Seminar Scandic Triangeln

Pre-BASIC Biogas

Malmö, Sweden • The 8th of November • 2016

SolrødBiogas
- helt naturligt

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The biogas plant

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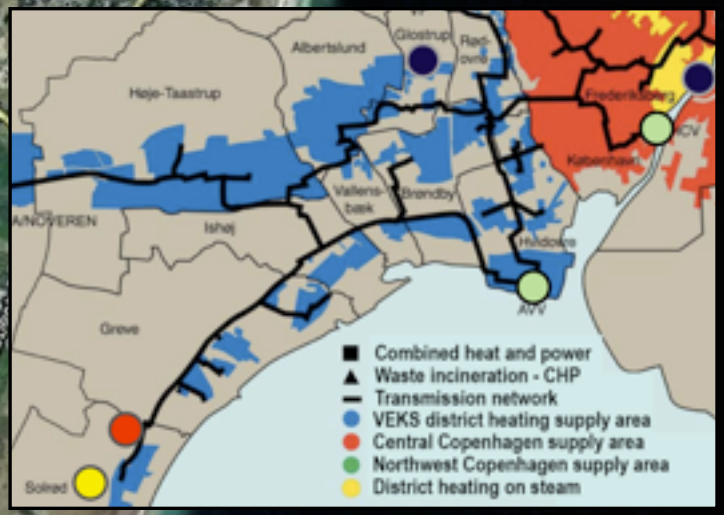
Solrød District heating
Biogas engine
Heat and power

Gas pipeline

Solrød Biogas
Nov. 2015

CPKelco

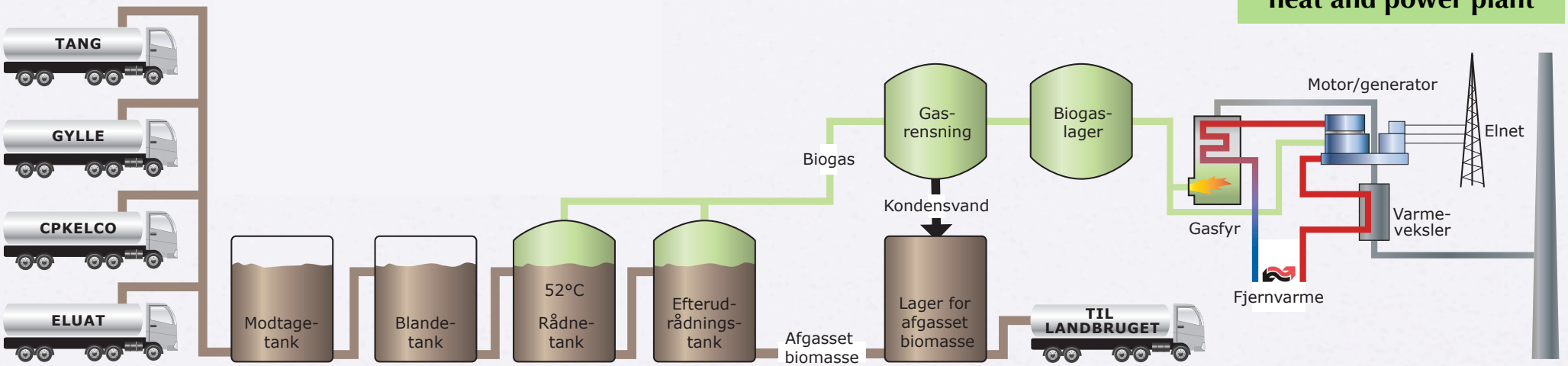


The Biogas plant

Biogas • Start November 2015 • Raw materials

Designed for 191,000 tons

Biogas used in combined heat and power plant



Biomass	Amount (tons)	Biogas	Main contribution
Manure (cattle, pig)	44,200	9.5%	Gas production and process stability
Seaweed - local beach	7,400	0.5%	Nutrients and improved water quality
CPKelco: Pectin, carrageenan	79,400	75.0%	Gas production
Chr.Hansen: Eluat *	60,000	15.0%	Gas production og nutrients
Ialt	191,000		

