

# ULTIMATE



WATER SMART INDUSTRIAL SYMBIOSIS

## CS 5 Lleida/Ostrava

A. Giménez-Lorang



Biogas production in CS5 Lleida: AnMBR versus BEFB, 30.10.2020



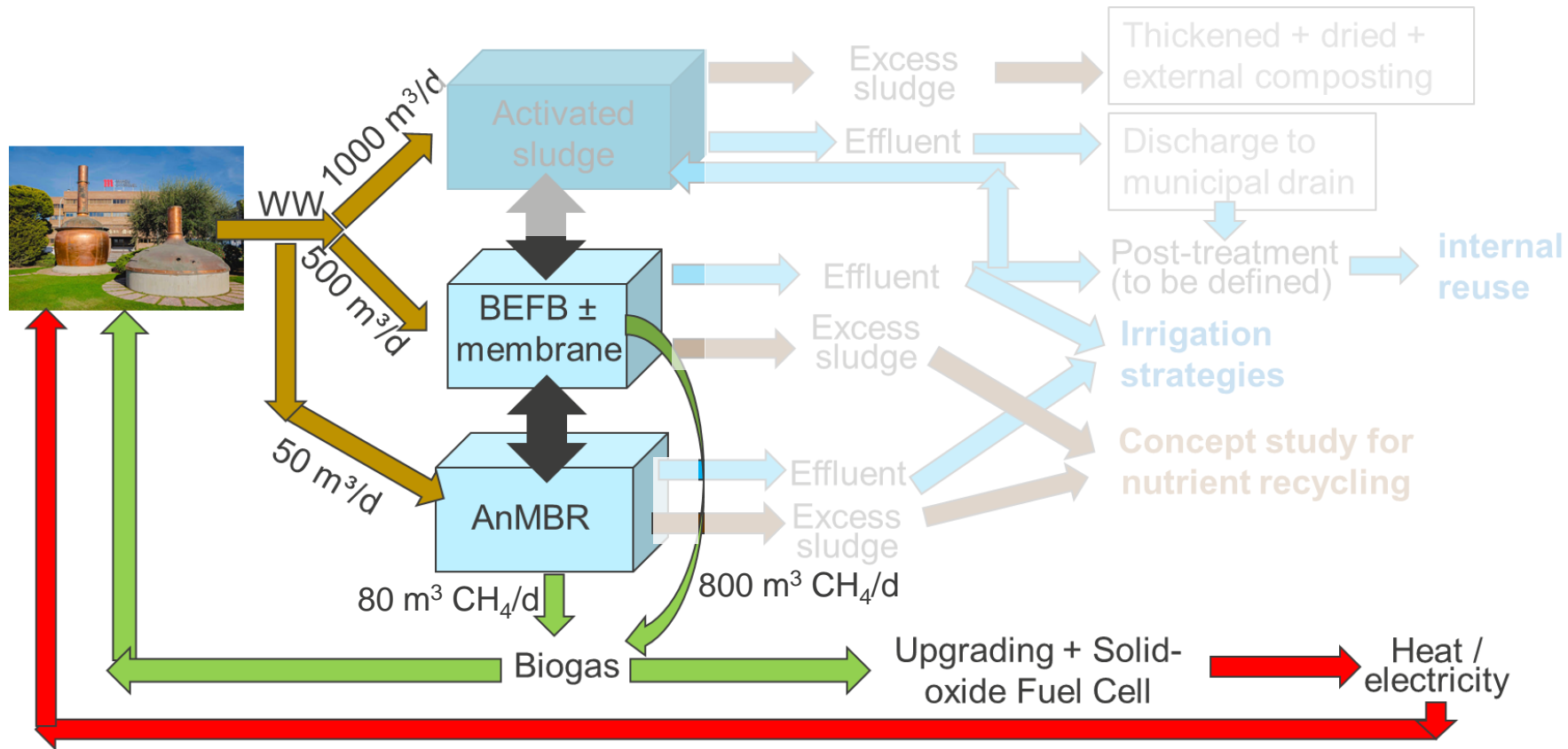
## ENERGY - Task 1.3.2

Anaerobic treatment of brewery wastewater and electricity production via solid-oxide fuel cell

