Thursday February 27th, 2008
To: Council Member James F. Gennaro
Committee on Environmental Protection, *Chair*

From: Shaun Chapman, *The Vote Solar Initiative*

Re: Public Testimony on Solar Power in the City: Impediments & Opportunity

I want to thank the City Council and especially Councilmember James F. Gennaro for inviting us here today to speak. This is a great effort, and the council should be commended for taking up this work.

The ribbon cutting ceremony on a 50 kW solar installation on Cabrini Terrace took place On January 26th. Mid January is not always thought of as the ideal time to do an outside event in New York, nor would it be thought of as an ideal to time talk about solar. But, as it turns out it was an ideal time. Because even on that cold blustery, grey day the panels were still pumping out 25 kilowatt-hours (kWh) of clean solar power: Plenty of electricity to power the elevators that brought everyone to the roof to view the panels.

This is how it could be all over New York City. A place where space comes at such a premium, it is a shame that we waste so much of it by under utilizing our rooftop space.
Some of this is NOT the city of New York's fault, however. There are regulatory hurdles that must be passed at the state level. The first great obstacle to getting more solar (a distributed generation resource, which means it is consumed close to where it is produced) is improved state net metering and interconnection standards.

Simply, net metering is a billing arrangement that allows customers to receive credit for energy they produce at home, and should be treated no differently than efficiency standards. Interconnection standards are the codes and standards that allow customers to connect safely to and feed power back into the electricity grid. Together these policies can provide enormous barriers OR smooth the way to a cleaner energy economy in the city and state. If financial incentives are the engines that drive markets, then good, clear net metering and interconnection standards are the smooth paved roads.

NJ for instance has some of the most advanced net metering and interconnection standards on the books. That program (with advanced funding mechanisms) has made NJ one of the best places in the country for solar.

On Monday of this week, the Lieutenant Governor released the first report of his task force on renewable energy. Up front in the report Lt. Gov Paterson made clear that the state MUST take up revised net metering standards that include, but are not limited to:

- An overall system cap of no less than 2 Megawatts (MW)
- Allow all customer classes to participate – currently, and unthinkably, excludes businesses

It is the recommendation of the Vote Solar Initiative that the Council adopt a resolution that supports net metering in line with the Interstate Renewable Energy Council's (IREC) Net Metering and Interconnection Model Standards. It would also be helpful is members of this council contacted the legislators in their district to tell them they would like to see best in class net metering and interconnection standards adopted in the State of New York.
I look forward to any questions you may have, and thank you for your time,

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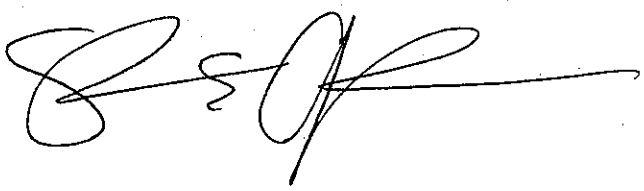

Along with this testimony please find:

- Copy of *Freeing the Grid 2007, Executive Summary*
- Copy of IREC's Net Metering Model Standards
- Copy of IREC's Interconnection Model Standards
- Copy of New York State Net Metering Report Card

COMMENTS ON BEHALF OF SUNPOWER CORPORATION

FEBRUARY 28, 2008

Good afternoon. My name is Jim Torpey and I am the Director of Market Development for Sunpower Corporation, a company that manufactures solar cells and installs solar electric generating systems for homes, businesses and utilities around the world.

Thank you for this opportunity to discuss the state of solar electric technology, industry and markets and the perspective of companies such as Sunpower regarding the role that New York State and particularly New York City can play in expanding the use of solar electricity in meeting our serious challenges of addressing climate change, improving energy security and strengthening the city's electric grid infrastructure. I will offer some ideas on ways that New York City and New York State can learn from other jurisdictions as New Yorkers seek to utilize clean solar technology for meeting greenhouse gas reduction targets, providing high paying, green technology jobs in the City and helping to relieve serious grid congestion within the five boroughs. The evidence suggests that distributed solar generation, paired with energy efficiency, can make significant reductions in New York City's carbon footprint.

I am particularly pleased to be here since I live in Brooklyn, and have a personal desire to see New York City become a major center of solar activity in the US. This discussion comes at an opportune time, following by a few days the release of Lt. Governor Patterson's Renewable Energy Task Force Report that calls for the installation of 100 MW of solar electric systems in New York State in the next four years.

For those of you who may not be familiar with the company, Sunpower is one of the largest US based solar companies, with over 3,500 employees in offices throughout Europe, Asia and the US. In addition to the San Jose California headquarters, we have regional offices in Richmond California, Hawaii, Southern California and Trenton New Jersey. Our company is unique in the industry in that we are integrated across the entire solar value chain from the manufacturing of solar cells and modules to the installation of some of the largest solar electric systems around the world, including the largest US installation recently completed at Nellis Air Force Base in Nevada totaling 14 MW. (A megawatt can power approximately 1,000 homes). In addition to installing some of the largest systems in the world, we sell products through a dealer network. We have for example, thirteen dealers in New York State including two installers located in New York City. Sunpower has the largest market share within the New York market. As a fully integrated solar company, we produce a solar cell that has the highest efficiency of any commercially available product- 22%, and hold numerous patents on everything from cells to large trackers for utility scale systems. Sunpower stock is traded on NASDQ and has a current market cap of about $5.5 billion with annual revenues of about $750 million.

People who have not been following the solar industry growth over the last few years may not realize that solar is no longer a cottage industry, but rather one that has begun to take its place as a serious alternative to more conventional fossil generation sources. In 2007 alone, there was over $1 billion in venture capital invested in the solar sector. There were a total of 2,400 MW of solar electric generation installed around the world. The industry has been growing at a compound rate of about 35-40% for the last five years and appears to be on track to continue this growth into the future. Of the solar capacity installed last year only 11% was installed in the US while two thirds of the total installations were completed in Europe, mainly Germany and Spain. In the US, the largest solar markets in 2006 and 2007 were California and New Jersey, where 64 Mw were installed in California and 21 MW installed in New Jersey. The solar industry is developing rapidly in California as the state moves toward its goal of installing 3000 MW in the next ten years. New Jersey has a program in place to reach a total installed capacity of 1700 MW by the year 2020. Other states in the region have also embraced clean distributed electricity generation with programs that will lead to hundreds of megawatts of solar installations over the next few years. Included in this group of neighboring states are Pennsylvania and Maryland, with smaller programs in Delaware, Massachusetts and Connecticut. These are some indications that the popularity of solar energy among the members of the public is starting to be translated into strong public policy within the local region.

At the same time, cities around the world, including New York City, are taking control of their own energy destiny to the extent possible with programs involving everything from Berkeley's solar loans that are treated as special assessments on the property tax bill to cities that are installing solar systems on their municipal buildings.

As the solar industry has expanded and the scale of mass production increased, the groundwork for significant cost reductions over the next five years has been established. What this could mean for the average residential customer in New York City is that a solar rooftop system that cost approximately $.55-$.67 per kilowatt hour (kwh) in 1990 and $.24-$.36 per kwh today will cost about $.12-$.18 per kwh in 2012. Since Con Ed's existing residential rates fall in this latter band, the achievement of these cost reductions could open a very large market for solar installers in the City. The goal of our industry is to reach grid parity (where solar electricity has the same price as electricity purchased from utilities) as soon as possible. For example, Sunpower has published its price reduction roadmap for the period between now and 2012. We have developed detailed plans for reducing costs along all the numerous parts of the solar value chain, from reducing silicon costs, to reducing the thickness of the cells, to reducing module manufacturing costs by locating module factories closer to end market customers, to producing products with simplified installation methods. Our goal, as communicated to Wall Street, is to reduce installed system prices by 50% by 2012- in five years.

In order to reach these cost reduction goals there must be a private /public partnership established between states and localities such as New York City and the solar industry. While we in the industry work hard to bring down the cost of solar equipment, we need help from you to enable the transition to a clean electric future.

The variations in the price of solar electricity as mentioned earlier depends on factors such as geography and the extent a region has developed a market infrastructure that can efficiently deliver product to customers. Although I am often questioned about the viability of solar in New York City, the experience in New Jersey shows that solar works in the mid Atlantic region. What is needed to get a vibrant market started is a combination of four elements. We in the solar industry are calling these elements the four Pillars. These key ingredients of any successful state or local market development activity are as follows :

1. net metering
2. reasonable access to the grid- appropriate Interconnection and permitting requirements
3. Short term incentives
4. Utility rate structures

Allow me to elaborate on each of these Four Pillars as they apply today in New York City.

1. Net Metering

Net metering is a low cost way for customers to receive credit for adopting clean technology at their home or business. There is currently a bill being considered in Albany to expand net metering opportunities to all customer classes. Please contact your representatives in Albany and urge that they pass this bill. There is a multi stakeholder letter of support currently being circulated that I would urge the City Council to consider signing as an indication of support for renewable energy. Adoption of this bill was also a recommendation of the Lt. Governor's Task Force report.

2. Grid Interconnection-

Interconnecting to the grid is an important aspect of integrating solar resources into everyday customer life. There are national standards that have been adopted to address all relevant safety and equipment issues. New York City has established layers of redundant permitting and equipment inspections that serve to unnecessarily drive up costs for New York City solar installations. I refer you to the January 2007 report[1] from the Center for Sustainable Energy at Bronx Community College for specific recommendations for bringing the New York City requirements up to date with national standards (e.g. UL)

3. Short Term Incentives

Several recent articles in the New York Times have chronicled the numerous tax breaks and incentives that are being provided to various electricity producing technologies such as coal and nuclear energy. Competing against these subsidized, mature industries requires that solar energy

[1] http://www.bcc.cuny.edu/institutionalDevelopment/cse/CUNYPV_%20PolicyAndBarriersStudy.pdf

In summary, I believe that New York State has an historic opportunity to endorse the findings of the Lt. Governor's recently released report that call for 100 MW of solar generation to be installed in the next four years around the State. In order to make these recommendations happen, the State will need to allocate the funds necessary to jump start the solar market in the State. If this is done, and the City addresses some of the local barriers specific to installations within the boroughs, the solar industry is prepared to invest significant dollars into developing a vibrant solar market within New York City. We at Sunpower and more broadly, within the solar industry, look forward to working with the New York City Council and the Mayor's office to make this goal into a reality.

Thank you for the opportunity to offer these remarks today.

Sincerely

Jim Torpey

Director- Market Development, Sunpower Corporation

February 28, 2008

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FOR THE RECORD Thursday February 28, 2008

New York City Council, Committee on Environmental Protection
Hon. James F. Gennaro, Chair

Testimony (outline) submitted by Christopher Neidl, Advocacy and Outreach Coordinator, Solar One. Contact: neidl@solar1.org

Background: PV entering the Mainstream:

i. Market doubling in size every 2-3 years
ii. Growth and innovation driving costs down
iii. Fossil fuel prices steadily rising
    1. Natural gas among the most volatile
        a. Quadrupled in price since 2000
iv. Fossil Fuel and Solar PV cost curves will converge within the next decade (Deutsche Bank).

Opportunities for Photovoltaics in New York City

- New York City Electricity Picture
    i. Rising electricity demands due to increased per capita use and growing population require us to expand our in-city capacity to generate more power
    ii. An EPA designated non-attainment area for criteria air pollutants, and
    iii. Has taken on commitments to cut greenhouse gas emissions by 30% by 2030 (PlaNYC, Local Law 55).
        1. Office of Long-Term Planning and Sustainability's Inventory of Greenhouse Gas Emissions (April 2007)
        2. Electricity is the fastest growing contributer
        3. By 2030, under a business-as-usual scenario, will be the single largest source, accounting for 1/3 of emissions.

- **Therefore, it makes good sense for the city to consider supporting any new source that can be developed locally, is non-polluting, carbon neutral.**

- PV can also go hand in hand with energy conservation and efficiency efforts.

i. Consumers installing PV systems have a strong economic rational to adopt efficiency measures and reduce electrical loads in there homes and businesses.
    1. Smaller loads = fewer PV panels required = cost savings

- PV creates 'green collar' jobs that are inherently local
    i. Ex. PV installation

Important but under-appreciated local advantages: PV mitigates the negative impacts of Peak Load periods, which have negative consequences for our economic competitiveness and overall quality of life.

- PV is on **When** we Need It
    i. Most active during periods of highest citywide demand: Sunny, summer afternoons
        1. The strength of this correlation has been studied scientifically (SUNY Albany, ASRC).
        2. Periods of greatest likelihood of power disruption
            a. Ex. Queens (2006), Washington Heights (1998)
        3. Periods when dirtiest, least efficient and most expensive sources are brought online to fill demand.
            a. Ex. Rooftop diesel generators
                i. Deployment for Demand Response and Peak Load Management (PLM)
                ii. 2006 blackout: over 1,000 MW of power (NYT, Aug 12, 2006)
                iii. Up to 200 x more polluting (NOx)
                iv. activated during worst air quality conditions

Opportunity: PV eligibility for Demand Response and P.L.M. programs, or be rewarded by some other means for this important benefit that they provide.

        4. The real wholesale price of power during these periods spikes far above the average retail price.
            a. More PV deployed during peak periods displaces highest cost electricity that Con Edison must purchase through the NYISO.

Opportunity: 1. Expanded net-metering
2. Real- time price for net-metered PV

- PV is on **Where** We Need It
    i. Deployable within the City
        1. The NYC area is a transmission 'load pocket'
            a. For reliability reasons, NYISO requires that 80% of the city's peak load demand capacity be sited within the 5 boroughs.

        2. PV has no footprint since it is deployed on vacant roof space.
        3. Contrast with
            a. leading renewable sources, i.e. large-scale wind.
            b. And centralized power plants
                i. The added difficulty of siting such plants in NYC because of community opposition and more attractive alternative land uses.

    ii. A clean **distributed** source reduces
        1. Power 5% losses from distribution
        2. Strain on the distribution and transmission network that causes power failure.
            a. Richard Perez (ASRC, SUNY Albany) study estimated that as little as 500 MW of PV capacity distributed throughout the 'load pockets' of the Northeast, could have prevented the August 2003 blackout.
            b. 1 or 2 MW, could have prevented the 2006 Queens blackout, and the 1998 Washington Heights blackout.

Opportunity: Create special incentives for PV deployed within distribution load pockets, and for new large construction in areas of future load growth.

The Net-Metering and Electricity Back-Feeding onto the NYC Network Distribution System.

- Current Net Metering in NYS
    i. Residential systems only
    ii. 10 kW cap
- New Legislation in the NYS Legislature
    i. All customer classes: residential, commercial and industrial
    ii. 2 MW cap (25 kW for residential)
    iii. Modeled on NJ law
        1. Contrast
            a. NJ: Between 2001 – 2007 installed 40 MW of PV

b. 1,500 - 1,800 MW goal by 2021(New Jersey Office of Clean Energy, August 2007)
c. NYS: today approximately 15 MW
    i. 1.5 MW in NYC
d. RPS by 2013: roughly another 16 MW (based on $ 13.9 million for PV in the NYS RPS).