* Eluate from lactic acid production

Raw materials

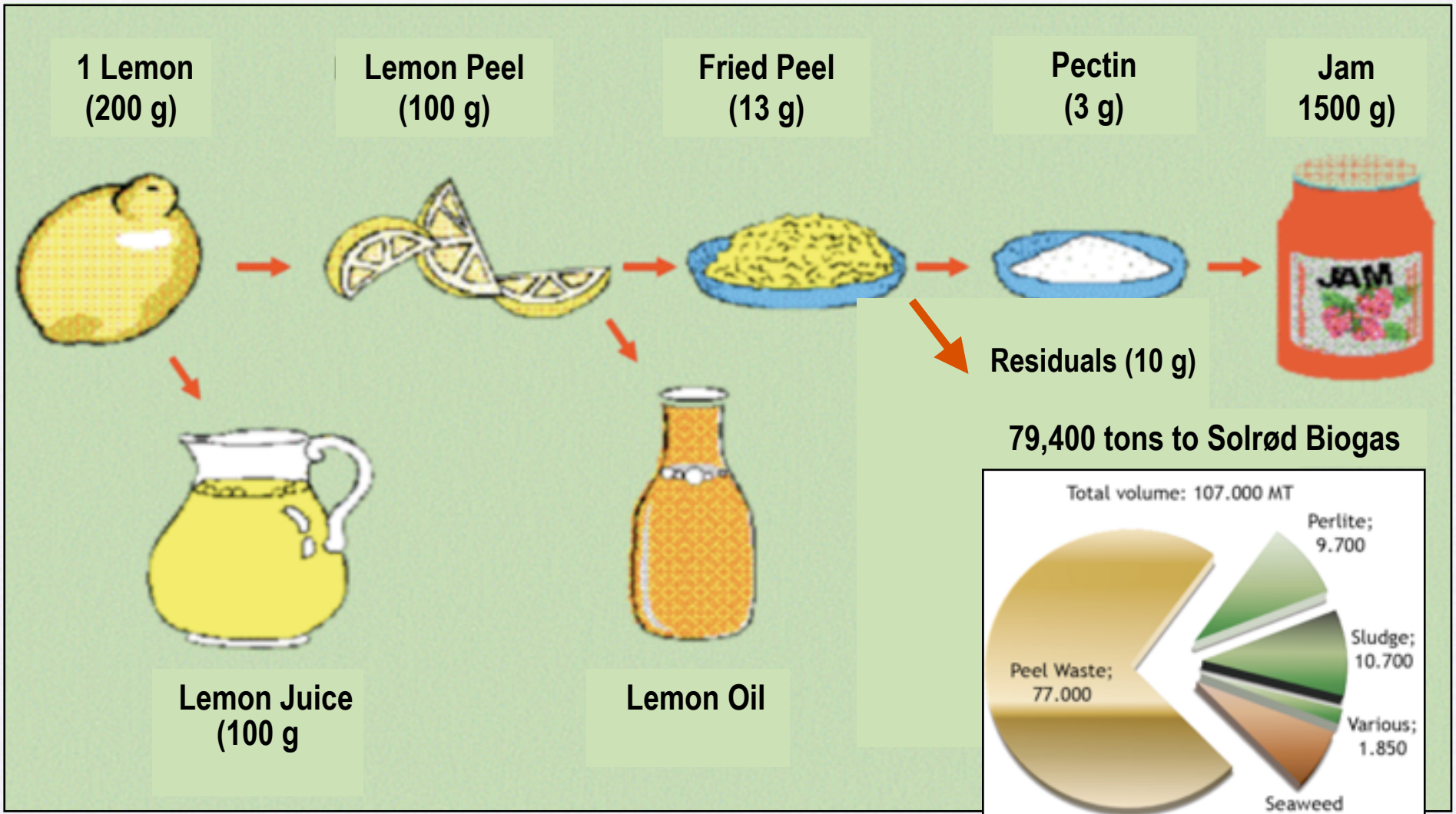
Supplies

Agricultural deliver slurry and receive degassed biomass from Solrød Biogas

CP Kelco deliver residual products of the pectin production to Solrød Biogas

Raw materials

Supply from CPKelco - around 75% of gas

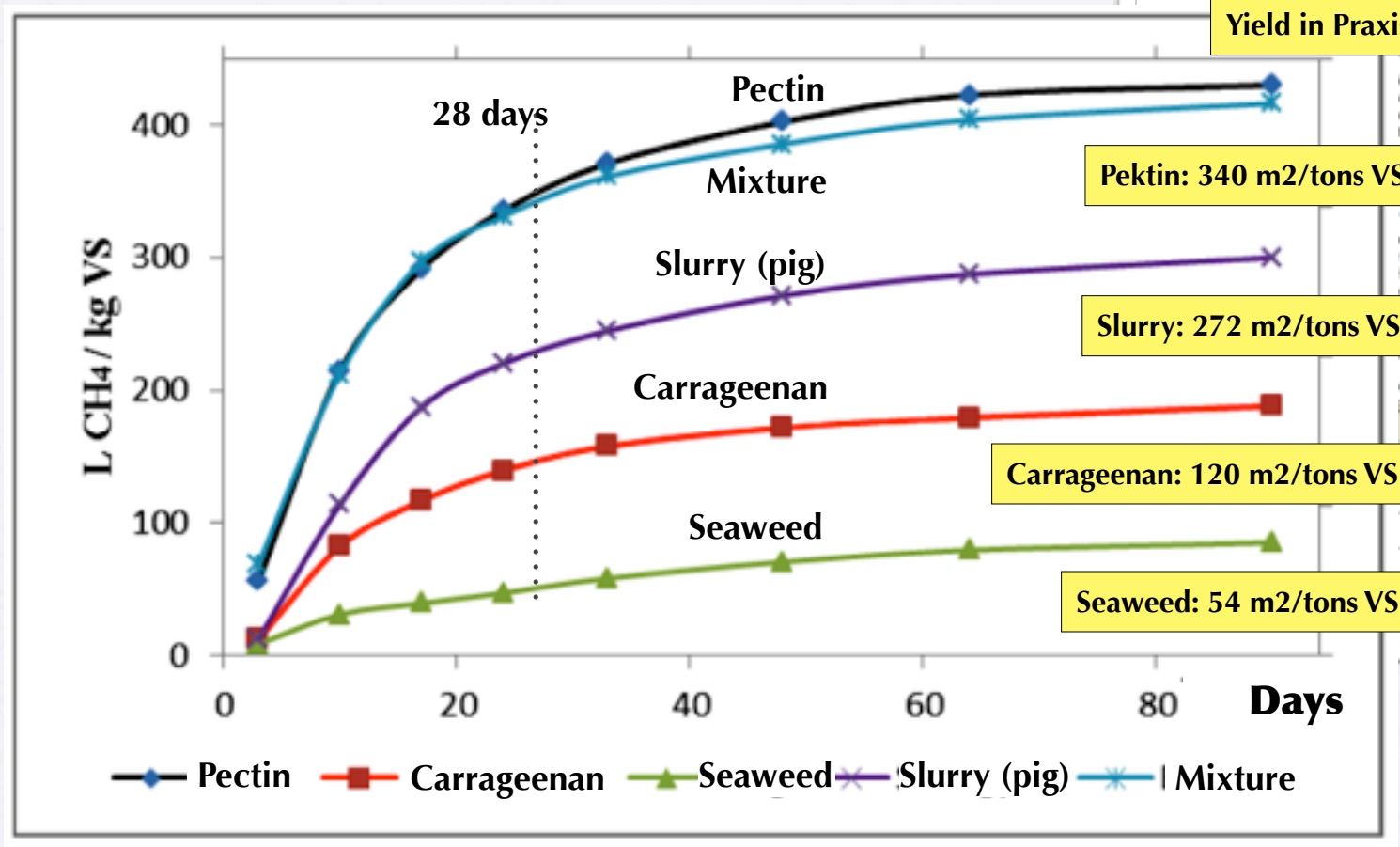


Biogas yield

Tests of raw materials

A number of tests has been initiated. Operation assumption:

- 320 m3 of methane per tons of dry matter
- 30 m3 of methane per tons of raw material
- or 1,060 m3 of biogas per hour



