03-E-0188
Comments

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Working with the states to develop cost-effective PV policies and programs.

November 17, 2008

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RE: PSC SAPA No.: 03-E-0188SA18/19
Modifications to Renewable Portfolio Standard

Hon. Jaclyn A. Brilling
Secretary
New York Public Service Commission
Three Empire State Plaza
Albany, NY 12223-1350

Dear Secretary Brilling:

Please find enclosed an original and five (5) copies of the *Comments of The Solar Alliance on the New York Public Service Commission's SAPA Notice Regarding Potential Modifications to the Renewable Portfolio Standard.*

Please do not hesitate to contact me at the number listed below should you have any questions about this submission.

Thank you in advance for your assistance.

Sincerely,

Fred Zalcman
New York Solar Alliance Team Leader

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COMMENTS OF THE SOLAR ALLIANCE ON THE NEW YORK PUBLIC SERVICE COMMISSION'S SAPA NOTICE REGARDING POTENTIAL MODIFICATIONS TO THE RENEWABLE PORTFOLIO STANDARD

I. INTRODUCTION

The Solar Alliance, a coalition of over 30 of the world's leading solar photovoltaic (PV) manufacturers, developers and financiers, appreciates this opportunity to comment on the Public Service Commission's exploration of modifications to New York State's Renewable Portfolio Standard (RPS) to increase the target level of PV, particularly in high cost, congested areas of the state.[1] If adopted, a four-year program dedicated to the development of 100MW of new RPS-funded PV, in tandem with procurements already underway via the state authorities, and further supplemented by well-structured utility-led PV acquisitions, will mark an important milestone in the mainstreaming of solar PV as a vital energy resource for New York State.

A vibrant solar program in New York will bring numerous benefits to the citizens of the State including the economic development associated with the creation of quality jobs, local grid congestion relief, long term energy cost reduction and electricity price stabilization, improved air quality and enhanced energy security for the State. Increasing New York's investment in stable-priced solar power today can serve as an important and effective hedging strategy to mitigate the very real risk of future electricity price increases driven by an over-reliance on fossil fuels.

The PSC will play a pivotal role in the development of flourishing solar industry. As recognized by the Governor's Renewable Energy Task Force Report, in order to fully realize the benefits of solar energy in New York, there is a need for short-term incentives that will support the early development of industry infrastructure and increases in in-State solar manufacturing. With incentives in place, the industry can move toward a position of grid parity where the prices of locally produced solar energy will be closer to and eventually even with those of fossil electricity supplied through the

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[1] The comments contained in this filing represent the position of the Solar Alliance as an organization, but not necessarily the views of any particular member with respect to any issue.

grid such that ratepayer incentives will no longer be necessary and solar PV will be the electricity resource of choice for more consumers.

Our comments are divided into four sections. Section II responds to the PSC's request for comment on the efficacy of modifying the RPS tier structure to accommodate additional PV development, especially in high cost areas of the state. Section III addresses the PSC's inquiry into whether a geographically targeted PV program focused on the New York City load pocket would be better administered by the local utility. As an adjunct to this discussion, Section IV discusses whether a utility role in the facilitation of PV project development should extend to ownership and rate basing of PV assets. And finally, Section V reviews the results of the cost study performed by consultants to NYSERDA and DPS Staff.

Our recommendations can be summarized as follows:

The Commission should modify the Customer Sited Tier allocations to support 100MW of PV development through 2012. Greater attention should be paid to development of PV in the New York City load pocket given the very high locational value of PV there, particularly at times of system constraints. However, a geographically targeted PV deployment strategy should not be pursued at the expense of providing continued momentum towards development of a self-sustaining statewide solar market.

The PV incentive program should continue to be administered by NYSERDA on a statewide basis. Consolidated Edison should be encouraged to play a more active and positive role in facilitating PV project development within its service territory, and particularly within network locations in need of load relief.

We support the involvement of investor-owned utilities such as Consolidated Edison in the development of PV, including under appropriate circumstances, utility ownership and ratebasing of PV system costs. The Commission should promote a diversity of ownership arrangements, in New York City and elsewhere across the state, and consequently should not restrict the scope of any program component targeting high cost load pockets to a single utility ownership model. Moreover, utility acquisition should supplement, and not supplant, PV resources procured through the CST.

To these ends, the Commission should authorize Consolidated Edison to procure up to 50MW of additional solar PV (i.e., over and above the 100MW incentivized statewide by NYSERDA) within constrained areas of its system. Preference should be given for a competitive procurement involving independent third-party developers. To preserve competitive solar markets, Consolidated Edison should own no more than 50% of these assets. The Commission should explore financial incentives that would make

Consolidated Edison financially indifferent between owning solar generation and contracting for solar energy, capacity and/or credits through power purchase agreements, or other similar means, with unaffiliated project developers.

The estimated $325 million price tag for a targeted PV development program as identified in the RPS Cost Study is likely to be exaggerated. A more realistic estimate, based on assumed adjustments to program design that would enable participation of lower-cost larger-scale projects, and which take into consideration the recent extension and expansion of the Federal Investment Tax Credit and the experience of other state incentive programs is likely to be at least 25% lower than assumed in the RPS Cost Study

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II. Should the Commission Modify the RPS Tier Allocations, Or Create a New Tier, to Increase the Targeted Level of PV and Other On-Peak Resources in High-Cost Areas?

Short answer: The Commission should modify the Customer Sited Tier allocations to support 100MW of PV development through 2012. Greater attention should be paid to development of PV in the New York City load pocket given the very high locational- value of PV there, particularly at times of system constraints. However, a geographically targeted PV deployment strategy should not be pursued at the expense of providing continued momentum towards development of a self-sustaining statewide solar market.

A. The Commission Should Modify the Customer Sited Tier to Incorporate a Target of 100MW of Solar PV by 2012.

The Solar Alliance wholeheartedly endorses the PSC's consideration of a focused effort to significantly increase PV development in New York State in the near-term. Increasing the target level of PV and short-term funding support through the CST will enable more homes, businesses and public institutions throughout New York State to deploy this clean and stable-priced alternative and bring multiple benefits to all electricity consumers and to the citizens at large. Similarly, adoption of more ambitious PV targets will restore New York to its rightful leadership position in the development of clean energy alternatives.

In recent years, New York has been overtaken by several other states which have committed to aggressive programs to exploit their solar resource. (See Table I) These include a number of states in the surrounding region, as well as states not historically regarded as at the vanguard of clean energy development.

TABLE 1. STATE SOLAR PV PROGRAMS
INSTALLED CAPACITY AND GOALS

STATE	CUMULATIVE INSTALLED CAPACITY (MW)	GOALS (MW)	TERMINAL DATE
California	327.0	3000	2017
New Jersey	57.8	1800	2020
Nevada	18.7	400	2020
Arizona	18.6	1500*	2025
New York	15.1	100	2011
Colorado	14.5	200	2020
Connecticut	9.3	17	2010
States with New Solar Set Aside Programs			
Missouri		200	2021
Massachusetts	4.6	250	2017
Pennsylvania		690	2020
Ohio		820**	2024
Maryland		1400	2022

Source: Wiser, Renewable Portfolio Standards: An Opportunity for Expanding State Solar Markets (2008).

***Total customer-sited renewables, of which most will be solar PV**
****Enacted in 2008 – Annual ramp-up with .5% of retail sales to be from solar by 2024**

The Renewable Energy Task Force, chaired by Governor David Paterson, recognized this deficiency by calling for "the State [to] support the installation of 100 MW of solar photovoltaic systems (as funded through an expanded RPS) ... across New York by 2011", and by subsequently "examin[ing] whether and to what extent further incentives or other policy measures will be necessary to drive down the cost of solar energy, with the ultimate aim of achieving parity with retail price by 2017."[2] Adoption of the

[2] The First Report of the Renewable Energy Task Force Report to Lieutenant Governor David Paterson, February 2008 at pp. 6, 8.

Renewable Energy Task Force's interim goal of 100 MW RPS-supported PV will restore New York to its rightful leadership position.[3]

However, this is not simply an interstate contest to see who can post the highest PV goals. Rather, the real importance of New York State rededicating itself to solar energy is the host of immediate energy, economic, and environmental benefits it will bring to electricity consumers, utilities and to the citizens of New York at large:

- *Fuel price hedge protection.* New York derives well over half of its electric generation from natural gas, coal and other fossil-fired generation. Because PV is a renewable resource that requires no purchased fuel to operate, it is not subject to the considerable volatility and risk of future price increases commonly associated with more conventional generation.[4] These cost increases are passed through to all consumers through the utility fuel adjustment clause that appears on the monthly electric bill. By "locking in" a percentage of its electric supply from customer-sited renewable resources, New York can insulate itself against the very real risks of a future run-up in the price of primary fuels.
- *Energy security.* According to the most recent published data, New Yorkers spent over $59 billion on energy resources in 2006.[5] With very little in the way of conventional fossil fuels, this results in a tremendous transfer of wealth to more resource-rich regions and nations. Investing in the means of capturing New York's ample sunshine will ensure that more of our energy dollars are invested in jobs and infrastructure right here.
- *Avoiding the purchase of electricity during system peaks.* Increased deployment of PV and other customer-sited generation can be a powerful tool to mitigate price spikes experienced during peak demand periods. In today's competitive electricity marketplace, where the market clearing price paid to <u>all</u> generators is set by the

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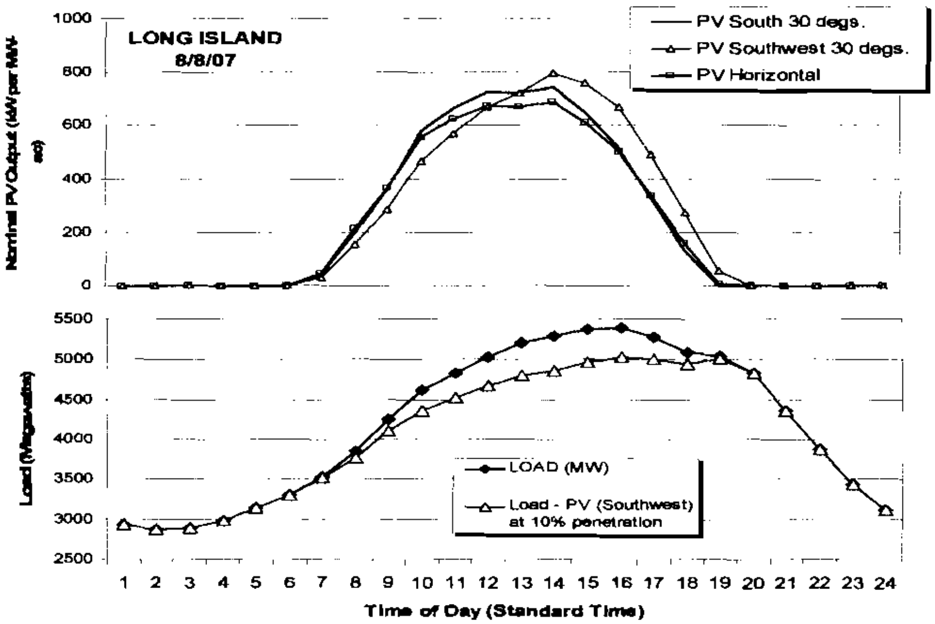
[3] There is a one-year discrepancy between the Renewable Energy Task Force's recommendation for a 100MW deployment (2011) and that evaluated in the RPS Cost Study (2012). The Solar Alliance's preference is for the earlier achievement date, but understands that this is partly dependent upon the timing of the Commission's decision and the ability of the program administrator to initiate a program offering.

[4] *See, e.g.,* Wall Street Journal, *"Surge in Natural-Gas Price Stoked by Global Trade"*, April 18, 2008 (predicting continued run-up in natural gas prices to trigger spikes in electricity prices within the year).

[5] NYSERDA, New York State Energy Fast Facts (2006) <http://www.nyserda.org/Energy_Information/FastFacts06.pdf>

most expensive plant needed to run in order to satisfy consumer demand, increased deployment of PV can help utilities avoid costly purchases during peak hours.

A recent SUNY study of the energy and capacity value of solar photovoltaic generation (PV) in New York State[6] finds that because of the strong coincidence that exists between peak demand and solar resource availability both downstate and upstate (see Figure 1. below), *the generation energy and capacity value of PV alone* amounts to 75% of the utility's average retail rate.



In New York City, the hourly price of electricity soared to over $216/MWh on the afternoon of August 8, 2007, the summer peak day, and the hourly price of electricity routinely exceeded $150 MWh during other extreme heat days. Utility purchase of electricity during these most expensive hours could be supplanted with PV strategically located in these congested zones.[7]

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[6] Perez, R. and Hoff, T., Energy and Capacity Valuation of Photovoltaic Power Generation in New York (February 2008), included as Appendix I to these comments.

[7] Source: New York Independent System Operator Decision Support System, OASIS Day Ahead Market Zonal LBMP for calendar year 2007, http://www.nyiso.com/public/market_data/pricing_data.jsp

- *Transmission loss savings.* As much as 15% of the useful energy that is paid for by the utility (and ultimately ratepayers) is lost when the energy that is generated by large centralized power plants and shipped to area homes, business and factories through the transmission and distribution network. Losses are most significant (and also most expensive) when the grid is under the greatest stress during hot, humid conditions – precisely when PV output is at its highest. These losses are avoided by placing generation closer to the point of consumption.

- *Mitigate demand and supply imbalances; construction and permitting risks.* Unlike traditional central generation options, PV is the ideal "just in time" resource, capable of being installed on customer rooftops and open spaces in a matter of months rather than years. Moreover, PV development can be developed in smaller increments than large-scale power plants, more closely aligning with supply needs and avoiding boom-and-bust development cycles that result in perennial excess- and under-capacity. Finally, as a distributed resource, PV can be located in closer proximity to load and avoids the permitting uncertainties and local opposition that often imperils central generation. While some of the risk of large-scale development is borne by the project developer, they inevitably translate into higher overall wholesale electricity prices that are passed on to the ultimate consumer.

- *Avoided environmental compliance costs.* Conventional fossil generators must comply with stringent regulations to limit the release of pollutants into the air and water that cause environmental degradation and impair public health. New York's coal-, natural gas-, and oil-fired generators incur significant costs in meeting current regulations governing pollutants associated with a range of environmental concerns including acid rain, ozone, fine particle pollution, and air toxics. Power plant contribution to global climate change is emerging as the most significant environmental issues of our generation. As regulations addressing global warming pollution are phased-in, owners of carbon-intensive generating plants will face mounting compliance costs. Since solar PV emits no pollutants, increasing the proportion of electricity supply from this clean energy option will result in the avoidance of environmental compliance costs that are passed on to New York consumers in the price of electricity.

