

Final Report

**Process Evaluation of the
Solar Program:
Residential and Commercial
Photovoltaic and Solar Thermal Applications**

Prepared for:
Energy Trust of Oregon

January 11, 2004

The logo for Quantec features the word "quantec" in a dark green, lowercase, sans-serif font. The text is positioned over a light olive-green, elongated triangular shape that points to the left and tapers towards the bottom left corner.

quantec

Prepared by:
M. Sami Khawaja
Sharon Baggett
Doug Bruchs
Quantec, LLC

In Association with:
Linda Dethman
Rick Kunkle
Dethman & Associates

And:
Jane Peters
Research Into Action, Inc.

K:\2004 Projects\2004-41 (ETO) Solar Thermal Eval\Reports\Process Evaluation Report\200441_Final_011105.doc

Quantec Offices

720 SW Washington, Suite 400
Portland, OR 97205
(503) 228-2992
(503) 228-3696 fax
www.quantecllc.com

1722 14th St., Suite 210
Boulder, CO 80302
(303) 998-0102
(303) 998-1007 fax

3445 Grant St.
Eugene, OR 97405
(541) 484-2992
(541) 683-3683 fax

28 Main St., Suite A
Reedsburg, WI 53959
(608) 524-4844
(608) 524-6361 fax

6 Ridgeland Rd
Barrington, RI 02806
(401) 289-0059
(401) 289-0287 fax

1038 E. Bastanchury Rd. #289
Fullerton, CA 92835-2786
(714) 626-0275
(714) 626-0563 fax



Table of Contents

| | |
|---|--------------|
| Executive Summary | ES-1 |
| I. Introduction | I-1 |
| Overview..... | I-1 |
| Previous Research..... | I-2 |
| Program Description..... | I-3 |
| II. Methodology..... | II-1 |
| Database Review..... | II-1 |
| Interviews..... | II-1 |
| Surveys..... | II-3 |
| III. Program History & Accomplishments | III-1 |
| Program History..... | III-1 |
| Accomplishments..... | III-6 |
| IV. Interview Results: Key Informants | IV-1 |
| Views of Program Marketing | IV-1 |
| Views of Incentives and Program Changes | IV-2 |
| Views of Program Results | IV-3 |
| Summary of Key informant Responses | IV-8 |
| V. Interview Results: Contractors..... | V-1 |
| Views of Program Marketing | V-1 |
| Views of Incentives and Program Changes | V-2 |
| Views of Program Results | V-2 |
| Summary of Contractor Responses..... | V-7 |
| VI. Survey Results | VI-1 |
| Considering Solar and Taking Action | VI-1 |
| Conducting Research | VI-3 |
| Installation | VI-5 |
| Factors in Purchase Decision..... | VI-5 |
| Installation and Performance | VI-6 |
| Satisfaction with Program and Savings | VI-8 |
| Satisfaction with Contact with the Energy Trust..... | VI-9 |
| Comparison with PV Market Characterization Results..... | VI-10 |

| | |
|--|---------------|
| VII. Results of Multiattribute Analytic Hierarchic Process | VII-1 |
| Approach..... | VII-1 |
| Results..... | VII-1 |
| VIII. Discussion & Recommendations | VIII-1 |
| Discussion of Key Findings..... | VIII-1 |
| Barriers Addressed..... | VIII-1 |
| Other Process Issues | VIII-4 |
| Recommendations..... | VIII-5 |
| Appendix A. Memo: Reasons for Differences in PV and SWH Subscription..... | A-1 |
| Appendix B. Interview Guides..... | B-1 |
| Appendix C. Survey Sample Dispositions and Demographics | C-1 |
| Sample Disposition | C-1 |
| PV Participant and Non-Participant Sample Demographics | C-1 |
| Appendix D. Surveys | D-1 |
| Appendix E. Electrical Training Centers | E-1 |
| Appendix F. Results: Solar Water Heat..... | F-1 |
| Views of Key Informants..... | F-1 |
| Views of Contractors | F-2 |
| Survey Results | F-2 |
| Considering Solar and Taking Action | F-4 |

Tables & Figures

| | |
|--|--------|
| Table I.1: Solar Program Incentive Structure | I-5 |
| Table II.1: Contractors Interviewed by Application | II-2 |
| Table II.2: Customer Type..... | II-4 |
| Table III.1: Summary of Incentive Adjustments for PV | III-4 |
| Figure III.1: Residential Project Applications Received by Incentive Phase (n=197) | III-4 |
| Figure III.2: Commercial Project Applications Received by Incentive Phase (n=19) | III-5 |
| Table III.2: PV: System Cost and Energy Totals through September 2004 by Sector | III-6 |
| Table III.3: Descriptive Statistics: Costs and Incentive..... | III-7 |
| Table III.4: Minimum, Maximum, Median and Standard Deviation: Percent of System Cost Covered..... | III-7 |
| Figure III.3: Distribution of Residential Projects by Percent of System Cost Covered by Incentive..... | III-8 |
| Figure III.4: Distribution of Commercial Projects by Percent of System Cost Covered | III-8 |
| Table III.5: System Characteristics (n = 193 and 20 for Residential and Commercial, respectively) | III-9 |
| Table III.6: TSRF Values | III-9 |
| Table III.7: Size of SWH Systems..... | III-10 |
| Table VI.1: Length of Time Customer Had Considered Solar Options..... | VI-1 |
| Table VI.2: Non-Participants' Reasons for Calling the Energy Trust | VI-2 |
| Table VI.3: Time First Concrete Step Taken..... | VI-2 |
| Table VI.4: Sources of Information Most Useful in Research* | VI-3 |
| Table VI.5: Preferred Medium for Accessing Information* | VI-4 |
| Table VI.6: Previous Experience with Solar Systems | VI-4 |
| Table VI.7: Non-Participant Project Types Considered | VI-5 |
| Table VI.8: Rating of Factors In Purchase Decision (n=66) | VI-6 |
| Table VI.9: Non-Participant Factors in Completing Considered System | VI-6 |
| Figure VI.1: Satisfaction with System..... | VI-7 |
| Table VI.10: Participant Satisfaction with Program Components (n=66) | VI-8 |

| | |
|--|--------|
| Table VI.11: Customer Satisfaction with Telephone Contact with the Energy Trust | VI-9 |
| Figure VII.1: Analytic Hierarchy Process Scales | VII-1 |
| Table VII.1: Assessment of Decision-Making Attributes (Importance Weights) | VII-2 |
| Figure VII.2: AHP System Attribute Model Results..... | VII-3 |
| Table VII.2: Barriers to Solar Purchasers (Importance Weights)..... | VII-3 |
| Figure VII.3: Barriers to Installing a Solar System | VII-4 |
| Table VIII.1: Performance on the Energy Trust Success Factors..... | VIII-5 |

Executive Summary

The Energy Trust of Oregon has offered the Solar Program (the Program) since May of 2003. The Program is a comprehensive market transformation effort, with goals set to overcome the perceived barriers – including cost, knowledge, performance, and difficulties encountered in the delivery chain – to the market for both photovoltaic (PV) and solar water heating systems (SWH) in Oregon. The Program works with solar professionals, local contractors, utilities, and state government to expand PV and SWH use by targeting early adopters of these technologies.

This report summarizes the results of the process evaluation conducted by Quantec, LLC, in association with Dethman & Associates and Research Into Action, Inc. (RIA). Key objectives of the evaluation include assessments of:

- Reasons for over-subscription to the PV component and under-subscription of SWH
- Program theory, design, and delivery
- Consumer motivations for purchasing solar technologies

This evaluation addresses the overall Program. However, while the evaluation team collected qualitative data on the SWH component (reasons for under-subscription and contractors views of the market and program effect on it), the survey sample included so few SWH respondents (reflective of Program activity) that no definitive SWH conclusions can be drawn at this time. Thus, this summary and the report primarily focus on the PV component.

The Program accomplished a great deal during the first phase, contributing to the installation of 193 residential and 20 commercial PV projects, and 41 residential and three commercial SWH projects (through September 2004), for energy savings of 814,354 kWh and 2,422 therms, and demand savings of 672,198W DC. The median percent of system cost covered by the incentive was 59% for residential PV, 28% for SWH pools, and 22% for SWH.

The Program was also successful in identifying and enlisting contractors, providing training equipment to institutions to enhance installer capability, and developing processes, materials, and other mechanisms aimed at enhancing system performance. The Program fostered new entrants to the market, additional employees to existing business, and increased sales, especially of PV, for many of the participating contractors.

Consumers installing solar systems express high levels of satisfaction with equipment installation and with the contractors. Key informant and contractors view some Program components differently, with some thinking Program requirements are needed to maintain the quality of system design and

installation, while others do not. Some believe the incentives are too low, while others think they are sufficient if coupled with additional supports, such as marketing and loans. Almost all agree that the incentives are still necessary. Some contractors are actively marketing the Program, while others do not or cannot.

A spike in the incentive level – a level that could not be maintained within program budgets – drove much of this success. The current incentive, while sufficient to maintain a level of interest above that prior to the Program, is likely not sufficient to transform the PV market. SHW incentives were viewed as insufficient to move the market, even when and if the Energy Trust focuses on this market. Key informants and contractors alike see the knowledge barriers as a problem, and believe marketing efforts above and beyond that done by contractors is needed. Early AHP results suggest future marketing efforts may need to emphasize the financial savings rather than environmental stewardship or technological innovation.

Central to the issues and to our recommendations is the question of the extent to which the Energy Trust is interested in short-term savings acquisition or longer-term market change. Or, if the organization is interested in both, how can they balance what is needed to achieve the changes. This issue affects all aspects of Program delivery, including incentive type and level, quality control for contractors, maintaining contractor activity in the market, approaches to marketing, and expanding or targeting market sectors.

We recognize that some of our recommendations are being considered for the Energy Trust's Phase 2 approach. This evaluation was focused on Phase 1 activities; as such, it reveals information that may inform action in Phase 2.

1. **Conclusion:** The Program has been effective in expanding the market capability for PV and in increasing the installation of PV systems throughout Oregon. The current level of marketing and incentives can be expected to maintain installation capability and market response at a level greater than the pre-Program period, but at a lower rate than that achieved with incentives at \$4/W plus bonus.

Recommendation: The Energy Trust can continue to implement the Program and will continue to achieve PV installations at the current levels.

2. **Conclusion:** The Energy Trust Solar Program currently can maintain capability, but it will not lead to a significant change in market response as currently designed. If the Energy Trust desires to facilitate market transformation at a higher level, there are a variety of opportunities for modifying the Program that might facilitate growth in demand.

Recommendation: To increase growth in market response, the Energy Trust will need to increase its role in marketing solar options to

Oregon residents. All solar contractors do not have the capability to grow demand for their products. The Energy Trust can support contractors in a variety of ways, such as providing marketing collateral, placing advertisements in bills or on radio or in newspapers, and by offering co-branded material.

3. **Conclusion:** Solar contractors have demonstrated some reluctance to increase their staff and capability without certainty that the demand for PV will increase. Based on Program experience to date, the easiest way to increase demand is to increase the incentive. However, increasing the incentive also leads to potentially excessive demand relative to Program budget. Additionally, an incentive based on installed kW does not necessarily facilitate the installation of optimum systems. Some of the key informants and some of the contractors note that a production- or performance-based incentive could be used to promote better design and to increase the stability of the solar industry.

Recommendation: The Energy Trust has a good basic program design but should monitor the experiences of other states with performance-based or production incentives to determine if this model might be appropriate for future efforts.

4. **Conclusion:** The Solar Program has led to an increase in the number of installers in Oregon. There are a limited number of dissatisfied customers, so there is good reason to believe that the contractor pool is performing well. At the same time, there is a mixed assessment on the part of contractors and key informants relative to “other contractors.” There is no way for this evaluation to determine directly whether there is a problem, yet the evaluation finds that the standards and requirements for the Program, including inspections, are the primary tool the Energy Trust has to monitor quality.

Recommendation: Continue Program standards and requirements for contractors and system quality. At the same time, continue to look for ways to reduce the paperwork, by minimizing redundancy, permitting contractors to identify projects and obtain Energy Trust input early in the sales process, and to streamline decision making at the Energy Trust to ensure contractors are able to be responsive to their customer’s timelines.

5. **Conclusion:** Solar contractors perceive there to be inconsistency in the Energy Trust inspections. This evaluation could not directly determine if there was any problem, but recognizes that it can be addressed.

Recommendation: Arrange for the inspectors to develop a common protocol and conduct biannual meetings to review the protocol and discuss and resolve potential inconsistencies in their inspection efforts.

6. **Conclusion:** Solar technologies are evolving at a rapid rate. Solar contractors typically are on the front line of these changes. Energy

Trust program staff need to work to stay as current as the contractors. Contractors can use additional support on certain technical issues, which are becoming more complex as the technology advances. To bring Union members into the solar community also takes education. The Energy Trust has expanded the solar education capabilities for nine institutions in Oregon, and this effort will need to continue, as well as exploring specifically enhanced coordination with Union trainers.

Recommendation: Continue to explore opportunities to expand educational capabilities for solar contractors, for building inspectors, for union leaders, for utility staff and for Energy Trust staff themselves. This should be a high priority for the Energy Trust, in cooperation with the Oregon Department of Energy.

I. Introduction

Overview

Since June of 2003, the Energy Trust of Oregon (Energy Trust) has offered the Solar Program (Program). Based on program materials, the Program is a comprehensive market transformation effort, with goals set to overcome the perceived barriers to the market for both photovoltaic (PV) and solar water heating systems (SWH) in Oregon. These barriers include cost, knowledge, performance, and difficulties encountered in the delivery chain.¹ Working with solar professionals, local contractors, utilities and state government, the Program's focus is to expand PV and SWH use by targeting early adopters of these technologies.

This report summarizes the results of the process evaluation conducted by Quantec, LLC, in association with Dethman & Associates and Research Into Action, Inc. (RIA). Key objectives of the evaluation include assessments of:

- Reasons for over-subscription to the PV component and under-subscription of SWH²
- Program theory, design, and delivery
- Consumer motivations for purchasing solar technologies

This evaluation addresses the overall Program. However, while the evaluation team collected qualitative data on the SWH component (reasons for under-subscription and contractors views of the market and program effect on it), the survey sample included so few SWH respondents (reflective of Program activity) that no definitive conclusions can be drawn at this time for this component. Thus, Sections IV, V, and VI, of this report present results for PV only. The limited data for SWH are presented in Appendix F. Total Program accomplishments reported, however, include both components and are presented in Section III.

¹ West, P., Brockman, K, Parry, A., & Rollier, C. (July 2004). "Solar electric market transformation: A case study from the Pacific Northwest." Paper presented at the National Solar Energy Conference, Portland, OR. The paper contains an in-depth description of the Energy Trust's review of barriers, lessons learned from other renewable energy programs, and further detail on program design.

² The exploration of over-subscription to PV and under subscription to SWH was completed by the evaluation earlier in the year, utilizing interviews with key informants. The summary of findings from this initial exploration is included in Appendix A.

Previous Research

As part of the Program's Phase 1, the Energy Trust commissioned a market characterization study to assess the baseline of the PV in market in Oregon.³ This study used interviews with market actors, a review of the Oregon business and residential energy tax credit database, and a survey of consumers installing systems and receiving Oregon energy tax credits to find that:

- Most systems in Oregon have been customized installations, with nearly equal number of off- and on-grid applications. Between 1999-2003, installations averaged about 37 per year.
- Technology is changing, including improvements in inverters and a trend toward more standard and easily integrated systems.
- System standards and certifications are needed to ensure quality and help grow the market.
- New entrants are challenging the industry and offering new business models.
- Tax credits are still needed, for at least another five years, to have a sustained impact in the market.
- Incentives may need to be flexible in response to changing market conditions (while system costs seem to be declining, this trend cannot be forecasted over the next several years).
- Net metering is important to the growth of PV, and there is a need for consistent interconnection standards.

In mid-2003, the Energy Trust also commissioned a market characterization study for SWH in Oregon.⁴ This assessment included interviews with key informants, an analysis of Oregon energy tax credit data for solar water heating systems, a limited Web-based review of information on solar water heating systems and programs in Oregon, and surveys with recent purchasers of SWH (between 2000 and 2003) who received Oregon State energy tax credits. Key findings from this study included:

- The SWH market is flat with 200-400 installations per year, and there has been little growth in demand over the last decade.
- The market is geographically concentrated in four general areas – Eugene, Medford/Ashland, Bend, and the greater Portland area. There are a limited number of market players concentrated in these areas that dominate the market.

³ Energy Market Innovations, Inc. (October 15, 2003). Oregon Photovoltaic Market Characterization: Final Report.

⁴ Dethman & Associates (May 21, 2003). Oregon Solar Thermal Market Characterization: Final Report.

- The technology is stable and has changed little in the last 20 years. Most manufacturers remaining in the market have been in business for many years.
- Residential retrofits are the primary market. Some people in the industry see opportunities in applications in new home construction and in commercial applications with high water use.
- Tax credits are important to buyers, helping to make the systems more economically viable. The state tax credit was crucial to the survival of the solar water heating market in Oregon after the Federal tax credit was removed.
- Market barriers are significant. Compared to conventional water heating systems, many consumers perceive solar water heaters as expensive, complicated, unattractive, and not applicable in many locations.
- Contractors are the most important source of information for customers. In areas where utilities have active SWH programs, they are also an important source of information.
- System cost, finding a good contractor, and uncertainty about system reliability are likely barriers among less motivated buyers.

The Energy Trust used these and other findings from the studies, along with industry input and review of other states' experiences, in designing the Program.

Program Description

The Program is modeled closely on the Bright Way to Heat Water™ Program⁵ for PV applications and solar thermal applications. Principal aspects of the Program include:

- To ensure quality installations of integrated PV systems and help move the industry toward a more common set of equipment and approaches, the Energy Trust developed criteria (outlined in the System Requirements Document) that must be met for systems receiving incentives.
- Contractors for PV and SWH components must sign an agreement with the Energy Trust and meet criteria of being licensed and bonded with the State of Oregon, provide specified equipment warranties, and use qualified personnel for all PV system installations. Contractors are expected to promote the Program to customers and to reduce the

⁵ The program is sponsored by the Bonneville Power Administration (BPA).

system cost to customers by passing on the incentive. Contractors also must complete the following Program steps:

- Conduct assessment of customer site and prepare bid
 - Complete Program's Sale Notification Form (for PV and SWH), which requires complete information on the system proposed, including a wiring/plumbing scheme, and consent agreement signed by customer allowing the Energy Trust access to their utility billing data, inspections, and possible metering.
 - Participate in Project Inspection (inspector uses Installation Checklist)
 - Receive Inspection and Approval Form, notified either of approval or of a Program violation. If notice of violation is received, contractor is given 30 days to correct the problem and notify the Energy Trust for a follow-up inspection.
- Installers must carry the appropriate electrical or plumbing license, as required by law in Oregon, to perform the installations. Contractors that are not licensed to perform the installations may subcontract installation work to licensed installers.
 - To contribute to the number of qualified installers, the Energy Trust encourages training through the unions and community colleges (equipment was donated to seven training centers to allow them to expand their training programs for installers).
 - To ensure quality and system performance, contracted inspectors conduct inspections and are available to contractors for technical assistance. Electrical metering of actual PV system yearly output (in kWh) is also conducted on every system installed to date.
 - Some basic marketing tools, including a brochure on the Program and state tax incentives, as well as an Oregon Solar Program Guide were to be developed. These are intended to be "early" marketing efforts, with further refinement of and assessment of need for additional marketing materials determined after the first phase of implementation.
 - Customer support is provided through the Energy Trust's call center and through the Energy Trust Web site. Callers can be routed to Program staff or eligible contractors, and details on how to participate, a list of contractors, and other information can be accessed via the Web site.
 - The Program's buy-down is an incentive per Watt installed, with caps on the maximum amount funded per customer to ensure wide distribution of funds over different installations. The incentives are intended to be flexible, with a bonus structure utilized at various points, if necessary, to optimize Program response.

Table I.1 shows the current incentives caps offered for homeowners and businesses to install PV and SWH.

Table I.1: Solar Program Incentive Structure

| | PV | Home SWH | Pool/Spa SWH |
|------------|----------------|--------------------------|---|
| Homeowners | Up to \$10,000 | Up to \$1,500 | Up to \$1,500 |
| Businesses | Up to \$15,000 | Up to 35% of system cost | Up to 35% of system cost applied over 5 years |

II. Methodology

The process evaluation included data collection from multiple sources: interviews with the Energy Trust staff; surveys with participants, non-participants, and pre- Energy Trust Program solar purchasers; a review and analysis of the program database; and a brief review of other state programs.

Database Review

We reviewed the Program database, which included all projects installed or committed through September 2004, to assess the characteristics of those installing, size of the systems, timing (in Program year), geographic location, and other variables. We calculated standard deviations on project characteristics, savings, and key variables, including system size/output and cost (\$/kW). This analysis included both PV and SWH Program participants.

Interviews

Staff

Following the evaluation kick-off meeting, Quantec staff conducted an interview with the program manager. Topics explored included history of the Program, elements in the Program design, changes in the Program to date, and perceived views of contractors. In addition to the formal interviews, Quantec staff also attended the Program Manager's 2004 American Solar Energy Society conference presentation on the Program and reviewed other relevant conference papers.

Contractors

Contractors were solicited for interviews from the Energy Trust's approved list. The evaluation team tried to gain participation from both active contractors (those with large numbers of projects) and from less active contractors. The evaluation team completed interviews with 17 of the 42 approved contractors. Table II.1 shows the sample breakdown by application. Ten of these surveys were completed in June 2004 (to provide data for an interim memo on Program process), and the remainder in September 2004. These interviews were designed to elicit views regarding:

- Program implementation
- Market conditions
- Impact of the Program on businesses
- Customer response to the Program

- Differences in PV and SWH promotion and installation
- Other factors that could affect the future market for these technologies.

