2011 UPDATES AND TRENDS

Annual Meeting

Interstate Renewable Energy Council

October 17, 2011
Dallas, Texas

IREC Interstate Renewable Energy Council

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UPDATES & TRENDS

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Opening Comments

A lot of ground has been covered over the past year at IREC. We've seen measurable gains on the regulatory front; higher bars set for renewable energy and energy efficiency training; U.S. grid-connected PV installations doubling in 2010 compared with installations in 2009; and on-going state support for renewable and efficiency policies.

Game changers don't come often, but we have a few worth mentioning including stopping an 8 cents/kWh charge on net metering systems in New Mexico. That charge would have ended net metering at the biggest utility in one of the nation's sunniest states. Colorado's community solar "gardens" are looking at technical issues, such as appropriate fees for delivery of energy. This expansion of program opportunities means one of the most dynamic state programs will continue to open up market opportunities for customers investing in green energy. And, Delaware now allows for community renewables — not just solar. Let's see what other technologies benefit from this rule.

We continue grading state net metering and interconnection procedures for the annual *Freeing the Grid* publication. While there weren't as many dramatic grade changes this year, consider this: Indiana went from a D to a B in net metering and from a C to a B in interconnection. Alaska went from no grade (or an F) to a C in net metering. West Virginia went from an F to a B in interconnection. And, swinging back to Delaware, they went from an F to an A in interconnection! IREC was involved in all of these grade changes.

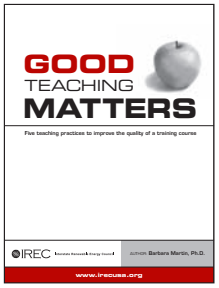
There is no doubt that the green job buzz has subsided, but that's good news. Now, quality measures and assessment components have the breathing room to be appropriately built into the clean energy workforce. Competency standards and work specifications take time to develop and implement. The results of high-quality training programs and verifiable credentialing schemes have a dramatic impact on market growth, customer acceptance and reduced costs. Greener career pathways leading to transportable credentials and degrees was one of many topics discussed when IREC organized the fourth national conference on workforce education for renewable energy and energy efficiency held last March in (snowy) Saratoga, New York.

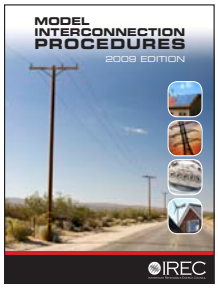
In IREC's role as the National Administrator of the U.S. Department of Energy's Solar Instructor Training Network, a solar career map has been created. What makes this career route unique is that the end product is an on-line, visual roadmap that includes occupational descriptive information, skills and competencies, education and training paths, certification opportunities, and licensing requirements. It is interactive and more flexible and realistic than the typical static chart of *mailroom-to-boardroom* advancement.

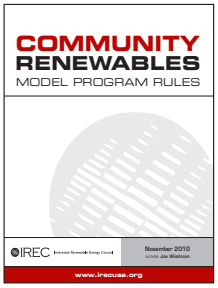
IREC's ISPQ credentialing program continues to grow with more than 115 active certificants. A number of major landmark events occurred over the past year. In March, IREC bought the ISPQ International Standard 01022 from the Institute for Sustainable Power. A Standards Committee was seated in May to add value to this Standard by creating a new, energy-related certificate specialty Standard. Then, at the end of July, IREC and the American National Standards Institute (ANSI) announced a partnership designed to help bolster the American workforce for the growing number of clean energy jobs. ANSI and IREC will pursue an independent, joint accreditation program for credit or non-credit energy efficiency and renewable energy-related certificate programs.

We thank all of our funders and members who have confidence in our work and give us the resources to move forward — the U.S. Department of Energy, the New York State Energy Research and Development Authority, the Energy Foundation, the Schwab Charitable Fund, the Grace Communications Foundation, and We Energies. We also thank the sponsors of our Annual Meeting for bringing us together to engage in thoughtful conversations about these issues.

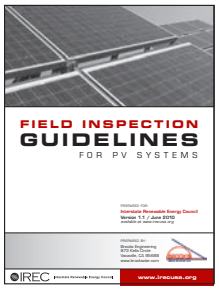
While we have been and will continue to run at a fast and full pace at IREC, at the end of the day, it's important to keep things in perspective. We know how lucky we are to be working with an incredible group of smart and creative people in our efforts to achieve a robust, clean energy economy.

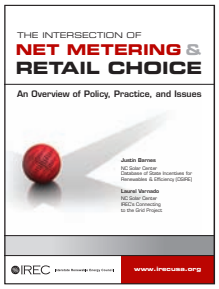


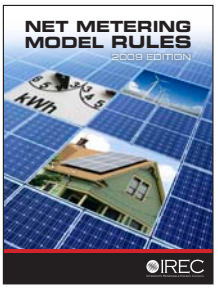


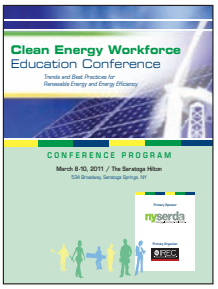


The Interstate Renewable Energy Council is a non-profit organization accelerating the use of renewable energy since 1982. IREC's programs and policies lead to easier, more affordable connection to the utility grid; fair credit for renewable energy produced; best practices for states, municipalities, utilities and industry; and quality assessment for the growing green workforce through the credentialing of trainers and training programs.









CHAPTER I

Kevin Fox, Jason Keyes
and Joe Wiedman

Regulatory Efforts

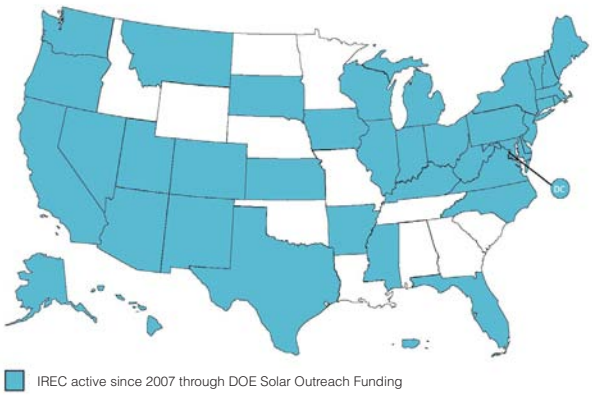
For nearly three decades, IREC has worked diligently to expand market opportunities for renewable energy. In the past five years, to achieve this goal, IREC has worked with a diverse set of stakeholders in 35 states to develop and implement best practices in net metering and interconnection, promote the availability of third party ownership models, implement successful wholesale market programs, develop reasonable retail rate design, improve land use and permitting processes, and promote the development of community renewables programs at state utility commissions and in a range of other settings. Simply put, all of these policies must be in alignment for a state's renewable energy program to "fire on all cylinders" — weakness on one of these issues undermines any positive impact from getting the others "right."

Our efforts on these issues have been and continue to be funded by the U.S. Department of Energy ("DOE"), the Energy Foundation, Solar America Board for Codes and Standards, Grace Foundation, and numerous additional donors both large and small. For all of this support, we are grateful. We simply could not do all of the work described here without such generous and widespread support.

The Foundations of Renewable Energy Markets – Net Metering and Interconnection

IREC participated in state utility commission dockets addressing net metering in 10 states during the past year. In 2011, states developing new or substantially improving net metering programs focused on the foundational issues: total program enrollment capacity, individual system capacity limits, rollover of excess generation, safe harbor provisions (forbidding special charges for net metered customers), REC ownership, and identification of eligible technologies. Similarly, development of robust interconnection procedures at its core focuses on putting in place simplified procedures for smaller facilities that utilize technical screens to speed these systems through the interconnection review process along with the development of clear study processes for larger facilities that might require more detailed review.[1] IREC participated in state utility commission dockets addressing interconnection in nine states during the past year.

IREC Involvement in Net Metering, Interconnection and Third-Party Rulemaking Through DOE Solar Outreach Grant



As more and more states move towards best practices in net metering rules and interconnection procedures, the pace of progress on these issues can appear to slow as laggard states embrace renewable energy and proceed along the path of best practices developed by vanguard states and as leading states improve their already solid programs to meet the needs of their evolving markets. However, much work remains to be done and progress is not uniform. For example, while 16 states score an "A" for net metering in *Freeing the Grid*,[2] strong net metering rules are only one part of a robust renewable energy policy. Interconnection procedures, utility rate polices, and incentives are also necessary to have a renewables program that fires on all cylinders. Unfortunately, only five states score an "A" for interconnection, and 23 states score lower than a "C" or do not have statewide interconnection standards at all.[3] IREC's experience in three states — Delaware, California, and Hawaii — drive this point home.

Delaware began 2011 with an "A" for net metering and an "F" for interconnection. This low score in interconnection came despite consistent legislative efforts to keep Delaware's

1 *For a complete review of these issues with explanations of their importance, see* Freeing the Grid, *available at www.newenergychoices.com*

2 *Based on preliminary* Freeing the Grid *2011 scoring.*

3 *Based on preliminary* Freeing the Grid *2011 scoring.*

On the net metering front, states continue to make steady progress towards best practices.

renewable energy policies on the forefront of best practices that included development of robust incentives for distributed generation as part of Delaware's renewable portfolio standard. Fortunately, during the process of developing Delaware's community renewables program, a hard look was taken at interconnection. After almost a year of effort on the part of stakeholders, Delaware is poised to adopt interconnection procedures that will garner it the top score in *Freeing the Grid*.

California has had a top-scoring interconnection process for net-metered generators for a number of years. However, California's desire to greatly expand distributed generation through a variety of new wholesale procurement programs has challenged California's utilities to keep up with an increasing volume of requests to interconnect new wholesale generators up to 20 MW in capacity. Hundreds of these generators have sought interconnection to California's electric transmission and distribution systems over the past two years, resulting in massive delays in processing interconnection requests. To address the backlog, California's Independent System Operator and its two largest investor-owned utilities held stakeholder processes and proposed tariff modifications to their FERC-approved small generator interconnection procedures. With support from the Energy Foundation, IREC was engaged in all three processes. Although we were able to introduce a number of beneficial changes, IREC protested and remains concerned about a number of aspects of the approved procedures. IREC expects to be active in continuing efforts to reform California's interconnection processes over the next year to better facilitate the success of California's wholesale distributed generation programs.

Hawaii's interconnection story has not been fully written yet, but the future looks bright. IREC has been engaged in an interconnection rulemaking in Hawaii for a little over a year and a half. The new interconnection procedures will be critical to ensuring the successful interconnection of generators participating in Hawaii's feed-in tariff program. IREC has played a key role in helping facilitate settlement discussions between the Hawaiian Electric Companies and a range of diverse stakeholders. Although settlement discussions were at times arduous, they ultimately lead to a number of important breakthroughs that *all* parties to the interconnection proceeding have agreed to support and present jointly to the Hawaii Public Utility Commission for approval. IREC believes a number of these agreements represent new national best practices for interconnecting distributed generation. As a result, Hawaii is poised to adopt interconnection procedures that will increase its *Freeing the Grid* score from an "F" to a "B."

On the net metering front, states continue to make steady progress towards best practices. For example, aggregate net metering allows customers with multiple meters on their property or accounts to aggregate the loads associated with these meters/accounts when determining the size renewable energy system they would need to offset their load. By allowing a customer to install one larger system versus smaller systems for each meter or account, aggregate net metering allows for economies of scale. During the last year, Oregon and Delaware embraced this best practice by authorizing aggregate net metering. A pilot program was also proposed in Arizona.

IREC has been deeply engaged in all of these issues by participating in preliminary workshops, submitting multiple rounds of comments, educating stakeholders on the technical and policy issues related to net metering and interconnection, coordinating stakeholder positions, attending workshops and hearings, and briefing legal and technical issues. Net metering and interconnection remain the foundation for developing robust solar PV markets; therefore, continued focus on assisting states in developing programs is essential.

Over the last year, IREC has also continued to engage in cutting edge research and reporting to support our market building efforts. IREC completed a study detailing methodologies for assessing possible rate impacts of net metering through a contract from the Solar America Board for Codes and Standards ("Solar ABCs"), and IREC continues to support the development of *Freeing the Grid*, which provides analysis and grading of states' net metering programs and interconnection procedures.

Third Party Ownership – Removing Barriers to Investment in Renewable Energy

Third party ownership models continue to propel the adoption of solar energy by removing significant barriers to renewable

Community renewables programs represent an exciting opportunity to expand options for utility ratepayers to invest in renewable energy.

energy investment including high upfront costs and lack of access to federal and state incentives. Fortunately, third party ownership was less of an issue in the past year, as it has now been approved in most states with active solar energy incentive programs. However, this important innovation in solar financing is likely to become an issue in many other states as solar facility costs continue to decline and solar energy becomes cost competitive without state incentives in the future. The Pennsylvania Public Utilities Commission recently moved to allow third party ownership of renewable energy systems, and IREC plans to participate and work hard to ensure Pennsylvania joins the 22 states that have moved to clearly authorize third party ownership.