- *Investment in distribution system upgrades and expansion.* As demonstrated by the recent Consolidated Edison rate case, utility customers are shouldering an enormous economic burden to maintain, replace and expand local facilities needed to reliably distribute power. While efforts to modernize this infrastructure are essential, distributed resources such as solar PV that can often serve as a cost-effective alternative to more traditional "poles and wires" have largely been ignored. Since the need for distribution system investment is often demand-driven, when strategically located in overstrained areas of the grid, PV's strong coincidence with peak demand could help defer or avoid the need for such investments.

- *Avoided payment for ancillary services.* Utilities and other load serving entities are responsible for compensating providers of "ancillary services", defined by FERC as encompassing "those services necessary to support the transmission of electric power from seller to purchaser given the obligations of control areas and transmitting utilities within those control areas to maintain reliable operations of the interconnected transmission system." In principle, owners of PV can work collaboratively with the distribution utility to configure their system to provide certain ancillary services, such as voltage support, allowing the utility to avoid payment for such services through the grid operator.[8]

In addition to these direct, cost-savings to utilities and their customers, PV offers a host of benefits to the people of New York. These societal benefits include but are not limited to:

- *Economic development and job creation.* As a distributed resource, solar generates more jobs per MWh than any other renewable energy technology.[9] These are high-skilled, high-paying jobs throughout the PV value chain, including wafer, cell and module manufacturers, integrators of cells into systems, power electronics manufacturers, distributors, designers and system installers. Were New York to establish a large-scale, long-term incentive program, the state can expect to capture a high portion of the manufacturing jobs (that tend to be located in close proximity to major markets) and virtually all of the permanent construction jobs.[10] These jobs would be dispersed throughout the state, including in the hard-hit upstate economy.

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[8] Hoff, T.E., Perez, R., Braun, G., Kuhn, M., Norris, B., The Value of Distributed Photovoltaics to Austin Energy and the City of Austin, Clean Power Research LLC, (March 17, 2006); *see generally,* U.S. Department of Energy, The Potential Benefits of Distributed Generation and Rate-Related Issues that May Impede their Expansion (February 2007).

[9] Kammen, Daniel, University of California – Berkeley, *Testimony before the US Senate Hearing on Environment and Public Works*, (Sept. 25 2007).

[10] Barclay's Capital Research has determined, in fact, that 75% of new jobs created with solar capacity additions are for construction, giving a significant boost to the local economy. EPIA, Barclay's Capital Research (2008).

Moreover, given the multiplier effect, additional jobs are created in industries that support the solar industry. According to a recent analysis conducted by the Workforce Development Institute, implementing the RETF goal of 100 MW solar PV will translate into over 1,000 direct, and another 1,000 indirect jobs in New York State.[11] It is worth highlighting other important findings of the WDI analysis:

- Investments in PV and other renewable energy systems can have significant beneficial impacts—adding both new energy supplies and high-wage jobs—thereby, tempering economic problems in industries and communities around the State.
- New York has the industrial infrastructure to support the development of the PV industry; new investment in the infrastructure can only enhance the State's comparative advantage in producing PV components as the nation moves toward a renewable energy future.
- Many of those jobs that would be created by the economic activity generated by the investment currently exist and cover a broad range of occupations;
- Public policy, including the state's Renewable Portfolio Standard is key to driving this economic activity.

At a time when the New York State economy is reeling from its dependence on the financial services sector, investing in the green economy will help diversify the state's economic base and provide a growth engine for the future.

- *Avoided environmental and public health impacts.* Even with strict emission controls, residual power plant pollution continues to exact a significant toll in terms of impaired public health and ecosystem degradation. A recent Abt study attributed 1,200 premature deaths and 2,500 heart attacks a year in New York to fine particle emissions (soot) from power plants.[12] Mercury emissions, over one-third of which come from coal-fired generation, is a bio-accumulative neurotoxin (i.e., it increases in toxicity as it moves up the food chain) and is said to affect cognitive and motor

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[11] Workforce Development Institute, The Economic Impact of Generating 100 MW of Renewable Energy via PV Investment in New York State (September 2008), included with these comments as Appendix II.

[12] Abt Associates, Power Plant Emissions: Particulate Matter-Related Health Damages and the Benefits of Alternative Emission Reduction Scenarios (June 2004), summary report available at http://www.catf.us/publications/reports/Dirty_Air_Dirty_Power.pdf.

skill development in children; in fish and wildlife, mercury contamination results in reproduction, neurological and behavioral disorders.[13] The New York State Department of Health has issued a health advisory warning against the consumption of fish from 87 water bodies located throughout New York State. As a non-emitting renewable energy technology, these public health and wildlife impacts are mitigated as solar displaces fossil generation and represents a bigger share of New York's overall resource mix.

New York State has been a pioneer in the fight against global climate change, having initiated the Nation's first program to reduce power sector carbon emissions. Solar PV can provide an important and cost-effective strategy to mitigate power sector emissions. Because only the incremental cost of PV is funded by ratepayers, this makes the investment an extremely cost-effective way for regulators to lower carbon emissions; recent studies at the California PUC have found the California Solar Initiative to have the lowest load-serving entity cost per ton of carbon reduction of any resource, including energy efficiency.[14]

- *Avoided risk of blackouts.* The economic losses to business and the general public due to power outages of even short duration are staggering. The 2003 blackout which affected much of the Northeast is reported to have resulted in economic losses of $6 to $10 billion. Large scale deployment of solar PV can reduce the risk of blackouts and brownouts by providing load relief that matches up well with system peak demand. During outages, facilities equipped and permitted to operate in an "islanded" mode can continue to power essential on-site load, reducing economic losses and maintaining services essential to the health and welfare of the public. Moreover, deployment of PV can expedite and facilitate the restoration of the grid by effectively removing load that would otherwise need to be served after a disruption in service.

As the Public Service Commission weighs these considerable and diverse benefits against the program cost, it is important to bear in mind the leveraging effect of these investments. For each state rebate dollar, this is leveraged by two federal and two

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[13] *See, e.g.,* U.S. Environmental Protection Agency's *Mercury White Paper* http://www.eoa.gov/ttn/oarpg/t3/memoranda/whtpaper.pdf

[14] Fitch, Julie, Director of Policy and Planning Division, California Public Utilities Commission, "Some Analysis of Potential AB 32-Related Electricity Rate Impacts," Presentation to the CMTA, Lake Tahoe, July 24, 2008.

private investment dollars, providing the state with tremendous financial return on its state rebate investment.

B. While Efforts Should be Made to Increase the Level of Solar Development Activity in New York City, the Expanded Solar PV Tier Should Not be so Narrowly Targeted.

The Solar Alliance concurs with the Commission that there are valid reasons justifying a heightened emphasis on solar development in high-cost New York City load pockets. As analysis demonstrates, given the very close correlation between PV resource availability and peak demand in downstate wholesale zones, increased PV deployment could offer significant energy and capacity value in these high price markets.[15] Moreover, there are legitimate equity interests at stake, with a disproportionate share of RPS direct expenditures occurring in upstate markets.[16]

While these and other characteristics of the New York City grid make it an ideal market for solar PV (e.g., grid congestion, a good solar resource, national and international visibility), there are challenges that suggest the PSC pursue a New York City-centric deployment complemented by a broader statewide strategy. These challenges include the inherent technical difficulties in interconnecting to Con Edison's networked distribution system; significantly higher labor and other installation costs relative to other parts of the state; code and permitting barriers; solar access issues, and so forth.[17] These market barriers must be addressed in parallel with efforts to tap viable solar markets across the state where there are also significant opportunities at present for

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[15] This is particularly true during extreme peak hours when locational wholesale prices can spike dramatically, resulting in significant wealth transfer from consumers to generators.

[16] The Solar Alliance has no issue with the allocation of RPS expenditures to date. The reality is that land-based wind development has been the technology of choice within the Main Tier of the RPS and this resource is located predominantly outside the New York City metropolitan area. Our only point is that it is understandable for the Commission to seek to further other eligible renewable technologies, particularly solar PV and other distributed renewables that may be more suitable development options in New York City, and to redistribute RPS costs and investments to achieve greater regional parity.

[17] For a fuller discussion of barriers to solar energy development in New York City, see The Center for Sustainable Energy, *New York City's Solar Energy Future: Policies and Barriers* (January 2007). (showing a $1.52/watt higher installed cost than the rest of the state for 2006; and $3.72/watt higher installed cost than for Long Island). This discrepancy can only partially be explained by the more prevalent use of higher cost Building Integrated PV (BIPV) in the New York City urban environment.

replicability and scalability. Only through a comprehensive, statewide approach will the market potential for solar PV be realized.

Consequently, the Solar Alliance recommends that the Commission establish "soft targets" of 25-30% for New York City within the current CST framework. Under this approach, up to 30MW of the incremental PV capacity to be brought on-line through an expanded CST would be earmarked for development in New York City and its environs.[18] To foster this development, NYSERDA should consider offering a $1-2/watt incentive adder for New York City in recognition of the higher cost of doing business here, while taking into account any offsetting advantages such as the recently-enacted 35% property tax abatement.[19] NYSERDA, in conjunction with Consolidated Edison, should conduct aggressive market and barrier-busting activities to promote PV development in the region, including coordinating activities with the New York City municipal efforts to create "Solar Enterprise Zones". However, to prevent a potential stranding of these incentive funds should the desired level of market activity not materialize in the anticipated timeframe, NYSERDA should retain the flexibility to periodically rededicate uncommitted PV incentive funds to other parts of the state showing robust growth.

III. Would a Targeted Program to Increase the Level of Photovoltaics in the Higher-Cost Load Pocket Areas in the New York City Metropolitan Area be Better Administered Directly by the Local Utility?

Short answer: The PV incentive program should continue to be administered by NYSERDA on a statewide basis. Consolidated Edison should be encouraged to play a more active and positive role in facilitating PV project development within its service territory, and particularly within network locations in need of load relief.

[18] This would be separate and apart from any PV that may be acquired and rate based by the distribution utility. See discussion, Section IV., infra.

[19] A11202, (enacted August 8, 2008). The law allows for an abatement of property taxes for the installation of solar energy equipment on eligible properties in New York City. Systems installed over the next two years are eligible for an abatement of 35% of system costs up to $250,000; for systems installed thereafter, the abatement drops to 20% of system costs.

The Solar Alliance believes that it is important for New York State's PV deployment program to continue to be administered on a centralized basis. PV markets do not rigidly follow utility service territory boundaries and it is important that the critical market transformation activity – well-established supply chains, product standardization, a competent and experienced installer base, knowledgeable code inspectors – be done in a comprehensive fashion across the state. The Solar Alliance is concerned that the PV market, already segmented between Long Island and the rest of the state, could be further balkanized by shifting program responsibility to Con Edison for the New York metropolitan area. We are not aware of a healthy PV market anywhere in the country manifesting this level of decentralization of administrative responsibility.

Having said that, the Solar Alliance nonetheless believes the local distribution utility can play a number of constructive supporting roles in conjunction with NYSERDA to enable a better synthesis of the multiple PV value streams, and provide a more coordinated approach to meeting distribution system needs. These include such functions as:

- Identifying areas of the distribution system that require upgrades and are amenable to a PV solution. The distribution utility is uniquely situated to identify stressed circuits on its distribution network. As demonstrated by Con Edison's recent experience in soliciting bids for geographically targeted demand-side management, distributed resources may be capable of cost-effectively deferring or diminishing the need for distribution system upgrades. Given PV's intrinsic advantages of short-lead time, discrete and "modular" capacity blocks, load proximity, close correlation between peak output and peak system demand, and ease of siting and permitting PV can serve as an ideal alternative to traditional "poles and wires" investment. PV development, in New York City and throughout the state, has been an essentially developer-driven, ad hoc process without regard to distribution system deferral value. What is lacking is a more formal and systematic mechanism for monetizing and securing these PV resource benefits, and for integrating them with other PV value streams available to the potential solar host.

- Determining segments of network system that can accommodate significant penetration of PV and making this information more readily available to the public. More recently, Consolidated Edison has taken a proactive approach to identifying and publicizing areas of its distribution network that can accept various forms of distributed generation. Much of the focus has been on synchronous generation given the concerns that such generation can contribute to fault current in excess of system limitations.[20] The distribution utility could supplement this with greater detail on any known or anticipated factors that could preclude or necessitate significant system modifications to accommodate large-scale PV or other inverter-based DG technologies. Further, the utility could make necessary system upgrades as a ratebased investment where such improvement confers broad benefits that extend beyond the individual solar host site.

- Assisting in marketing of PV program to customers. Consolidated Edison is well positioned to facilitate communications between its customer accounts and third party PV developers. At a minimum, the utility should more actively market the availability of PV incentives to those customers with facilities in constrained areas through targeted mailings, workshops and in one-on-one outreach conducted by customer account representatives. Further, the utility should respond to customer inquiries by making a list of NYSERDA eligible PV installers available to host customers, and by posting such information on its website.

- Facilitate fast track interconnection. Applications for interconnection within areas of the distribution network benefitting from load relief could be placed in a separate queue and given fast track consideration. Further, to the extent additional equipment is required on the utility side of the meter to enable safe interconnection, the utility could consider exceptions to the general rule that allows cost recovery from the customer-generator in light of the system-wide benefits such generation could provide.

- Provide additional incentive (beyond that generally available on a statewide basis) in recognition of the distribution system deferral benefits and other ancillary services PV may provide. Consolidated Edison could provide targeted area incentives to encourage PV development in areas where load relief is needed most. The incentive would be additive to the incentive more broadly available through NYSERDA. This program would be distinct from the various demand-response programs administered by the New York Independent System Operator aimed at dispatchable curtailment rather than permanent reductions to load to defer distribution system investment.[21] To the extent the resulting PV investment defers the need for more

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[20] See http://q050-w5.coned.com/dg/configurations/synFaultLimitations.asp

[21] *See, e.g.*, Pace Energy and Climate Center and Synapse Energy Economics, "A Comprehensive Process Evaluation of Early Experience Under New York's Pilot Program for Integration of Distributed Generation in Utility System Planning" (August 2006) at 70-72 (recommending zonal credits for distributed generation

expensive distributed generation or avoids peak energy and capacity charges, these benefits could be shared between the project developer, the customer host, the local utility and customers at large.

- Offer on-bill financing for solar PV. One of the challenges facing consumers interested in deployment of PV is the significant up-front investment required. Innovative strategies, such as the Power Purchase Agreement model wherein the system financing is arranged by a third party developer with installation costs recovered over time through a production-based charge, largely address this "first cost" barrier. A variant of this approach would leverage the utility's capitalization and/or billing infrastructure to finance solar installations on customer sites. Under this model, third party developers would have access to a utility arranged capital pool, with the utility's capital outlay recovered over time through a separate charge on the customer's electric bill, ideally structured so the consumer sees little or no net increase in their monthly electricity charges.[22]

Beyond these solar-specific measures, there are a number of policies and programs that distribution utilities can undertake to benefit clean distributed resources more generally. These include more progressive rate design policies including: the adoption revenue decoupling, elimination of volume discounts, and extension of time-of-use pricing – all being actively considered by the Commission. Similarly, the distribution utilities should move more aggressively to promote smart grid technologies that facilitate the deployment of clean distributed generation and its interaction with the grid.

