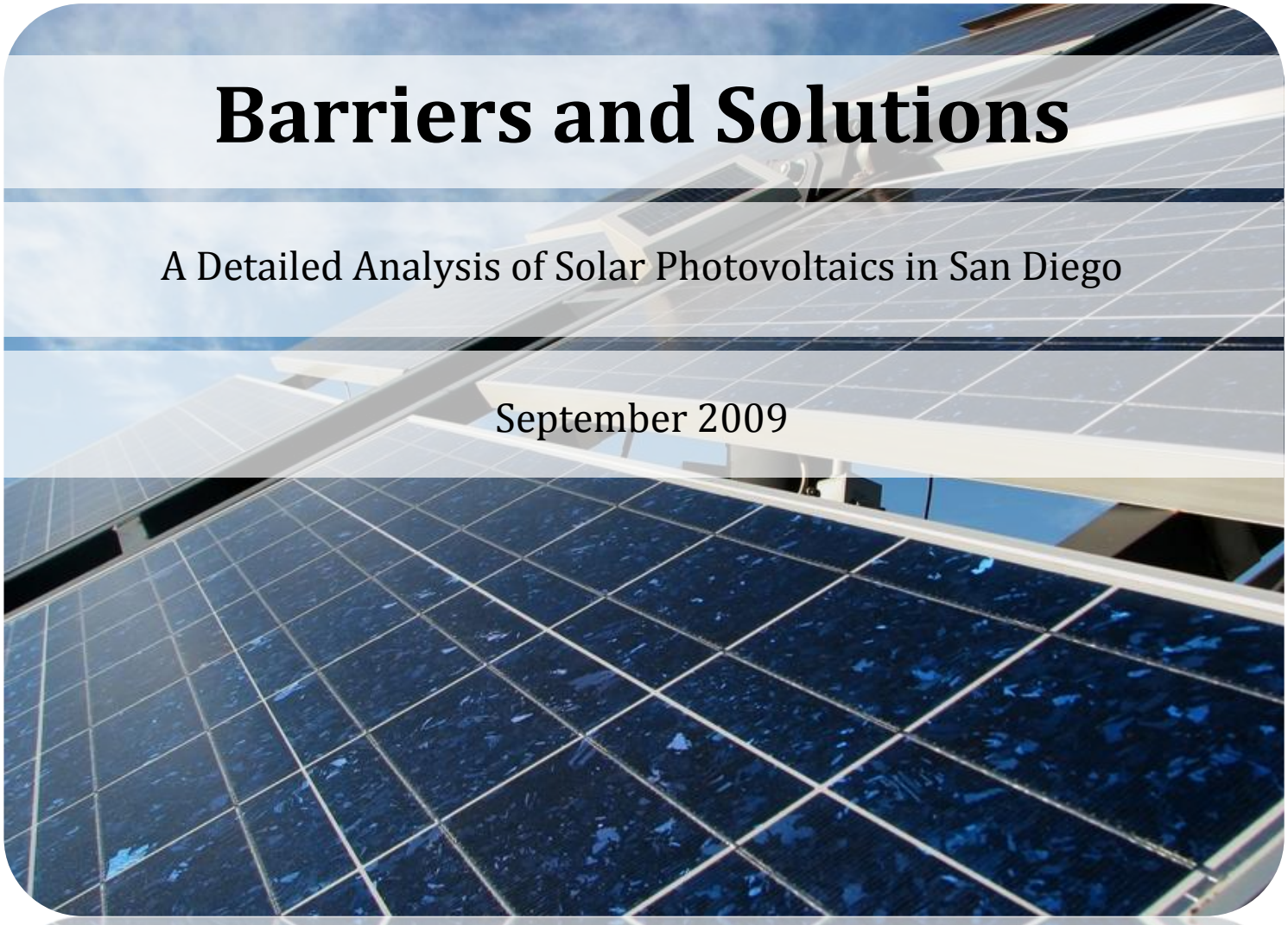
Barriers and Solutions

A Detailed Analysis of Solar Photovoltaics in San Diego

September 2009



THE CITY OF SAN DIEGO

Center for Sustainable Energy CALIFORNIA

U.S. DEPARTMENT OF ENERGY

A Collaboration Between the City of San Diego and the California Center for Sustainable Energy Funded Through the U.S. Department of Energy's Solar America Cities Partnership

Barriers and Solutions

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Barriers and Solutions to Solar Installation

Introduction

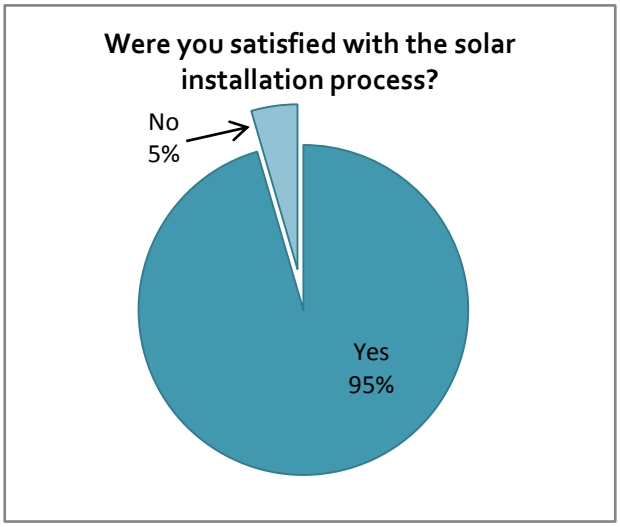
What does it take to increase the number of solar photovoltaic (PV) panel installations on residential and commercial buildings? Who do people listen to when considering solar energy as a viable option? How much value does a solar installation add to a home? How is the permit review process perceived by the public? What can municipal policies do to encourage the use of solar energy? When are state and federal incentives enough to make a difference? Who are the champions for solar installations and how can they expand the market?

These and other questions were among the topics recently explored by the City of San Diego. This city was acknowledged as having the most solar installations in the State in 2009. The goal of the study was to identify challenges and opportunities to advance residential and commercial solar installations.

Information for this report is from two sources: 1) a city-wide Solar Survey of property owners with solar PV installations; and 2) three Focus Groups of specific market segments. The Survey provides a broad brush overview of the experiences of more than 641 people who have solar PV installations. The three Focus Groups delve deeper into what impediments exist from the perspective of real estate and associated professionals, municipal permit review staff, and the residents who are using solar power.

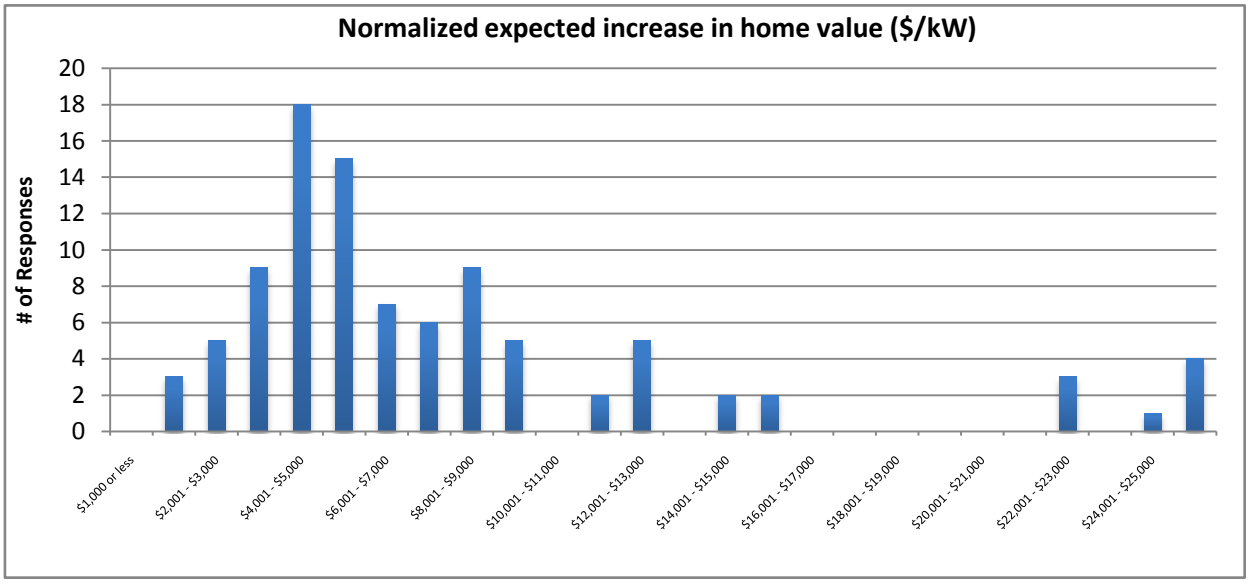
Appendix One is the detailed results from the Solar Survey and **Appendix Two** is the outcome from the three Focus Group meetings.

Raving Fans



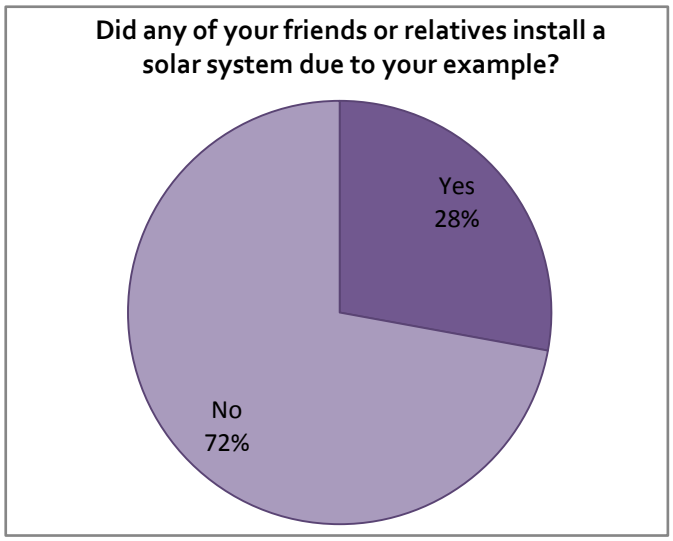
As with any innovation, certain individuals are inevitably more open to trying something new. These "early adopters" can play a key role in market penetration. Both the Survey and the Focus Group session found that, overwhelmingly, the PV customers were very happy with their systems. Of the Survey respondents, 95% were satisfied with the installation process (Appendix One, page 20). The benefits expressed most often include long-term energy cost relief and contributing to a reduced energy footprint. The desire to save money still remains the primary motivator to install solar. However, the data also indicates that "going green" is a significant motivation (Appendix One, page 26).

Property owners believe that their PV systems increase the value of their homes. Normalized Survey results indicated a perceived home value increase of $4,000 to $5,000 per kilowatt (kW) installed (Appendix One, page 30). Homeowners in the Focus Group felt that the value of their homes has increased equal to the cost of their PV systems, or approximately $7,600 per kW (Appendix Two, page 50). These homeowners indicated that they would have installed systems with even greater capacity were the local utility willing to purchase the excess power (Appendix Two, page 50).



A collateral benefit of solar installation is an increased awareness about energy conservation and efficiency. The Survey results indicate that 87% of respondents completed energy efficiency upgrades as part of their solar installations. The most common energy conservation improvements were window upgrades (Appendix One, page 24). Additionally, 77% of the Survey respondents stated that they are more conscious of their energy use since installing solar panels (Appendix One, page 25).

Once a solar PV system is installed, the owner is often asked many questions from neighbors, friends and relatives. The most common questions asked, as reported by Survey respondents, were about the financial aspects of a solar PV system: How much did it cost? How was the system financed? What type of payback is being realized? This was followed up by general interest in the system, and curiosity about technical aspects of the system. Respondents also indicated that only 1% of the feedback they received was negative (Appendix One, page 27). This seems to indicate that there is a high level of acceptance within the community for solar. This result is further corroborated by the Focus Group session with system owners (Appendix Two, pages 48-54). In a discussion about barriers encountered, none of the participants cited any negative feedback from neighbors or community members.

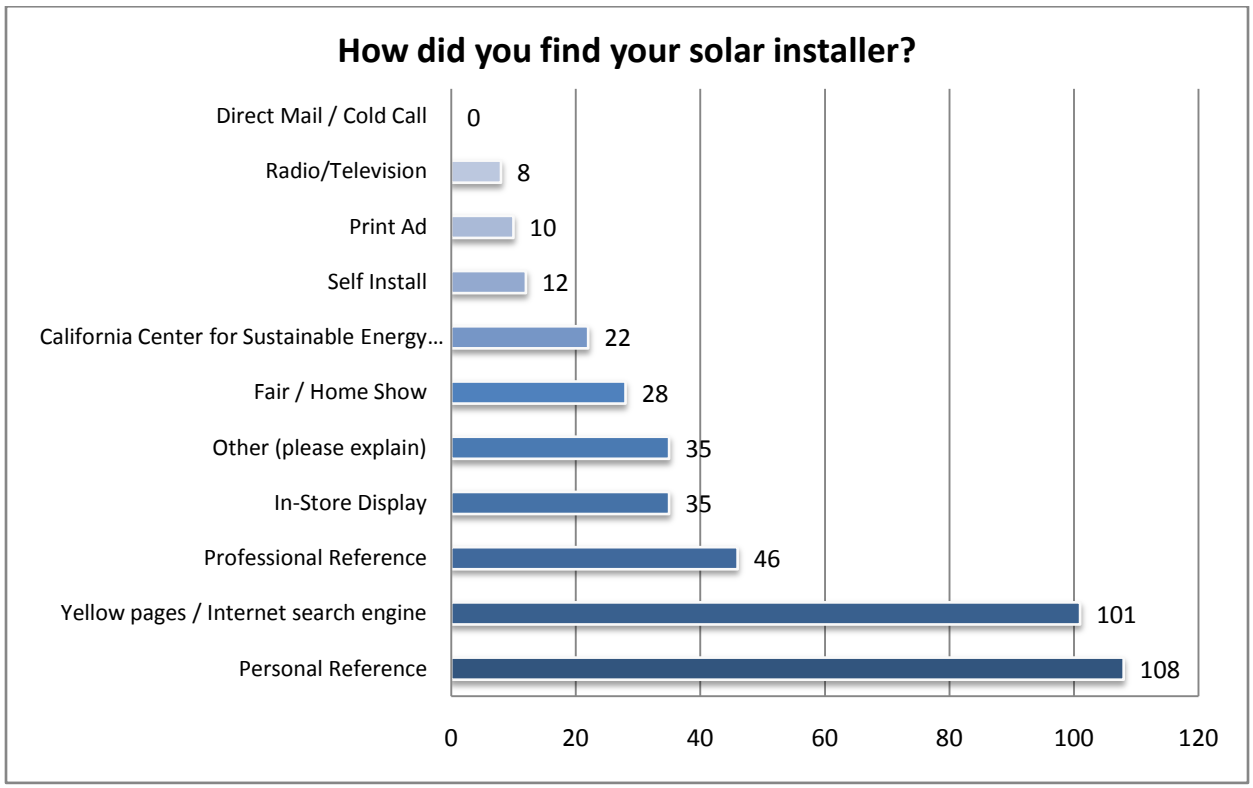


Early adopters have perhaps the greatest influence on marketing solar PV installations. This is made evident by the number of people who made the decision to install solar because they spoke with an early adopter. With 28% of respondents claiming that friends or relatives installed solar because of them, the data indicates that firsthand experience and feedback is significant in helping to promote solar to interested parties (Appendix One, page 29).

What are other successful marketing tools?

