JANUARY 29th, 2020

SUPERCRITICAL WATER GASIFICATION

Technology for Efficient Conversion of Wet Biomass

SCWG

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bio360 ReGen Europe Biogaz Europe BOIS ENERGIE Nantes 2020 GRTgaz

cade engineered technologies

- Est. 2003
- Albacete (Spain)
- SME – 50 employees

EXPERT ENGINEERING SERVICES & CAPACITIES

- Heat Transfer Equipment
- Simulation Eng.
- Plant Eng. Services
- Process & mechanical Consulting

OUR CUSTOMERS & INDUSTRY SECTORS

- End Users
- Engineering Companies
- Oil & Gas
- Power generation
- Solar & Renewables









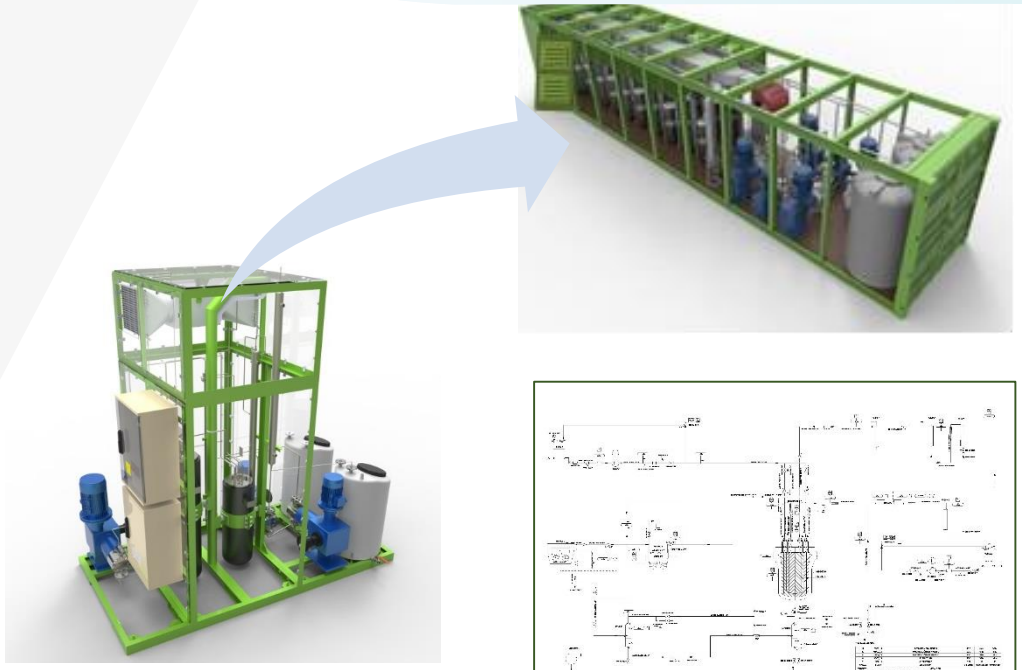
CADE- SCWG HISTORY

- **2010-2012** - Tech. & Eco. preliminary feasibility studies
- **2012-2014** - Pilot Plant design & construction
  Simulation tool development
- **2014-2016** - Patentability Study - Operational Improvements
  Feasibility Studies for customers
- **2016-2018** - ZeroSD/SCWD Applications – Scaling-up Studies
  Design & Operational Improvements
- **2018-2020** - Lab. Biomasses Gasification Tests - Simulation tool update
  Operational Improvements

CADE- SCWG APPROACH

FOCUSED ON INDUSTRIALIZATION

- Scaling-up in our DNA
- Balanced performance & efficiency vs CAPEX & OPEX:
  - In house core equipment design
  - Manufacturability and in serial production considerations
  - Materials of construction optimization
- Capabilities for integration with existing plants
- Industry 4.0



PILOT PLANT

OPERATIONAL RANGE

- Temperature **400 - 550 °C**
- Pressure **230 - 270 bar**
- Biomass flow **10 - 40 kg/h**
- Dry biomass **5 - 20 %-w**

Scalable plant concept, adaptable to any range of flows and biomasses, aimed to reach an optimized CAPEX/OPEX and syngas outcome

