

Energy Independence of Cities and Municipalities 2024 at Eryk-Biogas





Agrometer



Agrometer Concept

Application of Biogas Digestate



Agrometer in Brief

Agrometer is the global market leader in the most sustainable continuous flow digestate application systems using hoses (non-drag version).

Currently Agrometer solutions are yearly distributing more than 22.000.000 ton of digestate from biogas and liquid manure from agricultural farms.

Agrometer solutions are distributing 18% of the total slurry amount in Denmark, and 3% of the total amount in Germany.



WE ARE AN ALTERNATIVE



SELFPROPELLED SLURRY SPREADING

Slurry Distribution: **upto 250 m³/hour**
Fuel consumption: **12l/hour @ 170m³**
Total field weight: **22.450 kg**
Operating range: **30-36m boom**



UMBILICAL SLURRY SPREADING

Slurry Distribution: **upto 140 m³/hour**

Fuel consumption: **Tractor**

Total field weight: **14.900 kg (+ tool)**

Operating range: **6-18m tool**



MOBILE SLURRY PUMPING

Pump capacity: **upto 370 m³/hour**
Fuel consumption: **22l/hour @200m³**
Pump range: **4 km/pump unit**



The Agrometer Concept

- The Agrometer Concept is to ensure continuous operation in the fields by pumping slurry from pits, lagoons etc. to the applicators.
- In the fields The Agrometer Concept technically ensures that the feeding hose stays put on the ground, to prevent it from being dragged across the crops, hence making it suitable for operation in high crops.
- The Agrometer Concept operates with both mobile and stationary feeding pumps, and current setup can operate with a distance up to 20 km between storage and field.



5 Key Benefits of The Agrometer Concept

1

Low Operation Costs

The fairly small engines on the machines (168 - 208 kW) and the low number of rpm's required for operation, leads to a low fuel consumption.

The continuous in-field operation ensures a more steady and gentle stress on the machinery, which reduces wear and tear, providing a longer service life and less maintenance costs.

2

Reduce Structural Damage to the Fields

A limit of only 2 passes in the tramline and the low self-weight reduces field damage and soil compaction, which helps to protect the crops and increase yield.

Weight SDS self-propelled applicator: 46,200 lbs

Weight SRS umbilical applicator: 22,050 lbs (w/o tractor and tool)

Weight of machine hose when completely full: 13,275 lbs

3

High Performance Through Continuous Operation

The constant flow from pump to field enables continuous operation in the fields, ensuring a high overall performance against total machine operation hours. In average Agrometer machines, including reconnection of hoses, distribute 175-200 US ton/total working hour

4

Build to Biogas Digestate

Biogas digestate contains valuable nitrogen. Optimized utilization of the nitrogen ensures increased yield and helps to cut costs for fertilizer. The Agrometer Concept provides accurate application through dosage-controlled propulsion speed.

5

Improved Percolation and Cleaner Operation

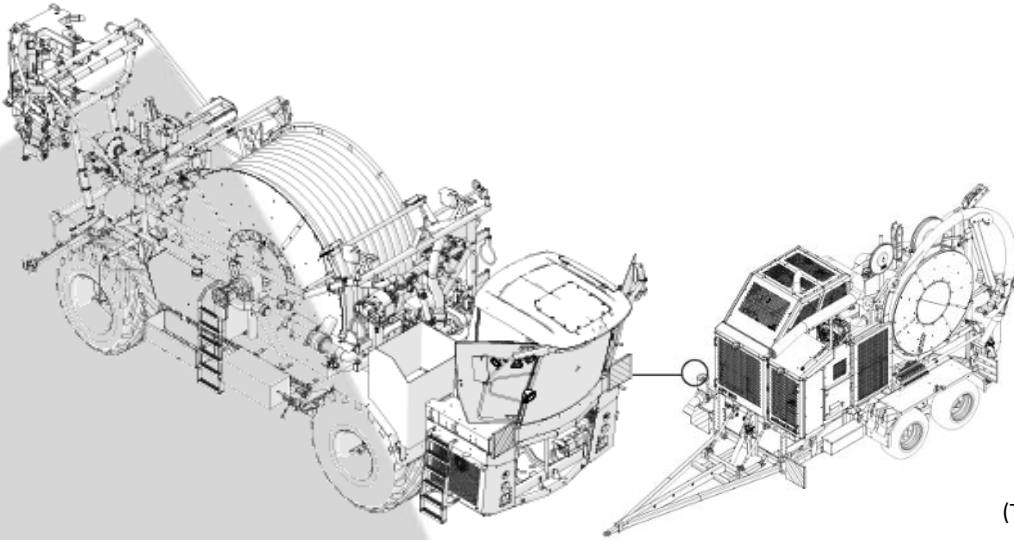
The way of operation means the complete tramline is passed only twice; outward laying out the machine hose and collecting it when returning.

This improves the percolation of the digestate, as half of the dose is applied on each passing.

The actual tramline itself however is only processed when returning, meaning the machine is not being soiled.



SUSTAINABLE SLURRY DISTRIBUTION AT LOWEST COST



VS.

Transport 2km from pit
(The case gets even better from a longer distance)



Fuel cost
0,22 EUR/m³

CO2 emissions incl. machines
1,05 kgCO₂e/m³

Impact of CO2 tax
x 100EUR/tCO₂ - > 0,10 EUR/m³

Community Aspects

Distributing 1.000m³ slurry by pumping reduces road transport with 64 truck loads between farm and field

Fuel cost

0,66 EUR/m³

CO2 emissions incl. machines

2,5 kgCO₂e/m³

Impact of CO2 tax
x 100EUR/tCO₂ - > 0,28 EUR/m³



Our solutions support the ESG agenda

E

-impact on Environmental

- Reducing CO2 emissions
- Reducing use of fossil fuel
- Nitrogen Utilization
- Extended equipment lifetime
- Increased crops yield

S

-impact on Society/Social

- Nitrogen Utilization
- Limited road operations
- Reduction in truck transports
- Limited odor nuisance from transport and distribution
- Limited dirt on roads
- Safe working conditions

G

-impact on Governance

- Documentation of slurry management
- Documenting efficiency
- Industrial operations





AMMONGAS
EUROPEAN ENERGY

Ammongas A/S

Engineering company specialized in Gas purification

Founded in 2002, Copenhagen

Initially made scrubbersolutions, air and gas cleansing.

From 2011, Ammongas started the journey into biogas upgrading



Ammongas A/S

In 2024 there are **35 employees**, herein **30 engineers**

Ammongas has today designed, built and commissioned **+30 biogas upgrading plants** across the globe. Including. **Scandinavia, Germany and the Unites States.**

From delivering small plants at **150 Nm³/h** raw biogas to **10.000 Nm³/h** raw biogas.

Today, **over 50 %** of the biomethane in the Danish National gas grid comes from an Ammongas biogas upgrading plant.

European Energy acquired Ammongas in 2022, and in 2023 Ammongas moved into the European Energy Headquarters in Søborg, part of greater Copenhagen.





Product Portfolio

CO2-Separation



CO2-Polishing



CO2-Liquefaction



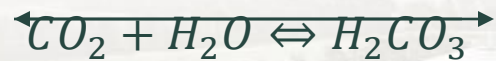
CO2-Capture



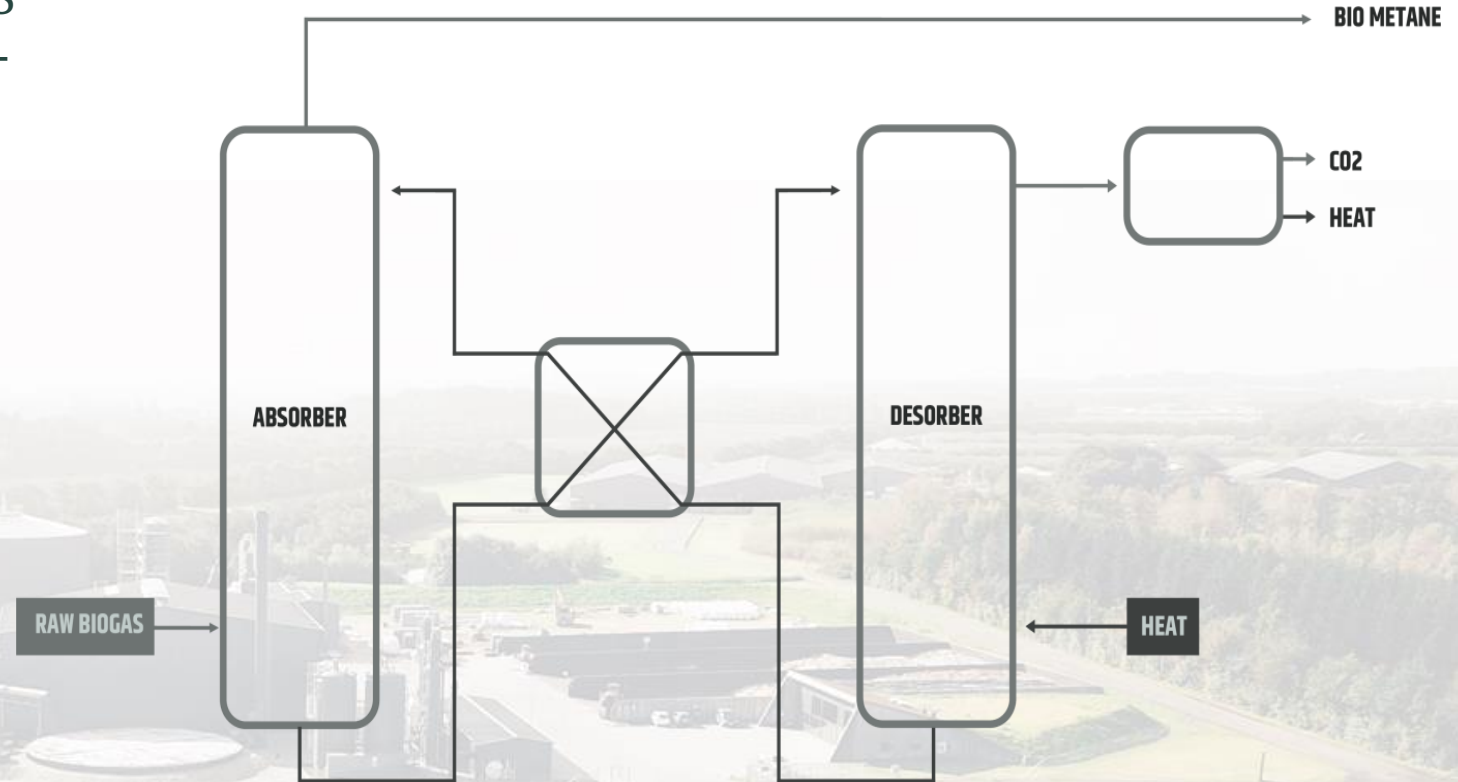
Ammongas Amine Biogas Upgrading

The amine-based chemical absorption process has been used for CO₂ and H₂S removal—acid gas removal—from gas-treating plants since 1950s and are considered to be by far the most developed CO₂ capture process.

- Absorption/Desorption of CO₂ using amines
- CO₂ reaction with water → carbonic acid



- Carbonic acid reacts with amine.



Pressureless
system

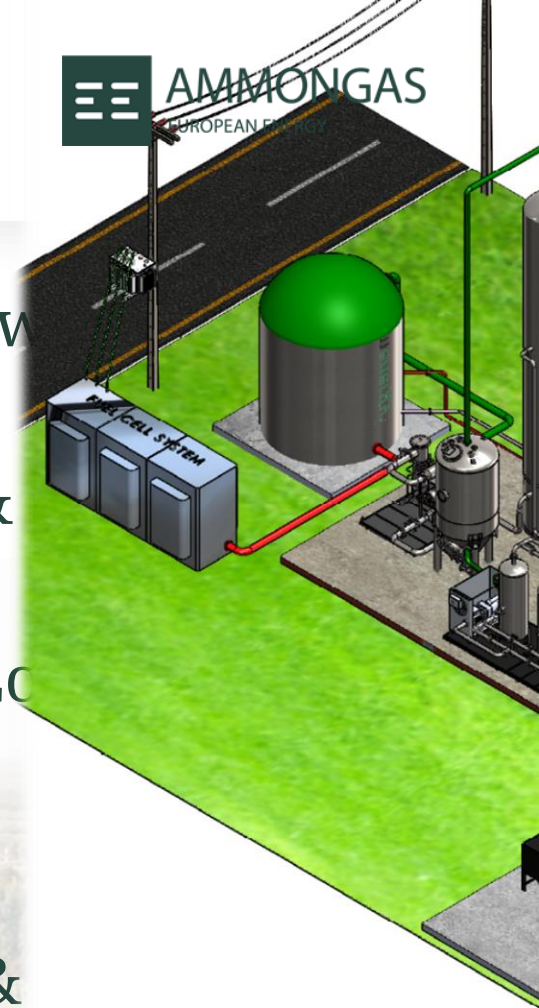
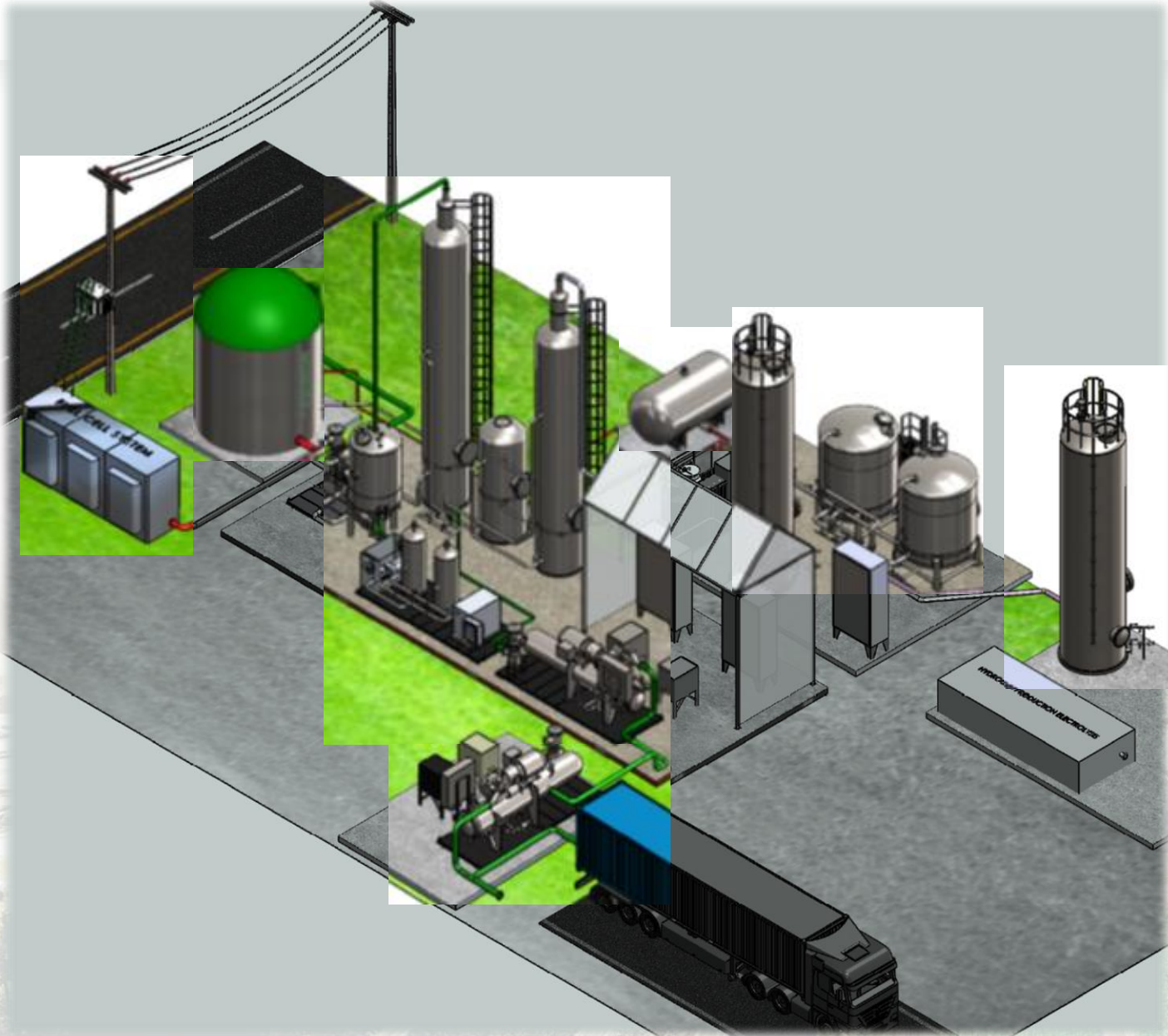
Methane Slip
Guarantee:
0.09%

Uptime Average
Including service
98.7%.