Table II.1: Contractors Interviewed by Application

| | |
|--------------------------------|-----------|
| Solar Electric Only | 10 |
| Solar Electric & Solar Thermal | 7 |
| Total | 17 |

Key Informants

We completed in-depth telephone interviews with 18 industry key informants, including representatives of the groups shown in Table II.2. The initial informants were identified in collaboration with the Energy Trust staff. A snowball approach was used to identify remaining informants; that is, initial informants were asked if there were other key actors with whom we should speak, and if identified, we made efforts to include them in our sample.

Key informants were intended to provide the view from those involved in policy, in other programs supporting solar efforts (e.g., state and officials), in leadership roles with organizations involved in the solar industry (e.g., unions, association of contractors, etc.), in implementing some aspect of the Program on a contract arrangement (e.g., training consultants and inspectors), or in contact with the Program from other avenues (e.g., city inspectors). Categories of those included in the sample represented:

- Utilities
- Unions
- City of Ashland
- City Inspectors
- Oregon Solar Energy Industries Association (OSEIA)
- Program training consultants
- Program Inspectors
- Technical consultants
- Oregon Department of Energy (ODOE)

These interviews were used to both explore key informants' views of the Program and market response. Specifically, we asked their views regarding:

- Current market issues
- Changes in incentives offered for PV connections
- Reasons for lag in SWH versus PV projects

- Policies regarding grid connection
- Views of role of the Energy Trust's program, tax credits, and utility incentives in customer decisions
- Assessment of the Energy Trust's program

Interview Guides are included in Appendix B.

Surveys

Participants

From the total Program population of 221 participants (from Program initiation through August 2004), we conducted 74 structured telephone surveys (66 solar electric and eight solar water heating) with a randomly selected sample, achieving 95% confidence level, with a margin of error of $\pm 10\%$. Topics addressed in these surveys included:

- Decision making
 - Experience, information sources, motivations (using Analytic Hierarchy Process [AHP] questions described below)
 - Barriers
 - Length of time project had been planned
 - Role of incentives – the Energy Trust, utility, and tax credits – and of contractor in purchase decision
- Satisfaction (installation, Program, performance)
- Customer demographics
- Recommendations/suggestions for Program improvement
- Future intent with solar

Non-Participants

The primary goal of this task was to explore interested non-participants' reasons for not yet installing a PV or a solar thermal system. The non-participant sample was taken from the Energy Trust's GoldMine database, which records information on consumers who called for some type of information regarding solar technology.

Purchasers of solar technologies are still seen as innovators or early adopters with unique characteristics in diffusion of innovation models. Thus, a non-participant sample with similar characteristics would allow for a more accurate comparison with participants than would a sample drawn from the general population. The decision made, in collaboration with the Energy Trust staff, was that those consumers who had called the Energy Trust's Call Center

for specific information were likely to be considering a decision to purchase and be most similar to those who had already made their purchase. Using the total call population (196) through September 9, 2004, from which to select our sample, we completed 44 surveys, achieving 95% confidence level, with a margin of error of $\pm 13\%$.

Topics explored included:

- Decision-making
 - Experience, information sources, motivations (including AHP questions)
 - Barriers
 - Specific project planned
 - Knowledge and view of incentives
 - Extent to which process pursued – talking with contractor, etc.
- Satisfaction with information received from the Energy Trust
- Customer demographics
- Future intent with solar

Profile of Survey Respondents. As shown in Table II.2, the majority of participants and non-participants surveyed were residential customers. For all demographic variables (e.g., annual household income, length of residence, age of home, business characteristics), chi square analyses revealed no significant differences between the two groups. Data on additional demographic characteristics are presented in Appendix C.

Table II.2: Customer Type

| | Participant | | Non-Participant | |
|-------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Residential | 72 | 97% | 41 | 93% |
| Commercial | 2 | 3% | 3 | 7% |
| | 74 | 100% | 44 | 100% |

Pre-Program Purchasers

Consumers' Decision-Making Process. The rate of adoption of solar technologies is determined by:

1. Predisposition among decision makers to purchase the product
2. Method of delivery and associated incentive
3. Economic factors such as the cost of the displaced fuel
4. Supply side factors (e.g., product improvement and upfront cost)

When products are first launched, they are likely to be adopted by consumers who are less risk averse than the general population. As the product moves along its adoption (diffusion) curve and as awareness and perceived value increase, more risk-averse segments of the population are likely to participate. While supply-side factors do influence adoption, adapting product delivery to the core tendencies and behaviors of various consumer groups can further help to drive adoption.

The theory of product diffusion developed by Rogers⁶ assumes that innovation can proceed across the five consumer categories:

- **Innovators** are more likely to take risk and more likely to pursue new ideas
- **Early adopters** are interested in new ideas but are more risk-averse
- **Early majority** want to see the product “proven” before entering the market
- **Late majority** are likely to go along with what others are doing
- **Laggards** tend to be the most risk averse

The availability of financial resources to purchase the product is another major attribute differentiating the consumer groups. The Innovators tend to not be resource constrained. As the market moves along the diffusion curve, resources become more constraining. Specifically in the case of solar products, concern for the environment is also likely to be strongest among the early market entrants.

For purpose of this analysis we defined three groups of market participants:

1. **Pre-Program**: The customers that purchased solar systems prior to the Energy Trust program. They still qualified for tax incentives, but did not receive rebates for their actions. These are likely to represent the Innovators.
2. **Participants**: The customers that installed solar systems and received the Energy Trust incentives. These are likely to represent Early Adopters.
3. **Non-Participants**: The customers that contacted the Energy Trust for information regarding solar systems and associated rebates but have selected not to participate at this time. These may represent the Early Majority.

⁶ Rogers, Everett M. (1976). New Product Adoption and Diffusion. *Journal of Consumer Research*, 2, March, 290 -301.

Based on the previous market research conducted for the Energy Trust (on PV and SWH), the following five attributes (which were likely to be important factors in the decision to purchase a solar system) are used in describing the three groups:

- Long-term savings on their energy bill
- The environmental benefits
- Interest in new technologies
- Becoming more energy independent
- The availability of financial incentives

The following common market barriers associated with preventing the adoption of solar systems were also analyzed:

- Up-front costs
- Lack of adequate information
- Appearance (aesthetics)
- Uncertainty of performance
- Finding an experienced contractor

In an effort to understand factors that play the greatest role in the decision to proceed with a solar project and to determine the relevance and significance of the various barriers commonly associated with the adoption of such an efficiency measure, the evaluation team used the Analytic Hierarchy Process (AHP) modeling approach. (See Section VII for a detailed description of the AHP approach).

Decision-making processes often involve several factors (i.e., they tend to have multi-attributes). Several tools exist for analysis of the impact of attributes on the final decision. The main reason for the choice of AHP over other multi-attribute analytic procedures was the simplicity of its underlying logic and its ability to assess the importance of the individual attributes in making the final decision. AHP compares attributes in a pair-wise fashion thus making the assessment of importance more achievable by the respondent. The structure of the AHP decision model lends itself well to decision scenarios involving multiple actors and multiple decision criteria.

For purposes of the AHP analysis, we conducted surveys with a sample of customers who purchased PV systems prior to the Energy Trust Program and included AHP questions in the participant and non-participant surveys. Pre-program purchasers were identified from a sample of 133 customers, taken from Oregon Department of Energy (ODOE) Business Energy Tax Credit (BETC) and Residential Energy Tax Credit (RETC) databases. This sample was utilized in the previous solar market research project conducted by

Energy Market Innovations, Inc., for the Energy Trust. In the interest of time, we used this sample list since the previous contractor had put considerable effort into completing the telephone contact information for these customers (phone numbers were available only on BETC and RETC paper applications on file at ODOE). The sample included those applying for the state tax credits for PV between January 2000 and April 2003. We limited our sample of pre-Program purchasers to PV systems due to the fact that most of the Program effort this first year was on PV (thus a more accurate comparison of purchaser attributes was possible).

Unfortunately, many of these applications were for off-grid projects, and these customers could not respond to the AHP questions since most had no choice about using solar versus on-grid energy (due to remote locations, etc.). Excluding these customers, issues with disconnected numbers, etc., limited the number of completed surveys to 19. Of these, 15 surveys had complete AHP sections for use in our analysis. Data for the AHP analysis were also available from 72 of the participant and 26 of the non-participant surveys.

See Appendix D for copies of all surveys.

III. Program History & Accomplishments

Program History

Design

Prior to the Program launch in spring 2003, the Energy Trust assembled a Technical Advisory Committee, which included industry key informants, solar contractors, state government staff, and others, to assist with Program design. According to staff, the Committee used a consensus process over a ten-month design period. With concessions made on all sides, the process led to a high-level of buy-in on the final Program design. The Energy Trust staff also reviewed existing studies to identify barriers and lessons learned from other states that had developed, launched, and/or ran Programs, specifically those that supported PV. As noted in the Introduction, the Program is modeled on the Bright Way™ Program and is built around a combination of efforts, working in concert to overcome barriers to market transformation. The Program structure provides incentives directly to contactors, with the expectation that these will be passed through in full to customers. The Program elements are linked to market barriers in that they are designed to:

- Lower the up-front costs of installed systems
- Promote high performing systems
- Reinforce market trends toward standardization
- Create greater public awareness
- Simplify the information and make obtaining it easier
- Create consistent quality assurance and protections
- Support industry development and trained installers

As previously described, to increase consumer confidence, the Program requires that consumers use an installation contractor who agrees to install to the Program's standards and pass the inspection requirements. Systems failing the inspection must be fixed at the installer's expense.

Program goals, as established by staff and reviewed by the Energy Trust's Renewable Energy Advisory Council,⁷ included:

- Double the number of grid-tied PV systems in Oregon within one year (provide incentives for 450 kW of new, grid-connected solar power – 115 new installations in year one)
- Create long-term sustainable markets, expanding the market each year
- Ensure high-quality installation and support quality assurance
- Lower delivered costs to the consumer
- Encourage higher system performance

In the first year, the Program focus was on the existing and new residential and commercial markets in the PacifiCorp and Portland General Electric (PGE) service territories.

The Energy Trust also identified the following seven “critical success factors” for the first phase of Program implementation:⁸

- A high level of customer satisfaction during the early phases to strengthen the positive image of solar for customers and industry
- Continued positive support of net-metering by PacifiCorp and PGE in order to broaden the market penetration for grid-tied PV in Oregon
- Effective coordination between the Energy Trust requirements, Oregon tax incentives, and solar vendor processes in such a way as to provide efficient Program information and avoid duplicate processes or conflicting messages
- Monitoring and modifying Program processes and forms to achieve early improvements in Program achievement and efficiency
- Evaluation of education market capabilities and needs to expand into certified installer training Programs and/or improve course effectiveness
- Develop and maintain an open and cooperative relationship with PV vendors, customers, and industry leaders to enhance perception of working with the Energy Trust
- Simplifying the process of selecting and installing a PV system for the customer

⁷ Energy Trust of Oregon, Inc., Solar Electric Program Guide. Rev. 10, 9/15/03, p. 5.

⁸ Ibid, p.6.

Program Launch

The PV incentive was launched first on May 2, 2003, with the SWH incentive following on May 19. Prior to the launch, the Energy Trust sent e-mail notices to contractors to notify them of four program training sessions to be held in April 2003 and sent them applications to qualify for the Program. An initial group of 12 contractors enrolled, and others followed; the Program had 42 approved contractors as of September 2004.

The Energy Trust also conducted seven free seminars for consumers around the state for both PV and SWH, with the focus on simplifying the solar choice and validating local Program contractors. The Energy Trust staff report that around 40 people usually attended each event (more than 200 attendees total), where community members could meet contractors and learn more about the Program. Some contractors also made contacts for future sales at these events.

The Energy Trust also granted nine PV systems to seven electrical training centers around the state (see complete list of centers in Appendix E). Centers receiving these systems were required to teach a PV installation training course that provides continuing education credits.⁹ The Energy Trust also promotes the Program through their Web site and the toll-free call center (www.energytrust.org, 1-866-ENTRUST). Almost 200 customers requested information on the solar program through the call center between January 1, 2003, and September 9, 2004.¹⁰

Incentives and Program Changes

At the start of the PV program the incentive level was set at \$2.50/W DC for residential and \$1.75/W DC for commercial systems, based on the technical committee's advice. The PV component had a very slow start; therefore, the Energy Trust began a series of adjustments to the PV incentives in August 2003. The first adjustment was an increase that was hoped would "jump start" the market. Following an overwhelming response to this increase, with the Pacific Power component exceeding its allocation by October 2003, the incentives were reduced. The cycle of changes are summarized in Table III.1.

⁹ Data regarding the number of training courses taught by the center to date were not available.

¹⁰ From January 1 through June 2003, the Energy Trust contracted with a utility for call center services. Beginning in later June, the Energy Trust began to provide the call center services in-house and a database for calls developed.

Table III.1: Summary of Incentive Adjustments for PV

| Incentive Phase | Date | Residential | Commercial | Cap |
|-----------------|-------------------|--|----------------------------|---|
| 1 | May 2, 2003 | \$2.50/W DC | 1.75/W DC | \$7,500 residential |
| 2 | August 7, 2003 | \$3.50/W DC + \$0.75 bonus | \$2.00/W DC + \$0.25 bonus | \$12,705 residential \$35,000 commercial |
| 3 | October 3, 2003 | \$3.50/W DC+ \$0.40 bonus | No change | No change |
| 4 | February 27, 2004 | \$3.50/W DC | No change | \$10,000 residential \$15,000 commercial |
| 5 | April 14, 2004 | \$3.00/W DC (PacifiCorp) \$3.00/W DC + \$0.25 bonus (PGE) | No change | No change |

Figures III.1 and III.2 show the percent of Program activity, by sector, associated with each incentive period. These data are reported at the project versus the measure level. As shown for the residential sector, the highest percentage of PV and SWH project applications were received during Phase 3, when the incentive level had dropped somewhat from the high in Phase 2. While this may appear surprising, we believe this, in some part, reflects the numbers of systems “sold” by contractors to the customers during Phase 2, but since the allocation was exceeded, and their project numbers limited, the contractors were forced to complete these project applications in Phase 3.

Figure III.1: Residential Project Applications Received by Incentive Phase (n=197)

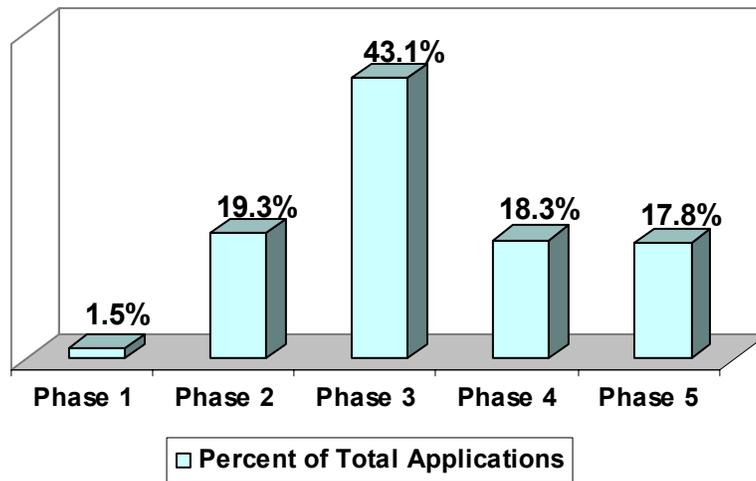
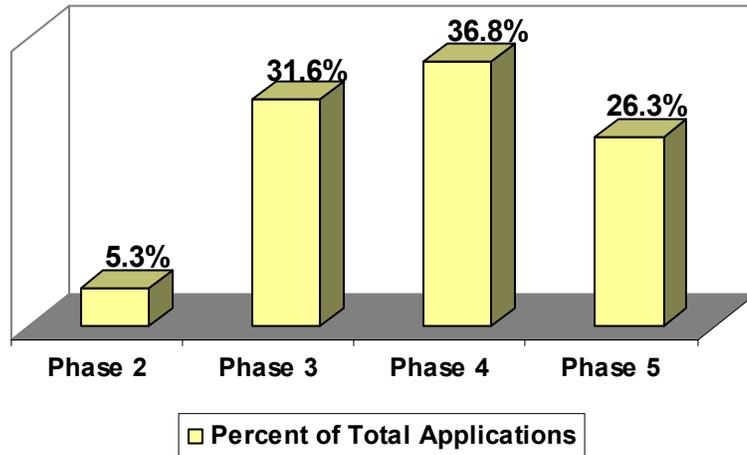


Figure III.2: Commercial Project Applications Received by Incentive Phase (n=19)



Each of these adjustments was designed to have a specific effect on the Program. The first incentive increase, in response to a very slow Program start, was intended as a bonus for the contractors to encourage more marketing. The Energy Trust believed that designing the adjustment as a bonus, rather than as an incentive increase, would make it easier to reduce the incentive when appropriate.

The bonus incentive was scheduled to expire or decrease after commitments for new systems totaled 115 kW of capacity. The bonus incentive resulted in a huge response, and when the capacity goal was met in October 2003, it was reduced. The reduced incentive did not significantly slow the response rate, and staff forecasted that if the December 2003 through January 2004 trend had continued, all Program funds for the PacifiCorp territory would be exhausted by June 2004. At this time, a warning was sent to contractors notifying them that incentives would be lowered within ten days, resulting in another rush of sales. As a consequence, contractors sold out the 2004 Program budget in the PacifiCorp territory by February 27, 2004. In the next adjustment, the performance bonus for contractors was eliminated, the caps were reduced, and staff successfully petitioned the Energy Trust Board for an additional \$500,000 in funding to continue the Program for PacifiCorp customers.

In April, in another effort to better manage the distribution of funds, incentives were further reduced and the following Program changes were made to prevent a reoccurrence of a run on funds:

- Previously, contractors were allowed to make reservations for funds by e-mail before obtaining signed commitment forms from customers. The Energy Trust would hold these reserved funds for ten days until the Sale Notification Form and Consent Agreement were received.

Staff noted that contractors were sometimes making reservations based solely on customer “interest” rather than a concrete commitment, and attrition rates for some of these contractors approached 80%. As this made it difficult for staff to manage the Program budget, the process was disallowed, with funds reserved only upon receipt of a completed application.

- To prevent contractors from reserving all of their projects in January but doing the work over the entire year, the Energy Trust set a timeline of 45 days for project completion. This timeline was too short for many projects, and many exceptions were granted. After consulting with the industry through OSEIA, the Energy Trust changed the Program, imposing a limit of eight uncompleted reservations to any one contractor at a time, with one-year to complete any one project. This effort to impose limits has also presented some issues, especially for new construction and projects requiring local design review, and some exceptions are still made on a case-by-base basis. There is no limit on the amount of funds any one contractor can employ in a year.

Accomplishments

All Measures

Table III.2 shows total system and incentive costs and energy totals accrued through September 2004, with PV accounting for the majority of costs and energy savings. Tables III.3 and III.4 look at the project costs and incentives and the percent of system costs covered by the incentive, respectively.

