<h1>SunShare Connect(TM) - Patents and IP</h1>

<h2>Strategic IP Domains</h2>

SunShare Connect(TM) will establish a hybrid IP portfolio combining utility patents, provisional filings, defensive publications, and modular open-source components.

We will protect core innovations across five verticals:

<h3>1. Thermal-Optical Microchannel Arrays</h3>

Patent Priority: Utility + International PCT
Claims Include:
- Integrated PV-microchannel panel with dual-phase energy capture
- Liquid-immersed optical structures for refractive beam steering
- Spectral-splitting fluid layers for wavelength-selective thermal harvesting
- Corrugated microchannel architecture for passive glare reduction

<h3>2. Desalination + Water Recovery Modules</h3>

Patent Priority: Utility (with modular retrofit claims)
Claims Include:
- Direct-contact membrane distillation (DCMD) integrated into PV panels
- Capillary-fed distillation layers using textured titanium
- Brine management systems using crystallizer synergy with thermal microchannels

- Thermosiphon loop heat reuse for off-grid water production

<h3>3. Environmental Resilience Layers</h3>

Patent Priority: Utility + Defensive Disclosure

Claims Include:

- Self-healing elastomer layers for hail and UV protection

- Ultrasound-integrated headers to mitigate biofouling in microchannels

- Freeze-resilient glycol-nanofluid circuits with ePTFE anti-leak membranes

<h3>4. Adaptive Optics & Smart Materials</h3>

Patent Priority: Provisional + Research Collaboration Licenses

Claims Include:

- Electrowetting-controlled fluid prisms for beam steering

- Dynamic glare-adaptive channel depths for angular light redirection

- Upconverting nanoparticle-infused liquids for infrared-to-visible light conversion

<h3>5. Modular Deployment & Retrofits</h3>

Patent Priority: Utility + Open Design Standard

Claims Include:

- 3030 cm modular microchannel tile design compatible with legacy PV racking

- 3D-printed microfluidic panel backplates for low-cost prototyping

- Self-cleaning coatings with electrostatic particulate removal

<h2>Target Environments & Use Cases</h2>

| Environment | Technology Pairing | IP Focus |

|---|---|---|

| Coastal | PV-MD + Electrodialysis | Freshwater yield optimization |

| Arid Desert | CPV/T + Multi-Effect Distillation (MED) | Optical + thermal integration |

| High Humidity | Atmospheric Water Harvesting + PVT | Water yield from AWG systems |

| Urban Glare | Glare-Adaptive Microchannels + Liquid Prisms | Visual compliance + optics |

<h2>Economic Edge & Patentable Advantages</h2>

Efficiency Gains: 13-17.45% PV output boost + thermal capture + desalination

Payback Periods: 3.8 years (retrofit), 6.2 years (integrated PVT-MD systems)

Manufacturing Innovation: Sub-100m 3D-printed fluidics reduce costs by 50%

Unmet Need: No standardized retrofit kits for framed solar modules exist

<h2>2025-2026 Pilot Deployment Timeline</h2>

| Phase | Location | Tech Stack | Objective |

|---|---|---|---|

| Alpha | Atacama, Chile | CPV + MED + Graphene-Coated Microfluidics | Test brine recycling loop |

| Beta | UAE (coastal) | Solar MD + Crystallizer Integration | Maximize freshwater recovery |

| Gamma | Singapore | AWG + Adaptive Optics + Modular Tiles | Humidity capture + light steer|

<h2>Next Steps</h2>

 Draft USPTO provisional filings for:

Multi-functional microchannel PV panel architecture

Optical prism integration for passive beam steering

Fluid-looped brine concentration in thermal desalination systems

 File defensive publications on:

3D-printed microfluidic templates

Capillary wickless distillation geometries

Nanofluid-based cooling for PV efficiency and freeze mitigation

 Publish open standards for modular microchannel tile interconnects and system integration kits.

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IP Guidance Provided by: Sage