2010 UPDATES & TRENDS

Annual Meeting

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IREC Interstate Renewable Energy Council

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UPDATES & TRENDS

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INTRODUCTION

The Interstate Renewable Energy Council (IREC) is pleased to present the 2010 collection of updates and trends covering regulatory issues, policies and incentives, installation and market data, and workforce development and training.

As you will read in Chapter One, IREC's regulatory work goes beyond net metering and interconnection. Some of the exciting emerging opportunities are community solar and net metering meter aggregation, third-party ownership, retail and wholesale rate design, the integration of advanced energy storage and the smart grid—all issues that are now on IREC's plate.

Chapter Two will give you a fast-paced overview of state-level policy and incentive development. Our colleagues at DSIRE tell us that taken as a whole, renewable portfolio standards, direct cash incentive programs, and net metering and interconnection rules are moving forward with new improvements, but feed-in tariff polices slowed while property-assessed clean energy financing basically came to a standstill.

In Chapter Three, Larry Sherwood once again gives us his updated solar installation report. Even with poor economic conditions, solar markets continue to grow in the United States. More than 107,000 solar installations were completed in 2009.

And in Chapter Four, we talk about our on-going work leading to quality training and building a competent workforce. It is essential that the development of this workforce includes industry-accepted competency standards and job availability.

Pulling all of these issues together, IREC stays focused on developing strong, fair, safe and sustainable market and policy conditions that will move renewable energy into the mainstream. However, we stand committed to the identification of new issues and to overcoming the challenges that arise.

We thank all of our funders and members who have confidence in our work and have given 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 all of the sponsors of our Annual Meeting for bringing us together to engage in thoughtful conversation about these issues giving us the time to learn from each other.

REGULATORY ISSUES

UPDATES & TRENDS

Jason Keyes, Kevin Fox, and Joe Wiedman

IREC extended the breadth and depth of its regulatory efforts over the past year through its legal team at Keyes & Fox, LLP. While continuing to participate in state utility commission rulemakings regarding net metering, interconnection and third-party ownership of renewable energy, IREC also dove into emerging issues of community solar, retail rate design, wholesale market design, smart grid, and integration of advanced energy storage devices including plug-in electric vehicles. As well, IREC took a significant role in development of the 2010 edition of ***Freeing the Grid***, worked with several Solar America Cities, drafted three new studies for the Solar America Board of Codes and Standards (Solar ABCs), and presented at numerous conferences.

This section is organized by issue, which also corresponds to IREC's sources of funding. IREC had five major funding sources for its regulatory work during the past year. Each source provided funding for specific issues. First and foremost, IREC is in its final year of its contract with the U.S. Department of Energy (DOE) to participate in state utility commission rulemakings regarding net metering, interconnection and third-party ownership of onsite PV systems. These are fundamental issues for customer-sited generation, and more than half of IREC's regulatory effort has been focused on these topics. An overview of IREC's activities related to these issues is addressed in the first subsection below.

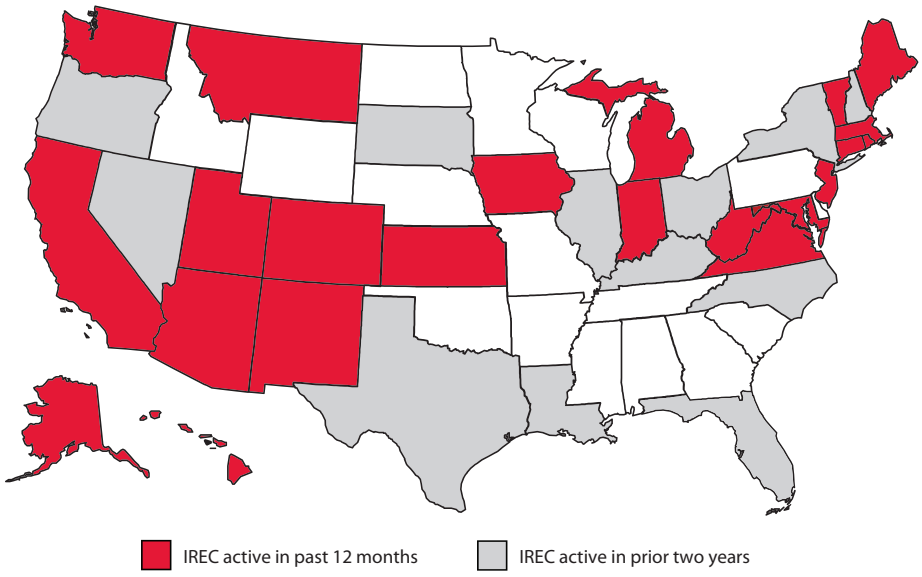
IREC's other four funding sources support an array of regulatory efforts. The Energy Foundation funded IREC's participation in California Public Utility Commission dockets on virtual net metering, energy storage, wholesale market design, and recently provided funding for IREC to participate in development of California's utility long-term procurement planning. The Schwab Charitable Fund is supporting IREC to assist states and local communities to establish community solar programs. The Solar ABCs funded IREC to publish three reports on emerging issues. The Grace Communications Foundation continued its support of IREC to assist with publication of ***Freeing the Grid*** and to address new developments in the renewable energy sector.

IREC's plans for regulatory engagement in the coming year are discussed in each of the subsections below.

Utility Commission Rulemakings Regarding Customer-sited Generation

In the past three years, IREC participated in rulemakings related to net metering, interconnection and third-party ownership of customer-sited generation in 33 states. In the past twelve months alone, IREC was involved in 21 states. The map on the following page shows the states in which IREC had some involvement in rule development. In a few cases, IREC's involvement was only for participation in preliminary workshops, but in most cases, involvement included multiple filings of extensive comments and multiple trips for workshops and hearings. IREC's involvement on these issues is funded by a five-year contract with the U.S. Department of Energy that ends in early 2011.

IREC INVOLVEMENT IN NET METERING, INTERCONNECTION AND THIRD PARTY RULEMAKINGS



Net Metering

IREC participated in state utility commission dockets addressing net metering in ten states during the past year. In prior years, IREC focused on creating or substantially expanding state programs by leveraging the success of programs that had been implemented in vanguard states. IREC successfully pursued this strategy in Alaska, Indiana, Kansas, Virginia and West Virginia during the past twelve months. Notably, West Virginia went from having a modest and ineffective net metering program to having one of the top ten programs in the nation. Indiana appears poised to do the same. Alaska is this year's newcomer to net metering, becoming the 43rd state with a program, though modestly capped at 25 kW per system.

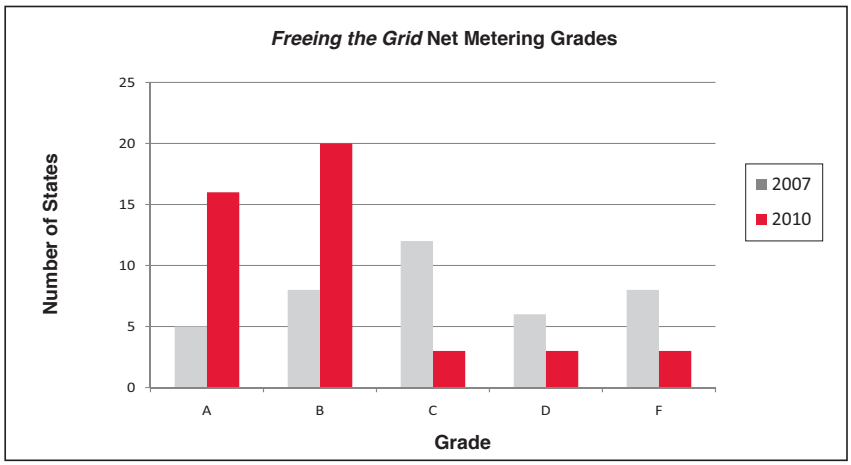
In addition to creating viable programs where no effective program previously existed, this year IREC made a pronounced effort to engage in states with strong renewables programs to make existing policies even more robust and push out the boundaries of what is considered to be "best practice" in designing net metering programs. This effort included addressing meter aggregation in New Jersey and Connecticut, eligible system size in New Jersey, rollover of excess generation in New Mexico and virtual net metering in Massachusetts and California.

IREC also responded to attempts to weaken existing net metering provisions in two states. IREC is active in New Mexico addressing attempts by that state's largest utility to institute an eight cent per kWh rider on new residential customer-sited generation and a two cent per kWh rider on commercial customer-sited generation. In Maryland, IREC is addressing attempts by utilities to interpret a new law that permits indefinite rollover of excess generation (the prior law had forced customers to forfeit end-of-year excess generation) as requiring avoided cost payment for all monthly excess generation. IREC continues to be involved in the Maryland rulemaking and is concerned that these new attempts to undermine the benefits of net metering may be a harbinger. IREC believes it is imperative that such attempts be addressed before they become new law that may be used in other states to weaken existing programs.

No attempt is made here to describe each net metering issue that IREC has addressed over the past year. For a complete listing with explanations, see the ***Freeing the Grid***, available at www.newenergychoices.com. States that are developing new net metering programs or are substantially improving on existing programs continue to focus on traditional issues: limits on total program enrollment, individual system capacity limits, how to rollover excess generation, instituting safe harbor provisions (forbidding special charges for net-metered customers), addressing renewable energy credit (REC) ownership, and identifying eligible technologies.

It seems a strong consensus has been built for minimum program enrollment capacity of at least 1%, minimum system capacity limit of at least one MW, full retail rollover for at least a year, and REC ownership residing with a system owner, which are all signs of progress. As well, it is a good sign that top states are looking to improve: New Jersey removed its system cap entirely, California expanded opportunities for customers in multi-tenant dwellings to net meter and raised its program enrollment cap, and meter aggregation is being addressed in New Jersey and Connecticut.

Over the past three years, progress on establishing robust state net metering policies has been astounding, as shown in the graph below. The number of states receiving grades of A or B in *Freeing the Grid* has increased from 13 in 2007 to 36 in 2010 (2010 grades are still being finalized, so this number could change slightly). Grade inflation has not been a factor; in fact, grading has become somewhat more difficult as an increasing number of states have raised the bar on "best practices" by expanding and improving their existing policies.



Six states lack net metering policies and another nine states have relatively poor rules. In all of these states, there are opportunities for substantial improvement. IREC looks forward to addressing these opportunities. IREC also sees a pronounced need over the coming years to focus on improving existing rules so that net metering is available to anyone interested in installing onsite renewable generation. Some of the greatest opportunities on the horizon are those that enable more customers to net meter through programs such as net metering meter aggregation and community solar programs that use virtual net metering.

Interconnection

IREC was active in developing interconnection procedures in eleven states during the past year. Many issues associated with interconnection procedure development address paramount issues of safety and grid reliability. These considerations necessitate cautious and deliberative rulemakings. Additional complexity is added by the need to address the nuances of interconnecting different types of generation. Due to the highly technical nature of these rulemakings, and the length of time involved in the development of detailed interconnection requirements, few entities participate other than utilities and utility commission staff, especially in smaller states. IREC's participation offers a voice that is not otherwise presented and often makes a substantial difference in the outcome of interconnection procedure development.

From a utility perspective, it can appear as though every interconnection is unique and needs its own engineering review. Although no two distribution circuits are identical, there are enough commonalities across circuits to make standard procedures an attractive, timely and cost-effective approach. Procedures that allow smaller systems to interconnect using technical screens and standard form agreements are a hallmark of states with active solar energy programs. States that lack solid procedures expose customers to uncertainty about the time and expense of interconnecting a system. This may discourage customers from making an investment in a solar system thereby undermining state policy goals and in-state economic activity and job growth.

As with net metering, IREC diversifies its efforts to focus on states with poor or nonexistent procedures as well as those where there is an opportunity to make significant improvements to existing procedures. However, with more room for improvement in state interconnection procedures than for net metering rules, IREC tends to focus its efforts on getting functional interconnection procedures in place in states where such procedures do not currently exist.

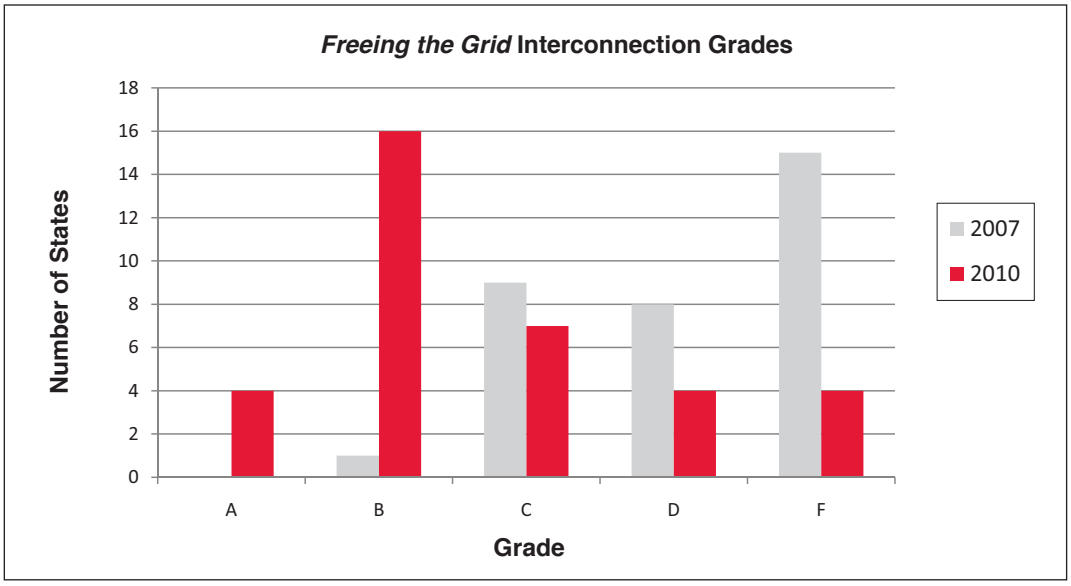
IREC's involvement over the past year led to significant improvements in several states. Iowa and Utah received F grades for their interconnection procedures in *Freeing the*

Grid 2009. These states now grade at a high B and an A, respectively. West Virginia also receives a grade of B for its new procedures. Maine and West Virginia had no procedures last year. Now Maine has the highest *Freeing the Grid* score in the country, although Vermont appears poised to adopt procedures rivaling Maine's for top honors.