INDUSTRIAL APPLICATIONS

WASTE WATER TREATMENT

Sewage sludge valorization

DIGESTATES

From anaerobic digestion

AGRIFOOD

Processed vegatables

Fruit

Oil / Olive

ANIMAL MANURE

From intensive farming

BIODIESEL

Glycerol valorization

FOOD AND DRINKS

Wines / alcohols

Milk industry

CHEMICAL INDUSTRY

Thermoestables

Thermoplastics

PAPER INDUSTRY

Black liquor

Zero Opex

- Pays for itself
- Saves disposal costs
- Complete sewage sludge valorization
- Almost get a zero exploitation cost UWWTP

Zero Carbon Footprint

- Green Carbon-Neutral Renewable Natural Gas
- CO_2 removal for carbon negative footprint
- Contributing to UWWTP energy autonomy

ZeroSD

Zero Sludge Disposal UWWTP

Zero Waste Disposal

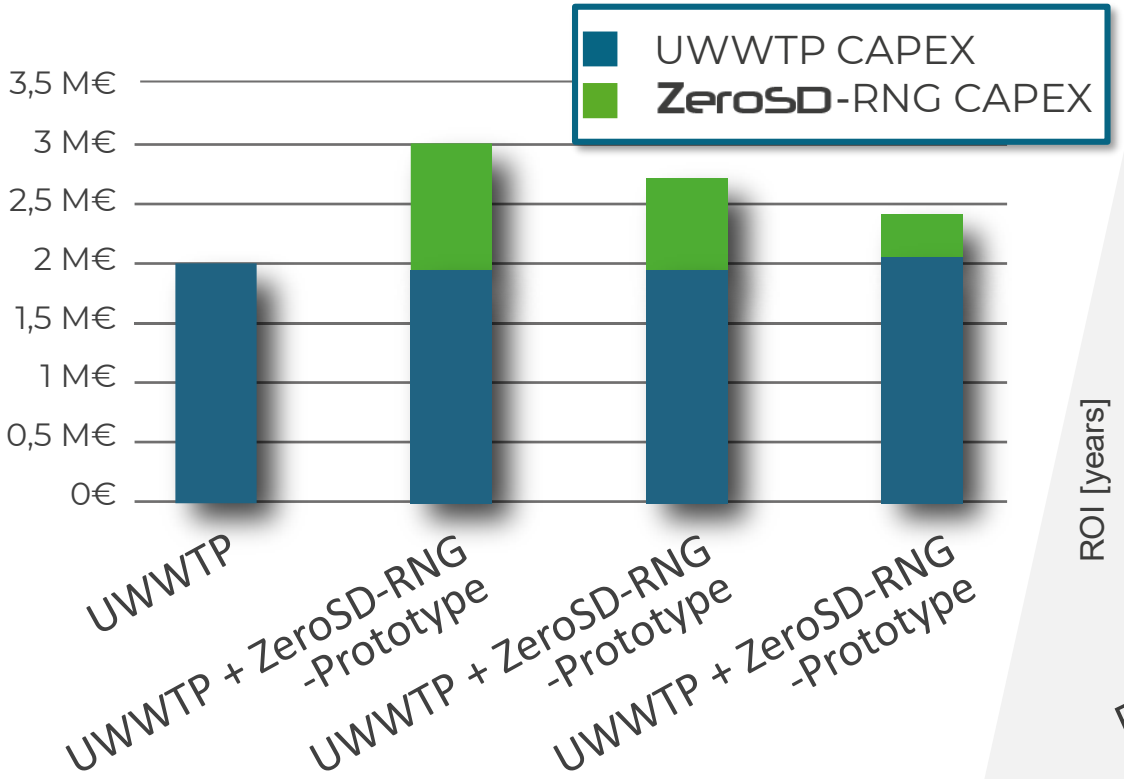
- Zero environmental impact
- Safe concentrated class-A fertilizer
- All pollutants eliminated: organic contaminants, CEC, PTE, pathogenic

