

Power Electronics Accelerator Consortium for Electrification (PACE) Overview

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Increasing role and **Opportunities** for power electronics systems integration



Interfacing Power conditioning and grid integration: DER and E energy storage SOLAR WIND Delivery **INDUSTRIAL** Long distance power transfer: Off-shore wind, utility-scale solar Management and RESIDENTIAL CONVENTIONAL conversion Megawatt-gigawatt scale hydrogen production, charging infrastructure, ΕV industrial processes and 目 equipment OTHER COMMERCIA

Major Drivers for near future grid R&D





Grid edge: Generation and load growth

LPT and distribution transformers: Efficiency standards and supply chain issues

Need for domestic manufacturing and systems integration innovation

MVAC : Utility scale DC sources and loads: On grid solutions

Off grid: MVDC Technologies global trend

Grid edge generation and load growth



Objectives

Optimize resource dispatch for reliability

Optimize resource dispatch for resiliency Optimize resource dispatch for economics

Use	Cases

Transactive capabilities for customer owned assets

Peak demand reduction

Emergency load curtailment Microgrids remote radial circuits

Utility scale storage, solar Electrification: Charging infrastructure, hydrogen production, steel manufacturing







Transformers: Materials and supply chain

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Need for domestic manufacturing and systems integration innovation

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Industry feedback

Deployment of power electronics systems designed and developed by global vendors:

Field issues unresolved due to lack of ownership Integration of multiple control and software platforms from different vendors:

Increasing operations, maintenance and cost issues

turnkey prototyping of integrated systems for mass manufacturing

Customized solutions

needed:

Limited resources

and services in

design,

development, and

Buy America Build America: "Made in the USA"

55% of the total cost of all components of the manufactured product

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AC/DC energy delivery system: Energy resources and loads Integration



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DC energy delivery system: Energy resources and loads Integration



Benefits:

- Off-grid MVDC :MW-scale-Accelerated deployment in comparison to grid connected solution (long permitting time)
- MVDC Distribution -> Increased efficiency with DER Integration
- MVDC Links -> Capacity expansion in congested areas while deferring infrastructure investments
 - **Higher stability** provided by DC system

What is PACE?

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PACE is a U.S. Department of Energy cross-cut initiative, currently supported by the **DOE Office of Electricity's** Transformer Resilience and Advanced Components (TRAC) program, Advanced Grid Transformative Solutions (AGTS), **Energy Efficiency and Renewable Energy** – Hydrogen and Fuel Cell Technologies Office(HFTO), & Grid Modernization Initiative(GMI).

PACE is a coalition of partner research institutions, utilities, and industry manufacturers working to take innovative research in power electronics to grid-level pilot demonstration.

Vision: Accelerate the development and demonstration of integrated grid systems with power electronics technologies for electrification

Focus: Solve power electronics and grid hardware barriers of cost, integration, and reliability

Impact: Increase adoption of power electronics technologies, create domestic manufacturing, and enable new market opportunities



PACE Framework and Collaboration

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	PACE Technology Areas				
Applications	Advanced Components & Power Stages	Advanced Converter Systems	Resource Integration & Management Systems	Grid Integration & Demonstrations	
Advanced grid–edge systems Utility scale: Medium voltage- MVAC &MVDC technologies	Materials & components, Intelligent power stages embedded Controllers	Converters, inverters, controls and protection, prototypes, diagnostics, prognostics, cybersecurity	Multi-stage converters, software platforms, algorithms, grid systems architecture & modelling	Grid integration , demonstration use cases	
Hydrogen and fuel cell technologies High voltage direct current (HVDC) Solid state power substations Advanced transformers Grid enhancing technologies -Power flow controllers	VALLEY OF CHALLENGES COMPONENT MANUFACTURERS	VALLEY OF CHALLENGES UNIVERSITIES	VALLEY OF CHALLENGES NATIONAL LABORATORIES	VALLEY OF CHALLENGES SYSTEM MANUFACTURERS UTILITIES	
	TRL 2–7	TRL 3–7	TRL 4–7	TRL 5–7	
	Accelerated Power Electronics Technologies				

PACE Execution Framework

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