IREC also participated in interconnection procedure development in Hawaii, Kansas, Michigan, Montana and Vermont. Hawaii presents an interesting opportunity to address interconnection issues in a state that has relatively high penetrations of intermittent renewables on an isolated island-grid system. Hawaii is a sunny state with high electricity rates, which provides tremendous potential for expanding upon Hawaii's significant existing base of installed solar capacity. However, moving to higher penetrations requires that a number of reliability issues be addressed. IREC is involved in Hawaii to increase the effectiveness of Hawaii's existing interconnection rules and to address grid operation issues associated with moving to higher penetrations of intermittent generation sources.

As with net metering, the various issues addressed in interconnection rulemakings are explained in *Freeing the Grid* and are not discussed here in any detail. Key issues are insurance requirements, technical screens for expediting interconnection of smaller generators, use of standardized agreements, timelines for applying technical screens and completing interconnection studies, setting of appropriate fees, expediting dispute resolution and determining when manual AC-disconnect switches are necessary.

The last three years have witnessed marked improvement in interconnection procedures, as seen on the following graph. However, the graph also demonstrates that there is significant room for improvement in state interconnection procedures. Few states top the charts, and 16 states have no state-wide procedures at all. Seven states that received F grades in *Freeing the Grid* last year were deemed to not have procedures at all this year, based on how minimal existing requirements are in those states.



Third-Party Ownership

IREC had great success in 2008 and early 2009 arguing that a third party owner of a customer-sited generator is not a utility. This issue has not been as pressing in 2010. For the layperson, the argument seems obvious: utilities are entities with wires that disseminate electricity from distant power plants to dispersed customers. By comparison, a rooftop generator simply provides power to the occupants of a building below. Although this may be intuitive to a layperson, the process of determining which types of entities are public utilities under state law often requires recourse to state statutory definitions of "public utility" and case law that has been developed over many decades, long before it became commercially viable to produce electricity from the sun on customers' rooftops.

Due to a concerted effort to address this issue in 2008 and 2009, resolution of this issue has been reached in almost all states that have substantial incentive programs. In almost all states that have looked carefully at this issue, third-party ownership of onsite generation has been determined to be allowed without subjecting a system owner to regulation as a public utility. In Arizona, this issue arose in the past year in the context of a petition for a declaratory order by SolarCity, a residential and commercial installer of solar systems that had successfully used this model to help customers finance solar systems in California and elsewhere. After much deliberation, the Arizona Corporation Commission determined in 2010 that it would permit third-party ownership of onsite solar systems for governmental entities, non-profit customers and educational institutions. IREC provided expert testimony in this proceeding and believes this outcome is a solid step in the direction of opening up additional financing options to customers in Arizona who are looking to invest in an onsite solar system.

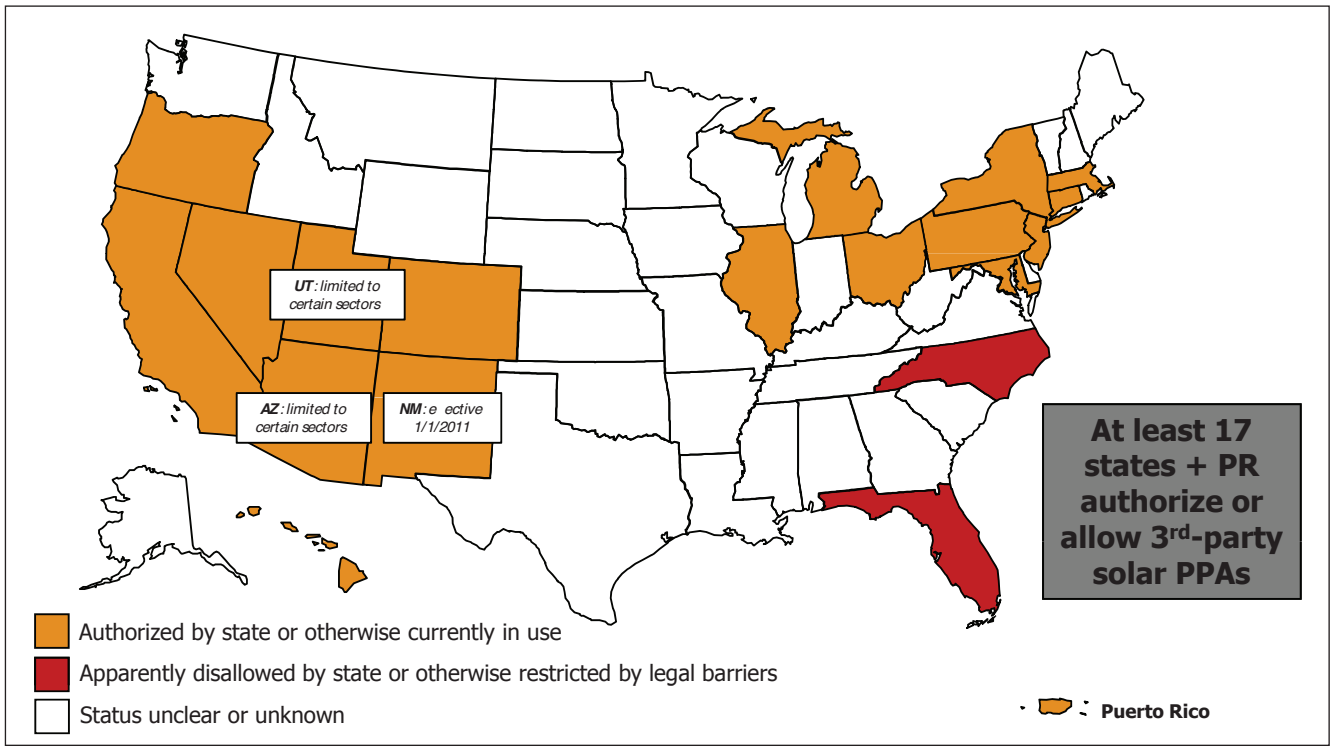
In New Mexico, a full year was spent in a rulemaking docket with four sets of required filings and multiple hearings to reach the conclusion that third party owners of distributed generation are not utilities. IREC was an active party. At the completion of the docket, two utilities appealed the decision to the New Mexico Supreme Court. Faced with this cost, supporters of the new order agreed to compromise legislation allowing third-party ownership, but permitting utilities to file tariffs to charge net-metered customers a fee for participating in this program. IREC was not an active party in that negotiation because it specifically avoids legislative efforts.

In Washington, the concept of third party owners being utilities was not at issue. Instead, a community solar program was being developed with participants able to collectively own systems located on local government property. The participants would therefore be third party owners. As in other states, IREC took an active role to assure that third party owners could participate with minimal administrative burdens. As well, the issue of third-party ownership seems to have been addressed along the way. Washington is now in a position to generally recognize that third party owners are not utilities without a lengthy and contentious docket to reach that conclusion.

IREC is working in collaboration with the North Carolina Solar Center to create a map that displays the availability of third party financing arrangements across the country. A current version of that map is displayed below. At the www.dsireusa.org, there is also a listing of the relevant statutes, rules and orders permitting third-party ownership by state. IREC was active in nearly all of these states to establish this important model of ownership.

THIRD PARTY SOLAR POWER PURCHASE AGREEMENTS

from www.dsireusa.org, July 2010



As solar energy costs decline and utility rates increase, it will be important for states that have not addressed third-party ownership to do so as this financing mechanism is becoming an increasingly preferred means of facilitating the installation of onsite solar systems. IREC intends to stay active on this issue as opportunities arise.

Other Regulatory Efforts

Community Solar

During the past year, IREC received a considerable number of requests for information on community solar program development from stakeholders and legislators in Arizona, Colorado, California, Connecticut, Delaware, Nevada, Massachusetts, Utah, Virginia and Washington. IREC responded to these inquires with information about existing state policies and engaged in many discussions with decision-makers at a local and state level.

Given significant interest by stakeholders and policy makers in expanding opportunities for participation in state solar programs, IREC is developing model rules for community programs that embody many of the best practices of programs that have been implemented to date. IREC's model will serve as a touch-point for stakeholder discussions on how community solar programs should be developed.

To promote community solar program development, IREC drafted two articles on community solar models, one for the March issue of the American Solar Energy Society (ASES) Solar Today publication and one for the July issue of Natural Gas & Electricity Journal. IREC has also been working with the National Renewable Energy Laboratory and the Northwest SEED Project to develop a community solar guide with a national scope that explores a number of community solar financing models and case studies. In addition to this growing list of publications, IREC also presented on the topic of community solar at the ASES Annual Meeting in Phoenix and at the Solar America Cities Annual Meeting in Salt Lake City.

IREC's early involvement in community solar was funded through its main contract with the Energy Foundation. In mid-2010, IREC received a grant from the Schwab Charitable Trust

to address community solar in more depth and that has been the catalyst enabling IREC to become an expert in this area.

Retail Rate Design

Through a contract from the Solar America Board for Codes and Standards (Solar ABCs), IREC has been investigating the rate impact of net metering on non-participating ratepayers, with a report due out this Fall. Various studies have looked at the costs and benefits of customer-sited generation, but assumptions have varied from study to study and each study was written in the context of a specific utility service area or state. All of these studies 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 a utility no longer needs to supply, reduced need for new peaking generation, reduced need for transmission and distribution system expansion, lower utility maintenance costs due to less stress on a utility system, elimination of line losses associated with 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.

On the cost side of the equation, the standard assumption made by the utility industry is that utilities would have made sales at retail rates to customers with on-site generation if on-site generation had not been installed, and therefore lost sales are a cost to the utility and its ratepayers. IREC challenges that assumption. Sales that utilities might have otherwise made are not guaranteed to utilities and not making those sales is not a cost. Looking at it from a different perspective, the cost to add new customers with on-site solar generation is minimal because they tend to add nothing to utility peak load, while they provide the benefits noted above that relate to providing generation during periods of peak utility load.

As noted earlier, IREC is now engaged on the issue of rate design in New Mexico. The state's largest utility has proposed a special charge for net metered customers based on the theory of lost retail sales and a short-term view of associated benefits. IREC is a party to the rate case and expects that other utilities may pursue the same arguments. IREC and other stakeholders will need to be present in these cases to present the counterargument.

Interconnection Screens

In a separate study funded by Solar ABCs, IREC investigated technical screens used in the Federal Energy Regulatory Commission's Small Generator Interconnection Procedures. These screens are widely duplicated in state interconnection procedures and were adopted five years ago, before the vast majority of distributed generation systems were installed. With recent experience gained both in the U.S. and internationally, a review of these technical screens was appropriate.

The study asked interconnection experts that had developed the underlying technical standard (IEEE 1547) about each of the screens. After a thorough review, the study concludes that several of the screens could potentially be relaxed. In particular, the study considered whether the screen limiting generation on a line section of a circuit to 15% of circuit peak load should instead allow higher penetration. As high penetration of solar generation becomes an issue, this technical screen could create a cost barrier as new generation is subjected to greater scrutiny.

The results of this study are already having an impact through discussions with IEEE, FERC and state utility commissions. The full study is available on the www.solarabcs.org site for review.

Wholesale Market Design

IREC has devoted significant resources over the past year to expanding market opportunities for wholesale markets for distributed solar PV systems less than 20 MW in capacity. In particular, IREC has focused on two fundamental aspects of wholesale market design: (1) development of reasonable power sale contract terms and conditions that can be used by small PV system developers in contracting to sell wholesale power to utilities, and (2) assisting PV stakeholders to identify approaches to wholesale market design that fit within state jurisdiction. IREC worked to address these issues in rulemakings in Arizona, California, and Oregon and assisted stakeholders in addressing state authority to establish wholesale market policies in response to two petitions filed with

the Federal Energy Regulatory Commission (FERC). Additional information on these efforts is provided below.