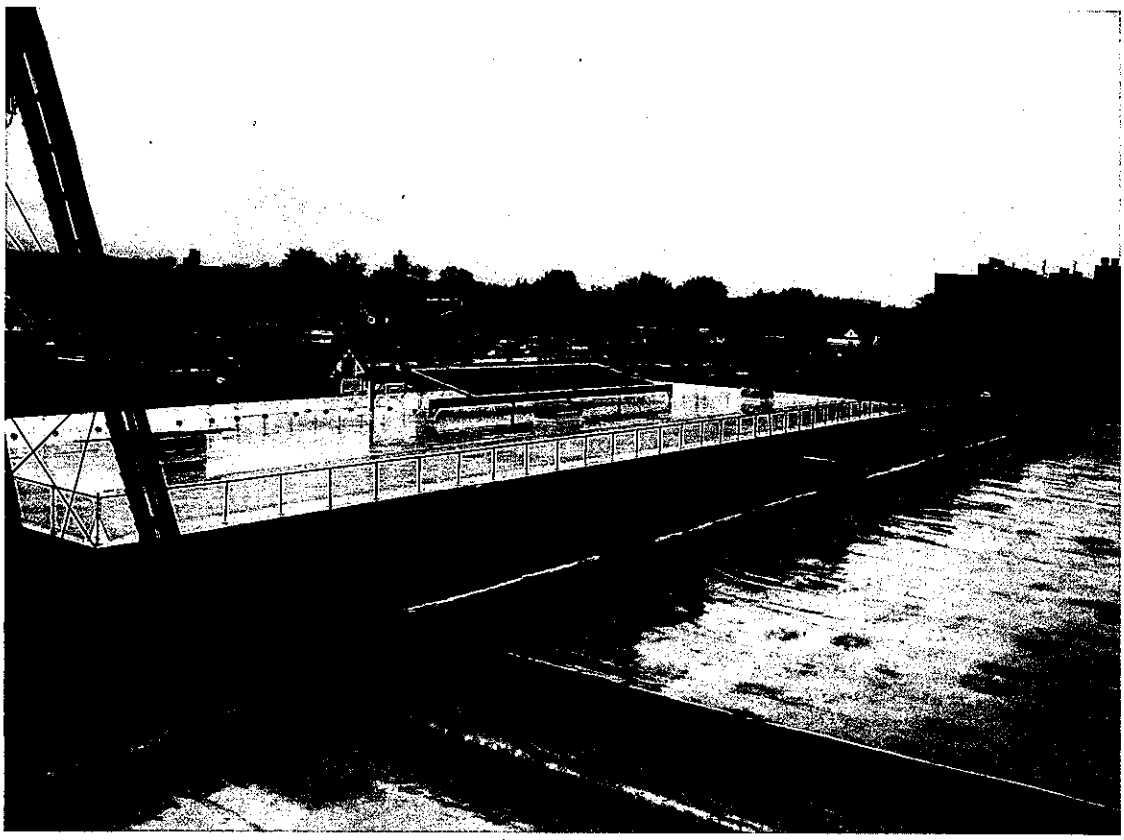
Recommendation: New York City Council resolution in support of expanded net metering.

- The challenge of bringing distributed generation onto the NYC network distribution system.
    i. Potentially greatest single limiting factor for PV's growth in NYC
    ii. Con Edison maintains that technical compatibility and safety issues exist with DG back feeding onto the grid.
    iii. Residential systems larger than 10 kW and all non-residential systems assessed by Con Edison as part of the interconnection process.
        1. If the analysis concludes that these systems may 'back feed' onto the grid at any point, an expensive reverse power relay must be installed.
            a. $10,000 -$40,000
- Consequence: smaller systems are being deployed on the most promising sites.
- New net-metering law will not necessarily solve this problem.
- If the advantages sited above are to ever reach a scale that will have a meaningful positive impact on NYC's electricity system, and if the large local solar market is to be realized, then this matter will need to be resolved quickly.

Critical Need: The completion of an independent 3rd party technical assessment of the network grid's distributed generation capabilities.

Example: Workman Cycles Factory, Ozone Park, Queens.

This picture shows a 1700 sq ft. solar system surrounded by 15,000 sq. ft. of available roof space.



The system, installed by Solar Energy Systems (SES) of Brooklyn was limited to 15 kW because of limited net-metering and network grid 'back feed' issues. If this system were sized any larger, an expensive reverse power relay would have been required by Con Edison to prevent potential back feed onto the grid during weekends, when the factory's load is dramatically reduced.

Factories such as Workman Cycles constitute the most promising locations for large PV adoption since they have considerable roof pace relative to their overall electricity load,

and do not present the costly challenges that accompany more vertical building types that are characteristic of NYC.

Note that in the past two weeks, 13 companies very similar to Worksman Cycle have contacted SES asking the company to evaluate their potential to utilize this technology. 85% of those have substantial roof space, enough to sustain large systems. However, due to the current constraints of net-metering and concerns over back feeding, this potential new capacity will be limited.

Statement of John Filippelli
Chief, Strategic Planning and Multi-Media Programs Branch
U.S. Environmental Protection Agency - Region 2
Before the New York City Council Committees on
Environmental Protection and Economic Development
February 28, 2008

Oversight – Solar Power in the City: Impediments and Opportunities

Thank you Chairman Gennaro, for the invitation to appear here today. I am John Filippelli, Chief, of the Strategic Planning and Multi-Media Programs Branch, at Region 2 of the U. S. Environmental Protection Agency (EPA). I appreciate the opportunity to highlight EPA's perspective on solar energy opportunities. EPA commends New York City in its continuing effort to improve the environment through thoughtful deliberation on significant environmental issues. PlanNYC is without doubt is the right step for the future of New York City, and a model of how other cities around the world should be looking forward to prepare for the needs of the future. Today, the City Council is taking another important step forward in exploring renewable energy options to power New York City through the use of solar power.

The matter you are considering today is of increasing importance as we all look to mitigate our greenhouse gas emissions and adapt to climate change. One of EPA Administrator Steve Johnson's priorities for the Agency is Clean Air and Affordable Energy and today I will be talking about some of EPA's voluntary conservation programs to promote clean air and affordable energy.

As we look to the future, we are faced with a dilemma, the ever-growing demand for electricity juxtaposed with the impacts of climate change. Organizations in the U.S. and around the world are turning to alternative energy, such as solar, wind, and tidal energy to meet growing demand, provide clean energy, and reduce greenhouse gas emissions. Solar energy is one of the

most attractive alternatives for creating a long-term sustainable energy system. For example a 100-megawatt solar thermal electric power plant, over its 20-year life, will avoid more than 3 million tons of carbon dioxide (CO2) emissions when compared with even the cleanest conventional fossil fuel-powered electric plants available today.

In most parts of the United States, residential and commercial consumers can choose to purchase electricity from renewable sources – primarily wind and hydro power, but also geothermal and solar power in some locations. While these alternative sources can still cost a bit more (*e.g.*, 1 to 2 cents more per kilowatt), that price differential may be driven more by high demand for renewables (caused, among other things, by minimum portfolio requirements imposed by many states on their regulated utilities) than by intrinsic costs. Given the virtual certainty that oil and natural gas prices will continue to climb, along with the astonishing advances in renewable technology over the past two decades, renewables are likely to become even more competitive in the future. Not only concerned individuals, but large institutional consumers, have made the socially conscious decision to purchase green power despite the current small cost differential.

EPA's Green Power Partnership is a voluntary program helping to increase the use of green power among leading U.S. organizations. Organizations are encouraged to purchase green power as a way to reduce the environmental impacts associated with conventional electricity use. The Green Power Partnership works with hundreds of leading organizations, including Fortune 500 companies, local, state, and federal government agencies, manufacturers and retailers, trade associations, as well as a growing number of colleges and universities. Partners are given expert advice, tools and resources as well as public recognition. Members are purchasing billions of kilowatt-hours (KWh) of green power annually, which has the equivalent impact of removing the

emissions of hundreds of thousands of passenger cars from the road each year. For more information about EPA's Green Power Partnership go to: www.epa.gov/greenpower

In early 2007, EPA Region 2 formed a Green Team to inform the architectural, real estate, construction, and management communities of a suite of voluntary programs, and encourage them to adopt such strategies. Many of these strategies focus on reducing energy requirements in all phases a project; design, development, construction and operation/maintenance. During the design and development stage of a project, one aspect the green team focuses on is the installation of renewable resources, and in particular, solar panels. EPA's green building team not only encourages the installation of solar panels, but also encourages the installation of passive solar systems involving the collection and storage of solar energy through building design and siting, and through technologies that capture and retain solar heat energy such as "smart" windows, trombe walls, flooring and other materials that serve as thermal mass to absorb and re-radiate solar heat, and evaporative cooling systems.

One example of EPA Green Teams' work is with the Destiny USA 800-acre mega-mall under construction in Syracuse, NY. The Destiny Mall plans to install a 3.2 megawatt solar array over its 25-acre parking lot. Not only will the array generate electricity, but it will provide desirable shading for the cars parked below. The 3.5 million kilowatt hours expected to be generated will be about 10% - 15% of the facility's total demand. Destiny is going even further by installing over a dozen 5kw vertical axis wind turbines on top of 42-foot high light poles around the parking lot, which will generate 64,000 - 84,000 kwhs annually (enough to power 6 homes). These initiatives, among others, aim to fulfill the commitment made by Robert Congel, Destiny's founder and one of the nation's most successful mall developers, who has pledged to

operate the planned mega-mall "100% fossil fuel free."

In New York City, 79 percent of carbon emissions are from commercial and residential buildings. Working with buildings facility managers on energy efficiency is one method of reducing carbon emissions, while creating the necessary capital to install or purchase renewable energy. The EnergyStar program, which is a joint effort of the U.S. Environmental Protection Agency and the U.S. Department of Energy is a program designed to save money and protect the environment through energy efficient products and practices. In 1992, EPA introduced EnergyStar as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Today, the EnergyStar label is on major appliances, office equipment, lighting fixtures, home electronics, and more. EPA has also extended the label to cover new homes and commercial and industrial buildings.

EnergyStar continues to deliver energy and cost reductions across the country, saving businesses, organizations, and consumers about $14 billion in 2006 alone. Over the past decade, EnergyStar has been a driving force behind the more widespread use of such technological innovations as LED traffic lights, efficient fluorescent lighting, power management systems for office equipment, and low standby energy use.

Through its partnerships with more than 9,000 private and public sector organizations, EnergyStar delivers best management practices, technical information, and easy to use building assessment tools that enable building managers to start down the path to greater efficiency and cost savings in managing their facilities. EPA's EnergyStar website for assessment tools can be found at:

<http://www.energystar.gov/index.cfm?fuseaction=labeled_buildings.showBuildingSearch>,

In early 2007, EPA began holding training for College and University facility managers in New York City and New York State to use the EnergyStar assessment tools and begin finding areas of energy reduction in their buildings and dormitories. While these trainings are tailored to a specific sector there are numerous opportunities in other energy consuming sectors. EnergyStar has many programs with tools customed to address energy needs of K-12 schools, hotels, commercial buildings, single family home, multi-family apartment complexes, medical offices, banks, courts and even supermarkets.

Another joint effort between EPA and Department of Energy is the National Action Plan for Energy Efficiency. This program is a private-public initiative begun in the fall of 2005 to create a sustainable, aggressive national commitment to energy efficiency through the collaborative efforts of gas and electric utilities, utility regulators, and other partner organizations. Such a commitment can take advantage of large opportunities in U.S. homes, buildings, and schools to reduce energy use, save billions on customer energy bills, and reduce the need for new power supplies. National Action Plan Leadership Group members are identifying key barriers limiting greater U.S. investment in energy efficiency, and developing and documenting sound business practices for removing these barriers. The Leadership Group members and Observers have been joined by numerous other key stakeholders in making commitments under the National Action Plan to work within their own organizations and across their spheres of influence to increase attention to, remove barriers to, and increase investment in cost-effective energy efficiency.

Another path for industry to incorporate renewable energy and energy efficiency is highlighted in EPA's Climate Leaders program. Climate Leaders is an EPA industry-

government partnership that works with companies to develop comprehensive climate change strategies. Partner companies commit to reducing their impact on the global environment by completing a corporate-wide inventory of their greenhouse gas emissions based on a quality management system, setting aggressive reduction goals, and annually reporting their progress to EPA. Through program participation, companies create a credible record of their accomplishments and receive EPA recognition as corporate environmental leaders. More information can be found at: www.epa.gov/climateleaders

EPA Region 2 also recognizes environmental leaders by honoring organizations for their achievements through the Environmental Quality Award. In 2007, the Atlantic County Utilities Authority (ACUA) was recognized by Region 2 for its comprehensive use of renewable energy technologies at its Atlantic City Waste Water Treatment facility. The Wastewater site currently hosts the only operating coastal wind farm in New Jersey. The turbines provide power for the plant and sell excess electricity into the grid. The ACUA also generates electricity from methane capture at its landfill and has a photovoltaic array in its parking lot, which provides electric power for the administrative buildings on the site.

Although New York City may not be suitable to site a commercial scale wind turbine, wastewater treatment sites and landfills offer opportunities for photovoltaic arrays. Wind turbines such as the commercial scale of the ACUA needs deep footings to anchor and support the towers supporting the turbines and these towers can reach 200 feet in height. Photovoltaic arrays place on the top of landfills require less deep anchors which do not present a threat to the landfill liner. While each wastewater or landfill site will differ, they could be explored for the use of photovoltaic arrays.

At EPA, we welcome the opportunity to work with the City on furthering environmental goal. Again, I would like to that the Chairmen and members of your respective committees for inviting me to provide testimony today. Please let me know if you have any questions or if EPA can be of assistance to the City of New York in this important effort to encourage clean energy in New York City and beyond.

Oversight- Solar Power in the City: Impediments and Oportunities'

Committee on Environmental Protection
NYC City Council – February 28th 2007

Anthony O. Pereira
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Board Member – New York Solar Energy Industries Association (NYSEIA)
Board Member – U.S. Green Building Council - NYC Chapter

About altPOWER®: Local company Incorporated by Anthony O. Pereira in 2002, 12 full time employees work out of the headquarters at 125 Maiden Lane, Manhattan. altPOWER is responsible for all of the solar projects in Battery Park City and has worked under contract for the NYC EDC and the NYPA including the recently installed a 36 kW PV array at Bronx High School of Science and the Christmas Tree PV system at Rockefeller Center

About the New York Solar Energy Industries Association (NYSEIA): A state wide not for profit organization of over 100 members ranging from manufacturers, installers, advocates, engineers and electricians working to promotes the use of clean renewable solar energy. Anthony O. Pereira served as President of the Board of NSYEIA from 2002-2006.

About the U.S. Green Building Council – New York City Chapter: USGBC New York's mission is to transform the way buildings are designed, built and operated and to create environmentally responsible, profitable and healthy places to live and work in the greater New York area.

Solar Energy As an Option

•Major Studies show that Photovoltaic (PV) peak production and NYC's Peak Demand coincide, solar electric systems can shave NYC's peak without producing air pollution (see Exhibit A)

•Studies show that enough solar energy falls on the surfaces of NYC to provide 2.5 times the energy generation produced by Con Edison (See Exhibit B)

•Other studies show that NYC roof tops alone could provide 6000 MWs of energy production through PV (Solar Electric) generation, current capacity is nearing the 2 MW range, far short of potential (See Exhibit C & D)

•Solar electric system installations are amongst the largest job creators for any energy production source worldwide (See Exhibit E)

•The PV industry is experiencing tremendous growth locally and worldwide with average global growth above 35% (See Ehibit F)

•PV generation should be allowed to participate in the local Demand Response (NYISO Load Curtailment) Program as it has been proven to be more effective at lower cost and without pollution (See Exhibit A)

•Recently local and national solar groups have called for 800 MW to be installed within the 5 boroughs over the next 12 years

What is Needed

•Immediately begin lobbying the PSC to increase incentives through NYSERDA for Grid Tied PV systems within Load Pocket zones that are also non-attainment zones for air quality standards, like the 5 boroughs,

•Expand on the studies by Columbia University and SUNY Albany to identify actual PV potential for specific buildings overlaying that data with data showing the ConEd network's highest demand and those locations best suited to benefit from disbursed grid tied PV systems

•Support the current 35% Property Tax Exemption for PV systems proposed by Mayor Bloomberg and now awaiting passage in Albany. This will be a great incentive to bridge the gap in adequate funding from NYSERDA and considering the potential non-extension of the Solar Investment Tax Credit (ITC)

•Help the industry lobby for a more efficient incentive program, the restrictions are onerous, the process is time consuming and delays projects and ultimately the funding is inadequate (50 kW system cap!)

What is Needed (continued)

- **Also, help the industry and environmental community with local policy goals including:**
  - Commercial PV System Net-Metering
  - Commercial PV System Sales Tax Exemption
  - Pressure the PSC to follow the statutes when developing interconnection and net-metering rules
  - Eliminate engineering review charges from utilities for commercial systems
  - Work to make the interconnection rules more logical considering the advantages PV systems provide to Con Edison
  - Initiate a 3rd party review of the Network Grid system maintained by ConEd to identify portions of the network which can allow for supplying the grid with excess PV power produced at locations with operating PV systems
  - Work with the NYC Dob and BEC to reduce the costs of getting PV system approvals in the 5 boroughs.