### OBJECTIVES:

**Biogas production** → biogas upgrading to biomethane → heat

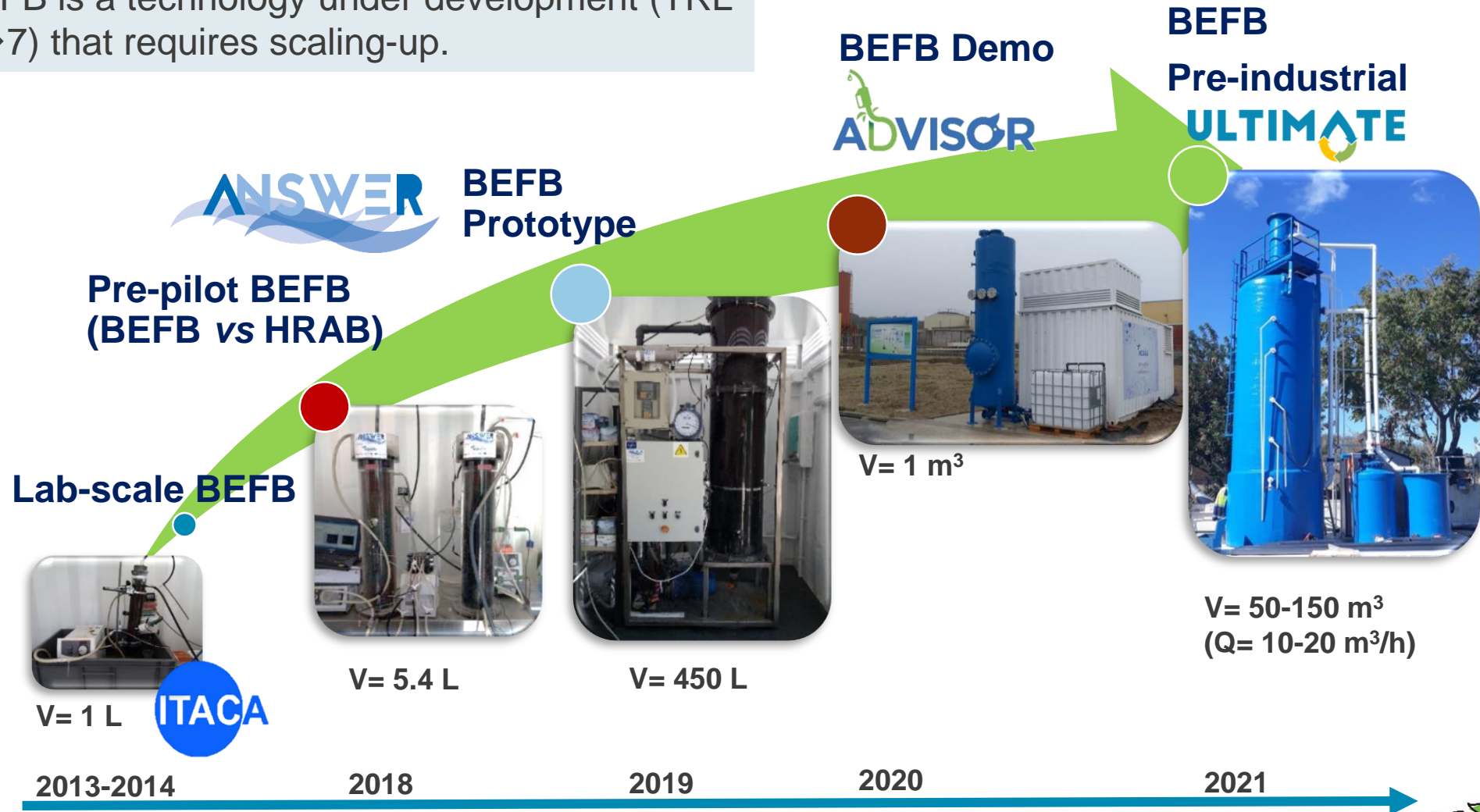
**Electricity production** via solid-oxide fuel cell operated with biogas or methane





# BEFB = BioElectrochemical Fluidized Bed

BEFB is a technology under development (TRL 5→7) that requires scaling-up.