Community Renewables – Expanding Opportunities for Investment in Renewable Energy

Community renewables programs represent an exciting opportunity to expand options for utility ratepayers to invest in renewable energy, as not all ratepayers are able or willing to host a renewable energy system on their property. They could be a renter, live in a multi-tenant building that does not allow solar, have a shaded roof or face any other number of barriers to hosting a renewable energy system on their site. According to a 2008 study by the National Renewable Energy Laboratory, only 22 to 27 percent of residential buildings are suitable for hosting an onsite solar PV system.[4] With over 2/3 of the residential market potentially unable to host an onsite system, clearly alternatives need to be available. Bridging this gap in offerings is not only smart business for solar companies seeking to reach customers eager for their product, but is also a matter of fairness as all utility ratepayers deserve an opportunity to participate in the renewable energy programs they support.

To assist stakeholders in developing community renewables programs that build on successful onsite renewable energy programs, IREC has engaged in a number of activities over the last year. We published model program rules to assist stakeholders in developing their programs. We spoke at nearly a dozen conferences and webinars to educate stakeholders on the opportunities community renewables programs represent and how they can build their own program based on their local needs and community preferences. We also assisted in the publications of a number of guidebooks and reports related to community renewables including: (1) *Solar Powering Your Community: A Guide for Local Governments*, published by the DOE; (2) *A Guide to Community Solar: Utility, Private and Non-profit Project Development* published by the DOE; and (3) *Community Power: Decentralized Renewable Energy in California* published by the Local Clean Energy Alliance. We continue to assist Washington, Colorado and Delaware in implementing their community renewables programs and working with other stakeholders at municipal and cooperative utilities as they explore the topic. IREC has also developed a white paper that explores opportunities for community solar in Texas.

One of the thorniest issues in developing a community renewables programs surrounds the valuation of the energy produced by the community system. Because of IREC's work on cost-benefit issues in renewable energy, we stand well positioned to address this topic in a way that ensures utilities have an opportunity to recover their costs while participants in a community renewable system receive fair compensation for their investment in renewable energy resources.

Retail Rate Design – Recognizing the Value of Solar Investments

The costs and benefits of distributed generation continues to be a hotly debated topic. Through a contract from the Solar ABCs, IREC authored a forthcoming study, *A Generalized Approach to Assessing the Rate Impacts of Net Energy Metering*, which investigates best practices in methodologies for assessing the rate impact of net metering on other ratepayers. Various studies have looked at the costs and benefits of customer-sited generation, but assumptions have varied from study to study and each was written in the context of a specific utility service area or state. All of them have recognized that solar energy systems provide power in the daytime, when electricity tends to be more costly, but they diverge from there.

IREC's study reviews the benefits considered in the various studies and suggests a uniform list of benefits, including utility savings related to variable energy costs for the electricity that the utility no longer needs to supply, reduced need

4 *See http://www.nrel.gov/docs/fy09osti/44073.pdf.*

IREC remains committed to assisting all stakeholders in assessing the impacts of distributed generation systems to ensure utilities are able to adequately recover their costs.

for new peaking generation, reduced need for transmission and distribution system expansion, lower utility maintenance costs due to less stress on the utility system, elimination of the line losses associated with the electricity that used to be generated remotely, and more. Each of these benefits in turn requires analysis, and studies have varied widely, particularly with respect to generation and T&D capacity benefits. The study similarly reviews the costs identified in prior studies to suggest a uniform list of costs that require assessment and consideration.

As a result of this effort, IREC was well positioned to engage in addressing rate impact claims made by a utility in New Mexico. The state's largest utility, PNM, had proposed a special charge for net-metered customers based on a lost retail sales and a short-term view of the benefits associated with net metering. IREC was a party to the rate case where PNM's proposed rate design was discussed and helped to successfully negotiate the withdrawal of this proposed standby charge on all new interconnected customers. IREC's expert testimony demonstrated that the benefits of distributed generation far *exceeded* the costs that those generators impose on the utility's system. When measuring the benefits of distributed generation against the fixed costs associated with "lost retail sales," IREC's testimony showed that many distributed generation customers would rightfully be due a *credit*, varying by customer class. This result is far from the roughly $0.08/kWh charge that the utility sought to recover from all applicable customer classes for each kWh produced.

Because a newly enacted New Mexico law permits utilities to seek recovery of standby charges from newly interconnected customers where the costs imposed by those customers outweigh the benefits to the system, IREC expects that other utilities may pursue the same arguments. IREC and others will need to be present in those cases to demonstrate the net benefits of distributed generation. The key fight in opposing these standby charges will be in showing that distributed generation contributes net benefits and causes only *de minimis*, if any, costs on a utility's system.

IREC also engaged on cost-benefit issues in Nevada, Virginia, California, and Colorado during the past year, and we expect cost-benefit issues to increasingly come to bear as solar penetration increases. As always, IREC remains committed to assisting all stakeholders in assessing the impacts of distributed generation systems to ensure utilities are able to adequately recover their costs. However, as the PNM rate case shows, careful review of claimed costs stemming for distributed generation is necessary to arrive at a fair and accurate outcome.

Wholesale Market Design – Ensuring Policies Allow Solar to Thrive in all Market Segments

In October 2010, IREC coauthored a report for the Solar ABCs titled *Sustainable, Multi-Segment Market Design for Distributed Solar Photovoltaics*,[5] which contains recommendations for implementing policy support across a range of market segments, including wholesale markets. The report supports targeted feed-in tariffs for smaller generators and competitive procurement for larger generators. IREC promoted these recommendations at a number of speaking engagements over the past year, including a January 2011 EUCI Conference in Los Angeles titled *Meeting RPS Through Large Scale PV*.

IREC's regulatory efforts during the prior year have focused on two fundamental aspects of wholesale market design: (1) reforming interconnection procedures to facilitate interconnection of generators selling wholesale power; and (2) assisting PV stakeholders to identify approaches to wholesale market design that fit within state jurisdiction. IREC has participated in regulatory proceedings in Hawaii, California, Colorado, New Jersey and Massachusetts to address the first of these issues. With regard to the second, IREC participated in regulatory proceedings in California and before the Federal Energy Regulatory Commission ("FERC"). At the federal level, IREC worked with The Solar Alliance, the Vote Solar Initiate, the California Solar Energy Industries Association and the national Solar Energy Industries Association to file comments at FERC in response to petitions filed by the CPUC and California's three largest investor-owned utilities regarding the extent of the CPUC's authority to establish wholesale power prices. This proceeding concluded in January 2011 when FERC issued the final of a series of decisions clarifying how states may establish feed-in tariffs pursuant to the federal Public Utility Regu-

5 *See http://www.solarabcs.org/about/publications/reports/market-design/*

IREC will be in a position to start developing specific policy suggestions and to begin participating publicly in the discussion on how to expedite and streamline the solar permitting process.

latory Policies Act. In a March 2011 LSI Telebriefing titled *New FERC Ruling on State Feed-in Tariffs*, IREC moderated a panel of experts to discuss and explain FERC's decision and the opportunities it presents for state policy development.

Land Use & Permitting – Expediting and Streamlining the Solar Development Process

IREC has begun a comprehensive review of the existing literature on the permitting issues being faced by rooftop and ground-mounted solar systems. Prior to beginning to advocate for specific policy revisions, IREC is working to ensure that we are familiar with the scope of issues that other parties have identified and the proposed solutions that are being circulated. Following this research and outreach effort, IREC will be in a position to start developing specific policy suggestions and to begin participating publicly in the discussion on how to expedite and streamline the solar permitting process, both for rooftop and ground-mounted systems.

In addition to these efforts, IREC published an article in the July/August issue of *Solar Today* that identified the challenges that the growing market for wholesale distributed generation may face if there is not an effort to coordinate the land use and environmental permitting processes. The article identifies some of the hurdles that ground-mounted distributed generation projects will face in the permitting process that are distinct from rooftop projects and explains how comprehensive planning by cities and counties may avoid some of the time delays and public controversies that these hurdles otherwise pose.

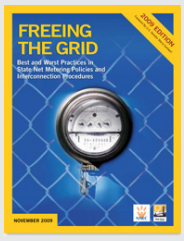
Outreach

During the past year, IREC had the privilege of speaking at the following events:

- American Solar Energy Society's Annual Conference, Solar 2011 in Raleigh, NC
- Solar Power International 2010 in Los Angeles, CA
- Solar America Cities Fourth Annual Conference in Philadelphia, PA
- The U.S. DOE Northeast Solar Boot Camp in New York, NY
- The U.S. DOE Southeast Solar Boot Camp in Atlanta, GA
- California Governor's Conference on Local Renewable Energy Resources in Los Angeles, CA
- EUCI, Meeting RPS Through Large Scale PV in Los Angeles, CA
- LSI Telebriefing: New FERC Ruling on State Feed-in Tariffs
- Intersolar Conference in San Francisco, CA
- SolarTech's Solar Leadership Summit in San Jose, CA
- Future Energy Conference in Seattle, WA
- Fourth International Conference on Integration of Renewable and Distributed Energy Resources in Albuquerque, NM

Each of these venues represented a unique opportunity to reach decision makers and other stakeholders interested in learning about IREC's work and how they can use it to expand opportunities for renewable energy development in their state or locality.

Finally, IREC continued its grading of state net metering and interconnection procedures for the annual publication of *Freeing the Grid*, and took on additional editorial duties for the publication. *Freeing the Grid* is now so well regarded that it served as part of the basis for grading regional teams vying for awards from a major DOE solicitation in the past year.



Even though states continue to grapple with budget shortfalls, unemployment and other ongoing economic blues, policymakers still see “green jobs” as an opportunity for economic revitalization and generally have maintained support for policies that foster growth in this area.

CHAPTER II

Chelsea Barnes, Justin Barnes, Rusty Haynes, Amy Heinemann,
Brian Lips and Amanda Zidek-Vanega
Database of State Incentives for Renewables & Efficiency (DSIRE)
N.C. Solar Center at N.C. State University

State Solar Incentives and Policy Trends

Introduction

Even though states continue to grapple with budget shortfalls, unemployment and other ongoing economic blues, policymakers still see "green jobs" as an opportunity for economic revitalization and generally have maintained support for policies that foster growth in this area. While only one state (Connecticut) passed an omnibus energy bill that made sweeping reforms related to both renewable energy and energy efficiency in 2010-11,[1] almost every U.S. state (45) plus the District of Columbia and Puerto Rico modified solar policies or programs in some way. *See www.dsireausa.org/solar for details regarding the current status of solar policies and programs.*

Renewable Portfolio Standards (RPS)

Twenty-nine states plus the District of Columbia and Puerto Rico have established mandatory renewable portfolio standard (RPS) policies, and eight states have set voluntary renewables goals. It is not surprising, therefore, that the number of new and expanded RPS policies waned again in 2010-11, compared to the number in previous years. While no new RPS policies were established, one voluntary goal was created (by Indiana) and two jurisdictions (California and the District of Columbia) adopted more ambitious standards. Furthermore, several important RPS changes were implemented, including major changes to facility eligibility criteria, significant rule adoptions, and the creation of programs that facilitate RPS compliance. Table 1 summarizes the most significant RPS developments that took place in 2010-11.[2]

The changes relating to facility eligibility are the most striking policy development. With the exception of the more stringent biomass regulations under review in Massachusetts, solar and wind developers and advocates could view these changes as dilutions of existing standards because non-solar and wind projects could be used for compliance. Yet, policymakers likely view these changes as facilitating compliance with the RPS standards since the changes broaden the eligible resource base.

Direct Cash Incentives for Solar

Direct cash incentive programs (including rebates, grants, performance-based incentives, and renewable energy credit

Table 1 Eleven states made significant adjustments to their RPS policies.

State	Arena	Type of Change	Highlights
CA	Legislative	Expansion/Facility Eligibility	New law replaced governor's executive order that increased standard to 33% by 2020; RPS now applies to publicly-owned utilities; unbundled tradable RECs authorized in a limited manner
CT	Legislative	Facilitating Programs	15-year REC contracts for zero-emission facilities (≤ 1 MW) and low-emission facilities (≤ 2 MW); 30-MW solar program established
DE	Legislative	Facility Eligibility	Certain new fuel cell projects qualify to produce SRECs (1 SREC per 6 MWh) but limited to 30% of the solar carve-out requirement annually
D.C.	Legislative	Expansion	New solar carve-out of 2.5% by 2023 replaced former carve-out of 0.4% by 2020; now largely limited to in-District facilities of 5 MW or less; solar thermal eligibility rules clarified
IN	Legislative	New goal	Voluntary goal of 10% by 2025 set; nuclear and natural gas included as eligible technologies
MD	Legislative	Facility Eligibility	New solar water heating eligible for solar carve-out; waste-to-energy designated as Tier I resource
MA	Regulatory	Facility Eligibility	Review of biomass eligibility criteria culminating in a rule proposal that would establish stringent facility efficiency criteria
MO	Regulatory	Facility Eligibility	PSC withdrew rules requiring delivery of renewable electricity into state and rules related to utility standard SREC purchase offers
NJ	Regulatory	Rules Established	Offshore wind carve-out certification, contracting and REC rules established
NC	Legislative	Facility Eligibility	Electricity demand reduction qualifies without limit
WI	Legislative	Facility Eligibility	Hydropower ≥ 60 MW placed in service after 12/30/2010 (including Canadian facilities) qualifies beginning 12/31/2015

1 This article is based on research conducted by the DSIRE staff regarding state solar policy developments in the United States. The timeframe for research summarized in this article is September 2010 to August 2011.