Heat Recuperation
70-90 %

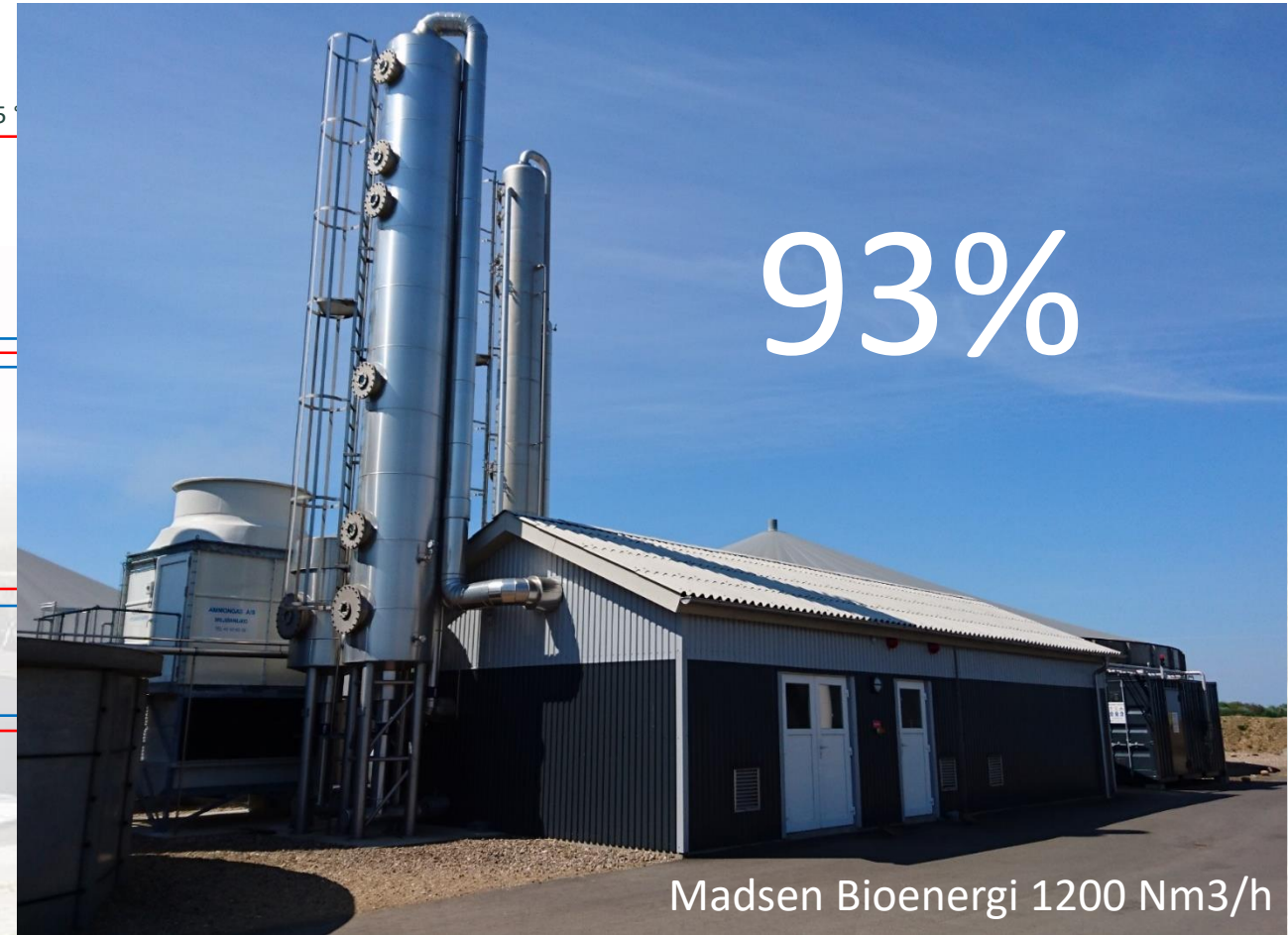
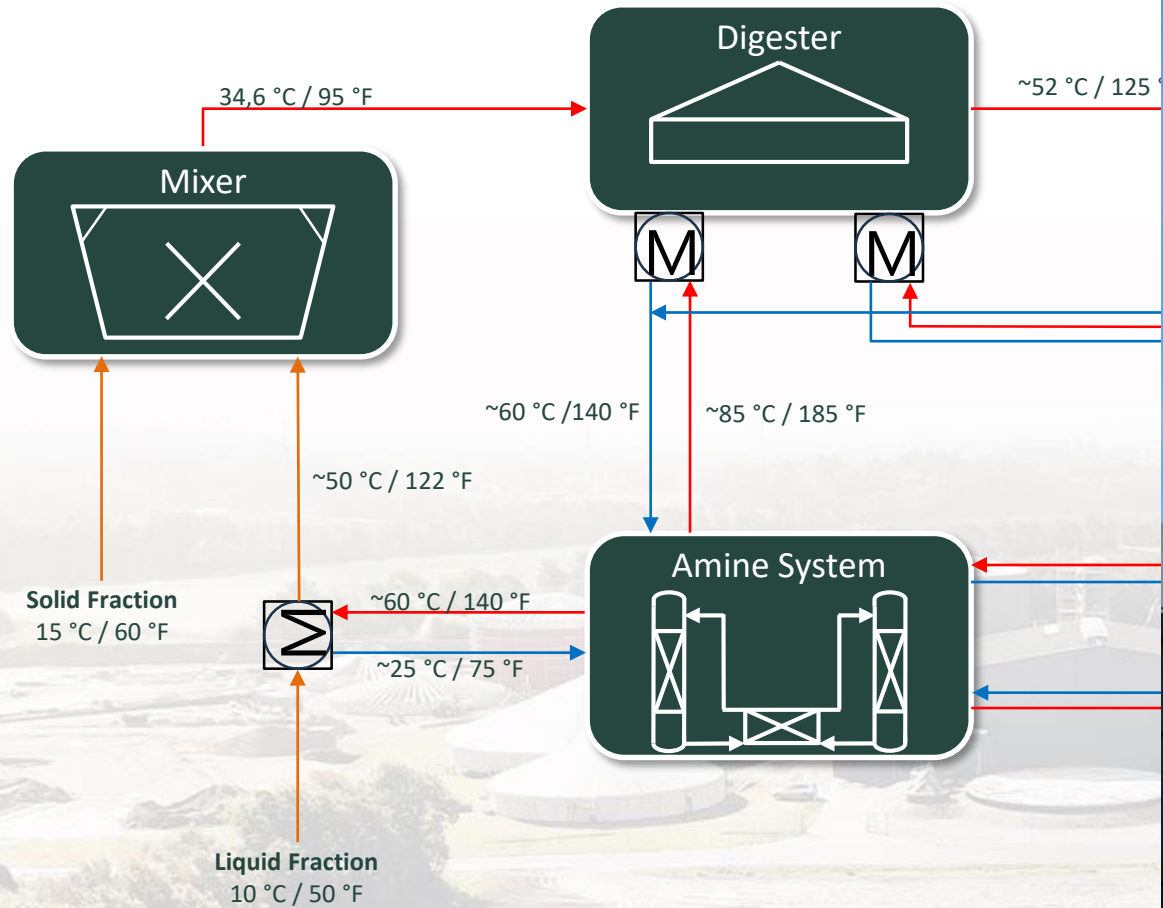
Typical
Biomethane Purity
>99%

Nothing is Plug & Play in a Biogas Ecosystem

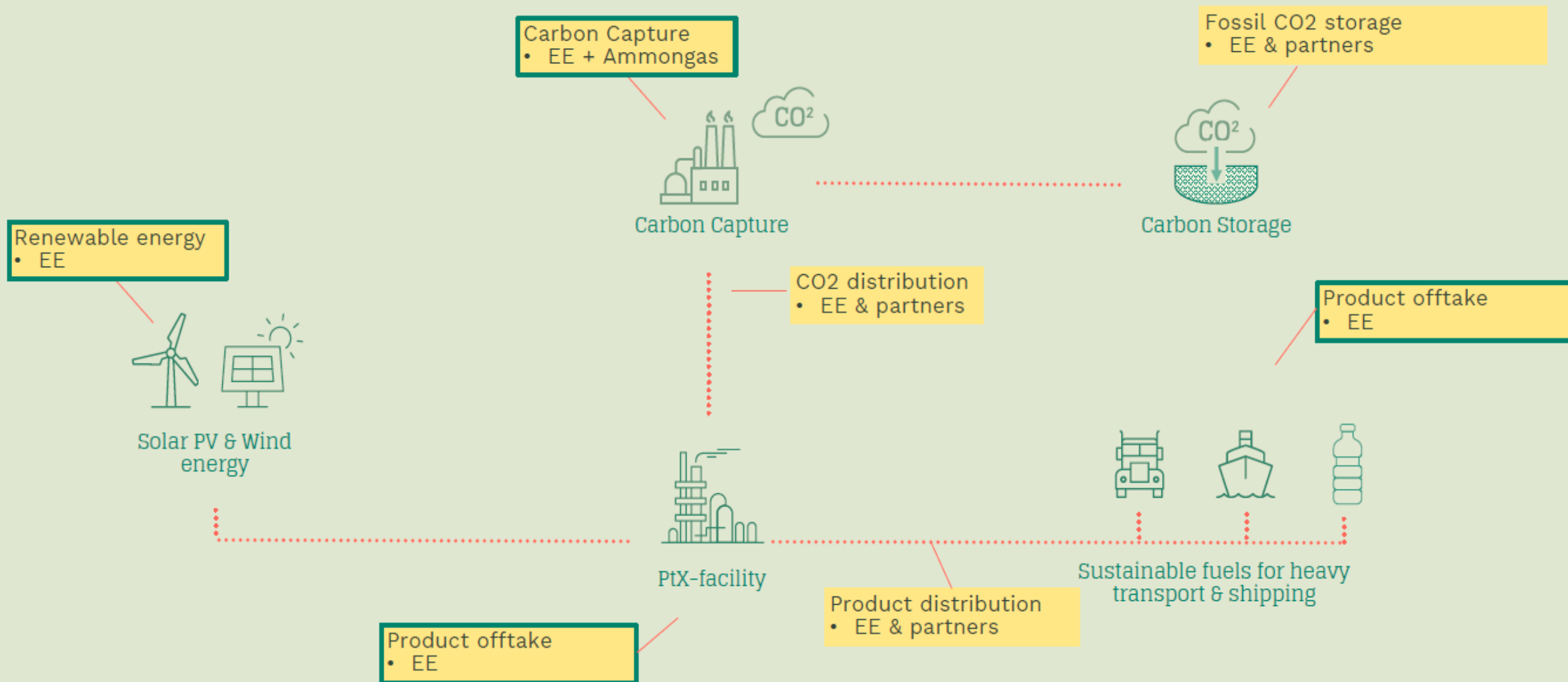


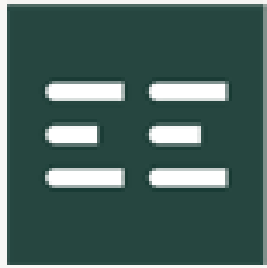
- Upstream & downstream equipment
- Mass balance & engineering
- Boiler & Heat Loss
- Compression
- H₂S Strategy
- Power, Water &
- Connecting pipe conduits
- Construction

Heat Recovery Loop



The Biogas Ecosystem can be part of the PtX ecosystem





AMMONGAS

EUROPEAN ENERGY

Questions?





ERYK

Presentation

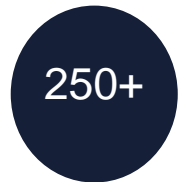
Bioenergy Business Delegation to Poland

Presented by:

Adam Piotrowski

Who we are:

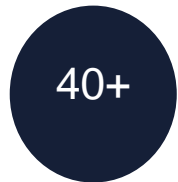
We are an international technical service provider with Danish-Polish DNA. Established in 2004, Eryk specialises in global electrical and mechanical installations for various sectors: from industry and automation, to building installations and energy & renewables. Eryk places a high priority on health and safety, quality, and environmental standards, which is why we are certified in all HSEQ standards. Through initiatives like the African vision project and the international apprenticeship program Eryk promotes sustainability and corporate social responsibility.



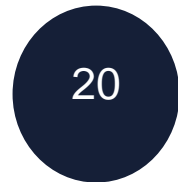
Projects
per
year



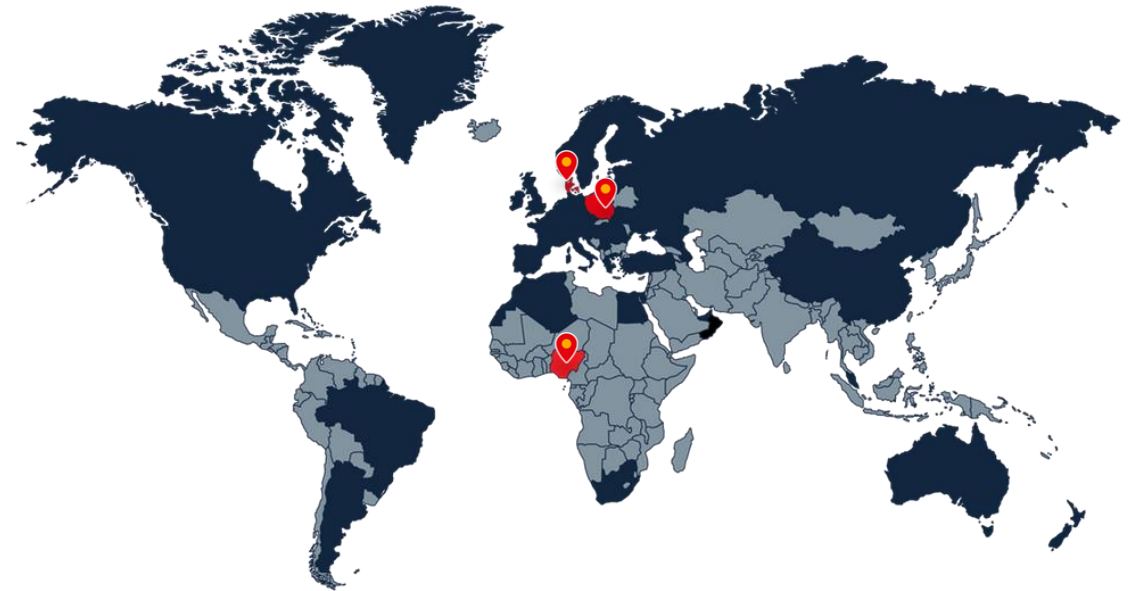
Employees



Project
Countries



Years on
the market



 Offices: Denmark, Poland and Nigeria

 Projects

What we offer:

INDUSTRY &
AUTOMATION

BUILDING INSTALLATION

ENERGY &
RENEWABLES

REMOTE IT SERVICES

Eryk has more than 200 travelling technicians including electricians, mechanics, welders, fitters and engineers.

OUR CORE COMPETENCES:

- Mechanical assembly
- Electrical installation
- Welding
- Commissioning
- Service & Maintenance
- Site management
- IT services

We have all competence levels from apprentices and juniors, newly graduated, to regular technicians, seniors, team leaders and site managers.



Competences



Technical skills at Eryk

HEAD – Our Strengths:

- Certified specialists
- Skilled & experienced
- Ambitious & motivated

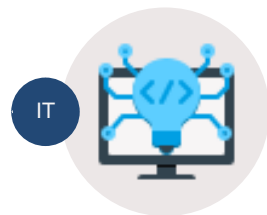
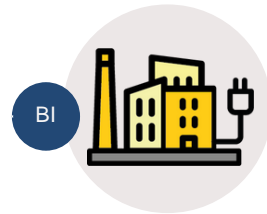
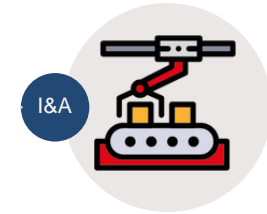
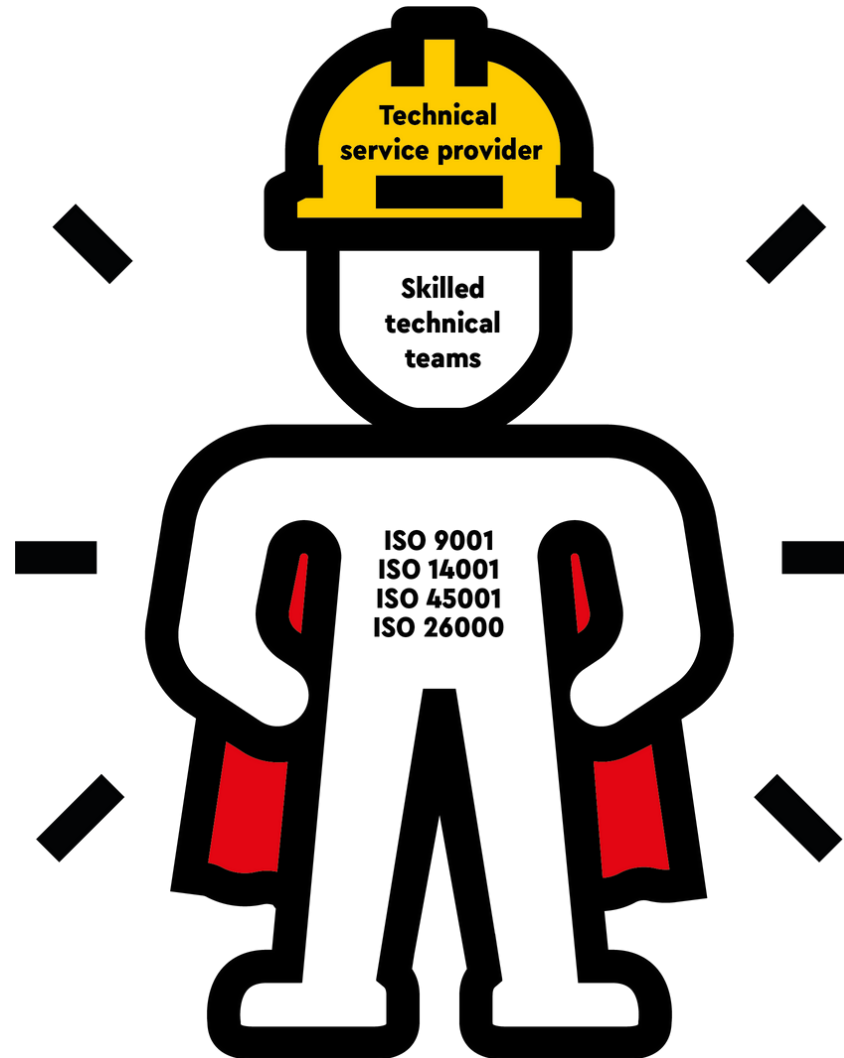
HEART - Our Values:

- Personal responsibility
- Respect
- Equality
- Customer-centrism

FEET - Our Foundation:

- Sustainable Business
- Fair operating practices
- Compliance
- Transparency

Eryk Hero



Case Studies – Energy & Renewables



Customer: Lillegaarden



Project location: Denmark



Electrical installation in a Biogas plant

Scope of work included cable pulling and cable tray assembly, switchboard assembly, installation of engines and pumps, control of all electrical installation systems, and undisclosed confidential tasks.



