



Auto Generative High Pressure  
Digester (AHPD) Presentation

**IANOS “IntegrAted SolutionS for the  
DecarbOnization and Smartification of  
Island” EU Project**

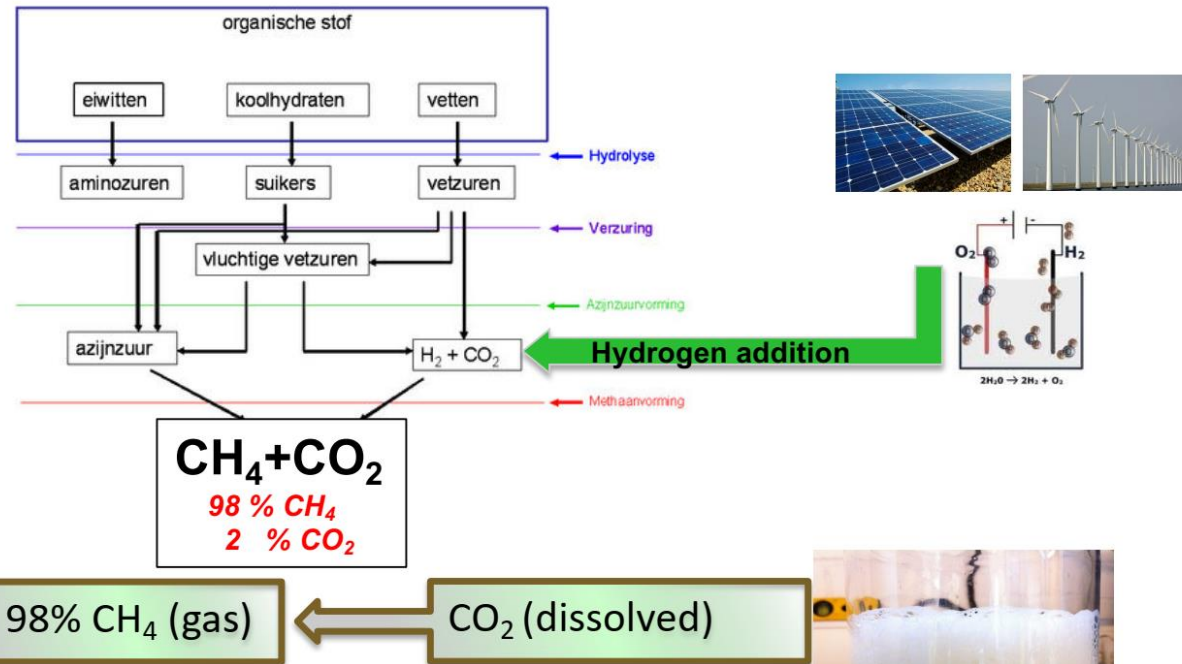
**EU GREEN WEEK 2021 PARTNER EVENT**

**ZERO** #EUGreenWeek  
**POLLUTION**  
for healthier people and planet

Thomas Bebis (CERTH)

# AHPD Operation

## AH<sub>2</sub>PD: All-in-one power balancing



### Short presentation of BAREAU:

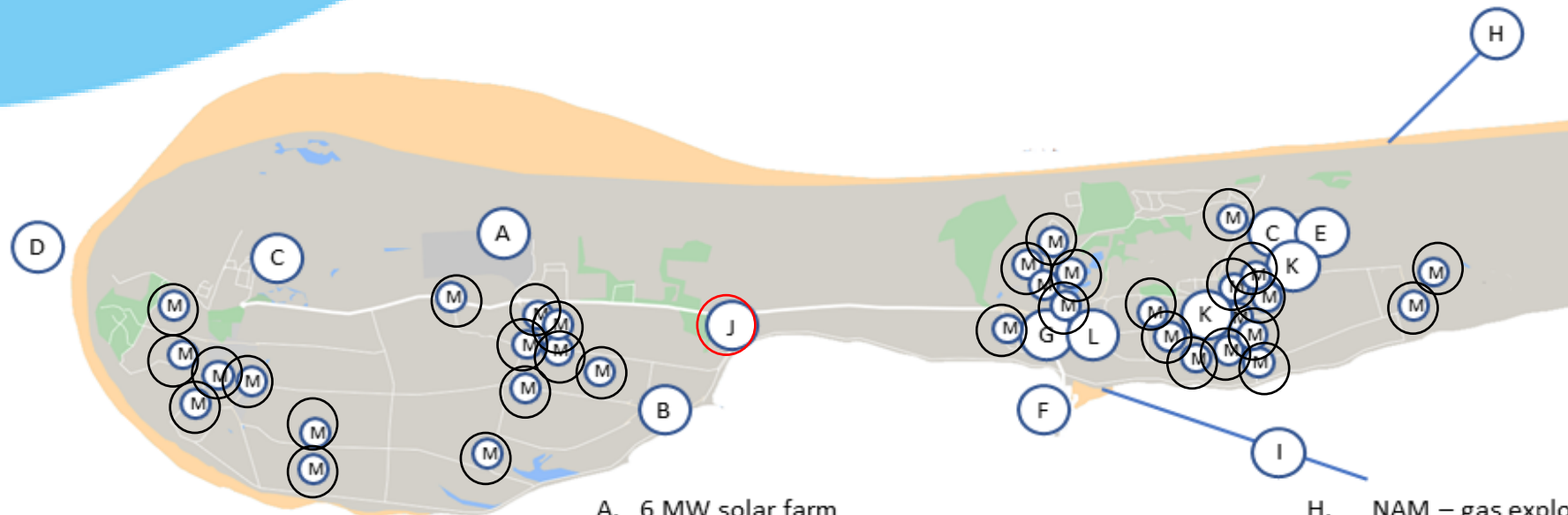
- Dutch Company
- Owner of the AHPD IP
- AHPD Pilot plant since 2010
- Focus on R&D => Scale-up
- Green gas production
- Power to CH<sub>4</sub>
- CO<sub>2</sub> reduction

