Can the In-house Installation of Solar Panels Increase Residential Builder’s Profits?

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The purpose of this paper is to analyze and determine if the In-house installation of solar panels by Residential Builders will lead to increased profits. Specifically, this pertains to Large Residential Developers that are focused on building single-family home developments with greater than 25 homes. With the demand for solar power in new homes continuously rising year after year, it is smart to find more profitable ways to install these systems, one of which is self-installation performed by the General Contractor. The Methodology of research I used is a combination of primary and secondary research, as well as interviews with current workers in the field. I also analyzed the licensing and training that is required to install solar panels to see how long it takes to make up the upfront costs. Through my research, I concluded that the in-house installation would lead to increased profits for Larger Residential Developers, although there is a required price to start the process of self-installation. In the end, Large Residential Developers could increase their profits by choosing to self-perform the solar installation on their developments, this is due to the labor savings that come with self-installation.

Key Words: Solar, Residential Construction, In-House Installation, Profits, Subcontractors

Introduction

“California leads the nation at 44.92% of all homes installed with solar. California also leads the nation with total homes installed with solar power at 6.3M [million] total homes which contribute to the 24,464MW [megawatts] of Solar capacity” (Gavop). With the demand for solar electricity continuously rising it is important to find ways to increase profits from the growing solar industry. Back in 2018, California mandated that all new single-family homes must include solar panels starting in 2020. Now that this mandate has taken place, Larger Scale Residential Builders should investigate self-installing these solar panels and their associated systems to increase their overall profits. However, this does not affect all Residential Builders; the idea is more focused on developers who produce anything more than 25 homes a year. This is since to install solar panels in California the company must carry certain licensing as well as a distributor to get the panels at a more cost-efficient price.

With all-new single-family and three-story residential buildings requiring solar, it opens a new market. Currently, Solar Panel Subcontractors have high pricing because of the requirements and relationships that are required to make profits from their work. They often have an associated mark-up that is either turned into profits or injected back into the company. Although subcontracting out work partially relieves the contractor of risk it is also important to see the associated benefits from self-performing the work. In this case, it may be more profitable to install the solar panels and systems in-house, compared to subcontracting out the work. With the in-house installation of the solar systems comes to the benefit of receiving these panels at a discounted rate. This can be achieved in multiple
ways, such as building a good relationship with the supplier or purchasing enough solar panels in bulk to receive a discount. Both methods would result in getting the solar panels for a discounted rate, in turn earning more profits.

In the state of California, there are a few requirements that Residential contractors need to perform the In-House installation of solar panels. The C46 Solar Contractor License is required to install and maintain panels in the state of California. This licensing requires a Contractor to be solely dedicated to the installation of solar. In this case, Large Scale Residential Developers could have a separate branch of their company dedicated to solar. This comes with multiple advantages for the company. Some of these advantages are, the ability to expand the company’s abilities to perform different types of work, and possibly bring in more jobs. As well there are federal solar incentives that can be applied to homeowners after construction is complete. This can also be an added selling feature of the homes produced. One of these incentives is the Solar Renewable Energy Certificate (SREC), which allows homeowners to accumulate additional income from their solar panels producing energy for the grid. This would allow for homes to be sold at a higher price to consumers due to the ability to make some of that money back through the incentives.

For this topic, I believe that I am not limited to just one of the two types of research, field, and secondary data collection. Field research will be used when talking about the history of subcontractor pricing on solar panel installation, as well as the installation process. It is important to understand the process of installation, as well as the pricing to determine if it is financially smart for Larger Residential developers to self-perform the installation of solar panels and their associated systems.

I will also be diving into a few sources that I found regarding the increasing demand for solar in the state of California. I also investigated the different price points of installation, comparing General Contractors performing a solar installation to Specialty Solar Subcontractors. These articles I decided to use support my claim that the solar industry is rapidly growing and that the price of subcontracting out the work to a specialty sub is very high. With the price of solar Subcontractors’ installations most of the time being two to three times the amount of the equipment, this leaves room for Large Scale Residential Builders to increase their profits by self-performing the installations.

By completing this Research project, I will be researching and analyzing the ability to self-perform solar panel installations within a construction company. I will also be diving into why this is a more profitable option for these companies in opposition to subcontracting out the work.

