



Hawaii Solar Desalination Project

*Cost Effective Sea Water Desalination using Solar
Thermal Energy Driven Forward Osmosis Process*

September 21, 2018

Team Members:

**Natural Energy Laboratory
of Hawaii Authority**

Trevi Systems, Inc.

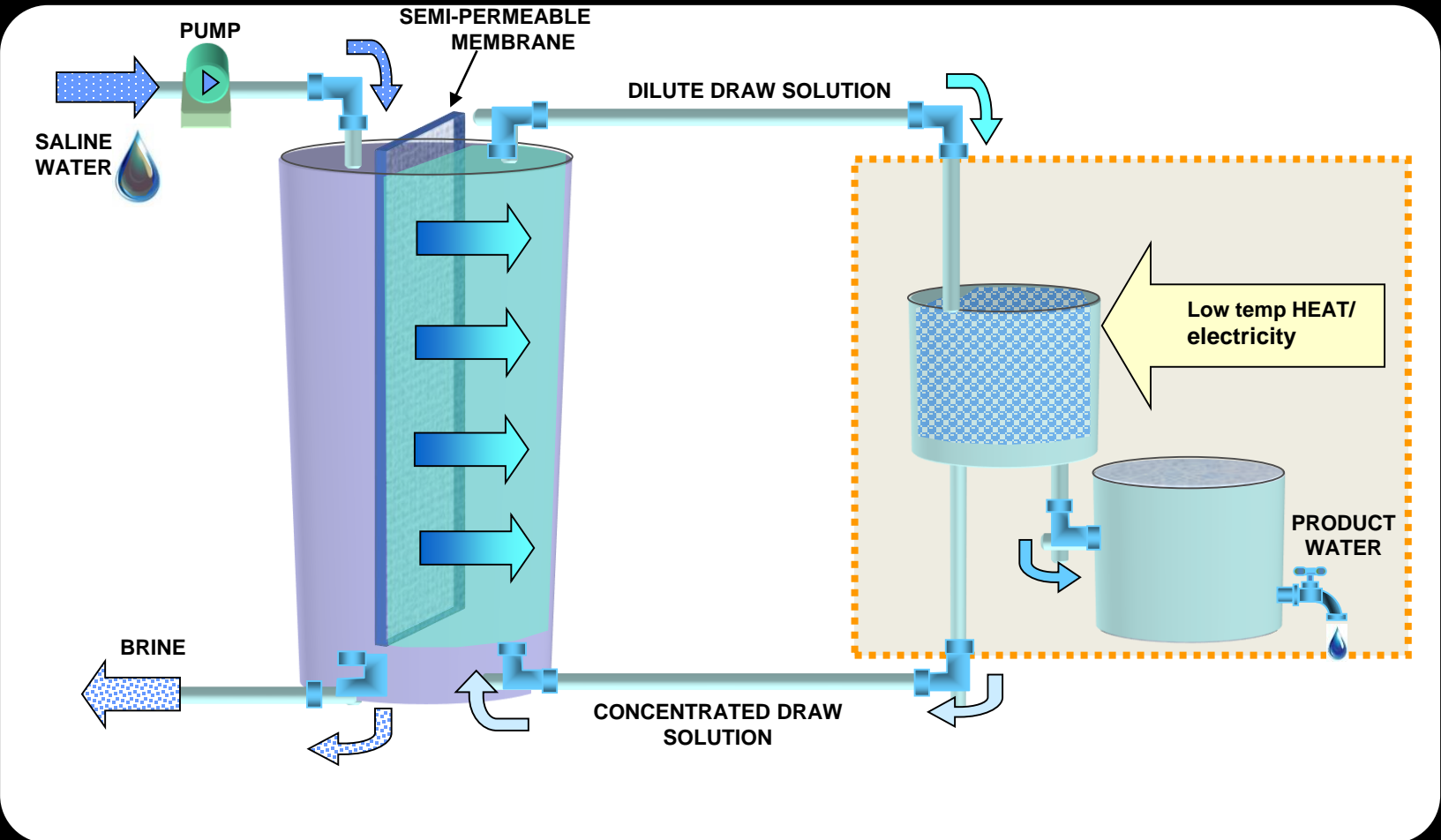
Cyanotech Corporation

Hawaii First Water, LLC

US DOE



FO Overview



Water Options for Hawaii Island

Desalination:

