

# **Would You Like Efficiency With That?**

## **Linking Efficiency and Renewables to Motivate Customer Action**

*Bill Schutten, Wisconsin Focus on Energy*  
*Kathy Kuntz, Wisconsin Energy Conservation Corporation*

### **ABSTRACT**

Amid buzz about climate change and the potential benefits of a green job economy some customers are finally, finally thinking about their energy usage. When nudged to reduce their dependence on fossil fuels, though, many of these customers dream of wind turbines in the backyard, not insulation in the attic. Even though the economics are much better for efficiency improvements, customers tend to be dazzled by the possibilities of renewable energy.

As energy efficiency advocates we can either rail in frustration that solar energy seems sexier than reducing duct leakage or we can join forces with the renewable energy advocates to marry efficiency and renewables together in customer minds.

This paper summarizes the Wisconsin strategies for marrying efficiency and renewables, focusing primarily on the residential existing homes market. Over the last few years we have implemented incentives and promotional strategies that encourage residential customers to think about their energy usage in holistic ways and that reward customers for pursuing both efficiency and renewable energy. And these strategies are working. Over three years we have seen a marked increase in the number of customers who pursue efficiency before they install a photovoltaic or solar hot water system. Our initiatives are also yielding some interesting in-field partnerships between efficiency and renewable energy installers, partnerships that make it easier for customers to do both.

### **Competing Opportunities: Sexy Renewables versus Practical Efficiency**

For years we have told customers that they should do energy efficiency first due to its increased cost effectiveness. The Focus mantra to homeowners has been that by targeting energy efficiency first a homeowner would be able to not only reduce the size of their utility bills, but also reduce the size and cost of the renewable energy system required to power their, now efficient, home. And due to increased cost effectiveness of energy efficiency measures over renewables measures, we have told them that every dollar spent on efficiency represents a potential five dollar investment in renewable energy—so spending \$1,000 on efficiency can save them \$5,000 on their renewable energy investment. And, to some extent, these admonitions fall on deaf ears. Every efficiency advocate has this experience sooner or later—we patiently field questions from the consumer who is enthusiastic about putting a wind turbine on the roof of their house. Asking questions, we learn that the consumer often has no idea of their home's current annual energy consumption. When we try to steer the conversation away from wind or solar to insulation or heating equipment the customer's eyes glaze over, they start to look skeptical and, ultimately, they say that they will 'think about it.'

Despite President Obama's statements to the contrary, energy efficiency is not sexy. Efficiency is like broccoli—sexy only to those embedded in the details. Both efficiency and

broccoli can yield sexy results—but getting there requires some effort and the general public does not perceive that effort to be fun, popular or easy. (Simon, Van de Grift)

A major challenge, then, is to frame energy efficiency effectively, especially when customers see renewable energy options as a very sexy alternative to eating their broccoli. The challenge seems most extreme when comparing solar electric systems to residential retrofits—the very visible PV on the roof versus largely invisible insulation in the walls.

This challenge is real in Wisconsin because we have a viable, and increasingly visible renewable energy market. In 2001 Wisconsin launched Focus on Energy, its statewide program that promoted both efficiency and renewables. About 10% of total budget was set aside for customer-sited renewables—including both solar electric and solar hot water systems for residential customers—and, at the onset of Focus, the state’s renewable energy markets were very small. In 2002 there were less than a dozen entities in the state that advertised themselves as solar electric installers, and the job title of “solar site assessor” had not yet come into existence. Over the past nine years though, Wisconsin’s renewable energy markets have enjoyed robust, steady growth and today there are 53 Focus-recognized entities offering solar electric design, installation, and repair services and this group includes a growing contingent of well-established electrical contractors, some of whom are household names in their communities. So in Wisconsin customers really do have choices – they can install renewable energy system or can install insulation and the same Focus website helps them go through either process. Indeed, the Focus Web site currently lists 77 Home Performance with ENERGY STAR consultants who can lead customers through retrofits in comparison to the 75 individuals who are certified to offer solar site assessments statewide. At this point it really becomes an issue of what the customer wants and what they can afford. And the issue becomes even more complicated as PV prices drop. Over the last year we have seen the installed cost of PV systems drop almost 20%. Market research suggests that manufacturing innovations will maintain this trend and that there may be a moment in the future where PV will achieve grid parity—where the cost of PV-sourced electricity will be equivalent to that purchased from the local utility. If that happened today most customers would choose PV and gladly leave efficiency behind. Our aim, then, is to figure out how to integrate efficiency and renewables so that even as PV gets cheaper, customers still see the value in doing efficiency first.