Table III.2: PV: System Cost and Energy Totals through September 2004 by Sector

| | Measure Type | n | Total Cost | Total Incentive | Total kWh | Total Therms | Total Watts |
|-------------|----------------------|-----|-------------|-----------------|-----------|--------------|-------------|
| Overall | Solar Hot Water | 35 | \$180,913 | \$33,625 | 77,072 | 143 | --- |
| | Solar Hot Water Pool | 9 | \$40,412 | \$7,186 | 105,130 | 2,279 | --- |
| | Solar Photovoltaic | 213 | \$4,443,707 | \$2,307,267 | 632,152 | --- | 672,198 |
| | <i>Sector Total</i> | 257 | \$4,665,032 | \$2,348,078 | 814,354 | 2,422 | 672,198 |
| Residential | Solar Hot Water | 33 | \$170,683 | \$31,385 | 74,272 | 143 | --- |
| | Solar Hot Water Pool | 8 | \$36,116 | \$5,961 | 92,880 | 2,279 | --- |
| | Solar Photovoltaic | 193 | \$3,434,443 | \$2,035,811 | 491,317 | --- | 534,919 |
| | <i>Sector Total</i> | 234 | \$3,641,242 | \$2,073,157 | 658,469 | 2,422 | 534,919 |
| Commercial | Solar Hot Water | 2 | \$10,230 | \$2,240 | 2,800 | --- | --- |
| | Solar Hot Water Pool | 1 | \$4,296 | \$1,225 | 12,250 | --- | --- |
| | Solar Photovoltaic | 20 | \$1,009,264 | \$271,456 | 140,835 | - | 137,279 |
| | <i>Sector Total</i> | 23 | \$1,023,790 | \$274,921 | 155,885 | - | 137,279 |

Table III.3: Descriptive Statistics: Costs and Incentive

| | Measure Type | n | Median Cost | Standard Deviation (Cost) | Median Incentive | Standard Deviation (Incentive) |
|-------------|----------------------|-----|-------------|---------------------------|------------------|--------------------------------|
| Overall | Solar Hot Water | 35 | \$5,049 | 2,036 | \$1,020 | 199 |
| | Solar Hot Water Pool | 9 | \$4,607 | 917 | \$750 | 279 |
| | Solar Photovoltaic | 213 | \$18,553 | 19,456 | \$11,583 | 3,936 |
| | <i>Sector Total</i> | 257 | \$17,370 | 18,711 | \$11,092 | 5,178 |
| Residential | Solar Hot Water | 33 | \$5,049 | 2,098 | \$1,020 | 201 |
| | Solar Hot Water Pool | 8 | \$4,641 | 977 | \$735 | 245 |
| | Solar Photovoltaic | 193 | \$17,975 | 4,215 | \$11,583 | 2,588 |
| | <i>Sector Total</i> | 234 | \$17,171 | 6,269 | \$11,232 | 4,360 |
| Commercial | Solar Hot Water | 2 | \$5,115 | 191 | \$1,120 | - |
| | Solar Hot Water Pool | 1 | \$4,296 | . | \$1,225 | . |
| | Solar Photovoltaic | 20 | \$37,829 | 54,896 | \$10,698 | 9,822 |
| | <i>Sector Total</i> | 23 | \$30,000 | 53,380 | \$9,900 | 10,080 |

Table III.4: Minimum, Maximum, Median and Standard Deviation: Percent of System Cost Covered

| | Measure Type | n | Minimum Subsidy | Maximum Subsidy | Median Subsidy | Standard Deviation (Subsidy) |
|-------------|----------------------|-----|-----------------|-----------------|----------------|------------------------------|
| Overall | Solar Hot Water | 35 | 7.2% | 30.7% | 20.0% | 4.5% |
| | Solar Hot Water Pool | 9 | 11.9% | 28.5% | 16.2% | 5.0% |
| | Solar Photovoltaic | 213 | 5.0% | 97.2% | 58.0% | 14.8% |
| | <i>Sector Total</i> | 257 | 5.0% | 97.2% | 55.4% | 19.8% |
| Residential | Solar Hot Water | 33 | 7.2% | 30.7% | 20.0% | 4.6% |
| | Solar Hot Water Pool | 8 | 11.9% | 21.4% | 16.1% | 3.0% |
| | Solar Photovoltaic | 193 | 5.0% | 97.2% | 59.0% | 12.7% |
| | <i>Sector Total</i> | 234 | 5.0% | 97.2% | 57.4% | 19.5% |
| Commercial | Solar Hot Water | 2 | 21.3% | 22.5% | 21.9% | 0.8% |
| | Solar Hot Water Pool | 1 | 28.5% | 28.5% | 28.5% | --- |
| | Solar Photovoltaic | 20 | 13.7% | 40.0% | 33.0% | 6.2% |
| | <i>Sector Total</i> | 23 | 13.7% | 40.0% | 32.1% | 6.4% |

As Table III.4 indicates, the standard deviations for costs, incentives, and percent of system costs covered are high for PV. We determined that just a few projects accounted for this finding. Exploring this with the Energy Trust staff, we found that these were residential projects and were among the first completed in the Program. They were installed by the same contractor, who Energy Trust staff believe was selling the systems near or below \$5/W. According to staff, the contractor has since increased prices, but they continue to be among the lowest in the Program. These residential systems, with the incentives covering greater than 80% of the system cost, are most evident in

Figure III.3, showing the distribution of residential projects by percent of system costs covered by the incentive. For PV system, more 51% of projects

Figure III.3: Distribution of Residential Projects by Percent of System Cost Covered by Incentive

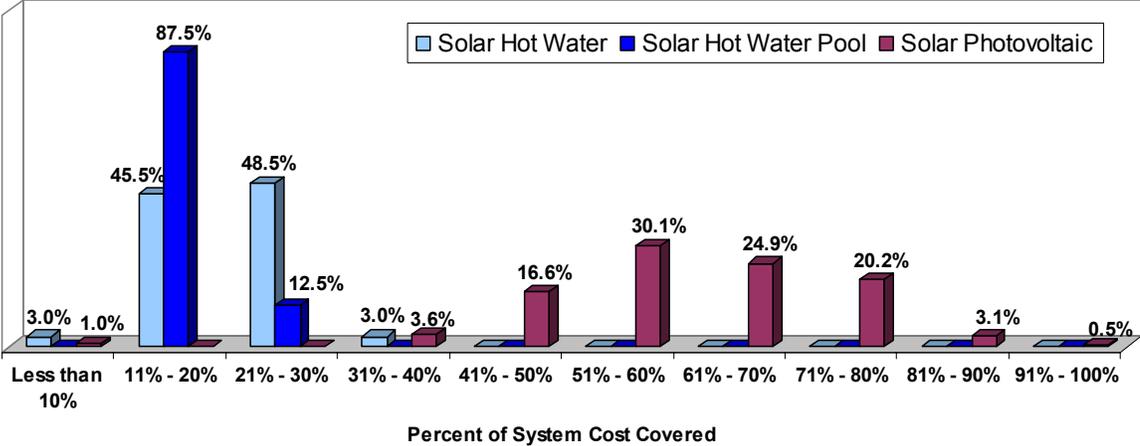
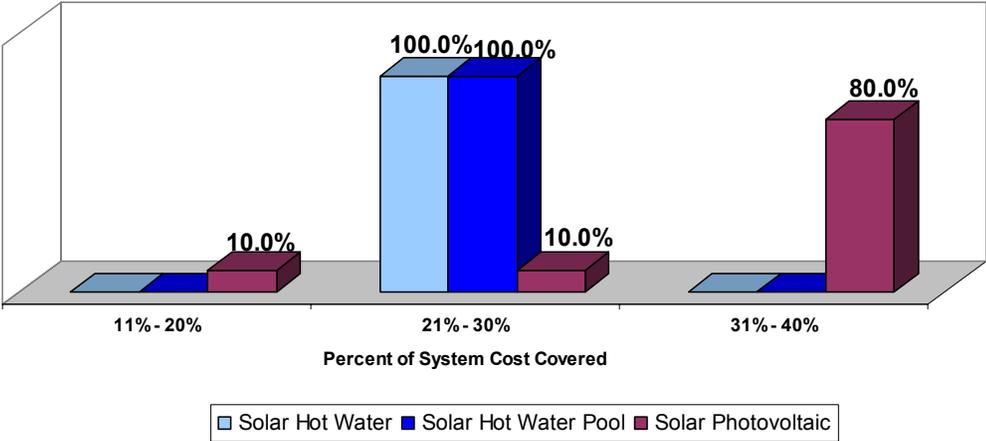


Figure III.4: Distribution of Commercial Projects by Percent of System Cost Covered



Photovoltaics

As seen in Table III.5, the median cost of installation per Watt was almost the same for residential and commercial projects, at \$6.62/W for residential project and \$6.77/W for commercial projects. The median system size was 3 kW and 4.8 kW, respectively, with the largest project a 30.0 kW commercial installation.

Table III.5: System Characteristics
(n = 193 and 20 for Residential and Commercial, respectively)

| | Install Cost per Watt | | System Size (kW) | | Incentive | |
|--------------------|-----------------------|------------|------------------|------------|-------------|------------|
| | Residential | Commercial | Residential | Commercial | Residential | Commercial |
| Minimum | \$4.37 | \$5.63 | 0.8 | 1.3 | \$1,000 | \$2,970 |
| Maximum | \$9.85 | \$11.82 | 4.5 | 30.0 | \$12,750 | \$35,000 |
| Median | \$6.62 | \$6.77 | 3.0 | 4.8 | \$11,583 | \$10,698 |
| Standard Deviation | 1.12 | 1.40 | 0.6 | 6.8 | \$2,588 | \$9,822 |

In calculating the data on Total Solar Resource Fraction¹¹ (TSRF) for all PV systems, we found four with TSRF figures <75% (the Program requirement for project approval is a TSRF >75%). All others met the Program requirement. To be certain that these few projects with very small TSRF figures did not skew the overall picture, we calculated the statistics for all participants and for only those systems with TSRF >75%. These data are shown in Table III.6.

Table III.6: TSRF Values

| | TSRF ALL (n=188) | TSRF >75% (n=184) |
|--------------------|---------------------|----------------------|
| Minimum | 12.9 | 75.4 |
| Maximum | 100 | 100 |
| Median | 96.0 | 96.3 |
| Standard Deviation | 12.1 | 6.4 |

* Data missing for 25 cases

Solar Water Heating

Table III.7 includes information on the size of the SWH systems. As shown, pool projects vary the most, with a standard deviation of 151 square feet.

¹¹ TSRF is the fraction of usable solar energy that is received by the solar panel/collector throughout the year. This accounts for impacts due to external shading, collector tilt and collector orientation. The higher the TSRF, the more effective the system performs and thus more energy is produced. With setting a limit of >75%, the Energy Trust intent is to approve those systems that are reaching this higher level of effectiveness.

Table III.7: Size of SWH Systems

| | SWH Pool | SWH |
|--------------------|--|--------------------------------|
| | Variable Label: Total Area of Collectors (ft ²)* | Total Area (ft ²)* |
| n= | 8 | 26 |
| Minimum | 312 | 21 |
| Maximum | 700 | 66 |
| Median | 490 | 60 |
| Standard Deviation | 151.3 | 14.5 |

* Data missing for 1 pool; 9 SWH.

IV. Interview Results: Key Informants

As described earlier, the key informants interviewed represent a wide range of persons with an interest in the industry, from leaders of solar organizations, to state agency representatives, to union leaders and trainers. And, as discussed in the Methodology section, a core list of knowledgeable key informants were identified by talking with staff of the Energy Trust and others were added to the list as these initial respondents referred the evaluation team to others they believed held important views on the solar industry and the Program. As PV dominated activity in the Program, and the evaluation team had earlier in the year developed a memo for the Energy Trust on reasons for over-subscription to PV and under-subscription to SWH (see Appendix A) the views summarized here relate only to the PV component.

These data were gathered during in-depth interviews with the key informants (and those with contractors). We used mainly open-ended questions to obtain respondents views of the Program and the market effects. Open-ended questions permitted us to delve deeply into the respondents' perspectives and to probe for the basis of their perception, resulting in a more complex data set than would result from closed ended questions where we offer the respondent a choice of a limited set of pre-determined responses. At the same time, because each respondent provided a unique view of the Program, at times it is difficult to determine what the collective assessment is of each point of view. The next evaluation of this Program can now generate closed-ended questions to test the breadth of support for some of the perspectives uncovered in this research.

Views of Program Marketing

We found general agreement among key informants that additional marketing efforts, both for solar technologies in general and for the Program in particular are needed at this time. And about one-fourth mentioned that this was especially the case in PGE's service territory.

Other key informants noted that some of the Energy Trust's efforts, such as the town meetings, had been very effective, especially for targeting those "closest to buying solar," but had a

"In the long term [the Program] will have a very good effect, but pricing is still an issue and also a lot of people still do not know about it and are unaware of the financial assistance. We need to get the information out."

"The Program is not terribly well known; it's not terribly well promoted to the general public."

"The Trust needs to get the word out more to the general population. Many people are unaware of the Program (and the technology). It needs to become more mainstream, using different media, such as popular radio programs."

limited effect because they were only held in a few places and they did not continue. Others felt that the Program's marketing had been effective in reaching contractors but not in presenting the Program to the public.

Some of the marketing ideas promoted by the key informants included:

- Using newspapers, television, and the internet to a greater extent
- Presenting more open forums and town meetings
- Bill stuffers
- Use newspapers and alternative weeklies, with intense repetition over several months
- Include brochures with electric bills or a message written on the bill itself (Eugene Water and Electric Board noted that they received more phone calls from the latter than from other, more costly methods)
- Offer door-to-door qualifying for homes with good solar access
- Use billboard advertisements and education
- Conduct direct mail for specific applications

One key informant noted that more face-to-face marketing is also needed, such as training utilities' customer service staff to mention solar options to customers who call to complain about their bills.

Five key informants proposed marketing to specific groups, such as holding conferences for big developers and business customers or involving the agricultural community, especially in eastern Oregon, or getting more utilities involved in the Program. Other general marketing ideas focused on educating consumers to encourage interest in the technologies.

"As part of educating the consumer, perhaps there could be more actual examples for the public to look at. For example, in Bend, there's a town home development with solar - it's a big selling point for them."

"Include in the educational component the fact that solar energy helps to offset pollution. People don't recognize that solar also decreases pollution, and it also doesn't affect the depletion of natural gas supplies."

Another informant, in addition to calling for more marketing, praised the Energy Trust staff for their efforts to date, acknowledging the limited Program budget and staff's commitment to getting the word out, even if it meant using personal time to do so.

Views of Incentives and Program Changes

Almost one-fourth of the key informants expressed concern that the incentive as too low, particularly in the PGE territory. There was general agreement that the current incentive levels should be, at least maintained, and if possible, increased. There were contrasting views, however, on whether the current

incentive level would still influence demand, with some believing it would, while others felt the incentive was not adequate to maintain the market demand. Two of the key informants interviewed emphasized the need for the incentives to stabilize, with one saying, “The yo-yo affect to find the right rebate amount has been very confusing and hard on contractors’ sales.”

Views of Program Results

Views of Consumer Response

Most key informants interviewed are somewhat removed from the end users (e.g., not working directly with consumers of solar systems) and thus could not comment on the consumers’ responses to the Program beyond citing the successful response when the incentive was at its highest. One, however, felt that the numerous Program changes have made it difficult for contractors to develop trust with consumers. In his view, consumers, especially those who had been waiting to install PV, were motivated to purchase by the incentive when it was at its highest level, as well as by the technology itself. If the contractor promoted the project at one incentive level, the customer begins to move toward the decision to purchase, and then the contractor has to return to the customer and tell him that the incentive is lower than originally promised, the dynamic of consumer mistrust is set.

“It has been tough on the contractors with the changes in the incentives, they work with customers over a period of months and suddenly they have to go to the consumer with the changes. The consumer tends to distrust the contractor when they have to make these changes. These starts and stops are hard. But at the same time they were not avoidable, and the specific issues were not foreseeable. Consistency is very important so that the contractors can do advertising, talk a single story to the consumers, so they can make a business plan.”

“People are now saying ‘I will wait until it goes up again.’ That is the perception. You need to establish an incentive appealing enough to get a consistent flow of interest, rather than feast or famine.”

View of Contractor Response

Differing views emerged among the key informants regarding the contractors’ overall response to the Program. Among those with more extensive involvement with contractors, there was some agreement that the complexity and time required for Program procedures were viewed as a negative by contractors, particularly early in the Program. One noted that this is still an issue when contractors cannot get a timely answer to questions from the Energy Trust staff, as when trying to determine the status of an incentive request.

“From [the contractors’] first reactions, [the Program] seems to be a hardship. This is hearsay, but some have said they tried to work with the Program but there are too many hoops. For instance, if a contractor is in the middle of the bidding process, some questions that are part of the Trust paperwork require the owner’s information, but the contractor doesn’t have this information because he doesn’t have the job yet, and the owner may be in the midst of getting several bids. There must be a way of them being able to put a bid together and get a commitment from the Trust without the owners’ information.”

The timing of bidding and the cycle of the construction process were cited as especially problematic for contractors, and two key informants stated that contractors have told them that the Program and paperwork are not worth their time. One key informant said that a contractor described the paperwork as “atrocious,” taking six to eight hours for a single project, but that the Energy Trust had recently made some changes that had helped, and he hoped they would continue to work on it.

Other key informants, however, reported that while some contractors’ initially chafed under the paperwork, most have now resolved this issue and are aware that the Program is directly responsible for a portion of their sales. As described by one key informant, the Energy Trust set up a complex program and, over time, has made some effort, by revising forms and other aspects, to make the process easier, resulting in his having heard more recently “slightly neutral toward positive comments from contractors.”

Some of the issues for contractors, in the key informants’ views, are related to the programs technical specifications. Examples cited included:

- Concerns regarding the disconnect switch required by PacifiCorp or about permitting required by local electrical inspectors, although no specifics were cited
- Some contractors’ views of the technical specifications, included for the security of the customer, as “unnecessary interference”

A representative from the electrical union noted that response from their membership has been good overall but that there has also been a negative response due to licensing issues (e.g., perception that the Energy Trust is allowing out-of-state contractors to hire “untrained” staff to do the work in Oregon). And another key informant believes the contractors like the technology, but the high front-end costs for consumers are a significant issue when it comes to promoting the technology.

Views of Program Effect on PV Market in Oregon

The majority of key informants and staff said they believe that the Program has substantially stimulated interest and encouraged the market for PV, increasing the sales of grid-tied PV systems and bringing in new contractors and consumers. Initially, it may also have decreased interest in SWH by causing this shift toward PV.

There was concern expressed, however, that the Program may also have encouraged poor quality workmanship, especially in some areas of the state, creating frustration among contractors. As one key informant said, “[the Program] is starting to help make solar a legitimate alternative to other energy sources,” but the Energy Trust now needs to focus on the quality of work and the installers. Another mentioned that the Energy Trust incentives do help

with payback but not to the point that solar can become a “common” choice. One informant noted that, while the Program has been very successful, there is still opportunity to get better educational materials into the market.

When asked about other factors that might be at work in these markets (e.g., the Oregon Tax Credit, market trends, other solar programs, green tags, Federal Tax Credits, etc.), key informants cited a range of additional factors, both local and international, affecting market activity. These include:

- The cost of steel, copper, and aluminum has increased substantially (increasing system costs), forcing contractors to start bids at a higher level to avoid risk of continued increases.
- High levels of demand in Europe (France, Germany) and Japan have created a shortage of PV panels.
- Areas such as Southern and Eastern Oregon have strong, independent solar contractors with history in the area, and the demographics of state in-migration indicate new residents are customers confident about PV and have both the desire and the finances to purchase.
- A federal incentive, the extra-accelerated depreciation credit for business, is being phased out at the end of 2004, encouraging commercial customers to take advantage before its demise.
- Oregon Department of Energy workshops on how to sell PV have influenced contractors.
- The combination of Oregon and Federal tax credits, as well as utility incentives, has definitively contributed to growth in PV.

Overall Program Assessment

Overall assessment of the Program was very positive across key informants and with many citing its impact on the PV market, including “getting a lot of new contractors and consumers excited and interested” and “starting to help make solar a legitimate alternative to other energy

sources.” But some issues were identified, including that the Program was not well promoted to the general public and that other policies regarding green

“I really like the Program The Trust has good guidelines set up - I’ve compared them to other states.”

“I can speak about PV only. Consumer response has been great. It has helped jump start the industry in Oregon and makes it more affordable for people. “

“The Trust promotes the Program well. The Program requirements for the system raised the level of installation (expertise). These requirements make for a good system.”

“They’ve done a good job reacting to the market. But the problem is that there is such a diverse set of people in the business. The question is how do you take an industry and make it grow up?”

“It is a good start and I’m enthusiastic about it. The way it is set up provides opportunities for both the installer and the consumer. The parameters of the Program have been done fairly well.”

tags and prohibitions on moving systems were not supportive of consumers. Another felt that the Program had fallen short in educating non-union contractors and that institutes of higher education in the state should be tapped to increase the educational component.

Recommendations for Program Changes

When asked if they had recommendations on how to improve the Solar Program, key informants suggested changes in several key areas.

Program Requirements and Staffing.

Changes most often suggested regarding Program processes included simplifying paperwork and requirements, reducing time lags, and stabilizing incentives and Program requirements. Two key informants suggested additions to the Energy Trust staff to better respond to the needs of contractors (see box at right).

“The Program could support [the solar industry] better by having someone who understands the construction industry in a senior staff position or on the Board . . . someone who has a broader view - even a retired construction supervisor, with 15-30 years experience. This person could better market the Program to contractors, and solar contractors could talk apples to apples with that person at the Trust.”

Training and Standards. Four of the key informants specifically addressed the need for additional training and standards to improve the quality of solar installations, but noted that enforcement of the standards is also essential. As one noted, the goal of the Program was to increase number of installations, increase awareness, support the industry and generate “green” energy. While some of these goals are being met, unless the quality is ensured, “solar could be set back like it was in the 1970s.”

A statewide industry representative noted that he had heard from contractors that some were confused about the training, with some expecting that the required sessions would give them technical expertise, “like electricians who want to expand their work opportunities but are green to the concept.” However, the training covers the Program expectations but not how to deliver. Thus, no qualifications-based training is provided and is probably needed.

Only one key informant reported concern with the Energy Trust inspectors, citing perceived serious differences in their level of skill and enforcement. Another reported that delays were involved when both the utility and the Program inspections were required, but acknowledged that “The Energy Trust is trying to work on reducing the number of inspections.”

Incentive Structure. Four key informants specifically identified the necessity of moving the Program to a performance-based system.¹² While aware that the Energy Trust did not have the funding necessary to begin with this type of structure, these key informants agreed that the current incentive Program would not be sufficient over the long-term and that it encourages poor quality installations that could seriously harm the image of solar and set back progress gained.

“Some, although not the low bidders, in the industry want strong stable incentives, performance. This allows the industry to value workmanship and quality, not just quantity.”

“Solar was given a tiny bit of money in Oregon. So why are they giving it away upfront? Use a production credit and get more of an industry going.”

“Rebates are the wrong way to do this. The problem with production credits is that they do not bring the upfront cost down and make it affordable. [The Energy Trust] should use the money to set up a revolving loan fund and get interest on that, then provide loan money upfront and a good enough incentive that almost makes the loan payment through production credits. It becomes more of a turning wheel – sustainable – instead of a piece of pie that gets chopped up and is gone.”

“I believe that the basic system is flawed. It is a front-end loaded system. It is not going to fail, but it is not going to achieve the sustainability I think we need to have.”

New Markets. To expand the Program, three of the key informants identified great potential in new home construction. Another recommended that the Energy Trust look at the potential of an innovative project being considered by the City of Ellensburg, WA. The City is considering allowing customer-owned systems to be installed on public buildings with good solar access, with customers retaining access to the power.

“The Energy Trust needs to move more quickly on the new homes portion of the solar program.”