At Hawaii electrical utility rates - 30c/kWh (and tracks with the cost of oil)

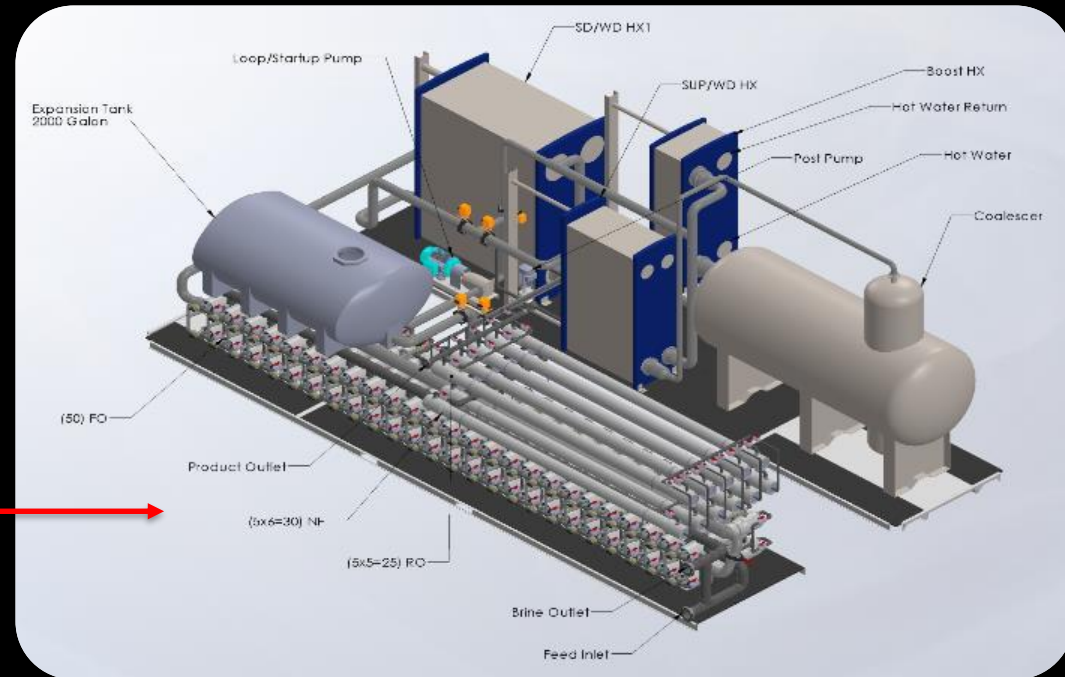
Energy cost

- RO \$1.11/m³ @ (3.7kWh_e)
 - MED \$1.10/m³ @ (65kWh_{t*} and 1.5kWh_e)
 - FO \$0.60/m³ @ (30kWh_{t*} and 1.0kWh_e)
- *Both MED and FO need a source of low temperature heat in addition to the electrical energy.*

