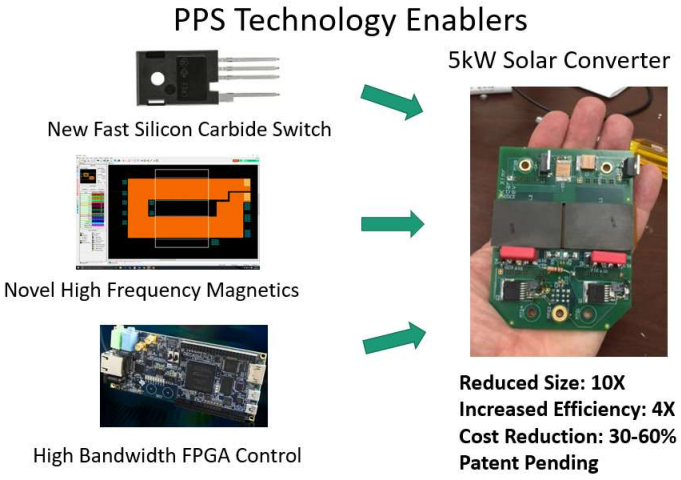
**Technical Assisstance Request**

**Ultra-Compact Residential Solar and Energy Storage System**

## PROPOSED TECHNOLOGY

PPS has developed an ultra-compact, combined solar and energy storage system (SESS), for use in a residential application. The system combines a 5kW solar input dc-dc converter, Li-ion battery, and grid-tie inverter in an ultra-compact package that significantly reduces equipment and installation costs. PPS exclusively uses SiC technology, novel high-frequency magnetics, and advanced Field-Programmable Gate Array (FPGA) controls to achieve 10X size reduction, 4X losses reduction and 50% cost reduction vs available systems.

PPS's core technology combines latest generation SiC MOSFETs, novel high-frequency magnetics and high-bandwidth FPGA control to dramatically reduce the losses, size, and cost of power converters.




PPS uses high-bandwidth FPGA control to take full advantage of the increased switching speed of the latest generation SiC MOSFETs. The speed and highly-parallel nature of FPGAs allow control of multiple phase converters at very high (200k – 1MHz) switching speeds, thereby reducing size of magnetics while maintaining reduced power converter losses. PPS uses Matlab/Simulink for complete power converter simulation and auto-code generation of VHDL (Very High-level Design Language) for the FPGA control.

PPS has applied this core technology to a novel, patent-pending topology that combines a 2-MPPT (Maximum Power Point Tracking) solar input, Grid-tie Inverter (GTI), and advanced Li-ion battery in an optimal form that eliminates many components (such as battery DC-DC converter) required in existing systems.

**PPS Ultra-Compact Residential Solar and Energy Storage System (SESS)**


The small size and highly integrated system will reduce installation costs by an estimated 70%. Furthermore, PPS has developed patent-pending power control technology that ensures zero power flow to the utility grid in order to maximize self-consumption and eliminate the need for a net-metering agreement, thereby eliminating additional meter and paperwork.

**POTENTIAL IMPACT**

By reducing hardware and installation costs, PPS Solar and Energy Storage System (SESS) will open the economic viability of solar power to many more households. Typically, a net-metering agreement with the utility is needed to make residential solar economically viable and in many US locations it is difficult to get these agreements due to an adverse utility or regulatory environment. In Hawaii, new residential solar systems cannot export power due to solar overwhelming the grid and causing potential instability. In both these cases, the ability of the SESS to prevent back-feeding power to the grid will allow many households to add solar power. By reducing the installed price of solar and energy storage from $3.75 to less than $2.00, and by removing the net-metering barriers, the PPS SESS has the potential to dramatically increase the market for solar power from 500k households per year to an estimate 5M.

**KEY RISKS**

The key risks for the PPS SESS are thermal performance due to small size and electromagnetic compatibility (EMC) due to use of extremely fast SiC MOSFETs. These risks will be retired through this proposed project.

**IMPACT OF FUNDING AND TECHNICAL ASSISSTANCE**

Funding and technical assisstance will allow PPS to retire the existing risks, complete the final product design and launch the SESS product. PPS will be able to hire additional engineering and manufacturing employees. The funding will be multiplied by the ability of PPS to get venture capital and/or loans to support the project. PPS is committed to develop and manufacture this and other products on the north side of Milwaukee, an economically distressed community.