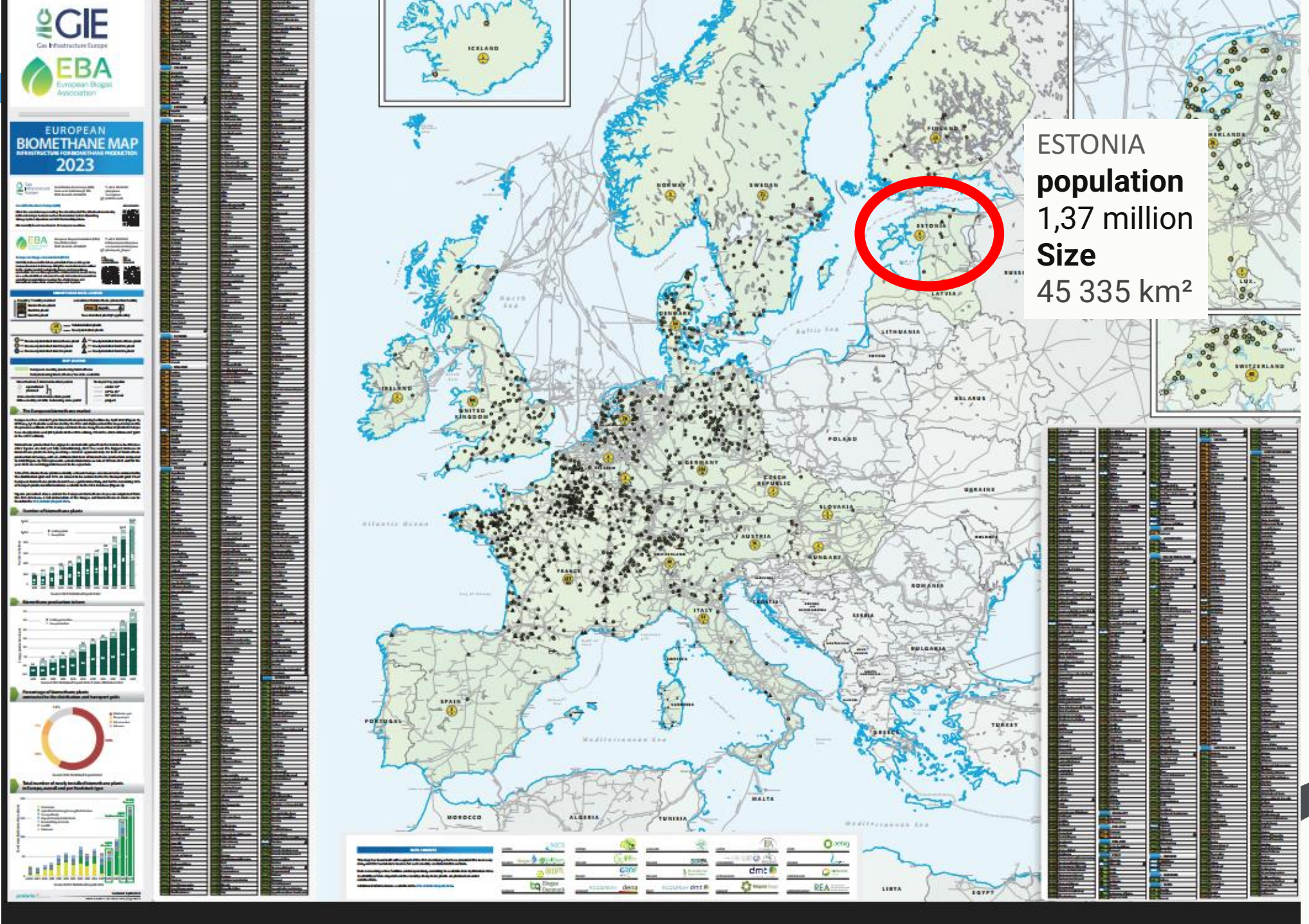
Real experiences of building and operating the first Baltic green field agricultural biomethane plant The case of Estonia

Ahto Oja
Estonian Biogas Association
Balti Biometaan OÜ
Ahto.oja@baltibiometaan.ee
+372 5082990

Date:
GreenMeUp webinar
17.02.2025

Funded by the European Union

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No. 101075676.