Exhibit A

Benefits of PV to New York City

PV is coincident with peak-power demand & shaves system peaks - *July 6, 1999*

Perez et al., ASRC

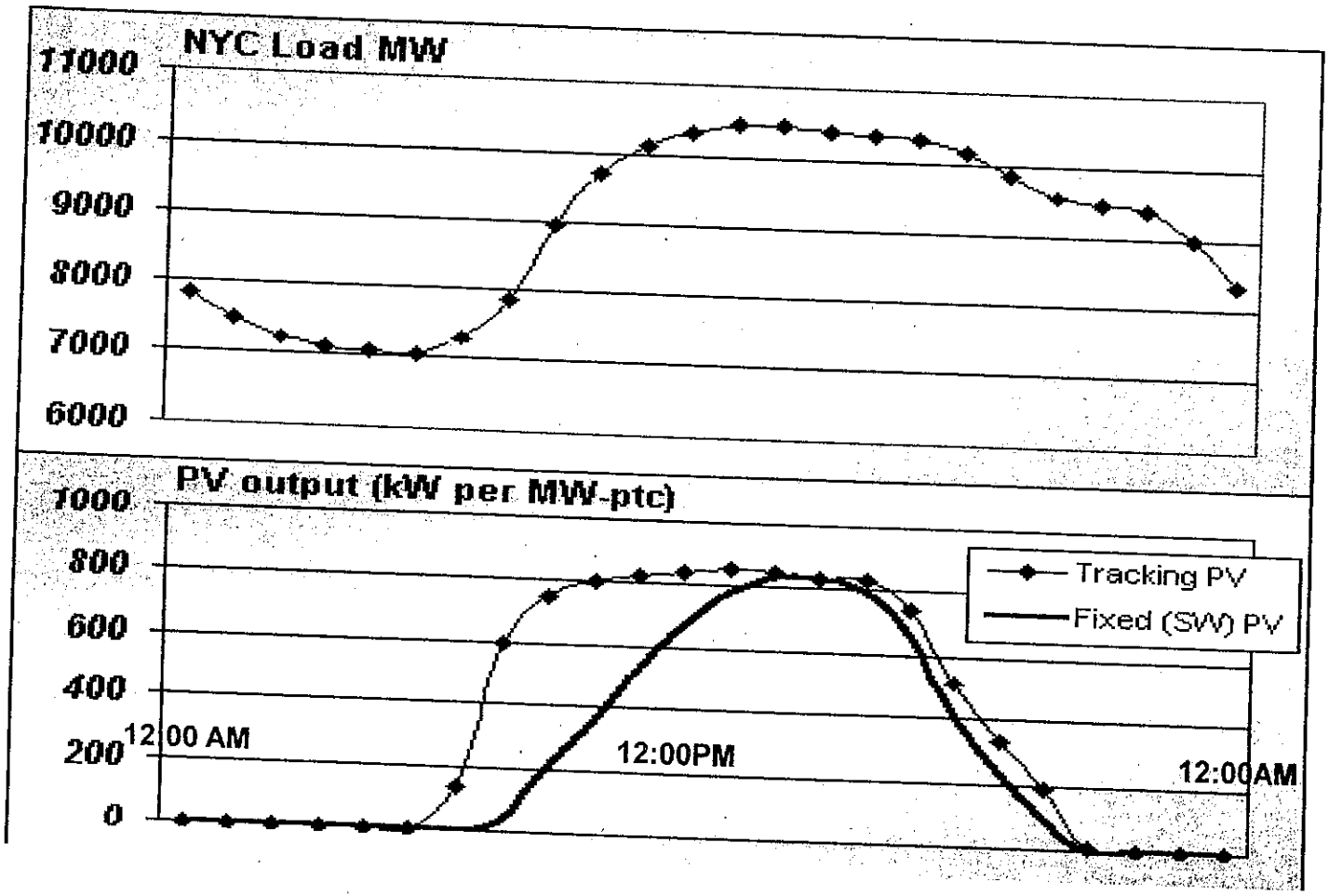


Exhibit B part 1

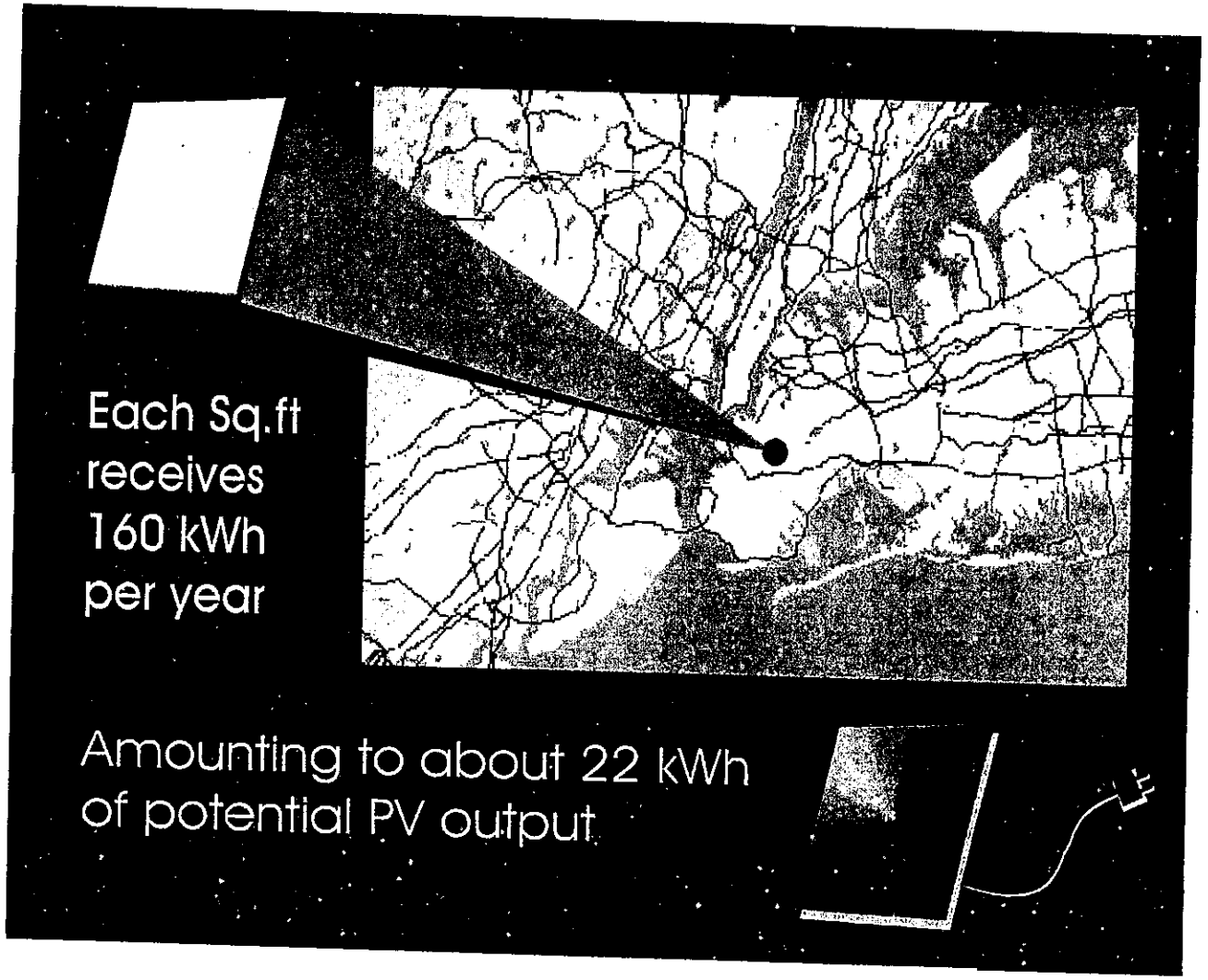
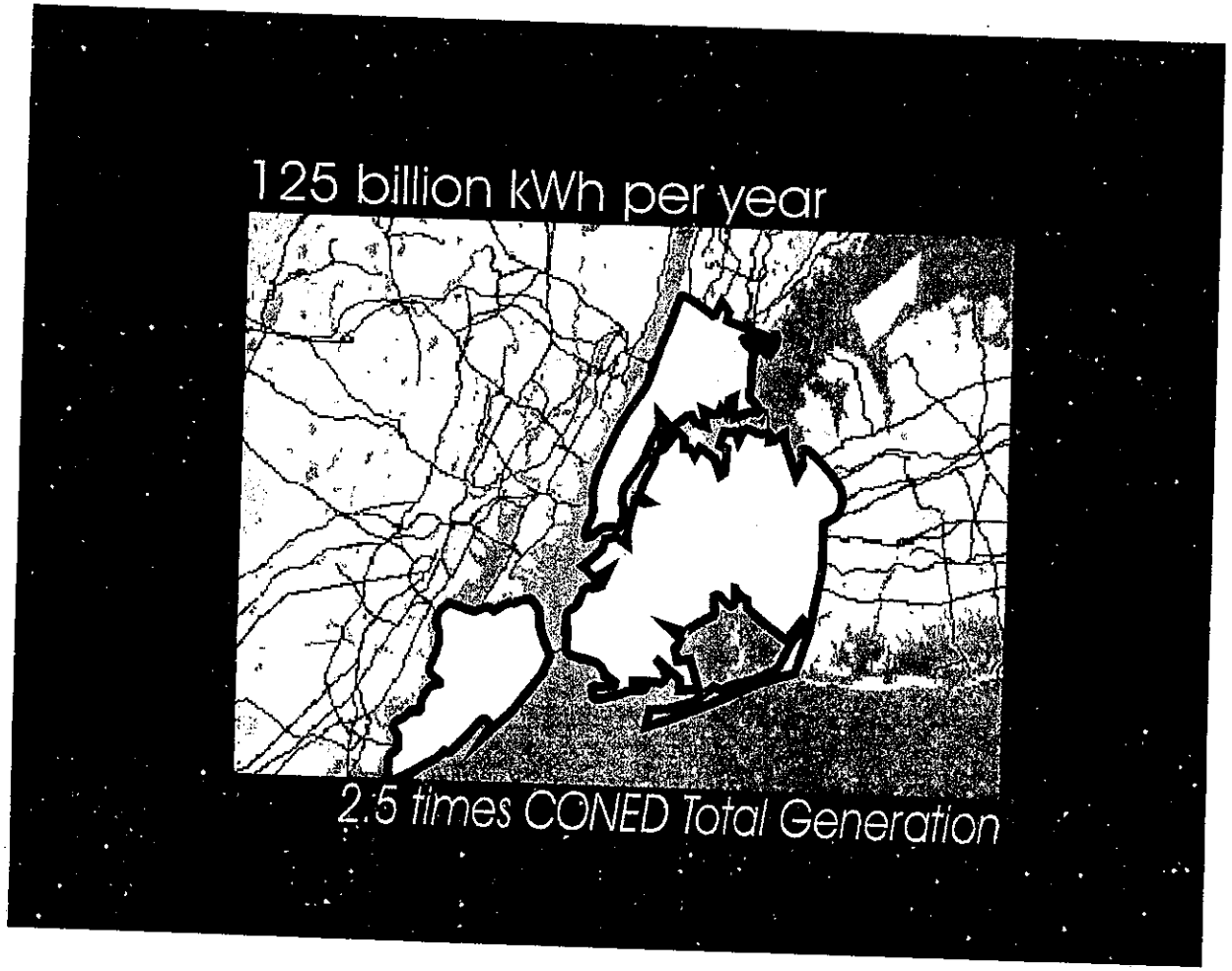


Exhibit B part 2

And if we cover NYC with PV…!



Perez et al., ASRC

Exhibit C

NYSEIA: NYS's Solar Potential

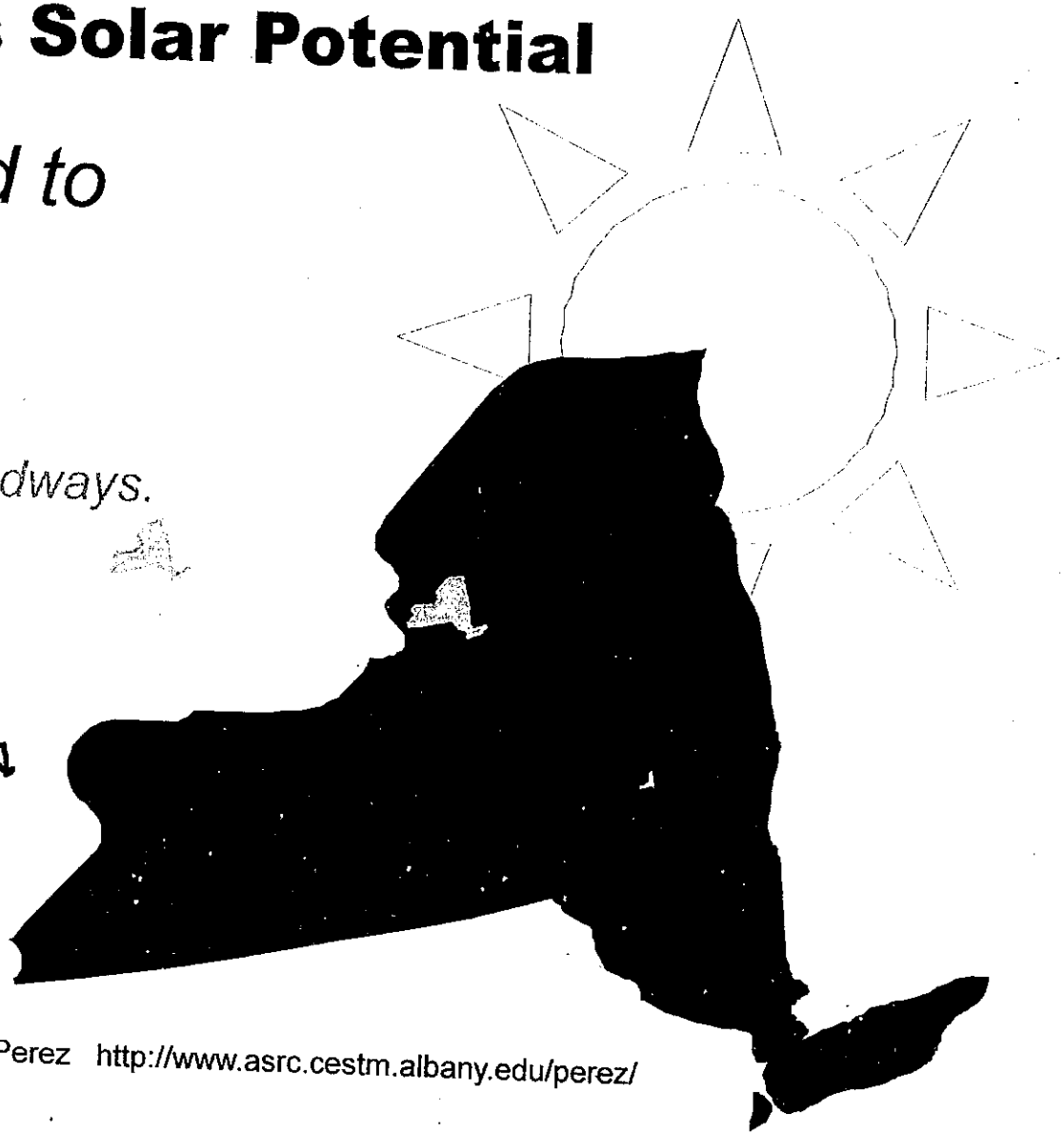
Space Required to Power NYS

TODAY: Almost 3% of NYS is buildings, parking lots and roadways.

Richard Perez, et al.

Yet, only 0.75% of NYS's area needed to produce all the electricity NY'ers use!

USA Total = 25,000 km2 PV
Richard Perez, et al.

