

Biogas today and tomorrow

*Prof. Jörgen Ejertsson
R&D Director*

Norrköping, 6th Nov. 2018



Mission:

”Scandinavian Biogas mission is to contribute to and facilitate the transition from fossil fuel to renewable energy



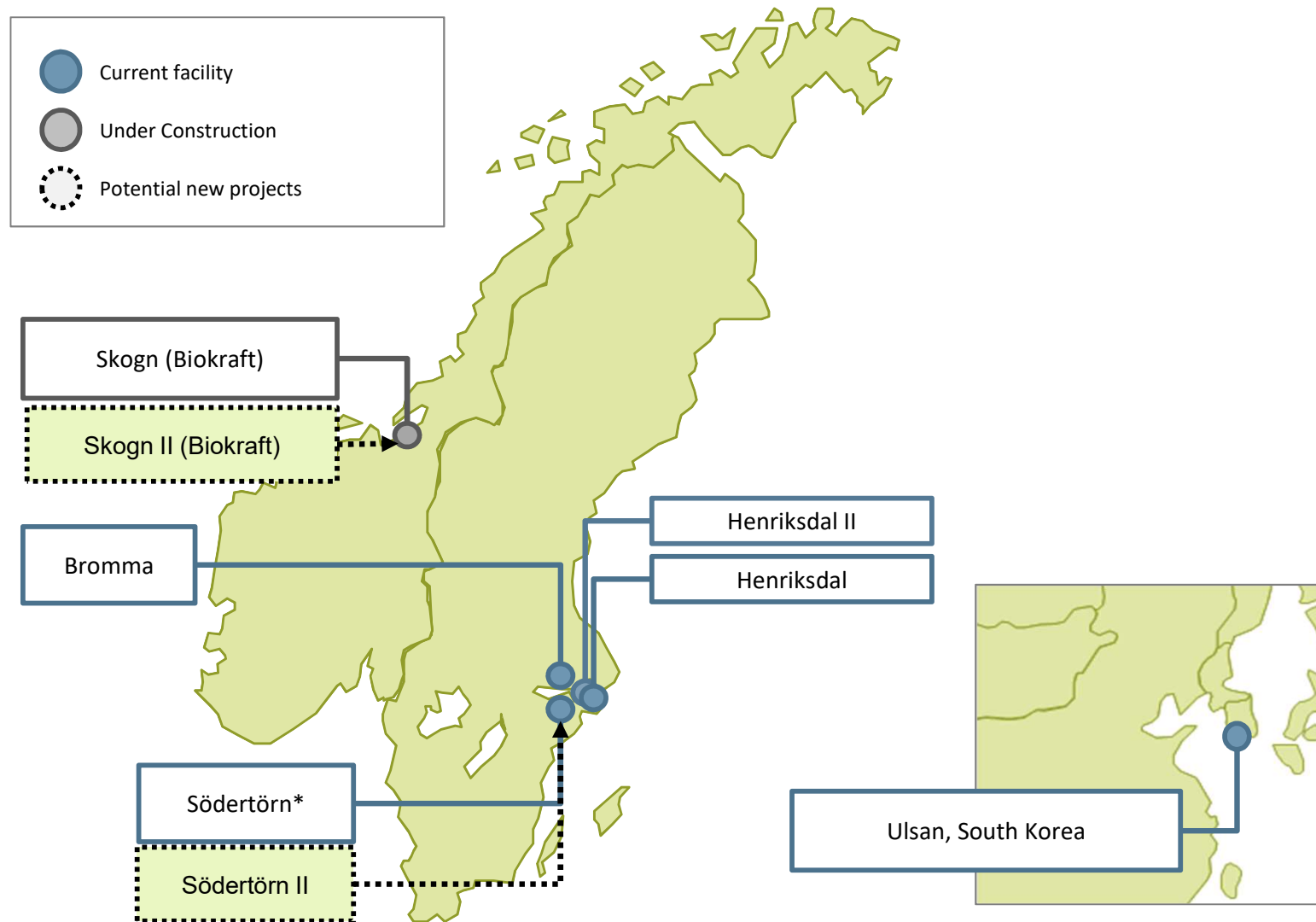
Matti Vikkula
CEO

Scandinavian Biogas - Facts

- Founded in December 2005
- Head office in Stockholm
- Research and Development unit in Linköping
- ~60 employees specialists in biogas processes and technology



Scandinavian Biogas sites: operational and planned



*The Södertörn site consists of a pre-treatment facility and a biogas facility

Scandinavian Biogas - 2017 Performance



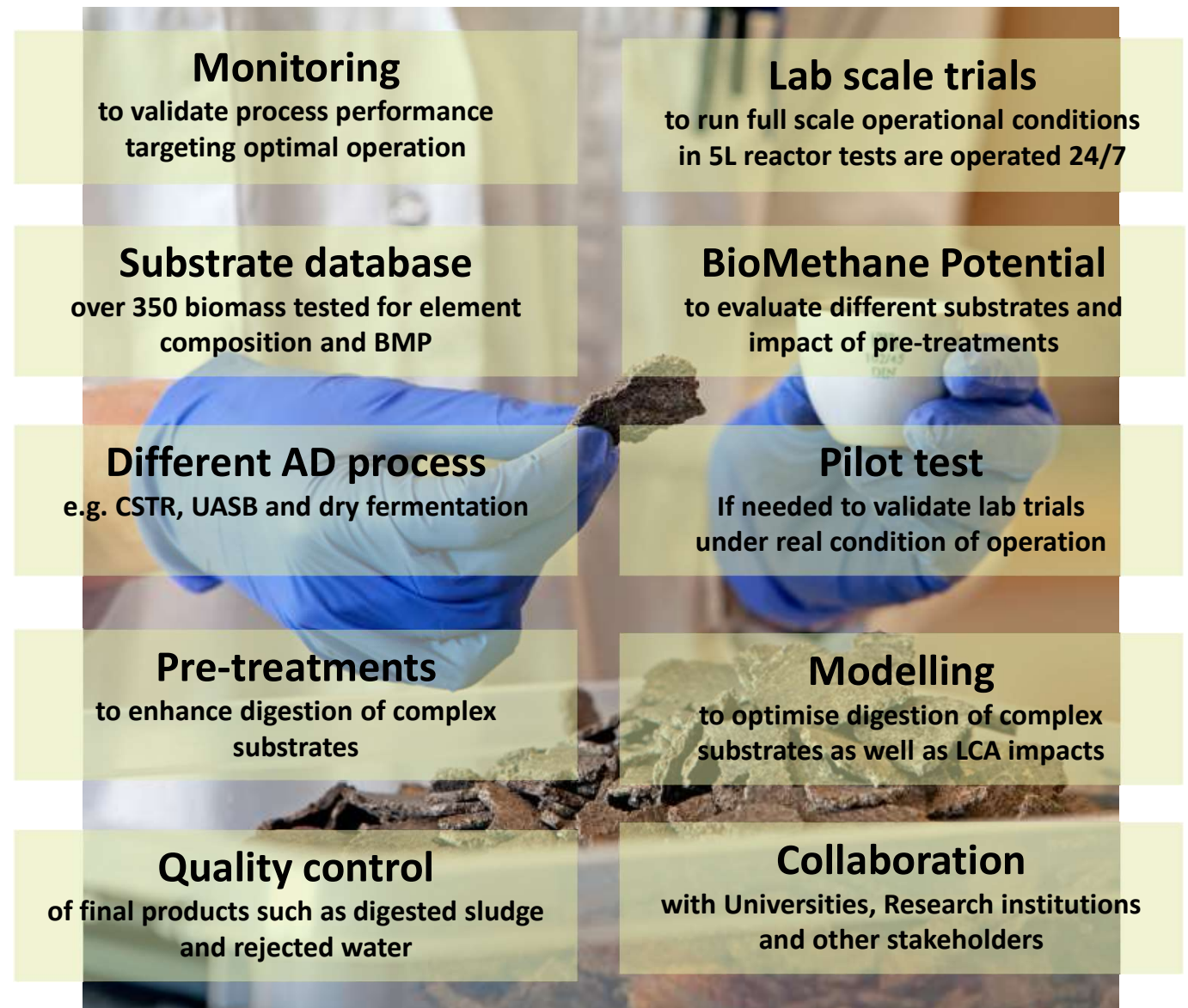
Scandinavian Biogas - Research and Development

”

To expand current understanding of the anaerobic digestion technology to secure process efficiency, flexibility and profitability.

