Joint Service Power Expo 2011

Jadoo Power Systems, Inc

Forward Deployable Renewable Energy

Ken Pearson, President and COO

more power. more possibilities.™

Jadoo Military Projects

Fuel Cell and Energy Storage Examples

PEPSAE

CCAT & Medical Evacuation

Unmanned Aerial Vehicles

Mako **Tiger Shark**

Delta II

Field Radio

PPS / G50
Wearable Power

Dry Chemical Hydride Hydrogen Storage

UGS Power

ODIS Unmanned Ground Vehicle

PEPSAE Product Platform

PEPSAE (Aero-Med Transport)

DC Voltage: 12 V / 120V nominal
DC Power: 150 W continuous/ 330 W peak
Energy: 1080 W-hrs. (N-Stor 360)
Weight: 35 lbs. (with fuel)
Dimensions: 16” x 4.8” x 10.5”
Exhaust: warm air vapor
Start-up time: <2 seconds
Safe to Fly

PEPSAE powering all medical devices:

DC Power: 150 W continuous/ 330 W peak
AC Voltage: 120 V nominal (2Connections)
AC Power: 150 W continuous/ 330 W peak
Weight: 5 lbs.
Dimensions: 3” x 4” x 12”

Sweet of Medical Equipment power by PEPSAE

DEVICE	Power Source	Average Current (A)	Peak Current (A)*	Voltage (V)	Average Power (W)	Peak Power (W)	Energy (Whr) for 1 hour
Propaq Monitor 260EL	DC						
NIBP q10 min, Pulse oximetry		1.08	2.2	14.008	15.07	20.9	15.09
Impact 326M Suction Pump	DC						
Continuous, Max vacuum		3.02	6.3	13.92	42.04	42.04	42.04
Zoll-M Series CCT	AC						
Shock 200J 6 Times/hr + 12 lead EKG + Printer		2.60	13.60	13.91	35.62	182.95	35.62
12 lead EKG, Printer		2.56	2.56	13.91	35.60	35.60	35.60
UNI-VENT "Eagle" 754M	DC						
Worst Case		2.96	5.43	13.97	41.64	75.86	41.71
Nominal		1.57	3.00	13.97	22.09	41.92	22.16
IVAC Medsystem III	AC						
999 mL/hr all ports		0.73	0.73	14.00	10.20	10.20	10.20
125 mL/hr all ports		0.66	0.66	14.00	9.28	9.28	9.28

Fuel Cell Products
100w to 330W in two additional platforms

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XRT 150/300 (Extended Run)

DC Voltage: 12 -13.5 V / 120V nominal
DC Power: 150 W or 300W continuous/ 330 W peak
Energy: : 2160 W-hrs. (6 x N-Stor 360)
Weight: 48 lbs. (with 6 hydrides fuel)
Dimensions: 7" x 14" x 12"
Exhaust: warm air vapor
Start-up time: <2 seconds
Power Distribution Manager 5VDC, 12VDC and 120VAC (True Sinewave)

Power Case 150/300

DC Voltage: 12 V / 120V nominal
DC Power: 150 W or 300W continuous/ 330 W peak
Energy: 1080 W-hrs. (N-Stor 360)
Weight: 35 lbs. (with fuel)
Dimensions: 18" x 7.8" x 14.5"
Exhaust: warm air vapor
Start-up time: <2 seconds
Power Distribution Manager 5VDC, 12VDC and 120VAC (True Sinewave)

Inside the Power Case 150/300

Current users and applications for PowerCase and XRT 150/300

Communications Repeaters

1. **Police**
2. **Sherriff**
3. **Forestry**

Media and Events

1. **NASCAR**
2. **Winter X-Games**
3. **Multiple media events**

Power Distribution

Power Distribution Module(PDM)

DC Voltage: 12 V nominal (6 Connections)
DC Power: 150 W continuous/ 330 W peak
AC Truesine Voltage: 120 V nominal (2 Connections)
AC Power: 150 W continuous/ 330 W peak
Weight: 6 lbs.
Dimensions: 4.4” x 5.5” x 7.5”

