Policy Building Blocks: Helping Policymakers Determine Policy Staging for the Development of Distributed PV Markets

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POLICY BUILDING BLOCKS: HELPING POLICYMAKERS DETERMINE POLICY STAGING FOR THE DEVELOPMENT OF DISTRIBUTED PV MARKETS

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ABSTRACT

There is a growing body of qualitative and a limited body of quantitative literature supporting the common assertion that policy drives development of clean energy resources. Recent work in this area indicates that the impact of policy depends on policy type, length of time in place, and economic and social contexts of implementation. This work aims to inform policymakers about the impact of different policy types and to assist in the staging of those policies to maximize individual policy effectiveness and development of the market. To do so, this paper provides a framework for policy development to support the market for distributed photovoltaic systems. Next steps include mathematical validation of the framework and development of specific policy pathways given state economic and resource contexts.

1. INTRODUCTION

The increased use of state policy instruments to drive distributed solar electricity markets is leading to documentation of policy lessons learned and best practices. Best practice and state policymaker guidebooks have emerged to inform and assist the development of effective policy (1, 2, 3). In addition, there is growing interest in quantifying the connection between policies and development more generally. To date, much of this work has been specific to wind resource development (4; 5) or has focused specifically on renewable portfolio standard (RPS) effectiveness (6).

An NREL report connecting renewable energy development with policy implementation used statistical methods to explain about 50% of the variation in installed capacity between states using policies in place. The report also described a mix of context factors, such as population, solar resource, and cost of electricity (7). These findings indicate that, given the data currently available on distributed solar installed capacity (8) as well as policy implementation data [from the Database of State Incentives for Renewable Energy and Energy Efficiency (DSIRE) at the time the research was completed], implementation cannot be explained completely by policy. More simply stated, policy plays a role in a complicated system of influences on clean energy development, but is not the only driver.

Finally, the report found a larger amount of development in states where there were more policies in place (as opposed to a limited number of policies). There are a number of interpretations of this finding, including that a scattershot approach of policy to address multiple market barriers might be the most effective policymaking strategy. However, a more likely explanation may be this: effective policy support for the development of sustainable markets results from a strategic (and cost-effective) policy development and implementation strategy.

To help determine the appropriate interpretation and inform the development in effective suites of policies, this paper postulates that the strategic development and maintenance of state policies in a particular context and motivation-based succession can foster the development of a stable distributed energy market. To support the postulation, Section 2 includes an outline of policymaker motivations for developing distributed generation markets. It is these motivations that provide the direction for policy development and can narrow the wide variety of policy options available in the current environment. Section 3 presents a framework for understanding staged development, depending on those motivations. Drawing on a large body of evaluative research, the framework is intended to provide a decision tool for policy makers interested in the development of renewable energy resources. Section 4 provides an overview of next steps, including the validation of the framework through qualitative and quantitative methods, and the development of policy pathways for states, given their particular economic and societal contexts. The framework and the pathways are intended to support decision makers in those contexts to select the most effective policies for developing sustainable markets for distributed solar.

2. POLICY MAKER MOTIVATIONS

Today, policymakers have a wide variety of policy options for the development of renewable energy resources. According to the DSIRE Database,[1] there are more than 30 policy types in implementation that promote renewable energy development in the United States. The volume of policies reflects the wide variety of motivations that policymakers have in designing and implementing policies.

Since the beginning of the recession, policymakers have been primarily driven by job development. In the case of renewable energy, distributed generation (DG) lends itself to increased job development over larger scale development, because DG requires more installers and business models for success in various markets. To determine the most effective policies at the individual state level, it is necessary to determine policymakers' motivations in developing distributed clean energy. Beyond job benefits, state policymakers are drawn by other benefits of DG. The Federal Energy Regulatory Commission (9) outlined the potential benefits of distributed generation as:

- Increased electric system reliability
- Reduction of peak power requirements
- Provision of ancillary services, including reactive power
- Improvements in power quality
- Reductions in land-use effects and rights-of-way acquisition costs
- Reduction in vulnerability to terrorism and improvements in infrastructure resilience.