IREC assisted stakeholders in filing comments with the California Public Utilities Commission (CPUC) in a proceeding aimed at expanding wholesale market opportunities for distributed renewable generation systems. IREC completed background legal research and drafted a legal brief supporting the CPUC's authority to establish procurement programs for wholesale PV systems in the 1-20 MW capacity range. IREC also worked with solar advocates in two additional CPUC proceedings to develop standard contract terms and conditions for wholesale distributed PV systems. IREC believes these contracts may serve as a useful template for development of standard contracts in wholesale market programs in California and beyond.

IREC carried lessons learned from these California rulemakings to neighboring states by providing assistance to stakeholders in Arizona and Oregon in developing wholesale market programs. IREC worked with Vote Solar to respond to an Arizona Corporation Commission (ACC) notice of inquiry on adopting a feed-in tariff in Arizona. At the request of ACC Chairman Kris Mayes, a member of IREC's legal team also testified at an open meeting at the ACC regarding the limits of state authority over wholesale markets. In Oregon, IREC assisted the Renewable Northwest Project in addressing jurisdictional considerations associated with implementation of an Oregon feed-in tariff program.

At a federal level, IREC worked with The Solar Alliance, Vote Solar, the California Solar Energy Industry Association and the national Solar Energy Industry Association to file comments at FERC in response to petitions filed by the CPUC and California's three largest investor-owned utilities (IOUs) regarding the extent of the CPUC's authority to establish wholesale power prices. This was precisely the issue that IREC had worked with stakeholders to address in California, Oregon and Arizona. In June of 2010, FERC issued a decision clarifying the extent of state authority to set wholesale market prices. Limitations reiterated by FERC in this decision have highlighted the importance of structuring wholesale programs at a state level to take advantage of market-based approaches to facilitating procurement from small-scale PV systems.

To disseminate information learned from these activities to interested stakeholders nationwide, IREC co-hosted a webinar with Vote Solar in early 2010 titled "Solar Feed-in Tariff Pricing in the U.S.: Practical Approaches to Establishing Wholesale Programs at the State Level." This webinar was attended by more than 200 participants. IREC also participated in a discussion of obstacles and opportunities for wholesale distributed generation (DG) markets on a panel at the National Association of Regulatory Utility Commissioners Summer Meetings in Sacramento.

The third paper IREC is completing for the Solar ABCs is titled Sustainable, Multi-Segment Market Design for Distribute Solar PV. This reports discusses policies being deployed by state policymakers in two important and distinct markets for solar photovoltaic (PV) investment—a retail market and a wholesale market. In areas of the U.S. that are experiencing the most significant growth in solar PV investment, state and local policymakers have taken important differences between retail and wholesale markets into account in establishing policies that promote growth in both of these market segments.

An important component of this Solar ABCs report is a discussion of wholesale market policies including avoided cost pricing mechanisms, REC markets, feed-in tariffs, and market-based procurement mechanisms such as auctions and requests for proposals. This paper dicusses the important differences between retail and wholesale PV markets and provides examples of policies that have been implemented in the U.S. in both of these markets. The Retail Market Policies section discusses policies that enable end-use retail electric customers to invest in solar PV systems to meet some or all of their electricity needs. The Wholesale Market Policies section, by comparison, discusses policies that enable small and medium scale project developers to develop distributed generating facilities that will serve nearby retail electric utility load. Building upon those sections, a final Recommendations section examines the ways in which leading U.S. markets for solar PV market growth have increasingly implemented a range of interrelated policies that can support sustainable, multi-segment market growth for distributed solar PV.

Smart Grid and Integration of Advanced Energy Storage Technology

IREC has been an active participant in California rulemakings related to smart grid deployment and integration of plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) (collectively, PEVs) with California's electric grid.

IREC entered the PEV proceeding to address the intersection of PEVs with net metering and virtual net metering and interconnection of BEVs. IREC focused its participation on addressing net metering concerns and possible metering options that would facilitate customer choice in integrating solar PV systems with charging a PEV. IREC also thought it important to address jurisdictional issues related to PEVs and whether BEV service providers are subject to Commission regulation as public utilities. This work drew on IREC's expertise in addressing third-party ownership of onsite solar PV systems and is important to ensuring that solar PV systems installed in multi-tenant buildings can be used to charge tenant vehicles.

IREC also filed comments in a California smart grid proceeding to ensure that smart grid infrastructure has necessary functionality to support the state's solar PV programs. IREC encouraged the CPUC to open a new proceeding to address issues related to integration of energy storage devices so that a fully operational smart grid has the capability to facilitate high penetrations of solar PV systems.

Outreach

Groundwork is laid for future regulatory efforts by broadcasting IREC's approaches through publications and presentations. As noted, IREC is publishing three studies through the Solar ABCs program this year. During the past year, IREC published magazine articles on market design, community solar, and third-party ownership and was quoted repeatedly in news articles. As well, IREC gave presentations at Solar 2010 in Phoenix, Solar Power International 2009 in Anaheim, SolarTech in San Ramon, and numerous legal seminars and webinars. Finally, IREC continued and expanded its grading of state net metering and interconnection procedures for the annual publication of ***Freeing the Grid***, which is causing utility commissions to take notice of their grades and seek to improve them.

"Groundwork is laid for future regulatory efforts by broadcasting IREC's approaches through publications and presentations."

STATE SOLAR INCENTIVES AND SOLAR POLICY TRENDS

Justin Barnes, Rusty Haynes, Amy Heinemann, Brian Lips, and Amanda Zidek-Vanega
Database of State Incentives for Renewable Energy (DSIRE) / North Carolina Solar Center at North Carolina State University

Introduction

State-level solar policy development has continued its recent brisk pace of change, with no fewer than 47 states—plus the District of Columbia, Puerto Rico and the U.S. Virgin Islands—modifying elements of a solar program or policy in the period from September 2009 to August 2010.[1] State-level renewables portfolio standards (RPS) continued to evolve; numerous financial incentive programs were created and expanded (although many programs wrestled with funding imbalances due to high demand); and most solar tax credits weathered the worst of the state budget crises. Federal support in the form of investment tax credits, grants in lieu of tax credits and funding for state solar programs continued.

Two innovative solar-friendly policies face serious hurdles. The Federal Housing Finance Agency (FHFA) has expressed concerns about property-assessed clean energy (PACE) financing and, as a result, its future as a viable policy option is uncertain. A separate federal ruling on California's feed-in tariff (FIT)—issued at the request of the California Public Utilities Commission—might have negative policy implications beyond California's borders. Details regarding the current status of state solar policies programs are available at www.dsireusa.org.

Renewables Portfolio Standards (RPS)

While RPS policies and solar carve-outs remain an important part of the state policy landscape, there have been few major developments this year, compared to recent years. However, several states modified policies, including the following:

- **California**. The governor issued an executive order in September 2009 that expanded the RPS from 20% by 2010 to 33% by 2020. In addition, the California Public Utilities Commission (CPUC) is working to authorize tradable renewable energy credits (TRECs) for RPS compliance, but a final decision is pending.
- **Colorado**. The overall standard of 20% renewables by 2020 was raised to 30% by 2020. In addition, the former 0.8% solar standard, including 0.4% from on-site solar, was replaced with a standard of 3% renewable distributed generation (DG), including 1.5% from customer-sited resources.
- **Delaware**. The RPS as a whole was expanded from 20% by 2020 to 25% by 2026. The solar carve-out was also accelerated during early compliance years, and the ultimate target was expanded from 2.005% by 2020 to 3.5% by 2026.
- **Illinois**. The existing solar carve-out—6% of the standard by 2015—remains in effect. Legislation enacted in August 2010 establishes interim compliance targets starting in 2012.
- **Maryland**. Legislation enacted in May 2010 accelerated the solar compliance benchmarks from 2011 to 2016 and increased the solar alternative compliance payment for these years. (Maryland's standard is 20% by 2022, which includes a solar carve-out of 2% by 2022.)

1 This section of IREC's annual Updates & Trends publication is based on the research of state solar policy developments in the United States as conducted by the DSIRE staff.

- **Massachusetts**. The state adopted rules establishing a solar carve-out of 400 megawatts (MW), including a program designed to improve the function of the state market for solar renewable energy certificates (SRECs). In addition, legislation in August 2010 raised the maximum capacity of a system eligible to qualify for the solar carve-out from 2 MW to 6 MW.
- **New Jersey**. The overall standard of 22.5% by 2021 remains intact, but the solar carve-out of 2.12% by 2021 was replaced with a standard of 5,316 gigawatt-hours (GWh) by 2026. This change addresses the possibility that New Jersey's aggressive energy efficiency goals would have substantially reduced the amount of solar energy required by the state's solar carve-out.
- **New York**. The standard of 24% by 2013 was expanded to 29% by 2015,[2] and the customer-sited tier target was raised from 2% of the 2013 standard to approximately 7% of the 2015 standard (equivalent to roughly 0.48% of state electricity sales).
- **Oklahoma**. A non-binding renewable energy goal of 15% by 2015 was enacted.
- **Puerto Rico**. The Commonwealth adopted a standard of 20% by 2035. Mandatory compliance begins in 2015.

Several other states made modest revisions to their existing RPS policies. Missouri, Oregon, Utah and West Virginia all changed existing standards or goals by refining resource eligibility criteria. Colorado and Virginia created compliance multipliers for certain resources.

In addition to state RPS policy changes, state SREC markets exhibit improved price transparency, additional sales opportunities and increased tracking-system compatibility. For example:

- Improved price transparency. Publicly accessible SREC trading and price data is available from the PJM-EIS Generation Attribute Tracking System (GATS). Several SREC trading and auction web sites also contain price data for various states.
- Additional sale opportunities and capabilities. Several SREC trading/auction web sites connect buyers and sellers and help generators navigate state regulatory requirements. Several regional and state tracking systems now offer bulletin boards where market participants may post offers to buy or sell SRECs (or RECs).
- Increased tracking system compatibility. The North Carolina Renewable Energy Tracking System (NC-RETS) permits REC and SREC transfers to and from the North American Renewables Registry (NARR). Efforts are underway to expand this ability in other tracking systems such as the Midwest Renewable Energy Tracking System (MRETS) and the PJM-EIS GATS.

Direct Cash Incentives for Solar

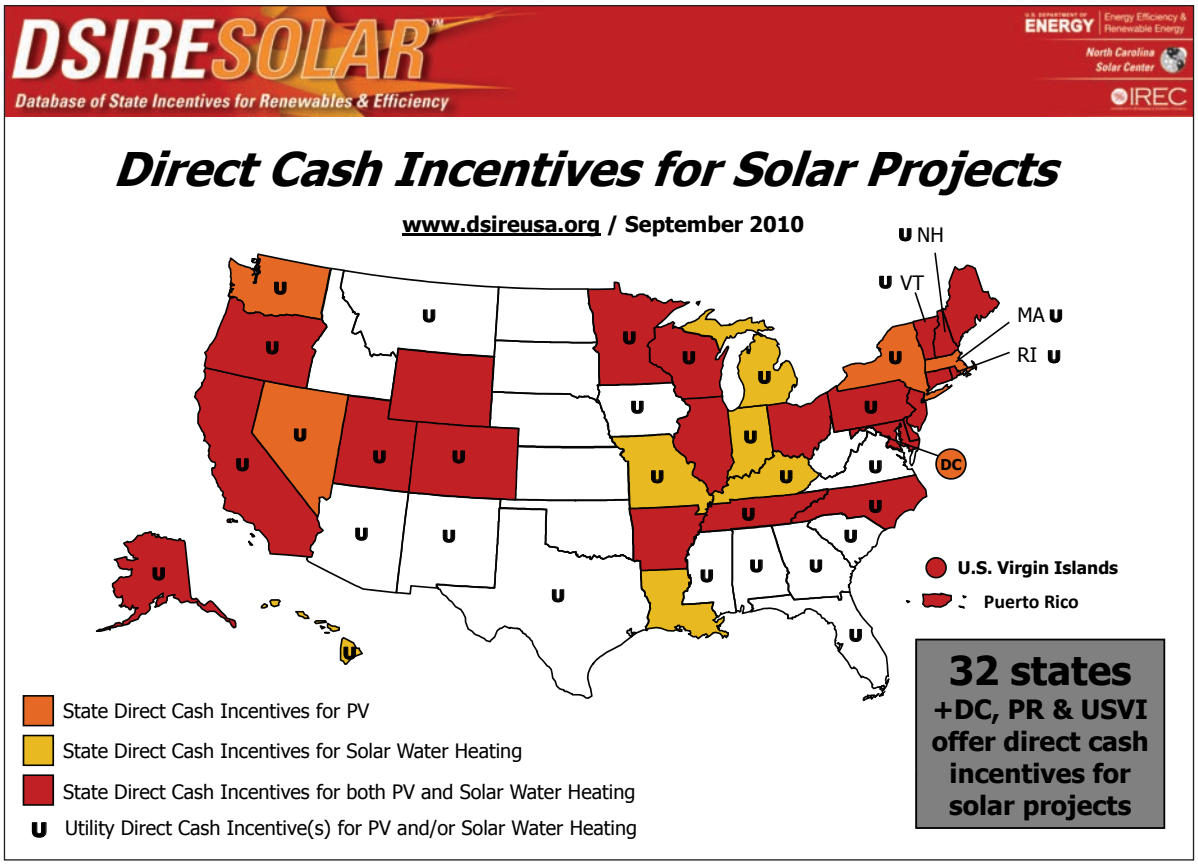
During the last year, there was significant activity involving direct cash incentives, which include rebates, grants, feed-in tariffs (FITs) and other forms of performance-based incentives (PBIs), and renewable energy credit (REC) purchase programs. Specifically, 27 new solar programs were created; 47 programs were modified in some way; and several programs were discontinued.[3] In addition, 34 new incentive programs were created using funding from the *American Recovery and Reinvestment Act of 2009* (ARRA).[4] Approximately half of these new federally-supported programs—in 17 states plus Puerto Rico—included residential solar water heating, under the banner of the U.S. Department of Energy's State Energy Efficient Appliance Rebate Program (SEEARP). As of August 31, 2010, 32 states, D.C., Puerto Rico, and the U.S. Virgin Islands offer direct cash incentives for solar (see Figure A on next page).

