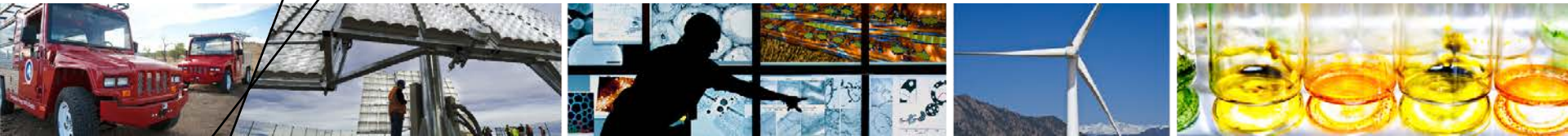


# Benchmarking Soft Costs for PV Systems in the United States



**ASES World Renewable Energy Forum**

**Kristen Ardani**

**5/17/2012**

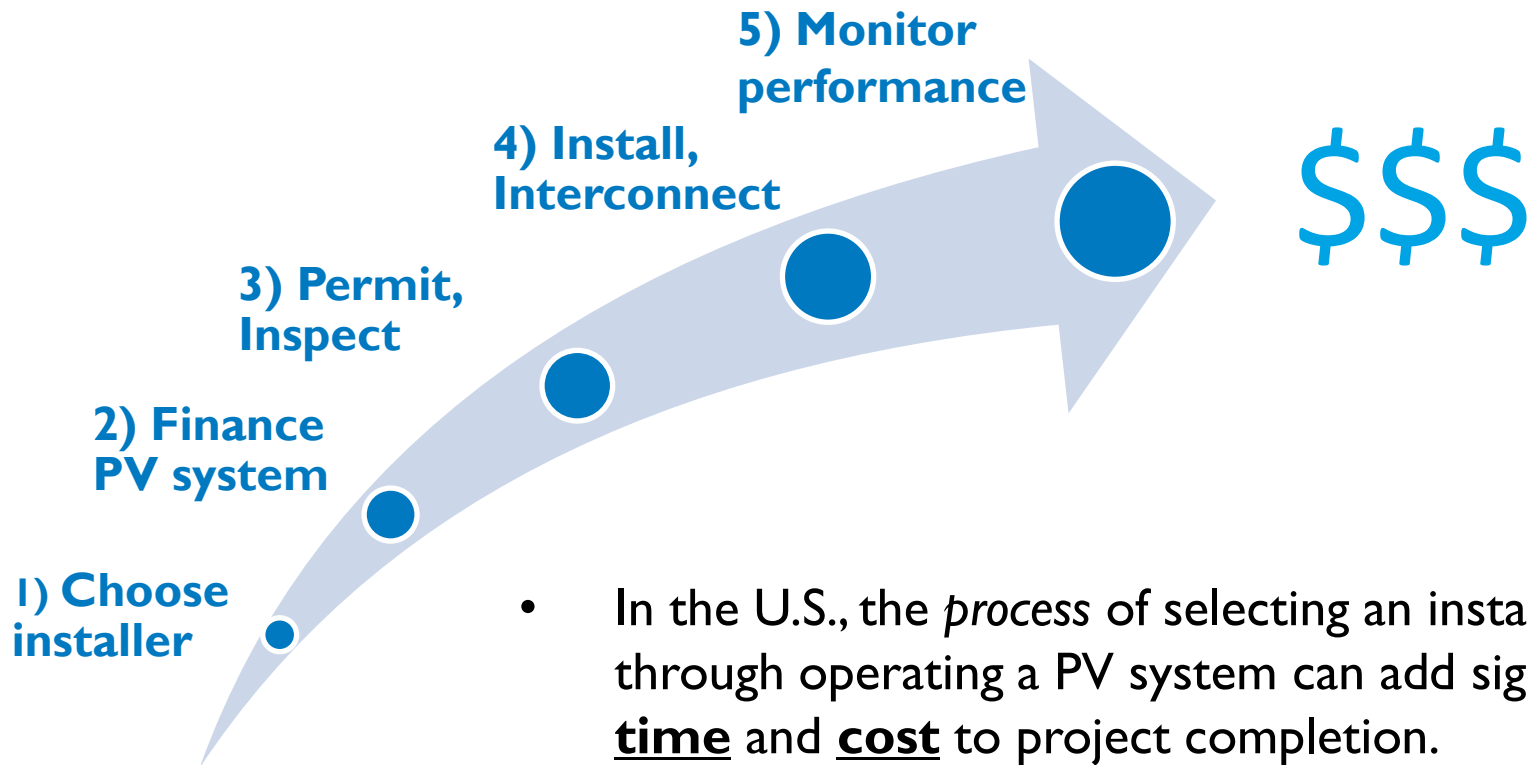
**NREL/PR-6A20-54689**

# 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



- 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.