Traditional media does not appear to be very effective in promoting the installation of solar PV panels. Only 4% of respondents indicated that they found a solar installer using TV, radio, or print media advertisements. None of the 405 respondents indicated that they were influenced by direct mail or cold calls (Appendix One, page 19). The internet and personal referrals were the predominant methods for selecting an

installer, with 25% and 27% respectively (Appendix One, page 19). A professional reference was the third strongest response, representing 11% of the total. The data also indicates that in-store displays and fairs / home shows are more effective than radio and TV advertising in the purchasing decision (Appendix One, page 19). Participants in the Focus Group felt that an expansion of the San Diego event called "Solar Week" would be beneficial. Solar Week is a week-long series of events hosted by the California Center for Sustainable Energy (CCSE), and includes both commercial and home tours, allowing potential customers to talk one-on-one with people about their systems (http://energycenter.org/index.php/outreach-a-education/annual-events/solar-energy-week) (Appendix Two, page 54).



It is clear that the influence of early adopters is significant, and as such, promoters of solar PV would benefit from working more closely with them.

RECOMMENDATIONS

1. Showcase the early adopters. An example includes providing a financial incentive for solar customers to participate in public forums. Additionally, local case studies would be valuable on websites and in other advertising capacities. Creating a secure web-based forum for discussion between existing solar PV system owners and potential customers may also prove useful.

2. Municipalities and other entities that want to promote solar power would benefit from setting up a variety of venues that can be used effectively for marketing. An example is San Diego's "Solar Map" (http://sd.solarmap.org/solar/) as well as promotion from the Mayor and other prominent leaders in the community.
3. Expand programs that allow those considering PV to talk one-on-one with installers and owners of PV systems, such as during Solar Week.

Cultivating New Champions

When considering who has the most access to homebuyers, the obvious answer is real estate professionals. However, according to the Focus Group session, this group finds it difficult to assess value for residential solar installations (Appendix Two, pages 42-47). Juxtaposed to the homeowners' view that their system's cost is matched by a corresponding increase in value, real estate professionals gave a list of reasons why PV systems are not important to their clients and are difficult to valuate. In fact, one of the comments from the real estate Focus Group session was that having a system could even be considered a liability, thereby reducing the value of the home (Appendix Two, pages 44-45).

What is the reason for this perception of solar PV installations?

There are fears on the part of home buyers about the operational ease, effectiveness, and ultimate repair costs associated with solar PV systems. Of further concern is that the technology is developing quite rapidly and adding the full price to the home cost for an older, previously installed system does not make sense (Appendix Two, page 43-45). Creating more user-friendly ways to evaluate PV systems would help eliminate some of the inconsistencies and apprehensions prevalent in the current market.

If increased home values were to begin to reflect the cost of these systems, as in the case of swimming pools or remodeled kitchens, it would require that system costs were more commonly known and benefits were well understood. Educating real estate professionals about solar PV is essential. Feeding into this evaluation is the cost of energy, which could be a larger influence if prices spiked.

RECOMMENDATIONS

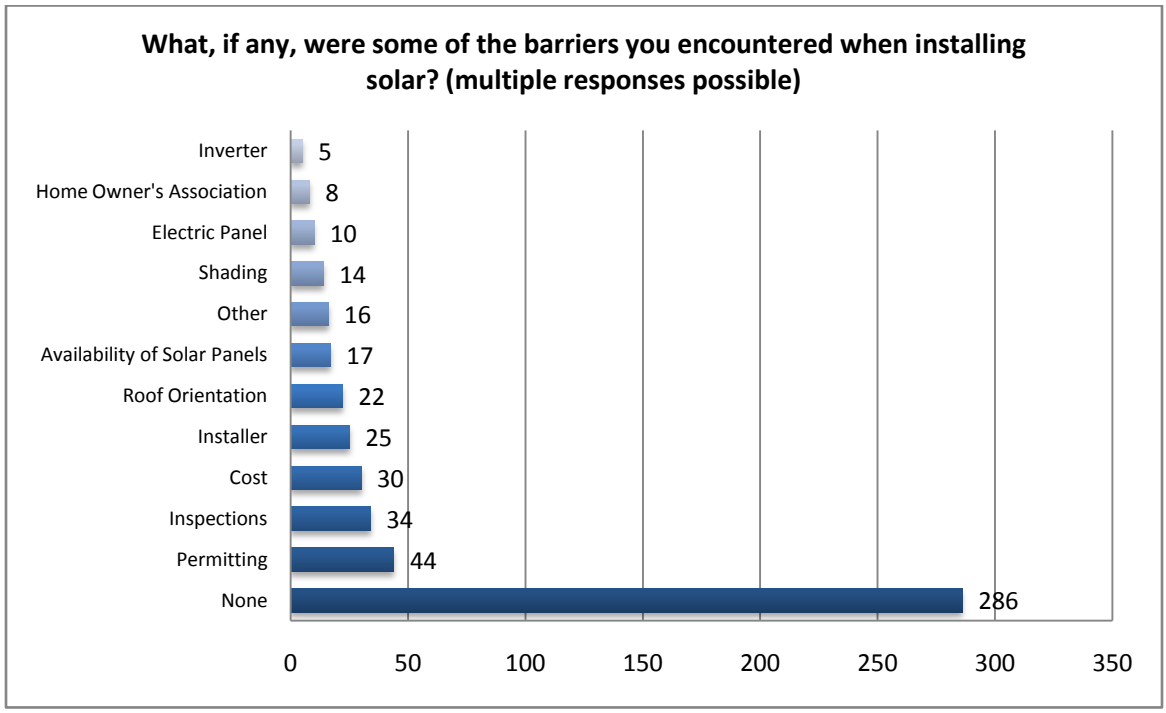
1. A quantitative analysis of building energy use, such as a Home Energy Rating System (HERS) rating, would provide a means to determine the effectiveness of the PV system. Municipalities could consider requiring such evaluations as part of the home sale disclosure.
2. Promote the "EcoBroker" certification program, which provides educational information targeted to licensed real estate brokers on energy and other environmental topics. It also includes marketing strategies for more environmentally-friendly real estate. More information can be found at http://www.ecobroker.com/.
3. Municipalities and other entities that want to promote solar power must design presentations specifically focused on addressing some of the concerns articulated by the real estate industry and present them to local professional associations such as the Association of REALTORS®. Frequently offered workshops may be especially important for assessors, such as those offered by CCSE, which highlight the California Solar Initiative. (http://energycenter.org/index.php/outreach-a-education/workshop-calendar/705).

Making the Process Easier

The speed and ease of installation is a critical factor in any effort to increase the use of solar power. In the Solar Survey, it was found that 56% of home owners and businesses reported facing no barriers when installing their solar PV system. Of the 44% that did face a challenge, one in three identified the permitting process and/or inspections as the problem (Appendix One, page 21). Municipalities have an opportunity to resolve the issues presented. In the Focus Group meeting with municipal permitting and inspection officials, a number of underlying issues were discovered.

Ideally, a solar PV permit could be completed over the counter with same day turn around; however, municipalities are often understaffed or lack personnel that are specially trained to review the permits. The City of San Diego is currently receiving approximately 40 solar PV permits per month. The permits had been processed over the counter, but there is no longer adequate staffing to continue this. It now takes about one week for a residential permit to be processed for mechanical, structural, and

electrical reviews. Other municipalities in the region are in the same situation as the City of San Diego, and are not able to process permits over the counter (Appendix Two, page 56).



Another challenge is the varying requirements from fire departments. This additional permit review extends the processing time. Not all municipalities require a permit review by the fire department, but for those that do, the increased time can be significant. (Appendix Two, page 56). Because special training is needed to review a solar PV permit and perform a plan check, Fire Department officials do not necessarily have the training for reviewing a solar PV installation and may not have clear guidelines.

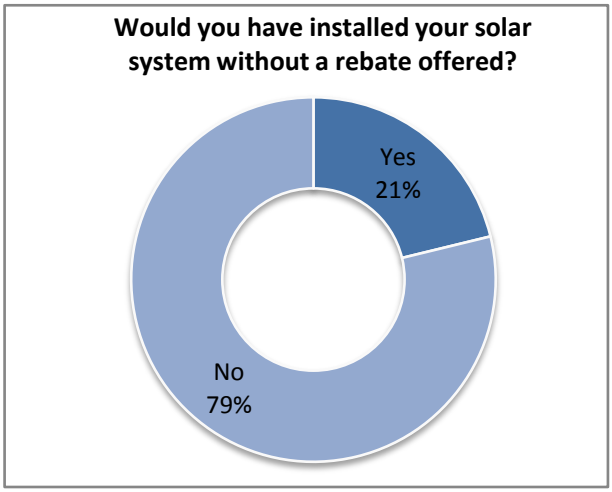
RECOMMENDATIONS

1. Training for permit review staff is essential. Municipalities need to ensure that all staff who deal with permitting, plan review, and inspections receive updates in order to keep current on the solar PV technology.
2. Fire safety guidelines would be best implemented by including them in the building/electrical codes rather than adding another layer of review to the process.

3. Contractors and installers would benefit from training about the requirements for how to prepare a successful permit application and what will be reviewed at the onsite inspection. Municipalities can host these training sessions and/or create guides that the public can easily access.
4. Consider raising the solar PV permit fee. Installers and contractors agreed that the current cost for a solar PV permit in the San Diego region is fairly low. They stated that if raising the cost of the permit would guarantee better trained and/or more staff, resulting in a more timely review, then they would fully support the fee increase.
5. Solar PV installers could file a Master Plan for the PV system installations that are most often used. Master Plans are already used by contractors for things like pools and staircases. The benefit to using a Master Plan is that it allows the permit review staff to process the permit application over the counter by simply comparing the proposed system to the master plan. If it matches, then it reduces staff time and overall cost.

Incentives are Essential

Subsidies and tax incentives continue to be a critical factor in deciding whether to purchase solar. In both the Focus Groups and Survey, respondents indicated overwhelmingly that rebates were essential to their decision to install a system. In fact, only 1 in 5 Survey respondents indicated that they would have installed their system without a rebate (Appendix One, page 23) and none of the Focus Group participants would have installed without rebates. Many Focus Group participants lamented the fact the there is no option for reimbursement from the utility company for those systems that produce more energy than what they need (Appendix Two, page 50).



The results from the Survey were also quite conclusive: the percentage of people who would have installed solar PV systems without incentives has hovered at or below 20% for the past 6 years. Respondents indicated that their primary reason for installing solar was "to reduce the electric bill," another clear indication that money is a factor for people choosing

to install solar PV systems on their homes (Appendix One, page 26).

California's solar incentive program, the California Solar Initiative (CSI), is a key driver for solar installations in the state and within the San Diego region. CSI was launched in 2007 as part of the Go Solar California program and builds upon nearly 10 years of state support for solar, including other incentive programs such as the Emerging Renewables Program (ERP) and the Self-Generation Incentive Program (SGIP). A key component to CSI is the required energy efficiency audit. By first installing energy efficiency measures, potential system owners are able to reduce the overall size of their system, which in turn, reduces upfront capital costs and the payback timeline. In the San Diego region, San Diego Gas & Electric provides an online tool to facilitate an energy efficiency audit. (http://energyaudit-sdge.sempra.com/index.asp).

Currently the CSI program in the San Diego region provides between $1.10 and $1.90 per watt. The systems currently cost between $8-10 per watt, and so the remainder of the system must be either be financed or paid for upfront. To help offset those costs and further promote solar installations, the Federal Government offers a tax credit equal to 30% of the cost of the installation (http://www.energy.gov/taxbreaks.htm). As mentioned above and highlighted in the Survey, this tax credit is vital to increase market penetration of solar PV (Appendix One, page 23).

Based on current installation data available from California Solar Statistics (www.californiasolarstatistics.ca.gov), the cost of installing a residential system averages $40,000. This is a huge investment for the average household. Coupled with this expense is the concern about whether or not the 10-20 year return on the investment would be realized before the property is sold to someone new. The recent passage of Assembly Bill 811 (AB 811) provides a new financing option that addresses these specific challenges. AB 811 was approved by the Governor in July 2008 and authorizes a legislative body of any city, "… to determine that it would be in the public interest to designate an area within which authorized city officials and free and willing property owners may enter into contractual assessments to finance the installation of distributed generation renewable energy sources or energy efficiency improvements that are permanently fixed to real property." In essence, the cost for eligible energy efficiency projects and renewable energy installations can be financed on the property tax, and the loan stays with the property and not with the property owner. This removes one of the obstacles to solar, which is paying for a system upfront when it has a long return on investment. It eliminates the concern that the property will be sold before recovering the system investment from utility bill savings.

Clean energy investments that have innovative funding mechanisms, including AB 811, are key to increasing renewable energy systems. In turn, this will help to accomplish the State's goal of having one million solar roofs in CA by 2017 and substantially reducing greenhouse gas emissions. The California Global Warming Solutions Act of 2006, AB 32, requires absolute reductions of greenhouse gas emissions to 1990 levels by 2020.

RECOMMENDATIONS

1. Utilities can significantly incentivize the installation of larger PV systems by providing refunds for the electricity that was unused and sent back to the grid. In addition to making larger systems viable, this would provide an incentive for energy efficiency upgrades in homes where systems are already in place.
2. State and federal rebates and other subsidies are essential to continue.
3. Municipalities may be able to build on the CSI requirement by adding a local mandate that a more comprehensive audit, such as a HERS rating, be performed before a solar PV permit is issued. This would not only help the system owner better understand his or her building, but also help solve the valuation paradox mentioned by real estate professionals.
4. Municipalities can positively influence the installation of PV systems by providing additional monetary assistance, such as grant money, and through programs similar to AB 811.

Conclusion

The good news is that the barriers presented by property owners, real estate and associated professionals and municipal permit review staff are NOT insurmountable. As noted in the report, each of the challenges had a realistic recommendation that is achievable. Marketing, targeted education and outreach, as well as financial incentives and financing mechanisms are the backbone for expanding solar PV installations.

How can the recommendations in this report be implemented? What are the roles of municipal, state and federal agencies? What is the role of non-governmental organizations (NGOs)?

1. The state can mandate that the solar PV incentives are linked to completion of a HERS rating, which is more rigorous than the current requirement in CSI.

Secondly, the state can mandate that a HERS rating is required as part of the disclosure information for sale of a property. This removes the inconsistency between regions.

2. Establishing partnerships between municipalities and NGO's can capitalize on the strengths of each. This is especially true for education and outreach programs, which are clearly needed for the contractors, property owners, real estate and associated professions, and municipal permit review staff.
3. The federal government must maintain the tax incentives in place for distributed renewable energy systems, and potentially expand support for states to continue their programs.

What can we gain from these efforts?

If 10 percent of the power in San Diego came from solar energy, it would reduce GHG emissions by 100,000 metric tons, the equivalent of removing 20,000 cars from the road, and would provide enough power for 10,000 homes (www.epa.gov/RDEE/energy-resources/calculator.html).

As is evident, switching from traditional power to solar provides significant positive impacts for the economy and the environment. Increased financing options are increasing the accessibility of solar power to a broader group of people. Government rebates and utility incentives continue to help shorten the payback. Most importantly, the growth of solar represents how the collective impact of individual action can make a BIG difference.

* * * * *

Appendix One:
Solar Survey Results

1 Overview

1.1 Purpose

The purpose of the survey was to understand the motivation, challenges and benefits perceived by individuals who decided to install solar systems in the City of San Diego. Approximately 2000 surveys were sent, and 641 surveys were completed. The primary response was from the residential sector. Individuals had the option to reply electronically, using SurveyMonkey, or to complete a paper survey. All responses were combined and checked to ensure that there were no duplicates.