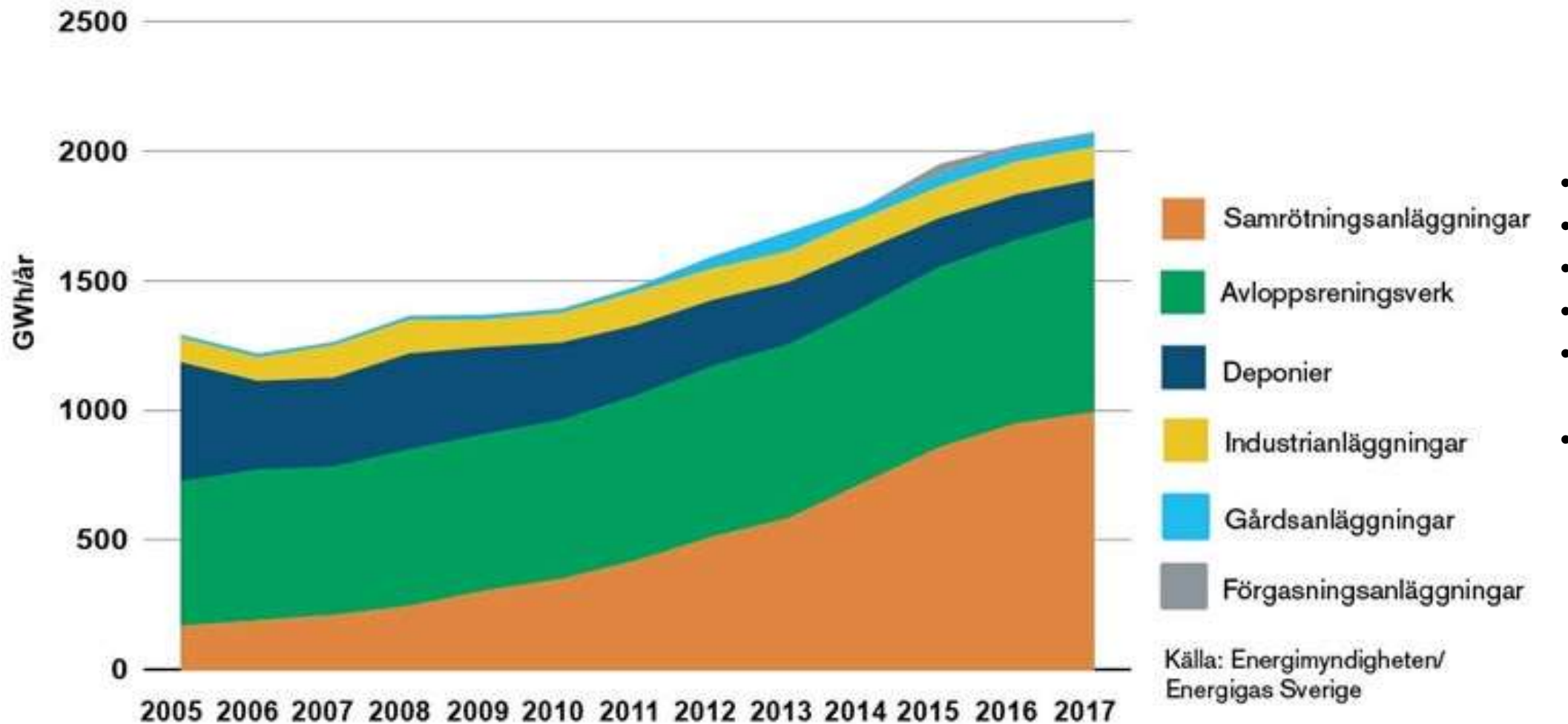
Processes are tailored at lab scale and applied to full scale production units.

Prof Jörgen Ejlerthsson
R&D Directors

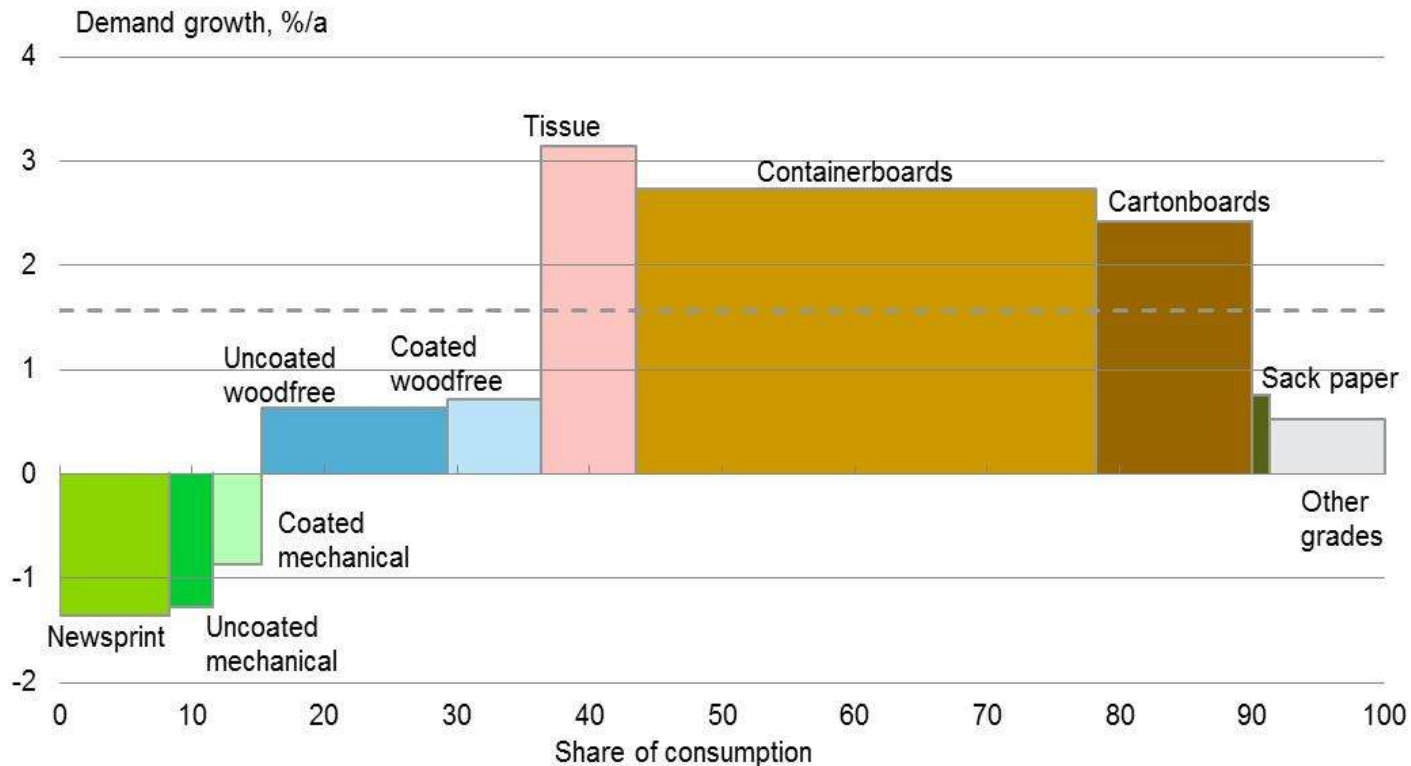


Biogas market in Sweden:

~3 TWh in 2020 and 15 TWh in 2030



The change in usage of fiber products – a possibility for biogas at PPI mills?