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in high-cost network locations) available for download at <http://www.nyserda.org/publications/06-11-IntegrationofDGPilot-complete.pdf>.

[22] An example of this is the PSE&G Solar Loan Program under which the utility offers to all customer classes 10 to 15 year loans covering approximately 40-50% percent of the total cost of the system. http://pseg.com/customer/solar/about.jsp Under the PSE&G program, loan repayments take the form of Solar Renewable Energy Credits generated by the solar system; these SRECs have significant monetary value under New Jersey's market-based Renewable Portfolio Standard. PSE&G has staked $105 million in loan funds, with the goal of facilitating 30MW of solar PV in its service territory over a two-year period.

IV. Would the Acquisition Cost of PV be Better Financed Directly by the Utility as a Ratebase Addition?

Short answer: We support the involvement of investor-owned utilities in the development of PV, including under appropriate circumstances, utility ownership and ratebasing of PV system costs. The Commission should promote a diversity of ownership arrangements, in New York City and elsewhere across the state, and consequently should not restrict the scope of any program component targeting high cost load pockets to a single utility ownership model. Moreover, utility acquisition should supplement, and not supplant, PV resources procured through the CST. To these ends, the Commission should authorize Consolidated Edison to procure up to 50MW of additional solar PV (i.e., over and above the 100MW incentivized statewide by NYSERDA) within constrained areas of its system. Preference should be given for a competitive procurement involving independent third-party developers. To preserve competitive solar markets, Consolidated Edison should own no more than 50% of these assets. The Commission should explore financial incentives that would make Consolidated Edison financially indifferent between owning solar generation and contracting for solar energy, capacity and/or credits through power purchase agreements with unaffiliated project developers.

A. The Commission Should Encourage a Diversity of PV Development Models, including Utility Ownership.

In order to support the New York Renewable Energy Task Force's stated goal of accelerating the date by which PV achieves grid parity in New York State, the PSC should encourage a wide range of ownership structures. To that end, the Solar Alliance supports the PSC easing current restrictions on utility ownership of generation assets to allow, under the parameters described below, utility ratebasing of solar PV within its service territory. Such allowance should be carefully structured to maximize both competition and innovation in the solar PV industry and thereby maximize the use of solar energy. The PSC must take care that its policies do not, by design or practical effect, limit ownership of PV systems in specific market segments to a particular entity or market participant.

Interest among utilities in solar development appears to be growing, fueled in part by the recent extension of the federal investment tax credit (ITC) to investor owned utilities.[23] Recent announcements include:

- National Grid recently announced plans to develop 5 MW of solar PV at four company-owned sites situated to alleviate congestion on the grid.[24]
- Southern California Edison has proposed a 250MW Solar Photovoltaic Program to site 1-2 MW PV arrays on commercial rooftops with the output fed directly into the grid. The host site would receive a lease payment for its participation.[25]
- Duke Energy Carolinas has proposed to install electricity generating solar panels at up to 850 North Carolina sites including homes, schools, stores and factories.[26]

The Solar Alliance believes that utility interest in PV is a significant development, and if properly harnessed, can bring important scale benefits to the industry. Moreover, access to utility rate base for future investment in PV represents a stable, long-term source of funds that can supplement and leverage private sector financing.

However, any allowance of utility acquisition of PV should be consistent with these important principles:

- Utility ownership should not be allowed to become the dominant business model for PV development in New York's high cost areas. One possible interpretation of the Commission's SAPA notice is the suggestion that *all* incremental development of PV in high cost areas be acquired by distribution utilities as rate based assets. The Commission should refrain from taking this extreme approach. Promoting utility-owned solar PV to the exclusion of other ownership models is detrimental to future

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[23] *See generally,* Solar Electric Power Association, "Utility Solar Business Models: Emerging Utility Strategies and Innovation (May 2008), <http://www.solarelectricpower.org/docs/Utility%20Business%20Model%20FINAL%206_03_8.pdf>.

[24] http://www.nationalgridus.com/aboutus/a3-1_news2.asp?document=3642

[25] SCE's petition is still pending with the California Public Utilities Commission. *See* R. 08-03-015, Application of Southern California Edison Company to Implement and Recover in Rates the Cost of its Proposed Solar Photovoltaic (PV) Program.

[26] North Carolina Utilities Commission Docket No. E-7, Sub. 856, Application of Duke Energy Carolinas, LLC for Approval of a Solar Photovoltaic Distributed Generation Program and for Approval of Proposed Method of Recovery of Associated Costs (pending).

development of the industry. This situation would eliminate any possibility of competition and reduce supplier interest in the market. Competition among ownership models, providers, installers, etc. is essential to meet the State's goals for renewable energy production and will result in lower costs over the long-term.

- A utility PV acquisition program should maximize the involvement of third-party developers. The domestic U.S. PV market has witnessed remarkable growth within the last decade, and with this maturation has come a greater sophistication in all facets of project development. Along the entire PV value chain – from manufacturing, to sales, marketing, design, finance, procurement, construction, operations and maintenance – the industry has been propelled by competition to achieve continual cost reduction, product innovation, and customer service.[27]

  There are now several examples – some proposed, others operational – of utility involvement in the development of PV resources. These range from utility-directed

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[27] One of the most significant developments has been the emergence of the Solar Power Purchase Agreement (SPPA) as the financing vehicle of choice among large commercial and public sector customers. Under a PPA, a third party owns and operates the PV system and provides the electricity to the building owner at an agreed-upon rate. The PPA provider receives state incentives and any federal or state tax benefits that come with ownership. This latter factor has been particularly helpful in enabling non-taxable entities such as schools, hospitals, correctional facilities and other government-owned properties to install solar PV systems at affordable prices. These arrangements have also provided electricity price certainty for building owners, a particularly attractive proposition in an era of uncertain energy costs. Third-party arrangements also benefit customers who lack the capital to finance a system at the time it is built or simply prefer to let someone else assume the responsibilities of solar system ownership. *See* Rahus Institute, *The Customer's Guide to Solar Power Service Agreements* (October2008) available at
http://www.californiasolarcenter.org/pdfs/ppa/Rahus_SPPACustomersGuide_v20081005LR.pdf

More recently, innovations in financing have extended beyond the commercial sector to residential and other hard to reach markets. Solar leases are becoming more prevalent which have enabled residential consumers to get solar PV installed at far less up-front cost than cash purchases. Both of these innovations in product offerings have significantly expanded the reach of distributed solar PV into the residential and commercial solar PV markets. *See, e.g., Connecticut's Solar Energy Leasing Plan for Homeowners,*
<http://www.ctcleanenergy.com/Portals/0/CCEF%20CT%20Solar%20Lease.pdf>.

development and ownership of PV assets under a turnkey construction contract with project developers, to utility financing and co-marketing of third-party or customer-owned PV, to utility procurement of PV output through a power purchase agreement with the project developer. While all of these arrangements are potentially viable and should be encouraged, the Solar Alliance submits that the better structured programs are those that are "open sourced" to capitalize on the innovation, creativity and collective experience of the independent solar industry in: cultivating interested customers: evaluating viability of potential host sites: arranging project finance; designing and engineering high performance systems; installation of systems that meet applicable codes and standards, and supporting ongoing operation and maintenance to ensure that the system is performing as intended. A utility acquisition program should be structured to capture the value-added utilities can bring to the table, while promoting the sustained and orderly development of a competitive industry. Any large-scale solar procurement should allow solar equipment suppliers to continue to do what they do best while the distribution utility focuses on providing brand identification, scale of operations, rate supported financing, and so forth.

- <u>Where the utility proposes to own and ratebase PV assets, this should be pursued through an open, competitive and transparent process</u>. Should utilities be allowed to have an ownership stake in PV generation, the Commission should ensure that such an arrangement maximizes value to ratepayers and promotes the interests of a vibrant solar marketplace in New York. In order to achieve these goals, the utilities should procure PV resources through an open, competitive and transparent solicitation process subject to evaluation by Commission Staff or an independent evaluator. Proposals would be screened based on a ranking and weighting of their responsiveness against a set of pre-determined selection criteria. The need for openness and transparency is especially important if the utility or its affiliate is authorized to proffer its own "build" option in order to safeguard against bias. An open and competitive solicitation subject to Commission oversight would elicit the widest array of possible project proposals from market participants, and enable the identification and selection of the mix of resource options that best address New York's solar market and broader energy resource needs.

- <u>The Commission should establish policies that make the utility financially indifferent as between solar "build versus buy" options</u>. Under existing Commission policy, the distribution utility can only earn a rate of return on rate based assets. In contrast, where the utility contractually secures an equivalent level of energy and capacity through a power purchase agreement, it is obliged to pass through these costs on a dollar-for-dollar basis with no return on investment. The inability to add to earnings creates a built-in disincentive to the utility pursuing solar development through a third-party arrangement. Some jurisdictions are beginning to address the disparate treatment of build and buy options. For example, the Massachusetts legislature recently enacted the Green Communities Act, which, in relevant part, requires utilities to enter into long-term contracts for renewable energy credits (RECs) and/or renewable energy and "provide for an annual renumeration for the contracting distribution utility equal to 4 percent of the annual payments under the contract to compensate the company for accepting the financial obligation of the long-term contract..."[28] Similarly, the Oregon Public Utility Commission is investigated various options for remediating potential bias favoring utility ownership of new generation. The New York PSC should follow the example of these states and create a more level financial playing field to encourage utilities to consider the widest array of possible resource options that redound to the benefit of their shareholders and their customers.

- The Commission should retain oversight of utility solar resource procurement. The Commission should review the results of the competitive solicitation on a contemporaneous basis. If approved, the Commission's determination should constitute prima facie evidence of the prudence of the utility's resource selection. The Commission should scrutinize the utility's preferred approach for potential impacts on competition and the development of the local solar industry. For example, California law requires a demonstration that utility ownership is in the public interest.[29] The California Commission must specifically review the effects of utility ownership on the development of the state's solar industry:

  > The commission shall deny the authorization sought if it finds that the proposed program will restrict competition or restrict growth in the solar energy industry or unfairly employ in a manner which would restrict competition in the market for solar energy systems any financial, marketing, distributing, or generating advantage which the corporation may exercise as a result of its authority to operate as a public utility. Before granting any such authorization, the commission shall find that the program of solar energy development proposed by the corporation

[28] Massachusetts General Laws, c. 169, §83.

[29] Cal. P.U. Code Section 2775.5.

will accelerate the development and use of solar energy systems in this state for the duration of the program.[30]

The New Jersey legislature has similarly conditioned its authorization of utility ownership of renewable generation facilities, requiring the Board of Public Utilities 'to take into account the potential for job creation from such investments, the effect on competition for such investments, existing market barriers, environmental benefits, and the availability of such opportunities in the marketplace."[31]

Were the Commission to move in this direction, it must exercise due care and put in place appropriate safeguards to ensure that the distribution utility does not unfairly leverage its control of the distribution system, access to rate-base funds, or customer relationships to the detriment of the private sector solar industry participants. While creating a level playing field could spur industry growth, actions by the utility to stymie competition will be detrimental to New York consumers and slow the development of a homegrown solar industry.

- <u>The utility should be bound by its cost bid in the same way third party developers are</u>. If the distribution utility opts for its own "build" option over competitive third party supply on the grounds that this represents the least-cost highest-value resource to ratepayers, it should not be able to come back in the context of a rate case for recovery of costs that exceed its stated cost goals. This would create an unlevel playing field (third party bidders do not have the same latitude to pass on increased costs) and subvert the competitive process.

B. Utility Ownership and Ratebasing of PV Should Supplement PV Development Supported through the CST.

The solar incentive program administered by NYSERDA has sought to achieve long-term statewide solar market transformation in ways that cannot be replicated through individual solar resource acquisition processes administered by distribution utilities within their respective territories. Although not without its limitations, the success of the NYSERDA solar program can be traced to the fact that it has offered a steady, stable and long-term incentive base that has encouraged the emergence multiple applications,

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[30] Id. at Section 2775.5 (b).

[31] N.J Laws, 48:3-98.1 et.seq.

investors, consumers, developers and technologies.[32] By contrast, the short-term utility acquisition implicit in the PSC's SAPA notice would by nature be more episodic and focused on meeting immediate generation and distribution system needs, only incidentally contributing to the development of a competitive and self-sustaining solar industry.

The Solar Alliance believes there is a place for *both* utility solar resource acquisition and market transformation activities and these should *each* be adequately funded. Specifically, the Solar Alliance recommends that utility acquisition be additive to a 100MW customer-sited PV development initiative funded under the CST. Given the modest growth targets projected by the PSC for solar PV over the next few years, even taking into consideration a 100MW/three year interim program, the Solar Alliance is concerned that utility acquisition could represent the entirety of the solar market in the Consolidated Edison service territory – and perhaps across New York State - for the foreseeable future, undermining progress made through the CST program to develop a more mature and dynamic solar marketplace.

C. The SAPA Notice Recommendation for Utility Financing Appears to Rest on the Flawed and Incomplete Premise that PV Entails a "Higher Acquisition Cost" Than Other Peaking Resources.

The SAPA notice seemingly relegates a supplemental PV acquisition program to the limited role of offsetting high peak energy costs in congested areas of the state. This appears based on the false predicate that PV is more expensive relative to conventional generation sources. A fuller understanding of PV capital and lifecycle costs today and over the intermediate term, as compared to those of conventional generation sources, is warranted to appreciate the more significant role PV can play in the state's overall resource mix.

During most of its development history, solar has been viewed as a relatively expensive generation resource. This is partly because until recently, energy markets and regulators have not assigned monetary value to 'externalities', notably including criteria pollutants like NO_X, SO_X and particulates, but also including CO_2 – now recognized as a major contributor to global warming and a key target of New York state energy policy. Nor have

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[32] NYSERDA's solar PV incentive program is embedded within a broader effort to sponsor technology development, provide manufacturing support, foster business growth and promote infrastructure development. Jeff Peterson, NYSERDA Program Manager for Clean Energy Research and Development, presentation to the New York Assembly Solar Roundtable, Kingston NY, September 3, 2008.

they historically valued contributions to reducing peak demand, now understood as the primary driver for many utilities' largest capital investments.