1.2 Conclusions from Data

Based on the responses of 641 individuals and businesses with solar installed on their properties, the following conclusions have been made:

1. Traditional media does not appear to be very effective in promoting installation of solar power. Only 4% of respondents indicated that they found a solar installer using TV, radio, or print media advertisements. More than 50% of respondents said that they used the internet or personal referrals to find their solar installer. (See Question 3.)

2. Subsidies and tax incentives continue to be a critical factor in deciding whether to purchase solar. Respondents indicated that their primary reason for installing solar was "to reduce the electric bill". However, without a rebate, no more than 20% of respondents would have installed solar panels. (See Question 6.)

3. There are three key barriers identified in the solar installation process: 1) permitting & inspections; 2) technical issues; and 3) availability of solar panels. It should be noted that 56% of the respondents stated that they did not encounter any barriers. Sixteen percent identified the knowledge of City staff reviewing the permits, as well as the inspection time and cost, as a barrier. This is tied to contractors' knowledge, experience, and familiarity with the permitting process. The City may reduce this barrier by improving the training of solar permitting staff and developing outreach programs which target solar PV system designers and installers. (See Question 5.)

4. Incentives for residents and businesses to produce beyond 100% of their electricity needs would be extremely useful. Many respondents indicated that they desired a larger system, but the

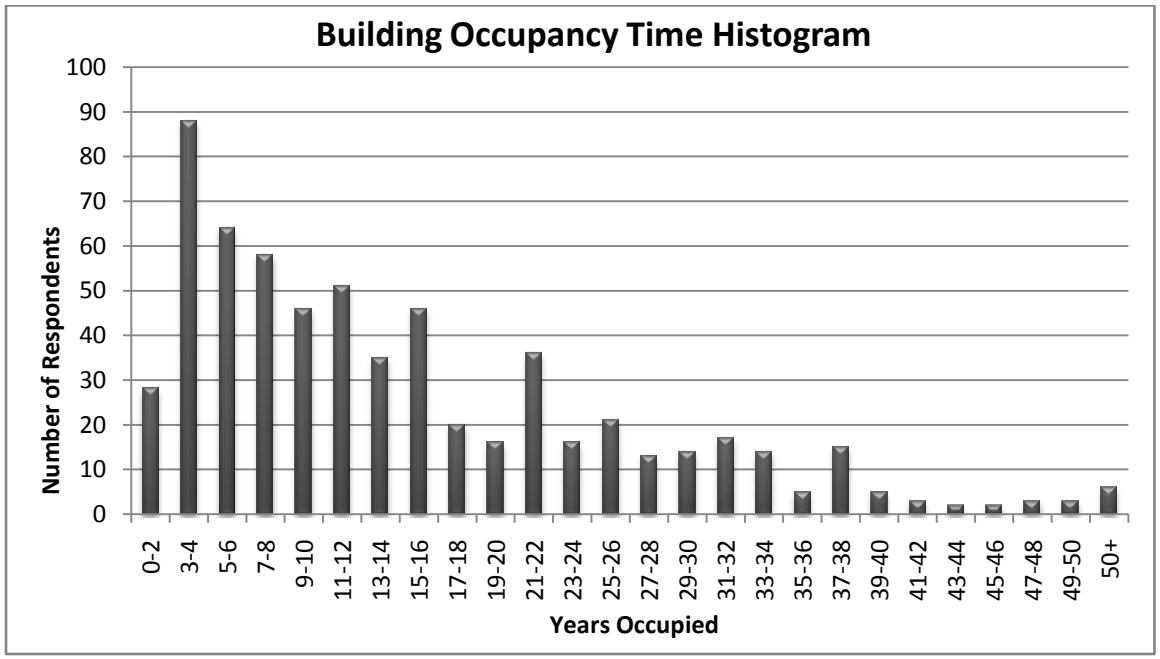
finances did not work out because SDG&E does not pay net producers. (See Questions 5 and 11.)

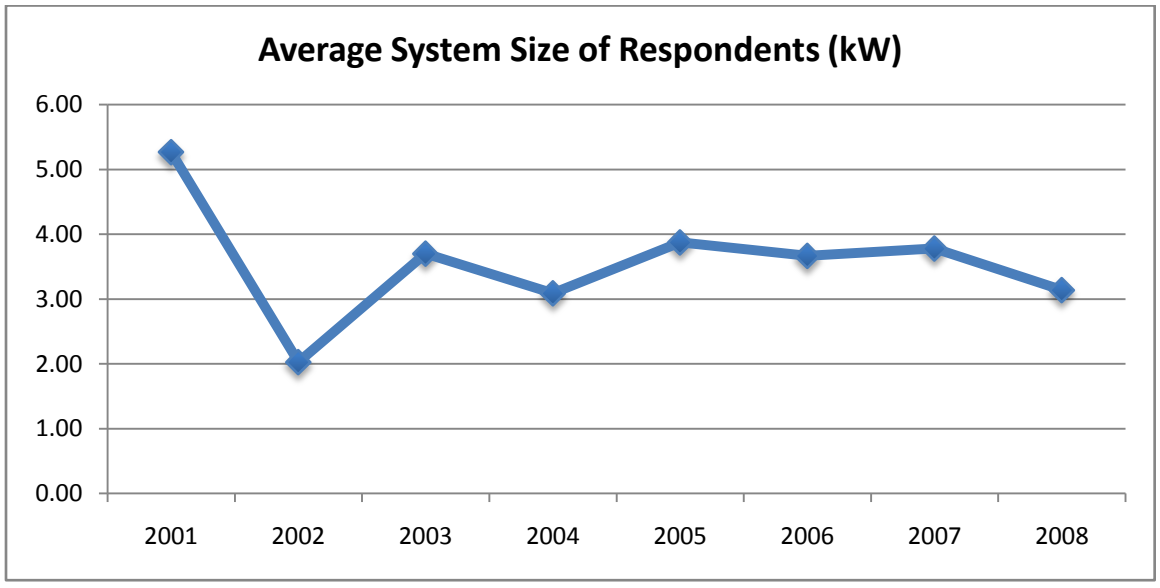
5. Greater emphasis needs to be placed on performing energy efficiency audits and upgrades in conjunction with solar PV system installation. Thirteen percent of respondents said they did no energy efficiency upgrades in conjunction with their system installation. (See Question 7.)

2 Analysis

1. **How many years have you occupied this property?**

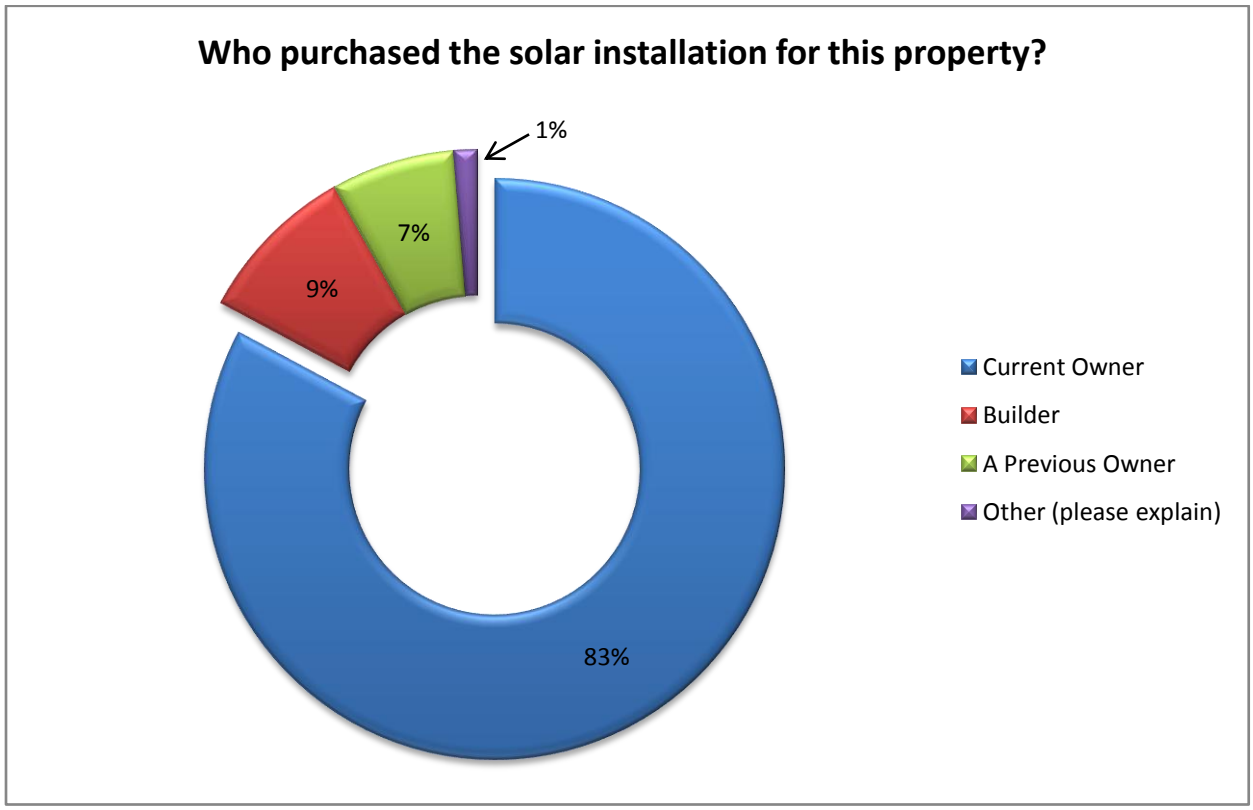
   - Total Respondents: 466





2. **Who purchased the solar installation for this property?**

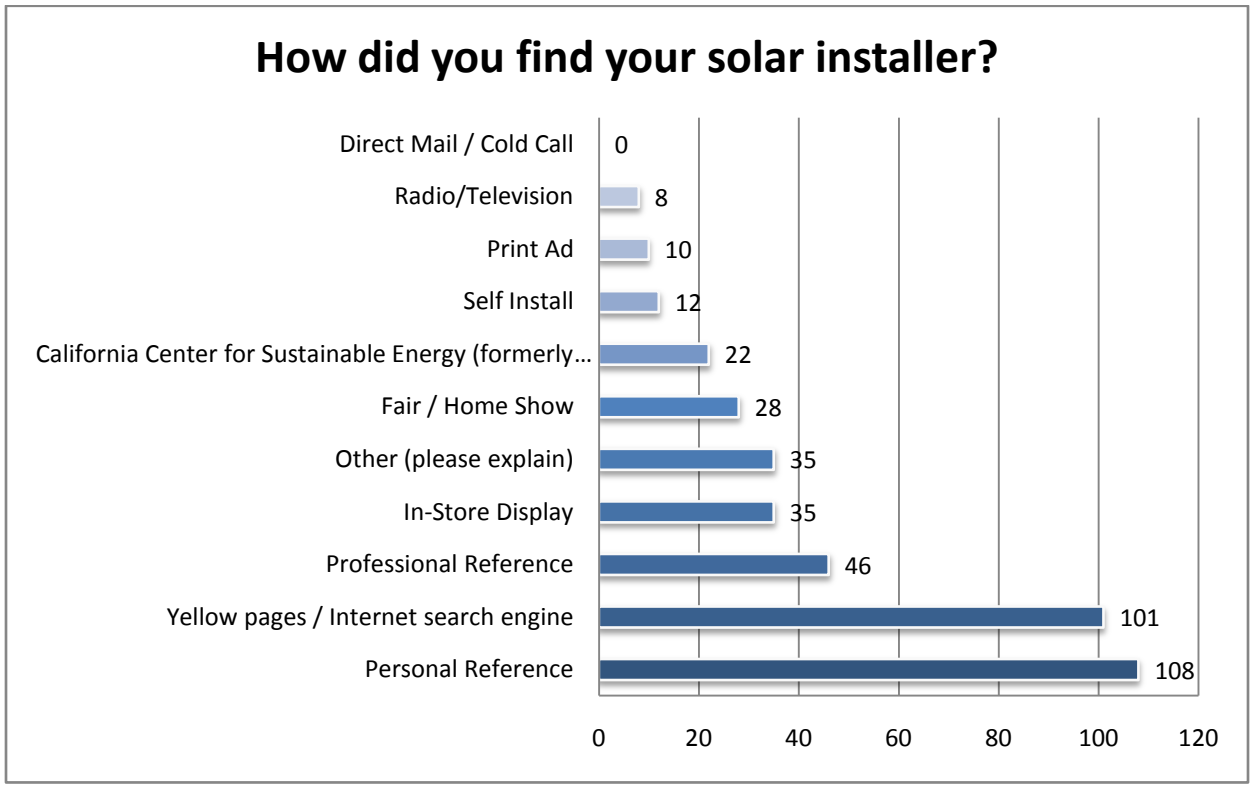
- Number of Responses: 466



- Decisions seem to be personally motivated. While 83% said it was their own decision to put solar on their building, many of those who responded "Builder Install" mentioned that solar was an upgrade option. This indicates a personal buying decision, which means that the true "personal decision" component comprises up to 92% of responses.

3. How did you find your solar installer?

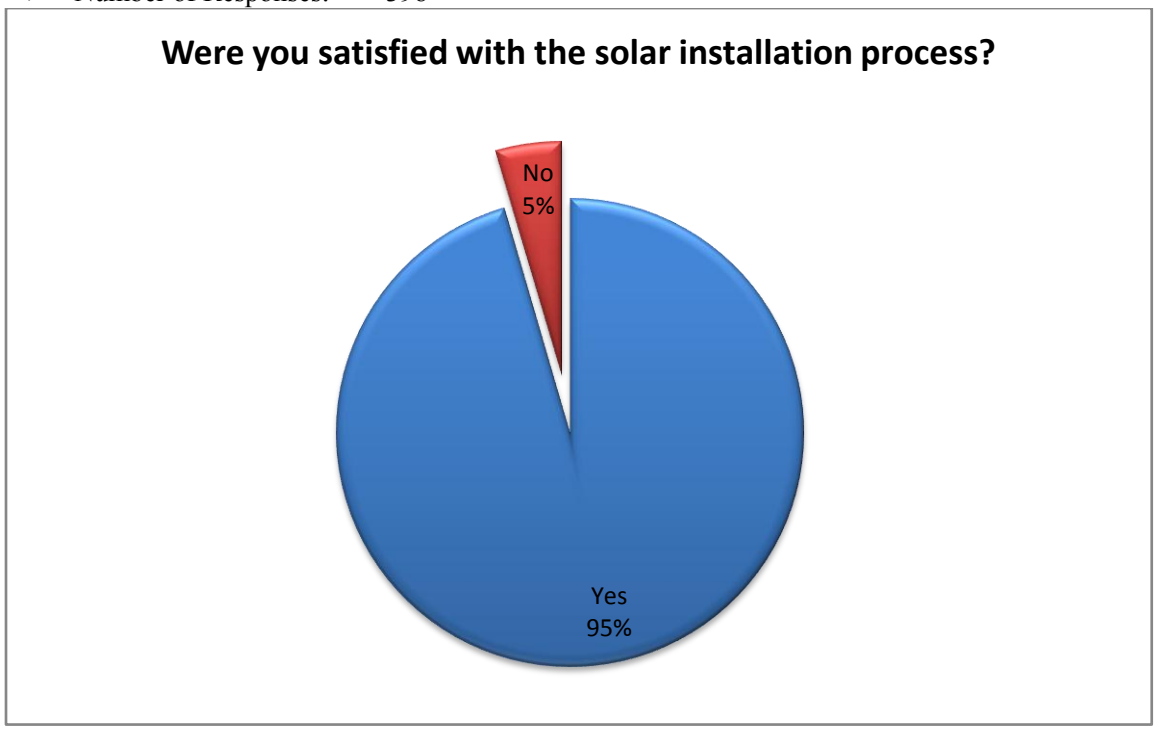
- Number of Responses: 405



- Based on the response data:
  - The internet and personal referrals were the predominant methods for selecting an installer (25% and 27% respectively). A professional reference was the third strongest response, representing 11% of the total.
  - Traditional media (TV, radio, and print) only had 18 total responses (4%).
  - Overall 48% of responses show a preference for personal interaction through recognized retailers, information distributors, personal referrals, and fairs / home shows.

