Solar Energy Industries Association®

December 1, 2014

The Honorable Gina McCarthy
Administrator, United States Environmental Protection Agency
1200 Pennsylvania Avenue, NW
Washington, DC 20460

To Be Submitted via: A-and-R-Docket@epa.gov

RE: Docket ID No. EPA-HQ-OAR-2013-0602

Comments to the EPA and States on the Proposed Clean Power Plan Regulating Existing Power Plants Under Section 111(d) of the Clean Air Act

Dear Administrator McCarthy:

The Solar Energy Industries Association (SEIA) and its 1,000 members would like to express our appreciation for the opportunity to provide input on the proposed Clean Power Plan regulating existing power plants under section 111(d) of the Clean Air Act (hereafter referred to as 111(d)).

Solar energy reduces carbon pollutants and offers a positive economic return while generating affordable and reliable energy. As a cost-effective clean energy source, solar avoids a number of costs associated with fossil fuel resources. Further, solar enjoys widespread bi-partisan support from policymakers and the general public throughout the United States. As fossil energy production declines, solar energy will be available to help meet energy demands in a clean and sustainable manner. Therefore, SEIA respectfully requests that the EPA adopt an approach to regulating carbon emissions under Section 111(d) of the Clean Air Act that recognizes the ability of solar to reduce carbon emissions from existing power plants and that promotes the increased deployment and use of solar energy.

The comments contained herein reflect the views of SEIA and not the views of any individual member company. The following is an outline of SEIA's comments to the EPA.

EXECUTIVE SUMMARY

The United States has some of the richest solar resources in the world. The U.S. solar industry grew by 53% from 2012 to 2013, accounting for nearly 30% of all new electric generating capacity added to the U.S. grid in 2013.[1] An additional 7.3 GW of solar capacity are expected to be added in 2014, brining the cumulative U.S. total to over 20 GW- enough to power more than 4 million homes. The U.S. solar

[1] SEIA/GTM U.S. Solar Market Insight™ Year in Review 2013 Report. All U.S. Solar Market Insight Reports are available here: http://www.seia.org/research-resources/us-solar-market-insight

industry now supports 143,000 employees at more than 6,100 companies spread across all 50 states. This phenomenal growth is the result of private investment, technological innovation, a maturing industry, customer demand, and smart federal and state policies.

The steady decline in solar energy costs makes it a cost-effective solution to reducing greenhouse gas emissions, modernizing grid operations, increasing energy independence, addressing water supply challenges, while simultaneously lowering long-term electricity supply costs and providing significant economic benefits. Solar contributes to a balanced portfolio of energy resources, and can help achieve an optimal long-term strategy for the economy and the environment.

The EPA's Clean Power Plan recognizes and bolsters the current opportunity to reduce carbon emissions by transitioning the United States electric grid from a fossil fuel dominant fuel mix to a balanced energy portfolio that includes a higher penetration of renewable energy resources. The Clean Power Plan will require affected electric generating units (affected EGUs) within each state to reduce their carbon emissions, thus presenting the opportunity for utilities and states to shift towards sources that generate energy with little or no carbon emissions such as solar energy. The EPA has already recognized the importance of renewable energy and the role for renewable energy to play in this transition, and has included renewable energy as a part of the best system of emission reduction (BSER) that has been adequately demonstrated to reduce emissions from affected EGUs.

Solar energy measures are part of the BSER because solar energy is technologically feasible, reasonable cost, reduces carbon emissions while providing other health and environmental benefits, and promotes technological development without negatively impacting the electric grid. Further, solar energy has been adequately demonstrated, as owners of affected EGUs are shifting generation away from dirty fossil fuels and turn to solar for a source of clean dependable energy.

SEIA supports the EPA and the Clean Power Plan, and agrees with EPA that solar energy measures are part of the BSER. However, SEIA is also concerned that building block 3 (renewable energy measures) as it is currently calculated is incomplete because it does not contain current solar market data on cost and penetration rates, and it does not include distributed PV, which represents about 50% of the total U.S. solar market. Therefore, as it is currently written, EPA's proposal does not accurately reflect the emissions reductions achievable through application of the BSER.

To ensure that EPA's final emissions goals accurately reflect application of the BSER to affected EGUs, the EPA should make the following changes:

1. **Include Distributed PV in Building Block 3:** Distributed PV is one of the largest and fastest growing segments of the renewable energy market, and is currently procured by entities that own and operate affected EGUs. Therefore, under EPA's system wide approach, distributed PV is

necessarily part of the BSER and failure to include it in EPA's final rule would be arbitrary and capricious.

2. **Use Accurate Cost and Penetration Data for Solar:** The data used by EPA for calculating solar energy potential as part of the building block 3 is out of date and incomplete. Therefore, the EPA's current proposal does not reflect the BSER. The EPA should update its cost and penetration data for solar when determining state emission reduction targets to ensure that the BSER is correctly reflected in state goals.
3. **Use the Alternative Approach for Determining State Goals**: The EPA should use the Alternative Approach when determining state emission reduction targets because the Alternative Approach more accurately reflects the emission reduction and deployment potential of renewable energy than the RPS Approach.
4. **Make the Following Adjustments When Determining State Goals:** To ensure that the EPA's state emission reduction targets reflect application of the BSER to affected EGUs, the EPA should make the following adjustments when determining state goals.
    1. The EPA should exclude the technical potential benchmark from the alternative approach and rely on the IPM model results with modifications.
    2. The EPA should use the Sunshot -62.5% cost scenario as the cost input for utility PV in the IPM model and as the cost input for distributed PV from the SolarDS model.
    3. The EPA should use the Sunshot -62.5% scenario distributed PV solar capacity projections to hard-wire distributed PV into the IPM model to include distributed PV.
    4. The EPA should update the current generation data for solar from EIA data with SEIA's recommended outlined approach.
    5. The EPA should update the performance estimates used in the IPM model for solar.
    6. The EPA should use a 2012 or higher baseline year.

These changes will ensure that the EPA's emission reduction targets accurately reflect application of the BSER to affected EGUs. In fact, with these adjustments in building block 3, the EPA will find that renewable energy potential is nearly double what EPA originally calculated, increasing from roughly 530 TWh to 973 TWh.

Finally, while natural gas will play an important role in the transition to a clean energy future, SEIA urges the EPA to ensure that its final rule does not require or incentivize states to over-rely on natural gas. An over-reliance on natural gas in the near term will incentivize significant natural gas infrastructure build-out over the next few years that will undermine the EPA's long term carbon reduction goals. Once the infrastructure is built, it will be more difficult and expensive for states to switch to lower and non-emitting sources like renewable energy in the future. Further, natural gas is subject to extreme price volatility, such as was experienced by ratepayers during the 2014 polar vortex. Thus, the EPA should craft a final rule that allows states to avoid unnecessary costs by encouraging energy diversity and recognizing the long term price certainty and emission reduction value provided by renewable energy.

The solar industry is one of the fastest growing industries in the United States and a proven technology to help reduce carbon emissions. We encourage the EPA to adopt a final rule that recognizes the value of solar energy as part of a balanced energy portfolio.

The following is an outline of SEIA's comments to the EPA.

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1. Introduction

1A. About SEIA

Established in 1974, the Solar Energy Industries Association is the national trade association of the U.S. solar energy industry. Through advocacy and education, SEIA and its member companies are building a strong solar industry to power America. As the voice of the industry, SEIA works to make solar a mainstream and significant energy source by expanding markets, removing market barriers, strengthening the industry and educating the public on the benefits of solar energy. SEIA represents the entire solar industry, encompassing all major solar technologies (photovoltaics, concentrating solar power and solar heating and cooling) and all points in the value chain, including financiers, project developers, component manufacturers and solar installers.[2]

The United States has some of the richest solar resources in the world; the U.S. solar industry grew by 53% from 2012 to 2013.[3] This phenomenal growth is the result of private investment, technological innovation, a maturing industry, customer demand, and smart federal and state policies.

1B. Introduction to Solar Energy

There are multiple forms of solar energy technologies, each with its own unique performance capabilities and benefits. Below is a description of the primary types of solar energy technologies:

1B1. Photovoltaics (PV)

Photovoltaic (PV) devices generate electricity directly from sunlight via an electronic process that occurs naturally in certain types of material, called semiconductors. Electrons in these materials are freed by solar energy and can be induced to travel through an electrical circuit, powering electrical devices or sending electricity to the grid. PV devices can be used to power anything from small electronics such as calculators and road signs up to homes and large commercial businesses.

PV technology can be applied in a number of different ways. The primary applications of PV solar are, distributed PV, utility PV and off-grid distributed PV. These applications are discussed in further detail below.

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[2] The views expressed herein are the views of SEIA and not the views of any individual member company

[3] U.S. Solar Market Insight™ Year in Review 2013 report.

Applications of PV Solar

Distributed PV

Distributed PV refers to solar electricity that is produced at or near the point where it is used.[4] Distributed PV can be located on rooftops or ground-mounted, and is typically connected to the local utility distribution grid. Distributed PV installations tend to be smaller than utility-scale arrays.[5] Due to the nature of proposed regulations, in these comments, distributed PV only refers to solar that is connected to the grid and thus can lower carbon emission from affected EGUs.

Distributed PV is one of the fast growing applications of PV technology in the United States. As of the end of 2013, the total U.S. cumulative installed capacity of distributed PV was 6.3 GW_{dc}.[6] In addition to reducing carbon emissions, distributed PV can provide wholesale ancillary services in the same fashion as utility-scale assets and can also provide local ancillary services beyond what utility-scale assets are capable of providing. These services include but are not limited to frequency regulation, frequency response, spinning and non-spinning reserves, voltage and reactive power support. Distributed PV can also provide incremental ancillary services on the local or distribution level. Local voltage support is critical to operating the distribution system within system constraints, and distribution system operators rely on a distributed set of voltage regulating equipment to provide that support. Distributed PV can augment and sometimes replace this equipment, providing real and reactive power support as identified by the distribution operator.

Utility PV

Utility-scale PV, or utility scale solar, refers to PV technology applied to the grid on a large-scale centralized basis. The defining features of utility-scale PV is that it is constructed as a centralized power plant, it is larger in size than distributed PV (generally larger than 10 MW), it is not generally located near the source of consumption, and the electricity generated by utility-scale PV is usually sold to wholesale utility buyers rather than retail consumers. There are a number of characteristics unique to large-scale installations that make them attractive to utilities, including advanced operational characteristics, low cost, and long-term fixed pricing. In addition, utility-scale PV can provide a variety of ancillary services associated with traditional fossil sources including frequency regulation, dynamic

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[4] Distributed PV is a type of distributed generation. Distributed generation refers to electricity that is generated at or near the point where it is used. There are several types of distributed generation, including distributed PV, solar heating and cooling, distributed wind, and combined heat and cooling.

[5] DG solar is also sometimes referred to as "behind the meter", although it does not have to be behind a meter. Different entities also classify the size of DG systems in various ways; for example, the EIA classifies DG solar as anything below 1 MW in size. The PURPA classification for DG solar classifies small DG as anything under or equal to 10 MW. SEIA/GTM Research classify DG solar as solar located on-site, or at the customer's end location.

[6] U.S. Solar Market Insight™ Q2 2014 report.

voltage and power factor regulation, and ramp rate controls. Thus, when included as part of a balanced energy portfolio, utility-scale PV contributes to the stability and reliability of the grid. Further, utility-scale PV reduces carbon emissions from fossil units by reducing the amount of conventional generation that must be dispatched to meet electricity demand. As of the end of Q2 2014, the total U.S. cumulative installed capacity of utility-scale PV was 7.3 GW_{dc}.[7]

Off-Grid Distributed PV

Off-grid distributed PV systems route electrons through a solar regulator which charges a battery. From the battery, the power can be directly utilized by appliances that require 12 volts, or via an inverter for appliances that require 240 volts. These systems are not connected to the grid, but can be used to reduce the need for production from the grid.

While not SEIA does not advocate for off-grid distributed PV to be a part of the Best System of Emission Reductions, the EPA should encourage states to use off-grid distributed PV systems for compliance, as these technologies avoid the need for electricity from the grid. For example, off-grid distributed PV systems placed on roadside assistance emergency phone boxes, wireless security and surveillance cameras, communication towers, and street lighting systems all can be used to avoid the use of electricity from the grid.

1B2. Concentrating Solar Power (CSP)

CSP uses mirrors to concentrate the sun's thermal energy to produce steam and drive a conventional steam turbine to produce electricity. This solar generated electricity is then sold to wholesale utility buyers. CSP can be integrated with thermal energy storage, which allows energy to be stored for later use. In this way, CSP with thermal energy storage provides flexibility to grid operators, offering power that can be dispatched as needed, day or night. These large-scale installations are attractive to utilities because they include advanced operational characteristics, delivering large quantities of solar power at a low cost and long-term fixed pricing that provides a hedge against fuel volatility.

CSP plants utilize conventional steam turbine generators, like those of conventional plants, but use the sun as the source of heat instead of fossil fuels. This allows CSP plants to provide the ancillary services historically offered by conventional plants, such as frequency response, load following, spinning and non-spinning reserves as well as ramping. CSP reduces carbon emissions from affected EGUs by reducing the amount of conventional generation that must be dispatched to meet electricity demand and provide the aforementioned ancillary services. As of the end of Q2 2014, there are 1.47 GW_{ac} of CSP facilities operating in the U.S.[8]

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[7] U.S. Solar Market Insight™ 2013 Year in Review Report.
[8] U.S. Solar Market Insight Q2 2014 report.

1B3. Solar Heating and Cooling (SHC)

SHC technologies collect thermal energy from the sun and use this heat to provide hot water, space heating and cooling and pool heating for residential, commercial and industrial applications. These technologies displace the need to use electricity or natural gas.[9] The SHC industry currently has a goal of 300 GW_{th} of SHC by 2050. Deployment at this scale would provide enormous benefits for homeowners, businesses and taxpayers, and generate nearly 8 percent of the total heating and cooling needs in the U.S., resulting in nearly $100 billion annually in positive economic impacts.[10]

1C. The EPA's Authority to Regulate Carbon Emissions from the Electric Sector

The EPA has authority to regulate air pollution, including greenhouse gas (GHG) emissions, under the Clean Air Act. The EPA regulates criteria air pollutants, such as smog pollutants, through the National Ambient Air Quality Standards (NAAQS) established under §110 of the Clean Air Act.[11] For air pollutants not covered by NAAQS, the EPA may control emissions through §111. To employ this authority, the EPA is required to take a number of procedural steps. The EPA must first make an endangerment finding that an air pollutant causes harm to health and the environment.[12] Next, the EPA must identify the categories of stationary sources that cause or contribute significantly to air pollution that endangers the public health and welfare.[13] The EPA must then control air pollution for new sources in the identified categories under §111(b).[14] Once new sources in the identified categories are controlled, the EPA must establish emission guidelines by which states regulate emissions from existing sources under §111(d).

The EPA has authority to regulate carbon emissions from EGUs under §111(d). In 2007, the U.S. Supreme Court in Massachusetts v. EPA, 549 U.S. 497 (2007) held that greenhouse gases (GHG), including carbon, are an air pollutant under the Clean Air Act. The EPA then conducted an endangerment finding and declared that GHG emissions, including carbon, endanger public health and welfare as a significant contributor to climate change. The EPA's finding was then confirmed in the Court's holding in American Electric Power Co. v. Connecticut, 131 S. Ct. 2527, 2537-2538 (2011), which held that a common law right to seek abatement of carbon-dioxide emissions from fossil fuel-fired plants was displaced by the EPA's authority to regulate carbon emissions under §111. The EPA then identified large coal and natural gas plants (hereinafter referred to as "affected EGUs") as stationary

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[9] For more information: http://www.seia.org/policy/solar-technology/solar-heating-cooling

[10] Solar Heating and Cooling: Energy for a Secure Future. Full report available here: www.seia.org/shca

[11] NAAQS standards have been set for sulfur dioxide, particulate matter, ozone, lead, carbon monoxide, and nitrogen dioxide. (http://www.epa.gov/air/criteria.html)

[12] This finding is available at: http://www.epa.gov/climatechange/endangerment/

[13] CAA Section 111(b)(1)(A)

[14] 42 U.S.C. §7411(b)(1)(B). EPA Standards of Performance for Greenhouse Gas Emissions for New Stationary Sources: Electric Utility Generating Units, 77 FR 22392 (April 13, 2012) and 79 FR 1430 (January 8, 2014)

source categories which contributed significantly to carbon pollution and should be controlled.[15] The EPA then properly proposed carbon emissions standards from new affected EGUs.[16]

Upon proposing emissions standards for carbon from new affected EGUs under §111(b), the EPA must issue emissions guidelines for states to reduce carbon emissions from existing sources under §111(d).[17] The emissions guidelines must be based on the best system of emission reduction (BSER) that the EPA determines has been adequately demonstrated for the affected EGUs.[18] Each state must then create an implementation plan that includes a standard of performance for carbon emissions from existing sources in compliance with the EPA's emissions guidelines.[19]

2. SEIA Comments on the EPA's Proposal for Regulating Carbon Emissions from Existing Sources under Section 111(d)[20]

The EPA issued a proposal for regulating carbon emissions from existing sources under §111(d) on June 15, 2014. The EPA issued its proposal after unprecedented public outreach. SEIA applauds the EPA for its outreach efforts and supports the approach put forth in its proposal. Specifically, SEIA supports the "outside the fence" approach taken by EPA for determining the BSER, and the broad compliance options made available to the states. The EPA's "outside the fence" approach follows the statutory scheme set forth in the Clean Air Act, and reflects current and widely anticipated regulatory and market developments.

While SEIA supports the framework put forth by EPA, SEIA believes that there are necessary adjustments to be made before the rule is finalized to ensure that the required carbon reductions are reflective of the application of the best system of emission reduction to affected EGUs. The following are SEIA's recommendations for improving the proposal to most effectively reduce carbon emissions from existing sources in compliance with §111(d) of the Clean Air Act.

2A. Determination of the Best System of Emission Reduction

EPA proposes that the best system for reducing carbon emissions from existing power plants is a system-wide approach based on the application of four building blocks that include on-site measures and measures taken to shift generation away from carbon intensive units. These building blocks are:

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[15] TTTT Sources
[16] 40 CFR Part 60.
[17] 40 CFR 60.22(a)
[18] 40 CFR 60.21(e); CAA Section 111(a)(1)
[19] CAA Section 111(d)(1)
[20] The EPA is offering the opportunity to comment on the proposed BSER, the proposed methodology for computing state goals based on application of the BSER, and the state-specific data used in computations (34835).

heat rate improvements; natural gas switching; renewable energy measures; and energy efficiency.[21] SEIA agrees with EPA's approach for determining the BSER.[22] Specifically, SEIA agrees with EPA that renewable energy measures, and solar measures especially, are necessarily part of the BSER. However, SEIA is also concerned that building block 3 (renewable energy measures) as it is currently calculated is incomplete because it does not contain current solar market data on cost and penetration rates, and it does not include distributed PV, which represents about 50% of the total U.S. solar market. Therefore, as it is currently written, EPA's proposal does not accurately reflect the emissions reductions achievable through application of the BSER.

2A1. Determining the Best System of Emission Reduction as Adequately Demonstrated

To determine the BSER, the EPA must identify the "system of emission reduction" that is the "best" and that is "adequately demonstrated" to reduce carbon emissions from the affected EGUs.[23]

First, EPA identifies systems of emission reduction. Once it has identified systems of emission reduction, the EPA is required to identify the "best" system of emissions reduction that has been "adequately demonstrated" for the affected EGUs.[24]

The EPA's inquiry into the "best" system of emission reduction has been established through substantial case law. To determine the best system, the EPA looks at the following factors: the system's technical feasibility; emissions reductions expected from the system; whether the costs of the system are reasonable; whether the system will promote technological development; and the energy impacts of the system.[25] The EPA has significant discretion in weighing the factors to determine the best system of emission reduction.[26]

Once the EPA has identified the best system of emission reduction, it must determine whether that system has been adequately demonstrated. The BSER is adequately demonstrated if it is fairly

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[21] 79 FR 34855

[22] The EPA proposes two alternatives to the four building blocks of the BSER. SEIA does not take a position on those two different approaches, but rather supports the use of measures taken at the plant as well as measures taken on the system to reduce carbon emissions from existing sources.

[23] 42 U.S. C. §7411(a)(1); 40 CFR 60.22(a)

[24] Id.

[25] Portland Cement Ass'n v. Ruckleshaus, 486 F.2d 375 (D.C. Cir. 1973); Essex Chemical Corp. v. Ruckelhaus, 486 F.2d 427 (D.C. Cir. 1973); Appalachain Power Co. v. EPA,416 U.S. 969 (1974); Sierra Club v. Costle, 675 F.2d 298 (D.C. Cir. 1981)

[26] EPA v. EME Homer City Generation, L.P. No. 12-1182, slip op. at 22 (U.S. April 29, 2014) citing Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc. 467 U.S. 831 (1984)

projected into the regulatory future. Therefore, the system may be achieved by some, but not necessarily all, affected EGUs. This test is aligned with the technology forcing intent of §111.[27]

2A2. Solar Energy Measures are Part of the Best System of Emission Reduction and are Adequately Demonstrated

Solar energy measures are part of the BSER because they represent a system for reducing emissions from affected EGUs that is technically feasible, done at reasonable cost, promotes technological development, and does not negatively impact the electric system.[28] Solar energy measures are measures taken by states to reduce emissions from affected EGUs through the deployment of solar energy.

2A3. Solar Energy Measures are a System of Emission Reduction

The EPA proposes that a system of emission reduction can include anything that reduces emissions from affected EGUs, ranging from add-on controls applied to affected sources' smokestacks to control emissions, to measures that replace production or generation at the affected sources thereby reducing emissions from those sources.[29] The EPA's definition is based in part on the broad definition of the term "system," which is defined as "a set of things working together as parts of a mechanism or interconnecting network; a complex whole"[30] and the interconnected nature of the electric grid.

SEIA agrees with EPA's proposal that a system of emission reduction can be a number of different measures, ranging from controls at the smokestack to measures that shift generation away from carbon intensive sources. Solar energy measures are one such system, as solar energy measures are used by states and EGUs to reduce carbon emissions by increasing the amount of solar deployed on the grid and shifting generation away from carbon intensive EGUs.

2B. Solar Energy Measures are Part of the Best System of Emission Reduction

As stated above, solar energy measures are part of the BSER because they represent a system for reducing emissions from affected EGUs that is technically feasible, done at reasonable cost, promotes technological development, and does not negatively impact the electric system.

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[27] Portland Cement Ass'n v. Ruckleshaus, 486 F.2d 375 (D.C. Cir. 1973); Essex Chemical Corp. v. Ruckelhaus, 486 F.2d 427 (D.C. Cir. 1973); Appalachain Power Co. v. EPA,416 U.S. 969 (1974); Sierra Club v. Costle, 675 F.2d 298 (D.C. Cir. 1981)

[28] Portland Cement Ass'n v. Ruckleshaus, 486 F.2d 375 (D.C. Cir. 1973)

[29] Clean Power Plan, Legal Memo at 51-52.

[30] SEIA agrees with the EPA that because the term "system" is not defined in statute or regulation, it is appropriate to take the ordinary meaning of the term.

2B1. Solar Energy Measures Should be Included as Part of the BSER Because Solar Energy Measures are Technically Feasible

A variety of solar technologies have been successfully deployed in the United States and around the world. From the first commercial solar projects installed in the 1980s, to the rapidly-increasing fleet of distributed and utility-scale solar assets providing a significant and growing percentage of the nation's power today, solar has demonstrated its capabilities and contributions to a cost-effective, reliable power supply.

1. Utility Scale and Distributed PV Should be Included in Building Block 3 Because Both Applications of PV are Technically Feasible

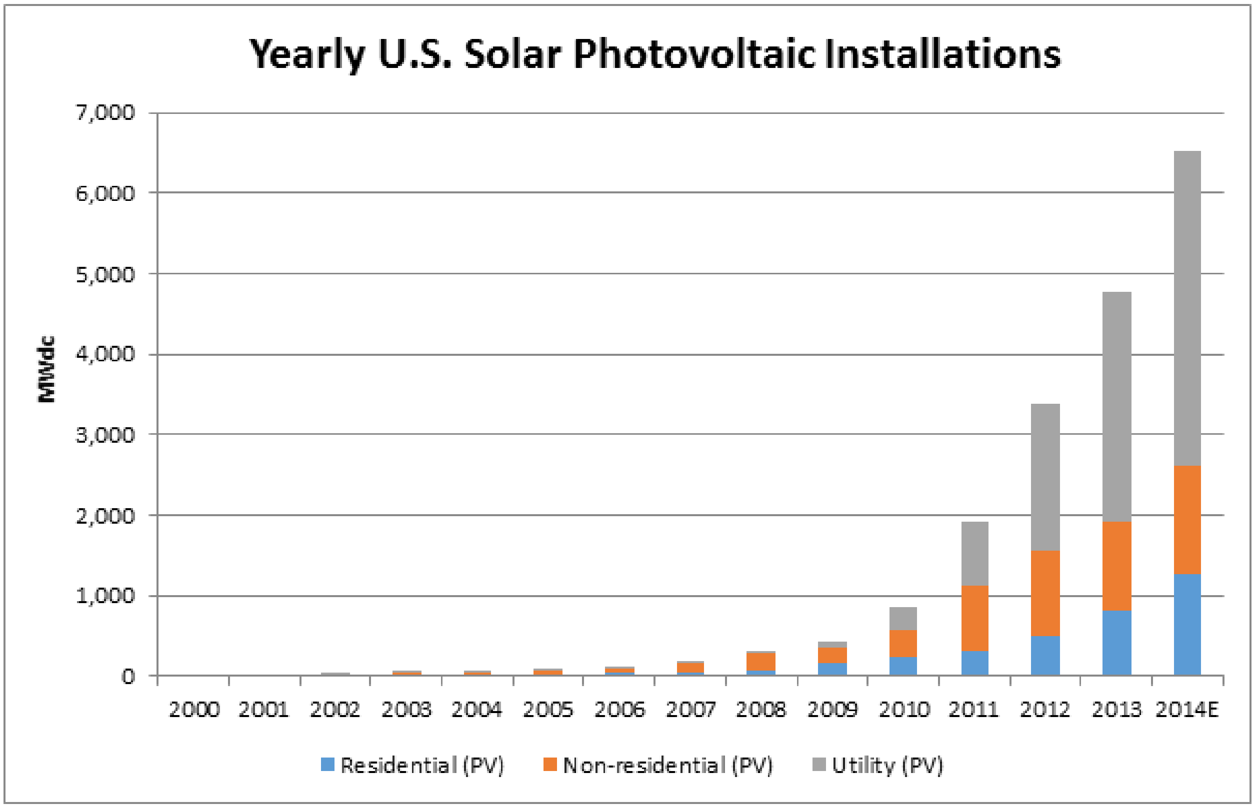
PV technology is being installed on a utility scale and distributed basis at an increasing rate throughout the country. The following chart shows the total installed solar PV capacity by state from 2006-2013. The chart includes both distributed PV and utility-scale PV installations.

Solar Photovoltaic Installations 2006-2013 and Cumulative (MW_{dc})[31]									
State	2006	2007	2008	2009	2010	2011	2012	2013	Cumulative (through 2013)
Alabama	<0.1	<0.1	<0.1	0.1	0.2	<0.1	0.6	0.8	1.9
Alaska	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2
Arizona	2.1	2.8	6.4	23.2	63.6	287.8	708.8	423.7	1,563.1
Arkansas	<0.1	<0.1	<0.1	<0.1	0.6	<0.1	0.6	0.2	1.8
California	69.5	91.8	178.7	210.3	255.6	537.8	983.2	2,607.7	5,183.4
Colorado	1.0	11.5	21.7	22.9	62.0	75.5	102.9	58.0	360.4
Connecticut	0.7	2.5	5.3	8.7	5.6	4.5	7.5	37.5	77.1
Delaware	0.3	0.4	0.6	0.7	2.4	20.9	19.7	16.7	62.8
Florida	0.2	1.0	0.9	35.9	34.8	21.5	21.9	20.4	137.3
Georgia	<0.1	<0.1	<0.1	0.1	1.6	5.1	8.2	88.5	109.9
Hawaii	0.7	2.9	8.6	11.5	18.5	40.5	114.3	153.0	358.2
Idaho	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.7	0.7	1.8
Illinois	0.1	0.2	0.4	0.6	11.0	0.7	26.7	0.5	43.4
Indiana	<0.1	<0.1	<0.1	<0.1	0.2	3.0	0.9	45.0	49.4
Iowa	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	1.1	3.4	4.6
Kansas	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.3	0.6	1.1
Kentucky	<0.1	<0.1	<0.1	<0.1	0.2	3.0	1.5	3.2	7.9

[31] Compiled from SEIA/GTM Research U.S. Solar Market Insight 2012 and 2013 and IREC U.S. Solar Market Trends 2012 and 2013.

