Moving towards sustainable wastewater treatment

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Cambridge
http://www.cir-strategy.com/events/water

VEOLIA WATER
Solutions & Technologies

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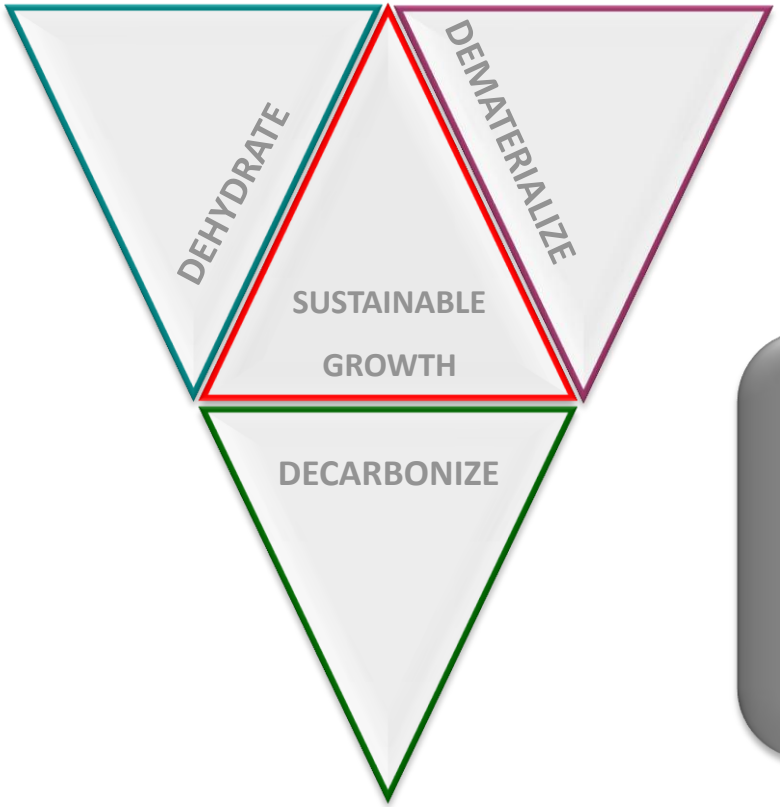
Introduction

Veolia Environement …Vision

" our collective ambition is to make ***Veolia the benchmark for sustainable growth"***

Antoine FREROT - CEO



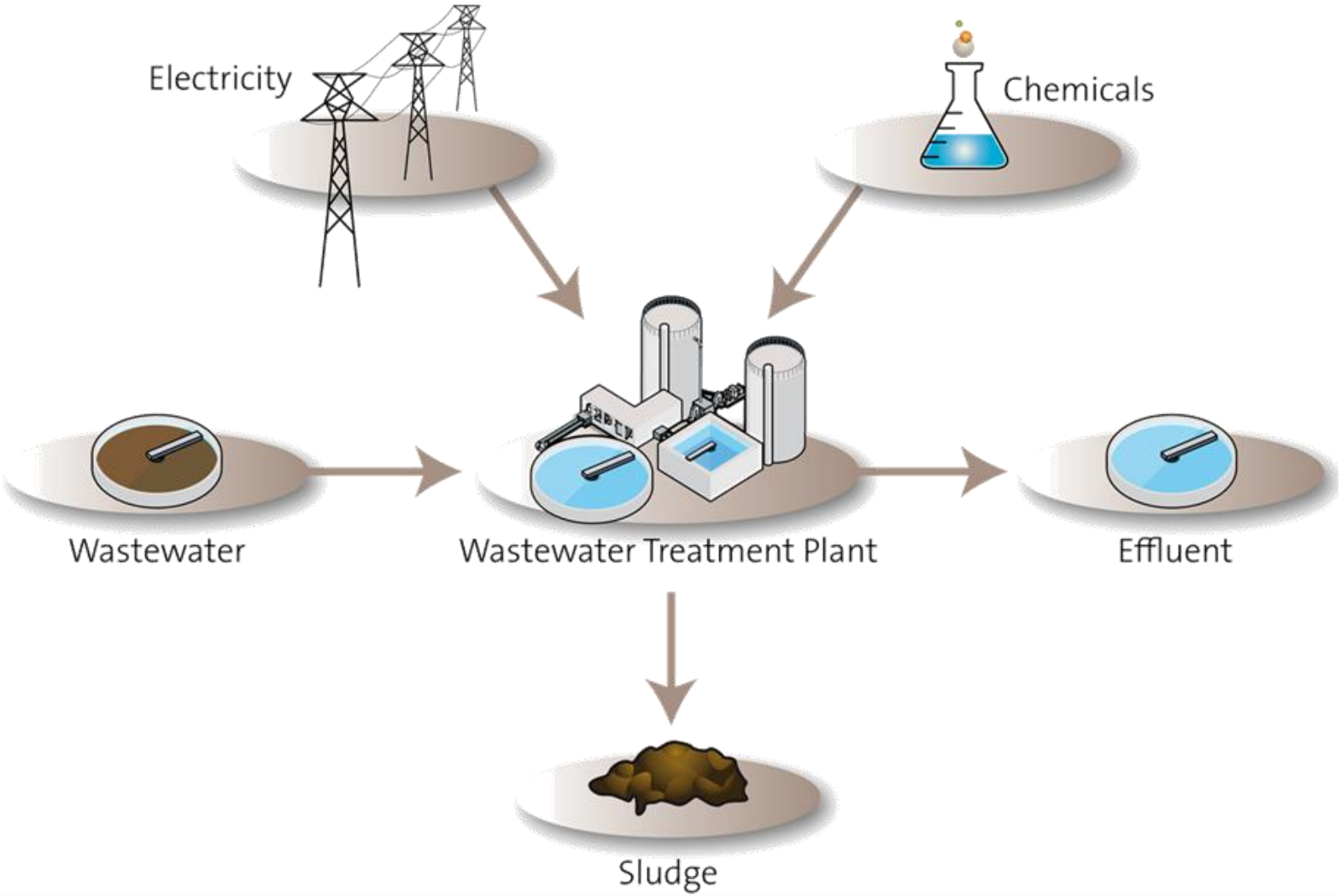
"Sustainable growth is that which meets the needs of the present without compromising the needs of the future"

Commitment …

R & D budget of 150 million euro
3 research centres
800 experts
200 international partners

- Treating wastewater for tomorrow
- Biopolymers from sludge
- Advances in biotechnology and microbiology
- Optimising efficiency
- Life cycle assessment
- Composting biodegradable wastes
- Waste sorting & recycling
- CO_2 capture storage and recovery ……

A traditional WWTP …



The challenge…

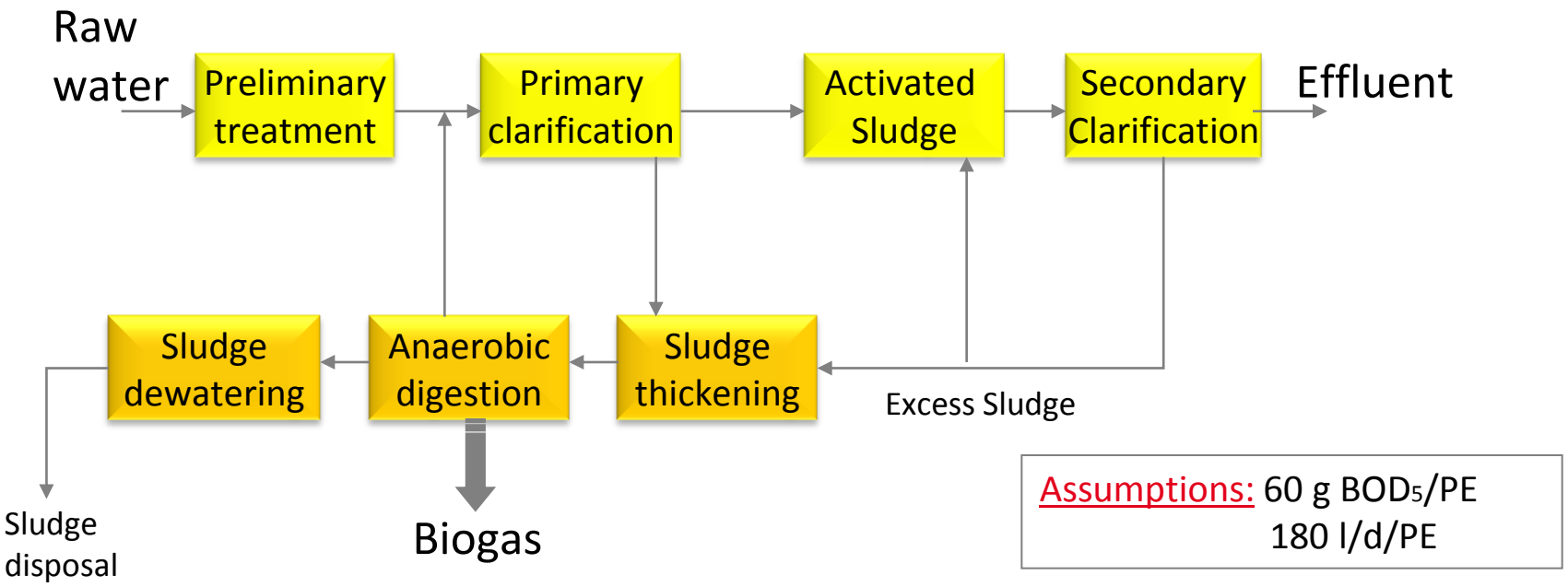
The challenge:- squeezing every last drop of benefit from our WWTP's by :-

Reducing energy use

Producing more energy

Recovering resources

Typical WWTP « for Carbon removal »

