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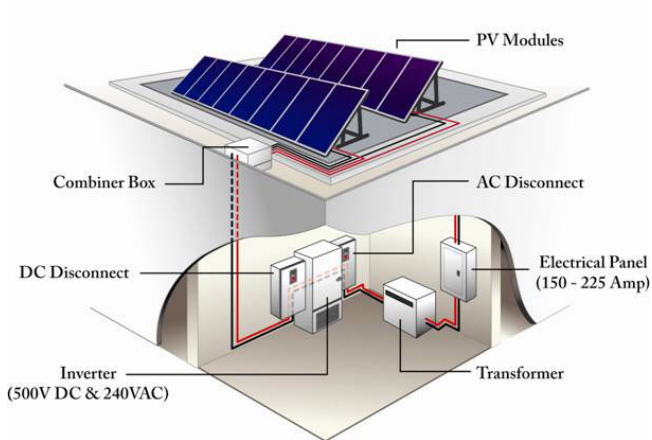
# ON-SITE PHOTOVOLTAIC GUIDANCE



## On-Site PV Guidance Report Offers Valuable Information for Project Implementers

In 2011, GSA contracted with the National Renewable Energy Laboratory (NREL) to collect critical knowledge gained from developing and implementing GSA's 63 newest on-site photovoltaic (PV) solar energy projects. The study was supported by the GPG program with the intent of optimizing how the agency locates, sizes and funds future projects for a maximum return on investment. The resulting lessons learned, best practices and case studies were compiled into a robust resource that also contains guidance on project considerations such as funding, incentives, interconnection and permitting. *On-Site PV Guidance* aims to help future project teams maximize their projects' chances for success and minimize the risk of underperformance, and may also be useful to other real estate organizations with interests in PV projects.

# INTRODUCTION



## Typical Components of a Grid-Connected PV System

PV arrays convert sunlight to electricity without moving parts and without producing air pollution or greenhouse gases (GHG). They require very little maintenance, make no noise, and can be mounted on many types of buildings and structures. PV direct current (DC) electric power can be conditioned into grid-quality alternating current (AC) electric power using an inverter.

*Credit: Jim Leyshon, NREL*

*“On-Site PV Guidance will prove to be a useful and valuable tool for anyone contemplating a solar energy project.”*

Kevin Myles  
Acting Branch Chief  
Energy and Sustainability Branch  
Facilities Management and Services Programs  
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## What We Did

### EXPERTS RESEARCHED PV POLICY AND SURVEYED PROJECT TEAMS

NREL researched existing literature to identify a broad set of policy challenges and risks involved in on-site PV deployment, then surveyed GSA project teams to collect information on the specific challenges they faced and their respective outcomes. Following review of the survey results, NREL conducted interviews with a subset of the respondents and aggregated the findings and industry research into lessons learned and best practices. GSA supplemented NREL's research with case studies from its project teams, and both organizations provided additional reference material and links to existing guidance.

## What We Evaluated

### STUDY CAPTURED PROJECT CHALLENGES AND LESSONS LEARNED

The survey captured both project-specific and general information on the types of challenges PV project teams experienced in the following categories: project management, site, interconnection, technical, economic, incentives, weather, lack of expertise, procurement, state or local laws and regulations, conflicts with agency or site mission or plans, net metering, and other utility issues. Respondents were asked about the effects of each challenge on their projects; whether there was an action, best practice, or key success factor employed that lessened the impact; and the potential impact on their project if the challenge had not been resolved. The survey also collected data on project location, utility provider and PV system capacity—factors that determine policies, rules, and contractual forms.

# FINDINGS



**GSA'S DIVERSE PORTFOLIO OFFERED A BROAD SPECTRUM OF EXPERIENCE** GSA's substantial portfolio of PV projects, together with its project teams' collective experience and knowledge, provided a rare opportunity for examining a broad spectrum of challenges and potential solutions. The study yielded wide-ranging lessons learned and best practices because the projects studied were diverse in terms of location, capacity, and funding source or mechanism — variables that have a potential impact on project considerations including, but not limited to, energy resource, financial strategy, procurement methods, construction type, and approach to operations and maintenance.