- Decreasing demand of printing paper leads to upshift in quality
 - Finishing
 - Bleaching
 - Coating
 - Final products
- Resulting in higher load on current WWTP - Environmental Demands

Establishing biogas production in the Swedish PPI

- Concluding remarks

- Anaerobic treatment of effluents from pulp & paper mills is an alternative to expanding aerobic wastewater treatment plants.
- Different strategies for wastewater treatment and biogas production need to be followed depending on raw material and production process at the specific mill
- The methane potential from an average mill is in the range of 10-50 GWh per year
- The total methane potential from the Swedish pulp and paper industry is in the range of 700-1 000 GWh per year.
 - 30% is originating from the mechanical pulp and paper mills.
 - 70% is originating from kraft pulp mills
- Pulp & paper mills are located outside traditionally “substrate-rich” areas
- Advantages with co-digestion on PPI sites – “industrial symbiosis”

EffiSludge: a model project for energy savings and sustainability in the pulp and paper industry

Francesco Ometto, Ph.D.
R&D Manager

Norrköping, 6th Nov. 2018



The LIFE Programme



The LIFE programme is the EU's funding instrument for the environment and climate action. Started 21st May 1992.

1 100 ongoing projects and over 4 600 projects funded projects.

€ 3.1 billion (1992-2013)

€ 3.4 billion Euro (2014-2020)

€ 5.0 billion Euro (2011-2027) – *under discussion*

**Environment
and Resource
Efficiency**

**Nature and
Biodiversity**

**Environ.
Governance
and
Information**

**Climate
Change
Mitigation**

**Climate
Change
Adaptation**



ENVIRONMENT LIFE Programme

European Commission > Environment > LIFE Programme

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Projects by theme

- [Nature, Biodiversity](#)
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Welcome to LIFE

LIFE is the EU's financial instrument supporting environmental, nature conservation and climate action projects throughout the EU. Since 1992, LIFE has co-financed more than 4500 projects. For the 2014-2020 funding period, LIFE will contribute approximately €3.4 billion to the protection of the environment and climate.

[Read more >>](#)

LIFE Regulation 2014-2020

[Read more >>](#)

Highlights

The Commission is proposing to increase funding by almost 60% for LIFE



*This project has been funded with support
from the European Commission.
Project number: LIFE14 CCM/SE/000221*

A cooperation between



Norske Skog Skogn



Norske Skog

The Problem



Industrial production of everyday goods such as paper, food, and chemicals generates **wastewater** that has to be treated to protect our environment.