GIE
EBA
EUROPEAN
BIOMETHANE MAP
2023
ESTONIA
population
1,37 million
Size
45 335 km²

GREENMEUP

Short history

- The **first** surveys on Estonian biomass availability and **potential biogas** production were made in Tallinn Technical University by Ülo Kask* at the **beginning on 2000**. Articles were published in journals in Estonian and in English (*CV: Ülo Kask (etis.ee)
- Consulting company **Mõnus Minek OÜ** was established **2007** and its main focus was on biogas sector development.
- **Estonian Biogas Association (MTU EBA)** was established in **June 2009**.
- OÜ Mõnus Minek was Estonian (responsible for Baltic States) partner in **EU IEE project GasHighWay 2009-2012.**
- **MTU EBA** was leading the **Estonian Renewable Fuel (including the biogas) working group 2012-2014**, which gave the input (political targets **FOR BIOMETHANE DEVELOPMENT**) to the **Estonian Long Term Energy Action Plan 2030 (NREAP 2030**).
- Methodology for the ENMAK 2030 development started with „Open Room“ methodology and drafts were public, discussed and developed in the web ased tool: www.energiatalgud.ee
- **Estonian Biogas Association (MTU EBA)** is the Estonian partner in the GreenMeUp project

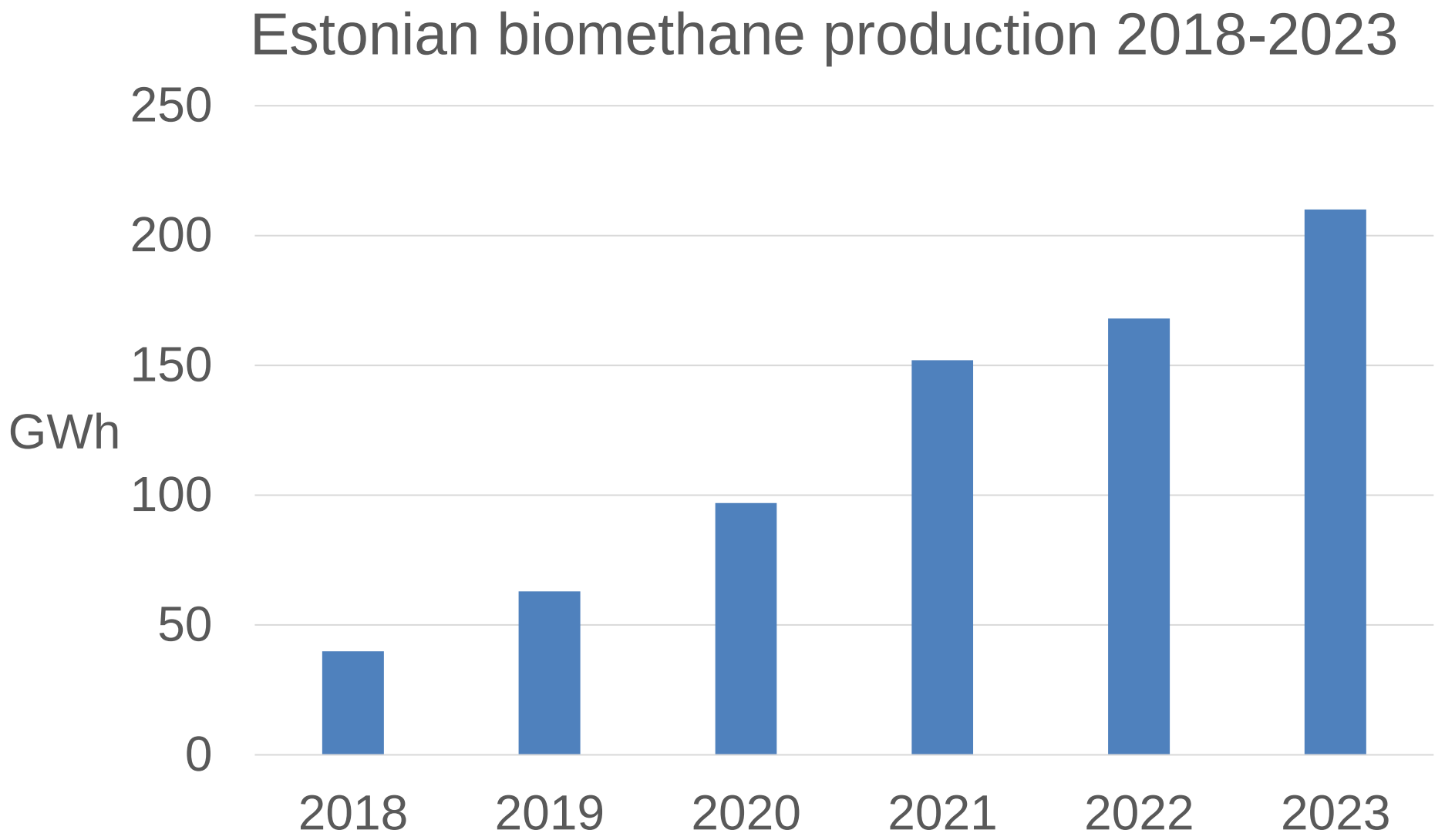
Estonian producers 2024:
12 biogas plants and **8** biomethane plants