2 It is worth noting that "significant" is subjective. We have focused on enacted legislation and broad regulatory determinations. Not included are activities related to utility compliance plan proceedings (e.g., Xcel Energy in Colorado), case-specific determinations (e.g., whole-tree harvesting in North Carolina and compliance waivers in Ohio), renewable energy working group activities (e.g., Delaware), relatively straightforward rule adoptions (e.g., Kansas), proposed legislation (numerous examples), and ongoing court challenges (e.g., Arizona, Colorado and Missouri).

Almost every U.S. state (45) plus the District of Columbia and Puerto Rico modified solar policies or programs in some way.

purchase programs) remained in place in many states, and the overall number of such programs did not change significantly since last year's report. Approximately 30 new direct cash incentives were created, while 23 such programs closed in the past year. Additionally, 59 programs were modified in some way.[3] As of August 31, 2011, twenty-six states offer direct cash incentive programs for solar — six fewer than in September 2010. (See Figure 1.)

Incentive Program Turmoil

Unpredictable changes in several incentive programs, as a result of either funding deficits or legal modifications, have fanned market uncertainty for consumers and businesses. For example, the District of Columbia's renewable energy incentive program was suspended in February after the city council reallocated $700,000 from the renewable energy incentive program to the general fund, causing the program to be oversubscribed and leaving pre-approved applicants without funding.[4,5] In March, available funding was identified by reallocating funds from other programs of the Sustainable Energy Trust Fund. The funds were used to support pre-approved projects only.[6] The incentive program is scheduled to reopen in October, with significantly reduced incentive levels.

A judicial decision briefly endangered Missouri's voter-mandated photovoltaic (PV) rebate programs in July. Cole County Circuit Court Judge Green ruled in favor of the Missouri Retailers Association, declaring the rebate program requirement within the state's RPS to be illegal.[7] Two of Missouri's investor-owned utilities, Ameren Missouri and Kansas City Power & Light, petitioned the Missouri Public Service Commission (PSC) for permission to end their solar rebate programs,[8] and Ameren suspended its program although approval from the PSC was pending.[9] Less than a month later, the circuit court judge set aside the original ruling, and the PSC required both programs to remain open for at least 120 days while the PSC considered the filings, in light of the subsequent circuit court ruling.[10]

Ohio closed all of its Advanced Energy grant programs in advance of the expected sunset of the state's public benefits fund collections (approximately $2.5 million in 2010).[11] While the sunset of the collection of funds was anticipated, premature program closures were not. The Ohio Department of Development has announced that the Advanced Energy Fund will provide support in the future, although the format will change and amounts will be much lower.

Lastly, in Colorado, Xcel Energy's Solar*Rewards Program experienced several incentive fluctuations. Since a 2010 law removed the $2/watt rebate from the RPS law, Xcel has restructured its rebate and REC-payment levels on numerous occasions. Xcel abruptly closed the program in February while it petitioned the Colorado Public Utilities Commission to lower the utility's rebate and REC levels again. The solar industry intervened and requested a hearing at the Public Utilities Commission (PUC). The PUC ordered the utility to negotiate with the solar industry. As a result, the program has been reactivated with lower incentive levels.[12]

Rebates vs. Solar Renewable Energy Credits (SRECs)

In continuation of a trend seen in prior years, reductions in up-front incentives for PV in several states with solar carve-outs are indicative in part of an increased reliance on SRECs as a financial incentive.[13] The last vestiges of New Jersey's vaunted solar rebates disappeared in June 2011 with the termination of the EDC Solar Financing Incentive (ESFI) program. The future of incentives funded by the Ohio Advanced Energy Fund is questionable with the expiration of the associated ratepayer surcharge. Up-front incentive levels in the District of Columbia, Delaware, Maryland, Massachusetts, New Hampshire, and

3 *This figure represents the tally of DSIRE news articles regarding direct cash incentives for solar reported via the* IREC Report *(formerly the IREC* State & Stakeholder *newsletter) from September 1, 2010, to August 31, 2011. These numbers include direct cash incentives offered by states, utilities and local jurisdictions.*

4 *Fiscal Year 2011 Revised Budget Request Act of 2010, December 17, 2010, http://www.dccouncil.washington.dc.us/images/00001/20101214151924.pdf*

5 *Resolution 19-67, March 15, 2011, http://www.dccouncil.washington.dc.us/images/00001/20110317123546.pdf*

6 *Ibid.*

7 *Tomich, J. Reversal on rebates stings solar industry, July 17, 2011. St. Louis Today. http://www.stltoday.com/business/local/article_16b120e8-a312-5eda-a95c-739d8fc17284.html*

8 *KCP&L Tariff Filing JE-2012-0014 and JE-2012-0015, July 11, 2011; Ameren Tariff Filing, YE-2012-0020, July 15, 2011.*

9 *Ameren Rebates and Funds for Solar Projects web site http://www.ameren.com/Solar/Pages/RebatesandFunds.aspx, accessed July 19, 2011 and confirmed by personal communication.*

10 *PSC Orders KCP&L July 27, 2011 (ET-2012-0021, http://pre.psc.mo.gov/orders/2011/072712021.htm) and Ameren Missouri July 27, 2011(ET-2012-0016, http://pre.psc.mo.gov/orders/2011/072712016.htm).*

11 *Public Benefits Fund for Renewables Map, DSIRE, http://www.dsireusa.org/documents/summarymaps/PBF_Map.pptx, May 2011.*

12 *Colorado Solar Energy Industry Association filed the request and negotiated the subsequent deal. http://www.coseia.org/newsite/xcel-energy.html*

13 *Reductions in installed system costs undoubtedly have played a significant role in stimulating incentive level declines.*

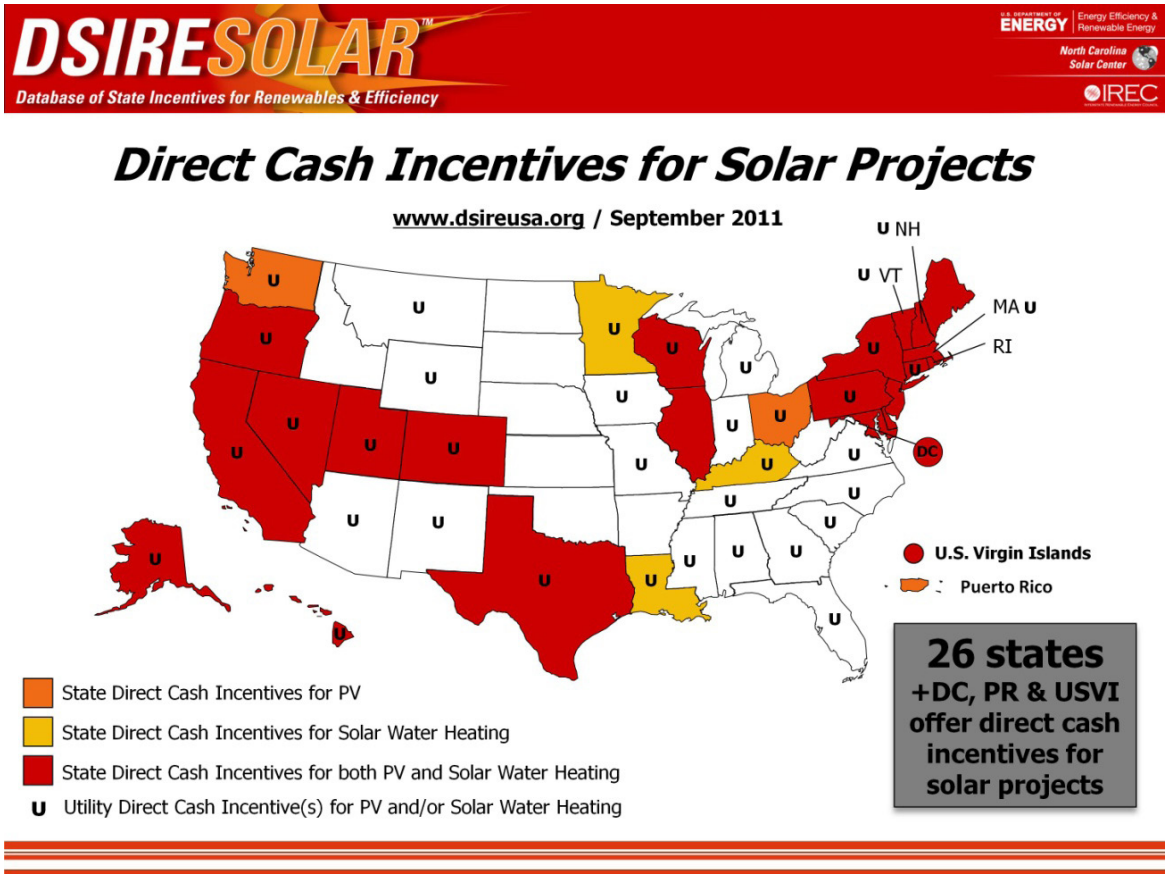


Figure 1: Direct Cash Incentives for Solar Projects

Pennsylvania are now generally at or below $1.50/watt, and in only one case does the maximum incentive exceed $50,000 ($52,500 under the Pennsylvania Sunshine program). Historically, incentives ranged from $3/watt to $6/watt.[14] The clear implication of incentive level declines coupled with lowered maximum incentives is that up-front incentives are now largely limited to residential and small non-residential systems.

Treatment of Third-Party-Owned Systems in Incentive Programs

Delaware enacted legislation in 2010 that prompted a series of program changes to Delmarva Power's Green Energy incentive program in 2011. Significantly, this new law clarified that renewable energy systems installed on a customer's property and owned by a third party are eligible for incentives. Previously, there was ambiguity about the eligibility of such systems for incentives under this program.

In 2011, Maryland created a sales tax exemption for electricity purchased via third-party power purchase agreements (PPAs). Maryland had already established sales tax exemptions for solar and wind energy *equipment* and purchases of electricity from investor-owned utilities. This new law leveled the playing field for third-party PPA electricity sales. Oregon also issued new rules for the state's Residential Energy Tax Credit (RETC); third-party ownership was addressed so that homeowners may use the tax credit for leased systems.

These recent incentive adjustments constitute an important trend that began a few years ago. For example, Xcel Energy and Black Hills Energy adjusted their PV incentive programs in 2009 after the Colorado legislators and regulators cleared the way for third-party PPAs. Both utilities allow systems installed in connection with a third-party PPA to receive incentive payments, although such systems are only eligible for performance-based incentives, not upfront rebates. In addition, Energy Trust of Oregon and the Commonwealth Solar II program in Massachusetts also allow third-party owners to receive incentives, but the incentive levels are smaller than those for customer-owned systems.

As third-party PPAs, equipment leases, and other innovative ownership models that facilitate financing enter new markets, there is a need for program administrators and policymakers to address them and determine how such financing models fit within existing or new program structures and incentives.

PACE

Overall excitement surrounding property assessed clean energy (PACE) financing has diminished since the Federal Housing Finance Agency (FHFA) issued a statement in 2010 indicating that PACE assessments acquiring a priority lien over existing mortgages, on par with property taxes, contradict

14 *Case Studies on the Effectiveness of State Financial Incentives for Renewable Energy, Susan Gouchoe, Valerie Everette, and Rusty Haynes (NC Solar Center). National Renewable Energy Laboratory, NREL/SR-620-32819. 2002. http://www.dsireusa.org/documents/PolicyPublications/Case_Studies_Report_2002.pdf*

traditional lending practices and raise "safety and soundness concerns."[15] As a result, most counties and municipalities developing or offering PACE programs put their programs on hold. Despite this set-back, several states enacted legislation authorizing new or amending existing PACE laws, and active programs are operating in five states. Michigan, Wyoming and Connecticut enacted PACE legislation, raising the total number of states allowing PACE financing to 27 plus the District of Columbia. Both Vermont and Oklahoma amended existing PACE laws, downgrading the senior lien to a junior lien status, thereby directly addressing FHFA's concerns. Vermont also established two reserve funds designed to cover losses in the event of foreclosure of participating properties and to offer additional security to financial institutions interested in funding PACE programs. PACE financing is now available to over 80 communities in Maine through Efficiency Maine, the state's PACE administrator.[16] Outside of Maine, the following communities continue to offer PACE financing to property owners: Palm Desert, CA; Sonoma County, CA; Boulder County, CO; Babylon, NY; and River Falls, WI.

