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U.S. solar PV market – an overview

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ABSTRACT

The U.S. solar PV market is suffering not from a lack of demand or high prices, but rather from an inconsistent labyrinth of rules and regulations which complicate and prolong uptake. There is significant pent-up demand in the U.S. among developers and especially manufacturers; there is not, however, a commensurate regulatory framework that will enable and encourage this demand to be realized. This paper takes a closer look at the obstacles and costs associated with large-scale implementation of PV in the U.S.

There is major optimism among developers and manufacturers that the U.S. will contribute significantly to 2011 global demand and shipments, and thus help absorb the ~50% increase in capacity coming online and decelerating growth in Europe.

Renewable Analytics' (RA's) September North American Survey of Dealers and Installers indicates an average expected 103% year-over-year growth in 2011 (Fig 1). RA estimates the U.S. market will grow substantially next year, from 813MW of sell-in in 2010, to 1.5GW in 2011, an 84% increase. While promising, this comes off a relatively low base, and comes with many caveats.

There are variables facing project developers in the U.S. that would seem anachronistic in any mature European market. RA believes the U.S. may begin to be a global leader when it turns toward grid parity in 2012, which corresponds with when the U.S. may begin to structurally mature. The next big PV cycle will be driven by pure economics – not EU feed-in tariffs. The U.S. should largely lead that cycle.

Cost of capital remains high in the U.S. compared to Europe. Interest rates of 4–5% are common in Germany, where banks have designated funds and operations that accommodate solar PV customers. Banks in the U.S. are still relatively naïve to the economics of PV. Financing will typically require higher down-payments, and interest rates of 8–9%. This is largely due to the perpetually shifting and uncertain regulatory market. Each State has a different incentive structure and interconnection model, and thus it is difficult for large banks to develop a national strategy. In Germany, incentives are the same nationwide, and the government has a structured and credible system for adjusting the framework; there is trust and continuity that lowers the perception of risk.

California

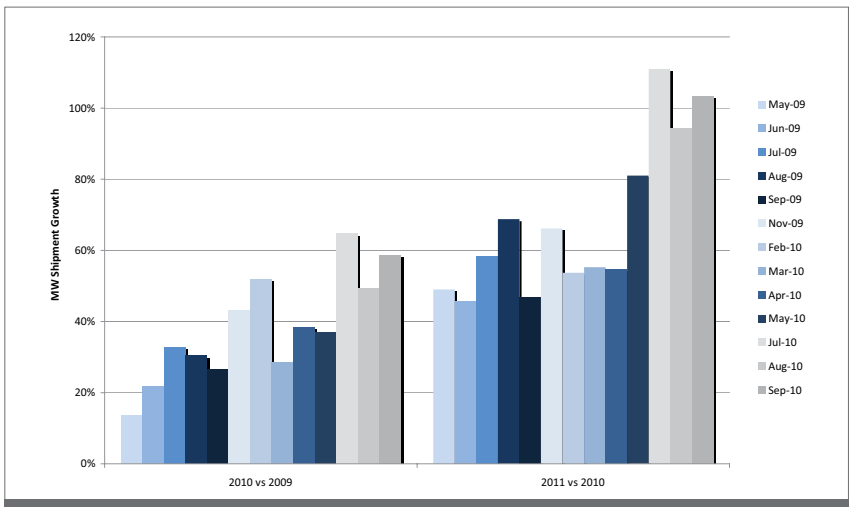
There are myriad examples. In California, each jurisdiction interprets the national electric code differently. Angiolo Laviziano, CEO of REC Solar, said in an interview that in Germany the code is a hard law and can only be changed or challenged in courts. In California, a building inspector has the power to interpret it differently. "The U.S. is obsessed with grounding codes, which can vary dramatically. Some municipalities even require the usage of equipment which has been certified by municipality-specific sanctioned labs to conduct grounding tests," he said. Similarly, in New York State, each municipality has its own electrical licensing body.

Adam Rizzo, CEO of Buffalo, NY-based Solar Liberty, remarked: "I have someone in my office that finds electricians that are licensed in whatever town we are evaluating a project, it's kept guys out, and adds costs... permitting takes four days in Germany, and 40 days in New York, and that's for a small project."

California interconnection assessments are expensive, particularly for large projects, and the order in which they are processed is more or less arbitrary. Lead times required to secure interconnection are significantly underestimated. Hans Isern, VP of engineering for San Francisco-based Silverado Power LLC, one of the largest developers in California, said: "Despite regulatory efforts to streamline the interconnection process in California, there is still a significant backlog of about 35GW of renewable capacity, much of which is unlikely to be built. For new projects seeking interconnection, study processes can be lengthy, with timeframes exceeding 420 days for small projects (<20MW) and 1,000 days for large (>20MW) systems. Combined with potentially expensive upgrades to the power grid, this can be a major risk for new solar projects' development schedules and budgets." There is also no guaranteed buyer of electricity, which adds to the risk of wasting time and money.

