USAID Distributed PV Building Blocks

Introduction: What is Distributed PV?

Presented by Alexandra Aznar | May 10, 2018
National Renewable Energy Laboratory
USAID Distributed PV Pilot Program

- A multi-year program to assist USAID partner countries across the DPV spectrum in developing and implementing pilot projects to accelerate DPV market development.

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Learning Objectives

• Understand where distributed PV (DPV) fits in the power system and why it’s unique.

• Understand the five key elements needed for a successful DPV program and how they relate to one another.

• Achieve high-level understanding of best practices for incorporating DPV into the power system.
Setting the Context
What Do We Mean by Distributed Photovoltaics (DPV)?

Centralized

Conventional generators and utility-scale renewables (e.g., hydropower, wind, solar photovoltaics, concentrating solar power, geothermal, biopower) interconnect at transmission and subtransmission levels.

Connected “behind-the-meter” of retail electricity customers

Distributed

Small-scale generators (e.g., distributed photovoltaics, small wind, run-of-river hydropower, fuel cells) interconnect at the distribution level.

Smaller scale in nature (e.g. less than 1 MW)
What is Happening Behind the Meter?

The Typical PV Owner as Customer, Self-provider, and Exporter

Source: Designing Distributed Generation Tariffs Well.
DPV Hardware Costs versus “Soft Costs”

Source: RMI, 2013
Many Interacting Stakeholder Perspectives

Distribution Utility
How will my costs change?
Will I recover all of my costs?

DG Owner
What is my bill savings?
When will my investment pay off?

Ratepayer
How are overall rates being affected?

Non-DG Owner
How will my rates be affected?

Grid System
How is overall CapEx and OpEx affected?

Society
Utility sector investability?
Economic impacts?
Job growth?
Emissions?

...influence outcomes here
DPV: Disruptions, Opportunities, and Challenges

• DPV is a key disruptive force shaping power system transformation worldwide; it presents a range of opportunities.

• DPV is challenging how we plan, operate, regulate, and even conceptualize the power system.

• Benefits and challenges of DPV are quite unique.

Consumers are no longer waiting for regulatory, legal, and technical issues to be resolved; they are simply deploying systems!
Building Blocks for Distributed PV
Building Blocks for DPV Deployment

1. Vision, Goals & Roles
2. DG Definition
3. Compensation Mechanism
4. Interconnection Processes, Standards and Codes
5. Public Policy Support (as needed)

- Metering & Billing Arrangements
- Sell Rate Design
- Retail Rate Design
- Utility Cost and Risk Allocation Rules
- Standard Interconnection Contract
- Interconnection Application Process
- Interconnection Screens
- Codes and Standards

All Financial Aspects
All Technical Requirements
Metering Requirements
1. Define Vision, Goals, and Roles for DG

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
<th>Implications For:</th>
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<tbody>
<tr>
<td>What is the <strong>desired</strong> role of DPV in the electric system?</td>
<td>Self-consumption</td>
<td>Definition of DG System Size Limits</td>
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<td>Source of New Energy/Capacity</td>
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<td>Who can <strong>own</strong> DPV systems?</td>
<td>Consumers 3&lt;sup&gt;rd&lt;/sup&gt; Parties Utilities Communities</td>
<td>DG Financing and Accessibility</td>
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<td>Who can <strong>install</strong> DPV?</td>
<td>Private Sector Utility Government</td>
<td>DG Business Models</td>
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<td>Which <strong>market</strong> segments is DPV desired for?</td>
<td>Residential Commercial Industrial Agricultural</td>
<td>Retail Rate Design Cross-subsidy Effects</td>
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Note: Most options are not mutually exclusive.
2. Define DG

A lot of variation:
100 kW, 100% of load, 1 MW, 125% of load, 1-2 MW, etc.

Source connected to distribution network
Source < 20 MW
Cogeneration on the distribution network
Cogeneration < 1 MW
0-50 MW; connected to distribution system
Small-scale, on distribution network < 1 MW
Systems < 20 MW

Sources < 0.5 MW
Sources < 0.1 MW

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