AGRICULTURAL MIXED SUBSTRATES	
Ebavere Biogas Plant	[Bioforce Ltd]
Aravete Biogaas	[Bioforce Ltd]
Tartu Biogaas	[Eesti Biogaas Ltd]
Vinni Biogaas	[Eesti Biogaas Ltd]
Oisu Biogaas	[Eesti Biogaas Ltd]
Siimani Plant (2018)	Biometaan OÜ

Industrial process waste water sludge
OÜ Eastman /Velsicol [benosaad]
Salutaguse Pärmitehas OÜ [east prod.]
EKT EcoBio Biowaste Biomethane Plant A le Coq biogaasijaam [õlleraba]
Estonian Cell Plant (2018) Rohegaas OÜ Estover Piimatööstus AS (cheese factory)

Waste Water Sludge
Tallinna Vesi AS
Tartu Vesi AS
Narva Vesi AS
Kuressaare Veevärk AS

Biogas from Landfill
Väätsa landfill
Tallinna Prügilagaas OÜ [Jõelähtme}
Paikre OÜ [close to Pärnu]
AS Uikala Prügila



Source: [Biomethane production in Estonia (biometaan.info)]

SIIMAN Biogas plant operated by Biometaan OÜ

Ownership

Järve Kaubanduskeskus	50% (AS Silikaatgrupp - investor)
OÜ Mangeni PM	40% (AS Silikaatgrupp – feedstock)
Balti Biometaan OÜ	10 % (operation & management)

Investment

6,2 meur

- 3 meur bank loan
- 2,6 meur investment grant (pilot, governmental)
- 0,6 meur equity

GREENMEUP

1, 2 = FERMENTERS

a' 5000 m3

6 = SOLID FEEDSTOCK

7 = BIOGAS UPGRADING

10 = bioCH4 LOADING TO CONTAINERD

16 = COMPRESSED bioCH4 FILLING STATION

BIOMETAAN OÜ IN KOKSVERE, ESTONIA

PLANNING, BUILDING, PERMITS

DO NOT DIRECT WASHING WASTE WATER FROM FARM WITH DISINFECTANTS TO BIOGAS PLANT

KEEP WARM AND COLD MAINTENANCE ROOMS **SEPARATELY**

PUMPS CREATE WARM

ELECTRICAL CABINET NEEDS COOLING

BE CAREFUL TO DESIGN THE **ACTIVE CARBON FITLER WITH RIGHT VOLUME**

HAMMERMILL FOR SOLID FEEDSTOCK

USE „WASTE HEAT“ FROM COMPRESSORS TO HEAT THE WORKSHOP AND OFFICE

2 heat exchangers: digestate **out** → up to 10 C warm to feeded feedstock;
70 C hot water from the woodchip boiler house → 20 C to feedstock [no pipes on walls]

FEEDSTOCK

Slurry	**81 000** t/y,	21 Nm3/t FM	6.6% DM
Manure	5 000 t/a	60 Nm3/t FM	25% DM
Grass/residues	1000 - 5000 t/a	150 Nm3/t FM	25% DM