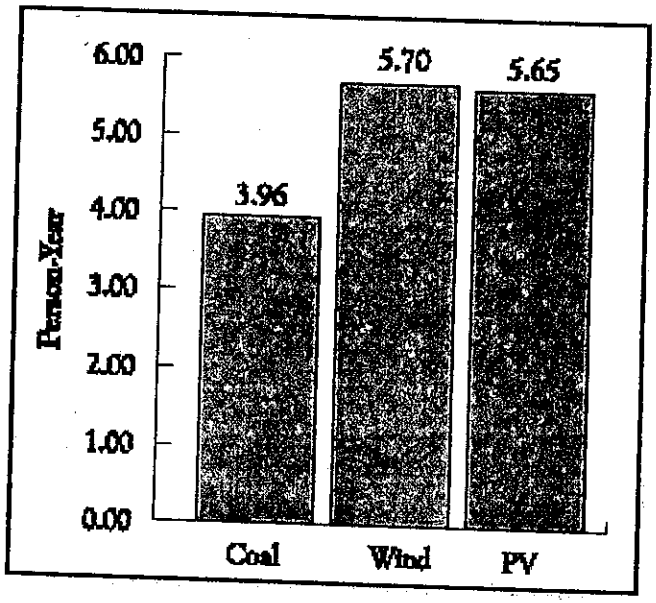


Graphic Courtesy of R. Perez http://www.asrc.cestm.albany.edu/perez/

Exhibit E

Solar Power as an Economic Development & Job Growth Engine

- Investments in Solar Electric System installations generate 42% more job-years per dollar investedtah comparable investments in coal power plants
- Solar Electric System Installations are one of the largest job creators per installed MW, per $1 Mil invested
- The NY RPS is projected to create 43,000 Renewable Energy Jobs across the State over the next decade (Hevesi et al., 2005)



Comparison: Coal, Wind and PV (Person-Years of labor Per $1 Million in Cost Over 10 Years Including Capital and Construction)

Source: Renewable Energy Policy Project, Nov. 2001c

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Solar Energy – Utilize It!

JAMES T. GALLAGHER
SENIOR VICE PRESIDENT FOR ENERGY AND TELECOMMUNICATIONS
NEW YORK CITY ECONOMIC DEVELOPMENT CORPORATION

HEARING BEFORE THE CITY COUNCIL
ENVIRONMENTAL PROTECTION COMMITTEE
FEBRUARY 28, 2008

Good afternoon Chair Gennaro and members of the Environmental Protection Committee. My name is James Gallagher and I am Senior Vice President for Energy and Telecommunications at the New York City Economic Development Corporation. Thank you for inviting us here today to testify on the City's efforts to promote the use of solar electricity.

As you may recall, in 2003, Mayor Bloomberg designated the Economic Development Corporation's Energy Department to take the lead in coordinating and addressing energy-related matters on behalf of the City. In my capacity as head of the Energy Department, I act as the City's chief advisor on energy policy issues. Such issues include increasing energy efficiency and clean energy resources, advocating for reasonable and competitive energy prices for all City consumers, and coordinating the City's response to proposed energy projects such as power plants, transmission lines and natural gas pipelines, and renewable

energy. I joined the Economic Development Corporation in December 2007—prior to this I was Director of the Office of Electricity and Environment at the New York State Public Service Commission. In this position, and among other responsibilities, I was responsible for overseeing the energy efficiency and renewable energy initiatives at both the investor owned utilities and at the New York State Energy Research and Development Authority. I also had primary oversight responsibilities for New York State's Renewable Portfolio Standard program. I was with the Public Service Commission for over 21 years but prior to that, and at the beginning of my energy career in the late 1970's, I was Manager of Solar Energy programs at the Tennessee Valley Authority. At EDC, my team works closely with the Mayor's Office of Long-Term Planning and Sustainability to implement the energy-related initiatives of PlaNYC, the City's long-term sustainability plan.

In my testimony today, I will describe our multi-pronged strategy to promote the use of solar energy, the existing challenges to solar in New York City, the PlaNYC initiatives to overcome these challenges, and our work to encourage further growth of the solar energy market.

Solar energy is a renewable, carbon free energy source that generates power by capturing the energy from the sun and converting it into usable electricity. Of all the renewable energy sources, solar currently has the greatest potential to generate electricity within the five boroughs. The technology is commercially available, our abundant roofs offer ample space for panels, and, for the most part, solar energy is most available when the city needs it most—during hot, sunny days. We currently have 1.9 MW of installed capacity in New York City as of December 2007, which represents only an infinitesimal portion of our peak demand. Estimates of the technical potential for solar energy in New York City by Columbia University, the City University of New York, and NYSERDA range from 6,000 MW to over 15,000 MW.

Solar can definitely contribute to the City's goals to ensure clean, reliable energy for New York, as well as efforts to secure our energy supply, reduce our greenhouse gas emissions and improve air quality. However, while solar power is promising in the long run, it is not yet financially feasible for it to play a larger role. As a result, even with incentives from the Federal government and the State, the City has only been able to achieve a small fraction of its potential, and without significant additional support from the Federal government, State, utilities, and

others, solar energy will not be able to assume a greater role in our energy supply portfolio.

In the near-term, the City will continue to be dependent on conventional sources of energy and increased energy efficiency; however, the City is committed to help ensure that solar meets its long-term potential to contribute more significantly to our supply. To do so, we must employ a range of strategies to develop a more competitive market for the technology. Our three-pronged approach to expand the use of solar electricity in New York City includes efforts to 1) reduce obstacles to interconnection and installation, 2) establish a foundation for continued solar industry growth through workforce training and increased understanding of solar opportunities and challenges, and 3) spur the market to achieve economies of scale and help bring down prices.

There are a number of obstacles to widespread use of solar electricity in New York City. Between 2005 and 2007, as part of the New York City Million Solar Roofs (MSR) Initiative, the City, led by the City University of New York (CUNY), identified barriers to market growth as part of a collaborative stakeholder process. The barriers identified fall into three interrelated categories: interconnection and codes, installed costs, and available funding. I will briefly describe each of these.

- **Interconnection and codes:** According to a series of interviews with New York City installers, interconnection with the electricity grid is one of the most significant obstacles to solar market growth in the City. Installers often report significant administrative delays, a lack of clarity about the procedures for delivering electricity to the grid, redundant interconnection requirements, prohibitively expensive code requirements, and unnecessarily small caps on the size of permissible net metering systems. Many of these difficulties, especially related to connection to the grid, are exacerbated by the city's network-based electricity delivery system. While progress has been made over the past several years in moving towards standardized interconnection requirements and agreements, more work is needed.

- **Installed costs:** Any delays, redundancies, and unnecessary technical requirements add to the already high cost of solar installations. In general, solar electricity is more expensive than conventional sources of electricity. However, New York City is uniquely expensive: our taller buildings require more wires and

cranes to carry equipment to rooftops, while interconnection requirements and inspections often delay implementation. Higher labor costs are also an important factor. For these reasons, installed costs for solar are approximately 30% higher than in New Jersey and 50% higher than in Long Island. New York installed costs, currently between $9,000 and $11,000 per KW, are also trending upwards while those in other markets are trending downward.

- **Funding**: There is funding available to help overcome the higher costs of solar, including a State and City sales tax waiver for residential installations, net-metering for small, residential buildings, a NYSERDA grant program, and a Federal production tax credit. However, the funding is currently not sufficient to move the market in a big way, partly because State programs primarily focus on small, residential installations, therefore excluding a large proportion of the City's load, and there is constant uncertainty whether the federal production tax credits will be available from year to year.

As part of a comprehensive plan to promote energy efficiency and ensure clean, reliable energy for all New Yorkers, PlaNYC includes a set of initiatives, consistent with the strategy I described above, to mitigate these challenges, spur the market, and continue to create a solid foundation for the solar market to eventually strengthen and grow.

First, PlaNYC states that the City will work with the State to identify and eliminate barriers to increasing the use of solar energy in the City, since the State, primarily the Public Service Commission, is responsible for setting interconnection regulations. Additionally, the City is working with area stakeholders to encourage the legislature to significantly raise or eliminate limits on the amount of solar that can be connected to the grid under the existing net-metering program, which is currently capped at 8.1 MW in the Con Edison service territory. Net-metering is also limited to a 10 KW cap for residential installations. In the fall of 2007, the Administration sent a letter to the State legislature in support of proposed amendments to Public Service Law that would allow net-metering for non-residential customers up to 2MW, streamline the interconnection process, and raise the overall cap on net-metered customers to the equivalent of 1 percent of the 2005 peak load.

To spur the market in the private sector, achieve needed economies of scale to bring down prices, and overcome the price differential for solar in New York City and the surrounding areas, PlaNYC includes a property tax abatement for solar panel installations. The incentive will cover 35% of installation costs for the first three years of the program, with the incentive scaling back to 20% in years four and five. The graduated structure of this incentive will grant early adopters greater benefits, ensuring that a market is established. Approval of this tax change is pending at the State level.

We will also be working with the State to discuss potential design changes and increased funding for the Renewable Portfolio Standard Program.

Because City facilities purchase their energy supplies from NYPA and are not generally eligible for NYSERDA incentives or tax credits, the economics for public solar projects are even less attractive than in the private sector. DCAS did take advantage of a NYSERDA program not funded through the SBC to install two small solar demonstration projects, one at Bronx HS of Science and one (not quite complete) at the Queens Hall of Science. To facilitate additional solar projects on City buildings, we are in the process of releasing an RFP to attract private solar

developers to build, own, operate, and maintain the panels on City buildings. This RFP will be for 2 MW of solar capacity, and therefore, this initiative on its own doubles the amount of solar capacity in New York City. Once the panels are installed, the City will enter into a long-term contract with the developer to purchase the solar energy generated by these panels. This third-party financing mechanism will hopefully prove to be a model for future projects.

Finally, to ensure that we have a strong foundation upon which New York City's solar markets can grow, the City, including the Mayor's Office of Long-Term Planning and Sustainability, EDC, and CUNY's Center for Sustainable Energy at Bronx Community College, is working with Con Edison, the New York Power Authority and an advisory board of solar experts to even better understand local market and technical barriers, as well as potential solutions. These include providing training for solar installers and collaboration with academic and research institutions to improve solar technology and help bring down prices. This partnership is part of the U.S. Department of Energy's Solar America City program.

New York City recently received the honor of being named one of thirteen "Solar America Cities" by the U.S. Department of Energy last spring in recognition of the

City's solar achievements to date as well as our comprehensive plan to promote solar electricity in the future. The award includes $200,000 in funding to support our work as well as $200,000 of in-kind technical assistance from the National Renewable Energy Laboratory (NREL) to pursue our solar projects.

As part of the Solar America Cities work, we have created an Advisory Board to provide stakeholder input and assistance on the Solar Cities projects. The kickoff meeting for this group was held in December 2007. In addition to City agencies, Con Edison, and the New York Power Authority, members include NYSERDA, National Resources Defense Council (NRDC), the New York State Department of Public Service, and a host of non-profit and interest groups.

The assistance we receive from this award will be instrumental in helping us move past the barriers to solar. Addressing the administrative, technical and regulatory barriers requires rigorous technical evaluation. With the assistance provided by NREL, and input from Con Edison, we will:

- Evaluate the real economic opportunities of solar electricity when benchmarked against a real-time pricing scheme, as opposed to averaged electricity costs

- Identify potential code changes that would help reduce any existing confusion regarding solar installations
- Identify locations in New York City best suited for solar electric generation and locations where solar generation would provide the most benefits to the grid
- Brainstorm strategies to include solar in the City's emergency planning
- Assess potential innovative financing mechanisms for PV systems, including the use of third-party ownership models and Clean Renewable Energy Bonds (CREBS)

To further support these efforts, CUNY, on behalf of the City, has joined The Solar Energy Consortium, a new research and economic development partnership between solar energy companies and academic institutions across the state. The mission of the Consortium is to advance the solar industry in New York by primarily focusing on research and technology and workforce economic development activities. Other members include Cornell University, Rensselaer Polytechnic Institute, Clarkson University, Binghamton University and The State University of New York at New Paltz.

In addition to PlaNYC and the Solar America Cities program, New York City has also been participating in Lieutenant Governor Paterson's Renewable Energy Task Force, which just released this week its report containing recommendations to significantly increase renewable energy generation in New York. The Task Force's recommendations, many of which are in line with the City's strategy I just described, include: additional funding for solar energy projects; a new net-metering law to include additional customer classes; incentives for solar manufacturers to locate in New York; expanding research and development in solar technology, and supporting an initial target of 100 MW statewide of solar PV systems.

To sum up, solar energy has the potential to make a larger contribution to our Citywide need for a clean and reliable energy supply in the long-term. To ensure we realize this potential, the City is working to reduce barriers, spur the market, and create a strong foundation on which to grow this market. The major barriers to meeting our PV targets are tied to making solar energy cost-effective and easier to connect to the grid. We are dedicated to finding creative solutions to these issues with the efforts we have already made with PlaNYC and the Solar America Cities program and we plan to continue to demonstrate our leadership in this area. I

thank the committee for the opportunity to testify today and I welcome any questions you may have.

Paul D. Tonko, President and CEO, NYSERDA
Testimony before the New York City Council Committee on Environmental Protection
Council Chamber at City Hall
February 28, 2008

Following the release of the "First Report of the Renewable Energy Task Force to the LT. Governor David A. Patterson", I am particularly excited to report on photovoltaic technology (PV), NYSERDA programs to promote PV in New York City and future State initiatives to further our commitment to renewable energy. We have the collective opportunity to take full advantage of clean energy technologies, such as PV, to promote economic growth, green collar jobs, a cleaner environment and energy independence. It is also an opportunity to make an investment in a strong societal commitment to future generations.

Through the complementary use of energy efficiency and renewable energy, we are reducing greenhouse gases and other pollutants associated with the generation of electricity by means of fossil fuels. New York State has made great strides in getting PV into the market as one of several renewable alternatives to traditional fossil fuels.

NYSERDA is partnering with over 125 PV distribution, design and installation companies, and is providing support for the installation of over 9 megawatts of PV systems across the State, totaling $40 million in investments in PV installations. In New York City, these investments total over $10 million.

We have only begun to scratch the surface of the role PV can play in New York City as we work toward and expand upon our statewide Renewable Portfolio Standard goals to increase electricity generated by renewable sources to 25% and beyond, and the goals of PlaNYC to reduce carbon emissions by 30 percent by the year 2030. Your vast urban cluster of rooftops certainly presents many opportunities for solar power applications.

TECHNOLOGY

Photovoltaic technology has made steady progress in efficiency, reliability and costs over the past couple of decades. Photovoltaic cells convert sunlight directly to electricity. The cells can be made from a

number of materials with the most common PV material being ultra-pure silicon. Other promising PV technologies have been developed and are starting to penetrate the market. So far, silicon-based solar cells have been able to compete with these new technologies through steady progress in technology and manufacturing methods. PV modules are now very reliable and warranties on PV modules exceed twenty years.

Reliability and cost improvements have also been made in the 'balance-of-systems' components such as inverters that convert the direct current from the PV modules to alternating current, and systems to mount PV modules on buildings.

BENEFITS

Photovoltaic systems benefit system owners and society by producing electricity without polluting the air or water. An average 6 kilowatt residential PV system in New York City reduces CO_2 emissions by about 6,500 pounds per year.

PV systems can also mitigate utility grid strain by generating on-site electricity when it is needed the most. For example, utility peaks are driven by high air conditioning demands on hot, sunny, summer days. These are the days when PV systems produce the most electricity. Further, less strain increases grid reliability, which is important to all, but particularly critical to our state's global economic engines, such as the NYSE, located in New York City.

I will provide an illustration of the benefits PV systems can provide. NYSERDA recently assisted Cabrini Terrace, located in northern Manhattan, in a solar conversion project. This was one of the first private cooperatives in the City to employ solar power. Cabrini's PV array will generate enough power to provide 10% of the 217 unit building's common area demand. This represents electricity that the stretched Manhattan power grid no longer needs to carry, particularly during peak demand periods. The building's carbon emissions will be cut by approximately 52,000 tons annually. While the system is guaranteed to serve the building a minimum of 25 years, it will pay for

itself in ten years, and is expected to lower the cooperative's electric bill by $10,000 annually.

ECONOMICS

The cost of electricity from PV systems installed in New York City currently costs an average of $9.30 per watt or about $56,000 (without incentives) for an average 6 kilowatt residential PV system. While the life cycle costs of these systems are generally advantageous to the owner, the up front costs, while declining, can be a barrier for some.

The good news is that there is help to offset those costs. NYSERDA can provide up to $40,000 in cash incentives for residential systems and $200,000 for commercial systems. State and federal tax credits can potentially reduce costs by up to another $7,000 for residential systems and $135,000 for commercial systems. Increasing demand for PV systems will further drive down the cost. State, federal, and local governments must work together to stimulate demand for PV and reduce barriers facing its installation in order to further lower costs.