### All-in-one!

20 bar autogenerative CO<sub>2</sub> removal  
+ Bio-Sabatier: H<sub>2</sub>+CO<sub>2</sub> => CH<sub>4</sub>+H<sub>2</sub>O

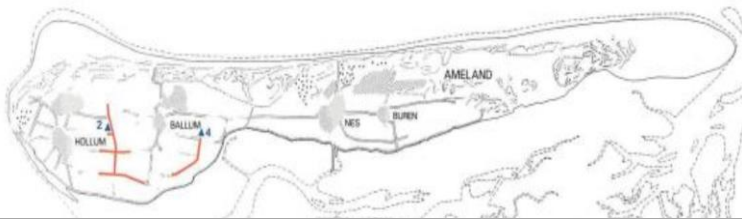


# Energy Assets Location on Ameland



- A. 6 MW solar farm
- B. 3 MW DC solar farm + battery pack + electrolyser
- C. Micro-CHPs
- D. 500 kW Tidal Kite
- E. 500 kWe fuel cell
- F. H2 watertaxis (vessels)
- G. Charging station public transport
- H. NAM – gas exploration platform
- I. Mainland cable connection
- J. Digester**
- K. Heat grid on recreational park and Buren
- L. heat grid with heat pumps, solar thermal collectors, innovative battery and heat buffer
- M. CH4 fuel cells

3 bar gasnet.



8 bar gasnet.



200 mbar gasnet.



GREEN WEEK 2021 PARTNER EVENT

# AHPD Specifics

## Small-scale Auto generative High-Pressure Digester (AHPD)

- converts sewage, industrial swill and other organic waste into green NG (CH<sub>4</sub>) (**300 tons dry substance** per year)
- produces **110.000 Nm<sup>3</sup>** green gas (90% CH<sub>4</sub>): **this is 1/60 of total CH<sub>4</sub> consumption on Ameland.**
- can have improved production (2\* more methane) by adding excess H<sub>2</sub> produced by a 2MWe Electrolyzer (Power-2-gas system)
- can be further improved by adding external CO<sub>2</sub> and extra H<sub>2</sub> (10x more methane).
- digestate can be used as fertilizer, thus closing a waste loop.

## Produced CH<sub>4</sub> can be injected in the existing NG network feeding:

- a) the 2 available CHPs (75kWe/110kWth) and the FC operating as a CHP (500 kWe), and
- b) the multiple Fuel Cells.

Will be operated for more than 40.000 hours on Ameland -> business ready by the end of IANOS.

## Business Models

This is a Private Investment

**Expected cost:** 3.5M EUR

**Available revenue streams:** Phosphate, fertilizer

**Payback time:** < 10 years (on larger scale)

## Environmental Impact

- can decarbonize heating system by 2-4% (ca. 200 tons CO<sub>2</sub> per annum) at this scale. After scale up: 20-40%.

- AHPD will decrease household sewage sludge by 60%, hospitality business residual waste by 40% and the need for fertilizer by 10% using digestate produced by the anaerobic digester



# Drivers/Barriers, Social acceptance

- Cooperation with local Waste Water Treatment Plant, CO<sub>2</sub> reduction from waste water.
- Flexibility of local PV solar farm and DERs by H<sub>2</sub> production.
- Complex technology, no consumers directly involved.
- Building licence is expected shortly.