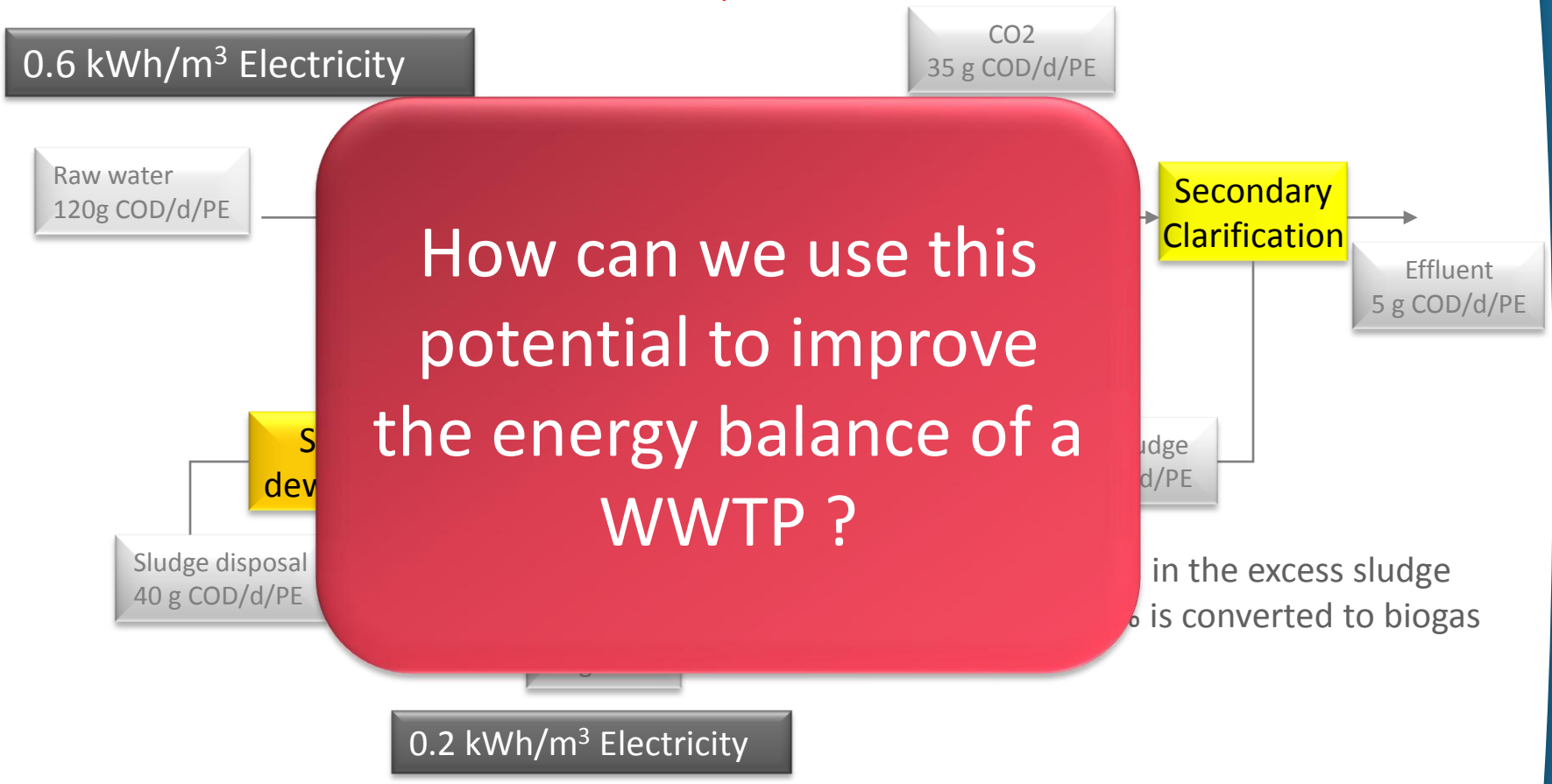


Average electricity consumption:

- 0.3 – 0.4 kWh/m^3 or 0,06 kWh/d.pe
- WWTP energy self-sufficient approx.: 50-70%

Carbon Mass Balance of a WWTP

1/3 from the inlet C is consumed in the water line



Existing Potential for x2 electricity needs for the WWTP with only *half (0.2 kWh/m³.d) of the energy potential from Sludge (0.4 kWh/m³.d) being used*

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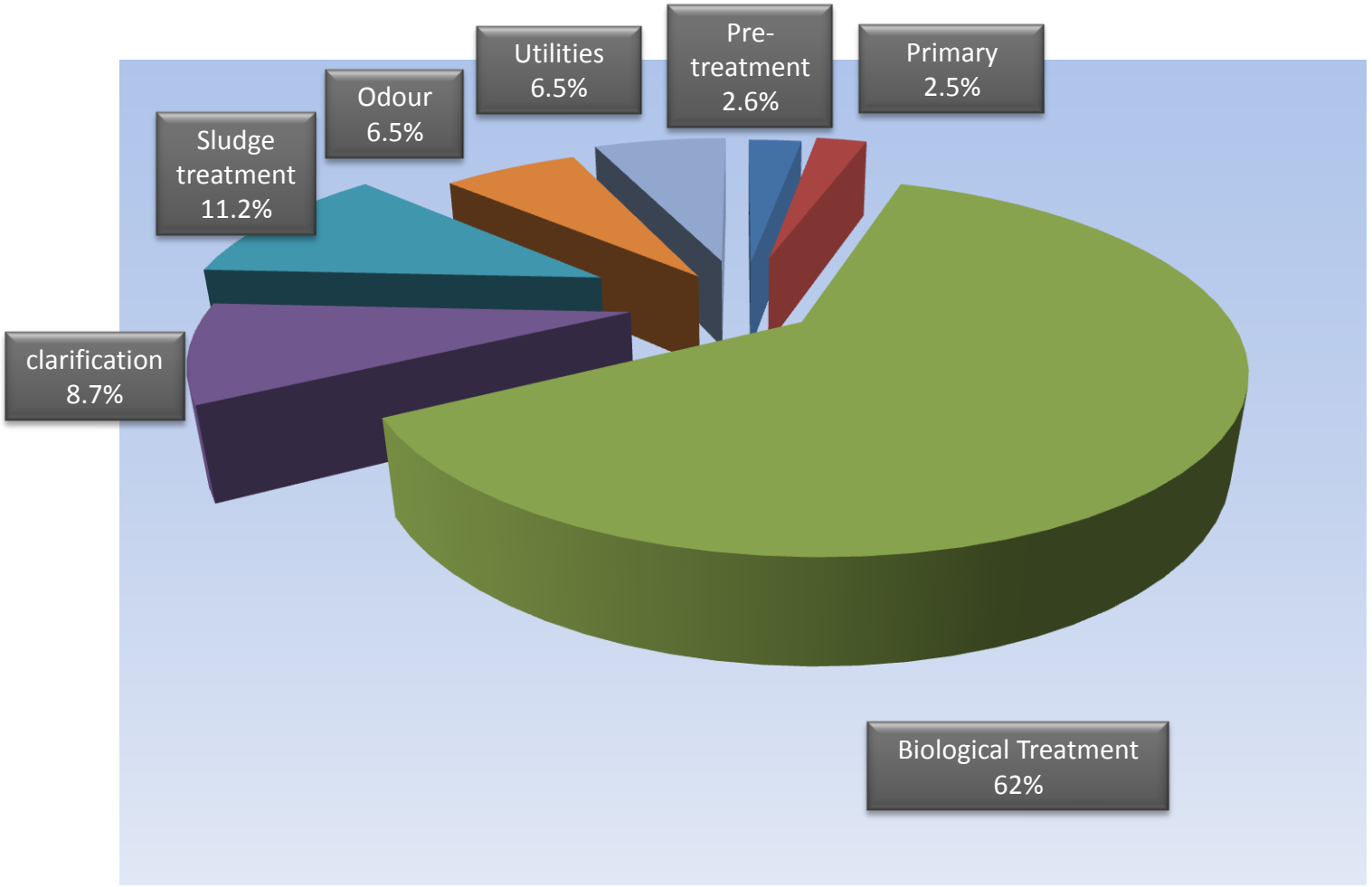
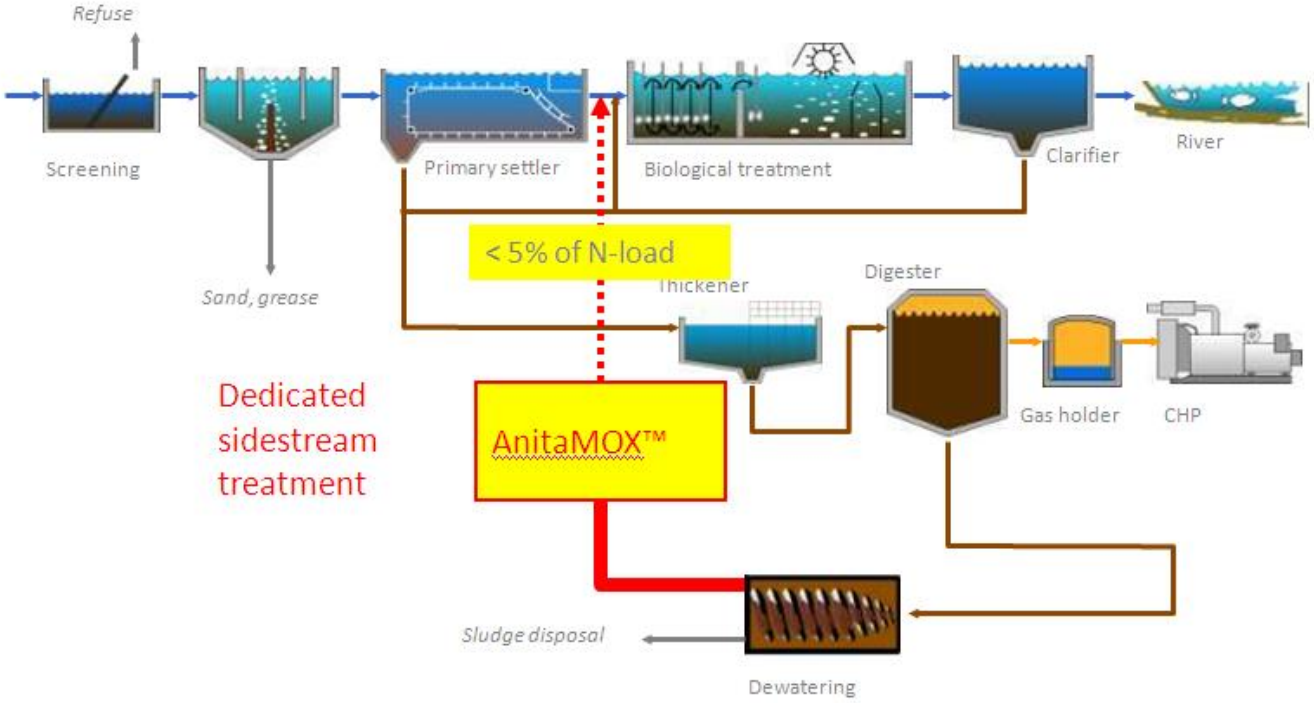
Step 1 - Process Optimisation