Federal tax credits are also critical to the economics of installing a PV system.

Yet, most customers do not install PV systems solely to save money. People and businesses who install PV systems are often more interested in the environmental, marketing, education, or price stabilization benefits PV has to offer. Many non-residential customers are interested in the public relations or education benefits. For example, a PV system can be an asset to a building owner that wants to attract environmentally-conscious tenants or add real dollar value to their property. Many commercial PV system owners use the PV system as a way to showcase their environmental commitments and stewardship. Or, a PV system can provide a unique educational opportunity for a school or not-for-profit organization interested in educating people about technology or the environment. Another benefit to the customer is that a PV system acts as a 'hedge' and helps protect them against rising electricity costs by allowing them to purchase a portion of their electricity at a fixed cost.

Customers considering installing PV systems should also consider saving energy through installing energy efficient equipment and increasing the energy efficiency of a home, business, or co-op. Reducing your electric consumption before you install a PV system allows you to serve a larger percentage of your electric load with the same size system. Or, bundling the installation of a PV system with the installation of energy efficient measures improve the economics of the PV system. NYSERDA has several programs designed to promote energy efficiency coupled with the integration of renewable technologies, such as the higher cash incentives for PV systems when installed on a New York ENERGY STAR® Labeled Home.

PV CONSIDERATIONS

It is important to remember that a PV system produces none of the benefits we have been talking about if it does not work properly. Well-designed and properly installed systems are a key component of NYSERDA's PV program. It is also important for system owners to periodically check system performance to ensure that it is working properly.

A PV system must be sited properly, as shading and sub-optimal orientation can severely reduce the energy produced by a PV system. Conversely, in dense urban centers in particular, the size of new buildings to be constructed should be considered as they could potentially shade out a neighboring solar array. System losses associated with shading can have a significant impact on system economics and erase the energy and environmental benefits everyone gains.

For new construction, planning for maximum solar access in the design process can substantially increase the benefits of a PV system. Architects, developers, and PV designers are encouraged to look at the potential for future development and consider the likelihood that a building could be built that would shade their PV system. In some cases, where production is not optimal, and customers still want to install PV systems, NYSERDA provides partial incentives for the system.

SUPPORT

NYSERDA supports PV technology development, expansion of PV companies, stimulation of PV markets and workforce training.

NYSERDA's first-come, first-served PV incentive program provides financial incentives directly to qualified installers that must be passed on to qualified customers. To be eligible, customers must contribute to the Renewable Portfolio Standard through their electricity supplier and the systems must be grid-connected. This program is designed to build long-term sustainable markets and infrastructure, and has made significant progress in the New York City area. With NYSERDA assistance, over 100 PV systems totaling over one megawatt have been installed in New York City. Another 110 systems totaling over one megawatt are under development in New York City. While there is over 2.5 times the number of residential systems than non-residential systems, non-residential PV systems make up 2/3 of the total kilowatt capacity.

Educating young minds who will soon be energy decision makers to think smart about energy use and about good environmental stewardship is critical to building a sustainable market. To that end, NYSERDA has also provided funding for 2 kW PV systems to 50 schools across the state and developed lesson plans for any school to use, even if they don't have a PV system. (www.SchoolPowerNaturally.org).

NYSERDA has provided millions of dollars to support PV training initiatives for designers, architects, builders, installers, code officials, and utility staff. For example, NYSERDA is working with City University of New York and Bronx Community College to develop a nationally accredited PV training program. NYSERDA has also teamed with the International Brotherhood of Electrical Workers (IBEW) to provide training for IBEW trainers and its members.

In addition to developing PV markets, NYSERDA has a portfolio of programs designed to help existing New York renewable energy

companies and to attract new renewable energy companies to New York.

NYSERDA has also committed $10 million to help companies that want to establish new lines to manufacture renewable, clean, or energy efficient products in New York. Up to $1.5 million is available per project. Products produced in these facilities will help New Yorkers reduce their electricity use. Companies may apply for this funding at any time.

In spring, 2008, NYSERDA anticipates releasing a program to provide up to $12 million to help companies develop and improve New York-manufactured renewable and clean energy technologies. This program will result in the introduction of products that provide New Yorkers additional options for improved reliability, power quality, and competitive electric costs using products which have superior environmental attributes.

NYSERDA also provides renewable energy companies financial assistance and access to expert consulting services as part of our business assistance effort. This funding helps companies grow and develop new markets for clean energy technologies through business plans, strategic alliances, acquiring rights to intellectual property, addressing new markets, securing capital and more.

NYSERDA is assisting several New York City-based companies through its clean energy business growth and development program. In partnership with NYSERDA, Solar Energy Systems, Inc. (SES) is building the commercial PV market in New York City with goals to install at least 350 kilowatts commercial PV systems through a unique "build, own, operate" model.

Another New York City-based business, FTL Ventures Studio, was recently awarded a contract to expand markets for their photovoltaic tents, shelters and lightweight structures.

Working with NYSERDA, Gaia Power Technologies is building markets for its energy storage and management system, the "PowerTower", to demonstrate the benefits to utilities for "peak-shifting" renewable energy.

I would also like to add that NYSERDA is co-sponsoring the NYC Solar Summit June 17, 2008. This is a day-long event intended focus on New York City and to delve deeply into solar technology developments, policy and green collar training opportunities. I invite you to join me at this undoubtedly interactive, vigorous and informative forum.

FUTURE OPPORTUNITIES

With all this in mind, I return to where I began this testimony. On February 25, the Lt. Governor's Renewable Energy Task Force announced sixteen recommendations to move New York towards greater renewable energy development. A number of these recommendations will accelerate the development and use of PV in New York. If you have not already, I invite you to review the detailed

recommendations listed on the Lt. Governors website. In short, with respect to PV, they include:

- Allowing net metering for all customer classes and increasing the size for projects eligible for net metering;
- Creating incentives to help homeowners and businesses install a goal of 100 megawatts of PV and 1,100 solar thermal systems statewide by the year 2011;
- Investing $400 million over four years to support clean energy technology clusters;
- Expanding accredited training programs to develop an abundant supply of green collar workers; and
- Maintaining a firm commitment to the Renewable Portfolio Standard to provide investors with confidence in New York's commitment.

CLOSING

Rising oil costs, unrest in oil producing countries, energy reliability, and economic and climate change concerns make this a critical time for New York State. Building a robust market for PV is an important piece

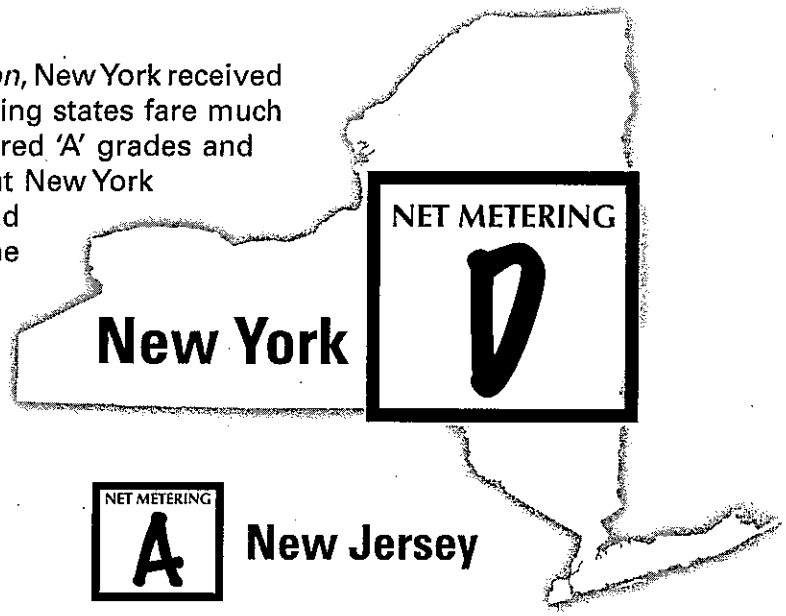
of our energy puzzle, especially when combined with energy efficiency. New York City presents many opportunities for using PV and growing PV businesses. With increasing state and City support and collaboration, we will be able to accelerate the building of strong and sustainable PV businesses and markets. Not only will PV help the environment and our energy security, but it will also help the economy.

BROAD COALITION SUPPORTS A STRONGER NET METERING PROGRAM IN NY

Business and Environmental Groups Recognize the Role that Net Metering Can Play in Protecting the Environment, Creating Jobs, and Accelerating Clean Energy Development

See page 4 for list of coalition members

In the recent report, *Freeing the Grid: 2007 Edition*, New York received a '**D**' grade for its net metering law. Neighboring states fare much better (e.g. New Jersey and Pennsylvania scored 'A' grades and Connecticut received a 'B'). The report found that New York restricts the size of renewable energy systems and is only one of two states in the nation (out of the 40 states with net metering policies) that does not allow commercial and industrial customers to net meter. Business leaders cite the restrictive net metering law as the biggest impediment to the state's renewable energy development.



How New York State can improve its Net Metering Program:

- ★ Increase system size to at least 2-MW.
  - » Right now, the ability of businesses to install larger solar systems is limited due to the fact that the law does not allow them to net meter.
  - » System sizes should be expanded to meet customer needs.
- ★ Open up net metering to ALL customer classes; NY's net metering program currently is limited to residential and agricultural.
- ★ Expand the same net excess generation (or rollover) as solar to wind.
- ★ Increase the overall limit on net metering enrollment.
  - » There were so many residential applications to install a photovoltaic system on homes within the service territory of the Central Hudson Gas and Electric Corporation that proponents of net metering had to petition the Commission to raise the limit. During the approval proceeding, Hudson Valley Clean Energy Inc. argued, "the refusal to enroll new photovoltaic net metering customers threatens its economic viability and the 22 skilled, well-paying jobs it provides."[1]

What is Net Metering?

Net metering is the simplest possible billing arrangement by which customers realize savings from their renewable energy systems, where 1-kWh (kilowatt-hour) generated by the customer has the exact same value (in cents/kWh) as 1-kWh consumed by the customer.

Net metering allows consumers to transfer surplus energy onto the utility grid essentially "banking" it for later use. When the customer's house is producing more electricity than it consumes, the electric meter literally spins backward, allowing consumers to store kilowatt credits, to be drawn upon later; just how cell phone roll-over minutes work.

Without exception, significant deployment of clean, customer-sited distributed generation occurs only in states with modern interconnection and net metering policies.

Benefits of Net Metering:[2]

- ★ Supplies customers with clean energy and hedges against rising energy bills.
- ★ Helps grow business and create jobs.
  - » Two megawatts of installed solar energy supports 16 local jobs.
  - » With other incentives and investments, net metering can help bring on-line 2,000-MW of solar power in 10 years—creating 13,000 direct and 30,000 indirect jobs in NY.
- ★ Reduces stress on New York's electric grid, often during peak times.
- ★ Significant deployment of clean energy will improve air and water quality and reduce greenhouse gas emissions.

A strong net metering policy is one of four key energy policies required to drive real, cost-effective distributed energy markets for solar, wind, and other renewable technologies. The other policies are favorable utility rates and revenue policies, encouraging standards and incentives, and high-quality interconnection standards. Put in place these four policies, and any state or utility can develop a world-leading market for small-scale clean energy. Get the details wrong in just one policy, and the market can come to a complete halt.

New York's restrictive net metering policy is the biggest impediment to renewable energy expansion in the state. It limits my company, which installs solar electric systems, and other installers to mostly small residential systems, whereas our out-of-state competitors can include larger and non-residential systems in their growth. Furthermore, while commercial customers in New York are demanding solar systems, the lack of net metering makes them impractical. This is not good for industry or job creation in New York.

Jeff Irish
Hudson Valley Clean Energy, Inc.

What Are the Key Components of an Effective Net Metering Program?

- ★ Allow monthly carryover of excess electricity at the retail rate—it's the 'net' in net metering.
- ★ Permit all customer classes to participate.
- ★ Let customer load determine the system size; large commercial customers may have loads in the tens of megawatts, and should be permitted a 2 or 3-MW system.
- ★ Include all clean energy technologies.
- ★ Recognize net metering as a key policy to aid the goals of the statewide renewable portfolio standard and achieve reductions in greenhouse gas emissions.
- ★ Ensure customer-sited systems receive the same treatment as customer efficiency measures.
- ★ Reduce unnecessary and burdensome red tape and special fees.
- ★ These components are currently part of successful net metering programs in CT, NJ and PA.

Overview of New York's Net Metering and Interconnection Standards

NET METERING	D	INTERCONNECTION	C
Eligible Renewable/ Other Technologies:	Photovoltaics, Wind, Biomass	**Eligible Renewable/ Other Technologies:**	Solar Thermal Electric, Photovoltaics, Landfill Gas, Wind, Biomass, Hydroelectric, Geothermal Electric, Fuel Cells, Municipal Solid Waste, CHP/Cogeneration, Microturbines, other Distributed Generation Technologies
Applicable Sectors:	Residential, Agricultural (NY's net metering rules are only one of two rules in the country to exclude the commercial class)	**Applicable Sectors:**	Commercial, Industrial, Residential, Agricultural
Limit on System Size:	10-kW for solar; 25-kW for residential wind; 125-kW for farm-based wind; 400-kW for farm-based biogas	**Special Rules for Net Metered Systems:**	Yes
Limit on Overall Enrollment:	0.1% of 1996 demand per IOU* for solar; 0.2% of 2003 demand per IOU* for wind; 0.4% of 1996 demand per IOU* for farm-based biogas	**Limit on System Size/Overall Enrollment:**	2-MW
Treatment of Net Excess:	Credited monthly at retail rate, except for wind greater than 10-kW, which is credited monthly at avoided-cost rate. Accounts reconciled annually at avoided-cost rate.	**Standard Interconnection Agreement:**	Yes
Utilities Involved:	All utilities	**Additional Insurance Requirements:**	No
		External Disconnect Required:	Yes

New York State Has Great Potential To Expand Small Scale Photovoltaic Systems

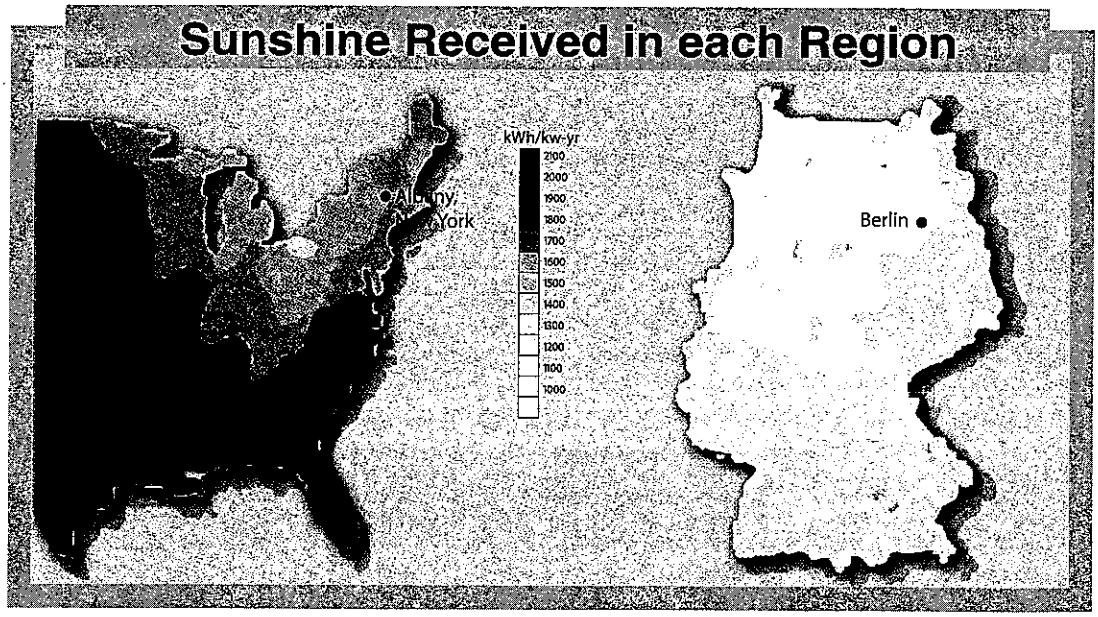


FIGURE 1: Amount of sunshine in New York State and other parts of the Northeast U.S. and the amount of sunshine in Germany, which leads the world in installed solar power capacity[3]