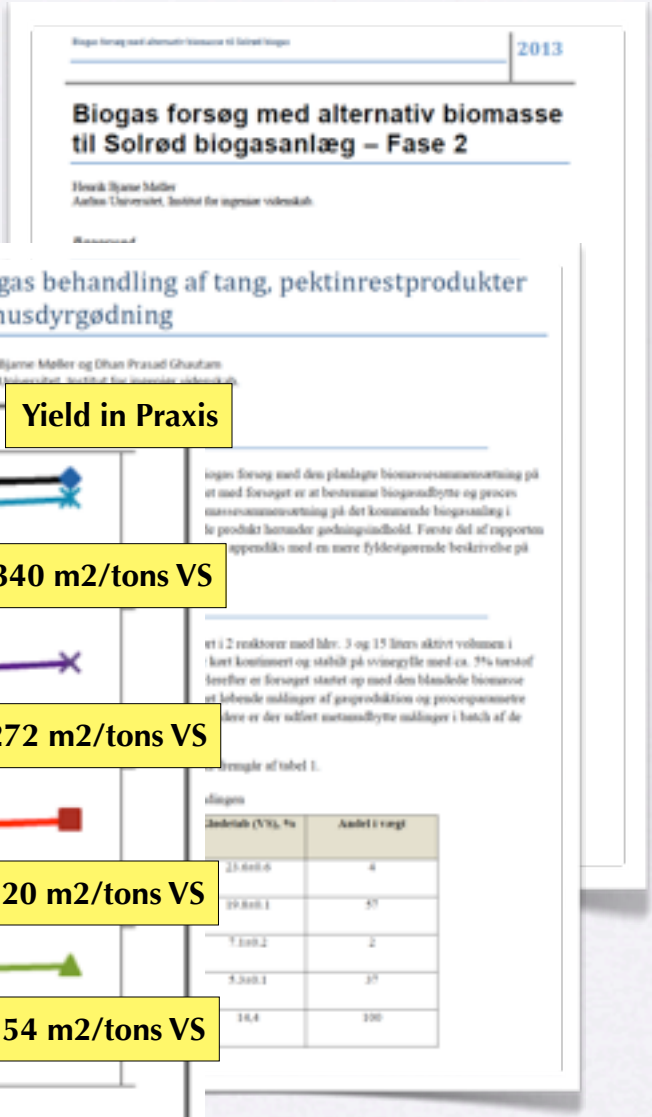
Yield in Praxis

Pektin: 340 m2/tons VS

Slurry: 272 m2/tons VS

Carrageenan: 120 m2/tons VS

Seaweed: 54 m2/tons VS