At the local level, there is still little familiarity on how PV works. Deep Patel, CEO of California-based GoGreenSolar.com, says that "in one municipality a permit that is rubber stamped will be deeply scrutinized in another. Plan checkers don't know much, they require corrections on plans that are just wrong. The developer has to explain to the person issuing the permit basic aspects about a PV system. It took me US$1,000 and several weeks to get a permit to build a 1.3kW system in my own backyard."

An incrementally positive regulatory development was the recent clarification issued by Federal Energy Regulatory Commission on its interpretation of the Public Utilities Regulatory Policies Act. FERC previously allowed (but did not require) utilities to purchase electricity produced at or below the "avoided cost," a benchmark set by States. In California this is pegged to the cost of natural gas generation, about US$0.09/kWh. A ruling issued in October allows States



Source: RA September North American Dealer & Installer Survey

Figure 1. Renewable Analytics' industry shipment comparison (2009–2011).

New Jersey SREC Data Month	Year	Active kW DC	Issued in Month	Traded in Month	High ($/MWh)	Low ($/MWh)	# SRECs Traded	Weighted Avg. Price ($/MWh)
Sept	2010	168,254	20,236	9,483	$685	$205	15,615	$603.56
Aug	2010	157,129	18,137	6,132	$685	$209	6,132	$606.97
Jul	2010	151,850	5,024	43,358	$691	$170	134,909	$605.97
Jun	2010	140,709	26,275	15,636	$690	$170	91,551	$588.96
May	2010	132,956	16504	8,737	$700	$170	75,915	$578.80
Apr	2010	123,892	12,546	6,773	$700	$170	67,178	$573.95
Mar	2010	119,829	5,814	9,522	$700	$209	60,405	$568.66
Feb	2010	113,770	6,784	9,720	$685	$170	50,883	$552.69
Jan	2010	103,857	5,249	11,731	$675	$110	41,163	$533.15
Dec	2009	100,086	7,862	7,582	$700	$195	29,432	$566.91
Nov	2009	97,491	6,191	7,292	$688	$170	21,850	$559.45
Oct	2009	93,412	8,085	7,004	$680	$170	14,558	$549.84
Sept	2009	92,032	8,796	5,119	$700	$170	7,554	$524.90
Aug	2009	89,660	10,320	2,435	$685	$170	2,435	$492.18
Average		120,352	11,273	10,752	$690	$176	44,256	$564.71

Source: New Jersey Board of Public Utilities

Table 1. New Jersey's Solar Renewable Energy Credits (SREC) activity August 2009–September 2010.

with renewable portfolio standards to set source-specific avoided costs. This notably affects California Senate Bill 32, which established an FiT mechanism. SB32 has been stalled on the desk of the Public Utilities Commission. John Cheney, CEO of Silverado Power, remarked: "There has been a general ideological preference against SB32 at the CPUC, which has hindered implementation of a real FiT. The specter of FERC suing over jurisdiction supported this preference, or allowed them to deflect the issue. There will be some chaos now surrounding implementation." The program remains in limbo.

As an alternative, an administrative law judge at the CPUC recently recommended a "Renewable Auction Mechanism," which is effectively a reverse auction feed-in tariff. Projects 1–20MW in size would be allocated a total of 1GW through 2011–12, with 250MW allocated each 180 days. Only investor-owned utilities PG&E, SCE and SDG&E would be required to buy power under the plan. The mechanics are still being worked out, but it does not address the structural hurdles. It is not a substitute for a statewide or national FiT.

A complimentary mechanism, which existed four years prior to the RAM, is Southern California Edison's Renewable Standard Program. The program, which targets 250MW per year, provides a standardized template to developers for renewable power purchase agreements for systems 1.5–20MW in size. Hans Isern of Silverado Power says it offers "an attractive mechanism to bring cost-competitive solar on line with relatively low transaction times and costs." He added: "Programs such as SCE's RSC are especially important to ensure market continuity for distributed solar generation." The RSP in part addresses the structural issues, and should be considered by other utilities to accelerate uptake. 90% of its allocation has gone toward solar PV.

