

Accelerating Deployment of Distributed Photovoltaics in Partner Countries

Background and Context

Due in part to the low cost of photovoltaic system hardware and scalability for deployment, grid-connected distributed photovoltaic (DPV) technologies are increasingly permeating global power markets. While this trend could help substantially reduce the carbon footprint of global power generation, empower citizens across the socio-economic spectrum, and expand local PV markets, there are a number of technical and policy issues—especially in countries that have limited technical resources and need to “get things right” the first time. Further, there is an added time sensitivity that is quite distinct to DPV in developing countries: facing unreliable and/or expensive electricity costs, consumers are no longer waiting for DPV policies, regulatory frameworks, incentive schemes, interconnection processes, or technical standards to deploy systems. They are simply installing them, leading to untracked and oftentimes illegal system deployment, safety issues for line workers, low-voltage network operational challenges, and a host of other issues.

There is a significant opportunity to help developing countries quickly augment DPV programs, and a wealth of international experience and expertise to draw upon to do so. USAID has launched a [multi-year program to assist countries across the DPV spectrum](#). The National Renewable Energy Laboratory (NREL) is supporting USAID (and drawing on Lawrence Berkeley National Laboratory

Objective

Help USAID partner countries address barriers to safe, effective, and accelerated deployment of distributed photovoltaics (DPV).

and others) in developing and implementing pilot projects in selected USAID partner countries, collaborating with these countries to accelerate DPV market development.

Topic Areas

The host of elements to consider in expanding global DPV markets is complex, as shown in the figure below. This USAID program will build capacity in partner countries through pilot projects targeted to specific needs. Initial discussions have identified six overarching technical topic areas for collaboration:

Goals and Approaches to Distributed Photovoltaic Programs

While some countries are starting DPV programs from scratch and want realistic goals, others may be working to determine how best to achieve a goal that has already been set. There are many aspects to consider: compensation and retail rate design factors; program design factors; technical aspects; and policy, planning, and legal issues. Countries also need to ensure the safety of their citizens, that DPV compensation is fair to all participants, and that customers have access to DPV, all while minimizing the potential negative impact on the utility. Moreover, DPV program goals should reflect a partner country’s broader energy, economic, energy security and environmental goals.

Foundational Codes, Standards and Interconnection Processes

Codes and standards ensure that DPV equipment is safe and installed properly. [Interconnection processes](#) ensure that DPV systems’ voltages and frequencies match utility specifications, that they are designed with various capabilities to support grid reliability and safety, and that DPV systems can be connected in a timely and orderly fashion.

Modeling and Mitigating Impacts on the Electric Distribution System

In many countries, utilities screen DPV system applications to ensure that the proposed DPV system will maintain or improve safety and reliability of the grid. If the system fails one of these screens, utilities may use specialized software to [evaluate power flow, voltage, and other characteristics](#), and determine mitigation measures such as upgrading the distribution line, installing voltage regulation devices, and other strategies.