New waste incineration plant

Scope of work included all automation related to the energy generation process, from the first waste sorters and conveyor belts, to the energy generation process itself. It also included cable trays, LV and HV cabling, connections both in the field and in control cabinets.



Electrical installations for Power plant

This plant obtains energy from the combustion of plastics, at that time it was a very innovative power plant. Scope of work included cable trays, LV and HV cabling, connections both in the field and in control cabinets.

Case Studies – Energy & Renewables



Customer: Vital Energi Ltd, SUKUP Europe A/S, Cimbria Unigrain A/S



Project locations: Norway, Egypt, Denmark & UK



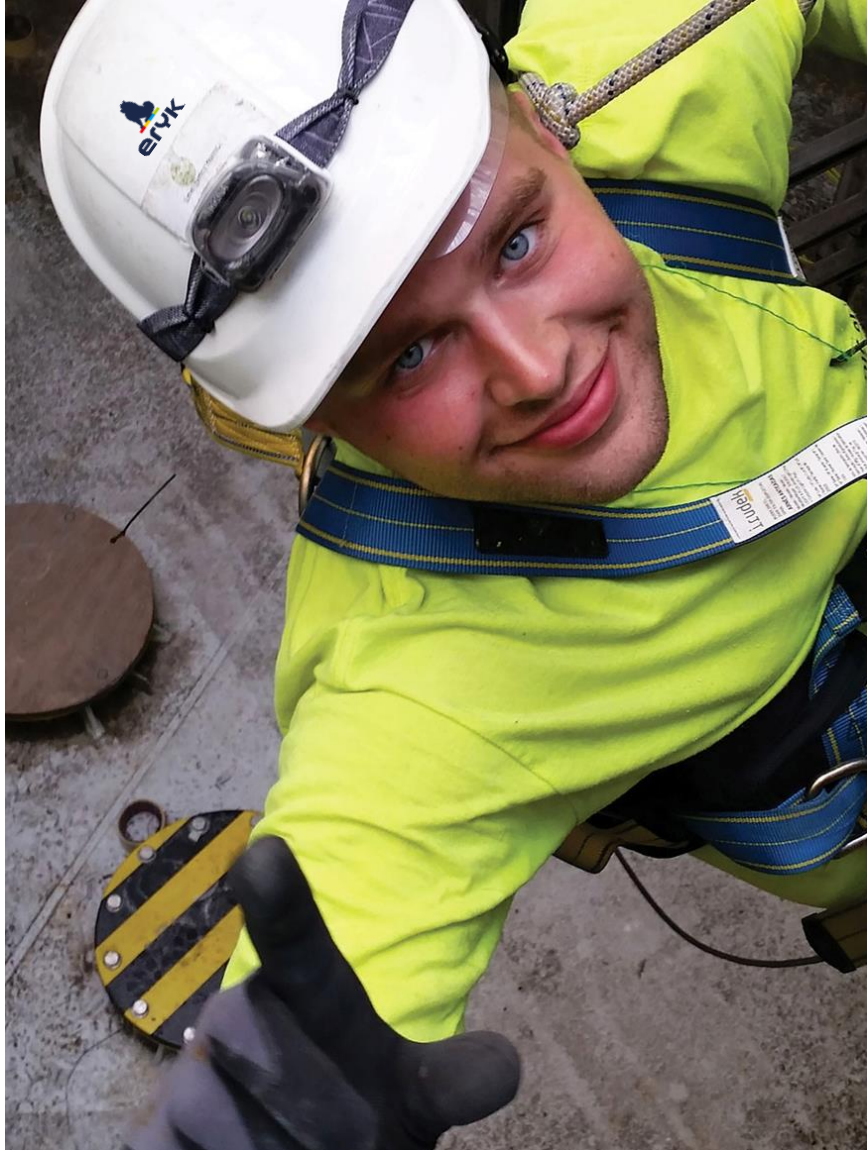
District heating plants

Installation and commissioning of a new Combined Heat and Power plant for Imperial College London, supplying heat to more than 22.000 students. Eryk was responsible for modification works of the main energy center steam system, replacement of a range of plate heat exchangers, replacement of gas engines.



Mechanical installation of Silos infrastructure

Eryk was responsible for reconstruction of steel structures and silos incl. steel erection. critical supervision and site management of silos installations - 23 different locations along the Nile, each including 12 silos (of 25 m height), which makes 276 grain silos in total.



We are proud of our growth from 0 - 300 employees over 20 years. We commit to delivering high quality services on time, competitively priced and in full compliance, always prioritising customer satisfaction.

Thank you for your attention



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www.eryk.com

„The Danish Biogas Model” - Biogas Production From Agricultural And Organic Waste

Biogas for sustainable food production Goodvalley



Anita Bednarek

Bioenergy Delegation to Poland

19 -22 March 2024

Biogas plants in Goodvalley Poland

8 agricultural biogas plant

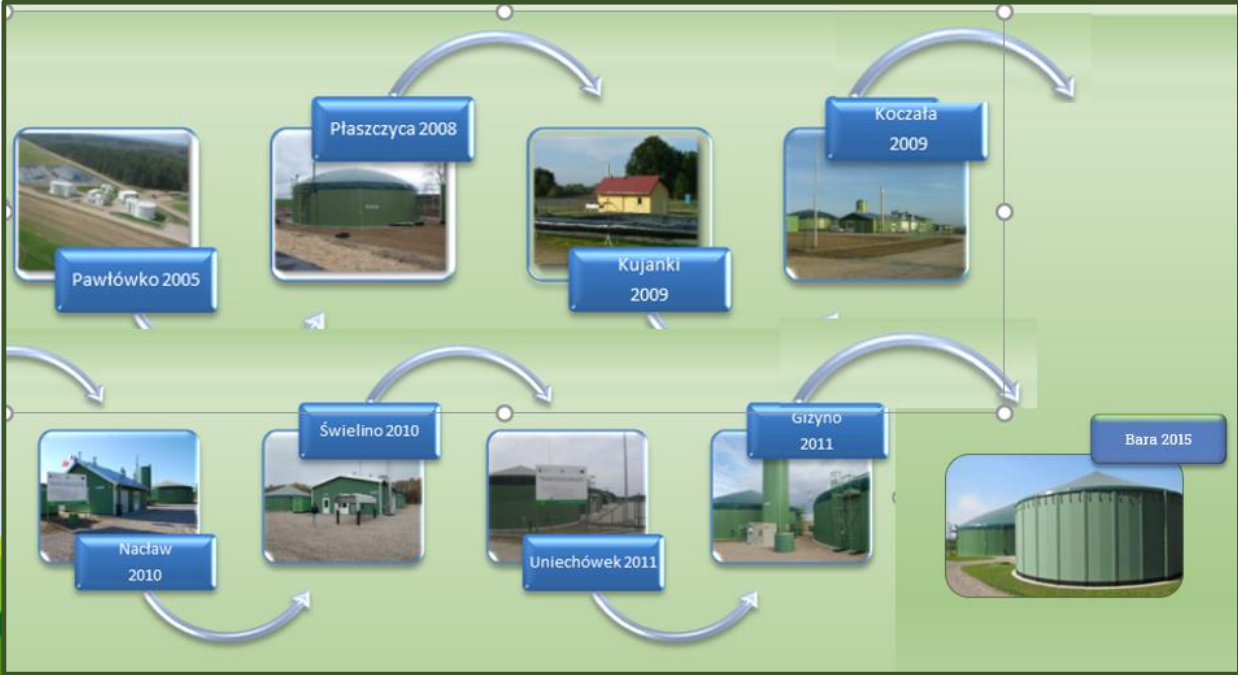
7,403 MW_e / 9,838 MW_t

32.670.000 m³ agricultural biogas per year

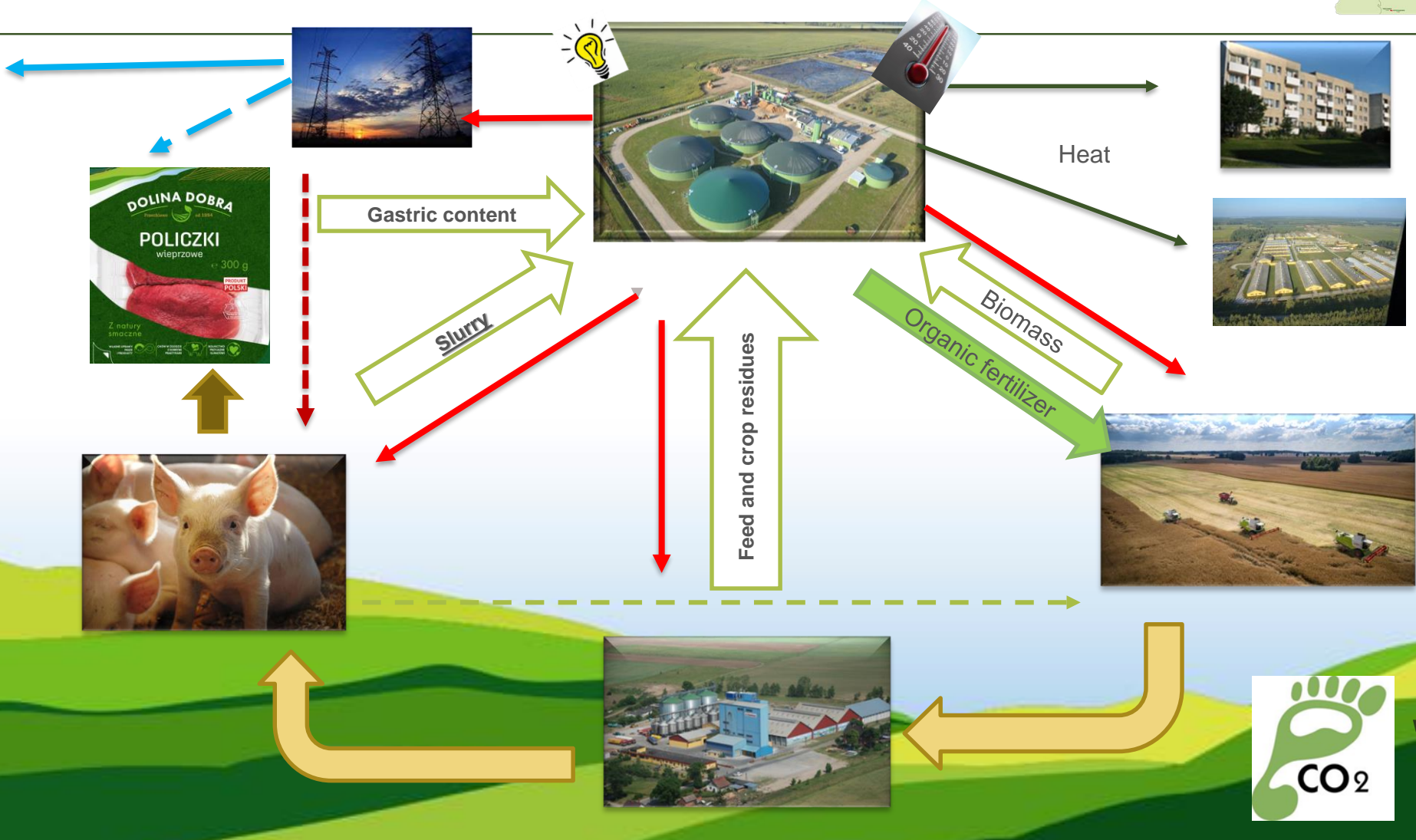
52.000 MWh per year

17.000 householdes

194.000 GJ green heat per year



Goodvalley – since 1994



Source: Own work

Biogas plant Pawłówko - first agricultural biogas plant in Poland



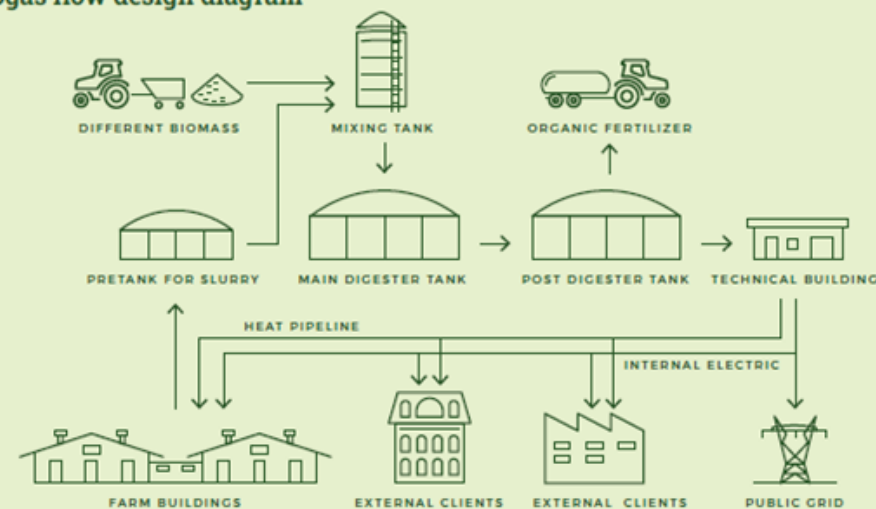
Start of production:

06.2005

Power:

946 kW_{el}/1 004 kWt

Biogas flow design diagram



Goodvalley biogas production

Biogas plant in Koczała



Start of production:

04.2009

Power:

2.126 kW_e/2.206 kW_t

Biogas plant Naclaw – heat for people

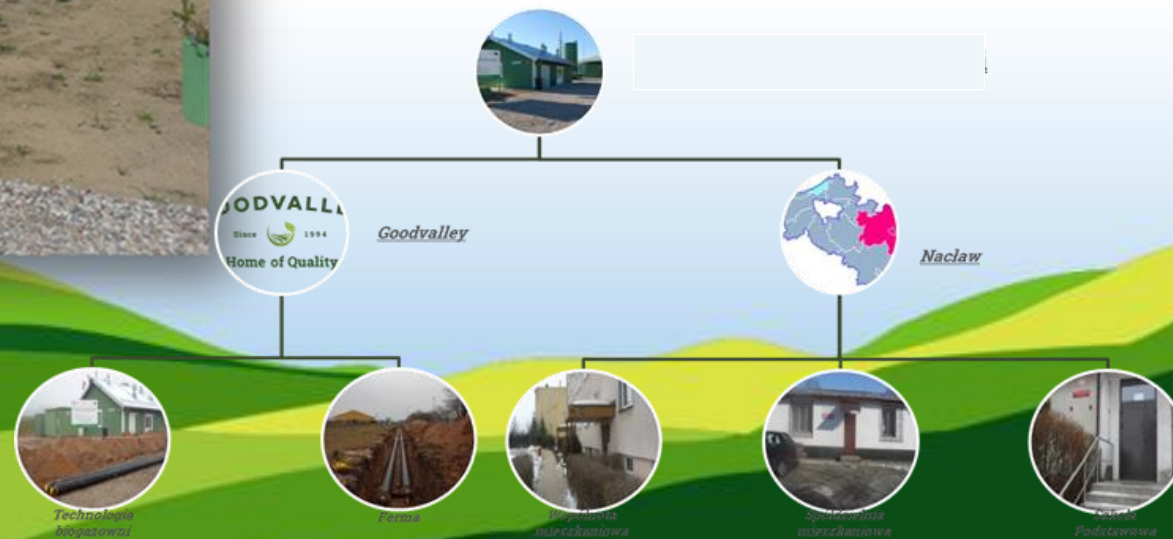


Start of production:

06.2010

Power:

625 kW_{el}/692 kW_t



Biogas plant in Uniechówek with the straw briquette line

UNIECHÓWEK



Start of production:

02.2011

Power:

1.063 kW_{el}/1.081 kW_t

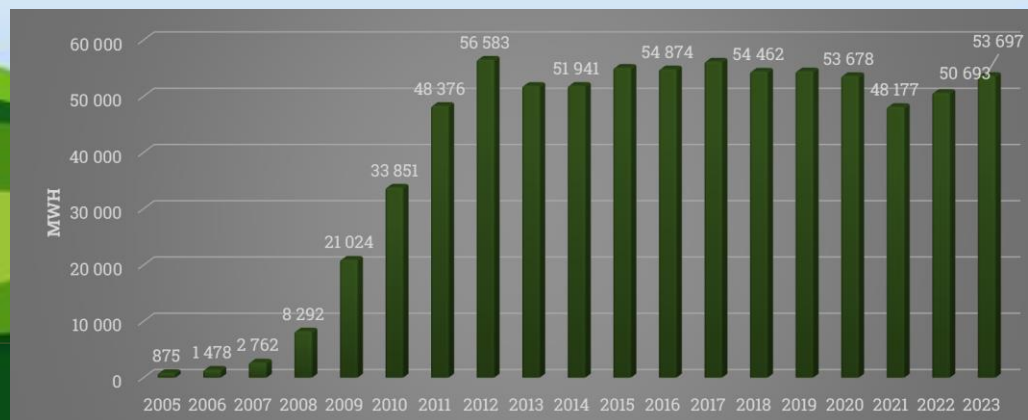
1,5 ton / h



Thanks to biogas plants...