**Methodology / Analysis**

When researching this topic, I used multiple means of information gathering. Specifically, for the methodology of my research paper, I am focusing on both field and secondary data collection. In terms of Field Research, I utilized this technique when analyzing the history of subcontractor pricing as well as the installation processes of the solar panels themselves and their associated battery storage systems.

I interviewed two individuals from different solar companies to learn more about the installation processes of solar panels and their average pricing. I found it important to gather information about how solar panels were installed to show that it doesn’t have to be an overcomplicated task. This is essential to show Larger Residential Builders that it is possible to venture into the field of solar installation rather easily. I also discussed with them the average amount of mark-up they apply to their
I also found this as a key piece of information to determine if it is a viable option for these companies to self-perform this work. This was also a key area for me to research because it shows if my topic of companies self-installing solar panels is more profitable than subcontracting out the work. It is of the utmost importance to analyze the subcontractor pricing to see if there are available benefits to the in-house installation of solar panels by Large Scale Residential builders.

I also conducted interviews with a few larger residential companies to see if an increase in profits for the in-house installation of solar panels would change the ways they currently do things and transition to installing these systems themselves. Even though there is increased risk in self-performing work, the possibility of having a much larger profit may negate this risk. This increased risk comes from the lack of subcontracting out the work. Normally, when a General Contractor hires a subcontractor, they are shielded from risk through the appropriate bonds and insurance. Without this extra protection from the risk, it then makes the GC completely liable for any issues that may arise.

While I was gathering all this information and analyzing it, I was able to form a conclusion on the topic of self-performing solar installations to increase profits as a larger Residential developer. The approach I took to reach this conclusion mainly focused on the pricing of a specialty solar subcontractor as well as the process of installing the panels. Studying the process of installing the solar panels helped me conclude that the actual installation and maintenance of the solar systems is not that difficult or time-consuming. Overall, I feel that the research I was able to analyze and perform worked very well in guiding me to my conclusion on this topic. I also believe that my methodology of research with online journals and articles as well as a few interviews with people in the industry helped me establish a clear idea of what was and was not possible.

**Detailed Literature Review**

Today in California it is incentivized to install solar panels on one's existing residential home, with the benefit of tax credits for the current and future owners. As for my topic, the in-house installation of solar panels and their associated systems is more focused on new construction, in comparison to upgrading existing buildings. In the article *An Empirical Analysis of the California Solar Market* by Johannes Mauritzen, he brings up a few points in which solar panels have gotten cheaper to acquire and thus should be cheaper to install. This comes into place as the largest expense of a solar installation is the labor. In this article, the author also dives into a Case Study about Solar City, which is one of the largest solar installers in California. In the figure below you can see that the residential installation of solar panels in California has been steadily increasing over the last 5 years, reaching a new high in 2021. (See figure 1). This shows that the federal mandates as well as other factors are contributing to the rise in the number of solar panel systems installations. This provides a big opportunity for Larger Residential companies to begin self-installing these systems to increase profits. This can be done by reducing the labor cost of the installation by not subcontracting out this solar installation. Now that it is necessary for all new homes built in California to have solar panels, being able to increase profits of the self-performing of work makes sense.
Although this article mostly focuses on the benefits that existing homeowners can get from installing panels it only briefly talks about how companies can benefit. These Residential Development Builders can save money as well through R&D Tax Credits. The R&D tax credits are utilized in a multitude of ways to save a construction company money, although the Research and Development that are done must fall into a list of specific activities. In this case, concerning my topic, I will only be looking into two of the possible categories. These categories are, “Exploring innovations such as ‘green building’ and sustainable design and technical improvements to a building’s heat, light, and power efficiency” (Clacconnect). The Research and Development tax credit could be used to transition a company into the solar business without issues. This is due to the company having the ability to write off associated costs with self-performing solar installs as they are trying out and attempting to implement this new idea.