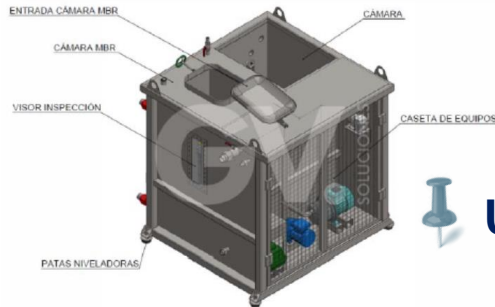
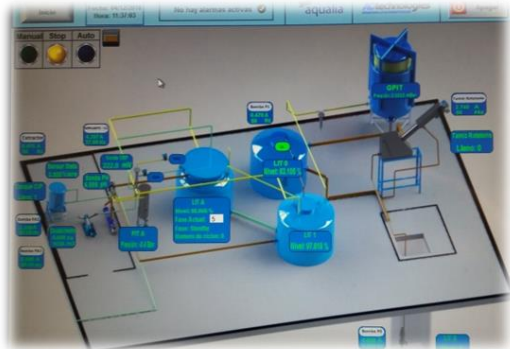
The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869318







# AnMBR = Anaerobic Membrane Bioreactor



-  **Urban**
-  **Black water**
-  **Industry**
-  **OFMSW**

SAnMBR control system:  
co-patented with U.Valencia / Polytechnic U. Valencia EP16382140.8