We want customers to focus on energy efficiency first largely because it is more cost effective both for customers and for the program. Despite the recent drop in PV system costs, the present benefit-cost ratio of PV is about 1/7 that of residential retrofits using a Total Resource Cost test. The most recent published benefit-cost numbers for PV in Wisconsin suggest that for every \$1 Focus spends to support the installation of a solar electric system, the customer and the state only realize about \$0.20 in benefits. This compares to a benefit of \$1.50 for every \$1 invested in residential retrofits.(Goldberg, 4-24 and 4-7) Due to the low benefit cost ratio of renewables, policy makers become uneasy about the potential rate impacts associated with rapidly growing renewable energy initiatives, especially if renewables threaten to outpace the more cost-effective efficiency efforts. As a result, clean energy programs like Focus need to manage the growth of renewables versus efficiency in order to ensure that, in the aggregate, the program’s portfolio of clean energy efforts maintains an acceptable benefit-cost ratio using the traditional benefit-cost tests. (There are, of course, questions about whether or not the traditional demand-side management cost tests are appropriate for renewable energy technologies but those issues are beyond the scope of this paper; in Wisconsin all technologies—whether efficiency or

renewables—are subject to the same set of rules and, as a result, policy makers are concerned about the balance between investments in efficiency and renewables.)

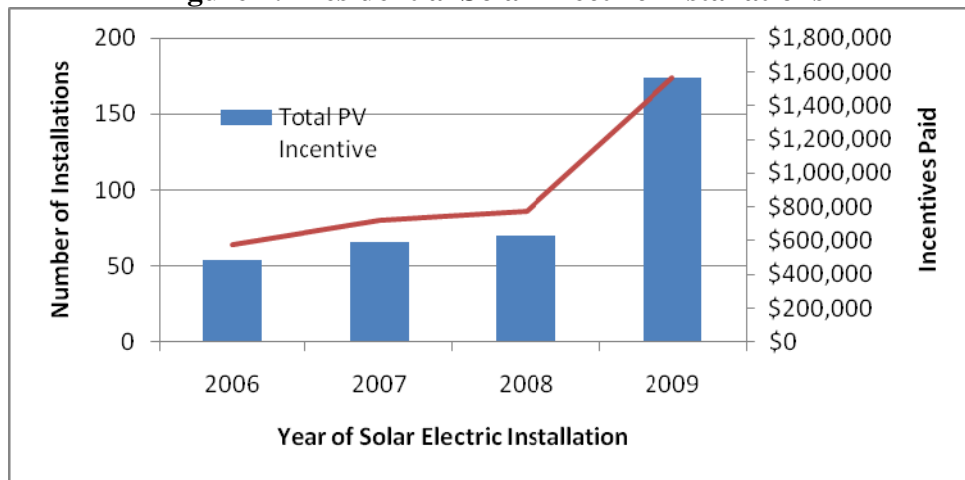
Beyond specific concerns about benefit-cost tests there is also a policy concern related to broader public perceptions. Nobody wants to be the program that puts solar systems on homes that are energy sieves. We note that a number of programs have begun to implement efficiency requirements. The California Solar Homes initiative, for example, requires that builders and developers meet certain efficiency standards in order to access renewable energy incentives. Austin Energy requires homeowners to achieve certain levels of efficiency before they can qualify for solar photovoltaic incentives.(Austin) The New Jersey Clean Energy Fund penalizes customers about 12% on their incentive payment if they do not do efficiency first.(Hill)

Research from the Energy Trust of Oregon, though, suggests that these concerns about PV powering energy guzzling homes might be misplaced. A 2009 analysis of residential PV participants by Trust staff indicated that 1/3 of the households installing PV had already participated in another Energy Trust program. The study also found that households installing PV were, on average, slightly more energy efficient than the typical household participating in Energy Trust programs.(Taylor) The Trust research suggests that those households choosing PV in Oregon may well have already pursued efficiency on their own. Less confident that this was the case in Wisconsin, Focus has worked to push customers along this path. The next section describes the specific initiatives Focus has deployed.

