ELEKTRA

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Project partners

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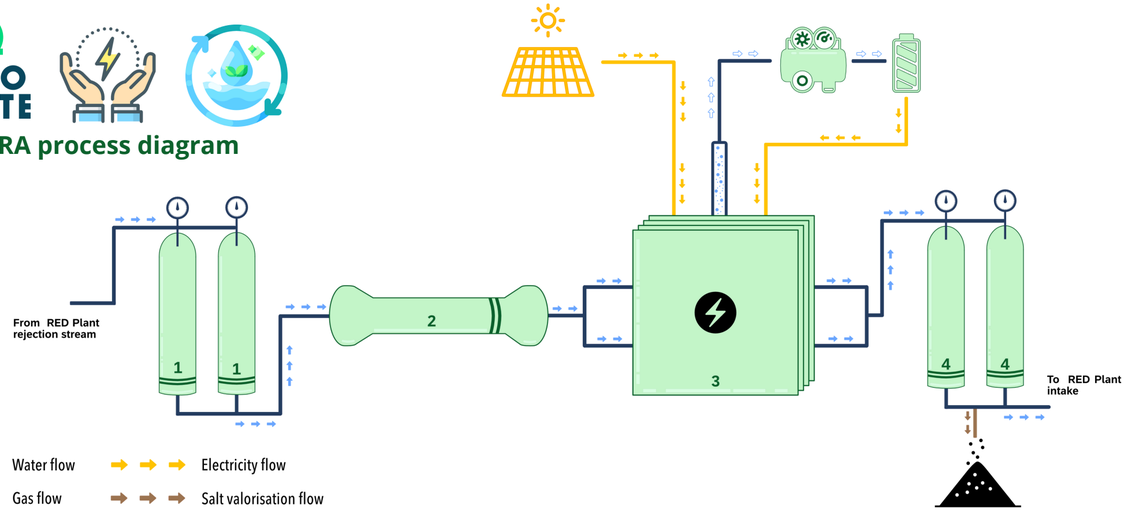
Circular economy applied to nitrate removal: hydrogen generation and waste valorization in drinking water.

ZERO WASTE

ELEKTRA process diagram



Bingemma pumping station where groundwater is extracted with a flow rate ranging from 18 to 38 m3/h, and a pressure ranging from 1.4 to 3.5 bar. The extracted water is intended for drinking water supply and usually has.

2 Reverse Electrodialysis Water Treatment Plants for nitrate elimination, coupled to Granular Activated Carbon filters for pesticide elimination, for the supply of 32,000 m3 of water per day, reaching productions of 40,000 m3 of water per day during the summer vacation season. Since the late 1980s, the concentration of nitrates in the surrounding aquifers has exceeded the maximum value of 50 mg/l established in Directive (EU) 2020/2184. The water to be treated comes from the reject stream of the reversible electrodialysis process.

Water for human consumption in La Aldea de San Nicolás comes from two sources, groundwater and desalinated seawater. For the period 2021-2027, total water demand for domestic use has been estimated at 0.4 Hm3 and for tourism at 0.015 Hm3. Their nitrate concentrations are well above the threshold value with an average of 247 mg/L. The origin of these pressures is diffuse pollution generated by agriculture and urban development due to discharges not connected to sanitation networks.

What does the LIFE Elektra project propose?

Develop a tandem prototype to treat streams with high nitrate concentrations by transforming nitrates into nitrogen gas.

Valorize waste from the pre- and post-conditioning stages of water treatment, aiming at Zero Liquid Discharge.

Hybridize energy by using high purity hydrogen gas from the denitrification process in a fuel cell and integrating solar photovoltaic energy.

Contribute to adapt water treatments to ecological processes for high nitrate concentrations.

Monitor and evaluate the environmental, social and economic impacts of the project through a comprehensive LCA, LCC and S-LCA analysis.

Which are the KPIs of LIFE Elektra?

Zero Liquid Discharge Goal: 15% of water waste (1.5% rejection of RED treatment process).

Recovery of 8.5% of the total water currently discharged to the sewer system.

Contribution to the Energy Efficiency Directive 2018/2002 by means of energy hybridization, and minimizing its use.

What are the benefits of LIFE Elektra?

SO1: Tandem Prototype Development: Validate a tandem ion exchange/osmosis/electrochemical denitrification tandem prototype for the treatment of streams with high nitrate concentrations. Transform nitrates into nitrogen gas, releasing it into the atmosphere without environmental impact.

SO2: Waste Valorization: Valorize the waste produced during the pre- and post-conditioning stages of electrochemical denitrification water. Zero Liquid Discharge Target, with an expected water residue of 15%, contributing to the recovery of 8.5% of the total water discharged to the sewage system.

SO3: Energy hybridization: uses high purity hydrogen gas from the denitrification process to power a fuel cell. Integrate solar photovoltaic energy.

For more information, visit ELEKTRA's website, and its social media sites.

elektralifeproject.eu · ELEKTRA LIFE EU · @ElektraLifeEu

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