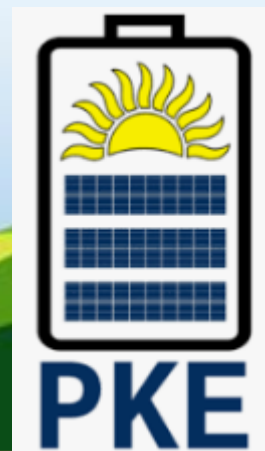
Thanks to our biogas plants...

- ❖ We have a renewable energy source - we are energy self-sufficient -we do not buy energy from outside, and we sell the surplus externally;
- ❖ We produce electricity and heat in cogeneration – we heat our buildings and 8 blockflats and a school in one location;
- ❖ We reduce primary energy consumption and increase energy efficiency;
- ❖ We optimize the circular economy;
- ❖ We manage agricultural and food residues and by-products, including use of best available techniques (BAT) in the context of pig slurry management;



Thanks to our biogas plants...

- ❖ We produce high-quality organic fertilizer - we make better use of nitrogen in fertilization;
- ❖ We destroy bacteria and pathogens in the fermentation process;
- ❖ We destroy weed seeds in fermentation - we reduce the use of pesticides;
- ❖ We reduce (by approx. 60%) odor associated with fertilizing fields with raw slurry;
- ❖ We are a member of the Przechlewski Energy Cluster;



Thanks to our biogas plants...

We reduce greenhouse gas emissions, including:

- we reduce methane emissions by managing e.g. slurry;
- we reduce emissions by disposing of slaughterhouse waste, stomach contents and sewage sludge from food plant;
- we reduce emissions related to replacing heat sources (e.g. oil boilers) with heat from biogas plants;
- we reduce CO₂ corresponding to the amount of electricity sold - approx. 8,500 tons of CO₂;
- we reduce emissions related to fertilizing fields (avoided emissions of pollutants from mineral fertilizers)– 1,25 t CO₂/ha

Anita Bednarek
Sustainability and Strategy
Development Manager
Goodvalley
tel.694-428-328
anita.bednarek@goodvalley.com



LSM • PUMPER

Denmark

LSM Pumper ApS

Headquarter

Vraa – Denmark – Europe

Phone +45 98 98 19 00

Info@lsm.dk

www.lsm.dk

Subsidiaries:

LSM Pumpen GmbH

LSM Pumps USA Inc



Denmark - Sigenevej 7 - Vrå 9760

LSM • PUMPER

Denmark

About us.:

- **LSM founded in 1982, by Leo Sørensen. In 1993, the first hose pump was produced. 10 employees in new buildings from 2008 and added 2018.**
- **Subsidiaries in Germany and the United States**
- **Exports account for about 80% of turnover**
- **Today, 13 different size hose pumps are produced, from 10mm to 300mm diameter hose.**
- **LSM is worldwide and the only manufacturer of 150, 200 and 300mm hose pumps.**



LSM • PUMPER

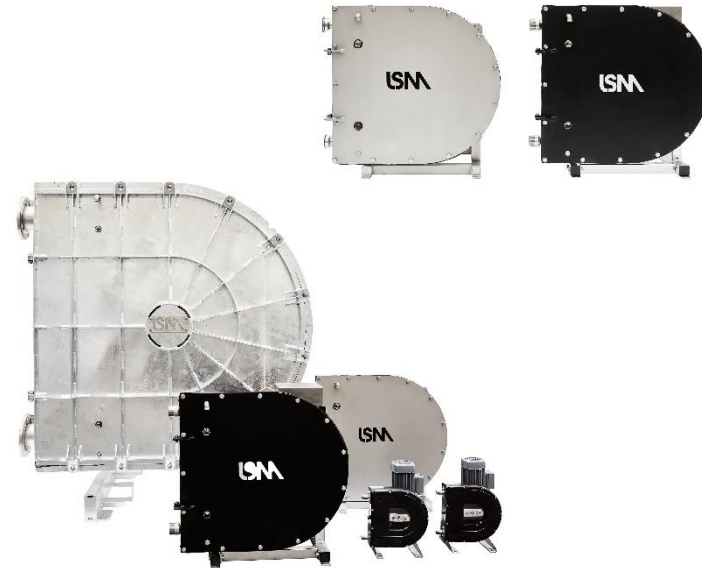
Denmark

Our product.:

Pumps from 10 to 200mm

NEW LSM300 linear hose pump

The LSM product range stretches from 10 – 300mm sizes (30 – 500.000l/h), which means that LSM can handle a wide range of applications: dosing (dosing tomato into mackerel cans), glue for the production of laminated wood, chemicals at waste water treatment plants, high-flow transfer applications within agro- and biogas, mining and fishing industries.



LSM • PUMPER

Denmark

Application.:

LSM's hose pumps have a wide range of applications in a number of different industries in Denmark and abroad including:

- **Biogas - Farmers**
- **Food Industry**
- Fishing Industry (unloading)
- Mining and contractor industry
- Chemical Industry
- Agricultural industry
- Combined heat and power plants
- Treatment plants
- Off-shore



LSM • PUMPER

Denmark

LSM 10 – LSM 15

Metering hose pump in Polyurethane

Capacity: 0 - 500 l/h



LSM 25 – LSM 100

Hose pump in steel / stainless steel

Capacity: 1– 40 m³/h



LSM 65 - LSM 200

Hose pump in galvanized steel

Capacity: 12 – 300m³/h



LSM125 + LSM300

LINEAR hose pump

LSM • PUMPER

Long distance manure pumping -
1.9 miles/3 km!

For more information:

Leo Sørensen: +45 4020 3100

Dan Christoffersen: +1 281 771 8045



Long distance manure pumping - 1.9 miles/3 km !

It's common knowledge that cattle manure is hard to pump and thus also a challenge to calculate the pumping capacity/friction and total dynamic head when it needs to be pumped over long distances. The Fair Oaks project in the US has shown us how it's done – and the interest from other farmers and biogas developers has been overwhelming.

We are already working on other projects across the US and seen a huge interest for pumps that can transport manure over long distances other places in the world. We would like to share one of these experiences with you here.

LSM Pumps & Fair Oaks Farms USA

Fair Oaks Farms in Indiana is one of the largest cattle farms in the US with 36,000 dairy cows over 35,000 acres (14,000 hectares) spread across eight properties.

LSM Pumps has its own branch in the US, and our colleague over there struck up a conversation with the daily manager of the biogas plant at Fair Oaks, who explained that they had had no luck attempting to pump the manure from one of the many barns to the digester site, a distance of 1.9 miles/3 km. The manure contains approx. 5% solids.

Ten years ago they dug a 6" pipeline between the two sites and tried out a variety of different pumps. Nothing worked to their satisfaction and as a last resort, they were considering a high-pressure pump with a roughly 300 hp motor, which is not feasible in a biogas context due to energy efficiency and energy consumption in general.

We decided at LSM to offer our client at Fair Oaks a slightly reinforced version of the LSM123 hose pump. It was a lease option with the agreement that they could purchase the pump if they were satisfied with the test result.

The pump was in operation by August 2022 and proved that it could pump the manure for 3 km using a humble 22 hp motor. Naturally, the customer bought the pump.

Work is currently underway to upgrade the installation at Fair Oaks with a further two LSM123 hose pumps, which will pump manure long-distance from two other farms, thereby eliminating the need to move the manure with vacuum trucks. The farm expects the project to be completed in 2024.



The setup at Fair Oaks looks like this:
The collecting lagoon is placed in close proximity to the barns, and holds approx. 10.000m³. The lagoon is equipped with agitators that keeps the manure at a steady consistency.

The LSM 123 is installed in a drywell right next to the lagoon connected to the 6" HDPE pipeline going to the digester site 1,9 miles/3km away!

The pump is installed with a pulsating dampener, pressure sensor and leak detection sensor. All is monitored from the office by the digester.

The key factor is flow velocity and keeping the pressure as low as possible.

Working with the customer, they expressed interest to be able to pump higher flow and with a higher solids content – this upgrade would require a "booster pump" and fall 2023 a second LSM 123 was installed.

This resulting in higher capacity, and even lower energy consumption!

New project in 2024, will include adding another long distance pipeline at the Fair Oaks farm – we will keep you updated.

LSM • PUMPER

Substrate and pineapple waste

For more information:

Leo Sørensen: +45 4020 3100

Jørgen Rasmussen: +45 3168 8862



LSM Pumps now in Asia

An exciting assignment completed in the Philippines

LSM Pumps ApS has just installed an LSM125 hose pump for an especially interesting customer in the Philippines on the island General Santos at Polomolok Biogas Plant, Polomolok.

The biogas plant was established four years ago. Its primary function is to convert substrate from processing at DOLE's production plant in Polomolok into biogas. The biogas plant is owned by METPOWER. DOLE transports thousands of canned pineapples all over the world every single day. Substrate and pineapple waste is driven to the plant and the mass is pumped through a mixer tank into three reactors. Each one produces 600 tonnes of biomass daily, which after defibering and crushing is converted into methane and CO₂. The methane is sold back to DOLE, which produces steam via its steamer that is then used to help preserve the pineapple product. CO₂ is converted into liquid via a cooling process and then resold in tank form to one of the world's largest carbonated drinks manufacturers.

Substrate and pineapple waste is mixed with the added liquid in the tank of Streisal mixers to give it a TS of around 15%.



The LSM125 hose pump replaces two other pumps, which could not adequately move the mass.

The installation of the LSM125 pump was completed in mid February and the manager of Polomolok Biogas plant was delighted with the results of the test run.

#slangepumpe #peristalticpump #biogas #lsmpump

STB - Straw To Biogas

Jesper Stræde

Export Sales Manager

✉ jst@linka.dk

☎ + 45 2889 0383



ABOUT LINKA ENERGY

- Linka Energy was established in 1978
- 50 employees divided into sales, project management, construction, production, assembly, service and administration
- Acquisition of Jernforsen in 2018
- Acquisition of Weiss in 2019
- More than 5,000 plants worldwide

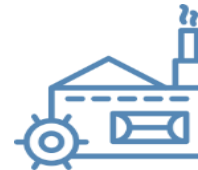
Operating philosophy

- World patented combustion technology that ensures total combustion of the fuel
- High operational reliability - get unplanned downtime
- Low energy consumption
- Minimum maintenance costs

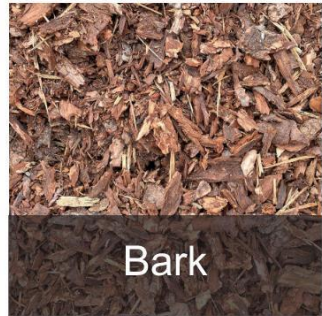


SOLUTIONS

- Our boiler systems are developed from our own design, based on +40 years of experience
- Biomass boiler systems from 250 kW to 30 MW thermal
- Proven, safe and efficient quality - at an affordable investment
- Boiler systems are adhering to strict EU emission legislation
- Segments include:
 - District heating networks
 - Industry and commercial use
 - Agriculture



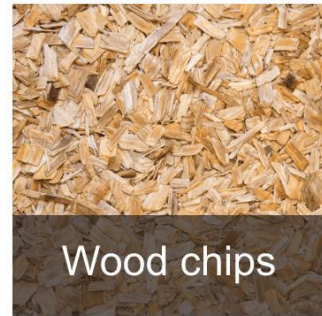
CONVERT YOUR WASTE INTO FUEL



Bark



Elephant grass



Wood chips



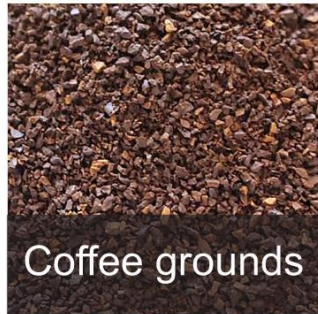
Seed grass



Straw



Straw briquettes



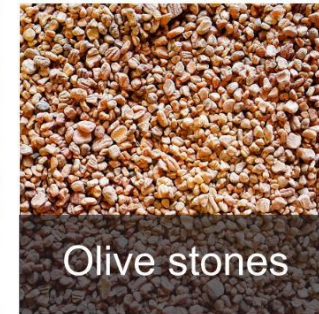
Coffee grounds



Coffee shells



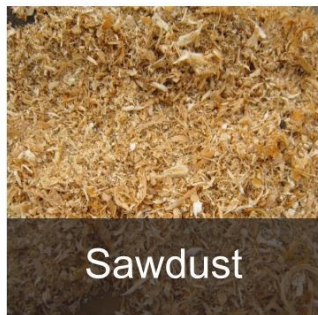
Cherry stones



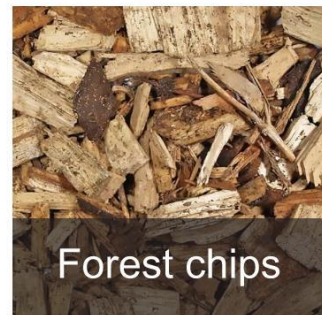
Olive stones



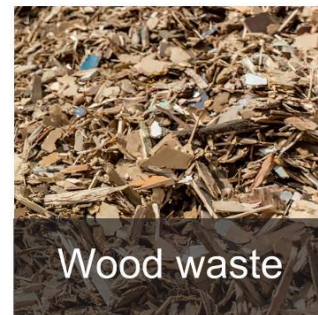
RT-chips



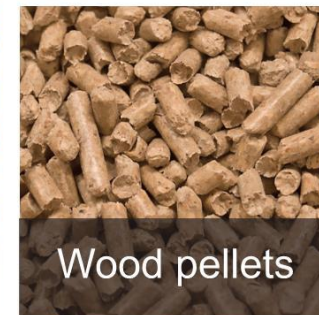
Sawdust



Forest chips



Wood waste



Wood pellets

STRAW - AS EXAMPLE

- Straw is CO₂-neutral and delivers a closed loop circuit on greenhouse gasses
- Locally grown and locally used - and available
- It is easily accessible and often a waste product
- The efficiencies and utilization value are extremely high
- Linka offers boilers from 250kW - 12MW^{thermal} on straw



Linka Shredder



Linka Energy A/S straw conveyor and TWIN 123 shredder





EUROmilling

LINKA[®]
ENERGY
a part of LINKA group



EUROmilling

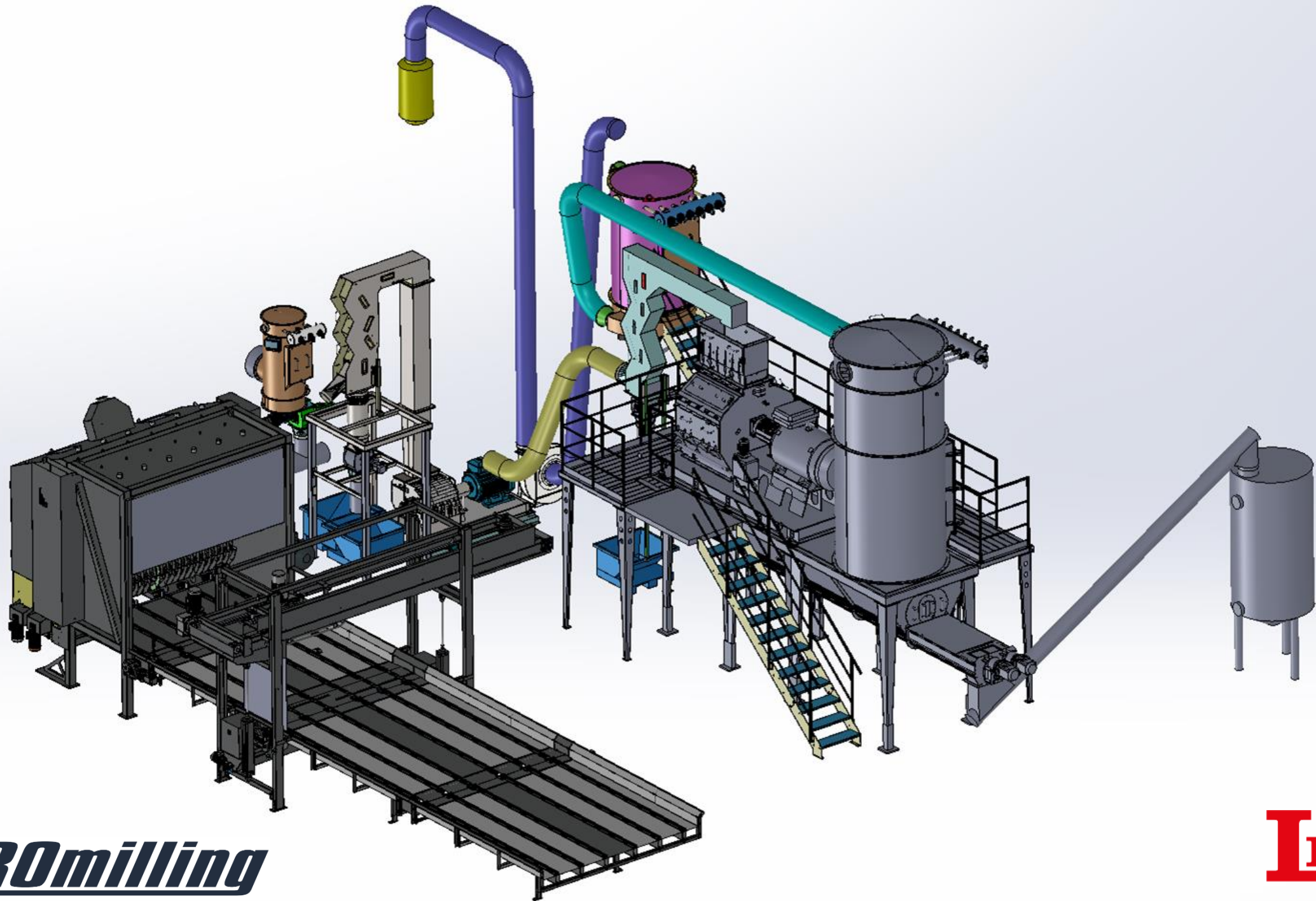
LINKA[®]
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ENERGY
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We are with you all the way

