



## SELF-POWERED SOLAR WATER HEATER

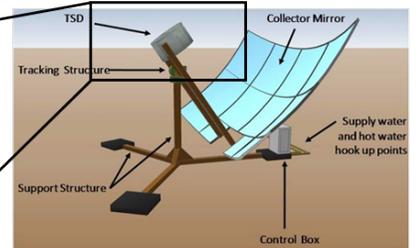
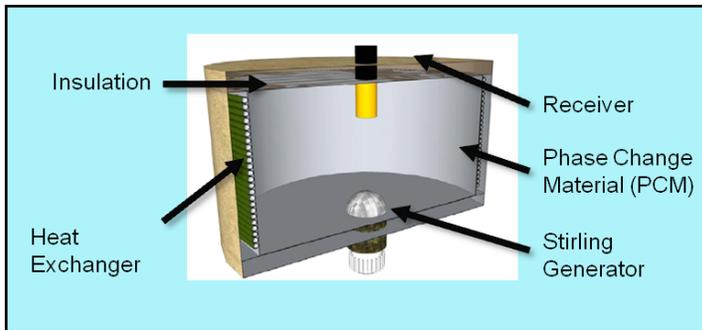
### PURPOSE:

The military has a mandated need to reduce water, fuel, and waste for both maneuver sustainment and contingency basing. Systems and processes that can use alternative energy are needed to reduce fuel consumption and take resupply trucks off the road, and out of harm's way. Field kitchens and sanitation centers, as well as showers, latrines, and laundry facilities, require several hundred gallons of hot water each day. Water supplied to these systems can be heated (and pumped) with solar energy instead of JP8 fired burners which would reduce fuel consumption that is associated with Military field food service operations.

### TECHNOLOGY:

The Self-Powered Solar Water Heater (SSWH) program is seeking a lightweight, low cost, mobile, solar powered component for heating/pumping water. The small-scale SSWH has been designed to include thermal/electric collectors to generate 200 watts of power for a 5 gpm pump, and provide 50 gallons of hot water (40,000 BTU) storage.

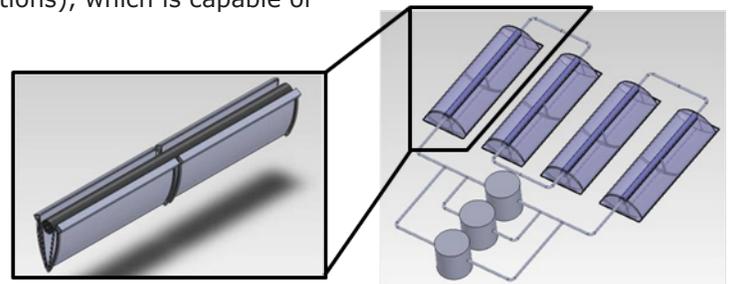
Three innovative solar energy concentrating technologies are currently being pursued including thermal storage technology from Thermal Storage Systems (TSS), a folding solar array from DaVin Engineering Corporation (DaVin), and commercial panel systems.



**THERMAL STORAGE DEVICE (TSD) - TSS**

TSS is developing a system that utilizes a Thermal Storage Device (TSD), a device in which cartridges provide high density metal-based heat storage. The design is based upon a novel tracking collector array that offers high quality heat storage within an exceptionally compact configuration (two 7½ x 7½ - foot segments, each consisting of nine 45 x 45 - inch primary panel sections), which is capable of providing heat for an extended period of time.

DaVin is developing a system that utilizes a folding solar array. The tracking parabolic collectors consist of a novel folding, solar-concentrating aluminum trough with an ethylene tetrafluoroethylene (EFTE) cover to provide an ultra-lightweight, robust, modular configuration.



**FOLDING TROUGH DESIGN - DAVIN**

Commercially available solar photovoltaic/thermal systems generally lack needed efficiency, modularity and reliability. However, some commercial systems are being reviewed. One is an unsolicited proposal for a system from 101Celcius MCPC-21 and another is the Office of Naval Research (ONR) Ground Renewable Expeditionary Energy System (GREENS) photovoltaic (PV) power system. Other technologies being tested are Heliodyne Gobi 406 rigid, high-durability, lightweight solar collectors, flexible PV array collectors from FTL Solar, and UniSolar PVL-136 flexible solar laminate panels.



**FLEXIBLE PV ARRAY COLLECTOR - UNISOLAR**

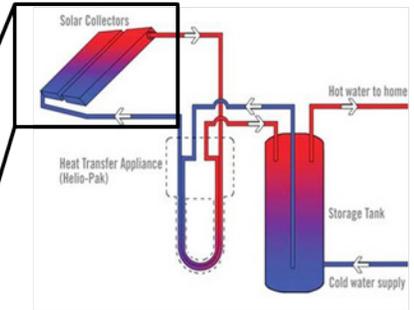
**UNCLASSIFIED**



These three technologies provide power generation to drive an integral pump. Also included in the system will be an electrical storage system to support constant power availability (1000 w-hour 24vDC power storage).

**APPLICATION AND BENEFITS:**

The SSWH systems are being designed for supporting organizational systems at Forward Operating Bases (FOB) with the first generation prototypes being sized for the Food Sanitation Center (FSC). The fully packaged system will be fully contained within a TRICON 8x8x6.5 foot container and all of the components will be man-portable (configured within the 147-pound MIL-STD-1472 4-person "lift and carry" limit) to maximize portability and modularity. The thermal/electricity collectors will be capable of heating and storing 40,000 BTU of hot water (raising the temperature of 50 gallons of water by 100°F) and generating and storing 1000 watt-hours of electricity at 24vDC.



**HELIODYNE SOLAR SYSTEM & GOBI SOLAR COLLECTOR**

**TECHNOLOGY TRANSITION:**

Testing of the commercial alternatives has begun along with simultaneous efforts to complete development and fabricate full-scale demonstrational prototypes under TSS and DaVin's SBIR contracts. Following acceptable performance demonstration of a fully functional system meeting the exit criteria of a Technology Transition Agreement (TTA), the SSWH will be transitioned by the Equipment & Energy Technology Team (EETT) to PM Force Sustainment Systems, Force Provider and the Systems Equipment and Engineering Team (SEET) for Engineering and Manufacturing Development for applications in Force Provider, the Food Sanitation Center and Field Kitchens. This technology will also be able to transition to other Military applications, such as the Air Force Containerized Single-Pallet Expeditionary Kitchen (CSPEK).

<b>PERFORMANCE METRICS</b>			
<b>MEASURE</b>	<b>CURRENT STATUS</b>	<b>EFFORT OBJECTIVE</b>	<b>CUSTOMER/ SERVICE OBJECTIVE</b>
<b>Heat Water</b>	Modern Burner Unit (MBU)	Self-powered Solar Water Heater (SSWH)	Modular, portable water heater
<b>Hot Water Storage</b>	0	50 gal @ Δ100°F (40,000 BTU)	50 gal @ Δ100°F (40,000 BTU)
<b>Fuel Consumption</b>	7 gal/day	3 gal/day	3 gal/day
<b>Power Storage</b>	0	1,000 W-hrs	1,000 W-hrs
<b>Portability</b>	2-man	2-man	4-man
<b>Cube</b>	FSC	TRICON	TRICON

**POINT OF CONTACT:**

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