Even on this limited basis, the installed cost of solar has been falling precipitously, spurred by explosive year-over-year growth in global demand.[33] This worldwide demand growth has precipitated an influx of significant new capital investment in solar companies,[34] and enabled the industry to exploit economies of scale, accelerate technology development and to bring new and better products to market faster. To take one example, recent developments of thin film solar PV panels have dramatically reduced the cost per watt of solar PV panels by utilizing non-silicon based technologies and/or very thin layers of silicon, improving the yield of each gram of silicon. In addition to cost per watt reductions, recent developments in conventional silicon-based conventional technologies have led to significant increases in solar PV module efficiencies in mass production, using new bifacial solar PV cells, back-contact cells, and other technologies capable of achieving module efficiencies up to 21.1% .

These positive developments are not confined to module supply but extend across the entire PV value chain. A recent analysis by Lawrence Berkeley Labs of the effect of California's suite of solar programs showed significant declines in non-module costs. The report also noted the likely influence of state incentive programs in stimulating these cost declines:

> Sustained, sizable, and stable markets for PV may be the most direct way of reducing non-module costs because such markets will presumably attract suppliers and encourage those suppliers to create an efficient delivery infrastructure. Though PV cost reductions in California are significant...deeper cost reductions are possible with a more sustained policy effort. [35]

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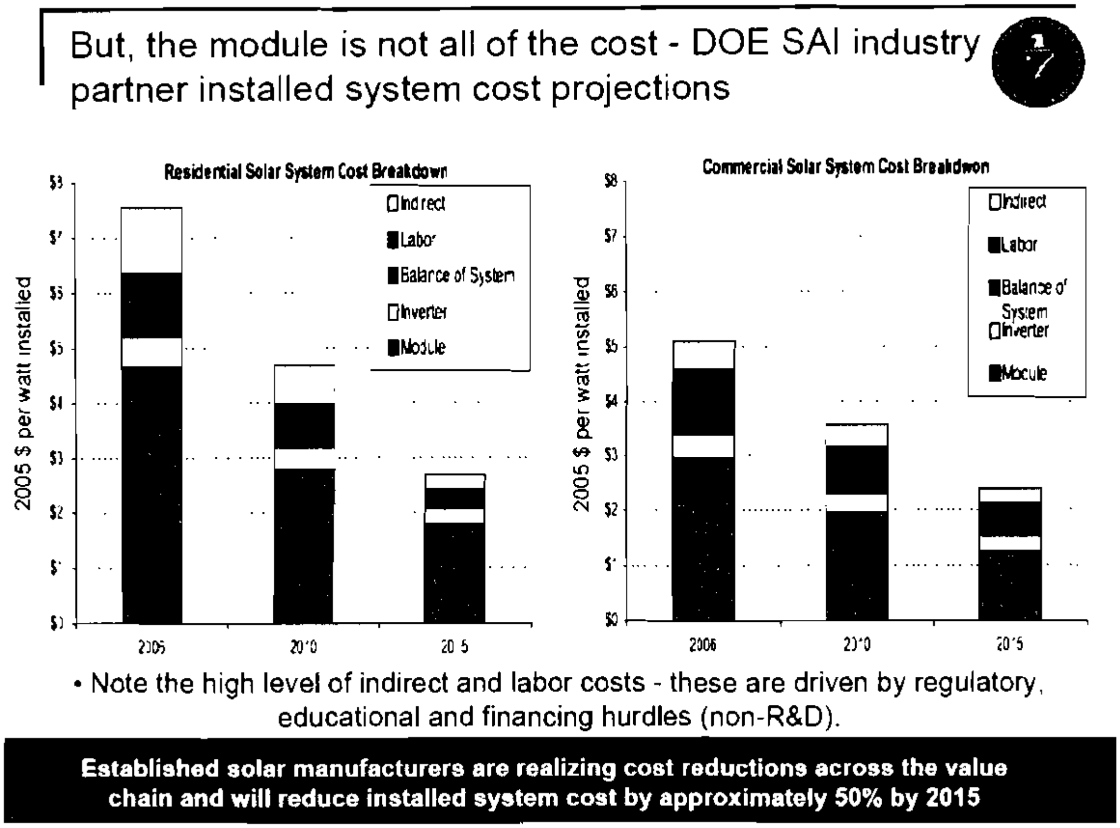
[33]http://www.solarbuzz.com/Marketbuzz2008-intro.htm

[34] The U.S, Department of Energy estimates that worldwide investment in solar energy companies reached $12 billion in 2007, an annual growth rate of 253% for the period between 2003 and 2007. *Solar Energy Industry Forecast: Perspectives on U.S. Solar Market Trajectory*; U. S. Department of Energy Solar Energy Technologies Program; June 24, 2008; http://www1.eere.energy.gov/solar/solar_america/pdfs/ solar_market_evolution.pdf (Presentation of Thomas P. Kimbis, U.S. DOE Solar Energy Technologies), hereinafter cited as "U.S.DOE Perspectives".

[35] Wiser, R., Bollinger, M., Cappers, P., Margolis, R., Letting the Sun Shine on Solar Costs: An Empirical Investigation of Solar Cost Trends in California, Lawrence Berkeley National Labs (January 2006), p. iii.

A U.S. Department of Energy analysis confirms deep reductions in other major cost centers including balance of system, inverters, labor and permitting.[36]



As revealed in a recent analysis of the cost of electric generation alternatives by the leading New York investment firm of Lazard Freres, PV capital costs are already comparable to conventional fossil generation sources and this favorable trend show no sign of abating. As the Lazard study underscores, "An important finding in respect of Solar PV technologies is the potential for significant cost reductions over time as manufacturing scale along the entire production value chain increases; by contrast, conventional generation technologies are experiencing capital cost inflation (as well as fuel cost inflation), driven by high levels of global demand for conventional generation equipment, where potentially cost-reducing manufacturing improvements for these mature technologies are largely incremental in nature."[37]

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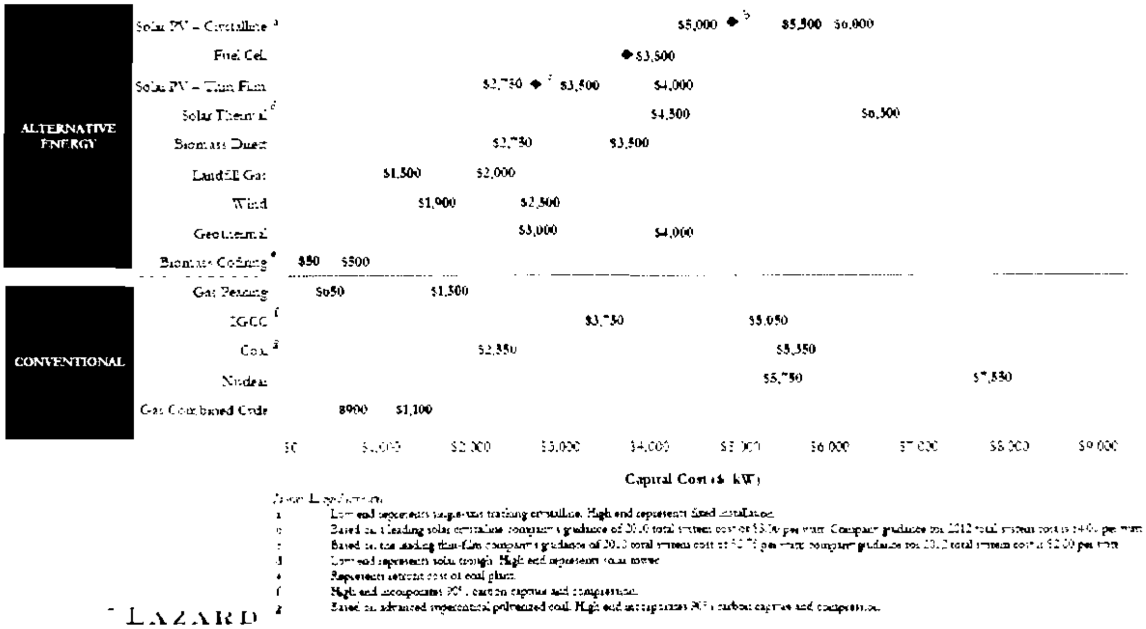
[36] Cf. fn. 32, U.S. DOE Perspectives.

[37] Lazard at 6.

Capital Cost Comparison

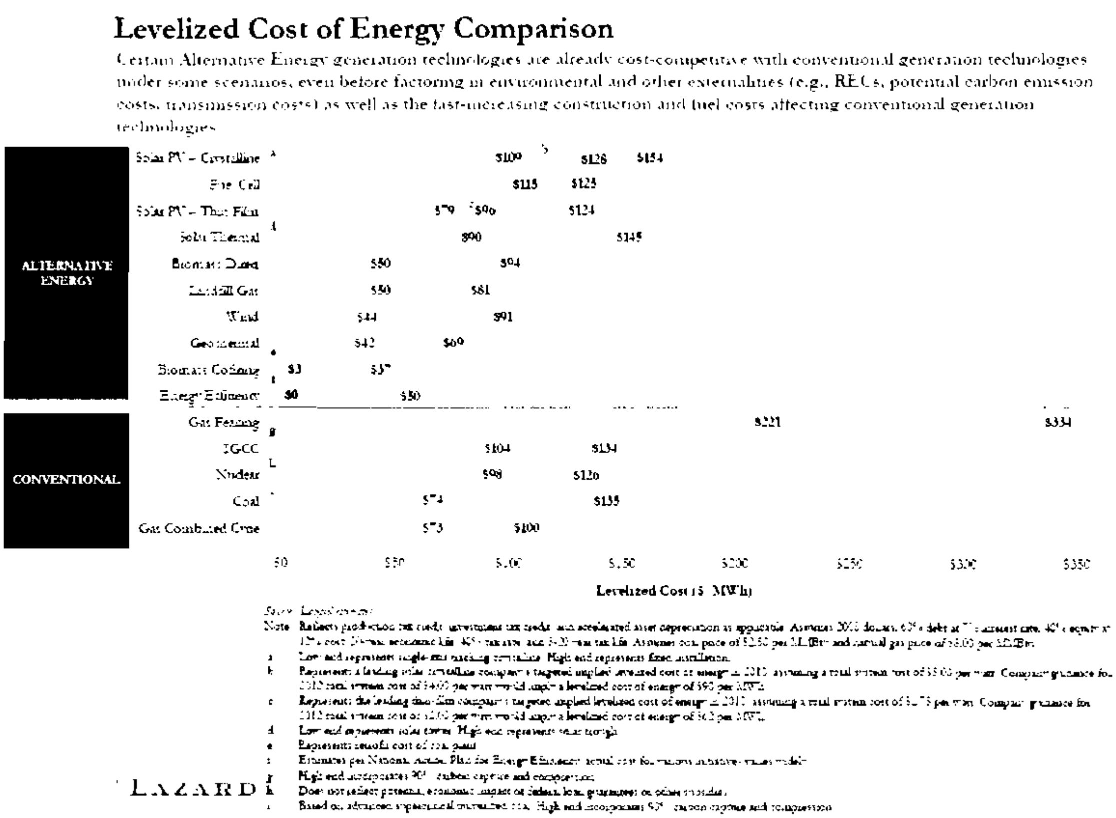
While capital costs for a number of Alternative Energy generation technologies (e.g., solar PV, solar thermal) are currently in excess of conventional generation technologies (e.g., gas, coal, nuclear), declining costs for many Alternative Energy generation technologies, coupled with rising construction and fuel costs for conventional generation technologies, are working to close formerly wide gaps in electricity costs. This assessment, however, does not take into account issues such as dispatch characteristics, capacity factors, fuel and other costs needed to compare generation technologies.



For crystalline PV, Lazard reports that capital costs today range from a low of $5,500 to a high of $6,000/kW, expected to decline to $5,000 by 2010 and $4,000 by 2012. For thin-film PV technologies, today's capital costs range from $3,500 to $4,000/kW, expected to drop to $2,750 by 2010 and $2,000 by 2012. These cost ranges compare favorable to Integrated Gas Combined Cycle (IGCC) ($ 3,750 - $5,500), coal ($2,550 - $ 5,350), and nuclear ($5,750 – 7,550).

Beyond that, a comparison of capital costs alone is not reflective of the lifecycle costs that New York ratepayers will ultimately bear for the resource choices made today. While useful for some purposes, a comparison confined to installed cost ignores ongoing fuel, operating and maintenance expenses over the generator's lifetime. For fossil-fueled technologies, these expenses typically exceed capital costs by a factor of ten or more. For solar, which uses no fuel and costs very little to operate and maintain over a plant's lifetime, they are negligible: what you see is what it costs. Thus capital cost comparisons alone can yield a highly distorted view of relative resource value over the longer planning horizon.

The central purpose of the aforementioned Lazard analysis is to compare the levelized cost of energy (in $/MWh or ¢/kWh) for these technologies, and to determine how sensitive these costs are to key variables such as fuel prices, emissions control and capital costs. Lazard presents the results of these analyses in a format similar to its capital cost comparison shown earlier. Its base case LCOE results reflect current costs. It confirms that with existing federal tax incentives, LCOE for ***thin-film solar PV today is competitive with all conventional generation except gas combined cycle plants,*** and probably will compete with those by 2012 or sooner. ***Crystalline PV today has a far lower LCOE than gas peakers*** which might serve the same loads, but a higher LCOE than other gas, coal and nuclear options; by 2012 if not sooner, it likely will compete with all of those except combined cycle gas plants.



The implication of these technology cost trends from a public policy perspective is that state policy makers should focus on bridging strategies to support and accelerate the drive to grid parity. The better functioning state incentive programs are connected to growing deployment targets of a decade or more. Rather than pursue a "one off" procurement by utilities, the Solar Alliance encourages the Commission to maintain its primary focus on longer-term market transformation strategies.

V. Does the RPS Cost Study Accurately Estimate the Funding Levels Needed to Achieve a 100MW Solar PV Target Over the Next Three Years?

Short answer: The estimated $325 million price tag for a targeted PV development program is likely to be exaggerated. A more realistic estimate, based on assumed adjustments to program design that would enable participation of lower-cost larger-scale projects, and which take into consideration the recent extension and expansion of the Federal Investment Tax Credit and the experience of other state incentive programs is likely to be at least 25% lower than assumed in the RPS Cost Study.

A. The RPS Cost Study Overstates the Funding Required to Secure 100MW of PV Over the Next Three Years.

The RPS cost study calculates the cost of a three-year, 100MW program to secure solar PV resources beyond those already assumed for the Customer Sited Tier at $325 million. For a number of reasons, the Solar Alliance believes the cost study overestimates the actual funding required to bring this level of new solar PV on-line.