- ✓ **Consultancy**
- ✓ **Development**
- ✓ **Support**



nature
energy

Meeting in Szczecin

20-21 March 2024

Sun, wind and biowaste



Are the three natural resources for the production of green energy

And the global potential is great



Nature Energy Korskro

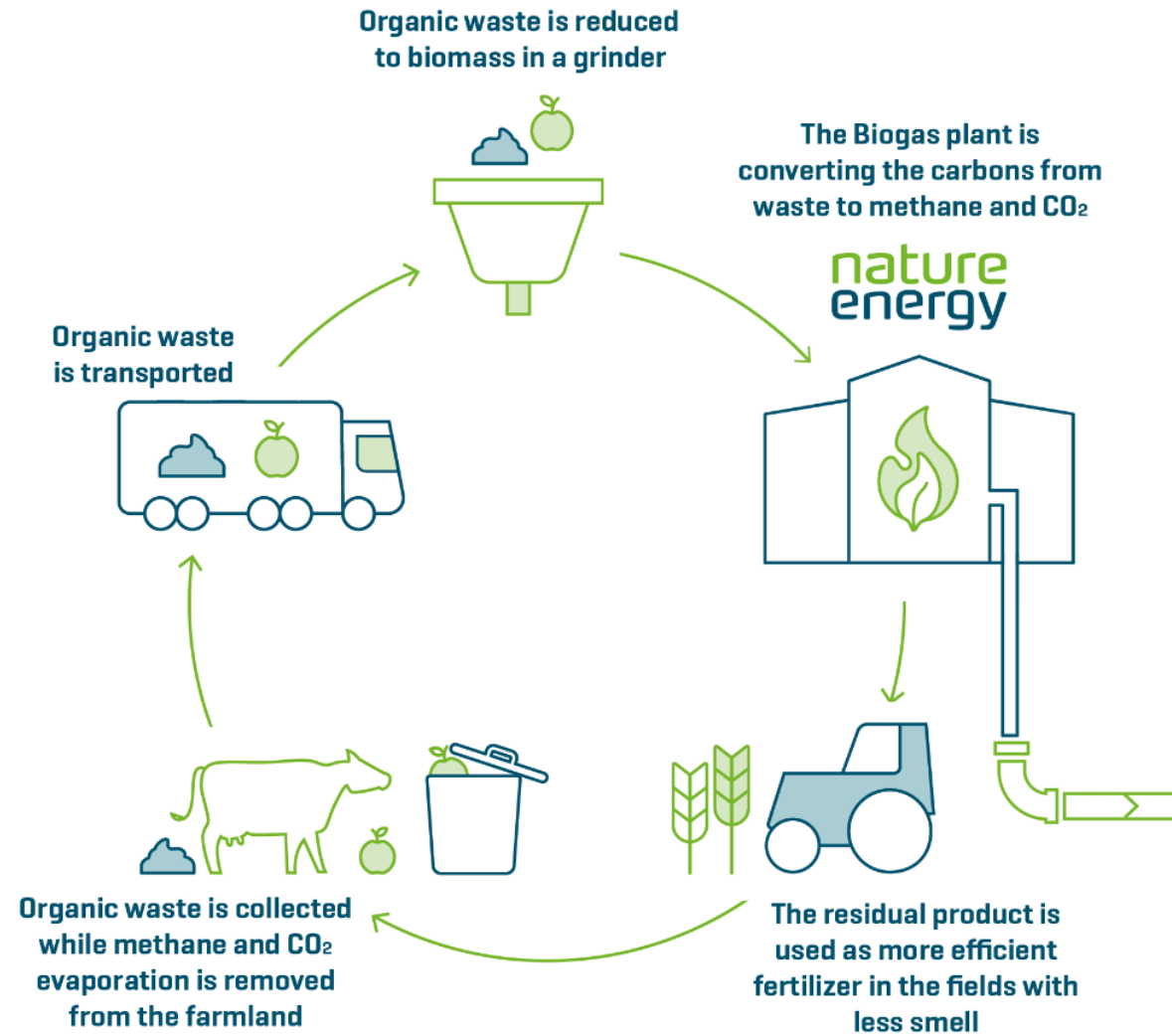
Production: 36.1 million m³ gas per year
Biomass capacity: 1 million tonnes per year



Our plants are centralized and receive feedstock from a large radius

- With our **advanced technology**, we can process all organic waste within a radius of 25 km
- Our business model takes in manure from several **small and medium sized farms** (from 200 size herds)
- We continuously improve our design to handle **all types of organic waste and manure**
- Our upstream processes are **circular and indefinite**
- One Nature Energy plant can process up to 0.5-1 mil. tons of organic waste and residues annually



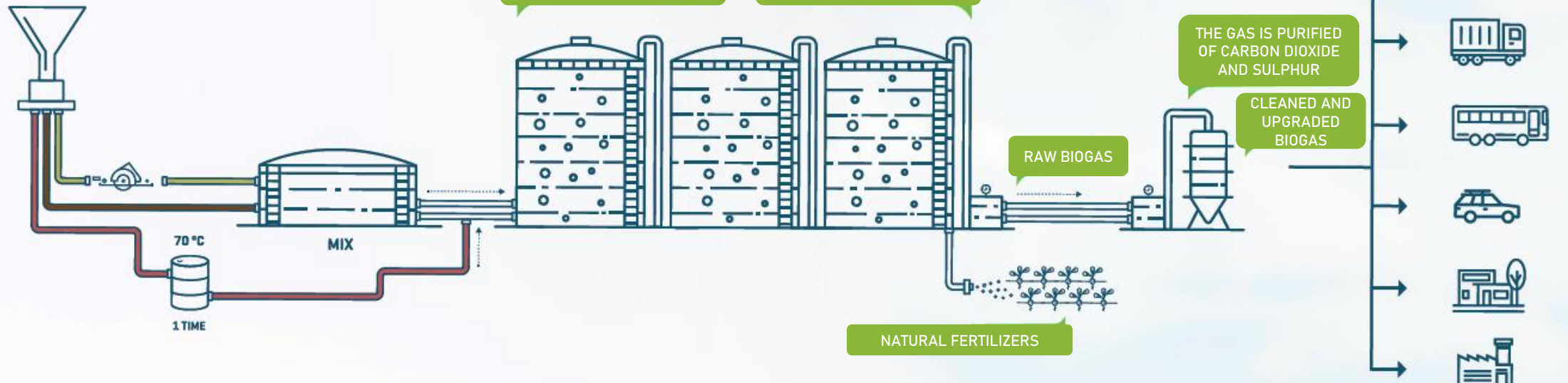


Biogas in a large scale

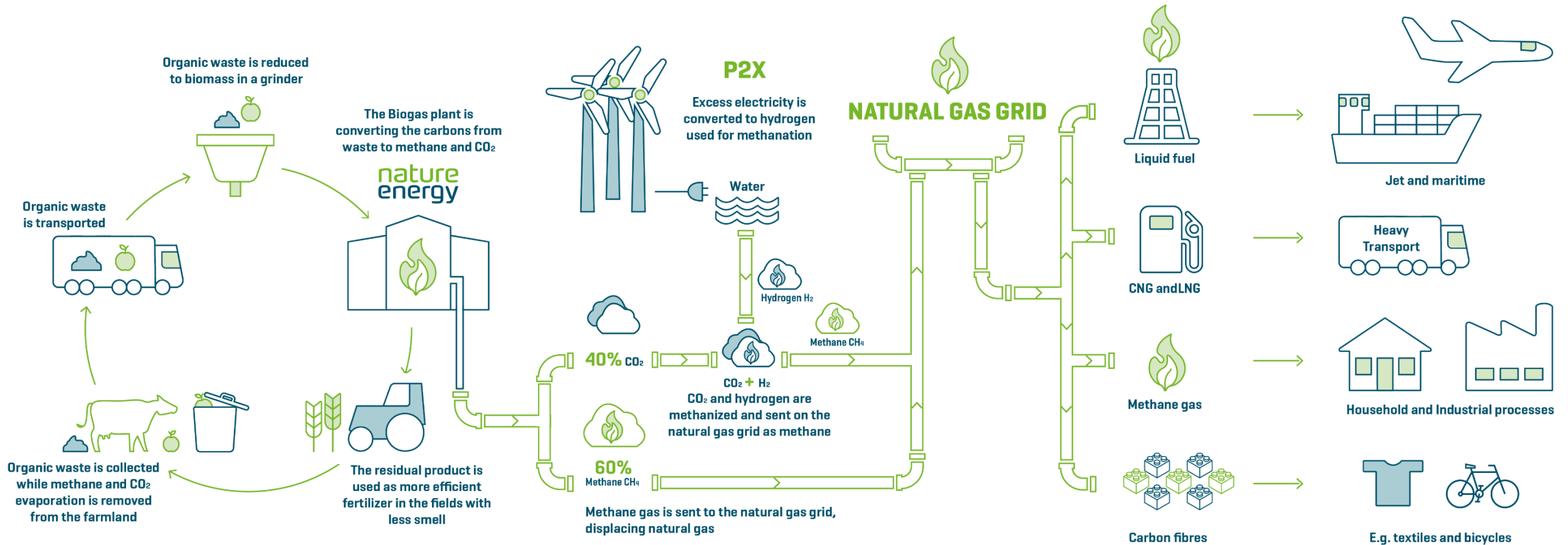
FOOD WASTE FROM HOUSEHOLDS AND BUSINESSES


SLURRY

DEEP LITTER



Circular economy





The biogas plant is a nutrient factory to farmers



Our biogas plants is an effective system for recycling of nutrients



A typical Nature Energy plant produces 0.5 mil. tons of nutrient rich green fertilizer



Saving costs on fertilizers and improving the environmental footprint of the farms



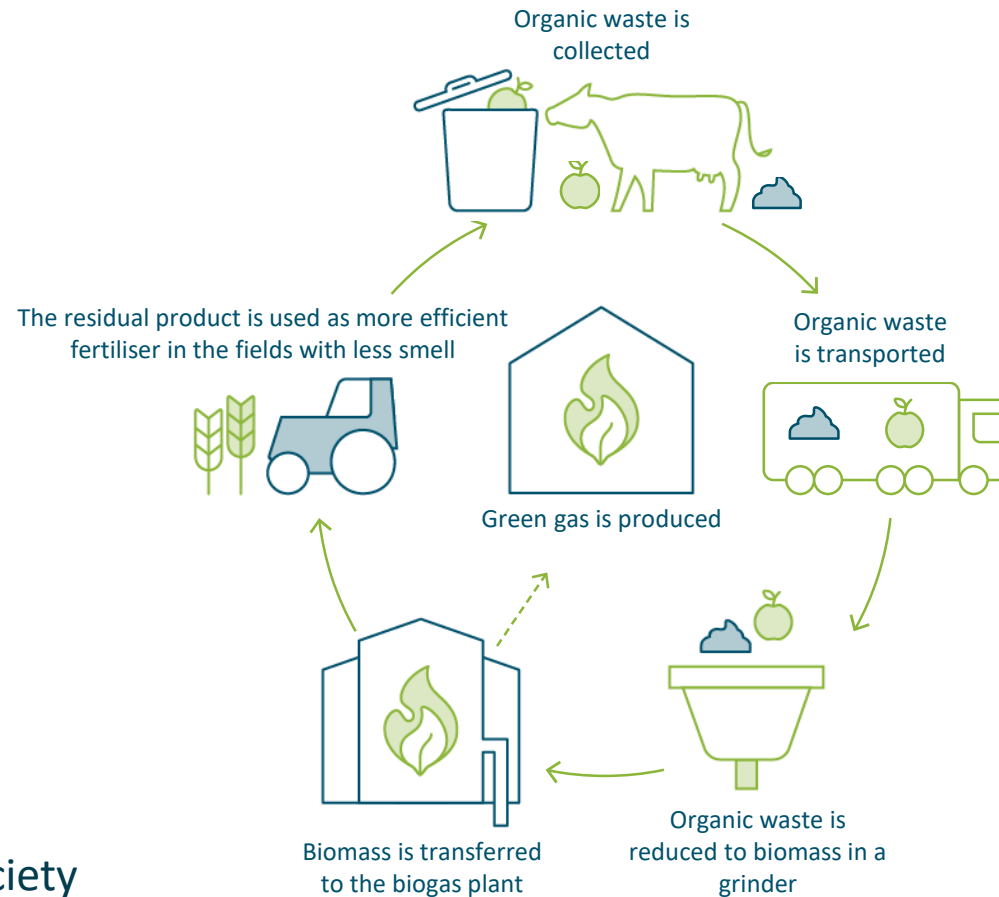
Cover-crops solutions

Turning waste to value – benefits with large scale biogas



The farmer

- Better fertilizer that can be spread more easily
- Farmer as energy-supplier
- Possibility to be a co-investor
- Economic savings as the biogas plant handles fertilizer accounting and transport of degassed biomass to the fields



The society

- Biological waste and residues are turned into value
- Local energy production
- Reduced emissions of greenhouse gases
- With a portfolio of biogas plants, we can:
 - optimize transport,
 - buy large amounts of biomasses when the price is good,
 - optimize the biomass mix,
 - Have experts for specific knowledge



The Municipal

- The municipality takes the final decision on establishment
- Handling of green waste/household waste
- Green fuel for local transport
- Option to carry out continuous control through the given approvals



The Community

- Jobs at the biogas plant
- Jobs in local area
- Reduces smell when spreading the manure
- Other supports to the local community

Thank you for your time!

Renew Energy A/S

Solution presentation

Morten Enzo Gyllenborg
CEO



There is no such thing as
waste but wasted
opportunities.