# Ex: Permitting, Inspection, Interconnection (PII)

**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”

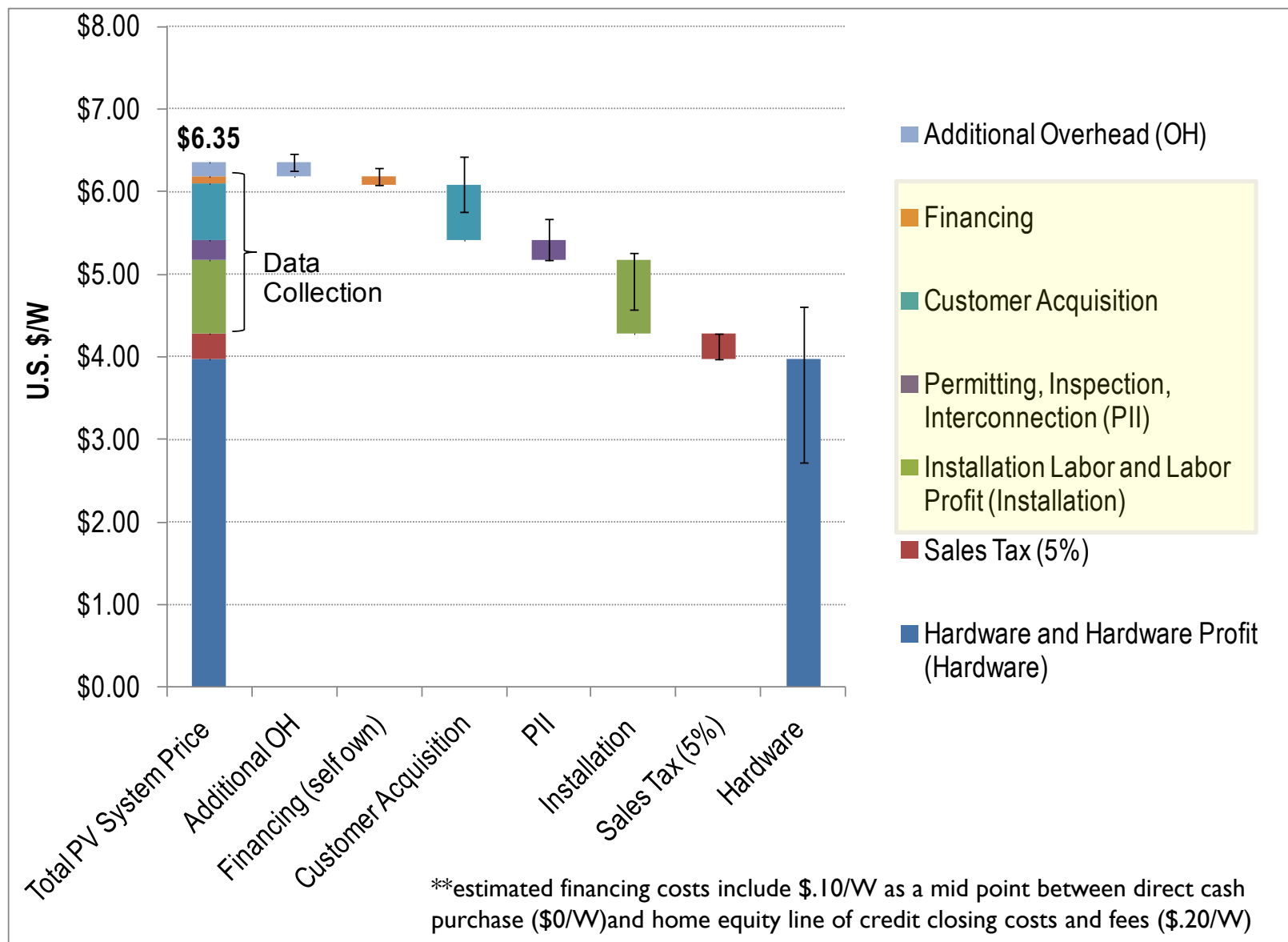
---