¹² Staff at the Energy Trust acknowledge that incentives cannot act alone to change the market, but expressed the view that performance-based systems shift all of the risk to the customer. The positive side of the approach is that it can serve to motivate the industry to develop high-performing systems and more standard designs. Our review found that some states, including Massachusetts, are using performance-based systems now. Others, including Connecticut and Pennsylvania, include some type of performance-based incentive in addition to the one provided up-front. California is developing a performance-based pilot for systems larger than 30kW. While there are concerns with capacity-based systems encouraging installation of generation capacity, rather than the efficient operation of that capacity, states have responded by shifting toward per-kWh incentives (versus per kW). [Bolinger, et al, *Learning by Doing: The evolution of state support for photovoltaics*. Paper Presented at the American Solar Energy Society Annual Conference, Portland, OR, July 2004]. Massachusetts has also found the performance incentive system administratively cumbersome and relatively expensive. [Sam Nutter (panelist), Renewable Energy Trust, Massachusetts, in panel *State Program Coordinators*, American Solar Energy Society Annual Conference, Portland, OR, July 2004]. Monitoring these and other states’ experience could provide evidence that would be of value should ETO consider a performance-based approach.

This allows customers with poor solar access to be involved in solar production.

The Future

Necessity of Incentives. Almost half of the key informants expressed support for maintaining the incentives, if not increasing them, predicting a decline in the market if the Program should be eliminated. There was divergence, however, in how much the incentive should be, with some finding the current level sufficient, while others felt that the PV incentive should be increased back up to \$4.00/W or \$4.25/W.¹³

Other Changes/Trends/Suggestions. Several of the key informants identified changes or proposed changes that could affect the future market for solar technologies. One felt that there was untapped potential in using building codes, which are often driven by what is cost effective for the consumer, to further the solar market. Four key informants noted the impact that electricians (and plumbers) entering the market and receiving licenses could have on the solar market. And one key informant mentioned a specific OSEIA initiative, that could support market growth (see side box), could also have an impact.

“OSEIA will be trying to get a bill passed for a tax credit carry forward measure. Now consumers can get \$1,500 each year, but they cannot install a larger system and get more than \$1,500 in one year. They can come back and do modules each year until the full system is in. We want to get a full installation installed in year one but get the full credit over a four-year period. That will help increase the market.”

Summary of Key Informant Responses

As indicated above, there was clear agreement among the key informants that the Program had been successful in bringing new interest to the solar market and in increasing contractor involvement in promoting and selling PV systems. Key informants, however, also indicated that a stronger role for the Energy Trust is needed in Program marketing and marketing solar technologies generally.

Interview data regarding specific Program components indicate differences in the views held by key informants. Key informants cite the success of the Program requirements (licensing, inspections) that have resulted in improved system quality. At the same time, they report that there is a need to monitor, and perhaps address, the work quality of some installers/contractors work, while letting those who are doing well have more freedom. Some key informants called for greater enforcement of standards through Program

¹³ Other key informants felt that only the SWH incentive should be increased.

requirements, while at the same time suggesting that paperwork should be reduced, believing that the paperwork does not ensure standards are met.

Finally, while there is consensus that the PV incentive should remain, some key informants clearly think the PV incentive should be at a higher rate, and some are comfortable with the current PV incentive. What is consistent is that all want the incentives to be set and to remain stable.

V. Interview Results: Contractors

The following discussion is based on in-depth interviews with 17 contractors identified from the Program database. The sample included both contractors who had been very active in the Program and those who had done very few projects.

Views of Program Marketing

Many, but not all, of the contractors interviewed report they are actively promoting the solar technologies through a variety of venues, including:

- Fairs
- Trade journals
- Targeted direct mail
- Television ads
- Technology installed in their stores/offices
- Local general and business newspapers
- Conferences, such as American Solar Energy Society (ASES)
- Real estate offices
- Yellow pages
- Web sites
- Cold calls

Two contractors, however, said that, having been in the business for years, they rely solely on word of mouth and referrals. Another noted that he is building solar systems (both PV & SWH) on a 14-foot tow-behind trailer to take to shows and fairs and thought that the Energy Trust should have something similar.

The contractors also shared their ideas for ways in which the Energy Trust could further market the Program and thus the technologies, including:

- Publicize the Energy Trust Web site
- Participate in events (like Home Shows)
- Use bill stuffers
- Base Energy Trust staff in key areas of action in the state (e.g., southern Oregon) to focus on promotion and education
- Provide co-op advertising dollars to contractors

“Marketing, marketing, marketing is what is needed. [The Energy Trust] have to build awareness. What is needed is a mass marketing campaign, including TV, radio, billboards, newspapers, bill stuffers. The state tax credit is the industry’s best-kept secret and the Energy Trust program is also a secret. No one knows about it. “

“ I wish they would do more marketing in the newspaper or on the radio or something to get the word out. I think we would have much greater response if there were some kind of marketing done so people were aware something was there. I think the large part of the population has no idea those solar incentives are there. “

Views of Incentives and Program Changes

Three contractors reported that the changing incentive levels had had a negative effect, saying that the shifts confuse the public, make selling the products more difficult, and present hardships for contractors. Contractors report that they have to bid in advance and face uncertainty about incentive levels at the time projects are actually sold and have to be delivered. These contractors noted that uncertainty about the incentives leads to caution on the part of contractors when deciding whether to push the product and/or add staff.

As with the key informants, there were contrasting views among the contractors on whether the incentive was adequate to maintain the market. One noted that his market for PV decreased by 50% when the incentive was reduced to \$3.00/W, evidence that a higher incentive is needed to maintain activity. Another contractor said that “the market is still soft,” while another said that there has not yet been enough market penetration to suggest it is time to reduce incentive levels.

Views of Program Results

Impact on Sales

More than half of the contractors said the Program had a definite impact on the sales of solar equipment. While one said these were not major increases, others cited increases of 15%, 300%, or by a factor of ten (mainly small firms where addition of one or two staff was quite significant). One contractor reported that the Program had only a marginal impact on business, primarily because most of their projects are too large to qualify. Another noted that, even though the Program was available, the poor economy limited its effect on sales.

“It increased my PV sales 10 times; I’m a top producer for the Trust. Before the Trust program I had sold only 5 PV systems in 20 years. Since the Trust program, I’ve sold 30 PV systems.”

Impact on Contractors’ Staff

As with sales, the contractors reported that the Program had a significant impact on adding staff or subcontractors to deal with increased sales. Two contractors said the Program was responsible for their decision to start their business. Almost half (8) of the contractors reported having increased staff or use of subcontractors in the past year, usually citing increases of one or two employees. For the remainder who had not added staff, reasons included:

- Perceived transitory nature of incentives
- Existing staff capable of handling projects

- No real growth in demand
- Lack of trained people to hire
- Desire to keep business small

“The Energy Trust Program created its own life for our business. I added two employees, was able to upgrade my truck and bought a trailer to support the grid-tied division we created. It became a very important part of my business.”

Views of Program Effect on PV Market in Oregon

One contractor specifically felt that the Program made PV very desirable for customers who had considered the technology, and for whom the incentive at its highest pushed them to finally make the decision to install. However, this same contractor reported that of customers now inquiring, only those with large disposable incomes are still willing to purchase the system. Others felt the Program had an effect on PV, primarily in Central and Southern Oregon.

Overall Program Assessment

Almost one-third of the contractors said that they believe the Energy Trust Program is on the right track and is doing well. One contractor specifically mentioned the regulation of the number of projects contractors can have and revisions made to reduce the paperwork as positive aspects of the Program.

“On the positive, the design of the is Program excellent. The flow of the rebate money was good, and the Energy Trust inspection requirement was great; keeping quality control high and contractors feet to the fire. It’s a positive way to make sure there is good relationship between the customer, the Energy Trust, and the contractor. “

“I think we are on the right track. We can use all the help we can get and the Energy Trust is providing some of that. It is a good start. I am pleased with it. Things have to evolve. ETO or some other entity needs to support that The way it is set up gives people opportunities both for the installer and consumer. The parameters of the program have been done fairly well.”

Others, however, were less positive, saying that they view the Program as still being “beta tested” and some revisions could be expected in a new program, but that Energy Trust staff had begun listening to the contractors’ concerns and responding to them at a very late date. Those expressing less satisfaction overall cited concerns that the rebate levels were no longer adequate, that the Energy Trust staff was not current on technological changes, and that “retroactive” new inspection requirements led customers to believe the contractor had “done something wrong.” Only one contractor expressed dissatisfaction with many facets of the Program, citing the Energy Trust’s “quick, rash decisions with certain project guidelines, changing the rules, and limiting contractors to eight projects at a time when we are more than capable of handling ten times that amount.” Another felt that “thousands of dollars were spent by contractors on advertising material, only to have the incentive and caps change within two weeks time. With a bunch of projects lined up, when they limited us to eight projects at a time, overnight they destroyed the work we had been doing. We had 40 projects ready to go.”

Recommendations for Program Changes

Program Requirements and Staffing.

Contractors, even while acknowledging that the Program has experienced “growing pains,” call for continued efforts to reduce paperwork and for more active and effective communication between the Energy Trust and the contractors. One contractor, however, noted that while he perceived the Program to be understaffed, making it very difficult to contact anyone when necessary, the really important thing was to “keep the incentives up to generate interest.” Another noted that better communication with the trade allies was critical, especially when Program changes are planned.

“Reduce the level of bureaucracy, the level of paperwork, the waiting time.”

“I would like to see them make the program more user friendly. The paperwork involved is atrocious. It takes me 6 or 8 hours to fill out all the paperwork for a project. I think they can work with the contractors to make that easier. They have done some things recently that have helped - I hope they continue working on that.

“They should have an individual with an electrical or mechanical superintendent background as a go-to person at the Trust. Someone who understands both labor and management (how bids are put together) and who knows that quick responses are very important.”

Training and Standards. Two contractors raised the issue of the value of strict requirements for contractors, while four others mentioned that the requirements made it difficult for them to participate.

The main source of concern regarding Program standards raised by contractors (with three mentioning) is the competency of the inspectors. As one contractor said, “I won’t subjugate my company to putting low-qualified guys on the roof and have poorly qualified inspectors sign off [on the system]. I’ve seen systems that have been passed that should not have been approved. The Energy Trust does not seem to have tests for qualifying inspectors.”

Another reported having seen poor quality PV installations and that “some of the inspectors are not qualified, or may even be competitors who did the job but did not win it.” Yet another asked, “How can you have someone inspect a system if they do not know the electrical code? The Energy Trust inspectors are not licensed

“The down side of front end loaded incentives is that they overemphasize PV in relation to the rest of the system because that is where the money is. It promotes poor system design where you loading things to the maximum, which is never a good idea with electronics. I don’t do that and consequently I have no competitive edge. I am designing my systems on good quality design and do not load the electronics (inverters) to more than 80% of its capacity. The incentives are based on how much PV on the roof; the rest is just ancillary. It encourages people that are just in it for the buck to maximize and then push some the load of PV on the rest of the electronics. It is a system.”

electricians.” Questions also arose about the need for multiple inspections by local, utility, and the Energy Trust inspectors.¹⁴

Incentive Structure. Only one contractor specifically cited an issue with the incentive structure (see side box), perceiving that the incentive encourages poor quality system design that could harm the image of solar and set back progress gained.

Another recommended no- or low-interest loans, in addition to the incentives, to overcome the first-cost barrier.

Other Changes. Other suggestions made by contractors included:

- Make the Energy Trust Web site more visually appealing and easier to navigate
- Provide better training on the technologies and technological changes for Energy Trust staff who are perceived by some contractors as not up-to-date on technologies
- Educate the utilities to be more knowledgeable about PV and to conduct better inspections of the installations
- Use direct deposit for rebates
- Have more ETO staff to process paperwork
- Delete the inspection Program
- Delete limit of eight projects; let the free market take care of it

Necessity of Incentives. Among contractors, views on the necessity of the incentives (and their levels) varied a great deal. Almost all felt the incentive was needed to increase market response; others had more specific comments, including:

- Two contractors said that the incentive plus the tax credit(s) must cover 75% - 80% of the PV installation to continue generating

“Without incentives I don’t think there would be much of a PV market. With the cost of energy in Oregon, and the cost of PV, the payback isn’t there, even with incentives.”

“At \$3/W, it is solar for the rich. I have been trying to sell this to lower and upper middle class people, because they need it. Without green tags, it is asking too much of customers.”

“Some incentives are required to level the playing field, but would like to see them entirely on the production side with low or no interest loans so have some stimulation on the front end.”

¹⁴ ETO provided inspector training for PV in May, 2003, and SWH in August, 2003. The training focused on system requirements, solar resource calculation requirements for the Program, forms and processes, communication protocol with contractors, County building inspectors, and customers, dealing with violations, and other topics. ETO staff report that the inspectors are carefully selected technology experts with significant solar installation knowledge and experience. Utility inspections are required for grid connection and local (county or city) require additional safety inspections.

business, while others said the PV incentive should increase, to around \$3.75/W to \$4.00/W. Another felt that \$3.50/W would move the market, and one said that he is able to get customers to install if the incentive is in the range of \$3.50/W to \$3.90/W.

- Two contractors felt that the current commercial program incentive levels were so low and the cap on size so limiting, that this component should be dropped altogether, unless the caps/incentives were adjusted.
- Two contractors noted that the current incentive level would be acceptable if customers were allowed to retain the green tags.
- Another contractor held a more mixed view, feeling that, from a business perspective, incentives should not be kept in place, but that to achieve social ends, it might be necessary. It might also be better to put some of the incentive funds into community outreach.

Three contractors emphasized that incentives, even at current levels, must be accompanied by a broader marketing effort, quality assurance, and education to truly make a long-term impact on the market.

Other Changes/ Trends/Suggestions. Almost one-third of the contractors mentioned stabilizing the incentives as important for maintaining demand for PV.

Two contractors mentioned issues with the quality of system components and service that could affect the future market. The first noted that there is “shoddy equipment” being installed, and felt that nothing in the Program prevents this from occurring. The other noted that while his company services past solar customers, not all installers do this and thus a ‘repair incentive’ should be built into the Program.

“The incentives need to be stabilized; levels should be maintained. Don’t jump around with different levels every six months – that creates confusion. The program needs consistency and there is real value if it remains the same.”

The Future

Contractors offered several suggestions for the future, to encourage the solar market and maintain demand.

These included:

- More education for the general public, particularly focusing on the payback and environmental benefits
- Focus on organizations, such as the Home Builders Association and Construction and

The Energy Trust should continue with what they’re doing, but increase exposure to the public. The seminars they put on have been aimed at wholesalers, distributors, and contractors, but not the public. They need to put on some seminars for them too. The deficiency [in the Program] is lack of public awareness but I’m not sure how to accomplish this.”

“Increase the exposure of the public to what’s available. I think the Trust is promoting well to contractors; now they need to draw the public in to both technologies. The Trust needs to address what would have the most impact on the public.”

Contractor's Board, providing them with a simple brochure on the Program and how to contact a certified contractor

Summary of Contractor Responses

A higher percentage of contractors than key informants appear to understand their primary role in promoting the Program, but like the key informants, they also see a need for more marketing by the Energy Trust. As with key informants, many contractors believe that very few people know about solar options or about the incentives available.

Most felt the Program had been successful in increasing activity for PV. More than half said the Program had increased their sales, and almost as many had added staff or subcontractors as result.

As with key informants, there is wide divergence on the issue of the Program requirements. Some contractors feel regulation on project numbers and requirements contribute to Program quality; others feel it limited their sales. Some actually recommended stricter requirements for contractors, perceiving that the Program is not preventing inferior installations. A few contractors are concerned with the quality of the Energy Trust inspectors. However, the comment made regarding inspectors competing with the contractors for projects indicates that they may not fully understand the Energy Trust policies governing the inspectors.¹⁵

Contractors report that the paperwork and other requirements are time consuming and costly, and that Energy Trust staff need to increase their knowledge of the technologies and how the solar contractors' businesses work.

While contractors largely agreed that the incentives are necessary to maintain demand and should be consistent, there is a diversity of views on the specifics. Some of the contractors desire a return to an incentive near to the \$4/W level. Others are comfortable with the current level, but note that additional support is necessary at this level, such as retention of green tags, no- or low-cost loans, and more education of consumers. The need to raise the incentives significantly was seen as most critical for commercial projects.

¹⁵ Energy Trust policy prohibits inspectors from being trade allies or from competing with trade allies for projects within the Energy Trust territory.

VI. Survey Results

As noted in the Introduction, the survey results presented in this section are based on surveys with 66 PV-only participants and with 26 non-participants, those customers who had called the Energy Trust for information about solar technology or the Program.¹⁶ These surveys were conducted in October 2004 and, therefore, reflect only activity through September 2004.

Considering Solar and Taking Action

We began the surveys by asking each customer how long he had considered solar options. As shown in Table VI.1, 39% of participants and 65% of non-participants said they had considered solar options only within the last two years. Participants, however, were more likely to indicate that they had considered the technology for a longer period of time.

Table VI.1: Length of Time Customer Had Considered Solar Options

| Time Solar Considered | Participant | | Non-Participant | |
|-----------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Less than one year | 14 | 21% | 7 | 27% |
| 1-2 years | 12 | 18% | 10 | 38% |
| 3-5 years | 19 | 29% | 4 | 15% |
| 6-10 years | 9 | 14% | 1 | 4% |
| More than 10 years | 12 | 18% | 4 | 15% |
| | 66 | 100% | 26 | 100% |

For non-participants, one of the steps in their process of considering a solar installation was to call the Energy Trust. As shown in Table VI.2, there were a variety of responses provided by non-participants when asked the main reason for their call, ranging from just having a general question to calling in response to a TV or news article. The wide variety of “other” reasons given show the range of sources that led to the customers learning about the Program, clearly indicating that there is no single vehicle driving Program awareness.

After questions concerning when they began considering solar, we asked customers to identify when they had taken the first concrete step toward an installation. Among participants, 77% said less than one year ago, likely as a result of the Program incentive. Only four non-participants said they had taken

¹⁶ Non-participants include those reporting that they were considering PV only or PV AND SWH.

any concrete action, and all of these said this action had been within the last year (see Table VI.3).

Table VI.2: Non-Participants' Reasons for Calling the Energy Trust

| | Frequency | Percent |
|---|------------|-------------|
| Main Reasons | | |
| Saw it on the website and wanted to learn more | 5 | 17% |
| I had a question about the program | 4 | 14% |
| Heard about it from friend and wanted more information | 2 | 7% |
| Installer/contractor told me to call them about the incentives | 2 | 7% |
| Called Energy Trust for another reason and they told me about the incentive | 1 | 3% |
| News article piqued my interest | 1 | 3% |
| TV feature piqued my interest | 1 | 3% |
| Other | 13 | 45% |
| | 29* | 100% |
| Other Reasons | | |
| Utility bill stuffer | 3 | 19% |
| Heard about it from people at environmental organizations | 2 | 13% |
| Saw info in book on solar energy | 2 | 13% |
| Environmental Building Supplies | 1 | 6% |
| Heard about Program on radio | 1 | 6% |
| Heard about it at a seminar | 1 | 6% |
| Heard about it from Co-op Oregon; also the Apollo Alliance | 1 | 6% |
| Heard about it from a home show | 1 | 6% |
| Member of a solar group | 1 | 6% |
| Saw a PV system at another house | 1 | 6% |
| Wanted to make new home more efficient and energy independent | 1 | 6% |
| Wanted to save energy and money | 1 | 6% |
| | 16* | 100% |

* Multiple responses possible.

Table VI.3: Time First Concrete Step Taken

| Time | Participant | | Non-Participant | |
|------------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| No step taken | --- | --- | 22 | 85% |
| Less than one year ago | 51 | 77% | 4 | 15% |
| 1-2 years ago | 15 | 23% | --- | --- |
| | 66 | 100% | 26 | 100% |

Four (15%) non-participants said that they had taken a concrete step toward installation of a solar system, including receiving estimates from or initiating contact with contractors.

Conducting Research

To explore the types of information sought by those researching solar systems, we asked those surveyed to identify first, those sources of information most useful in their research; and second, their preferred medium for such material. Except for the “other” category, as shown in Table VI.4, participants most frequently cited performance reviews and case studies, while non-participants most frequently cited costs over time. More than half (55%) of participants and 46% of non-participants cited a single source as most useful; 24% and 42% (respectively) cited two sources while 21% and 12% respectively cited three or more sources as useful.

Table VI.4: Sources of Information Most Useful in Research*

| Source | Participant | | Non-Participant | |
|--|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Performance reviews | 29 | 24% | 8 | 14% |
| Case studies | 24 | 20% | 6 | 10% |
| Fact sheets | 19 | 16% | 9 | 15% |
| Maintenance requirements costs over time | 11 | 9% | 12 | 20% |
| Documents on how to install | 2 | 2% | 8 | 14% |
| Other | 34 | 29% | 16 | 27% |
| | 119 | 100% | 59 | 100% |

* Multiple responses possible.

The following are some of the other types of information that the two groups thought would be useful to consumers in their research:

- Information from contractor (8)
- Friend’s knowledge (3)
- Product catalogues/manufacturer specification sheets (3)
- *Home Power Magazine* (2)
- Solar tour/demonstration (2)
- Solar architecture class
- Having a direct contact at the Energy Trust
- Utility bill stuffer
- Speaking with others currently utilizing the technology
- Local public library
- The Energy Trust-provided rating system or general information about the differences between solar panels
- More information on general cost-benefit analysis

- Information on useful Web sites

While about one-third of the surveyed participants said that they preferred accessing information electronically, the same proportion of non-participants expressed a preference for printed materials. A higher percentage of participants, perhaps as a result of working with their contractor through the Program, said they preferred getting information from a contractor, while non-participants were more likely to say they preferred workshops and electronic sources (see Table VI.5). More than half (53%) of participants and 35% of non-participants cited one preferred medium; 35% and 30% respectively cited two preferred mediums; and 12% and 35% respectively cited three or more medium.