## Wisconsin Efficiency and Renewable Energy Markets

Wisconsin’s programs have grown dramatically since 2005. Legislative changes stabilized funding levels and the program has effectively leveraged private markets to increase activity. Growth in PV market, though, dwarfs the growth in efficiency activity. As illustrated in Figure 1 the residential PV market has seen 39.5% average annual growth rate in the number of installed systems since 2006 and a 47.7% average annual growth rate in incentives paid.

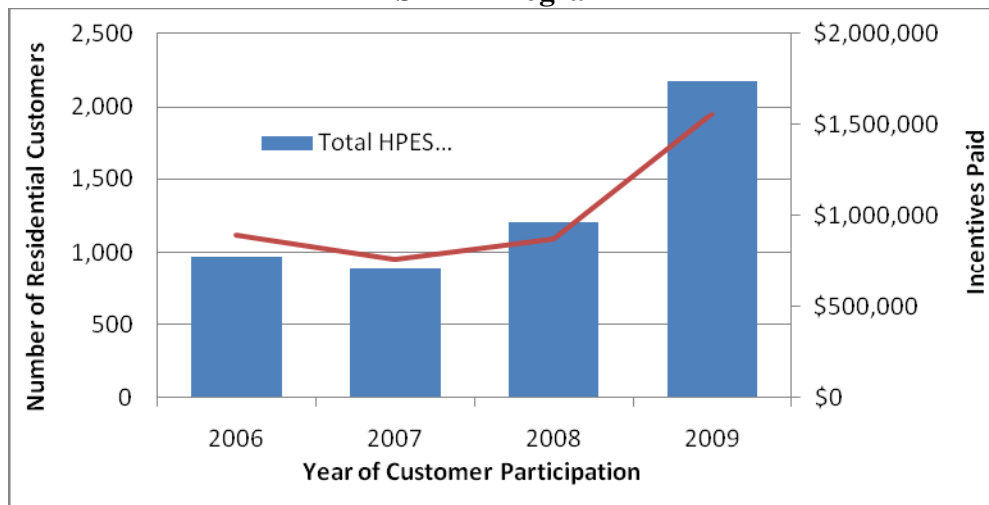
**Figure 1: Residential Solar Electric Installations**



Meanwhile, the number of residential retrofits has grown at a respectable, but much smaller, average annual growth rate of 20.3% during that same timeframe, and residential retrofit incentives have grown at a 31.1% average annual growth rate (Figure 2). If those trends

continue, the amount of incentives paid for solar electric installations would eclipse those paid for residential efficiency retrofits by 2011.

**Figure 2: Residential Customer Participation in the Home Performance with ENERGY STAR Program**



Again, this scenario is problematic for policy makers because renewable energy systems are less cost effective than efficiency retrofits—for both consumers and the broader stakeholder community. As Focus watched this trend evolve, we asked ourselves whether we could leverage some of that renewable energy enthusiasm into efficiency actions. The next section describes our activities to this effect and progress to date.

## Can You Leverage Enthusiasm for Renewables into Efficiency Actions?

### Through Incentives: First iteration – Bonus

Starting July 1, 2007 Focus on Energy began offering a \$500 Solar Bonus to single-family, solar electric or solar water heating system owners who first participated with the Wisconsin ENERGY STAR Home (Focus’ residential new construction program) or Home Performance with ENERGY STAR (Focus’ comprehensive residential retrofit program) before installing their solar system. The concept was to encourage customers to target the energy efficiency of their home prior to installing a renewable energy system, promote “cross-pollination” across Focus programs, and increase a customer’s total participation with the Focus program. Between January 2006 and June 2007, prior to the launch of this \$500 Solar Bonus, only 5.1% of solar electric system owners participated in either of these programs prior to the installation of their solar system.

Focus set the bonus at \$500, aiming to make the offer substantial enough to nudge customers and not so substantial that it would break the budget. While \$500 sounds appealing, on average, qualification for this \$500 bonus would increase a customer’s total Focus incentive for installing a solar electric system by only 6%, but it was believed that this incentive signal, combined with the marketing surrounding it, would begin to increase the number of solar system owners who first participated with one of the Focus on Energy home efficiency programs.

Initially, Focus promoted the Solar Bonus only on the incentive application a customer must fill out, prior to the system's installation, in order to qualify for the Focus on Energy incentive (Image 1). The intent here was to prompt customers to pause as they applied for a system. In addition, we have some anecdotal evidence that the bonus did cause some customers to pause; the program received regular phone calls from customers interested in learning more about the bonus and at least a few customers indicated that they would delay their system and do efficiency first.