4. Were you satisfied with the solar installation process?

- Number of Responses: 398

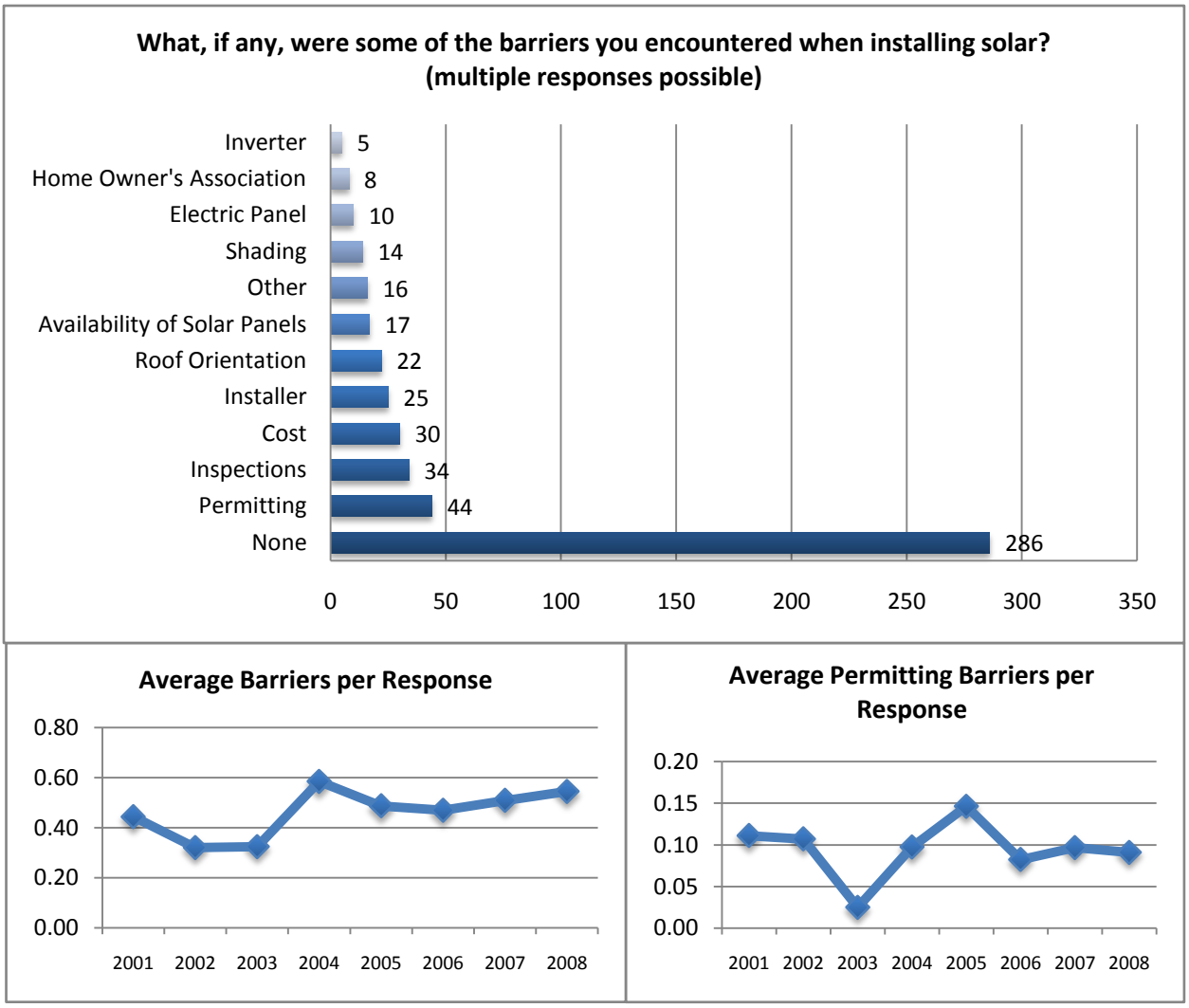


- The majority of respondents were satisfied with the installation process. This may indicate that the majority of solar installers are knowledgeable and efficient.

- Of the 5% who said "No", the primary reasons included:
  - Inexperience
  - Length of time to install was longer than expected

5. What, if any, were some barriers you encountered? (multiple responses possible)

- Number of Responses: 511



- Results show that 56% of respondents felt there were no barriers to a solar installation.
- The most common single response was permitting issues.
- Sixteen percent indicated that the permitting and inspection process was an impediment to the solar installation. This is a shared responsibility between City staff and installers to be knowledgeable about the permitting requirements.
- The HOA barrier was not significantly large; however, this may be another area in which the City can intercede to support solar.

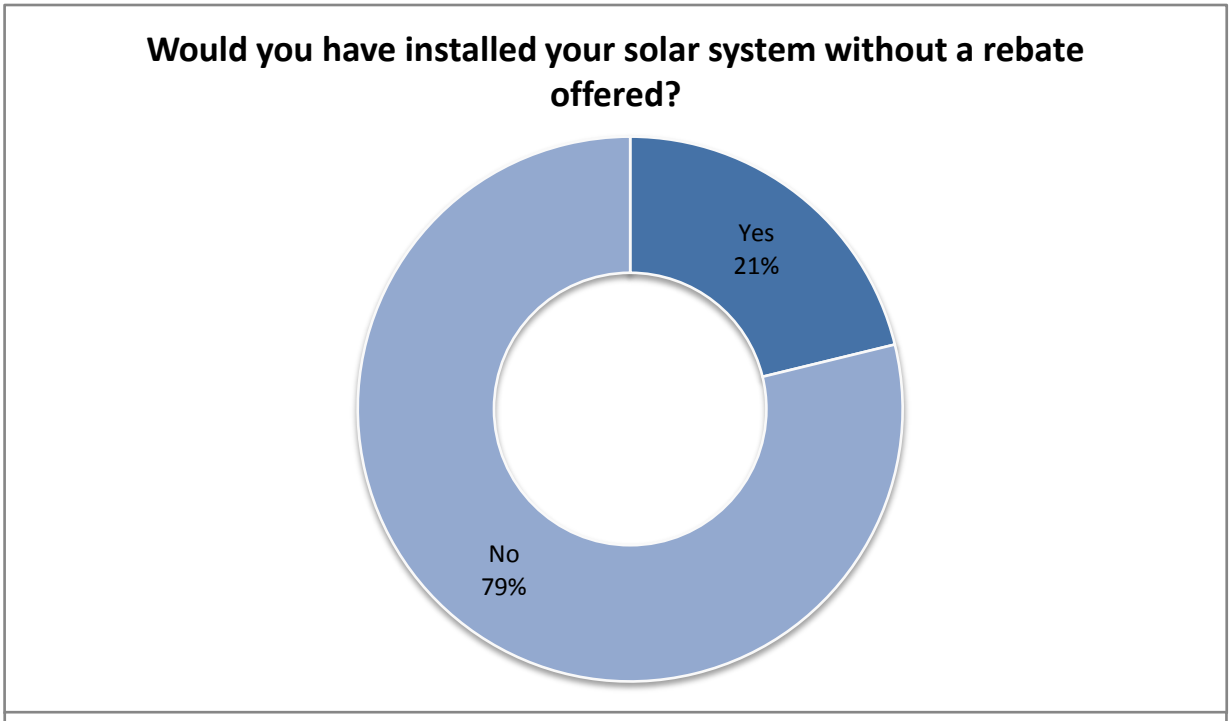
- Technical issues:
  - Four percent indicated shading and roof orientation issues. Increased outreach to builders and architects regarding building orientation and shading issues could help reduce these barriers.

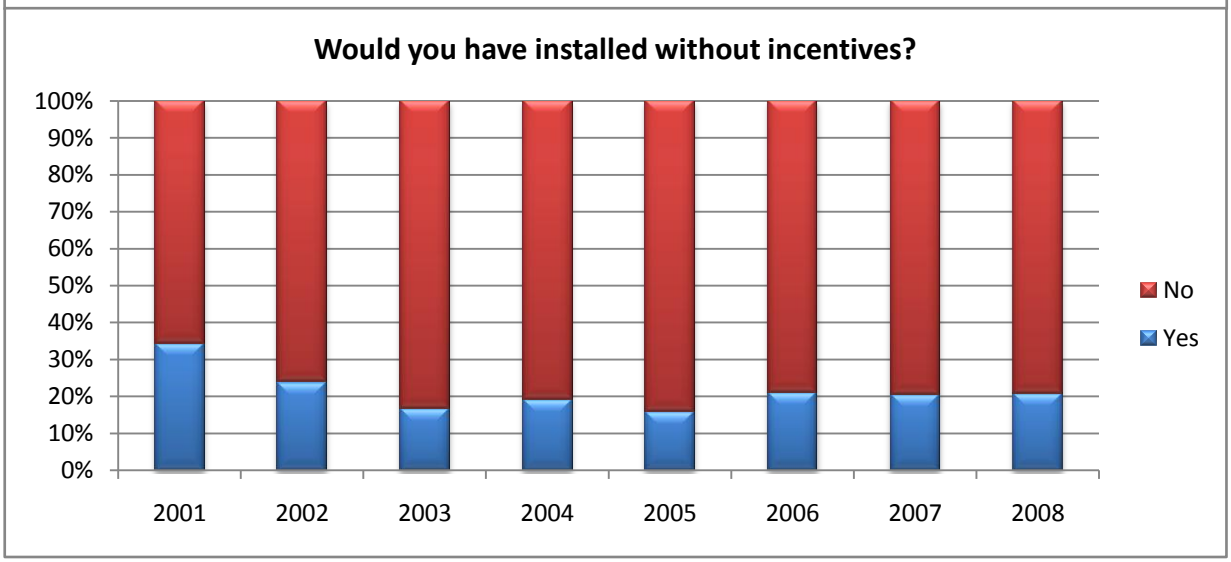
- Eight percent indicated that the installer's knowledge, the inverter, and/or the electrical panel were barriers.
- Three percent responded that availability of the solar modules was an issue for them.

- Since multiple responses were possible, those that chose "Other" were usually follow-up comments expanding on the designated list of options they selected.

6. **Would you have installed your solar system without a rebate offered?**

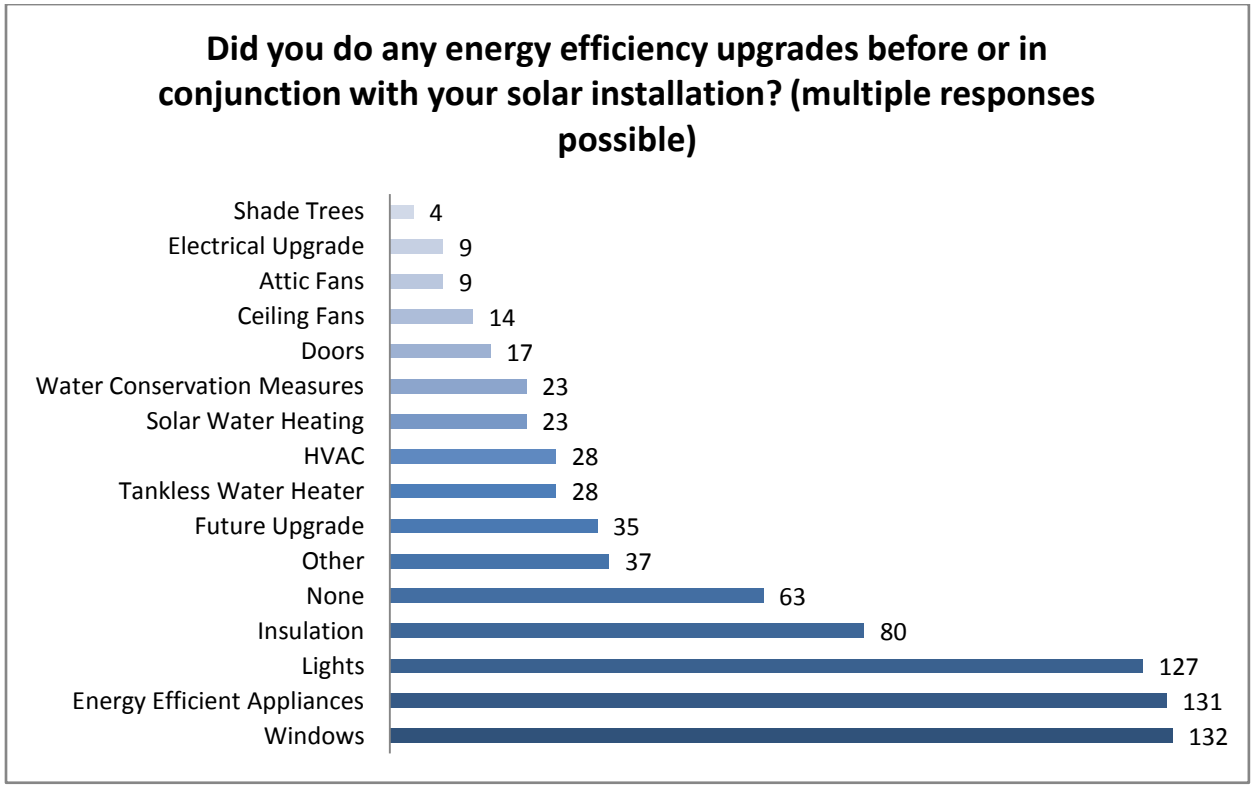
- Number of Responses: 401





- Results indicate that while 21% of individuals would still purchase solar panels without a rebate or subsidy, these incentives are still the main driver in making the final decision to install solar.
- Over time there has been little change in the percent of individuals who would have installed solar without a rebate.