Lightweight Military Battery Charging Module

Glen Air Mighty Mouse Connector
DC Voltage: 12 VDC / 5VDC
DC Power: 150 W continuous/ 330 W peak
Weight: .5 lbs.
Dimensions: 2.5” x 1.25” x 5.5”

Battery Charging Demonstration

PEPSAE powering four single soldier chargers with four LI145s. The Status of Charger Indicator (SOCI) on three LI 145s had one green dot (0-20%) and one had two green dots (21-40%). The PEPSAE powered up in four seconds. The chargers operated without any issues with all four receiving power needed to go from “Idle” mode to “Charge” state. The PEPSAE operated at 14 Volts continuous at about 4 Amps and in just over 2 hours charged three of the LI-145, that started with a SOCI of one dot, to three dots, the forth battery charged to four dots.

Energy Storage Platform

Metal Hydrides

Jadoo Power's Baseline Technology
Practical Power Limit: 300W
Max Energy Density 1.6 Wt.%
Cost: Medium @ Commercial
Transportation : Limited today
H2 –Physical Storage
Safety ; Excellent

FillPoint (Hydride Refill)

1.5 hours refill

Stationary Refill: Use Pressure Bottle

Autonomous Refill with Hydrolysis Chemistry

Integrated electrolyzer planned for 2012

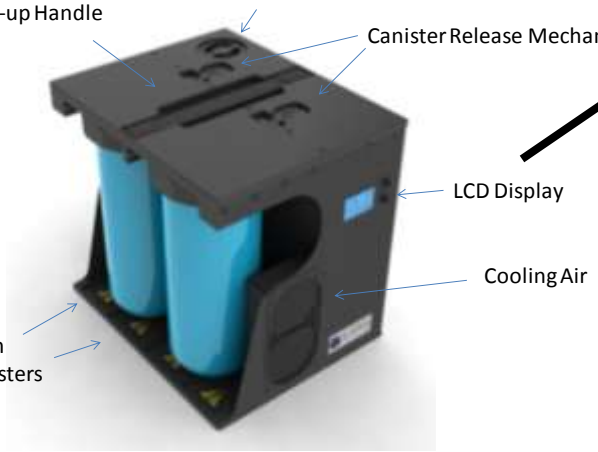
AB Derivatives

Advance Thermal Chemical Generation
Practical Power Limit: 150 W
Energy Density 500 W-Hrs/kg
Cost: High
Transportation: Easier today, unknown later
H2: - Thermal Generation
Safety: Very Stable

Water Fill

Hydrolysis Chemistry

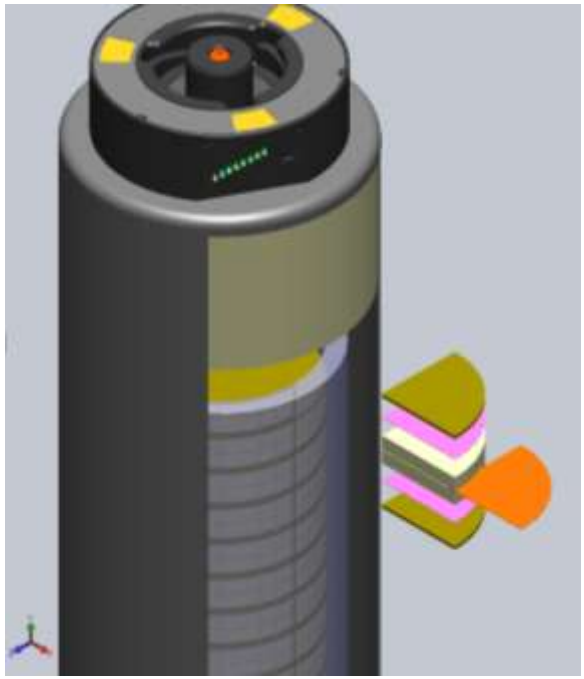
Solid Dry Material
Practical Power Limit 500W
Max Energy Density 3.5 Wt. %
Cost: Low @ Commercial
Transportation: Limited Today
H2: Solid - Hydrolysis
Safety: Very Good