First, resolution of the uncertainty surrounding extension of the Federal Investment Tax Credit (ITC) for solar energy will leverage federal incentives to improve the economic attractiveness of solar for most end users and will allow state program administrators to lower incentives accordingly.[38] Thus, the $3.25/watt average rebate level for the first year of the program could be dropped without seeing a significant attrition in applications.[39] A number of state solar program administrators are already moving to leverage these changes in federal tax policy by lowering rebates from their previous levels. The Connecticut Clean Energy Fund recently moved to reduce rebates to maintain comparable out-of-pocket consumer

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[38] Under the Energy Improvement and Extension Act of 2008, Congress not only extended the pre-existing 30% ITC for commercial applications, it removed the previous $2,000 benefit limit for residential systems. This "uncapped" residential ITC will markedly increase the allowable federal contribution towards buying down the upfront cost of a residential PV system.

[39] *See* Lawrence Berkeley National Labs, "Shaking Up the Residential PV Market: Implications of Recent Changes to the ITC", available at http://eetd.lbl.gov/ea/emp/cases/res-itc-report.pdf (break-even analysis showing how much state solar program administrators can drop rebate levels without leaving consumers any worse off depends upon solar owner's tax bracket, system size, and whether state incentives are treated as taxable income). A decision to drop the rebate and to what level should be based on detailed analysis of market impact relative to retail power rates and other market factors discussed subsequently.

costs as existed prior to the change in federal tax incentives.[40] Likewise, the New Jersey Office of Clean Energy has proposed reduced rebate levels, based at least in part on the more favorable tax incentives enacted by Congress.[41]

Secondly, the RPS cost study's presumed rebate level of $3.25/watt does not appear to differentiate between residential, commercial and non-profit/institutional applications and the distinctly different per/watt installed costs and concomitant incentive levels needed to meet typical investment criteria for customers within these respective segments. An analysis of rebate levels must begin by determining the requisite payback, cash flows, or internal rate of return that will encourage the consumer to deploy behind-the-meter solar as an alternative to grid supply. Research confirms that different customer segments have differing investment criteria. Beyond early adopters (who may be motivated to install solar for a variety of non-economic reasons), simple paybacks on the order of 5 to 7 years are required to motivate commercial investment, while residential consumers expect at least a 10-12 year payback.[42] Meeting these investment criteria is crucial to economic viability and project feasibility. While we understand that the cost study merely reflects the current incentive program structure which caps incentives at 50kw, as discussed in the next section, the Solar Alliance believes the time has come to remove this significant market constraint. The immediate implication is that by applying the rebate level necessary to stimulate residential consumer support to all market segments is likely to significantly overstate the cost of the program.

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[40] Connecticut Clean Energy Fund, "Rebate Level Revised Under Solar Energy Program", http://www.ctcleanenergy.com/Portals/0/Solar%20PV%20Rebate%20Program%20-%20rebate%20levels%20revised%20-%2008%2010-27.pdf.

[41] New Jersey Board of Public Utilities, Request for Public Comment – Renewable Energy Rebate Levels. http://www.njcleanenergy.com/files/file/program_updates/RE%2020081030a.pdf (October 30, 2008).

[42] Summit Blue Consulting, *An Analysis of Potential Ratepayer Impact of Alternatives for Transitioning the New Jersey Solar Market from Rebates to Market-Based Incentives* (hereinafter "New Jersey Solar Program Cost Study), available for download at http://www.njcleanenergy.com/files/file/2NJBPU%20SACP%20RPI%20Analysis%20Report-revised-0806.pdf August 2007 at 18-20.

B. To Support Greater Market Diversity and Maximize the Ability of Ratepayer Funds to Leverage PV Development, The PSC Should Direct NYSERDA or Utility Program Administrators to Offer Incentives to Systems Up to 2MW in Size.

Beyond these budget matters, the PSC should take this opportunity to provide essential strategic direction to support a broader diversity of solar applications throughout New York State. One of the hallmarks of a robust state-based solar market is an incentive structure conducive to solar development in homes, businesses and governmental facilities. Incentives must be available across the full spectrum of customer classes and system sizes.

Unfortunately, due to severe funding constraints solar PV incentives offered through the RPS (and previously through the System Benefits Charge) have historically been limited to systems under 50kw. This fact, coupled with one of the most restrictive net metering policies in the country, has constrained solar energy as an economically viable option for New York's large commercial, industrial and governmental customers. It is critical that the PSC and NYSERDA work collaboratively to correct this situation. [43]

The goal of the solar program should be to maximize the installed solar capacity within the residential and non-residential market segments while minimizing the overall cost of doing so. To that end, the Solar Alliance recommends that the PSC require solar program administrators to allocate funding to the residential and non-residential market segments in approximately the same proportion as the market segment contributes to total utility retail electric revenue. Unused incentive funds within each market segment should carry forward into future years within the respective market segment; however the program administrator should retain flexibility to move unused funding to other market segments if market conditions warrant. Significant adjustments should be implemented only after public notice and opportunity for comment.

Extending solar PV incentives to larger commercial, industrial and governmental customers is important for reasons of equity and in the interest of promoting a more

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[43] Residential systems make up 71% of all installed PV capacity funded through the NYSERDA rebate program to date, while commercial and industrial applications represent a 29% share. *New York Energy $mart Program Quarterly Evaluation Report* (November 2007) at Table 5-7. California and New Jersey are the United States' two leading solar PV markets. In these states, commercial installations represent well over half of all solar capacity installed to date.

balanced solar market. Extending solar incentives to these larger systems means that New York can maximize the use of available funds to meet RPS goals. Moreover, tapping the large system market and increasing overall deployment will accelerate PV system cost reductions throughout the industry. The time is ripe for extension of the PV incentive program given recent changes in New York's net metering law, enabling commercial customers with systems up to 2MW to take advantage of this equitable billing arrangement.

C. The Solar Incentive Program Should Maintain A Sustainable Yearly Growth Rate After 2012.

The RPS cost study shows a regression in incremental installed capacity to pre-2009 levels beginning in 2012. This makes no sense. The goal of the solar program should be to continually build on the earlier achievements and market activity until extra-market support is no longer necessary. While the Solar Alliance understands that the Commission is not determining the solar program budget beyond 2012 in the instant proceeding, it is nevertheless important to place a three-year interim program in the context of where the NY solar market has been – and where it is going. The Solar Alliance is deeply concerned that the assumption of a return to pre-2009 market support activity reflects a bias against continued RPS support beyond the next three year period. The Commission should, in its final order in this proceeding, clearly articulate its strategic vision for solar resource development and indicate whether it embraces the Governor's Renewable Energy Task Force objective of facilitating grid parity by 2017.

VI. Conclusion

The Solar Alliance respectfully requests that the Commission modify the RPS consistent with the preceding comments.

Respectfully submitted,

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Solar Alliance, New York Team Leader

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APPENDIX I

Energy and Capacity Valuation of Photovoltaic Power Generation in New York

Prepared by Richard Perez & Thomas E. Hoff, Clean Power Research

for the Solar Alliance and the New York Solar Energy Industry Association

March, 2008.

Executive Summary

This initial investigation in the value of photovoltaic (PV) power generation for New York focuses on the value to utilities. Specifically, the report asks whether PV net-metering constitutes a loss to the utilities which would negatively affect their rate payers.

The value of customer-sited PV generation to a utility includes generation-level energy and capacity, as well as environmental compliance benefits, fuel price hedge protection, and location specific-transmission and distribution (T&D) and loss savings benefits.

Results show that, because of the strong coincidence that exists between peak demand and solar resource availability both downstate and upstate, the generation energy and capacity value of PV alone amount to 75% of the revenue loss utilities would incur from their net-metered customers. It is very likely that the other value elements: environmental compliance, fuel price risk mitigation, and localized T&D/loss savings, which will be quantified in detail in a subsequent study, will bridge the remaining 25% gap[1], making distributed PV a net benefit to New York utilities, and by extension to their rate payers.

Introduction

What is the value of distributed photovoltaics (PV)? The answer is driven by the perspective of the one who is asking the question [2, 4, 5]. Table 1 conceptually illustrates how to incorporate perspective for a program that is designed to incentivize

[1] a modest carbon fee of $40 per metric ton alone would bridge much of this gap

individual owners to invest in PV. The table suggests that there are really three questions, not just one question.

1. Individual customers (i.e., potential system owners) want to know if there is sufficient economic incentive to invest; this occurs when incentives plus utility bill savings plus tax effects exceed PV system cost

2. Utilities want to know if the cost savings associated with the addition of PV to the utility grid offset the reduced revenue from lower utility bill sales

3. Constituents (ratepayers and taxpayers) want to know if the benefits to them exceed the cost of the direct incentive program and tax effects

Table 1
Effect of Perspective on Question: What is the Value of PV?

	System Owners	**Utility**	**Constituents**
Equipment	cost		
Incentives	benefit		cost
Utility Bill	benefit	cost	
Tax Effects	benefit		cost
Utility Cost Savings		benefit	
Constituent Benefits			benefit
Net Benefit	???	???	???

Objective

As an initial step towards a comprehensive New York State PV valuation study, the objective of this project is to assemble and contextualize the key underlying facts central to the utility's perspective. Some of the key benefits to the utility include energy production value, generation capacity value, transmission and distribution (T&D) system capacity deferral value, loss savings, environmental value, and fuel price hedge protection [3]. This initial work will focus on the energy production value and the generation capacity value.

Subsequent phases of this work should address the comprehensive value to all parties involved. In particular, the following benefits to the utility need to be evaluated:

- T&D capacity deferral value
- Loss savings

- Environmental compliance value
- Fuel price hedge protection

In addition, the benefits to ratepayers need to be addressed, including:
- Long-term, system-wide rate protection [1]
- Environmental health benefits [1]
- Business development opportunities (job and business creation) [1]
- Use of in-state resource and reduction of state imports
- Power grid security enhancement
- Disaster recovery [3]

While this study focuses on the generation energy and capacity value to the utility, a preliminary discussion of the value of the other benefits to the utility and ratepayers is provided in the Appendix 2.

Value to Utility

Energy Value

The value of PV-generated energy was quantified at the wholesale level using the location-based-marginal energy generation pricing administered by NYISO for the year 2007 for three selected regions in the state of New York: Western, Capital and Long Island (see Figure 1) while considering three PV geometry configurations: South-facing tilted (30° slope), southwest-facing tilted (30° slope), and horizontal.

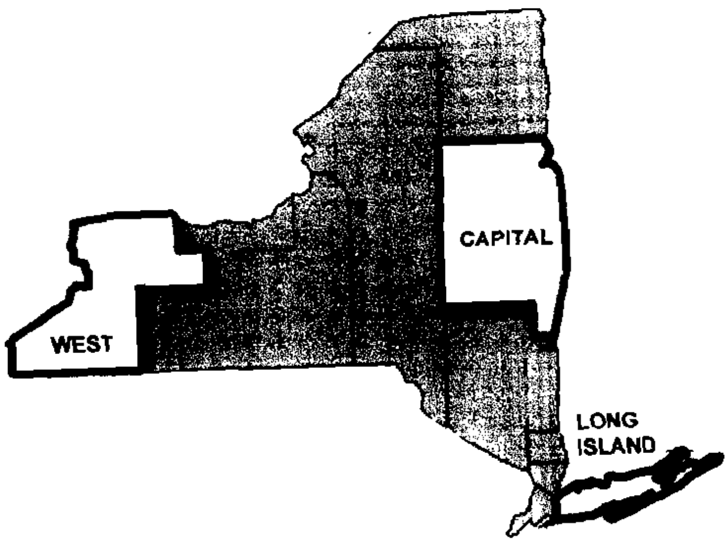

Figure 1: Selected NYISO Electrical regions

The regions were selected to represent the electrical and climatic landscape of New York State, from the Long Island load pocket (most expensive wholesale energy) to the western frontier (typically the least expensive rates), with the capital region at a crossroads.

The PV configurations were selected to represent optimal energy gain (south-facing tilt), optimal summer peak time match (southwest-facing tilt) and least-cost commercial applications (horizontal).

PV Energy Yield: Table 2 summarizes the energy production of all selected PV configurations in each region in 2007.

TABLE 2
PV Output in kWh Normalized to one $kWac_{ptc}$[2] Systems

Location	PV Geometry		
	South 30° Tilt	Southest 30° Tilt	Horizontal
Long Island	1,652	1,560	1,415
Capital	1,593	1,497	1,360
West	1,457	1,388	1,288

Overall the energy yield in Long Island was roughly 15% higher than in the west and 6% higher than in the Capital region. South-facing tilted installations produce 10-13% more energy than a horizontal installations, while a southwest orientation still results in a 6-9% gain over the horizontal.

Wholesale Energy Value: Table 3 compares the wholesale value of PV energy when sold at the location-based marginal pricing (LBMP) and compares this value to the average LBMP traded in each considered region. The table includes both year-around and summer (June to September) values.

TABLE 3
LBMP Value of PV Energy vs. Average LBMP pricing ($/MWh)

ALL YEAR	PV Geometry			AVERAGE PRICE
Location	South 30° Tilt	Southest 30° Tilt	Horizontal	
Long Island	$ 106	$ 109	$ 107	$ 93
Capital	$ 78	$ 78	$ 78	$ 73
West	$ 61	$ 62	$ 61	$ 55
SUMMER	PV Geometry			AVERAGE PRICE
Location	South 30° Tilt	Southest 30° Tilt	Horizontal	
Long Island	$ 117	$ 123	$ 115	$ 91
Capital	$ 80	$ 81	$ 79	$ 69
West	$ 72	$ 73	$ 71	$ 60

[2] AC output at PTC conditions: 20 degrees C ambient and 1000 Watts per m^2 solar irradiance. The AC-PTC rating is typically 70%-80% of the dc system rating at standard test conditions (stc).

On a year-around basis, the PV MWh are worth more than the average traded price -- 7%, 11% and 15%, respectively for the Capital, West and Long Island regions. In summer the solar premium is higher, respectively 16%, 20% and 30% for the three regions. The southwest orientation yields a slightly higher per MWh premium, reaching 35% in summer for Long Island -- $123/Mwh against a $91/Mwh average traded price.

Congestion Pricing: In addition to the LBMP, the NYISO congestion pricing data reflect the value of producing the energy locally over importing it in the considered region. Congestion pricing data are summarized in Table 4. Congestion pricing represents the penalty imposed on out-of-zone generators (i.e., not imposed on PV that produces energy locally). Data show congestion pricing is a significant issue in the Long Island load pocket. There, the local congestion premium garnered by PV is considerably higher than the mean local congestion premium, exceeding 100% for southwest-oriented systems in summer.