Table VI.5: Preferred Medium for Accessing Information*

| Medium | Participant | | Non-Participant | |
|----------------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Website (electronic) | 34 | 32% | 15 | 26% |
| Contractor | 29 | 27% | 9 | 16% |
| Printed medium (brochures) | 26 | 25% | 19 | 33% |
| Workshops | 10 | 9% | 12 | 21% |
| Other | 7 | 7% | 3 | 4% |
| | 106 | 100% | 58 | 100% |

* Multiple responses possible.

Another factor in decision-making is the customer's previous experience with solar technologies. As shown in Table VI.6, participants were somewhat more likely than non-participants to report having previous experience with solar technology, and of these, 14 (74%) had experience with solar water heating.

Table VI.6: Previous Experience with Solar Systems

| Experience | Participant | | Non-Participant | |
|-----------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Yes | 19 | 29% | 4 | 15% |
| No | 47 | 71% | 22 | 85% |
| | 66 | 100% | 26 | 100% |
| Type of System | | | | |
| Solar water heating | 14 | 74% | 4 | 100% |
| PV | 4 | 21% | --- | --- |
| Both | 1 | 5% | --- | --- |
| | 19 | 100% | 4 | 100% |

Installation

Only one of the systems installed by participants was reported as an addition to an existing system; all others were new systems. Overall, 59 (89%) said the systems were currently operating in their home or business. Of the remaining, six said the system(s) had not yet been installed and another had sold the home in which it was installed.

We also asked non-participants whether they had installed or were in the process of installing solar systems since the time they had contacted the Energy Trust for information. None of the non-participants had installed or were in the process of installing a solar electric system.

When asked if they were still considering projects about which they had called the Energy Trust, 88% responded affirmatively and more than half have since consulted a contractor. Of those who had contacted a contractor, 14 (58%) said the contractor explained the Energy Trust incentives and how these would reduce installation costs.

Almost all of the projects initially under consideration were new systems, as shown in Table VI.7, and a high percentage of non-participants (42%) were considering installing both PV and solar water heating systems. Most of the respondents were not yet sure of the size of the system they would install.

Table VI.7: Non-Participant Project Types Considered

| | Frequency | Percent |
|-----------------------------------|-----------|-------------|
| Type of Project | | |
| PV Only | 15 | 58% |
| Both PV and SWH | 11 | 42% |
| | 26 | 100% |
| System or Enhancement | | |
| New system | 25 | 96% |
| An addition to an existing system | 1 | 4% |
| | 26 | 100% |

Factors in Purchase Decision

We asked participants to rate the importance of each of a list of factors on their purchase of a solar system. The responses are summarized in Table VI.8.

Table VI.8: Participants' Rating of Factors In Purchase Decision (n=66)

| | High Importance | Medium Importance | Low Importance | No Importance | Don't Know |
|---|-----------------|-------------------|----------------|---------------|------------|
| Owning or using a PV solar water system in the past | 20% | 8% | --- | 33% | 39% |
| Having friends or colleagues who had installed PV solar water heating systems | 32% | 11% | 15% | 30% | 12% |
| Reading learning about PV solar water heating from magazines, journals, or websites | 48% | 36% | 9% | 6% | --- |
| Information gained at a home show, energy fair, or other | 30% | 24% | 12% | 26% | 8% |
| Information gained from an environmental or solar organization | 38% | 32% | 12% | 15% | 3% |
| Information provided by a PV solar water heating contractor | 56% | 18% | 15% | 9% | 2% |
| Information from your utility | 11% | 14% | 26% | 38% | 12% |

For non-participants still considering a system but that had not yet taken concrete steps towards installation, we asked them to identify the key factors that would determine whether they would go forward with their solar installation. As shown in Table VI.9, timing and savings/incentive amounts were the most frequently cited factors; having capital available was also commonly noted. Of these factors, 52% rated having sufficient finances as the *most important factor* in their moving forward with installation. Timing (17%) and level of incentives (9%) were the next most frequently cited.

Table VI.9: Non-Participant Factors in Completing Considered System

| Factor | Frequency | Percent |
|---|-----------|-------------|
| Timing | 7 | 32% |
| Magnitude of expected savings, costs and availability of incentives | 5 | 23% |
| Adequate available capital | 4 | 18% |
| Availability of additional information | 2 | 9% |
| Dependent on purchase of new home | 2 | 9% |
| Finding a reliable, experienced contractor | 2 | 9% |
| | 22 | 100% |

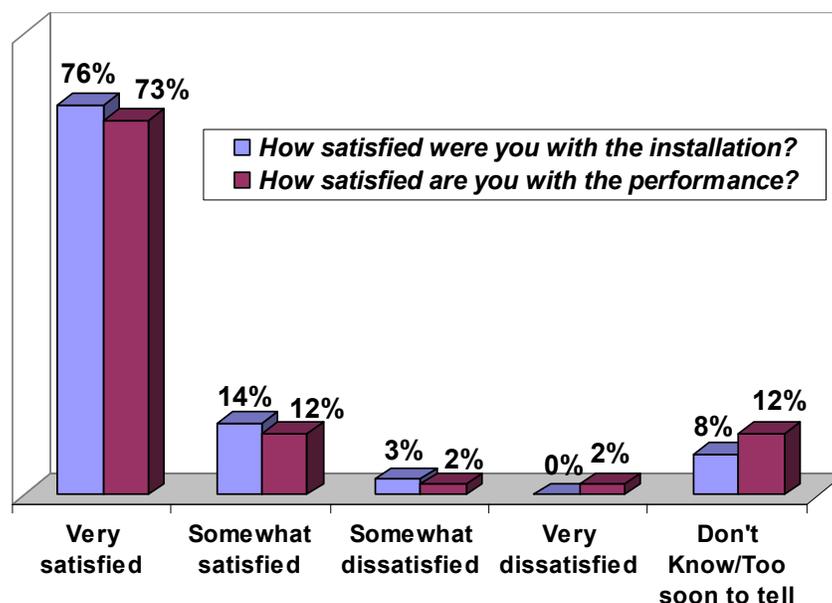
Installation and Performance

Most of the participants, 59 (89%), used contractors to install their systems. Five (8%) of participants said they did some of the work, while only two (3%) completed the installation alone or with friends. Of those using contractors, 79% rated the information the contractor provided on the Energy Trust

incentives and on its effect on system costs as “very clear;” another 18% rated it as “somewhat clear.” Additionally, 95% rated this information as “very useful” or “somewhat useful” in making their decision to install a solar system.

As shown in Figure VI.1, approximately three-quarters of the participants with installed systems said they were “very satisfied” with the installation and the performance of their systems. When asked the reasons for their satisfaction with the installation, most of the comments focused on the great job done by the contractor. Others reflected satisfaction with the aesthetics, the technology and the price.

Figure VI.1: Satisfaction with System



Examples of comments having to do with satisfaction included:

- “[The contractor] explained everything, they worked steadily, they always gave me an update, and they were wonderful to work with.”
- “[The system] performs great, the installation was conducted neatly, and there was no damage. They did a great job.”
- “We are very satisfied because everything went smoothly and its aesthetic is pleasing.”
- “The price, the performance and the installation made it all very satisfactory.”
- “[The contractor] did it on time, it is showing results, they were neat, and it is metered well.”

Of the few who said they were less satisfied, they noted that either the job was still not completed (“held up for more than five months and no one updates us”), that the contractor was not competent or pleasing to work with, that installation did not turn out to look like what was shown in the contractor’s sketches, and other contractor errors during installation.¹⁷

Those expressing high levels of satisfaction with their systems’ performance often cited the electricity generated, the efficiency of the system, benefits to the environment and energy independence, as well as the savings. Many said it completely met their expectations.

Sample comments include:

- “Very satisfied because it’s producing more electricity than expected.”
- “Very satisfied because I’m saving money and improving the environment.”
- “Very satisfied because the system satisfies most of our electrical needs, it puts back into the grid some of those energy units that we do not use, and it helps diversify the energy base, which is good for our country.”

Those less than satisfied with their system’s performance noted some initial operating problems or lower-than-expected electricity production.

Satisfaction with Program and Savings

To assess overall response to key aspects of the Program, we asked participants to rate their satisfaction with the incentive, overall Program experience, and changes in their monthly energy bill. As shown in Table VI.11, 93% said they were “completely” or “somewhat” satisfied with the incentive; 93% were similarly satisfied with their overall experience with the Program. Fewer (68%) gave high ratings to the savings on their monthly energy bill.

Table VI.10: Participant Satisfaction with Program Components (n=66)

| | Completely Satisfied | Somewhat Satisfied | Neither Satisfied nor Dissatisfied | Somewhat Dissatisfied | Not at all Satisfied | Don't Know/ Too Soon to Tell |
|--------------------------------|----------------------|--------------------|------------------------------------|-----------------------|----------------------|------------------------------|
| Incentive | 73% | 20% | 5% | 2% | --- | 2% |
| Program Experience | 67% | 26% | 5% | 3% | --- | --- |
| Savings on Monthly Energy Bill | 53% | 15% | 11% | --- | 5% | 17% |

¹⁷ There was no clear pattern of dissatisfaction connected to one contractor; two projects where customers cited issues were with one contractor.

Satisfaction with Contact with the Energy Trust

Finally, we asked all surveyed whether they had contacted the Energy Trust by telephone for information, to resolve issues, or for any other reason. Less than half (29 or 44%) of participants and 24 (92%) of non-participants said that they had spoken with someone from the Energy Trust by phone to resolve an issue.¹⁸ As shown in Table VI.11, the highest satisfaction ratings were given to the Energy Trust staff’s courtesy during phone contact, with somewhat lower ratings for “helpfulness.”

Table VI.11: Customer Satisfaction with Telephone Contact with the Energy Trust

| | Extremely satisfied | | Satisfied | | Neither Satisfied nor Dissatisfied | | Unsatisfied | | Extremely Dissatisfied | |
|-------------------------------|---------------------|-----------|-----------|-----------|------------------------------------|-----------|-------------|-----------|------------------------|-----------|
| | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. |
| n= | 29 | 24 | 29 | 24 | 29 | 24 | 29 | 24 | 29 | 24 |
| Courtesy on the phone | 83% | 79% | 14% | 17% | 3% | 4% | --- | --- | --- | --- |
| Helpfulness on the phone | 66% | 50% | 21% | 33% | 14% | 13% | --- | 4% | --- | --- |
| Knowledge of program services | 72% | 54% | 24% | 25% | 3% | 21% | --- | --- | --- | --- |

The lone non-participant expressing dissatisfaction with the Energy Trust’s helpfulness noted, “the person didn’t seem to have been in the solar business very long – not that well informed.”

We also asked Program participants if they had spoken or written to the Energy Trust regarding any issues needing resolution. Only 11 (17%) of participants had done so. Of these, five rated their satisfaction with resolution of these issues as “extremely satisfied;” two gave ratings of “satisfied,” three as “unsatisfied,” and one “extremely unsatisfied.” Those expressing dissatisfaction provided the following comments:

- “[The Energy Trust] said I was missing paper work, but I was never sent the appropriate agreement paperwork.”
- “The Energy Trust was unreasonable and inflexible regarding personal installment and the installation of a second system.”¹⁹

¹⁸ As a reminder, the non-participants were drawn directly from the list of people who had called the Energy Trust for information and yet not installed a system to date. Some of these respondents, however, had never had to contact the Trust for any reason other than the initial call.

¹⁹ The Program did not allow self-installations during the period covered by this evaluation.

- “I did not get any resolution regarding green tags, and would like to get them. The Energy Trust did not provide a satisfactory response on this issue.”

Comparison with PV Market Characterization Results

Several differences can be identified between participants surveyed for this evaluation and PV purchasers surveyed in the PV market characterization study.²⁰ Given the small sample in the earlier study (23) and changes in technology since many of the pre-Program purchasers completed their PV installation, these differences suggest that the Program may be reaching a different market segment. The evaluation survey found that:

- Program purchaser had considered a solar purchase for fewer years prior to installation than had pre-Program purchasers
- Program purchasers were less likely to have had previous experience with solar energy than pre-Program purchasers
- Program purchasers were more likely to report that the information provided by the installation contractor was important in their purchase decision than were pre-Program purchasers

At the same time, both Program and pre-Program purchasers expressed similar levels of satisfaction with the completed solar project, suggesting that Program installations are meeting expectations about as well as pre-Program installations did.

²⁰ Energy Market Innovations, Inc. (October 15, 2003). Oregon Photovoltaic Market Characterization: Final Report.

VII. Results of Multiattribute Analytic Hierarchic Process

Approach

AHP is a mathematical approach that estimates relative importance of various factors in decision making using pair-wise comparisons. In this case, for example, we asked respondents to compare the importance of long-term energy bill reduction to that of environmental benefits in their decision to purchase a solar system. The respondent may indicate the “environmental benefits” was more important. The follow up question would be to indicate, on a scale of 1 to 9, how much more important the item is, as outlined in Figure VII.1.

Figure VII.1: Analytic Hierarchy Process Scales

| |
|--|
| 1 = One item is <i>EQUALLY</i> as important as the other |
| 3 = One item is <i>MODERATELY</i> more important than the other |
| 5 = One item is <i>STRONGLY</i> more important than the other |
| 7 = One item is <i>VERY STRONGLY</i> more important than the other |
| 9 = One item is <i>EXTREMELY</i> more important than the other |
| 2, 4, 6, and 8 are intermediate values |

Responses are aggregated for each respondent and across all respondents to compute relative importance weights of the attributes and the barriers as shown below. While we propose that the Energy Trust conduct these surveys each year with new participants and information seekers, the results reported here are from the first year of data collection. Changes in attributes and barrier weights are measured, and conducting these analyses over time would allow for the determining at what point in time, and on what variables, participant motivations change, indicating that the market has changed to include purchasers who are no longer innovators or early adopters. The motivations, as they change, will also assist the Energy Trust in refining/revising marketing messages.

Results

Attributes. As described in the Methodology section, each of the three respondent types – pre-Program purchasers, Program participants and non-participants – were asked pair-wise comparisons regarding their valuation of six decision-making attributes. The weight for each attribute, by respondent type, as determined by the AHP model is provided in Table VII.1. While Innovators considered the environment benefits of a photovoltaic and/or solar

thermal system as the most important factor in their decision to install a solar system, participants and non-participants place a greater emphasis on the availability of financial incentives.

**Table VII.1: Assessment of Decision-Making Attributes
(Importance Weights)**

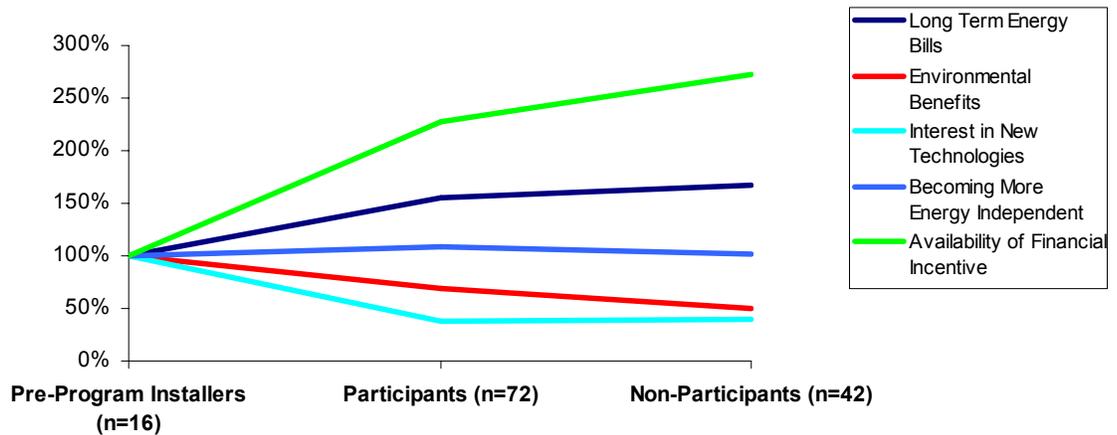
| Purchaser Type | Pre-Program (Innovators) (n=15) | Participants (Early Adopters) (n=72) | Non-Participants (Early Majority) (n=42) |
|-------------------------------------|---------------------------------------|--|--|
| Long-Term Energy Bill Savings | 0.08 | 0.13 | 0.14 |
| Environmental Benefits | 0.32 | 0.22 | 0.16 |
| Interest in New Technologies | 0.23 | 0.09 | 0.09 |
| Becoming More Energy Independent | 0.22 | 0.24 | 0.22 |
| Availability of Financial Incentive | 0.14 | 0.32 | 0.38 |

Figure VII.2 represents a slightly different way of viewing the results. The individual group (pre-Program, participants and non-participants) weights within each attribute (e.g., long-term monetary savings) are normalized with respect to the pre-Program. As such, pre-Program weights are equal to 100%, and the other two groups' weights show their respective assessment of the importance of the attribute relative to that of the pre-Program. These three customer groups, in essence, represent three stages on a product diffusion curve.

As evident in Figure VII.2, the availability of an incentive is more important to non-participants than to participants and in turn, significantly more important to participants than pre-Program customers. Environmental benefits, as seen in the figure, are most important to the pre-Program group. The importance of environmental benefits clearly declines as you move to participants and then again to non-participants. In addition to being more interested in the environmental benefits of installing a photovoltaic and/or solar thermal system, pre-Program customers also displayed the greatest interest in new technologies.²¹ While the importance of becoming energy independent was constant across all respondents, the monetary benefits of savings on the energy bill is more important for non-participants than for either participants or pre-Program customers. This is expected in product diffusion. As you move along the curve, monetary benefits (cost-benefit) are expected to become more important.

²¹ The literature suggests that fascination with new technologies is a driver for the “innovator” and not most others, including early adopters.

Figure VII.2: AHP System Attribute Model Results



Barriers

Again, each of the three respondent types were asked pair-wise comparisons regarding their valuation of the common market barriers that are associated with preventing the adoption of solar systems.

The weight for each attribute, by respondent type, as determined by the AHP model, is provided in Table VII.2. As evident in the table, all respondent types considered up front cost to be the greatest barrier.

Table VII.2: Barriers to Solar Purchasers (Importance Weights)

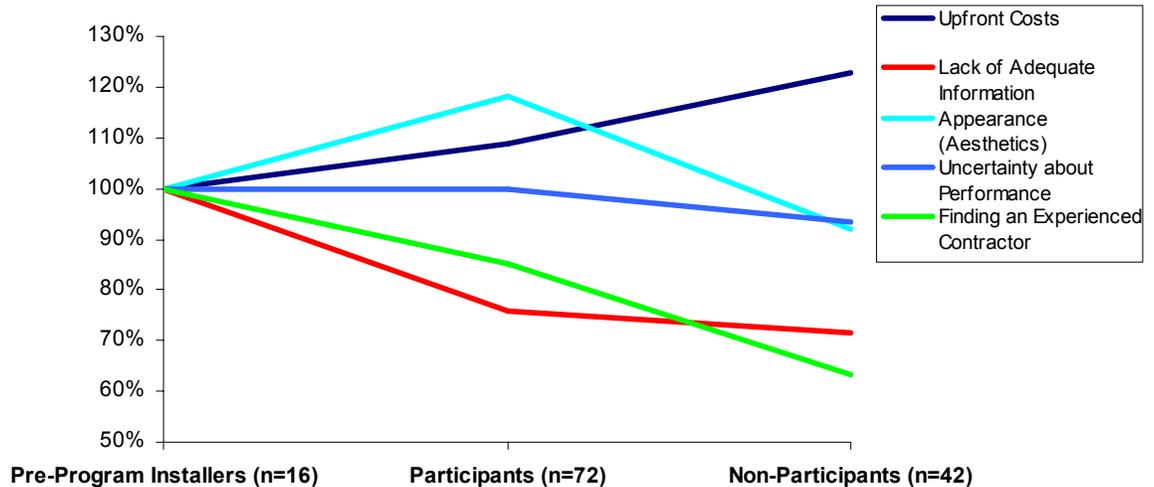
| Purchaser Type | Pre-Program (n=15) | Participants (n=72) | Non-Participants (n=42) |
|-----------------------------------|--------------------|---------------------|-------------------------|
| Upfront Cost | 0.48 | 0.52 | 0.59 |
| Lack of Adequate Information | 0.19 | 0.15 | 0.14 |
| Appearance (Aesthetics) | 0.11 | 0.13 | 0.1 |
| Uncertainty about Performance | 0.11 | 0.11 | 0.1 |
| Finding an Experienced Contractor | 0.11 | 0.09 | 0.07 |

Figure VII.3 is constructed in a similar manner to Figure VII.2 above. As the figure shows:

- Upfront cost barrier increases in importance going from pre-Program to participants to non-participants.
- Lack of adequate information and finding experienced contractors become significantly less important as barriers for participants and non-participants.

- Uncertainty about performance also declines from pre-Program to participant to non-participant, though not at such an extreme rate.
- Aesthetics were a much larger barrier for participants than the other two response groups.

Figure VII.3: Barriers to Installing a Solar System



Overall, the results of the AHP analysis are intuitive. They resemble the shift in importance of attributes that one would expect in moving along the diffusion curve. In this case, as the market is moving along the solar systems diffusion curve:

- Monetary matters (long-term savings and financial incentives, i.e., cost effectiveness) become more important.
- Environmental benefits and interest in new technologies become less important
- Energy independence becomes moderately less important

With regard to the significance of barriers:

- Upfront cost increases in importance as a barrier along the diffusion curve.