Renew Energy at a glance

- ❑ Family-owned design and engineering company headquartered in Svendborg, Denmark

Europe served out of Denmark (for now)

Representation in USA

Representation in South Korea

Representation in South Africa

■ DENMARK ■ REPUBLIC OF KOREA ■ SOUTH AFRICA ■ UNITED STATES OF AMERICA



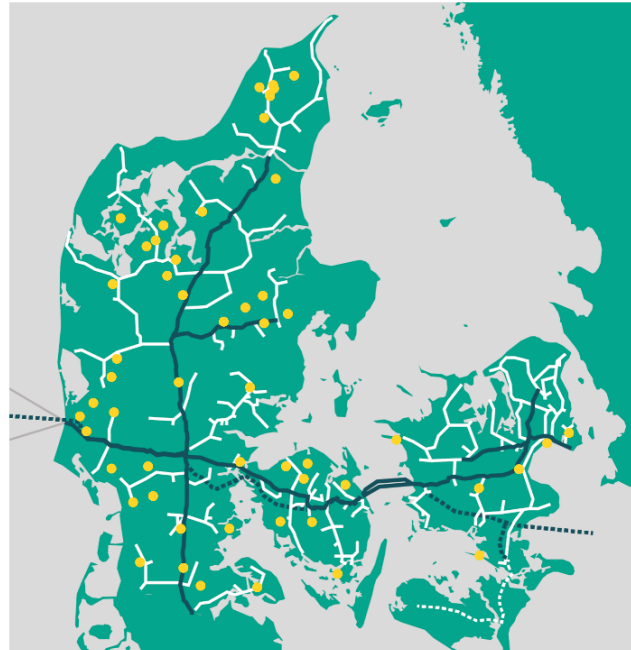
Denmark - World-leading biomethane production

Unbroken Chain

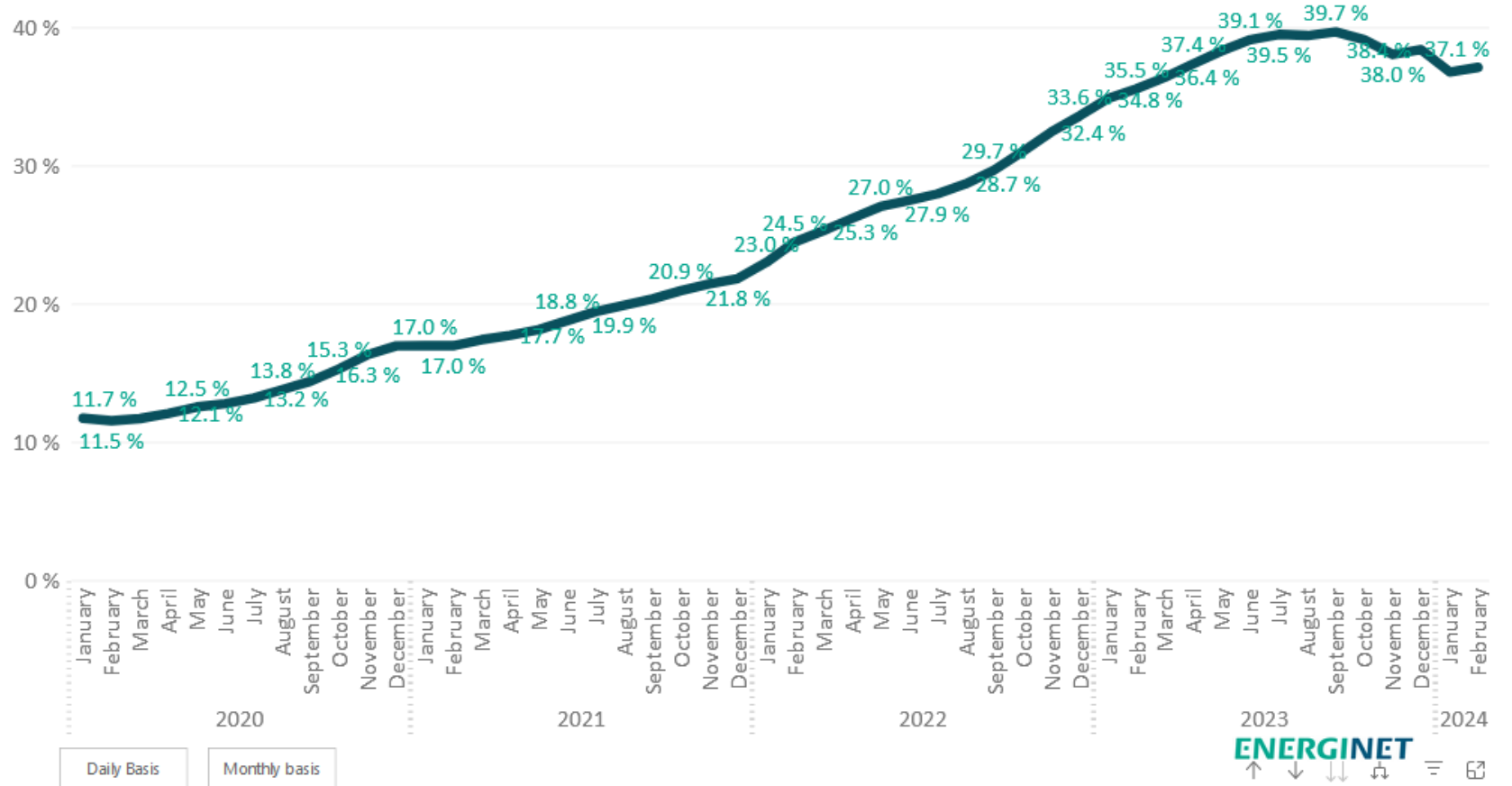
A guarantee of origin (GO) is a certificate documenting and guaranteeing the origin of the renewable energy.

2023: App. 40% biomethane in gas network

Goal in 2030: 100% biomethane in



Share of biomethane in relation to the last 12 months of production and gas consumption



Brief company history

30 years of experience

1990 – 2007

Bioscan A/S

2007 – present

Renew Energy A/S

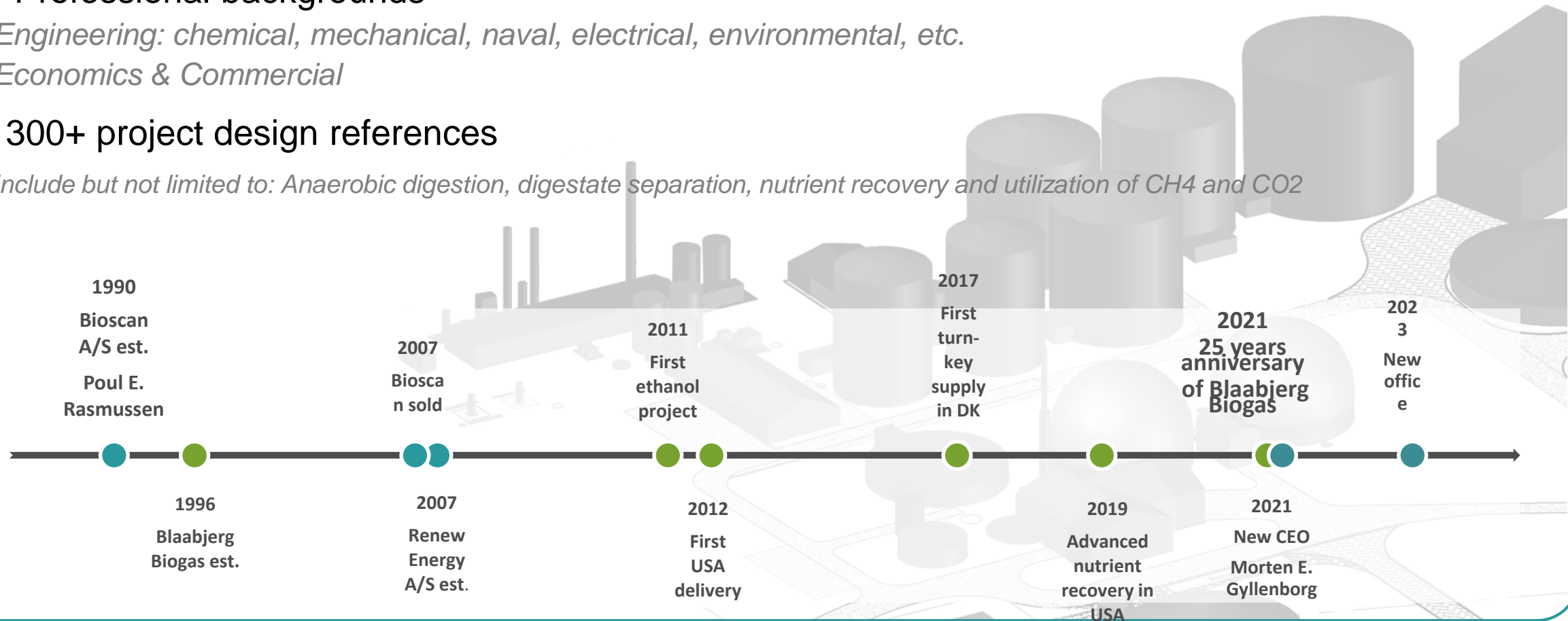
Professional backgrounds

Engineering: chemical, mechanical, naval, electrical, environmental, etc.








Economics & Commercial

300+ project design references







Include but not limited to: Anaerobic digestion, digestate separation, nutrient recovery and utilization of CH₄ and CO₂



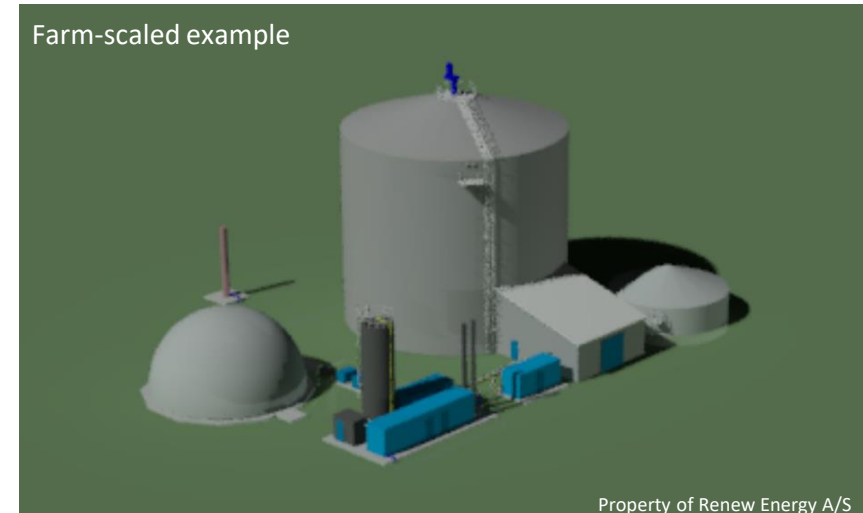
□ Engineering services

-  *Basic engineering package*
-  *Detailed engineering and support*
-  *Construction supervision*
-  *Procurement assistance*
-  *Commissioning*
-  *Training and documentation*
-  *O&M services*

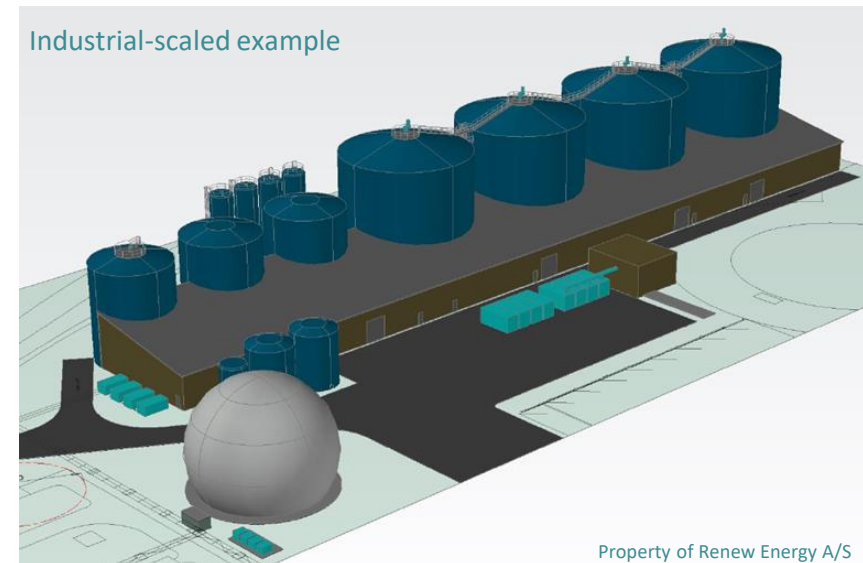
□ Technology agnostic design philosophy

-  *Process integration*
-  *Robustness – flexibility and durability*
-  *Optimized energy consumption*
-  *Automation control*
-  *Optimized business case*
-  *Focusing on Total Cost of Ownership (TCO)*