Trevi's Solar FO System in Hawaii

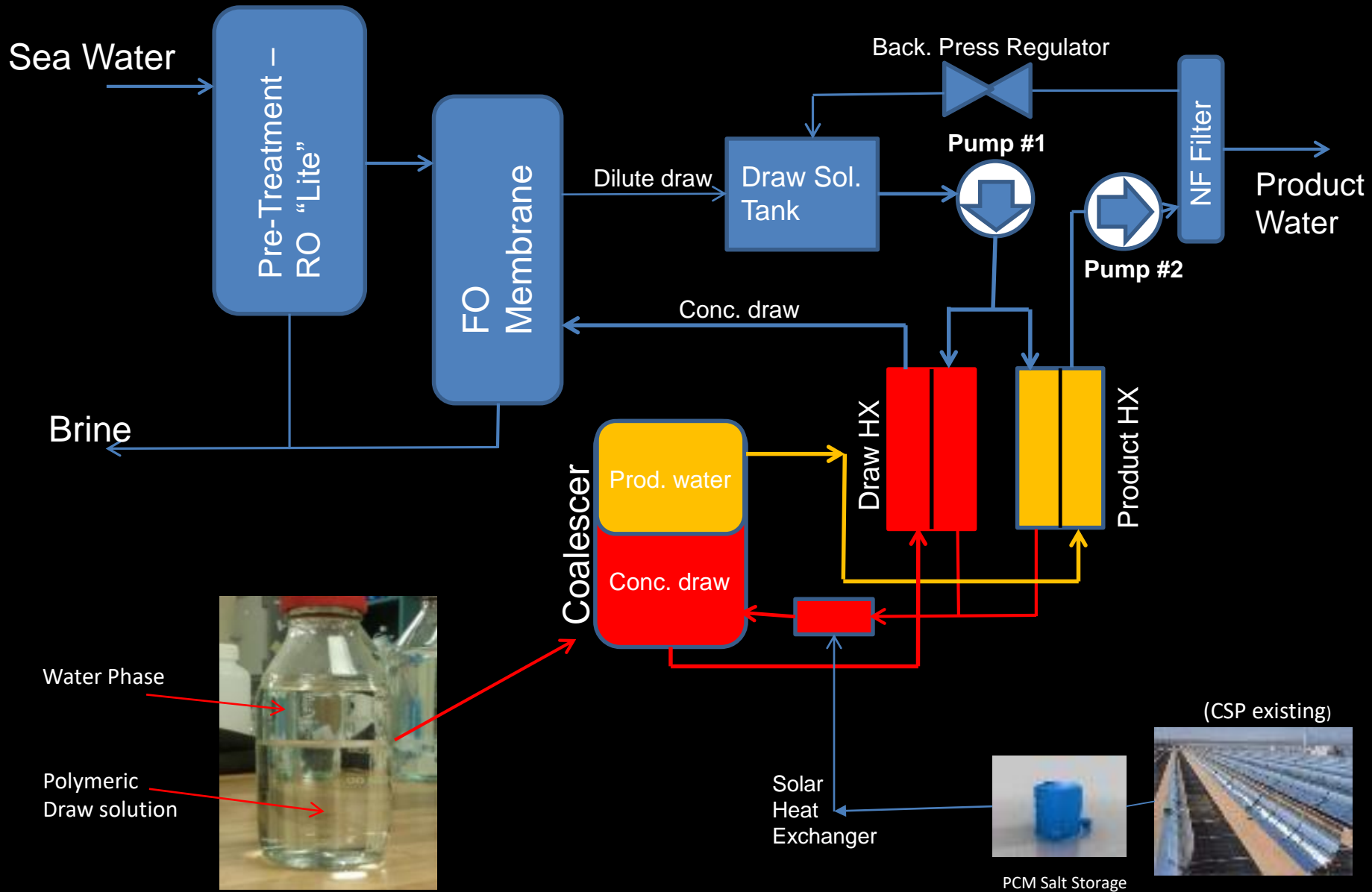


Energy Storage Tank



500m³/day FO System

FO Desalination Components at NELHA



Water Phase

Polymeric Draw solution



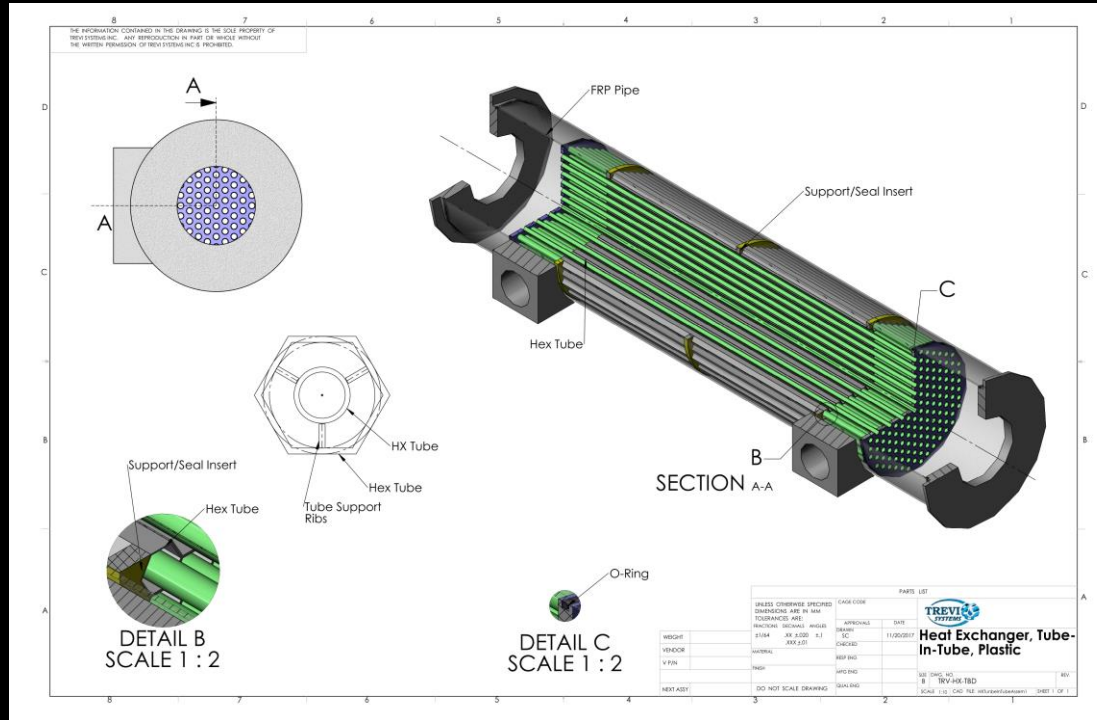
Solar Heat Exchanger



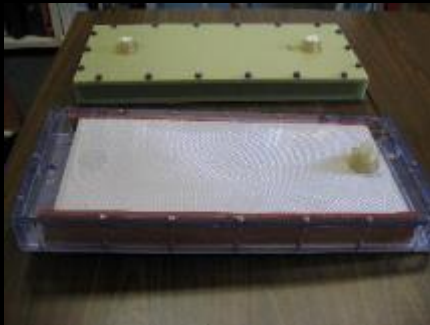
PCM Salt Storage



Plastic Heat Exchanger Fabrication



3D CAD of proposed tube-in-tube design



Trevi's Plastic Plate and Frame heat exchangers



Trevi developed Spiral Wound plastic HX

- The unique phase change characteristics of its draw solution require a non-traditional heat exchanger design.

Masdar 2 container 50m3/day Pilot (Outside Dubai)



FO membranes, Pre-treatment and Heat recovery HX



CEO J Webley, CSO G Carmignani and Field Te.ch at Masdar



Biological Fouling at Masdar Trial



Coalescer and loop pump



Kuwait 10m³/day System



US Navy 10m³/day System



Saudi 10m³/day Systems



1m³/day Test System

Hybrid Power and Water Plants



LFR Array



PCM Salt

Low Temp.
Heat to FO
Plant

Water

Hi Temp heat
for
dispatchable
power gen.

Grid
Baseload



PV Array

Battery or
flow
storage

Peak Power
Demand