



Sustainable Peri-Urban framework
for Climate Neutral development

SOLUTIONS PROVIDER

Optimized Treatment and Reuse of Membrane Reject Streams from Treated Wastewater for PtX Ultrapure Water Production and Sustainable Crop Irrigation



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General Information

Solution Name

Optimized Treatment and Reuse of Membrane Reject Streams from Treated Wastewater for PtX Ultrapure Water Production and Sustainable Crop Irrigation

Solution Type

Technical hardware

Solution Owner

Ultraaqua A/S

TRL Level

4 - 7

Challenge solved

Target Pain Point

Power-to-X and other sustainable energy technologies require large volumes of high-quality water for ultrapure water production, but freshwater resources are increasingly limited. Treated municipal wastewater could provide an alternative source, yet the membrane reject streams generated during ultrapure water production contain concentrated micropollutants, PFAS and pathogens that currently limit safe reuse, regulatory compliance, and circular water management. The key challenge is therefore to develop a cost-effective treatment solution that can remove critical contaminants from these reject streams while enabling their potential reuse, for example in agricultural irrigation, without compromising environmental or public health requirements.



The Innovation

Core Functionality

- Targeted treatment of membrane reject streams from ultrapure water production using treated municipal wastewater as the feed source.
- Removal of critical contaminants, including micropollutants, PFAS, and pathogens, through ozonation, adsorption technologies, UV disinfection, and integrated bubble fractionation with UV destruction.
- Laboratory-scale testing followed by pilot-scale validation at the Port of Aalborg test and demonstration site using locally treated municipal wastewater.
- Resource recovery and reuse assessment, including evaluation of the treated reject stream for agricultural irrigation based on nutrient content, water quality, and regulatory requirements.

Beyond State of the Art

The solution is unique because no established treatment concept currently exists for reject streams from ultrapure water production using treated municipal wastewater. It targets the concentrated side stream rather than the full water flow, enabling more efficient removal of micropollutants, PFAS, and pathogens. At the same time, it explores reuse of the treated reject stream for agricultural irrigation, supporting both sustainable energy production and circular water use.



User value - Benefits

01

Enables sustainable ultrapure water production by using treated municipal wastewater instead of scarce freshwater resources

02

Reduces environmental impact by removing concentrated micropollutants, PFAS, and pathogens from membrane reject streams.

03

Supports circular water reuse by assessing the treated reject stream for agricultural irrigation and nutrient recovery.

04

Improves regulatory readiness by aligning treatment and reuse concepts with current EU wastewater and water reuse requirements.

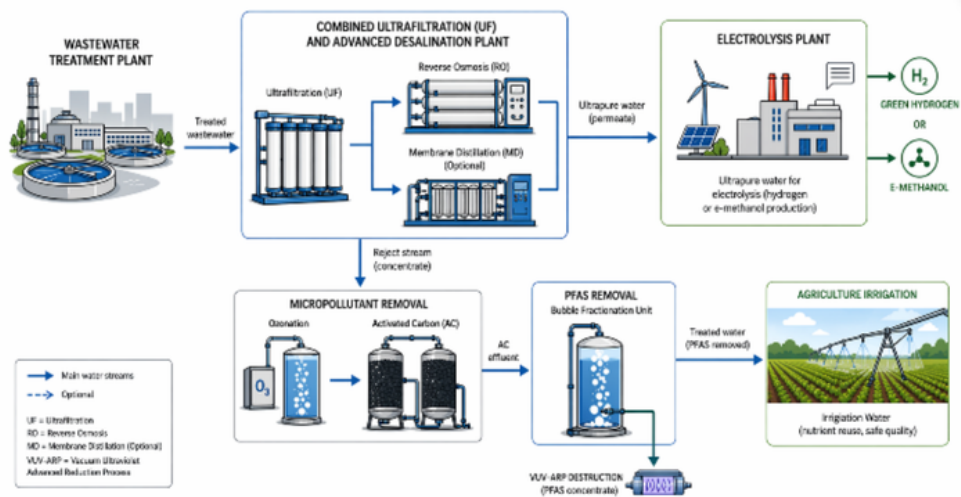
Implementation and validation

Living Lab

Living Lab 2: Aalborg, Denmark

Replication Potential

The Tulcea Port was selected as the replication site for the LL2 solution



SPURUP

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