

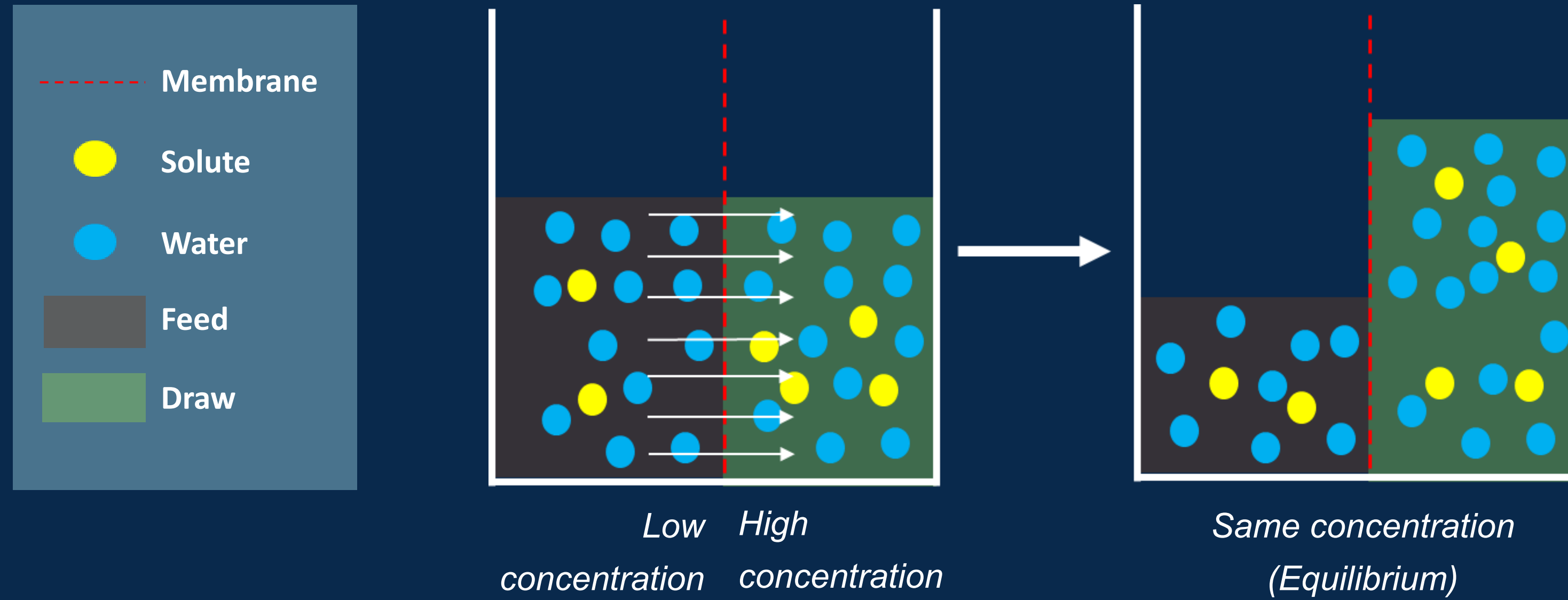
Forward osmosis membrane technology: An enabler for sustainable and resilient water production

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What is forward osmosis?



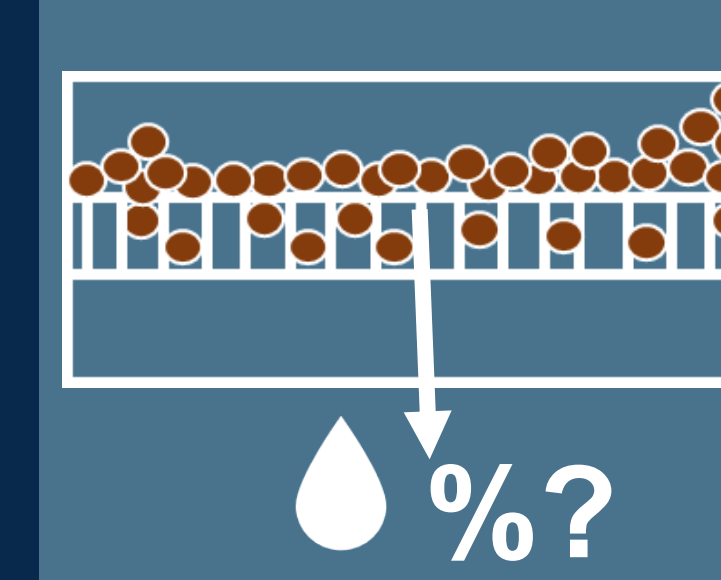
Project Aim and Outcomes:

To advance forward osmosis as a competitive solution for water reclamation through characterization of separation principles and system design

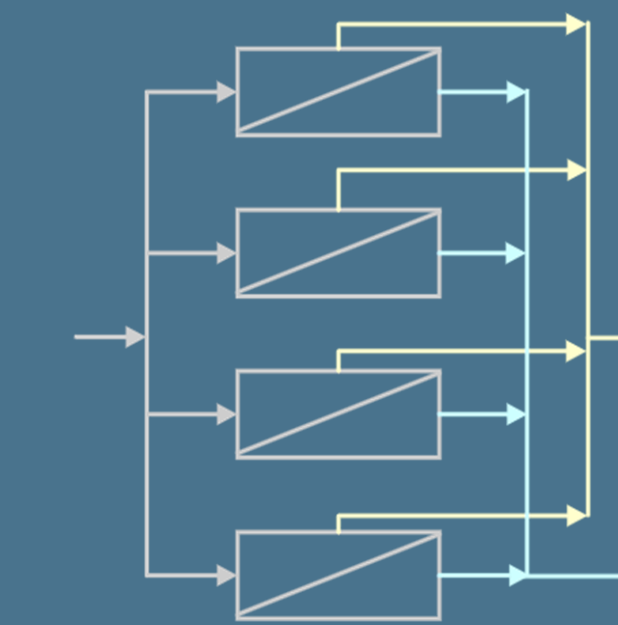
Market gap and application?



