

Solar Economies of Scope through the Intersection of Four Industries: PV Installation, Electrical, Construction, and Roofing

Study using new data shows that most solar photovoltaic (PV) installers are licensed to provide related services such as electrical contracting, construction, and roofing, and that installers with multiple technical backgrounds offer lower prices.

Summary

Over the past two decades, the U.S. solar photovoltaic (PV) installation industry grew from dozens to thousands of installation companies. In *Solar Economies of Scope: The Intersection of the PV Installation, Electrical, Construction, and Roofing Industries*, we use a new data set to show how this industry is intertwined with other related service industries. We find that most PV installers are licensed to provide services other than PV installation. Further, we find evidence of solar “economies of scope,” meaning that installation costs are lower when installers offer multiple services, especially when PV systems are installed during new construction.

Context

The relationships between PV installation, electrical contracting, construction, and roofing could yield cost synergies or economies of scope that could be tapped to reduce PV prices. Solar economies of scope could come in two forms. First, installers with multiple technical backgrounds may be able to install PV more efficiently than installers with less technical experience. For instance, licensed electricians may be able to install PV more efficiently than non-electricians, particularly for

jobs requiring complex wiring and for PV systems installed with batteries. Second, installers may tap economies of scope by installing PV at the same time as new construction or roof replacement. In this case, the costs of installing PV and a roof at the same time may be lower than the costs of installing the two separately.

Data and Methods

We use contractor license data from the California Contractors State License Board (CSLB). The CSLB data comprise records on all licensed contractors in the state of California. Using installer names from the Lawrence Berkeley National Laboratory’s Tracking the Sun data set, we match the CSLB data to 2,029 contractors that installed PV in California from 2010 to 2016. We test the effects of installer background on prices using an econometric analysis using price data from the Tracking the Sun data set.

Results and Conclusions

In California, four types of licenses enable contractors to install PV: electrical, general building, general engineering licenses, and a specialized solar contractor license. The CSLB data show that most installers hold a single PV-enabling license, most commonly an electrical license (35%) or a general building license (25%) (Figure 1). About 9% of installers hold only a solar contractor license, and about 25% hold multiple PV-enabling licenses. Interestingly, about 5% of installers do not hold any of the PV-enabling licenses (though they are licensed in other professions such as roofing). In such a case, the installer most likely collaborated with another contractor that held a PV-enabling license to pull the solar permit.

The CSLB data show that installers of different scales tend to hold different licenses. Small-scale installers are less likely to hold the designated solar

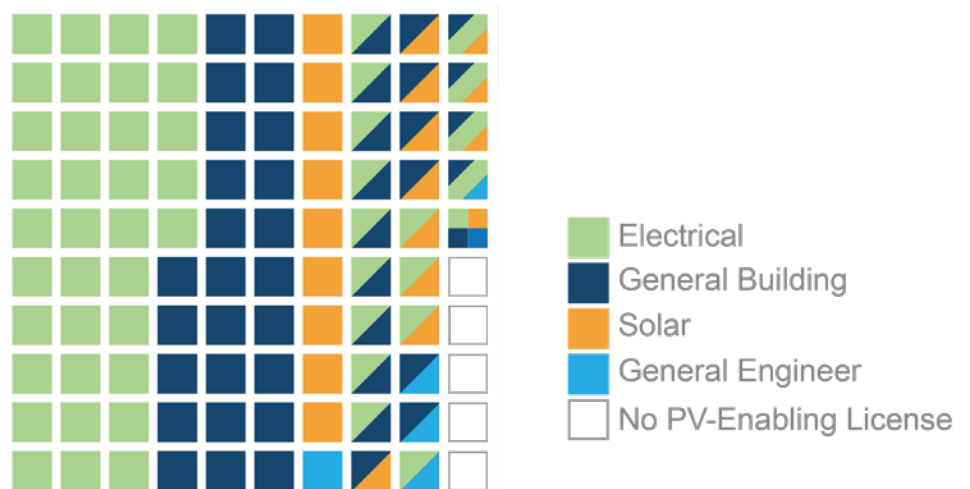


Figure 1. Combinations of PV-enabling licenses held by installers

contractor license, indicating that small-scale installers are primarily related-service contractors that dabble in PV installation. Large-scale installers are more likely to hold general building and roofing licenses. Furthermore, large-scale installers are more likely to install systems during new construction. Together, these data suggest that large-scale installers are incorporating multiple services into their business models.