**Image 1. Front Page of Solar Electric Incentive Application**

\$500 Solar Bonus  
Language

\$500 Solar Bonus  
Language

<b>SOLAR ELECTRIC (PHOTOVOLTAIC) SYSTEM CASH-BACK REWARD PRE-APPROVAL APPLICATION</b> 				
Projects from 0.5 to 50 kilowatts capacity. Valid through December 31, 2009.			<input type="checkbox"/> Initial Application <input type="checkbox"/> Updated Application	
<b>STEPS TO APPLY FOR A CASH-BACK REWARD</b>				
1. Focus on Energy strongly recommends that you arrange for a Focus on Energy Solar Electric Site Assessment to help determine if a solar electric system is suitable for your location ( <a href="http://focusonenergy.com/siteassessments">focusonenergy.com/siteassessments</a> ). 2. Focus on Energy recommends obtaining at least three bids for your solar electric system from eligible installation contractors on the <a href="http://focusonenergy.com/fullserviceinstallers">Focus on Energy Full Service Solar Electric System Installation Firms</a> list ( <a href="http://focusonenergy.com/fullserviceinstallers">focusonenergy.com/fullserviceinstallers</a> ). 3. Make sure your installation contractor designs the system according to the system requirements specified in this application. 4. Complete and email or mail a signed copy of this application to the address at the bottom of the page. 5. Homeowners that have fully participated in the Wisconsin ENERGY STAR Home Program or Home Performance with ENERGY STAR Program are eligible to receive a \$500 bonus reward ( <a href="http://focusonenergy.com/solarbonus">focusonenergy.com/solarbonus</a> ). 6. <b>Do not purchase, order or install any equipment until you have been notified by Focus on Energy that your application is approved! Installation prior to Focus on Energy approval may render your project ineligible for funding.</b> 7. Within 30 days of receiving a completed application, Focus on Energy will notify you if your application has been approved. You will also receive a Notice of Installation form that you will need to complete and return after your system has been installed. 8. If your system's expected electricity production changes by more than 20 percent after your Cash-Back Reward is approved, please update the information on the system using a new Cash-Back Reward application and mail it to the address listed below. If the updated Cash-Back Reward application is not approved by Focus on Energy, additional funds may not be awarded. 9. Install the system and ensure installation meets all applicable local, state and national codes, including the National Electric Code, has the appropriate permits and that you have a signed interconnection agreement with your electric provider. You have one year to install and submit the completed Notice of Installation. 10. To receive the Cash-Back Reward payment, mail the Notice of Installation to the address at the bottom of this page.  Questions regarding this application should be directed to Focus on Energy at 800.762.7077 or <a href="mailto:renewableapplications@focusonenergy.com">renewableapplications@focusonenergy.com</a> .				
<b>APPLICANT INFORMATION</b> Complete all appropriate fields. Please print.				
Contact Name or Name of Residential Owner			Company/Organization (if applicable)	
Federal I.D. NO. (if applicable)	<input type="checkbox"/> LLC <input type="checkbox"/> Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Individual/Sole proprietor <input type="checkbox"/> School <input type="checkbox"/> 501(c)3 <input type="checkbox"/> Government <input type="checkbox"/> Other:	<input type="checkbox"/> For Profit <input type="checkbox"/> Not for Profit		
\$500 Solar Bonus for Homeowners ( <a href="http://focusonenergy.com/solarbonus">focusonenergy.com/solarbonus</a> ): <input type="checkbox"/> Home is/will be certified Wisconsin ENERGY STAR Home <input type="checkbox"/> Home has/will complete Home Performance with ENERGY STAR in-home evaluation and post performance inspection <input type="checkbox"/> Home is NOT participating in the Wisconsin ENERGY STAR Home or Home Performance with ENERGY STAR Programs				
Mailing Address	City	State	ZIP	County
Owner/Contact Home Phone	Owner/Contact Work Phone		Owner/Contact Email	
Installation address (no PO Boxes)	City	State	ZIP	County
Electric utility at installation address		Space heating fuel supplier at installation address		
Current space heating fuel type: <input type="checkbox"/> Natural gas <input type="checkbox"/> Propane (LP) <input type="checkbox"/> Oil <input type="checkbox"/> Electric <input type="checkbox"/> Other:				
<b>INSTALLATION CONTRACTOR INFORMATION</b>				
Company installing the system			Lead Installer's Name	
Mailing Address	City	State	ZIP	
Company Phone	Company Email	NABCEP License Number		
<b>E-mail or mail the completed Cash-Back Reward application to:</b> <a href="mailto:renewableapplications@focusonenergy.com">renewableapplications@focusonenergy.com</a> Focus on Energy, Attn: Renewable Energy Cash-Back Rewards, 431 Charming Drive, Madison, WI 53719. Questions regarding this application should be directed to Focus on Energy at 800.762.7077.				
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In early 2009, Focus increased its promotion of the bonus through a direct mail campaign to past Home Performance and Wisconsin ENERGY STAR Home participants. The aim here