7. **Did you do any energy efficiency upgrades before or in conjunction with your solar installation? (multiple answers possible)**



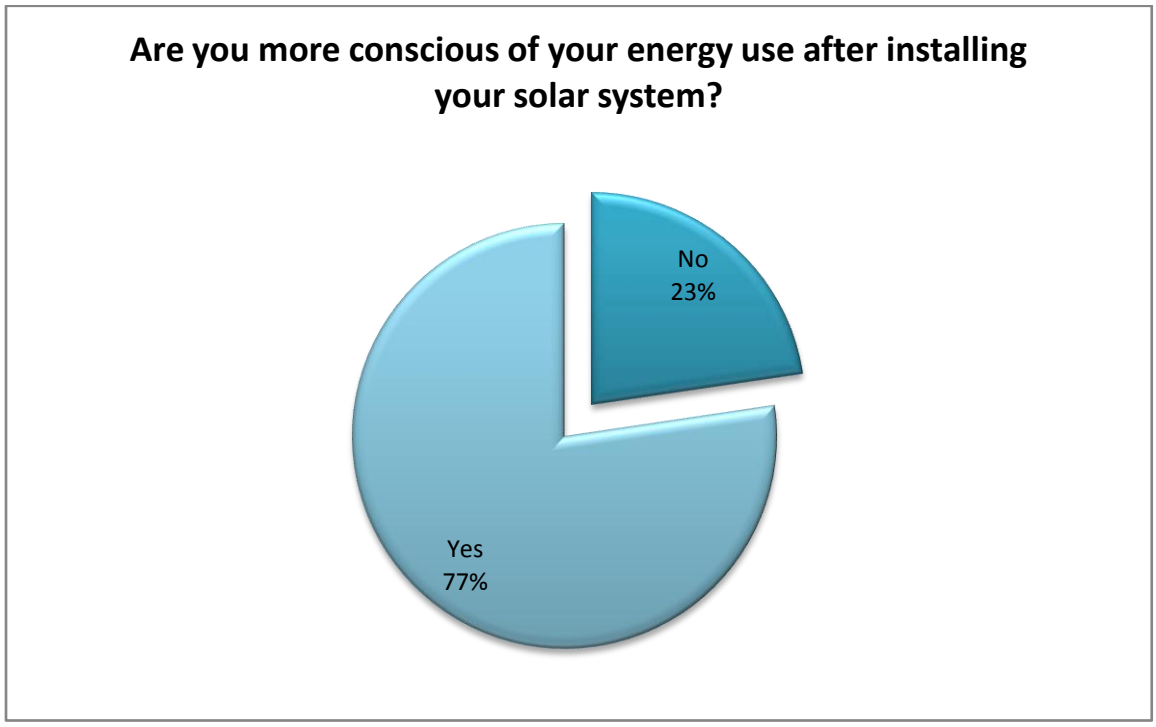
- Eighty-seven percent of respondents indicated that as part of their solar installation, significant attention was paid to energy efficiency:
  - The most common energy efficiency improvements were window upgrades;
  - The most common EE upgrades were those that carried rebate incentives and/or subsidies (windows, energy-efficient appliances, lights, etc.);
  - Shade trees, which are a low- cost option for reducing energy use, were infrequently selected.

- Since multiple responses were possible, those that chose "Other" were usually follow-up comments expanding on the designated list of options they selected.

- Thirteen percent responded that no energy efficiency upgrades were done in conjunction with the solar installation.

8. Are you more conscious of your energy use after installing your solar system?

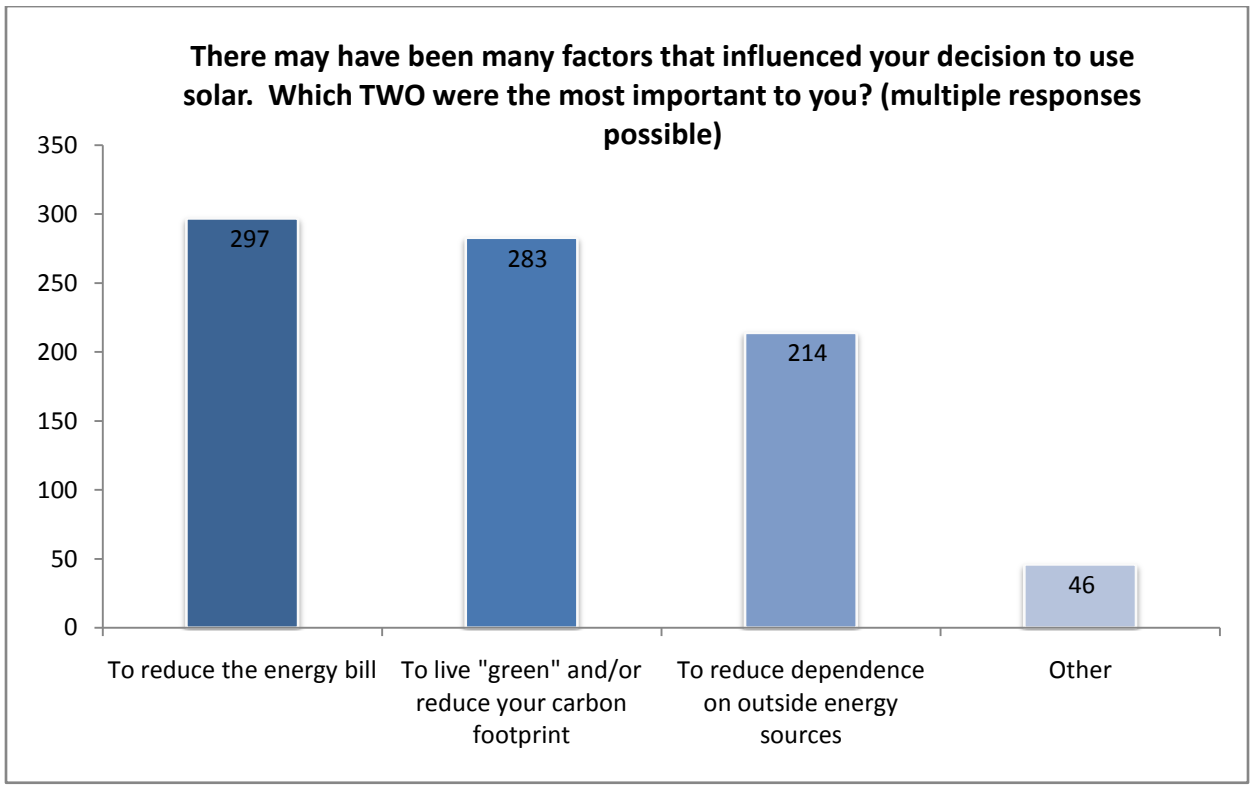
- Number of Responses: 406



- Seventy-seven percent of respondents are more conscious of their energy use since installing solar panels.

- Of the 23% who said "No", those same people stated that their motivation for installing solar panels included:
  - "To live green and/or reduce your carbon footprint" (64%);
  - "To reduce the energy bill" (70%);
  - "To reduce dependence on outside energy sources" (53%).

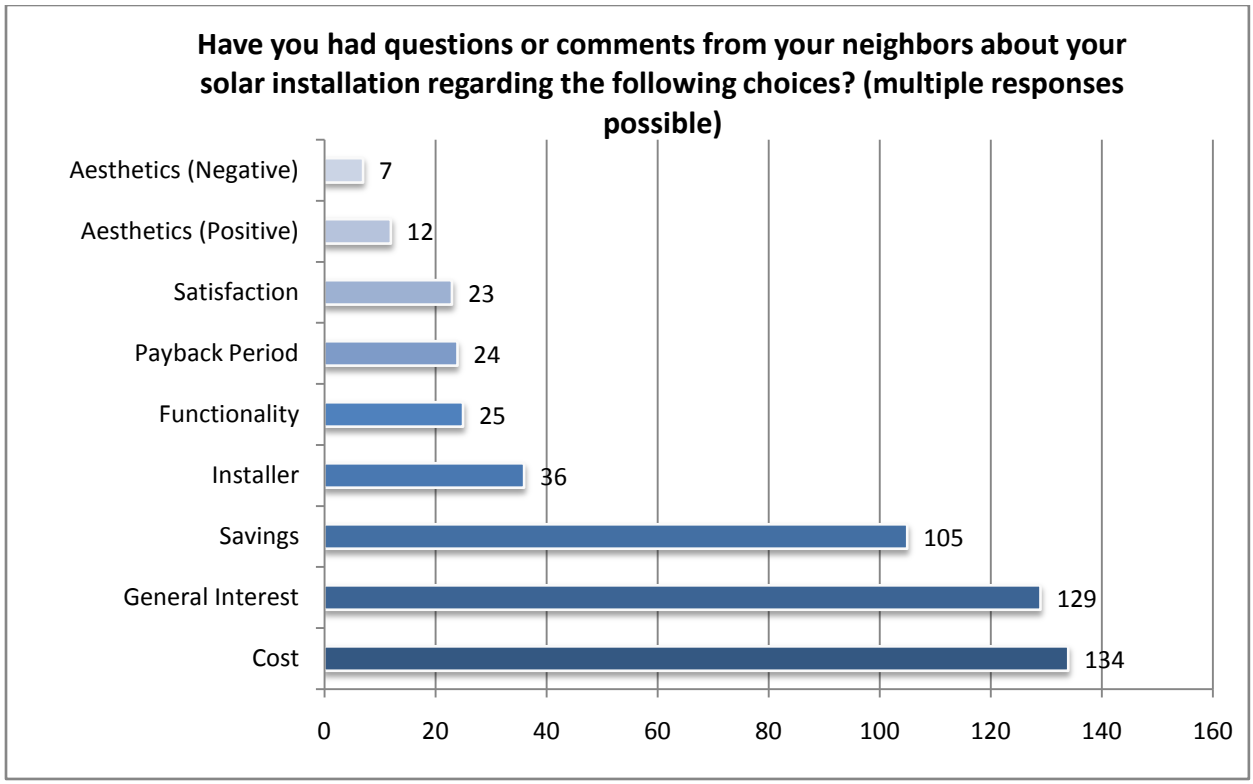
9. **There may have been many factors that influenced your decision to use solar. Which TWO were the most important to you? (multiple responses)**



- The desire to save money still remains the primary motivator to install solar. However, the data also indicates "going green" as a significant motivation.

10. Have you had questions or comments from your neighbors about your solar installation regarding the following choices? (multiple responses possible)

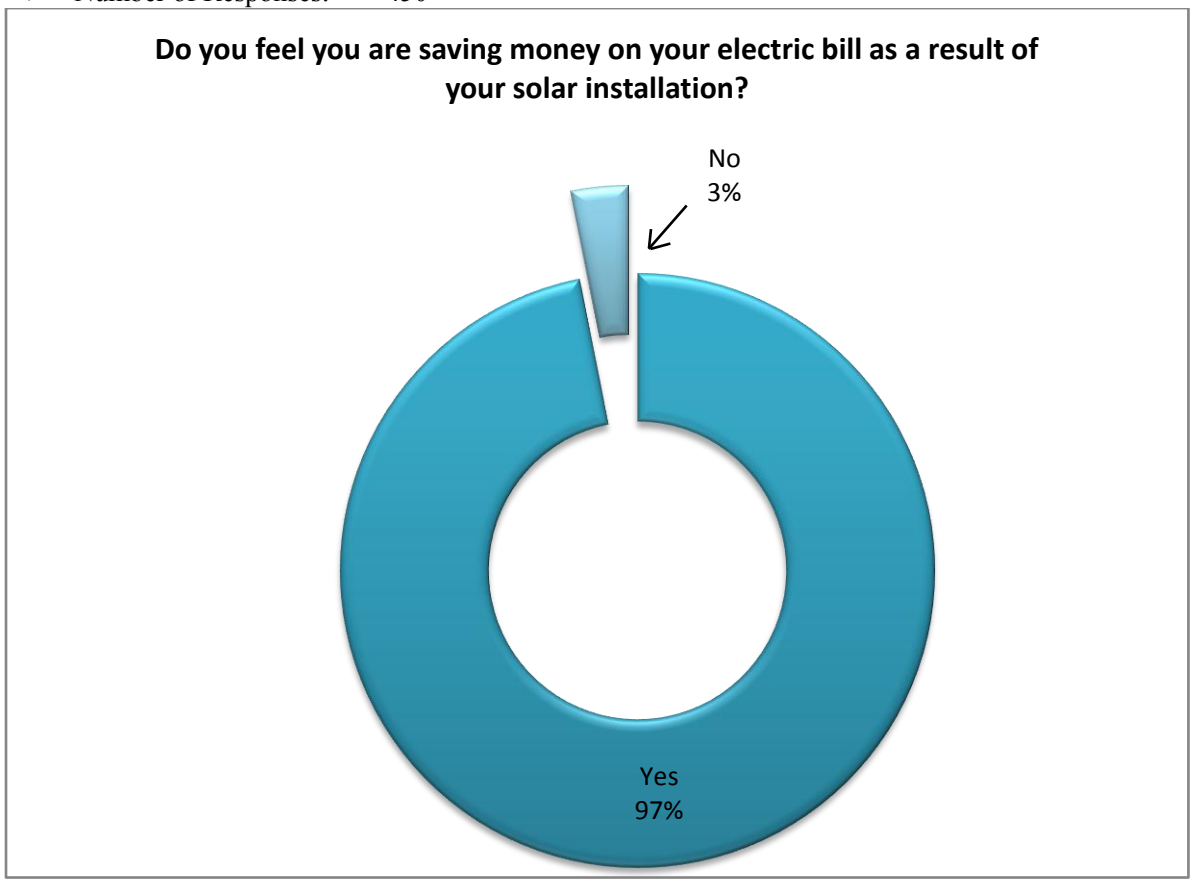
- Total Responses: 495



- The data shows that the primary area of interest was financial, including the cost of the installation (27%), the payback (26%), and savings realized by the owner (21%).
- Negative feedback only represents 1% of the total.

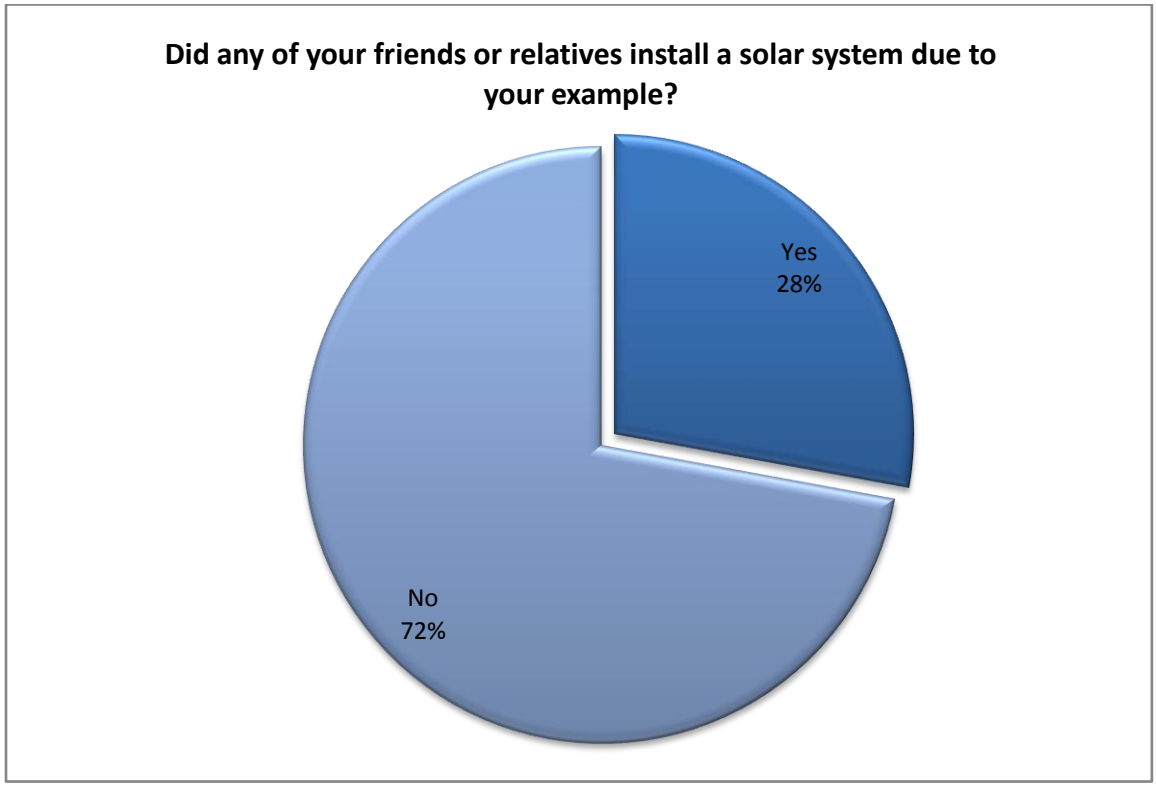
11. Do you feel you are saving money on your electric bill as a result of your solar installation?

