



Project 13-9: Impact of Photovoltaic Generation on Distribution Systems

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Project Summary:

In recent years, solar power, and more specifically solar photovoltaic (PV) power, has been growing worldwide at a tremendous rate, as illustrated in the figure below. It has also been the fastest growing form of power generation in the US. A significant portion of solar generation is implemented at the distribution level for a number of reasons, including:

- Modularity, and the decreased benefits of scale compared to other forms of generation.
- The solar energy resource is widely available. Unlike wind energy, which tends to be somewhat concentrated in certain locations, solar energy is more consistently available across a given region.
- Solar PV is relatively easy to site, with limited visual, audible, and other environmental impacts.
- Various incentives, such as net metering, are specifically applicable to behind-the-meter retail application of PV.
- Distributed application of PV is sometimes specifically incited by legislators and regulators, sometimes based on the questionable assumption that installing this resource on distribution systems is beneficial to the power system. (E.g., power resources close to the load, etc.)

Global PV Installations



PV power on a distribution system, however, can pose significant challenges to system design, operations, and power quality. The characteristics of PV power are such that the impacts are different than most other forms of distributed generation; more severe in some areas, and more benign in others.

This report provides a tutorial background on distributed PV power generation and its impacts on distribution systems. A previous DSTAR report, Project 8-8, issued in 2002, documented impacts and issues of distributed generation in general. At that time, PV was perhaps the lesser in consideration of many types of distributed generation (DG). With the growth of PV and its move to the forefront of the various forms of DG, as well as changes in technology and regulatory climate, and the unique characteristics of PV generation, the DSTAR membership determined that a similar guide focused on PV is

a high priority. This report builds on the success of the prior P8-8 document, with a concentration on small residential rooftop and commercial behind-the-meter applications.

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Who Should Use:

Distribution Planners, Engineers/Supervisors, DER/Grid Modernization personnel

For the complete report on Project 13-9: Impact of Photovoltaic Generation on Distribution Systems, visit www.dstar.org.



LAVELLE FREEMAN
GE Energy Consulting
Technical Director
DSTAR Program Manager

GE Power
1 River Road
Schenectady, NY 12345
(518) 385-3335

CONTACT ME
Lavelle.Freeman@ge.com