TABLE 4
Avoided Congestion Pricing from Local PV Generation ($/MWh)

ALL YEAR	PV Geometry			AVERAGE PRICE
Location	South 30° Tilt	Southest 30° Tilt	Horizontal	
Long Island	$ (32)	$ (34)	$ (32)	$ (24)
Capital	$ (7)	$ (7)	$ (7)	$ (8)
West	$ (2)	$ (2)	$ (2)	$ (2)
SUMMER	PV Geometry			AVERAGE PRICE
Location	South 30° Tilt	Southest 30° Tilt	Horizontal	
Long Island	$ (35)	$ (39)	$ (34)	$ (19)
Capital	$ (1)	$ (2)	$ (1)	$ (1)
West	$ -	$ -	$ -	$ -

Capacity Value

Quantifying Capacity Credit: We used two metrics that were recently recommended by a panel of utility, solar industry and government professionals [7]. The two metrics are the Effective Load Carrying Capability (ELCC) and the Solar Load Control Capacity (SLC). Both metrics are described in detail in Appendix 1. The ELCC represents the increase in capacity available on a local grid and that is attributable to the added PV generation without increasing the grid's loss of load risk. The SLC reflects the synergy that exists between load control (e.g., demand response) and PV generation. The metric is an answer to the question: Given a certain amount of Demand Response (DR) available to a utility, how much more guaranteed load reduction is possible when PV is deployed?

Table 5 reports the ELCC and SLC of PV for grid penetration ranging from 2% to 20% as derived from the analysis of 2007 PV generation and load data. The table also reports the amount of demand response in MWh needed to achieve 100% PV capacity credit and the amount of DR that would have been necessary to achieve the same objective without PV. Capacity credit results are further summarized in Figure 2 for the southwest facing orientation, using a composite of the two metrics.

TABLE 5

PV Capacity Credit (%) as quantified by the ELCC and SLC Metrics and DR (MWh) required to firmly displace peak with, and without PV

	PV PENETRATION	2%	5%	10%	15%	20%
Capital	ELCC South 30	71%	62%	59%	41%	31%
Capital	ELCC Southwest 30	84%	79%	70%	50%	39%
Capital	ELCC Horizontal	67%	60%	57%	42%	32%
Long Island	ELCC South 30	53%	53%	53%	43%	32%
Long Island	ELCC Southwest 30	70%	70%	70%	48%	38%
Long Island	ELCC Horizontal	51%	51%	51%	44%	33%
West	ELCC South 30	87%	81%	74%	59%	44%
West	ELCC Southwest 30	90%	90%	74%	59%	44%
West	ELCC Horizontal	81%	75%	73%	59%	44%
Capital	SLC South 30	75%	65%	56%	44%	40%
Capital	SLC Southwest 30	85%	82%	65%	57%	45%
Capital	SLC Horizontal	70%	63%	60%	45%	41%
Long Island	SLC South 30	55%	53%	52%	48%	46%
Long Island	SLC Southwest 30	72%	71%	60%	55%	53%
Long Island	SLC Horizontal	55%	54%	53%	49%	45%
West	SLC South 30	87%	85%	74%	55%	33%
West	SLC Southwest 30	88%	88%	75%	57%	34%
West	SLC Horizontal	83%	82%	69%	52%	32%
Capital	MWh DR South 30	26	86	573	2,508	9,035
Capital	MWh DR Southwest 30	12	42	355	1,510	7,081
Capital	MWh DR Horizontal	29	100	585	2,376	8,839
Long Island	MWh DR South 30	63	246	1,028	2,711	7,330
Long Island	MWh DR Southwest 30	32	120	645	1,705	4,639
Long Island	MWh DR Horizontal	70	258	1,058	2,713	7,065
West	MWh DR South 30	15	51	476	4,931	32,095
West	MWh DR Southwest 30	10	39	459	4,755	31,906
West	MWh DR Horizontal	28	90	646	5,233	32,330
Capital	MWh DR No PV	117	828	5,566	18,949	44,901
Long Island	MWh DR No PV	198	1,100	6,602	22,264	51,941
West	MWh DR No PV	278	2,481	13,684	40,590	109,465

Results in Table 5 and Figure 2 show that the capacity credit of PV in the State of New York is high. The capacity credit decreases with penetration[3], but remains significantly higher than the resource's capacity factor at high penetration (note that 20% penetration represents well over 6,000 MW of PV in New York). The amount of demand response necessary to guaranty firm peak reduction with PV is a small fraction of the amount that would be necessary to achieve the same without PV – e.g., for Long Island at 10% penetration the DR requirement with southwest facing PV would be 645 MWh; achieving the same objective without PV would require 10 times more DR.

Interestingly the capacity credit extracted from the 2007 load and PV output data is found to be higher for the upstate regions than downstate, at least a low penetration. At high

[3] The reason for this decrease is that, as PV penetration exceeds the size required to shave the highest demand peaks which are highly correlated with the solar resource, PV must meet secondary peaks and non peak loads which are less correlated with solar gain.

penetration Long Island retains a higher capacity credit. This upstate trend is consistent with a previous observation by the authors that compared the evolution of effective capacity nationwide from the late 1980's to the early 2000's [8]. A general increase in PV capacity for northern utilities had been noted possibly traceable to increased cooling demand from higher technology use, as well as a gradual winter and summer temperature increase likely linked to intensifying global warming. The West and Capital regions are solidly summer peaking with 2007 summer to winter peak ratios of 1.15 and 1.20 respectively. The Long Island region is highly summer peaking with a 2007 summer-winter ratio of 1.50 -- explaining the greater resilience of capacity credit at high penetration (see note 2 above).

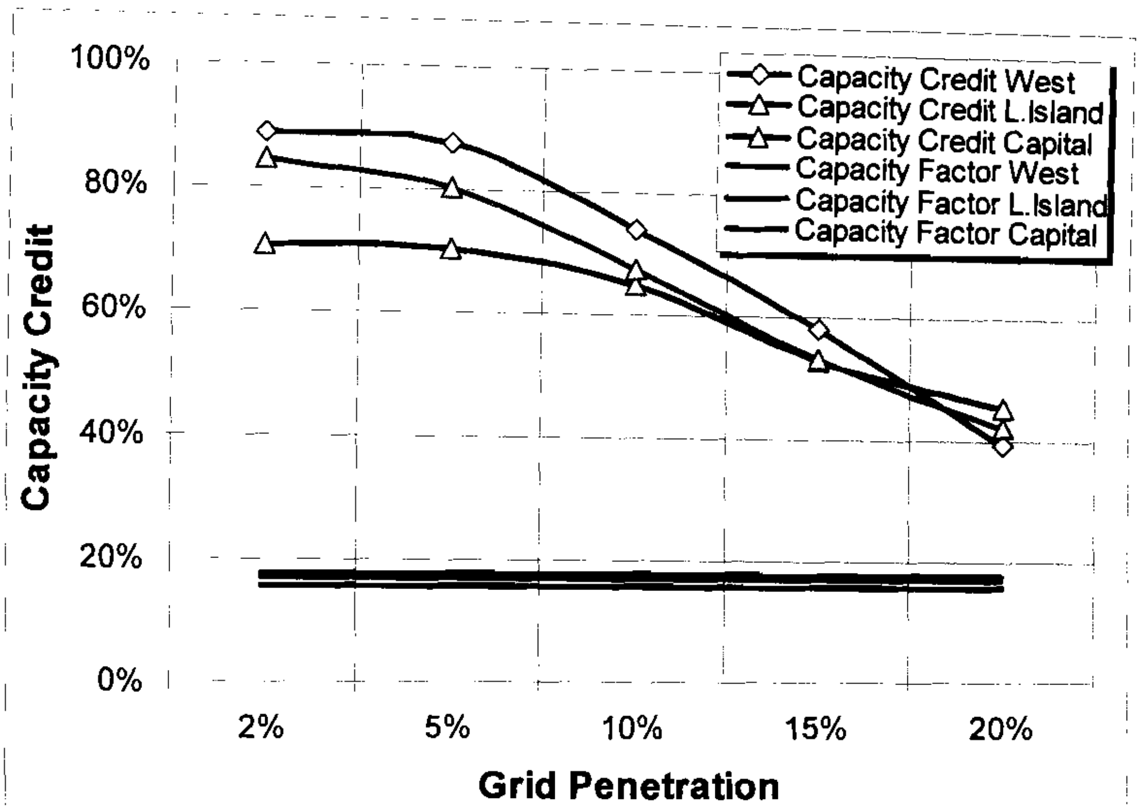

Figure 2: Composite capacity Credit[4] for the southwest-facing tilted PV configuration, compared to the resource's capacity factor[5]

The main reasons for the upstate downstate difference, however, are the demand load shapes and peak-day solar conditions. Figures 3, 4 and 5 display the solar resource for all PV configurations and load shape on peak day for the West, Capital and Long Island regions respectively. The figures also show the load impact of a 10% PV penetration for southwest facing installations. The upstate peaks occur earlier in the day and have less of an evening shoulder (i.e., more commercial cooling relative to residential cooling). Also,

[4] The composite capacity credit is the mean of the ELCC and SLC metrics

[5] The capacity factor is the mean output divided by the rated capacity

while the solar resource was significant during the downstate peak day (August 8), it was ideal during the upstate peak day (August 2).