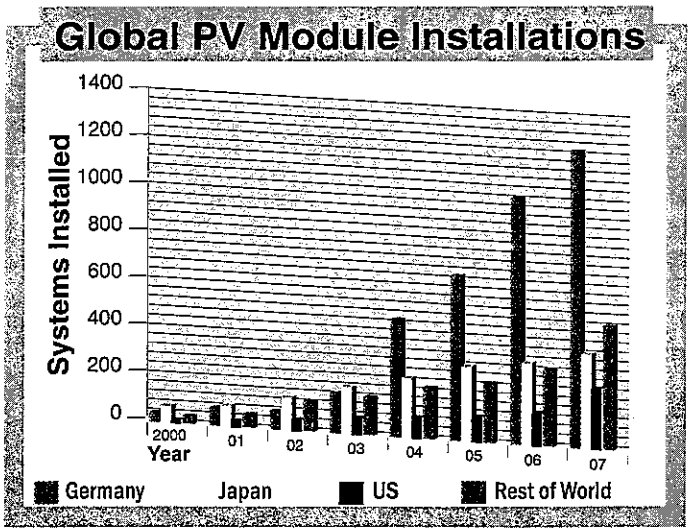


FIGURE 2: Installed solar power capacity 2000-2007 (in MW) in Germany, U.S., Japan, and rest of world (2007 is an estimate)[4]

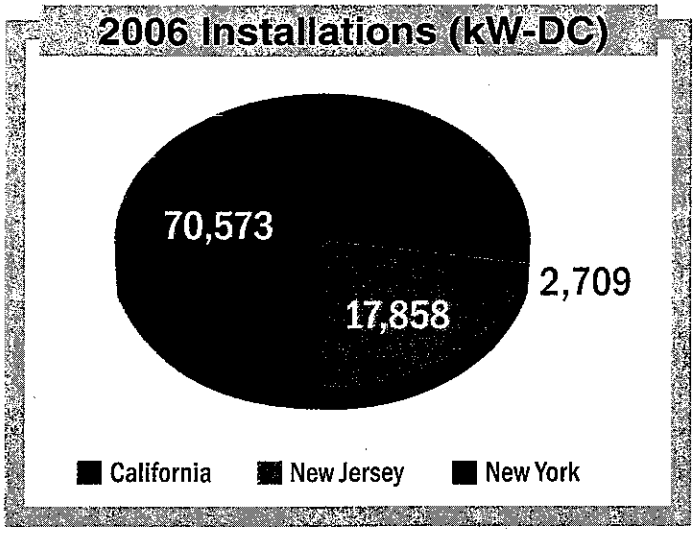


FIGURE 3: 2006 Installed solar power capacity (in kW-DC) in New York State compared to New Jersey and California[5]

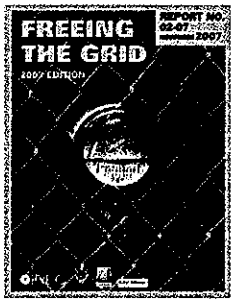
1 State of New York Public Service Commission. (June 21, 2007) CASE 07-E-0437. Order raising net metering ceiling and providing for additional proceeding. http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/0/9FCC8A6ADD1948C98525730100481601/$File/377_07E0437final.pdf?OpenElement

2 Solar Initiative of New York (May 2007). New York's Solar Roadmap. http://www.neny.org/download.cfm/NENY_Membership_Application.pdf?AssetID=225

3 Solar Initiative of New York (May 2007). New York's Solar Roadmap. http://www.neny.org/download.cfm/NENY_Membership_Application.pdf?AssetID=225

4 PV News, July 2007 as quoted in Travis Bradford and Paul Maycock, "PV Market Update: Demand Grows Quickly and Supply Races to Catch Up," Renewable Energy World, July 2007. http://www.renewable-energy-world.com/display_article/305266/121/CRTIS/none/none/PV-market-update:-Demand-grows-quickly-and-supply-races-to-catch-up/

5 Id.



Freeing the Grid: 2007 Edition

Available for a free download at:
www.NewEnergyChoices.org/uploads/FreeingTheGrid2007_report.pdf

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LIST OF COALITION MEMBERS JAN. 2008

- Alliance for Clean Energy New York, Inc.
- American Lung Association of NY State
- Black Rock Forest Consortium
- Citizens Campaign for the Environment
- Environmental Advocates of New York
- Hudson River Sloop Clearwater
- Hudson Valley Clean Energy, Inc.
- Long Island Neighborhood Network
- Natural Resources Defense Council
- Network for New Energy Choices
- New York City Apollo Alliance
- New York Interfaith Power and Light
- New York League of Conservation Voters
- New York Public Interest Research Group
- New York Solar Energy Industries Association
- New York State Apollo Alliance
- Pace Energy Project
- Renewable Energy Long Island
- Solar Alliance
- The Solar Energy Consortium
- SunEdison
- The Vote Solar Initiative

FREEING THE GRID

2007 EDITION - SUMMARY

REPORT NO. 02-07
SEPTEMBER 2007

IREC
INTERSTATE RENEWABLE ENERGY COUNCIL

Vote Solar

Solar Alliance
The PV Industries in the States

FREEING THE GRID

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This document is in advance of a larger update to **Freeing the Grid**. The full updated report will be released at the National Association of Regulatory Utility Commissioners' (NARUC) annual convention, November 11 - 14, 2007.

Available for Online Download
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www.newenergychoices.org/uploads/FreeingTheGrid2007_ExSum.pdf

Full Report
www.newenergychoices.org/uploads/FreeingTheGrid2007_report.pdf

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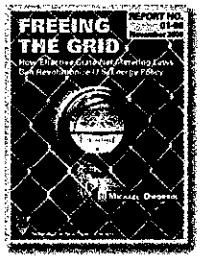
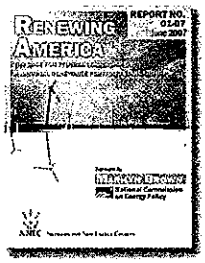


Freeing The Grid
How Effective State Net Metering Laws Can Revolutionize U.S. Energy policy

NO 01-06 Nov. 2006
Forward By Michael Dworkin
Professor of Law and Director of the Institute for Energy & the Environment
Vermont Law School

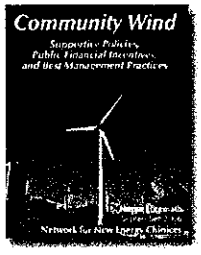


Renewing America:
The Case for Federal Leadership on a National RPS

NO 01-07 Jun. 2007
Christopher Cooper,
Senior Policy Strategist
Dr. Benjamin Sovacool,
Senior Research Fellow
Forward By Marilyn Brown
National Commission on Energy Policy

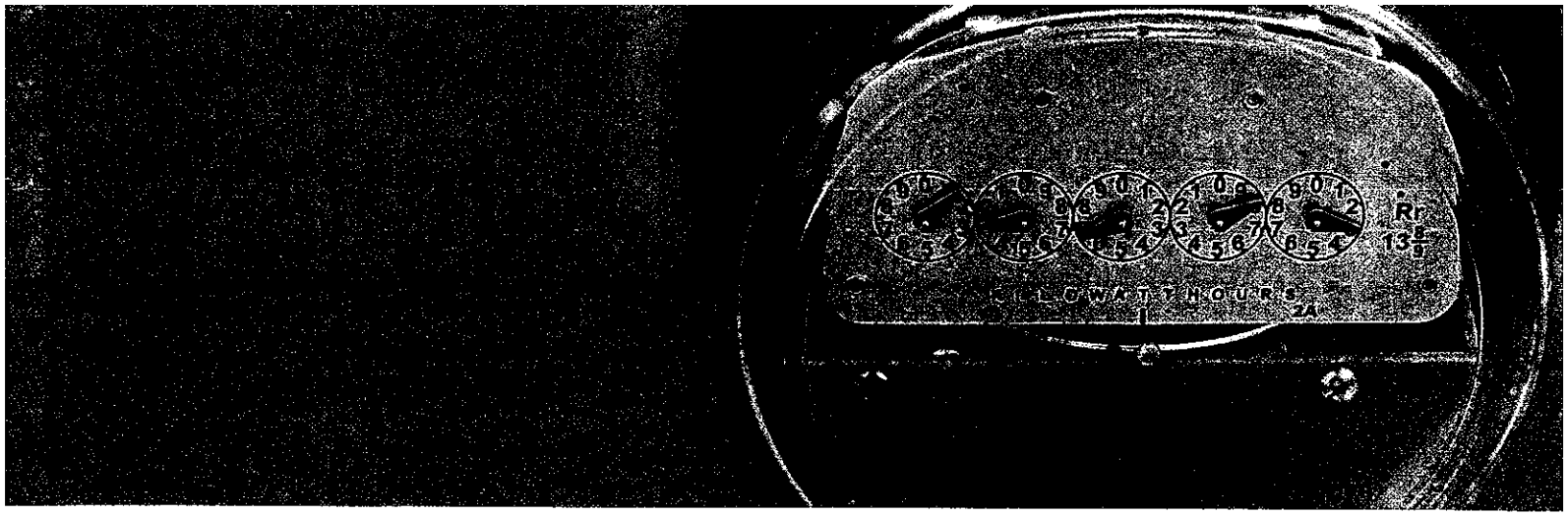
The Rush to Ethanol:
Not All Biofuels Are Created Equal

July 2007
A report by Food & Water Watch, the Network for New Energy Choices, and the Institute for Energy and the Environment at Vermont Law School provides comprehensive analysis and recommendations for U.S. biofuels and transportation policies.



Community Wind
Supportive Policies, Public Financial Incentives, and Best Management Practices
September 2006

All publications are free for online download, check our website www.newenergychoices.org for more information.



INTRODUCTION

Since the 2006 edition of **Freeing the Grid**, there have been great strides in bringing more clean energy to the grid. Many states have taken the lead by reforming their clean energy policies and goals. But we are still far from conquering the "Energy Trilemma" – an energy world constrained by the three forces of financial goals, environmental concerns and security risks. In this 2007 edition, the Network for New Energy Choices teamed up with the Solar Alliance, the Vote Solar Initiative, and the Interstate Renewable Energy Council to bring the most up to date analysis of statewide interconnection and net metering rules. In our study, we graded each state based on its progress towards the goals of smoother interconnection and favorable net metering standards.

What Is Interconnection?

An interconnection standard is the set of rules under which a customer-generator interfaces with the electricity grid. Generally, the distribution utility must study and approve the generator within a framework established by the state utilities commission. Therein lays the conflict. Utilities that may perceive customer-generators as a threat to their financial bottom line have the authority to decide how many systems may connect to the grid, and under what circumstances. This situation can result in a significant barrier, as utilities either apply to a two-kilowatt (kW) residential solar generator a set of procedures better suited to a two-gigawatt nuclear power plant; or impose steep fees, redundant safety requirements, or other preventative measures.

While the underlying engineering standards and requirements are well-known (generally, the Institute for Electrical and Electronics Engineers' (IEEE) 1547 standard covers all the bases), an engineering standard is not a complete procedure. A full procedure must address fees, timelines, insurance requirements and indemnification, forms and certain other issues, to provide a comprehensive procedure that supports investment in small generation – either by individuals or by project development investors.

Wherever the standard is unclear, or where redundant or unnecessary tests or steps are piled on the existing national standards, the results can be costly. The impact of these costs on small generators can be significant.

Sunshine Solar Inc. INVOICE

Solar Panels (2,500 Watts)	$	11,700
Racks, Wiring, and Hardware	$	1,250
Inverter	$	1,950
Installation Labor	$	1,650
Redundant Disconnect + Labor	$	400
Interconnection Forms & Fees + Labor	$	1,000
Total Cost	$	17,950

Consider the example above, assume Ray McSolar purchases a 2.5-kW solar s ystem – more expensive per watt than a larger solar roof, but enough for his needs. His state's interconnection rules force him to endure lots of testing, pay big fees to the electric company, and install an external disconnect switch.

With $48.50 earned for electricity produced each month, he'll be running that system for more than two years just to pay off the red tape!

WHAT IS NET METERING?

Imagine the simplest possible metering arrangement: a single, 1950s-standard electromechanical meter. Now imagine that a residential customer, Ray McSolar, added a rooftop solar-electric system to his home, on his side of this meter.

Ray wakes up pretty early for his job; on most days, he's up and out of the house before the sun rises. In these dark morning hours Ray makes his coffee and breakfast, while watching some morning news on the TV. In this case, the meter spins forward as Ray is consuming electricity from the grid.

As the sun rises, Ray heads off to work. Making sure not to waste a drop of electricity, he shuts off all his appliances. The meter spins in reverse as the solar panels churn out electricity – electricity Ray sends back to the overstressed grid.

When Ray returns at night to cook dinner and relax in front of the TV, the meter spins forward again while he consumes electricity.

The result? Ray's bill will show only his net consumption of electricity from the grid. Should it be a hot sunny month (the sort of months when the grid needs the most help), or a month in which Ray's electricity use is low, he can carry any excess electricity his system generated to the next bill, just as he might roll over excess cell phone minutes.

The result of net metering is to allow for the production of electricity that a strained grid did not have to produce. This is, in fact, exactly the same result Ray would get if he had installed a more efficient refrigerator. The only way his utility would know the difference between the use of more efficient technologies (like that refrigerator) and the use of on-site generation (e.g. solar panels) is if it installed a costly additional meter at Ray's home and underwent the expense of reading both meters and billing Ray for the results.

In effect, net metering is the simplest possible billing arrangement for customer-sited distributed generation. Without exception, significant deployment of clean, customer-sited distributed generation occurs only in states with modern interconnection and net metering policies.

Interconnection and Net Metering: *What's the Difference?*

Interconnection – the technical rules for customers to "plug in" to the grid.

Net Metering – the billing arrangement by which customers realize savings from their systems, where one kilowatt-hour (kWh) generated by the customer has the exact same value as one kWh consumed by the customer.

OUR SCORING METHODS:

In our evaluation of statewide interconnection and net metering programs, we developed an index that rewards program elements that promote participation, expand renewable energy generation, or otherwise advance the goals sought by net metering. Conversely, the index assigns demerits to program components that discourage participation or limit renewable energy generation.

We measured program components and assigned numerical values to each. Negative values represent factors that undermine the effectiveness of the net metering program. Positive values represent additional incentives that contribute to program effectiveness.

Applying these numerical values to program components allows us to plot (separately) the effectiveness of each interconnection and net metering program, and to assign a letter grade to each.

An analysis of the provisions of many state programs demonstrates a distinctive distribution: perhaps a dozen "best practices" states where the framework is more or less standardized and small-scale generation is already flourishing or about to begin surging; a large undifferentiated middle where development is limited; and a few states where customer generation is actively discouraged or impossible outside of isolated demonstration projects.

Policy Points: Net Metering

Individual System Capacity

In certain cases, statutory limitations on the size of eligible technologies prevent customer-generators from correctly sizing a system to meet their own demand.

Uniform size limits reduce regulatory confusion while promoting the broadest population of renewable energy generating systems. Increasing the eligible facility size for non-residential systems also could encourage participation in net metering programs by large investors. It is no longer uncommon to see renewable energy systems in the 100 kW to 2 megawatts (MW) range. Several project developers in Oregon, for example, argued that the transactional cost of systems less than 100 kW are too great to interest large investment partners.[1]

There is no policy justification for limiting system size to an arbitrary level. Customer load and demand should determine the system design parameters, and it is simple to prevent "oversizing" without recourse to arbitrary distinctions that may exclude the most cost-effective projects.

While the most progressive state standards embrace this concept, many are converging on a consensus level of 2 MW.

Points	Largest
+5	Greater than 1 MW
+4	Between 750 kW and 1 MW
+3	Between 500 kW and 750 kW
+2	Between 100 kW and 500 kW
+1	Between 50 kW and 100 kW
0	Not greater than 50 kW
-1	Residential systems capped below 20 kW
Notes	Some permit up to 80 MW on very large loads (such as a military base or corporate headquarters campus)

Total Program Capacity Limits

In a nod to utility concerns that on-site generation represents lost revenues (an intuitive but short-sighted view of the arrangement), many states have limited the total capacity eligible for net metering either statewide or for any given utility.