- 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:**

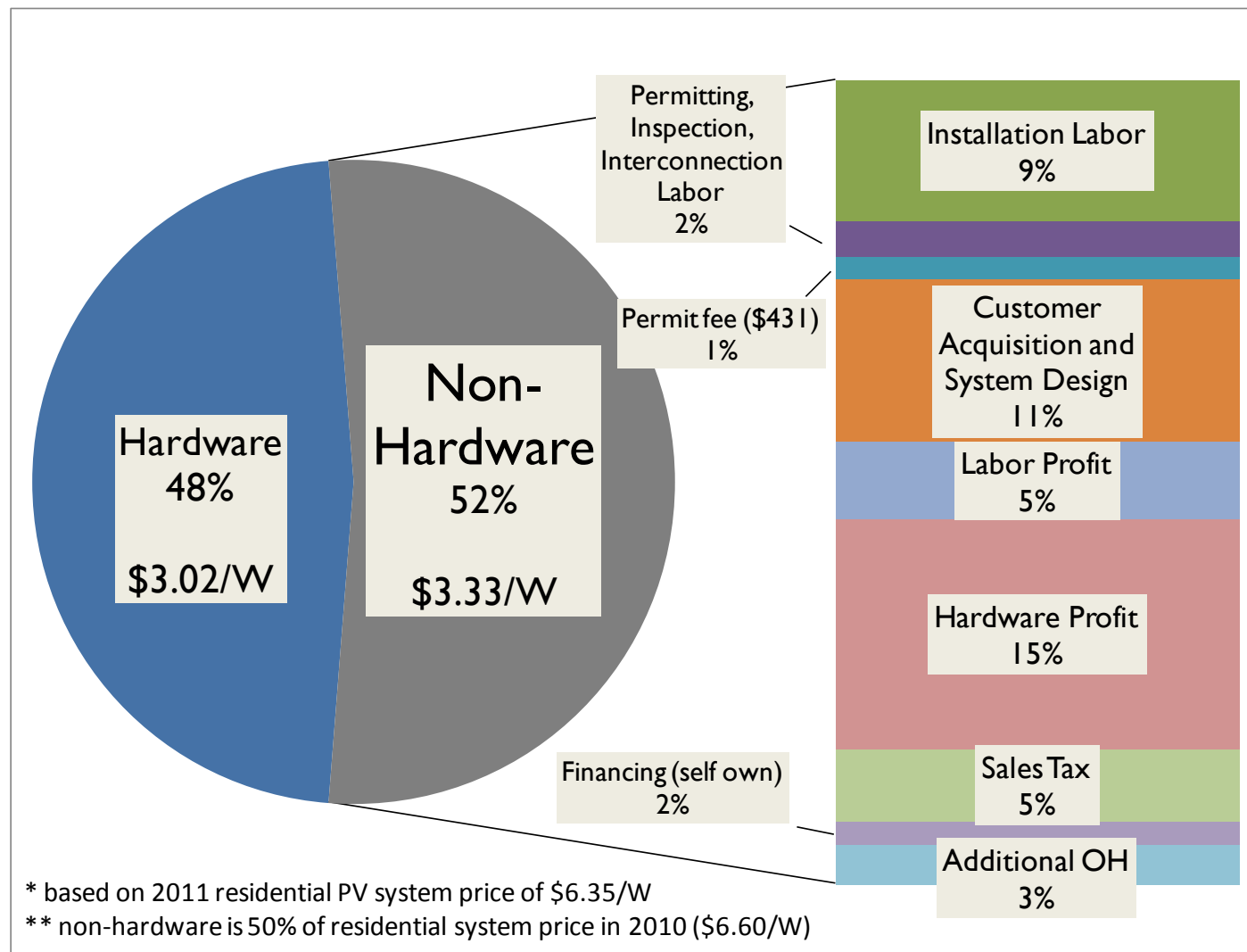
- Installation
- Permitting, Inspection, Interconnection
- Customer acquisition
- Financing