was to encourage those households that had already invested in efficiency to extend their investment to renewable energy. The direct mail pushed participants to a Focus Web site page (Image 2). This same page was promoted to individuals who had signed up to receive an e-newsletter about Focus' renewable energy offerings. Subsequent to the direct mail effort, a flyer regarding the bonus offer was included in the materials sent to households after they participated in either efficiency program.

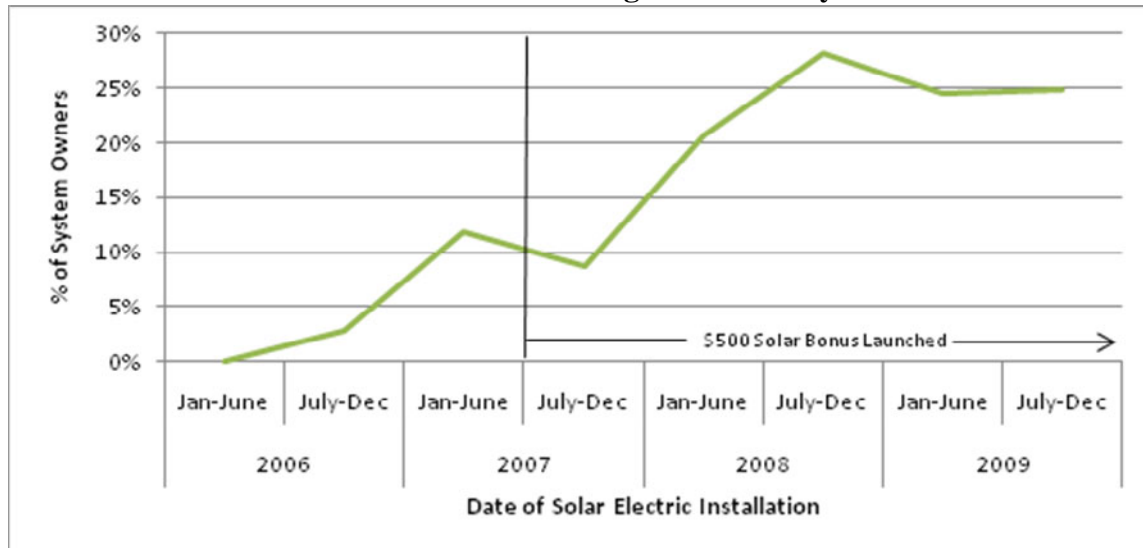
**Image 2. Solar Bonus Landing Page**

The screenshot shows the Focus on Energy website's Solar Bonus Landing Page. At the top, there is a navigation bar with links for Home, About Us, Calendar, Contact Us, Evaluation Reports, Site Map, and a search box. Below this is a secondary navigation bar with buttons for Residential Programs, Business Programs, Renewable Energy, Financial Incentives and Cash-Back Rewards, Environmental and Economic Research, Information Center, and Find Products/Services/Verify Eligibility. The main content area has a green header with 'Renewable Energy Overview' and a sidebar with links to Solar Electric, Solar Hot Water, Wind, Biomass Combustion, Biogas Digestion, Partners, and a Printable Version. The main text area is titled 'Got energy efficiency?' and 'Now, save an additional \$500 with solar and wind energy!'. It includes a paragraph explaining the \$500 bonus incentive, a 'Build efficient with Wisconsin ENERGY STAR Homes' section, an 'Improve efficiency with Home Performance with ENERGY STAR' section, and a 'How to apply' section with a list of links. A 'Play Animation' button is also visible. At the bottom, there is a disclaimer: '\*Remember, you must receive approval from Focus on Energy for your renewable energy system before you install, purchase or order any equipment for the system. Visit focusonenergy.com/reincentives for details.'