The Problem

Treating wastewater comes at high costs for the industry
in terms of



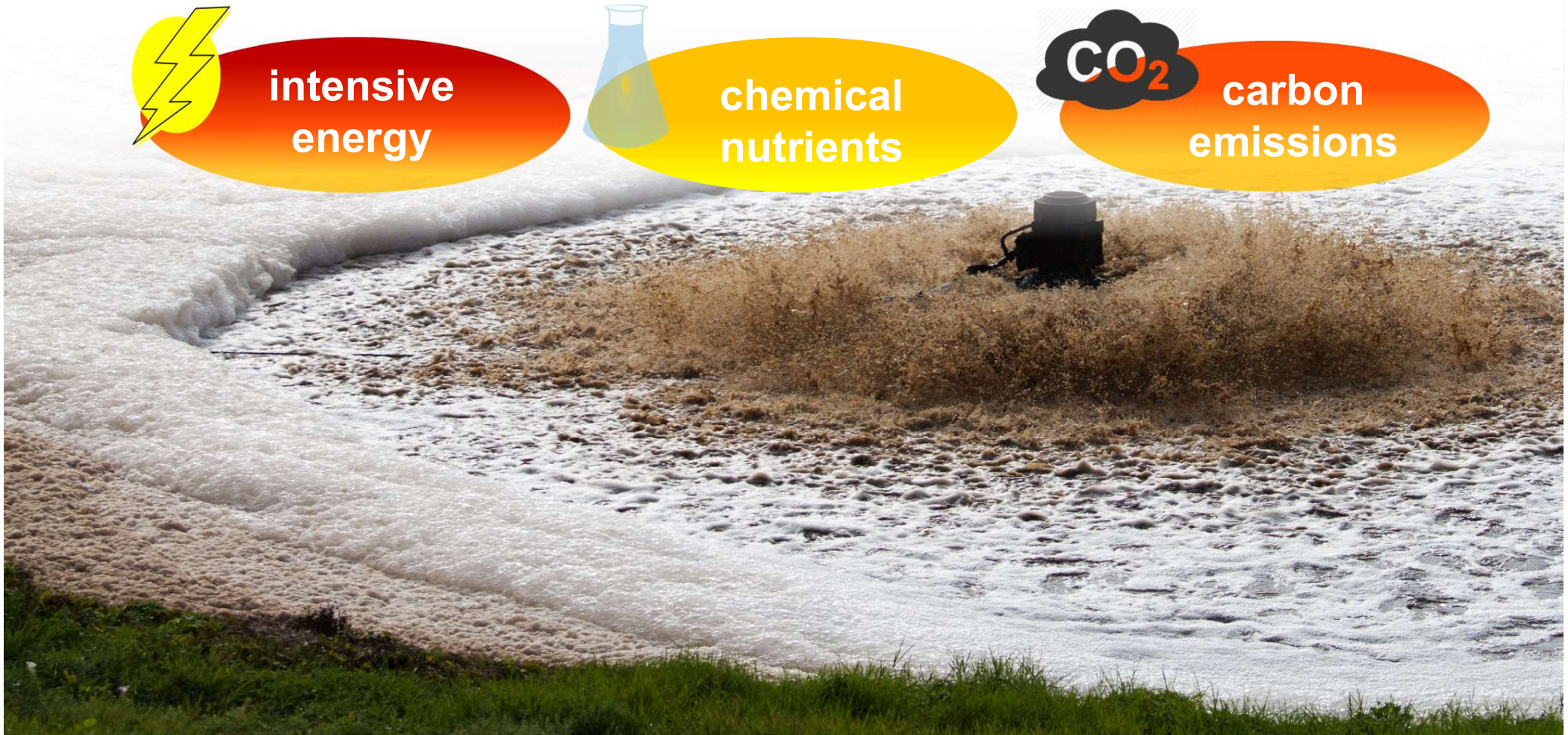
**intensive
energy**



**chemical
nutrients**



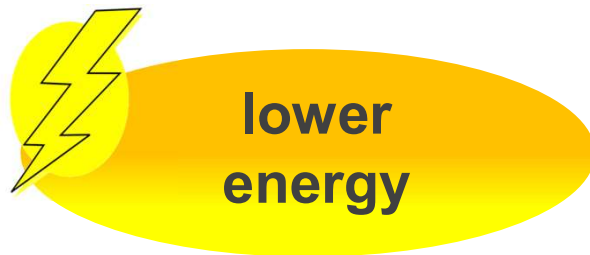
**carbon
emissions**



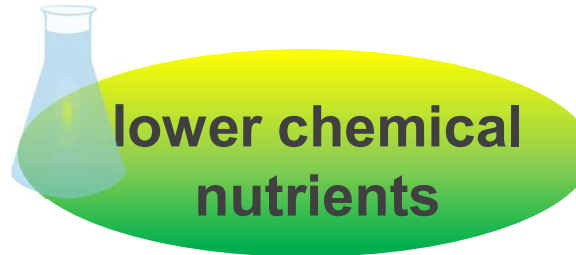
The solution



Sustainable Industrial Wastewater Treatment



innovative operations
+
onsite BIOGAS from
waste products

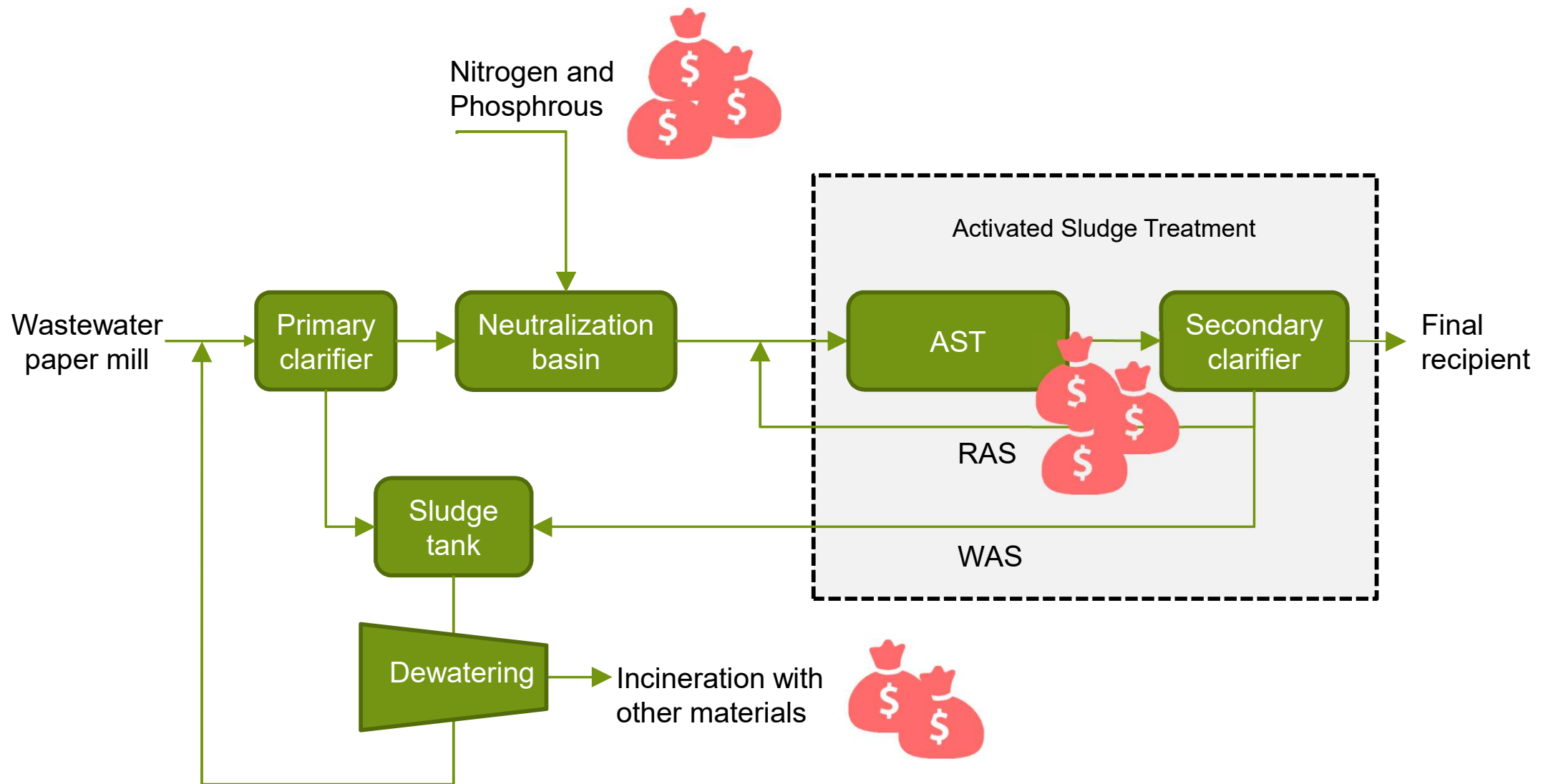


nutrients recovery
and
reuse



renewable fuels
+
lower energy/chemicals

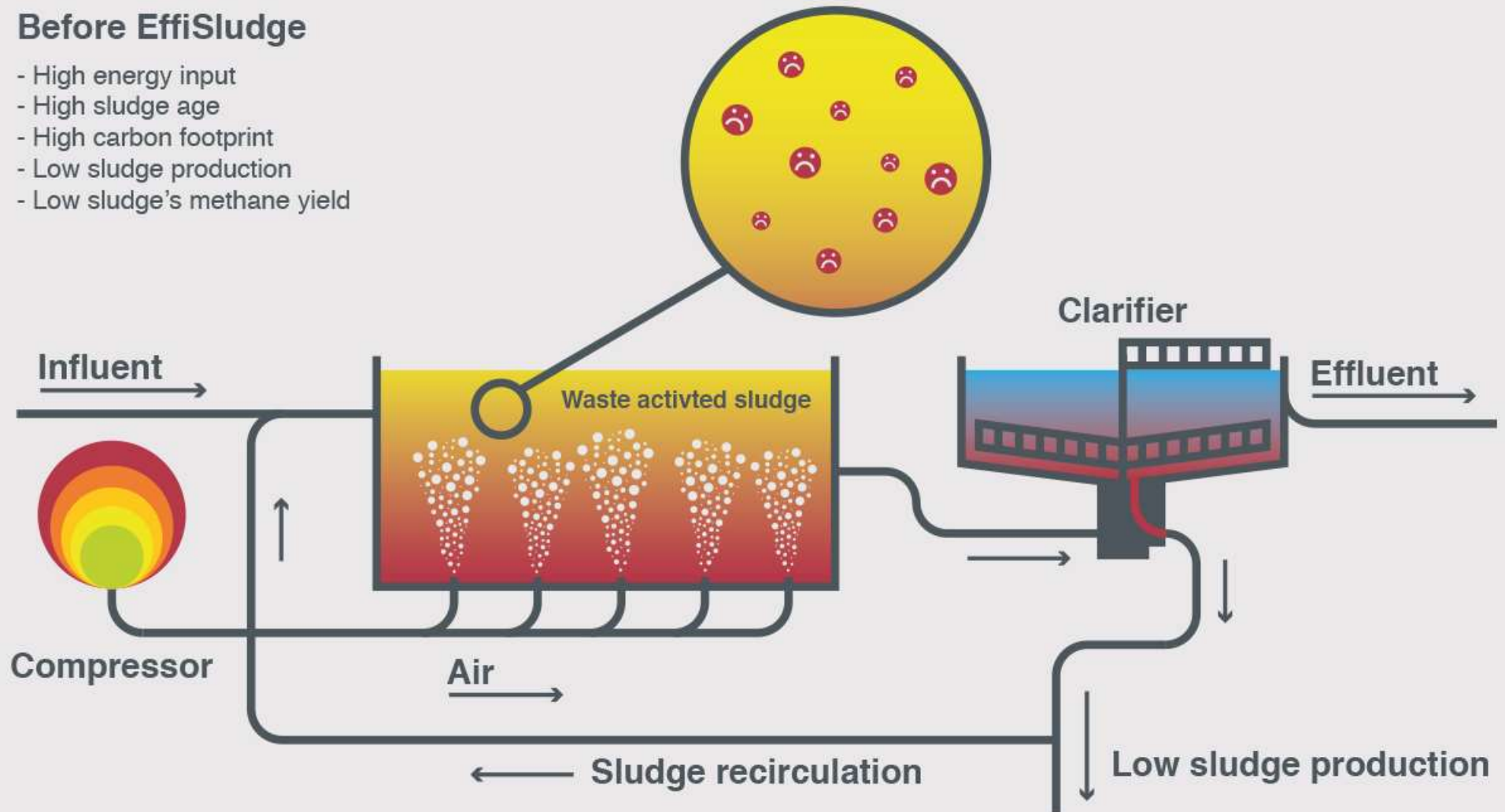
Mill's WWT – Today