An econometric analysis provides evidence of economies of scope in PV installation. Costs of systems installed by installers with electrical, general building, general engineering, or

roofing licenses are lower than costs of systems installed by installers with the specialized solar contractor license, on average. Further, system costs are lower on average when systems are installed during new construction, especially when these systems are installed by licensed roofers (Figure 2). Our analysis indicates that policies that encourage the integration of PV installation with other industries and with other construction activities may yield significant PV price reductions. California’s new building code mandating that PV be installed on all new homes will provide an ideal testing ground for this hypothesis.

More Information

For more information, download the full technical report: O’Shaughnessy, Eric, and Robert Margolis. 2018. *Solar Economies of Scope through the Intersection of Four Industries: PV Installation, Electrical, Construction, and Roofing*. NREL/TP-6A20-72171. <https://www.nrel.gov/docs/fy19osti/72171.pdf>.

For questions, contact Eric O’Shaughnessy at eric.oshaughnessy@nrel.gov.

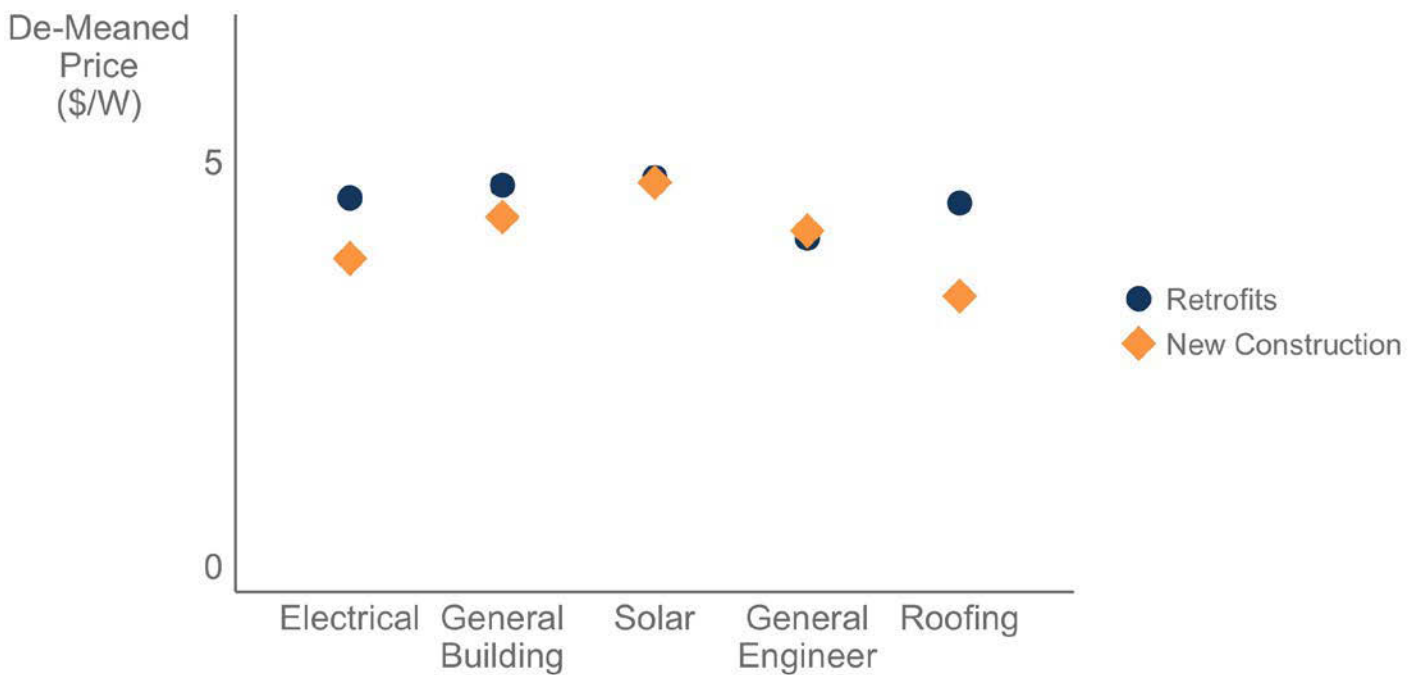


Figure 2. De-meaned average installed PV prices for retrofit and new-construction systems by license held. De-meaned prices refer to prices that factor out differences in prices that result from declining prices over time.



National Renewable Energy Laboratory
15013 Denver West Parkway
Golden, CO 80401
303-275-3000 • www.nrel.gov

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NREL/FS-6A20-72239 • November 2018

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