Louisiana	<0.1	<0.1	0.1	0.2	2.4	10.8	11.9	28.0	53.4
Maine	0.1	<0.1	<0.1	<0.1	0.2	0.6	1.7	2.5	5.3
Maryland	0.1	0.3	2.2	2.5	5.3	24.3	79.7	58.7	175.4
Massachusetts	1.5	1.4	2.9	9.5	20.4	36.4	123.2	222.6	445.0
Michigan	<0.1	<0.1	<0.1	0.3	1.9	6.2	11.1	2.3	22.2
Minnesota	0.1	0.3	0.3	0.9	1.7	1.2	6.5	3.8	15.1
Mississippi	<0.1	<0.1	<0.1	0.1	0.1	0.3	0.1	0.3	1.0
Missouri	<0.1	<0.1	<0.1	0.1	0.5	1.3	16.6	30.4	48.9
Montana	<0.1	0.2	0.1	0.2	<0.1	<0.1	1.4	0.9	3.0
Nebraska	<0.1	<0.1	<0.1	<0.1	0.2	0.1	0.1	0.2	0.6
Nevada	3.2	15.9	14.9	2.5	68.3	19.4	225.6	46.9	424.0
New Hampshire	<0.1	<0.1	<0.1	<0.1	1.3	1.0	2.3	4.1	9.6
New Jersey	17.9	20.4	22.5	57.3	132.4	306.1	390.7	202.3	1,184.6
New Mexico	0.2	0.2	0.6	1.4	40.9	122.1	37.9	49.1	256.6
New York	3.0	3.8	7.0	12.1	21.6	68.3	55.6	61.1	240.5
North Carolina	0.1	0.4	4.0	7.9	28.7	45.5	122.4	261.1	470.1
North Dakota	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2
Ohio	0.1	0.1	0.4	0.5	18.7	10.9	48.3	18.5	98.4
Oklahoma	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2	0.4	0.7
Oregon	0.5	1.1	4.8	6.3	9.9	11.9	20.6	6.4	62.8
Pennsylvania	0.2	0.1	3.0	3.4	46.5	78.2	31.3	15.9	180.2
Rhode Island	0.2	<0.1	<0.1	<0.1	<0.1	0.6	0.7	5.7	7.6
South Carolina	<0.1	0.1	0.1	0.2	0.3	3.2	0.5	3.5	8.0
South Dakota	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tennessee	0.1	<0.1	<0.1	0.5	4.8	16.3	23.0	19.8	64.8
Texas	0.7	0.6	1.2	3.8	25.9	51.5	54.7	75.6	215.9
Utah	<0.1	<0.1	<0.1	0.2	1.4	2.3	5.6	6.0	16.0
Vermont	0.1	0.2	0.4	0.6	2.2	7.8	16.3	13.6	41.5
Virginia	<0.1	<0.1	<0.1	0.3	1.9	1.8	5.2	2.2	12.6
Washington	0.4	1.2	0.8	1.8	2.9	4.2	7.2	7.9	27.4
Washington DC	<0.1	<0.1	0.2	0.3	3.5	7.2	2.3	2.6	16.5
West Virginia	<0.1	<0.1	<0.1	<0.1	<0.1	0.6	1.1	0.5	2.2
Wisconsin	0.3	0.6	1.7	2.2	3.5	4.2	8.2	1.4	22.5
Wyoming	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.4	0.4	1.0

The below graph shows the yearly U.S. solar PV installations by market segment, showing that both utility scale PV and distributed PV should be included in building block 3 because both applications are technically feasible.[32]



The following chart breaks out distributed PV and utility PV and shows installed capacity for all 50 states cumulative through 2013.[33]

Cumulative Solar Photovoltaic Installations through 2013 (MW_{dc})[34]		
State	Distributed PV	Utility PV
Alabama	1.4	0.5
Alaska	0.2	0.0

[32] SEIA/GTM Research *U.S. Solar Market Insight*
[33] Note that these cumulative numbers from the U.S. Solar Market Insight Q2 2014 report will differ from the numbers presented in Section 3B5 from the EIA. This is because the EIA data does not accurately capture all solar industry generation. See Section 3B5 for a further description of this.
[34] Compiled from SEIA/GTM Research U.S. Solar Market Insight 2012 and 2013 and IREC U.S. Solar Market Trends 2012 and 2013.

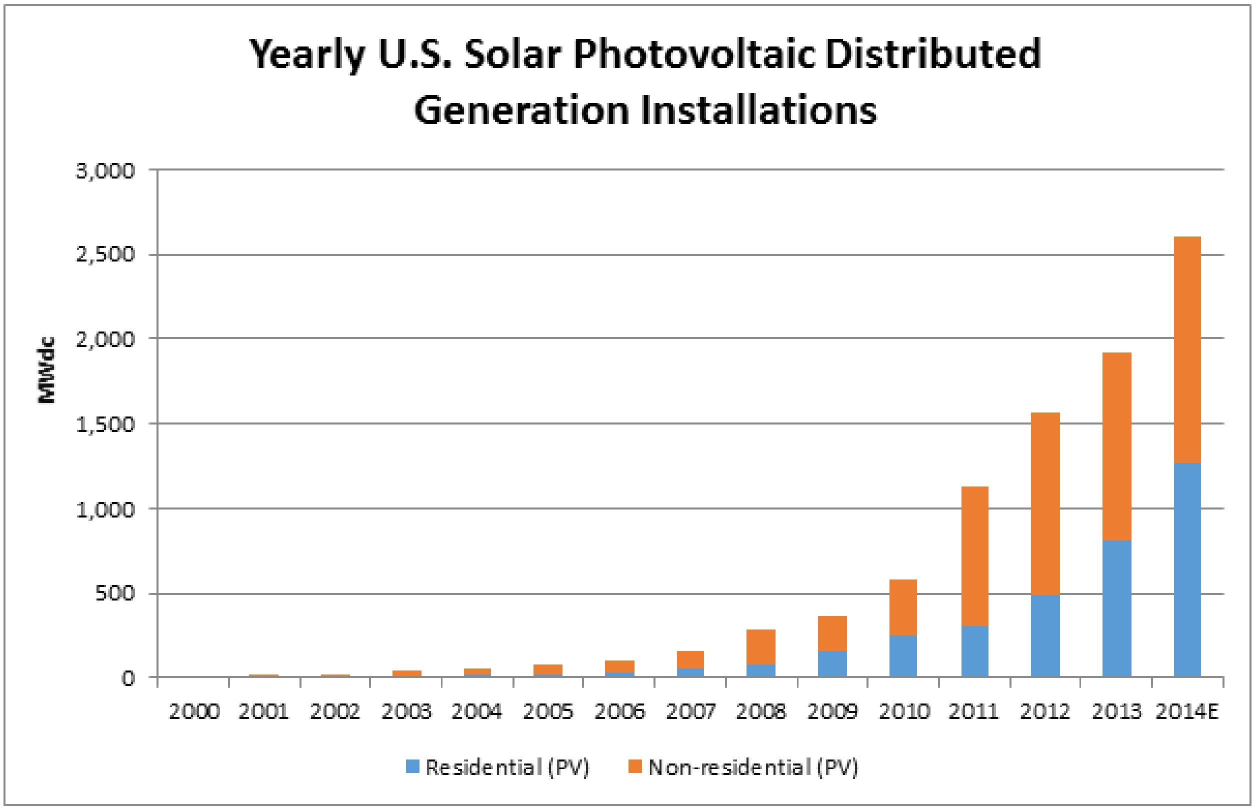
Arizona	485.4	1,077.7
Arkansas	1.8	0.0
California	2,438.7	2,744.7
Colorado	253.8	106.6
Connecticut	69.7	7.4
Delaware	29.7	33.1
Florida	69.7	67.6
Georgia	20.4	89.5
Hawaii	330.8	27.4
Idaho	1.8	0.0
Illinois	7.3	36.1
Indiana	5.6	43.8
Iowa	4.6	0.0
Kansas	1.1	0.0
Kentucky	6.6	1.3
Louisiana	53.4	0.0
Maine	5.3	0.0
Maryland	145.4	30.0
Massachusetts	386.7	58.3
Michigan	22.2	0.0
Minnesota	12.8	2.3
Mississippi	0.9	0.1
Missouri	48.9	0.0
Montana	3.0	0.0
Nebraska	0.6	0.0
Nevada	91.3	332.7
New Hampshire	9.6	0.0
New Jersey	1,021.1	163.5
New Mexico	66.1	190.5
New York	187.7	52.8
North Carolina	18.8	450.2
North Dakota	0.2	0.0
Ohio	74.0	24.4
Oklahoma	0.7	0.0
Oregon	47.0	15.8
Pennsylvania	158.6	21.6
Rhode Island	1.9	5.7
South Carolina	5.0	3.0

South Dakota	<0.1	0.0
Tennessee	47.1	17.7
Texas	70.2	145.7
Utah	16.0	0.0
Vermont	24.6	16.9
Virginia	12.6	0.0
Washington	27.4	0.0
Washington DC	16.5	0.0
West Virginia	2.2	0.0
Wisconsin	21.4	1.1
Wyoming	1.0	0.0

a. Distributed PV Should be Included in Building Block 3 Because it is Technically Feasible

The below chart shows the growth of distributed PV installations from 2000-2014, demonstrating that distributed PV should be included in building block 3 because it is technically feasible.[35]

[35] SEIA/GTM Research *U.S. Solar Market Insight.*



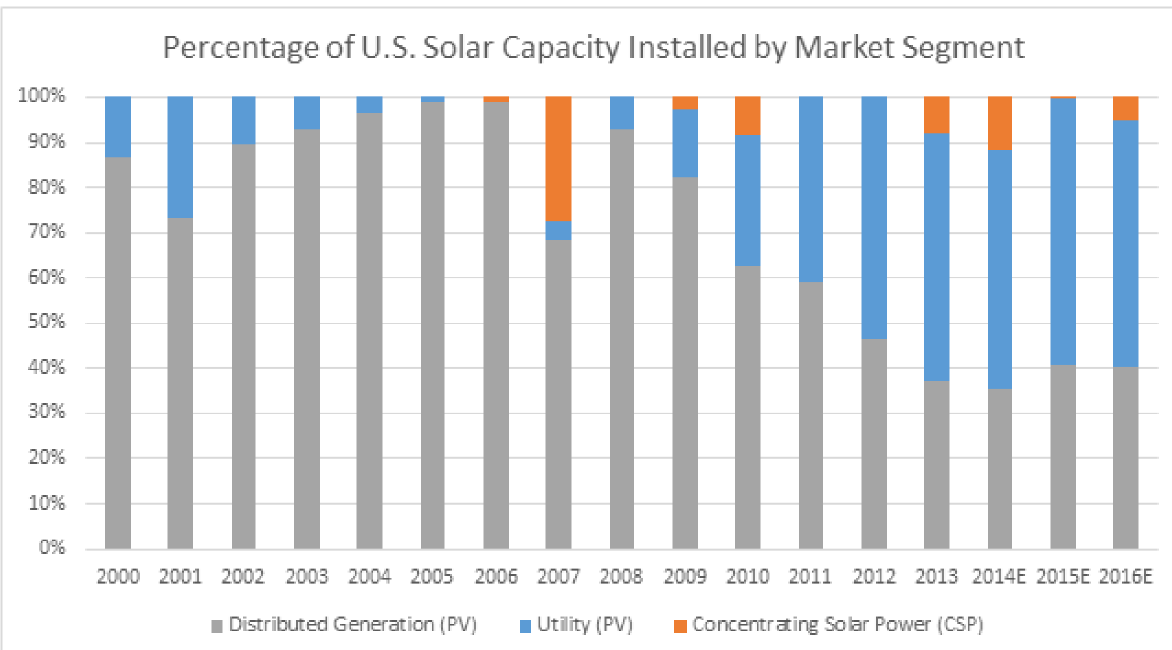
As the chart shows, distributed PV is growing rapidly year over year. Distributed PV is generally broken into two segments: residential and non-residential.

The residential PV sector represents homeowners who are installing solar. With falling solar prices and the rise of 3rd party financing, more homeowners are going solar than ever before. Homeowners are either directly purchasing these solar systems, or leasing them through certain solar companies. The energy produced by homeowners is often used to offset the need for generation from affected EGUs or is counted towards clean energy requirements such as renewable portfolio standards.

The non-residential sector typically represents those business owners who are installing solar systems. Solar energy generated from commercial units also reduces the need for generation from affected EGUs and is often counted towards clean energy requirements or used to make green claims by the companies that invest in the systems. See Section 2B6 on procurement of solar for more discussion of affected EGUs procuring distributed PV.

In addition to affected EGUs, some of the most well-run and efficient companies are turning to solar energy to reduce their carbon footprint and hedge against risks associated with energy prices and climate change. As of mid-2014, cumulative commercial deployment totaled 4,530 MW at over 41,800 facilities throughout the country, an increase of more than 34 percent over last year. A recent SEIA report "Solar Means Business 2014" shows that Wal-Mart leads all U.S. companies with 105 MW of installed capacity, with Costco, Kohl's, Apple, IKEA, and Macy's all having at least 20 MW. The report also found that growth in the commercial market is not limited to just California, as 129 million people – 41% of all Americans - live within 20 miles of at least one of the more than 1,100 commercial solar installations that were analyzed.[36]

It is also important to point out the percentage of the solar market that is comprised of distributed PV. Note that in all years, at least 40% or more of the total installed solar in each year comes from the distributed PV sector. This is shown the following graph, which breaks utility PV, CSP, and distributed PV from 2000-2016.[37]

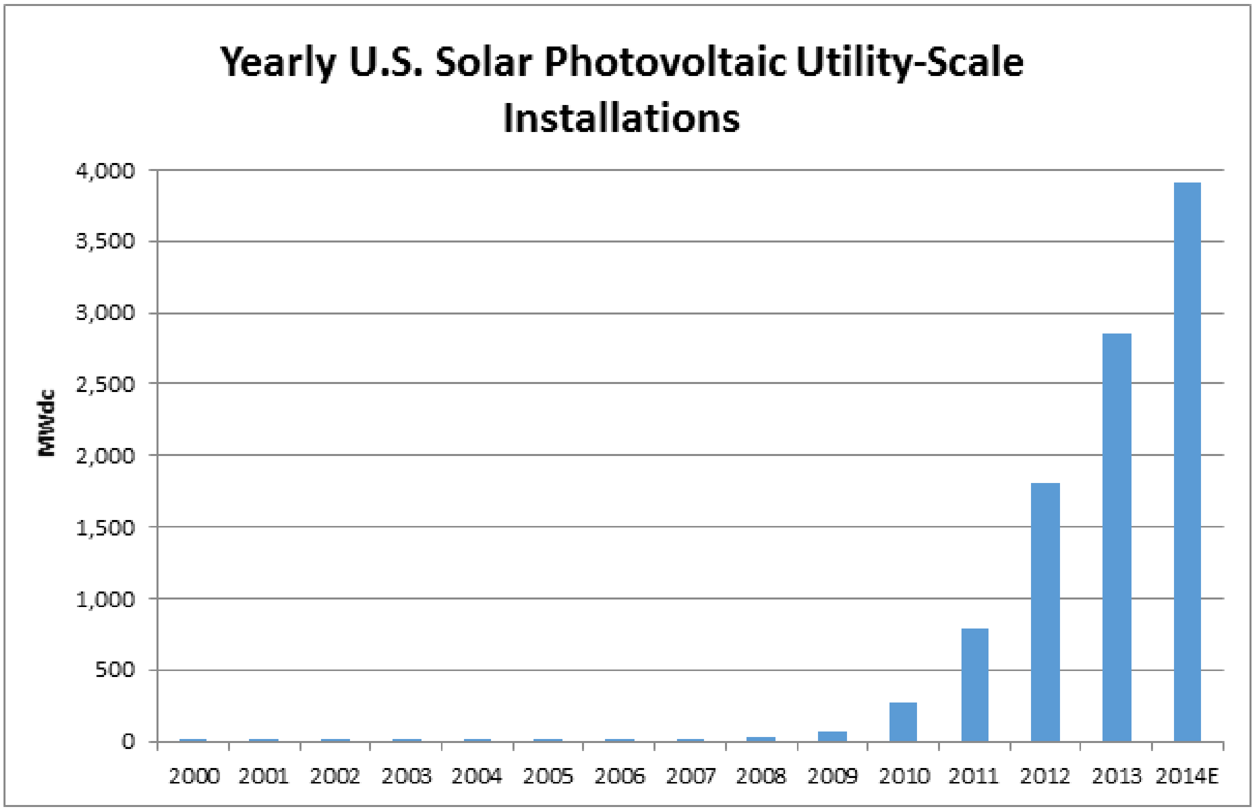


[36] Solar Means Business Report, 2014. Available here: http://www.seia.org/research-resources/solar-means-business-report

[37] SEIA/GTM Research *U.S. Solar Market Insight.*

b. Utility Scale PV Should be Included in Building Block 3 Because it is Technically Feasible

The below chart shows the growth of utility PV installations from 2000-2014, demonstrating that utility PV is technically feasible.[38] For further discussion of how utility scale PV is deployed by affected EGUs, see Section 2B6 on solar procurement.



2. <u>CSP Should be Included in Building Block 3 Because it is Technically Feasible</u>

CSP technology is technically feasible and is being installed throughout the country today. The following chart shows the total installed solar CSP capacity from 2006-2013. For further discussion of how CSP is deployed by affected EGUs, see Section 2B6 on solar procurement.

[38] SEIA/GTM Research *U.S. Solar Market Insight.*

Concentrating Solar Power Installations, 2006-2013 and Cumulative (MW_{ac})[39]									
State	2006	2007	2008	2009	2010	2011	2012	2013	Cumulative (through 2013)
Arizona	1.0				2.0			280.0	283.0
California				10.0				125.0	1,006.0
Florida					75.0				75.0
Hawaii				2.0				5.0	7.0
Nevada		64.0							64.0

3. Third-Party Studies Verify That Solar Energy is Technically Feasible and Should be Included in Building Block 3

Several third-party verified studies show the technical feasibility of all solar energy as well. Below two such studies are highlighted.

The Department of Energy (DOE) SunShot Vision study shows that solar energy can meet roughly 14% of U.S. electricity demand by 2030 based on widely anticipated cost reductions.[40] Achieving the expected price targets is projected to result in the cumulative installation of approximately 302 gigawatts (GW) of PV and 28 GW of CSP by 2030. **By 2030, this translates into PV generating 505 terawatt-hours (TWh) per year of electricity or 11% of total U.S. electricity demand, and CSP generating 137 TWh per year or 3% of total demand for a combined solar generation of 642 TWh in 2030, well more than the EPA's total solar generation target of 8,722 GWh in 2030 under the alternative approach.[41] This is also 7,360% more than what the EPA had estimated for solar.** It should be noted that the DOE Sunshot study also analyzed the grid integration and reliability aspect of this amount of solar generation on the grid, and found that solar could be added to the grid at the projected levels without adverse effects on grid reliability. See the Section 2B5 for more information on grid reliability and grid integration. See a further breakdown of the Sunshot study below:

[39] Compiled from: SEIA/GTM Research Solar Market Insight 2013.
[40] The DOE Sunshot Vision Study is available here: http://energy.gov/sites/prod/files/2014/01/f7/47927.pdf
[41] http://energy.gov/sites/prod/files/2014/01/f7/47927.pdf and the Alternative RE Approach Technical Support Document, p.4.

Table 3-2. Solar Deployment in the SunShot Scenario[18]

	2030			2050		
	Capacity [gigawatts (GW)]	Energy [terawatt-hours (TWh)][a]	Fraction of Electric-Sector Demand (%)	Capacity (GW)	Energy (TWh)[a]	Fraction of Electric-Sector Demand (%)
Total Solar	**329**	**642**	**13.8**	**714**	**1,448**	**26.9**
Total PV	**302**	**505**	**10.8**	**632**	**1,036**	**19.3**
Rooftop PV	121	164	3.5	240	318	5.9
Utility PV[b]	181	341	7.3	391	718	13.4
Total CSP	**28**	**137**	**3.0**	**83**	**412**	**7.7**
Electricity Demand[c]	-	**4,421**	-	-	**5,103**	-

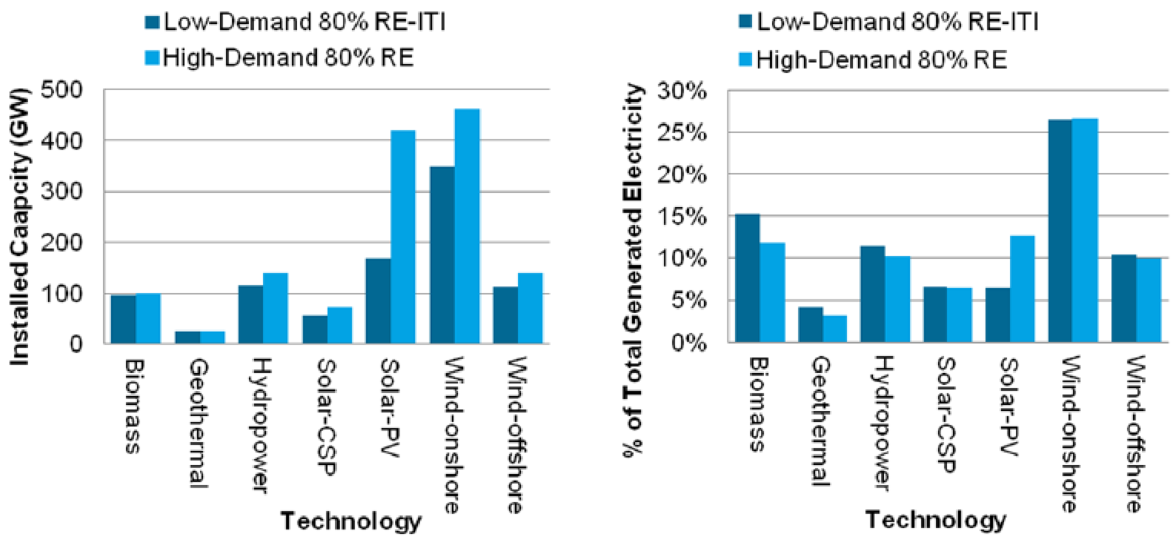
Components do not always add up to totals because of rounding.

[a] The capacity-expansion models (ReEDS and SolarDS) place solar technologies in locations where they are most economic, leading to capacity factors of about 15% for rooftop PV, 23% for utility-scale PV (1-axis tracking systems), 60% for CSP (ReEDS primarily builds CSP systems with several hours of storage), and 41% for wind.
[b] Utility PV includes central and distributed utility-scale PV systems. See Appendix A for descriptions of these types of utility-scale systems.
[c] Electricity demand is based on projections of electricity sales through 2035 from *Annual Energy Outlook 2010* (EIA 2010); extrapolated through 2050.

Additionally, the Renewable Electricity Futures Study (RE Futures) conducted by the National Renewable Energy Laboratory (NREL) shows a modelling scenario with renewables achieving between 30%-90% of generation levels.[42] The cost assumptions used to arrive at the 2030 generation levels in NREL's report are higher than current industry projections. For example, the U.S. Solar Market Insight Q2 2014 report (see section 2B2 on full detailed cost descriptions) shows that solar is outpacing the 2030 cost assumptions within the NREL report. Therefore, solar is reasonably expected to meet its share of the 80% by 2050 renewable electricity targets within the RE Futures study, and solar may exceed the solar targets put forth in the study.

Further, the two graphs below show that, based on the cost assumptions in the RE Futures study, solar can represent nearly 20% of total generated electricity in the high-demand scenario for 2050, and at least 12% in the low-demand scenario for 2050.

[42] The NREL Renewable Electricity Futures Study is available here: http://www.nrel.gov/analysis/re_futures/



(a) Installed renewable capacity in 2050 (b) Percent of total generated electricity in 2050

Figure 3-14. Renewable supply in 2050 in High-Demand 80% RE scenario and the (low-demand) 80% RE-ITI scenario

2B2. Solar Energy Measures Should be Included in the BSER Because They are a Reasonable Cost System to Reduce Emissions from Affected EGUs

There are a number of ways to consider whether a system of emission reduction is reasonable cost, and EPA has broad discretion when making this determination.[43] Below, SEIA provides information showing that solar energy measures are reasonable cost under the methodologies proposed by the EPA for setting state goals. Further, SEIA provides data showing solar costs are falling in relation to other sources of energy, reinforcing the EPA's position that solar energy measures are reasonable cost.

1. **Solar Energy is Reasonable Cost under Both of EPA's Proposed Methodologies for Setting State Goals, and Therefore Should be Included in the BSER**

In its proposal the EPA finds that renewables cost \$10-\$40/ton under its Renewable Portfolio Standard (RPS) approach and \$30/MWh under its Alternative approach, which the EPA determines to be reasonable cost.[44] SEIA agrees with EPA that renewable energy, including solar, is reasonable cost under

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[43] EPA v. EME Homer City Generation, L.P. No. 12-1182, slip op. at 22 (U.S. April 29, 2014) citing Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc. 467 U.S. 831 (1984)

[44] 79 FR 34869 and the Alternative RE Approach Technical Support Document.

both approaches. However, the EPA should recognize that solar costs are even lower than projected by the EPA and distributed PV must be included in building block 3 because it is a reasonable cost emission reduction technology.

i. Solar Energy is Reasonable Cost Under the Alternative Approach

Under the alternative approach, the EPA notes that RE deployment levels were modelled with a cost reduction of $30/MWh, a level that is consistent with the cost range of $10-$40/metric ton of avoided CO2 emissions. In a recent analysis of the EPA's Clean Power Plan performed by the Natural Resources Defense Council (NRDC), NRDC updated the cost assumptions for solar and wind energy that are used in the IPM model.[45] See Section 3B3 for a discussion on the updated costs. The model results show that with these updated costs for renewable energy, the overall nationwide cost of abatement for renewable energy is approximately $14/metric ton avoided carbon emissions in 2020, and $19/metric ton avoided carbon emissions in 2030. These costs fall well within the range of $10-$40/metric ton of avoided carbon emissions that the EPA had initially set, and demonstrate that renewables, including solar, are a reasonable cost emissions reduction measure.

ii. Distributed PV Should be Included in Building Block 3 Because it is Reasonable Cost When Compared to the Default Generation Mix

It should be noted that the abatement costs for renewable energy discussed above do not include distributed PV, as the IPM model does not look at retail costs as an input. The IPM model essentially looks at the incremental total system cost (i.e. $30/MWh cost to deploy renewable energy as a part of the best system) versus the emission reductions achieved (i.e. $19/metric ton avoided carbon emissions in 2030 in the NRDC analysis) to determine what technologies should be deployed at reasonable cost. Since distributed PV is purchased and contracted by consumers and utilities at retail rates, and not wholesale rates, distributed PV cannot be entered into the IPM model as a piece of the incremental total system cost. Retail and wholesale electricity rates are simply not comparable in this regard.

The EPA stated in the Alternative RE Approach Technical Support document that "distributed generation RE technologies were omitted from the RE Alternative Approach because their market potential cannot be tested in the current IPM framework."[46] However, the difference between modelling methods for distributed PV versus other renewables is not grounds to exclude distributed PV from building block 3. In fact, exclusion of distributed PV on these grounds would be arbitrary and capricious because

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[45] During the comment period, SEIA worked with NRDC on improving the solar cost, performance, and generation data for use in the IPM model and NRDC analysis. http://www.nrdc.org/

[46] EPA's Alternative RE Approach Technical Support Document: http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-alternative-re-approach.pdf

distributed PV is used to shift generation away from affected EGUs, and it is possible to accurately model distributed PV as part of building block 3.

Distributed PV can be included within the IPM model, as shown and elaborated further upon in Section 3B2. Distributed PV is hard-wired into the IPM model by using the distributed PV capacity projections from the Sunshot -62.5% scenario. These capacity projections assume a certain cost assumption and were calculated using a model called SolarDS.

The capacity projections show the amount of solar (GW) that will be built at the given cost assumptions over the default generation mix within the model precisely because distributed PV is more economical. The SolarDS model inherently includes this comparison of distributed PV to other sources of electricity as it produces the output of solar. The capacity projections- the output of SolarDS based on the cost- show that distributed PV should be included within the baseline mix of electricity in a state. For more information on the comparison of distributed PV to other sources of electricity, please review the PV Annual Revenue Calculator and PV Financial Performance Calculator sections of the NREL SolarDS Documentation and Sample Results report.[47]

The EPA will need to determine which costs to assume for input into the SolarDS model. To this end, the EPA should compare the Department of Energy's Sunshot -62.5% scenario with current industry trends. The Sunshot -62.5% scenario cost assumptions are $1.88/watt for commercial PV and $2.25/watt for residential PV. The latest U.S. Solar Market Insight Report (Q2 2014) shows that commercial distributed PV is currently $2.39/watt and residential distributed PV is currently $3.92/watt. The decreasing trendline of these current industry costs from the SMI report places solar on track to meet the 2030 goals for the -75% scenario and to exceed the 2030 goals for the -62.5%. Under the -62.5% scenario, approximately 67.3 GW of distributed PV will be deployed instead of the default electricity mix based on cost by 2030. This significant level of projected distributed PV deployment based on the trendline of current industry costs demonstrates that distributed PV is reasonable cost when compared to the default electricity mix.