Wastewater treatment plant energy use …



Process optimisation …

Dedicated sidestream process …



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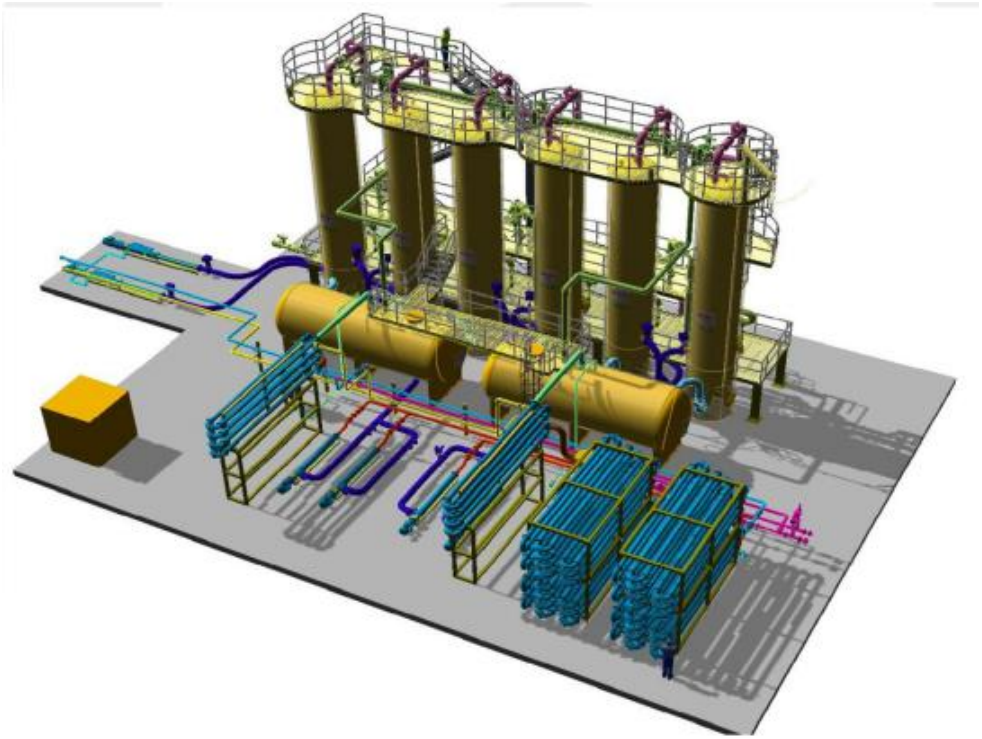
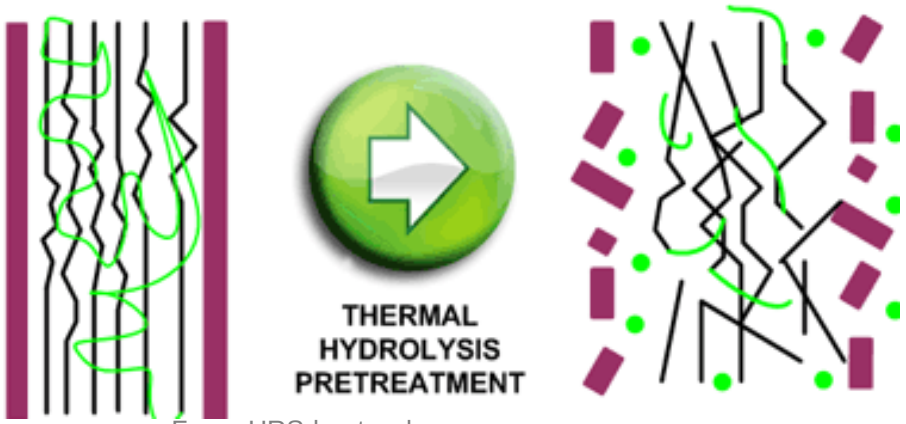
Step 2 – Produce more energy



Thermal Hydrolysis releases energy stored in sludge

- High Temperature & Pressure (150-190 C & 6 -15 bar) to ”crack” bio- molecules

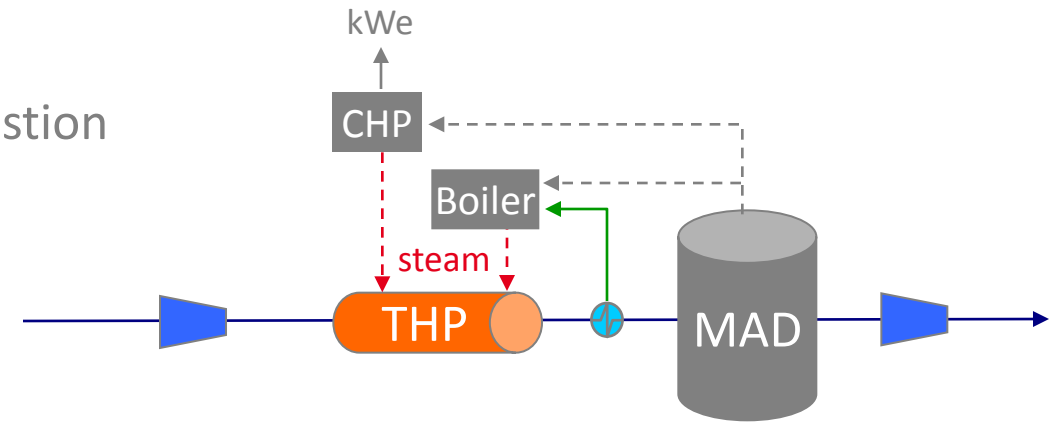


From: HRS-heatexchangers.com

- More bio-active carbon sources available
- Most effective biogas enhancement – more gas + less sludge
- Biosolids Pasteurisation

Classical « LD » concept

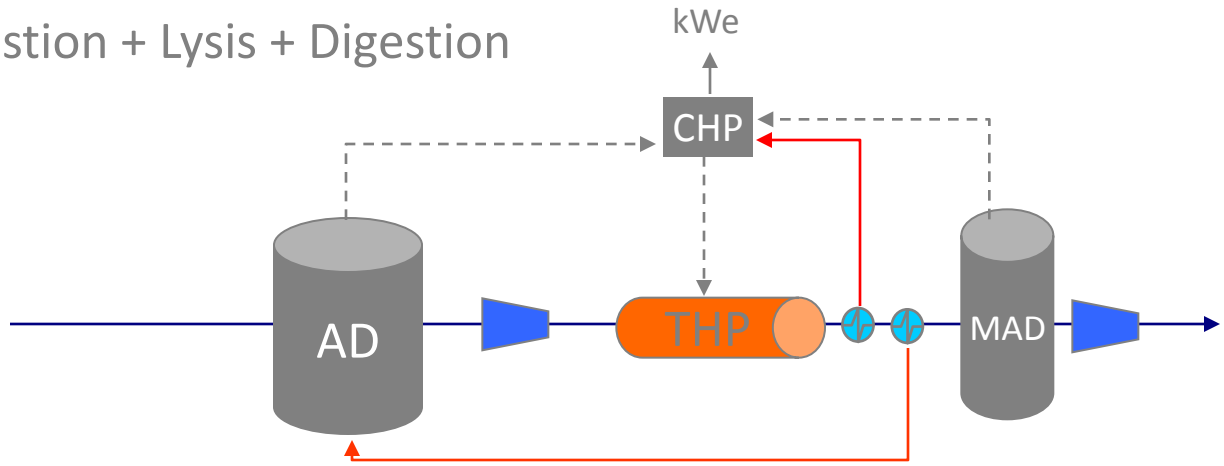
LD Lysis + Digestion



- Thermal hydrolyis increase's the biodegradability of sludge producing more biogas which can be used for steam production by the boiler and CHP
- Higher sludge volume reduction
- Smaller anaerobic digester