2 New York's RPS anticipates that 1% of retail sales will be met with voluntary green power purchases. Thus, the original standard was officially defined as 25% by 2013 and has been increased to 30% by 2015.

3 These figures include state, utility and local government direct cash incentive programs that support solar.

4 This figure includes rebates and grants that were designed to be available for several months; it does not include one-time requests for proposals.

FIGURE A: DIRECT CASH INCENTIVES FOR SOLAR PROJECTS.



Several programs' incentives were modified to reflect increased demand or expected demand. The most common solar program modifications made during the last year include: (1) reducing individual incentive levels to reflect current market conditions; (2) employing planned step-downs when designing or modifying incentive programs; and (3) incorporating performance-based metrics into program design.

- ***Incentive Level Reductions.*** Many state and utility programs reduced per-kilowatt or per-kilowatt-hour incentive levels. Such actions can extend the duration of programs and provide greater market certainty by ensuring that incentives are more consistently available. Energy Trust of Oregon, for example, responded to increased demand for photovoltaic (PV) rebates by reducing incentive levels for commercial, industrial, non-profit, government and residential systems in order to keep the program open. In Colorado, Xcel Energy and Black Hills Energy reduced incentive levels, but began offering rebates and REC payments to larger systems, and extended incentive eligibility to third-party owners. Xcel Energy also implemented a planned step-down structure for REC payments, creating a predictable path for REC payments in the future. While reducing incentive levels helps to keep programs open and available to more people, it could also deter installations in some cases by raising the net cost of the project to the system owner.

- ***Planned step-downs***. Quite a few incentive programs operate on a declining block structure, in which incentive levels are designed to decrease when the aggregate capacity installed under the program reaches certain benchmarks. Incentive programs at the state or utility level in Arizona, California, Colorado, Nevada, New York, Pennsylvania and Vermont employ step-downs. Programs in Arizona, Colorado, New York and Vermont implemented this structure for the first time this year. New Jersey's original 2010 program plan also incorporated the incentive step-down design. However, due to

overall budget reductions, the plan was pre-empted and incentive levels were reduced directly. In most (but not all) cases, the step-down paths are predictable and transparent so that it is clear when reductions in incentive levels will occur. The California Solar Initiative and the Pennsylvania Sunshine Solar Program employ such an approach. Both programs have online tracking systems, allowing stakeholders to monitor the status of rebate levels and anticipate step-downs.

- ***Performance-based metrics.*** It is increasingly common for states and utilities to incorporate performance-based metrics into existing rebate programs, or to establish new performance-based incentives. For example, using ARRA funds, Arkansas created a statewide rebate program that incorporated lessons from other state rebate programs and relies heavily on performance-based metrics to determine incentive levels. The rebate mechanism is based on actual system production during the first year of operation and, as such, it functions in the same way as a PBI.

Few direct cash incentives take the form of a feed-in tariff (FIT). As of August 31, 2010, three states[5] and seven utilities have established FITs that support PV (see Table A). Most of these programs are in the "pilot" stage and are limited in scope. Early experience with FITs in the United States has demonstrated the ability of such policies to encourage rapid PV development. However, some programs have become fully subscribed almost immediately.[5]

Experimentation with these policies has yet to produce a replicable, scalable FIT design in the United States. In addition, a July 2010 order by the Federal Energy Regulatory Commission (FERC), issued at the request of the California Public Utilities Commission, held that states may not establish wholesale electricity rates that exceed utilities' avoided-cost rates. State policy makers will have to consider this when designing FIT policies.[6] However, utilities that establish FITs without a state mandate to do so have fewer limitations.[7]

5 Oregon's anticipated pilot FIT for PV changed into "super net metering" due to FERC jurisdictional concerns regarding a state's ability to set electricity purchase prices. As a result, Oregon's PBI is not addressed in this section.

6 For more information on feed-in tariff policy design options, see Couture, T.D.; Cory, K.; Kreycik, C.; Williams, E. "Policymaker's Guide to Feed-in Tariff Policy Design." July 2010. NREL Technical Report TP-6A2-44849. http://www.nrel.gov/docs/fy10osti/44849.pdf

*7 For a detailed discussion of these issues, see Hempling, S.; Elefant, C.; Cory, K.; Porter, K. "*Renewable Energy Prices in State-Level Feed-in Tariffs: Federal Law Constraints and Possible Solutions.*"* January 2010. NREL Technical Report TP-6A2-47408. http://www.nrel.gov/analysis/pdfs/47408.pdf

TABLE A: FEED-IN TARIFFS EXIST ON A LIMITED-BASIS IN EIGHT STATES.

PROGRAM NAME	STATE	RATE	DATE PROGRAM BEGAN AND STATUS
California Feed-in Tariff	CA	Rate time-differentiated	2/08, accepting applications
Hawaii Feed-in Tariff	HI	Rate not yet determined	Pending
Vermont Standard Offer for Qualifying SPEED Resources	VT	$0.24/kWh; Interim price was $0.30/kWh (9/09-1/10)	9/09, closed to new applicants
Sacramento Municipal Utility District (SMUD) – Feed-in Tariff	CA	Rate varies depending on the year placed in service, time of day, time of year and length of contract	1/10, closed to new applicants
Gainesville Regional Utilities – Solar Feed-in Tariff	FL	$0.26-$0.32/kWh (higher for building or pavement-mounted systems)	3/09, closed to new applicants
Indianapolis Power & Light – Rate REP	IN	$0.20-$0.24/kWh (higher for systems 20 kW - 100 kW)	3/10, accepting applications
Consumers Energy - Experimental Advanced Renewable Program	MI	$0.375/kWh-$0.65/kWh (varies by several factors)	8/09, accepting applications
CPS Energy – Solartricity Producer Program	TX	$0.27/kWh	6/10, accepting applications
Wisconsin Power & Light (Alliant Energy) – Advanced Renewables Tariff	WI	$0.25/kWh	1/09, closed to new applicants
River Falls Municipal Utilities - Distributed Solar Tariff	WI	$0.30/kWh	1/09, closed to new applicants

Tax Credits

During the past year, Florida, Pennsylvania and Puerto Rico eliminated several solar-related tax incentives (including income tax credits and property tax incentives) for budgetary reasons, and Oklahoma deferred payments on its production tax credits for a year.

Other states extended or improved tax incentive programs. For example, Arizona extended an existing tax credit for non-residential solar and wind projects for six years, and enacted a new production tax credit for projects 1 MW or larger. North Carolina and Montana both made modest but meaningful adjustments to existing tax credits. Hawaii and Oregon adjusted their solar tax credits to prevent gaming and to limit the budget impact of the credits.

PACE Authorization—

Policy Continues to Evolve but Faces Challenges

From September 2009 to August 2010, nine states have enacted new legislation authorizing local governments to establish PACE programs: Georgia, Florida, Maine, Massachusetts, Minnesota, Missouri, New Hampshire, New York and North Carolina, bringing the total of states that authorize PACE to 24.[8] Six states amended existing PACE laws: California, Colorado, Illinois, Ohio, Virginia and Wisconsin. These amendments were designed to facilitate implementation and/or expand the scope of PACE programs. Ohio, for example, extended PACE financing to energy efficiency technologies (previously, only solar was eligible). California created a statewide PACE Bond Reserve Program to help reduce program costs to localities. Colorado created a statewide improvement district that allows local governments to aggregate with other local governments across the state to reduce administrative costs and utilize bond revenue raised by the larger improvement district. In addition, the ARRA provided funding to support development of local PACE programs.[9] However, recent guidance from Fannie Mae and Freddie Mac in May 2010,[10] and from the Federal Housing Finance Authority (FHFA) in July 2010,[11] have raised questions about federal support of PACE. The agencies' concern is with PACE assessments acquiring a priority lien over existing mortgages, on par with property taxes. FHFA argues that this stipulation contradicts traditional lending practices and raises "safety and soundness concerns." Until this uncertainty is resolved, it is likely that most local PACE programs for residential property owners will remain in limbo. One exception is Maine, which enacted PACE legislation specifying that PACE-related liens are secondary. As a result, Maine is moving forward with PACE implementation and plans to implement local programs in fall 2010. (Maine is using ARRA funds to support PACE implementation.)[12]

Net Metering & Interconnection

Increasingly, policymakers understand that solid net metering policies play an important role in cultivating markets for on-site renewables, and that these policies must evolve as markets expand. Seven states enacted legislation that enhanced existing net metering laws. Examples include:

- California raised the aggregate capacity limit on net metering from 2.5% to 5%;
- New Jersey replaced its individual capacity limit with a limit based on a customer's use;
- New York fixed a glitch that severely limited non-residential net metering;[13]
- West Virginia established a new, robust net metering policy.

8 PACE financing effectively allows property owners to borrow money to pay for renewable energy and/or energy-efficiency improvements. The amount borrowed is typically repaid over a period of years via a special assessment on the owner's property. Many PACE laws have specified that such assessments are to be considered a senior lien in the event of bankruptcy or default.

9 ARRA Funding for PACE programs was awarded via the Department of Energy's Energy Efficient Conservation Block Grant Retrofit Ramp-Up Program and State Energy Program. Awards have since been rescinded or reworked due to the uncertainty surrounding the viability of PACE.

10 https://www.efanniemae.com/sf/guides/ssg/annltrs/pdf/2010/ll1006.pdf *and* http://www.freddiemac.com/sell/guide/bulletins/pdf/iltr050510.pdf

11 http://www.fhfa.gov/webfiles/15884/PACESTMT7610.pdf

12 Maine's PACE policy is both complex and unique, and probably does not serve as a replicable model for other states' PACE policies.

13 In 2008, New York enacted legislation expanding net metering to non-residential solar and wind energy systems up to 2 MW in capacity. However, the law also limited the size of individual systems to the on-site peak load from the previous 12 months. That language was removed by new legislation enacted in 2010, allowing non-residential electric customers to net-meter solar and wind-energy systems large enough to offset all of their on-site electricity consumption.

Other revisions were implemented to allow community-owned systems and third-party-owned systems, to improve the treatment of net excess generation (NEG), and to extend net metering to more types of energy systems. Maryland enacted net metering legislation in May 2010 that ultimately could have a negative impact on the treatment of customer NEG; rulemaking is underway.[14]

In addition, 10 states adopted new or improved interconnection standards to facilitate the process of allowing customers and other system owners to connect to the grid. One of the most significant changes occurred in Maine, which adopted new standards that embrace the 2006 IREC Model Interconnection Procedures.[15] See the "Regulatory Issues Updates & Trends" section on page 7 of this publication for more details on key developments in net metering and interconnection standards during the last year.

14 Legislation enacted in 2010 will require NEG to be carried forward from month to month as a monetary credit, valued at the "prevailing market price of energy applicable to the electric company in the PJM Interconnection energy market," as opposed to as a kWh credit. However, system owners will be compensated at the end of a 12-month period for any remaining NEG, replacing the current requirement that system owners surrender annual net NEG to the utility.

15 IREC updated its model interconnection procedures in 2009. The 2009 IREC model is available at http://irecusa.org/wp-content/uploads/2010/01/IREC-Interconnection-Procedures-2010final.pdf

Conclusion

While overall solar policy trends have been positive, states faced several challenges over the last year. Taken as a whole, RPS policies, direct cash incentive programs, net metering and interconnection standards moved forward, while FIT policy adoption slowed and PACE financing (mostly) ground to a halt. Adjustments were made to state tax credits, although few were completely eliminated. Over the next year, states will need to keep a close eye on budgets and the aforementioned policy obstacles. States will also need to adapt to scheduled and unforeseen policy adjustments at the federal level.

Acknowledgment: During the review process, the authors benefitted from input provided by Sarah Busche, Joyce McLaren, and Barry Friedman of NREL. We also appreciate Jane Weissman's guidance and support.

"Increasingly, policymakers understand that solid net metering policies play an important role in cultivating markets for on-site renewables, and that these policies must evolve as markets expand."

SOLAR INSTALLATION TRENDS

Larry Sherwood

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 installations.
- **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 into 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 continue to generate power today, few new systems had been installed until recently. Installations resumed in 2006, with several small plants constructed in 2009 and a significant number of announcements for new plants are projected to be completed between 2010-2015. 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. Since 2006, the solar heating and cooling market has grown each year.