# 2011 Residential Total Installed PV System Price



Additional Sources: Goodrich et al 2012, LBNL

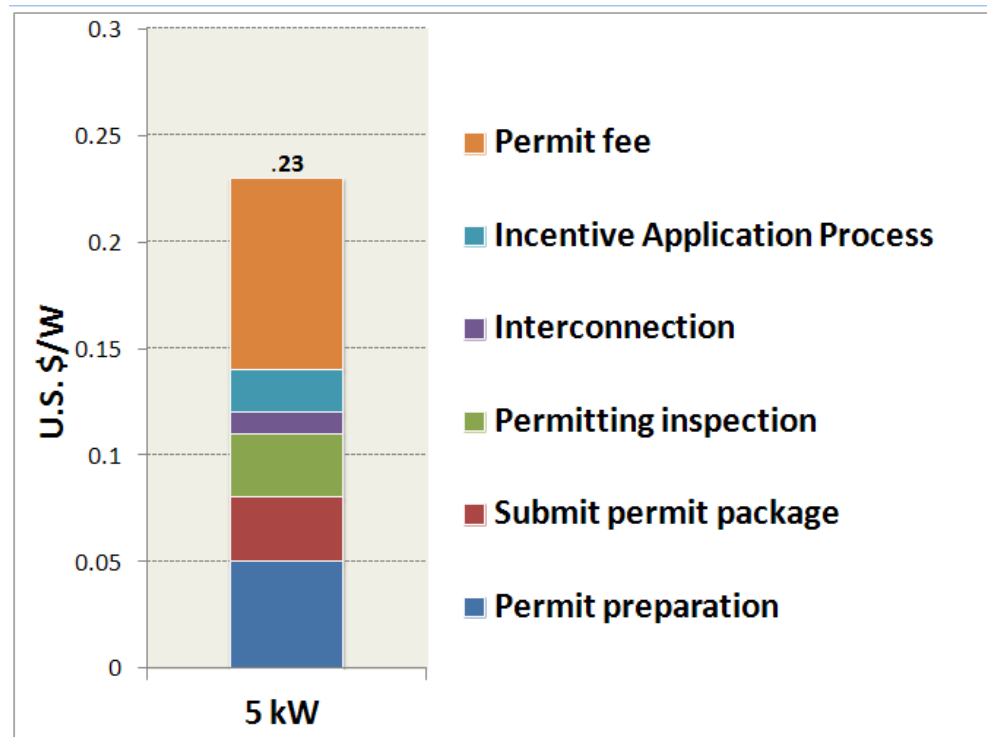
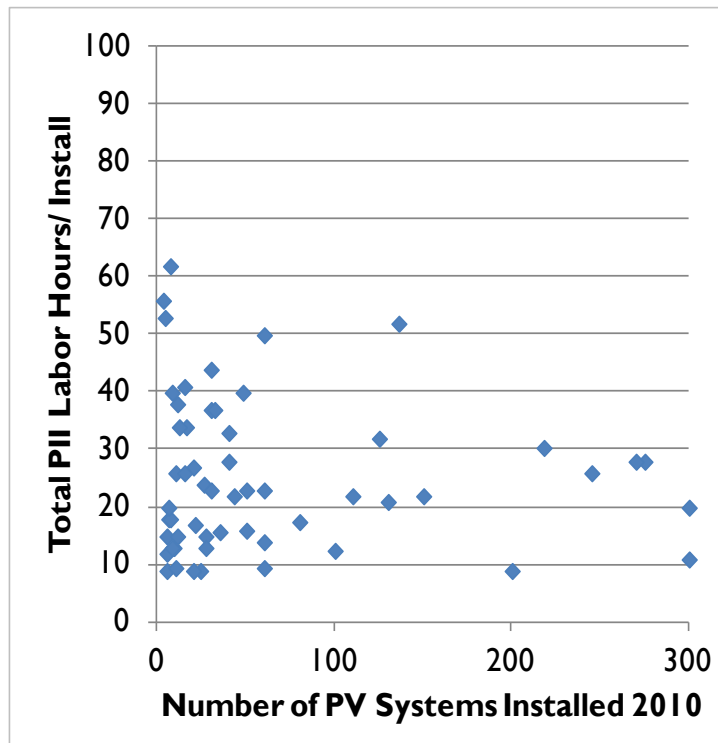
# 2011 Residential Non-Hardware Breakdown



- **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 3<sup>rd</sup> party owned systems ; \$1.50/W for overnight cash purchase (\$0/W financing cost)