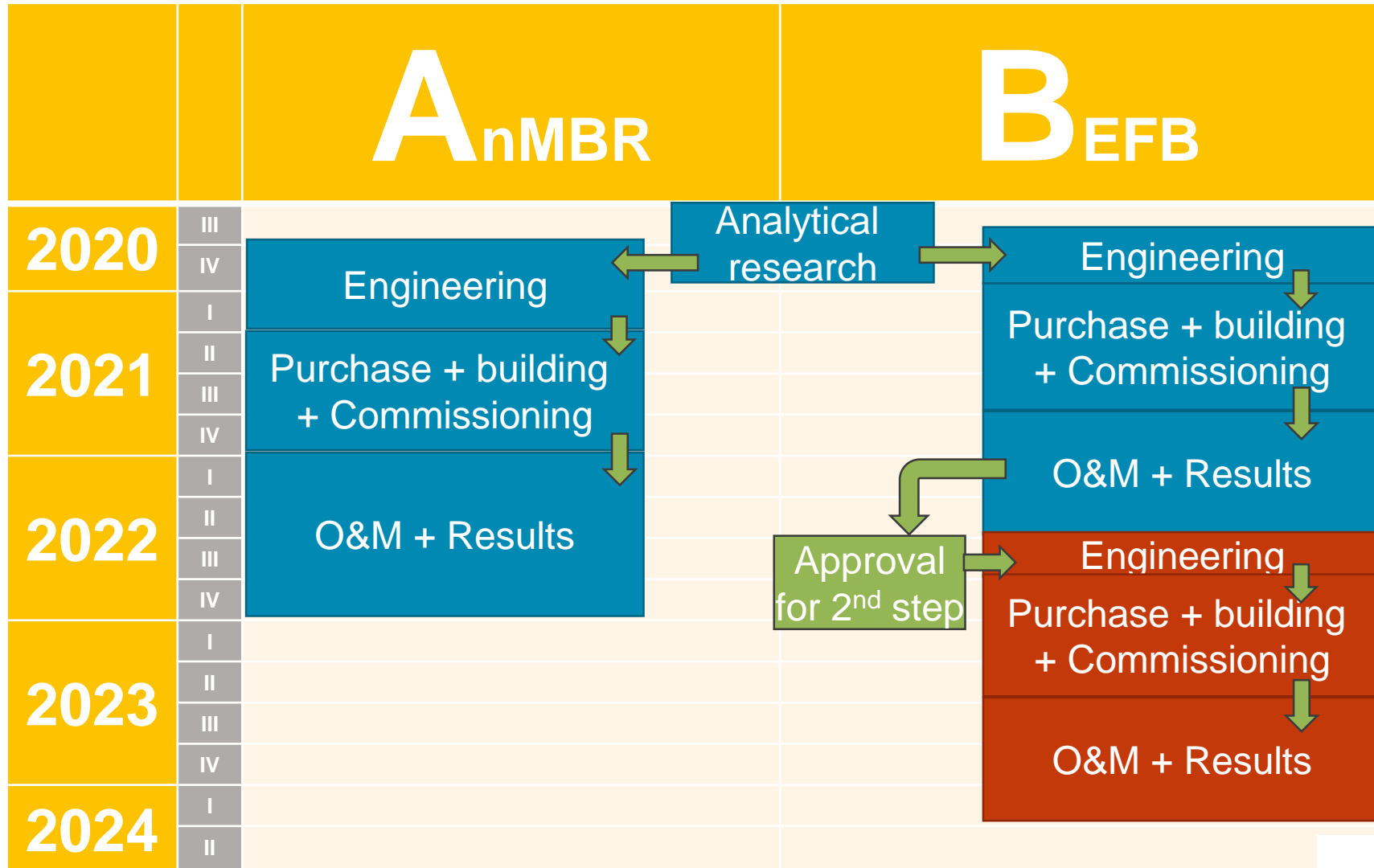


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# Schedule