SACP Prices – Set by the NJ Board of Public Utilities	
	$/MWh
2009	$711
2010	$693
2011	$675
2012	$658
2013	$641
2014	$625
2015	$609
2016	$594

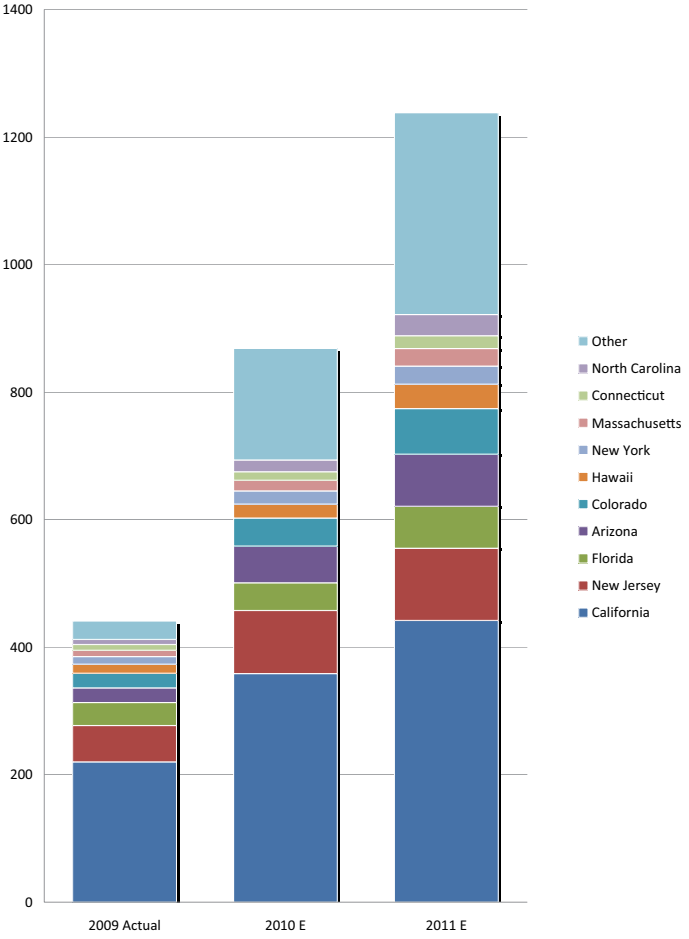
Source: New Jersey Clean Energy Program

Table 2. Solar Alternative Compliance Payment (SACP) prices as set by the New Jersey Board of Public Utilities.

New Jersey

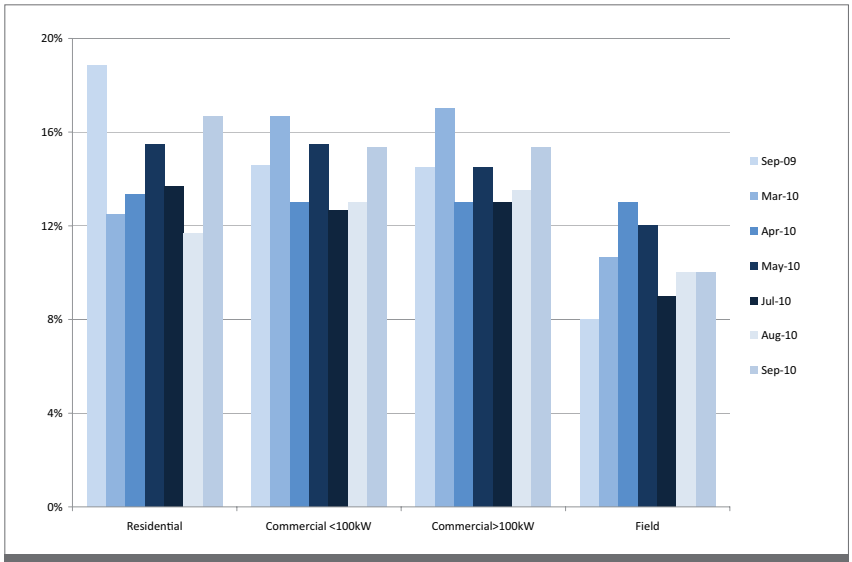
New Jersey provides an incentive scheme that may be a cleaner model to other States. Its renewable portfolio standard, which is set at 8.3% for 2011, moving to 22.5% by 2021, includes a specific carve-out for non-hydro renewables, and within that a solar-specific carve-out. Utilities must generate 306GWh of solar electricity in 2011, moving to 2.52TWh by 2021, and 5.3TWh by 2026. To accomplish this, the state has established its Solar Renewable Energy Credits program, spurring demand, making NJ the east-coast leader (Fig 2).

Utilities submit SRECs representing a certain portion of required solar PV generation. If a utility is not able to fulfill its requirement, it must pay a Solar Alternative Compliance Payment – which are set at a price that the Board of Public Utilities believes will provide adequate incentive to solar developers – or purchase SRECs on the open market from other utilities that have generated excess credits. SREC pricing from August '09 – September '10 averaged US$565/mWh (see Table 1). SACP pricing



Source: RA September North American Dealer & Installer Survey

Figure 2. Renewable Analytics' PV installation estimates by state 2009–2010.