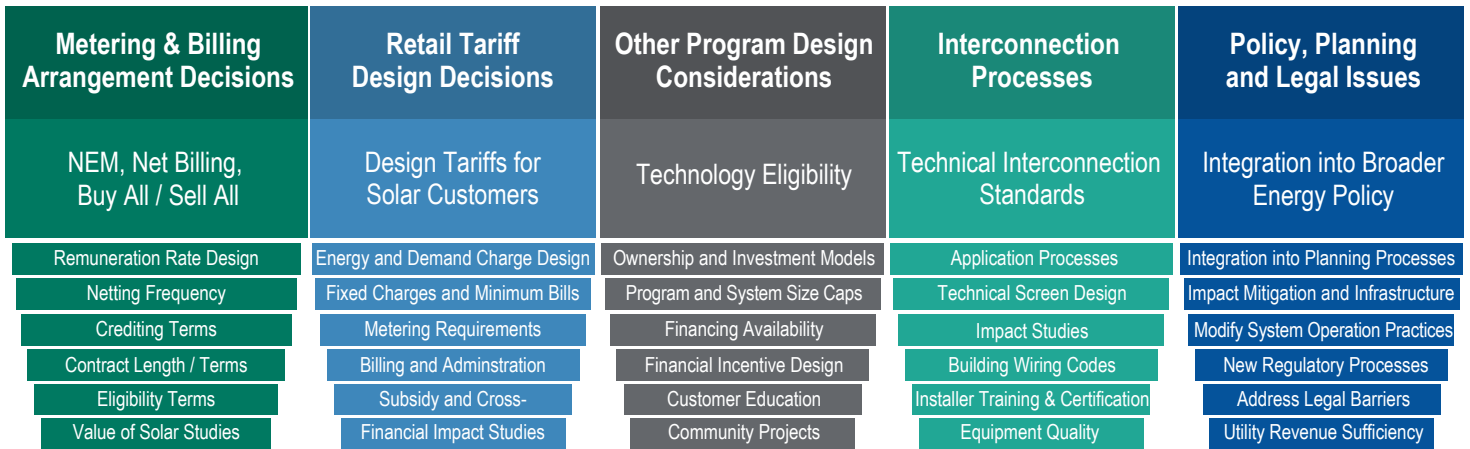
Distributed Generation Compensation Mechanism Design

Perspectives on fair compensation for DPV resources vary among stakeholders. Metering and billing arrangements such as [net energy metering and net billing tariffs](#) have different pros and cons, and retail tariff design choices impact the level of DPV deployment, as well as system cost and equity considerations.

Quantifying Distributed Photovoltaic Economic Impacts

Consideration of the costs and benefits to stakeholders is fundamental. The DPV project team has a well-developed approach for providing a multi-step process for transparent and focused consideration of long-run marginal benefits and costs of a DPV program.

← THE LANDSCAPE OF DISTRIBUTED PROGRAM DESIGN →



The approach includes financial, planning, and operational tools and balances the need for rigor with cost and time considerations. It can be employed to benchmark current and potential future compensation mechanisms for DPV, or be used to directly set a Value-of-Solar tariff.

Facilitating “Win-Win” Outcomes for Electric Distribution Companies

Healthy utilities are critical to the success of DPV programs. Utilities are impacted by the costs and benefits of accommodating DPV on the grid, and at the same time DPV provides new business opportunities such as through developing utility-owned rooftop and **community solar** projects. How will utilities be impacted in an environment of increasing DPV, and in what ways can utility interests be better aligned with what is best for the grid system and society at large?

Approach

Capacity building through this DPV pilot program is targeted to USAID partner

countries that are faced with critical challenges in developing and expanding a DPV market. The program is one of direct engagement with in-country stakeholders through sharing international best practices, providing review and input on country-developed documents (such as tariff design), analytic support, training on key tools and approaches, and other mechanisms. Engagement is anticipated to occur over a period of time and not as a “one-off” activity, as appropriate for the specific country situation.

The first step is to identify potential pilot projects. The DPV program team will engage with local stakeholders and USAID staff in the Regional Bureaus and at Missions to identify countries and particular stakeholders that may be good candidates for this program. Considerations such as an existing DPV market, time sensitivity, synergy with related USAID projects, and potential for replicability will help determine selections for technical assistance.

Once the rough outlines of a project are defined, the team will engage remotely with in-country partners to confirm that the technical assistance activities address the need. Next, a small technical team will spend a week in-country to meet with stakeholders to deepen understanding of the country context and sharpen the project parameters. The team will also seek letters of support from key country stakeholders. Back in the U.S., the technical team will develop a well-defined Statement of Work for the pilot project. Depending on funding availability, the program technical team will also implement the pilot project, or serve as a project manager, technical monitor, and/or advisor to USAID contractors. Resources may be available from this DPV program; Missions will also have the opportunity to buy in to this effort.

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The USAID-NREL Partnership addresses critical challenges to scaling up advanced energy systems through global tools and technical assistance, including the Renewable Energy Data Explorer, Greening the Grid, the International Jobs and Economic Development Impacts tool, and the Resilient Energy Platform. More information can be found at: www.nrel.gov/usaaid-partnership.