Hourly production 180-190 Nm3/h
Daily production 3600- 4320 Nm3/h
Annual production up to **1,5 million Nm3 (bioCH4)**
used 100% in Estonian transport

The sand-cleaned slurry is pumped through a pipe to the BMJ

LESSONS ON FEEDSTOCK

STABILITY, QUALITY,

ORIGIN OF FEEDSTOCK →

DETERMNES THE MANAGEMENT OF DIGESTATE →

USING THE (… 10% …) BIOWASTE **MAKES DIGESTATE 100% WASTE**

→REQUIRES WASTE PERMIT TO BIOGAS PLANT [EXPENSIVE AND TIME-CONSUMING**]**

→REQUIRES WASTE PERMIT TO FARMERS → **WHICH FARMERS DON'T HAVE**

FOR AGRICULTURAL BIOGAS PLANTS CERTIFICATION / PASTEURIZATION OF FEEDSTOCK/DIGESTATE **IS NOT THE OPTION →CIRCULAR ECONOMY IS NOT POSSIBLE**

OPERATION AND MAINTENANCE

KEEP CRITICAL SPARE PARTS STORAGE

SOLID FEEDSTOCK FEEDING FACILITY UNDER ROOF / CLOSED ROOM

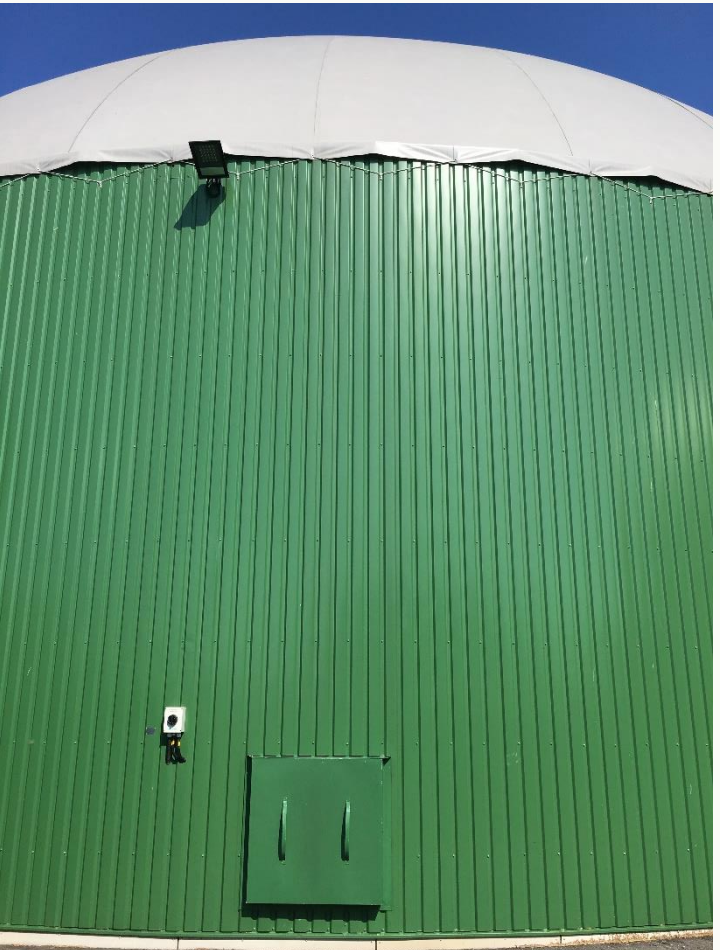
MAXIMIZING AUTOMATION →DIFFERENT SUPPLIERS