« DLD » New concept

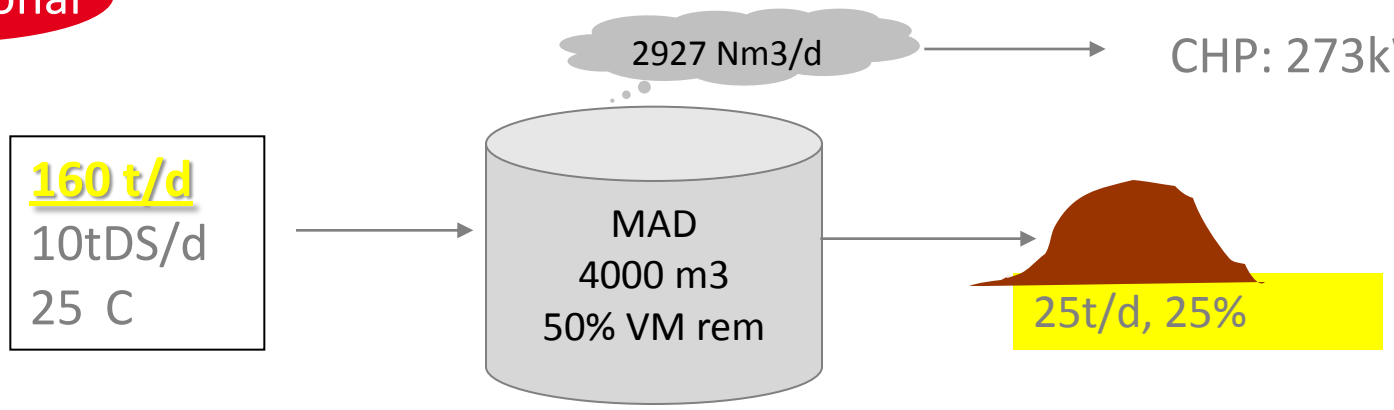
DLD Digestion + Lysis + Digestion



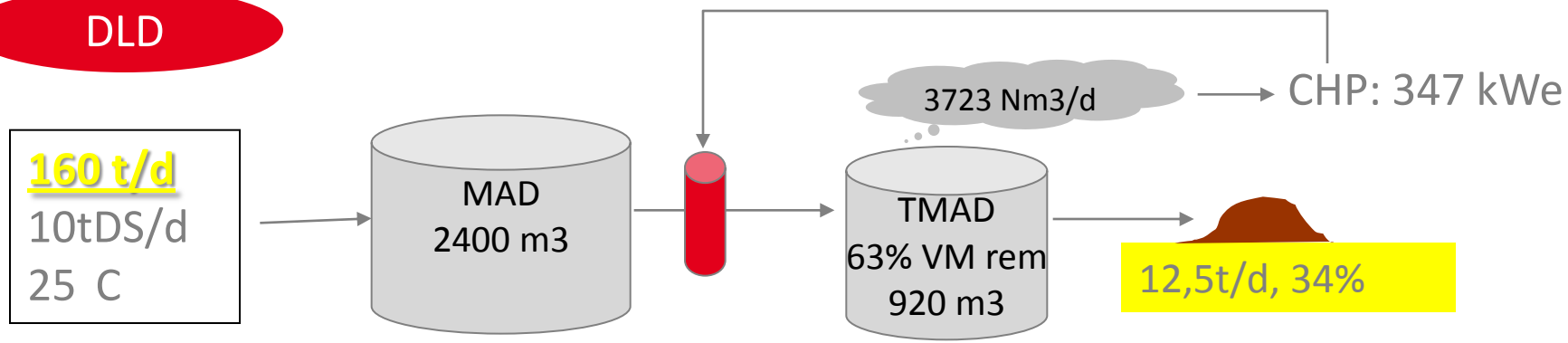
- Let the biology do the work first!
- THP on digested sludge -> reduces THP design & steam consumption
- Increase of Biogas production
- Steam produced only by CHP -> electricity production optimised

New « DLD » on mixed sludge

Conventional



DLD



+25-30% increase in electricity production &
-50% reduction in final sludge volume

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Step 3 – Use innovative technologies

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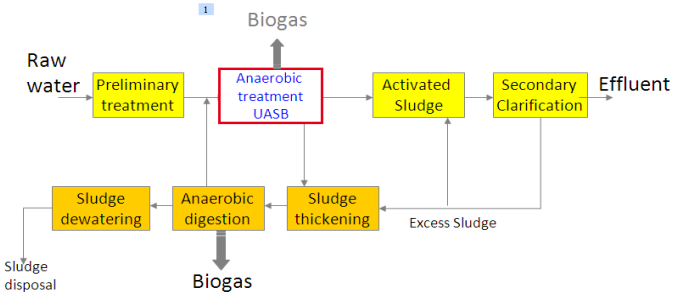
VWS Biorefinery …

Replacement of a primary settler by UASB,
«Carbon Removal Objective »



Electricity consumption reduction from 0.3 to 0.25 kWh/m^3
Sludge production reduction to 30%
WWTP self sufficient increase from 50-70% to 100-110%

South Pest treatment works, Budapest, Hungary

- Revenue generated through gate fees
- Biogas production – up by 400%
- Subsequent energy generation – up by 300%

Biorefinery

Production of resou
(biofertilizers, biopla

5. Bio-polymers

Green chemicals …

Primary coagulant subsitute - Hydrex 3808 – Tannin based product

- Renewable source, recycled bark waste of mimosa tree
- Non toxic, biodegradable
- Low mwt cationic
- No alkalinity consumption, wide pH range
- No additional sludge

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OCEAN software tool

OCEAN software tool for assessing energy efficiency …

- Veolia has developed a software to enable quick assessments of ways to improve WWTP energy efficiency
  - at tender phase
  - on existing plants
- Based on process design models and plant operational conditions
- Best scenario
  - depending on the thermal energy balance
  - depending on the power energy balance
  - depending on electricity & fuel costs

OCEAN overview …

Operation conditions:

% COD, BOD, N loads & flow

Aeration monitoring

Design conditions :