## Replication

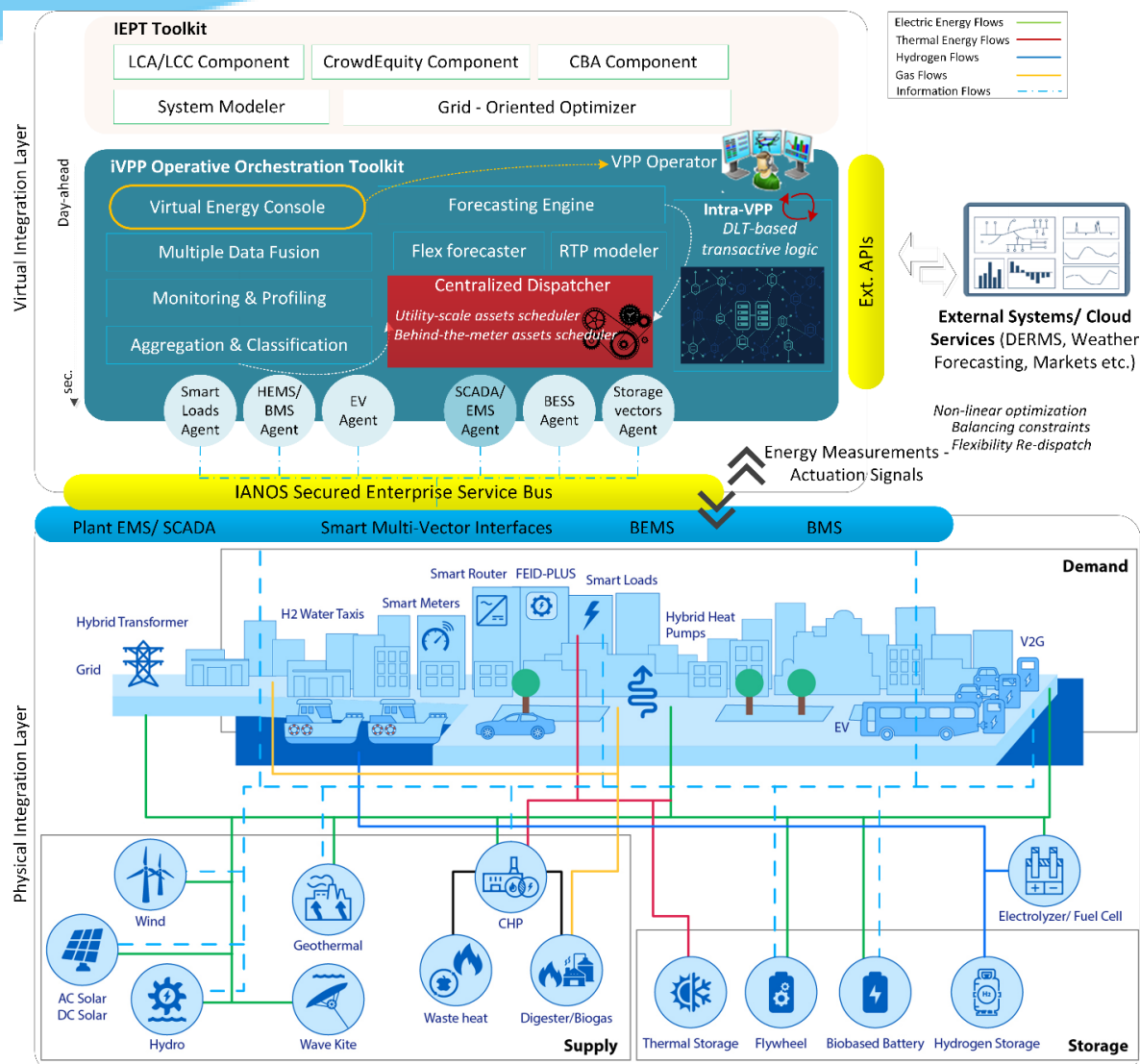
**Lampedusa (IT):** The sizing of an anaerobic digester to be implemented in Lampedusa, will be investigated. As a preliminary description, it will be a dual stage continuously stirred reactor, fed with 60-80% food waste and organic fraction of municipal solid waste, and 40-20% sewage sludge from municipal wastewater treatment.

**Bora-Bora (FR):** Bora Bora's municipality has been very active on developing waste reduction and improved waste sorting and collection. This use case will be particularly useful in order to limit even more landfill of waste, and value additional waste into the energy system.

**Nisyros (GR):** This can be replicated in Nisyros as the Municipality is interested in developing of a sustainable solid waste management and organic fraction valorization, aiming to tackle one of the most severe concerns in Greek islands.



# intelligent Virtual Power Plant (iVPP) and the AHPD



Sets up a virtual network of decentralized, a) vRES generating units such as wind, solar, tidal resources, and b) dispatchable ones, such as geothermal and **green gas** (clean biogas) CHP plants, as well as c) Energy Storage Systems (ESS), integrated as a single unit, providing flexibility services and fostering island REC's self-consumption;

## Inclusion of an IEPT toolkit:

**LCA/LCC (VERIFY)** web-based real time toolkit for the calculation of the associated environmental impact and associated costs

**CBA-relevant toolkit:** to facilitate the optimisation process and overall long-term cost benefit

**Crowdequity component:** to foster the collection of the raised capital for new investments

aiming at assisting the system planner on examining the potential of infusing new technologies in its RE portfolio and recommending on additional energy storage implementation



# IANOS

SUSTAINABLE SOLUTIONS  
for islands' decarbonisation



H2020-LC-SC3-2018-2019-2020 / H2020-LC-SC3-2020-EC-ES-SCC  
EUROPEAN COMMISSION  
Innovation and Networks Executive Agency  
Grant agreement no. 957810