- Number of Responses: 450



12. Did any of your friends or relatives install a solar system due to your example?

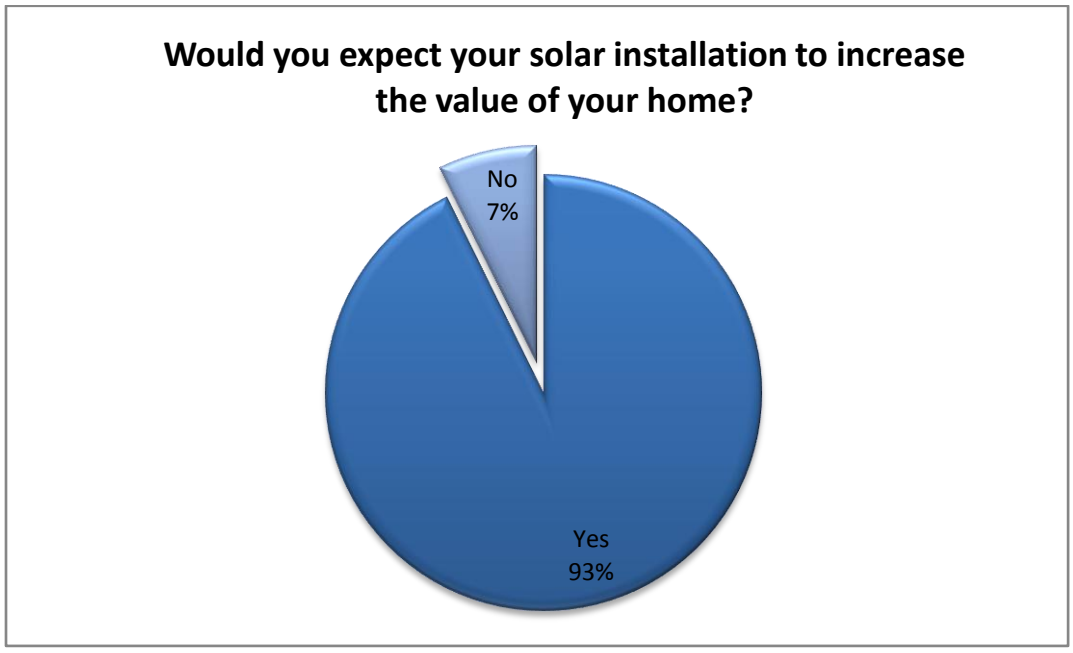
- Total Respondents: 643

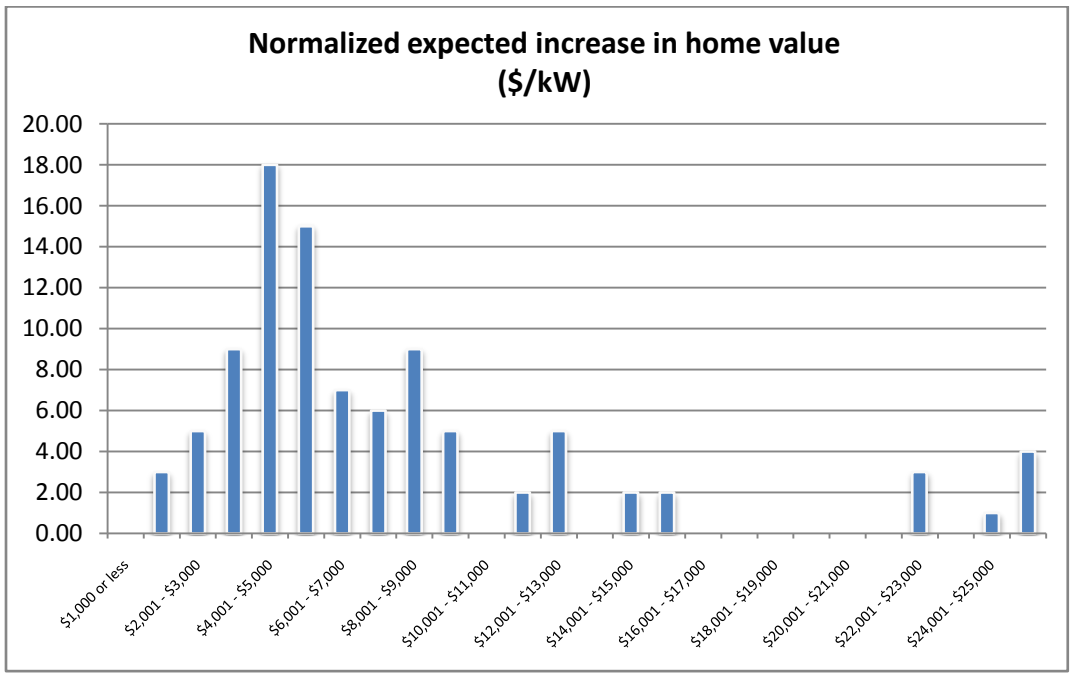


- With 28% of respondents claiming that friends/relatives installed solar because of them, the data supports the previous question which showed that 27% of respondents found their solar installer using a personal reference. This also indicates that firsthand experience and feedback are significant in helping to promote solar to interested parties.

13. Would you expect your solar installation to increase the value of your home?

- Number of Responses: 453





- With normalized data we see that most respondents expect an increase of $4,000 to $5,000 per kW installed.

- While the majority agrees that investing in solar PV will increase the value of their homes, the actual estimates vary significantly. Even under normalized conditions we see that there are still a number of outliers that expect large increases in the value of their house post-install.

3 Next Steps

After analysis of the survey results, more clarification is needed to determine barriers and incentives to installing solar. This can be accomplished in two ways: focus groups and researching national "best in class."

3.1 Focus Group Follow-up Questions

1. **Real Estate & Home Appraisers**
    a. What difficulties do you face when selling (or valuating) a solar home?
        i. What could be done to remove these barriers?
    b. How do you appraise the value of solar water heating vs. photovoltaic?
    c. How does a solar installation affect the value of the home?
        i. Are there clear guidelines that help assess the value a solar install adds/subtracts?
        ii. What factors would you need to better appraise the value of solar (system age, capacity, original costs, kWh production, etc.)?
    d. Do you evaluate the functionality of a solar PV system before putting the home on the market (i.e. ensuring the solar PV system is up to code, producing at maximum capacity, has the proper meter, disconnects, etc.)?
    e. Do you highlight solar PV systems as a "value-added" feature on a home when putting it on the market?
    f. Would a home energy rating (i.e. HERS) be beneficial to sales/marketing?
    g. When a home has a solar PV system what questions do potential buyers ask?

2. **City Permitting Officials**
    a. How familiar are you with solar installations?
    b. What are the problems/barriers you find when dealing with solar permits?
    c. What can the City do that would help you streamline the permitting process?
    d. What can builders/contractors/architects do to help streamline the permitting/inspection process for you?
    e. Do you feel you are/were adequately trained in solar permitting requirements/specifications?
    f. Are you aware of solar permitting "best practices"?

3. **Previous Solar Customers**
    a. Do you think having Solar installed on your property has increased its value?
    b. Do you think having an energy rating with quantitative measurements/values on the performance of your property would be beneficial (e.g. expected yearly energy usage, Net Zero energy, etc)? Why or why not?
    c. Did you do an energy audit in conjunction with your solar install? Why or why not?
    d. Did you perform any energy efficiency upgrades before, during or after your system's installation?
    e. Have there been any unexpected issues that have come up since installing solar on your property?
    f. What can be done to make it easier for someone interested in solar to install it?
    g. Are you familiar with what passive solar is?

3.2 "Best in Class" in California

1. **San Francisco's "GoSolarSF" Program**
   GoSolarSF is the largest municipal solar incentive program in the USA. The program encourages residents to hire local installers by providing additional rebates and a training program to help certify local contractors. It includes an "environmental justice" clause which provides even greater incentive to those who are low income and/or live in areas that have been "traditionally affected by pollution from energy generation" in San Francisco.

   Additional Benefits:

   - Permitting fee is only $85, far below the Northern California average of $212.
   - Streamlined permitting process.

2. **City of San Jose – Solar Permitting Process**
   Identified in a study by the Sierra Club, San Jose is one of four cities in Northern California that has an "over-the-counter" permitting process for most solar installations. San Jose, by defining what criteria qualifies a project for over-the-counter permitting, greatly reduces the time frame for a project and reduces cost by eliminating extra staff hours.

   Criteria that qualify a project for over-the-counter permitting include:

   1. Total panel weight (including frame) is not greater than 5 pounds per square foot.

   2. Maximum concentrated load at each point of support does not exceed 40 pounds.

   3. Maximum height above roof surface does not exceed 18 inches.

3. **Sonoma County's "Solar Sonoma County" Program**
   This began with a smaller, city-wide program called "Solar Sebastopol" but because of the high level of success realized, expanded into a county-wide program. This program helped to centralize all of the information into one website which helps to reduce knowledge barriers. Additionally, the program has engaged the participation of a full range of stakeholders including banks, installers, real estate professionals, NPO's, vendors, schools and individual citizens.

   Successes include a reduction in barriers to both knowledge and accessibility. Educational outreach and partnerships with schools have helped to improve knowledge of how solar works and how to obtain financing. The full range of stakeholders guarantees consistency and cooperation throughout the entire program.

4. **City of Berkeley – Inspector Training**
   The City of Berkeley's inspectors have been identified as being exceptionally knowledgeable about inspecting solar installations. This helps to reduce the time needed to inspect solar installations and prevents unnecessary delays due to inspectors' lack of knowledge.

   The City Planning Department also offers free non-binding design review evaluation of solar equipment installations; this facilitates a positive back and forth with the designer/contractor early in the process and prevents expensive design revisions further down the road.

* * * * * *

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Appendix Two:
Solar Photovoltaic Focus Group
Final Report

Introduction

On behalf of the Department of Energy (DOE) Solar America Cities grant for the City of San Diego (City) in partnership with the California Center for Sustainable Energy (CCSE), three focus group sessions were conducted by Rea & Parker Research. The purpose of conducting the focus groups was to elicit from specific stakeholder groups the perceived value and barriers for solar energy systems.

1 Focus Group Meetings Overview

Real estate professionals, generally, did not think the market was valuing photovoltaic systems as highly as their cost would merit. Two paradoxical situations represent the barriers to higher valuations. First, these systems must become more widespread and commonplace in order for the average home buyer to feel the need for a photovoltaic system enough to pay premium dollars. Yet, were these systems to become more widespread, then the scarcity value that attracts higher-end buyers would begin to dissipate. Second, energy cost histories are needed to convince home buyers of the true value of these systems. However, cost histories can be produced only over time, and time works against value as potential buyers fear that older systems will require repairs or become obsolete.

Homeowners with photovoltaic systems have quite a contrary view of the value of their systems, assuming their homes have increased in value approximately equal to the cost of their systems. They are very happy with their systems, freely discussing reasons why and what type of value they are getting out of the systems beyond increased property value. These benefits also include long-term energy cost relief and contributing to a reduced energy footprint, among others. The only negative concern is that San Diego Gas & Electric made the start-up more difficult than necessary and the company does not purchase the surplus power the homeowner is generating. These homeowners indicated they would have installed systems with even greater capacity were SDG&E willing to purchase that excess power. That said, these homeowners still derive enormous satisfaction from knowing they are part of the solution and not the problem.

City and county permitting and inspection officials indicated that application and permit fees for photovoltaic systems are relatively inexpensive and do not cover the cost of processing and inspecting. They also indicated three improvements that could make the process work more smoothly: 1) clearly define the role of fire departments in the photovoltaic process (e.g. when and under what circumstances they are to become involved) because their involvement tends to slow the permitting process; 2) provide more and better trained inspectors and plan checkers; and 3) ensure that contractors and installers are better educated, thereby allowing the process to work efficiently. As the economy has slowed, several less-than-experienced contractors and workers have moved out of conventional construction into solar, and this inexperience has led to extra time and steps in both the application and inspection processes.

1.1 Comparative Analysis of Focus Group Discussions

Real estate professionals see trouble assessing value for residential solar installations while homeowners see value. Juxtaposed to the homeowners' view that their system's cost is matched by a corresponding increase in value, real estate professionals gave a list of reasons why photovoltaics are not important to their clients and why having a system could even be a liability, or reduce the value of the homes. These include fears on the part of home buyers about the operational ease and effectiveness and ultimate repair costs associated with the photovoltaic system. Further concerns are that the technology is developing so rapidly that paying full cost for a system today will have become a poor decision in short order when new technologies render their system obsolete.

BARRIERS

A number of barriers to more extensive installation of photovoltaic systems throughout the region were illuminated. One barrier discussed in two of the focus groups was the cost of a photovoltaic system, both in terms of the initial investment and the disparity between the values different groups placed upon a system. Although homeowners believe their systems are valued at cost, real estate professionals feel there is little, if any, value added because of a lack of clear valuation guidelines and liability issues.

If values were to begin to reflect the cost of these systems (as in the case of swimming pools in upscale areas or remodeled kitchens with extensive use of granite), then the cost would likely be more proportionately represented upon resale. If energy costs were to increase sharply once again, that, too, might trigger some additional value consideration for these systems.

Another barrier that was revealed during focus group discussions among real estate professionals and permit/inspection participants was the concern that, when the technology is advancing so quickly, any purchase will quickly become obsolete. Homeowners acknowledge this possibility but are relatively unconcerned in light of the benefits that they obtain from their systems.

A further potential barrier was brought forth during a discussion among permitting and inspection officials. Currently, all of the homeowners involved are very satisfied with the contractors they selected, as well as with the installation process. However, permitting and inspection officials warned of an influx of untrained contractors and construction workers, who, in the face of the economic downturn, are eschewing conventional construction and attempting to profit from becoming solar contractors, despite a lack of experience. Poor application procedures tend to slow the process and increase its cost to both the public and private sectors. Further, the 1980's experience with poorly installed solar panels is not so distant a memory that these fears could not be reawakened.

POSSIBLE SOLUTIONS

The three focus groups provided possible solutions to many of these barriers.

The sometimes prohibitive cost could be mitigated through additional government subsidies. The Imperial Beach $30,000 grant program was particularly interesting to homeowners. Additionally, SDG&E could agree to purchase surplus electricity from homeowners.

A universally accepted and understood rating system that indicates quality and long-term reliability of systems could help allay fears of system obsolescence in the face of rapid technological advances, as well as provide an easier and more reliable method for home buyers to determine the real value of an installed system. Additionally, concerns regarding maintenance of systems for homebuyers could be allayed through a combination of better warranties and well-documented cost savings.

As discussed above, the fear exists among real estate professionals, in particular, that today's system will be out-of-date tomorrow. This can be solved by a slowdown in technological advances (not only unlikely but also undesirable) or by a significant drop in price for these systems that would cause obsolescence to be less costly. This decline in prices is not likely as long as there are so few systems, but there may not be a substantial growth in the number of systems until prices decline. This paradox is seen by these participants as solvable through the use of government subsidies under present cost structures to reduce

the net cost to the homeowner or by upwardly ratcheted energy costs that would increase the value of photovoltaic systems.