It makes little sense to limit the total amount of clean energy that customers may generate and contribute to the electricity grid. Utilities do not have an inherent right to charge for electricity that customers could otherwise generate more efficiently and more cleanly on their own. Capacity limits artificially restrict the expansion of on-site renewable generation and curtail the market for new renewable energy distributed generation (DG) systems. They may also prove incompatible with aggressive targets for renewable energy deployment set by several states.

Capacity limits, based on a percentage of peak demand, create uncertainty for new customers considering net metering. Since customers have no way of knowing when capacity limits will be met, they cannot effectively plan for future DG installations.[2] This regulatory uncertainty inhibits renewable energy investment.

Points	Total Program Limit as Percentage of Peak Demand
+2.5	> 5% or no limit
+2	Between 2% and 5%
+1.5	Between 1% and 2%
+1	Between 0.5% and 1%
+0.5	Between 0.2% and 0.5%
0	Between 0.1% and 0.2%
-0.5	Less than 0.1%
Bonus +1	For excluding generators that don't export electricity, or measuring based on energy produced instead of total capacity.

Restrictions on "Rollover"

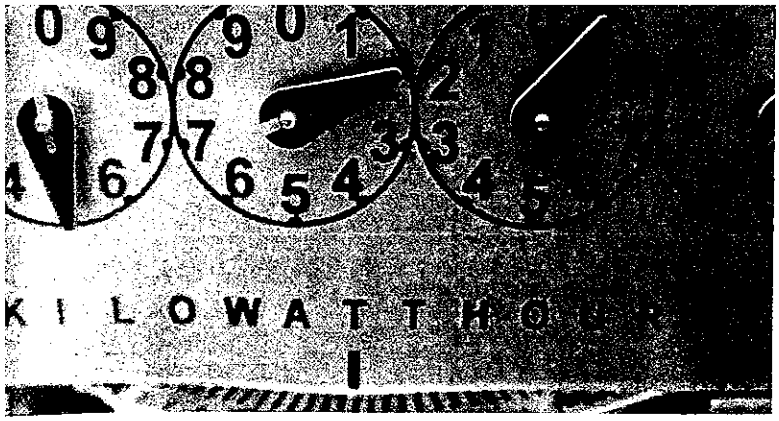
When customers generate more electricity during a monthly billing period than they consume, some states allow customers to "roll over" the excess generation. The utility carries forward any excess generation until it is used up. Some of the least effective programs allow zero rollover, granting the utility excess electricity generated by customers each month. In these states, customers undersize their systems so that the system is less than the customer's monthly minimum load. Other states limit the time over which rollover can be used.

Restricting rollover to a single month is more a function of utility billing cycles than public policy. In fact, it is very easy for the administrative costs associated with paying for small amounts of excess generation (withdrawing bills, hand–billing, etc.) to overwhelm any saved revenue for the utility. To be successful, a net metering program must facilitate rollover so that customer-generators can receive credit for excess energy generated during the seasons when renewable output is highest and apply it toward their consumption when output is lowest, striving towards a zero bill.

In the worst possible case, a so-called net metering tariff could actually require customers to pay utility transmission and distribution fees even on generation they never rolled over – paying the utility a fee in exchange for not using their services.

Remember Ray McSolar and his 1950s meter? That's the best implementation of rollover – to read this meter annually is to provide the lowest administrative cost and best equity for the customer.

Points	Rollover Provisions
+1.5	Indefinite rollover at retail rates.
+1	Monthly rollover for one year, annual payment at retail rates. (It is key to limit payout in this case so that customers do not oversize their generator beyond their own needs. Indefinite rollover is easier.)
+0.5	Monthly rollover for one year; annual payment at wholesale or avoided cost.
0	Monthly rollover for one year; excess energy donated to utility annually.
-2	Monthly payment at wholesale or avoided cost.
-4	No rollover permitted; excess energy donated to utility monthly.



Metering Issues

Requiring customer-generators to pay for additional meters adds no value to the customer-generator or the utility. Once again, if a customer could save 20% of their usage with a better air conditioner, would it be reasonable to meter the savings and compensate them differently?

Some states compel customers that choose to net meter to switch to a time-of-use (TOU) rate, where they pay differing amounts depending on the time of day. This can either reflect the reality of the grid (and reward generators who produce during constrained peaks), or disadvantage customers.

Points	Metering Provisions
+2	Single meter
+1	Dual meters or dual registers – utility pays for the additional meter
0	Dual meters or dual registers – customer pays for the additional meter
Points	**Metering Provisions Under Time of Use**
+2	TOU meters with time bin carryover
+1	TOU meters with segregated time periods
-1	Fixed TOU rate disadvantages small generators

Renewable Energy Credit Ownership

Customer–generators that install renewable resources have done so with their own investment of money and effort. Often these generators qualify for renewable energy credits (RECs) that can be used for marketing purposes or to meet legal renewable energy targets. Utilities that have simply permitted these customers to reduce their net usage from the grid should not be permitted to seize these credits without paying for them.

Points	REC Ownership
+1	Owned by customer
-5	Transferred to utility

Eligible Technologies

Subject to appropriate interconnection standards, there is no reason to exclude any type of renewable customer-generators from net metering; some states even permit non-renewable generators to address particular local concerns.

Points	Eligible Technologies
+1	All renewable and zero-emission technologies
+0.5	Solar and wind included, one or more other renewables excluded
+0.5	All renewables, plus one or more non-renewable technologies
0	Solar only
-0.5	Solar excluded from standard

Eligible Customers

Some state net metering rules restrict the customer classes that are eligible to participate. Some state rules exclude commercial customers who may have the most substantial effect on reducing demand on the strained grid, and who often enjoy the lowest costs for installed systems.

The Texas State Energy Conservation Office has noted, "It would make more sense to limit the eligibility of a technology for a period of time, say five or ten years, in order to give the technology a period in which it has the opportunity to become commercially viable, than to limit the size of the initial market, when the goal is creating a critical mass of market demand."[3]

Allowing commercial and industrial customers to be eligible for net metering is essential to jump-starting new renewable energy markets.

Points	Largest Permissible Customer-Generator
+2	No eligible class restrictions
+1	Commercial at overall net metering limits, and residential larger than 10 kW permitted
0	Residential only, larger than 10 kW permitted
0	Commercial only
-1	All other restrictions

Bonuses for additional net metering provisions

Points	Reason for Bonus
+1	One customer can aggregate net meter within contiguous property.
+1	Utility provides a meter change if needed at utility cost.
+3	"Safe harbor language" protects customers from unspecified additional equipment, fees, requirements to change tariffs, etc.

Standby Charges or Other Fees

Many utilities claim that, in the event that net metered systems fail, the utility is required to meet the resulting customer demand. As a result, many states allow utilities to impose a "standby charge" on net metered customers.

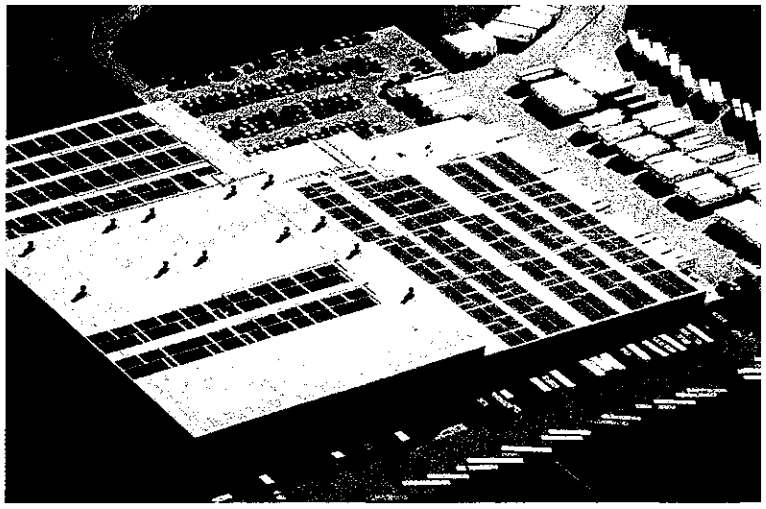
Standby charges are illogical. Some researchers have noted that they are "analogous to assigning standby fees to residential customers who purchase high efficiency air conditioning units,"[4] because, in theory, utilities would be required to meet increased demand should the air conditioners fail and need to be replaced by more conventional units.

In some cases, standby charges are equal to or even exceed rates for full electrical service, in effect creating an economic disincentive for customers to install renewable energy systems.

Standby charges are particularly burdensome to small generators. Utilities only need to provide a negligible amount of back-up power for these customers. Nevertheless, standby fees may be so costly that they diminish most, if not all, of the economic incentive net metering was intended to offer smaller generators.

There are a variety of other idiosyncratic fees and charges that can render net metering unworkable.

Points	Fees
-1	Minor additional fees for net metering
-5	Significant additional charges or fees[5]
-5	Per kWh fee on all production (in addition to other fees)[6]



Policy Points: Interconnection

Eligible Technologies

While public policy may suggest an emphasis on renewable energy, the system and engineering impacts of a system should be evaluated solely on their own merits. To do otherwise introduces complexity and may restrict innovation. If a generator complies fully with the relevant technical standards, there is no operational or safety justification to deny it interconnection.

Points	Customers that Qualify
0	All customer generators qualify.
-1	Only renewable generators permitted.

Individual System Capacity

Technical standards can and should become significantly more stringent as system sizes increase. However, they should also permit systems that are sized to meet even large onsite loads. Office parks, prisons, or college campuses can potentially accommodate installations of two megawatts or more just to serve a portion of native load, and increasingly, forward-thinking states facilitate this option.

Points	System Capacity
0	Generators from 2 MW to 20 MW permitted
-1	1 MW to 2 MW
-2	500 kW to 1 MW
-3	100 kW to 500 kW
-4	Less than 100 kW
Notes	Larger generators generally fall under federal jurisdiction and don't need to be considered here.

"Breakpoints" for Interconnection Process

Many technical considerations and studies become relevant only for relatively large generators. It is most efficient to break a single overall interconnection process into separate "tracks" based on generator capacity, relieving complexity for the smallest systems while preserving conservative and thorough studies for larger installations.

The emerging consensus is to fragment applicants at 4 breakpoints: 10 kW, 2 MW, 10 MW (non-export), and 20 MW.

Points	Levels
1	Four levels
0	Three levels
-1	Two levels
-2	No breakpoints; one process for all generators regardless of size.
Bonus +1	Progressive standards that allow larger systems in any category.

Timelines

Time is money, and for a device like a rooftop solar generator, (where physical installation may take just two working days) paperwork and permits represent the single largest obstacle to quick installation.

The Federal Energy Regulatory Commission (FERC) adopted a model interconnection standard (Order 2006) establishing a timeline for each step of the application process, for each type of generator. There is room for improvement in these guidelines, and some states have elected to trim the amount of time allowed – for instance, for the read-through of the application of the very simplest small generators using pre-certified equipment.

Points	Timelines
+1	Timelines Quicker than FERC's
0	Timelines the Same as FERC's
-1	Timelines Longer than FERC's

Interconnection Charges

Interconnection processing and study fees can easily add up to "death by a thousand cuts." Fees of $100 here and $250 there quickly add up for small systems. What's more, uncapped or unknown fees can make it impossible to obtain financing for larger projects, as their total cost may be under the control of a hostile utility.

Again, we refer to the FERC process, which established reasonable fee levels through an extensive compromise and negotiation process.

Points	Fees
+1	Fees lower than FERC's
0	Fees the same as FERC's
-1	Fees greater than FERC's

Engineering Charges

An interconnection standard may require engineering review; where it does, it is key that the fees associated with that review are known beforehand.

Points	Fees
+1	Engineering Fees Fixed
0	Engineering Fees Not Fixed

External Disconnect Switch

In theory, a customer-generator presents a safety hazard if the grid goes down and an interconnected system continues to produce power without the utility's knowledge (a situation utilities call "islanding"). Potentially, line workers could come into contact with an unexpectedly energized line. Many utilities cite these safety concerns to require that net metered customers install and test external disconnect switches on any interconnected system. However, the practical effect is that, like hidden interconnection fees, requiring additional external disconnect switches only adds unnecessary costs and discourages customers from investing in renewable energy systems.[7]

It is important to note that not one accident resulting from the islanding of net metered renewable energy systems has been reported.[8] More importantly, utility workers are trained to treat all lines as live, and a variety of other safety precautions are required as part of standard operating

procedures.[9] An external disconnect switch represents a fourth or fifth level of redundancy that is only relevant if a utility worker ignores his or her training. If a worker is following proper protocol, none of the levels of safety preceding an external disconnect switch will ever be needed, much less the switch itself.[10]

Requiring additional external disconnect switches is made unnecessary since all inverters that meet IEEE standards have automatic shut-off capabilities integrated with the systems.[11] All modern inverters shut down interconnected systems automatically in the event of grid failure.[12]

Points	Requirement
+1	Redundant External Disconnect Switch Prohibited
0	Redundant External Disconnect Switch Not Addressed
-1	Redundant External Disconnect at Utility's Discretion
-2	Redundant External Disconnect Switch Required

Certification

The electrical safety and operation of the grid must be a primary concern in the development of any interconnection procedure, and must remain an engineering standard, not a policy determination.

The relevant standards have been developed jointly by utilities, equipment manufacturers, national laboratories and testing facilities, and governmental representatives.

While some states have provided for additional options (e.g. the reuse of certification on equipment individually type-tested by utilities), others have used conflicting technical standards – a critical flaw that may in fact impact the safety and security of the grid. Still others have added idiosyncratic or unspecified "blanket" clauses that introduce uncertainties. Potential purchasers or investors in these systems do not know when such a clause might arise to disqualify them.

Points	Standard
+1	UL 1741 / IEEE 1547 standards used in addition to other options (e.g. self-certification)
0	UL 1741 / IEEE 1547 used
-1	UL 1741 / IEEE 1547 not used, or modified elements of IEEE 1547
-4	Standard used in conflict with or in excess of IEEE 1547

Technical Screens

Every interconnection is different, but all interconnections share some fundamental characteristics. These relate to, among other things, the size of the generator relative to the section of the grid to which the generator connects, and the ratings of the protective equipment installed. These factors determine how complex the interconnection process needs to be.

FERC Order 2006 provides a thorough set of technical screens that has been copied by many jurisdictions; any significant revision of these guidelines introduces difficulties to the process (and may increase system expense, as configurations or programming must be changed to differ from these widely-used benchmarks).

Points	Screen
0	FERC screens used
-1	Partial adoption of screens
-2	No screens used or utility discretion
Penalties:	Used more conservative screen than FERC = -1 for each
Bonus:	Dropped one or more FERC screens that do not affect safety or used more liberal screen element that does not affect safety = +1 for each

Spot Network Interconnection / Area Network Interconnection

A "spot network" might be designed to serve a large single location (such as a corporate campus or high-rise building); an "area network" describes the power distribution system in an area dense with users (such as a downtown area).

Either increases reliability by creating more potential paths from generation to load. However, the types of systems that can be connected are usually restricted, as these networks are much less tolerant of any export.

Some jurisdictions have extended this concern to ban these types of interconnections completely. However, the very area networks that jurisdictions aim to protect are those most in need of the relief that distributed generation can bring. More appropriate is to create more stringent technical standards for these types of systems, or simply require that they install specified high-speed equipment that disconnects systems in case of any outage.