# AnMBR vs. BEFB

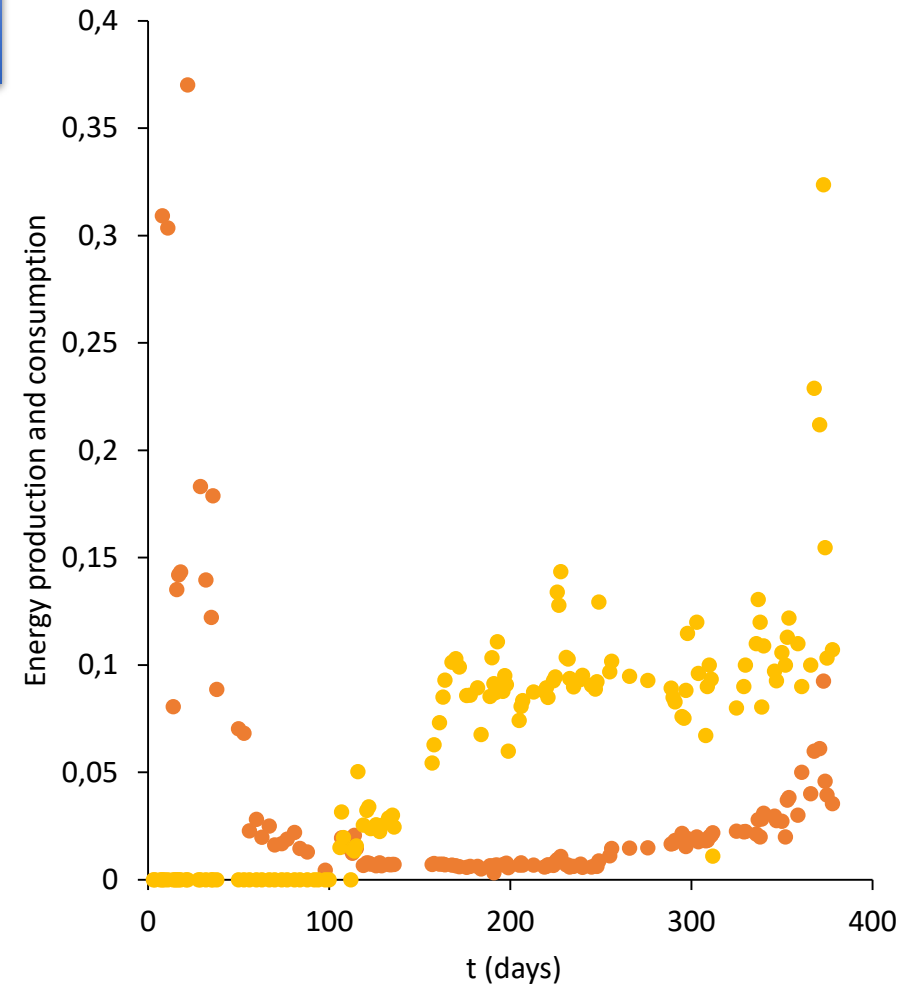
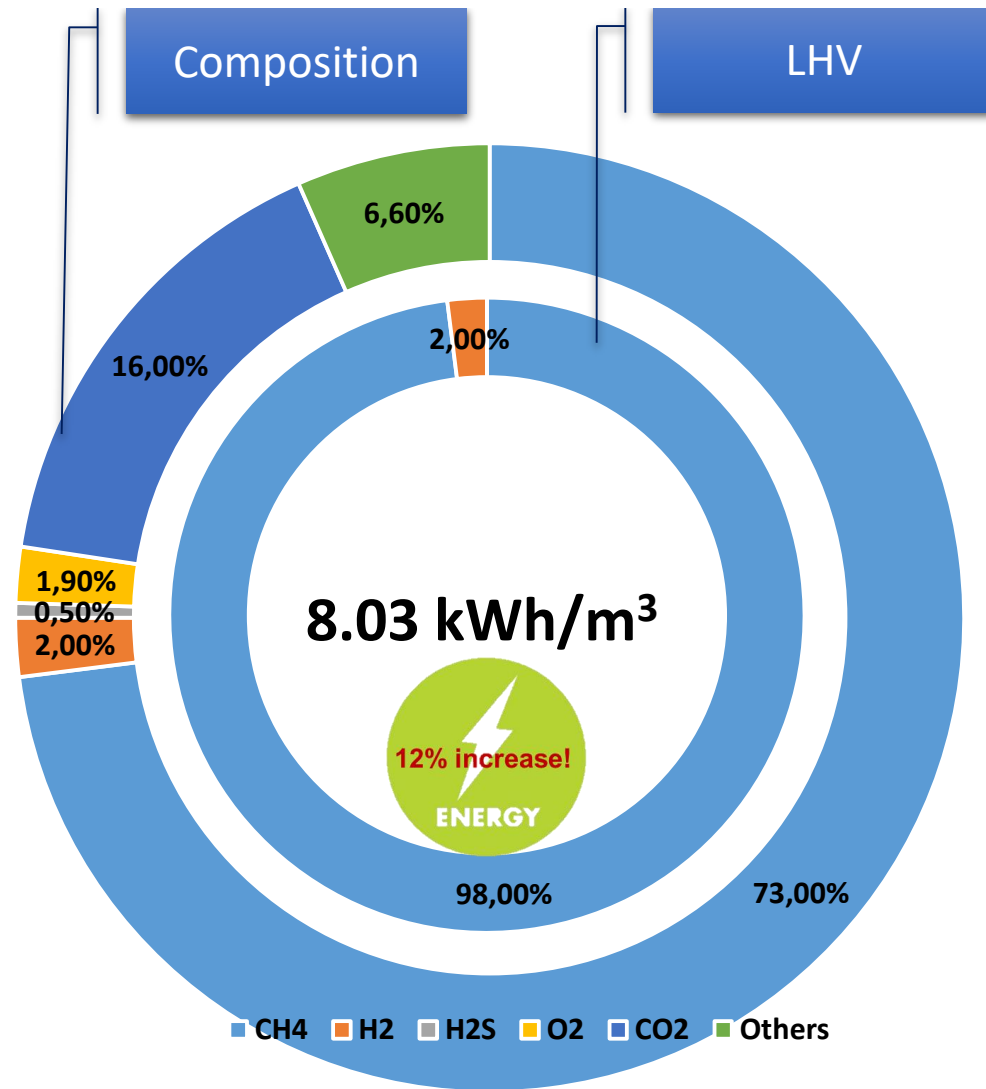