Later in my research, I came across another article from Unbound Solar that went over the average subcontractor mark-up on solar systems installation alone. Unbound Solar is a company that specialized in designing and shipping solar systems but does not provide any installation assistance in terms of labor. In the article located on their website, Why is Solar so Expensive, the author dives into the reality of the unreasonably high subcontractor labor costs. This article states that Larger Solar installers often mark up their installation costs two or three times the equipment cost because there is often little competition. A simple example used in the article states, that a solar system for a home was priced at $10,000 for the required equipment. With the mark-up being applied by the solar contractor this often comes out to $20,000-$30,000. In this scenario, we can see that some solar subcontractors will mark up their services because of a lack of competition for their services, as well as a high overhead involved for the subcontractors.

The image below found on the Unbound Solar website shows a distribution of average pricing for a solar with the equipment costing around $7,500. This graphic does a great job at showing the differences in cost of installation between a local General Contractor and a Turnkey solar Subcontractor. This graphic shows that installing a solar panel system as a General Contractor cost less in terms of labor. (See figure 2). This is a small indication that Large Scale Residential Builders who decide to self-perform solar installs can boost their profits by not having to pay the subcontractor mark-up on labor.
In my opinion, this is done by the solar installers because of the current rise in solar demand as well as the scarcity of companies that can self-perform work. Although it seems that the installation of solar panels and their associated systems would be difficult, it isn’t. It would be relatively easy for larger residential builders to introduce the self-performing installation of solar panels. With a Larger Residential Builder adopting this idea of self-performing solar installs on their residential developments, it would increase their profits by eliminating the subcontractor labor mark-up. Although, this does only make sense for builders that are producing 25 or more homes a year to see a sizable return on their investment.

The articles I used for the detailed literature portion of this research paper, I thought did a good job at displaying the information that I felt would help me come to my conclusion. In the first article, *An Empirical Analysis of the California Solar Market* by Johannes Mauritzen, the author goes into how the solar market is in a constant state of growth in California specifically. However, Mauritzen’s ideas can be applied to the whole country as residential solar systems continue to become more prevalent. This piece illustrated that the solar industry is continuously growing and how solar will be very common in the future. The other article that I found was by a solar supplier that’s main aim is to supply high-quality solar panels that are affordable. The article I decided to dive into was *Why is Solar so Expensive*. This article gave a better look into how solar subcontractors price their services compared to other entities. It also did a good job at showing how turnkey solar installers can have a larger price gap between themselves and a normal contractor. These are the two main articles I used for this paper also supplemented with other ideas and information. I thought that they did a great job at relating the information to my topic as well as bringing the whole idea of self-performing the installation of solar panels for a greater profit together.

## Results

### Interviews

During my research process, I was able to interview one General Contractor who works for a Large-Scale Residential Developer, specializing in expansive single-family home developments. I was also
able to interview two Solar install Subcontractors, that have Subcontracted out work for a larger G.C. in the past. I have included a few of the relevant interview questions here:

1. **Would your company consider installing solar panels and battery storage systems in-house if it leads to increased profits?**

   In my interview with the General Contractor, we talked about many things regarding why a company would or would not want to self-install solar panel systems. The main talking point of my interview was that a company that is producing many homes a year could transition to self-installing solar systems to increase their profits by decreasing the number of Subcontracts that are required. The GC I was, fortunately, able to interview was open to the idea of self-performing the solar installs to increase profits. Although he did bring up the possible issue of increased contractor risk due to the lack of a subcontract.

2. **Does the access to solar panels at a discounted rate like many solar subcontractors have access to affect your company’s ability to self-install if you have thought about it before?**

   Continuing my interview from the previous question I asked the General Contractor about the average rates that Solar Subcontractors charge when performing the work. I also asked about the Subcontractor mark-up, but he did not have any information on it. As for Subcontractors getting solar panels at a discounted rate from supplies the GC, in the interview, he stated that he thought it would not be super difficult to obtain a solar panel distributor if their company decided to get into the solar panel market.

3. **Does your company perform subcontract work for General Contractors, and what is the average amount of mark-up that is applied?**

   In my interview with one of the Solar Subcontractors, I was able to gather a decent amount of information regarding their pricing. The main talking point of this interview was the mark-up that is applied to their Subcontracts. I was told that it depends, but since the company, he works for is a dedicated solar installer their mark-up is higher. This is due to the workers at the company having a vast knowledge of the solar industry as well as how to be efficient and fast when installing their systems. As for working for a GC directly, he told me that the company he works for has installed for GCs in the past but has since moved to just completing solar jobs on their own.