SOLVES RAIN WATER PURIFICATION ISSUE FROM

OPEN-AIR LOADING PLOT

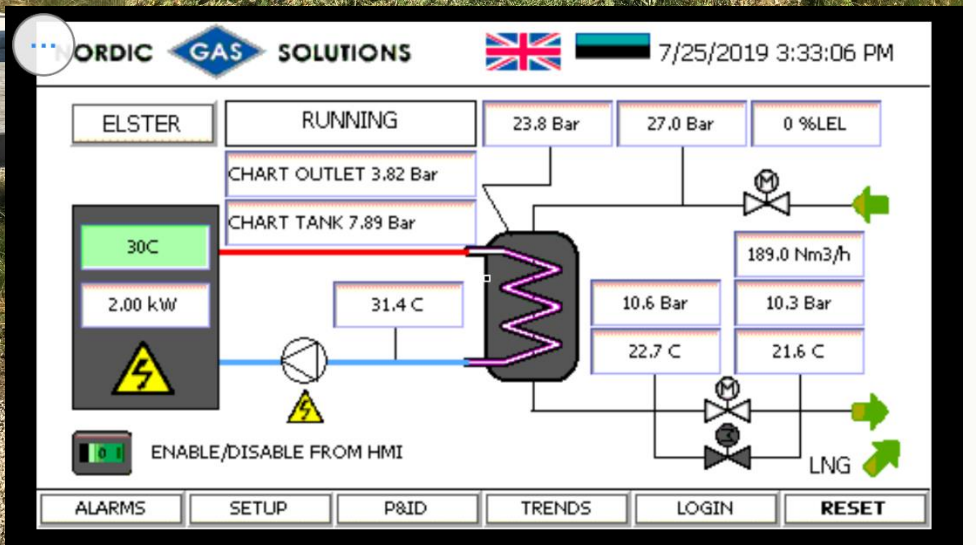
TRANSPORTED SOLID FEEDSTOCK LOADING DIRECTLY TO THE FEEDING FACILITY – **REDUCES NEED / INVESTMENT** TO SOLID FEEDSTOCK STORAGE

We add 15 tons of solid manure, 15 tons of grass silage / feed residues and 250 m3 of slurry to the digester per day



- AVOID ICE MELTING ON THE MIXER REGULATOR AND SAFETY SWITCH
- BUILD MAINTENANCE TRAIL AROUND THE DIGESTER
- LEAVE ENOUGH ROOM AROUND MAINTENANCE HOLE

Public, the first 100% compressed biomethane filling station in the Baltics in Koksvere



INNOVATIONS 2022 AND BEYOND

Solar PV Station 250 kWel – **working** (www.biometaan.ee)
Bioon – biogas digestate to liquid and solid **fertilize** (www.bioon.ee)
tested, but on hold
Thori Tanklad OÜ – the **first mobile and autonomous CBM filling station** – **working** (www.thoritanklad.ee) – merged to Biometaan OÜ at 2025
Convion solid oxide fuel cell [SOFC] on biomethane (www.convion.fi), 4th in the world of its kind – **working** 2022
The **SOFC Convion C60 is mobile, autonomous combined heat (25%) and electricity (with 60% efficiency, 60 kW*h) generator**

Wind generaator → hydrogen + off-CO2 from biogas membrane Upgrade unit → SYNGAS – in future
H2S removal from biogas **-** possible to produce solid sulphur - in future
Off-gas CO2 from upgrading – **to purify it to liquid certified CO2 as product -** in future

Possible to produce **green hydrogen from biomethane**
– present containers can transport hydrogen

Thank you!

greenmeup-project.eu

GreenMeUp Project

GreenMeUp Project

info@greenmeup-project.eu

This project has received funding from the European Union's Horizon Europe Research and Innovation Programme under Grant Agreement No 101075676