Hydrogen Storage – EDAB development & testing

Objective is a 500 W-hr/kg canister design

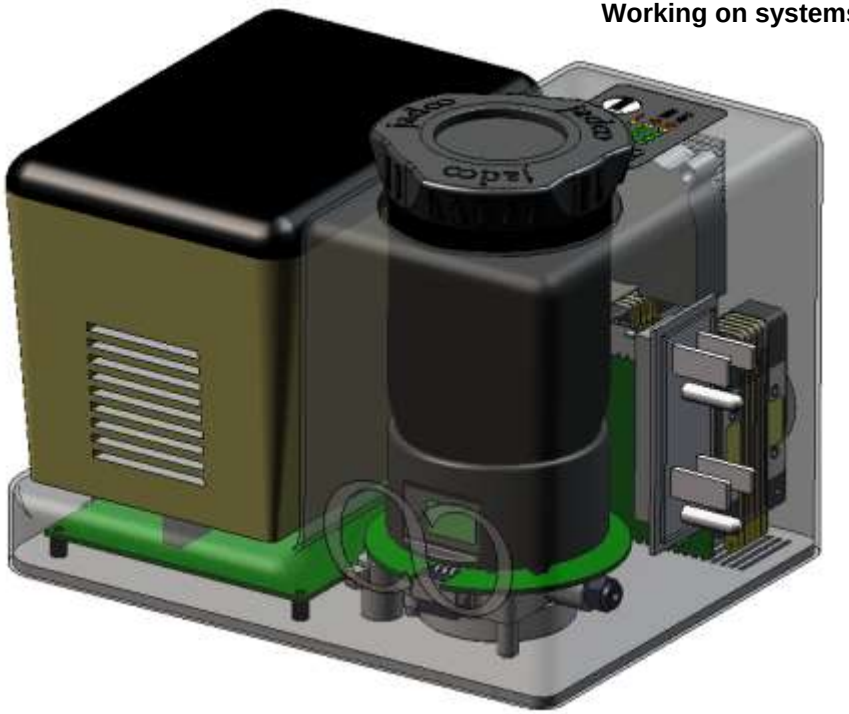
- Optimized EDAB to thermally decomposition material providing 11% by weight H_2 gas evolution
- Currently optimizing cartridge design using the past three years of development to produce a high density pellet packaging system
- Utilize Computational Fluids Dynamics (CFD) thermal modeling to identify and evaluate additional design optimization
- Testing at cartridge level

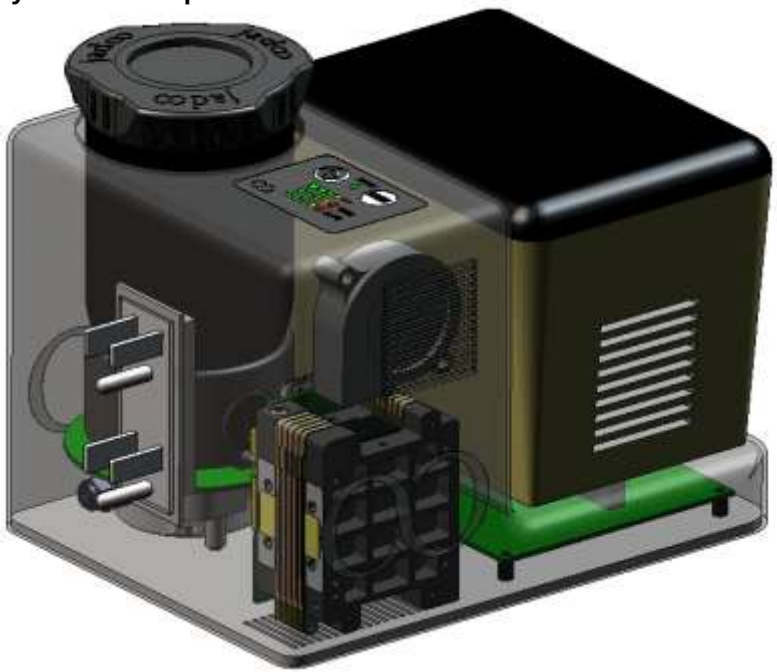


Unattended Ground Sensor Power System

Jadoo UGS-20PS

Advance Thermal Chemical Hydrogen Storage
Practical Power Limit: 20 W
Energy Density 500 W-hrs/kg
Cost: High
Transportation: Easier today, unknown later
H2: - Thermal Generation
Safety: Very Stable
Working on systems for 30 day unattended power