- Information, uncertainty, and experienced vendors will become less important. This is presumably due to additional information and experiences from completed projects being available to the market.²²

Therefore, unless the affordability of installing these systems improves, either through cost reduction, energy cost increases, or increased financial incentives, the movement along the solar system diffusion curve is likely to be very limited. This analysis has shown that the curve may already be beyond the innovators and into market segments more interested in financial rewards than environmental stewardship and technological innovation. This may also, however, be an artifact of the incentive itself, with those utilizing the Energy Trust program or considering using it to install a system, bringing this attribute more to the forefront in their thinking.

These findings are based on a very limited sample, and one assessment, and should be viewed only as an early indication of possible movement along the curve. Determining to what extent these trends continue requires data collection over several years to compare to this baseline. Only then can we say with confidence that there is evidence of moving further along the diffusion and market transformation curve.

²² AHP measures the *relative* and not *absolute* importance of barriers to each other. In other words, it is possible that all barriers have become less important, but relative importance of one to the other may have increased. Earlier in the report, we conclude that consumers valued sources of information about equipment and expected performance. Yet our AHP results indicate that information is becoming less important relative to primarily the upfront cost.

VIII. Discussion & Recommendations

Discussion of Key Findings

The Program accomplished a great deal during the first phase, identifying and enlisting contractors and developing processes, materials, and mechanisms aimed at enhancing system performance. New businesses were started, employees hired, and sales, especially of PV, increased for many of the participating contractors. Consumers installing solar systems express high levels of satisfaction with equipment installation and with the contractors. But, there is diversity among contractors and key informants in their view of key Program components, with some thinking Program requirements are needed to ensure quality, while others do not. Some believe the incentives are too low, while others think they are no longer needed. Some are actively marketing the Program, while others do not or cannot.

Some issues of concern surfaced during our investigation and are addressed in our recommendations. Central to the issues and to our recommendations is the question of the extent to which the Energy Trust is interested in short-term savings acquisition or longer-term market change. Or, if the organization is interested in both, how can they balance what is needed to achieve the changes. This issue affects all aspects of Program delivery, including incentive type and level, quality control for contractors, maintaining contractor activity in the market, approaches to marketing, and expanding or targeting market sectors.

The following discussion of findings is organized by barrier addressed by the Program.

Barriers Addressed

Knowledge

The Energy Trust addressed the knowledge barrier by providing phone and Web-based information, as well as some marketing efforts, such as holding community meetings, using various media, attending events, and providing limited materials. The evaluation revealed a consensus among key informants and contractors that the Program has yet to become visible and that the current level of support for marketing is inadequate. Most felt that the public is not aware of solar opportunities. Marketing for SWH was especially weak during this first year, both by the Energy Trust and by contractors, who realized more profit from PV installations.

While Energy Trust staff emphasize that the Program is to be contractor-driven, the data indicate that market actors perceive the need for a broader marketing effort by the Energy Trust. This effort is needed to expand knowledge of solar technologies, as well as of the Program. With the contractors currently responsible for marketing the Program, the “message” is limited to customers expressing interest. In addition, only a few contractors are actively marketing; others are too small to do so.

These limitations, combined with the high first cost of systems, results in a very small segment – early adopters with sufficient incomes – choosing solar options. While this approach may have provided short-term installations to meet the Energy Trust goals in the first phase (and did so only for PV and in PacifiCorp territory), it is not sufficient to achieve long-term market change. To do so will require greater outreach, combined with education, to both the general public and in target markets, such as new construction.

In thinking about this issue, it is also useful to compare the ratio of funds going toward public awareness versus incentives, which varies by state. Wisconsin, for example, in choosing to focus first on “preparing the marketplace,” devotes more to awareness.

System Performance

The Energy Trust program addresses the performance barrier primarily through efforts to increase the number of qualified installers. The data show a contrast between the perspective of some key informants and contractors, who express concern about the competency of some contractors, and the largely positive ratings participating customers give to their project contractors.

We heard concern expressed about the quality of contractors primarily from union and industry organization representatives, and from one large contractor. Their views are not to be dismissed as they hear from and represent a wide range of players. Some of their concerns rise from the entry into the market of newer firms with less experience in Oregon and with different approaches to customer outreach and sales, and with the potential that inferior installations, if occurring, may cause issues in the future. This may be reflective of a “requirements are needed for them, but not for me” attitude, but may also indicate that there are a few contractors doing inferior installations. The Energy Trust requirements are needed ensure quality contracting and installation.

Delivery

The Program approaches delivery barriers through specific technical specifications, having knowledgeable utilities, and using independent inspections. Some contractors and key informants expressed concern, however, that the Program’s technical requirements were adding significantly

to installation costs and that, given the already high first cost of the technology, if the incentive does not exceed these extra costs, they cannot pass an incentive along to their customers. Some also said that the time and complexity of paperwork, as well as the lack of fit of this process with the normal construction process, were barriers to participation.

Still, there is clear recognition that the Energy Trust has made some effort to simplify the process (although more effort is desired), and many accept the requirements as necessary when there is an incentive, especially recognizing the significant contribution the Program has made to their sales. There is also some evidence that contractors are learning to more accurately build Program costs into the cost of doing business.

The use of independent inspectors also elicited negative views from some of the informants and contractors. Those expressing concern see an inconsistency across inspectors, as well as redundancy and additional time and cost involved in having as many as three inspectors (city/county, utility, and the Energy Trust) for each project. The evaluation did not include data collection to either confirm or reject these views.

Incentive to Reduce First Cost

Intended to address the first cost barrier (in concert with the state tax credits), the incentive served to move consumers, some of whom reported having considered PV for five to ten years, to take action. At its highest level (\$4.25/W DC for PV), the incentive resulted in rapid sales for most contractors; at its reduced level, however, activity has lagged. More than 50% of the contractors expressed concern with the shifting incentive levels and are hesitant to make long-term investments in their businesses until they have confidence in a stable incentive level. A few, however, feel that “the writing is on the wall,” with energy prices soaring and programs like this one to push demand, and are investing in elaborate marketing efforts (e.g., a demonstration van to more effectively reach consumers).

Setting the correct incentive level has been a challenge for most states using system benefit funds to fund programs to support renewable energy technologies (in this discussion, for PV). Many started programs offering very low incentives but had to increase them, sometimes more than once, then reduce them again due to overwhelming response. Many states are now revising their initial buy-down programs, including instituting declining incentives and moving to loan and financing options or combining these with incentives. Wisconsin, for example, uses low-interest loans (buy-down of Fannie Mae), as well as a first cost incentive (no more than 25% of system cost). Others, such as Massachusetts, are using performance-based incentive structures.

Other Process Issues

Customer & Contractor Concerns with the Energy Trust Response

A few key informants, contractors, and customers expressed concerns with the knowledge level of staff at the Energy Trust. For dissatisfied callers, this may be the hotline staff, although we do not know exactly with whom they spoke. For contractors and key informants, the desire was for Program staff, or someone involved with the Program, to have greater knowledge of electrical and construction contracting industries.

Performance on the Energy Trust’s “Critical Success Factors”

In designing the Program, the Energy Trust developed a set of critical success factors by which to measure Program progress and achievement. While each was not directly measured as part of this process evaluation, these evaluation data provide a basis upon which to assess progress toward these goals.

Table VIII.1: Performance on the Energy Trust Success Factors

| Factor | Progress Assessment |
|--|--|
| A high level of customer satisfaction during the early phases to strengthen the positive image of solar for customers and industry | Survey results indicate high levels of satisfaction with equipment installation and performance |
| Continued positive support of net-metering by PacifiCorp and PGE in order to broaden the market penetration for grid-tied PV in Oregon. | Few problems encountered with net metering; both utilities support |
| Effective marrying of the Energy Trust requirements, Oregon tax incentives, and solar vendor processes in such a way as to provide efficient Program information and avoid duplicate processes or conflicting messages | Interviews indicate a smooth relationship with ODOE and cross-promotion on both sides of the Program and the tax credits |
| Monitoring and modifying Program processes and forms to achieve early improvements in Program achievement and Program efficiency | Interviews indicate that while some modifications have been made, contractors still report that program processes are too complex and time consuming, although they are adapting |
| Evaluation of education market capabilities and needs to expand into certified installer training Programs and/or improve course effectiveness | <p>Seven technical training centers established; no evaluation of training programs completed</p> <p>Unions express desire for more training</p> <p>Survey data indicate that customers are very satisfied with contractor performance; some concern among informants and contractors with quality of contractors.</p> |
| Develop and maintain an open and cooperative relationship with PV vendors, customers, and industry leaders to enhance perception of working with the Energy Trust | All expressed view that the Energy Trust was learning, and making some changes, and in general trying to work cooperatively with industry groups. Contractors and customers expressed some concern with staff ability to address questions/issues and knowledge of technology and market in which contractors operate |
| Simplifying the end-to-end process of selecting and installing a PV system for the customer | Participants using the contractor as a key information source; pre-program purchasers did not seeing the contractor as a key information source |

Recommendations

Based on the issues discussed above, our team makes the following recommendations. We believe that marketing and incentives are needed to enhance knowledge and create short- and longer-term demand for solar alternatives.

We recognize that some of our recommendations are being considered for the Energy Trust's Phase 2 approach.²³ This evaluation was focused on Phase 1 activities; as such, it reveals information that may inform action in Phase 2.

1. **Conclusion:** The Program has been effective in expanding the market capability for PV and in increasing the installation of PV systems throughout Oregon. The current level of marketing and incentives can be expected to maintain installation capability and market response at a level greater than the pre-Program period, but at a lower rate than that achieved with incentives at \$4/W plus bonus.

Recommendation: The Energy Trust can continue to implement the Program and will continue to achieve PV installations at the current model levels.

2. **Conclusion:** The Energy Trust Solar Program currently can maintain capability but will not lead to a significant change in market response as currently designed. If the Energy Trust desires to facilitate market transformation at a higher level, there are a variety of opportunities for modifying the Program that might facilitate growth in demand.

Recommendation: To increase growth in market response, the Energy Trust will need to increase its role in marketing solar options to Oregon residents. All solar contractors do not have the capability to grow demand for their products. The Energy Trust can support contractors in a variety of ways, such as providing marketing collateral, placing advertisements in bills or on radio or in newspapers, and by offering co-branded material.

3. **Conclusion:** Solar contractors have demonstrated some reluctance to increase their staff and capability without certainty that the demand for PV will increase. Based on experience in the Program to date, the easiest way to increase demand is to increase the incentive. However, increasing the incentive also leads to potentially excessive demand relative to Program budget. Additionally, an incentive based on installed kW does not necessarily facilitate the installation of optimum systems. Some of the key informants and some of the contractors note that a production- or performance-based incentive could be used to promote better design and to increase the stability of the solar industry.

Recommendation: The Energy Trust has a good basic program design but should monitor the experiences of other states with performance-based or production incentives to determine if this model might be appropriate for future efforts.

4. **Conclusion:** The Solar Program has led to an increase in the number of installers in Oregon. There are a limited number of dissatisfied customers, so there is good reason to believe that the contractor pool is

²³ Energy Trust of Oregon, Inc. Solar Electric Program Guide. Rev. 10, 9/15/03, p. 9.

performing well. At the same time, there is a mixed assessment on the part of contractors and key informants relative to “other contractors.” There is no way for this evaluation to determine directly whether there is a problem, yet the evaluation finds that the standards and requirements for the Program, including inspections, are the primary tool the Energy Trust has to monitor quality.

Recommendation: Continue Program standards and requirements for contractors and system quality. At the same time, continue to look for ways to reduce the paperwork, by minimizing redundancy, permitting contractors to identify projects and obtain Energy Trust input early in the sales process, and to streamline decision making at the Energy Trust to ensure contractors are able to be responsive to their customer’s timelines.

5. **Conclusion:** Solar contractors perceive there to be inconsistency in the Energy Trust inspections. This evaluation could not directly determine if there was any problem but recognizes that it can be addressed.

Recommendation: Arrange for the inspectors to develop a common protocol and conduct biannual meetings to review the protocol and discuss and resolve potential inconsistencies in their inspection efforts.

6. **Conclusion:** Solar technologies are evolving at a rapid rate. Solar contractors typically are on the front line of these changes. Energy Trust program staff need to work to stay as current as the contractors. Contractors can use additional support on certain technical issues, which are becoming more complex as the technology advances. To bring Union members into the solar community also takes education. The Energy Trust has expanded the solar education capabilities for nine institutions in Oregon, and this effort will need to continue, as well as exploring specifically enhanced coordination with Union trainers.

Recommendation: Continue to explore opportunities to expand educational capabilities for solar contractors, for building inspectors, for union leaders, for utility staff and for Energy Trust staff themselves. This should be a high priority for the Energy Trust, in cooperation with the Oregon Department of Energy.

Appendix A. Memo: Reasons for Differences in PV and SWH Subscription



Date: June 30, 2004
To: Ben Bronfman, Peter West; Energy Trust of Oregon
From: Sharon Baggett
Re: Interim Memo; Preliminary Results from Solar Program Evaluation

This memo, as outlined in the evaluation workplan, is focused on addressing the ETO's initial questions:

- Reasons why the Photovoltaic (PV) component of the Solar Program was oversubscribed in the first few months of 2004, while solar thermal applications (ST) lagged
- Reasons for geographic variability in program subscription

To address this issue, our team conducted in-depth, telephone interviews with:

- Three key informants
- Nine contractors

For our sample, we chose the top producing 12 contractors from the program database. Additional participating contractors will be surveyed in later stages of the process evaluation. This sample was intended to provide a quick view into the reasons for PV subscription rates and general information on the market for solar technologies in different geographic regions of Oregon.

Key Preliminary Results

Reasons for Difference in PV and ST Participation

While there were some differing views expressed among contractors and key informants, there was a great deal of consistency in their views on the reasons for the level of PV subscription. Key reasons identified were:

- There is more money to be made in PV.

“The plumbing systems you make \$1,000 a day versus 4 or 5k for PV. So it is pretty cut and dried. And water heating packages are not maintenance free, whereas PV has almost no maintenance. So that [PV] is the direction any smart contractor will try to head.”

“Thermal market will suffer until the incentive is increased; it competes with the PV market in terms of contractor profits and the difficulty of the system installation. Unless the incentives can be sufficient to cover these differences, ST will languish.”

- PV was promoted more, especially when the incentive was high. The incentives made PV affordable for those with an interest.
- The ST incentive is low at a time when costs are increasing due to the rising costs of materials (e.g., copper), and the ETO did not really promote ST. One informant noted, “no marketing has been a real loss for solar water heating.”
- There have been few innovations in ST technology, unlike PV.
- Customer views of PV, on the one hand, are more positive – “it’s glamorous, cool, magical, cutting edge technology.” Solar thermal, on the other hand, is seen as complex, costly, and has aesthetic barriers as well.
- ST requirements, based on the Bright Way program, are a disincentive to some contractors. One informant said his organization estimated that these requirements add \$500 to \$1,000 to the system cost.

Differences in Program Participation by Areas of State

- Customers in the growth areas, Bend and southern Oregon, represent some immigration from California, where more experiences with PV has lead to greater confidence and, consequently, purchase.
- There have been some new firms entering the market and some existing firms who sold more PV as a result of the incentive. One or two of the firms beginning to do business in Oregon as a result of the incentive have experience in other solar programs throughout the U.S. And, in general, there are more contractors in the PacifiCorp’s service territory than in that of PGE.

Response to ETO Program

- The incentive definitely increased sales for PV, and most contractors were positive about the program, with reservations regarding ETO’s learning curve and negative views about constantly changing rates and policies. Many of those we spoke with felt that the Program, and ETO’s management of it, was “slightly better” now than in the beginning.

- The rapid change in PV incentives negatively affected some contractors. Two noted that the abrupt change caused them to lose money and projects, with one contractor reporting that the cap on the commercial side took away his entire commercial market. Limiting contractors to eight projects had a similar negative effect on a couple of contractors who had more than eight projects in development.

“A solar system is not an impulse buy. You work with a customer. They think about it for a while. You can’t go back to them and tell them the program has changed.”

“Consistency is very important so that the contractors can do advertising, talk a single story to the consumers, and so they can make a business plan.”

- Four contractors said they have increased staff, and some reported having hired more subcontractors. Others were cautious about the long-term stability of the market (and the incentives) and did not want to add permanent staff. Most of the contractors have been small, and stay small, due to uncertainty about the market.

“Providing more certainty of a market is the best thing that could be done, and then the firms will invest their own money into their firms.”

- With the reduction in PV incentive, a few contractors said they intend to promote ST more often.
- One respondent and one informant noted that the up-front incentive has contributed to less professional contractors entering the market.

Based on these results, our team believes that several actions could be taken during this program year to address the difference in subscription rates and geographic distribution of participation:

- ***Raise incentive for solar thermal, market it aggressively.*** Contractors we interviewed noted that the added cost, \$500 to \$1,000 more, to qualify for ST program, given the current incentive, made no sense. Others estimated that ST costs have increased in the last year by up to \$1,000 per system, and the incentive does not address this increase.
- ***Continue PV incentive and review levels by utility territory.*** Contractors and key informants believe incentives are critical for maintaining the PV market; and these incentives should remain constant, not move up and down. As one informant noted, “the yoyo affect to find the right rebate amount has been very confusing and hard on sales.” Another noted that “we know for certain that \$2.50 is too low but do not know where the next point is that works. It may be

that \$3 works well enough in the Pacific territory, but \$3.25 in PGE seems too low still.”

- ***Market in the valley.*** Contractors and key informants believe there is a market for PV, even in the Willamette valley region. However, the ETO should do more to demonstrate that PV works in this region of the state and market this more effectively. The ETO should conduct community presentations, especially in PGE territory, similar to those conducted early in the Program. As one key informant noted, “need to do it and keep doing it.” Marketing can work with incentives to raise awareness and create demand for PV.

Note:

Our discussions with the initial sample of contractors and key informants also provided insights into the current market for PV and ST and to other issues related to developing these markets. We will provide a discussion of these data in the process evaluation report, along with additional data collected from program participants, contractors, and informants. However, if the ETO staff is interested in these preliminary insights, we can discuss them at your convenience.

Appendix B. Interview Guides



Energy Trust Solar Program Evaluation

Key Informant Interview Guide

June 15, 2004

General Questions:

1. How have you been involved with the ETO solar program? What was your level of input during Program development? What is your relationship with the Program now? (delivery, advisor, partner, observer)
2. What is your perception of the consumer response to the Solar Program, both PV and solar water heating? What about the contractor response? Was this what you expected? Why?
3. What affect do you think the ETO Solar Program has had on the market for PV and solar water heating systems in Oregon? Why? What other factors do you think might be at work, in addition to the Program? (Oregon Tax Credit, market trends, other solar programs, green tags, Federal Tax Credits, etc.)
4. The PV portion of the ETO Solar Program is over subscribed while the solar water heating portion is undersubscribed. Why do you think this is the case?
5. What is the relationship of the ETO Solar Program to your constituency?
 - ODOE: What is the relationship between the state tax credits and ETO incentives – are consumers applying for both?
 - OSEIA: How is ETO supporting the solar industry and contractors?
6. Have issues about utility grid connection policies and support been a concern? If not, how were these issues addressed?
7. What is your perspective of the solar industry and marketplace? Do you expect demand for PV to remain strong in Oregon (or in particular areas)? Do you think demand for solar water heating systems will pick up in Oregon (or in particular areas)? Will the solar industry be able to respond? Why?
8. What is your assessment of the ETO Solar Program so far? What are the successes? Where has the Program fallen short?

9. What recommendations do you have for improving or modifying the ETO Solar Program? Specifically, what can be done to the Solar Water Heating Program to stimulate interest in solar water heating systems? In what ways could the PV Program be modified to maintain a stable market for PV systems in Oregon?
- Do incentive levels need to be maintained or increased?
 - Do outreach/marketing/education efforts need to be expanded? How?
 - Do efforts to support the solar industry, provide training, and develop standards and guidelines need to be improved? In what ways?



ETO Solar Program Evaluation

Interview Guide: Initial Contractor Interview

[Sample = 10; 3 most active; of 7 remaining, include some doing both PV & ST]

Intro: Hello, my name is _____ and I'm assisting the Energy Trust of Oregon in the evaluation of their Solar Program. We identified your business as one that has been active in ETO's incentive program this past year and would like to get some quick impressions from you. Do you have about five minutes to answer just a few questions?

1. How did the ETO Solar Program affect your sales of solar technology this past year?
2. What else affected your sales?
3. Have you increased your installation capability (staff or subcontractors) during this year? Why did you do (or not do) this?
4. What is your sense of the consumer's interest in PV versus solar thermal applications (pool and domestic hot water)? (Probe as to what they think is driving the interest in each)
5. Given this level of interest, to what extent do you promote PV versus Solar thermal applications? What influences your decision to do this? [Probe: low margins on ST, percent of overall sales, skepticism regarding program longevity, no consumer demand, other] [For contractors that just sell PV, ask how they are marketing.]
6. How do you see the ETO solar program targeting PV and solar thermal responding to current market trends or needs?
7. To what extent do you think it is necessary to maintain these incentives, even at a reduced level, to maintain market for PV? To what extent is the demand for PV staying the same, changing? What do you expect to happen in the near future? Longer term? Is there anything else the ETO should consider to maintain the market for PV?

8. What do you think might be done to stimulate the Solar Thermal market?

If you agree, we would like to contact you again later in the summer to explore, in more detail, your experience with solar products and with the ETO program. Would this be OK? If so, would you prefer to complete the survey by telephone, e-mail, or fax?

