

Solar Photovoltaic/Thermal (PVT) Collection System

PROBLEM:

PV (photovoltaic) collects about 15% of available solar energy as electricity, but no thermal energy.

Thermal collects about 70% of available solar energy as heat, but no PV electricity.



SOLUTION:

Combine PV and Thermal in the same collection device – call it PVT energy, and capture the warmth that is wasted.

[Numerous peer-reviewed lab studies](#) have explored and confirmed the large gain in efficiency of the combination of PV and Thermal collection.



OBJECTIVE:

Produce a marketable and economical PVT collection system that generates both electricity and useful thermal energy from the same collection device.

HISTORY:

80% or more of the energy in liquid fuels is wasted as heat in ICE (internal combustion engine) power plants, used for transportation and other purposes. A hundred years of R & D has produced only small improvements in ICE efficiency.

Likewise, decades of R & D in PV efficiency: only small improvements. Combined PVT collection promises large improvements in overall efficiency.



ADVANTAGES OF PVT SYSTEM:

Increases PV collection efficiency by reducing PV surface temperature. Melts snow covering by reversing thermal energy flow.

Additional thermal capture also displaces fossil-fuel based space and water heating, improves overall efficiency, and adds significant value to the energy collection system.

MARKET POTENTIAL:

Multi-\$Billion. Customers: B2B & B2C; residential, neighborhood, small community, commercial, for on- and off-grid applications.

COMPETITION:

Small PV/domestic water or PV/space heating collection systems that use liquid glycol-based heat transfer fluid. These systems are relatively expensive, with negligible market share; and none collect heat from both sides of the PV panel using air/gas transfer fluid.



STEP 1:

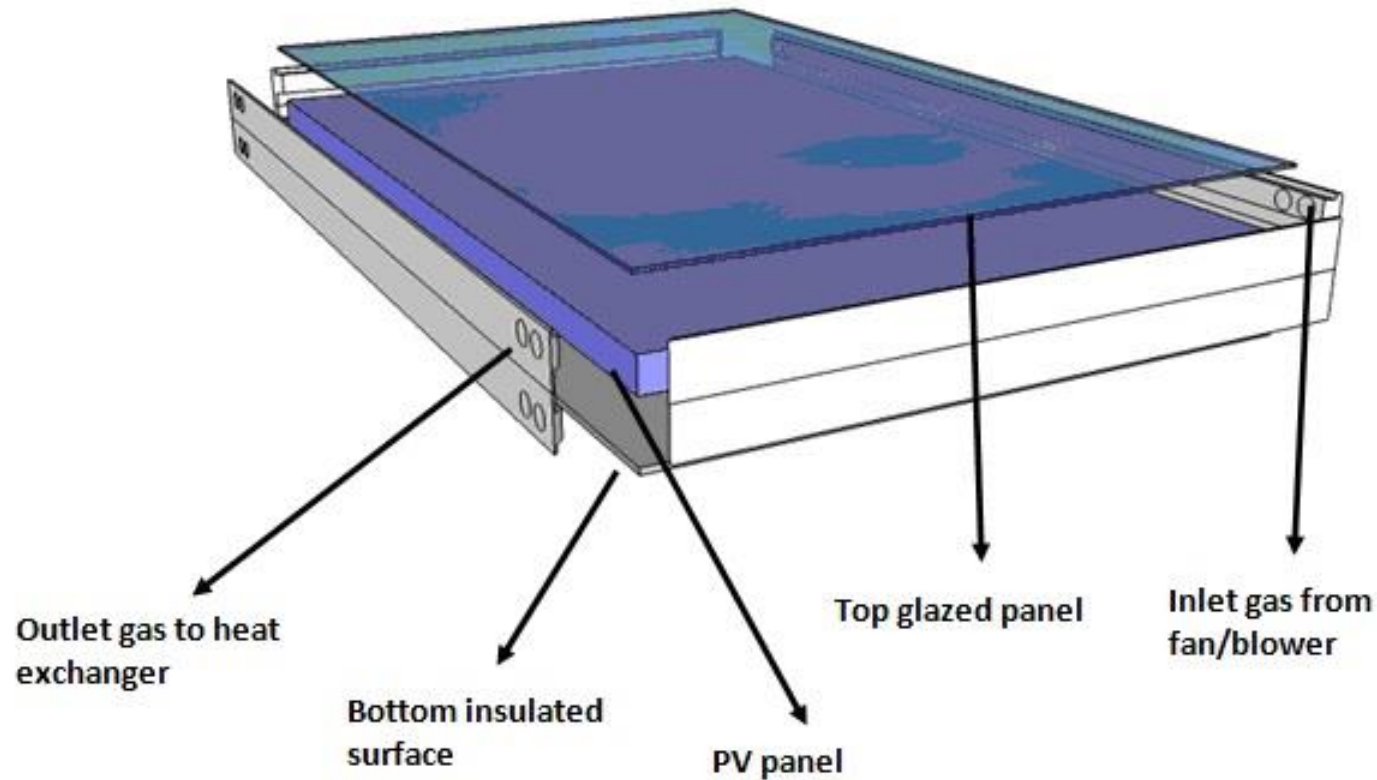
Apply for \$\$\$ from [DOE](#), [NSF](#), philanthropy, or private investment; need US\$ 200k - \$250k to launch.