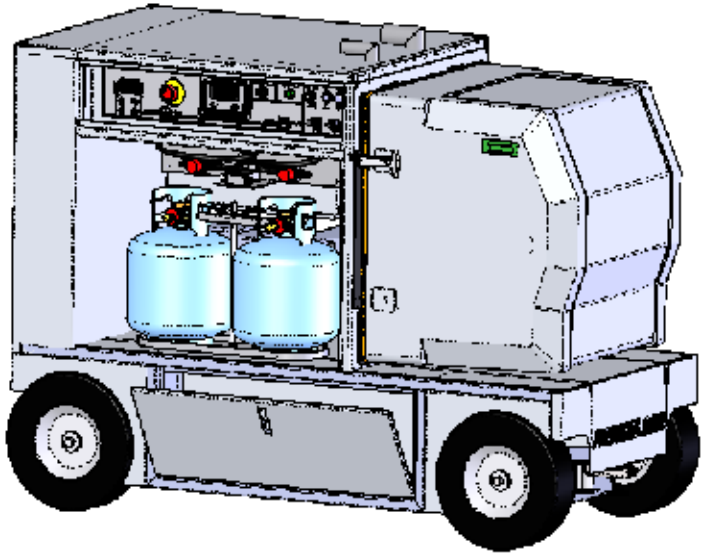




Mobile Solid Oxide Fuel Cell Generator

Jadoo and Delphi Automotive Joint Program:

- Funded under DOE Grant
- 3KW SOFC generator
- Utilized standard LPG (propane)
- To be deployed in field trials with NASCAR
- High efficiency and low emissions



Jadoo Solar Products

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Solar Thermal

Residential Hot Water

Commercial Hot Water

Solar Electric

Water Wells

Security

Remote Site Power

Lightweight and Rugged ST Collector

Key Product Attributes for Forward Deployment

- 60% lighter than competitive collectors
- Impact resistant
- Shock and vibration resistant
- More efficient than PV

Jadoo's Skyline Collectors

Applications

- Showers
- Sinks/Dishwashing
- Laundry

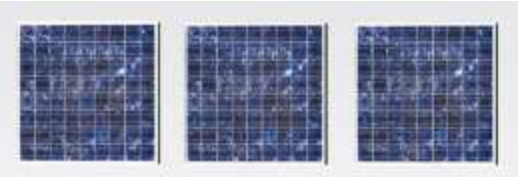
Military Solar Development

Goals for Jadoo Solar Military Programs:

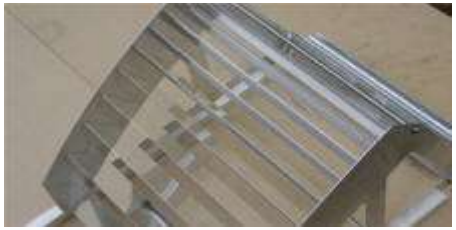
- Transition commercial Solar Thermal and Solar Electric Systems to Military Applications
- Focus on FOBs
- Add ruggedization and rapid deployment features
- Develop specialized systems to support robust Renewable Energy and FOB Microgrid Infrastructure capabilities