Current situation in Estonia

Biomethane plants

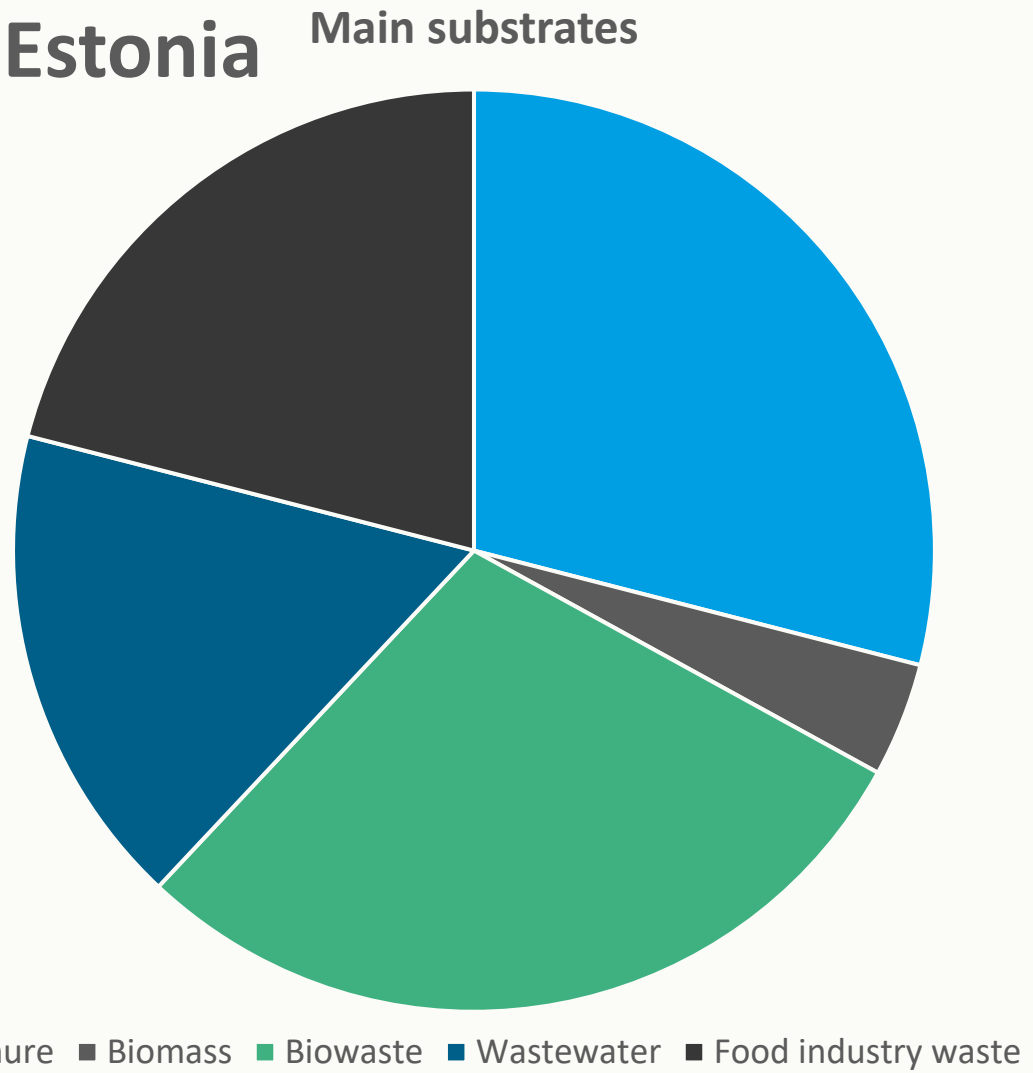
Rohegaas OÜ	55 GWh/a	5 500 000m3
Biometaan OÜ	15 GWh/a	1 500 000m3
Vinni Biogaas OÜ	25 GWh/a	2 500 000m3
Tartu Biogaas OÜ	30 GWh/a	3 500 000m3
Oisu Biogaas OÜ	20 GWh/a	2 000 000m3
Bioforce Aravete OÜ	30 GWh/a	3 000 000m3
EKT Ecobio OÜ ca	20 GWh/a	2 000 000m3
Ebavere Bioforce OÜ	35 GWh/a	3 500 000m3
Bioforce Laatre OÜ – Under Construction	ca 25 GWh/a	2 500 000m3
Bioforce Viiratsi OÜ- Under development	ca 110 GWh/a	7 000 000m3