Net Metering and Interconnection

The era of simple net metering is over. In 2010-11, states continued to focus on fine-tuning and enhancing existing policies to accommodate new applications of renewable energy. Around a dozen states expanded or otherwise amended net metering policies that were already in place.

Regulators in California and New York ironed out more issues related to the treatment of net excess generation (NEG), providing additional policy clarity for customers and utilities.[17,18] Maryland enacted legislation to repair a legislative snafu made last year that watered down the value of NEG.[19]

Vermont increased the individual system limit for net metering from 250 kW to 500 kW, and raised the aggregate capacity limit from 2% to 4% of a utility's peak demand. Group net metering was also enhanced and utilities are now required to offer additional credits of $0.20/kWh, minus the highest residential rate, for solar net metering.

Indiana vastly improved its net metering policy by raising the maximum individual system capacity from 10 kW to 1 MW. Indiana also restricted a renewables property tax exemption by allowing the exemption only for systems that are net-metered.

Massachusetts enacted legislation creating a new category of net metering that applies to certain government facilities up to 10 MW. The aggregate capacity limit for such facilities is 2% of a utility's peak load. Nevada enacted new legislation that allows meter aggregation for large hydroelectric facilities (up to 1 MW) and certain wind turbines, and raised the aggregate capacity limit for net metering from 1% of a utility's peak load to a statewide cap of 2% of peak load for all utilities combined. Rhode Island completely overhauled its policy, allowing net metering for certain systems up to 5 MW, extending net metering to additional renewable resources, raising the aggregate limit of net-metered systems, and expanding meter aggregation and virtual net metering options.

Delaware adopted new regulations for meter aggregation and community net metering, and extended net metering to systems under third-party ownership. New York enacted legislation allowing virtual net metering for non-residential systems, and California regulators approved virtual net metering for multi-tenant properties. Connecticut included a provision for virtual net metering for municipal customers in its omnibus energy bill.

Three years after Louisiana enacted legislation raising the individual system limit to 300 kW for non-residential net metering, state regulators adopted this limit. Virginia raised the limit for residential net metering from 10 kW to 20 kW, but standby charges apply to such systems greater than 10 kW. Hawaii regulators issued an order approving changes to Kauai's program, which was full, implementing a *Net Metering Pilot Program* with higher capacity limits and a fixed $0.20 per kWh rate for net excess generation. They also lifted aggregate capacity limits for Hawaiian Electric Company, which are now based on per-circuit caps rather than a percentage of peak demand.

Alaska regulators adopted interconnection guidelines for net-metered systems up to 25 kW. West Virginia corrected its interconnection standards, adding comprehensive interconnection agreement language to its rules.

See Chapter 1 for more details on key developments regarding net metering and interconnection during the last year.

Tax Credits/Incentives

No clear trends in tax incentive policy emerged. Some states extended and/or expanded tax credits that support solar; others allowed tax incentives to expire; and others reduced the scope of tax credits or eliminated them altogether.

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15 See this Federal Housing Finance Agency statement, issued in July 2010: http://www.fhfa.gov/webfiles/15884/PACESTMT7610.pdf

16 Maine received a $30 million grant from the U.S. Department of Energy Better Buildings Program, established through ARRA, to implement its statewide PACE program.

17 In June 2011, the California Public Utilities Commission set the compensation rate for NEG at the 12-month average spot market price for the hours of 7 a.m. to 5 p.m. for the year in which NEG was generated. (Alternatively, net-metered customers may opt to carry forward NEG indefinitely.)

18 In May 2011, the New York Public Service Commission issued an order that required utilities to (1) adopt consistent NEG credit calculations that include all kWh-based customer charges and (2) allow customers eligible for an annual cash-out of unused NEG at avoided cost, such as residential solar customers, to make a one-time selection of the annual period in question.

19 Legislation enacted in May 2010 required NEG to be carried forward each month as a monetary credit, valued at the "prevailing market price of energy," as opposed to as a kWh credit. Subsequent legislation, enacted in May 2011, restored monthly rollover of NEG at the retail rate.

No clear trends in tax incentive policy emerged. Some states extended and/or expanded tax credits that support solar; others allowed tax incentives to expire; and others reduced the scope of tax credits or eliminated them altogether.

Three states increased or extended tax credits during the past year. Georgia increased the aggregate cap of its tax credit and extended the credit by two years, until the end of 2014. Iowa extended its renewable energy production tax credits until 2015. Ohio established emergency rules for its renewables payment in lieu of property tax, and extended the application and construction deadlines for this incentive.

Several states eliminated or drastically reduced the scope of tax incentives. Oregon continued to tighten rules for its Business Energy Tax Credit (BETC) after several years of scrutiny and recent negative press. The BETC was initially authorized in 1979, though significant expansions to the tax credit were made in 1993 and over the past 10 years. Legislation enacted in August 2011 eliminated the BETC in its current form and replaced it with a new tax credit auction program and a grant program. Applications for the BETC that were submitted after April 15, 2011 will not be approved. Rules for the new programs have not yet been established; they are expected to be developed by October 2011. Oregon's renewable manufacturing tax credit will remain in place until its scheduled sunset in 2014. Idaho's renewable energy equipment sales tax refund expired in July 2011 and was not extended. Indiana specifically excluded utilities from taking the state's property tax exemption for renewables. Howard County, Maryland eliminated its property tax exemption. Vermont adjusted its solar business tax credit. Even though Vermont's credit was fully allocated at the end of 2010 (and is not slated for renewal), Vermont created a "grant in lieu of" option, allowing system owners with a credit allocation to take an upfront cash grant in lieu of the credit at 50% of the value of the credit. The intention was to extend the state's Clean Energy Development Fund, which must cover the cost of the solar business tax credit.

Solar Permitting, Solar Access and Solar-Ready Provisions

Four states created or revised permitting laws relating to solar. Oregon established a new solar permitting law; Connecticut established a local-option building permit fee waiver for renewable energy projects; and Colorado expanded and strengthened its solar permitting law. Vermont established a law in which net-metered PV systems 5 kW or less follow an expedited process for the *Certificate of Public Good* **if** the customer successfully informs the Public Service Board and complies with applicable utility interconnection requirements. In this case, 10 days after receiving the certificate of compliance with the interconnection requirements, a *Certificate of Public Good* is automatically "deemed issued," and the customers may proceed with installation. In Arizona, Tucson reactivated its solar permit fee waiver program.

Two states revised their solar access laws. Texas created a new solar rights law, and Oregon expanded its existing solar rights law. Under Oregon's new law, in areas zoned as commercial or residential, PV and solar-thermal systems are explicitly allowed as a permitted use.

Two jurisdictions created solar requirements for new homes. Puerto Rico updated its building energy code to require solar water heaters for all new one- and two-dwelling units and townhouses. California adopted regulations that apply to subdivisions created after January 1, 2011. Sellers of new homes in subdivisions must provide prospective buyers with information about solar costs, potential energy savings, and available incentives. (Builders may opt out of these requirements by installing PV elsewhere in an amount equal to 20% of buyers in the development opting for solar.)

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Public data on U.S. solar installations by technology, state and market sector allow for a better understanding of the environmental and economic impact of solar installations.

CHAPTER III

Larry Sherwood

Solar Installation Trends

Introduction

Different solar energy technologies create energy for different end uses. Two solar technologies, photovoltaics (PV) and concentrating solar power (CSP), produce electricity. A third technology, solar thermal collectors, produces heat for water heating, space heating or cooling, pool heating or process heat.

Photovoltaic cells are semi-conductor devices that generate electricity when exposed to the sun. Manufacturers assemble the cells into modules, which can be installed on buildings, parking structures or in ground-mounted arrays. PV was invented in the 1950s and first used to power satellites. As PV prices declined, PV systems were installed in many off-grid installations — installations not connected to the utility grid. In the last decade, and especially in the last several years, grid-connected installations have become the largest sector for PV.

Concentrating solar power (CSP) systems use mirrors and collecting receivers to heat a fluid to a high temperature (300°F to more than 1,000°F), and then run the heat extracted from the fluid through a traditional turbine power generator or Stirling engine. CSP can also be paired with existing or new traditional power plants, providing high-temperature heat for the thermal cycle. These generating stations typically produce bulk power on the utility side of the meter rather than generating electricity on the customer side of the meter. CSP plants were first installed in the United States in the early 1980s, and installations continued through the early 1990s. Although many of these installations still generate power today, few new systems had been installed since the early 1990s until recently. Installations have resumed, with one large plant constructed in 2010 and a significant number of announcements for new plants projected to be completed between 2011-2015. In another application, concentrating solar thermal can provide high temperature solar process heat for industrial or commercial applications. A few systems are installed each year using this technology.

Solar thermal energy is used to heat water, to heat and cool buildings, and to heat swimming pools. A variety of flat plate, evacuated tube and concentrating collector technologies produce the heat needed for these applications. Solar water heating systems were common in southern California in the early 1900s before the introduction of natural gas. Many systems were sold in the United States in the late 1970s and early 1980s. In the mid-1980s, the expiration of federal solar tax credits and the crash of energy prices led to an industry slow-down.

This report provides public data on U.S. solar installations by technology, state and market sector. Public data on solar installations help industry, government and non-profit organizations improve their efforts to increase the number (and capacity) of solar installations across the United States. Analysis of multi-year installation trends and state installation data helps these stakeholders learn more about state solar markets and evaluate the effectiveness of marketing, financial incentives and education initiatives. In addition, these data allow for a better understanding of the environmental and economic impact of solar installations.

For all solar technologies, the United States is only a small part of a robust world solar market. Product availability and pricing generally reflect this status. Germany is the top market for PV; Spain is the top market for CSP; and China is the largest market for solar thermal collectors. The grid-connected PV market in Ontario, Canada, ranks as one of the largest markets in North America. Ontario's market is discussed briefly. (Other than Ontario's market, this report does not analyze markets outside the United States.)

The information here is a summary of information included in the report *U.S. Solar Market Trends 2010*, available on the IREC web site at *http://irecusa.org/wp-content/uploads/2011/07/IREC-Solar-Market-Trends-Report-revised070811.pdf* In addition to more analysis, the full report contains details of the data collection methods and assumptions.

Photovoltaics

Overall Trends in Installations and Capacity

Annual U.S. grid-connected PV installations doubled in 2010 compared with installations in 2009 to 894 MW_{DC}, raising the cumulative installed grid-connected capacity to 2.15 GW_{DC} (see Figure 1). The capacity of PV systems installed in 2010

State renewable portfolio standard (RPS) requirements are encouraging investments in utility-scale solar plants.

was over eight times the capacity of PV installed in 2006. More than 50,000 systems were installed in 2010, a 46% increase over the number installed the year before. In 2010, 262 MW_{DC} were installed on residential buildings, 347 MW_{DC} at non-residential sites and 285 MW_{DC} in the utility sector.

Some PV installations are off-grid. Based on anecdotal information, off-grid installations likely totaled 40-60 MW in 2010, but IREC has not collected data for these installations, and they are not included in this report's charts.

The following factors helped drive PV growth in 2010:
There was stability in federal incentive policy. Tax credits for both residential and commercial installations are currently in place through 2016. In February 2009, as part of the American Recovery and Reinvestment Act (ARRA), Congress enacted the U.S. Treasury Grant in Lieu of the Investment Tax Credit Program (ITC). This program, commonly known as the Treasury cash grant program, provides commercial installations with the alternative of a cash grant instead of the tax credit. Although enacted in early 2009, the rules were not created until later that year. In 2010, the program operated for the entire year. The cash grant program was originally scheduled to expire at the end of 2010, but was extended through the end of 2011. The threatened expiration caused many projects to begin construction in 2010, in order to qualify for the grant program, but probably did not significantly affect the number of completed installations. Federal tax policy stability is good for solar markets. Developers and installers can plan and market their products and consumers can make rational decisions without arbitrary incentive deadlines.

Capital markets improved. Installing solar requires significant capital investment. With the economic meltdown in 2008, many capital markets dried up, contributing to the lack of growth in non-residential solar installations in 2009 compared with 2008. In 2010, the capital markets recovery can be seen in the growth of 63% for non-residential installations compared with 2009.

State renewable portfolio standard (RPS) requirements are encouraging investments in utility-scale solar plants. Utility sector investments increased by more than four times in 2010 compared with 2009 and this sector seems poised to continue its rapid growth over the next several years. In some states, RPS requirements have led to robust solar renewable energy credit (SREC) markets, which in turn have resulted in increased demand for and installation of distributed solar installations.