These cost assumptions may be a conservative projection as well, as an October 2014 notice from the Sunshot program projects that distributed solar prices are still on track to meet the Sunshot goal (a full -75% reduction in price) by 2020, which would result in higher demand for distributed PV systems than in -62.5% projection.[48] Second, the SolarDS model assumes no further price declines after 2020, when in

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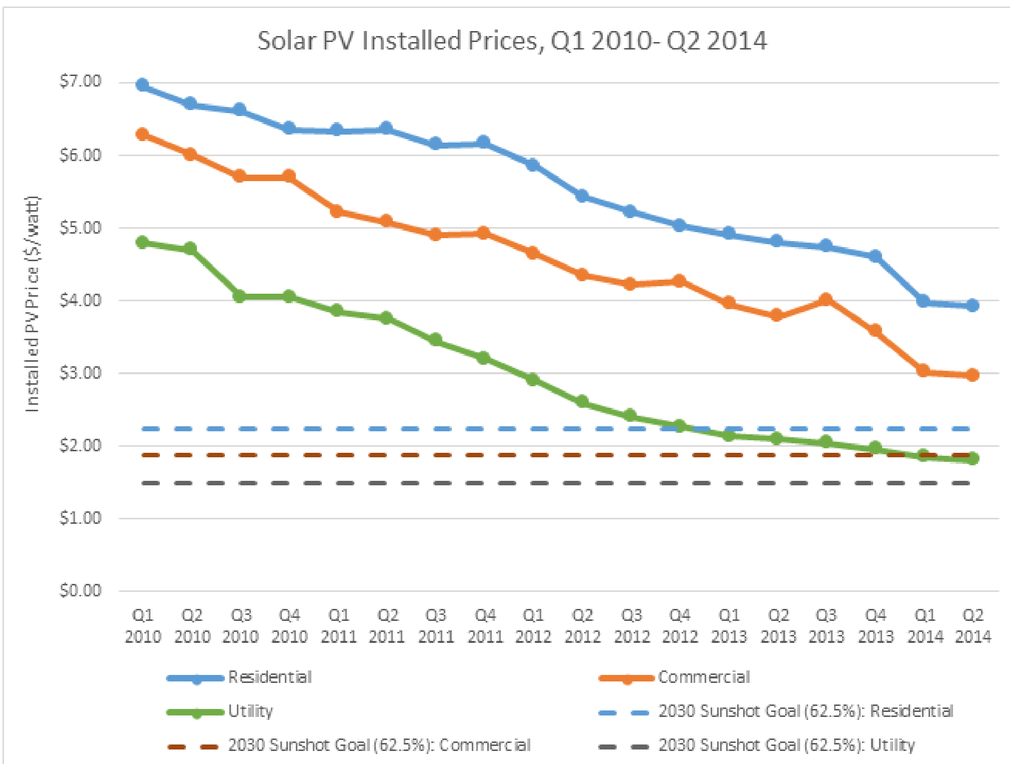
[47]The NREL "Solar Deployment System (SolarDS) Model: Documentation and Sample Results" report is available here: http://www.nrel.gov/docs/fy10osti/45832.pdf

[48] U.S. DOE Sunshot, "Photovoltaic System Pricing Trends: Historical, Recent, and Near-Term Projections." October 2014. Copy available at: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0CC0QFjAC&url=http%3A%2F%2Fny-sun.ny.gov%2F-%2Fmedia%2FNYSun%2Ffiles%2FMeetings%2F2014-11-06%2FSunShot-Solar-

fact many analysts expect that solar prices will continue to decline. Finally, the SolarDS model does not assume any carbon price or incentives for renewable energy beyond those already in place in 2012.[49]

Once EPA has determined that distributed PV is part of the BSER, it will need to factor distributed PV into the state goals. For a further discussion of how distributed PV can be factored into EPA's state goal calculation, see Section 3B2.

The below graph shows the declining solar prices over the past 4 years and the 2030 Sunshot -62.5% scenario.



c. Solar Energy is Reasonable Cost Under the RPS Approach

SEIA does not advocate for the RPS approach. For more discussion, see Section 3D. However, SEIA agrees with EPA that solar energy is reasonable cost as part of building block 3 under the RPS approach.

Industry-Update.pdf&ei=W1dqVIzfO9W3yASv1oGIDg&usg=AFQjCNFhnGZs41wmZP0ch3ZWQbBBcb35TA&sig2=YfPjLEA6Hz_TNtkpn2SNrA&bvm=bv.79142246,d.aWw

[49] NREL's analysis assumed that the PTC and ITC expired in 2012 and 2016, respectively.

Under the RPS approach, the EPA has examined the cost of implementing renewable measures under an RPS policy. The EPA states, "Analysis of RE development in response to state RPS policies also finds historical and projected costs of RPS-driven RE deployment to be modest." The EPA goes on to cite a number of LBNL and NREL studies looking at the costs and benefits of state RPS policies. SEIA agrees that the cost of deploying renewable energy measures, including solar, through state RPS policies is reasonable cost. A May 2014 joint study from LBNL and NREL analyzing the state level cost and benefits estimates from RPS policies found that "over the 2010-2012 period, average estimated incremental RPS compliance costs in the U.S. were equivalent to 0.9% of retail electricity rates when calculated as a weighted-average (based on revenues from retail electricity sales in each RPS state) or 1.2% when calculated as a simple average."[50] For states with a restructured electricity market, this estimated incremental RPS compliance cost for retail rates can also be expressed in terms of the cost per unit of renewable energy required, estimated in the range of $2-$48/MWh.[51] For states with a regulated electricity market, the costs are in the range of minus $4-$44/MWh.[52] The study also looked at the cost of renewable energy to reduce emissions through state RPS policies. The estimates of the benefits ranged from approximately $4-$23/MWh of renewable generation, depending on the cost value assumed for CO_2, cumulating to roughly tens to hundreds of millions of dollars on an annual basis depending on the state. The joint study also looks at a number of other benefits, including economic impacts and wholesale market price reductions.

2. Solar Energy Measures are Reasonable Cost to Utilities

Utilities are increasingly procuring solar energy because solar energy technologies, including utility PV, distributed PV, and CSP, have become reasonable cost resources when compared to other resources. Further, the various forms of solar technologies provide significant economic benefits beyond cost, such as price certainty, hedge value, and avoided infrastructure investment. For more information on procurement of solar energy, see Section 2B6.

One of the primary methods of procurement is through a Power Purchase Agreement (PPA) with a solar developer. Many utilities are now signing PPAs in the $50-$60/MWh range over 20 to 25 years, offering price certainty to both utilities and ratepayers without any of the fluctuation in costs that accompanies fossil-fuel plants, which are subject to variability in fuel costs throughout their operating lives, as discussed below. In fact, Recurrent Energy, a developer of utility-scale solar PV, recently executed a

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[50] Note that substantial variation exists around the averages, both from year-to-year and across states. See page V, VI, and VII. The study, "A Survey of State-Level Cost and Benefit Estimates of Renewable Portfolio Standards" is available here:
http://emp.lbl.gov/publications/survey-state-level-cost-and-benefit-estimates-renewable-portfolio-standards

[51] Id.

[52] Id.

power purchase agreement with Austin Energy in Texas for less than $50/MWh.[53] These costs will continue to decline as economies of scale are achieved.

Solar projects being offered and installed today show that solar is already cost-competitive with new and existing fossil generation in certain circumstances. For example, in 2013 Xcel Energy received approval from the Colorado Public Service Commission to procure 170 MW of solar strictly on a cost competitiveness basis.[54] In addition, solar recently outbid natural gas in a competitive evaluation for utility resource planning in Minnesota.[55] Furthermore, a recent NY Times article notes the following: "According to a study by the investment banking firm Lazard, the cost of utility-scale solar energy is as low as 5.6 cents a kilowatt-hour, and wind is as low as 1.4 cents. In comparison, natural gas comes at 6.1 cents a kilowatt-hour on the low end and coal at 6.6 cents. Without subsidies, the firm's analysis shows, solar costs about 7.2 cents a kilowatt-hour at the low end, with wind at 3.7 cents."[56] These competitive costs are one of the reasons utilities are looking to include solar systems as part of a balanced energy portfolio.

In addition, solar energy offers price certainty to utilities because the fuel is free once the system is constructed. This allows costs to be transparent and fixed over the length of the contract, which may be anywhere from 10-30 years. Even when conventional fossil-based generators offer long-term contracts, the actual energy price paid usually varies along with the underlying fluctuating fuel prices.[57]As a result, solar is seen as a valuable hedge against volatile fossil fuel prices.[58]

Further, distributed PV allows utilities to avoid significant infrastructure costs. A recent McKinsey analysis notes the following avoided costs with the deployment of distributed PV:

> The impact on national energy systems can be significant. A recent report by the California Solar Initiative estimated that 1 to 1.6 GW per year of solar power generated by consumers would

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[53] http://www.greentechmedia.com/articles/read/Austin-Energy-Switches-From-SunEdison-to-Recurrent-For-5-Cent-Solar.

[54] More info available at: http://www.xcelenergy.com/About_Us/Energy_News/News_Archive/Xcel_Energy_proposes_adding_economic_solar,_wind_to_meet_future_customer_energy_demands

[55] More info available at: http://www.renewableenergyworld.com/rea/news/article/2014/01/minn-judge-solar-beats-natural-gas-for-utility-procurement

[56] NY Times Article "Solar and Wind Energy Start to Win on Price vs. Conventional Fuels" from Nov. 24, 2014. Available here: http://www.nytimes.com/2014/11/24/business/energy-environment/solar-and-wind-energy-start-to-win-on-price-vs-conventional-fuels.html

[57] While fuel-price hedging contracts exist, the terms of the contracts can be limited and tend to be very expensive.

[58] More info available at: http://www.nrel.gov/docs/fy13osti/59065.pdf; In fact, Renewables Portfolio Standards, such as the California program, were initially adopted primarily for fuel diversity and hedging purposes, in response to the 2001 energy crisis that resulted in significant part from reliance on natural gas supplies.

> supply the equivalent capacity of adding a new 500kV transmission line, estimated to cost nearly $1.8 billion in capital costs. Distributed generation could also provide other benefits, such as lower line losses due to shorter distances transmitted, productive use of unutilized real estate (rooftops), and environmental benefits. It could be particularly relevant for heavily congested areas where adding new infrastructure is impractical. Distributed generation can also make the grid more resilient, since it would continue to function when central infrastructure is out of commission. If renewable generation costs continue to fall and energy storage capabilities grow rapidly, we can imagine entire neighborhoods or factory complexes being served through distributed solar power. This could make remote housing and manufacturing plants more viable by reducing the transmission capacity required from the grid or even eliminating the need to access the grid altogether.[59]

3. Solar Energy Measures are Reasonable Cost to Ratepayers

Solar energy measures are being adopted by states and utilities around the country because they are reasonable cost to ratepayers as well. Ratepayers are typically billed for their consumption of electricity in kWhs. The charge per kWh may include transmission and distribution services, or they may be billed separately. Utility-scale solar operates much in the same manner as a traditional fossil fuel plant, and the energy is generally sold to utilities at the wholesale price in the same manner as fossil plants. Therefore, the ratepayer will often see no difference on their electric bill when energy comes from a wholesale solar generator rather than a wholesale fossil fuel generator.

Similarly, distributed PV has a negligible impact on the ratepayer and has been shown to provide a benefit to ratepayers in many circumstances. The benefit to the ratepayer will depend largely on whether the system is owned or leased, as well as other factors including where on the grid the system is located. If the system is owned or leased by the ratepayer, they will often be able to sell the excess energy they generate back to their utility reducing their overall bill. If the system is installed pursuant to a power purchase agreement, the ratepayer may be able to procure energy at a rate that is lower than the rate provided by the utility through a power purchase agreement. Further, ratepayers may be able to avoid some transmission and distribution service costs that they would be subject to if they were purchasing energy from a central station plant, as the solar system is located on the customer site.

There are numerous third party verified studies that have looked at the costs and benefits of distributed PV to the ratepayer.[60] While some studies show a net benefit and others a net cost to ratepayers, when

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[59] See page 143-144. Analysis found here: http://www.mckinsey.com/insights/business_technology/disruptive_technologies

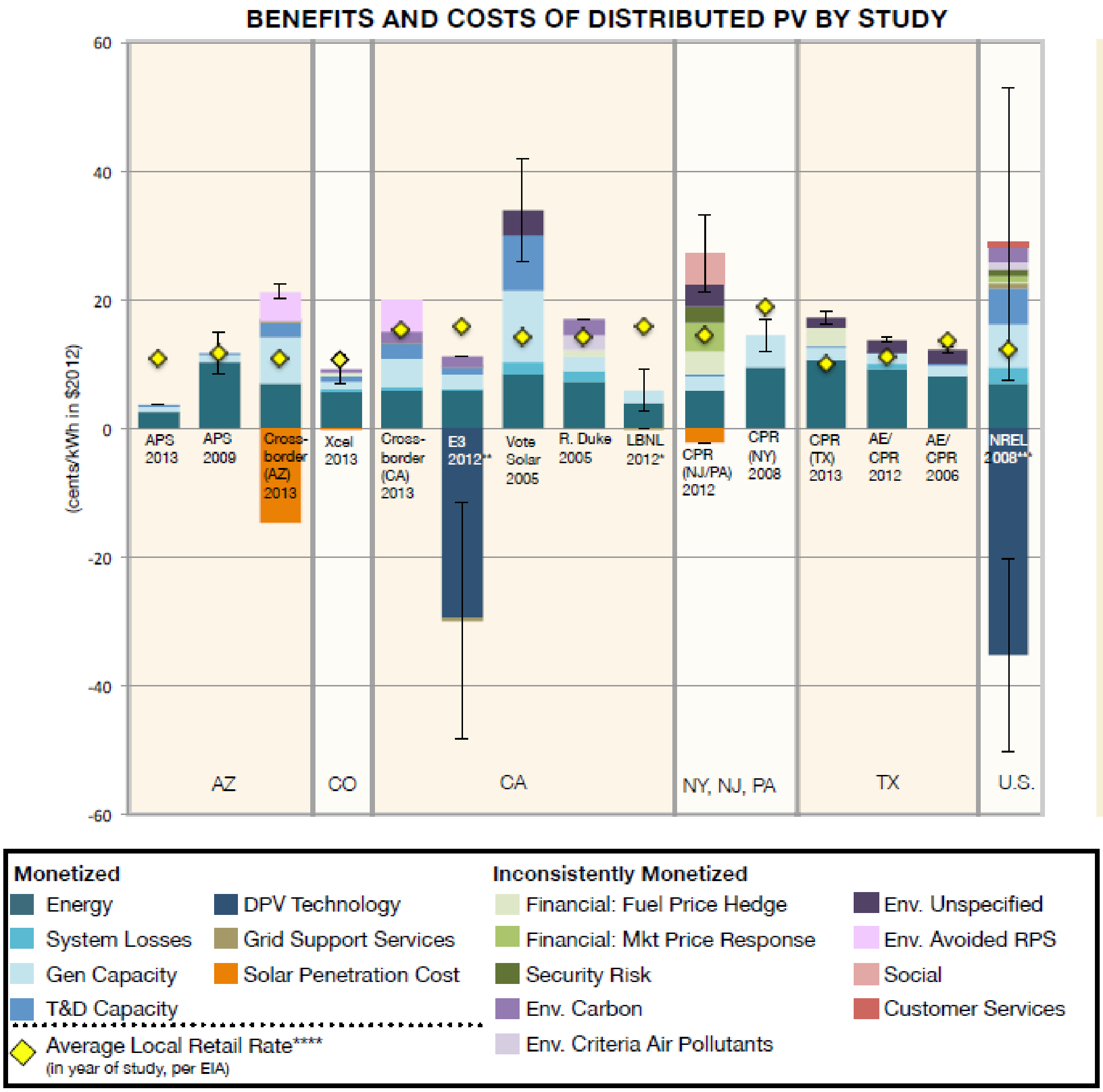
[60] The following are examples of recent studies that have looked at the costs and benefits of distributed solar to the ratepayer: IREC, A Regulator's Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation, at http://www.irecusa.org/wp-content/uploads/2013/10/IREC_Rabago_Regulators-Guidebook-to-

taken as a whole the studies clearly show that distributed PV is reasonable cost to ratepayers. A recent report by the Rocky Mountain Institute completed a meta-analysis of 16 distributed PV cost-benefit studies, reflecting diverse levels of distributed PV penetration levels.[61] The chart below shows a summary of the costs and benefits of including distributed PV to the grid.[62]

Assessing-Benefits-and-Costs-of-DSG.pdf; Hoff et al., The Value of Distributed Photovoltaics to Austin Energy and the City of Austin (Mar. 2006), at http://www.ilsr.org/wp-content/uploads/2014/05/Value-of-PV-to-Austin-Energy.pdf; Tom Beach, Crossborder Energy, The Benefits and Costs of Solar Distributed Generation for Arizona Public Service" (May 2013), available at http://www.seia.org/research-resources/benefits-costs-solar-distributed-generation-arizona-public-service; Tom Beach, Crossborder Energy, Evaluating the Benefits and Costs of Net Energy Metering in California" (January 2013), available at http://votesolar.org/wp-content/uploads/2013/01/Crossborder-Energy-CA-Net-Metering-Cost-Benefit-Jan-2013-final.pdf; Tom Beach, Crossborder Energy,The Benefits and Costs of Solar Generation for Electric Ratepayers in North Carolina (2013), at http://energync.org/assets/files/Benefits%20and%20Costs%20of%20Solar%20Generation%20for%20Ratepayers%20in%20North%20Carolina(2).pdf; Energy & Environmental Economics, *Nevada Net Energy Metering Impacts Evaluation*, Prepared for NV PUC (July 2014), at http://puc.nv.gov/uploadedFiles/pucnvgov/Content/About/Media_Outreach/Announcements/Announcements/E3%20PUCN%20NEM%20Report%202014.pdf?pdf=Net-Metering-Study

[61] http://www.rmi.org/Knowledge-Center/Library/2013-13_eLabDERCostValue

[62] Graph from page 22 of the following Rocky Mountain Institute study: http://www.rmi.org/Knowledge-Center/Library/2013-13_eLabDERCostValue; Note that there is a significant range of estimated value across the studies, due to differences in the regions, input assumptions, and methodological approaches. Thus, comparing the below studies show in the graph can be helpful and informative, but the aforementioned differences should be normalized first.



4. <u>Solar Energy Measures Will Continue to be Reasonable Cost Because Industry Costs are Expected to Decline in the Future</u>

Costs across the solar industry are falling rapidly, which will lead to reduced overall costs for implementing solar measures to reduce emissions from affected EGUs. These costs are: installed costs, future installed costs, balance of system costs, and raw material costs.

a. Installed Costs

Current installed costs for solar show that solar energy is already a cost-competitive emissions reduction technology and prices continue to decline rapidly. As of Q2 2014, installed distributed PV prices have dropped by 8% over the last year and 39% since Q2 2010. Utility-scale solar PV prices have seen even larger declines- by 14% over the last year and 61% from Q2 2010.[63] Looking back further, the price to install a distributed PV system has dropped by nearly 70% since 2001- from $10.00/watt to $3.13/watt as of Q2 2014.[64] For distributed PV, the national weighted average residential PV installed system price for Q2 was $3.92/watt. Further, the national weighted average of non-residential PV (commercial, industrial, gov't and non-profit) installed system price for Q2 was $2.39/watt.[65] The estimated utility scale PV national installed system price for Q2 was $1.81/watt, which is 14% lower than 2013 and 61% lower than 2010 (as noted previously).[66]

The two charts below help to illustrate these declining costs. The first chart shows quarterly cost declines by sector, while the second chart shows yearly blended average cost declines.[67]

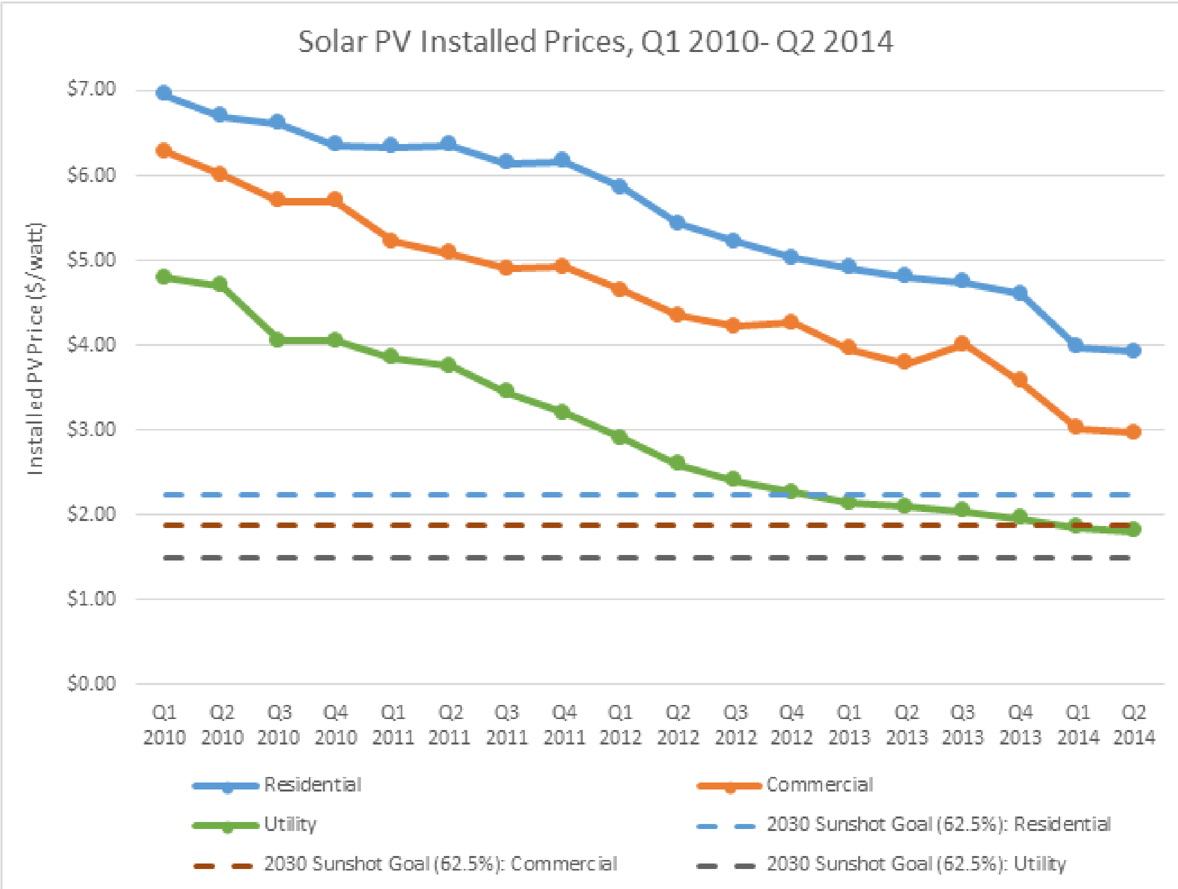
[63] U.S. Solar Market Insight Q2 2014 Report. Available at: www.seia.org/smi.

[64] Lawrence Berkeley National Laboratory *Tracking the Sun V* and SEIA/GTM Research *U.S. Solar Market Insight Q2 2014*

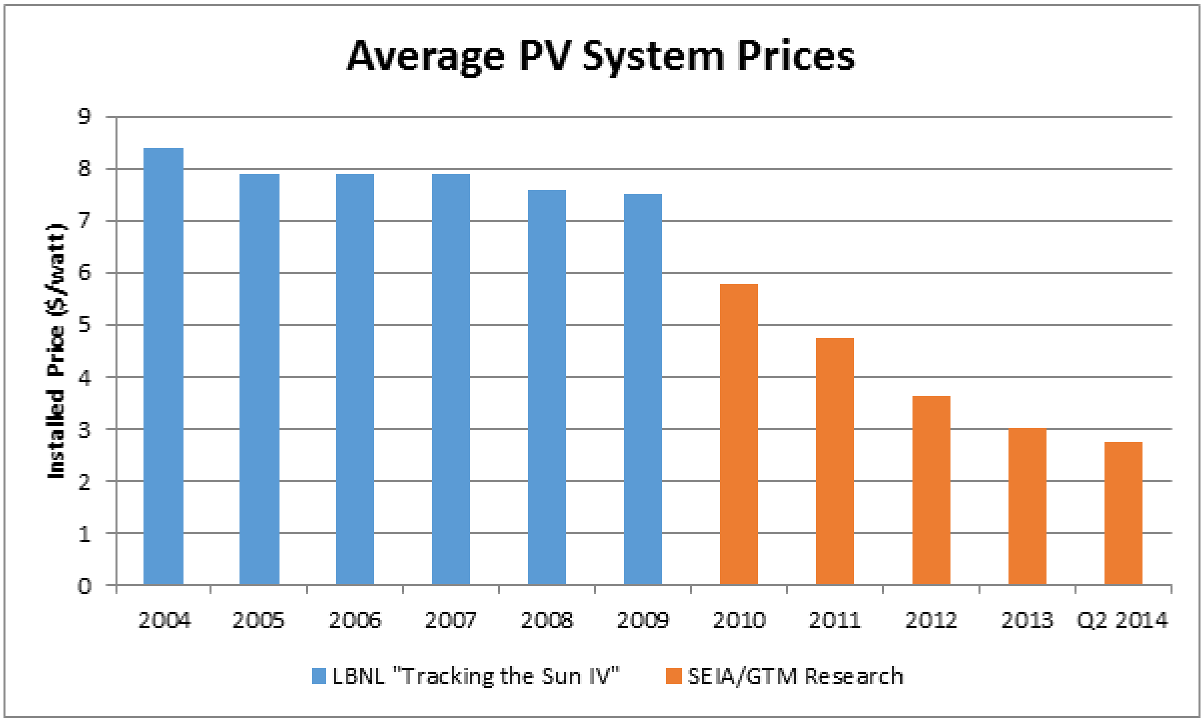
[65] Id.

[66] Id.