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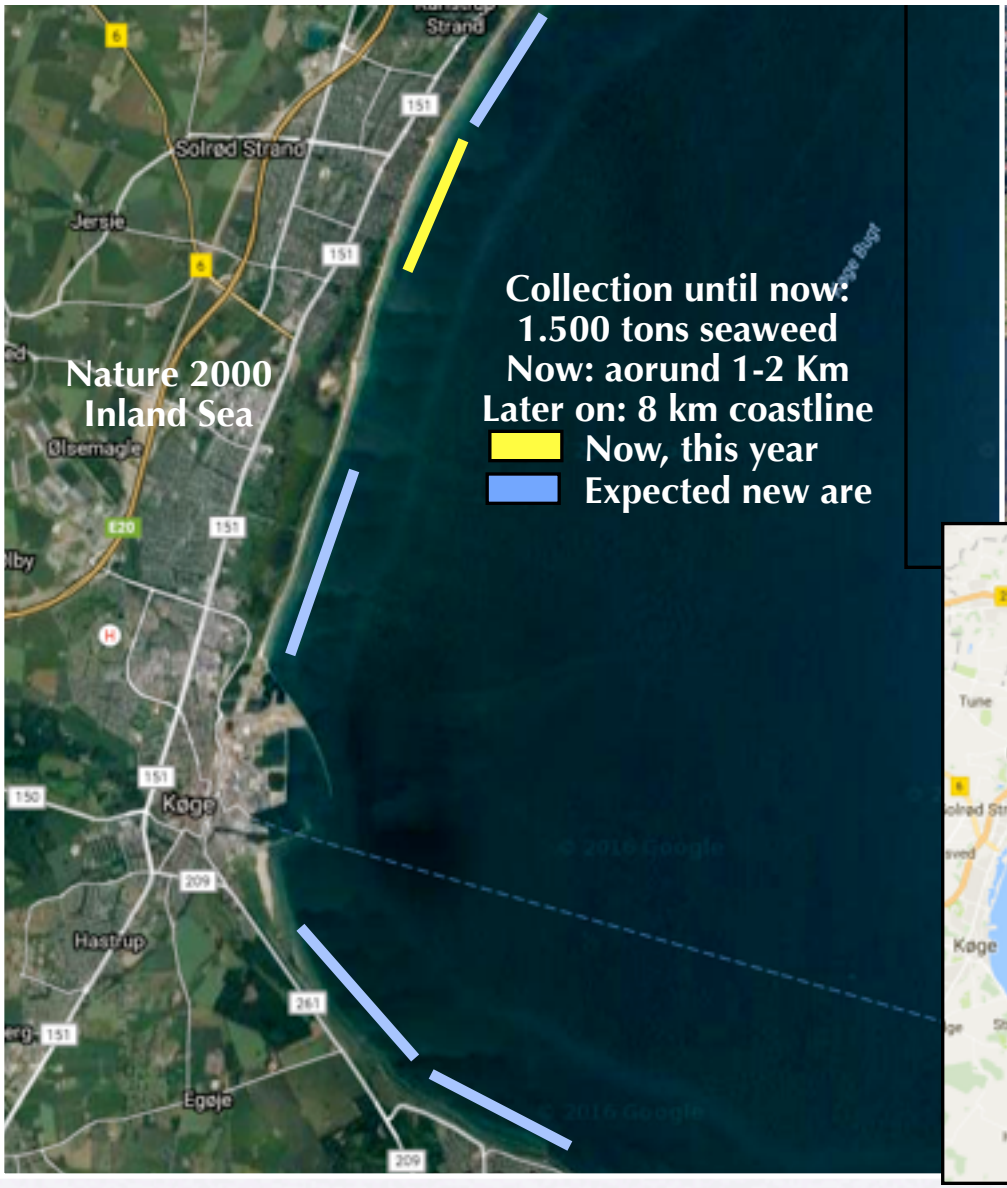
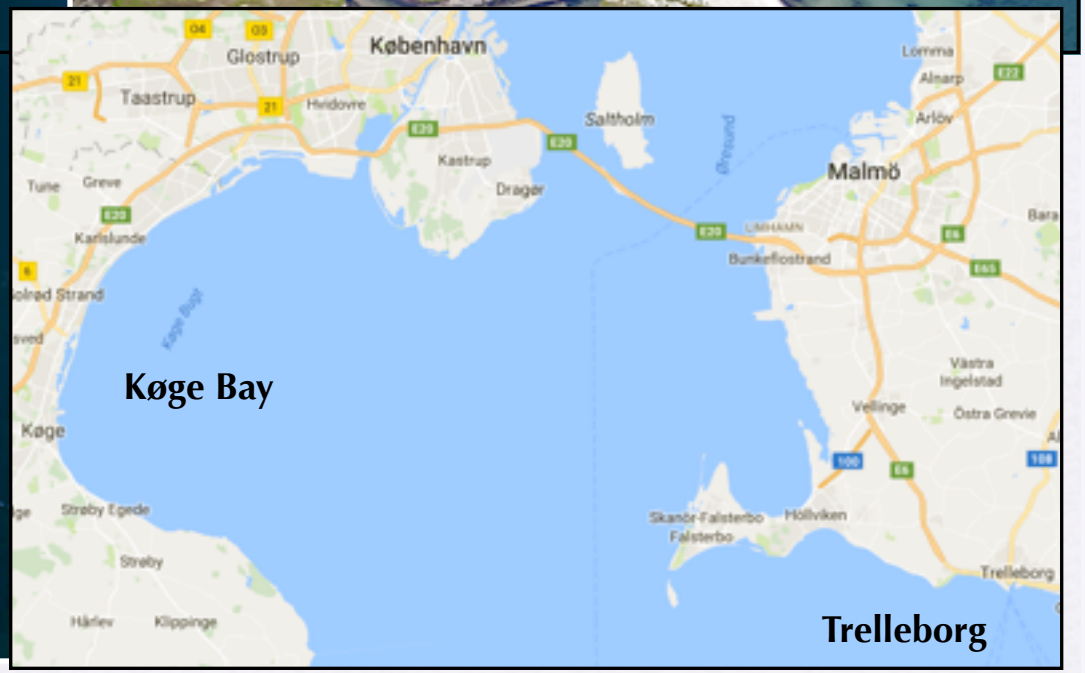
Raw materials

