



Technical assistance request

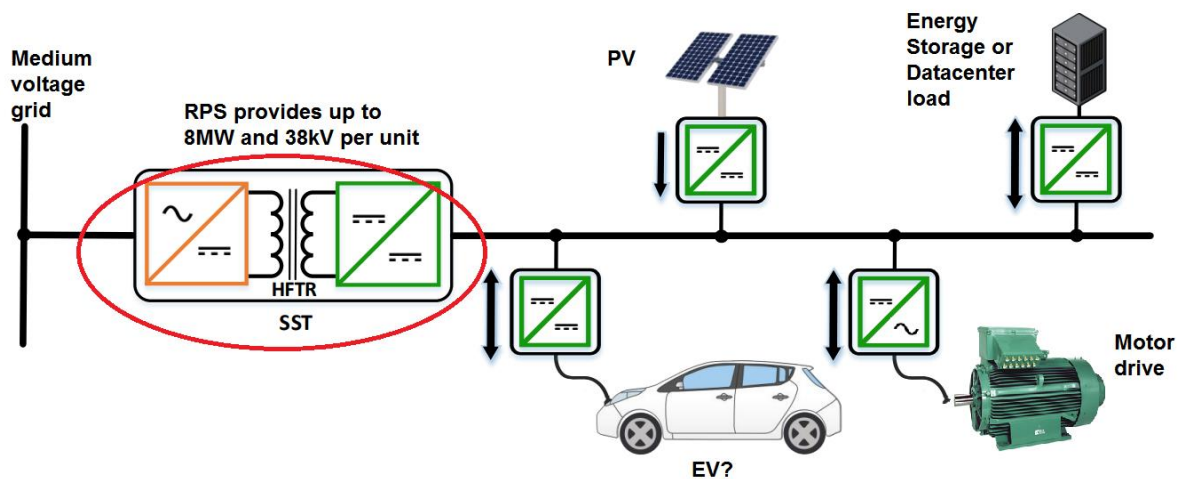
Solid State Substation / Solid State Transformer based

Resilient Power Router

- Can NREL and the U.S. DOE assist with interoperability standards for hydrogen equipment?
- What revenue streams and off-takers are most valuable when integrating hydrogen?
- Can Solar to Hydrogen be used for refilling freight vehicles and if so, how should refueling stations be designed for high safety?
- How does net metering impact the payback period of co-located solar and battery/EV?
- RPS has been unable to find a U.S. lab able to test HVDC power electronics. Are there any voucher eligible facilities able to reach above 100kVDC?
- What is the optimal DC/AC power ratio for solar inverters that have high 4 hour overload ratings?
- Perform efficiency testing of uni-directional vs bi-directional Silicon Carbide high voltage (>10kV DC) solar DC/DC converters vs AC/DC converters.
- Evaluating benefits and setting standards of performance for multi-port power hubs that can connect to asynchronous grids or multiple feeders simultaneously
- Economic benefit of co-locating EV charging with solar and storage for C&I customers interested in microgrids and power resiliency as a service
- Evaluating market policies encouraging higher voltage solar interconnection to utilities or solar developers or independent power producers
- Optimal magnetic material for HF transformers
- Ceramic material improvement for HF insulation and capacitors at high temperature
- Simulation studies for pilot sites for multi-terminal MVDC microgrids
- Lifetime testing of high voltage silicon carbide vs silicon transistors
- Evaluating system stress due to mechanical grid equipment vs solid state compensation (wind and solar)
- Creating standards and cost metrics for MVDC and DC solar + storage systems (no AC)
- Evaluating arc flash risk of solid state transformer vs 60Hz transformer
- Determining overall economic benefit to HVDC connected solar+storage including peaker plant and non-wire-alternative analysis
- Evaluating interconnection study time at AC feeder level vs HVDC multi-terminal network
- Determining Balance of System cost reduction with direct connected central inverter ○
What components can be eliminated when the inverter is connected at 15-35kV?
- Value of magnetizing loss elimination across different locations and transformer types

- Evaluating anti-islanding powerline communication zero notch for \$250k transfer trip elimination
 - Could this effect any other equipment?
 - How fast should it disconnect?
- Cost and safety implications of increasing solar string voltage to 3kVdc
- Third party harmonic and voltage ride through standards verification
 - How much better can the harmonic requirements be if every inverter is a high frequency modular multi-level system?
 - What harmonic limits are needed in very high penetration scenarios?
- >15kV high power (multi-megawatt) testing with BIL, thermal, and reliability HAST/HALT testing

Appendix: Overview of Solid State Transformer applications ([US. DOE SETO](#), [Slides](#), and [IEEE reference](#))



[NREL Source on Solar + Storage for EVs](#): Matteo Muratori, Eleftheria Kontou, Emma Elgqvist, Dylan Cutler, Joshua Eichman

