

Study C

Find when recovered heat earns its place

Which qualified membrane and source/sink conditions can deliver the same useful water and cooling service at a lower whole-system burden?

Comparative validation and operating-envelope research. This is a proposed study; no result or novelty is established.

What earlier work establishes

Waste-heat desalination and Janus membrane architectures are established. Combined oil/surfactant exposure also appears in later public research; it is not by itself an originality claim.

The proposed difference

Measure the boundary at which a material's stability, absolute throughput, cleaning burden and cooling demand change the preferred process.

A fair comparison

Qualified conventional MD material

Best feasible electric treatment plus equal cooling service

The decision

Accepted water and equal cooling service with absolute flux, maintenance, heat and electricity separately accounted.

Planned scope

48 material screens, 72 equal-service comparisons and six 30-cycle endurance campaigns; 972 principal panels.

Before confirmation

Use a measured source/sink envelope, available qualified specimens and a question beyond repeating established material performance.

Funding basis

18 funded months. Preliminary standalone estimate: lower \$2,275,358, base \$2,686,825, higher \$3,525,225. All studies use the same rates and cost rules, including founder coordination, scientific staff, analyses, equipment, institutional costs and reserve. These are unquoted planning estimates; shared execution requires an itemized combined scope.

Methods and source review

Complete methods and reading limits · Editable unified budget

N13: US20190233305A1: Using waste heat from a data center cooling system to facilitate low-temperature desalination

N14: Chen et al., Experimental study of a membrane distillation desalination system based on CPU waste heat

N15: Malaguti et al., Waste heat won't make membrane distillation cool: Thermodynamic analysis of cooling and pumping burdens

N24: Alfa Laval AQUA fresh-water generator, operating principle and installation

S24: Novel Janus Membrane for Membrane Distillation with Simultaneous Fouling and Wetting Resistance

N34: Ma et al., Hydrogel modified evaporation interface for highly stable membrane distillation

S09: Waste heat won't make membrane distillation cool: Thermodynamic analysis of cooling and pumping burdens

S22: Analysis of energy, water, land and cost implications of zero and minimal liquid discharge desalination technologies