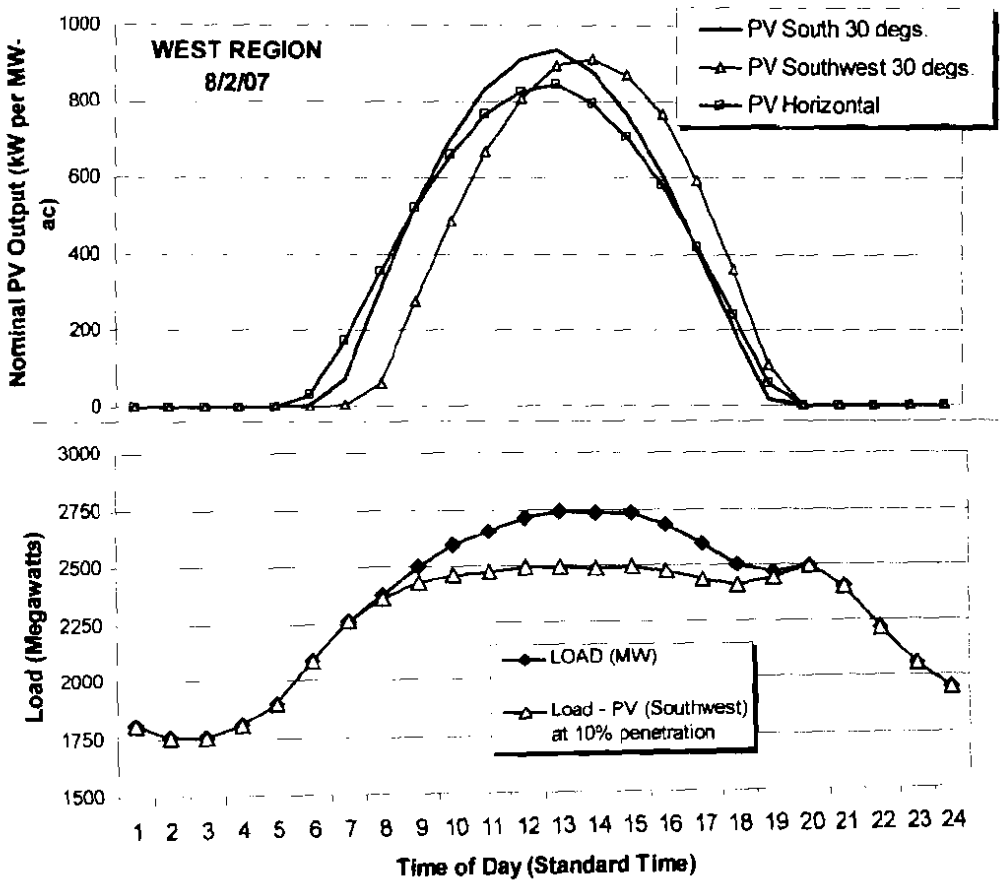

Figure 3: Peak day PV resource and load in the West region

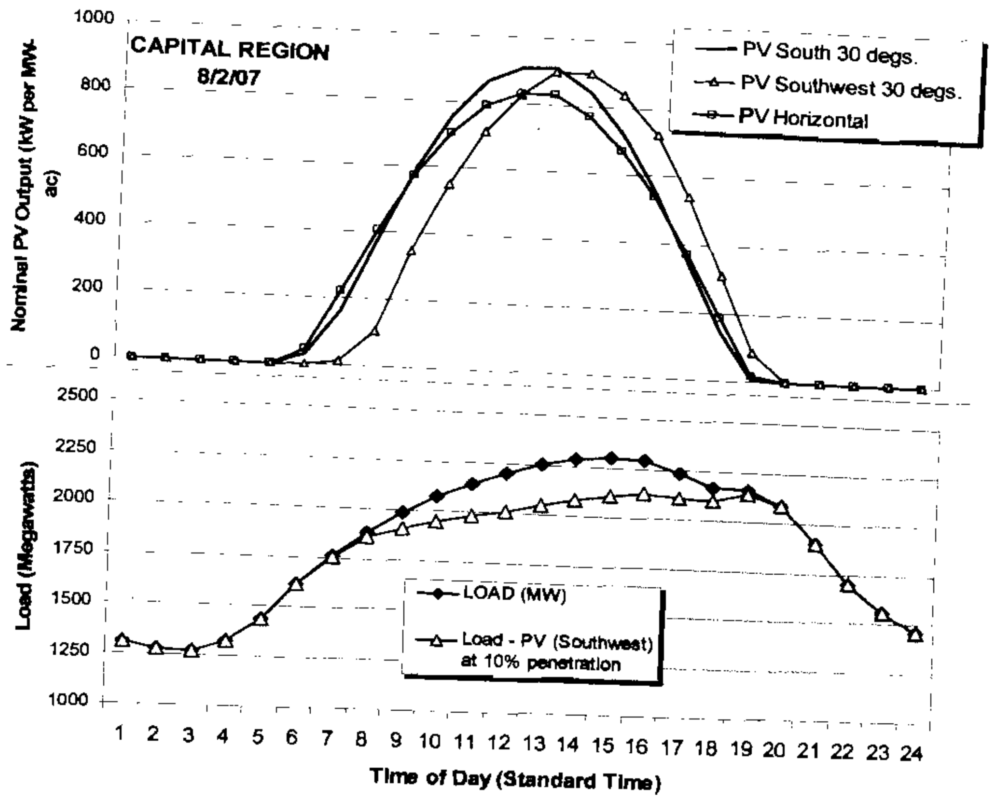

Figure 3: Peak day PV resource and load in the Capital region

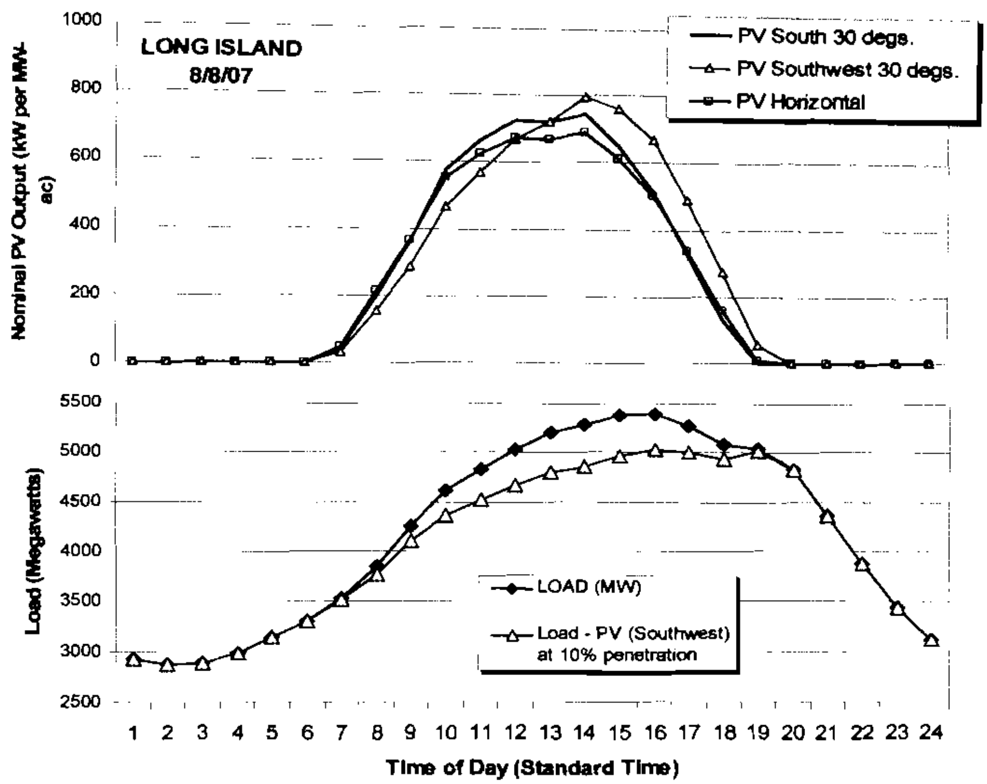

Figure 4: Peak day PV resource and load in the Long Island region

Capacity value: While capacity is not a directly traded commodity, its value is quantifiable trough DR programs, that, in effect provide up to $100 per kW per year for stand-by capacity [e.g., 6] that may, or may not be called upon. Another gauge of capacity is demand-based tarrification offered to large utility customers that is valued at $180/kW per year upstate (National Grid) and as high as $250/kW per year downstate (ConEdison).

In the case of DR, it as been demonstrated that the addition of PV on the grid firmly diminishes the need for DR and saves money to the DR program administrator, commensurately with the capacity credit of the solar resource -- a windfall that PV does not currently capture. The 2007 data analyzed in this study and presented in Table 5 fully confirm this assertion.

Taking the smaller DR number of $100/kW as a gauge of regional capacity value downstate, the 70% capacity credit of PV would be worth an additional $45 for each PV-generated MWh – a value the wholesale level that is not currently captured by PV but directly benefits the utilities.

Conclusion

The sum of the wholesale energy and capacity value of PV equals $0.109/kWh energy + $0.045/kWh capacity = $0.154/kWh in the Long Island region. The net metered-residential customer retail rates in that region currently equals about $0.20/kWh. As a result, these two values alone amount to over three-quarters of the net metered-residential customer retail rates in that region. The addition of loss savings, T&D system benefits, environmental compliance value, and fuel risk mitigation benefits unique to PV will result in additional cost-savings to the utility and thus increase the value from the utility's perspective.

Thus, the answer to the question, "What is the value of PV," from the utility perspective is likely to be that **New York's utilities will have a net benefit from the net-metered deployment of PV in their service territories.**

Next Steps

The next steps in addressing the comprehensive value of PV include (1) calculating the other benefits to the utility, (2) evaluating the economics from the system owner's perspective, and (3) calculating the benefits to all the ratepayers.

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1. Hoff, T. E. and R. M. Margolis (2003) "Distributed Photovoltaics in New Jersey", Prepared Under NREL Contract AAD-2-31904-03, October 2003. http://www.clean-power.com/research/distributedgeneration/DistributedPVInNewJersey.pdf.

2. Hoff, T. E. and R. M. Margolis (2005) "Moving Towards a More Comprehensive Framework to Evaluate Distributed Photovoltaics", Prepared Under NREL Contract AAD-2-31904-03, June 6, 2005. http://www.clean-power.com/research/customerPV/EvaluationFramework.pdf.

3. Hoff, T. E, et. al. (2006). The Value of Distributed Photovoltaics to Austin Energy and the City of Austin. SOLICITATION NUMBER: SL04300013.March 17, 2006. http://www.austinenergy.com/About%20Us/Newsroom/Reports/PV-ValueReport.pdf

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APPENDIX 1 -- EFFECTIVE CAPACITY METRICS

Effective Load Carrying Capability (ELCC)

The ELCC metric was introduced by Garver in 1966[6] and has been used mainly by "island" utilities before the strengthening of continental/regional interconnectivity. The method was applied at Pacific Gas and Electric Company[7]. The ELCC of a power plant represents its ability to increase the total generation capacity of a local grid (e.g., a contiguous utility's service territory) without increasing its loss of load probability. The ELCC is determined by calculating the loss of load probability (LOLP) for two resources. The first resource is the actual resource with its time-varying output. The second resource is an "equivalent" resource with a constant output. The ELCC may be graphically visualized on a load duration curve plot. The example presented in figure 1 -- using load data from Rochester Gas and Electric and a PV penetration X/L = 20% (see case studies below) -- shows the utility load duration curve with and without PV, and also shows the load duration curve obtained with a constant output generator with an ELCC capacity calculated at 145 MW for this case study (see quantitative case studies below).

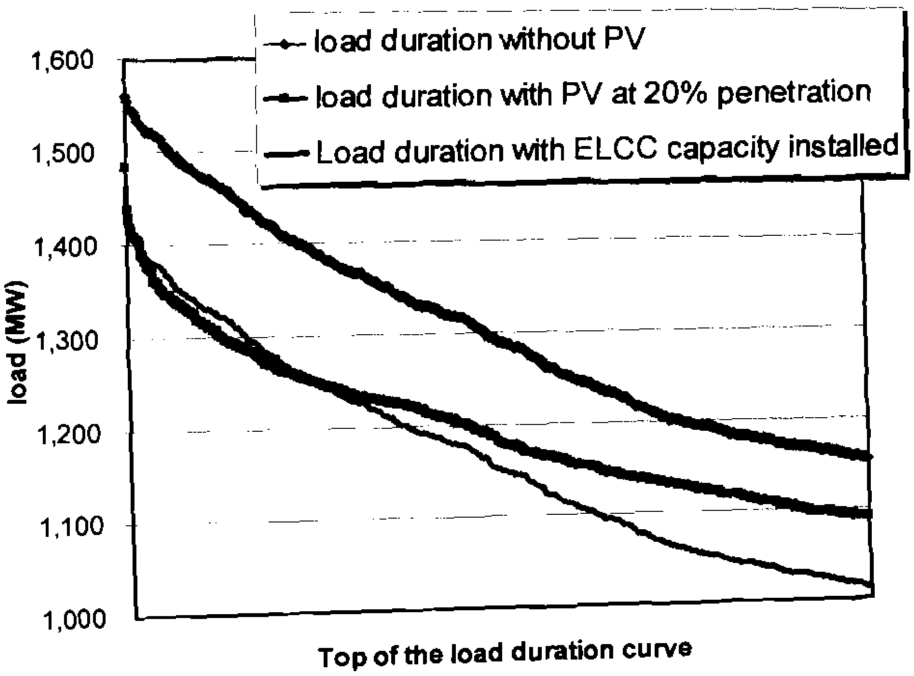

Figure 1. Comparing Load duration curves with and without PV to equivalent load duration curve assuming a constant output generator with an ELCC capacity. The above example is given for Rochester Gas and Electric (peak load = 1561 MW) and a PV penetration of 20% (312 MW). The ELCC calculated for this case figure is 47% (146 MW).

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[6] Garver, L. L., (1966): Effective Load carrying Capability of Generating Units. IEEE Transactions, Power Apparatus and Systems. Vol. Pas-85, no. 8

[7] T. Hoff, "Calculating Photovoltaics' Value: A Utility Perspective," IEEE Transactions on Energy Conversion 3: 491-495 (September 1988).

It has also been shown that ELCC could be estimated from simple proxy measurements of local characteristics, such as a utility's summer-to-winter peak load ratio (see Fig. 2).

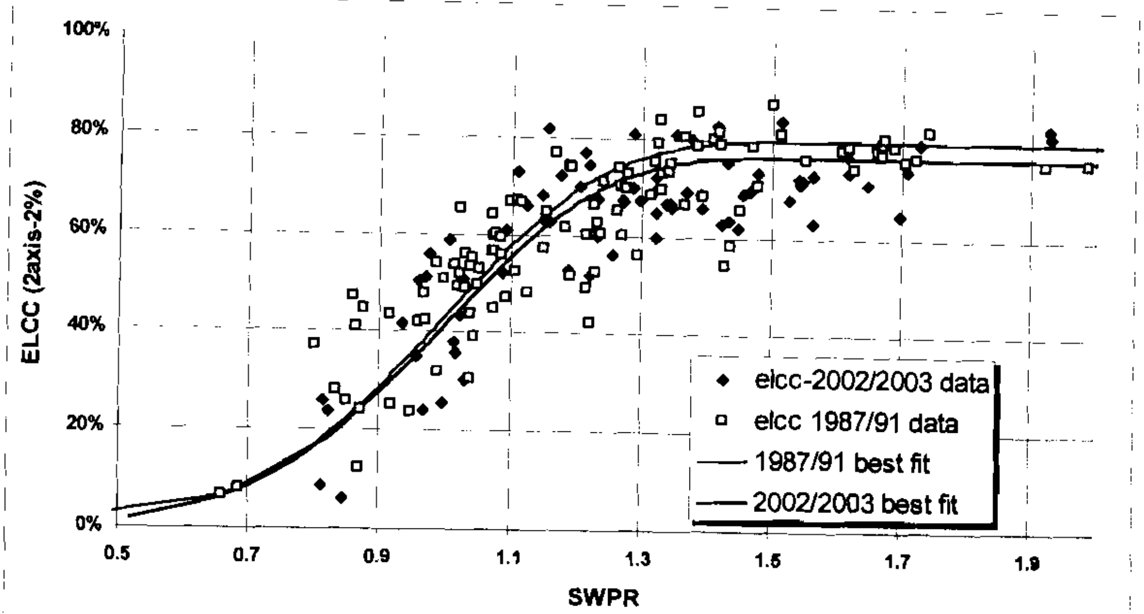


Figure 2. Relationship between ELCC and a utility's (or substation's) summer-to-winter peak load ratio.

Solar-Load-Control-based Capacity (SLC)

This metric answers the question: Given a certain amount of demand response available to a utility, how much more guaranteed load reduction is possible if PV is deployed?

It is illustrated in Figure 5.

Given a penetration p = X / L, the effective capacity is given by

$$SLC = (X - Y) / X \tag{6}$$

Where Y is the amount of load reduction achieved in the absence of PV with the same cumulative amount load control needed to guaranty a load reduction equal to X with PV

As above, this metric accounts directly for grid penetration.

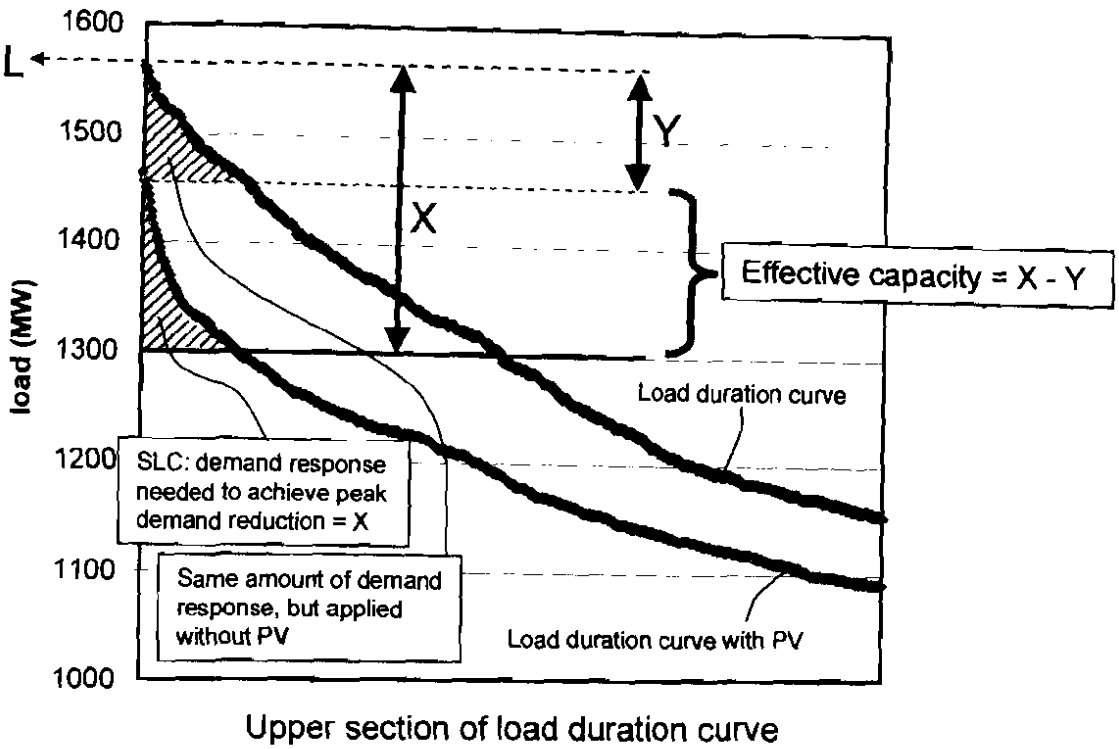


Figure 3. The same amount of demand response load management can be added to mitigate peak load with or without PV present, resulting respectively in load reduction to the Y' and X threshold lines. The effective capacity of PV is measured by its ability to reduce peak loading from the blue to the red threshold. The above illustration is for Rochester gas and Electric with a 260 MW installed PV capacity (SW facing).

APPENDIX II

WORKING DRAFT

THE ECONOMIC IMPACT OF GENERATING 100 MW OF ELECTRICITY VIA PV INVESTMENTS IN NEW YORK STATE

Workforce Development Institute

24 Fourth Street

Troy, New York 12180

Panel on

"Working for Sustainability"
Clean Energy, Green Jobs and Global Warming Solutions
September 10, 2008
6:30-9:30pm
New York State United Teachers
800 Troy Schenectady Rd
Latham, NY 12210

Summary

This presentation summarizes the results of an economic impact analysis of investing $370 million for a 100 MW photovoltaic (PV) system in New York State.