Mill's WWT – Today Activated Sludge Treatment

Before EffiSludge

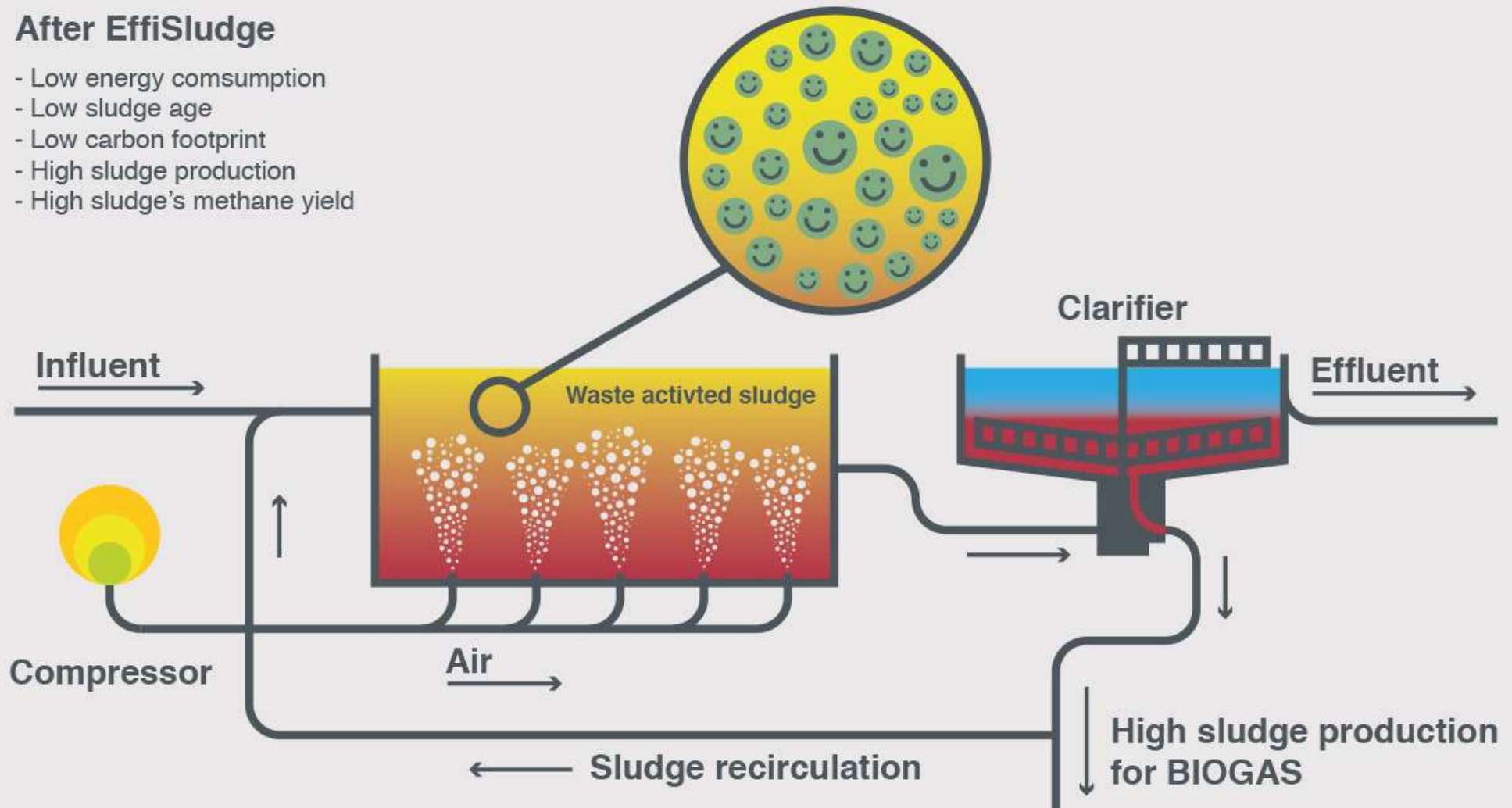
- High energy input
- High sludge age
- High carbon footprint
- Low sludge production
- Low sludge's methane yield



Mill's WWT – EffiSludge Activated Sludge Treatment

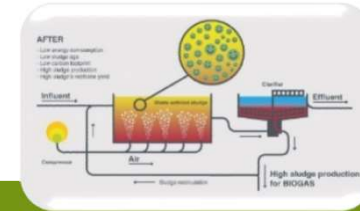
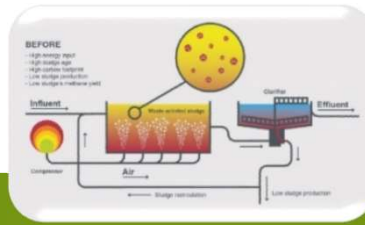
After EffiSludge

- Low energy consumption
- Low sludge age
- Low carbon footprint
- High sludge production
- High sludge's methane yield

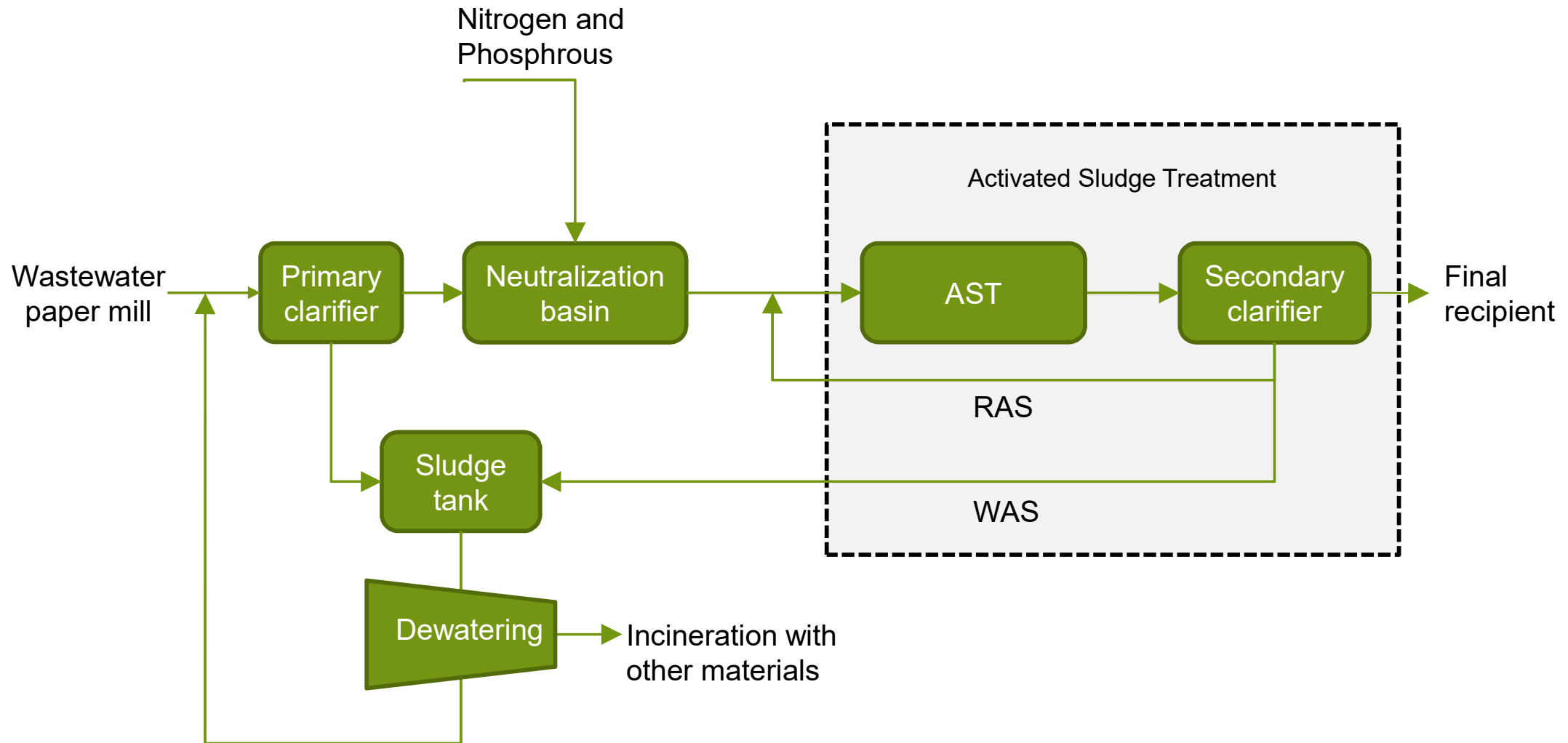


Mill's WWT – EffiSludge (target parameters)