Membrane fouling and water recovery?



Array Design and Configuration?



Whole life cost? (environmental and economical)



Forward osmosis system and challenges

Feed Water Quality

Different feed waters have different characteristics that will impact operational and treatment performance.

Membrane fouling

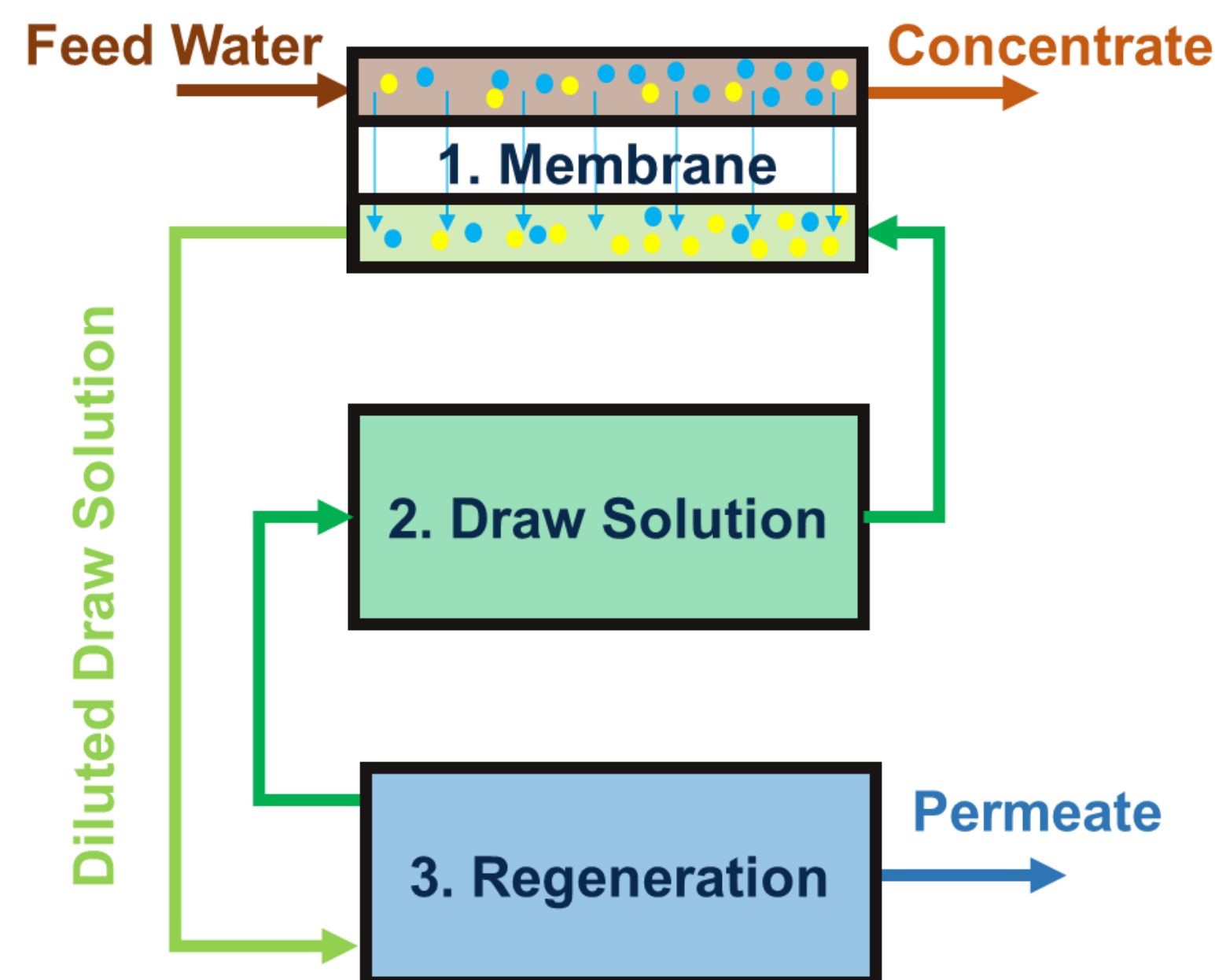
Unwanted impurities sticking to the membrane slowing down the filtration process or causing contamination.

Array Configuration

Setup of multiple forward osmosis unit dictates performance of system.

Energy requirement

Regeneration step is energy intensive



Concentrated Brines

Environmental challenges from high saline concentrate

Low Water Flux

Reduced flow of water passing through the membrane.

Reverse Solute Flux

Solute from the draw solution passing to the feed solution.

Permeate Quality

Ensuring required water quality for application requirement

Market Gap and Application

Water Quality and Volume Reduction

High water quality required for industries like hydrogen (conductivity <math><5\mu\text{cm}</math>). Application for volume reduction to reduce water wastage.

Direct potable re-use schemes

Waste-water treated to drinking quality state without any environmental buffer, aids water scarce areas with their water requirement.

Used in place of energy intensive water treatment systems

Pressure driven (reverse osmosis) and thermal (multi-stage distillation) treatment process require high energy input for water filtration.

Waste heat from industrial process for regeneration

Low grade waste heat can be used to separate draw solute and water.

Potential of resource recovery (water, salts and metals)

The concentrate produced has potential for extraction of useful resources depending on the feed water selected.

Hybrid/ synergistic application with existing system

Use alongside existing technologies like reverse osmosis and membrane distillation.