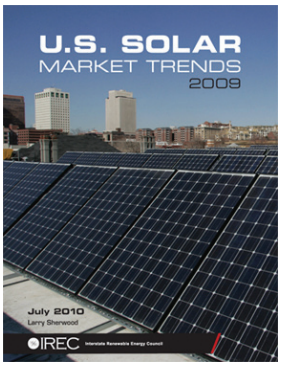
This report provides public data on U.S. solar installations by technology, state and market sector. Public data on solar installations help industry, government and non-profit organizations improve their efforts to increase the number (and capacity) of solar installations across the United States. Analysis 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 in Section 2. (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 2009, available on the IREC web site at http://irecusa.org/wp-content/uploads/2010/07/IREC-Solar-Market-Trends-Report-2010_7-27-10_web1.pdf *In addition to more analysis, the full report contains details of the data collection methods and assumptions.*

Photovoltaics

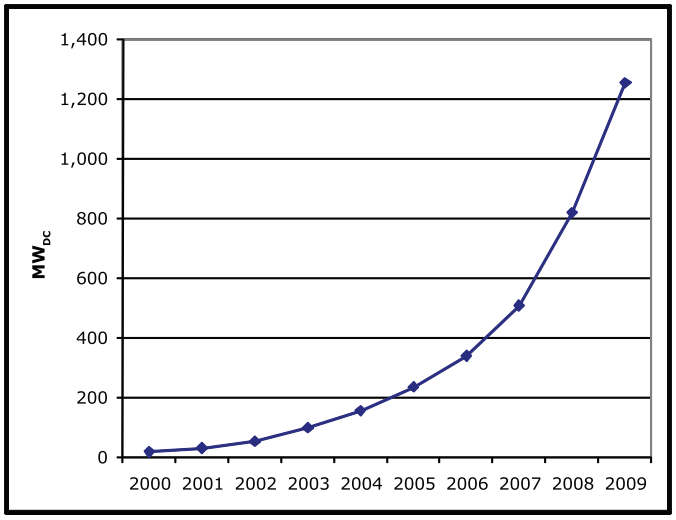
Overall Trends in Installations and Capacity



Annual U.S. grid-connected PV installations grew by 40% in 2009 compared with installations in 2008 to 435 MW_{DC}, raising the cumulative installed grid-connected capacity to 1.25 GW_{DC}, a new industry milestone (See Figure 1). Although PV growth was strong in 2009, the annual growth rate was significantly less than the rate in 2007 (61%) and in 2008 (84%). Considering the poor economy in 2009, this growth was still impressive. The capacity of PV systems installed in 2009 was four times the capacity of PV installed in 2006. More than 34,000 sites installed PV in 2009, an 81% increase over the number of 2008 installations. Most of these installations are mounted on buildings, but some are ground-mounted or pole-mounted installations.

Some PV installations are off-grid. Based on anecdotal information, off-grid installations likely totaled 40-60 MW in 2009, but IREC has not collected data for these installations, and they are not included in this report's charts.

Fig. 1: *Cumulative U.S. Grid-tied Photovoltaic Installations (2000-2009)*



The following factors helped drive PV growth in 2009:

- Many states continue to offer financial incentives for PV, and system installation growth more than doubled in New Jersey, Florida, Arizona, Massachusetts, and Texas. Each of these states has one or more significant financial incentive and/or a renewable portfolio standard (RPS) program with a specific solar mandate (or customer-sited mandate).
- Federal tax incentives were renewed and expanded in October 2008, and further revised in February 2009. These incentives played a significant role in the markets for 2009, but the impact varies greatly by market sector. (These effects are described in the next section.)
- During 2009, the price of PV modules began to fall. For systems installed under the California Solar Initiative, the installed cost decreased by 7% in the fourth quarter of 2009 compared with the fourth quarter of 2008.

Grid-Connected Installations by Sector

The growth rate of grid-connected PV varied significantly by market sector, with large growth in the residential and utility sectors, and no growth in the non-residential 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. Figure 2 shows the annual PV installation capacity data, segmented by residential, non-residential and utility installations.

Table 1: SAMPLE INSTALLATIONS BY SECTOR

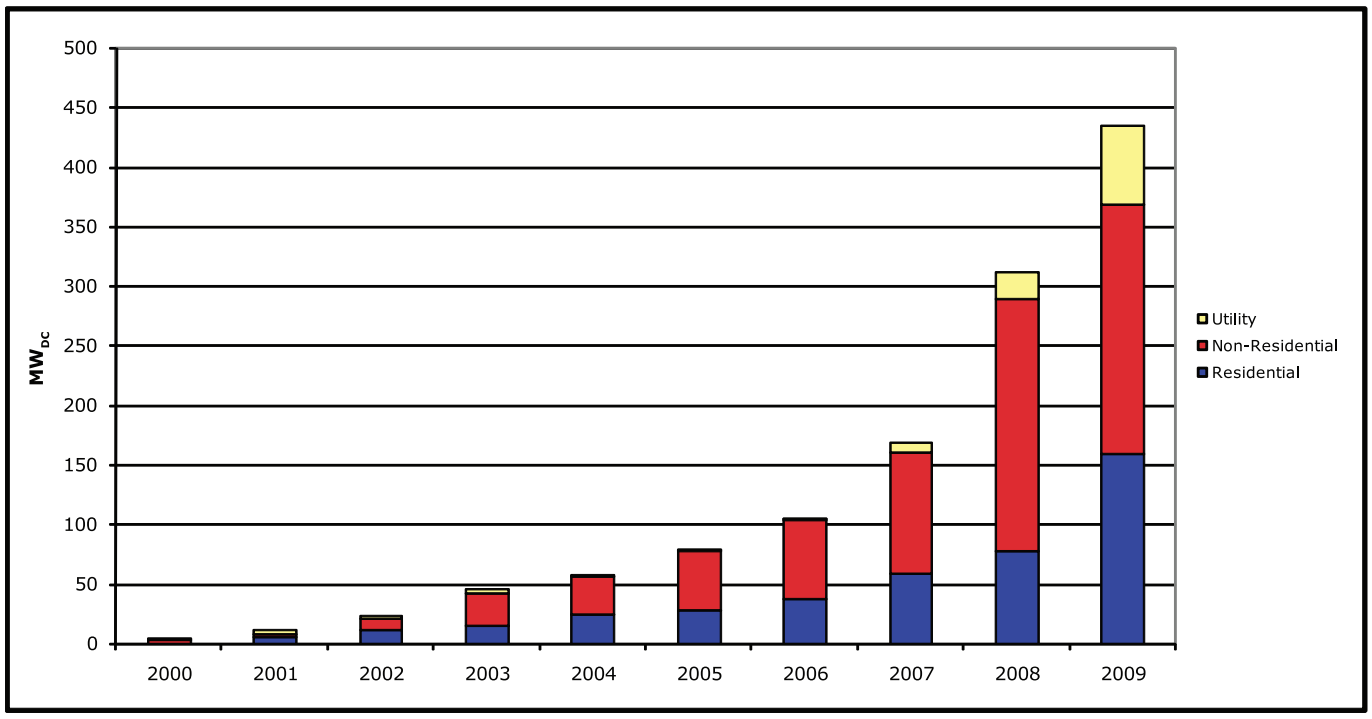
Sector	Example Installations
Residential	• Residential installation owned by homeowner or building owner; electricity generated is used on-site • Residential installation owned by third party, with electricity sold to the homeowner or building owner
Non-Residential	• Non-residential installation owned 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

Residential capacity installed in 2009 more than doubled compared with capacity installed in 2008 and represented 36% of all new grid-connected PV capacity. This market share is consistent with residential installations in 2005, 2006 and 2007, and is significantly higher than the 27% market share for residential installations in 2008.

In October 2008, the residential federal investment tax credit (ITC) was renewed and the $2,000 cap was removed for residential installations beginning in January 2009. In the final quarter of 2008, this policy change caused some homeowners to delay new installations until 2009 in order to receive a larger federal tax credit. These consumer decisions decreased the number of residential installations in 2008 and increased the number in 2009.

The non-residential sector experienced no growth in capacity installed in 2009 compared with capacity installed in 2008. This was a dramatic change from the past several years, when the non-residential sector experienced large growth rates.

Fig. 2: *Annual Installed Grid-Connected PV Capacity by Sector (2000-2009)*



A number of factors led to the lack of growth in the capacity of non-residential installations in 2009 compared with the 2008 installations. First, for most of 2008, the future of the residential and business ITCs was uncertain; the residential ITC was scheduled to expire and the commercial ITC was scheduled to decrease from 30% to 10% on January 1, 2009. Developers signed many contracts for new installations with a delivery date before the end of 2008. This resulted in a rush of installations in the last quarter of 2008, but few orders for installation in 2009. When the ITC was extended in October 2008, the economy soured and credit markets froze. Obtaining orders and financing for new projects was very difficult in this environment. The American Recovery and Reinvestment Act of 2009, enacted in February 2009, included a provision for cash grants instead of tax credits. However, the rules for this program were not published until July 2009, further slowing orders. In the last half of 2009, federal incentive rules were clear, credit markets improved slightly, and federal stimulus funds flowed. However, these improvements came too late for 2009 installations. Growth in the non-residential sector should return in 2010.

Virtually all of the larger installations and many of the medium-sized non-residential installations use power purchase agreements (PPAs). In addition, several companies now provide PPAs for residential customers in specific states or utility service territories. In these agreements, a third party finances and owns the solar installation and receives the available tax advantages and other incentives. The third party then leases the system or sells the solar-generated electricity to the building or site owner through a long-term contract.

In several states, regulators are considering defining third-party owners of solar equipment as utilities (i.e. the PPA model discussed previously). Such rulings are very unfavorable to the third-party solar PPA model. If such rulings are made, third-party owners in these states may still be able to lease solar facilities to customers (as opposed to owning and operating solar facilities) without being classified as utilities, but their ability to use the federal ITC will need to be clarified. If a third-party PPA provider has the same legal obligations as a utility, the cost of doing business generally becomes prohibitively expensive.

Utility installations, defined here as installations for bulk power on the utility's side of the meter, tripled in 2009 and represented 16% of grid-connected PV capacity installed in 2009. A 25-MW_{AC} installation in Florida and a 21-MW_{AC} installation in California were the largest PV systems installed in 2009 — and the two largest PV installations ever installed in the United States.

The renewal of the federal ITC in October 2008 allowed utilities to use federal credits for the first time. This change, along with solar carve-outs within some states' renewable portfolio requirements, led to dramatic growth in utility sector installations. Announcements of projects to be installed in 2010 indicate continued rapid growth of PV projects in the utility sector.

Size of Grid-Connected PV Installations

The average size of a grid-connected PV residential installation has grown steadily from 2.1 kW_{DC} in 2000 to 5.2 kW_{DC} in 2009 (see Figure 3). The average size of a non-residential system decreased to 90 kW_{DC} in 2009 from 115 kW_{DC} in 2008, though the long-term trend is an increase in the average size in this sector as well (see Figure 4). The average size of grid-connected PV installations varies from state-to-state, depending on available incentives, interconnection

Fig. 3: *Average Capacity of U.S. Grid-Connected Residential PV Installations (2000-2009)*

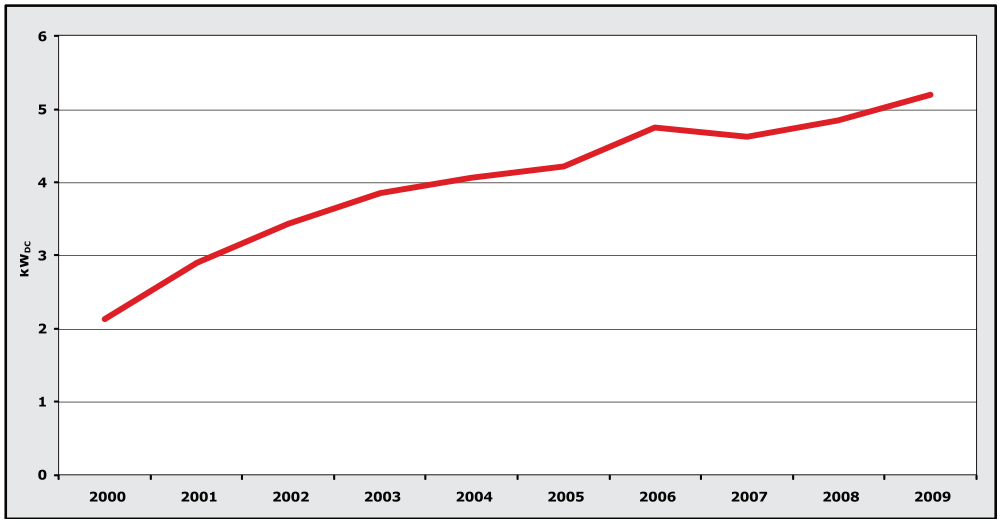
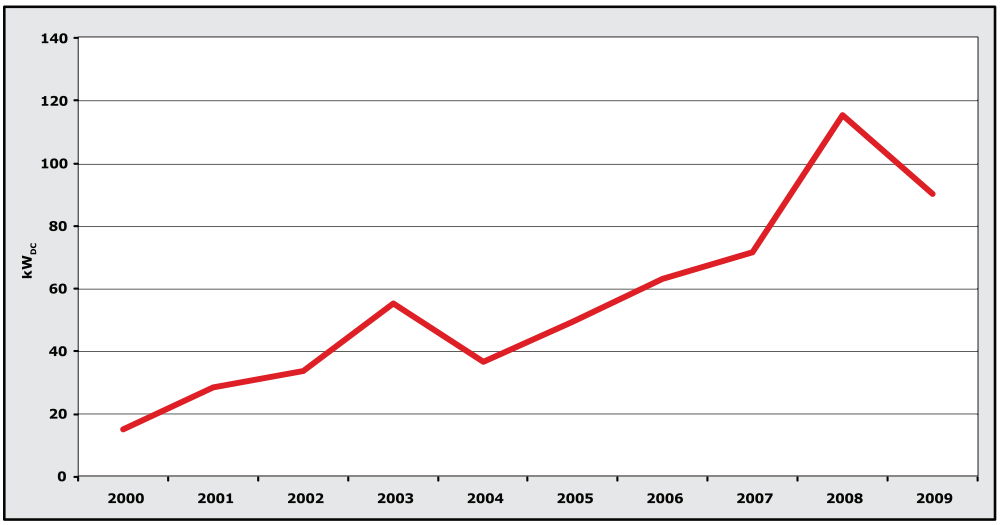