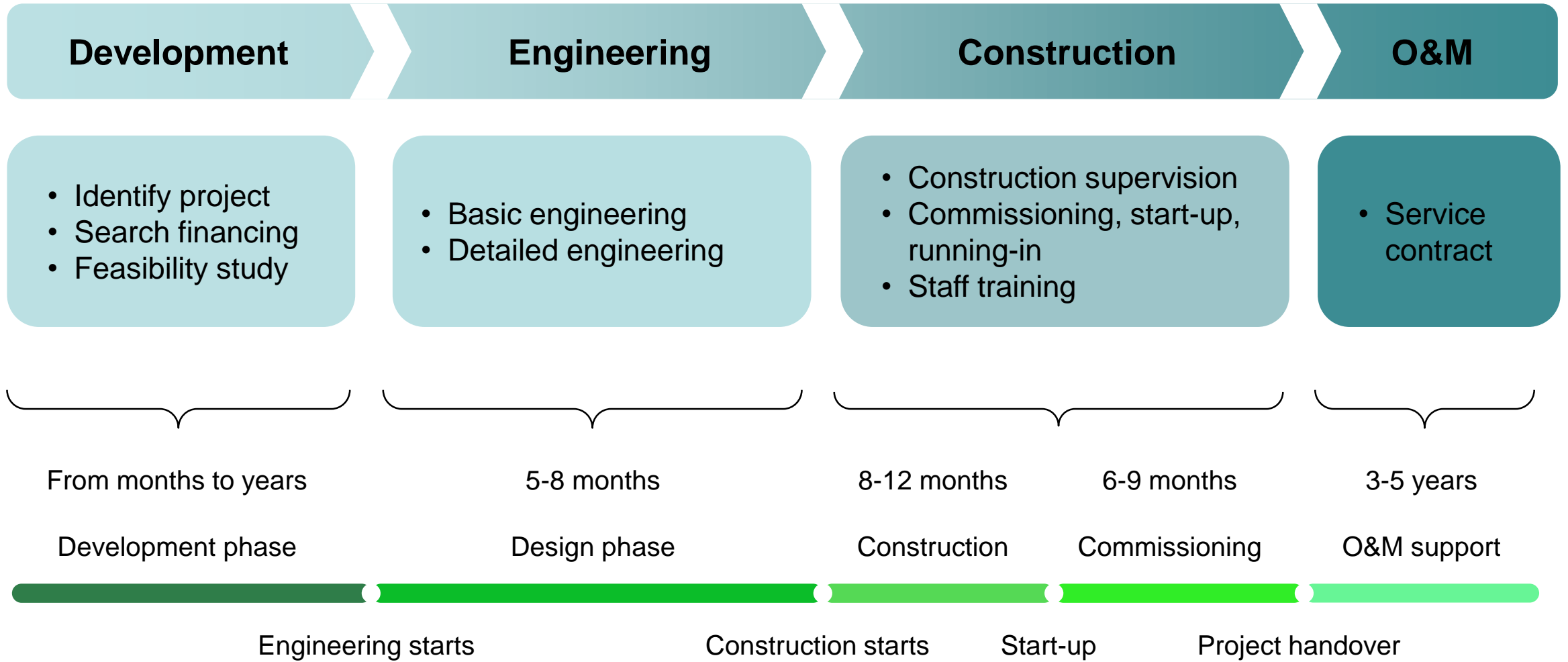
Farm-scaled example



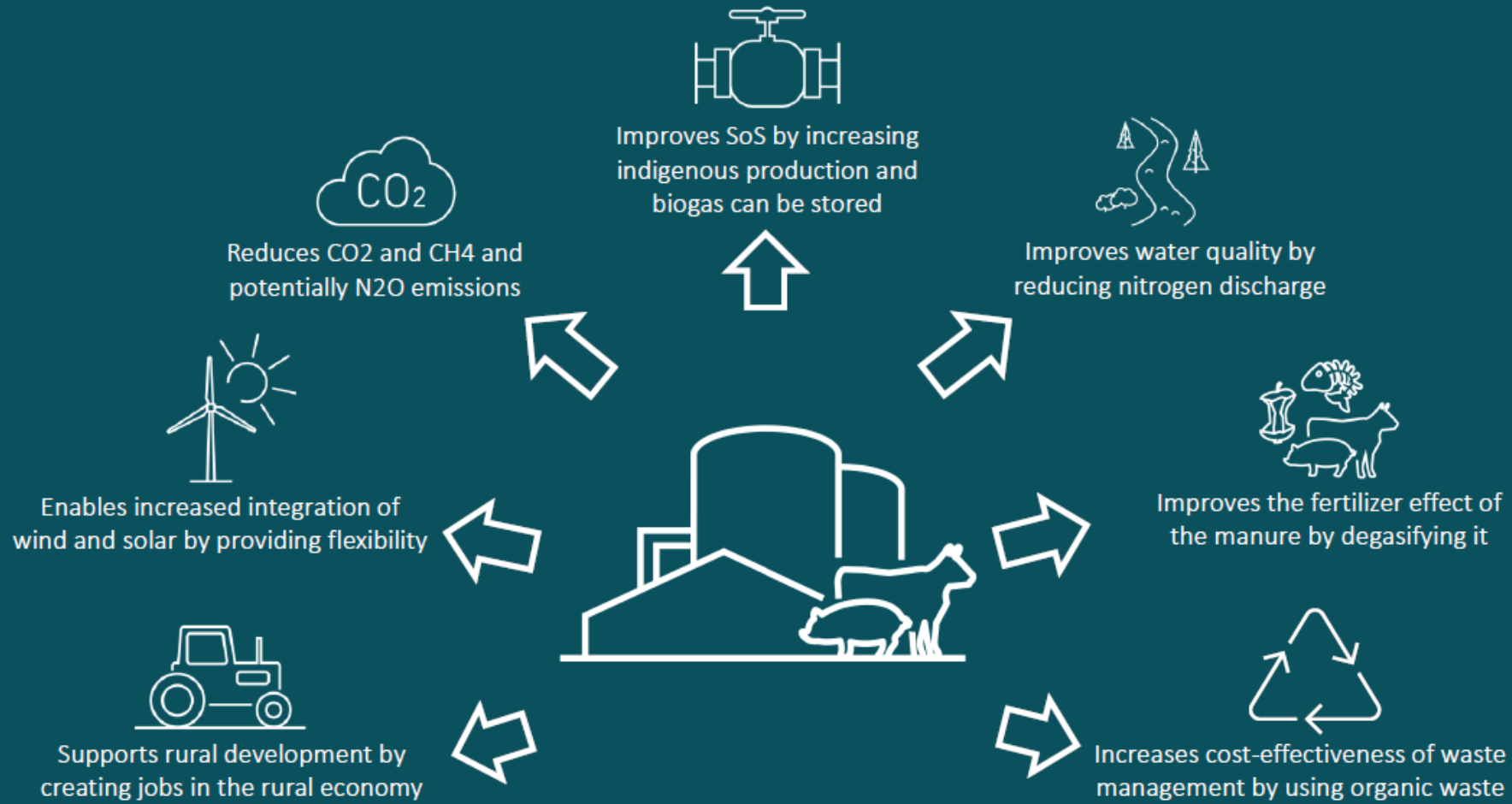
Industrial-scaled example



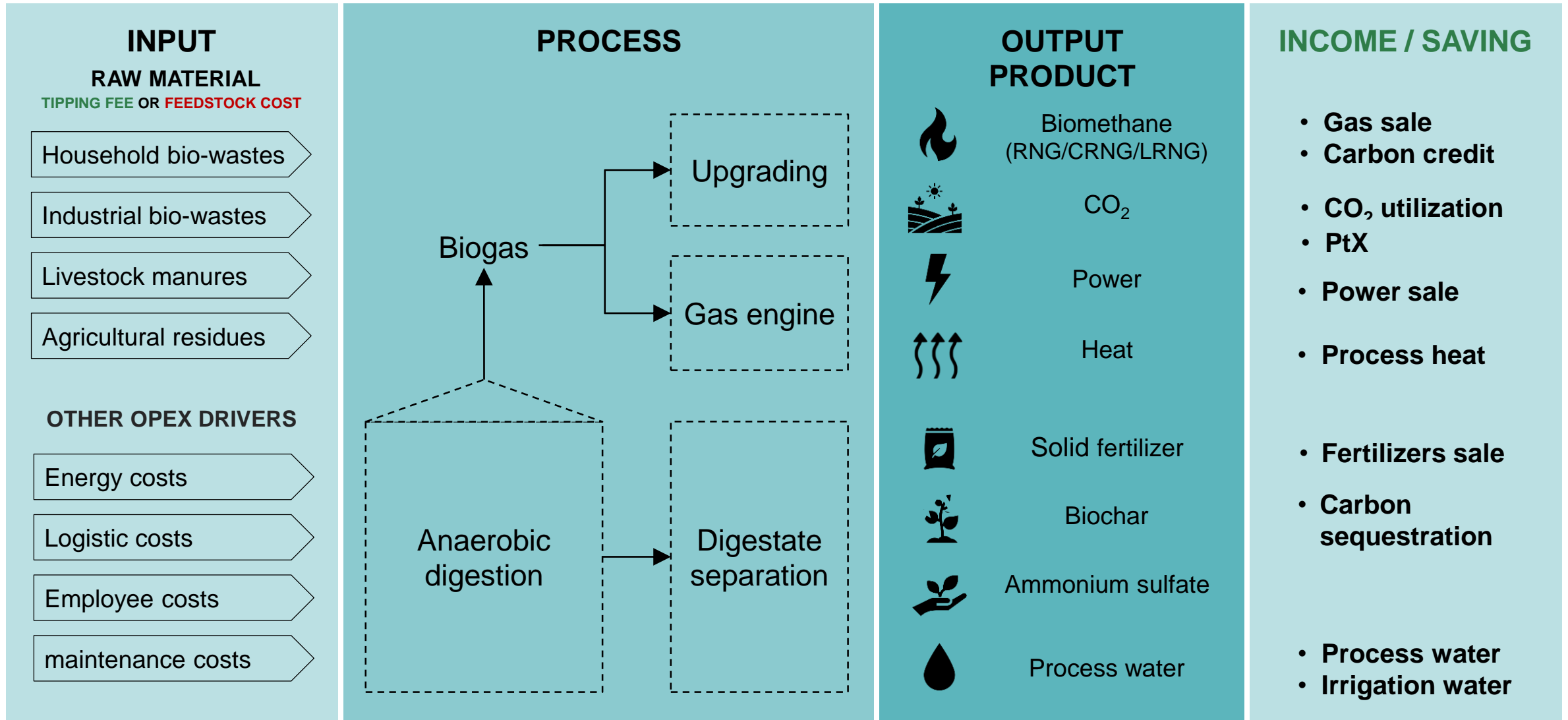
Typical project phases and Milestones



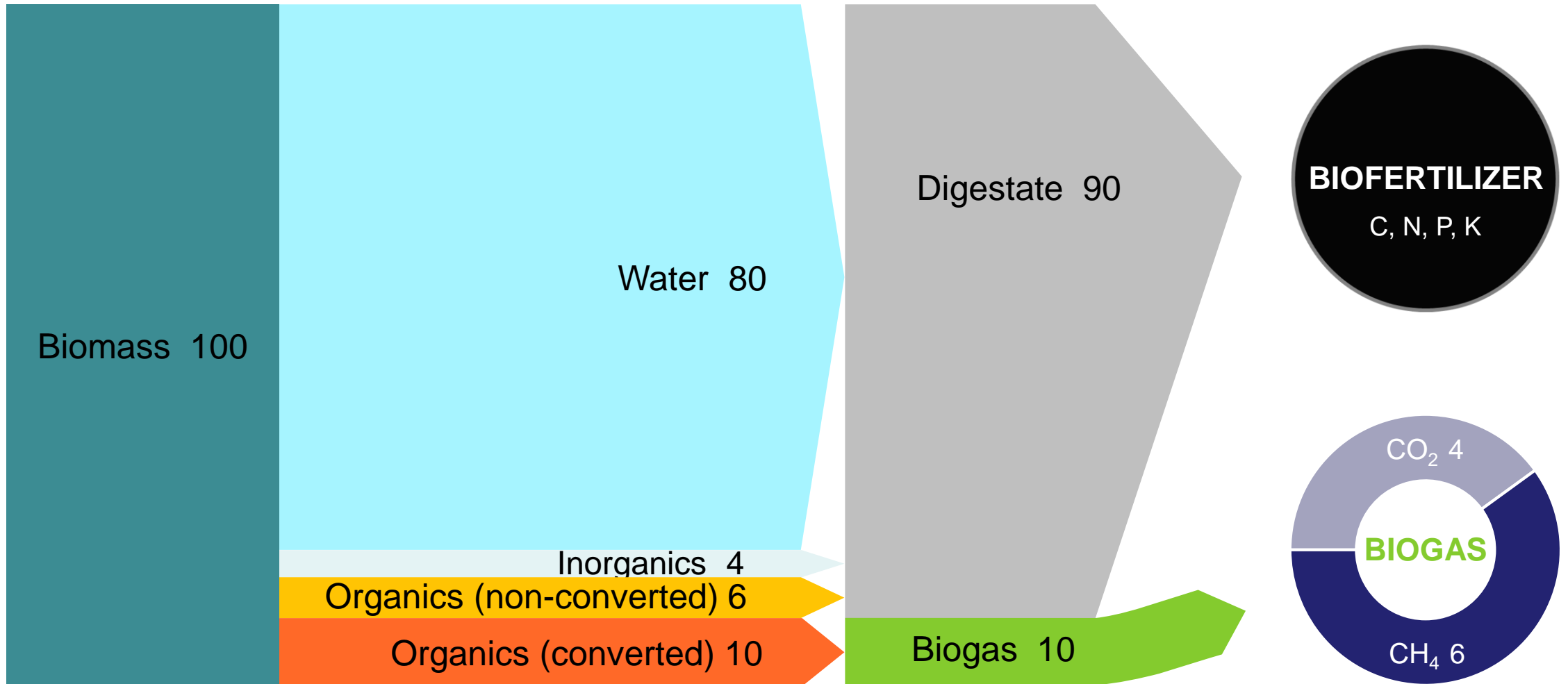
Anaerobic Digestion – the circular economy driver



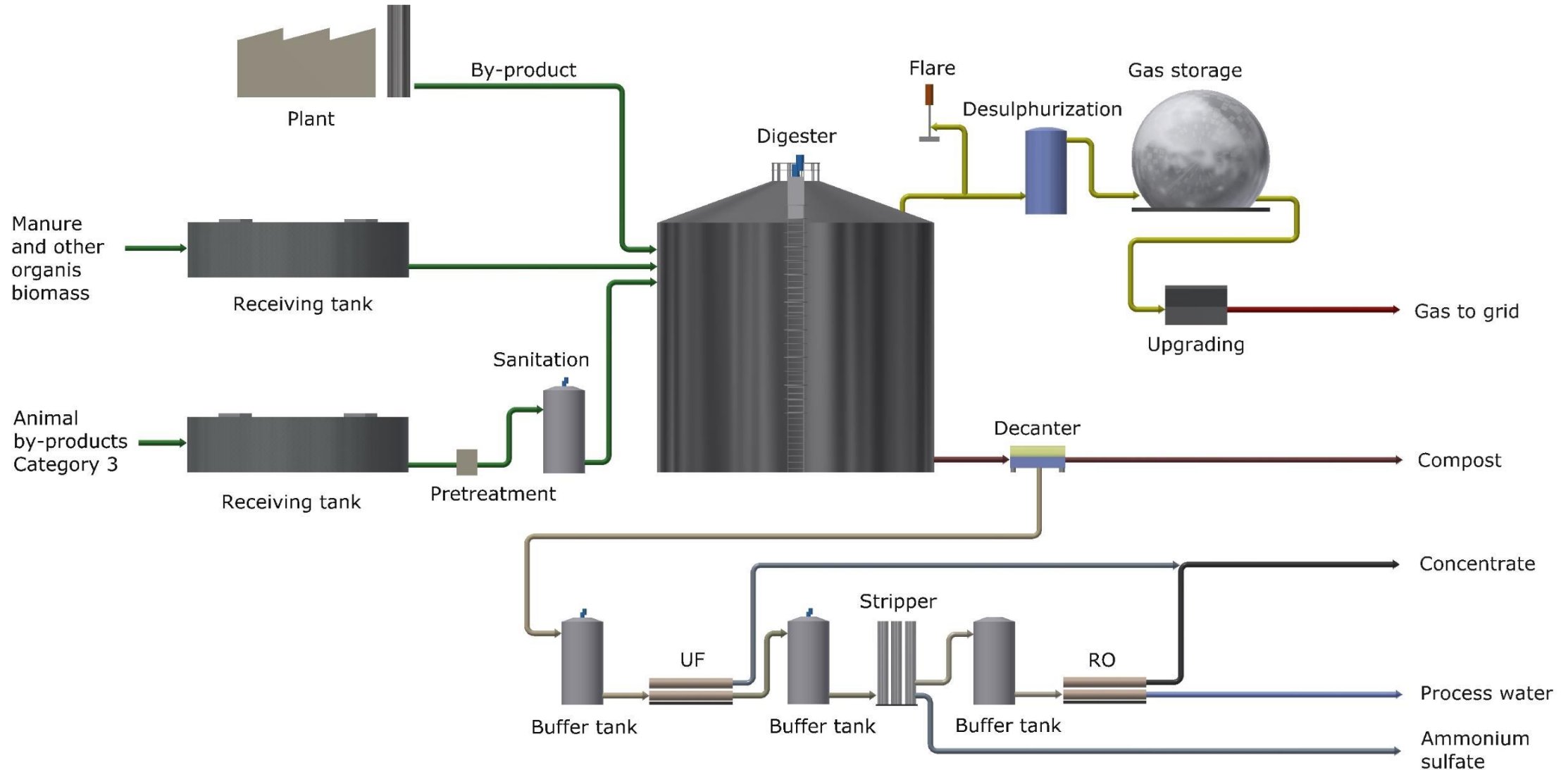
Value Chain of biogas projects



Methane - a (very important) byproduct

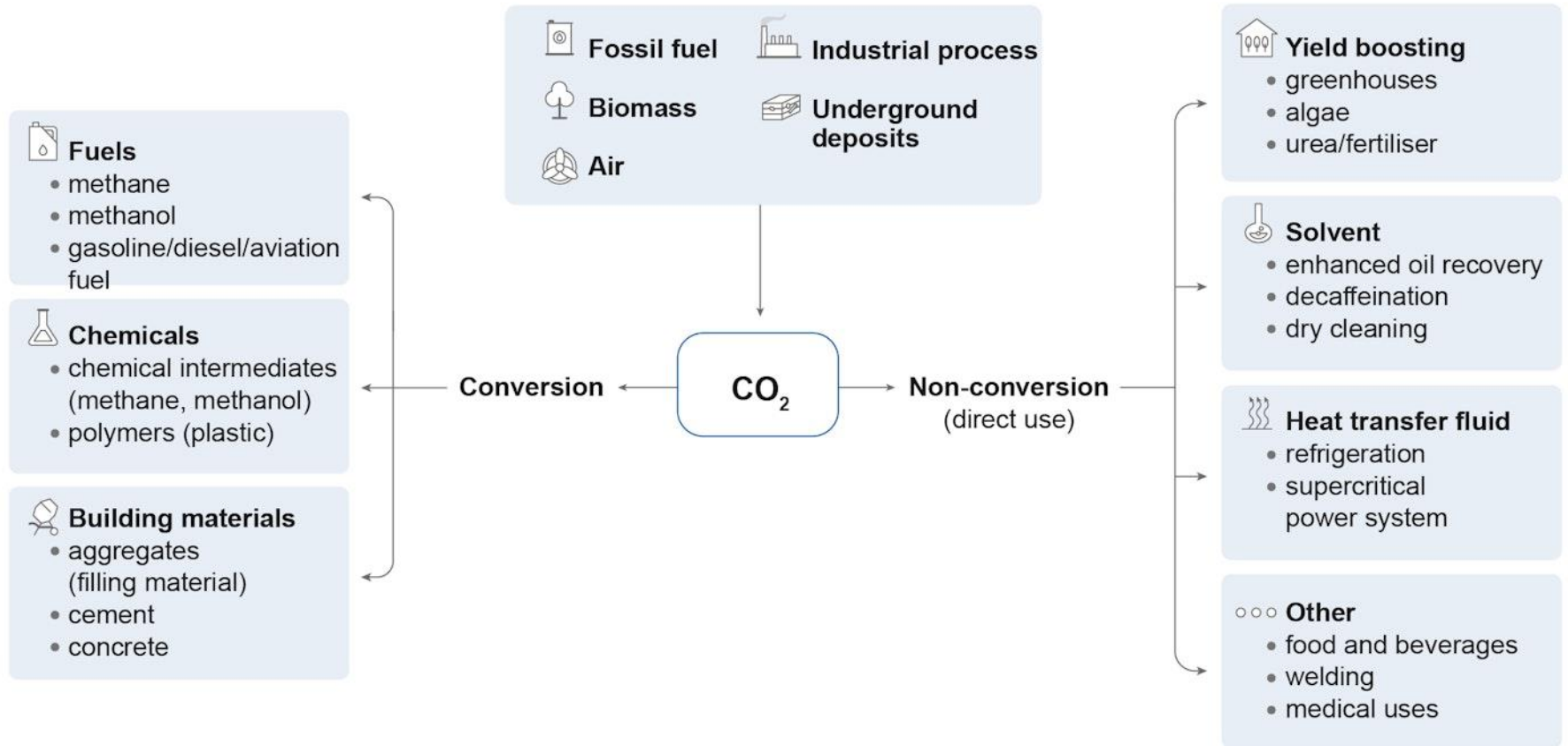
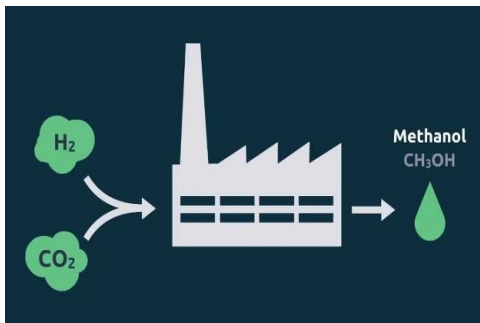