[67] Lawrence Berkeley National Laboratory *Tracking the Sun V* and SEIA/GTM Research *U.S. Solar Market Insight Q2 2014*



Solar PV Installed Prices, Q1 2010- Q2 2014
Installed PV Price ($/watt)
$7.00
$6.00
$5.00
$4.00
$3.00
$2.00
$1.00
$0.00
Q1 2010
Q2 2010
Q3 2010
Q4 2010
Q1 2011
Q2 2011
Q3 2011
Q4 2011
Q1 2012
Q2 2012
Q3 2012
Q4 2012
Q1 2013
Q2 2013
Q3 2013
Q4 2013
Q1 2014
Q2 2014
Residential
Commercial
Utility
2030 Sunshot Goal (62.5%): Residential
2030 Sunshot Goal (62.5%): Commercial
2030 Sunshot Goal (62.5%): Utility



b. Future Costs

Future costs of solar are forecasted to decline as well, according to several third-party verified studies. The DOE SunShot Vision study uses the NREL Regional Energy Deployment System (ReEDS) and Solar Deployment System (SolarDS) models to develop and evaluate a SunShot scenario (-75% cost reduction) and a reference scenario. Two alternative cost scenarios were also modeled, including a -62.5% scenario and a -50% scenario. In both the Sunshot and reference scenarios, the models are used to develop a least-cost geographical deployment of solar technologies and other generating technologies (conventional and other renewable).[68]

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[68] The DOE SunShot Vision study states, "The scenarios assume the federal investment tax credit (ITC) and production tax credit (PTC) run through their currently established expiration dates —end of 2016 and 2012, respectively—but that existing supports for conventional technologies that are embedded in the tax code or through other provisions continue indefinitely. Further, the scenarios do not incorporate any additional costs for mercury and air toxins, carbon emissions, or other environmental externalities associated most strongly with conventional generation technologies. Key variables evaluated by the models include solar resource quality, cost of electricity, transmission requirements, reserve requirements, variability impacts, and projected fuel prices. For the SunShot scenario, solar technology installed system prices are assumed to reach the SunShot Initiative's targets by 2020: $1/watt (W) for utility-scale PV systems, $1.25/W for commercial rooftop PV, $1.50/W for residential rooftop PV, and $3.60/W for CSP systems with up to 14 hours of thermal energy storage capacity. The reference

The chart below shows the cost assumptions used in the DOE Sunshot scenarios. The chart has been recreated from the DOE Sunshot study.[69]

Projected PV Installed System Prices and Performance (2010 U.S. Dollars/W)

	Utility PV		Res. Rooftop PV (Distributed PV)		Commercial Rooftop PV (Distributed PV)	
	Sunshot (-75%)	SS -62.5%	Sunshot (-75%)	SS -62.5%	Sunshot (-75%)	SS -62.5%
	$/W_{dc}$					
2010	4.00	4.00	6.00	6.00	5.00	5.00
2020	1.00	1.50	1.50	2.25	1.25	1.88
2030	1.00	1.50	1.50	2.25	1.25	1.88
2040	1.00	1.50	1.50	2.25	1.25	1.88
2050	1.00	1.50	1.50	2.25	1.25	1.88

CSP, which historically has been limited to larger utility-scale plants and relatively fewer installations, has comparatively less price history and can be expected to have a more granular price trajectory. Pricing for utility-scale plants in many jurisdictions is also kept confidential. The chart below shows the

scenario is modeled with moderate solar energy price reductions to enable comparison of the costs, benefits, and challenges relative to the reference case of achieving the SunShot price targets." Study available at: http://energy.gov/sites/prod/files/2014/01/f7/47927.pdf

[69] Full chart available on page 43: http://energy.gov/sites/prod/files/2014/01/f7/47927_chapter3_0.pdf

cost assumptions used in the DOE Sunshot scenarios for CSP.[70] The chart has been recreated from the DOE Sunshot study. Note the $/W$_{ac}$ and not $/W$_{dc}$ used for CSP.[71]

	CSP		
	Sunshot		
	$/W$_{ac}$	Hours of storage	Capacity Factor
2010	7.20	6	43
2020	3.60	14	67
2030	3.60	14	67
2040	3.60	14	67
2050	3.60	14	67

Although the first commercial deployment of CSP was in the late 1980s, large-scale deployment has only recently resumed and is now occurring worldwide. The DOE has issued multiple grants recently, which, along with company-funded R&D, has helped reduce the costs of CSP, particularly CSP combined with Thermal Energy Storage ("TES"; when combined with CSP "CSP+TES"), which offers dispatchable solar power, including the ancillary services needed for reliability that traditionally have come from fossil-fueled generators. Cost of electricity from CSP plants depends on many factors, including capacity, location, and cost of debt and equity. Current costs are therefore variable, as innovation and

[70] The CSP prices are based on a project's "overnight installed cost," which is the total direct and indirect costs that would be incurred if the projects was built in an instant, void of any additional costs for financing the construction period. The number of hours of thermal energy storage for CSP is optimized in the ReEDS model, and is slightly different than the numbers in this table due to restrictions on the solar multiple within the ReEDS. Full chart available on page 43: http://energy.gov/sites/prod/files/2014/01/f7/47927_chapter3_0.pdf

[71] Watts direct current (Wdc) is defined by the direct current array size of a PV plant as measured under standard test conditions (STC). It is the sum of the STC ratings of all the panels in the plant. Watts alternating current (Wac) is defined by the maximum AC output of all the inverters at a given plant. In cases where the DC power exceeds the AC capacity (beyond efficiency losses), the inverter will "clip" power, meaning it will only put out its maximum rated AC power. For a utility PV plant, an inverter loading ratio (ILR) of 1.3 would be typical. This means that a plant would have 1.3 MWdc of modules and a 1 MWac inverter. If the plant cost $2 million to build, it would have costs of $2.00/Wdc or $2.60/Wac. These units are different ways of describing the same plant. However, knowing the DC array size (and other system characteristics) is extremely important because it has a closer relationship to energy harvest than does the inverter size.

deployment continues. However, several studies have shown that CSP+TES projects provide substantial value to the energy system, reducing the overall costs that energy customers pay and increasing the extent to which PV and other intermittent renewables can be integrated onto the grid. For example, NREL issued a report in November 2012, entitled "Simulating the Value of Concentrating Solar Power with Thermal Energy Storage in a Production Cost Model".[72] In September 2014, the Concentrating Solar Power Alliance issued an updated report, entitled "The Economic and Reliability Benefits of CSP with Thermal Energy Storage: Recent Studies and Research Needs," which both summarizes recent studies by NREL and the LBNL, among others, and adds analyses that tie the results of those studies together. A recent NREL report shows that CSP+TES provides up to $30-60/MWh in flexibility benefits, enabling CSP+TES to contribute to reducing net system costs (the costs that energy customers ultimately pay for energy).[73]

c. Balance of System Costs

For PV systems, it is also important to recognize the balance of system costs in comparison to the panel costs. The RE Futures study identifies a capital cost breakdown for a non-tracking utility PV with a 10 MW (DC) install size project in 2012, as show in the pie chart below.[74] At the time of the RE Futures study, module costs at $1,400/kW$_{dc}$ appeared to comprise approximately 50% of utility-scale PV installation costs. Since that time, module costs have declined by more than half while balance of system costs have also declined significantly, although to a lesser extent.

[72] http://www.nrel.gov/docs/fy13osti/57376.pdf

[73] Jorgenson, J., P. Denholm, and M. Mehos, "Estimating the Value of Utility-Scale Solar Technologies in California Under a 40% Renewable Portfolio Standard," National Renewable Energy Laboratory, Technical Report, TP-6A20-61685 (May 2014).

[74] See page 42 of: http://bv.com/docs/reports-studies/nrel-cost-report.pdf

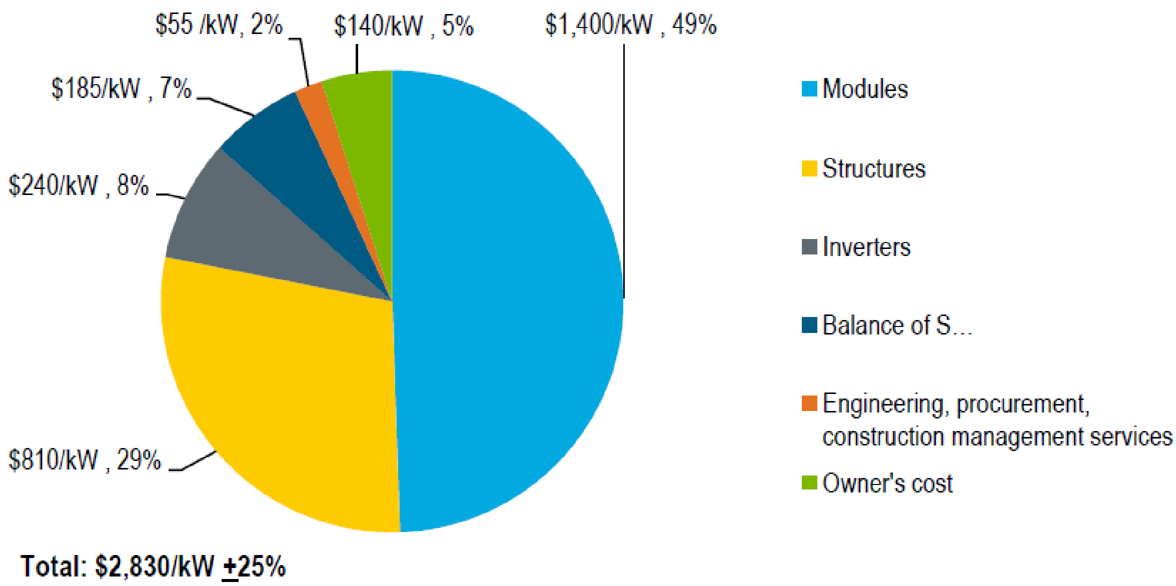

Figure 11. Capital cost breakdown for a solar photovoltaic power plant

Two recent reports from NREL acknowledged the balance of system costs for all solar and the fact that with falling module and other hardware costs, the total cost of a solar system is increasingly dependent on the “soft”, or non-hardware costs. The reports found that solar financing and other non-hardware costs now comprise up to 64% of the total price of residential solar energy systems. The report notes:

> The authors found that in the first half of 2012, soft costs represented the majority of all costs — 64% of the total price for residential systems, up from 50% of the total price in the first edition. Similar results were found for small and large commercial installations — 57% of the total cost for small (less than 250 kilowatts) commercial systems (up from 44%); and 52% of the total costs for large (250 kilowatts or larger) commercial systems (up from 41%).For residential systems, the greatest soft costs were supply chain costs ($0.61/watt), installation labor ($0.55/W), customer acquisition ($0.48/W), and indirect corporate costs ($0.47/W), such as maintaining office management and accounting functions. Other soft costs examined for the report included costs for permitting, inspection, interconnection, subsidy applications and system design.[75]

As total installation costs have declined and continue to decline at a more rapid pace than previously expected, solar is increasingly cost competitive with alternative sources of energy and other carbon emission reduction measures.

[75] Report available here: http://www.nrel.gov/news/press/2013/5306.html

d. Materials Costs

In addition, the RE Futures study also examined the cost and availability of the future supply of sourced materials for PV panels. Ultimately, the study found no concern over the availability of PV materials even in the scenario of planned significant deployment of solar PV globally. The study notes:

> RE Futures does not identify any insurmountable long-term constraints to manufacturing capacity, material supply, or labor availability for any of the renewable technologies considered in this study (see RE Futures Volume 2). Growth in renewable capacity additions globally and in the United States has been considerable over the last decade, demonstrating the ability to scale manufacturing and deployment at a rapid pace. … The estimated annual capacity of PV deployment is high, especially in later years, but PV manufacturing and deployment are scalable. Worldwide PV production capacity has been growing rapidly and is already comparable to the deployment levels projected for the latter years in many of the 80%-by-2050 RE scenarios. Moreover, many of the renewable technologies are based on common materials that are not supply-constrained. Even for PV, which uses some materials that may be supply-constrained, worldwide production capacity is already sizable, and that capacity continues to scale rapidly. Even considering the High-Demand 80% RE scenario, and worldwide demand for PV, given the variety of PV feedstocks used today and the possibility of newer ones being developed in the future, reaching the required levels of installed capacity need not be limited by the availability of raw materials.[76]

These facts illustrate that solar energy measures can be implemented at a reasonable cost, and that cost should not be an impediment to solar energy inclusion in the BSER.

2B3. Solar Energy Measures Should be Included in the BSER Because They Reduce Carbon Emissions from Affected EGUs

Solar energy is not a hypothetical way to reduce carbon emissions; solar energy generation significantly reduces carbon emissions today. Solar energy systems in the U.S. are expected to generate more than 20,000 gigawatt hours (GWh) in 2014.[77] With one GWh of solar generation eliminating 690 metric tons of CO_2 emissions, solar generation can be expected to avoid 13.8 million metric tons of CO_2 emissions in 2014.[78]

Emission reductions resulting from solar deployment are certain to grow. In 2013 alone, the solar industry grew 53 percent over 2012, installing 5.2 GW of solar generating capacity. On average, a new

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[76] http://www.nrel.gov/docs/fy12osti/52409-1.pdf page 138
[77] SEIA analysis based on data from SEIA/GTM Research U.S. Solar Market Insight: 2013 Year in Review
[78] For more information, see http://www.epa.gov/cleanenergy/energy-resources/refs.html

solar project was installed in the U.S. every 4 minutes in 2013.[79] Solar energy accounted for 29 percent of new electric generation capacity installed in 2013.[80] An approximate 6.8 GW of new solar capacity is projected to come online in 2014.[81]

The EPA's Avoided Emissions and Generation Tool (AVERT) can be used to calculate the carbon emissions reductions from solar energy using historic dispatch data.[82] The chart below shows the current CO_2, NO_x and SO_2 avoided in each AVERT region at current solar energy deployment levels.[83] Additional information on evaluation, measurement and verification (EM&V) from all solar energy, including distributed solar, is provided in the EM&V section of these comments.

AVERT REGION	STATES WITHIN AVERT REGION	CUMULATIVE CAPACITY (MW)	CO_2 EMISSIONS REDUCED (TONS)	SO_2 EMISSIONS REDUCED (POUNDS)	NO_X EMISSIONS REDUCED (POUNDS)
California	CA, UT	5171.70	4,433,300	705,700	6,340,000
Great Lakes/ Mid-Atlantic	DE, IL, IN, KY, MD, MI, NJ, OH, PA, VA, WI, WV	1241.90	1,325,700	6,069,800	2,406,700
Lower Midwest	AR, KS, LA, MO, NM, OK, TX	141.48	180,800	418,300	394,800
Northeast	CT, MA, ME, NH, NJ, NY, RI, VT	1408.35	1,113,600	1,972,900	1,574,000

[79] U.S. Solar Market Insight 2013 Year in Review Report. Available at: www.seia.org/smi.
[80] U.S. Solar Market Insight 2013 Year in Review Report. Available at: www.seia.org/smi.
[81] SEIA analysis based on data from SEIA/GTM Research U.S. Solar Market Insight: 2013 Year in Review and EIA Electric Power Monthly, December 2013, Table ES3.
[82] The AVERT tool statistically determines the marginal electric generating units (EGUs) on an hourly basis. The AVERT tool is free to use with a simple user interface designed to meet the needs of state air quality planners and other interested stakeholders, and can easily be used to evaluate county-level emissions displaced at EGUs by EE/RE policies and programs, and to analyze the emission benefits of different renewable energy programs in multiple states within an AVERT region. The tool can also be used to quantify the nitrogen oxides (NO_x), sulfur dioxide (SO_2), and carbon dioxide (CO_2) emissions benefits of state and multi-state renewable policies and programs. Read more here: http://epa.gov/statelocalclimate/resources/avert/index.html
[83] Solar deployment data taken from SEIA/GTM Research U.S. Solar Market Insight: 2013 Year in Review and SEIA solar industry 2012 data. Report available here: http://www.seia.org/research-resources/us-solar-market-insight. Hawaii and Alaska have been excluded; the total MW of cumulative capacity in each state have been split equally between the utility PV and rooftop PV specifications in the model; states in multiple AVERT regions have had their cumulative capacity divided equally among the multiple AVERT regions the state is present in, with the exception of Texas. All Texas cumulative solar capacity was run in the Texas AVERT region.

Northwest	ID, MT, NV, OR, UT, WA, WY	312.70	329,800	389,800	785,200
Rocky Mountains	CO, SD, WY	331.50	464,000	647,900	899,300
Southeast	AL, AR, FL, GA, KY, LA, MO, MS, NC, OK, SC, TN, TX, VA, WV	927.03	959,800	2,975,400	1,486,000
Southwest	AZ, CA, NM, NV, TX	1850.40	2,070,300	977,800	2,987,300
Texas	TX, OK	201.20	203,600	408,800	236,800
Upper Midwest	IA, IL, MI, MN, MO, MT, ND, NE, SD, WI	72.43	94,500	286,000	170,800

As the EPA recognized correctly in its proposal, an increase in the amount of electricity produced from solar decreases the amount of electricity produced by fossil fuel power plants. Solar can potentially replace polluting sources on a 1:1 basis, depending on the combination of solar and other technologies deployed on the complex grid. For example, CSP with thermal energy storage can provide the equivalent of baseload, intermediate, or peaking conventional fossil-fuel generation; in other areas, PV combined with wind, storage and/or demand-side resources could provide a complete substitute for fossil-fired generation. As a general matter, when solar is placed on the grid it displaces electricity production from a source that emits carbon pollution, often at a high rate, such as a simple-cycle natural gas generator.

Numerous studies have shown the extent to which renewable energy can effectively reduce emissions. The Western Wind and Solar Integration Study, performed by the National Renewable Energy Laboratory (NREL), evaluated the impacts of operating the Western Interconnect with high penetrations of wind and solar. The study found that CO_2 emissions could be reduced by 29 percent to 34 percent, or the equivalent of 260-300 billion pounds per year when the Western Interconnect obtains 33 percent of electricity from wind and solar.[84]

In February 2014, PJM, the nation's largest grid operator (with territory covering 13 states and Washington, DC), released a study analyzing a high penetration of renewable generation on the PJM grid. The study considered scenarios of up to 30 percent wind and solar and found no significant operating issues. In addition, the study found that CO_2 emissions could be reduced by 28 percent in the

[84] While this study presumed that the various electrical assets in the Western Interconnect could be coordinated in an optimal fashion, setting aside institutional barriers presented by differing operating regimes within the Western Interconnect, it demonstrates both the strong carbon reduction potential as well as need to reduce those counterproductive barriers. Western Wind and Solar Integration Study, available at: http://www.nrel.gov/electricity/transmission/western_wind.html

"High Solar Best Onshore" scenario compared to the business as usual (BAU) scenario in the target year 2026.[85]

In February of 2012, the U.S. Department of Energy (DOE) released the SunShot Vision Study, a detailed report that examines the potential for and barriers to solar PV and CSP in the U.S., while striving for reduced solar costs. The report states:

> Solar energy reduces GHG emissions compared with most other sources of energy. Compared with the reference scenario, the SunShot scenario is estimated to reduce electric-sector operational carbon dioxide (CO_2) emissions by 181 million metric tons (MMT) per year by 2030 (an 8 percent reduction), and the estimated reduction by 2050 is 760 MMT per year for the SunShot scenario (a 28 percent reduction)…. Significant reductions in U.S. GHG emissions are projected under the SunShot scenario. Combined with other efforts worldwide, these reductions have the potential to contribute significantly to the deceleration of global climate change.[86]

Furthermore, life-cycle GHG emissions from PV and CSP, as assessed in the SunShot Vision study, are orders of magnitude lower than lifecycle GHG emissions from natural gas and coal power plants.[87]

a. Distributed PV Reduces Emissions From Affected EGUs and Should be Included in Building Block 3

As stated above, with one GWh of solar generation eliminating 690 metric tons of CO_2 emissions, solar generation can be expected to avoid 13.8 million metric tons of CO_2 emissions in 2014.[88] Of this, distributed PV capacity (as of June 2014) will generate 10,450,000 MWh/year and displace 7,206,000 MT of CO2 per year.[89] The mode of carbon displacement for distributed PV is identical or slightly better than utility PV, as distributed PV does not need to factor in line loss. The above mentioned studies apply to distributed PV as well. Therefore, distributed PV is clearly an effective means of reducing emissions and must be included in building block 3.

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[85] PJM Renewable Integration Study, available at: http://www.pjm.com/~/media/committees-groups/committees/mic/20140303/20140303-pris-executive-summary.ashx

[86] For additional figures, see http://www1.eere.energy.gov/solar/pdfs/47927_chapter7.pdf. Chapter 3 of the SunShot Vision study describes the SunShot and reference scenarios, including descriptions of the modeled electricity capacity and generation mixes and discussion of peak and baseload power resources.

[87] Id.

[88] For more information, see http://www.epa.gov/cleanenergy/energy-resources/refs.html

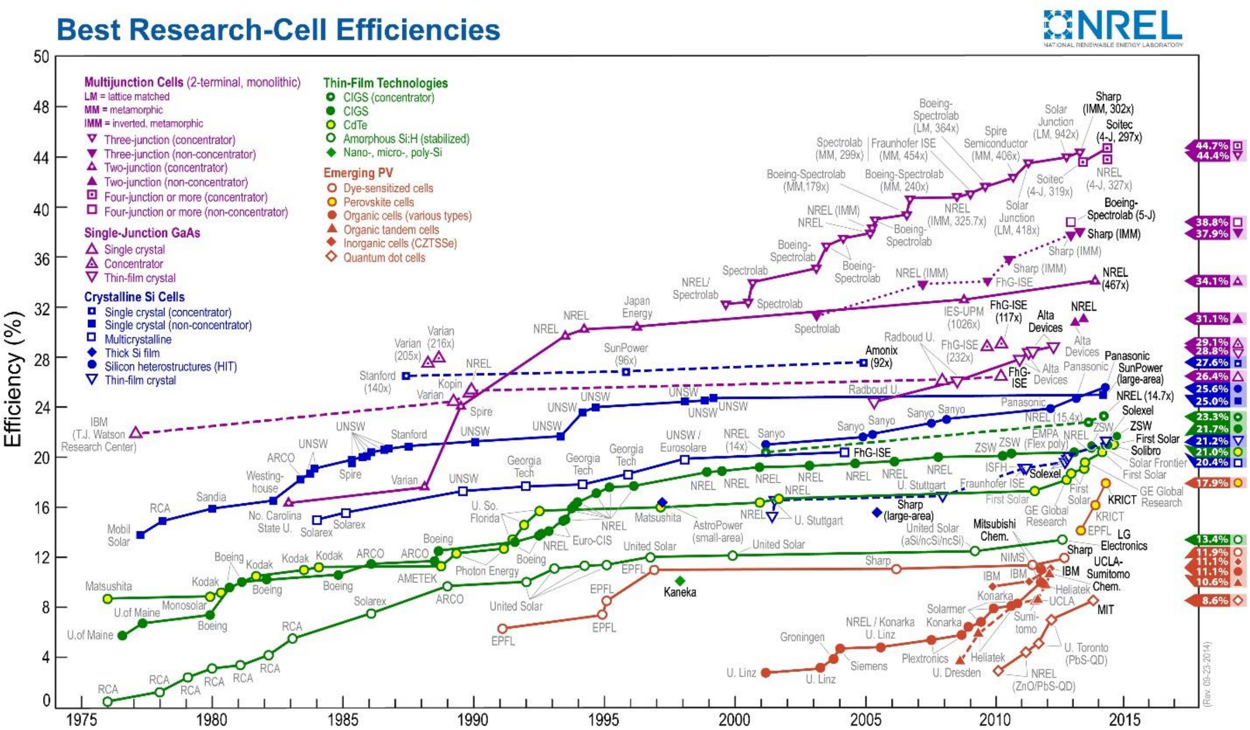
[89] Solar data from U.S. Solar Market Insight Q2 2014. See also: http://www.epa.gov/cleanenergy/energy-resources/refs.html

2B4. Solar Energy Measures Should be Included in the BSER Because They Promote Technological Development

When determining the BSER, EPA considers measures that promote technological development. As discussed above, solar energy measures throughout the United States have driven significant solar deployment and are expected to continue driving solar installations at an increasing rate. Alongside this rapid deployment are decreasing costs and increased emissions reductions.

i. PV Measures Promote Technological Development

Further, new solar technologies and efficiencies of solar panels are continually being developed. NREL maintains a plot of compiled values of the highest confirmed conversion efficiencies for solar cells, as shown in the chart below:[90]



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[90] Devices included in this plot of the current state of the art have efficiencies that are confirmed by independent, recognized test labs (e.g., NREL, AIST, Fraunhofer) and are reported on a standardized basis. The measurements for new entries must be with respect to Standard Test or Reporting Conditions(STC) as defined by the global reference spectrum for flat-plate devices and the direct reference spectrum for concentrator devices as listed in standards IEC 60904-3 edition2 or ASTM G173. The reference temperature is 25°C and the area is the cell total area or the area defined by an aperture. More at: http://www.nrel.gov/ncpv/pdfs/cell_efficiency_explanatory_notes.pdf

A report by the McKinsey Global Institute called, "Disruptive technologies: Advances that will transform life, business, and the global economy" notes the following for technological development of solar energy:[91]

> Technological advances that reduce the costs of renewable energy generation will be important enablers of adoption. During the past two decades, the efficiency of solar panels (the percentage of solar energy converted into electricity) has risen to 15 percent; in laboratory tests, panels have achieved as much as 44 percent efficiency. The cost of solar cells has already dropped from nearly $8 per watt of capacity in 1990 to less than 80 cents. Further advances in solar and wind power technologies are under way. Thin film cells, which are made from compounds like cadmium telluride, copper indium gallium arsenide (CIGS), or amorphous silicon (A-Si), are being developed for PV use. These advances reduce the amount of material used in creating solar cells and can be "printed" on flexible surfaces, potentially reducing cost and increasing ease of application. Researchers are also working with nanomaterials, including polymer films that are less than 100 nanometers thick that could replace silicon cells and nanomaterial-based coatings that repel water and that prevent dust and debris from sticking to panels.

ii. CSP Measures Promote Technological Development

The technologies used for CSP also promote technological development. The first commercial utility-scale CSP projects in the United Stated were built in the late 1980's by Luz International. Luz built nine parabolic trough plants in southern California that totaled 354 MWs- an indication of the robust nature of this technology- all of these plants continue in operation today. Parabolic trough technology has continued to improve since the Lux plants were built, substantially increasing receiver efficiency, reducing cost and weight of reflector structures, and updating control. Troughs remained the only commercial CSP technology until 2007 when an 11 MW commercial solar power tower went into operation in Spain. In the US, the Ivanpah Solar Electric Generating System, a 377 MW plant with three steam power towers in California became operational in 2014. This is the largest commercial power tower facility in the world. As with trough technology, tower technology is rapidly improving, including new lightweight solar collector designs, advanced automation of assembly and installation of collectors, improved control systems, and higher temperatures that allow improved power cycle efficiency.

Since the first CSP plants went into commercial operation, they have often incorporated thermal energy storage. The first of the Luz parabolic trough plants included three hours of thermal energy storage, which was used to help the plant meet a nighttime peak during winter months. More recently, many parabolic trough projects in the U.S. and Spain have incorporated high-temperature and highly efficient molten-salt thermal energy storage. The Solana 250 MW solar trough plant, in Arizona, is the first commercial plant in the U.S. to incorporate this type of storage. Solana, which became operational in

[91] http://www.mckinsey.com/insights/business_technology/disruptive_technologies

2013, incorporates 6 hours of thermal energy storage. The storage system at Solana allows the utility dispatch solar power to meet peak system loads and reliability needs in the summer and winter.

The first commercial solar power tower, in Spain, and a similar 20 MW tower included steam accumulators that allowed 30 minutes of buffer storage, enabling the plants to operate through transient cloud interruptions of sunlight. In 2011 the first commercial power tower with direct molten-salt thermal energy storage became operational in Spain, a 20 MW plant with 15 hours of storage. In a direct molten-salt system, the molten salt serves as both the initial heat transfer medium (the substance heated through concentrated sunlight) as well as the storage medium, as opposed to an indirect molten-salt system, in which another substance is used as the initial heat transfer medium (such as steam, specialized heat transfer fluids, or even air).The direct molten-salt storage enables this plant to operate 24 hours per day through much of the year.

In the United States, the 110 MW Crescent Dunes project is under construction, and is expected to become operational in 2015. This direct molten-salt tower will incorporate 10 hours of thermal energy storage, and is expected to become operational in 2015. This plant will operate from noon to 10pm throughout the year. As with trough technology, tower technology is rapidly improving; with new lightweight solar collector designs, advanced automation of assembly and installation of collectors, improved control systems, integration of efficient thermal energy storage and movement to higher temperatures that allow improved power cycle efficiency.

DOE, which tracks the cost of renewable technologies, estimates that between 2010 and 2013, the price of CSP fell from 21¢/kWh to 13¢/kWh[92]. Through new R&D in CSP technologies like DOE's SunShot program, the advancement in CSP technology noted above, and the learning coming from deployment of commercial projects in the US and around the world, CSP prices are expected to continue to decrease.

2B5. Solar Energy Measures Should be Included in the BSER Because They Can be Reliably Integrated into the Electric Grid

When establishing the BSER, the EPA considers the impact that systems of emissions reductions have on the energy system and electric grid. Several studies have clearly shown that high levels of renewables, including solar energy measures, can be integrated into the grid without negatively impacting reliability or grid requirements. In fact, solar energy can improve grid reliability and provide benefits to the existing energy infrastructure, including reducing transmission losses and relieving congestion on the

[92] US Department of Energy, http://energy.gov/eere/sunshot/concentrating-solar-power

grid. There are several resources the EPA can look to for understanding how solar fits into the grid in terms of reliability and higher penetrations of renewable energy.[93]

Reliability and Transmission Benefits of Solar

Solar energy can be configured and operated to provide various reliability services and transmission benefits that will be essential to electric power system operations in conjunction with the state implementation of §111(d) regulations.

CSP technologies employ conventional synchronous turbine generators and inherently possess valuable system reliability attributes, such as, but not limited to, active and reactive power support, dynamic voltage support and regulation, voltage control and some degree of inertia response. With the integration of thermal energy storage, CSP facilities can be fully dispatched by utilities and system operators, meaning that the plants are capable of ramping power output up and down to meet changing energy demand and supply, without material efficiency losses. CSP with storage plants can be a significant source of essential grid flexibility services, such as ramping, regulation, load following reserves and spinning reserves, which are critical to a reliable system. These services are typically provided by fossil-fired generators operating at sub-optimal heat rates, which may increase their emissions.