Investments in PVs and other renewable energy systems can have significant beneficial impacts—adding both new energy supplies and high-wage jobs—thereby, tempering economic problems in industries and communities around the State.

New York has the industrial infrastructure to support the development of the PV industry; new investment in the infrastructure can only enhance the State's comparative advantage in producing PV components as the nation moves toward a renewable energy future.

Government regulatory and tax policies that encourage investment in renewable energy, and electric prices, are major underlying factors that will determine future investment in the PV industry.

Many of those jobs that would be created by the economic activity generated by the investment (described below) currently exist and cover a broad range of occupations.

The cost breakdown in the analysis relies on estimates made by the Renewable Energy Policy Project (REPP) based in Washington, DC. On the basis of REPP estimates, we assumed that $300 million of the $370 million investment will be accounted for by expenditures in the manufacturing sector. The balance of the investment or $70 million would be accounted for by expenditures in the construction and installation sector. In addition, the cost breakdowns of various components of the system are allocated to specific North American Industrial Classification System (NAICS) defined industries.

We conducted the analysis by employing an input-output model developed by Economic Modeling Systems Inc., (EMSI). The analysis indicates that a $370 million investment would result in new jobs and earnings across a range of industries—obviously, manufacturing and construction would gain the most.

The $370 million private investment would result in 1,070 direct jobs-- 800 in manufacturing and 270 in construction and installation. These jobs would generate $70 million in new earnings. The investment would also generate 1,000 indirect jobs and $50 million in new earnings.

The total economic impact of the $370 million investment: 2,070 jobs and $120 million in earnings.

(The analysis assumes no public subsidies.)

Three policy areas that are important:

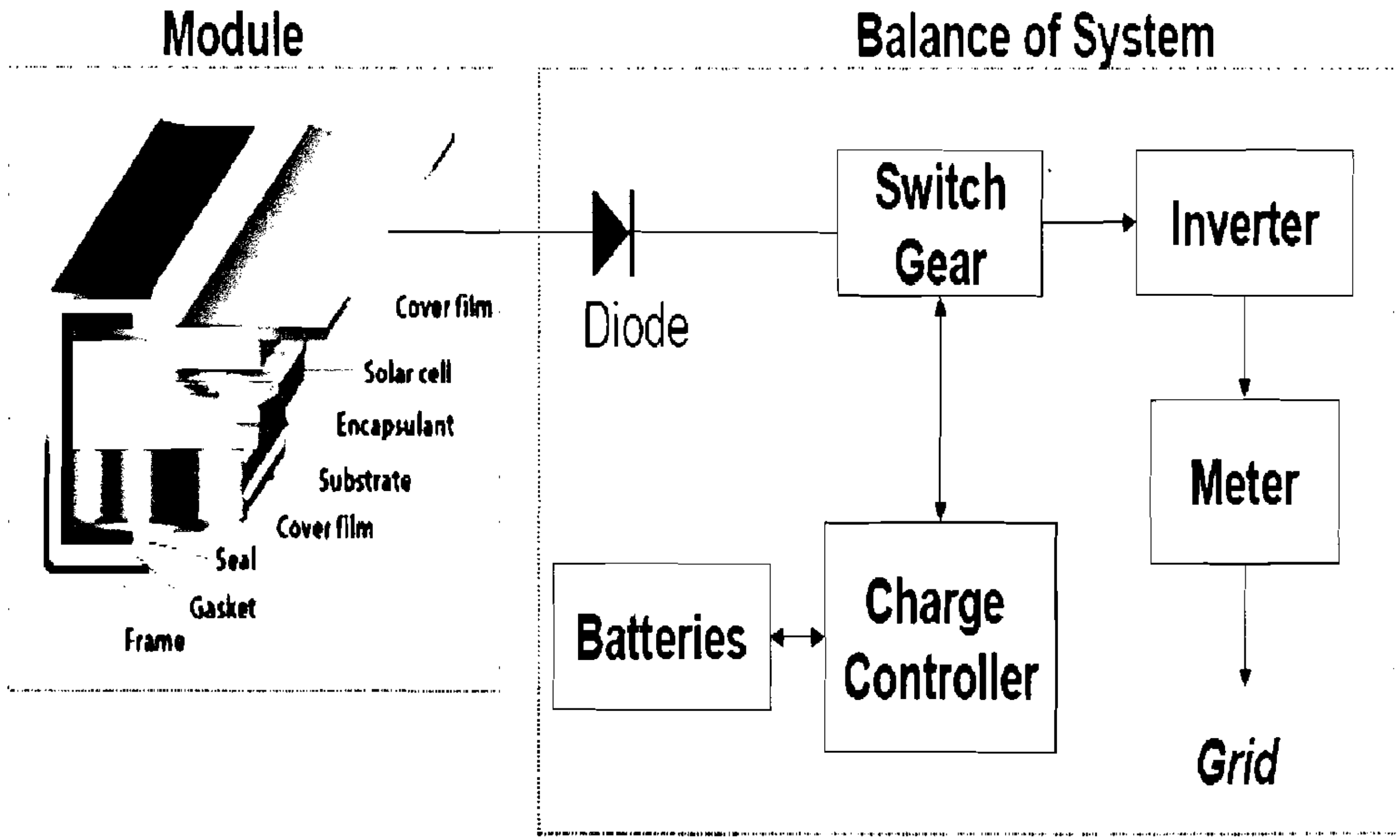
Regulatory policy that encourages the use of PV installations. This is being done through the Renewable Portfolio Standard (RPS), and tax policy at the Federal level.

An economic development policy that provides incentives for investment in the industry, taking into account market demand (downstate) and presence of manufacturing facilities (upstate).

A workforce development policy that enhances replacement of aging workers and ensures broad access to jobs in these industries.

I. NREL Component Breakdown

Solar PV Components



Source: George Sterzinger and Matt Svrcek, *Solar PV Development: Location of Economic Activity*, Renewable Energy Policy Project, Technical Report, January 2005.

II. WDI Cost Allocation

Industry Distribution of $367 million in total Expenditures for 100 MW PV Deployment

Construction and installation	**20% of total cost**	$73,434,125
Manufacturing	**80% of total cost**	$293,736,501
Module	**78% of total manufacturing**	$229,114,471
Solar cell	68% of module cost	$154,652,267.67
Electrical materials	9% of module cost	$20,391,187.89
Packaging	24% of module cost	$54,071,015.07
Inverter	**11% of total manufacturing**	$32,311,015
Balance of System	**11% of total manufacturing**	$32,311,015

III. WDI Industry Allocation ($millions)

NAICS	NAICS Industries	Components	
238210	Electrical Contractors	Construction and Installation	$73
325211	Plastics Material and Resin Manufacturing	Encapsulant	$13
326113	Unlaminated Plastics Film and Sheet (Except Packaging) Manufacturing	Rear Layer	$13
327211	Flat Glass	Top Surface	$13
331422	Copper Wire (except Mechanical) Drawing	Wiring	$20
332322	Sheet Metal Work Manufacturing	Frame	$15
334413	Semiconductors and Related Devices	Solar Cells, Blocking Diode	$155
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	Meter	$6
335313	Switchgear and Switchboard Apparatus Manufacturing	Circuit Breakers and Fuses	$4
335911	Storage Batteries	Batteries	$14
335931	Current-Carrying Wiring Device Manufacturing	Module Electrical Connections, Switch Gear	$8
335999	Electronic Equipment and Components, NEC	Charge Controller, Inverter	$32
	Total		$366

Source: Industry –Component allocation adapted from George Sterzinger and Matt Svrcek, *Solar PV Development: Location of Economic Activity, Renewable Energy Policy Project*, Technical Report, January 2005; WDI Analysis

IV. IMPACT

The manufacture and installment/deployment of 100 MW of PV in New York State would add slightly over 2000 direct and indirect jobs to the economy. The installment phase of the deployment would create over 250 jobs in construction. Overall these jobs would add nearly $120 million in new worker earnings.

NAICS Code	Industries	New Jobs	New Earnings (000's)	Annual Earns. (000's)
23	Construction	267	$14,817	$57
31-33	Manufacturing	818	$53,220	$71
42	Wholesale trade	72	$5,231	$78
44-45	Retail trade	172	$5,227	$31
48-49	Transportation and warehousing	42	$2,156	$48
51	Information	20	$1,883	$98
52	Finance and insurance	34	$3,817	$175
53	Real estate and rental and leasing	56	$2,658	$48
54	Professional and technical services	66	$5,453	$88
55	Management of companies and enterprises	18	$2,221	$137
56	Administrative and waste services	58	$2,080	$38
61	Educational services	24	$851	$36
62	Health care and social assistance	161	$8,101	$46
71	Arts, entertainment, and recreation	21	$701	$40
72	Accommodation and food services	80	$1,832	$24
81	Other services, except public administration	57	$1,806	$28
90	Government	103	$6,055	$61

Note: WDI Analysis; EMSI Input-Output Model. Numbers are rounded and industries gaining less than eighteen jobs are excluded. The EMSI input-output model in this report is created using the national Input-Output matrix provided by the Bureau of Economic Analysis. This is combined with the national Total Gross Output, the regional Total Gross Output, the land area of the subject region, regional DIRT data and regional in/out commuter patterns in order to calculate regional requirements, imports and exports. After using matrix algebra to calculate the regional multiplier, the resulting matrix is multiplied by the sales vector and converted back to jobs or earnings. Specifically, this data comes from the U.S. Department of Commerce, Bureau of Economic Analysis, Industry Economic Accounts: Benchmark & Annual Input-Output (I-O) Accounts.

Manufacturing 100MW of PV components will create over 800 new high paying manufacturing jobs in New York State. Major job gains would occur in the following industries.

NAICS Code	Industries	New Jobs	Annual Earnings Per Worker (000)
325	Chemical manufacturing	25	$85
326	Plastics and rubber products manufacturing	50	$52
327	Nonmetallic mineral product manufacturing	80	$60
331	Primary metal manufacturing	200	$74
332	Fabricated metal product manufacturing	90	$57
334	Computer and electronics manufacturing	90	$106
335	Electrical equipment and appliance mfg.	260	$72

Note: WDI Analysis; EMSI Input-Output Model. Numbers are rounded and industries gaining less than ten jobs are excluded. See detailed I-O note in the previous slide. In order to capture a complete picture of industry employment, EMSI basically combines covered employment data from Quarterly Census of Employment and Wages (QCEW) produced by the Department of Labor with total employment data in Regional Economic Information System (REIS) published by the Bureau of Economic Analysis (BEA), augmented with County Business Patterns (CBP) and Non-employer Statistics (NES) published by the U.S. Census Bureau. Projections are based on the latest available EMSI industry data combined with past trends in each industry and the industry growth rates in national projections (Bureau of Labor Statistics) and states' own projections, where available. EMSI also uses data from NYSDOL.

SUMMARY WDI ESTIMATES

MANUFACTURING: ≈ 800

CONSTRUCTION AND INSTALLATION: ≈ 270

[illegible]
[illegible]

OTHER JOBS IN ECONOMY: ≈ 1000

TOTAL JOBS CREATED: ≈ 2070

TOTAL EARNINGS: ≈ $ 120 MILLION

Workforce Development Institute
www.wdiny.org

V. New York's Industrial infrastructure for PV production

NAICS Code	Description	2006 Jobs	2010 Jobs	Annual Earnings Per Worker	2006 Establishments
238210	Electrical contractors	60,017	62,312	$55,457	5,009
334413	Semiconductors and related device mfg.	9,838	9,434	$119,895	67
332322	Sheet metal work manufacturing	5,677	5,399	$57,436	231
335999	Miscellaneous electrical equipment mfg.	1,775	1,033	$75,303	39
334515	Electricity and signal testing instruments	1,469	1,114	$72,349	47
331422	Copper wire, except mechanical, drawing	1,401	1,454	$63,937	14
326121	Unlaminated plastics profile shape mfg.	1,271	1,020	$70,906	19
335313	Switchgear and switchboard apparatus mfg.	375	282	$74,856	24
335911	Storage battery manufacturing	139	64	$35,330	1
	Total	**81,962**	**82,111**	**$64,501**	**5451**

Source: EMSI Complete Employment - September 2007. Includes data from the New York State Department of Labor

NYS's Comparative position in these industries

NAICS Code	Description	2006 Jobs	2006 LQ	2010 LQ
331422	Copper wire. except mechanical. drawing	1,401	1.03	1.23
335999	Miscellaneous electrical equipment mfg.	1,775	0.98	0.57
238210	Electrical contractors	60,017	0.91	0.94
332322	Sheet metal work manufacturing	5,677	0.82	0.80
326121	Unlaminated plastics profile shape mfg.	1,271	0.76	0.69
334413	Semiconductors and related device mfg.	9,838	0.69	0.67
334515	Electricity and signal testing instruments	1,469	0.57	0.56
335313	Switchgear and switchboard apparatus mfg.	375	0.19	0.17
335911	Storage battery manufacturing	139	0.14	0.08
	Total	**81,962**	**0.84**	**0.85**

Source: EMSI Complete Employment - September 2007

Source: EMSI; WDI Analysis

VI. Occupational Distribution for PV Manufacture

LABOR REQUIRMENTS PER MEGAWATT (in hours)

Project Activity	Occupational Category: Prof, Tech & Manage (0/1)	Clerical & Sales (2)	Service (3)	Agri, Fishery, Forestry (4)	Process-ing (5)	Mach Trades (6)	Bench-work (7)	Struc-tural Work (8)	Misc (9)	TOTAL by Project Activity
Glass	50				50	50			50	200
Plastics	50					250				300
Silicon	1,550	200	200		3 300	200	200			5,650
Cell Manufacturer	800				1 600		600	50	150	3,200
Module Assembler	3,500				1 600		8 250	750	6 850	20,950
Wires	150					1 700				1,850
Inverters	750				1 000	1 000	1 000	1 000		4,750
Mounting Frame	500	500				150	100	150	100	1,500
Systems Integration	8,900	2 850								11,750
Distributor Contractor/	1,500	1 500							1 000	4,000
Installer	2,500							8 000		10,500
Servicing	5,000									5,000
TOTAL by Occupation	25,250	5 050	200	0	7 550	3 350	10 150	9 950	8 150	**69,650**
TOTAL Person- Years	12.9	2.6	0.1	0	3.9	1.7	5.2	5.1	4.2	**35.5c**

a. Figures derived from a survey to determine labor requirements for a 2-kW residential PV installation.
b. Includes servicing for ten years of operation.
c. Totals for person-years do not add up due to rounding.

Source: Virender Singh with BBC Research and Consulting and Jeffery Fehrs, *The Work That Goes into Renewable Energy, Renewable Energy Policy Project*, Research report November, 2001; WDI.