It has been over two and a half years since Focus on Energy began offering this \$500 Solar Bonus and it has had a measured effect on the percentage of residential solar system owners who first targeted the energy efficiency of their residence prior to installing a solar electric system by participating in the Home Performance with ENERGY STAR or Wisconsin ENERGY STAR Homes programs. In 2009, nearly 25% of solar electric system owners had first targeted the efficiency of their home before installing their solar electric system, a five-fold increase in the cross-program participation level prior to the launch of the solar bonus initiative. More, as is clear from Figure 3 below, the increase occurred after the introduction of the Solar

Bonus (July 2007) and it largely occurred before Focus began promoting the bonus to past efficiency participants.

**Figure 3. % of Residential, Solar Electric System Owners who Participated in HPES or WESH PRIOR to Installing their Solar System**



Year	Month Range	Total Number of Installed Solar Electric Projects Co-funded by Focus on Energy	Total Number of Co-funded projects that Targeted Efficiency First	% of Projects that Targeted Efficiency First
2006	Jan-June	28	0	0%
	July-Dec	36	1	3%
2007	Jan-June	34	4	12%
	July-Dec	46	4	9%
2008	Jan-June	29	6	21%
	July-Dec	57	16	28%
2009	Jan-June	49	12	24%
	July-Dec	125	31	25%

The strong correlation between the increase in the percentage of individuals targeting EE prior to installing a solar electric system after the launch of the \$500 Solar Bonus suggest that this bonus initiative had a significant impact on the decision making process of a future solar owner. At some point in the decision-making process, the customer learned of the opportunity to qualify for these extra funds or of the importance of targeting energy efficiency first and acted on that information. Additional analysis of the timeframes between the solar and retrofit efforts indicates that the bulk of these households completed both the efficiency work and the renewable energy installation at their homes almost simultaneously. This reinforces our hypothesis that the Solar Bonus influenced the efficiency work.

We also observed a correlation between the launch of the Solar Bonus and an increase in the number of solar hot water system owners who target efficiency first. Prior to the launch of this \$500 Solar Bonus, 12% of solar hot water system owners fully participated in one of the



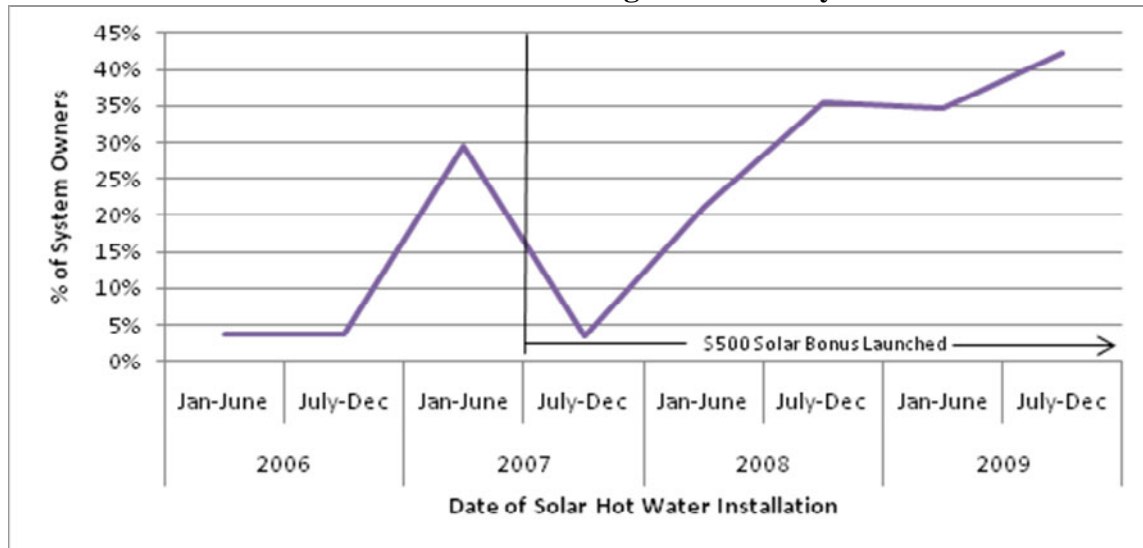
residential energy efficiency programs prior to the installation of their solar system (Figure 4). Unlike the small, 6%, increase in incentive dollars this \$500 bonus had on the average solar electric system incentive, qualification for the \$500 bonus resulted in a whopping 23% increase in a solar hot water systems owner's incentive. Based on economics alone, one would expect to see a stronger correlation in the launch of the solar bonus and the percentage of customers participating in the home EE programs prior to the installation of their solar hot water system. In fact, in 2009, 39% of solar hot water system owners first participated in one of the Focus home EE programs, a 200% increase for the pre-bonus timeframe. However, in the period just prior to the launch of the \$500 Solar Bonus, 30% of homeowners who installed solar hot water systems had also previously targeted efficiency first independent of any reward for doing so. We suspect this bump is associated with some changes in program eligibility that went into effect July 1, 2007 that essentially made some households ineligible for the program going forward. This anomaly reduces the correlation of the introduction of the Solar Bonus and the increase in the percentage of homeowners that targeted efficiency prior to the installing a solar hot water system.