This paper presupposes an interest from the policymakers on the development of a distributed solar market for any combination of the reasons just listed. The framework presented below includes policies that emphasize a number of different motivations. The appropriate policy (or policies) actually selected within each stage will be determined by specific motivation and other context factors.

3. POLICY FRAMEWORK

The purpose of using policy tools in supporting the development of renewable energy and capture some or all of the benefits described previously. The variety of policy options and uncertainty as to their impacts can lead to confusion, ineffective policies, or worse, unintended impacts.

To inform the decisions of state policymakers, the framework summarized in Figure 1 can be used to narrow the options within the wide variety of renewable resource development policies. This framework illustrates how states can build policy portfolios by first setting the stage for clean energy in the market. This is done creating low-cost policies, and then growing the market with successive policies until the need for financial incentives can be reduced and eventually eliminated. The framework focuses on the development of distributed PV resources because that is the focus of this paper, but similar frameworks are available for other resources and scales and for energy efficiency.

The goal of the framework is to achieve responsible market saturation. That is, to develop a self-sustaining market in which the full economic and societal benefits and costs of distributed energy resources are realized, allowing for developers and decision makers to make informed investment decisions regarding the development of energy resources.

Using this framework can help meet that goal because it proposes a staged, cost-effective approach to policy development. To achieve market saturation, each state will require a unique suite of policies dependent on its history, resource availability, and context. While the final suite will be unique, the framework is designed to be general enough that policymakers can determine which specific policy within each stage is appropriate for their context. The following subsections describe each stage, briefly describe the policies in the stage, and justify placement of each policy type within that stage.

[1] http://www.dsireusa.org

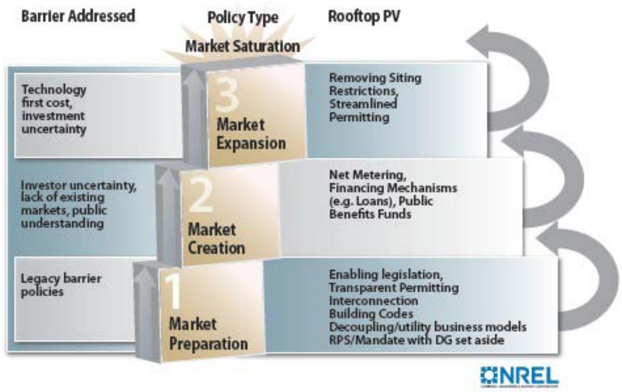

Fig. 1. Policy-Stacking Framework for Distributed Generation PV

3.1 Market Preparation

The purpose of this stage is to ensure that market players *can*, technically and legally, use the technology to its fullest extent. This stage focuses on removing legacy or institutional barriers to ease implementation of advanced technologies, not on establishing mechanisms that alter market or economic decision making. Because they are not seeking to directly alter the economics of PV installations, these policies have low or no cost to the state that is implementing the rules. Policies included in this category for distributed generation development include:

- Interconnection. This policy type allows for a generator to technically and legally connect to the utility grid. At the state level, these policies range from stating that the utility must allow for interconnection from distributed generation resources, to creating detailed processes and timelines for utilities to abide by in their connection generators. Often, states institute a streamlined and standard interconnection process for distributed generation. This process can increase likelihood of investment in projects by reducing the uncertainty surrounding interconnection to the grid. The development of interconnection standards typically involves legislative motivation and regulatory action, and can take months to years to implement, depending on processes in the state.
- Enabling Legislation for Third Party System Ownership. This policy type allows for third parties to own photovoltaic systems without becoming utilities. Because of the relative newness of innovative financing mechanisms, many states still have not clarified the rules of what type of generation owner qualifies as a utility. If project owners are subject to extensive utility rules it would make the development of PV cost prohibitive for homeowners. In states where the rules are clarified, a system owner is able to maintain a certain number of systems without being subject to regulation by the public utility commission. Enabling third party ownership is typically a legislative change to the definition of utility, and can be done in a single bill and implemented within weeks at the regulatory level.
- Transparent Permitting. Permitting for distributed energy resources is typically in the purview of the local jurisdiction. However, states can have a role in permitting by ensuring that the process and fees are transparent to the developer, reducing the cost uncertainty risk for owners and developers. This legislative policy can be quickly enacted but implementation and enforcement can be challenging and costly, depending on the motivation of the localities to comply.
- Building Energy Codes. Building codes can impact the development of distributed generation. Energy codes can provide safety requirements for the installation of PV systems, stipulating that they meet both electrical and physical rooftop safety. Such codes may create unnecessary requirements, categorizing PV as a roof covering, thereby including additional requirements of builders or homeowners installing the technology (10). This additional layer of requirements presents a legacy barrier to PV development. In addition to removing legacy barriers, building codes can be tools to ease the technical aspects of using technology, by incorporating requirements for new development to be designed for later solar PV installation, also referred to as being “solar ready” (11). This inclusion prepares the market for distributed PV by increasing the likelihood that buildings will be correctly designed and built for optimal PV use. Because the solar ready requirement does not include an investment in the technology, it is an option for jurisdictions wanting to allow for long-term development of distributed generation without investing a large amount of public capital. States have different processes for making changes to building codes, and these are typically multi-month to multi-year processes.

3.2 Market Creation

The second stage of the framework builds on the market foundation to create markets for the technology. Policies created at this point facilitate the uptake of technologies in the market without directly altering project economics. The policies allow a motivated consumer to access a market and services related to distributed generation, but do not make attempts to monetize the non-economic benefits of distributed generation. These policies go beyond preparing the market into driving market demand for clean energy. They use mandates to assure investors that the market for the technology is certain to exist over the long term and establish programmatic financing mechanisms. Specific policy types in this stage are:

- Mandates. These direct the utilities to sell, generate, or purchase a certain percentage of their portfolios as renewable energy. In the United States, these mandates are most commonly called Renewable Portfolio Standards (RPSs) with a DG bonus or set-aside. The purpose of this policy aspect is to create a market for distributed generation and for the large-scale generation that may dominate policy compliance for economic purposes. This aspect is an acknowledgement of the potential public benefits of distributed generation. Because an RPS alters the market environment for electrical power, it can be politically contentious. RPSs are typically legislatively driven and include regulatory design and implementation, and can take years to develop and implement, and usually require public investment for a monitoring and enforcement system.
- Net metering. This policy allows for the distributed generator to be compensated for electricity produced and fed into the grid. The provision of electricity includes a wide range of aspects beyond the generation and delivery of electricity to the grid (e.g., transmission and distribution costs, maintenance, reliability). Therefore, determining the value of providing electricity onto the grid from a distributed generator is a complicated process and differs across the United States. As such, the effectiveness of these policies to create markets in which generators are compensated for the electricity produced and provided to the grid varies. These policies are typically legislatively driven and implemented by regulatory authorities. Development and implementation can take months to years as a result of determining the appropriate value of the electricity to the grid.
- Financing Mechanisms. This category of policies creates a market by allowing customers with different financial needs to have access to the market through various mechanisms, such as loan guarantees, and low interest loans. Because financing institutions have limited experience with distributed energy projects, governments can provide incentives for those organizations to consider the investment. These incentives differ from direct incentives in the next stage because they target the development of the market, as opposed to the development of individual projects.
- Public Benefit Funds. This type of policy, also called a systems benefit charge, is a charge on electricity customers that is used to implement programs that are deemed to be in the public good. The funds collected are traditionally focused on energy efficiency improvements and lowering the costs of electricity to low-income communities. These programs, can, however, support the broad financing mechanisms above for distributed generation development. The fact that they provide a sustained funding mechanism for energy related programs and projects contributes to the development of a consistent market. Such programs also reduce investment risk by signaling to the private market that the government intends to create lasting markets.