To explain further, the ability to store and produce energy at any time enables CSP projects to provide or withhold power as needed for the grid. For all intents and purposes it has all the attributes of a fossil fueled power plant, without carbon emissions.[94] CSP plants can be built in a number of configurations, ranging from baseload to peaker. These attributes include:

a. **System Benefits:** The primary benefit provided to the grid system by CSP plants with storage is the ability to dispatch power whenever it is needed most, day or night. In addition, CSP with storage can provide ancillary services and reduce integration costs while providing the same reactive power quality attributes of traditional thermal plants. The important role of storage and reactive power in maintaining grid reliability is emphasized in NERC's report *Potential Reliability Impacts of EPA's Proposed Clean Power Plan, Initial Reliability Review*, November 2014.
b. **Energy Value**: Thermal energy storage allows CSP plants to shift electricity generation to the highest value hours across the operating day, overnight, or the next day as needed by the utility or system operator.

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[93] See the NREL Renewable Electricity Futures Study, available here: http://www.nrel.gov/analysis/re_futures/ See also the study "Integrating High Penetration Renewables: Best Practices from International Experience" available here: http://www.jisea.org/high_pen.cfm

[94] Some CSP plants that do not incorporate storage use a de minimis amount of fossil fuels to increase efficiency at the beginning and end of the solar day, or during transient cloud cover.

c. **Capacity**: At low penetrations of solar power on the grid, solar correlates well with daily peak demands. As solar penetration increases, however, peak demand shifts to the evening hours. CSP with storage allows for shifting energy into the periods of highest demand or value. CSP plants can also be hybridized to use natural gas or other fuels to provide high availability even on cloudy days.
d. **Power Quality**: Since CSP projects typically generate power with a steam turbine, just as most fossil-fueled plants, they have the same power quality characteristics as those plants. These attributes include reactive power support, dynamic voltage support, voltage control, inertia response, and primary frequency control.
e. **Ancillary Services**: CSP plants with thermal energy storage can provide spinning reserves, non-spinning reserves, and regulation and they can operate efficiently at part load.
f. **Integration**: CSP with storage can vary its production to complement other renewables that are more dependent on the times at which the resource is present (whether sunlight or wind),transitional periods, helping to lessen grid ramps and providing both rapid response and significant supply of power at times that other resources are unavailable.

With supportive policies and standards in place, utility-scale solar PV can include advanced features that enable it to operate more like conventional power plants and actively contribute to the stability and reliability of a regional grid as part of a balanced energy portfolio.[95] Some of these features include voltage regulation, active power controls, ramp-rate power controls, fault ride-through, and frequency response controls. These capabilities are managed through the use of a plant-level controller specifically engineered to regulate real and reactive power output of the solar facility such that it behaves as a single large conventional generator, although within the limits dictated by the intermittent nature of the solar resource. These advanced features can enable solar PV to provide a state or region with additional system flexibility by responding to utility and independent system operator instructions.

Distributed PV can provide wholesale ancillary services in the same fashion as utility-scale assets and can also provide local ancillary services beyond what utility-scale assets are capable. These services include but are not limited to frequency regulation, frequency response, spinning and non-spinning reserves, voltage and reactive power support. In addition, distributed PV can provide incremental ancillary services on the local or distribution level. Local voltage support is critical to operating the distribution system within system constraints, and distribution system operators rely on a distributed set of voltage regulating equipment to provide that support. Distributed PV can augment and sometimes replace this equipment, providing real and reactive power support as identified by the distribution operator.

On an aggregated basis, utility-scale and distributed PV resources provide significant reliability and transmission benefits to a state or regional grid. Even if solar PV output varies at a few individual

[95] See "Grid-Friendly" Utility Scale PV Plants, First Solar at 3 and 13 (August 13, 2013).

locations due to localized cloud coverage, when the sum of the solar installations in a geographic area is assessed, the variability is reduced and can be managed by the grid operator. In a recent study regarding the integration of wind and solar in PJM, General Electric International, Inc. (GE) found that PJM's large geographic footprint significantly reduced the magnitude of variability-related challenges as compared to smaller balancing areas.[96] GE noted that an individual solar PV plant's variability is significantly reduced when solar plants are aggregated and located in a geographically diverse manner throughout PJM.[97]

Further, targeted deployment of solar generation in congested areas can provide relief to transmission and distribution systems, defer costly transmission upgrades, and help maintain grid reliability. For example, unlike central station power plants, solar installed on-site does not experience transmission and distribution system losses, which can be as high as 7 percent on a utility distribution system and up to 20 percent at the time of system peak.[98] These avoided line losses through solar DG contribute to further CO_2 reductions. Similarly, utilities may site small utility-scale power plants in specific locations to ease congestion on a particular transmission line.

Finally, solar technologies that require transmission investment often do not require pipelines, coal transport or the associated production and processing infrastructure needed by coal and gas industries. This has the potential to save immense costs as the energy infrastructure in the U.S. ages and requires repairs.

Solar Energy Can be Integrated into the Grid at High Penetration Levels

As renewable energy becomes a larger component of the electricity sector, the generation profile of the electric resources available throughout the day is changing. For example, solar and wind resources peak in terms of output at specific times depending on geography and other factors. The addition of renewable energy has spurred utilities and regulators to think differently about matching supply and demand. The EPA's proposal to require affected sources to shift generation correctly reflects regulator and utility actions to accommodate more renewables in the grid today and moving forward, and is thus follows the forward looking intent of 111(d).

Utilities and policymakers are already addressing the changes to grid operations presented by increased renewable penetration. For example, in areas of an electric grid where the peak energy use is in the late afternoon, solar systems can be configured to coincide with peak demand later in the day. Solar can also be coupled with storage technologies to match their output to local power demand patterns, including

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[96] See PJM Renewable Integration Study, General Electric International, Inc. at 12 (February 28, 2014) (GE Study).
[97] See Id. at 12 and 15.
[98] For more information, see the paper, "Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements" available at: www.raponline.org/document/download/id/4537

evening peaks. This can be done economically, if supported through appropriate policies, pricing options, and program offerings.[99] For a discussion of strategies to address the changes to grid operations presented by renewables, we recommend *Teaching the Duck to Fly*, a paper recently published by the Regulatory Assistance Project.[100]

Some stakeholders have expressed concerns that solar and wind energy can increase costs and energy system emissions due to an increased need to cycle conventional power plants in response to variable renewable output.[101] However, such claims have been proven to be overstated, and could largely be avoided through a balanced portfolio of complementary solar, wind and other clean energy resources. The Western Wind and Solar Integration study found that not only is a high renewable energy penetration achievable, but also that any increases in costs or emissions associated with increased cycling of fossil fuel power plants are nominal compared to the overall cost and emissions savings associated with reduced generation from fossil fuel power plants.[102] The PJM Renewable Integration Study reached a similar conclusion: any increased costs associated with increased cycling of conventional generators are dwarfed by the savings in fuel costs.[103]

Further, a recently released NERC report expressed concerns regarding the impact of high penetration renewables on the grid as a result of the Clean Power Plan. The report cited concerns such as the need to build out new infrastructure, the inability for renewable energy to ramp up as needed, impacts on reliability, and an overreliance on natural gas. However, upon review the report appears to be very preliminary and not based on any modelling. In fact, the main concerns regarding renewables integration have been rebutted or are currently being addressed by regulators in states throughout the country. For example, The SunShot Vision Study, the Renewable Energy Futures Study, the Western Wind and Solar Integration Study, the forthcoming Wind Vision Study (all NREL), the Minnesota Renewable Energy Integration and Transmission Study[104], and the PJM Renewable Integration Study (GE) show that renewables, including solar, can be integrated at high levels without significant issue.

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[99] See "Teaching the Duck to Fly: Integrating Renewable Energy," available here: http://www.raponline.org/featured-work/teach-the-duck-to-fly-integrating-renewable-energy
[100] Id.
[101] Western Wind and Solar Integration Study, available at: http://www.nrel.gov/electricity/transmission/western_wind.html (Citing cycling concerns at pg. vii)
[102] Western Wind and Solar Integration Study, available at: http://www.nrel.gov/electricity/transmission/western_wind.html
[103] PJM Renewable Integration Study, available at: http://www.pjm.com/~/media/committees-groups/committees/mic/20140303/20140303-pris-executive-summary.ashx
[104] Minnesota Renewable Energy Integration and Transmission Study, Final Report, October 31, 2014 (http://mn.gov/commerce/energy/images/FINAL-MRITS-Report14.pdf)

2B6. Solar Energy Measures are Adequately Demonstrated Because They are Currently Being Used by Utilities and Other Owners of Affected EGUs

Once the EPA has established that a system of emission reduction is technically feasible and reduces emissions at reasonable cost, it must determine whether the system has been adequately demonstrated.

Solar energy measures have been adequately demonstrated because they are currently being used by owners of affected EGUs, including utilities and independent power producers, to shift generation away from fossil resources and diversify their energy mix with cleaner resources. For example, NRG, Inc., which owns a significant energy portfolio comprised of both fossil and renewable energy assets, recently announced that it intends to reduce its carbon emissions by 2050 through divestment of dirty fossil resources and investment in renewable resources such as wind and solar.[105]

In many states some solar and wind technologies have already reached grid parity, making the utilities' choice to install or purchase renewable energy over fossil resources a decision based solely on price.[106] As previously noted, utilities can now sign solar power purchase agreements for $50-$60 /MWh.

Further, in some cases solar is even competitive with base load generation. For example, a new conventional natural gas combined cycle power plant costs $66/MWh while a new conventional coal fired power plant costs $96/MWh. In some cases the interest in solar generation has created a backlog of applications for interconnection; in others, utilities have combined solar procurement with their long term resource planning and procurement due to the competitive price and hedge value of solar relative to natural gas and other generation.

Further, utilities have become heavily involved in the valuation and procurement of distributed PV through RPS policies, value of solar dockets, and direct ownership as the price of distributed PV drops and the benefits to both the grid and ratepayers is being realized.

Below is a discussion of solar procurement by entities that own or operate affected EGUs. Each of the models discussed below shows that utility scale and distributed PV, as well as CSP and SHC, can be procured by utilities to reduce generation (and emissions) from affected units. See Appendix E for further information.

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[105] http://www.nytimes.com/2014/11/21/business/energy-environment/nrg-sets-goals-to-cut-carbon-emissions.html?emc=eta1&_r=1

[106] http://www.nytimes.com/2014/11/24/business/energy-environment/solar-and-wind-energy-start-to-win-on-price-vs-conventional-fuels.html?_r=0

1. Distributed PV is Adequately Demonstrated and Should be Included in Building Block 3 Because Utilities and Other Owners of Affected EGUs Currently Procure Distributed PV

Utilities and other entities that own affected EGUs are procuring distributed PV on an increasing basis. Some of the most common examples are residential systems, commercial systems, community solar, and distributed solar RECs. Examples are discussed in the next section under "Solar Procurement Methods" and provided in Appendix E.

2. Solar Procurement Methods [107]

a. Solar Purchases

Purchases of solar energy output can take on a number of different forms, but predominately are comprised of power purchase agreements (PPAs), feed-in tariffs (FITs), value of solar rates, and excess generation net metering contracts. All can be constructed to various contract lengths and amounts. A few examples are listed below. For a list of further examples and program descriptions, see Appendix E.

- Virginia Dominion Power Renewable Energy Tariff: Under the tariff, the utility enters into a PPA with the solar energy supplier, thereby creating competition among generators and helping to lower renewable energy prices.[108]
- PSEG Wyandot Solar Farm Contract: PSEG Solar Source, LLC contracted with Ohio Power Company, a subsidiary of AEP, for a 12MW solar PV project that was built in 2010.[109]
- City of Palo Alto Utility Solar Rate: Through its Palo Alto CLEAN program, CAPU purchases electricity generated by solar electric systems located in CAPU's service territory at a solar rate that reflects an estimated value of solar. As of February 3, 2014, CAPU is offering to purchase up to 3 MW of solar electricity.
- Xcel Value of Solar Tariff: In Minnesota, the Commission has authorized Xcel to file a Value of Solar Tariff with the Commission. Under the tariff, Xcel will pay a solar rate to solar customers in exchange for their solar energy. This solar energy will be generated by distributed PV systems (mostly residential rooftop). Xcel will receive the solar REC, which Xcel can then use to comply with its renewable energy standard requirements in Minnesota. The legislation enabling the tariff requires the Commission to consider the environmental benefits of solar in determining

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[107] The following procurement definitions and examples are taken from the Solar Electric Power Association (SEPA) database. SEPA maintains a comprehensive utility solar database that details all utilities and the solar projects within the portfolio of the utility.

[108] *http://media.law.stanford.edu/organizations/programs-and-centers/steyer-taylor/State-Policy-Report-low-res.pdf*

[109] http://usd.solarelectricpower.org/summarytables/index.cfm?view=projects

the value of solar.[110] The Commission included the social cost of carbon in its final methodology for determining the value of solar.[111]

- Five CSP plants, with a total capacity of 1,300 MW, were recently built under long term PPAs; the power from these plants was purchased by Arizona Public Service, Pacific Gas & Electric, Southern California Edison and NV Energy. Specifics of these plants are presented in Appendix B.

b. Solar Ownership

This refers to ownership and operation of solar electricity resources as enterprise assets by entities that own or operate affected EGUs. The most common evidentiary benefits of the ownership model are the ability to provide stable prices, large-scale market activity, and/or procurement risk mitigation. A few examples are listed below. For a list of further examples and program descriptions, see Appendix E.

- SCE&G Distributed PV RFP: On August 21, 2014, SCE&G announced plans to contract for several small distributed PV installations. For example, the company's North Charleston installation will be built on the 3 acre site of a former gas facility with a generating capacity of 300-500 kW. This was done in conjunction with the passing of the Distributed Energy Resource Program Act, which is intended to allow increased penetration of utility and distributed PV by SCE&G throughout South Carolina.
- NY Reforming Energy Vision Docket:[112] Utilities have requested authority to construct and own distributed energy resources, including distributed PV, in New York State.[113] The proceeding is part of New York's effort to reduce its greenhouse gas emissions and bring the benefits of distributed energy resources to more ratepayers at affordable rates. These resources include various types of distributed PV including residential rooftop, commercial PV, and community solar.
- Duke Energy Corp Utility PV Ownership: Duke Energy recently announced plans to invest $500 million in new solar energy facilities across North Carolina, including direct ownership of 128MW of utility-scale solar to be built at 3 sites.

c. Unregulated Activities

This refers to business models adopted by unregulated entities, such as holding companies or unregulated subsidiaries of IOUs. These unregulated bodies principally participate in the solar markets

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[110] Sec. 10. Minnesota Statutes 2012, section 216B.164 as amended. (https://www.revisor.mn.gov/laws/?id=85&year=2013&type=0)

[111] http://mn.gov/commerce/energy/images/MN-VOS-Methodology-FINAL.pdf
[112] NYPSC 14-M-0101 (http://www3.dps.ny.gov/W/PSCWeb.nsf/All/26BE8A93967E604785257CC40066B91A?OpenDocument)
[113] See Staff Straw Proposal at 67

either by developing and owning solar installations, by selling solar power output to load-serving utilities, or by making financial investments in the solar industry. An example is listed below. For a list of further examples and program descriptions, see Appendix E.

- Southern Power Utility Scale PV Ownership: Southern Company, a subsidiary of Southern Power, has acquired the Solar Gen 2 150 MW facility in California from First Solar, Inc. Along with other projects, Southern Company now owns more than 400 MW of solar generating capacity that it offers to its customers and that can be used to shift generation away from dirtier fossil resources.

d. Community Solar

In its most basic form, a utility community solar program consists of one or more larger utility-managed photovoltaic projects from which customers can purchase a fractional share of the electricity output to virtually offset their electric bill as if the solar system were on their property, i.e. net metered. An example is listed below. For a list of further examples and program descriptions, see Appendix E.

- Colorado Solar Gardens: Colorado's Solar Gardens is one of the most successful shared renewables programs, with shares in the projects selling out about 30 minutes after they were announced. The CO IOUs are required to purchase the energy from the projects, capped at 6 MW per year from 2011-2013. Due to the success of the program, most CO IOUs decided to continue supporting the Solar Garden projects by purchasing the energy.[114]

e. Property Leasing

This topic captures programs where utilities or other entities have leased customer property for the installation of one or more solar projects. Under this model, customers are typically compensated with a nominal annual lease payment in exchange for access to the property over a set contract term. A couple examples are listed below. For a list of further examples and program descriptions, see Appendix E.

- Arizona Public Service Luke Air Force Base Facility: APS recently partnered with Luke Air Force Base. Under the agreement, APS leased 106 acres from the Air Force to construct a solar plant that will "help save the Air Force money" and allow both "Luke and APS to meet their renewable energy generation goals."
- Lakeland Electric Solar Water Heating Program: Lakeland Electric, a utility based in Florida, has been offering a leasing program for solar water heating systems for the past 15 years.[115]

[114] http://sharedrenewables.org/index.php?option=com_legislation&view=listing&stateCode=CO
[115] For more information on the program, see here: http://www.lakelandelectric.com/Customers/ProgramsServices/SolarWaterHeater.aspx

f. Requests for Proposals

Utilities often issue requests for proposals as part of their efforts to increase solar or renewable energy more broadly within their service territories. A utility-issued RFP may either seek a specific single partner, or just as likely announce that a variety of projects are being sought such that, when combined, allow for a target amount of solar/renewable energy generation to be reached. An examples is listed below. For a list of further examples and program descriptions, see Appendix E.

- Seattle City Light Renewable Energy RFP: Seattle City Light recently announce an RFP to procure 150,000 MWh of renewable energy or renewable energy credits per year. Sources must qualify for Washington's State's renewable energy portfolio standard. City light has stated it will consider a broad range of proposals and contractual arrangements.

g. Merchant Solar Plants

A merchant plant is a power plant built for the purpose of selling directly to the wholesale electricity market, rather than under contract. While merchant plants are traditionally fossil plants, solar companies are now constructing merchant plants that will sell solar energy directly in wholesale spot markets. The off takers in these markets are generally utilities that may choose to purchase from a solar plant rather than a fossil plant, which allows utilities to reduce emissions from their overall energy mix. An example is listed below:

- First Solar Barilla PV Plant: First Solar has recently completed the initial 18MW phase of the Barilla PV plant in Texas, the first plant in the state to operate without a power purchase agreement. This merchant solar plant, located in West Texas, will instead sell electricity on Texas' ERCOT grid spot market.[116]

h. Solar REC Purchases

Utilities around the country purchase solar RECs and distributed generation renewable energy credits (RECs) from solar systems to comply with state renewable portfolio standards. One of the primary motivations of such standards is to shift generation away from affected EGUs and towards lower emitting renewable energy resources. Currently, 23 states and the District of Columbia have renewable portfolio standards that include solar and distributed solar carve-outs. Under these requirements, utilities are required to purchase solar renewable energy credits (SRECs) from distributed solar systems that are then used to reduce the utility's overall reliance on carbon emitting resources. A utility will generally issue an RFP to purchase RECs when purchased in large quantities. The primary goals of state

[116] http://www.pv-tech.org/news/first_solar_completes_merchant_pv_power_plant_in_texas

solar requirements are to reduce emissions, stimulate economic activity, hedge against fossil fuel prices, and improve grid resiliency and reliability through increased solar deployment.[117] These goals are clearly aligned with the requirements for establishing the BSER as set forth under 111(d). For a full list of solar RPS requirements, see DSIRE Solar Policy Guide.[118]

- Nevada Energy Integrated Resource Plan: Nevada Energy IRP counts distributed PV towards the NV RPS, so distributed PV penetration is tracked closely and is included as part of the utilities' overall resource plan.
- New Jersey RPS § 14:8-2.1 Purpose and scope:
  The purpose and scope of the NJ RPS states: "(a) Each supplier/provider, as defined at N.J.A.C. 14:8-1.2, that sells electricity to retail customers in New Jersey, shall include in its electric energy portfolio electricity generated from renewable energy sources. This subchapter is designed to encourage the development of renewable sources of electricity and new, cleaner generation technology; minimize the environmental impact of air pollutant emissions from electric generation; reduce possible transport of emissions and minimize any adverse environmental impact from deregulation of energy generation; and support the reliability of the supply of electricity in New Jersey."
- New York RPS Objectives (Case 03-E-0188):[119]
  The objective of the NY RPS states: "New York's Environment: improve New York's environment by reducing air emissions, including greenhouse gas emissions, and other adverse environmental impacts on New York State, including upon underserved communities, of electricity generation…"

i. Utility Engagement in the Valuation of Distributed PV

As distributed PV generation becomes a larger portion of the energy mix, many utilities are working to properly value distributed PV generation. Currently, there have been 15 value of solar studies or proceedings undertaken by states. These proceedings involve dozens of stakeholders engaging in a robust analysis of the benefits and costs of solar to the utility, ratepayers, and the grid. In addition, there are active dockets in Louisiana, South Carolina, and New York evaluating the benefits and costs of distributed PV.

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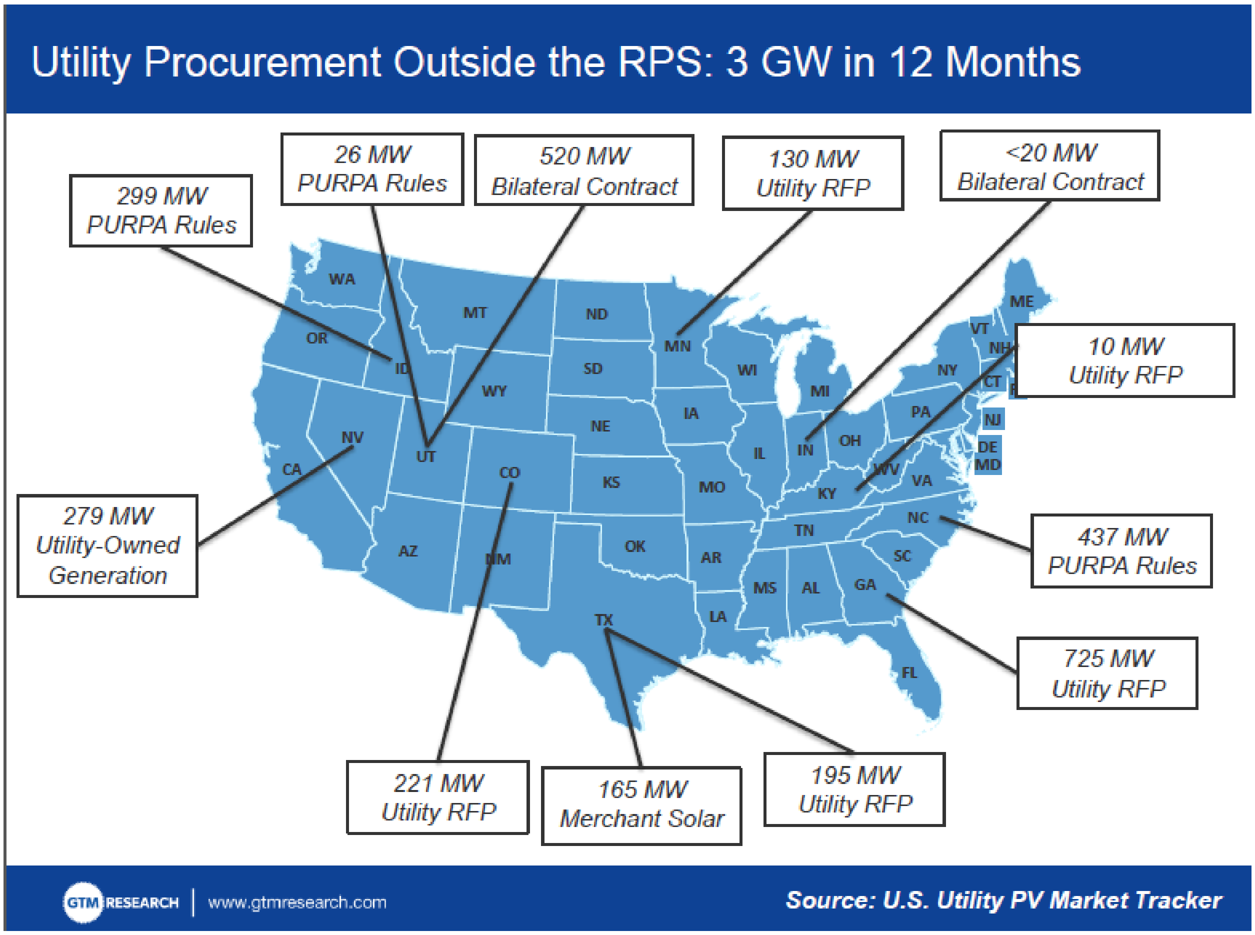
[117] www.dsireusa.org/solar/solarpolicyguide/?id=21
[118] Id.
[119] Order Regarding Retail Renewable Portfolio Standard (http://www3.dps.ny.gov/pscweb/WebFileRoom.nsf/Web/85D8CCC6A42DB86F85256F1900533518/$File/301.03e0188.RPS.pdf?OpenElement)

Finally, the graph below shows methods that utilities have used to procure solar energy <u>outside RPS</u> requirements in the past 12 months (Nov. 2013-Nov. 2014):



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Each of the models discussed above shows that utility scale and distributed PV, as well as CSP and SHC, can be procured to reduce generation (and emissions) from affected EGUs.

2B7. Solar Energy Measures Avoid Health and Environmental Concerns Associated with Dirtier Sources of Energy.

Solar energy does not produce as many costly externalities as fossil sources.[121] Emissions from coal power, for example, can cause bronchitis, asthma, heart disease, water pollution, land degradation and

[120]Chart from November 2014, GTM Research Utility PV Tracker: http://www.greentechmedia.com/pv-tracker.
[121] Externalities are defined as the costs unaccounted for by the price of a product.

more — all in addition to climate change.[122] One study concluded that, when monetized, the "social cost" of coal-fired power could be as high as 60 percent of residential electricity prices.[123] Similarly, the EPA determined that particulate exposure from coal-fired power costs Americans between $110 billion and $270 billion each year.[124] When energy sources are adjusted to account for these externalities, solar energy becomes even more cost-competitive.[125]

3. Determination of State Goals

Once the EPA determines the BSER that has been adequately demonstrated for the affected EGUs, it calculates the emission limitation achievable through the application of the BSER to the affected EGUs.[126] The emission limitation is expressed as an emissions rate to the state in the emissions guideline issued pursuant to 40 CFR 60.22(b).[127] In the immediate rulemaking, the emission limitation achievable through application of the BSER is the state goal.[128] Each state then develops an implementation plan that includes a standard of performance for affected EGUs to meet the emissions guideline.[129] The standard of performance, when taken as a whole, must achieve the required emissions performance level required by the EPA.[130]

3A. The Proposed State Goals do not Reflect Emissions Limitations Achievable through Application of the BSER to Affected EGUs.

As discussed above, the BSER as proposed by EPA does not properly account for solar energy measures because it fails to project accurate emissions reduction and cost potential, and it fails to include

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[122] Towards the Full Cost of Coal: A review of the recent literature assessing the negative health care externalities associated with coal-fired electricity production (Caroline Burkhard Golin 2012).

[123] Epstein, P. R., Buonocore, J. J., Eckerle, K., Hendryx, M., Stout Iii, B. M., Heinberg, R., ... Glustrom, L. (2011). Full cost accounting for the life cycle of coal. *Annals of the New York Academy of Sciences, 1219*(1), 73-98. Per Towards the Full Cost of Coal: A review of the recent literature assessing the negative health care externalities associated with coal-fired electricity production (Caroline Burkhard Golin 2012).

[124] Regulatory Impact Analysis for the Federal Implementation Plans to Reduce Interstate Transport of Fine Particulate Matter and Ozone in 27 States; Correction of SIP Approvals for 22 States (U.S. EPA Office of Air and Radiation 2011), per Solar Electricity: Economic Development and Impact (presentation by Lee J. Peterson, Esq. 2012).

[125] Solar Electricity: Economic Development and Impact (presentation by Lee J. Peterson, Esq. 2012).

[126] CAA Section 111(d)(1); Clean Power Plan Legal Memo at 97

[127] Id.

[128] Id.

[129] CAA Section 111(d)(1); CAA Section 111(a) (1); Legal Memo 94

[130] Id.

distributed PV entirely. Therefore, the state goals as set forth in EPA's proposal are inaccurate. Below are the steps the EPA should take to accurately account for solar energy as a part of the BSER.

- The EPA should exclude the technical potential benchmark from the alternative approach and rely on the IPM model results with modifications.
- The EPA should use the Sunshot -62.5% cost scenario as the cost input for utility PV in the IPM model and as the cost input for distributed PV from the SolarDS model.
- The EPA should use the Sunshot -62.5% scenario distributed PV solar capacity projections to hard-wire distributed PV into the IPM model to include distributed PV.
- The EPA should update the current generation data for solar from EIA data with SEIA's recommended outlined approach.
- The EPA should update the performance estimates used in the IPM model for solar.
- The EPA should use a 2012 or higher baseline year.

These steps are elaborated upon below in Section 3B.

3B. The EPA Should Use the Alternative Approach with Modifications to Determine the State Goals.