Contractor training and educational programs are key, especially in light of the constant technological advances and the influx of new, less-experienced installers.

As a practical consideration for the upkeep of installed systems, designs should be more modular, with plug in replacement parts and an easier panel cleaning method.

Permitting costs were not seen as a major barrier to installing a photovoltaic system. According to municipal officials, these costs are quite low in San Diego County. Inasmuch as these costs were not seen as a barrier by the homeowners, San Diego area governments might wish to explore further how to recover costs for an expedited permit review. If permit fee increases are warranted, it is essential to consider the level at which the increases would not be detrimental to the number of installations.

1.2 Overall Conclusions

Once owned, photovoltaic systems seem to be bringing much satisfaction to their owners. Market growth will occur in photovoltaics as costs are brought down and as electric power grows more expensive. It may be important to prime the market through the use of continued incentives and support with San Diego Gas and Electric.

It is clear that a more focused outreach campaign should be targeted toward real estate and associated professionals. A primary reason solar is not valued is because it is not understood. Just as with swimming pools, the more the professionals know about solar installations and the associated benefits, the better qualified they will be to value it as part of the home sale price and to promote it. Providing commonly understood and accepted documentation about the quality, condition, and reliability of each system will help greatly to facilitate the property's marketability and return a greater portion of the initial cost to the homeowner.

Training for contractors, inspectors, and permitting officials will certainly benefit the homeowner in terms of time saved and enhanced quality of the installation. Jurisdictions may also want to consider increasing

fees and using the revenue for training more inspectors and plan checkers, and possibly create an incentive program.

1.3 Focus Group Methodology

Two of these focus groups took place on Thursday, July 9, 2009 and one on July 13. These focus groups were conducted at the facilities of the California Center for Sustainable Energy and were scheduled to require approximately 1 hour and 15 minutes each.

a. The first focus group on July 9 started at 5:15 p.m. and finished at 6:45 p.m. It was conducted among real estate brokers and sales personnel as well as residential appraisers.
b. The second focus group, also on July 9, was conducted among homeowners who had previously installed a photovoltaic system in their homes. It began at 7:15 p.m. and lasted until 8:45 p.m.
c. The third focus group was conducted on July 13 among permitting and inspection officials from various jurisdictions within San Diego County. This session started at 5:15 p.m. and finished at 6:45 p.m.

The California Center for Sustainable Energy recruited participants for the three groups, seeking to achieve diversely distributed groups of participants from areas where photovoltaic installations tend to be concentrated.

2 Individual Focus Group Meeting Analysis

City of San Diego &

California Center for Sustainable Energy

Photovoltaic Solar Energy Systems

2.1 Focus Group #1: Real Estate Professionals

Focus Group Summary

The focus group was comprised of eight participants. Six were real estate brokers and sales personnel with varying degrees of experience, ranging from 1 year to 30 years. Also attending was one appraiser with 35 years of experience and one finance specialist. Participants came from San Diego, Chula Vista, La Mesa, El Cajon and the North County coastal area, but all indicated that they handled transactions throughout the County and into Orange and Riverside Counties. A majority of participants were EcoBroker Certified® professionals, an Association of Energy and Environmental Real Estate Professionals designation for real estate professionals focused on "green" properties.

- Solar Installations are Not a Standard Amenity:
  - When these systems are the "exception and not the rule," full value is not possible. The example provided pertained to swimming pools—the only pool on the block cannot cover its cost with a corresponding increase in value, but when every home has a pool, then the pool's cost will be reflected in the value because the buyer would likely want to install one to match the neighborhood amenities.
  - Paradoxically, it is this uniqueness that makes these systems particularly attractive to high-end homeowners.

- Age and Type of Home:
  - Comparability from house to house to establish the cost savings is possible in a tract development but not with older homes that are not directly comparable.

- Documentation of Energy Cost Savings:

- Cost savings must be well-documented in order to highlight the benefits of the system; however, this can only be accomplished when a system has been in operation for some time. The age of a system tends to work against value because it is not as cost effective as a newer system.

- Prominence as a Desirable Asset:
  - There are not enough of these systems in place for a groundswell of support to have developed—there are not enough systems "out there to make people say „we have to have it.' No one has ever asked for it. They ask for granite counters, hardwood floors, or pools."

- Technology Changing Quickly:
  - So many changes are occurring or can be expected to occur that people are waiting for the next "cutting edge" development. Why buy now when it might be obsolete tomorrow?

- Financing:
  - Financing residential solar PV systems has become more difficult as a result of the decrease of funding availability from mortgage refinancing and home equity loans.

- Home Inspections:
  - Photovoltaic systems are so few in number that they are not part of the standard inspection process. Training in the inspection of such systems would not be cost effective given that such training is not likely to be utilized very frequently.
  - Participants were very favorably inclined toward a rating system that would be universally applicable across all homes and across the photovoltaic industry.

Addressing Barriers: The two greatest challenges in valuing residential photovoltaic systems from a real estate and finance perspective are: 1) inadequate explanation and appreciation of cost savings from an installed system; and 2) buyer's inability to determine how well the system is functioning. Participants indicated that these barriers could be addressed in a number of ways:

- Warranties on equipment.
- Documentation of cost savings.
- Buyer education regarding ease of operation.
- Information on the modular nature of systems and the ease of repair.
- The inclusion of government subsidized loans for photovoltaic systems in the stimulus plan.

Possibly high-end luxury homes would have a larger value increase because of the clientele's preference for this type of an amenity. The discussion raised the question of whether enough penetration in that market would eventually impact the value increase in less expensive homes. Additionally, areas with heavy use of propane in lieu of natural gas favored photovoltaic systems.

Detailed Focus Group Input

Photovoltaic Impact on Residential Property Values:

A series of questions (see Appendix for Discussion Guide) triggered considerable discussion among the participants about the impact photovoltaic systems have on home values. Some comments were made in the introductory remarks, but this provided an opportunity for respondents to elaborate. Major themes pertaining to value included the documentation of cost savings and the age of the system.

Energy cost savings can make a difference in value obtained for the home, but there are some other problems associated with directly translating these cost savings into value:

- It was felt that high-end luxury homes could experience significant increases in value because of the uniqueness factor and that, if there were enough penetration in that market, the value increase could begin to "seep downward."
- Areas with heavy use of propane in lieu of natural gas (e.g. Elfin Forest) are more likely to show a higher value for photovoltaic systems.
- People can see windows and appliances but have a hard time ascribing value to what they cannot see—e.g. the roof and a solar installation.
- Comparability from house to house to establish the cost savings is possible in a tract development but not with older homes that are not directly comparable.
- With significant capital outlay required and the technology advancing rapidly, consumers may be leery of investing in solar PV systems. One participant cited his development where all 200 homes are plumbed for solar hot water systems, and no one has yet installed a system. Another said that the value reflects this reluctance. If the cost can be quickly recovered, then obsolescence is not a serious issue.

- One participant indicated that his normal SDG&E bill is $70—how much can he save to justify significant cost or value?
- The value of multi-family units would likely be more positively responsive because of cost efficiencies and less concern with appearance.
- Young clientele are a bit more "green-minded," but would prefer to use their more limited funds to maximize their house size and location.

An interesting paradox arises in that it was strongly indicated that cost savings must be well-documented. Such documentation requires time, but age tends to work against the value of photovoltaic systems in a number of ways:

- Older systems are less advanced and, therefore, closer to obsolescence.
- Buyers fear older systems, wondering if it is a "headache waiting to happen."
- If the system is modern, well installed, and state of the art, it can be a bonus—more in generating a faster sale than in generating more value, however.

Two suggested rules of thumb were offered: 1) One-half the cost of a photovoltaic system could be recovered on resale and 2) A $100 savings per month could recover between $12,000 and $25,000 in value. The first rule was rejected out-of-hand—original cost and value of solar were unrelated. The second suggestion was accepted by most participants; however, participants cautioned that the savings must be proven and expected to continue into the future without serious maintenance or repair issues.

Verification of Operational Functionality:

In determining the value of a property, the realtors and appraiser verify the performance of the system by asking the owner to represent the system's condition and functionality. Owners are asked about it just as they are asked if the roof leaks.

Any doubt or equivocation causes the recommendation that a specialist be called in and that any problems be identified before the buyer finds them. It is best to be pre-emptive with any such problems. The real estate professional is not equipped to make any binding representations. Photovoltaic systems are so few in number that they are not part of the standard inspection process. Training in the inspection of such systems would not be cost effective given that such training is not likely to be utilized very frequently.

Therefore, the respondents were very favorably inclined toward a rating system that would be universally applicable across all homes and across the photovoltaic industry. Such a system would rate a home against some standard in order to identify the degree to which the rated home was out-performing some target measure. Furthermore, a well-rated house implies a well-constructed house. Others in the group were quick to point out, however, that the rating would have to be converted into cost savings and would have to be mandated by the Multiple Listing Service in order to have truly broad applicability.

Potential buyers, when looking into purchasing a home equipped with a photovoltaic system, ask the following questions:

- How does it work?
- How old is it?
- How long will it last?
- What is the first thing that can be expected to fail and what will that cost?
- Cost savings are usually brought up by the listing agent before the buyer asks anything about that—again evidencing the fear and uncertainty associated with an infrequently encountered technology.
- The rating idea discussed previously would help here.

Barriers and Challenges Faced When Selling/Appraising a Photovoltaic Home

The Appendix also contains a written exercise that was completed by the eight participants. The focus group participants were asked to indicate which of the difficulties/challenges/barriers listed in the table below were ones they faced when appraising or marketing homes with photovoltaic systems. If they indicated more than one of these, they were asked to rank them. The table identifies how many of the eight participants indicated they faced that particular challenge and what the average ranking was for those who mentioned it.

Number and Ranking of Solar Home Challenges/Barriers to Residential Home Marketing and Appraisal		
Difficulty/Challenge/Barrier	# of Indications (out of 8)	Mean Ranking (1-7 scale)
It is difficult to explain the cost savings associated with a solar system	7	2.7
Adequate information about the system is not available	7	3.0
Buyers sometimes cannot appreciate the value added that a solar system provides and will not want to pay more for a house with a solar system.	6	2.3
Difficult to determine if the system is functioning according to design	6	2.3
Homeowner sometimes does not know or does not fully disclose facts about the solar system.	6	3.9
Not adequately trained for solar PV system assessment/valuation.	2	4.0
There is generally not adequate time or resources to make a thorough assessment of a solar PV system in relation to the house's overall value.	2	4.0
Other, please specify_____ a. Not enough solar homes	1	6.0

Although the difficulty in explaining cost savings and the lack of adequate information are mentioned most often (7 out of 8 respondents), the buyer's inability to fully appreciate the value added and the difficulty in determining how well the system is functioning were more problematic for those who were troubled by these challenges (rankings of 2.3 on 1-7 scale and mentioned by 6 out of 8 respondents). Although 8 ranks were possible, the greatest number of ranks given by any one participant was 7; hence the 1-7 scale.

In the ensuing discussion, respondents specifically mentioned that:

- Warranties can be very important.
- Documenting cost savings is vital.
- Buyers must be shown how easy it is to operate these systems.
- Systems should be more modular, with plug in replacement parts.
- The government should have used the stimulus plan to subsidize loans for photovoltaic installations.

Finally, the participants took the opportunity to ask personnel from the City of San Diego and California Center for Sustainable Energy questions about incentive plans, the need to clean the solar panels, and a new proposal to use a facilities benefit tax structure to finance new installations.

2.2 Focus Group #2: Homeowners with Photovoltaic Systems

Focus Group Summary

The focus group was comprised of eleven participants, including two married couples. Participants came from Point Loma, Sorrento Valley, Imperial Beach, Carlsbad, Escondido, Alpine, and La Mesa. The timeframe spent in San Diego County ranged from 15 years to 50 years. The photovoltaic systems were installed as recently as 1½ years ago or had been in place as long as 7 years, and the systems ranged in size between 2.5 kW and 5.8 kW. All participants received a state rebate for a portion of their systems through the California Solar Initiative (CSI).

- Reasons Given for Deciding to Install A Photovoltaic System:
    - Need to reduce the use of fossil fuels.
    - Desire to be part of the solution rather than part of the problem.
    - Initially installed to offset cost of pool and spa and the results have promoted more eco-friendly behavior.
    - Beneficial as a means to save energy costs after retirement when system has been paid for.
    - Feeling of being connected to the sun. It is empowering and allows this respondent to say that he does not "want no stinking corporate electricity."
    - One respondent commented that it is a wonderful retirement plan: it pays off in a few years and then he will have free power for the rest of his life.
    - Another respondent considers himself a "geek that is now kind of cool."
    - It is sunny all the time here—it's free—capture it.
    - Wants to get an electric car one day.
    - Ability to use air conditioner or electric car (in the future) cost-free due to energy produced by the solar installation.

- Installation Process:
    - The installation process was unanimously indicated as excellent by such contractors as Sullivan, Clean Power, Akeena, SPG Solar, Independent Energy Solutions, and Home Energy Systems.
    - One participant was particularly impressed that certified roofers were used to do the work. Another was very happy with his "turnkey operation. I never have to worry about it. People shouldn't be intimidated." A design engineer among the participants added that his system reflected "fantastic engineering"—another commented upon her "fantastic job."

- Permitting Process:
    - There was no problem with the permitting process, but there was some dissatisfaction expressed regarding SDG&E's connection policies and attitude toward solar energy, which was characterized as anywhere from not helpful to hostile.
    - They were particularly tough on one participant who had dogs in requiring that his animals be separated from the meter—a reasonable request for meter reader safety, but not an issue until he converted to photovoltaics. It took him 3 months to get his system turned on. Most others were displeased with the standard 3-week wait to start the system, and one participant was particularly vocal about SDG&E consistently downplaying the value of solar, recommending conservation instead.

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- Financing and Perceived Cost Savings:
    - To fund their PV System, all participants took advantage of the federal and state tax incentives that were available. The two Imperial Beach residents used $30,000 grants that were available from the City. Another participant used a home equity line of credit, citing that mortgage interest is deductible but electricity costs are not. Other respondents used lump sum retirement benefits, life insurance cash value, refinanced first mortgages, and even cash. There was no dominant method of payment among the group.
    - The proposed plan in San Diego to finance solar installations with a benefit assessment that is added to property taxes and liens on the property rather than the purchaser was unanimously favored by the group.
    - When asked about the payback time for a system, an interesting discussion arose that lead to a significant conclusion—payback was not the deciding factor for these homeowners. They

indicated that their home is a long-term investment and they "just do not think about payback."

- Their reward, rather than payback, includes the contribution they are making to their environmental footprint, as evidenced by the read-out that shows how much CO^2 is not being used by them, and their meter spinning backwards. As one participant said, "Everybody asks about payback, but it's not that important."
- Being part of the solution and not the problem is a substantial benefit of photovoltaic ownership.
- In the long-term, electrical power will be cost-free to them. As such, a short-term payback is not seen as vital to them.
- Several want to eventually use electric cars for their vehicular travel. Their photovoltaic system will make that transportation mode truly cost-free to them.