	A <sub>n</sub> MBR	B <sub>E</sub> FB
Suspended matter tolerance	+	-
Quality of treated water / performance	++	+
Energy consumption	(-)	+
Methane productivity	¿=?	¿=?
Biogas heat value	¿?	¿?
Toxic / inhibitory compounds tolerance / resilience	-	+
Organic overload tolerance / resilience	-	+
Low temperature tolerance / resilience	-	+
Nutrient removal	-	+



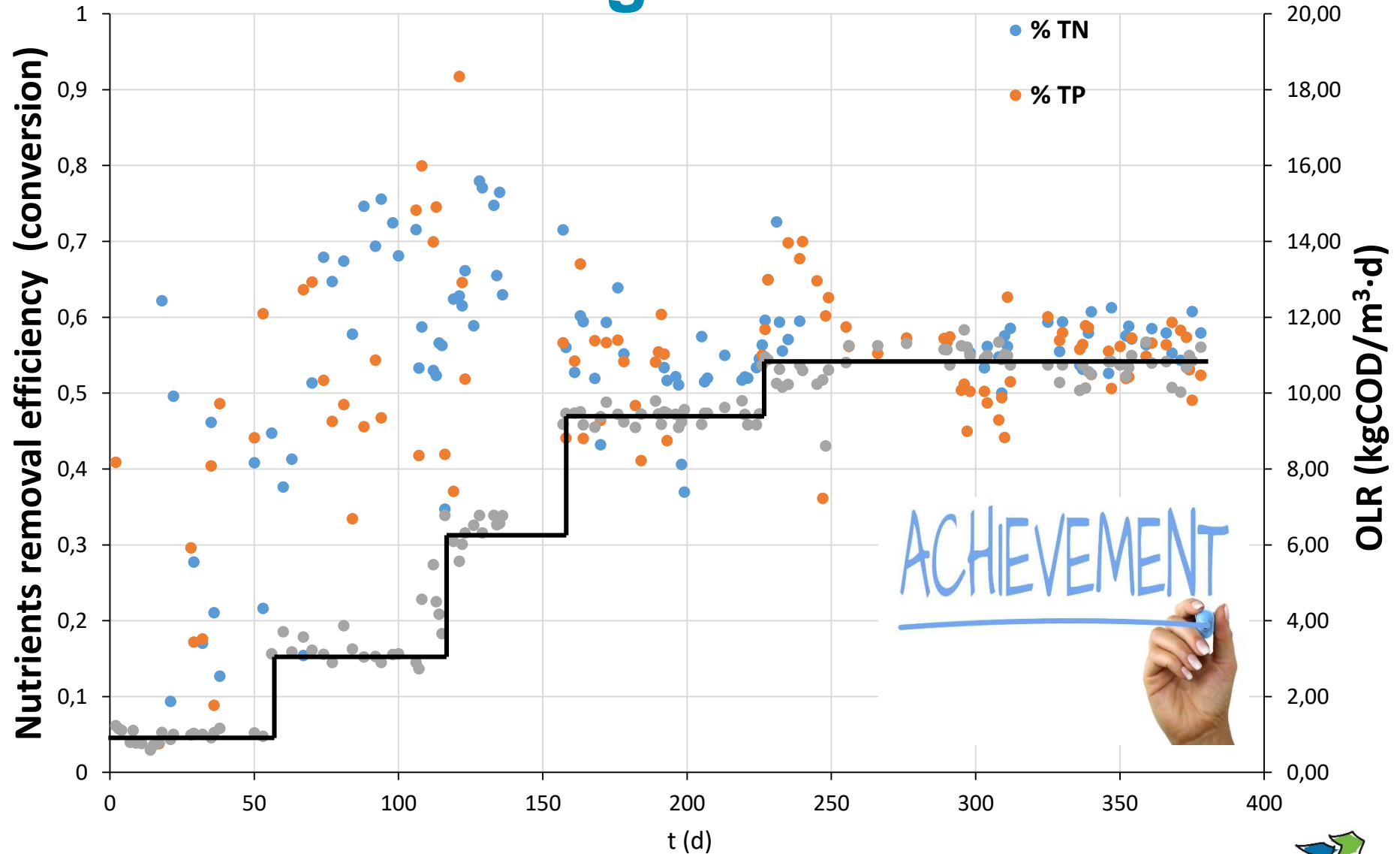


# BEFB biogas quality – self-sufficient process





# Nutrient removal through an anaerobic treatment







# Fuel Cells

- Conversion of chemical energy of fuel (hydrogen, natural gas, methanol, other hydrocarbon) into electric and heat energy.
- Classification according to electrolyte, fuel or operation temperature.
- To gain competitiveness: Sector trying to decrease material production cost, energetic production cost (<40\$/kW) and increasing durability.

Type	Advantages	Disadvantages
<b>SOFC</b> <i>Solid oxide fuel cell</i>	<ul style="list-style-type: none"> <li>• High efficiency, suitable for CHP</li> <li>• Fuel flexibility, tolerance to fuel impurities</li> <li>• No need for precious metal catalysts</li> </ul>	<ul style="list-style-type: none"> <li>• Long startup time</li> <li>• High temperature corrosion and break down of fuel cell elements</li> </ul>



BlueGen BG-15



Electrical efficiency**	Up to 57%
Overall efficiency**	Up to 88%
Seasonal space heating energy efficiency class	A+++
Annual fuel consumption***	22.000 kWh per year
Fuel types	Natural gas according EN 437 Bio methane LNG
Fuel inlet pressure	Max pressure: 25 mbar Min pressure: 15 mbar
Water consumption	up to 32 l/day
Electrical power supply	Max: 0.2 kW

## Schedule:

6/21: 1st trial in urban  
WWTP (Lleida)  
+  
9/2022: 2nd trial in  
industrial WWTP  
Mahou San Miguel  
(Lleida)



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