy duty gas vehicles
  - Supported by the Danish Transport Authority
  - Participants include Ecological Council, Volvo, Scania, The Danish Biogas Association
  - 4 trucks to be demonstrated: 2 CNG and 2 dual fuel
- Participates in application to the Danish Transport Authority
  - Project manager: Municipality of Fredericia
  - Biogas as fuel for buses and other vehicles in Fredericia