Appendix C. Survey Sample Dispositions and Demographics

Sample Disposition

Table C.1: Pre-Program

| Disposition | Pre-Program | Non-Participant | Participants |
|--------------------------------------|-------------|-----------------|--------------|
| NIS/DIS/change# | 26 | 15 | 26 |
| Non-residential | 10 | 16 | 13 |
| No answer | 2 | 3 | 5 |
| Busy | 7 | 1 | 3 |
| Cell phone | 1 | 1 | --- |
| Answering machine | 36 | 28 | 50 |
| Language | --- | 2 | --- |
| Not Available (Health/Deaf/Deceased) | 1 | 1 | --- |
| Away for duration | 1 | 3 | 4 |
| Callback | 4 | 13 | 12 |
| Callback to complete | 2 | 1 | --- |
| Terminate | 3 | 15 | --- |
| Refusal -- Initial | --- | 5 | 7 |
| Screen Outs | --- | 6 | 4 |
| Complete | 40 | 50 | 74 |
| Not Called | --- | 36 | 23 |
| Total | 133 | 196 | 221 |

PV Participant and Non-Participant Sample Demographics

Table C.2: Annual Household Income (2003 – Residential Only)

| | Participant | | Non-Participant | |
|-----------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Less than \$50,000 | 18 | 28% | 13 | 57% |
| \$50,000 - \$75,000 | 22 | 34% | 4 | 17% |
| \$75,000 - \$100,000 | 13 | 20% | 4 | 17% |
| \$100,000 - \$150,000 | 7 | 11% | --- | --- |
| Over \$150,000 | 3 | 5% | --- | --- |
| Don't know/Not Sure | 1 | 2% | 2 | 9% |
| | 64 | 100% | 23 | 100% |

Table C.3: Length of Residence

| | Participant | | Non-Participant | |
|--------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Less than one year | --- | --- | 1 | 4% |
| 1-2 years | 4 | 6% | --- | --- |
| 3-5 years | 5 | 8% | 5 | 22% |
| 6-10 years | 6 | 9% | 2 | 9% |
| More than 10 years | 49 | 77% | 15 | 65% |
| | 64 | 100% | 23 | 100% |

Table C.4: Age of Home

| | Participant | | Non-Participant | |
|------------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Less than 5 years old | 20 | 31% | 4 | 17% |
| 5 – 10 years | 10 | 16% | 4 | 17% |
| 11 – 15 years | 4 | 6% | 1 | 4% |
| 16 – 20 years | 7 | 11% | --- | --- |
| 21 - 25 years | 6 | 9% | 2 | 9% |
| More than 25 years old | 17 | 27% | 7 | 30% |
| Don't know | --- | --- | 5 | 22% |
| | 64 | 100% | 23 | 100% |

Table C.5: Square Footage of Commercial Business

| | Participant | Non-Participant |
|------------------|-------------|-----------------|
| 1,001 to 5,000 | --- | 1 |
| 5,001 to 10,000 | 1 | --- |
| 10,001 to 25,000 | 1 | 1 |
| 25,001 to 50,000 | --- | 1 |
| | 2 | 3 |

Table C.6: Number of Business Establishments

| | Participant | Non-Participant |
|--------|-------------|-----------------|
| One | 1 | 3 |
| 2 to 5 | 1 | --- |
| | 2 | 3 |

Table C.7: Number of Employees

| | Participant | Non-Participant |
|--------------|-------------|-----------------|
| Fewer than 5 | 1 | 1 |
| 10 to 19 | 1 | --- |
| 20 to 49 | --- | 2 |
| | 2 | 3 |

Appendix D. *Surveys*

ETO Solar Program Participant Survey

[In items below, **insert PV or solar water** based on information from database]

Hello, my name is _____, and I'm calling on behalf of the Energy Trust of Oregon. We are talking with households in Oregon that have installed a photovoltaic/solar water heating system and then received a discount, through their installer, as part of the Energy Trust's Solar Program. Could I please speak to the person most familiar with your PV/solar water heating system?

[If needed: The interview will take about 15 minutes.]

[If no one in the household is familiar, terminate politely. Arrange for call back if needed. When the correct person is on the phone, repeat the introduction as needed and continue]

Screening

A. To double check, are you familiar with the buying and installing of your PV/solar water system?

Yes

No Thank and terminate

B. Are you still operating your PV/solar water heating system at your home?

Yes Go To Q1

No

C. Could you tell me why you are not operating the system at this time?

Introduction

1. How did you first learn about the incentive offered by the Energy Trust of Oregon?

Attended community event

Installer/contractor

Friend or colleague

Called Energy Trust

Energy Trust website

Other (specify _____)

Don't know/don't remember [DO NOT READ]

2. How long had considered installing your current PV/solar water heating system?
- Less than one year
 - 1-2 years
 - 3-5 years
 - 6-10 years
 - More than 10 years
 - Don't know/don't remember [DO NOT READ]
- 2a. When did you take the first concrete step toward the purchase of your current system? [If needed: examples include contacting a contractor, doing research on options, etc.]
- Less than one year ago
 - 1-2 years ago
 - 3-5 years ago
 - More than 5 years ago
 - Don't know/don't remember [DO NOT READ]
3. Have you previously owned a solar system (PV or solar water heating)?
- Yes
 - No GO TO Q5
4. What type did you previously own?
- PV
 - Solar thermal (water heating)
 - Both
5. Is the system for which you received the ETO incentive a:
- New system
 - Addition to existing system
6. In researching your solar system, what types of information were most useful to you? [RECORD ALL THAT APPLY]
- Fact sheets
 - Case studies
 - Performance reviews
 - Maintenance requirements costs over time
 - Documents on how to install
 - Other (specify _____)

7. Through what medium do you prefer to access this type of information? (Record all that apply)

- Website (electronic)
- Printed medium (brochures)
- Workshops
- Contractor
- Other (specify: _____)

8. How would you rate the importance of each of the following in your decision to install PV/ST? Would you say (insert a-j) had high, medium, low, or no importance in your decision?

| | High Importance | Medium Importance | Low Importance | No Importance | DK/NA |
|--|-----------------|-------------------|----------------|---------------|-------|
| a. Owning or using a PV/solar water system in the past | | | | | |
| b. Having friends or colleagues who had installed PV/solar water heating systems | | | | | |
| c. Reading/learning about PV/solar water heating from magazines, journals, or websites | | | | | |
| d. Information gained at a home show, energy fair, or other | | | | | |
| e. Information gained from an environmental or solar organization | | | | | |
| j. Information provided by a PV/solar water heating contractor | | | | | |
| k. Information from your utility | | | | | |

9. Were there any other important sources of information or experience about solar systems that we haven't mentioned that helped you decide to install your system?

- Yes (Specify: _____)
- No GO TO Q10

- 9a. How important was this information? Was it of:
- High importance
 - Medium importance
 - Low importance
 - Don't know/not sure [DO NOT READ]
10. Were there any other types of information that would have been useful to you in your research and decision-making?
- Yes (Specify: _____)
 - No

AHP 1 – Assess Buyer Type

In the next series of questions, I'm going to ask you to prioritize some of the factors that might have been included in your decision to purchase a solar system.

[Information Seekers' verbs in parentheses]

11. First, in making the decision to buy your solar system, which of the following two factors was more important . . . ?

| | |
|-----------------------------------|------------------------|
| Long-Term Savings on Energy Bills | Environmental Benefits |
| 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |

- a. On a scale of 1 to 9 (1 being "Equally Important", 9 being "Extremely More Important"), how much more important was it?
12. In making the decision to buy your solar system, which of the following two factors was more important . . . ?

| | |
|-----------------------------------|------------------------------|
| Long-Term Savings on Energy Bills | Interest in New Technologies |
| 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |

- a. On a scale of 1 to 9 (1 being "Equally Important", 9 being "Extremely More Important"), how much more important was it?
13. In making the decision to buy your solar system, which of the following two factors was more important . . . ?

| | |
|-----------------------------------|----------------------------------|
| Long-Term Savings on Energy Bills | Becoming More Energy Independent |
| 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |

- a. On a scale of 1 to 9 (1 being "Equally Important", 9 being "Extremely More Important"), how much more important was it?

14. In making the decision to buy your solar system, which of the following two factors was more important . . . ?

| | | | | | | | | | | | | | | | | | |
|-----------------------------------|---|---|---|---|---------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Long-Term Savings on Energy Bills | | | | | Availability of a financial incentive | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important was it?

15. In making the decision to buy your solar system, which of the following two factors was more important . . . ?

| | | | | | | | | | | | | | | | | | |
|------------------------------|---|---|---|---|---------------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Interest in New Technologies | | | | | Availability of a financial incentive | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important was it?

AHP 2 – Assess Importance of Barriers

16. In deciding to move forward with your purchase of a solar system, which of these two factors concerned you more . . . ?

| | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|---|---|------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Up Front Capital Cost | | | | | Lack of Adequate Information | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important was it?

17. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned you more . . . ?

| | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|---|---|-------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Up Front Capital Cost | | | | | Uncertainty About Performance | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important was it?

18. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned you more . . . ?

| | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|---|---|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Up Front Capital Cost | | | | | Finding an Experienced Contractor | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important was it?

19. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned you more . . . ?

Up Front Capital Cost

Appearance (Aesthetics) of PV/ST systems

1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important was it?

20. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned you more . . . ?

Appearance (Aesthetics) of PV/ST systems

Uncertainty About Performance

1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important was it?

Installation and Performance

21. Which of the following best describes who installed your solar water heating system? Was it . . .

- A contractor
- You, with help from a contractor
- You [Note to interviewers: This could include friends or others too.]
- Other (specify: _____)

22. How would you rate the information the contractor provided on the Energy Trust of Oregon and how the Trust incentive could lower the cost of your system? Would you say the information was:

- Very clear
- Somewhat clear
- Neither clear nor unclear
- Not very clear
- Not at all clear
- Contractor did not provide information [DO NOT READ]
- Don't know/don't remember [DO NOT READ]

- 22a. [If “not very clear” or “not at all clear”] Why do you say that? {probe what was unclear?}

23. To what extent was this information useful in making your decision to install a solar system?
- Very useful
 - Somewhat useful
 - Neither useful nor not useful
 - Not very useful
 - Not at all useful
 - Don't know/don't remember [DO NOT READ]

[DO NOT ASK #24 if no contractor was involved in installation – Q. 21]

24. How satisfied were you with the installation of your PV/solar water heating system? Would you say . . .
- Very satisfied
 - Somewhat satisfied
 - Neither satisfied nor dissatisfied
 - Somewhat dissatisfied
 - Very dissatisfied
 - Don't know/too soon to tell [DO NOT READ]

25. Why do you say (insert rating from question above)

26. How satisfied are you with the performance of your PV/solar water heating system?
- Very satisfied
 - Somewhat satisfied
 - Neither satisfied nor dissatisfied
 - Somewhat dissatisfied
 - Very dissatisfied
 - Don't know/too soon to tell [DO NOT READ]

27. Why do you say (insert rating from question above)

Satisfaction

We'd like to get a sense of your satisfaction with the overall Energy Trust of Oregon Solar Program. Please use a scale from 1 to 5, where 1 indicates **not at all satisfied** and 5 indicates **completely satisfied**. Please rate

28. Your satisfaction with the rebate amount

- 1 (specify: why? _____)
- 2 (specify: why? _____)
- 3
- 4
- 5
- Don't know/not sure [DO NOT READ]

29. Your overall satisfaction with your program experience

- 1 (specify: why? _____)
- 2 (specify: why? _____)
- 3
- 4
- 5
- Don't know/not sure [DO NOT READ]

30. Your satisfaction with the savings on your monthly energy bill

- 1 (specify: why? _____)
- 2 (specify: why? _____)
- 3
- 4
- 5
- Don't know/not sure [DO NOT READ]
- Too soon too tell/other (specify response: _____)

I have a few questions that deal specifically with these interactions you may have had with the Energy Trust. Please use a scale from 1 to 5, where 1 indicates **extremely unsatisfactory** and 5 indicates **extremely satisfactory**.

31. Have you ever spoken with anyone at the Energy Trust on the phone?

- Yes
- No GO TO Q35

32. How would you rate the Energy Trust's courtesy on the phone:
- 1 (specify: why? _____)
 - 2 (specify: why? _____)
 - 3
 - 4
 - 5
33. How would you rate the Energy Trust's helpfulness on the phone:
- 1 (specify: why? _____)
 - 2 (specify: why? _____)
 - 3
 - 4
 - 5
34. How would you rate the Energy Trust's knowledge of program services:
- 1 (specify: why? _____)
 - 2 (specify: why? _____)
 - 3
 - 4
 - 5
35. Have you spoken to or written to the Trust about any issues that needed resolution?
- Yes
 - No GO TO Q37
36. On a scale of 1 to 5, where 1 indicates extremely unsatisfactory and 5 indicates extremely satisfactory, how would you rate your satisfaction with any issue that needed resolution:
- 1 (specify: why? _____)
 - 2 (specify: why? _____)
 - 3
 - 4
 - 5

Finally, I'd like to ask just a few questions that tell us a bit more about participants in ETO's programs. Again, all responses remain completely confidential.

37. How long have you lived in Oregon?
- Less than one year
 - 1- 2 years
 - 3-5 years
 - 6-10 years
 - More than 10 years
38. Approximately how old is your home? Is it . . .
- Less than 5 years old
 - 5 – 10 years
 - 11 – 15 years
 - 16 – 20 years
 - 21 - 25 years
 - More than 25 years old
 - DK/NA
39. About how large is your home in square feet, excluding your garage? Is it . . .
- Less than 1,500 square feet
 - 1,500 – 2,000 square feet
 - 2,000 – 2,500 square feet
 - 2,500 – 3,000 square feet
 - More than 3,000 square feet
 - DK/NA
40. Which of these categories best describes your annual household income in 2003? Would it be . . .
- Less than \$50,000
 - \$50,000 - \$75,000
 - \$75,000 - \$100,000
 - \$100,000 - \$150,000
 - Over \$150,000
 - DK/NA

41. Which of these categories best describes your age? Is it . . .

- Less than 25
- 25 – 34
- 35 – 44
- 45 – 54
- 55 – 59
- 60 – 64
- Over 64
- DK/NA/Refused

Thank you very much for your help.

Interviewer: Note the person's gender.

- Male
- Female

Note from database:

- Commercial
- Residential

Date of completion: _____

Time of completion: _____

Interviewer: _____

ETO Solar Program Non-Participant Survey

[In items below, insert PV or solar water heating based on information from database]

Hello, my name is _____, and I'm calling on behalf of the Energy Trust of Oregon. To help the Energy Trust improve its services, we are talking with persons who called the Energy Trust for information about the incentives they are offering for installing photovoltaic systems or solar water heating systems. Could I please speak to the person who called the Energy Trust for information?

[If needed: The interview will take about 5-7 minutes.]

- Yes
- No one in the household called..... Terminate
- Person is not available Arrange for call back
[When the correct person is on the phone, repeat the introduction as needed and continue]

Screening

- A. To double check, are you the person who called the Energy Trust for information about their program for PV and solar water systems?
- Yes
 - No Thank and terminate

Introduction

1. What was the main reason you called the Energy Trust about incentives for installing solar system? [DO NOT READ; RECORD ALL OPEN ENDED RESPONSES]
 - Heard about it from friend and wanted more information
 - Installer/contractor told me to call them about the incentives
 - Called Energy Trust for another reason and they told me about the incentive
 - Saw it on the website and wanted to learn more
 - News article piqued my interest
 - TV feature piqued my interest
 - I had a question about the program
 - Other (specify: _____)
 - Don't know/don't remember [DO NOT READ]

2. How long have you been considering the installation of a PV/solar water heating system?
- Less than 1 year
 - 1-2 years
 - 3-5 years
 - 6-10 years
 - More than 10 years
 - Don't know/don't remember
3. Have you taken any concrete steps toward an installation?
- Yes (specify: _____)
 - No GO TO Q4
- 3b. How long ago did you take this step?
- Less than one year ago
 - 1-2 years ago
 - 3-5 years ago
 - More than 5 years ago
 - Don't know/don't remember [DO NOT READ]
4. Have you previously owned a solar system (PV or solar water heating)?
- Yes
 - No GO TO Q6
5. What type did you previously own?
- PV
 - Solar thermal (water heating)
 - Both
6. In researching a PV/ST system, what types of information have been most useful to you?
- Fact sheets
 - Case studies
 - Performance reviews
 - Maintenance requirements & costs over time
 - Documents on how to install
 - Other (specify _____)
7. Through what medium do you prefer to access this information? [Record all that apply]
- Website (electronic)
 - Printed medium (brochures)
 - Workshops
 - Contractor
 - Other (specify: _____)

8. Have you installed, or are you in the process of installing, a PV or solar thermal water heating system since you contacted the Energy Trust?

- Yes, PV
- Yes, solar thermal water heating
- Yes, both
- No GO TO Q15

9. Did you (or will you) apply for the state tax credit for your PV/solar water heating system?

- Yes GO TO Q12
- No

10. Why did you (will you) not apply for the tax credit?

11. Why didn't you apply for the ETO incentive through your installer?

Next I'd like to ask some questions about the factors that were involved with your decision to purchase PV/solar water heating.

12. How would you rate the importance of each of the following in your decision to install PV/ST? Would you say (insert a-j) had high, medium, low, or no importance in your decision?

| | High Importance | Medium Importance | Low Importance | No Importance | DK/NA |
|--|-----------------|-------------------|----------------|---------------|-------|
| a. Owning or using a PV/solar water system in the past | | | | | |
| b. Having friends or colleagues who had installed PV/solar water heating systems | | | | | |
| c. Reading/learning about PV/solar water heating from magazines, journals, or websites | | | | | |
| d. Information gained at a home show, energy fair, or other | | | | | |
| e. Information gained from an environmental or solar organization | | | | | |

| | High Importance | Medium Importance | Low Importance | No Importance | DK/NA |
|--|-----------------|-------------------|----------------|---------------|-------|
| j. Information provided by a PV/solar water heating contractor | | | | | |
| k. Information from your utility | | | | | |

13. Were there any other important sources of information or experience about PV/solar water heating systems that we didn't mention that helped you decide to install your system?
- Yes (specify: _____)
- No
- 13a. How important was this information? Was it of:
- High importance
- Medium importance
- Low importance
- Don't know/not sure [DO NOT READ]
14. Were there any other types of information that would have been useful to you in your research and decision-making?
- Yes (Specify: _____)
- No

AHP 1 – Assess Buyer Type

In the next series of questions, I'm going to ask you to prioritize some of the factors that you might have included (might include) in your decision to purchase a solar system. (If purchased since calling, use past tense; if not yet purchased, use present tense)

15. In making the decision to buy and install your solar system, which of the following two factors was (is) more important . . . ?

Long-Term Savings on Energy Bills

1 2 3 4 5 6 7 8 9

Environmental Benefits

1 2 3 4 5 6 7 8 9

- a. On a scale of 1 to 9 (1 being "Equally Important", 9 being "Extremely More Important"), how much more important is (was) it?

16. In making the decision to buy and install your solar system, which of the following two factors was (is) more important . . . ?

| | |
|-----------------------------------|------------------------------|
| Long-term savings on energy bills | Interest in new technologies |
| 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is it?

17. In making the decision to buy and install your solar system PV/ST, which of the following two factors was (is) more important . . . ?

| | |
|-----------------------------------|----------------------------------|
| Long-term savings on energy bills | Becoming More Energy Independent |
| 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is it?

18. In making the decision to buy and install your solar system, which of the following two factors was (is) more important . . . ?

| | |
|-----------------------------------|---------------------------------------|
| Long-term savings on energy bills | Availability of a financial incentive |
| 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is it?

19. In making the decision to buy and install your solar system, which of the following two factors was (is) more important . . . ?

| | |
|----------------------------------|---------------------------------------|
| PV: Interest in new technologies | Availability of a financial incentive |
| 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is it?

AHP 2 – Assess Importance of Barriers

20. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned (concerns) you more . . . ?

| | |
|-----------------------|------------------------------|
| Up front capital cost | Lack of adequate information |
| 1 2 3 4 5 6 7 8 9 | 1 2 3 4 5 6 7 8 9 |

- a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is (was) it?

21. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned (concerns) you more . . . ?

| | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|---|---|-------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Up front capital cost | | | | | Uncertainty about performance | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is (was) it?

22. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned (concerns) you more . . . ?

| | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|---|---|-----------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Up front capital cost | | | | | Finding an experienced contractor | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is (was) it?

23. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned (concerns) you more . . . ?

| | | | | | | | | | | | | | | | | | |
|-----------------------|---|---|---|---|--|---|---|---|---|---|---|---|---|---|---|---|---|
| Up front capital cost | | | | | Appearance (Aesthetics) of PV/ST systems | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is (was) it?

24. In deciding to move forward with your purchase of a solar system, which of these two factors presented concerned (concerns) you more . . . ?

| | | | | | | | | | | | | | | | | | |
|--|---|---|---|---|-------------------------------|---|---|---|---|---|---|---|---|---|---|---|---|
| Appearance (Aesthetics) of PV/ST systems | | | | | Uncertainty About Performance | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

a. On a scale of 1 to 9 (1 being “Equally Important”, 9 being “Extremely More Important”), how much more important is (was) it?