Fig. 4: *Average Capacity of U.S. Grid-Connected Non-Residential PV Installations (2000-2009)*



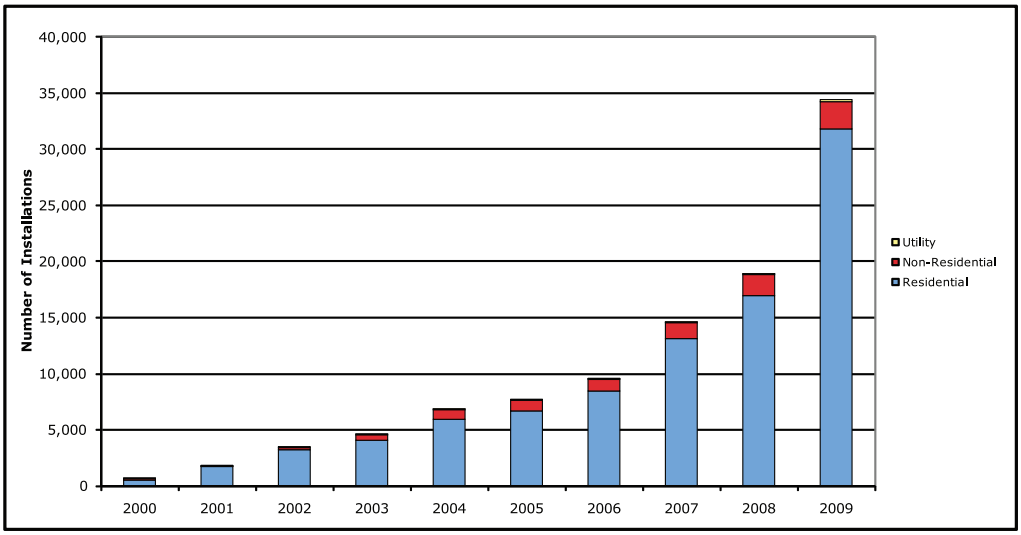
standards, net metering regulations, solar resources, retail electricity rates, and other factors. The Interstate Renewable Energy Council provides summary tables of state net metering and interconnection policies at http://bit.ly/bzcxaD, and the Database for State Incentives for Renewables & Efficiency provides summary tables of state and utility financial incentives at http://bit.ly/aigaN3.

Although the number of utility PV installations remains small, the average system size is over 400 kW_{DC}. Just six utility installations greater than 1 MW_{DC} totaled 60 MW_{DC}, or 14% of the capacity total of U.S. systems installed in 2009. 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 1 MW in 2009 and will continue into 2010.

Feed-in tariff incentives generate electricity for the utility sector and represent a small, but growing, 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.

More than 34,000 grid-connected PV installations were completed in 2009, with 92% of these at residential locations (see Figure 5). By contrast, residential systems accounted for only 36% of the PV capacity installed in 2009, as discussed previously. At the end of 2009, 104,000 PV installations were connected to the U.S. grid, including more than 93,000 residential installations. The average size of non-residential systems is more than ten times the average size of residential systems.

Fig. 5: *Number of Annual U.S. Grid-Connected PV Installations (2000-2009)*



Installations by State

In 2009, installations of grid-connected PV systems were concentrated in California, New Jersey, Florida, Colorado, and Arizona, as shown in Table 2. Eighty percent of grid-connected PV capacity installed in 2009 occurred in these five states, and 92% occurred in the top ten states. The market share for annual installations in California slipped below 50% for the first time. Although markets are growing in California, they are growing much faster in other states.

The market more than doubled in New Jersey, Florida, Arizona, Massachusetts and Texas. Florida's rank increased the most of any state, largely due to a single 28-MW_{DC} utility installation. Of the states with more than 1 MW_{DC} installed in 2009, only Nevada saw a decline in the capacity of systems installed in 2009 compared with those installed in 2008. Nevada was home to one large single installation in both 2007 and 2008. No similar installation was completed in Nevada in 2009.

Table 2: TOP TEN STATES
Ranked by Grid-Connected PV Capacity Installed in 2009

2009 Rank by State	2009 (MW_{DC})	2008 (MW_{DC})	08-09 % change	2009 Market Share	2008 Rank
1. California	212.1	197.6	7%	49%	1
2. New Jersey	57.3	22.5	155%	13%	2
3. Florida	35.7	0.9	3668%	8%	16
4. Colorado	23.4	21.7	8%	5%	4
5. Arizona	21.1	6.2	243%	5%	8
6. Hawaii	12.7	8.6	48%	3%	5
7. New York	12.1	7.0	72%	3%	7
8. Massachusetts	9.5	3.5	174%	2%	11
9. Connecticut	8.7	7.5	16%	2%	6
10. North Carolina	7.8	4.0	96%	2%	10
All Other States	34.2	24.6	41%	7%	--
Total	**434.6**	**311.3**	**40%**	**--**	**--**

2008 and 2009 columns include installations completed in those years. "2009 Market Share" means share of 2009 installations. "2008 Rank" is the state ranking for installations completed in 2008.

Table 3: TOP TEN STATES
Ranked by Grid-Connected PV Cumulative Installed Capacity through 2009

	MW_{DC}	Market Share
1. California	768	61%
2. New Jersey	128	10%
3. Colorado	59	5%
4. Arizona	46	4%
5. Florida	39	3%
6. Nevada	36	3%
7. New York	34	3%
8. Hawaii	26	2%
9. Connecticut	20	2%
10. Massachusetts	18	1%
All Other States	83	7%
Total	**1,256**	**--**

Table 4: TOP TEN STATES
Ranked by Cumulative Installed PV Capacity per Capita (W_{DC}/person) through 2009

	Cumulative through 2009 (W_{DC}/person)	2009 Installations (W_{DC}/person)
1. California	20.8	5.7
2. Hawaii	20.2	9.8
3. New Jersey	14.6	6.6
4. Nevada	13.8	1.0
5. Colorado	11.8	4.7
6. Arizona	7.0	3.2
7. Connecticut	5.6	2.5
8. Delaware	3.7	1.6
9. Oregon	3.7	1.7
10. Vermont	2.7	1.0
National Average	**4.2**	**1.4**

Table 4 shows the cumulative per capita grid-connected PV capacity through 2009. Even with the largest population in the country, California has the highest total capacity of installations per capita—a capacity that is almost five times the national average. Both Hawaii and New Jersey installed more PV on a per-capita basis than California in 2009.

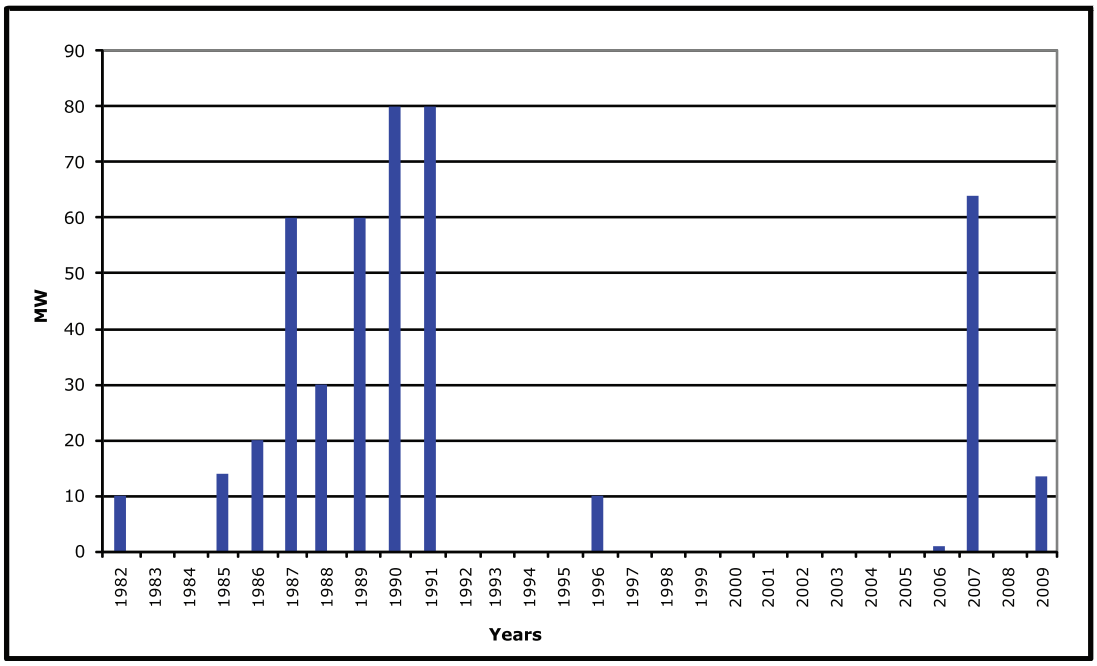
The large number of installations in a few states raises the national average, but 43 states have a per-capita PV installation rate that is less than the national average. As a point of reference, Germany, with less solar resource than most U.S. states, has more than 100 W installed per capita, considerably more than the average 4.2 W installed per capita in the United States.

Concentrating Solar power

Four small concentrating solar power (CSP) plants with a combined capacity of 13.5 MW were connected to the grid in 2009 (see Figure 6). These plants are located in California, Arizona and Hawaii. A total of 65 MW of CSP capacity were added in 2006 and 2007, and nine CSP plants with a total capacity of 354 MW were constructed in California from 1982 to 1991. These plants continue to operate today.

The future prospects for CSP plants look bright. Developers may complete several new plants in 2011. Several different companies have announced plans totaling more than 10,000 MW of generating capacity, and some have begun to receive required approvals from government agencies for these projects. Financing, siting and transmission issues will determine when, and if, these projects will be constructed.

Fig. 6: *Annual Installed U.S. CSP Capacity (1982-2009)*



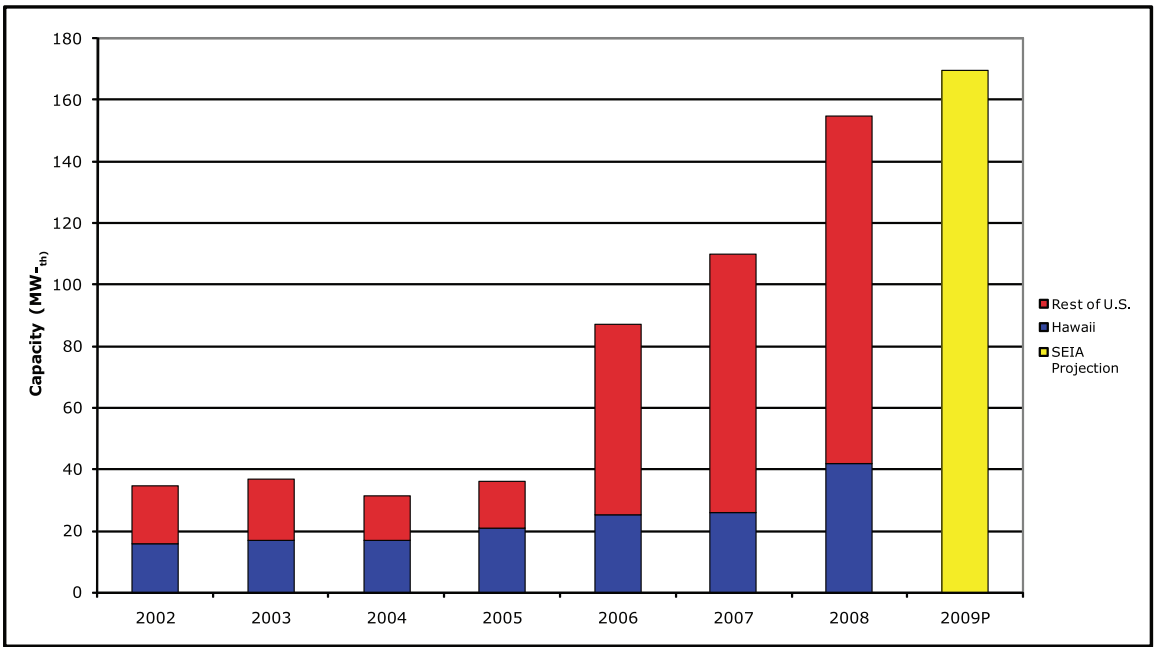
Solar Heating and Cooling

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.