SEIA believes that the Alternative Approach, when adjusted to adequately capture the contributions from solar, would most effectively capture the emissions reductions achievable through application of the BSER to affected EGUs. The Alternative Approach is more accurate because it does not rely on one policy to determine the solar potential in a state, as the RPS approach does.[131] Thus the Alternative

[131] There are numerous policies that are driving the growth of solar. For utility scale solar, there are several policy drivers at the federal and state level that play a key role in creating the foundation for continued increase in utility scale solar. At the federal level Modified Accelerated Cost Recovery System (MACRS) and the Investment Tax Credit (ITC) create the predictable tax environment necessary to foster investment in utility scale projects. At the state level, RPS policies have historically been the main driver for utility scale solar projects: as of March 2013, there are 29 states plus Washington, DC that have an RPS, while an additional 8 states have a renewable portfolio goal. As installed costs have dropped, state and local tax policies as well as utility procurement policies are playing an increasingly important role in the growth in utility scale solar projects. However, for distributed solar, the most important policy driver is the net metering policy. As of July 2013, there are 43 states plus Washington, DC that have adopted a solar net metering policy. This policy, in combination with the federal 30% investment tax credit, along with other state incentive programs such as rebate and loan programs have driven deployment in this sector. A state RPS with either a solar carve-out or a DG carve-out can be a driver of deployment; however, as of March 2013 only 16 states and Washington, DC have an RPS policy with this provision. See more at: http://www.dsireusa.org/documents/summarymaps/RPS_map.pdf; http://www.dsireusa.org/documents/summarymaps/net_metering_map.pdf; and http://www.dsireusa.org/documents/summarymaps/Solar_DG_RPS_map.pdf

Approach would set a more realistic expectation of the amount of solar growth feasible that will create a balanced energy portfolio in each state.

The Natural Resource Defense Council (NRDC) engaged with ICF to run the Integrated Planning Model (IPM®), the same model that EPA uses, to reproduce EPA's RE Market Potential run based on the below solar energy recommendations, using up-to-date cost and performance assumptions for renewable energy technologies. The resulting national target for renewable generation nearly doubles from EPA's estimate, growing from 524 TWh in 2030 to approximately 973 TWh in 2030.[132] This clearly demonstrates that significantly higher levels of renewable energy are both technically and economically achievable, compared to the levels proposed in either of EPA's target-setting approaches. Based on these results, EPA should strengthen the contributions of renewable energy in its target-setting to accurately reflect the full potential that these technologies can have in reducing dangerous carbon pollution from the electricity sector.

The following adjustments should be made to the EPA's proposed rule to accurately include solar energy in the alternative approach. Failure to make these adjustments would be arbitrary, as state goals would not reflect the emission limitations achievable through solar energy measures in place today.

3B1. Exclude the Technical Potential Benchmark from the Alternative Approach and Rely on the IPM Model Results with Modifications.

Within the Alternative Approach, the current proposed rule first establishes a technical potential benchmark that is used in combination with an IPM projected market potential. SEIA does not support the inclusion of the technical potential benchmark in setting a state's target. Instead, SEIA recommends that EPA rely solely on the IPM model when applying its Alternative Approach.

As the EPA notes in its proposal, applying NREL's technical potential for solar in each state to determine the state goals has limited value. In fact, SEIA believes that the technical potential is arbitrary because it shows the solar capacity that could be built in a given state without recognizing real-world limiting factors such as economic growth and grid constraints. Therefore, the EPA should not rely on NREL's technical potential for setting state goals. See Appendix A for more information on the technical potential of solar.

The EPA should solely rely on the IPM model for setting the state targets. Unlike the technical potential, the IPM model takes into account the cost of building renewable generation, as well as grid conditions in

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[132] See the NRDC comments to the EPA on the Clean Power Plan. SEIA supports the NRDC analysis of solar within the EPA's Clean Power Plan and building block 3. See Table 1.3 in the EPA's Alternative RE Approach Technical Support Document. Available here: http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-alternative-re-approach.pdf

each state and a number of other factors. In addition, the IPM model considers the resource potential that is considered by NREL's technical potential. SEIA believes that with the correct solar data inputs, the IPM model provides a realistic projection of solar energy potential at the state level that can be relied upon for setting state goals.

Further, there is precedent to rely solely on the IPM model for setting the renewable targets in each state under the Alternative Approach. The EPA currently uses the IPM model to analyze the impact of air emissions policies on the U.S. electric power sector such as the Clean Air Interstate Rule, Cross-State Air Pollution Rule (CSAPR), the Mercury and Air Toxics Standards (MATS), and the proposed Carbon Pollution Standards for New Power Plants.[133] Therefore, there is precedent to rely solely on the IPM model for setting the renewable targets in each state under the Alternative Approach. The EPA also notes that "for the development of its latest power sector modeling platform, EPA has increased its external engagement with state air quality planning officials, power company representatives, regional transmission organizations, and others who have provided input on the data, assumptions, and structure of EPA's Power Sector Modeling Platform v.5.1,"[134] which shows that the model includes feedback from a variety of stakeholders, and can be used reliably to set the state targets for compliance.[135]

Should, however, the EPA default to use the technical potential benchmark, please view SEIA's calculation of the solar technical potential benchmark in Appendix A.

3B2. Use Sunshot -62.5% Scenario Distributed PV Solar Capacity Projections to Hard-wire Distributed PV into the IPM Model.

As demonstrated in the comments above, distributed PV meets the necessary requirements to be considered a part of the BSER. Distributed PV can be deployed at a reasonable cost, reduces emissions, is technically feasible, and is also adequately demonstrated. As distributed PV is a unique, customer-sited generation resource, it may be difficult to represent the technology in a wholesale power model

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133 http://www.epa.gov/ttn/ecas/regdata/RIAs/111dproposalRIAfinal0602.pdf p. 3-3.

134 http://www.epa.gov/powersectormodeling/

135 "IPM is a multi-regional, dynamic, deterministic linear programming model of the U.S. electric power sector. It provides forecasts of least cost capacity expansion, electricity dispatch, and emission control strategies while meeting energy demand and environmental, transmission, dispatch, and reliability constraints. EPA has used IPM for over two decades to better understand power sector behavior under future business- as- usual conditions and evaluate the economic and emission impacts of prospective environmental policies. The model is designed to reflect electricity markets as accurately as possible. EPA uses the best available information from utilities, industry experts, gas and coal market experts, financial institutions, and government statistics as the basis for the detailed power sector modeling in IPM." http://www.epa.gov/ttn/ecas/regdata/RIAs/111dproposalRIAfinal0602.pdf p. 3-2.

such as IPM. Instead, it is more accurate to rely on separate modeling that fully accounts for market dynamics at the customer level. For example, NREL has developed the Solar Deployment System model (solarDS), a modeling complement to ReEDS which projects distributed PV installations by state based on system prices, retail rates, and consumer economics.[136] A further description of the model is provided here:

> The Solar Deployment System (SolarDS) model is a geospatially rich, bottom -up, market-penetration model that simulates the potential adoption PV on residential and commercial rooftops in the continental United States through 2030. SolarDS was developed by the National Renewable Energy Laboratory (NREL) to examine the market competitiveness of PV based on regional solar resources, capital costs, electricity prices, utility rate structures, and federal and local incentives. SolarDS calculations are run at a high level of disaggregation by calculating PV generation in 216 solar resource regions, shown in Figure ES-1, and combining PV output with state-based electricity rate distributions from 3000 utilities. Regional PV financial performance is used to simulate PV adoption rates for each customer type and building type. SolarDS then aggregates regional PV adoption to the state and national level.

In an analysis of the EPA Clean Power Plan performed by the NRDC[137], NRDC utilized the DOE Sunshot distributed solar capacity projections from their -62.5% price scenario for input into the IPM model. To arrive at these distributed PV capacity projections, the DOE ran the -62.5% price scenario through the SolarDS model. The -62.5% cost scenario is reasonable to use, as the cost assumptions correspond with the level of prices and projection of prices seen in today's distributed PV markets. Refer back to Section 2B2 for discussion of reasonable cost. See Appendix C for these solar capacity projections from the Sunshot -62.5% scenario. NRDC also approximated a growth pathway between 2014 installed capacity and the Sunshot 2030 distributed PV capacity projections. The Sunshot -62.5% distributed PV solar capacity projections were then hard-wired into IPM to ensure that the effects on the grid and other generation options are captured. Meaning, the capacity projections were forced into the IPM model to build a certain GW amount of distributed PV in 2020. The IPM model then went through the same set of steps as the model would with other technologies (i.e. cost considerations, regulations, etc.).

The analysis by NRDC notes that using the -62.5% cost reduction scenario may be a conservative projection, as an October 2014 notice from the Sunshot program projects that distributed solar prices are still on track to meet the Sunshot goal (a full -75% reduction in price) by 2020, which would result in higher demand for distributed PV systems than in the -62.5% projection.[138] Second, NREL's analysis

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[136] See NREL's "The Solar Deployment System (SolarDS) Model: Documentation and Sample Results", available here: http://www.nrel.gov/docs/fy10osti/45832.pdf

[137] http://www.nrdc.org/

[138] U.S. DOE Sunshot, "Photovoltaic System Pricing Trends: Historical, Recent, and Near-Term Projections." October 2014. Copy available at: http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=3&cad=rja&uact=8&ved=0CC0QFjAC&url=http%3A%2F%2Fny-sun.ny.gov%2F-%2Fmedia%2FNYSun%2Ffiles%2FMeetings%2F2014-11-06%2FSunShot-Solar-

assumes no further price declines after 2020, when in fact many analysts expect that prices will continue to decline. Finally, the NRDC analysis does not assume any carbon price or incentives for renewable energy beyond those already in place in 2012.[139] Therefore, an analysis that includes an application of a $30/MWh cost reduction or similar incentive for zero-carbon technologies would lead to even higher levels of distributed PV deployment to achieve cost-effective emissions reductions.

3B3. Use the Sunshot -62.5% Cost Scenario as the Cost Input for Utility PV in the IPM Model and as the Cost Input for Distributed PV from the SolarDS Model.

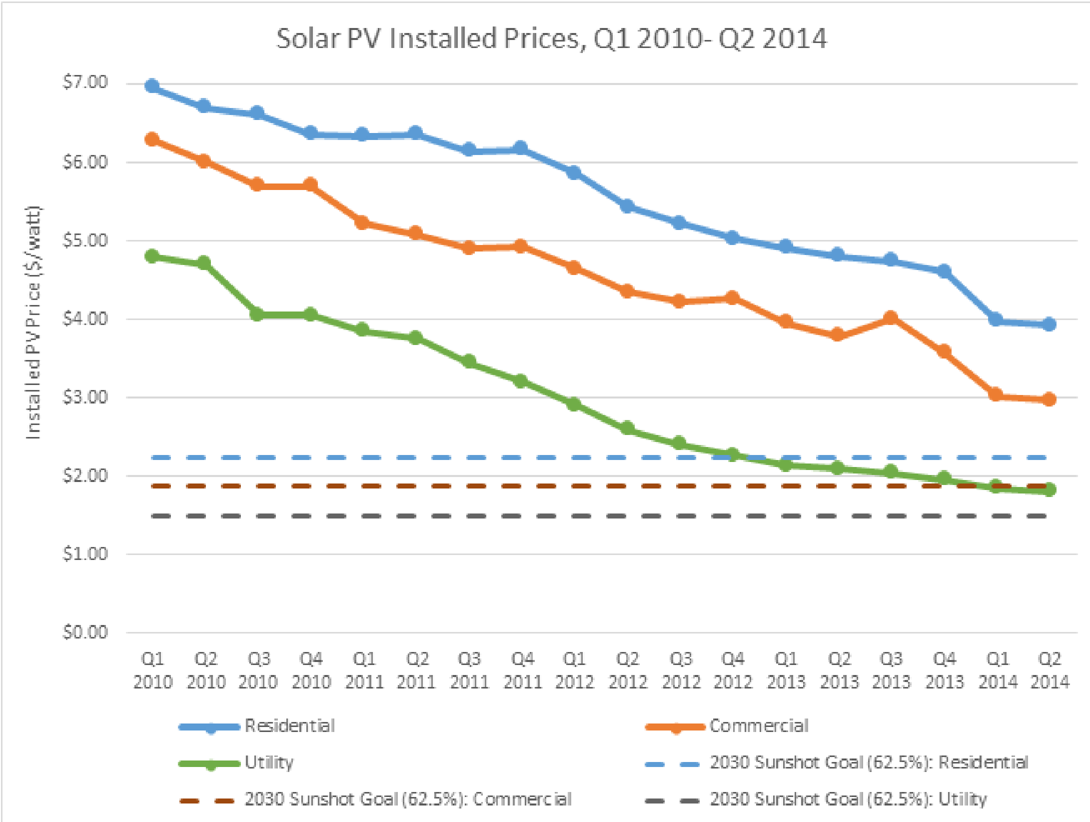
The strengths of the Alternative Approach lie in its use of technical and economic data to calculate the state renewable energy potential. However, the EPA has relied on outdated and incorrect data from the EIA, which contains several-year old cost and performance data and results in levelized costs for wind and solar which are 46% above current averages for each technology.[140] EPA's modeling should use the most reliable and up-to-date cost and performance assumptions available, which will provide a more accurate representation of the cost competitiveness of renewables and demonstrate that more renewables can be deployed at reasonable cost. Refer back to Section 2B2 for discussion of reasonable cost.

Based on data from the latest U.S. Solar Market Insight Report (Q2 2014), the costs for utility PV are at $1.81/watt, while the costs for residential and commercial PV (which together make up the distributed solar market) are at $3.92/watt and $2.39/watt, respectively. This places solar on track or close to meet the 2030 SunShot goals. Therefore, the Sunshot assumptions can be used as a trendline for 2030 solar costs. The below graph shows the declining solar prices over the past 4 years and the 2030 Sunshot - 62.5% scenario.

Industry-Update.pdf&ei=W1dqVIzfO9W3yASv1oGIDg&usg=AFQjCNFhnGZs41wmZP0ch3ZWQbBBcb35TA&sig2=YfPjLEA6HzTNtkpn2SNrA&bvm=bv.79142246,d.aWw

[139] NREL's analysis assumed that the PTC and ITC expired in 2012 and 2016, respectively.

[140] NRDC calculation.



<u>The -62.5% Sunshot cost assumptions to use are: $1.50/watt for utility PV as an input directly into the IPM model; $2.25/watt for residential distributed PV and $1.88/watt for commercial distributed PV for use with the -62.5% capacity projections as inputs directly for the solarDS model, which is then hard-wired into the IPM model.</u>

NRDC compared a variety of sources to determine an installed cost for utility solar PV. The below chart shows the inputs NRDC used in their IPM analysis, and the sources used for the cost assumption. Note that the $1.77/watt that NRDC uses for utility PV is rather conservative as an October 2014 Sunshot report “Photovoltaic System Pricing Trends: Historical, Recent, and Near-Term Projections” shows solar meeting the $1.00/watt projections for utility PV in 2030.

Comparison of Cost and Performance Characteristics: Updated Costs and Performance vs. AEO2013

Renewable Energy Cost Assumptions		
	Installed Costs ($/kW)	
	Onshore Wind	Solar PV[141]
EIA AEO 2013[142]	2213	3098
Updated Costs and Performance	1750	1770[143]

3B4. Update the Capital Cost Adders for CSP.

For CSP cost, the Proposed Rule's 2016 cost and performance numbers are consistent with a near-term molten-salt tower, if the location multipliers are accounted for and the dollars are converted to 2014 dollars. However, the maximum targets for solar thermal provided in the Proposed Rule are too low; in addition, the "short term capital cost adders," intended to account for maxing out the production capacity of any given technology, are too high and their use results in unrealistically high costs (we note as well that the steps on the short term cost adders of 90 MW and 60 MW are unrealistically low). These should be corrected. The cost adder should be no more than 10% or 20%. There is significant excess capacity for the CSP equipment today, including factories for receivers and mirrors all over the world. Most of the equipment in a CSP plant is conventional power plant equipment or materials (steel and concrete); only a small percent is specialty equipment, for example mirrors, receivers, heat transfer fluids and salt. In addition, the future cost reduction assumptions are too conservative, as costs are predicted to continue to decrease as new CSP plants come on line. If availability impacts the EPA analysis, it is important to note that operating CSP plants in the US have availabilities above 95% after the first couple years of operation. Finally, CSP plants can be adapted to the needs of the utility; they can be designed for peaking, intermediate or baseload. EPA's model only includes the intermediate load plant configuration, but in the future, the baseload and the peaker plant configurations are likely to be as or more relevant. EPA should model all of the three options.

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[141] Cost and performance assumptions for solar are given in terms of kWdc. EIA's assumptions are converted from AC to DC using a 0.8 derate factor.

[142] Energy Information Agency, "Annual Energy Outlook 2013", April 2013.

[143] Range of estimates based on data from the following sources. *See* Bottom-up modeling estimates in: U.S. DOE Sunshot, "Photovoltaic System Pricing Trends: Historical, Recent, and Near-Term Projections." October 2014; "Bloomberg New Energy Finance. "H1 2014 Levelized Cost of Electricity – PV." February 2014; Lazard. "Levelized Cost of Energy – v. 8.0; Bloomberg New Energy Finance/World Energy Council. "World Energy Perspective: Cost of Energy Technologies." 2013; SEIA/GTM U.S. Solar Market Insight Q2 2014.

3B5. Update the Current Generation Data for Solar from EIA Data with the Below Outlined Approach.

The IPM model base case should accurately depict the solar market today in order to give an accurate forecast for future solar deployment. The EPA can source data from a number of publicly available data sources to understand the solar potential from DG solar, utility PV, and CSP.[144] The EIA collects data on distributed PV, utility PV and CSP capacity and generation through 4 separate forms. Those forms are:[145]

- EIA form 860: Annual Electric Generator Report
  This covers system-level data for all plants larger than 1 MW_{ac}; therefore it does not include most distributed PV capacity deployed. While detailed data from this form is reported only annually, monthly data releases with important metrics are available from EIA's Electric Power Monthly table 6.3.[146]
- EIA form 861: Annual Electric Power Industry Report
  This form includes data on the number and capacity of solar energy systems deployed under net energy metering. (Note: data for 2012 and 2013 likely does not include plants larger than 2 MW_{ac} but a form update recently approved by OMB means new data will include those systems and capacity.) This form also contains fields related to energy exported to the grid from these systems reported in megawatt-hours (MWh) but due to different metering infrastructure and different interpretations of the survey questions, this data is not consistent or reliable.
- EIA form 826: Monthly Electric Utility Sales and Revenue Report with State Distributions
  This form includes data on the number and capacity of solar energy systems deployed under net energy metering. This data is updated monthly and, thus, is more current than form 861 data. However, it covers fewer than 300 of the roughly 3,000 utilities in the U.S. and excludes a couple utilities with significant amounts of customer-sited solar. (Note: data for 2012 and 2013 likely does not include plants larger than 2 MW_{ac} but a form update recently approved by OMB means new data will include those systems and capacity.) This form also contains fields related to energy exported to the grid from those systems in megawatt-hours (MWh) but due to different metering infrastructure and different interpretations of the survey questions, this data is not consistent or reliable.
- EIA form 923: Power Plant Operations Report
  This form gathers data on generation from a sample of power plants larger than 1 MW_{ac}. Since this form does not cover all power plants, EIA uses this data to estimate generation from power plants not surveyed. Given the variation in solar production from location to location and with

[144] There is very limited data on SHC. To assess the growing SHC market, SEIA encourages Congress to instruct the EIA to collect SHC data again.
[145] For more detail on EIA forms, see http://www.eia.gov/survey/
[146] http://www.eia.gov/electricity/monthly/

different plant configurations that are not readily captured by EIA, estimating total solar generation based on data from this form is not a reliable reference source.

The four EIA forms outlined above contain limited information about current solar capacity deployed. While the EPA relied on data from 2012 in the proposed rule, SEIA strongly encourages the EPA to use the latest available data before setting final targets. Given the rapid deployment of solar energy in recent years, the amount of existing solar capacity is now much higher than at the end of 2012. Further, the EPA failed to account for distributed PV capacity reported in forms 826 and 861.

Given the shortcomings regarding the timing and limitations of EIA forms utilized, SEIA submits that a more comprehensive estimation approach would present a more accurate picture of actual solar generation. SEIA therefore recommends the following method for estimating the current generation from solar energy:

SEIA suggests the EPA take the latest available data on solar PV capacity (both distributed and utility) from EIA forms 860, 861 and 826 and multiply this capacity by the estimated generation per unit of capacity by state as shown in the table below, which is current through the end of September 2014.[147]

	Capacity (MWac)[148]				**Estimated Annual Generation (MWh)[149]**			
	Customer-Sited DG		**Utility**	***Total***	**Customer-Sited DG**		**Utility**	***Total***
State	**Residential**	**Non-Residential**			**Residential**	**Non-Residential**		
AK	0.30	0.18		*0.48*	254	186		*440*
AL	0.25	0.21		*0.46*	347	346		*694*
AR	1.52	1.78		*3.30*	2,102	3,015		*5,117*
AZ	288.14	276.83	1,213.70	*1,778.67*	507,741	596,571	2,951,610	*4,055,922*
CA	1,424.82	1,131.99	4,470.30	*7,027.11*	2,351,226	2,274,410	10,210,829	*14,836,464*
CO	128.92	128.92	103.40	*361.24*	206,010	252,056	230,382	*688,448*
CT	38.36	51.50	5.00	*94.86*	47,742	78,493	8,780	*135,015*
DC	5.34	3.85		*9.19*	7,062	6,228		*13,290*

[147] For each state, we estimated system performance (MWhac/MWdc/year) based on taking the simple average of performance of all the weather stations with typical meteorological year 3 (TMY3) data in that state. This method also likely underestimates the amount of solar currently being generated, since the weighted average yield per MWdc will likely be higher than the simple average of TMY3 sites. The reason that this would likely underestimate energy production is because developers are more likely to site plants in higher resource parts of a given state. For example, there is more solar in southern California than in the far northwest corner of California but weather stations from northwest California are included in the simple average.
[148] Source: EIA forms 826, 861 and 860. Includes both photovoltaic (PV) and concentrating solar power (CSP) capacity.
[149] Estimate based on average modeled system performance in each state using TMY3 weather data.

DE	15.72	16.59	27.10	*59.41*	20,695	26,613	50,048	*97,356*
FL	41.30	43.80	64.20	*149.30*	60,862	78,541	130,856	*270,259*
GA	7.19	37.82	10.50	*55.51*	10,082	65,339	20,771	*96,191*
HI	218.21	56.61	24.20	*299.01*	347,317	108,410	53,500	*509,227*
IA	13.85	9.31		*23.16*	17,272	14,393		*31,665*
ID	2.04	1.65		*3.69*	2,982	2,939		*5,921*
IL	4.39	4.82	29.00	*38.21*	5,593	7,523	51,708	*64,824*
IN	2.51	1.71	64.70	*68.93*	3,140	2,613	113,583	*119,335*
KS	1.07	1.16		*2.23*	1,596	2,106		*3,702*
KY	1.01	1.21		*2.21*	1,293	1,880		*3,173*
LA	73.81	3.44		*77.25*	103,510	5,837		*109,347*
MA	103.32	373.06	126.40	*602.78*	124,427	552,098	215,336	*891,861*
MD	49.76	72.95	45.20	*167.91*	65,965	118,216	81,447	*265,629*
ME	10.68	3.86		*14.53*	12,578	5,577		*18,155*
MI	13.57	9.12		*22.69*	16,181	13,318		*29,499*
MN	8.72	10.60		*19.32*	10,508	15,750		*26,257*
MO	39.01	56.02	7.70	*102.73*	53,221	93,429	14,797	*161,447*
MS	0.05	0.00		*0.05*	72	0		*72*
MT	3.38	1.74		*5.12*	4,514	2,849		*7,363*
NC	20.84	34.44	279.90	*335.18*	28,962	60,105	547,483	*636,549*
ND	0.41	0.05		*0.46*	524	78		*602*
NE	0.40	0.48		*0.88*	571	833		*1,404*
NH	7.03	4.16		*11.19*	8,389	6,079		*14,468*
NJ	196.21	776.23	218.60	*1,191.04*	256,218	1,243,794	392,955	*1,892,967*
NM	27.89	41.13	185.60	*254.62*	49,423	89,077	460,202	*598,703*
NV	17.96	55.58	494.30	*567.83*	30,231	114,692	1,157,783	*1,302,706*
NY	128.85	100.41	31.50	*260.76*	154,994	147,879	53,018	*355,891*
OH	7.80	59.40	28.10	*95.30*	9,411	87,669	47,171	*144,252*
OK	0.98	0.41		*1.38*	1,473	750		*2,223*
OR	32.74	39.53	10.70	*82.97*	43,187	63,701	19,828	*126,716*
PA	61.01	134.39	29.50	*224.90*	74,735	202,061	50,244	*327,040*
PR	2.00	2.17		*4.17*	3,149	4,107		*7,256*
RI	1.45	5.26	4.90	*11.62*	1,808	8,042	8,637	*18,486*
SC	3.10	0.45	2.50	*6.04*	4,449	791	5,074	*10,313*
SD	0.03	0.22		*0.25*	33	364		*397*
TN	0.06	0.40	12.10	*12.55*	77	661	21,739	*22,477*
TX	52.07	46.35	119.00	*217.42*	77,883	84,306	248,151	*410,340*
UT	12.04	15.11	1.30	*28.46*	19,566	30,056	2,961	*52,582*

VA	7.63	7.04		*14.67*	10,278	11,614		*21,892*
VT	90.07	6.65	10.00	*106.72*	105,364	9,507	16,453	*131,324*
WA	30.30	9.14	0.50	*39.94*	36,121	13,312	817	*50,250*
WI	7.91	6.02		*13.92*	9,708	9,080		*18,788*
WV	1.88	0.53		*2.41*	2,251	777		*3,028*
WY	1.02	1.02		*2.04*	1,560	1,909		*3,469*
Total	***3,208.91***	***3,647.28***	***7,619.90***	***14,476.09***	***4,914,655***	***6,519,980***	***17,166,160***	***28,600,794***

The data in the annual generation column at the far right should be used as a direct input into the IPM model.

3B6. Update the Performance Estimates used in the IPM Model for Solar.

The EPA used EIA data that does not reflect current performance estimates within the solar market. The solar performance estimates are based on the simple average of performance at each TMY3 weather station in each state as modeled using PVWatts in NREL's System Advisor Model (SAM). For detailed charts on the solar performance estimates, see Appendix D. SEIA recommends using the maximum capacity factor in each state, as utility scale developers will target the highest resource regions. It should be noted that through innovation such as oversized inverters, individual projects have reported capacity factors of up to 30%, but SEIA does not currently have publicly available data that captures this trend at a national level.

3B7. SEIA Does Not Take a Position on the NODA Regionalized Approach for RE Target Setting

The EPA is requesting comment on grouping states into certain regions, summing the RE target generation identified under the alternative approach, and then reallocating the summed generation proportionally to each state within that region by a chosen criterion, such as each state's share of total electricity sales within that region in 2012.[150] SEIA does not take a position on this regionalized approach for setting the renewables target for states under building block 3. However, SEIA notes that a regionalized approach would better align RE targets with the proposal to allow the use of certain out-of-state renewables for compliance, as the EPA notes as well. This would allow for more state flexibility in compliance plans. Furthermore, the electric grid is not confined to one state in the contiguous U.S., and grid regions have become geographically integrated. SEIA does not take a position on the grouping of states or criteria for reapportioning the state RE targets within given regions.

[150] 79 FR 64551

3B8. SEIA supports the changing the goal setting equation for calculating building block 3 as mentioned in the NODA to reflect the reduced utilization of affected EGUs from displacement by renewable energy.

As proposed, the Clean Power Plan evaluates the impact of building block 3 on each state's carbon intensity by adding MWhs of expected renewable and nuclear generation only to the denominator of the state's 2012 adjusted rate. The calculation of the impact of increased generation under building block three does not reflect the displacement of emissions and generation from affected EGUs that would result from the new renewable generation. The final Clean Power Plan should treat generation from renewable energy and existing NGCC in the same way. In calculating the impacts of building block 3 on the state emission rate goals, the EPA should be consistent with the approach in building block 2.

SEIA supports the second proposal outlined within the NODA that assumes renewables and energy efficiency would replace dirtier fossil generation first. This would correctly remove from each state's carbon intensity numerator emission reductions to express the drawdown in fossil fuel resources when renewables and energy efficiency increase. That is, affected EGU MWhs should be removed from the denominator and the equivalent number of MWhs should be added back based on low- and zero-carbon generation from building block 3, and emissions associated with affected EGUs should be removed from each state's carbon emissions numerator.