Zero Water Discharge

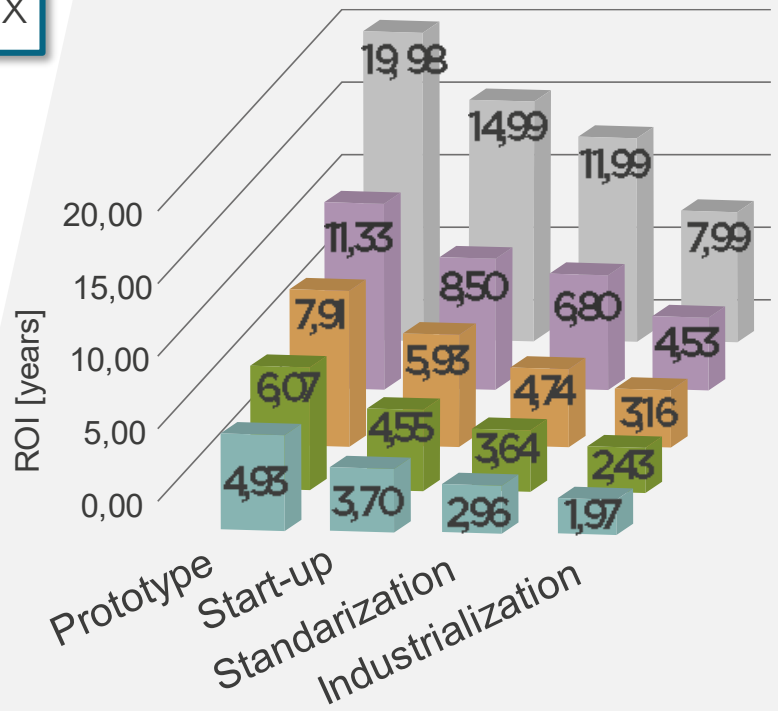
- Clean pure water recovery
- Contribution to UWWTP improvement by integration pack

FEASIBILITY ANALYSIS

ZeroSD-RNG 20% DM & 20K p.e. UWWTP CAPEX



ZeroSD-RNG 20K p.e. size - simple ROI



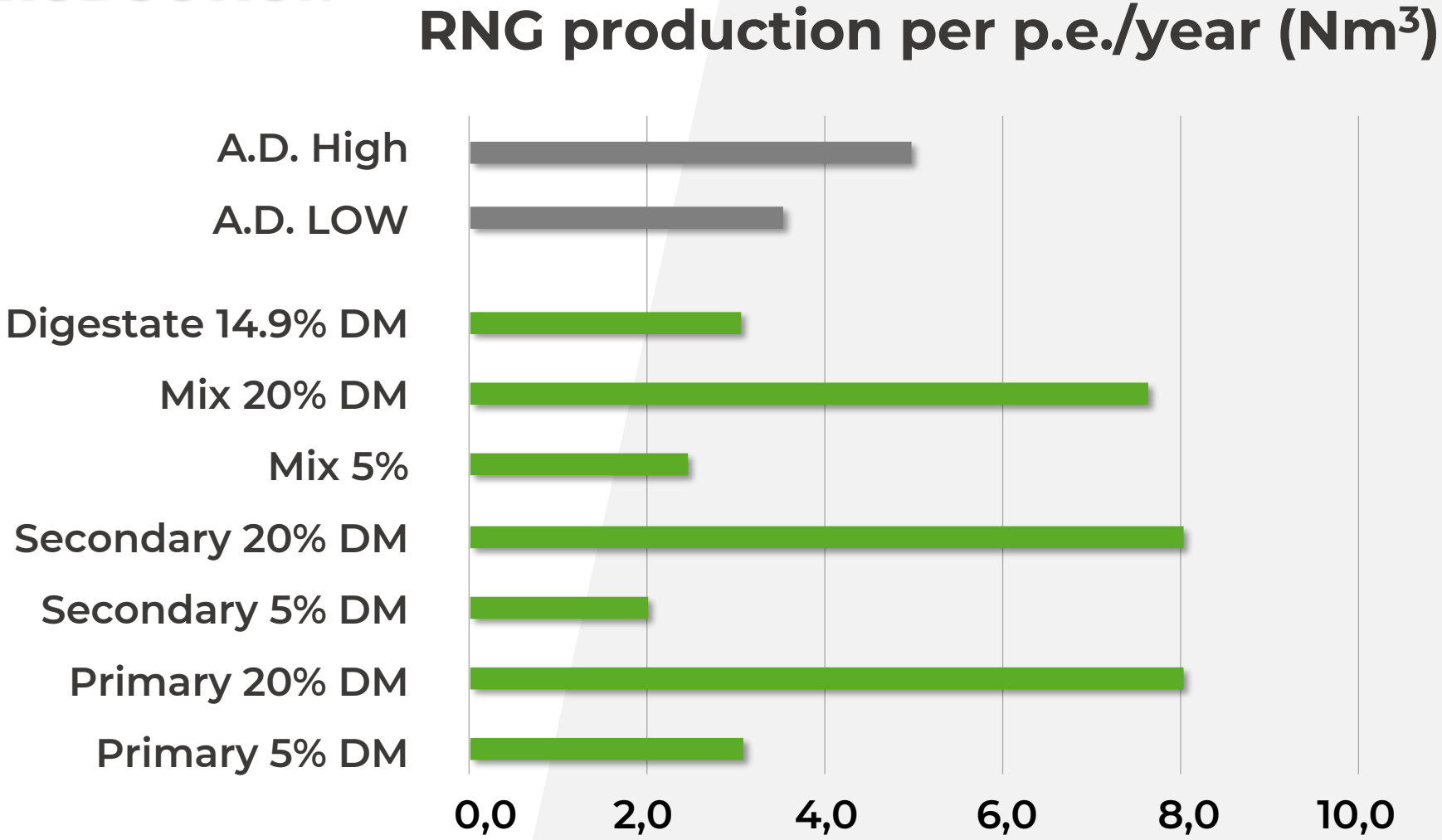
- 20€/ Sewage Sludge Tn
- 40€/ Sewage Sludge Tn
- 60€/ Sewage Sludge Tn
- 80€/ Sewage Sludge Tn
- 100€/ Sewage Sludge Tn