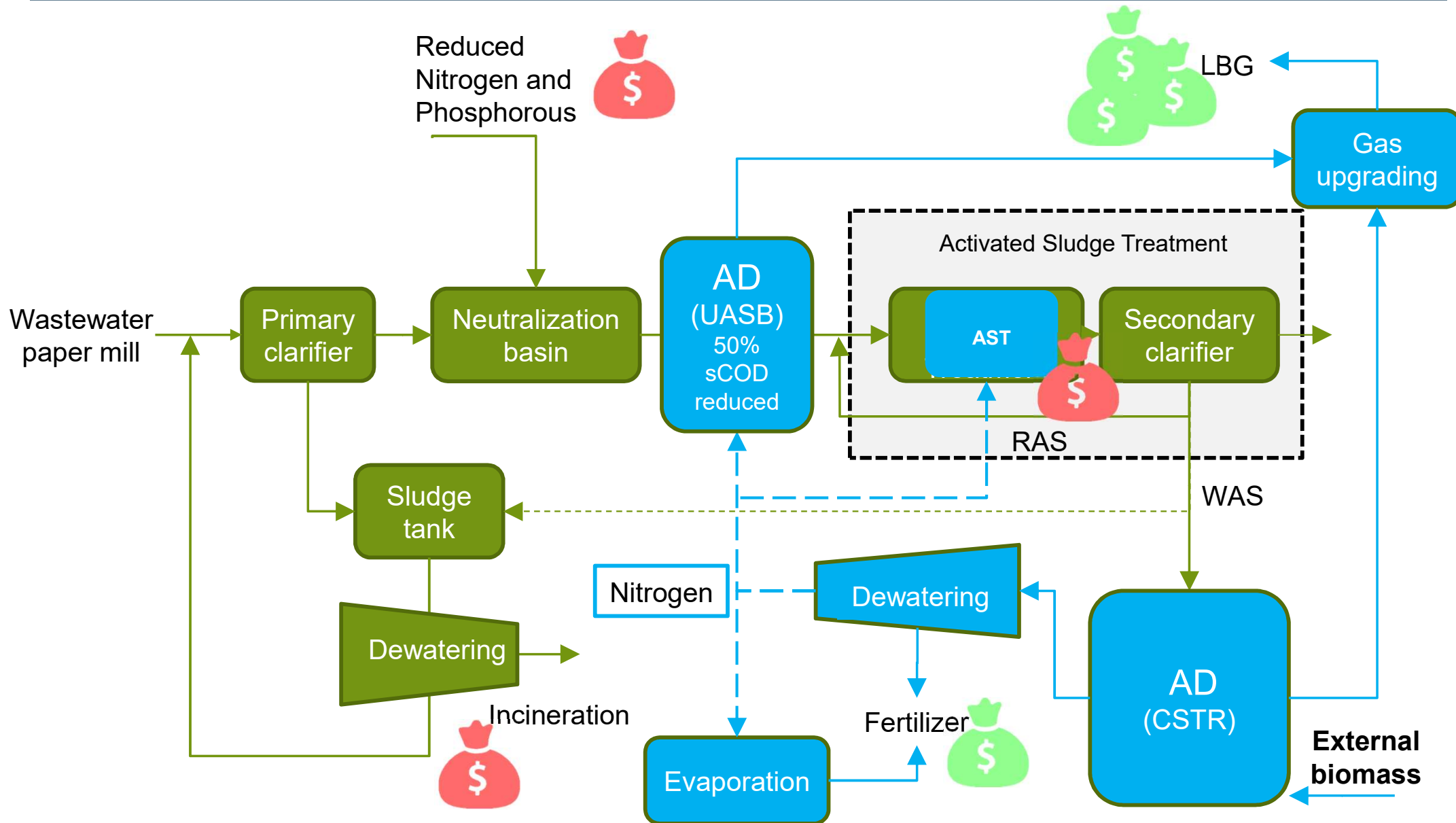
PARAMETERS	TODAY VALUES	EffiSludge TARGET VALUES
Sludge age (d)	10-12	4-6
Energy demand (MWh/d)	46	28
WAS production (kg SS/kgCODred)	0.25-0.30	0.35-0.45
BMP value (Nm ³ /ton VS)	90-100	130-150
Nutrient recirculation	NO (external addition)	YES (from AD rejected water)

