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# Zero Liquid Discharge Water Desalination Process Using Humidification-Dehumidification in a Thermally-Actuated Transport Reactor

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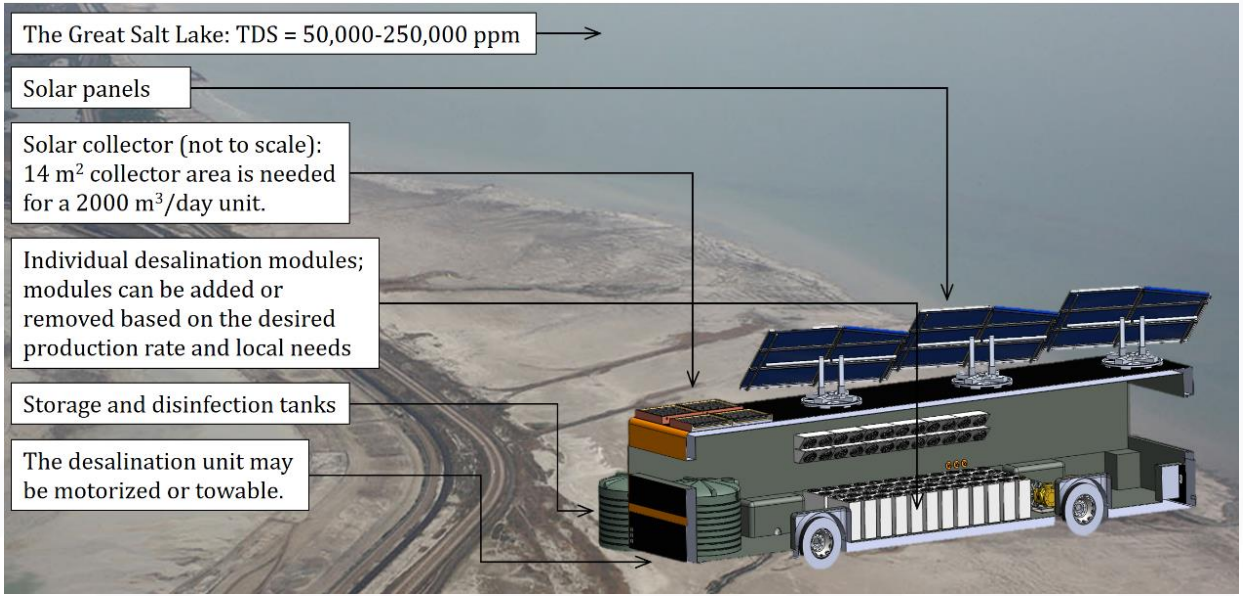
# Key Technical Challenge

- Desalination can be expensive and inefficient:
  - Multi-billion dollar projects.
  - 3-5X the minimum thermodynamic energy of separation.

1. **Electricity**: Most efficient desalination plants require large electrical energy.
2. **Mobility**: Desalination plants are very large and immobile in order to reach acceptable efficiencies.
3. **Environmental consideration**: Brine byproduct may be environmentally damaging and increases the operating cost.

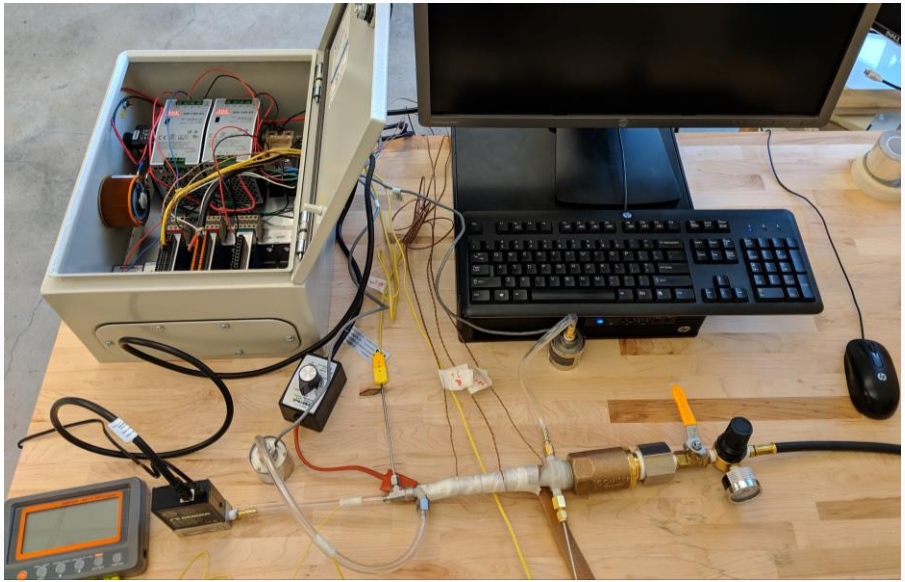
# Approach

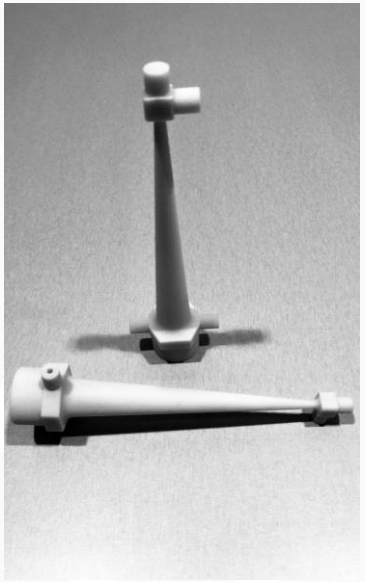
- Small-scale, portable, modular, thermally-actuated water humidification-dehumidification desalination plant
- 10 kg/hr zero liquid discharge (ZLD) desalination module for 100,000 ppm source water



# Approach

- Thermally actuated nozzles
- No membranes
- Extensive heat recuperation
- Patent application is in preparation





# Impact

- Specific energy consumption will be 54 $kWh_{th}/m^3$ (2.8*X* minimum thermodynamic energy
- $\$1.52/m^3$ levelized cost of water.
- A town of 7,000 people could have water security for 25 years, for 30.4 million dollars using this desalination technology.