# 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

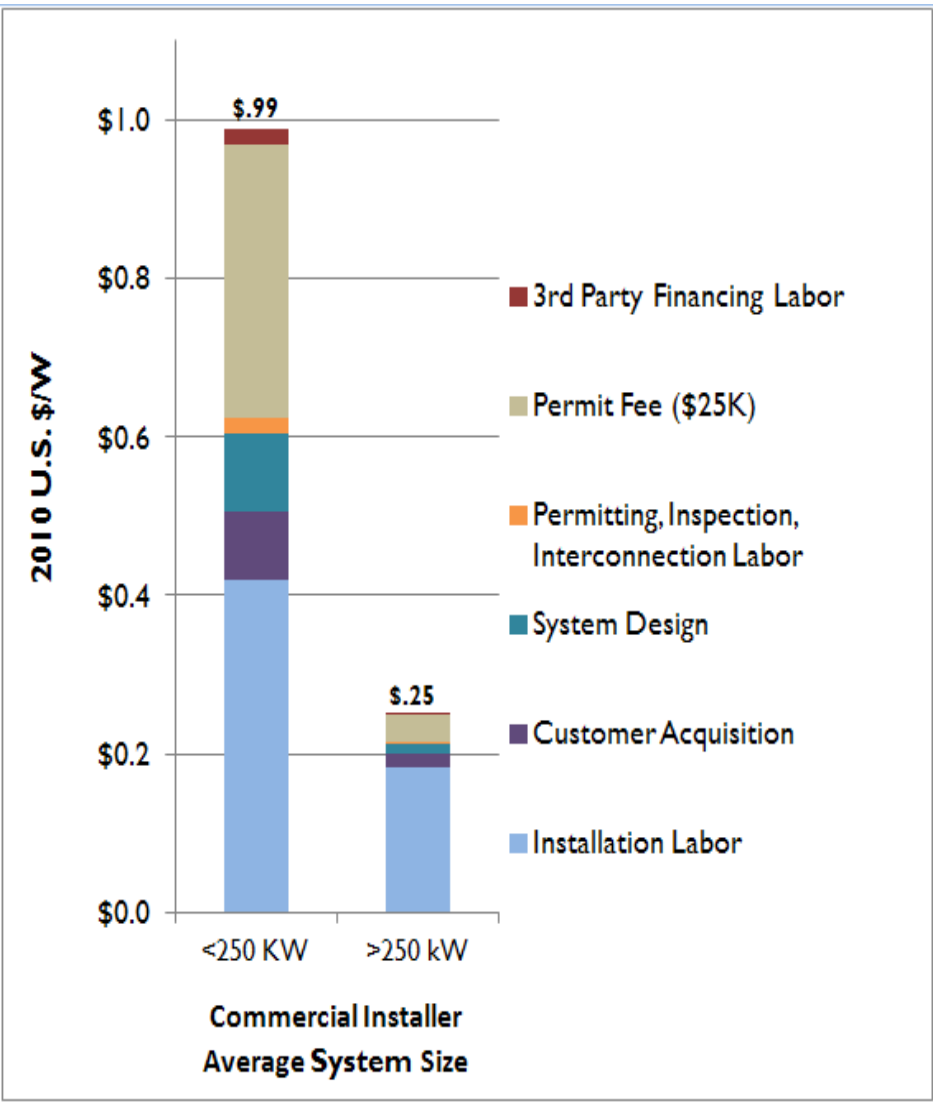


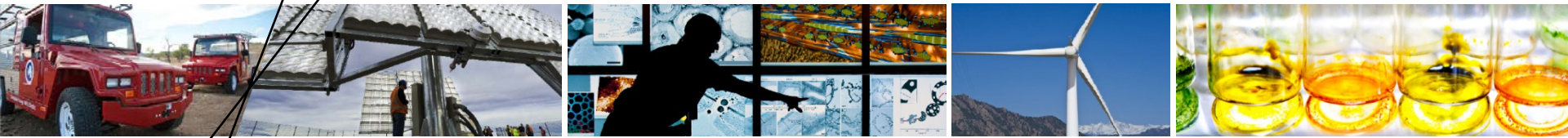
# Commercial Non-hardware BOS Costs

| Cost Category                                 | <250 kW       | >250 kW       |
|---|---------------|---------------|
| 3 <sup>rd</sup> Party Financing Labor         | \$0.02        | \$0.003       |
| Permit fee (\$25,000)*                        | \$0.35        | \$0.03        |
| Permitting, Inspection, Interconnection Labor | \$0.02        | \$0.003       |
| System Design                                 | \$0.10        | \$0.01        |
| Customer Acquisition**                        | \$0.09        | \$0.02        |
| Installation Labor                            | \$0.42        | \$0.18        |
| <b>Total</b>                                  | <b>\$0.99</b> | <b>\$0.25</b> |

\* 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?**