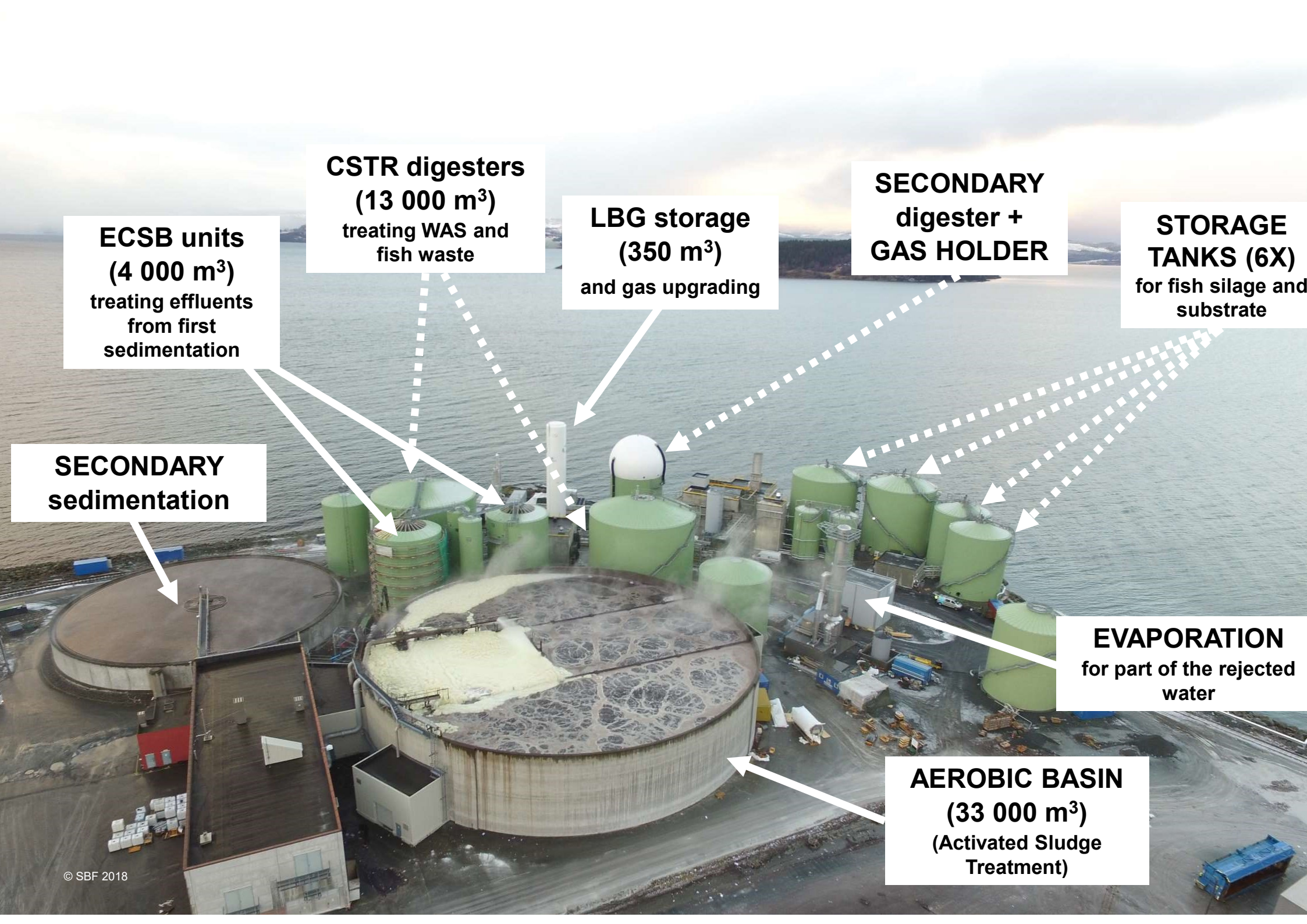


Mill's WWTP – Today



Mill's WWT – EffiSludge





**ECSB units
(4 000 m³)**
treating effluents
from first
sedimentation

**CSTR digesters
(13 000 m³)**
treating WAS and
fish waste

**LBG storage
(350 m³)**
and gas upgrading

**SECONDARY
digester +
GAS HOLDER**

**STORAGE
TANKS (6X)**
for fish silage and
substrate

**SECONDARY
sedimentation**

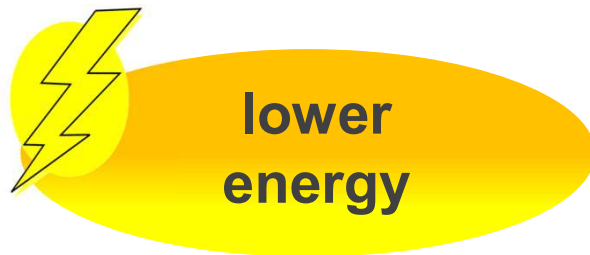
EVAPORATION
for part of the rejected
water

**AEROBIC BASIN
(33 000 m³)**
(Activated Sludge
Treatment)

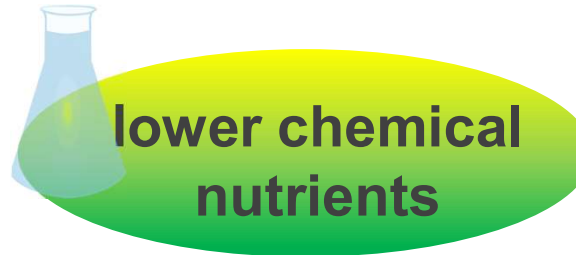
The solution



Sustainable Industrial Wastewater Treatment



innovative operations
+
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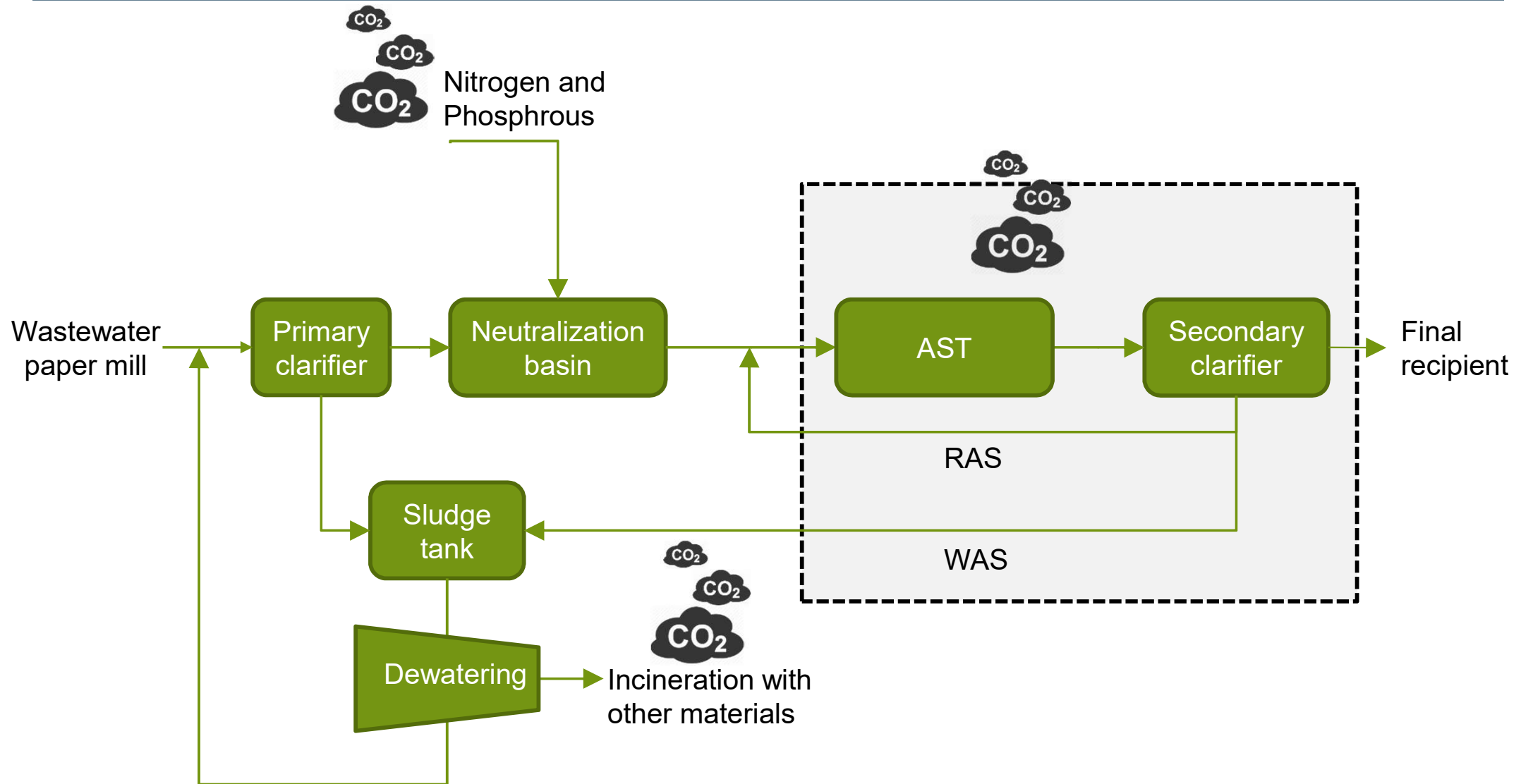