Figure 7 shows that the annual installed capacity of solar thermal systems for water heating and space heating grew by 40% in 2008 and was projected to grow by 10% in 2009 (SEIA 2010). In 2006, the new federal residential ITC and the expanded business ITC, together with rising conventional energy prices, contributed to a dramatic increase in the U.S. solar water heating market. Congress further enhanced the residential credits in February 2009 with the removal of the $2,000 cap. The improved federal incentives were offset somewhat by the economic downturn, resulting in slower growth in 2009 compared with 2008 and 2007.

Fig. 7: *Annual Installed U.S. Capacity for Solar Heating and Cooling (2002-2009)*
Based on analysis of collector shipment data from EIA, and 2009 projection from SEIA.



Prior to 2006, about half of the solar water heaters sold each year in the United States were installed in Hawaii. By 2008, the national capacity of systems installed each year was four times the capacity installed in 2005, and installations outside Hawaii increased by seven times (see Figure 7). Data for solar thermal installations comes from the U.S. Energy Information Administration and lag the data from other sources by a year. These data are only available through 2008. Installation estimates for 2009 come from the Solar Energy Industries Association (SEIA 2010).

Figure 8 shows that, like PV installations, solar water heating and space heating installations are concentrated in a few states (and Puerto Rico). After Hawaii, California, Puerto Rico and Florida lead the country in solar water heating installations. Hawaii has been the number one state for solar water heating installations for many years. High energy prices and strong government policies have built the solar water heating market in Hawaii. In addition, installation costs are lower in Hawaii than in most other locations in the United States because freezing is not a concern.

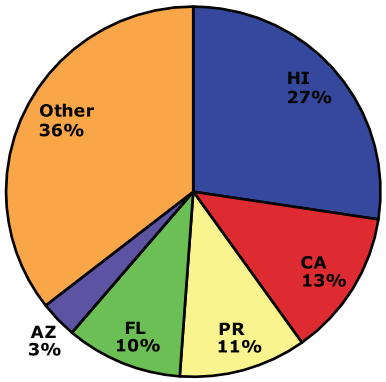


Fig. 8: *Installed U.S. Solar Heating and Cooling Capacity by State for 2008. Based on analysis of EIA data for 2008*

Solar Pool Heating

Fig. 9: *Annual Installed Capacity for Solar Pool Heating (2000-2009)*
Based on collector shipment data from EIA and 2009 projection from SEIA.

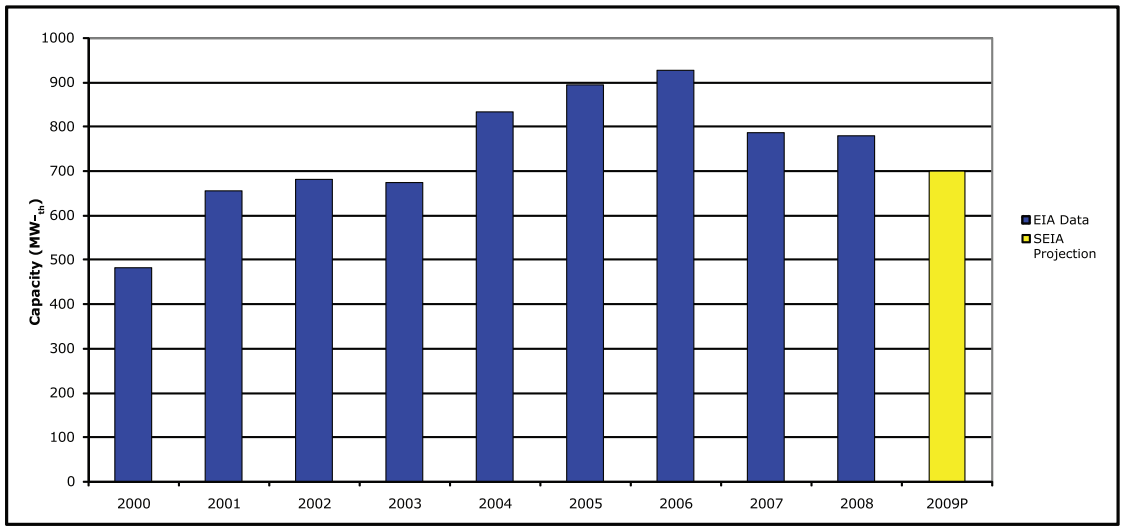


Figure 9 shows the annual installed capacity for solar pool heating systems from 2000 to 2009. Annual pool heating installations were projected to have fallen by 10% in 2009 compared to 2008 (SEIA 2010). Annual installations also fell in 2008 and 2007 compared with the previous years.

To a certain extent, the sales of solar pool heating systems follow the sales of pools. The economic decline in the real estate markets in Florida and California likely led to the decrease in pool installations and thus the decline in the installed capacity of solar pool systems in recent years.

For solar pool heating systems, installations are concentrated in just a few states, notably Florida and California (see Figure 10). Unlike other solar technologies, only a few states offer incentives for solar pool heating systems, and those incentives are modest.

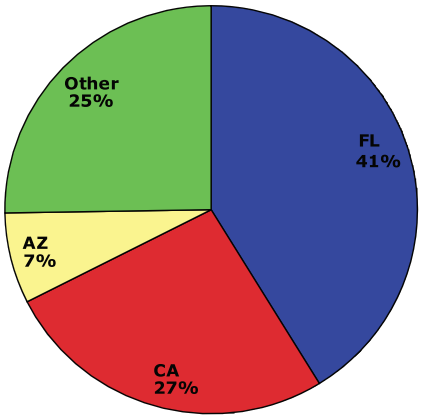


Fig. 10: *U.S. Solar Pool Heating Capacity Installed in 2008 by State*
Based on EIA Data for 2008

Prospects for 2009 and 2010

Early indicators predict 50% to 100% growth of grid-connected PV installations in 2010, compared to grid-connected PV installations in 2009. Other solar technologies should also see increased growth in 2010, with the possible exception of solar pool heating. The long-term extension of the federal ITC, new rules that allow electric utilities to use the ITC, the establishment of a grant alternative to the commercial ITC, and federal stimulus spending will all help drive market growth. In addition, improved capital availability will allow consumers and businesses to take advantage of these financial incentives.

Companies have announced plans for many large solar projects, including CSP projects, utility-owned projects and projects owned by third parties. Many of these projects will be completed in 2010, and many more will start construction in 2010 in order to take advantage of the federal cash grant program, which is currently set to expire at the end of 2010. Completion of these latter projects will likely occur between 2011 and 2013.

Electric utility announcements point to growth in installations on the utility side of the meter, producing bulk electricity for the grid. In 2010, utilities could install more than four times the capacity installed in 2009. Many of these installations will be large arrays owned by the utility or a third party. Others will involve siting PV on residential or commercial buildings.

A number of states are using federal stimulus funds to increase funds that provide rebates for PV and/or solar water heating installations. Most of these installations will be completed in 2010. In addition, some stimulus funds are paying for the cost of solar installations on government buildings and, again, most of these installations will be completed in 2010.

Prices for PV modules fell throughout 2009, and many analysts expect prices to continue to fall in 2010. Lower PV prices increase the potential of installations in states without state, local or utility incentives. However, in 2010, installations will continue to be concentrated in states with strong financial incentives and other strong solar policies, which will remain critical to market growth.

Conclusion

In spite of poor economic conditions, 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. More than 107,000 solar installations were completed in 2009. The markets for each solar technology are concentrated in a few states.

The number of new grid-connected PV installations grew by 40% in 2009 compared with the number installed in 2008. The two largest PV systems installed in 2009 together accounted for 12% of the annual installed PV capacity. The PV market is expanding to more states, and installations doubled in more than seven states. However, California remains the dominant market.

Solar water heating installations have boomed since the enhanced federal ITC took effect in 2006 and grew by an additional 10% in 2009. In the continental 48 states, the annual installed capacity of solar water heating systems has quintupled since 2005. Hawaii remains the largest domestic market for solar water heaters.

Four new concentrating solar power plants were connected to the grid in 2009. The future prospects for CSP look bright, with thousands of megawatts of installations planned for the next five years.

U.S. market growth will accelerate in 2010, especially for grid-connected PV installations. Federal tax policies and stimulus spending will drive this accelerated market growth.

Acknowledgements

The author appreciates the data supplied by many national, state and utility offices and programs, and the assistance of Justin Baca from the Solar Energy Industries Association with the collection of some of this data. The author also thanks Justin Baca, Solar Energy Industries Association; Jon Guice, AltaTerra Research Network; Rusty Haynes, North Carolina Solar Center; Mike Taylor; Solar Electric Power Association; Jane Weissman, Interstate Renewable Energy Council for their reviews of the draft report.

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WORKFORCE DEVELOPMENT AND TRAINING

Jane Weissman, Jerry Ventre, Barbara Martin and Pat Fox

Late last year, more than 500 participants from across the U.S. and Europe packed plenary and breakout sessions at the third ***New Ideas in Educating a Workforce in Renewable Energy and Energy Efficiency Conference,*** November 19-20 in New York's capital city. National leaders in renewable education and training shared valuable, updated information and insight into all aspects of building and maintaining a quality, credentialed, safety-conscious green workforce. This was the third national conference on workforce education organized by the Interstate Renewable Energy Council and sponsored by the New York State Energy Research and Development Authority.

Some key questions addressed were:

- With the enormous public investment in green jobs, how are programs and training maintained after the grants go away?
- What's the balance between job creation and good instruction?
- How are quality assurances built into training programs?
- How do you define the ***green*** job?

IREC has looked at dozens of definitions of a green job and we have found that the consensus is that there is no consensus on the "one" definition of a green job. Through the many descriptions of a green job, we have found common threads: a green job improves the environment; will be similar to existing job titles, with incremental skill enhancements; and will require specialized knowledge, skills, training, or experience.

Debra Rowe, a leader in renewable energy and sustainable education at Oakland Community College, says "Every job should have a green tinge to it." Jim Dunlop, a recognized expert in solar training, advises us that "The best approaches incorporate solar training into existing educational programs and the trades, and develop add-on skills and workforce potential rather than creating an entirely new workforce." Hudson Valley Community College in Upstate New York is a good example of this as the school offers both credit and non-credit courses in photovoltaic training as part of its Electrical Construction and Maintenance Department. Lane Community College in Eugene, Oregon offers solar thermal and solar electric system installation courses as part of its Energy Management Program leading to a two-year Associate of Applied Science degree.

IREC keeps track of the different renewable energy practitioner training courses being offered around the country and have found that not all training is "created equal" in terms of content and time. There might be an eight-hour, continuing education course on new codes but a 30-hour course on OSHA safety. Entry-level courses or "Solar 101" can span from a three-day course to a semester-long one. Brian Hurd set up a two-parter at the East LA Skills Center starting with a Photovoltaic Introduction 100-hour course followed by a 300-hour one with hands-on instruction.

We are often asked how long should a course be? The simple answer is "it depends." It depends on who is being taught—what competencies and prerequisites the student brings to the class—and what kind of job the student will be qualified to do upon completion. The length and depth of a course should be long enough to provide learners with exposure to all critical tasks involved in the job they are being taught to do.

Entry-level training is just that. It can provide baseline knowledge about renewable energy technologies and allow

the student to pick and choose what the next steps toward a job or career path could be. Completing an entry-level class with a well-prepared, end-of-course assessment (such as an exam) can lead the student on the pathway to installation, sales, policy, nonprofit kinds of jobs and other career possibilities. Entry level courses do not result in the student being qualified to install. This is where we're seeing problems and in some cases, misguided marketing. The course that sells itself as a three or five-day course with no prerequisites can hardly deliver qualified installers at the end of the week. In addition to not enough in-class and hands-on instruction, there are also jurisdictional licensing requirements that have to be met before someone is "qualified" to do the job.

More and more training offerings require certain competencies for enrollment in the class. UL University recently rolled out its photovoltaic training program which clearly states that students have to be licensed electricians with the completion of 30 hours of OSHA construction safety. Other schools and organizations require sequential courses—completion of an entry-level program before enrollment into an intermediate course which is required before taking an advanced class.

How do you know you're being taught the right skills? This is probably the core question. To help answer this, we look to industry-approved job/task analyses which, through a formal process, determine for a certain job what people do, what they must know to do it, and the skills they must have to do it. IREC has been primarily using the Job/Task Analyses (JTA) prepared by the North American Board of Certified Energy Practitioners for our ISPQ assessment of training programs. These JTAs are prepared by technical committees of subject matter experts and are reviewed on a periodic basis to reflect changes in codes, technologies, and markets. But, here's the catch...what happens when there are two or three or more different standards for the same job? What happens when there are different certifications being offered?

Certification, certificate, accreditation, licensing—all terms we hear and use. However, each one is different, conveying that a different set of criteria, requirements and achievements have been met. There is often confusion among these designations as they are used interchangeably and frequently incorrectly.