Flow, Inlet loads

COD, BOD, N, P,

Temperature

Outlet guarantees

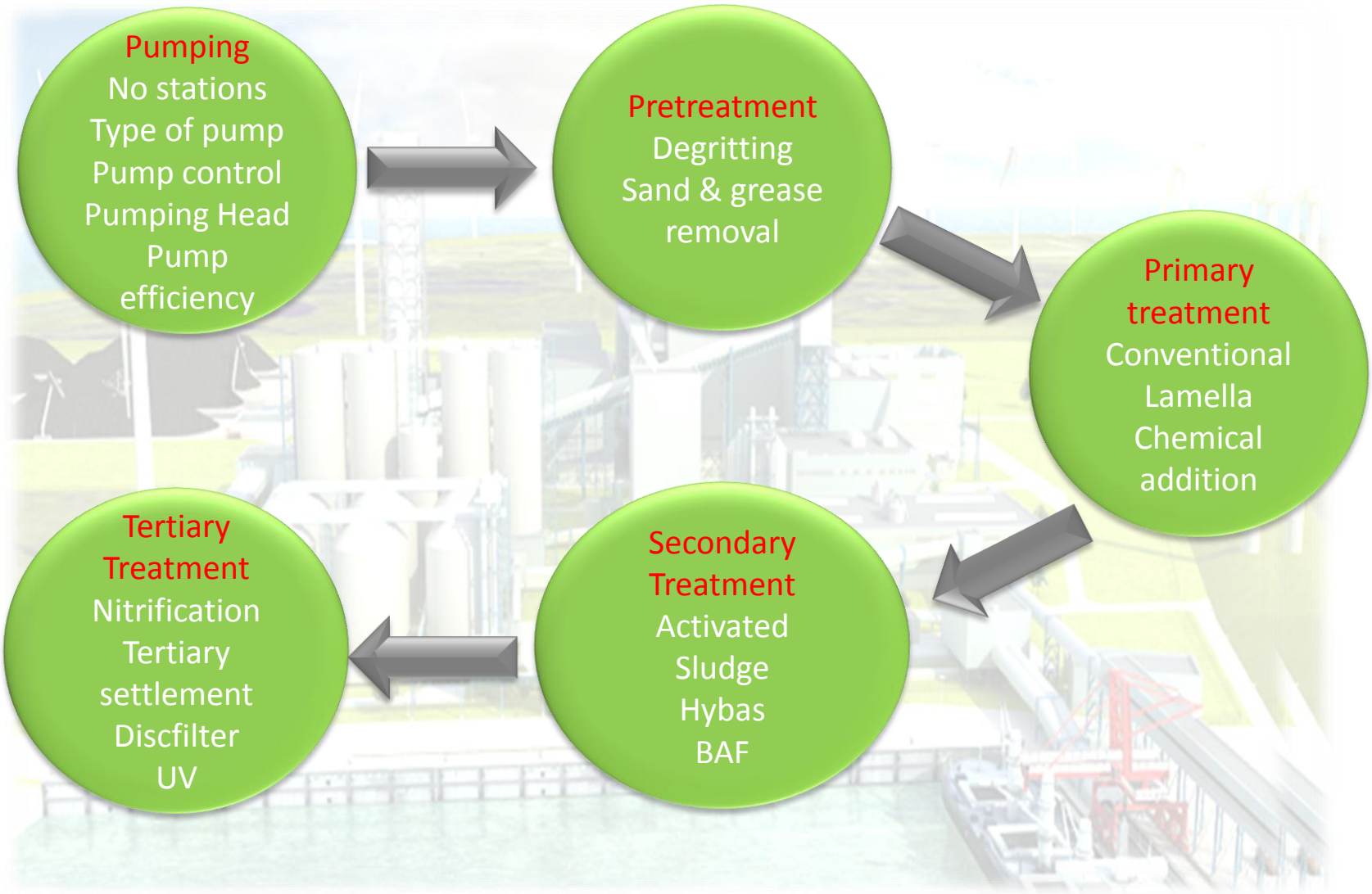
Build water & sludge treatment lines

Energy balance & savings potential

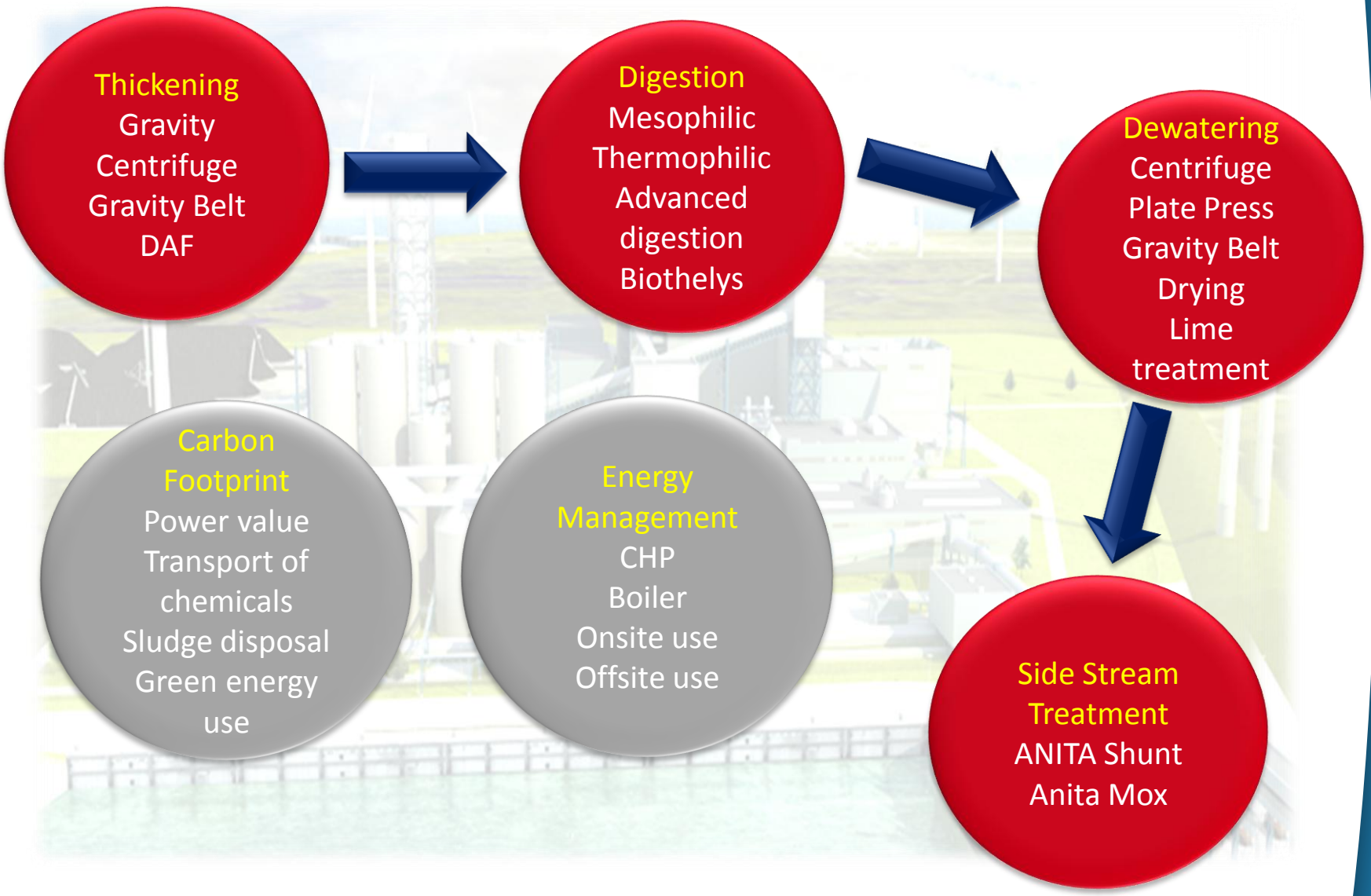
Carbon fooprint

Technological Roadmapping

