Topic Area 1: Power and Control Electronics (PACE)

Supporting Offices: EERE, OE

	Year 1/Phase 1	Year 2/Phase 2	Year 3/Phase 3
TOTAL	**$5,000,000**	**$5,000,000**	**$3,750,000**

Description

A proposed PACE-centric GMLC project would leverage components of laboratory-led 'Grid Shot' proposal presented at the Energy Earthshots™ National Lab Ideation Forum. The focus would be on addressing gaps in 'smart' medium-voltage (MV, 4.16kV-34.5kV) electrical interfaces critical to a modernized grid (see Figure 2) through development of a medium-voltage power and control electronics sub-system approach that is modular, scalable, and cost-effective. The sub-system could be used as a building block to interface distributed energy resources to the grid, and that is also scalable to higher voltages (>34.5kV) to support low-loss transmission. The approach would be developed in concert with relevant stakeholders from academia, industry, and utilities to connect wind, solar, energy storage, and fuel-cells/electrolyzers to the grid; control power flow; and provide grid support/conditioning services. Activities would support technology development and demonstration at the sub-system and power-system levels, while leveraging concurrent advances in materials, components, and devices [e.g., Wide Band Gap Semiconductor (WBS)] through other programs (e.g., PowerAmerica). Performance targets and success metrics would be developed to focus on achieving low-cost, along with high-efficiency, security, and reliability, while providing grid integration across a broad array of realistic use cases. Some specific roles for the labs would include:

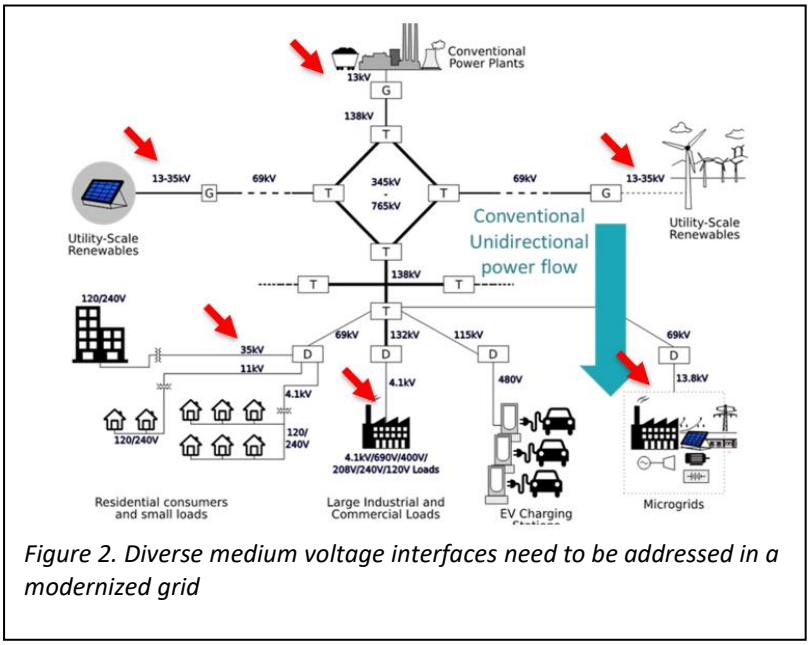

Figure 2. Diverse medium voltage interfaces need to be addressed in a modernized grid

- Leveraging current integrated systems test beds to safely evaluate and test reconfigurable power and control electronics sub-systems in terms of performance, durability, cost, and provided grid-services;
- Evaluating system integration and cybersecurity, while providing guidance in future developments in both hardware (e.g., WBS, Solid-State Transformers, etc.) and software;