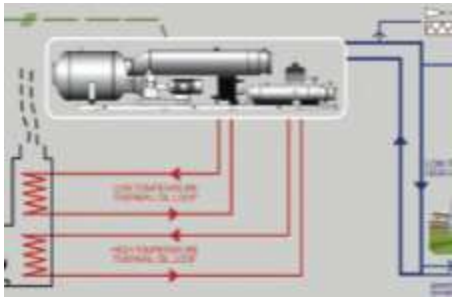
Solar Thermal

Solar Electric



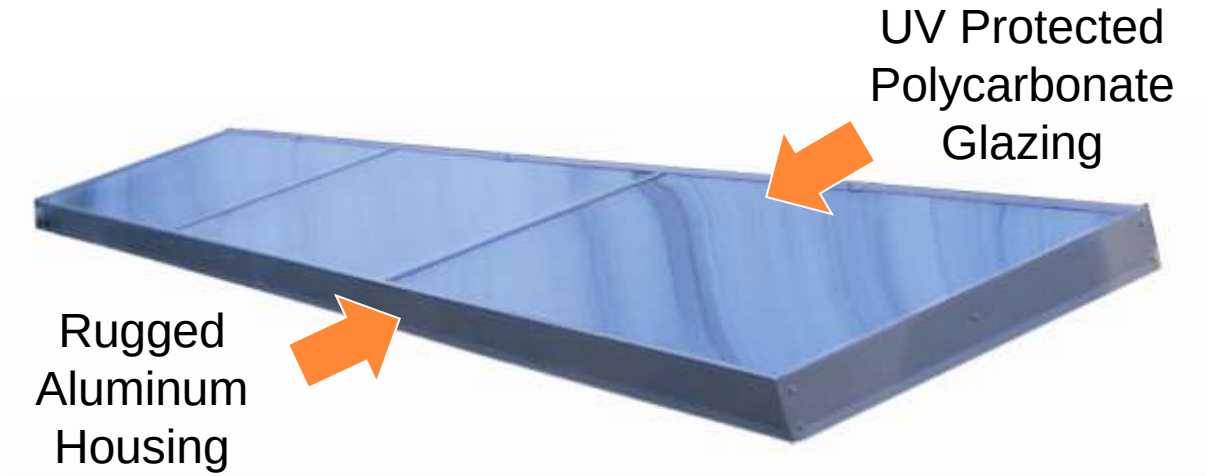
Concentrated Solar





Hybrid Renewable Energy Infrastructure

20 Sqft COTS Product



Standard commercial collector, the Skyline 20-01
20 square feet of collector area
144” x 20” x 3”, 38lbs., 1.9 lbs/sq ft.
Produces between 10,000 and 15,000 btu’s per day.
Each panel offsets roughly 4 therms of natural gas per month
Offsets 6 Tons of CO_2 production per year
Or equivalent to not driving a car for 15,625 miles.

Recreational Mobile Solar Trailer

Deployable Mobile Hot Water

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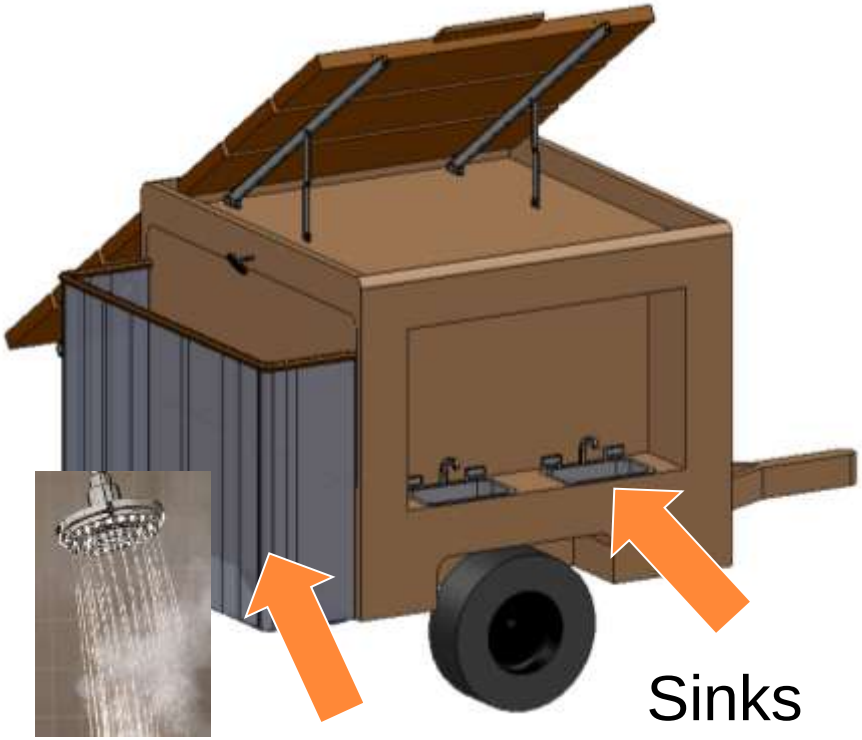
Solar Thermal