- Several indicated that they would have installed even greater capacity if they would be paid for the extra generation. They also want SDG&E to adopt time of use metering because they are generating the excess power precisely at the times it is most needed. Again, SDG&E seems to be presenting barriers to photovoltaics that are doing some harm to the market for these systems.
- Savings from the photovoltaic system are enormous, with total annual bills ranging between $60 and $150 versus monthly bills that could reach up to $200-$300.

- Home Value
  - Participants believe that their home values are positively impacted by their photovoltaic systems in terms of achieving their asking price more readily and more quickly. The mean estimated value of their homes is $732,000 for the average of 2,200 square feet. The mean system size is 3.79 kilowatts (kW).
  - Participants estimate that their systems have added $29,000 to their home values—or 4 percent. The average cost of the system for those who estimated a value increase was $30,100 after rebates, so these homeowners believe their systems are worth approximately what they paid for them.
  - On a per kW basis, these owners estimate the value of their homes to have increased by $7,600 per kW at an average cost of $8,000 per kW.

The contrast between the perceptions of real estate professionals and homeowners were most obvious in two distinct ways:

1. Homeowners experienced very positive feelings about the solar PV system installation and highlighted many cost savings benefits that can be documented.
2. Homeowners believe that the home value is positively impacted by the photovoltaic system.

Detailed Focus Group Input

Installation:

A series of questions (see Appendix for Discussion Guide) triggered considerable discussion among the participants about the installation of their photovoltaic systems. For the reasons cited above—long standing interest, financial inducements, high energy costs, as well as the others discussed below, these respondents sought to obtain photovoltaic systems more as a specific and distinct undertaking than as part of a larger remodel. Most began their search on the Internet; one attended Solar Week and toured various solar homes. The first system among the participants was installed by a company found through a reference from their electrician. Generally, 3-6 companies were screened and interviewed, with three formal bids being most common. Price was not the number one factor. Contractors were judged on the basis of their knowledge, the engineering and aesthetics of the equipment including as minimal a footprint as possible, and the ease of operation. One decision was influenced by the contractor's guarantee to clean the panels as necessary on a continuing basis; another was influenced by monitoring software. Prices were found, for the most part, to be competitive, although one participant warned of certain contractors who were trying to charge approximately $20,000 more than appropriate.

Barriers and Challenges Faced by Homeowners with Solar Photovoltaic Systems:

Participants were asked to complete a written exercise (see Appendix) that identified and rated difficulties, challenges or barriers that they experienced in the installation of their system. The focus group participants were asked to indicate which of the difficulties/challenges/barriers listed in the table below were ones that they faced. If they indicated more than one of these, they were asked to rank them. The table identifies how many of the ten participants who completed the exercise indicated that they faced that particular challenge and what the average ranking was for those who mentioned it.

Number and Ranking of Photovoltaic Challenges/Barriers to Residential Homeowners		
Difficulty/Challenge/Barrier	# of Indications (out of 10)	Mean Ranking (1-3 scale)
Overall cost of the system	5	1.2
Problems with utility interconnection	3	1.7
Inadequate government incentives	3	2.3
Problems with city/county permitting and/or inspections	1	1.0
Inadequate financing options	0	
Installer/contractor took too long	0	
Installer/contractor did poor workmanship	0	
Permitting too expensive	0	
Problems with location of solar panels on roof	0	
Problems with home's electrical system	0	
Other, please specify	0	
I faced no barriers/challenges during the installation process of my solar system	4	

In contrast to the real estate professionals' barriers, homeowners experienced very few difficulties, with cost being the most mentioned (5 out of 10) and highest ranked overall (setting aside the 1.0 rank for permitting that was mentioned only once and which did not get voiced at all during the discussion)—1.2 on a 1-3 scale. Although 11 ranks were possible, the greatest number of ranks given by any one participant was 3; hence the 1-3 scale. Four out of the 10 had no issues at all—again in contrast to the real estate professionals, where everyone had something to offer. That said, this is clearly a very well satisfied group of photovoltaic solar homeowners.

When asked if there were any negatives associated with their systems, the major discussion focused upon cleaning the panels and the difficulty of doing so without hiring someone to do it. The longer-time owner of his system indicated that he may have purchased before the technology matured and had experienced some issues—he had some bad panels, for example. His upgrade two years ago has taken care of any problems.

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Cost Savings and Additional Energy-Saving Upgrades:

Only one couple conducted an SDG&E energy audit before undertaking the installation of their solar PV system. SDG&E recommended certain behavioral modifications that resulted in minor cost reductions and discouraged their installation of a solar PV system. Three others did a quick online audit.

Besides the photovoltaic system, two participants indicated they installed double pane windows, three others bought new appliances (including front load washers), another has installed a tankless water heater, and one has replaced all of his incandescent light bulbs with fluorescent ones.

Savings from the photovoltaic system are enormous, with total annual bills ranging between $60 and $150 (generally minimum charges from SDG&E for being hooked up) versus monthly bills that used to total up to $200-$300.

Participants believe their home values are positively impacted by their photovoltaic systems in terms of achieving their asking price more readily and more quickly. In this regard, and to examine perception differences between homeowners and real estate professionals who indicated relatively minor value benefits, another written exercise was distributed (see Appendix).
This exercise asked the respondents to estimate the following:

Estimated Value of Home (photovoltaic solar system included)	_____
Estimate the dollar amount that your photovoltaic solar system has added to your home's value	_____
Approximate square footage of home	_____
Cost of photovoltaic system	_____
Kilowatts of photovoltaic system (if known)	_____

There were nine completed forms, with the two couples submitting only one from each. The mean estimated value of their homes is $732,000 for the average of 2,200 square feet. A number of these homes are relatively small, with two being less than 1,000 square feet (although one includes a 1,600 square foot garage) and another being 1,450 square feet. One home is 3,100 square feet and two homes are 3,000 square feet. The mean system size is 3.79 kilowatts (kW).

Participants estimate that their systems have added $29,000 to their home values—or 4 percent. The average cost of the system for those who estimated their value increase was $30,100 after rebates, so these homeowners believe that their systems are worth approximately what they paid for them. On a per kW basis, these owners estimate the value of their homes to have increased by $7,600 per kW at an average cost of $8,000 per kW.

The average size of their systems is 3.8 kW, with size seemingly unrelated to square footage. The largest system (5.8 kW) is on a 2,050 square foot home, the two 3,000 square foot homes have 2.94 kW and 4.3 kW systems (the 3,100 square foot homeowner does not know his or her system's size) and the two at less than 1,000 square feet have 2.5 kW and 3.16 kW systems. Several indicated that they would have installed even greater capacity if they would be paid for the extra generation, and they indicated that there are bills in the state legislature to accomplish that. They also want SDG&E to adopt time of use metering because they are generating the excess power precisely at the times it is most needed.

Lastly, to prospective purchasers of photovoltaic systems, "the message needs to go out that if you take out a loan to fund the installation, you are paying the bank versus SDG&E, but 10 years later, it will be paid for and it's free." Without making this purchase, homeowners will continue to pay SDG&E at ever increasing rates to "tear down the mountains for coal." They acknowledge that information is hard to find and that Solar Week must be expanded as a way to inform the community about these benefits. Information must be made more readily available about the true cost and savings of these systems, warranties, reputation of installation contractors, optimal system output and about the need to "save the planet. This is an exciting trend—a positive direction."

2.3 Focus Group #3: City and County Permitting Officials and Inspectors

Focus Group Summary

The focus group was comprised of nine participants, with representatives from the City of San Diego, San Diego County, Chula Vista, and Escondido. All had considerable experience with their current employer, ranging from 10 years to more than 30 years.

The City of San Diego's representatives indicated the following:

- The City plan checks and inspects 30-40 residential photovoltaic projects and 4-5 commercial projects monthly.
- Most of the photovoltaic inspection work has been moved to electrical inspectors.
- Affordable/In-fill Housing and Sustainable Buildings Expedite Program (Expedite Program) becomes involved when another level of discretionary review is required (i.e. entitlements such as a Site Development or Coastal Development Permit). This permit process can take a very long time (from 3 months to 2 years). The Expedite Program can help reduce that time for a photovoltaic project by approximately 50 percent if the developer pays an additional $500 per unit or an additional fee per square foot.

Ease and Cost of Permit Review Process:

- Chula Vista tries to do residential photovoltaic permits over-the-counter; although sometimes the Fire Department does not do its plan check in as timely a manner. The permit fee for residential solar PV systems is $45. Commercial projects can take 3 weeks.
- The City of Chula Vista begins to charge on a time basis after two permit submittals are returned for correction.

- Escondido can process the permit over-the-counter if there is pre-approval from the fire department. If not, the process can take 5-7 days. Fees are under $100 for residential systems.
- San Diego County processes residential applications (which represent more than 85 percent of all such applications) over-the-counter, charges no fee and does not involve the 17 fire districts that exist within the unincorporated portions of the County.
- The City of San Diego used to process permits over-the-counter but no longer has the staff to do so. It now takes about one week for the residential permit to be processed for mechanical, structural, and electrical reviews. The permit costs $94, and there is no fire department involvement. Commercial applications require 5-10 working days.
- Participants claimed that the solar permitting fees in these San Diego County jurisdictions are lower than they are in Los Angeles and San Francisco. In fact, they are lower even than the cost of review and inspection. These fees cost the various governments involved at least $200-$250 per residential solar installation.
- It was estimated that a perfect permit and inspection process costs the local San Diego jurisdiction approximately $300 and can balloon to $600-$1000 for a poorly prepared application and/or poorly done installation.

The Focus Group identified three potential improvements that could help streamline the permit and inspection process:

- Define the role of the fire departments.
- The State Fire Marshall has issued guidelines for solar installations that are "vague." Therefore, their involvement in the permitting process can be inconsistent and time consuming.
- Both the City of San Diego and County of San Diego do not involve their fire agencies for residential permits.
- The County does involve its fire departments for commercial permits.
- Escondido and Chula Vista, on the other hand, do have their fire departments involved in residential permits. Their involvement is usually triggered by some fire and/or safety issue other than solar that requires their involvement in the plan review process.
- Standardize the permitting system statewide so that contractors do not have to encounter differing policies that can cause delays and additional costs.
- A strong consensus existed that special training is required in order to review photovoltaic applications and inspect installation. Technology is advancing so rapidly that this training needs to be regularly updated.

Education and Training of Contractors:

- Most frequently mentioned and of considerable importance was that contractors and installers need better education/training regarding how to submit a solar PV application.
- Contractors/installers require more information to properly prepare for an inspection, and there are concerns that there are not enough plan checkers and inspectors to adequately cover the increasing demand for solar installations.

Detailed Focus Group Input

Most permit applications are "very clean," now, according to one participant. There is excellent software available and instructions and templates from the jurisdictions have become clearer and more easily obtained as the solar permitting process has evolved and matured. The City of San Diego's Development Services website was cited as particularly good. The two fundamental causes for permit applications to have to be corrected and re-submitted are that a required attachment is missing or the project is a retrofit with hand-drafted plans. However, there is some evidence the economy is chasing some inexperienced contractors into solar and that this might reverse the improvements to some extent. This reveals itself below in the discussion of the written exercise.

Suggested Improvements to the Solar Permit Process:

- Define the role of the fire departments. The State Fire Marshall has issued guidelines for solar installations that are "vague." Therefore, their involvement in the permitting process can be inconsistent and time consuming—"They don't even know their own requirements."
- Standardize the permitting system statewide so that contractors do not have to encounter differing policies that can cause delays and additional costs.
    - A representative of the City of San Diego addressed standardization by discussing the Master Plan concept.
    - The Master Plan concept is very similar to what is applied to swimming pools, where the contractor submits a standard set of plans for approval and then uses that standard for installations during the next three years, with preapproval from the City that only checks to see that the Master Plan is being followed.
    - Plan checks proceed much faster using the Master Plan process, and yet, it has been used only once for solar.

- Reasons suggested in the group for this lack of use of the Master Plan were: 1) technology is changing so quickly that a three year plan is of little value; and 2) there are far more variables in a solar installation than there are for swimming pools so that a Master Plan is unlikely to be as universally applicable. It can work for tract homes but not individual installations.

Inspections:

Contractors should be on site for inspections within a two hour window that they can obtain by calling the morning of the inspection. On hand, the contractor should have approved plans, a responsible person to access the system in an OSHA compliant manner, and SDG&E work orders for meter upgrades (60 percent of solar photovoltaic installations require such upgrades). Wiring and equipment must be clearly identifiable. Risk Management has sought to stop inspectors in Chula Vista from going onto the roof but many are still doing so.

Again, the fire department is brought up as a source of inefficiency, especially on commercial jobs, where last minute discretionary "requests" could cost thousands of dollars and much time. This again brought forth in the discussion the need for standardization, in particular, involving the Fire Marshall's vagaries. The fire department is much less a problem for the Expedite program because they are involved long before the solar installation and will have pre-approved solar as part of their overall review.

Streamlining the Process:

The Appendix contains a written exercise that was completed by the nine participants. The exercise asks them to identify and rate the changes and improvements that they believe can help to streamline the permit and/or inspection process. The focus group participants were asked to indicate which of the suggested improvements listed in the table below were ones they thought could be of benefit. If they indicated more than one of these, they were asked to rank them. The table identifies how many of the nine participants indicated each improvement and what the average ranking was for those who mentioned it.

Number and Ranking of Potential Photovoltaic Permit and Inspection Streamlining Improvements		
Improvement	# of Indications (out of 9)	Mean Ranking (1-7 scale)
Contractors and installers need better education/training regarding how to submit a solar PV application	9	2.3
Contractors/installers require more information to properly prepare for an inspection	7	2.0
There are not enough plan checkers and inspectors to adequately cover the increasing demand for solar installations	7	2.7
Plan checkers and inspectors need more training on solar PV requirements	4	3.9
Guidelines for reviewing a solar PV permit and/or conducting an inspection do not cover all nuances that exist with a solar PV installation	3	1.6
Permit and inspection requirements are not available on an appropriate website	2	4.0
The application process to obtain a solar installation permit takes too long	1	7.0
Other, please specify_____		
a. Fire Department needs to standardize their corrections and not vacillate on inspection criteria	1	1.0
b. Cost per plan check and inspection needs to be cost recoverable	1	1.0

As discussed above, most frequently mentioned (9 out of 9) and of considerable importance (2.3 on 1-7 scale) was that contractors and installers need better education/training regarding how to submit a solar PV application. Although 8 ranks were possible, the greatest number of ranks given by any one participant was 7; hence the 1-7 scale.

Next in order of mention were that contractors/installers require more information to properly prepare for an inspection (7 out of 9 mentions and a ranking of 2.0) and that there are not enough plan checkers and inspectors to adequately cover the increasing demand for solar installations (7 out of 9 mentions and a ranking of 2.7). Ranked highly by the three participants who thought it would be beneficial was that guidelines for reviewing a solar PV permit and/or conducting an inspection do not cover all nuances that exist with a solar PV installation (ranking of 1.6). Only one participant reiterated the fire department issue, but, as an open-ended response, its frequency of mention is expected to be lower than if it had been listed as a response choice.

Training:

A strong consensus existed that special training is required in order to review photovoltaic applications and inspect installation. Technology is advancing so rapidly that this training needs to be regularly updated. The Green Building Code is approximately 1½ years away from implementation, and that will add even more factors that will require adequate training and knowledge. The City of San Diego's General Plan Update has led to the City Council and Planning Commission asking for more photovoltaics in projects that they are asked to approve.

All participants thought that they, themselves, were well trained at present and fully capable of changing jurisdictions with only a minimum of training in policy differences. Their skill set is very transferable.

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