Benchmarking Soft Costs for PV Systems in the United States

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Outline

• Why we should care about non-hardware cost for PV systems

• Benchmarking non-hardware costs in the U.S.

• With rapid decline in hardware costs, reducing soft-cost is becoming increasingly important.
There is more to a system than hardware

1) Choose installer
2) Finance PV system
3) Permit, Inspect
4) Install, Interconnect
5) Monitor performance

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- In the U.S., the process of selecting an installer through operating a PV system can add significant time and cost to project completion.

- Inefficient supply chains, O&M, and delays can also increase cost.
  - Need for streamlined processes.
The Problem: Inconsistent PII requirements, delays, and lengthy wait times are costly

- 18,000+ local jurisdictions with different PV permitting requirements
- 5,000+ utilities with interconnection standards and net metering programs

Permitting fees vary widely across the U.S. ex) for 5kW system:
- Typical permit fees are $200-$450/install (as high as $2000/install)
- Currently in the U.S. PII typically range from $0.15/W to $0.25/W, and can be as high as $0.5/W depending on jurisdiction.
NREL recently benchmarked “Soft Costs”

- Benchmarked 2010 non-hardware BoS costs and integrated into bottom up PV system price model

- Distributed an online data collection tool to residential and commercial PV installers
  - Data collection focused on annual/per install labor hours expended on specific tasks to capture time and cost of PV business process

Data collected to estimate the cost/W for:

- Installation
- Permitting, Inspection, Interconnection
- Customer acquisition
- Financing
2011 Residential Total Installed PV System Price

**estimated financing costs include $.10/W as a mid point between direct cash purchase ($0/W) and home equity line of credit closing costs and fees ($.20/W)**

Additional Sources: Goodrich et al 2012, LBNL
2011 Residential Non-Hardware Breakdown

- **Total non-hardware BOS** (including profit) $3.33/W; approx 52% of total price
- **NREL data collection non-hardware BOS** $1.59/W*; approx 48% of total non-hardware BOS

  *$1.52/W for 3rd party owned systems; $1.50/W for overnight cash purchase ($0/W financing cost)

* based on 2011 residential PV system price of $6.35/W
** non-hardware is 50% of residential system price in 2010 ($6.60/W)
Permitting, Inspection, Interconnection

PII labor hrs/install may be more dependent on jurisdictional factors than economies of scale

- Total PII labor hrs/install cluster 15 to 25 hrs.
- # installations, x>1000, 20 labor hrs/install
## Commercial Non-hardware BOS Costs

<table>
<thead>
<tr>
<th>Cost Category</th>
<th>&lt;250 kW</th>
<th>&gt;250 kW</th>
</tr>
</thead>
<tbody>
<tr>
<td>3rd Party Financing Labor</td>
<td>$0.02</td>
<td>$0.003</td>
</tr>
<tr>
<td>Permit fee ($25,000)*</td>
<td>$0.35</td>
<td>$0.03</td>
</tr>
<tr>
<td>Permitting, Inspection, Interconnection Labor</td>
<td>$0.02</td>
<td>$0.003</td>
</tr>
<tr>
<td>System Design</td>
<td>$0.10</td>
<td>$0.01</td>
</tr>
<tr>
<td>Customer Acquisition**</td>
<td>$0.09</td>
<td>$0.02</td>
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<tr>
<td>Installation Labor</td>
<td>$0.42</td>
<td>$0.18</td>
</tr>
<tr>
<td>Total</td>
<td>$0.99</td>
<td>$0.25</td>
</tr>
</tbody>
</table>

* Permit fee is translated to $/W based on a median system size of 72 kW within the <250 kW size category and a median system size 750 kW within the >250 kW size category

** Includes marketing and advertising total annual cost
Questions?