

The Convergence of the Smart Grid with Photovoltaics: Identifying Value and Opportunities

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Situation

While the PV market has entered a time of robust growth, electric utilities and others have begun to implement the Smart Grid.

PV Drivers

- PV cost competitiveness
- Investment in technologies, projects and new business models
- Demand for green energy

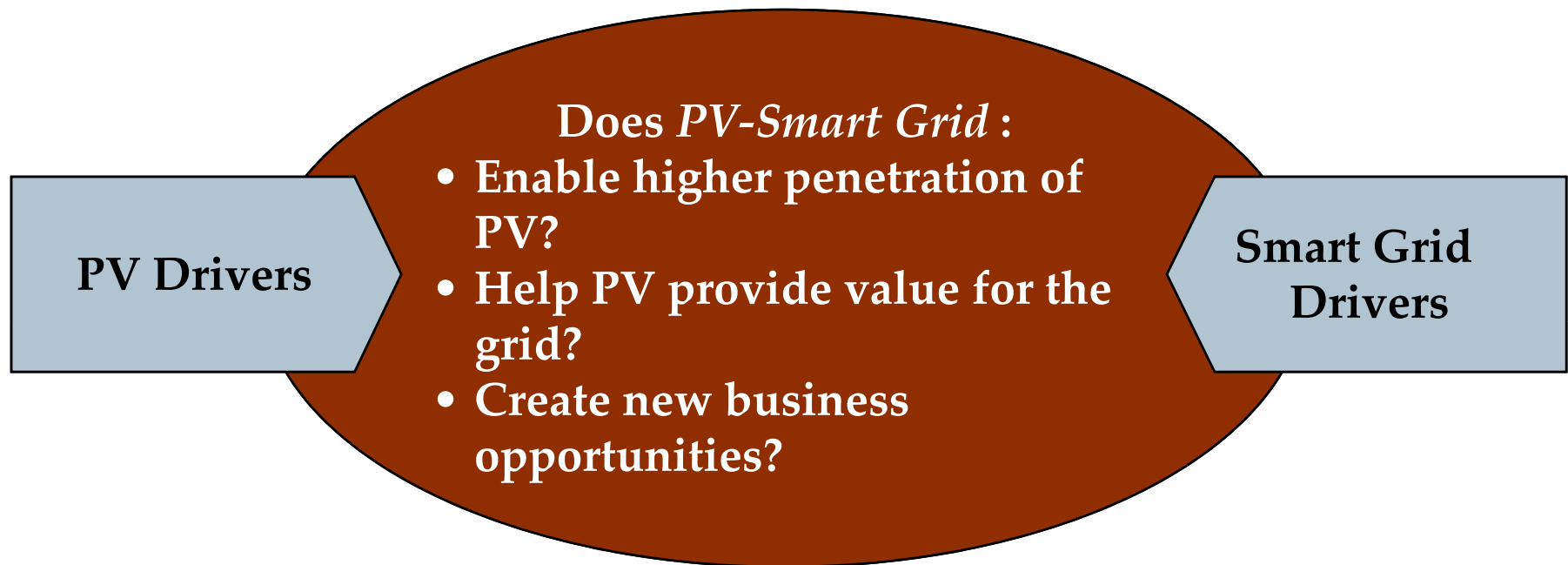
Smart Grid Drivers

- Energy reliability and security
- Integration of renewable energy
- Customer experience and end-users as energy partners

Navigant Consulting is completing a large multi-client study to examine the value and opportunities created by integrating PV with Smart Grid.

Opportunity

The *PV-Smart Grid* may present an opportunity to address key issues faced by PV and Smart Grid alone.



The Value of the Smart Grid for PV

The Smart Grid enables higher penetrations of PV by addressing key technical challenges.

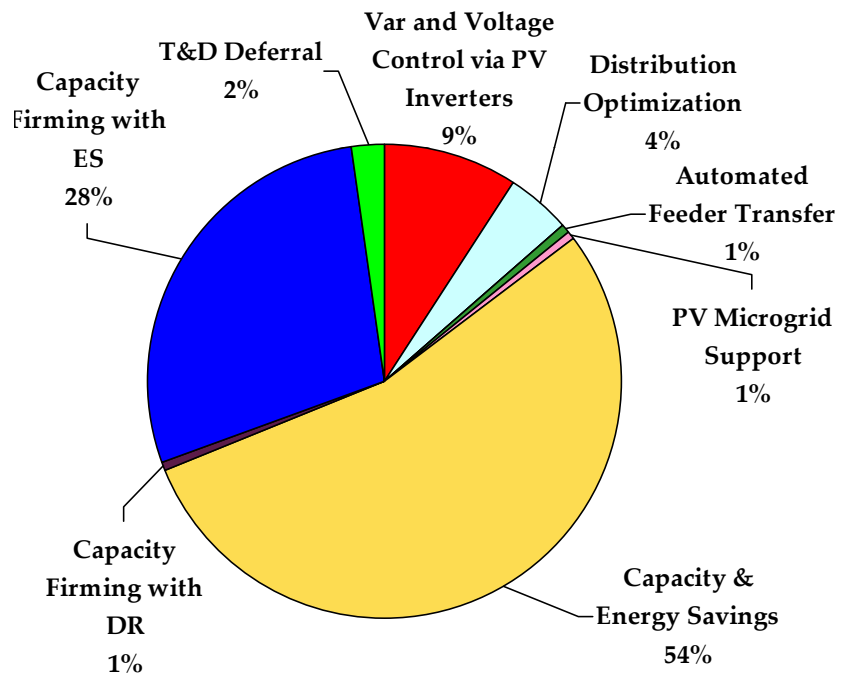
Can the Smart Grid enable higher penetrations of PV?

- Barriers to high penetration of PV include:
 - Technical T&D challenges
 - Communications challenges
 - Regulatory and business model challenges
- The Smart Grid addresses key technical T&D challenges
- By addressing the technical issues will allow utilities to accept more PV on distribution feeders without compromising operating performance and service quality

Yes. Smart Grid could support more PV on distribution feeders.

Areas of Value Creation

Analysis shows that PV provides value from capacity and energy savings, firmer capacity with energy storage, and grid optimization.



- Capacity and energy savings
- Firmer capacity with energy storage
- Grid optimization

The Value of PV for the Grid

Distributed PV can provide benefits in key areas. Combining this resource with energy storage enhances its value.

Can more PV provide value for the grid?

- The greatest value of PV is derived from avoiding central generating capacity and avoided energy costs
- Energy storage is a key for enhancing the value of PV in a Smart Grid context
- When concentrated, PV can provide benefits related to grid optimization
- PV is cost effective assuming continuation of rebates and ITC credits – however, the incremental value of Smart Grid is not enough to overcome the loss of incentives

Yes. PV in high penetrations can provide grid benefits.

Enhancements to Achieve Benefits

Achieving the benefits highlighted in the study requires enhancement of technology, policy and business models.

Areas for Enhancement

Technology

- Technical/business requirements for coordination of AMI and PV
- Functional requirements for leveraging PV as a grid resource

Policy

- Eligibility of integrated PV/energy storage systems for state/federal rebates and Investment Tax Credits
- Modification of technical standards and guidelines (e.g., IEEE 1547) to allow PV inverters to provide grid support

Business Models

- Tariffs and pricing mechanisms that monetize the benefits provided by distributed PV

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