Seaweed - Collection area





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Collection of seaweed

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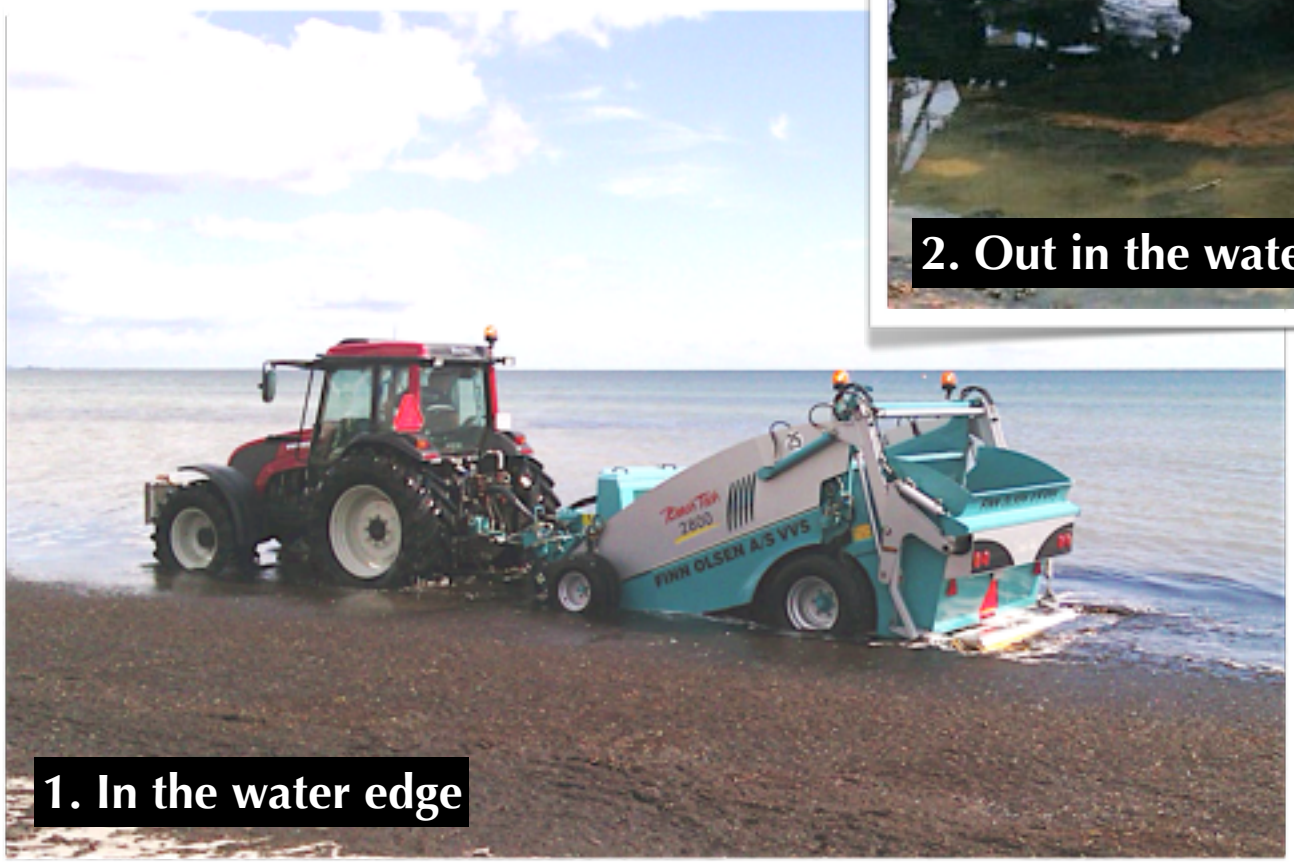
Collection of seaweed

2. Out in the water



1. In the water edge

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Collection of seaweed

Sorting facility

3. On the beach, sorted

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Collection of seaweed

Seaweed - The new methods

Supplier: Solrød Strand Beach Cleaning Laug

Delivery requirements:
Cadmium and other below limit values
No visible plastic, metal and big stone
Sand maximum of 60% of dry matter

Actual collection - Continuous collection - three steps
- Experiments with a variety of methods

Measurement

2009-2013 - mg/Kg dry matter

Parameters	Average	Limit value
Nitrogen, total	46,340	Non
Phosphor, total	732	Non
Leed (Pb)	<3.58	120
Cadmium (Cd)	0.52	0.80
Chromium	<2.40	100
Mercury (Hg)	<0.01	0.80
Nickel (Ni)	3.5	30
Zinc	38	4,000
DEHP	<0.50	50
Nonylphenol	0.64	10
PAH (sum of 9)	2.41	3
LAS	<50	1,300

First step
Seaweed on the beach is collected and thrown back to the sea (beachfront) to reduce the content of sand

Second step
The seaweed is picked up in the water with a reduced content of sand

Third step
Seaweed is transported directly to the biogas plant on a small truck

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Collection of seaweed

Three steps collection

First step

Seaweed on the beach is collected and thrown back to the sea (beachfront) to reduce the content of sand

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Collection of seaweed

Three steps collection

Second step

The seaweed is picked up in the water with a reduced content of sand

Collection of seaweed

Three steps collection

Second step

The seaweed is picked up in the water with a reduced content of sand

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Collection of seaweed

The same day - after ....