PV

Solar panels unfold to harvest solar energy

Solar panels stow for transportation

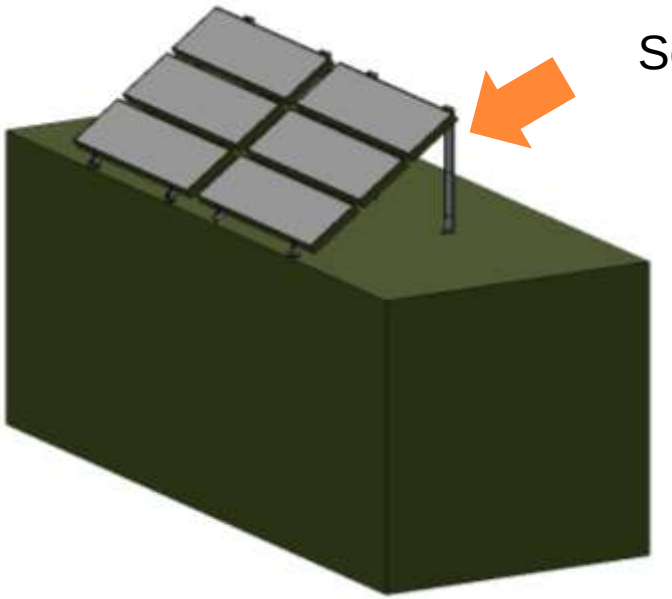


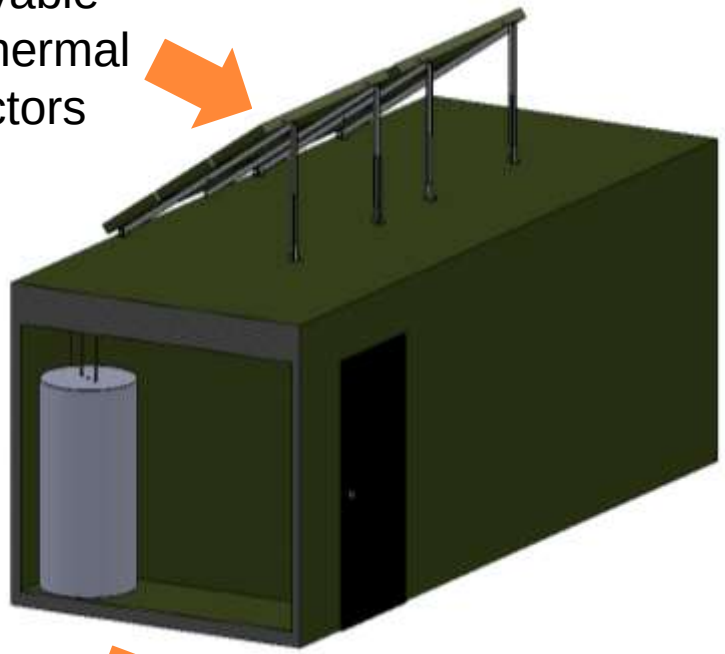
Shower

Sinks

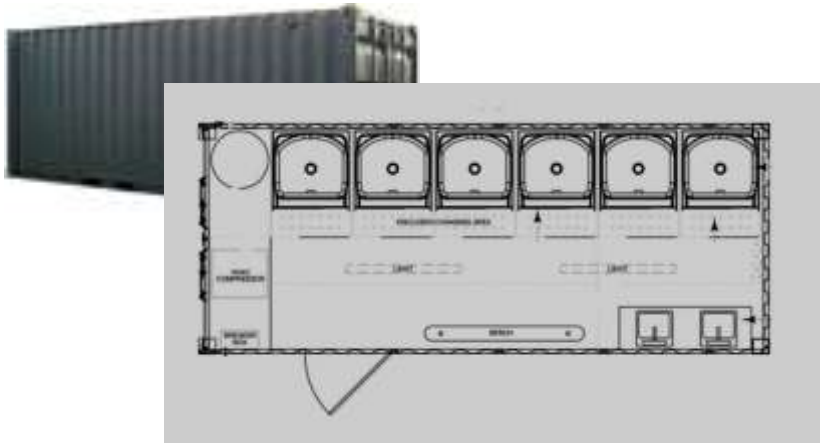
Solar Assisted Shower Unit

Deployable
Solar Thermal
Collectors





Solar Assisted
Hot Water Tank



Same Solar System can be used for Kitchen Unit, Laundry Unit, Bathing Unit, Sink Unit