nutrients recovery
and
reuse

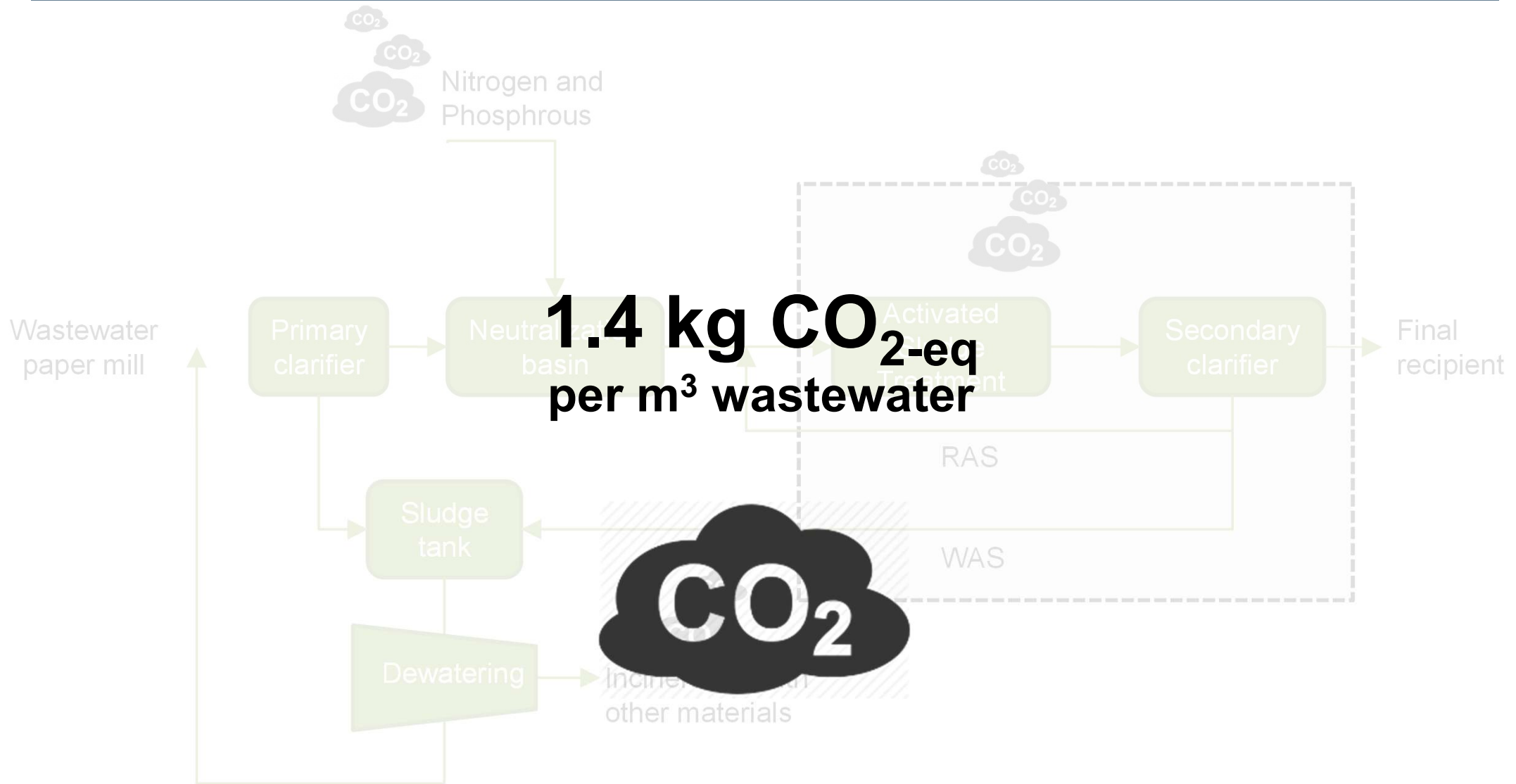


renewable fuels
+
lower energy/chemicals

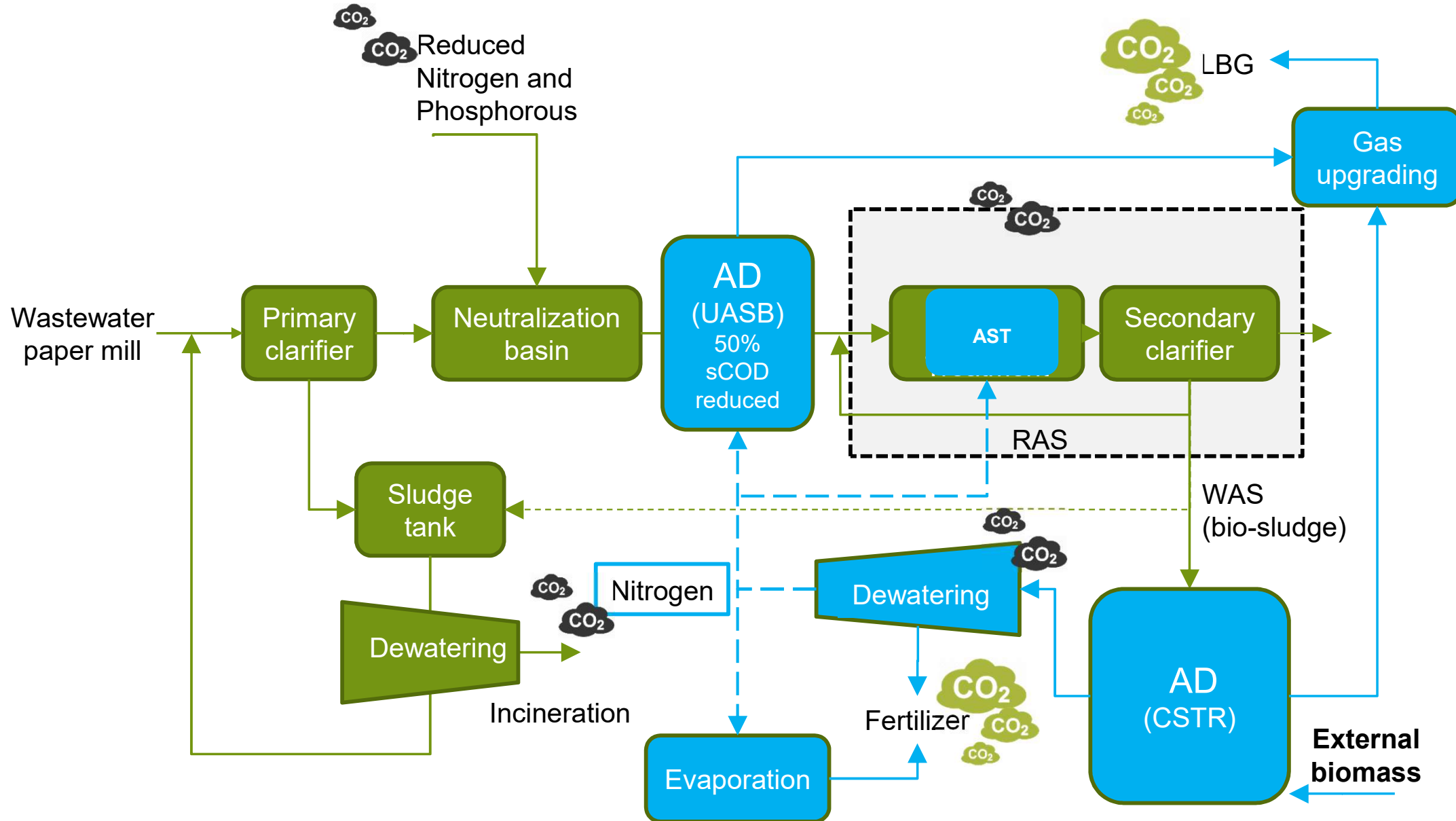
Mill's WWTP – Today (carbon footprint)



Mill's WWTP – Today (carbon footprint)



Mill's WWTP – EffiSludge (carbon footprint)



0.9 kg CO₂-eq per m³ wastewater*

The diagram illustrates the CO₂ management in a wastewater treatment plant. Key components and flows include:

- Inputs:** Wastewater from a paper mill, CO₂ from a gasifier, and Reduced Nitrogen and Phosphorous.
- Primary Treatment:** Wastewater flows through a Primary clarifier to a Sludge tank, then to a Dewatering unit. The Sludge tank also receives CO₂ from the gasifier.
- Neutralization and Anaerobic Digestion (AD):** Wastewater from the Primary clarifier goes to a Neutralization basin, then to an AD (CSTR) unit. The AD (CSTR) unit also receives CO₂ from the gasifier and produces biogas (LBG).
- Secondary Treatment:** Wastewater from the AD (CSTR) goes to a Secondary clarifier, which produces RAS (Return Activated Sludge) and WAS (Waste Activated Sludge).
- Sludge Management:** WAS is sent to a Dewatering unit, which produces Fertilizer and CO₂. Fertilizer is then sent to an Evaporation unit, which produces CO₂ and a final product.
- CO₂ Recovery:** CO₂ is recovered from the Dewatering unit and sent to a Gas upgrading unit, which produces LBG.

*estimated value to be validated during 2019.

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Mill's WWTP – Carbon saving



14 000 000



500 g CO₂-eq
per m³ wastewater



160 000

A saving of ~ 3.5 million kg CO₂/year



500 000



Thanks for the attention!

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