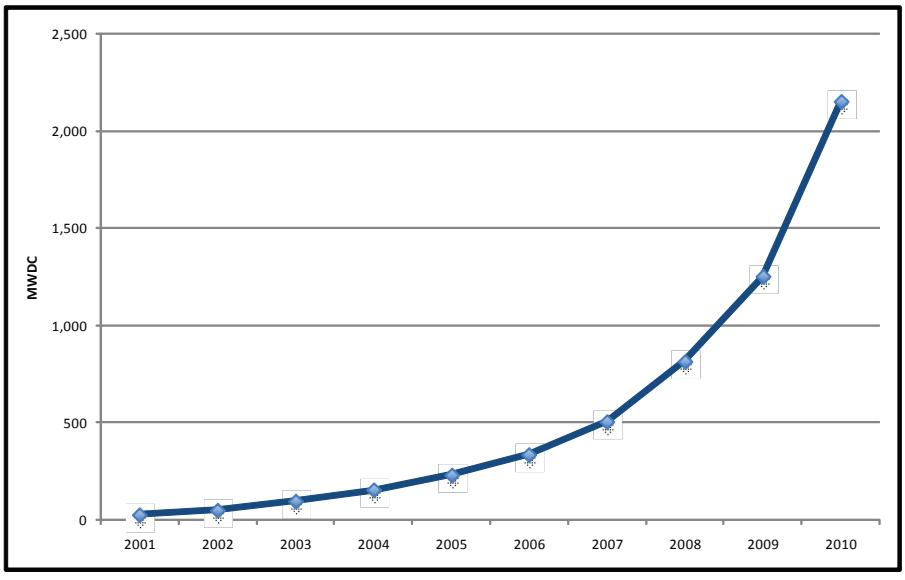


Figure 1: Cumulative U.S. Grid-tied Photovoltaic Installations (2001-2010)

State financial incentives continue to be an important factor, especially for residential and commercial distributed installations. Of the top ten states for PV installations, six have state or utility rebate programs that are the most significant driver in those markets. The federal incentives are important, but they are generally insufficient to create a market by themselves.

Federal stimulus funding continued. ARRA provided funding that helped solar installations in a number of different ways. First, the state of the economy means that tax equity investors are in short supply. The cash grant program provided a stronger incentive for installations than the federal tax credit. The cash grant program provided $410 million in 2010 and funded

Table 1:
SAMPLE INSTALLATIONS BY SECTOR

Sector	Example Installations
Residential	• Residential installation owned by homeowner or building owner; electricity generated is used on-site • Residential installation owned by third party, with electricity sold to the homeowner or building owner
Non-Residential	• Non-residential installation owned by building owner; electricity generated is used on-site • Residential installation owned by third party, with electricity sold to the building owner and used on-site
Utility	• Installation owned by utility; electricity generated goes into bulk power grid • Installation owned by third party; electricity generated goes into bulk power grid • Installation owned by building owner; electricity generated goes into bulk power grid through a feed-in tariff or similar incentive

at least 40% of the non-residential PV installations during the year. Second, ARRA funded many government solar installations at both the federal and state levels. Third, some states used their ARRA funding to create or enhance state financial incentive programs. Although the impact of ARRA programs will continue to be felt in 2011, this impact will begin to decrease as the funding is completed.

PV modules prices declined. Based on price data for a sample of 2010 installations, total installed price dropped by 14% for residential installations and 20% for non-residential installations.

Grid-Connected Installations by Sector

The growth rate of grid-connected PV varied by market sector, with the largest growth occurring in the utility sector. Non-residential facilities include government buildings, retail stores and military installations. The larger average size of these facilities results in a larger aggregated capacity. Residential and non-residential installations are generally on the customer's side of the meter and produce electricity used on-site. In contrast, utility installations are on the utility's side of the meter and produce bulk electricity for the grid. Table 1 shows examples of installations in each sector.

2010 marked the emergence of the utility sector photovoltaic market. Utility sector photovoltaic installations quadrupled over 2009 installations. Figure 2 shows the annual PV installation capacity data, segmented by residential, non-residential and utility installations. The share of utility sector installations of all U.S. grid-connected PV installations grew from virtually none in 2006 to 15% in 2009 and 32% in 2010. Of the ten largest PV installations in the U.S., six were installed in 2010. The two largest U.S. PV installations were installed in 2010. These

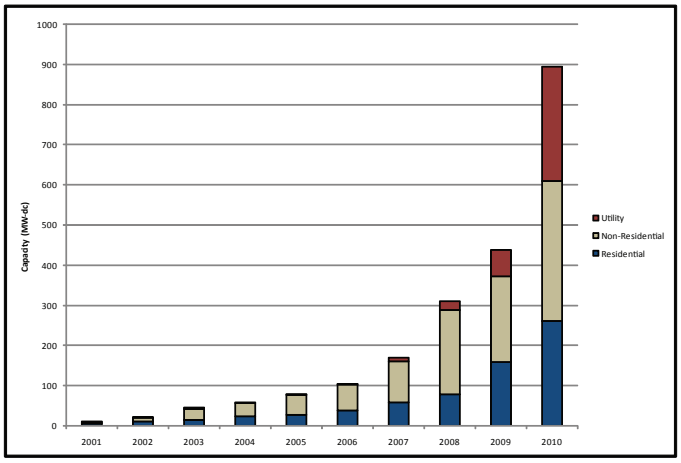


Figure 2: Annual Installed Grid-Connected PV Capacity by Sector (2001-2010)

are the 58 MW_{DC} Sempra/First Solar plant in Boulder City, Nevada, which supplies power to Pacific Gas and Electric customers in northern California and the 35 MW_{DC} Southern Company/First Solar plant in Cimarron, New Mexico, which supplies power to Tri-State Generation and Transmission Association customers in Colorado, Nebraska, New Mexico, and Wyoming.

State renewable portfolio standard (RPS) requirements encourage investments in utility-scale solar plants in some states. Federal tax incentives and grants and lower costs for PV modules also made these investments attractive. Construction has begun on many additional utility sector installations, and utilities and developers have announced even more projects to be built in the next few years. Installations in this sector seem poised for continued growth.

In 2010, annual distributed grid-connected PV installations in the United States grew by 62%, to 609 MW_{DC}. Distributed installations provide electricity, which is used at the host customer's site. Photovoltaics were installed at more than 50,000 sites in 2010, a 46% increase over the number of installations in 2009.

Residential installations increased by 64% and accounted for 29% of all PV installations in 2010. Residential installation growth has been dramatic each year for the past five years, with annual growth rates between 33 and 103%. Federal incentives for residential installations are stable, with no changes made in 2010 and current incentive levels set until 2016. Most installations occur in states with state or local incentives, in addition to federal incentives.

The non-residential sector, which includes sites such as government buildings, retail stores and military installations, also experienced dramatic growth in 2010, compared with 2009. After a year of no growth in 2009, non-residential installations increased by 63% in 2010 and accounted for 39% of 2010 installations on a capacity basis.

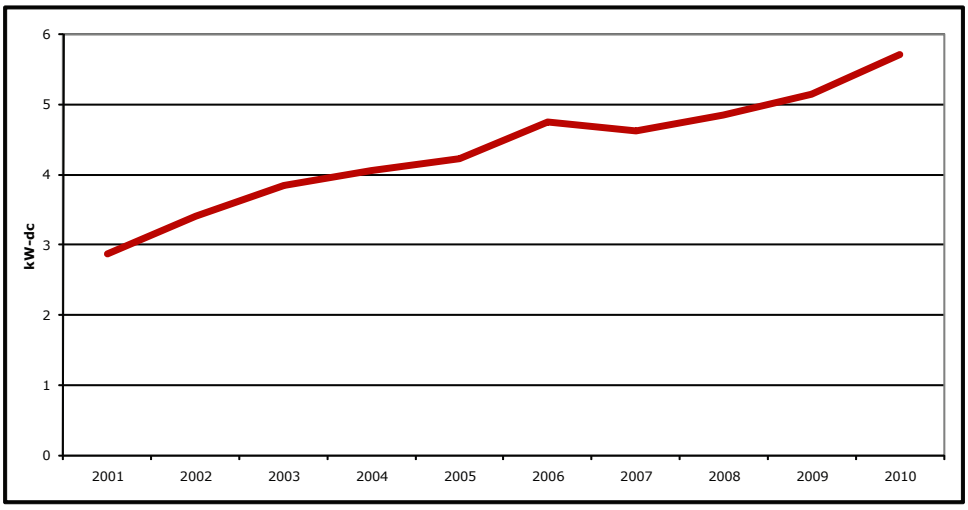


Figure 3: Average Capacity of U.S. Grid-Connected Residential PV Installations (2001-2010)

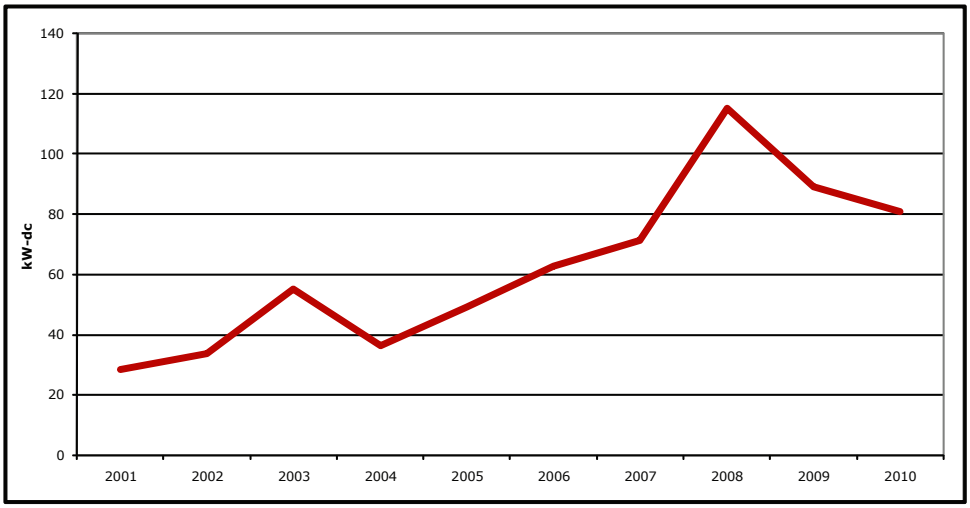


Figure 4: Average Capacity of U.S. Grid-Connected Non-Residential PV Installations (2001-2010)

As part of the federal stimulus legislation passed in February 2009, commercial entities may receive the federal incentive as a cash grant instead of a tax credit. The rules governing the cash grant program were not created for several months, so the impact on 2009 installations was muted. In 2010, the program operated for the entire year. The cash grant program was originally scheduled to expire at the end of 2010, but in late 2010, was extended through the end of 2011. The threatened expiration caused many projects to begin construction late in 2010, in order to qualify for the cash grant program. These late 2010 project starts did not significantly affect the number of completed installations in 2010. They will be completed in 2011 or later.

Capital markets improved in 2010. Installing solar requires significant capital investment, yet the economic meltdown in 2008 caused many sources of capital to dry up. This was one factor in the lack of growth in non-residential solar installations in 2009, compared with 2008. In 2010, the capital market's recovery is reflected in the growth of non-residential installations.

Size of Grid-Connected PV Installations

The average size of a grid-connected PV residential installation has grown steadily from 2.9 kW_{DC} in 2001 to 5.7 kW_{DC} in 2010 (see Figure 3). The average size of a non-residential system decreased to 81 kW_{DC} in 2010 from 89 kW_{DC} in 2009 and 115 kW_{DC} in 2008 (see Figure 4). This non-residential data does not include utility sector installations.

Although the number of utility PV installations remains small, the average system size is large (over 1,450 kW_{DC}), so these installations represent 32% of all installations on a capacity basis**.** Just 34 utility installations greater than 1 MW_{DC} totaled 239 MW_{DC}, or 27% of the capacity total of U.S. systems installed in 2010. In 2009, just six such installations totaled 60 MW_{DC}.

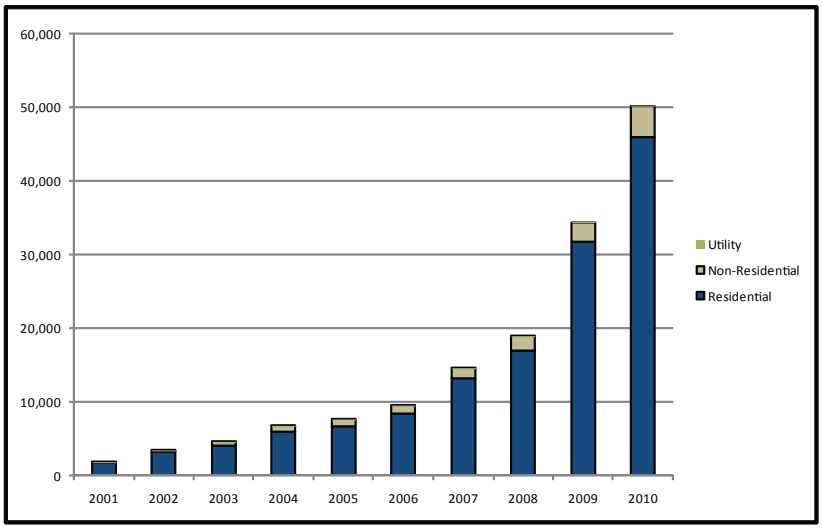


Figure 5: Number of Annual U.S. Grid-Connected PV Installations (2001-2010)

Large utility installations attract significant attention, but small installations also occur in the utility sector. In New Jersey, PSE&G began installing 200-W PV systems mounted on power poles. These installations totaled more than 13 MW_{DC} in 2010.