Processing seaweed

Treatment at the biogas plant

[1] Seaweed is put in a tank with very strong stirrer. [2] The stirrer separates sand and seaweed
[3] The sand is removed from the bottom of the tank. [4] Seaweed is decomposed and diluted with additional material from the biogas reactor to make it pumpable and pumped into the biogas reactor

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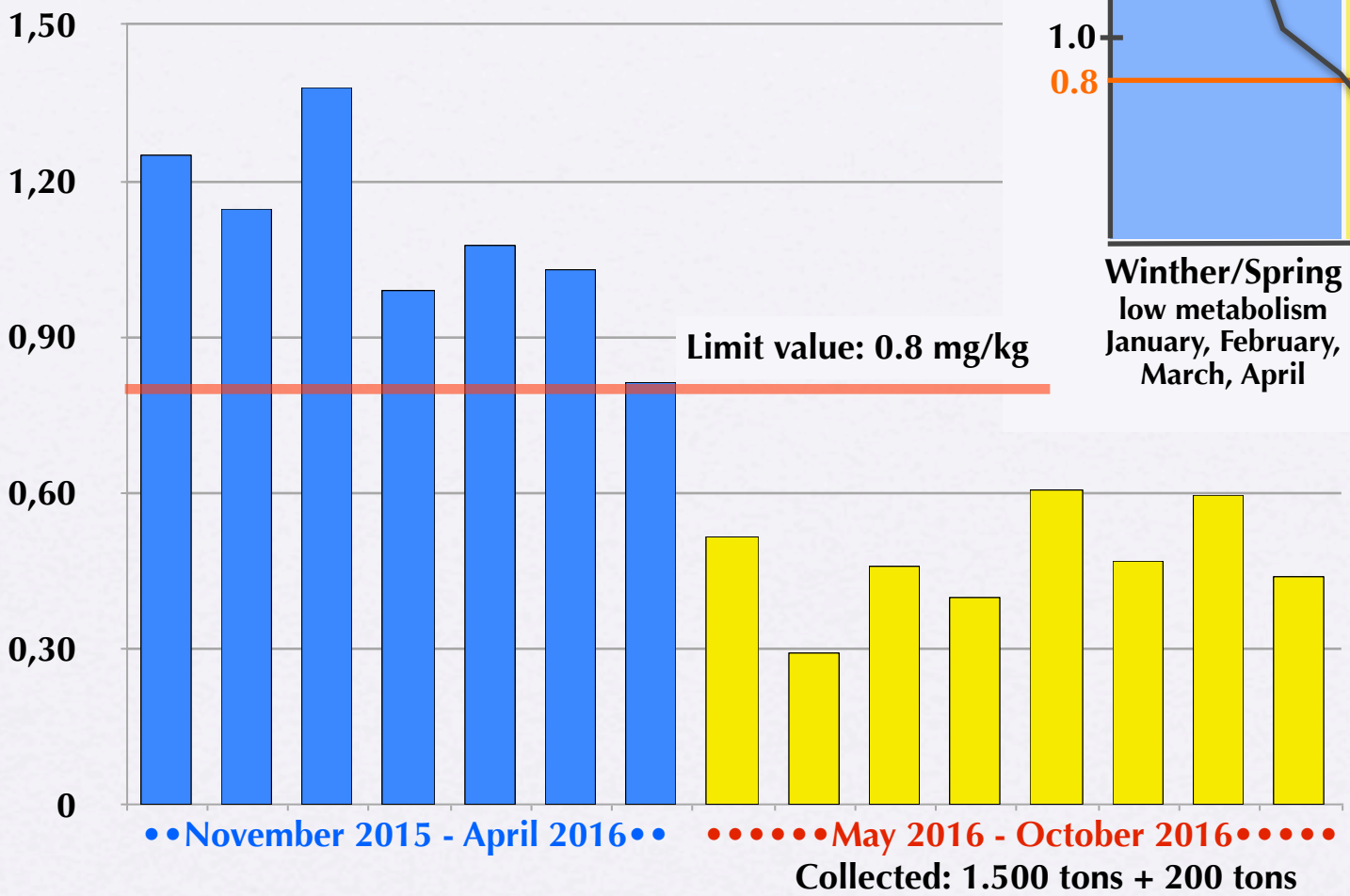
Processing seaweed