This second proposal for setting the state goals under building block 3 as outlined in the NODA is consistent with how renewable energy would be used under a best system of emissions reductions, as displacing the highest-emitting resources first would be the most cost-effective option. To expand upon this, if carbon cost were accounted for in generation dispatch decisions, as it may be in some regions as part of implementation of BB2, many gas units would be dispatched lower on the supply curve than many coal units, putting coal units onto the margin where they will be displaced by renewable energy.

3B9. SEIA Supports a 2012 or Higher Baseline Year

The EPA is requesting comment on whether the EPA should use a different single data year or the average of a combination of years to calculate the state fossil fuel emission rates used in state goal calculations.[151] The EPA currently uses 2012 as the baseline year for calculating the state goals. SEIA does not support using a baseline year below 2012, and strongly suggests the use of a baseline year of 2013 or higher in setting the solar portion of the renewable state target under building block 3. The solar industry has grown dramatically in recent years and the amount of solar capacity online in the U.S.

[151] 79 FR 64548

has doubled since the end of 2012.[152] Therefore, the use of a lower baseline year would not accurately represent the current or future potential contributions from solar to a low carbon energy supply.

Should the EPA use an average of multiple years of generation to set the baseline, it will be critical for the EPA to adjust the calculation to reflect the generating fleet as it exists today (i.e. end of September 2014). To do this, the EPA can look at the generation mix relative to the existing online generation capacity of each technology in each averaged year. Put another way, the EPA could look at the average capacity factor of each technology in each year and then apply that to generation fleet as it exists today. To clarify further, the EPA could estimate baseline solar generation by either multiplying the historical average capacity factor for solar in each state by the current existing capacity in each state, or by modelling the expected performance of current existing capacity in each state. Modelling for wind and solar is a sensible approach as wind and solar are at the top of merit order dispatch, and thus their modeled performance is very likely to reflect their average lifetime performance.

Correctly assessing the baseline and solar energy's contribution to the baseline for the Clean Power Plan is critical, as the generation fleet has changed in meaningful ways since 2012 and especially since 2010. Using a simple average of absolute generation levels of each technology would grossly underrepresent solar generation as it exists today because there is a significantly larger amount of solar capacity online today.

3C. As an Example, Other Approaches to Setting the Renewables Portion to the State Targets Show Double the Amount of Renewable Energy Potential using the Correct Data for Renewable Energy.

As an example, other approaches to setting the renewables portion to the state targets, such as the Union of Concerned Scientists' (UCS) demonstrated renewables growth approach, show double the amount of renewable energy potential using the correct data for renewable energy.[153] The UCS demonstrated growth approach would improve on the EPA's proposed approach by incorporating the following core components:

- Setting a national renewable energy growth rate benchmark based on demonstrated growth in the states from 2009 to 2013
- Assuming full compliance with current state RES policies, as set by law, that require certain percentages of electricity to come from renewable sources

[152] SEIA/GTM U.S. Solar Market Insight Report.

[153] For a detailed explanation of the UCS demonstrated growth approach, please see: http://www.ucsusa.org/our-work/global-warming/reduce-emissions/role-of-renewable-energy-in-epa-clean-power-plan#.VHUxBckueYE

- Accounting for actual and expected renewable energy growth between 2013 and 2017.

The UCS state-level renewable energy targets begin in 2017, the proposed start date for state compliance plans, and ramp up through 2030. To determine each state's 2017 generation levels, the UCS uses actual generation data from 2013 (the EPA's approach uses 2012 data) and adds projected generation from wind and utility-scale solar projects known to be under construction through 2016.

This demonstrated renewables growth approach results in a total of 923 TWh of total renewables to be deployed nationwide, nearly double the EPA's estimate of 524 TWh in 2030.[154] To arrive at this level of generation, the UCS utilized the ReEDS model and SolarDS. Inputs were provided into SolarDS first, with the output then inserted into the ReEDS model; this allows for distributed PV to be included. The below table shows the updated solar data and cost assumptions that were used in the UCS demonstrated growth approach:

Comparison of Overnight Capital Costs for Solar Electric Generation Technologies (2013$/kW$_{AC}$)									
	UCS Demonstrated Growth Approach					EIA AEO 2014			
Technology	2010	2020	2030	2040	2050	2010	2020	2030	2040
Solar PV-Utility	5,215	1,925	1,604	1,283	1,283	3,943	3,334	2,963	2,625
Solar PV-Res.	Used NREL's Sunshot scenarios, 62.5% by 2020 and 75% by 2040					7,636	3,850	2,823	2,823
Solar PV-Comm.	Used NREL's Sunshot scenarios, 62.5% by 2020 and 75% by 2040					6,545	2,951	2,567	2,567

3D. Should the EPA Default to the Current Approach (RPS approach) in Setting State Targets, Several Key Changes Must be Made as Noted Below.

SEIA believes that the Alternative Approach, when adjusted, captures the emissions reductions achievable through application of the BSER to affected EGUs most effectively. The Alternative Approach is more accurate because it is state specific rather than regional, and does not rely on one policy to determine the solar potential in a state. While SEIA is not in favor of the current approach (RPS approach), should the EPA default to this, there are two key changes that must be made: use the highest RPS in a region absent a state specific determination that a lower RPS would be more appropriate, and use 2030 RPS targets.

[154] See Table 1.3 in the EPA's Alternative RE Approach Technical Support Document. Available here: http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-alternative-re-approach.pdf

First, the EPA should use the highest RPS in a region to set the state targets, not the average RPS, unless a state specific determination shows that a lower RPS would be more appropriate. The current approach groups states into 6 different regions and takes the average of the 2020 RPS goals for those states in that region and multiples this by the total 2012 generation for the region. The EPA chose this RPS approach for two principal reasons: "First, in establishing the requirements, states have already had the opportunity to assess those requirements against a range of policy objectives including both feasibility and costs. … Second, renewable resource development potential varies by region, and the RPS requirements developed by the states necessarily reflect consideration of the states' own respective regional contexts."[155] The highest RPS goal in the region still fits within the principal reasons the EPA used, as the state will have weighed the feasibility and cost of the RPS policy against other policy objectives, yet still arrived at the aggressive RPS goal.

Furthermore, there are many instances where solar deployment has exceeded RPS deployment schedules, indicating that the RPS goal could have been more aggressive. For example, in New Jersey, Pennsylvania, Arizona, California and Massachusetts, solar has already exceeded the RPS goals.[156] These aggressive goals are an indication that higher-levels of renewable energy deployment are viewed as possible in each respective region. Also, a recent report called "The State Clean Energy Cookbook" from former Senator Jeff Bingaman notes that only five of twenty-nine states have fallen below 90 percent of expected annual progress toward RPS targets.[157]

Secondly, the EPA should use 2030 RPS targets, not 2020 targets in setting the state goals. As the compliance period for the Clean Power Plan rule extends out to 2030, not 2020, selecting the RPS goals for 2020 severely limits the renewable energy potential for an entire decade. For example, the RPS goal for HI is set for 40% by 2030, compared to just 25% by 2020.[158] Minnesota also has a 10% solar target by 2030, in addition to other RPS goals.[159] Today, 2020 RPS goals are less than 6 years away, and by the time the rule is made final, less than 5 years away. Utilities are already planning for these RPS requirements in 2020 as part of their integrated resource planning processes. Selecting a 2030 RPS goal sends a clear message on the potential for a state to include renewables as part of a balanced state energy portfolio by 2030.

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[155] Federal Register, Vol. 79 No. 117 Wednesday, June 18, 2014, p. 34866.
[156] http://uspref.org/wp-content/uploads/2012/06/Ramping-up-Renewables-Leveraging-State-RPS-Programs-amid-Uncertain-Federal-Support-US-PREF-White-Paper1.pdf
[157] http://media.law.stanford.edu/organizations/programs-and-centers/steyer-taylor/State-Policy-Report-low-res.pdf
[158] http://energy.hawaii.gov/renewable-energy
[159] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MN14R&re=1&ee=0

4. Compliance Comments

4A. Existing Measures and Early Action

4A1. SEIA Supports the EPA Proposal to Allow Existing Measures to Count Towards Compliance After the Date of the Proposed Rule, But Requests that EPA Provide Clearer Guidance in the Final Rule[160]

SEIA interprets the EPA's proposal regarding existing measures to mean that state measures which exist after the date of this proposal, June 18, 2014, can be used to drive emissions reductions during the compliance period (2020-2030). However, because building block 3 was factored into determination of the state goals, existing renewable energy goals and actions that were implemented prior to 2018 are allowed to count of the compliance period. Therefore, MWh from renewable energy capacity installed pursuant to an existing measure or program any time prior to 2020 can be counted towards compliance during the compliance period (2020-2030) if the existing measure is included in a state's implementation plan. For example, if 1000 MW of solar capacity was installed in 2013 pursuant to an RPS and the state includes the RPS in its compliance plan, then emissions displaced by MWh from the 1000 MW of solar capacity during the compliance period (2020-2030) can count towards the state's 111(d) compliance requirements in that period.

SEIA supports the EPA's proposal consistent with this understanding. SEIA agrees that existing measures should be allowed to count during the compliance period, and can help states meet interim compliance goals set forth in the original proposal. SEIA believes that this is consistent with EPA's interpretation of the BSER as including measures taken by states to reduce emissions across the electric system. Further, this is consistent with the cooperative model promoted by Section 111(d) and the Clean Air Act, which

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[160] The EPA is proposing that, for an existing state requirement, program, or measure, a state may apply toward its required emission performance level the emission reductions that existing state programs and measures achieve during a plan performance period as a result of actions taken after the date of this proposal. An ''existing measure'' refers to a state or utility requirement, program, or measure that is currently ''on the books.'' (34918) For the purposes of this discussion, this may include a legal requirement that includes current and future obligations or current programs and measures that are in place and are anticipated to be continued or expanded in the future in accordance with established plans. Existing measures may have past, current, and future impacts on EGU CO_2 emissions. (34918 ft nt. 292) We are also proposing that this proposed limitation would not apply to existing renewable energy requirements, programs and measures because existing renewable energy generation prior to the date of proposal of the emission guidelines was factored into the state-specific CO_2 goals as part of building block 3. (34918 ft. nt. 293)

provides states with significant flexibility in determining the best method for reducing emissions. Further, allowing states to count existing measures towards compliance recognizes the investment already made by states towards emission reduction, and will allow states to carry forward programs that are in motion without distorting current markets.

However, during the comment period there has been significant confusion regarding exactly which existing renewable energy measures can be counted towards compliance and when credit will be given. This confusion is already threatening potential emission reductions by slowing project development because states and EGUs are uncertain which actions will count towards compliance, and when these actions can count. Therefore, while SEIA supports the proposal put forth by EPA as interpreted above, SEIA requests that in the final rule the EPA more clearly state which actions can count towards compliance and when such actions count.

4A2. EPA Proposal to Allow Pre-2020 Emissions Reductions to Count Towards Overall State Goals[161]

SEIA proposes that the EPA allow reductions from existing measures prior to 2020 to count towards compliance in 2020. However, to avoid significantly weakening the overall state goals and to prevent unintended consequences that may arise from allowing early action to count during the compliance period, SEIA recommends that the EPA allow emission reductions to be banked according to limiting criteria.

SEIA recommends that states should be allowed to get limited credit for ("bank") MWh generated prior to 2020. Specifically, states should be allowed to bank MWh generated from the date their SIP is

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[161] The EPA also solicits comment on a second broad option. This option would recognize emission reductions that existing state requirements, programs and measures achieved starting from a specified date prior to the initial plan performance period, as well as emission reductions achieved during a plan performance period. The specified date could be, for example: The date of promulgation of the emission guidelines; the date of proposal of the emission guidelines; the end date of the base period for the EPA's BSER-based goals analysis (e.g., the beginning of 2013 for blocks 1–3 and the beginning of 2017 for block 4, end-use energy efficiency); the end of 2005; or another date… The agency is seeking comment on whether some variation of this approach could be justified as consistent with the EPA's proposed goal-setting approach, as well as the general concept of the BSER and its application in establishing state goals. In particular, we are seeking comment on whether the emission effects of actions that are taken after proposal or promulgation of the emission guidelines or the approval of a state plan, but which occur prior to the beginning of the initial state plan performance period, could be applied toward meeting the required level of emission performance in a state plan. (34919) The EPA is also seeking comment on the 2020-2029 Glide Path and early action in the Notice of Data Availability (NODA). SEIA's proposal below addresses the EPA's comments on crediting certain pre-2020 reductions that could be used to reduce the overall amount of reductions in the 2020-2029 period.

submitted, and that those credits be eligible for compliance purposes for 36 months from the date of the start of the compliance period.

This approach is consistent with EPA's goal of compliance flexibility and EPA's rationale that states and EPA will need a few years to create and approve compliance plans prior to 2020. Further, limited banking after SIP approval ensures that only measures included in approved SIPs are used for compliance and incentivizes states to submit SIPs for approval in a timely manner. Limiting banking to 2-3 years is aligned with best practices of most RPSs and regional markets which allow banking for 2-3 years without significantly reducing overall state goals. However, some banking incentivizes early action and market momentum while reducing large fluctuations in the supply curve, which in turn will reduce compliance costs and increase the viability of building block 3 as a compliance option for states.

While SEIA supports limited banking, SEIA believes that unlimited banking or extended banking of emission reductions beyond a 3 year timeframe should not be permitted for states. Unlimited or extended banking damages the ability of the Clean Power Plan to "lock-in" long-term emissions reductions and systematic long-term change by allowing states to increase actual emissions in compliance years. As stated above, some flexibility in this regard is warranted but extended or unlimited banking would undermine the effectiveness of the Plan. Additionally, extended or unlimited banking creates distortions in the market by allowing states and EGUs to choose not to create new renewables until late in the compliance period or only create new renewables early on. Both create significant uncertainty for renewable energy markets, which may increase compliance costs or lead to states failing to comply. Further, SEIA is concerned that unlimited banking may lead to gaming and enforcement challenges if the EPA uncovers validation issues with MWhs generated many years prior.

Therefore, SEIA supports limited banking as outlined above.

4B. Interstate Emissions Effects

4B1. The EPA Should Credit States that Invest in Renewable Energy[162]

SEIA supports the approach put forth by the EPA regarding crediting states under building block 3. In order to aid state compliance with 111(d) obligations, it would be most efficient and equitable for the

[162] The EPA is proposing that, for renewable energy measures, consistent with existing state RPS policies, a state could take into account all of the CO2emission reductions from renewable energy measures implemented by the state, whether they occur in the state or in other states. This proposed approach for RE acknowledges the existence of renewable energy certificates (REC) that allow for interstate trading of RE attributes and the fact that a given state's RPS requirements often allow for the use of qualifying RE located in another state to be used to comply with that state's RPS. The EPA is also seeking comment on how to avoid double counting emission reductions using this proposed approach. (34921)

EPA to model its approach after the best practices of existing state RPSs. Relying upon existing best practices and infrastructure will aid states in efficiently meeting their obligations, while making double-counting structurally impossible, thereby maintaining the integrity of the emissions reductions which will be achieved. SEIA recommends that the following rules undergird 111(d) SIPs.

A. RECs delivered over tracking systems are the primary tool for tracking the compliance benefits of renewable electricity.
B. Only the party retiring the REC is located is permitted to claim compliance credit.
C. RECs owned by non-compliance ("voluntary") buyers are not counted toward state 111(d) compliance obligations.
Observance of these rules will help to assure the continuation of the robust renewable energy market, uphold the integrity and emissions objectives of the rule, promote efficient market structures, and avoid double-counting.

While SEIA recommends the default rules set forth above, SEIA also recognizes that states should be allowed to enter into bilateral and multilateral agreements, whether REC based or based on emissions budgeting. While states should have be allowed to enter into agreements, they should be required to show that the emission reductions are real, verifiable, and are not being claimed by another entity or state

A. <u>RECs delivered over tracking systems are the primary tool for tracking the compliance benefits of renewable electricity.</u>

The transfer and retirement of RECs in tracking systems - a system in which only the REC owner is entitled to compliance credit - ensures that the REC can only be used by one party. In order to ensure that a given MWh is only used once, the EPA must make clear that, as a general rule, the *generation* of renewable electricity does not qualify for 111(d) compliance credit, but that the *consumption* of renewable electricity, as demonstrated by REC retirement, does. As noted above, this should not preclude states from entering into bilateral or multilateral agreements if they choose to do, so long as they can show that emission reductions are real, verifiable, and are not being claimed by another entity or state.

B. <u>Only the party retiring the REC is located is permitted to claim compliance credit.</u>

If RECs are not used as the compliance instrument for renewable energy, it would be possible for double counting to occur. Double counting would occur in a state where the SIP is based on the *generation* of renewable energy, but the REC associated with that generation is sold into a state where the SIP is based the *consumption* of renewable energy. In such a situation, two states would be seeking to claim the emissions and compliance benefits of the same MWh. To ensure that this scenario does not arise, and additionally, to promote a robust market for the purchase of renewable energy, the EPA should be clear that only the party which retires the REC is able to claim 111(d) compliance credit.

Rewarding REC purchases, as opposed to generation has the additional benefit of reducing compliance costs by allowing states to benefit from the comparative advantages of interstate trade. States where renewable generation is relatively expensive, or resources are scarce, are able to purchase RECs from neighboring states where generation is more economical, or resources are readily available, thereby encouraging renewable energy development and compliance at the lowest total cost.

As noted above, this should not preclude states from entering into bilateral or multilateral agreements if they choose to do, so long as they can show that emission reductions are real, verifiable, and are not being claimed by another entity or state.

C. RECs owned by non-compliance entity ("voluntary") buyers are not counted toward state 111(d) compliance obligations.

An additional situation where double counting could arise, is the situation where a voluntary buyer of RECs uses the REC for its own benefit, but then a compliance entity seeks to claim the benefit of the same MWh of renewable electricity. The renewable energy industry in the United States has been boosted by a vibrant voluntary market for RECs. According to the National Renewable Energy Laboratory (NREL), in 2012, total retail sales of renewable energy in voluntary purchase markets exceeded 48 million megawatt-hours (MWh) and represented approximately 1.3% of total U.S. electricity sales.[163]

Voluntary buyers purchase renewable energy because they support the generation of renewable energy above the minimum standards required by government regulations. Just like a buyer in an RPS market, when a voluntary customer purchases a REC, it has purchased the exclusive rights to claim that REC for itself. If federal and/or state government agencies were to create a system where a state were to be permitted to take title to those claiming rights away from the REC consumer, then the voluntary REC owner would have had its property rights taken without compensation, potentially in violation of the Fifth Amendment to the United States Constitution.

In order to account for voluntary REC purchases in rate based SIPs, the EPA should mandate that the party claiming 111(d) compliance benefits must own and retire the associated REC.

In order to account for voluntary REC purchases in mass based SIPs, the EPA should follow California's practices in its AB 32 cap and trade program. California has enacted a voluntary renewable energy

[163] *Status and Trends in the U.S. Voluntary Green Power Market (2012 Data);* J. Heeter and T. Nicholas, National Renewable Energy Laboratory.

program which retires emission allowances equivalent to the avoided emissions associated with voluntary REC purchases.[164] The retirement of these allowances ensures that the owner of the REC is able claim the emission reduction benefits from their purchase. In the absence of this allowance retirement, parties other than the REC owner would be able to claim the benefits of the REC's lack of emissions and avoided emissions, thereby negating the zero emission and emissions reductions benefits owned by the REC purchaser. This result would discourage future REC purchases, and potentially lead to a Fifth Amendment government taking.

SEIA recommends that in order to ensure an active, growing, efficient renewable energy market with integrity, that the EPA adopt the above referenced industry best practices to undergird 111(d) compliance programs.

4C. Federal Enforceability: The EPA Should Implement Enforceable Emissions Targets but Allow Programmatic Flexibility[165]

SEIA does not take a position on any of the approaches put forth by EPA regarding the structure of state plans.[166] What is important is that the EPA require states to commit to binding and verifiable emission reductions, but allow states significant programmatic flexibility in achieving those reductions.

As recognized by the EPA, Section 111(d) provides EPA and states significant flexibility in determining how to structure state plans to most effectively achieve emissions reductions. SEIA urges the EPA to take advantage of this flexibility and allow states to maintain autonomy over their emission reduction programs to the extent possible. States have shown that they can achieve significant reductions through a combination of programs and measures developed and managed at the state level. SEIA is concerned that taking an overly prescriptive approach to enforcing state programs will render the programs less effective by exposing states to litigation risk and disrupting the administration of the

[164] See http://www.arb.ca.gov/cc/capandtrade/guidance/chapter7.pdf.

[165] The EPA is proposing that all measures relied on to achieve the emission performance level be included in the state plan, and that inclusion in the state plan renders those measures federally enforceable. In light of current state programs, and of stakeholder expressions of concerns over the above-noted issues, including legal enforcement considerations, with respect to those programs, the EPA is proposing to authorize states either to submit plans that hold the affected EGUs fully and solely responsible for achieving the emission performance level, or to submit plans that rely in part on measures imposed on entities other than affected EGUs to achieve at least part of that level, as well as on measures imposed on affected EGUs to achieve the balance of that level. The EPA requests comment on this proposed approach, as opposed to the approach under which state plans simply would be required to hold the affected EGUs fully and solely responsible for achieving the emission performance level. (34901)

[166] The EPA suggests a number of approaches to state plans, including a portfolio approach, state commitment approach, and alternatives.

programs by state agencies. Therefore, SEIA suggests the EPA require states to commit to binding emission reductions, but allow states significant programmatic flexibility in achieving their reduction goals.

4D. Evaluation, Measurement and Verification: The EPA Should Provide Guidance for Evaluation, Measurement and Verification of Solar[167]

Existing protocols already exist for measuring, verifying, and crediting the renewable electricity generated from solar systems and the associated carbon emissions reductions. The two basic main steps are: (i) to track the output – i.e. meter the solar energy generated (MWh)- and (ii) to determine the emissions rate of electricity that is being displaced (lbs/MWh). The EPA should provide guidance to states on which protocols and methods will be acceptable to the EPA for compliance with the rule. SEIA has provided a discussion of this issue in Appendix B.

4E. Periodic Review of the Best System of Emissions Reductions: The EPA Should Review the BSER Every 8 Years[168]

Under §111(b)(1)(B), the EPA reviews and, if appropriate, revises its standards of performance for new sources. Section 111(d) does not require regular review and revision of the rule. However, because the section is silent on the issue, EPA has discretion to institute a periodic review of its standard for existing sources. Because §111(d) is intended to capture reasonably anticipated regulatory and technological developments, it would be inconsistent with the statutory scheme for EPA not to revisit and update the BSER and state goals periodically. In addition, periodic review would be consistent with the "no backsliding" policy set forth in the Clean Power Plan to ensure that emissions reductions are maintained during and after the compliance period.[169] To ensure that state goals continue to be a reflection of the BSER, SEIA recommends that EPA treat the 2030 goals as a default and review the final goals by no later than 2024.

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[167] As discussed in section VIII.F.1, the EPA is seeking comment on whether the agency should provide guidance on enforceability considerations related to requirements in a state plan for entities other than affected EGUs (and if so, which types of entities). Also, as discussed in section VIII.F.4, the EPA intends to develop guidance for evaluation, monitoring, and verification (EM&V) of renewable energy and demand-side energy efficiency programs and measures incorporated in state plans.

[168] The EPA notes that CAA section 111(b)(1)(B) calls for the EPA, at least every eight years, to review and, if appropriate, revise federal standards of performance for new sources. This requirement provides for regular updating of performance standards as technical advances provide technologies that are cleaner or less costly. The agency requests comment on the implications of this concept, if any, for CAA section 111(d). (34908)

[169] Clean Power Plan at 34,917

4F. Post-2030 Emissions Reduction Requirements: The EPA Should Require State Emission Levels to be Maintained After the Compliance Period has Ended[170]

Congress intended emission reductions under §111(d) to be permanent. In fact, other emission limits set under §111(d) are permanent requirements. Therefore, the EPA should require emissions reductions achieved by existing sources under §111(d) to be permanent reductions that remain in place after 2030.

4G. Concerns with Natural Gas[171]

SEIA urges the EPA to consider the impact of its rule on the build out of natural gas infrastructure. SEIA is concerned that, depending on how the rule is implemented, affected EGUs may be incentivized to build significant natural gas infrastructure that will be in place for the next 20-30 years once constructed. This would undermine EPA's long term emission reduction goals and potentially discourage states from relying on renewable energy resources as a compliance option. Further, significant build out of natural gas infrastructure over the next few years could negatively impact ratepayers in the long run if such infrastructure becomes stranded assets as carbon emissions become more expensive in the future.

There are two areas of particular concern in the proposed rule.

1. Emissions Changes from the Substitution of New Natural Gas Generation

SEIA is concerned that under the rule, states may be incentivized to construct new natural gas plants that are not subject to 111(d) to avoid 111(d) requirements on affected EGUs. Therefore, emissions that result from substituting generation by affected EGUs should be calculated toward a required emission performance level for affected EGUs. This means that if new natural gas plants are used for compliance purposes, they should be factored into the establishment of state targets to maintain symmetry between the resources considered in setting the target and resources allowed for compliance. Treating

[170] Specifically, the state plan must demonstrate that the projected emission performance of affected EGUs in the state will be equivalent to or better than the applicable interim goal during the 2020–2029 period, and equivalent to or better than the applicable final goal during the year 2030. The state plan must identify requirements that continue to apply after 2030 and are likely to maintain continued emission performance by affected EGUs that meets the final goal; (34904)

[171] The agency requests comment on how emissions changes under a rate-based plan resulting from substitution of generation by new NGCC for generation by affected EGUs should be calculated toward a required emission performance level for affected EGUs. Specifically, considering the legal structure of CAA section 111(d), should the calculation consider only the emission reductions at affected EGUs, or should the calculation also consider the new emissions added by the new NGCC unit, which is not an affected unit under section 111(d)? Should the emissions from a new NGCC included as an enforceable measure in a mass-based state plan (e.g., in a plan using a portfolio approach) also be considered?

new gas generation as if it has zero carbon emissions would result in less overall carbon emission reductions because the gas generation would be subject to the cap under 111(d). This would allow a state to treat new gas facilities as if they were zero-emitting resources, creating a disincentive to rely on renewables or existing natural gas that is subject to 111(d) regulations.

2. EPA's "Glide Path" Proposal[172]

SEIA is also concerned with the "glide path" proposed by the EPA and the incentive it might create to build significant natural gas infrastructure in the early years of the compliance period. SEIA recognizes the need for some compliance flexibility early on. Therefore, SEIA proposes limited banking (see Section 4A2). However, SEIA urges to the EPA to carefully consider whether the proposed "glide path" will create an early incentive to construct significant natural gas infrastructure that will make it more difficult and expensive for states to reduce emissions through the deployment of renewables and other measures in the long term. Natural gas has a history of price fluctuations, and a low cost in the U.S. in 2014 doesn't guarantee it will remain inexpensive in 2020 or 2030, particularly given the very high price for natural gas elsewhere in the world and increasing demand for the product. A portfolio of energy resources can act as a hedge against price increases in natural gas; particularly as the price of renewable energy continues to decrease. CSP plants, for example, use conventional steam turbines, and when combined with thermal energy storage have the same operational characteristics of fossil fueled power plants, without their emissions.

Further, SEIA urges the EPA to recognize the speed of solar deployment, along with the modularity of solar, which makes it a great choice for meeting incremental generation needs and can assist states in quickly achieving compliance with EPA regulations under §111(d). The development and construction timeline for a large, centralized conventional fossil fuel power plant is typically a multi-year process (and longer for nuclear energy). By comparison, the time from conception to operation for renewable energy projects can be much faster. While very large solar and wind plants are still subject to some of the same

[172] The EPA is requesting comment from the NODA on the phasing in of Building Block 2, leading to a more gradual glide path. The EPA is specifically asking for comment on phasing in dispatch changes under Building Block 2.[172] SEIA does not support the gradual phasing in of dispatch for natural gas plants under Building Block 2. States should be encouraged to begin compliance measures as soon as the compliance period begins in 2020, regardless of the make-up of the state compliance plans. Allowing the gradual phase in of Building Block 2 could delay action by some states on the compliance plan and thus further delay emission reductions. Furthermore, the 2020-2029 glide path is intended to show that a state is making progress towards the end target in 2030. Incorporating renewable energy and energy efficiency measures into a state compliance plan can demonstrate that a state is making progress towards the 2030 goal in the earlier years of the compliance period as these measures are quick to install, while the other compliance measures- such as the switching to natural gas- can demonstrate compliance in the later years of the compliance period.

siting and permitting-related requirements as large fossil plants, medium and small solar facilities can be built quickly, especially with the right policies in place. In places with streamlined permitting and interconnection procedures, it is possible for a three-person crew to install up to three residential PV systems in a day. For larger commercial flat-roof PV systems, a six-person crew can install 100 kW of PV in a day.