IF NO INSTALLATION IN Q. 8, GO TO Q. 32

25. Which of the following best describes who installed your PV/solar water heating system? Was it . . .

- A contractor
- You, with help from a contractor
- You [Note to interviewers: This could include friends or others too.]
- Other (specify: _____)

26. How would you rate the information the contractor provided on how the Energy Trust incentive could lower the cost of your system? Would you say the information was:
- Very clear
 - Somewhat clear
 - Not very clear
 - Not at all clear
 - Don't know/don't remember [DO NOT READ]

26a. [If "not very clear" or "not at all clear"] Why do you say that? {probe what was unclear?}

27. To what extent was this information useful in making your decision to install a solar system?
- Very useful
 - Somewhat useful
 - Neither useful nor not useful
 - Not very useful
 - Not at all useful
 - Don't know/don't remember [DO NOT READ]

[DO NOT ASK #28 if no contractor was involved in installation – Q. 25]

28. How satisfied were you with the installation of your PV/solar water heating system? Would you say . . .
- Very satisfied
 - Somewhat satisfied
 - Somewhat dissatisfied
 - Very dissatisfied
 - DK/too soon to tell [DO NOT READ]

29. Why do you say (insert rating from question above)

30. How satisfied are you with the performance of your PV/solar water heating system?
- Very satisfied
 - Somewhat satisfied
 - Somewhat dissatisfied
 - Very dissatisfied
 - DK/too soon to tell [DO NOT READ]

31. Why do you say (insert rating from question above)

[SKIP TO Q. 40]

32. Are you still considering installing a PV/solar water heating system at your home?

- Yes
- No

33. What is/was the project under consideration? [Check all that apply]

- PV
- ST

33a. What size system is planned?

- Size (specify: _____)

33b. Is the system:

- New
- A replacement
- An addition to an existing system

34. **IF "NO" in Q 32:** Why did you decide not to install a PV/solar water heating system?

35. Did you/have you talked with a contractor about buying a solar system?

- Yes
- No **GO TO Q38**

36. Did the contractor explain the Energy Trust incentives and how they would reduce the installation cost of your system?

- Yes
- No **GO TO Q38**
- Don't know/don't remember **[DO NOT READ]** **GO TO Q38**

37. Would you say the information the contractor provided regarding the Energy Trust incentive was:
- Very clear
 - Somewhat clear
 - Not very clear
 - Not at all clear
 - Contractor did not provide information
 - Don't know/don't remember **[DO NOT READ]**

[If no in Q32, skip to Q40]

38. **If Yes in Q32:** What are the key factors in how or when you will decide to go forward with your PV/solar water heating project?

39. Which of these is most important to your decision?

Next, I have a few questions that deal specifically with these interactions you may have had with the Energy Trust. Please use a scale from 1 to 5, where 1 indicates **extremely unsatisfactory** and 5 indicates **extremely satisfactory**.

40. Have you ever spoken with anyone at the Energy Trust on the phone?

- Yes
- No GO TO Q44

41. How would you rate the Energy Trust's courtesy on the phone:

1 (specify: why? _____)

2 (specify: why? _____)

3

4

5

42. How would you rate the Energy Trust's helpfulness on the phone:

1 (specify: why? _____)

2 (specify: why? _____)

3

4

5

43. How would you rate the Energy Trust's knowledge of program services:
- 1 (specify: why? _____)
- 2 (specify: why? _____)
- 3
- 4
- 5

Finally, I'd like to ask just a few questions that tell us a bit more about those who consider or install PV/solar water heating systems. Again, all responses remain completely confidential.

44. How long have you lived in Oregon?
- Less than one year
 - 1- 2 years
 - 3-5 years
 - 6-10 years
 - More than 10 years
45. Approximately how old is your home? Is it . . .
- Less than 5 years old
 - 5 – 10 years
 - 11 – 15 years
 - 16 – 20 years
 - 21 - 25 years
 - More than 25 years old
 - DK/NA
46. About how large is your home in square feet, excluding your garage? Is it . . .
- Less than 1,500 square feet
 - 1,500 – 2,000 square feet
 - 2,000 – 2,500 square feet
 - 2,500 – 3,000 square feet
 - More than 3,000 square feet
 - DK/NA
47. Which of these categories best describes your annual household income in 2003? Would it be . . .
- Less than \$50,000
 - \$50,000 - \$75,000
 - \$75,000 - \$100,000
 - \$100,000 - \$150,000
 - Over \$150,000
 - DK/NA

48. Which of these categories best describes your age? Is it . . .

- Less than 25
- 25 – 34
- 35 – 44
- 45 – 54
- 55 – 59
- 60 – 64
- Over 64
- DK/NA

Thank and close.

Interviewer: Note the person's gender.

- Male
- Female

Record type of customer

- Commercial
- Residential

Date of completion: _____

Time of completion: _____

Interviewer: _____

Appendix E. Electrical Training Centers

Energy Trust has granted the following training centers with a new PV system for use in PV installation courses offered to apprentice and journeyman electricians, inspectors and the public.

Central Electrical Training Center, Tangent

IBEW Local 280

Courses planned: Electrical apprenticeship training, journeyman continuing education

Training contact: Dan Campbell, 541-917-6199, campbell@cjatc.org

Chemeketa Community College, Salem

Independent Electrical Contractors of Oregon

Courses planned: Electrical apprenticeship training, journeyman continuing education

Training contact: Kelly Bartlett, 503-598-7789, kelly@iecoregon.org

Crater Lake Electrical JATC Training Center, Medford

IBEW Local 659

Courses planned: Electrical apprenticeship training, journeyman continuing education

Training contact: Clarine Lizana, 541-773-5888, clejatc@ccountry.net

Lane Community College, Eugene

Courses planned: Two-year degree program that supports the Limited Renewable Energy License

Training contact: Roger Ebbage, 541-463-3977, ebbager@lanecc.edu

NECA-IBEW Electrical Training Center (NIETC), Portland

IBEW Local 48

Courses planned: Electrical apprenticeship training, journeyman continuing education

Training contact: Brian Crise, 503-262-9991, bcrise@nietc.org

Klamath Community College, Klamath Falls

Courses planned: Electrical apprenticeship training, journeyman continuing education, community education classes

Training contact: Bill Brown, 541-880-2215, brownb@kcc.cc.or.us

UA 290 & IBEW 280 Training Center, Redmond

IBEW Local 280

Courses planned: Electrical apprenticeship training, journeyman continuing education

Training contact: Dan Campbell, 541-917-6199, campbell@cjatc.org

Appendix F.

Results: Solar Water Heat

Views of Key Informants

Several key informants noted that SWH had not received adequate marketing to be successful. Two contractors said that the increase in PV incentive might have initially caused a decrease in SWH. While there were contrasting views regarding whether the current incentive level could maintain demand, most felt that this would not be the case for SWH. Other barriers to success of SWH reported include:

- Increases the cost of copper, steel and aluminum have hit the SWH the hardest, with the average price of SHW having increased to \$4,500 to \$5,000+ over the last year.
- SWH relies more on installers' knowledge and skill than does PV.

Asked about the future market for SWH, about one-fourth of the informants felt that there would growth; others said it would grow when the Energy Trust begins marketing. Two informants mentioned that contractor "push back", e.g.,

boycotting the SWH component due to paperwork and requirements, would have to be overcome for more to participate in the Program and promote SWH. Another noted that better education of consumers is needed, so that they understand what is required for an effective SWH system. Another two contractors said "just get the word out there, advertise it", while others see the need to focus on the new construction market for real growth to occur. One contractor recommended working more with codes to push SWH (e.g., making SWH mandatory for pools)

Marketing ideas proposed for SWH included:

- More demonstration systems installed in target industries in various parts of the state (motels, lumber, paper production)

"Twenty years after the big boom in solar water heating it needs to be brought back to a state of the art orientation, and new homes can do that."

"I am pretty leery about the solar thermal market, but if the energy market gets really bad, solar thermal will build up. Or if we can break into the new construction market, it could really help the solar thermal market take off."

"We need something new that seems to catch attention. So getting a handful of really committed and jazzed up plumbers is what is needed along with a good sales person. We need something to push solar thermal, showcase the best thermal contractors, really push it a bit. We need marketing that creates a splash. Let's say we want 20 hidden solar plumbers to appear in the next year. We need to find a way to get them out; maybe a competition could be used to get them to want to do the work and get out there."

"Utilities could inform customers of solar options when they call to complain about their bills."

- Create something new and “splashy” to get public attention
- More face-to-face marketing
- Support contractors with marketing materials

Views of Contractors

Contractors were in agreement that the incentive for SWH is not sufficient. Increases in system costs and the added costs associated with the program requirements reduce profit margins. One contractor recommended that the SWH incentive be increased to \$1500 to better cover the costs of increased paperwork and inspections. Another said that the incentive plus the tax credit must cover 50% of a SWH installation. Another noted that the incentives “just need to go way up” for SWH, to help overcome the “bad taste” left among contractors from previous SWH experience.

Contractors report that the Program’s impact on SWH sales has been minimal. One, however, noted that his sales were starting to increase. Another said that, with the reduction in the PV incentive, his company had given more emphasis to promoting SWH.

When asked about how the market for SWH could be stimulated, ideas suggested by contractors included:

- Low- or no-cost loans
- Marketing to contractors, such as home builders, and consumers; make it easier to find a trade ally when interested
- Educate customers that light (not direct sunlight) is needed for SWH (e.g., “it works even when cloudy”) and continuously promote it

Survey Results

Given the small sample sizes, no conclusions are drawn regarding SWH participants. Rather data are presented to provide the Energy Trust an early view of customers participating in the SWH component of the Program.

Table F.1: Customer Type

| | Participant | | Non-Participant | |
|-------------|-------------|-------------|-----------------|------------|
| | Frequency | Percent | Frequency | Percent |
| Residential | 8 | 100% | 28 | 97% |
| Commercial | --- | --- | 1 | 3% |
| | 8 | 100% | 28 | 97% |

Table F.2: Annual Household Income (2003 – Residential Only)

| | Participant | | Non-Participant | |
|-----------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Less than \$50,000 | 3 | 38% | 14 | 50% |
| \$50,000 - \$75,000 | 2 | 25% | 9 | 32% |
| \$75,000 - \$100,000 | 1 | 13% | 3 | 11% |
| \$100,000 - \$150,000 | 1 | 13% | 1 | 4% |
| Over \$150,000 | 1 | 13% | 1 | 4% |
| | 8 | 100% | 28 | 100% |

Table F.3: Length of Residence

| | Participant | | Non-Participant | |
|--------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Less than one year | --- | --- | --- | --- |
| 1-2 years | --- | --- | 2 | 7% |
| 3-5 years | --- | --- | 3 | 11% |
| 6-10 years | 1 | 13% | --- | --- |
| More than 10 years | 7 | 88% | 23 | 82% |
| | 8 | 100% | 28 | 100% |

Table F.4: Age of Home

| | Participant | | Non-Participant | |
|---------------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Less than 5 years old | 1 | 13% | 6 | 21% |
| 5 – 10 years | 1 | 13% | 4 | 14% |
| 11 – 15 years | --- | --- | 3 | 11% |
| 16 – 20 years | --- | --- | 1 | 4% |
| 21 - 25 years | --- | --- | 2 | 7% |
| More than 25 years old | 6 | 75% | 9 | 32% |
| Don't know/Not Applicable | --- | --- | 3 | 11% |
| | 8 | 100% | 28 | 100% |

Table F.5: Square Footage of Commercial Business

| | Non-Participant |
|------------------|-----------------|
| | Frequency |
| 1,001 to 5,000 | --- |
| 5,001 to 10,000 | --- |
| 10,001 to 25,000 | 1 |
| 25,001 to 50,000 | --- |
| | 1 |

Table F.6: Number of Business Establishments

| | Non-Participant |
|--------|-----------------|
| One | 1 |
| 2 to 5 | --- |
| | 1 |

Table F.7: Number of Employees

| | Non-Participant |
|--------------|-----------------|
| Fewer than 5 | --- |
| 10 to 19 | --- |
| 20 to 49 | 1 |
| | 1 |

Considering Solar and Taking Action

Table F.8: Length of Time Customer Had Considered Solar Options

| Time Solar Considered | Participant | | Non-Participant | |
|-----------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Less than one year | 4 | 50% | 11 | 38% |
| 1-2 years | --- | --- | 7 | 24% |
| 3-5 years | 2 | 25% | 4 | 14% |
| 6-10 years | 1 | 13% | 3 | 10% |
| | 1 | 13% | 4 | 14% |
| | 8 | 100% | 29 | 100% |

Table F.9: Non-Participant Project Types Considered

| | Frequency | Percent |
|-----------------------------------|-----------|-------------|
| Type of Project | | |
| Solar thermal (water heating) | 16 | 59% |
| Both | 11 | 41% |
| | 27 | 100% |
| System or Enhancement | | |
| New system | 24 | 89% |
| A replacement | 2 | 7% |
| An addition to an existing system | 1 | 4% |
| | 27 | 100% |

* Excludes two non-participants who have already begun installation of solar system

**Table F.10: Non-Participant Factors in Completing Considered System
(Multiple Responses Possible)**

| Factor | Frequency | Percent |
|--|-----------|-------------|
| Sufficient finances | 12 | 44% |
| Finding a reliable, experienced contractor | 3 | 11% |
| Obtaining sufficient information | 3 | 11% |
| The level of incentives | 3 | 11% |
| Timing | 3 | 11% |
| The aesthetics of the unit | 1 | 4% |
| The projected savings | 1 | 4% |
| Whether respondent is moving | 1 | 4% |
| | 27 | 100% |

Table F.11: Non-Participants' Reasons for Calling the Energy Trust

| | Frequency | Percent |
|--|------------|-------------|
| Main Reasons | | |
| I had a question about the program | 6 | 19% |
| Heard about it from friend and wanted more information | 4 | 13% |
| Installer/contractor told me to call them about the incentives | 2 | 6% |
| News article piqued my interest | 2 | 6% |
| TV feature piqued my interest | 2 | 6% |
| Saw it on the website and wanted to learn more | 1 | 3% |
| Other | 15 | 47% |
| | 32* | 100% |
| Other Reasons | | |
| Heard about it from EWEB | 2 | 13% |
| Saw info in book on solar energy | 2 | 13% |
| Utility website | 2 | 13% |
| Coordinating on behalf of his Home Owners Association | 1 | 7% |
| General interest | 1 | 7% |
| Heard about it from Co-op Oregon; also the Apollo Alliance | 1 | 7% |
| Heard about it from a home show | 1 | 7% |
| Heard about it from people at environmental organizations | 1 | 7% |
| Member of a solar group | 1 | 7% |
| Other websites referenced the Energy Trust | 1 | 7% |
| Utility bill stuffer | 1 | 7% |
| Wanted to save energy and money | 1 | 7% |
| | 15 | 100% |

* Multiple responses possible.

Table F.12: Time First Concrete Step Taken

| Time | Participant | | Non-Participant | |
|------------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| No step taken | --- | --- | 22 | 76% |
| Less than one year ago | 8 | 100% | 7 | 24% |
| 1-2 years ago | --- | --- | --- | --- |
| | 8 | 100% | 29 | 100% |

Table F.13: Sources of Information Most Useful in Research*

| Source | Participant | | Non-Participant | |
|--|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Fact sheets | 5 | 31% | 7 | 11% |
| Maintenance requirements costs over time | 4 | 25% | 11 | 18% |
| Case studies | 3 | 19% | 9 | 15% |
| Documents on how to install | 1 | 6% | 6 | 10% |
| Performance reviews | 1 | 6% | 10 | 16% |
| Other | 2 | 13% | 18 | 30% |
| | 16 | 100% | 61 | 100% |

* Multiple responses possible.

Table F.14: Other Sources of Information Most Useful in Research (Participants)

| Source | Participant | |
|-----------------------------|-------------|-------------|
| | Frequency | Percent |
| All were helpful | 1 | 25% |
| Information from contractor | 1 | 25% |
| Solar tour/demonstration | 1 | 25% |
| Various websites | 1 | 25% |
| | 4 | 100% |

* Multiple responses possible.

**Table F.15: Other Sources of Information Most Useful in Research
(Non-Participants)**

| Source | Participant | |
|--|-------------|-------------|
| | Frequency | Percent |
| Booklet from the Energy Trust | 2 | 11% |
| Hasn't done much research yet | 4 | 22% |
| Information about new solar products | 1 | 6% |
| Information comparing gas vs. solar | 1 | 6% |
| Information from the Trust not that useful | 1 | 6% |
| Information on costs and expected savings of average PV | 2 | 11% |
| Information that compares solar needs by square footage of house and family size | 1 | 6% |
| Saw a solar thermal system at an open house | 1 | 6% |
| Solar fair | 1 | 6% |
| Speaking with individuals with solar experience | 2 | 11% |
| Various websites | 2 | 11% |
| | 18 | 100% |

Table F.16: Preferred Medium for Accessing Information*

| Medium | Participant | | Non-Participant | |
|--|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Printed medium (brochures) | --- | --- | 20 | 33% |
| Website (electronic) | 8 | 50% | 16 | 27% |
| Contractor | 5 | 31% | 11 | 18% |
| Workshops | 1 | 6% | 11 | 18% |
| Talking to consultants and other experts | 2 | 13% | 2 | 4% |
| | 16 | 100% | 60 | 100% |

* Multiple responses possible.

Table F.17: Previous Experience with Solar Systems

| | Participant | | Non-Participant | |
|-----------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Experience | | | | |
| Yes | 1 | 13% | 5 | 17% |
| No | 7 | 88% | 24 | 83% |
| | 8 | 100% | 29 | 100% |
| Type of System | | | | |
| Solar water heating | --- | --- | 4 | 80% |
| PV | 1 | 100% | 1 | 20% |
| Both | --- | --- | --- | --- |
| | 1 | 100% | 5 | 100% |

Table F.18: Installed New Solar System Since Contacting the Trust

| | Participant | | Non-Participant | |
|-----|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Yes | 8 | 100% | 2 | 7% |
| No | --- | --- | 26 | 93% |
| | 8 | 100% | 2 | 100% |

Table F.19: Continued Operation of Installed Solar Systems

| | Participant | | Non-Participant | |
|-------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Experience | | | | |
| Yes | 8 | 100% | 2 | 100% |
| No | --- | --- | --- | --- |
| | 8 | 100% | 2 | 100% |

Table F.20: Rating of Factors In Purchase Decision

| Component | High Importance | | Medium Importance | | Low Importance | | No Importance | | Don't Know/NA | |
|---|-----------------|-----------|-------------------|-----------|----------------|-----------|---------------|-----------|---------------|-----------|
| | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. |
| n= | 8 | 2 | 8 | 2 | 8 | 2 | 8 | 2 | 8 | 2 |
| Owning or using a PV solar water system in the past | 1 | 1 | --- | --- | --- | 1 | 1 | --- | 6 | --- |
| Having friends or colleagues who had installed PV solar water heating systems | 1 | 1 | 3 | 1 | 3 | --- | 1 | --- | --- | --- |
| Reading learning about PV solar water heating from magazines, journals, or websites | 2 | 1 | 4 | 1 | --- | --- | 2 | --- | --- | --- |
| Information gained at a home show, energy fair, or other | 2 | --- | --- | 1 | 1 | 1 | 4 | --- | 1 | --- |
| Information gained from an environmental or solar organization | 3 | 2 | 2 | --- | --- | --- | 2 | --- | 1 | --- |
| Information provided by a PV solar water heating contractor | 6 | 2 | 2 | --- | --- | --- | --- | --- | --- | --- |
| Information from your utility | --- | --- | 2 | --- | 2 | --- | 4 | 2 | --- | --- |

Table F.21: Person Installing the System

| | Participant | | Non-Participant | |
|--------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| A contractor | 8 | 100% | 2 | 100% |
| | 8 | 100% | 2 | 100% |

Table F.22: Customer Rating of Information Contractor Provided on Using ETO Program to Lower System Cost

| | Participant | | Non-Participant | |
|----------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Very clear | 7 | 88% | 2 | 100% |
| Somewhat clear | 1 | 13% | | |
| | 8 | 100% | 2 | 100% |

Table F.23: How useful was this information in making your decision to install a solar system?

| | Participant | | Non-Participant | |
|-------------------|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Very useful | 6 | 75% | 1 | 50% |
| Somewhat useful | 1 | 13% | 1 | 50% |
| Not at all useful | 1 | 13% | | |
| | 8 | 100% | 2 | 100% |

Table F.24: Participant Satisfaction with Program Components

| Component | Completely Satisfied | Somewhat Satisfied | Neither Satisfied nor Dissatisfied | Don't Know/ Too Soon to Tell |
|--------------------------------|----------------------|--------------------|------------------------------------|------------------------------|
| Incentive | 5 | 2 | 1 | --- |
| Program Experience | 6 | 2 | --- | --- |
| Savings on Monthly Energy Bill | 6 | --- | --- | 2 |

Table F.25: Have you ever spoken with anyone at the Energy Trust on the phone?

| | Participant | | Non-Participant | |
|-----|-------------|-------------|-----------------|-------------|
| | Frequency | Percent | Frequency | Percent |
| Yes | 2 | 25% | 27 | 93% |
| No | 6 | 75% | 2 | 7% |
| | 8 | 100% | 29 | 100% |

Table F.26: Customer Satisfaction with Components of Telephone Contact with the Energy Trust

| Component | Extremely satisfied | | Satisfied | | Neither Satisfied nor Dissatisfied | | Unsatisfied | | Extremely Dissatisfied | |
|-------------------------------|---------------------|-----------|-----------|-----------|------------------------------------|-----------|-------------|-----------|------------------------|-----------|
| | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. | Part. | Non-Part. |
| n= | 2 | 27 | 2 | 27 | 2 | 27 | 2 | 27 | 2 | 27 |
| Courtesy on the phone | 100% | 85% | --- | 11% | --- | 4% | --- | --- | --- | --- |
| Helpfulness on the phone | 50% | 59% | 50% | 19% | --- | 11% | --- | 11% | --- | --- |
| Knowledge of program services | 100% | 52% | --- | 19% | --- | 11% | --- | 15% | --- | 4% |