It is also important to note that Focus' efforts to integrate renewable energy into efficiency efforts have achieved less substantial results. In 2006, Focus launched an incentive for Wisconsin ENERGY STAR Home builders to encourage those builders to make homes 'renewable ready' for either solar hot water, solar electric or both technologies. The \$100-\$150 incentive paid most of the up-front costs associated with including pipes/wires in the frame that would make it easier to add solar to the roof later. The program hoped that builders would use the 'renewable ready' terminology to attract buyers interested in green homes. Builder participation in this effort has been very modest. From 2007 through 2009, less than 0.1% of homes certified claimed the incentive for being renewable ready. While this might reflect builder resistance, we believe it also suggests that it is much easier to promote efficiency to those already interested in renewables than vice versa.

Combined, these data suggest that the \$500 Solar Bonus initiative did encourage customers to pursue efficiency prior to installing a solar system, and this is the sort of evolution we had hoped to see when the bonus was launched in mid-2007. While these results were encouraging, growing concerns about the ongoing growth of the solar markets prompted the program to develop and implement additional incentive changes starting in 2010 that nudge customers toward efficiency even more aggressively. Those efforts are described in the next section.



**Figure 4. % of Residential, Solar Hot Water System Owners who Participated in HPES or WESH PRIOR to Installing their Solar System**



Year	Month Range	Total Number of Installed Solar Hot Water Projects Co-funded by Focus on Energy	Total Number of Co-funded projects that Targeted EE First	% of Projects that Targeted Efficiency First
2006	Jan-June	54	2	4%
	July-Dec	55	2	4%
2007	Jan-June	51	15	29%
	July-Dec	28	1	4%
2008	Jan-June	52	11	21%
	July-Dec	48	17	35%
2009	Jan-June	46	16	35%
	July-Dec	64	27	42%

### Promoting Efficiency First More Aggressively

In late 2009, Focus determined that a stronger nudge toward efficiency was warranted. This was based on both concerns about the rapid growth of the PV market and a sense that the bonus was working. The Focus program was challenged to develop an even more effective means to communicate / reward customers who target energy conservation or efficiency prior to installing a solar electric, solar water heating, or customer-sited wind electric system. The program chose to develop a tiered incentive structure whereby customers got a higher, “efficiency first” incentives if they implemented major efficiency measures or demonstrated a level of energy conservation prior to installing their renewable energy system. The efficiency first incentives are 17% to 25% higher for solar electric systems, and 10% higher for solar hot water and wind electric systems compared to the standard incentives that all Focus-eligible customers qualify for.

By creating a tiered incentive structure, where the standard incentive is perceived by the customer as inferior to the efficiency first incentive, the program is sending a stronger and clearer message to customers. Some programs (most notably New Jersey) use a penalty if customers do not do efficiency first. We chose to frame this as a bonus but to make it clear that the customer was losing something if they do not target energy efficiency first.

While it is too soon to report results associated with the new levels, the initial response from the market indicates that the tiered approach will affect installations. It is striking that stakeholders seem uniformly determined to ensure that all of their customers will qualify for the Efficiency First tier.