Nutrient recovery solution - Tailored fertilizer

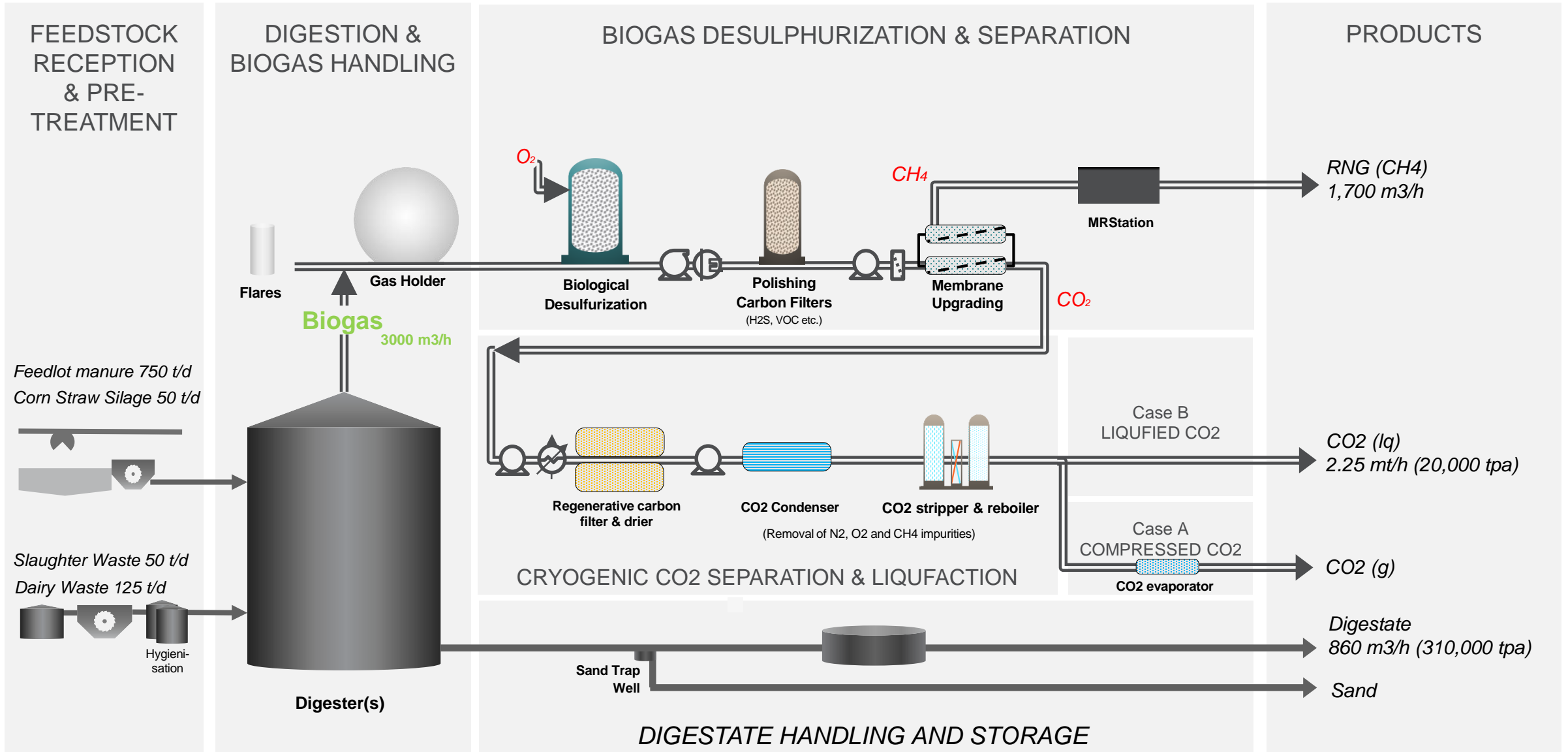


CO₂ is a valuable commodity

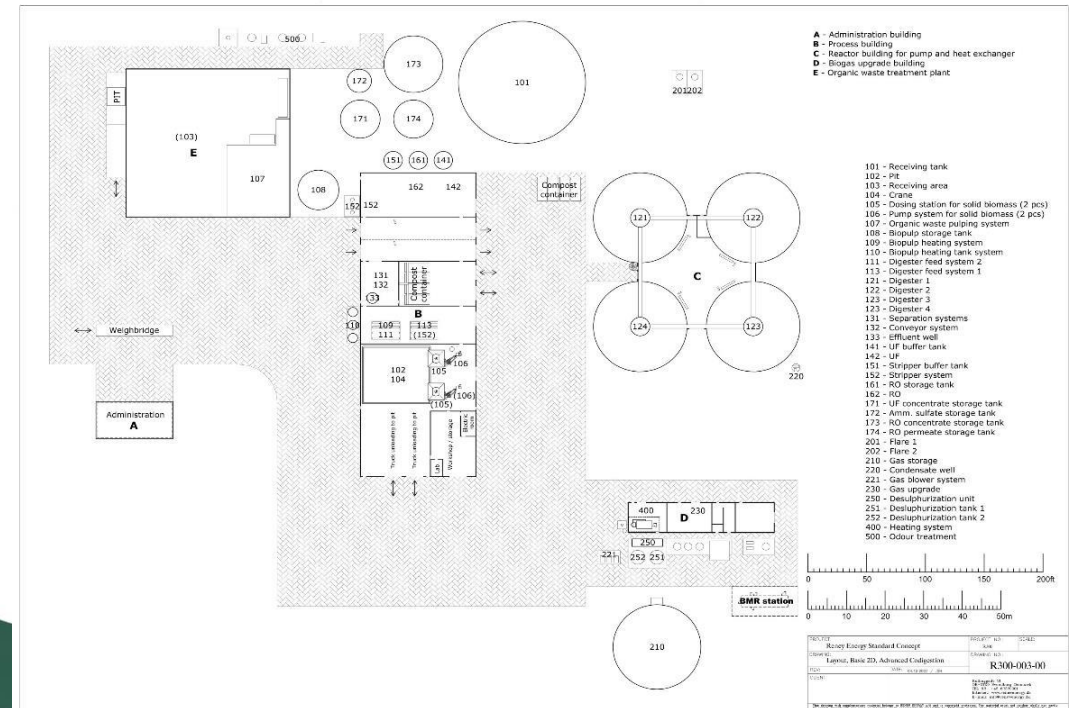
Globally, some 230 million tonnes (Mt) of carbon dioxide are used every year.



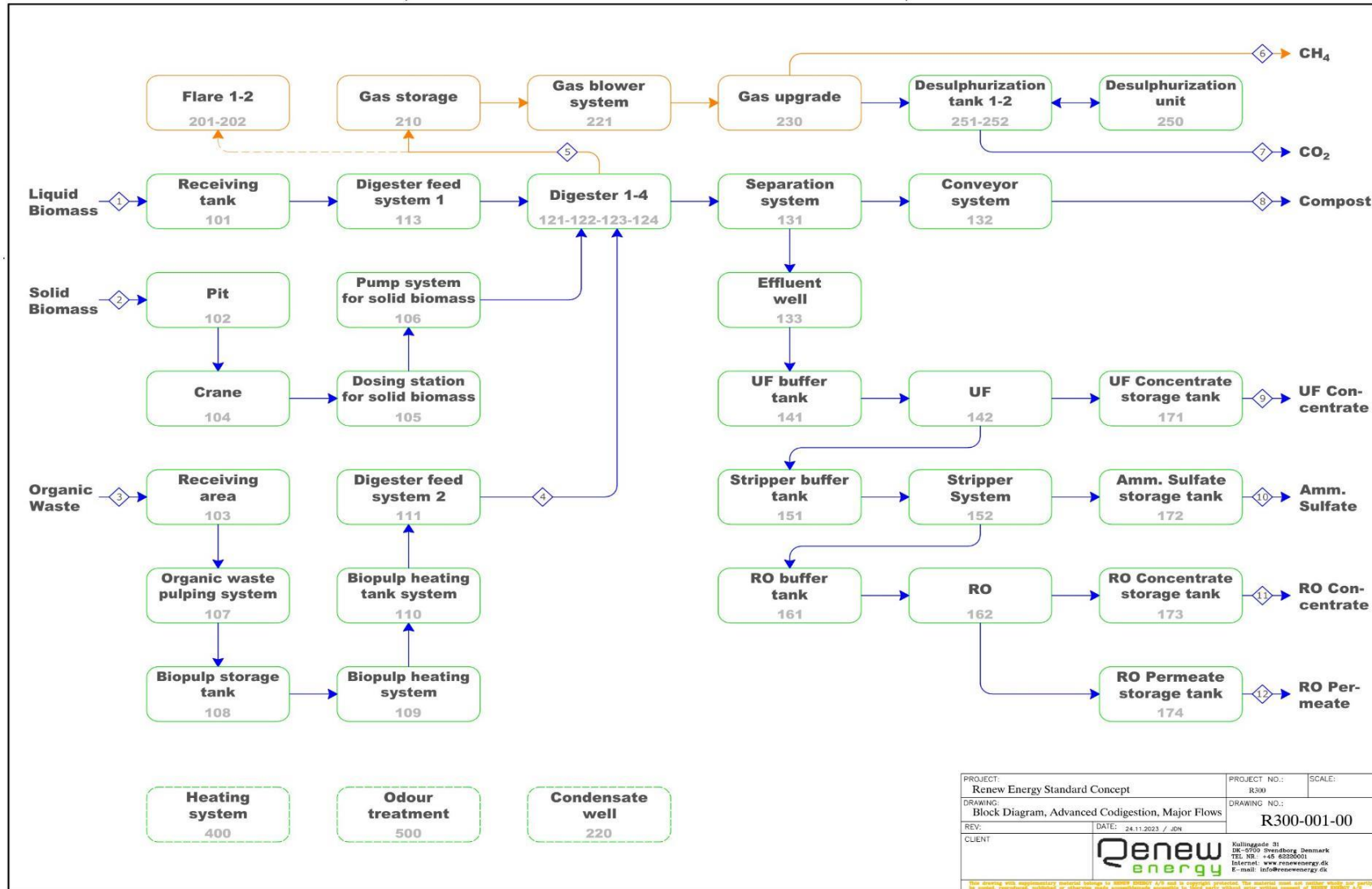
Conceptual Block Flow Diagram



RE's standard plant design covers concepts/solutions that fit from single farm-sized to industrial-scale.

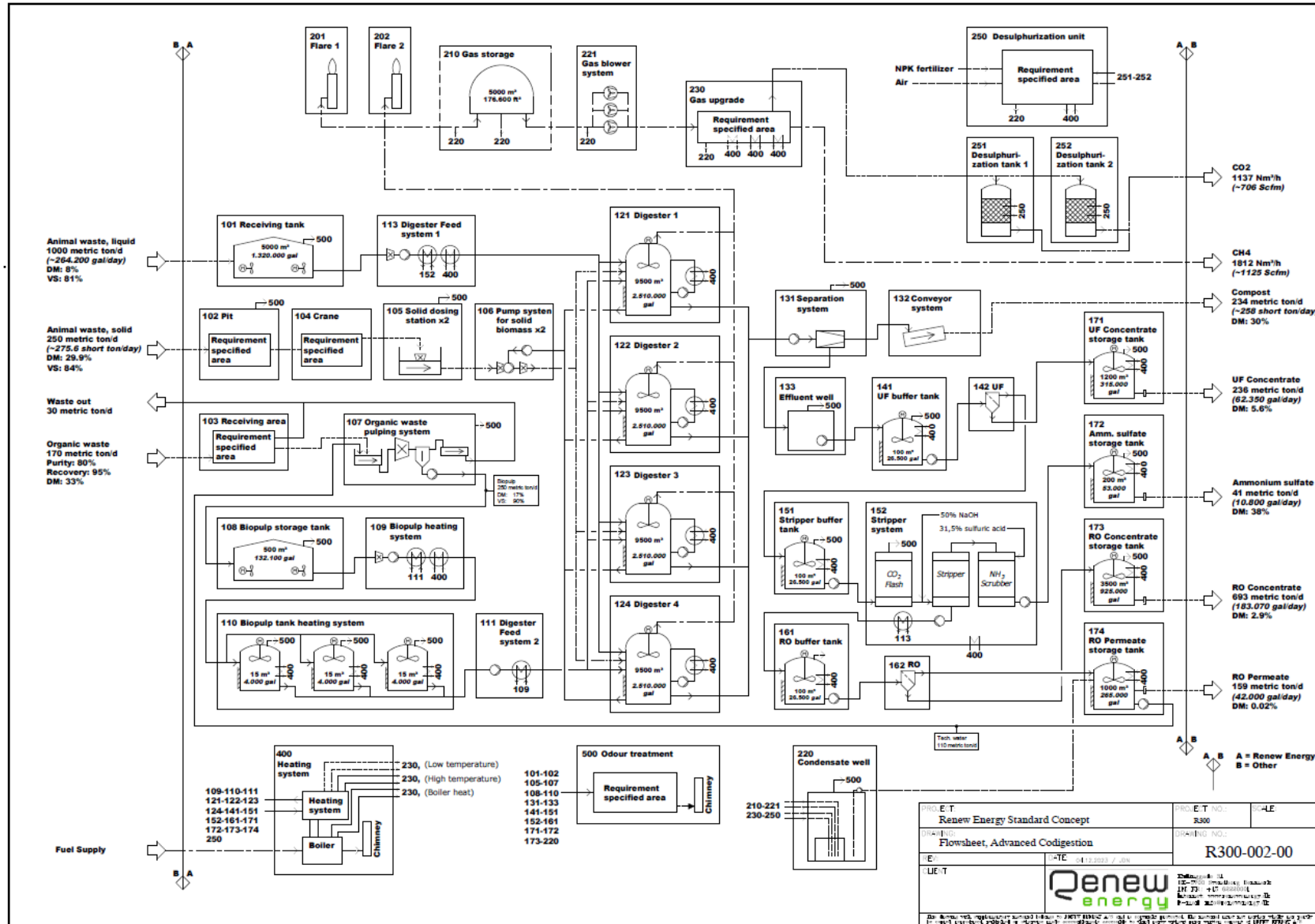


Standard Plant Design - Block Diagram, Advanced Co-digestion



PROJECT: Renew Energy Standard Concept	PROJECT NO.: R300	SCALE:
DRAWING: Block Diagram, Advanced Codigestion, Major Flows	DRAWING NO.: R300-001-00	
REV:	DATE:	
CLIENT	Rullingsgade 31 DK-5700 Svendborg Denmark TEL. NR. +45 62200011 Internet: www.renewenergy.dk E-mail: info@renewenergy.dk	

Standard Plant Design - Flowsheet, Advanced Co-digestion



A few selected references

	Cayuga	Fremont	Trenton	Allter Power	Kurana	Blaabjerg
<u>Location/Type</u>	Agri	Codigest	Food only	Codigest	Bioethanol	Codigest
Denmark	✓					✓
EU				✓	✓	
North America	✓	✓	✓			
Others						
<u>Feestock type</u>						
Livestock manures	✓	✓				✓
Industrial bio-wastes		✓	✓	✓	✓	✓
Household bio-wastes		✓	✓			✓
Agricultural residues		✓				✓
<u>Energy product</u>						
CHP		✓	✓	✓	✓	✓
Biomethan	✓					✓
<u>By-Product</u>						
Fertilizer	✓	✓	✓	✓	✓	✓
CO2						

Trenton Biogas, New Jersey, USA.

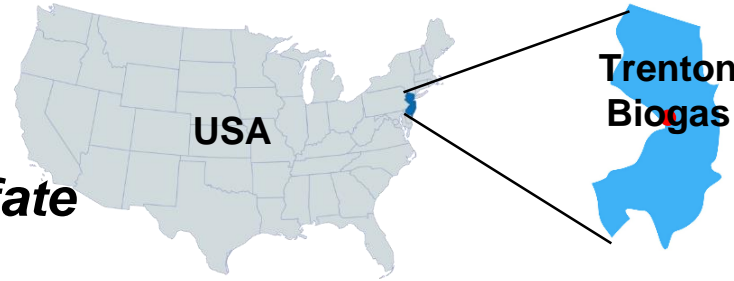
400 tons/day Food waste

3MW power (CHP)

5 000 ton/year ammonium Sulfate

30 000 ton/year solid fertilizer

Construction: 2019



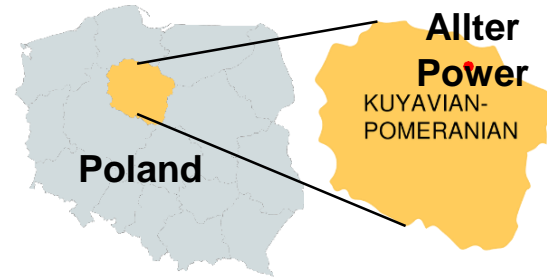
Allter Power, Mełno, Poland

**230 tons/day Rye silage, beet pulp,
pig manure, vegetable waste,
Glycerol**

1.6 MW power (CHP)

75.000 ton/year organic fertilizer

Construction: 2011



Gas engines



Desulphurization
unit

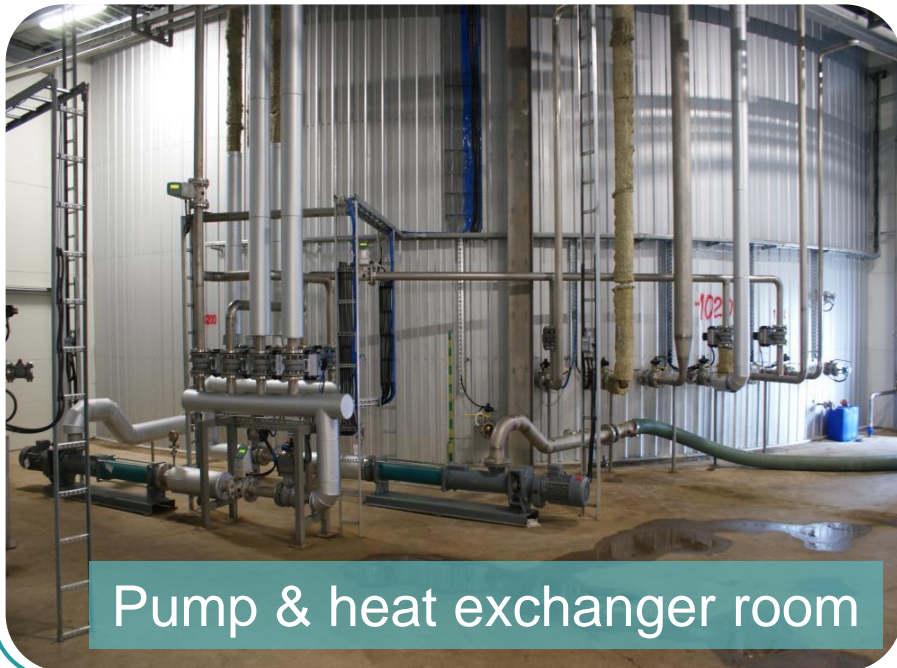
UAB Kurana, Pasvalys, Lithuania

800 tons/day Whole silage, local industrial by-product

16.5 MW power (CHP)

18 000 ton/year solid fertilizer

Construction: 2012



Pump & heat exchanger room



Ammonia stripping towers



Sulfuric & citric acid dosing tanks

Blaabjerg, Denmark



Bolted digester

1 000 tons/day mixed feedstock
13 M m³/year bio-methane
320 000 tons/year digestate fertilizer
Construction: 1996
Expansions & renovations:
2009, 2011, 2015, 2020.



Upgrading plant



Odor treatment

Ready to Renew?
Contact us at
renewenergy.dk

Morten Enzo Gyllenborg, CEO

mog@renewenergy.dk



renew
energy