3.3 Market Expansion

This stage of policy development targets the development of projects and includes both incentives that attempt to distribute the high first costs of distributed technologies and policies that facilitate project installation. The purpose of this category is to increase the installation of individual projects through monetizing the non-economic benefits of distributed generation for the developer. Because the value of those benefits vary in different contexts, these policies can be politically challenging to put in place and technically challenging to design and implement. There is a large body of literature (encompassing the energy field as well as other fields) that discusses the design and implementation of effective market incentives. Specific policy types include:

- Incentives. In the context of this framework, incentives are defined as direct monetary support for specific project development. Incentives, especially in the current economic environment, can be politically challenging to implement and require detailed design to ensure that they are effectively reaching the intended market at levels that spur development without creating over-subsidization. Because of the complications and expense of these types of policies, they are most used and most cost-effective in environments where the market is prepared for project development. There are three primary types of incentives:
    - Investment incentives directly alter the first cost of technologies. These incentives can take the form of grants, rebates, or tax incentives, depending on the market needs. Grants are typically applied to larger scale projects and are paid in advance of development, and so target development that would not take place without advance investment. Rebates are most commonly based on equipment purchases and can be applied at the time of purchase or through a post-purchase mechanism. Tax incentives can be deductions or credits, can be applied to entire installations, and are applied after purchase, annually. Tax incentives target development that does not need direct capital investment, but instead prioritizes reduction in pay-back period.
    - Production incentives provide payment for electricity produced from the distributed electricity. These are different from net metering because the aim is not to provide the economic value of electricity sold into the grid, but instead, to monetize

the indirect benefits of distributed generation and apply that on a production basis to projects. These incentives do not directly remove the challenge of higher first costs, and so are most effective in situations in which those high first costs can be spread over the course of the project lifetime (e.g., where direct priori investment is not a priority). In the last decade, incentives for distributed generation have tended toward the production type, because it assures the public that the investment is resulting in clean energy development (whereas investment incentives have the potential to be invested in projects that do not materialize).

  - Feed-in-Tariffs. This incentive type reduces investment risk by providing fixed payments for projects based on the levelized cost of renewable energy generation. This (among other design characteristics) distinguishes feed-in-tariffs from production-based incentives, which are based on monetizing the value of the electricity to the grid or the value to the electricity purchaser.
- Removing Siting Restrictions or Ensuring Broad Market Access. Siting restrictions can be stipulated by local ordinances or home owners associations and designate where solar panels can be placed within the jurisdiction. Twenty-four states currently have laws in place that prevent the restriction of solar facilities on residences (12). Like the current state role in encouraging transparency in permitting policies, these typically legislative policies cost nothing to put in place, but implementation and enforcement can be challenging and costly, depending on the interests of the localities. This is an expansion policy (as opposed to a preparation policy) because the effect of siting restrictions is currently unclear, and to date, market development has not been limited by these types of regulations.
- Streamlined Permitting. Permitting for solar facilities has traditionally been the jurisdiction of localities, but there are some states that also issue permits. In the past two years, both Colorado (13) and Vermont (14) have issued laws regulating state permits for renewable energy systems. Such permitting falls into the market expansion category as a potential follow-on to the development of transparent permitting. However, because of its limited use to date there is little information on effectiveness, potential intended or unintended impacts, or broad applicability, so it is not currently considered a primary policy for developing markets.

4. NEXT STEPS: CONTEXT-SPECIFIC PATHWAY OPTIONS

This paper lays out a framework and potential pathways for policy development in various frameworks for policymakers based on qualitative best practices and historic evaluations of policy effectiveness. The next steps for this work are to:

- Develop models to validate the placement of policies in the appropriate groupings and attempt to determine the appropriate weight of policies within different state contexts.
- Develop policy-specific, quantitative-impact potential information for policymakers who want to develop (or further develop) distributed generation markets within their states.

Another potential next step is to determine the impacts of the in-policy attributes (e.g., the relative goal of the RPS) to determine which design elements of policies are the most effective at driving the market.

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