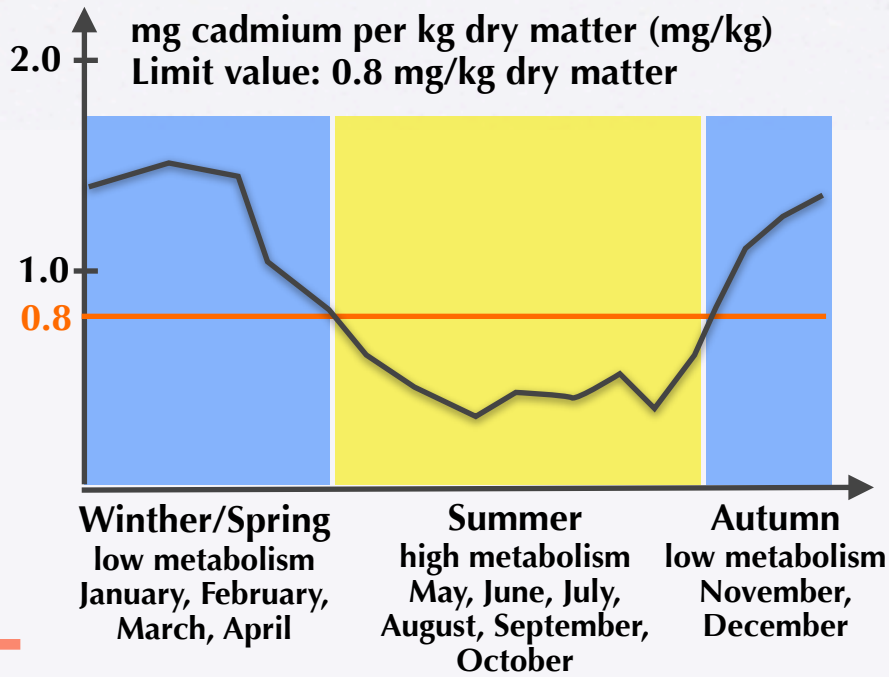
Seaweed and cadmium

Current measurements in November 2015 to October 2016 of the collected seaweed



Expected cadmium content

Study from the bay of Køge



Delivery requirements:

Solrød Strand Beach Cleaning Laug is responsible for comply with the limit values for cadmium and others components

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Turnover in the facility: 35 million kr
Economic side effects: 22-32 million kr