Source: RA September North American Dealer & Installer Survey

Figure 3. Internal rates of return (IRR) by system type September 2009–2010.

was set by the BPU at US$711/mWh 2009, US$694/mWh in 2010, and US$675/mWh in 2011 (see Table 2).

George Schaefer, CFO of New Jersey-based developer Soltage, Inc. said in an interview with RA that the whole pricing scheme is under review, and that this uncertainty makes it difficult to predict. "There is good availability of SREC contracts up to five years, but should be extended to provide more financial security." New Jersey Governor Chris Christie, who gained a national profile by taking a hard-line stance on fiscal austerity (in large part by killing a proposed US$9 billion train tunnel under the Hudson River to New York City), is reportedly "reexamining" the program. Mr. Schaefer said his company has given up predicting future pricing.

Federal

At the federal level, a big policy overhang is the expiration of the Investment Tax Credit cash grant program, which provides for a grant in lieu of the existing 30% investment tax credit. This will expire on December 31st 2010, if not renewed by Congress. On November 16th, a spokesman for Senator Jeff Bingaman (D-NM), chair of the Senate Energy and Natural Resources Committee, said in an interview with *Reuters* of the cash in lieu of credit program: "...[he] does not believe that we should be using the tax code for making grants, and also feels that the grant program is akin to corporate welfare." Chances of passing it in the next Congress are much lower, he said, in part because many incoming congressmen do not believe stimulus provisions overall have worked effectively.

Many solar PV projects do not have sufficient tax liabilities so that the 30% credit meaningfully adds to returns. For large, speculative projects designed to have annuity-like returns, this program is critical. A lot of large utility-scale projects in the U.S. were banking on the ITC. Financing projects through tax equity arrangements is more complicated and costly. REC's Laviziano said: "This is important, in these projects the third decimal in IRRs [internal rates of return] count. This will put some projects back to the drawing board."

The Republican takeover of the House of Representatives makes a comprehensive federal energy policy that may include an RPS or carbon cap unlikely in the mid-term. Sen. Bingaman has said: "I'd be surprised if that kind of a comprehensive climate and energy bill could pass both houses in the next Congress, since they've been unable to pass in this Congress..." John Shimkus of Illinois, the vice chairman of the Republican party's congressional campaign, is vying for the chairmanship of the House Energy and Commerce Committee. The *New York Times* reported that Rep. Shimkus said in a climate change hearing in 2009: "The earth will end only when God declares it's time to be over. Man will not destroy this earth...This earth will not be destroyed by a flood." In a recent interview in *Politico*, Mr. Shimkus said that debate on climate change would come to a halt: "The focus is not going to be climate... The climate debate has, at least for two years, ended with this election."

An RPS law may in any event be challenged on constitutional grounds by States, which still reserve the power, with some federal oversight, to regulate the electricity market.

Outlook

The U.S. has the ingredients to be a huge market. Despite the challenges, IRRs are quite good, in the 10–17% range as reported by installers (this does, however, include the investment tax credit). The most substantial inhibitors to PV uptake are structural, not economic – module prices are 10–15% cheaper in the U.S. than in Europe.

European developers, which could provide immediate scale and competence in the U.S., have not made inroads largely because the system is so convoluted. According to Mr. Laviziano, it is not only the most capable, effective or cost-efficient developer that has edge in the U.S.; rather it is the developer than can also get through the fragmented and jurisdiction-specific business licenses, interconnection applications and lead-times, electrician licensing, rebates, and worker safety laws.

This maturation process is typical for cyclical, subsidized growth industries. At the local level, there is still little familiarity on how PV works.

Overall, RA expects the U.S. to take longer than expected by manufacturers to be a primary global PV driver, or to reach its full growth potential. It is important to approach claims that U.S. allocation will substantially buoy demand and pricing in 2011 with some healthy scepticism. This will happen when the financial and political environment in the U.S. catches up to the economics, most likely in 2012.

Acknowledgements

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About the Authors

Renewable Analytics LLC is an industry research firm formed to address the underserved need for objective and timely supply chain research in the solar photovoltaic industry. Almost all of the research available in the market today is either investment banking-driven or tends to focus on broad themes and long-term trends. The founding team of Renewable Analytics has more than 20 years of combined relevant experience, including management in the solar industry, technology supply chain research, and fundamental analysis. Renewable Analytics conducts its research via typical channel checks, combined with more systematic surveys. Research reports track the changes in the variables that impact growth and profitability including but not limited to: end customer and market demand per country, subsidies in each country, pricing of silicon and other key components, cell equipment utilization rates, solar equipment shipments, technology transitions, foreign exchange and interest rates.

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