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# The Role of Government Policy in the Development of Solar Photovoltaic Power

CPI Insight Series: Project Overview

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## Descriptors

Sector	Power and Energy, Innovation, Removing Barriers/Complementary Policies
Region	United States, China, Europe
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## About CPI

Climate Policy Initiative (CPI) is a policy effectiveness analysis and advisory organization whose mission is to assess, diagnose, and support the efforts of key governments around the world to achieve low-carbon growth.

CPI is headquartered in San Francisco and has offices around the world, which are affiliated with distinguished research institutions. Offices include: CPI at Tsinghua, affiliated with the School of Public Policy and Management at Tsinghua University; CPI Berlin, affiliated with the Department for Energy, Transportation, and the Environment at DIW Berlin; CPI Rio, affiliated with Pontifical Catholic University of Rio (PUC-Rio); and CPI Venice, affiliated with Fondazione Eni Enrico Mattei (FEEM). CPI is an independent, not-for-profit organization that receives long-term funding from George Soros.

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## Project Motivations

In late 2010, CPI began a study of the impact of national and international policy on the development of Solar Photovoltaic (PV) technology. A full report, including region-specific analysis, is expected this summer.

CPI selected Solar PV as one of its first global analytic efforts for a number of reasons:

- The technical potential of PV is large enough to make a significant contribution to greenhouse gas mitigation goals.<sup>1</sup>
- PV costs have decreased substantially, in part as a direct and indirect result of government policies.
- PV costs must come down further to become cost competitive with conventional energy sources, a major step toward reaching PV's potential.<sup>2</sup>
- There is substantial global experience with PV policy, as numerous countries have used diverse policy approaches with varied success.
- Solar PV is representative of the many technologies relevant to climate and energy that still require research, innovation, and market deployment.

CPI's focus in this project has been on the effectiveness of policy in helping PV reach its technical potential. More specifically, the focus has been the impact of policy in driving down the cost of energy from PV, as cost is the single most important obstacle standing in the way of PV's potential. In this project overview, we address several of the major questions that policymakers face in their effort to make PV more cost competitive. We then set out the framework under which we have begun to analyze these questions.

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<sup>1</sup> The CPI report "Assessment of Photovoltaic Technology Policy in Germany and China" (November 2010), estimates the technical potential of PV. For example, using only the building integrated systems, it estimates that around 30% of electricity in both China and Germany could be generated from solar. Including solar parks more than doubles this number. In a different approach, the McKinsey study, "Pathways to a Low Carbon Economy" suggests that approximately 4% of the greenhouse gas savings required between now and 2030 to meet the 2 degrees C path could be achieved through Solar PV.

<sup>2</sup> The November CPI report argues that costs must fall 50% to 70% more for PV to be economically competitive in general applications.

## 1 The Major Policy Questions

With the role of policy in PV cost reduction in mind, we have identified several major questions that policy makers will face and which our work will address. Some of these include:

### 1. How effective have current and past PV policies been and why?

Policy effectiveness lies at the heart of CPI policy evaluation.<sup>3</sup> The organization's approach is to use data-based analysis of policies to identify policy design and implementation issues that have led to the success or failure of a policy. Our approach to assessing policy effectiveness looks beyond simple measures of abatement per dollar spent to incorporate concepts such as the timing of abatement, treatment of risk and uncertainty, and measuring both the direct impact of a policy on emissions versus the impact of a policy in making other policies more effective.

### 2. Have targeted or broad based policies been more effective?

A well-structured, broad-based policy (e.g., a carbon price) could allow technology or project developers access to the widest range of potential tools to achieve their mitigation objective. Targeted tools (e.g., a specific research grant) could focus on one particular obstacle to technological advancement. In many cases, a mix of policies could be appropriate. Our aim is to analyze the specifics of the PV industry and relevant policy so far and draw lessons about what types of policies work and how.

### 3. How effective have PV policies been in achieving multiple objectives, including non-energy or climate related objectives?

PV policy in China and Germany has pursued twin goals of national industrial development and progress on clean technology. The perceived success of these policies could depend upon which lens is used for evaluation.<sup>4</sup> The primary focus of this study is on developing clean technology and reducing its cost. However, understanding this dimension of policy effectiveness will help us draw insights as to the cost and effectiveness of the policy with respect to the additional objectives and the cost of combining objectives.

### 4. At what geographic level should policies be set and how do local and national policies interact on a global scale?

Participants in the PV industry, as well as the activities, businesses, and projects they undertake, may be national, global, or local. A PV unit installation might be a very local issue, for instance, while poly-silicon production or wafer manufacturing may be designed for the global market. As a result, local policies could interfere with (or complement) national policies, and the national policies of various countries could interact with each other.

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<sup>3</sup> CPI's general approach to policy effectiveness will be laid out in a separate paper.

Understanding this dynamic is important to designing policies and coordinating policy development.

**5. How should policies be structured to facilitate effective use of the capital markets?**

In general, the role of the capital markets become increasingly significant as technologies near commercial deployment; as it is at this point where financing can make the difference between a project succeeding or failing. Whether a project can be financed will depend upon its risk/reward balance. For PV, the risks and rewards will be determined by among other things, the geography, technology, activity, and policy. As in question 4, the impact of policy on financing may be very different for a manufacturer that is building a factory for the global market, than for a local rooftop installation.

## 2 Framework for Evaluating the Impact of Policies on the Long-term Costs of Solar PV

Given the breadth of the PV sector and the issues discussed above, we propose to break down the problem into its component parts - as defined by value chain segments - and then evaluate the impact of policies on each of these segments. In this context, we will link the effectiveness of policy in achieving its objectives through four steps (see Figure 1 on the following page):

- **Objectives** - As described earlier, we begin with the objective of cost reduction.
- **Activities** - We then look at the business activities that lead to technology development and wide-scale deployment– including research, design, manufacture, development, installation, and financing – and identify which of these could facilitate achievement of the desired objective.
- **Drivers** - For each of these activities, we look at the drivers or levers than can be used to squeeze performance out of the activity, leading towards fulfillment of the objective.
- **Policies** - Finally, we look at policies and assess their impact on the drivers.

With a better understanding of the components of the PV industry, we can begin to address each of the policy questions above, including:

- The effectiveness of relevant policies on each particular activity;
- How well broad-based policies may have worked in creating opportunities to innovate between segments, and where targeted policies have been successful;
- Where – at a geographical and activity level – have policies interfered or complemented each other.

Together, this understanding should enable policy makers to build cost effective policy sets.

**Figure 1. Framework for Evaluating the Impact of Policies on the Long Term Costs of Solar PV**