Feed-in tariff incentives generate electricity for the utility sector and currently represent just a small segment of the U.S. PV market. With a feed-in tariff, the utility purchases all the output of the PV system at guaranteed prices, which are typically higher than retail electricity prices.

The average size of grid-connected PV installations varies from state-to-state, depending on available incentives, interconnection standards, net metering regulations, solar resources, retail electricity rates, and other factors. The Interstate Renewable Energy Council provides summary tables of state net metering and interconnection policies, and the Database of State Incentives for Renewables & Efficiency provides summary tables of state and utility financial incentives.

Over 50,000 grid-connected PV installations were completed in 2010, with 91% of these at residential locations (see Figure 5). By contrast, residential systems accounted for only 29% of the PV capacity installed in 2010, as discussed previously. The number of utility installations is small and does not show up on this figure. At the end of 2010, 154,000 PV installations were connected to the U.S. grid, including over 139,000 residential installations. The average size of non-residential systems is more than ten times the average size of residential systems.

Grid-Connected Installations by State

In 2010, installations of grid-connected PV systems were

2010 Rank by State	2010 (MW_{DC})	2009 (MW_{DC})	09-10 % change	2010 Market Share	2009 Rank
1. California	252.0	213.7	18%	28%	1
2. New Jersey	132.4	57.3	131%	15%	2
3. Nevada	68.3	2.5	2598%	8%	15
4. Arizona	63.6	21.1	201%	7%	5
5. Colorado	62.0	23.4	165%	7%	4
6. Pennsylvania	46.5	4.4	947%	5%	13
7. New Mexico	40.9	1.4	2815%	5%	20
8. Florida	34.8	35.7	-2%	4%	3
9. North Carolina	28.7	6.6	332%	3%	10
10. Texas	25.9	4.2	517%	3%	14
All Other States	138.3	67.6	105%	15%	--
Total	893.3	438.0	104%	--	--

Table 2: TOP TEN STATES Ranked by Grid-Connected PV Capacity Installed in 2010

2009 and 2010 columns include installations completed in those years. "2010 Market Share" means share of 2010 installations. "2009 Rank" is the state ranking for installations completed in 2009

		MW_{DC}	Market Share
1.	California	1,022	48%
2.	New Jersey	260	12%
3.	Colorado	121	6%
4.	Arizona	110	5%
5.	Nevada	105	5%
6.	Florida	73	3%
7.	New York	56	3%
8.	Pennsylvania	55	2%
9.	Hawaii	45	2%
10.	New Mexico	43	2%
All Other States		264	12%
Total		2,153	--

Table 3: TOP TEN STATES
Ranked by Grid-Connected PV Cumulative Installed Capacity through 2010

concentrated in California, New Jersey, Nevada, Arizona, and Colorado, as shown in Table 2. The market more than doubled in all of the top ten states, except for California and Florida. Nevada, New Mexico and Texas are new states on the top ten list this year due to one very large installation in each of those states. Pennsylvania made it onto the list because of installations driven by its rebate program, which began in mid-year 2009. With the exception of Nevada, all states on the 2010 top ten list made this list because of their state renewable portfolio or financial incentive programs. Although Nevada has a renewable portfolio standard and a solar rebate program, it makes the top ten list because of the single large 58 MW_{DC} installation that sells electricity to Pacific Gas and Electric in California to meet the California renewable portfolio standard.

On a per capita basis, six states (Arizona, Colorado, Hawaii, Nevada, New Jersey and New Mexico) had more installations than California in 2010, showing how the market is diversifying across the country. On a cumulative basis, Nevada, Hawaii and New Jersey now have more per capita installations than California (see Table 4).

		Cumulative through 2010 (W_{DC}/person)	2010 Installations (W_{DC}/person)
1.	Nevada	38.8	25.3
2.	Hawaii	32.9	13.6
3.	New Jersey	29.6	15.1
4.	California	27.4	6.8
5.	Colorado	24.1	12.3
6.	New Mexico	21.0	19.9
7.	Arizona	17.2	10.0
8.	Dist of Columbia	7.4	5.8
9.	Connecticut	6.9	1.4
10.	Oregon	6.2	2.6
National Average		7.0	2.9

Table 4: TOP TEN STATES
Ranked by Cumulative Installed PV Capacity per Capita (W_{DC}/person) through 2010

Concentrating Solar Power

In 2010 the largest plant since the 1980s was completed. Florida Power and Light installed a 75 MW_{AC} CSP plant near Indiantown, Florida in 2010. In addition, one small CSP plant was installed in Colorado. This plant provides supplemental heat to an existing coal-fired power plant.

The future prospects for CSP plants look bright. Several different companies have announced plans totaling over 10,000 MW of generating capacity, and some received required permits and financing in 2011. These plants will be constructed over the next few years.

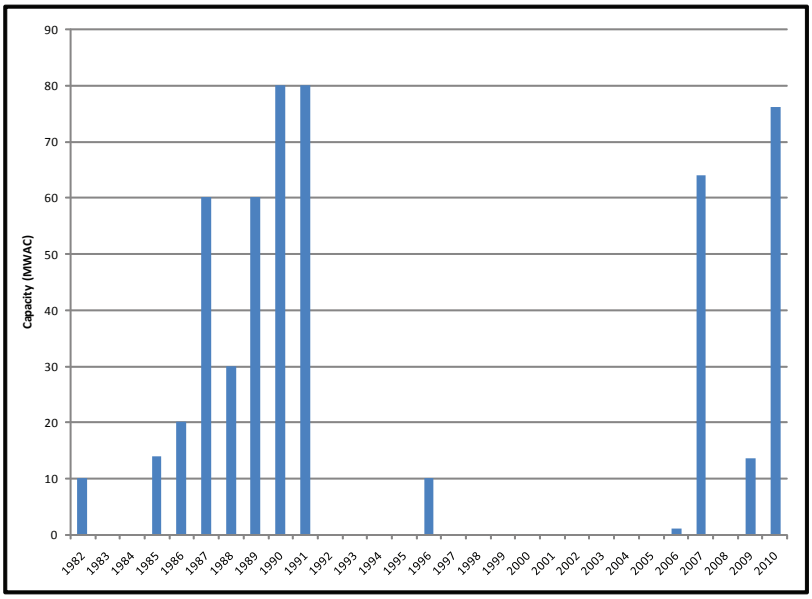


Figure 6: Annual Installed U.S. CSP Capacity (1982-2010)

Solar Heating and Cooling

Solar Water and Space Heating

Solar thermal collectors can heat hot water for domestic or commercial use, or heat spaces such as houses or offices. Solar thermal collectors can also provide heat for industrial processes or space cooling.

GreenTech Media and the Solar Energy Industries Association estimate that solar water-heating installations increased by 6% in 2010, compared with 2009. Solar water heating has shown only two years of strong growth in the last 10 years. In 2006, solar water heating installations more than doubled compared with 2005. That year, the residential federal ITC was established and the commercial ITC increased. Then in 2008, installations grew by 56% compared with 2007. In 2008, the cap on the amount of the federal ITC a residential customer could receive was removed. The solar water-heating markets respond when federal incentives are increased, but, unlike photovoltaic installations, market demand does not sustain high growth rates (see Figure 7).

State rebates and other incentives for solar hot water have increased in recent years. Arizona, California, Connecticut, Florida, Hawaii, Maryland, Oregon, Pennsylvania, Vermont and Wisconsin all provided rebates for over 100 systems in 2010. However, these programs are not spending enough money to affect much growth in national installations. California has a new solar thermal program as part of its California Solar Initiative. Although the program only operated for a few months in 2010, it is expected to rapidly increase the number of solar hot water installations in the state.

Seventy-nine percent of total solar water heating installations in 2009 was on residential buildings. Contrast this with photovoltaics, where residential installations were only 29% of the total installations in 2010. Diversification in different market sectors has helped PV growth sustain itself year after year.

A positive development for solar thermal is the emergence of a market for solar thermal process heating systems, which use solar thermal energy to provide energy for industrial process uses. This market in 2009 was about one-quarter of the solar hot water market. These are installations on industrial or commercial establishments and include some third party power purchase agreement (PPA) systems. Since this ownership model has been key to the growth of the non-residential PV market, it will be interesting to see how it affects the solar thermal market's growth.

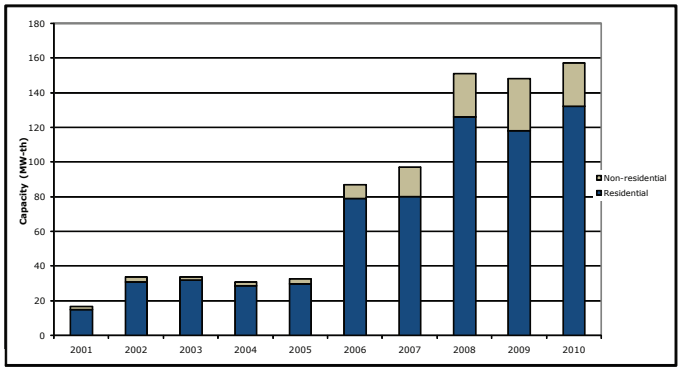


Figure 7: Annual Installed U.S. Capacity for Solar Heating and Cooling (2001-2010)

Based on analysis of collector shipment data from EIA and GTM/ SEIA.

Solar Pool Heating

In the other major solar thermal sector, pool-heating installations increased by 13%, the largest improvement in five years (see Figure 8). Even though growth was good in 2010, the annual capacity installed is 30% less than the installations in 2006, the best year for pool heating installations. The solar pool-heating market has been soft for years, due to the weak real estate markets in California and Florida. The economic decline in the real estate markets in Florida and California led to the decrease in pool installations and thus the decline in the installed capacity of new solar pool systems in recent years.

For solar pool heating systems, installations are concentrated in just a few states, notably Florida and California. Unlike other solar technologies, only a few states offer incentives for solar pool heating systems, and those incentives are modest.

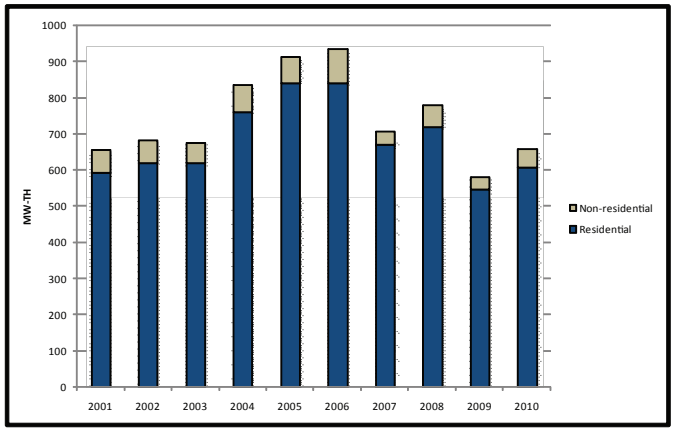


Figure 8: Annual Installed Capacity for Solar Pool Heating (2001-2010)

Based on collector shipment data from EIA and GTM/ SEIA.

Number of Installations

The number of all solar installations completed in 2010 grew by 22% to over 124,000 installations (compared to the number completed in 2009), as shown in Figure 9. This figure includes grid- connected and off-grid PV, solar heating and cooling, solar pool heating and solar thermal-electric. Through 2005, over half of these installations were for solar pool heating. However, because of the expanded federal ITC and the slump in the new pool market, the market shares of the different solar technologies have changed significantly since 2006. Grid-connected PV and solar water heating installations experienced the largest growth during this period and in 2010 together represented 74% of all solar installations.