RNG Selling price: 0,04 €/kWh

ZeroSD-RNG O&M (electricity, personal, spares, reagent and spare parts): 37,024€/year

No subsidies considered

TECHNOLOGY ADVANTAGES AND RNG PRODUCTION



TECHNOLOGY ADVANTAGES AND RNG PRODUCTION

PROFIT

UWWTP

- Sewage Sludge Management

UWWTP + A.D.

- Biogas Generation
- Biogas Management

UWWTP + ZeroSD

- RNG
- Water recycling
- Nutrients (P,N) recovery

70 kWh/p.e.-year RNG Generation

4 kg/p.e.-year P, N Nutrient Recovery

96% Sewage Sludge Recovery

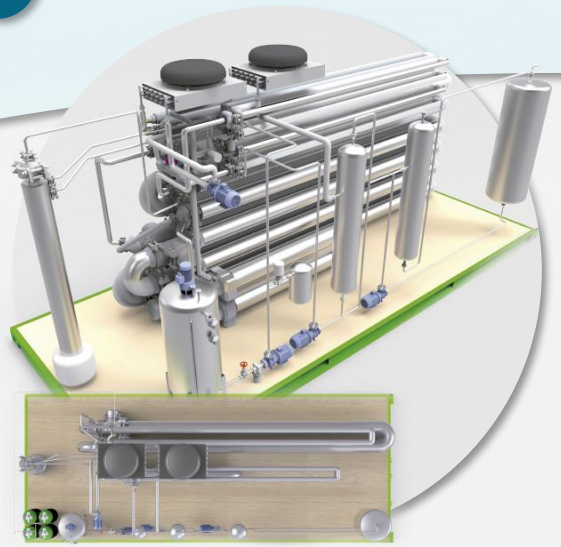
SUSTAINABILITY

FUTURE ACTIVITIES

2020 - Pilot Plant Gasification Experiments

2021 - Industrial Scale Pilot Plant

2022 - Industrial Scale Pilot Plant Operation



2023 - Industrial Plant Optimization

2024 - Industrial Plant Commercialization

INDUSTRIAL SCALE PILOT PLANT PROJECT

Project in consortium (Biomass producer, RNG stakeholders, R+D Institutes, Gas Purifying, etc.)

Installation in a real industry

2020 Project Definition

2021 Construction & Start-Up

100-1000 Tn/year Capacity

3-4 M€ Project Budget

EU or Business Angel funding

bio360 ReGen Europe Biogaz Europe BOIS ENERGIE Nantes 2020

LET'S TALK

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