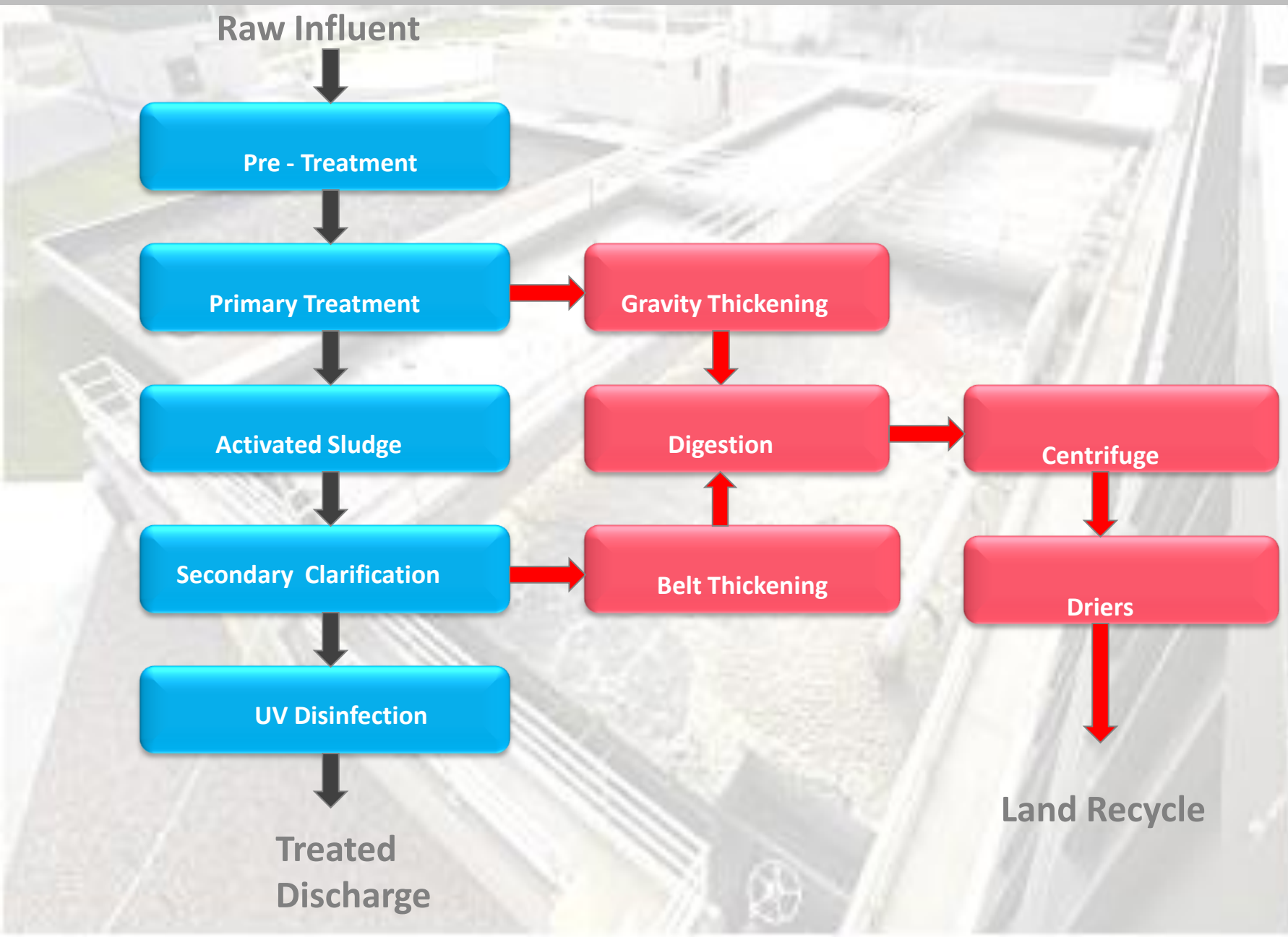
Water treatment line …



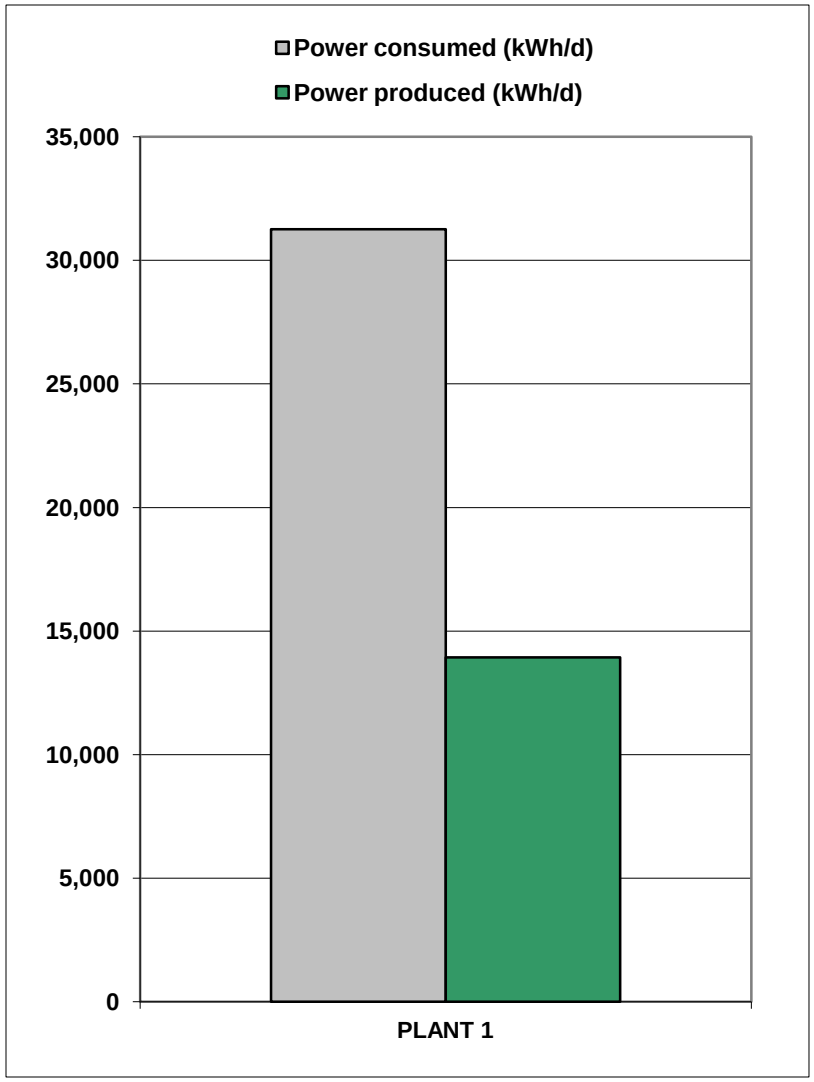
Sludge treatment line …

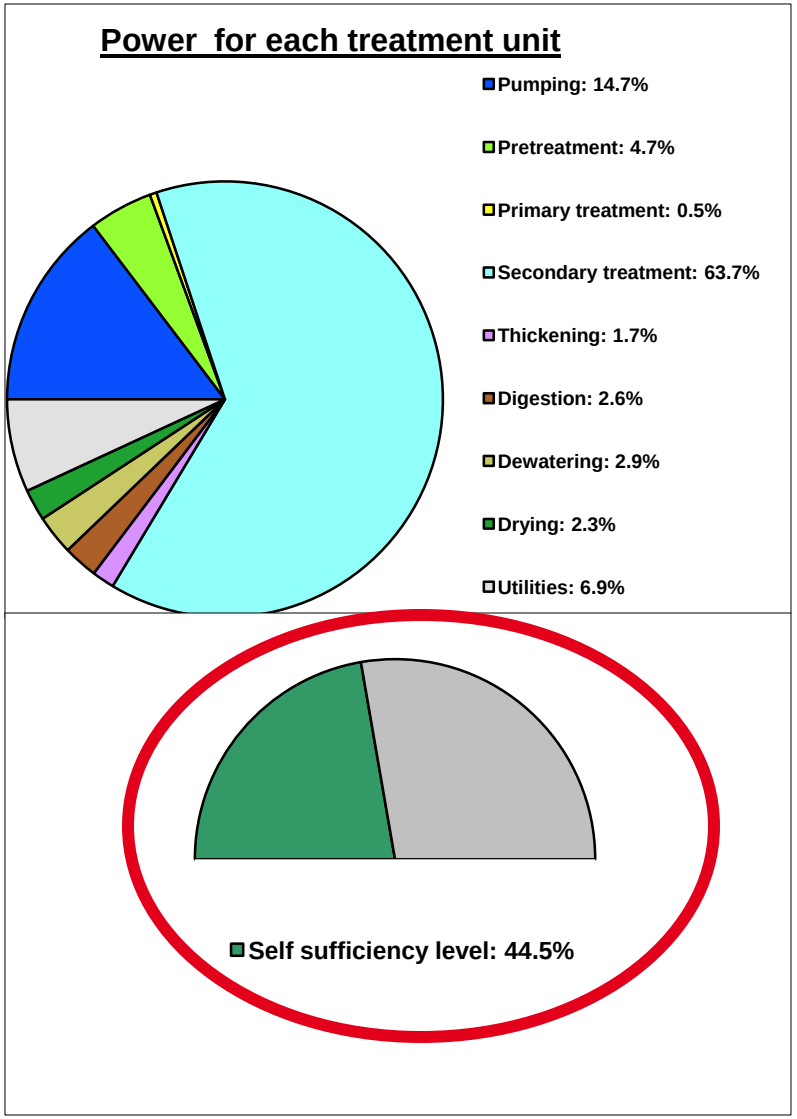


EXISTING 500,000 pe WWTP

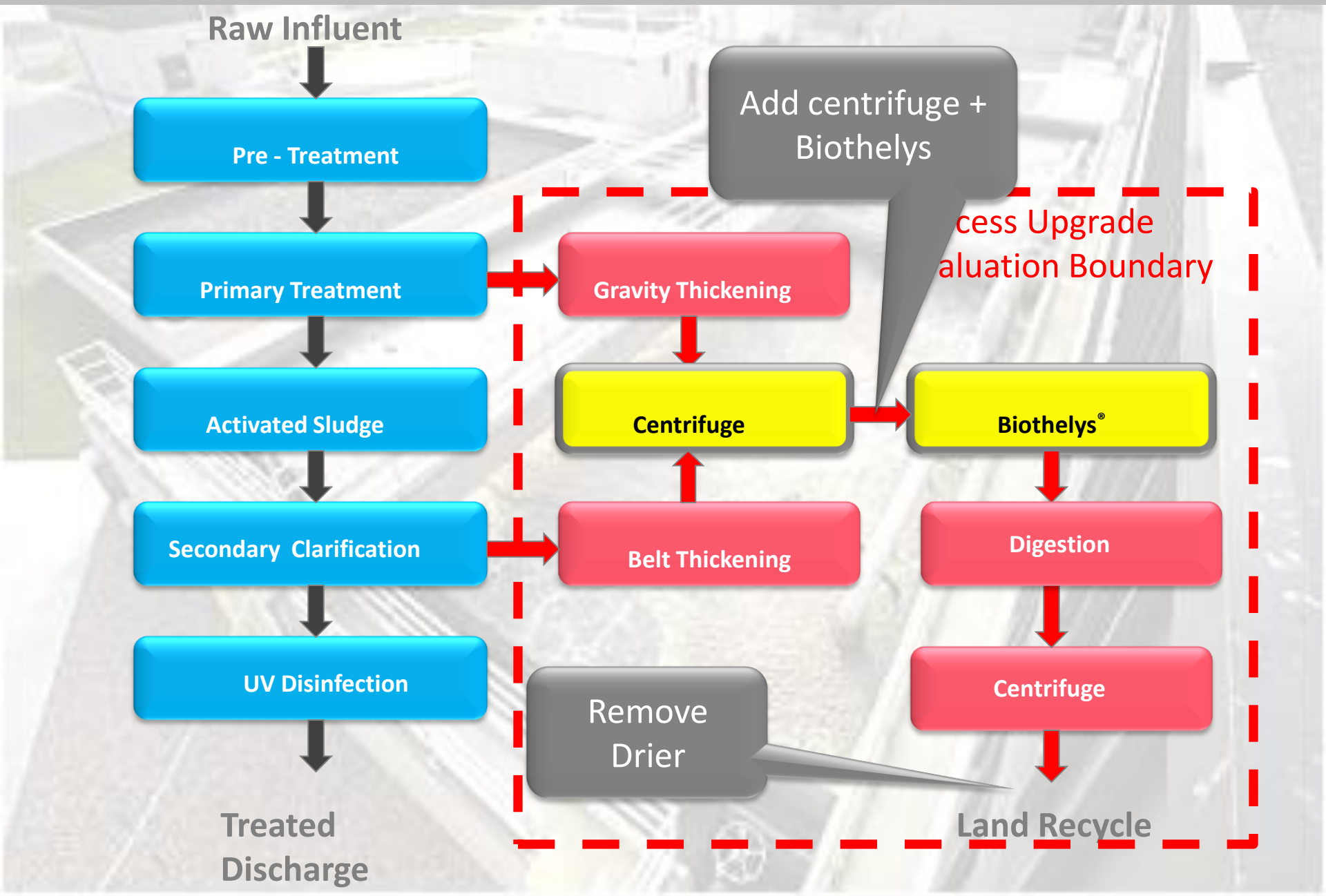


Existing process energy balance …