STEP 2:

Design and build working prototypes, based on a two-sided collection system using air/helium heat transfer fluid, as disclosed in US Patents [# 9,263,986](#) and [# 9,401,676](#) (D. Williams).

STEP 3:

Assemble development team and secure lab space on or near University campus; begin design work, sourcing for system components, and prototype construction.



A collector assembly encloses a PV panel using a simple frame to capture thermal energy from both sides of the PV panel. The chambers created by the frame will be filled with an air/gas mixture to transfer heat via fluid flow.

MARKET ADVANTAGE:

PVT increases PV output, and adds thermal collection for space and water heating.

Our studies show that a typical residential roof-top installation may provide most or all of both electric and space heating requirements.

Existing and new government incentives will accelerate renewable energy development, and stimulate market awareness and demand.



RISKS:

Delays or other obstacles to commercialization of PVT technology in the energy marketplace.

Loss or change in governmental incentives for promoting renewable energy utilization.

PVT's thermal output requires integration with existing HVAC systems.

Significant decrease in costs of fossil fuel or major utility generated electricity.

Resistance to innovation from competing PV only systems that currently hold 98% of market.



THE PVT SOLAR OPPORTUNITY:

- Growing market and incentives for renewable energy products, systems, and services.
- Early-to-market advantage for cost-effective, novel product that multiplies energy collection, with recently issued patents.
- Additional IP generated from R & D work.
- Faster customer payback compared to PV only systems.



THE PVT SOLAR OPPORTUNITY:

- Comprehensive energy solution for on- or off-grid applications.
- Displacement of fossil-fuel based space and water heating systems.
- Zero fuel costs and zero carbon emissions.
- Spin-off applications include water purification, water pumping/heating, and heating/charging systems for off-grid, RV, or remote locations.



PRINCIPAL INVESTIGATOR (PI):

Founder and CTO, inventor (7 US patents, including 2 in PVT tech) and entrepreneur, with significant experience in all phases of product development and delivery, including research and design, IP processes, fabrication, manufacturing, packaging, marketing, and management.

Doug Williams

Founder and Chief Technical Officer

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TEAM:

Northwestern University Professor in Mechanical Engineering with signed NDA and consulting agreements.

Post-Doc research associate with expertise in fluid flow modeling and mechanics.

ADVISORS:

MIT Professor Emeritus of Plasma Physics.

Northwestern Professor of Molecular Biosciences.

Retired oil industry PhD Chemical Engineer.

