NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

Nanyang Environment and Water Research Institute

Innovative Integration Of Bipolar Membrane Electrodialysis (BMED) Into Seawater Desalination Plants For Decarbonization, Resource Recovery, And Low-energy, Low-chemical Desalination

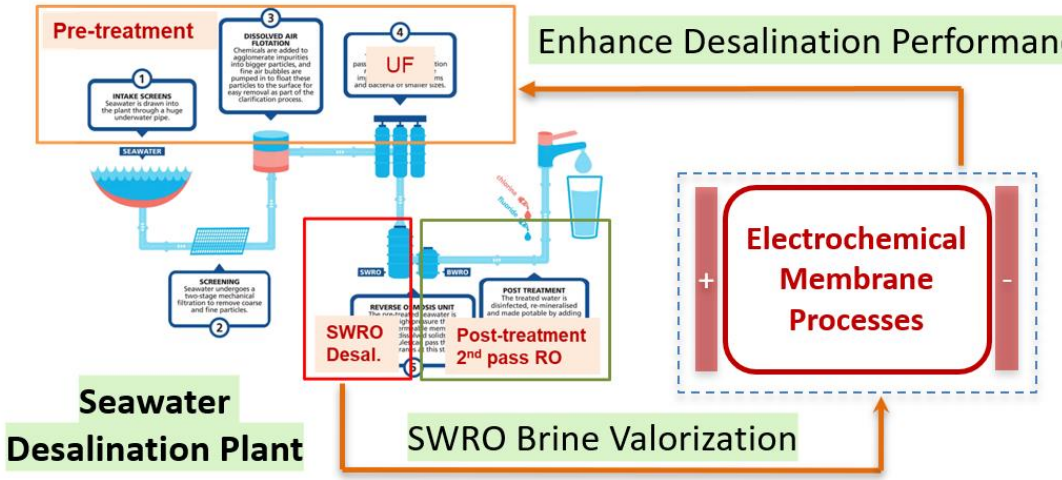
Abstract:

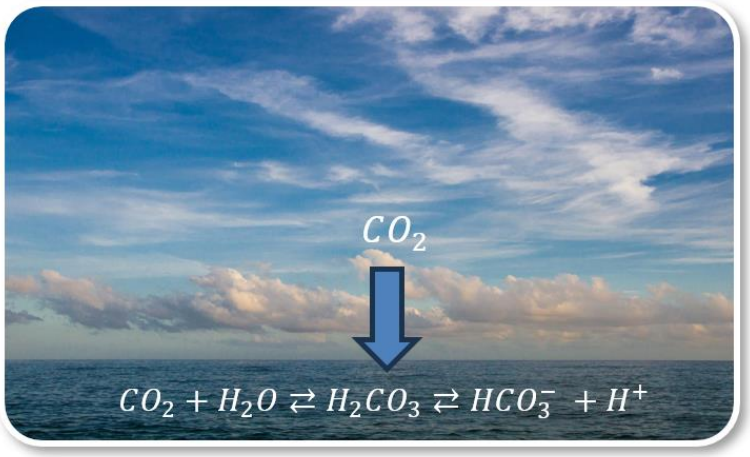
Seawater desalination is an energy-intensive process, contributing significantly to carbon emissions.

On the other hand, seawater can act as a large carbon sink to absorb CO_2 for storage. In this project we propose to develop an innovative system via integrating bipolar membrane electrodialysis (BMED) into seawater reverse osmosis (SWRO) desalination plants to valorize waste SWRO brine for producing chemicals (i.e., acid and base) that can be strategically used for decarbonization and simultaneously reducing both energy and chemical consumptions during desalination. Innovative electrochemically assisted membrane processes will also be integrated into the desalination plants to enhance seawater pre-treatment and desalination performance. Both laboratory and pilot-scale studies will be performed to optimize and demonstrate the proposed BMED-integrated system.

It is expected that that the proposed system and method can help achieve carbon-neutral seawater desalination. The proposed system can potentially further achieve carbon-negative, low-energy and low-chemical desalination, as well as resource recovery.

The success of this project will help Singapore significantly reduce its carbon footprint in water industry and enhance its resource resilience, placing Singapore as a leader in developing and implementing innovative seawater desalination, decarbonization, and resource recovery technologies.



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Objective: **Integrate decarbonization processes into SWRO desalination plants toward carbon-neutral seawater desalination**