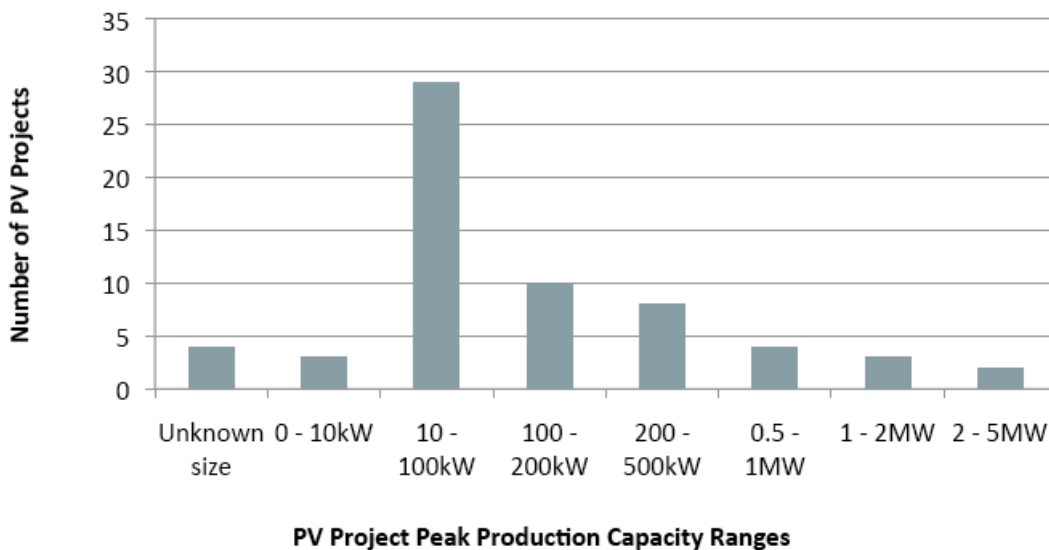
**CHALLENGES WERE NUMEROUS AND UNIVERSAL** The study revealed that PV project developers face many challenges in ensuring that installations are both feasible and operable. No trends were identified based on project location. Most challenges faced by GSA project teams fell within five main categories: project management, site, interconnection, technical, and economic. Project teams were usually able to overcome the issues they encountered, though many of the projects experienced delays or financial impacts.



**MANY PROJECT RISKS CAN BE MITIGATED BY ADVANCE PLANNING AND MANAGEMENT** Project teams can plan for and manage risks to address potential issues before they arise, as well as expedite implementation and improve quality of outcomes. Early discovery of potential challenges often allows for modifications in design and scheduling to be made at minimum cost to the project, so that the project can remain a viable investment. Forming an integrated project team (i.e., with an executive level champion, architect, engineer, lawyer, contracting officer, estimator, energy expert, and facility manager) from the outset can be invaluable for surfacing and addressing potential challenges.

## Projects in NREL Study, by System Capacity

Of the 63 projects included, capacity ranges widely



# CONCLUSIONS

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These Findings are based on the report, “On-Site PV Guidance” which is available from the GPG program website, [www.gsa.gov/gpg](http://www.gsa.gov/gpg)

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## What We Concluded

### LEARNING FROM THE PAST ADDS VALUE TO THE FUTURE

With more than 9,600 assets and over 354 million square feet of workspace, GSA has enormous potential for implementing renewable energy technologies, including solar PV, to reduce energy use and associated emissions. By learning from the experiences of their predecessors and from the additional guidance provided in *On-Site PV Guidance*, project teams can maximize their projects' chances for success while avoiding pitfalls such as schedule delays, adverse financial impacts, and reduced quality. One of the most remarkable findings from this study is the modest effort needed to identify and avoid these pitfalls; sometimes it is only a matter of ensuring early in the project that the right people are on the team and in contact with the appropriate experts.

There are several excellent resources in *On-Site PV Guidance* that should be explored by federal agencies and others who are contemplating implementing a PV project. Two sections of the report also function as standalone guidance for future PV project implementers: the *Photovoltaic (PV) Project Considerations Guide* and *GSA PV Project Lessons Learned and Best Practices*.

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*Reference above to any specific commercial product, process or service does not constitute or imply its endorsement, recommendation or favoring by the United States Government or any agency thereof.*