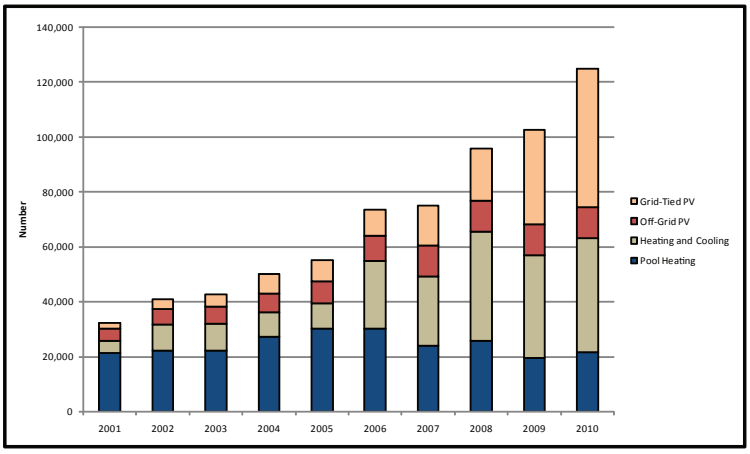


Figure 9: Number of Annual U.S. Solar Installations by Technology (2001-2010)

Table 5 shows that the cumulative total of U.S. solar installations from1994-2010 is 886,000 systems. Figure 9 and Table 3 show only the number of installations for each technology, not the relative energy contribution. Since grid-connected PV installations are larger on average, the energy contribution from PV installations will be larger than the relative number of installations.

Solar Pool Heating	354,000
Solar Heating and Cooling	274,000
Grid-Connected Photovoltaics	154,000
Off-grid Photovoltaics	104,000
Total	886,000

TABLE 5: CUMULATIVE U.S.SOLAR INSTALLATIONS BY TECHNOLOGY, 1994-2010

Note: There are less than 100 Concentrating Solar Power Plants and they are not included in this table.

Prospects for 2011

What can we expect in U.S. solar markets this year? Early indicators point to continued grid-connected PV growth and the continuation of the 2010 trend of higher growth rates for utility sector installations. Reductions in PV modules prices, long-term extension of the federal ITC, new rules that allow electric utilities to use the ITC and the continuation of the cash grant alternative to the commercial ITC will all help drive market growth. In addition, improved capital availability will allow customers to take advantage of these financial incentives.

Companies have announced plans for many large solar projects, including solar thermal electric projects, utility-owned projects and third party-owned projects. Some of these projects will be completed in 2011, and many more will start construction in 2011 to take advantage of the federal cash grant program. Completion of these later projects will likely occur in 2012-2015.

Prices for PV modules fell in 2009 and 2010, and many analysts expect prices to continue to fall in 2011. Lower PV prices increase the potential of installations in states without state or local incentives. The number of states with strong markets continues to grow, although installations in 2011 will continue to be concentrated in states with strong financial incentives. Strong solar policies remain critical to market growth.

Conclusion

Solar markets continue to grow in the United States due to consumer interest in green technologies, concern about energy prices, and financial incentives available from the federal government, states, local governments and utilities. Over 124,000 solar installations were completed in 2010. The markets for each solar technology are concentrated in a few states.

Led by a quadrupling of utility sector installations, the capacity of new grid-connected PV installations doubled in 2010 compared with the number installed in 2009. The two largest PV systems installed in 2010 together accounted for 9% of the annual installed PV capacity. The PV market is expanding to more states, and installations doubled in more than nine states. California remains the largest market.

Solar water heating installations have grown moderately since the enhanced federal ITC took effect in 2006 and grew by an additional 6% in 2010. Solar pool heating grew by 13%, the largest growth in a number of years.

A 75 MW CSP plant in Florida marked the largest such installation in the U.S. since 1991. The future prospects for CSP look bright, with thousands of megawatts of installations planned for the next five years.

U.S. market growth will continue in 2011, especially for grid-connected PV installations. Federal and state policies will drive this accelerated market growth.

ACKNOWLEDGEMENTS

This work was funded by the U.S. Department of Energy through the Solar Energy Technologies Program. The author appreciates the data supplied by many national, state and utility offices and programs, in addition to data shared by Shayle Kann and M.J. Shiao of GreenTech Media and Rebecca Campbell of Solar Electric Power Association. Jane Pulaski of IREC and Amy Heinemann of the North Carolina Solar Center provided helpful reviews. Jane Weissman, Executive Director of the Interstate Renewable Energy Council, supported this work and Janet Meyer provided valuable editorial assistance.

CHAPTER IV

Pat Fox and
Laure-Jeanne Davignon

IREC ISPQ Credentialing Program Update

IREC has continued to expand and evolve the IREC ISPQ Credentialing Program. The need for quality training for the developing clean energy workforce is stronger than ever and the third-party assessment provided by the IREC ISPQ Credentialing Program is in high demand.

Growth

The IREC ISPQ Credentialing Program has continued to see significant growth over the last year. The total number of credentials granted to renewable energy training providers as of August 30, 2011 is 117. Over 80% of these credentials are for training in solar photovoltaics, with the remaining training providers focused on solar thermal and small wind.

After a year of exponential growth in 2010, the volume of applications has returned to a more sustainable level. As of September, 23 credentials have been awarded in 2011 which, although lower than 2010, represents a 21% increase over 2009.

Significantly, the program has seen a shift in the type of accreditation credential being sought. Prior to 2011, the majority of accreditation credentials were focused on the Continuing Education Provider designation. As the market and program have matured, the recognition of the value of a more robust quality assessment has been recognized and is in higher demand. As a result, the majority of applications for accreditation in the last 12 months have been for Training Program Accreditation. There are currently four Training Program Accreditation applications in process, with eight Letters of Intent in the queue.

To support the growth of the Program and the expanding scope, early in 2011, IREC established an IREC ISPQ Application Processing Center on Wolf Road, in Albany, New York. In addition, four new positions have been added to the IREC ISPQ team including a Deputy Project Director, an Application Processor, an Administrative Assistant, and a Director of Assessor Development.

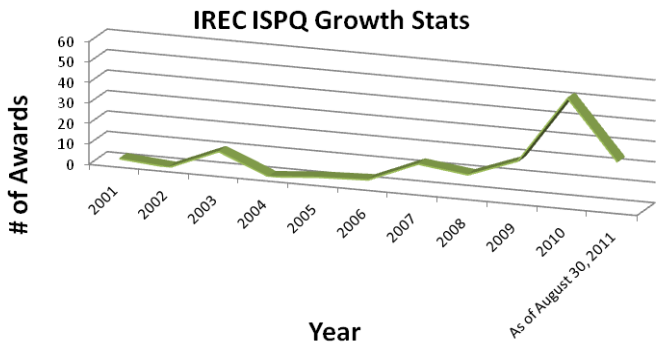


Figure 1: IREC ISPQ Program Growth, 2001-August 30, 2011

Expanding Scope

In late 2010, IREC was asked by the U.S. Department of Energy to apply the IREC ISPQ accreditation scheme to the weatherization training provider network. In response, the IREC team has updated the IREC ISPQ program documentation to encompass energy efficiency and weatherization, and approved four new Job Task Analyses (JTA's) for use in our program. The JTA's for Energy Auditor, Crew Leader, Quality Control Inspector, and Retrofit Installer/Technician were finalized by the National Renewable Energy Laboratory in June of 2011 and approved by IREC that same month. As the Weatherization Training Centers have been using these JTA's to evaluate and update their curriculum in preparation for accreditation, IREC has recruited and trained four new Assessors with energy efficiency expertise. This activity positions the IREC ISPQ team to be ready to process applications as they come in later in 2011.

Evolving the Program

IREC has recognized the need to continue to raise the bar for quality training in the United States. To facilitate our ability to continuously improve the Standard used for assessment of training providers, in March 2011, IREC purchased the ISPQ International Standard 01022 from the Institute for Sustainable Power (ISP). IREC continues to license the use of the Standard

Figure 2: IREC ISPQ new logo and marks.

to the international community and plans to continue the development of Standard 01022 for the assessment of renewable energy and energy efficiency training providers.

In May 2011, IREC seated a Standards Committee, inviting a diverse group of subject matter experts in renewable energy, energy efficiency, training, curriculum development, and standards, to begin the development of a new standard. This team, facilitated by Christine Niero of Professional Testing, and chaired by Jane Weissman of IREC, is rapidly developing the new IREC ISPQ Standard for Assessment of Certificate Programs in renewable energy and energy efficiency. With the rapid growth of certificate programs offered by community colleges and private training organizations, the demand for this standard for quality assessment is expected to be strong. IREC plans to have the initial standard completed by the end of 2011.

In conjunction with this standards development effort, IREC has signed a Memo of Understanding with the American National Standards Institute (ANSI) to enter into a partnership to develop a program for the accreditation of energy-related certificate programs. This program is expected to use the new IREC ISPQ Standard as the basis for assessment of these programs. The joint ANSI-IREC accreditation process will assess whether a certificate program's curriculum, educational process, and management system meet industry expectations, resulting in the issuance of a market-valued certificate. This is an important expansion of the IREC ISPQ influence to support the development of a qualified workforce for the clean energy economy.

A New Look

With the purchase of the ISPQ Standard 01022, the launch of our standards development efforts, and the expansion into energy efficiency and weatherization, it was clearly time to update our visuals. A new logo for the program and new marks for each credential were designed and introduced in September 2011. The new look is in alignment with the overall IREC organizational theme and colors and brings a fresh new face to our ever evolving program.

For more information on the IREC ISPQ Credentialing Program, contact Pat Fox at patfox@irecusa.org.

Watch the new video on the IREC ISPQ Process

Here was our challenge — we wanted to produce a video that gave a brief but comprehensive overview of the designations and application process for applying for the IREC ISPQ credentials. Now, here's potential for a snooze moment. We could have put together a narrated Power Point presentation but decided that images were more engaging and memorable than bullet points. Working with a company in Austin and their illustrator and animator, we produced an explanatory, illustrated, three and a half minute video. Take a look. www.irecusa.org

CHAPTER V

Joe Sarubbi

The Solar Instructor Training Network

Training tomorrow's solar instructors today

Introduction

Launched in 2009, the U.S. Department of Energy established the Solar Instructor Training Network (SITN), composed of nine Regional Training Providers (RTPs) to fulfill a critical need for high-quality, local, and accessible training in solar system design, installation, sales, and inspection through train-the-trainer programs. In support of the U.S. Department of Energy's SunShot initiative, the nine RTPs, from Maine to California, are well-established solar training institutions whose expert trainers are teaching instructors in first-class training facilities across the U.S. The primary goal of the SunShot initiative is to make solar energy technologies cost-competitive with other forms of energy by reducing the cost of solar energy systems by about 75% before 2020. The goal of the SITN is to support this effort by helping to build the highest quality and most productive solar workforce in the world.

IREC as National Administrator

The Interstate Renewable Energy Council (IREC) is the National Administrator for the SITN. IREC works closely with the RTPs, helping build the well-trained, highly-qualified solar energy workforce of sufficient size and diversity that will meet the employment needs of a rapidly growing domestic solar industry. As National Administrator, IREC assembled a team of some of the best experts in the solar industry including training and workforce development. This team is helping to provide guidance and direction to the RTPs, and they are sharing industry best practices to help ensure the SITN develops the best qualified workforce.

How is the SITN accomplishing its goals? Here are some guiding principles:

- Provide training where it is needed.
- Expand training to include code and building officials, inspectors, and firefighters.
- Train to industry standards, and update training as changes in technology and applications happen.
- Ensure training programs do not out-grow industry demand — seek responsible growth.
- Integrate solar training standards and curriculum into existing educational and workforce infrastructures.
- Build on the strengths of each RTP: share strongest qualities and innovative practices across the Network.
- Establish strong connections with industry stakeholders including workforce investment boards (WIBs), Solar America Communities, and agencies.

IREC Expert Team and RTP Activities

Throughout this past year, IREC has assembled several *Working Groups* to help support the efforts of the Solar Instructor Training Network.

Solar Career Pathways:

The purpose of the Solar Career Pathways Working Group is to build a career lattice that describes a broad spectrum of cross-sector pathways within the solar industry, including a wide variety of occupations accessible to workers with a wide variety of skill and experience. Such a lattice will also help create an integrated system of solar education and training across regions and sectors. It's anticipated that the career lattice will be on-line by October 2011.

Metrics:

The Metrics Working Group has developed seven survey instruments that will be used for data collection to determine the progress and success of the Solar Instructor Training Network. There will be both quantitative and qualitative analysis of each region with the intention of improving solar training across the country in a more unified manner.

Best Practices:

IREC has assembled a cadre of professionals within the solar, education, and training industries who have combined their efforts under an umbrella of coordinated activity to develop Best Practices for the SITN. This exceptional group has the wealth of expertise and experience to provide the most effective

methods for training in areas such as: program development; curriculum development; course integration; instructional guidelines; laboratory design, equipment recommendations; and more. It's anticipated the Best Practices document will be available by January 2011.

On-line Code Official Training:
The purpose of this project is to develop a complete package of on-line training modules for code officials conducting review and inspection of PV systems for code compliance purposes. The on-line training will utilize the U.S. Department of Energy's National Training Education Resource (NTER) — an open source platform that uses simulation-driven scenarios, game-based learning, and immersive 3-D visualization. The key target areas are Authorities Having Jurisdiction (AHJs) and code enforcement officials in all states throughout the U.S. Each RTP will provide a hands-on training component to support the on-line efforts.

