

NREL reports soft costs now largest piece of solar installation total cost

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Two detailed reports from the Energy Department's National Renewable Energy Laboratory (NREL) find that solar financing and other non-hardware costs—often referred to as "soft costs"—now comprise up to 64% of the total price of residential solar energy systems, reflecting how soft costs are becoming an increasingly larger fraction of the cost of installing solar.

"The two new reports, along with previous reports, provide a comprehensive look at the full cost of installing solar, while delineating and quantifying the various contributors to that final cost," NREL analyst Barry Friedman said.

The first new report, "Benchmarking Non-Hardware Balance-of-System (Soft) Costs for U.S. Photovoltaic Systems, Using a Bottom-up Approach and Installer Survey – Second EditionPDF" is a follow-up to the first edition published in 2012, but offers a more in-depth look at non-hardware business process and installation costs associated with photovoltaic (PV) solar [energy](#) systems.

Research interviews included 55 residential PV installers representing about 27 megawatts of capacity installed during the first half of 2012. Researchers also gathered data from 22 commercial PV installers representing 269 commercial PV installations for the same time period, for a total of 66 megawatts of capacity.

The authors found that in the first half of 2012, soft costs represented

the majority of all costs—64% of the total price for residential systems, up from 50% of the total price in the first edition. Similar results were found for small and large commercial installations—57% of the total cost for small (less than 250 kilowatts) commercial systems (up from 44%); and 52% of the total costs for large (250 kilowatts or larger) commercial systems (up from 41%).

For residential systems, the greatest soft costs were supply chain costs (\$0.61/watt), installation labor (\$0.55/W), customer acquisition (\$0.48/W), and indirect corporate costs (\$0.47/W), such as maintaining office management and accounting functions. Other soft costs examined for the report included costs for permitting, inspection, interconnection, subsidy applications and system design. Soft costs for small commercial (250 kW) systems were also collected and analyzed. In contrast to the first edition of the report, the new report unpacked the "other" soft costs category, using a detailed "bottom-up" cost-accounting framework to quantify five sub-categories: transaction costs, indirect corporate costs, installer/developer profit, supply chain costs, and sales tax (see figure below).

Residential soft cost categories for the first (2010 data) and second (2012 data) editions of the benchmarking study. For the first edition of the benchmarking study, 2010 "all other soft costs" had not been differentiated. For the second edition, we quantified five sub-categories within this broader category.

By modeling a third-party ownership structure—[solar energy systems](#) leased to homeowners, for example—the new approach captured costs of doing business that had not been previously quantified. Those costs include engineering, procurement, and construction; developer and finance department staff and overhead; professional and legal services; capital costs during construction; and other costs.

The second report "Financing, Overhead, and Profit: An In-depth Discussion of Costs Associated with Third-party Financing of Residential and Commercial Photovoltaic SystemsPDF" takes a deeper look at the five sub-categories identified in the benchmarking study that had been lumped together in the first edition of the benchmarking study.

Researchers and industry developed and vetted a bottom-up analysis of costs associated with developing, financing, constructing and arranging the financing for third-party owned systems. The model quantifies the indirect corporate costs required to install distributed PV systems as well as the transactional costs associated with arranging third-party financing. The authors conducted in-depth interviews with members of finance departments at large PV installation companies and collected data from corporate public filings.

They found that third-party ownership added \$0.78 per watt for residential systems and \$0.67 per watt for commercial projects. They also noted three of the main benefits of third-party financing arrangements:

Third-party financiers offer additional services, such as shopping for systems, maintaining systems, and applying for incentives. Third-party financing may effectively lower the levelized cost of energy over time through economics of scale. Businesses offering third-party ownership of installations have gained approximately 70% of residential market share in the United States, driving much of the PV demand.

NREL is the U.S. Department of Energy's primary national laboratory for renewable energy and energy efficiency research and development. NREL is operated for the Energy Department by the Alliance for Sustainable Energy, LLC.

The findings in these reports provide benchmarks and help track

progress of the SunShot Initiative, a national effort to make solar energy fully cost-competitive with traditional energy sources by the end of the decade. Through SunShot, the Energy Department supports efforts by private companies, universities and national laboratories to drive down the cost of solar electricity to \$0.06 per kilowatt-hour. Learn more at <http://www.energy.gov/sunshot>.

Provided by National Renewable Energy Laboratory

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