### **And What About Technical Assistance and All of That?**

Beyond incentives, the Focus team has also attempted to encourage our market providers to integrate efficiency and renewables in their interactions with customers. While this sounds rational, it is complicated in practice. In both the efficiency and renewable energy markets Focus depends on private market actors—we call them market providers—to deliver assessments and project implementation to customers. On the efficiency side, stakeholders have been developing this market since the mid 1990s when the state energy office first launched a Home Energy Rating System initiative. From the onset, Wisconsin's aim was to create a private industry of independent building scientists who deliver unbiased energy advice to residential customers. Focus built upon this network when it launched one of the first Home Performance with ENERGY STAR programs in the nation in 2001 and these same “consultants” were a cornerstone of Wisconsin's residential new construction efforts beginning in 1998. In both programs, the emphasis for consultants has been on building shell, HVAC, and water heating systems. While there have been some attempts to encourage consultants to address other items such as appliances and lighting, not much success has been achieved due, in part because that is not their core expertise.

On the renewable side, Wisconsin led the nation in creating a site assessment program where commercial and residential customers could get unbiased information about the viability of wind or solar at their site. Part of the driver here was to ensure good installations – there is no point in putting PV on a roof that is shaded by pine trees. Wisconsin's renewable energy advocates were haunted by bad installations in the 1970s and wanted to ensure that customers had good, site-specific information this time around. More, Focus based its incentives on estimated system production so it was critical that the program have accurate information. Therefore, Focus worked with the Midwest Renewable Energy Association to create an independent site assessment program where individuals were trained to do site assessments. In addition, this training included an emphasis on efficiency—especially plug load that contributed to overall electric usage.

In the end, then, Wisconsin has multiple sets of actors serving the same customers and addressing part of the equation. Over time there were some efforts to educate and integrate – Focus offered its Home Performance consultants training in the basics about solar assessment so that they could advise customers if their site was a good solar site or not. There is some anecdotal evidence that a few consultants did integrate this into their practices. In addition, Focus also educated solar site assessors about what Home Performance Consultants do and the advantages for homeowners to increase their referrals to the program but these efforts have had little impact. The challenge here is that Focus is asking each group of actors to go outside of

their area of expertise without specific remuneration associated with those efforts. The program is currently exploring how we might deploy referral bonuses to encourage cross-referrals forward.

We believe that there are partnership opportunities – that in the same way Home Performance consultants might develop relationships with other allies who install and refer customers, the solar and Home Performance folks might become partners in the market. Arguably, the new incentive structure should promote these partnerships.

### **Does Efficiency Have To Come First?**

Focus' approach has been to push customers to do efficiency first, before they pursue renewable energy options. This approach is based on rational economics—doing efficiency first will reduce the size of your renewable energy system and efficiency is cheaper. Some argue, though, that customers will do what they want and that it is most important that, in the end, we influence them to do more rather than alienating them by insisting they do things in our preferred order.

There is some evidence that grid-tied renewable energy installations can spur subsequent energy efficiency and conservation behaviors, at least at the residential level. The authors are aware of one study that examined this issue specifically – a UK dissertation by James Keirstead where Keirstead found that while there is some evidence that on site generation “provides a tangible hook to engage householders emotionally with the issues of energy use.” Keirstead focused on grid-tied households, noting that most prior research was with off-grid homes (where usage reductions would be expected). Keirstead's own research suggests that households with PV, especially those households with monitoring systems that document both generation and usage, tended to reduce their consumption after the PV installation. Keirstead found that some households reported reducing their consumption 35% with monitoring equipment and that there was some overall reported reduction—in the 6% range—across the households in his study. He also notes:

Interestingly those who reported an overall saving said that they were significantly more aware of electricity generation and consumption and were even likely to try and live within the means of their PV system. The increase in awareness led respondents to be more careful about turning off lights and stand-by functions. PV however did not alter the self-identity of households, who already thought of themselves as ‘green’. No major changes in appliance ownership were seen; perhaps because of the short length of time since the respondents purchased PV (75% of respondents had owned their systems for less than 2 years). (Keirstead, 280)

Keirstead also notes that the households with the highest level of reported electric savings were those that also had installed feedback devices that enabled them to monitor their usage as well as their production. (Keirstead, 282) Obviously, we need more research in this area.

## Conclusion

We need effective, aggressive action if we are going to meet the challenges of climate change. As discussed in the introduction, many residential customers have a disconnect between what is economically rational and what has curb appeal relative to addressing their energy usage. Focus on Energy's approach to this disconnect is, increasingly, to leverage customers' enthusiasm for renewable energy into action that entails both energy efficiency and renewable energy. Essentially, we are using the lure of chocolate cake to get people to eat their broccoli and the good news is that, for a good portion of customers, the strategy is working.

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