*"**Certification** is a formal process of assessing knowledge and work experience and is typically awarded for a certain period of time with requirements for re-certification.*

*A **certificate** is usually a document demonstrating that the holder has successfully completed an educational course or program."*

Certification is a formal process of assessing knowledge and work experience and is typically awarded for a certain period of time with requirements for re-certification. A certificate is usually a document demonstrating that the holder has successfully completed an educational course or program. A certificate is a one-time statement about an individual; a snapshot defining an accomplishment. Each one—a professional certification award or a certificate—measures different levels of proficiency and competency.

Here's where we are tripping over terms: We're seeing training providers offer a "certification" which is really a certificate and we're seeing certificate holders claiming they are certified. Confusing? You bet it is. And where it falls the hardest is on the consumer who expects that a "certification" claim ensures good workmanship.

Professional certification programs are not built overnight—certain tenets need to be followed. The International Standard ISO/IEC 17024 provides the framework for the development and management of bodies that certify people. This can get a bit thick but stick with us for a moment—there are very important parts of ISO/IEC 17024 that if followed, can help prevent awarding credentials to unqualified people.

ISO/IEC 17024 addresses impartiality, the validity and reliability of the assessment process (writing and administrating the exam) and independence—meaning separation of training from testing. We get calls and emails all of the time asking where people can take a renewable energy course and get certified. Actually, there should be two answers. The first answer should identify schools and organizations providing training and the second reply should list organizations offering certification. While a training provider can offer a "certificate," it should be a separate credentialing body that offers the certification.

Dr. Sarah White and her colleagues from the Center on Wisconsin Strategy published a terrific report earlier this year on *Greener Skills—How Credentials Create Value in the Clean Energy Economy*. They caution against fragmentation not only in the green training system but also with standards and credentials. They write, "Developing common standards and conferring commonly recognized credentials for verified occupational skills offers a firm path forward."

We agree with Dr. White's guidance and add that all stakeholders—educators, the industry, government and consumers—are important players to monitor and make sure that there is substantiated evidence that credentialing programs offer reliable and impartial evaluations.

This is an incredibly exciting time for renewable energy and the heightened importance these clean technologies bring to our economy and environment. A competent workforce is critical for success. It is essential that the development of this workforce includes industry-accepted competency standards and job availability.[16]

16 Parts of this section include excerpts from articles written for Solar Today (Weissman and Ventre) and the American Technical Education Association Journal (Weissman).

"This is an incredibly exciting time for renewable energy and the heightened importance these clean technologies bring to our economy and environment. A competent workforce is critical for success."

GOOD TEACHING MATTERS

Five Teaching Practices to Improve the Quality of a Training Course

By Dr. Barbara Martin

While technical information is essential to effective training, good teaching practices matter, too.

1. ***Know Your Students***. Your students come to training with different levels of knowledge and experience. It is important for trainers to know the variety of skill sets that students have when they arrive. Trainers need to do an audience analysis before students arrive (if possible) or conduct a brief learner analysis in the first hour of class. Then classes should be arranged so that students of similar backgrounds can work together, that students who already know the content can move ahead, or that more knowledgeable and experienced students can work with other students and help them learn. Knowing students' prerequisite knowledge can make a big difference in how a class or course should be organized.

2. ***Write Learning Objectives***. Learning objectives should be written in terms of what the learner will be able to do when s/he finishes the class and/or what skills s/he needs for the job. An example is: The student will conduct a site survey. They should *not* be written in terms of what the instructor is going to do, e.g., Present information about electrical design. Learning objectives should also focus on the application and use of knowledge and skills, rather than on rote memory and recall. For example, NABCEP's task analyses can be used by trainers and curriculum specialists to establish learner-centered, application-based objectives.

3. ***Include Practice and Feedback in the Training***. Learning is a two-way street. Just hearing information rarely helps students learn what they need to know. Students must be actively involved with the content to learn. This does not just mean physically engaged, e.g., hands-on labs, although labs are a good thing to include. It means that the student must be *mentally engaged*. Students should be asked to practice new learning by answering questions, doing problem solving activities, engaging in real-life or problem-based exercises, and responding to case studies and troubleshooting examples. Instructors can then provide feedback to correct mistakes, give additional information to clarify or extend content, or to tell students that they've "got it."

4. ***Create Simple PowerPoint Slides***. Slides and transparencies should include no more than *8 to 10 words* on any one slide. That's right, just 8-10 words!! This forces the instructor to talk to the students rather than reading the slides to them. Many instructors cram as much information as they can on a slide so that it will trigger their memory when they are teaching. However, the tendency is for instructors to *read* the information to the students rather than to teach it. Since students can read faster than the instructor can read it to them, students are often ready to move on before the instructor has finished. Instructors should include just a few words on a slide to jog their memory as they are teaching and also include photos, graphics and illustrations to make the slides more interesting.

5. ***Design Test and Evaluation Measures that Promote Transfer***. Each and every class should have a test, quiz, or evaluation instrument that assesses whether or not students have learned the content stated in the objectives. This evaluation is *in addition* to any test that might be given. A classroom-based test should measure the stated learning objectives. These evaluation instruments should re-create what the learners will be expected to do on the job; successful students will demonstrate that they can perform job-based tasks without assistance. This allows the instructor to better determine whether or not the skills learned in the training will transfer to the job. Based on the test results, instructors can do at least two things: (1) tell whether or not students have learned what was intended and (2) evaluate their class and their instruction to see what, if anything, needs to be improved.

See www.irecusa.org Workforce Development for an in-depth discussion of each of these five teaching practices.

ISPQ UPDATE

By Pat Fox

The past year has been an exciting time for IREC's ISPQ Accreditation and Certification Program. The program has experienced explosive growth in application volume and IREC has awarded a record number of credentials. ISPQ is clearly becoming more widely recognized as a credential of high value for training providers in the renewable energy sector.

ISPQ Activity

In February 2010, IREC announced the release of the newly updated ISPQ International Standard 01022, and in April 2010, IREC fully transitioned to the new standard with an updated ISPQ Candidate Handbook and updated applications for the six credentials offered through the program. All of the documents related to the ISPQ program can be found at www.ispqusa.org.

The six credentials currently offered by IREC through the ISPQ Accreditation and Certification Program include:

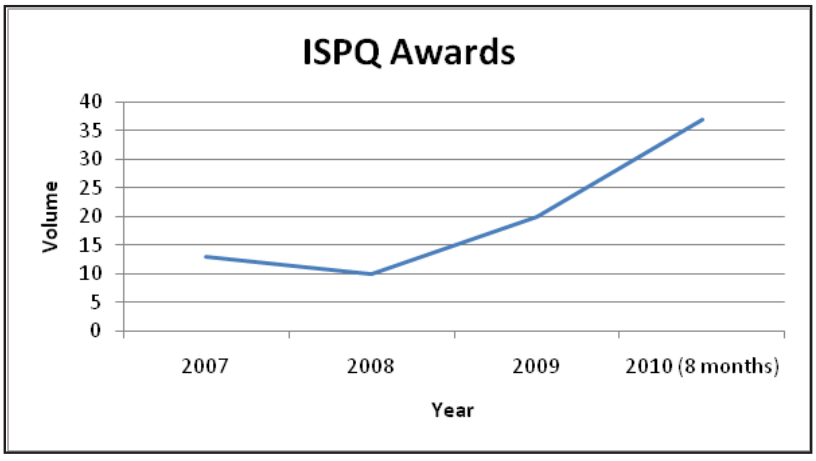
1. Accreditation for Training Programs
2. Accreditation for Continuing Education Providers
3. Certification for Affiliated Master Trainers
4. Certification for Independent Master Trainers
5. Certification for Affiliated Instructors
6. Certification for Independent Instructors

ISPQ Recognized as a Mark of Quality

The growth in the volume of applications for IREC's ISPQ recognition has several drivers:

- The North American Board of Energy Practitioners (NABCEP) has determined that one of the paths to qualify to sit for their exams is to take an ISPQ accredited course.
- The State of Pennsylvania includes taking an ISPQ accredited course as one of the ways for an installer to qualify for the PA Sunshine Program.
- The State of Minnesota through its CARET program is offering rebates to training providers to help cover the cost of training program accreditation.
- New York State continues to promote ISPQ accreditation for training programs that are funded by the New York State Energy Research and Development Authority.
- North Carolina recognizes ISPQ accredited courses as counting toward continuing education credits for PV installers.

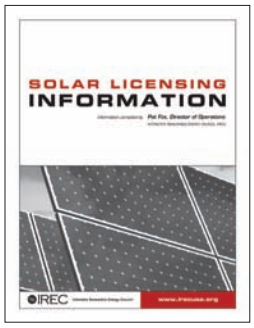
For more information on ISPQ, contact Pat Fox at patfox@irecusa.org.



As of September 1, 2010 there are 83 active ISPQ credentials awarded in North America

SOLAR LICENSING DATABASE

By Pat Fox



In July 2010, IREC released the solar licensing database. Recognizing that the licensing requirements for installing PV and solar thermal vary by state, IREC undertook the effort to gather state-specific information.

The IREC Solar Licensing Database provides a state-by-state view of licensing requirements along with links to assist the user in finding state-specific resources. The database also includes several summary tables which provide a high-level perspective of the solar licensing landscape.

Across the country, there are many methods being used to regulate solar installations including a variety of license classifications, practitioner certifications, and managing the market through incentive requirements. Currently, 14 states have defined specific solar license classifications, while 17 states have included language regarding practitioner certification in the state solar incentive programs.

Establishing regulations to protect the consumer and ensure that photovoltaic and solar thermal installations are designed and implemented with quality and safety, both licensure and certification are two approaches that can be used to complement each other. ***Licensure*** refers to a mandatory system of standards, usually controlled by state government, to which a practitioner must conform in order to practice a given profession. ***Certification*** refers to a voluntary system of standards, usually set by key stakeholders, that practitioners can choose to meet in order to demonstrate accomplishment or ability in their profession.

The advantages of using licensure are that states can control the selection and enforcement of a standard and that the concept of state regulation is understood and accepted by the consumer.

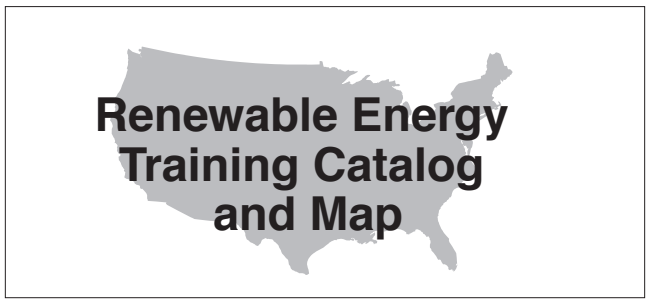
The advantages of using certification are that it is standardized for a specific job based on common measures of competence to verify skills and that it is portable across regions, states and employers.

The use of both licensure and certification can provide a solution of complementary components which balance the enforcement of standards through regulation and the assurance of quality through measured competency.

The IREC Solar Licensing Database is designed as an information resource that brings together in one place the varying requirements for installation. As the regulatory approaches evolve and new information becomes available this resource will be actively updated.

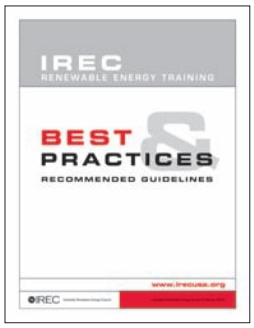
http://irecusa.org/2010/08/solar-licensing-information/

OTHER IREC RESOURCES

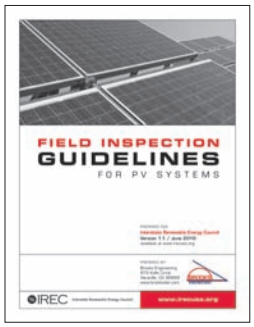


The Renewable Energy Training Catalog lists practitioner training courses, entry-level classes, workshops and related training programs.

This directory includes information on four- year colleges and universities which are offering undergraduate and graduate courses in renewable energy and energy efficiency.



Best Practices & Recommended Guidelines for Renewable Energy Training (2010)**.**
The 26-page document covers recommended principles for training; reviews industry-approved job/task analyses; discusses types of educational programs; walks through the essential steps of designing a training course; offers a checklist for assessing learning outcomes; looks at certification and accreditation; and lists resources to assist in training.



Field Inspection Guidelines for PV Systems.
According to its author, Bill Brooks of Brooks Solar, the intent of the 2010 Guidelines is to consolidate the most import aspects of a field inspection into a simple process that can be performed in as little as 15 minutes. Explanation and illustrative pictures are provided to instruct the inspector on the specific details of each step. The 2010 edition of the Guidelines is an update from the 2006 edition.

Don't miss the fourth national conference on educating the renewable energy and energy efficiency workforce. Be part of the one national event that brings together innovative educators who are training today's green workforce. This event offers the most current information on instructional strategies, curricula development, credentialing, and best practices for training in the renewable energy and energy efficiency fields. The primary conference sponsor is the New York State Energy Research and Development Authority; IREC is the conference organizer.

Visit www.irecusa.org

ANNUAL UPDATES & TRENDS REPORT

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