Current situation in Estonia

Main substrates according

To Guarantees of Origin

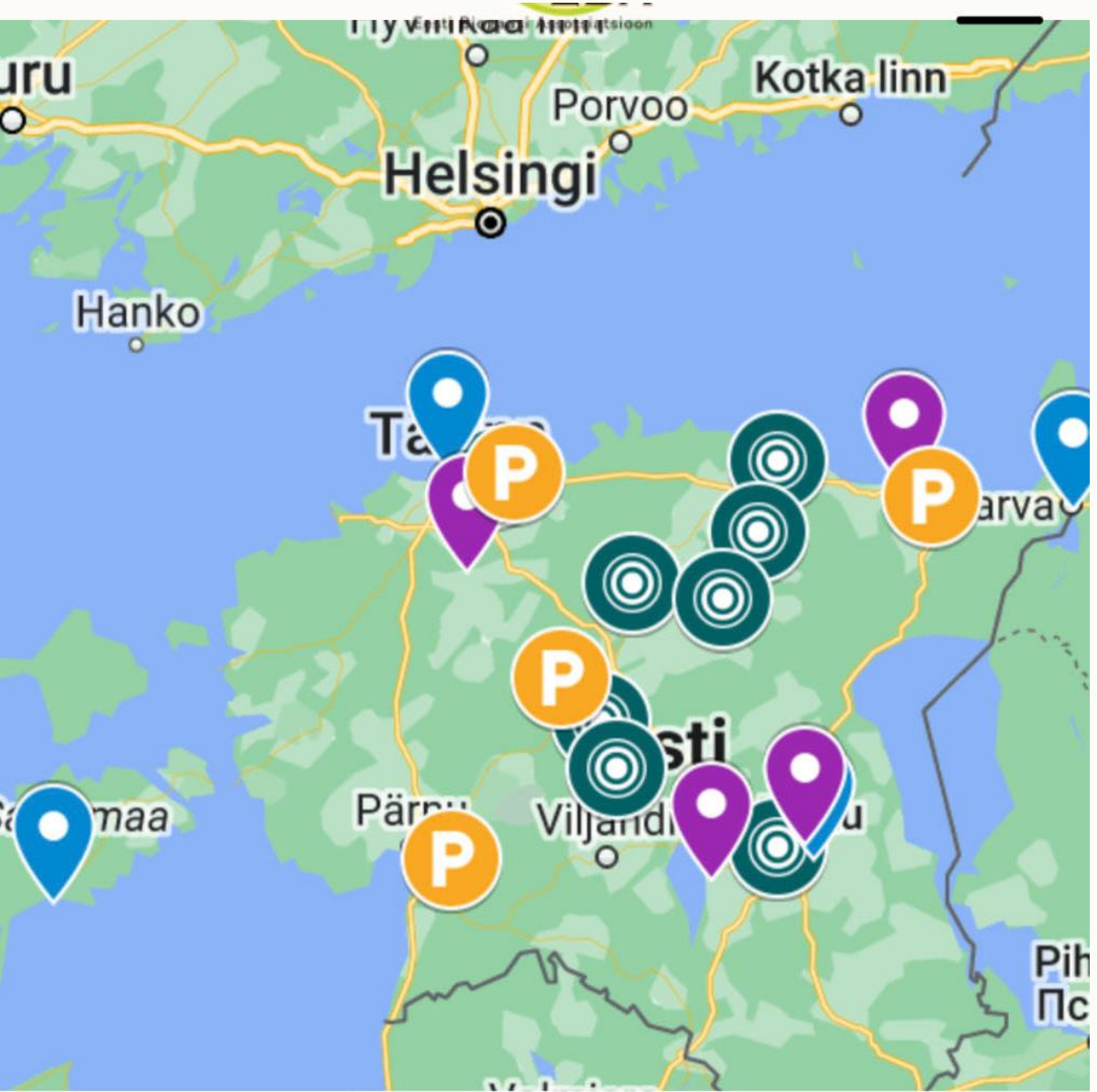
Register.



Current situation in Estonia

- Subsidy for biomethane production until the February of 2024

  100EUR/MWh –natural gas market price
- Functional Guarantees of Origin register by Elering (TSO)
- 28 CNG filling stations
- 2 LNG filling stations
- 6700 gas vehicles



Biogas production facilities in Estonia

Sewage treatment plants

Landfills

Industrial wastewater treatment plants

Agricultural biomethane plants

Final remarks

- Biomethane market in Estonia has taken a great leap over the past 7 years.
- Production has ramped up from 0 to 280 GWh
- All of the bigger biogas plants have converted to biomethane upgrading and there has been at least 1 new biomethane plant added to the map every year.
- Yet it will take continuous work to reach 1 TWh by 2030 and also to uptake the market for biomethane.
- To grant security for new biomethane plants, it will be essential
    - to work towards international biomethane register and
    - to also uptake biomethane international trading