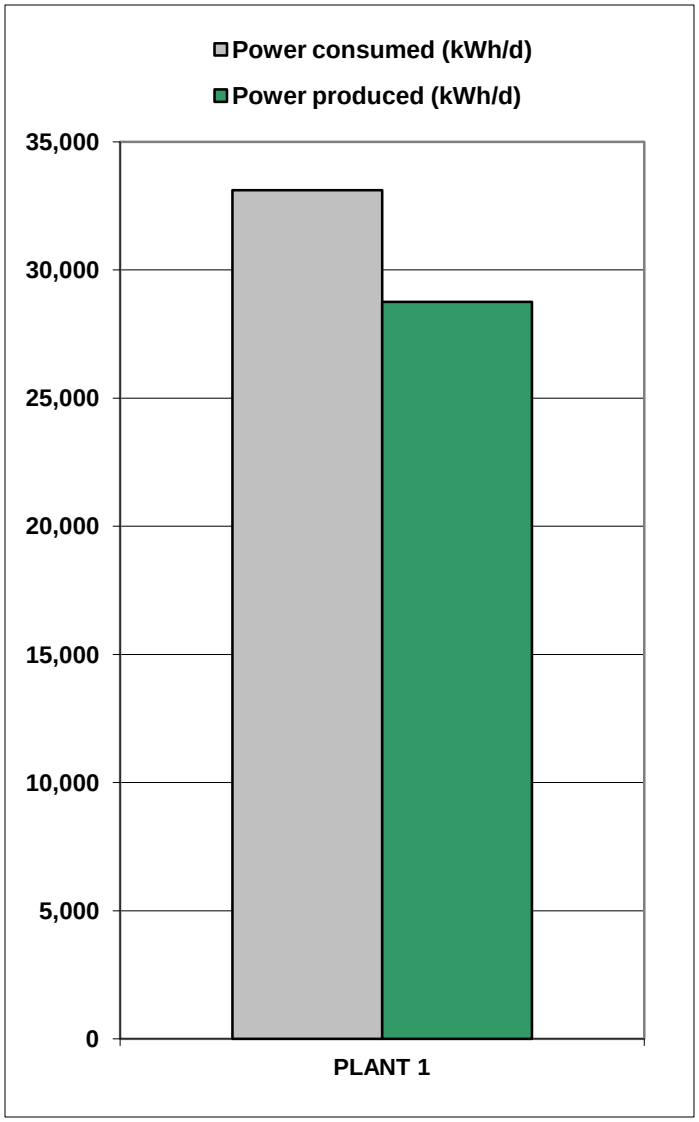


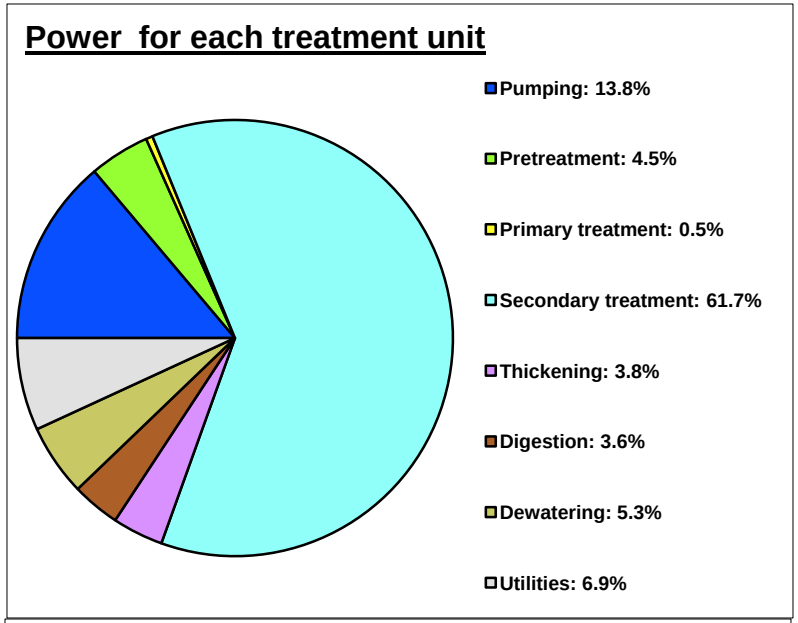


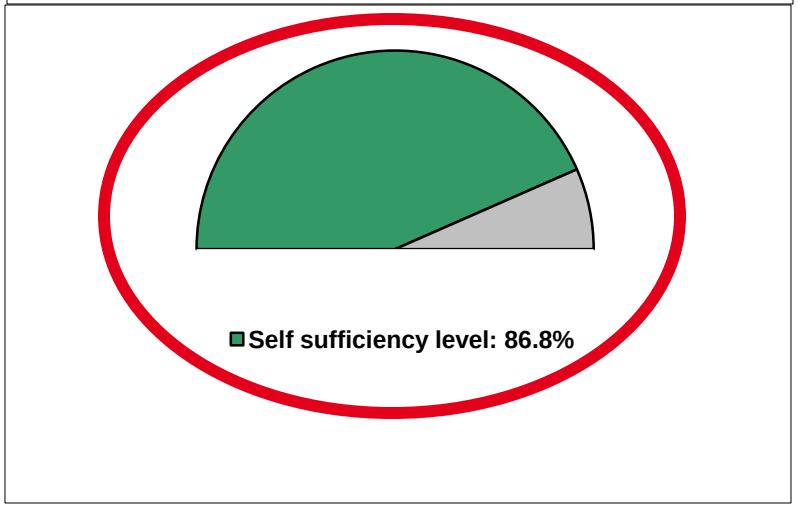
PROPOSED UPGRADE…



Proposed process energy balance …







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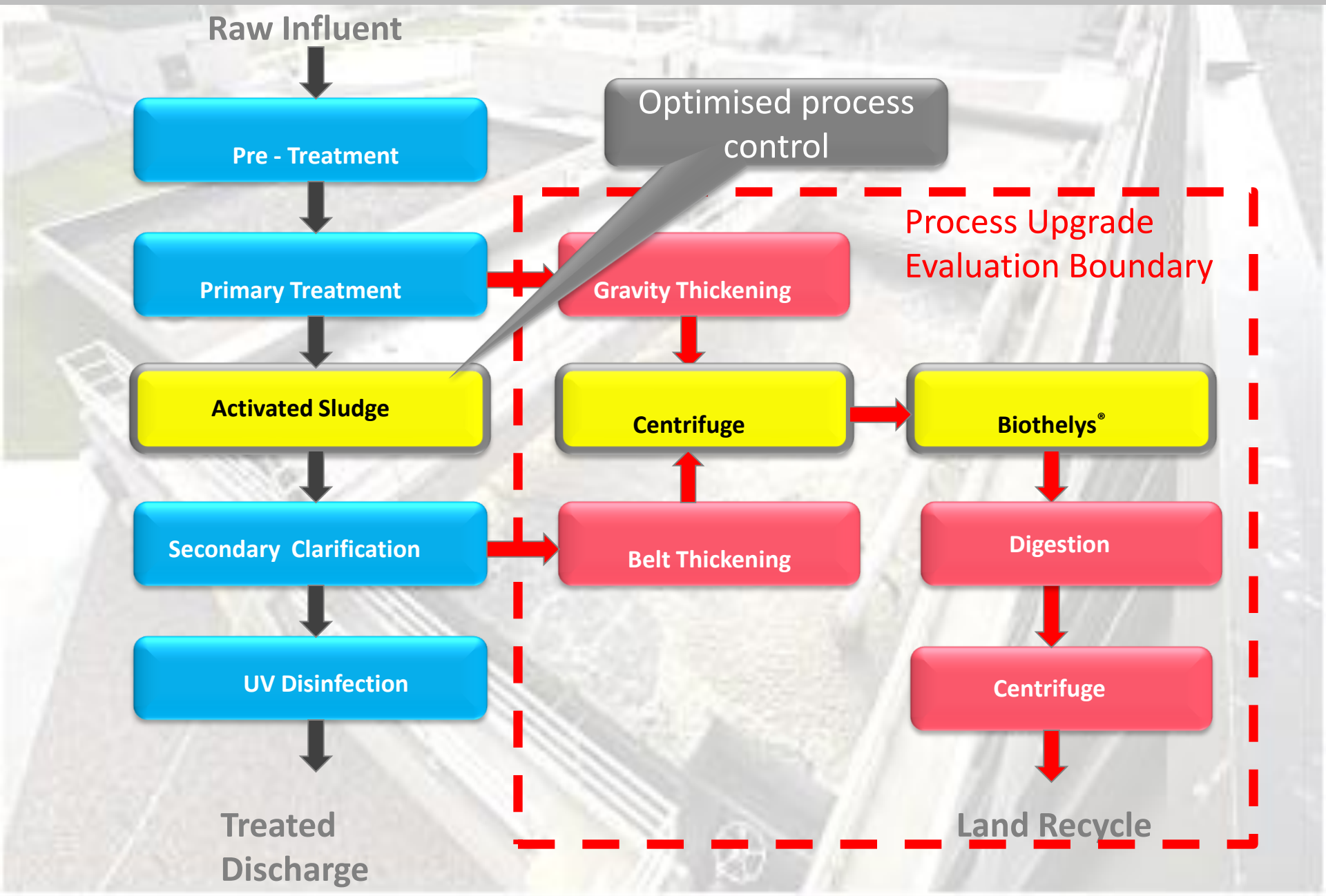