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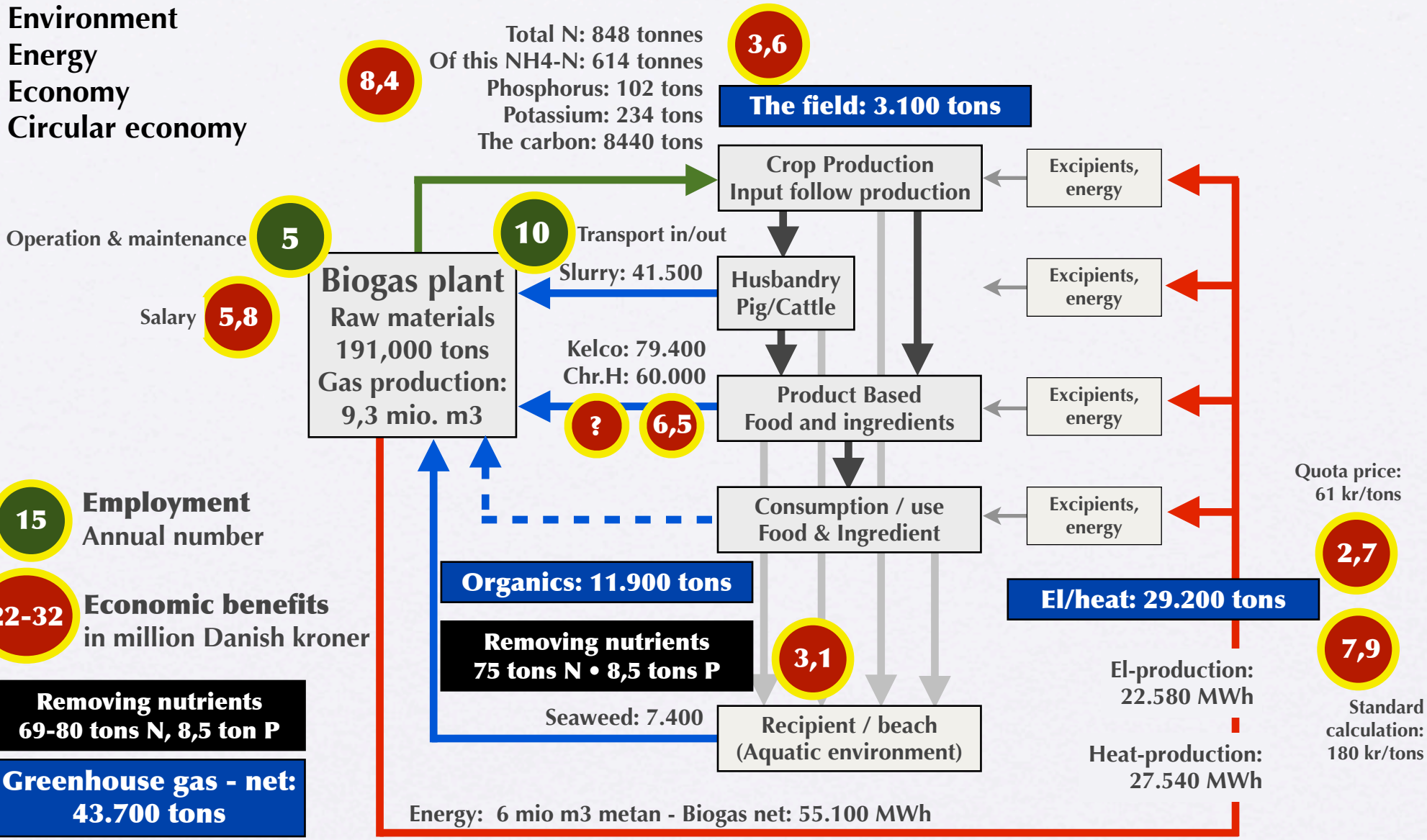
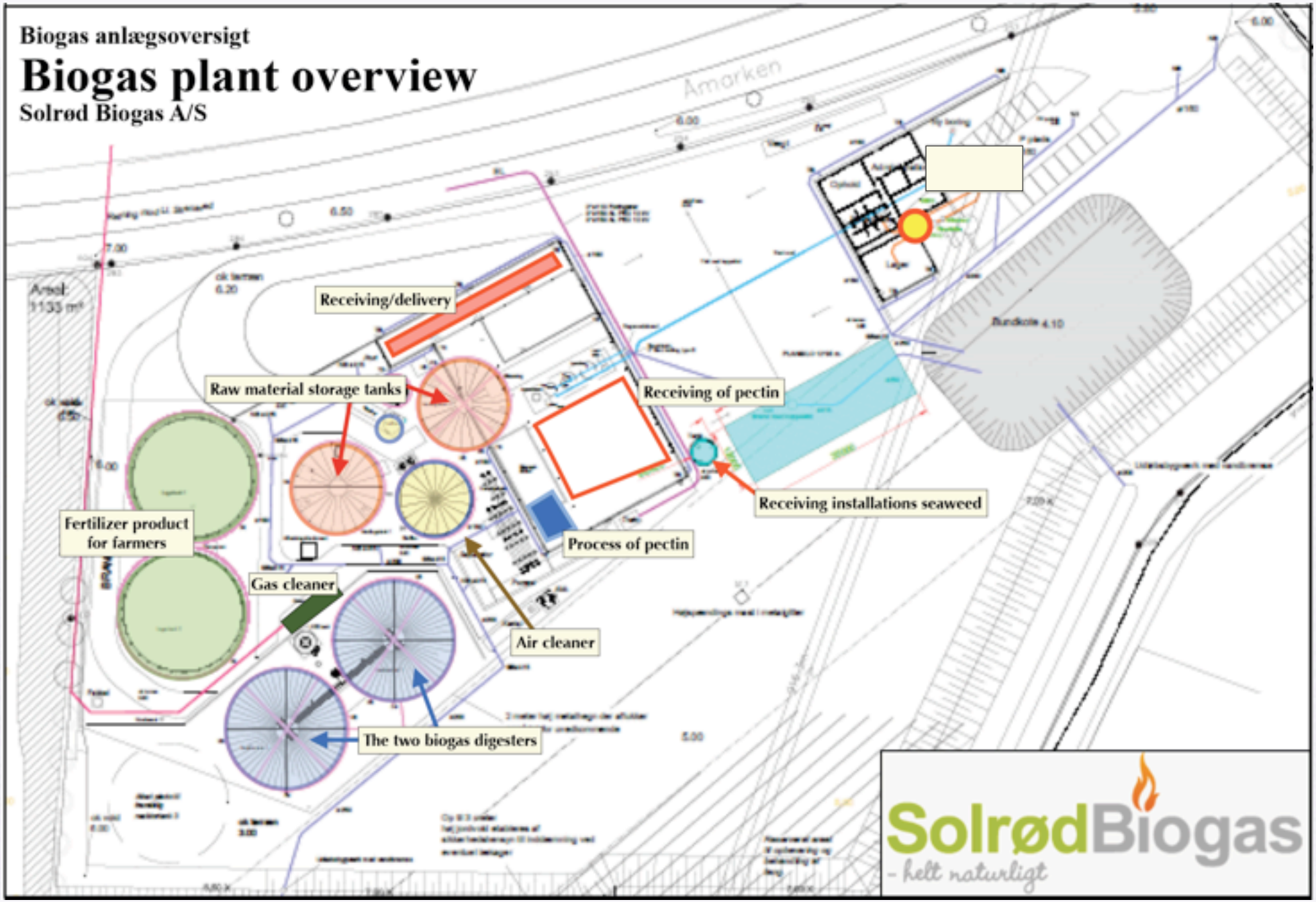
+ Environment
+ Energy
+ Economy
= Circular economy




Biogas anlægsoversigt
Biogas plant overview
Solrød Biogas A/S
Receiving/delivery
Raw material storage tanks
Receiving of pectin
Receiving installations seaweed
Fertilizer product for farmers
Process of pectin
Gas cleaner
Air cleaner
The two biogas digesters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Eelgrass
Brown algae
Fedtemøj
Thank you for your attention