

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



**National Renewable Energy  
Marketing Conference**

**October 27, 2008**

Navigant Consulting, Inc.  
77 South Bedford Street  
Burlington, MA 01803  
(781) 270-8303  
[www.navigantconsulting.com](http://www.navigantconsulting.com)

**NAVIGANT**  
CONSULTING

## 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.

Does *PV-Smart Grid* :

**PV Drivers**

- Enable higher penetration of PV?
- Help PV provide value for the grid?
- Create new business opportunities?

**Smart Grid Drivers**

## Smart Grid Enables More PV on Distribution Feeders

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

### Can the PV-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.**

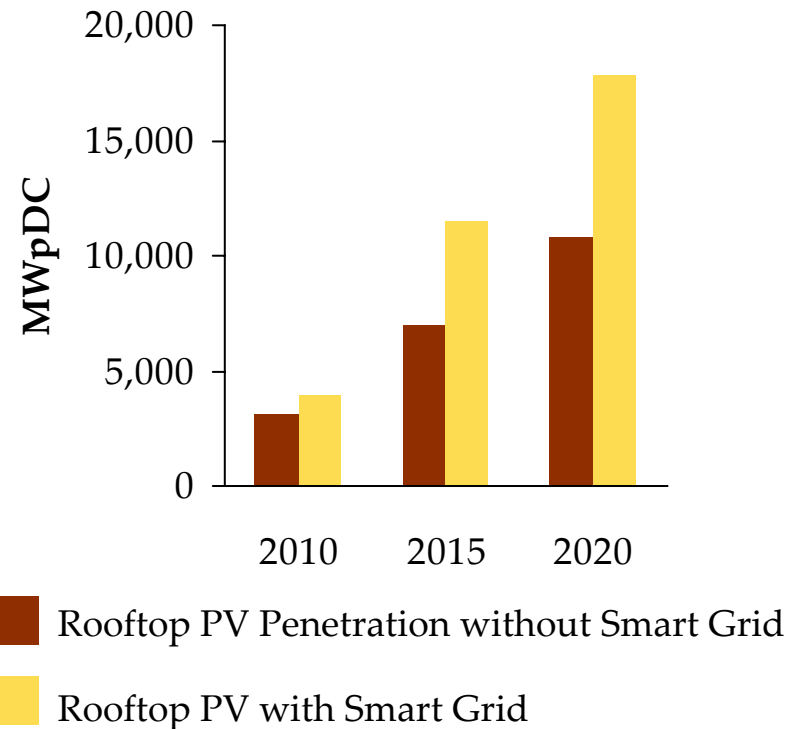
## Increased Distributed PV Penetration

NCI estimates that rooftop PV penetration could be significantly higher by 2020 as a result of addressing T&D barriers with Smart Grid.

### The Smart Grid Enables Higher Penetration of PV

- The Smart Grid coupled with energy storage can address important T&D challenges:
  1. Voltage Regulation
  2. Reverse Power Flow
  3. Power Fluctuations/Frequency Regulation
- Addressing these challenges supports higher net metering caps, better interconnection standards and more prevalent time of use tariffs options

### Cumulative Installed Capacity Rooftop PV



## High Penetrations of PV Adds New Value

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

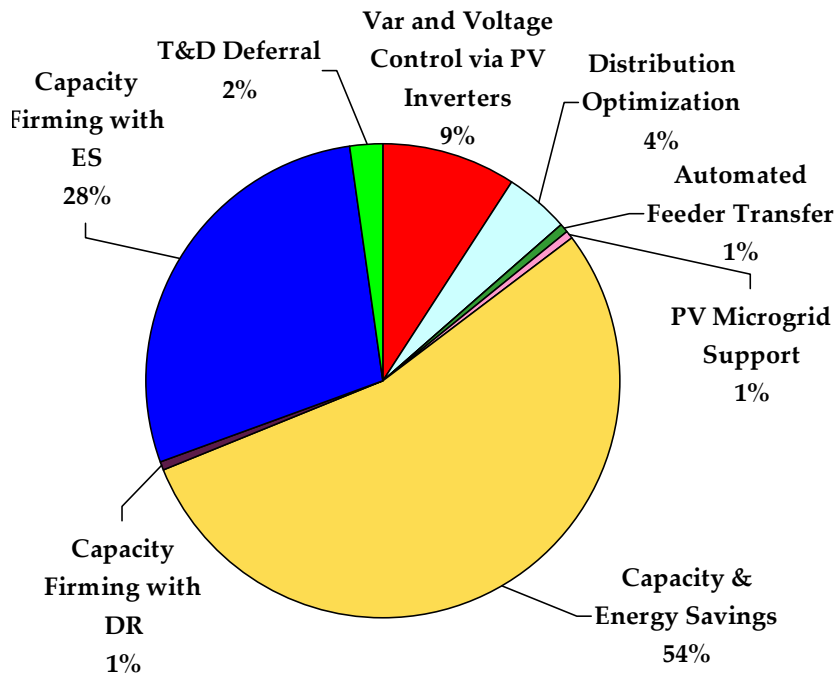
### Can the PV-Smart Grid help PV provide value for the grid?

- 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.**

# 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

# Unlocking Value Could Create New Business Opportunities

By leveraging the Smart Grid and high penetrations of distributed PV, new opportunities to unlock value can be created.

## Can the PV-Smart Grid create new business opportunities?

- The analysis reveals three main areas for new value:
  - Deferred/avoided energy and capacity from traditional generation
  - Smart capacity firming by combining PV with energy storage
  - Grid optimization through coordinated control of PV inverters
- Tapping this value will require enhancements to technology, policy and business models

**Yes. PV-Smart Grid could create new business opportunities.**



## Enhancements to Achieve Benefits

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

### 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 (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
- Service offerings to facilitate participation of PV as a grid resource

# Contact Information

**Forrest Small**  
**Director, Energy Practice**  
**Burlington, MA 01803**  
**781-270-8303**  
**[Forrest.Small@navigantconsulting.com](mailto:Forrest.Small@navigantconsulting.com)**