Spot Network Interconnection

Points	Terms
1	Allowed for all systems with a single customer, or systems above 50 kW allowed
0	Allowed, but limited to 50 kW
-1	Not allowed
Bonus:	Separate standards for one customer vs. multi-customer spot networks – with single customer more liberal than FERC standard = +1
Bonus:	Systems allowed provided they install high-speed network protectors = +1

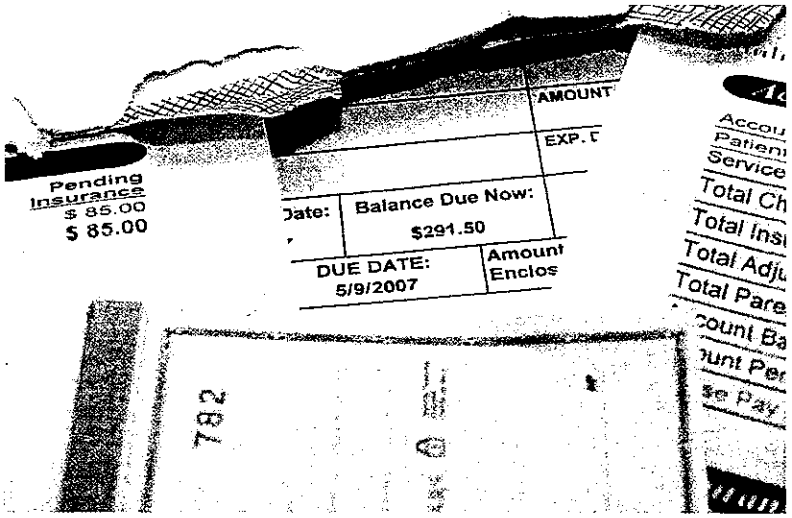
Area Network Interconnection

Points	Terms
1	Allowed for systems 500 kW or greater and 10% minimum load
0	Not addressed or allowed but at utility discretion or only after study
-1	Not allowed
Bonus:	Allowed for systems that do not export power = +1

Standard Form Agreement

The point where the "rubber meets the road" in any interconnection framework is the agreement. Without a standard agreement, the interconnection process is immediately more complex. If the standard is overly complicated, or includes clauses hostile to the customer – such as requiring the customer to indemnify the utility for a broad list of potential liabilities, with no equivalent protection from the utility – then the standard loses much of its value.

Points	Form Style
+1	Standard agreement with friendly clauses
0	Standard agreement with standard clauses
-0.5	No standard agreement
-1	Standard agreement with excessively complex or hostile clauses



Insurance Requirements

Because of potential personal injury and property damage liability risks associated with interconnection, many states allow utilities to impose liability insurance requirements on customer-generators. Some states want customer-generators to carry $100,000 or more in coverage to protect utilities from being held financially responsible for problems caused by interconnected systems.

However, to our knowledge there has never been a documented case of a small-scale net metered system causing electrical failure or creating potential personal injury or property damage liabilities for a utility.[13] Renewable energy technologies manufactured and installed in compliance with interconnection standards significantly reduce the risk of potential safety issues.[14] Product liability insurance carried by equipment manufacturers, as well as the ability of these manufacturers to indemnify customers or utilities, further negates the need for additional insurance.[15]

Excessive insurance requirements only serve to discourage customers from investing in renewable energy systems and participating in net metering programs. Requiring customer-generators—especially those with relatively small systems – to obtain and maintain million-dollar insurance policies is impractical. The high premiums associated with these policies will likely exceed the economic benefits of participating in net metering programs.

Points	Requirements
+1	Insurance requirements prohibited
+0.5	Insurance required, but not more than typical customer would carry
0	Not addressed
-2	Additional insurance required

Dispute Resolution

Inevitably, some requests for interconnection will result in disputes. The best standards provide a low-cost means of accessing an expert judgment (for instance, through a telephone call to a technical master employed by the state utility commission). Others are more administratively burdensome or complex.

Of course, if the standard explicitly states that all disputes will be resolved through or by a utility's discretion, the standard becomes less reliable in the eyes of counter-parties.

Points	Dispute Process
+2	Process in place (low or no cost, quick)
0	Not addressed or costly or administratively burdensome
-1	Utility discretion

Miscellaneous

Adverse system impact check needed on 2-MW expedited interconnections = -1 (This study addresses the potential impact of a customer-generator on the transmission network. It should not be applied to very small generators.)

Certificate of completion required without addressing local code official refusal = -1 (Some states require that a local code official sign or certify documentation associated with the interconnection process. Since these officials do not generally certify documents other than their own inspections, they can be resistant to do so, delaying or complicating the process.)

Interconnection process is significantly different from FERC standards = -1 (The overall framework of the FERC process is well-understood and should be the basic underpinning of any standard.)

GRADING

Net Metering

A Full retail credit with no subtractions. Customers protected from fees and additional charges. Rules encourage use of Distributed Generation (DG).

B Generally good net metering rules with full retail credit but there may be certain fees or costs that detract from full retail equivalent value. There may be some obstacles to obtaining net metering.

C Adequate net metering rules, but there may be some significant fees or other obstacles that undercut the value or make the process of net metering more difficult.

D Poor net metering with substantial charges or other hindrances. Many customers will forgo an opportunity to install DG because net metering rules subtract substantial economic value from the DG system operation.

F Net metering rules that hamper customer use of DG.

Interconnection

A No restrictions on interconnection of distributed generation that meet safety standards. Rules "encourage" customer-generator interconnection and represent most or all state best practices.

B Good interconnection rules that incorporate many best practices adopted by states. Few to no customer-generators will be blocked by interconnection barriers. There may remain some defects in the rules, such as, lack of standardized interconnection agreements and expedited interconnection to networks.

C Adequate for interconnection although generators incur higher fees and longer delays than necessary. There are likely a few generators that will be precluded from interconnection because of remaining barriers in the interconnection rules.

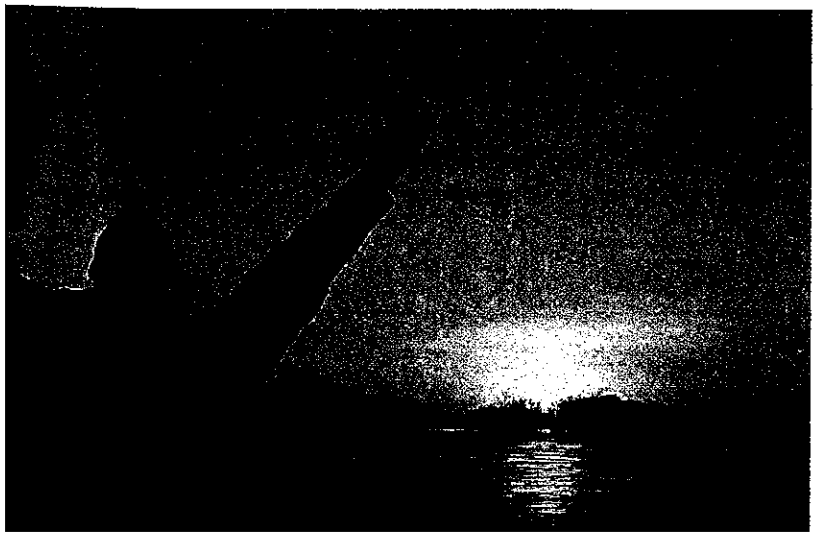
D Poor interconnection rules that leave many needless barriers to interconnection in place. A few state best practices included but many best practices options excluded. A significant number of generators will experience delays and high fees to be interconnected and a sizable percentage may be blocked from using DG because of these rules.

F Interconnection rules retain many barriers to interconnection. Few to no generators will experience expedited interconnection and few to no state best practices are adopted. Many to most DG systems will be blocked from interconnecting because of the rules.

NOTES FORTHE FUTURE

We observe that despite the developments and in some cases vast improvements in the interconnection and net metering rules and regulations in several notable states, New Jersey continues to maintain a leadership role among all states in both of these critical policy areas. This is not to say that the New Jersey rules cannot be improved upon or that there are not state rules that have indeed improved upon the New Jersey rules in certain discrete areas. In several areas the state has adopted policies that go beyond the simple removal of barriers to actual encouragement of the use of distributed generation by customers. In order to advance the use of clean and renewable distributed generation, we encourage states to improve upon the best practices in New Jersey that is, to incorporate those rules as a starting point and adopting the best practices developed in more recent state rulemaking proceedings.

As states continue to discuss and implement new interconnection and net metering rules there will invariably be improvements in standard practice that were not anticipated when the point and grading scale used for this report was developed. As those improvements arise, the grading and point scale we use will be modified to accommodate them. Conversely, the standard may also need to be revised to appropriately downgrade a limited number states that erect unforeseen new barriers. In sum, the grading and point scale is subject to ongoing revision to address evolutions and devolutions in the interconnection and net metering policy arena. Of course, best practices have a way of becoming commonplace, and this, too, will require a scoring adjustment. For example, as we approach more than a dozen states with a 2 MW system capacity limit, this once aggressive policy stance will be regarded as commonplace, and only larger limits will obtain maximum points.



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ENDNOTES

1 Oregon Department of Energy. (2006) Net Metering: Comments by Kyle L. Davis of PacifiCorp. July 10, 2006. Page 3. http://www.oregon.gov/ENERGY/RENEW/docs/ODOENetMeteringPaper-Revisions.pdf.

2 Pacific Gas and Electric Company, Generator Interconnection Services Department. (2006) Pacific Gas and Electric Company's Position on the Net Energy Metering Enrollment Cap.

3 Texas State Energy Conservation Office. (2002) An Analysis Working Paper on Net Metering as an Incentive for Fuel Cell Applications. September 10, 2002. http://www.seco.cpa.state.tx.us/zzz_feulcell-initiative/fciac_incen_netmeter.pdf

4 Wenger, Howard, Tom Hoff, and Jan Pepper. (1996) Photovoltaic Economics and Markets: The Sacramento Municipal Utility District as a Case Study. California Energy Commission. September, 1996. http://www.energy.ca.gov/papers/CEC-999-1996-014.PDF

5 The fees here are typically a one time fee or flat monthly fee as differentiated from the much more problematic on-going per kWh production fee.

6 A per kWh charge effectively undoes net metering, will be administratively burdensome and requires more expensive metering than simple net metering thus the significant negative score

7 Cook, Christopher. (2003) Interconnection of PV Systems to the Grid - The Utility Accessible External Disconnect Switch: Critical Safety Component or Useless Equipment Requirement? Paper A160, ASES Solar 2003, Proceedings of 32nd ASES Annual Conference.

8 Xu, et al. (2004) An Assessment of Distributed Generation Islanding Detection Methods and Issues for Canada. CANMET Energy Technology Centre – Varennes, Natural Resources Canada. Report #CETC-Varennes 2004-074(TR).

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10 Cook, Christopher. (2003) Interconnection of PV Systems to the Grid - The Utility Accessible External Disconnect Switch: Critical Safety Component or Useless Equipment Requirement? Paper A160, ASES Solar 2003, Proceedings of 32nd ASES Annual Conference.

11 Institute of Electrical and Electronics Engineers (IEEE). (2003) 1547-2003 IEEE Standard for Interconnecting Distributed Resources with Electric Power Systems.

12 Haynes, Rusty and Whitaker, Church. (2007) Connecting to the Grid: A Guide To Distributed Generation Interconnection Issues, Fifth Edition. Interstate Renewable Energy Council (IREC) and North Carolina Solar Center. http://www.irecusa.org/fileadmin/user_upload/ConnectDocs/IC_Guide.pdf

13 Starrs, Thomas J. (no date) Barriers and Solutions to Interconnection Issues for Solar Photovoltaic Systems. Prepared for the Solar Electric Power Association. http://www.resourcesaver.com/file/toolmanager/O63F14189.pdf

14 Ibid.

15 Starrs, Thomas J. and Robert K. Harmon. (2000) Allocating Risks: An Analysis of Insurance Requirements for Small-Scale PV Systems. http://www.puc.state.pa.us/electric/pdf/NMIC_SunEdison_Comments_Att3.pdf

NET METERING

STATE	Grade
IREC Model	**A**
New Jersey	A
Colorado	A
Pennsylvania	A
Maryland	A
California	A
Oregon	B
Delaware	B
Iowa	B
Connecticut	B
Ohio	B
New Mexico	B
Arkansas	C
New Hampshire	C
Rhode Island	C
Hawaii	C
Maine	C
Louisiana	C
Virginia	C
North Dakota	C
Minnesota	C
Massachusetts	C
Montana	C
Vermont	C
Missouri	C
Washington	D
New York	D
Texas	D
Kentucky	D
Michigan	D
Wyoming	D
Oklahoma	D
Indiana	D
West Virginia	D
Utah	F
D.C.	F
Georgia	F
North Carolina	F
Wisconsin	F

INTERCONNECTION

STATE	Grade
IREC Model	**A**
New Jersey	B
Arizona	B
California	C
Ohio	C
Texas	C
New York	C
Colorado	C
Oregon*	C
Massachusetts	C
Georgia	C
New Mexico*	C
Vermont	C
Minnesota	D
Rhode Island	D
Wisconsin	D
West Virginia	D
Arkansas	D
New Hampshire	D
Virginia	D
Iowa	D
Maryland*	D
Montana	D
Michigan	D
Indiana	D
Pennsylvania	D
Connecticut	D
North Carolina	F
D.C.	F
Wyoming	F
Louisiana	F
Delaware	F
Hawaii	F
Utah	F
Washington	F
Missouri	F

A	**15+**
B	**9 - 15**
C	**6 - 9**
D	**3 - 6**
F	**< 3**

NOTE: 7.5 points were added to normalize interconnection to net metering.

Detailed and updated scoring for any state is available upon request and will be released with the full report at the National Association of Regulatory Utility Commissioners' (NARUC) Annual Convention, November 11 - 14, 2007.

* OR graded on June 2007 rules. Newly adopted rules appear to be a significant improvement.

* MD graded on workgroup report currently before the Commission; final rules have not yet been adopted.

* NM graded on existing rules. A consensus working group report is expected to significantly improve this grade.

WHO WE ARE

IREC

www.irecusa.org

The Interstate Renewable Energy Council's (IREC) mission is to accelerate the sustainable utilization of renewable energy sources and technologies in and through state and local government and community activities.

IREC focuses on some of the current and often difficult issues impacting expanded renewable energy use such as rules that support renewable energy and distributed resources in a restructured market, connecting small-scale renewables to the utility grid, developing quality credentials that indicate a level of knowledge and skills competency for renewable energy professionals, and getting the right information to the right people.

IREC's members include state energy offices, city energy offices, other municipal and state agencies, national laboratories, solar and renewable organizations and companies, and individual members. In addition, IREC works with many partners including the federal government, national environmental and municipal organizations, regulatory commissions, state-appointed consumer representatives, energy service providers, utility groups, universities and research institutes.

Vote Solar Initiative

www.votesolar.org

The Vote Solar Initiative is a non-profit organization with the mission of stopping global warming and increasing energy independence by bringing solar energy into the mainstream.

Stopping global warming is the challenge of this century — and our success will hinge on our ability to transition to renewable energy. Solar energy — clean, homegrown, and reliable — has the potential to play a large part of the solution. While solar is the fastest growing energy source in the world, we've just scratched the surface of its potential.

Vote Solar is working on the key policies necessary to bring solar to scale. Vote Solar works with state governments to build sustainable solar markets, removing regulatory barriers and laying the necessary groundwork for a solar future. And Vote Solar works with cities to build large-scale and cost effective solar projects, building the economies of scale necessary to bring down costs.

Polls show that Americans overwhelmingly want greater investment in solar and other renewable energy sources. We turn that desire into results. Join us, and we'll let you know about opportunities to take action — and help jumpstart the solar revolution.

Network for New Energy Choices

www.newenergychoices.org

The Network for New Energy Choices (NNEC) promotes safe, clean, and environmentally responsible energy options. We advocate for energy conservation, energy efficiency and renewable energy as the solutions to our energy crisis and we work to transform the public consciousness about the way we produce, distribute and consume energy.

Today's energy system relies on polluting and inefficient technologies. This energy model is harming human health and the environment, with potentially catastrophic consequences for the planet's climate.

The nonprofit organization GRACE created the Network for New Energy Choices in 2006 to raise awareness about the problems with our energy system and to empower individuals and communities to choose sustainable energy solutions.

Collaborating with a growing coalition of consumers, grassroots organizations, academics, and policymakers, NNEC uses creative communication, internet advocacy, and public education to bring about a new world of energy choices.

Solar Alliance

www.solaralliance.org

The Solar Alliance is an alliance of leading photovoltaic manufacturers and installers focused on helping legislators, regulators and utilities make the transition to solar power. The Solar Alliance provides the technical and policy expertise that results in programs that best serve the interests of all residential, commercial, and government ratepayers.

IREC
INTERSTATE RENEWABLE ENERGY COUNCIL

NNEC

THE Vote Solar INITIATIVE

Solar Alliance
The PV Industries in the States

FREEING THE GRID

2007 EDITION - SUMMARY

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