Forward Deployable Solar Concentrator

- Lightweight rugged aluminum construction
- Collapsible into flat form factor for transportation
- Easy to setup and tear down in the field
- Good wind loading characteristics
- Requires light duty tracker due to lightweight design
- 200% to 300% better concentration than Fresnel lens

Applications

- Water Heating
- Space Heating & Cooling
- CPV or CSP Electricity
- Combined Heat and Power
- Water purification/desalinization
- Hydrogen generation

Lightweight, collapsible solar concentrator for redeployable applications

High Efficiency Solar Thermal Cooling/Heating Design (HE-STACH)

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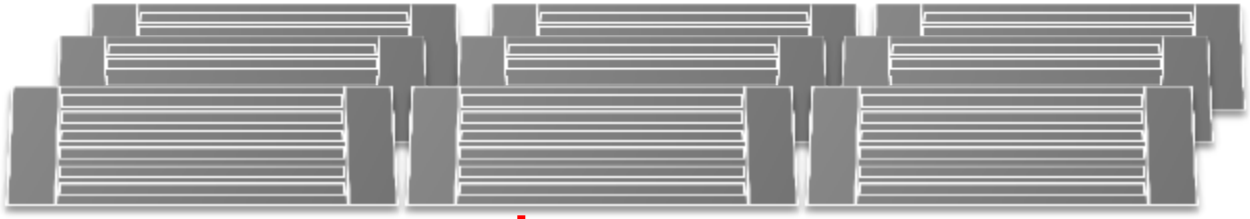


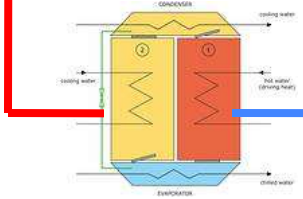
Concentrated Solar Array

Storage

Hybrid Generator with Organic Rankine Cycle Engine

Electricity

Hot Water



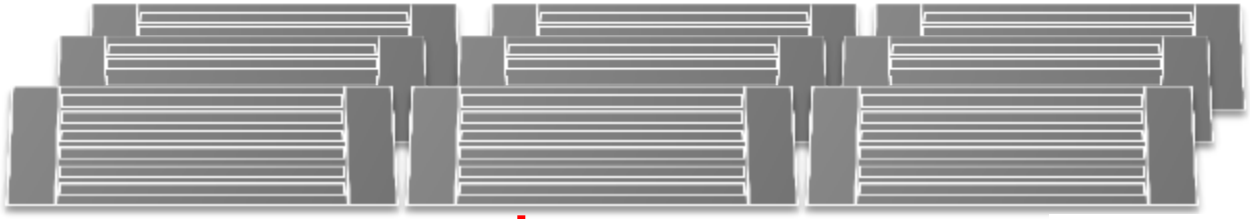
Cold Water

Adsorption Chiller

Space Heating/ Cooling Water

Heat Exchanger & Blower

Space Heating and Cooling



Concentrated Solar Array

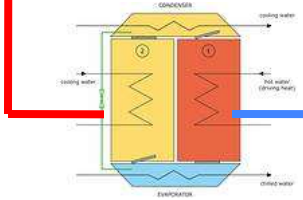
Storage

Space Heating/ Cooling Water

PV Panel

Battery

Hot Water



Cold Water

Adsorption Chiller

Hot or Cold Air

Heat Exchanger

Blower

Renewable/Fuel Cell Infrastructure

End-to-end Fueling Infrastructure

Concentrated Solar

Solar Thermo Hydrolysis

Hydrogen Filling

Hydrogen Distribution

Portable Fuel Cells

Summary

- There are a number of Renewable Energy Technologies that can be applied to reduce fuel consumption at FOBs
- Commercial technologies will require some degree of ruggedization and modification to support forward deployment
- Key issues will be integrating solutions together that utilize the best form of energy and which allow the tie in of renewable resources with conventional resources in a seamless way
- Jadoo is working to apply its expertise in renewable energy in military products to develop a suite of products to support the goals of decreasing the need for the transportation of conventional fuels to FOBs