   From my interviews with the General Contractor and two Subcontractors, I was able to form a better idea of what they thought of this proposal. From the GC I got the feeling that he was interested in hearing more about how this is possible for the Residential Developer portion of the industry. He also brought up valid points of how this could be beneficial to the consumer and the builder. As for the subcontractors they both were interested in the topic but did offer a few counterarguments as to why they should still be valid for large development jobs. One of these I found most interesting was that they are specialized companies that are most efficient at completing the necessary work.

   As for the results of my research, I would determine that it would be more profitable for Residential Developer Companies to self-install solar panels on larger developments. The increased profits will drastically rise with the more houses produced. This is because the savings is in the labor portion of
the cost. Although, there is a possibility that the solar panels and their associated systems could be bought at a bulk price.

**Discussion / Conclusion**

In the end, after completing my research and this paper, I conclude that the In-House installation of solar panels by Large Residential Developers would increase profits for their respective companies. This is possible by reducing installation prices in comparison to current subcontractor labor rates. This idea of self-installation would only impact the profits for Developer Builders that are producing at least 25 homes a year. This is because of the licensing costs associated with being able to install the solar panels, but also their associated battery storage systems. Another reason is the pricing of the solar panels themselves, with self-installation solar panels could be purchased in bulk and stored, furthering the increase in profit. For larger residential builders I think it is necessary to find ways to both be more efficient but also be more profitable. Having these General Contractors self-performing the installation of the solar panels and their battery storage systems, their profits will increase due to the savings that will be received on not paying the subcontractor mark-up.

Based on the research techniques I utilized, I am confident in the new knowledge when it comes to increasing profits for Large Residential Builders from the self-performing installation of solar panels and their associated systems. The new knowledge comes from the idea that installing solar systems is physically not that difficult to learn and understand, and that companies should look to complete the work in-house, rather than outsourcing it. The main goal is not to put solar subcontractors out of business. The goal is to increase profits and efficiency for Large Residential Developers by having an in-house crew install the panels, and not have the possibility of subcontractors taking longer than expected or not completing their work. Profits and Time drive the construction industry, as well as being able to manage and control risk as much as possible.

With the Residential construction industry constantly moving towards a society of sustainable housing, the ability for contractors to self-perform the work also opens more building opportunities and more opportunities for profits. By self-performing the work, the General Contractor takes on some risk in terms of installation accuracy and that the systems work. They are also eliminating some risks by being able to control their crews more efficiently than one that is subcontracted out.

I enjoyed the process of researching and writing this paper, as well as learning more about Large Scale Residential developments, and the solar industry. For the topic I decided to research, Should Large Scale Residential Builders self-perform the installation of solar panels to increase their companies’ profits, I feel that this is the future of the industry. When searching for relevant information on the Cal Poly databases and a few internet sources, I found it challenging to find this type of information. However, I did find some valuable sources to help convey my topic. While conducting interviews I also faced some adversity while trying to find some individuals that were willing to talk to me. However, I was able to get in touch with a few companies with the help of friends and previous employers.

**Challenges Incurred During Research / Possible Future Research**

During my research and writing of this paper, I was faced with multiple challenges regarding information gathering, interviews, and determining relevant information to include in my paper. For information gathering, I found it difficult to find the exact relevant information I needed from academic journals and articles. I had trouble finding concrete information on general solar
subcontractor pricing and well as the actual cost of the installation. However, I did find a few articles and journals that supported my research.

Also, the interview process was a little difficult for me, due to the fact I had trouble hearing back from the multiple companies I reached out to regarding my topic. Although two solar subcontractors and one general contractor responded to my emails; I was able to meet for an interview. The interviews themselves went rather smoothly and provided me with some useful information for my paper.

As for the possibilities for future research, I think that this topic would also be a good Project-Based senior project due to the ability to do a cost breakdown of the installation processes and Labor to determine a precise number of homes to increase the profits. After the initialization costs are accounted for, the main goal would be to help Large-Scale Residential Builders determine if it is financially smart to go along with the in-house installations of these solar systems.

References


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