Long-Term Instructor Development:
To help ensure quality training, the SITN is working to develop quality trainers. The Long-Term Instructor Development Working Group is developing the necessary guidelines to determine instructor "readiness" for teaching solar technology. The Working Group has identified the qualities that instructors should have after they've completed training provided by the RTPs. The guidelines are to help the RTPs understand the steps towards instructor "readiness" to improve the quality of training offered.

Other IREC Accomplishments

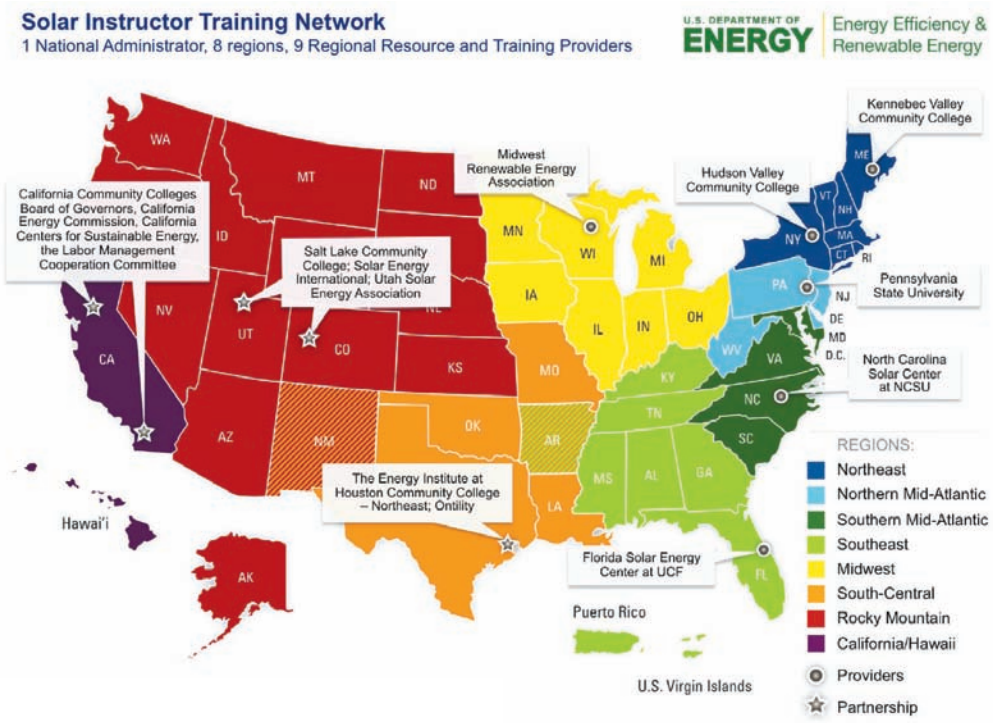
Advisory Board
IREC assembled a broad group of Subject Matter Experts, including stakeholders from the major sectors in the solar, trades, utility and workforce industries to participate in the SITN Advisory Board. IREC works with the Advisory Board to identify workforce issues, to respond to proposed agendas and action steps, to offer direction, and to provide advice on new market conditions.

National Website
IREC designed, developed, and manages a national website for the SITN project to serve as a tool for communicating information on all aspects of the training network. The website includes resources, deliverables, working group activities, relevant news and information. The IREC Team conducts interviews, researches case studies, and reaches out to the RTPs, DOE and other stakeholders to ensure the website is populated with the most pertinent and up-to-date information. In Phase 2 of the SITN project, the website will also serve as an internal platform for RTPs and working groups to share information, documentation, and interact with each other.

SITN Quarterly Newsletter
To better serve the needs of the SITN, IREC produces a quarterly e-newsletter that identifies RTP and National Administrator activities. In each issue a specific RTP project is highlighted to showcase the efforts of that team and region. The newsletter complements the website by providing a means for individuals to get first-hand knowledge of activities in a concise format.

Seminar Series
The IREC Team developed the SITN "Seminar Series" which consists of monthly webinars on topics of relevance to the Network. The first webinar was "U.S. Solar Market and Installation Trends." Future webinars include topics such as: the Solar Career Mapping Project, PV Installer Safety, Certification and Credentialing, Designing PV Labs, etc. The Seminar Series is available to RTPs and all Partner Institutions.

Regional Training Provider Coordination
As National Administrator, IREC is responsible for coordinating RTP activities at the national level, and convenes meetings of all pertinent players on a regular basis to facilitate the project. IREC is helping to harmonize the activities of the RTPs to improve connectivity to each other and function as a true network of training centers. IREC convened a meeting of the RTPs at the Clean Energy Workforce Education Conference held in Saratoga Springs, New York in March, and another meeting was held in Houston in April.



Regional Training Provider Highlights

Each RTP is using innovative approaches to select educational institutions in their regions for training solar instructors, including distance learning courses, instructor mentoring, and mobile lab training units for hands-on training. The RTPs sponsor instructor training in PV and solar heating and cooling technologies, and in some cases assist in equipping the laboratories and facilities of local training providers.

As a network, the Regional Training Providers collaborate with IREC and each other to share best practices, participate in Working Group activities, resolve challenges related to solar training and workforce development, and work together to ensure the goals and objectives of the project are being met. Currently, the RTPs are working diligently to complete Phase 1 of their projects. Each RTP spent the last 18 – 20 months developing Train-the-Trainer programs; constructing and/or enhancing training laboratories; developing partnerships with industry stakeholders; and training instructors from institutions throughout their regions. While all are working towards the same overall goal, each RTP developed their own unique plan for reaching that goal. Below are some of the highlights from each RTP.

Region 1: Northeast Region (PV)
The Regional Training Provider for the Northeast Region is Hudson Valley Community College (HVCC), which is located in upstate New York. Chosen for its national reputation in solar training, HVCC has a well-scripted plan for training, and is currently working with 24 institutions throughout New York and New England with a focus on PV. HVCC has a first-class training facility know as TEC-SMART (Training and Education Center for Semiconductor and Alternative and Renewable Technologies), to support its training efforts.

Region 1: Northeast Region (SHC)
Region 1 is also supported by Kennebec Valley Community College (KVCC) which provides the region with training for solar heating and cooling (SHC). Located in central Maine, KVCC has emerged as a national leader in SHC training and has constructed a first-rate training facility to support the region. KVCC has developed excellent SHC curriculum to support training and is collaborating with Region 2 for on-line delivery of the SHC curriculum. Once complete, the curriculum will be available to all regions within the SITN.

Region 2: Northern Mid-Atlantic Region
The Northern Mid-Atlantic Region, which is administrated by Pennsylvania State University (Penn State), has developed a positive niche for the SITN with its focus on solar design at the engineering level, as well as the development of an on-line platform for training in the PV industry. The country is already faced with a dearth of Power Engineers, and finding Power Engineers with a solar technology background as been challenging for solar companies seeking to build utility-scale PV systems. Penn State is trying to help fill that void as part of the SITN. Penn State has also partnered with Kennebec Community College for the development of online solar thermal courses that will be available to the SITN when completed.

Region 3: Southern Mid-Atlantic Region
North Carolina State University (NC State) manages the Southern Mid-Atlantic Region and has developed a well thought-out project with a solid team of professionals committed to the success of the SITN. NC State has been running the North

"Our experience shows that consistently deploying the latest solar industry best practices can improve the average installation's performance by up to 30%"

Ben Foster (VP of Operations – Optony Inc.):
Stated during the DOE BoS Process Workshop 2/9/2011

Carolina Solar Center since 1988 with deep-rooted ties to the solar industry and an excellent reputation. With first-class laboratory facilities, NC State has been training individuals in PV and SHC for a long time, making them a natural fit for the SITN. As part of this project, NC State has developed a unique financial modeling tool for the solar industry and is sharing it with the SITN for nationwide use.

Region 4: Southeast Region
The Southeast Region is coordinated by another well-established solar organization — the Florida Solar Energy Center (FSEC). As part of University of Central Florida, FSEC has provided training since 1975 and has enjoyed a strong national reputation. With excellent training facilities and a seasoned professional team, FSEC brings solid perspective to the SITN. Moreover, FSEC's inclusion of PV Sales Training and System Design courses for Phase 2 of the project is a perfect complement to the goals of the SITN. Over the years, FSEC has developed a wealth of instructor training resources and is sharing those resources and concepts with the SITN.

Region 5: Midwest Region
The Midwest Renewable Energy Association (MREA), located in the heart of Wisconsin, is a non-profit organization dedicated to education and community outreach in the renewable energy industry since 1990, and administers the Midwest Region's RTP. MREA does an excellent job managing the project and brings significant experience to the SITN. With first-class training facilities, MREA provides solid instructor training in PV and SHC for the Midwest Region. MREA has also developed a unique training program model which provides two paths: instructor training and solar program assistance. This model is a well-conceived plan for new solar instructors to follow and has been shared with the SITN.

Region 6: South-Central Region
The South-Central Region, managed by Houston Community College – Northeast (HCC), has partnered with Ontility, a full-service solar company with a national reputation in solar training and support. HCC, with strong industry ties, has just opened its new Energy Center with first-class facilities for on-site training. Ontility has developed an excellent training and instructor support program for the South-Central Region, and has a highly experienced professional staff for top-notch training. Ontility's knowledge and understanding of instructor training is shared throughout the SITN.

Region 7: Rocky Mountain Region
The Rocky Mountain Region is managed and supported by another unique partnership of Salt Lake Community College (SLCC), Solar Energy International (SEI), and the Utah Solar Energy Association (USEA). Rocky Mountain is the largest (geographically) of the eight regions covering 14 states including Alaska. SEI has been providing solar training since 1991 and has garnered a national and international reputation. SEI handles the training component of the partnership while SLCC and USEA provide administrative support and statewide outreach. SEI's training facilities are topnotch and they have developed a solar instructor training program, including on-line courses, that is widely recognized and strongly resonates with the SITN.

Region 8: California-Hawaii Region
The California- Hawaii Region is also a unique partnership of several organizations: California Community Colleges Board of Governors; California Energy Commission; California Centers for Sustainable Energy; and the Labor Management Cooperation Committee. Daily project oversight is provided by the City College of San Francisco.

California has led the nation with solar installations and many institutions were offering solar training well before the creation of the SITN making California a solid fit for this project. With more than 60 community colleges offering solar training throughout the state, California is poised to start offering advanced PV, solar design, and PV sales and marketing courses. Hawaii has a robust solar industry as well and California supports both PV and SHC initiatives there.

Visit IREC's updated and enhanced Solar Licensing Database, a web-based resource for policy makers, practitioners, consumers, and anyone else looking for solar licensing information in the U.S. In the database, licensing requirements for installing photovoltaic and solar thermal systems are documented for each state.

Solar Licensing Database |
Interstate Renewable Energy Council

IREC organized the fourth national conference on workforce education for renewable energy and energy efficiency. Held in Saratoga, New York on March 8-10, 2011, the conference consisted of two days of sessions and a pre-conference day of technical workshops. Five-hundred educators and industry representatives from 43 states attended.

National leaders in renewable and energy efficiency education and training shared valuable, updated information and insight into all aspects of building and maintaining a quality, credentialed, safety-conscience green workforce.

Issues critical to the state of today's clean energy workforce were discussed with presentations covering topics such as balancing classroom and field experiences, incorporating new skills into training programs, introducing clean energy technologies and careers to high school students, instructional strategies for creative learning, labor market research results, workforce strategies by the trades and utilities, and providing new opportunities for disadvantaged workers. A number of sessions looked at industry competencies and assessment programs.

The Conference's primary sponsor was the New York State Energy Research and Development Authority (NYSERDA).

Presentations are posted on the IREC web site at http://irecusa.org/irec-programs/workforce-development/2011-clean-energy-workforce-education-conference/presentations/

SAVE-the-DATE

The next Clean Energy Workforce Education Conference is set for **November 13-15, 2012 in Albany, New York**. Watch the www.irecusa.org site for news.

PHOTO CREDITS: Page 10 Top right to left: Photovoltaic awning at parking structure in Madison, Wisconsin *Photo courtesy of City of Madison* / Photovoltaic carport awning in Las Vegas, Nevada *Photo courtesy of NV Energy* / PV in installer *Photo courtesy of NREL* / Bottom: 30-MW installation in Cimaron, New Mexico *Photo courtesy of First Solar, Inc.* / Energy efficiency / Residential solar installation in Columbus, Wisconsin *Photo courtesy of H&H Solar* / Energy efficiency *Photo courtesy of NREL*. Page 16 Top right to left: Solar thermal installation at the Allison Inn, Oregon *Photo courtesy of Energy Trust of Oregon* /Photovoltaic installation at San Francisco International Airport *Photo courtesy of San Francisco Water, Power, Sewer* / Residence with photovoltaics and solar hot water in Fitchburg, Wisconsin *Photo courtesy of H&H Solar / bottom* 75-MW Martin Solar Plant near Indiantown, Florida *Photos courtesy of Florida Power & Light.*

Annual Updates & Trends Report

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