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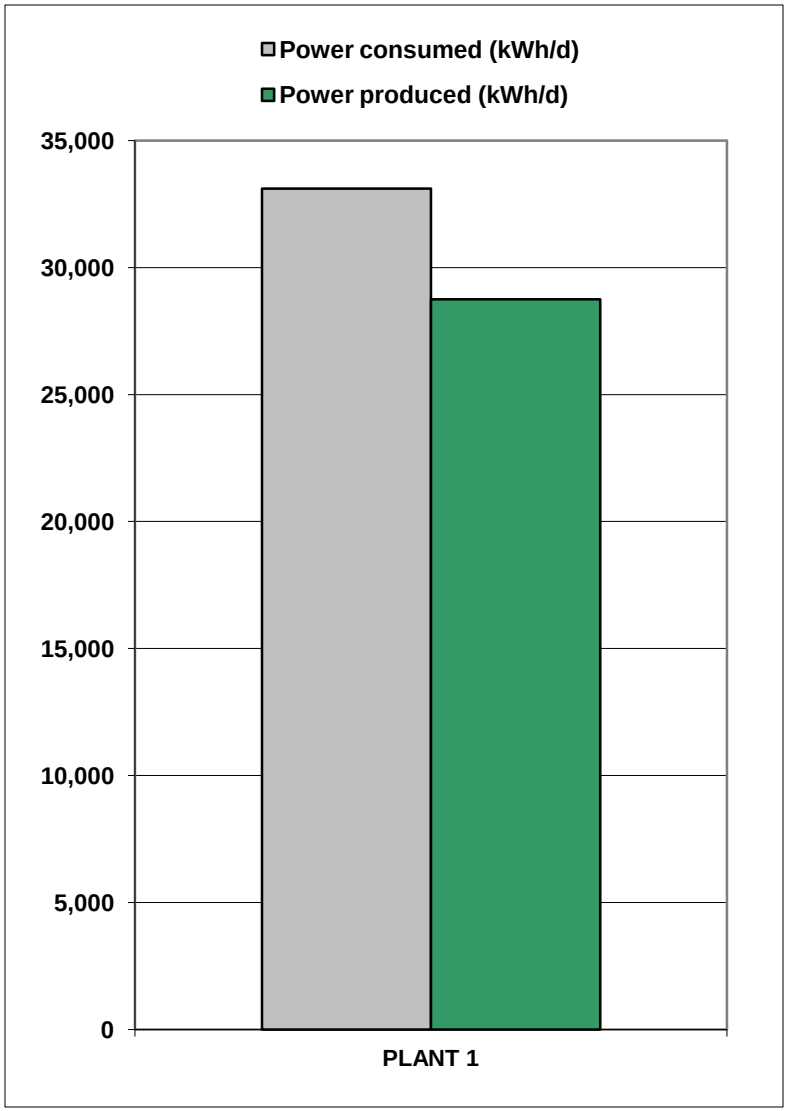
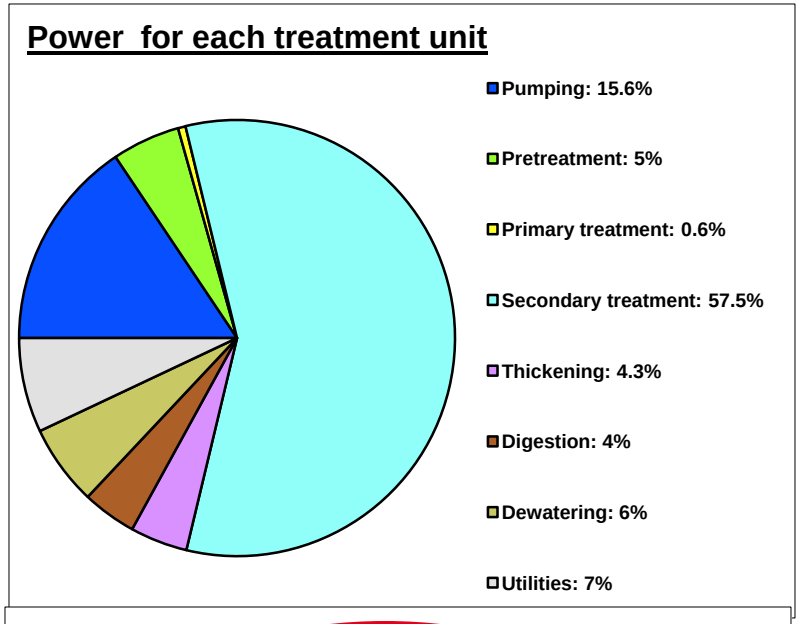
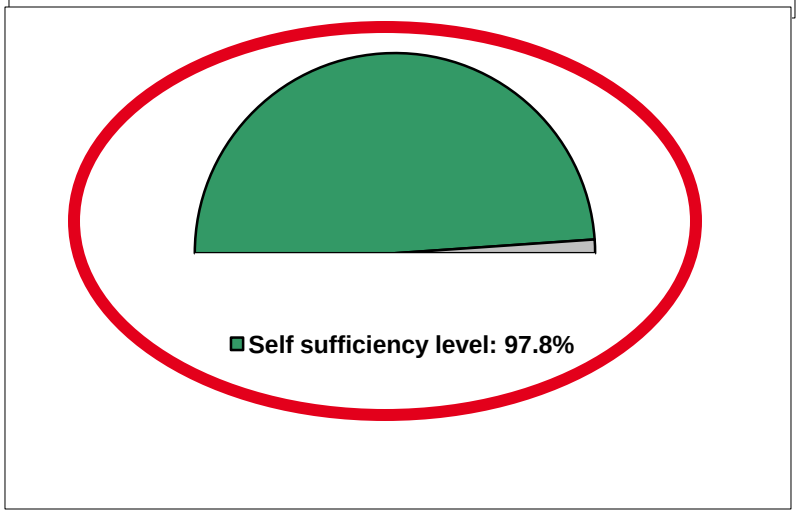
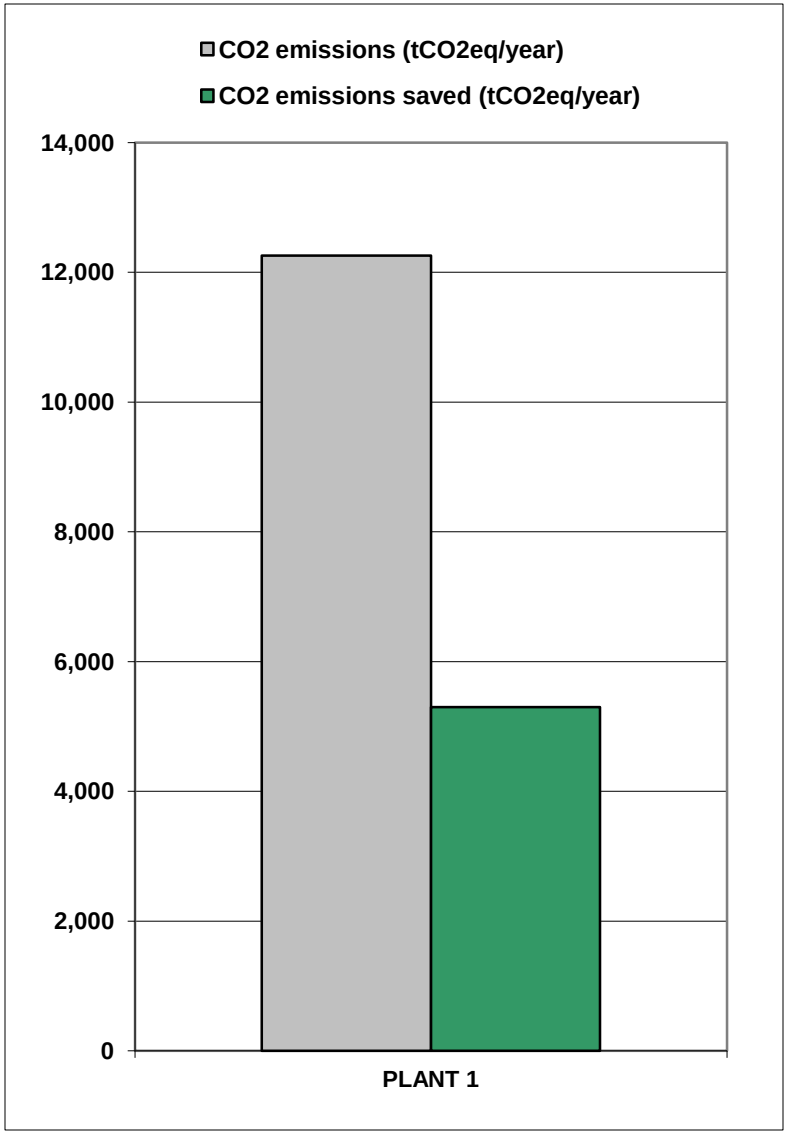
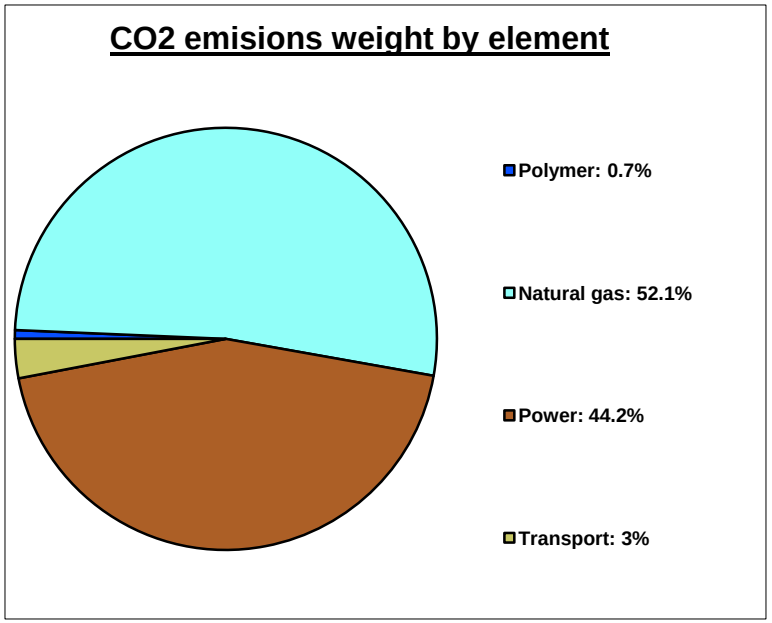




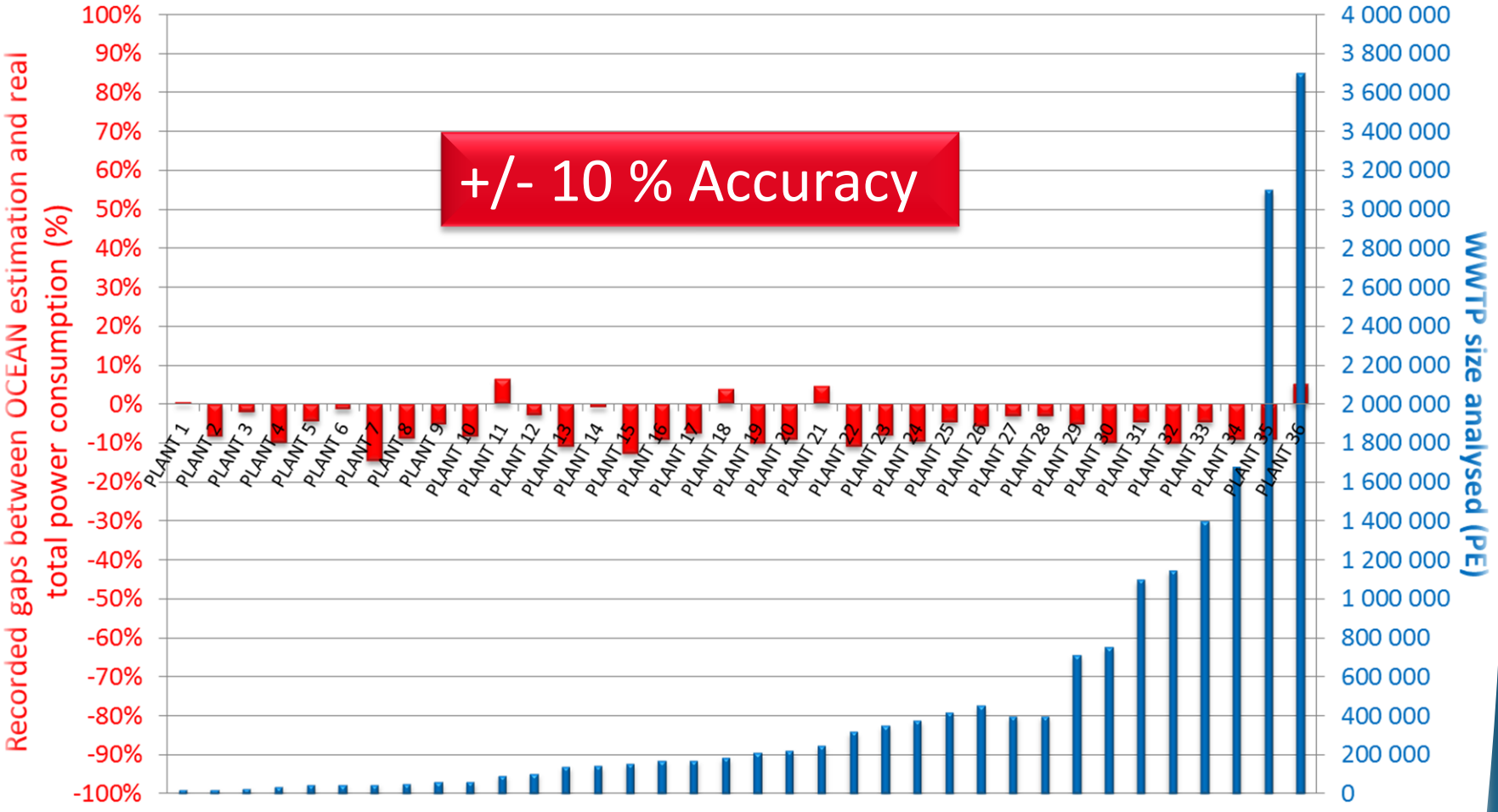


Proposed process carbon emissions…





Real values & OCEAN calculations …



Conclusions …

- To ensure future sustainability of our WWTP's we will need to optimise energy use and energy production
- Technology is currently available to reduce energy use and enable us to move towards energy neutral and net energy generating plants
- Adopting a Biorefinery approach will allow recovery of inorganic's and green organic platform chemicals, further improving sustainability
- OCEAN software provide's a simple and quick management tool to assess the impact of process upgrades and operational changes on energy balance and carbon emissions

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Questions ……