4H. Recognize Each Solar Technology as a Compliance Option and Specifically Mention these Technologies May be Eligible within State Compliance Plans.

The EPA needs to clearly state in the final rule which renewable energy projects and technologies will be eligible as compliance measures. SEIA encourages the EPA to clearly state that energy generated from distributed PV, CSP, utility PV, and SHC projects be specifically named as eligible technologies.

5. Conclusion

The solar industry is one of the fastest growing industries in the United States. For all of the above reasons, we respectfully request that the EPA adopt an approach to regulating carbon emissions under Section 111(d) of the Clean Air Act that accurately reflects the potential for solar to reduce carbon emissions from affected EGUs as discussed in these comments.

Thank you for your consideration of our input, and we look forward to working with the EPA. If you have any questions, please do not hesitate to contact me.

Respectfully,

Rhone Resch

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APPENDIX A – SEIA Calculation of the Technical Potential Benchmark

Should the EPA choose to include the technical benchmark potential, the EPA must include updated solar data to reflect the current solar industry. To establish the technical potential benchmark, the EPA compares each state's renewable energy technical potential against its existing renewable energy generation. The technical potential is measured by NREL in the report "U.S. Renewable Energy Technical Potential: a GIS-based analysis" and existing renewable generation as reported by the EIA for 2012. The EPA notes that for solar, the EPA uses NREL's technical potential estimates for urban utility-scale PV, rural utility-scale PV, and CSP. Should the EPA include the technical potential benchmark, the EPA must include the technical potential estimates for distributed solar. This technical potential for rooftop solar can be found here: http://www.nrel.gov/gis/re_potential.html.

SEIA has severe concerns with the existing renewable generation data used for solar as reported by the EIA in 2012. As stated in comments above, SEIA recommends the EPA take the latest available data on solar capacity (both DG and utility) from EIA forms 860, 861 and 826 and multiply it by the estimated generation per unit of capacity by state as shown in the table on page 67 in Section 3B5 that is current through April 2014. For CSP facilities in operation, the EPA should use production estimates provided by NREL since generation from these plants is more project-specific.

The comparison of the renewable technical potential to the existing renewable net generation yields the proportion of achieved renewable generation from technical potential, which the EPA represents as the renewable energy development rate. The EPA next takes the average renewable energy development rate for the top third of states to use as a benchmark renewable energy development rate for each technology. The benchmark rate is applied to each state's technical potential to calculate the benchmark generation for each technology type.

Using the SEIA recommended approach for accurate solar data in each state and the NREL technical potential figures gives **a new benchmark average solar development rate of 4.74%** when looking at the top 16 states as the approach calls for. **The current EPA proposal has a benchmark average solar development rate of 0.009%.**

For illustrative purposes, the following chart shows what each state's technical potential for solar would be with this approach (this excludes current CSP generation from each state in the calculation):

Benchmark Generation for Solar for each State (GWh)	State
95.98011027	Alaska
55.88955507	Alabama
200.1702	Arizona
143423.3466	Arkansas
470827.755	California
30391.932	Colorado
5003.9232	Connecticut
4289.5104	District of Columbia
649.9962	Delaware
10729.701	Florida
3125.2242	Georgia
22151.3472	Hawaii
2080.5282	Iowa
1168.8366	Idaho
311.3706	Illinois
2804.4684	Indiana
193.392	Kansas
187.23	Kentucky
4772.4216	Louisiana
697.3962	Massachusetts
11269.113	Maryland
27486.4068	Maine
838.3638	Michigan
1157.3658	Minnesota
68.8248	Missouri
4635.8148	Mississippi
393.7518	Montana
35422.4466	North Carolina
11610.2508	North Dakota
17453.865	Nebraska
117.6468	New Hampshire
645.2562	New Jersey
81386.3214	New Mexico
74.8446	Nevada
24650.4174	New York

6235.1856	Ohio
153.576	Oklahoma
5400.045	Oregon
14165.3004	Pennsylvania
423.0924	Rhode Island
517.6554	South Carolina
294.4014	South Dakota
66.9762	Tennessee
1131.912	Texas
11806.2498	Utah
1009.62	Virginia
1987.245	Vermont
6401.133	Washington
880.3602	Wisconsin
1718.9136	West Virginia
200.1228	Wyoming
972,762.8977	**TOTAL**

The EPA realizes the limits with the technical potential, and therefore pairs the benchmark development rates with an IPM model to take into account the cost of building the renewable generation.[173]
The final target renewable generation for each state is achieved by taking the lesser of these two approaches: the technology benchmark rate multiplied by the in-state technical potential, or the IPM-projected market potential for that specific technology.

However, as mentioned in the comments above, SEIA does not support including the technical potential benchmark in the alternative approach. To clarify how the technical potential is not a realistic number to use in setting a benchmark, Texas has enough renewable potential to meet the 111(d) requirements of every state combined several times over. In 2012 (according to EIA form 861 data), Texas consumed 365,000 GWh of electricity. The table below summarizes the renewable energy potential relative to annual consumption in Texas.[174] That is, Texas could get 22% of its electricity from rooftop PV, 81% from

[173] Alternative RE Approach Technical Support Document, "While the benchmark Re development rate offers a useful metric to quantify the proportion of RE generation consistent with what has been demonstrably achieved in practice by the top third of states, EPA recognizes that a metric based solely on technical potential has limitations." P.2
[174] Data from the NREL report "U.S. Renewable Energy Technical Potential: a GIS-based analysis" and EIA 2012 data.

urban utility PV, more than 10,000% of its electricity from rural utility PV, etc. A fraction of any one of these would be more than enough to comply with the requirements for Texas under the Clean Power Plan.

	km2	**Acres**	**GW**	**GWh**	**Renewable Potential as a fraction of Total Texas Consumption**
Urban Utility PV	3,214	794,089	154	294,684	81%
Rural Utility-scale PV	425,230	105,076,479	20,411	38,993,582	10680%
Rooftop PV			60	78,717	22%
CSP	235,398	58,168,046	7,743	22,786,750	6241%
Onshore Wind	380,306	93,975,509	1,902	5,552,400	1521%
Offshore Wind	54,289	13,415,007	271	1,101,063	302%
Total (Excluding CSP due to overlap with Rural PV)	*863,038*	*213,261,084*	*22,799*	*46,020,445*	*12605%*

Furthermore, the SunShot study also notes that the land area that is potentially suitable for solar deployment is enormous and "thus land, per se, is not a constraint on meeting the SunShot scenario level of deployment."[175] The study goes on to note:

> However, it is important to make careful selection of sites in order to provide access to available or planned transmission, and to minimize conflicts with environmental, cultural, and aesthetic interests. The land area required to supply all end-use electricity in the United States using PV is only about 0.6% of the country's total land area. Similarly, the technical potential for CSP is enormous: about 17,500 TWh of annual CSP electricity generation, which is more than four times the 2010 U.S. annual demand, could be sited in seven southwestern states on land that has been pre-screened to avoid prominent land-use issues and to meet technical requirements such as insolation and slope. About 370,000–1,100,000 hectares (ha) (900,000–2,700,000 acres) are required for utility-scale solar installations in 2030 under the SunShot scenario, and about 860,000–2,500,000 ha (2,100,000–6,300,000 acres) are required in 2050. The required land area is equivalent to about 0.05%–0.14% of the

[175] http://energy.gov/sites/prod/files/2014/01/f7/47927.pdf

contiguous U.S. land area in 2030 and about 0.11%–0.33% in 2050. Solar development in the SunShot scenario is greatest in the South and Southwest. Often the highest-quality solar resource areas are dry environments that are typically not well suited for cropland or offer little value for forestry and rangeland.[176]

APPENDIX B- Evaluation, Measurement & Verification

Existing protocols already exist for measuring, verifying, and crediting the renewable electricity generated from solar systems and the associated carbon emissions reductions. The two basic main steps are to, (i) track the output – i.e. meter the solar energy generated (MWh)- and (ii) to determine the emissions rate of electricity that is being displaced (lbs/MWh). It may also be necessary to adjust for transmission and distribution (T&D) losses if the solar energy is being generated at or near the customer, but is displacing central station generation.

Tracking the Output

Utility PV and CSP

For utility PV and CSP systems, EM&V is not difficult. All utility scale solar projects and CSP projects are already metered and monitored. The metered electricity is also usually assigned a renewable energy credit (REC), whether for compliance with RPS or for use in voluntary green power programs. One REC is typically equal to 1 MWh of generation. Rigorous accounting methods and transaction platforms for RECs already exist throughout the U.S.; for example, in almost every state that has an RPS policy, there is a method to track the RECs. More generally, these RECs are often part of broader generation attribute tracking systems, such as the GATS system used in the PJM control area and the GIS system used in the New England ISO.

Distributed PV

The distributed PV sector is comprised of the residential and commercial markets. Although not all distributed PV systems are metered and monitored, many are. For example, every system that is contracted under third-party ownership is metered and monitored, typically remotely (electronically) and often in near real time, such that time of day production can be recorded. Of existing solar capacity, nearly 70% of the residential market and 50% of the commercial market is contracted under third party ownership. Moreover, in states where distributed PV is used to meet state RPS requirements, metering and reporting is required for tracking of SRECs, regardless of the ownership of the system. The type of metering may be similar to that for third-party owned systems or may be less granular, for example using an analog meter to manually record monthly production. For the portion of the distributed PV market that is not metered, estimates of performance can be made by using any number of publicly and

[176] http://energy.gov/sites/prod/files/2014/01/f7/47927.pdf

commercially available models including the NREL PVWatts model Sandia National Labs flat plate model, PVSyst, SolarAnywhere® FleetView®, and Homer.

Determining the Emissions Rate of Electricity that is Being Displaced

Once the generation is known, either through direct metering or from the sale of the RECs, the next step is to determine the fossil fuel energy that is being displaced by the solar energy and the associated avoided carbon emissions. The EPA has already spelled out guidance to states for incorporating more renewable energy into state implementation plans for compliance purposes with pollutants under Section 110 of the Clean Air Act, and has included an Appendix within the guidance that details some of the methods available for quantifying the carbon emissions reduced by renewable energy.[177] These methods include energy models, historic generation and emissions data, capacity factor emission rates, and system average emission rates.

One example of a model that uses historic dispatch data is the Avoided Emissions and Generation Tool (AVERT), developed by the EPA. The AVERT model uses historic dispatch data to statistically determine the marginal EGUs on an hourly basis. The AVERT model is free to use and comes with a simple user interface designed to meet the needs of state air quality planners and other interested stakeholders, and can easily be used to evaluate county-level emissions displaced at EGUs by renewable energy policies and programs, and to analyze the emission benefits of different renewable energy programs in multiple states within an AVERT region.

Another example of an energy model is the ForeSEE model. A Georgia Tech startup recently developed the ForeSEE model that examines the CO_2 emissions avoided from solar, including DG PV, as well as the NO_x and SO_x emissions too. While this model is currently only available for Atlanta and the State of Georgia, as the model was designed to look at the impact of Georgia Power's distributed solar policies for the city of Atlanta, the startup (Cox and Golin Consulting) is expanding ForeSEE's application throughout the country to inform debates about the value of solar.[178]

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[177]More information on the Roadmap can be found here: http://epa.gov/airquality/eere/ Appendix I on "Methods for Quantifying Energy Efficiency and Renewable Energy Emission Reductions" is available here: http://epa.gov/airquality/eere/pdfs/appendixI.pdf

[178] See "Sustaining the City: Understanding the Role of Energy and Carbon Dioxide Emissions in Sustainable Development in Major Metropolitan Areas" by William Matthew Cox, June 2014. Available here: https://smartech.gatech.edu/handle/1853/52316

Additional Solar Factors to Note

The methods that can be used to determine the emissions rate of electricity that is being displaced from solar all have advantages and disadvantages. Depending on the approach that is chosen, the calculated carbon emission reductions from solar will likely differ. For example, solar energy typically displaces fossil fuels at or near the peak demand hours, when the sun is shining. The EGUs on the margin at peak demand hours are almost always natural gas units; therefore, in a more complex approach to calculating the carbon emission reductions- such as a dispatch model- the carbon emission reductions from solar may be less than with an averaging approach, because averaging will tend to include higher-emitting baseload EGUs such as coal plants.

Solar heating and cooling (SHC) is another type of solar energy that is generally not accounted for in energy models. Solar heating and cooling systems should be a part of any state compliance plan for 111(d), as SHC systems displace the need for the combustion of fossil fuels for heating and cooling needs.

Finally, the use of solar storage affects the calculation of carbon emission reductions. With thermal energy storage, solar energy is able to displace EGUs operating at the margin during non-peak hours, and even potentially cut into base load EGU supply. With the development of all types of storage, solar can substantially displace natural gas and coal EGUs, and play an even more significant role in reducing carbon emissions. Any methods used to quantify the carbon emission reductions from solar must be able to account for solar storage. This poses a problem for those models and methods that use resource availability (i.e. sunlight) as the assumed proxy for solar energy generation, but should not be difficult for dispatch models and other approaches that rely on plant operating characteristics.

The EM&V of solar output (MWh) is straight-forward and will increasingly include granular time of day output for large and small systems, which provides high confidence in the ability to track solar generation.

APPENDIX C- DOE Sunshot Capacity Projections with -62.5% Cost Reduction Scenario

The below DOE Sunshot capacity projections were used as inputs into the IPM model. The IPM model was told – or, “hard-wired”- to build the below distributed PV capacity in each state in 2030 under the -62.5% cost reduction scenario.

	Rooftop PV						
	2030				2050		
	SunShot 75% cost reduction (GW)	SunShot 62.5% cost reduction (GW)	REF case (GW)		SunShot 75% cost reduction (GW)	SunShot 62.5% cost reduction (GW)	REF case (GW)
Alabama	0.6	0.2	0.0		2.3	0.8	0.2
Arizona	7.4	4.8	2.2		10.6	7.6	4.6
Arkansas	0.2	0.1	0.0		1.3	0.4	0.1
California	29.5	19.8	11.4		37.8	24.4	16.1
Colorado	4.3	2.6	1.5		5.8	3.8	2.0
Connecticut	2.2	1.1	0.2		3.5	2.2	0.9
Delaware	0.6	0.3	0.1		1.2	0.7	0.3
Florida	10.7	4.7	0.6		29.0	15.2	4.8
Georgia	2.4	1.0	0.1		6.5	2.6	0.8
Idaho	0.1	0.0	0.0		0.9	0.3	0.0
Illinois	1.8	0.7	0.2		5.1	1.7	0.4
Indiana	0.7	0.4	0.2		1.9	0.8	0.4
Iowa	0.8	0.6	0.4		1.6	0.9	0.7
Kansas	0.9	0.7	0.5		1.7	1.0	0.7
Kentucky	0.4	0.1	0.0		1.6	0.4	0.1
Louisiana	1.2	0.8	0.6		2.3	1.2	0.8
Maine	0.5	0.2	0.1		1.0	0.6	0.2
Maryland	1.6	0.8	0.2		3.7	2.1	0.9
Massachusetts	1.9	0.9	0.1		3.1	1.7	0.5

Michigan	1.4	0.7	0.1		4.9	1.7	0.8
Minnesota	1.3	0.6	0.0		3.6	1.3	0.6
Mississippi	0.2	0.1	0.0		1.0	0.3	0.0
Missouri	2.0	1.0	0.2		5.0	2.4	1.2
Montana	0.4	0.1	0.0		0.8	0.4	0.1
Nebraska	0.5	0.3	0.1		1.2	0.6	0.4
Nevada	3.4	2.1	0.7		5.0	3.6	2.2
New Hampshire	0.3	0.1	0.0		0.7	0.2	0.0
New Jersey	2.6	1.2	0.2		4.1	2.5	0.8
New Mexico	1.1	0.7	0.4		1.8	1.3	0.7
New York	6.5	3.9	1.2		11.5	8.0	4.6
North Carolina	2.4	1.2	0.4		6.7	2.5	1.2
North Dakota	0.2	0.1	0.0		0.8	0.2	0.0
Ohio	1.0	0.3	0.0		4.3	1.2	0.3
Oklahoma	1.1	0.7	0.4		2.7	1.3	0.8
Oregon	0.6	0.3	0.2		0.9	0.4	0.2
Pennsylvania	3.2	1.6	0.4		6.9	3.2	1.2
Rhode Island	0.7	0.4	0.1		1.2	0.7	0.2
South Carolina	0.7	0.3	0.0		2.2	0.7	0.2
South Dakota	0.3	0.2	0.1		0.6	0.3	0.2
Tennessee	1.1	0.3	0.0		4.6	1.2	0.2
Texas	15.2	7.7	1.5		33.9	20.0	8.8
Utah	0.8	0.4	0.0		2.6	1.4	0.5

Vermont	0.2	0.1	0.0		0.3	0.1	0.0
Virginia	1.8	0.8	0.1		5.3	2.2	0.9
Washington	1.9	1.6	0.6		2.3	1.8	0.7
West Virginia	0.2	0.1	0.0		0.7	0.3	0.1
Wisconsin	1.2	0.5	0.1		3.3	1.2	0.4
Wyoming	0.2	0.1	0.0		0.5	0.3	0.1

APPENDIX D- TMY3 Solar PV System Performance

The following shows the solar performance estimates based on the simple average of performance at each TMY3 weather station in each state as modeled using PVWatts in NREL's System Advisor Model (SAM). These performance estimates were then used as an input in NRDC's IPM analysis.

Average of Capacity Factors in Each State			
Average of DC to AC Capacity Factor	**Column Labels**		
	0-Axis		**1-Axis**
Row Labels	**15**	**Lat**	**Lat**
AL	15.51%	15.86%	19.76%
AR	15.40%	15.82%	20.12%
AZ	19.62%	20.47%	27.10%
CA	18.40%	18.96%	24.61%
CO	17.83%	18.80%	24.73%
CT	13.86%	14.43%	17.93%
DE	14.68%	15.31%	19.12%

FL	16.47%	16.75%	20.90%
GA	15.70%	16.12%	20.08%
IA	13.98%	14.61%	18.61%
ID	16.27%	17.09%	22.70%
IL	14.23%	14.75%	18.61%
IN	13.92%	14.28%	17.85%
KS	16.52%	17.41%	22.41%
KY	14.31%	14.67%	18.41%
LA	15.57%	15.84%	19.78%
MA	13.43%	14.00%	17.35%
MD	14.76%	15.39%	19.26%
ME	13.18%	13.87%	17.63%
MI	13.34%	13.72%	17.39%
MN	13.51%	14.29%	18.36%
MO	15.12%	15.66%	19.95%
MS	15.73%	16.05%	20.10%
MT	14.90%	16.06%	21.01%
NC	15.52%	16.07%	20.10%
ND	14.18%	15.26%	19.84%
NE	15.84%	16.83%	21.66%
NH	13.30%	13.86%	17.44%
NJ	14.60%	15.26%	19.05%
NM	19.77%	20.62%	27.20%
NV	18.71%	19.66%	26.19%
NY	13.43%	13.90%	17.41%
OH	13.45%	13.74%	17.04%
OK	16.81%	17.46%	22.56%
OR	14.73%	15.24%	19.83%
PA	13.73%	14.15%	17.56%
RI	13.90%	14.58%	18.00%
SC	16.07%	16.61%	20.79%
SD	14.83%	15.75%	20.35%
TN	15.25%	15.66%	19.65%
TX	16.66%	17.00%	21.67%
UT	18.07%	18.96%	25.13%
VA	15.06%	15.66%	19.64%
VT	13.05%	13.48%	17.08%
WA	13.29%	13.77%	17.83%

WI	13.75%	14.36%	18.30%
WV	13.35%	13.68%	16.87%
WY	17.08%	18.29%	24.13%
Grand Total	**15.47%**	**16.07%**	**20.53%**

Maximum Capacity Factor in Each State			
Max of DC to AC Capacity Factor	**Column Labels**		
	0-Axis		**1-Axis**
Row Labels	**15**	**Lat**	**Lat**
AL	16.82%	17.22%	21.57%
AR	16.66%	17.32%	22.33%
AZ	20.55%	21.47%	28.91%
CA	21.41%	22.20%	29.62%
CO	20.43%	21.65%	28.91%
CT	14.71%	15.41%	19.23%
DE	14.99%	15.57%	19.58%
FL	17.92%	18.24%	22.93%
GA	16.58%	17.08%	21.41%
IA	15.83%	16.75%	21.42%
ID	17.79%	18.81%	25.02%
IL	15.49%	16.19%	20.59%
IN	15.32%	15.77%	20.02%
KS	18.44%	19.42%	25.42%
KY	15.46%	15.97%	20.26%
LA	16.47%	16.83%	21.31%
MA	14.71%	15.54%	19.29%
MD	15.29%	15.94%	20.16%
ME	14.98%	15.94%	20.15%

MI	14.12%	14.61%	18.60%
MN	14.93%	16.02%	20.53%
MO	16.38%	17.12%	21.84%
MS	16.26%	16.72%	21.06%
MT	15.90%	17.34%	23.03%
NC	16.91%	17.59%	22.50%
ND	15.20%	16.49%	21.50%
NE	17.56%	18.89%	24.64%
NH	14.38%	14.98%	19.13%
NJ	16.06%	16.78%	21.25%
NM	21.00%	21.86%	28.95%
NV	20.00%	20.98%	28.29%
NY	15.09%	15.89%	19.87%
OH	14.45%	14.86%	18.59%
OK	18.47%	19.41%	25.44%
OR	17.48%	18.29%	24.36%
PA	14.94%	15.65%	19.56%
RI	14.31%	14.97%	18.52%
SC	16.74%	17.31%	21.84%
SD	16.63%	17.98%	23.45%
TN	16.09%	16.69%	21.14%
TX	20.50%	21.03%	27.96%
UT	19.60%	20.52%	27.40%
VA	17.05%	17.88%	22.87%
VT	13.82%	14.31%	18.20%
WA	15.33%	16.06%	21.37%
WI	14.74%	15.49%	19.61%
WV	14.51%	14.88%	18.49%
WY	18.56%	19.91%	26.53%
Grand Total	**21.41%**	**22.20%**	**29.62%**

Count of Weather Stations in Each State			

Count of DC to AC Capacity Factor	Column Labels		
	0-Axis		1-Axis
Row Labels	15	Lat	Lat
AL	14	14	14
AR	18	18	18
AZ	18	18	18
CA	73	73	73
CO	25	25	25
CT	7	7	7
DE	2	2	2
FL	42	42	42
GA	19	19	19
IA	39	39	39
ID	13	13	13
IL	19	19	19
IN	10	10	10
KS	23	23	23
KY	12	12	12
LA	17	17	17
MA	15	15	15
MD	5	5	5
ME	15	15	15
MI	31	31	31
MN	54	54	54
MO	17	17	17
MS	13	13	13
MT	16	16	16
NC	22	22	22
ND	10	10	10
NE	26	26	26
NH	8	8	8
NJ	9	9	9
NM	17	17	17
NV	10	10	10
NY	24	24	24
OH	13	13	13

OK	**15**	**15**	**15**
OR	**19**	**19**	**19**
PA	**21**	**21**	**21**
RI	**3**	**3**	**3**
SC	**10**	**10**	**10**
SD	**11**	**11**	**11**
TN	**8**	**8**	**8**
TX	**61**	**61**	**61**
UT	**13**	**13**	**13**
VA	**31**	**31**	**31**
VT	**4**	**4**	**4**
WA	**29**	**29**	**29**
WI	**20**	**20**	**20**
WV	**11**	**11**	**11**
WY	**13**	**13**	**13**
Grand Total	**925**	**925**	**925**

APPENDIX E- Solar Procurement[179]

The following is a list of utility solar procurement programs and activities. SEIA has provided URLs to many of the solar procurement programs and activities within the tables below. These tables are followed by another table showing solar on the grid within the service territory of each utility, as well as a table that shows current CSP projects. Finally, details on specific utility solar procurement programs are also included.

[179] All solar procurement data taken from Solar Electric Power Association database 12.1.14

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Dover Electric Dept.	DE	Site Lease (Ground)	N/A	PV	N/A	N/A	N/A	http://www.renewableenergyworld.com/rea/news/article/2009/07/dover-delaware-plans-10-mw-solar-project
Palo Alto Utilities	CA	RFP	All Renewable	PV, CSP, CPV	20000 MWh	60000 MWh	9-Oct-13	https://www.cityofpaloalto.org/civicax/filebank/documents/39981
Public Service Electric & Gas Co. Long Island	NY	RFP	Solar Only	PV	2 MW	2 MW	9-Oct-13	https://www.psegliny.com/page.cfm/AboutUs/PressReleases/040214-solar
Ohio Edison (FirstEnergy)	OH	RFP	All Renewable	PV	N/A	6600 MWh	14-Oct-13	http://www.bizjournals.com/prnewswire/press_releases/2014/10/22/CL44642
The Illuminating Co (First Energy)	OH	RFP	All Renewable	PV	N/A	6600 MWh	14-Oct-13	http://www.bizjournals.com/prnewswire/press_release

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								s/2014/10/22/CL44642
Toledo Edison (FirstEnergy)	OH	RFP	All Renewable	PV	N/A	6600 MWh	14-Oct-13	http://www.bizjournals.com/prnewswire/press_releases/2014/10/22/CL44642
Tennessee Valley Authority	TN	RFP	Solar Only	PV	500 kW	N/A	7-Nov-13	http://www.tva.com/environment/epa_mitigation/pdf/Solicitation%20for%20Solar%20Aggregated%20Value%20Education%20Initiative.pdf
Southern Maryland Elec Co-op	MD	RFP	Solar Only	PV	2 MW	10 MW	1-Jul-13	http://www.smeco.com/news/11-09-23/SMECO_Plans_to_Build_Solar_Project.aspx
Pacific Power (PacifiCorp)	OR	RFP	All Renewable	PV	N/A	10 MW	31-May-13	https://www.pacificpower.net/env/bsre/cpf/eligibility.html

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Rocky Mtn Power (PacifiCorp)	UT	RFP	All Renewable	PV	N/A	10 MW	31-May-13	https://www.rockymountainpower.net/env/bsre/bscpf/eligibility.html
CPS Energy	TX	RFP	Solar Only	PV	400 MW	400 MW	7-Dec-11	http://www.ocisolarpower.com/news.html
United Illuminating	CT	RFP	All Renewable	PV, CSP, CPV	N/A	N/A	26-Jul-11	http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=12&cad=rja&uact=8&ved=0CCgQFjABOAo&url=http%3A%2F%2Fnuwnotes1.nu.com%2Fapps%2Fwhpwr%2Frfp.nsf%2F0%2FEE27CC26B410A19B85256F540081E92B%2F%24FILE%2FCCEO_RFP_Term_Sheet_2011.doc&ei=Y7p0VMHqPMmnyASg6oLICg&usg=AFQjCNGqk4

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								QL2WUWv7zbuPtuHbg32sSm7g
Conn. Light & Power (Northeast Utilities)	CT	RFP	All Renewable	PV, CSP, CPV	N/A	N/A	26-Jul-11	http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=12&cad=rja&uact=8&ved=0CCgQFjABOAo&url=http%3A%2F%2Fnuwnotes1.nu.com%2Fapps%2Fwhpwr%2Frfp.nsf%2F0%2FEE27CC26B410A19B85256F540081E92B%2F%24FILE%2FCCEO_RFP_Term_Sheet_2011.doc&ei=Y7p0VMHqPMmnyASg6oLICg&usg=AFQjCNGqk4QL2WUWv7zbuPtuHbg32sSm7g

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Arkansas Valley Electric Co-op	AR	RFP	All Renewable	PV, CSP, CPV	2 MW	N/A	14-Oct-10	*could not find anything*
Detroit Edison (DTE Energy)	MI	RFP	All Renewable	PV, CSP, CPV	1 MW	N/A	15-Feb-11	https://dteenergy.mediaroom.com/index.php?s=26817&item=72245
Detroit Edison (DTE Energy)	MI	RFP	Solar Only	PV	3 MW	3 MW	26-Apr-11	https://dteenergy.mediaroom.com/index.php?s=26817&item=72271
El Paso Electric	TX	RFP	All Source	PV, CSP, CPV	N/A	200 MW	19-Aug-11	http://greenenergymaine.com/job/el-paso-electric-seeks-proposals-its-peaking-capacity-needs
Georgia Power (Southern Co)	GA	RFP	Solar Only	PV	1 kW	100 kW	11-Jul-11	http://www.georestore.com/ProjectDetail.aspx?pid=570
Holy Cross Energy	CO	RFP	All Renewable	PV, CPV	N/A	10 MW	1-Feb-11	http://biomassconference.crowdvine.com/attachments/

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								0002/7215/Golis-Diana.pdf
Lincoln Electric System	NE	RFP	Solar Only	PV	5 kW	5 kW	21-Jul-11	http://apps3.eere.energy.gov/greenpower/financial/archives.shtml
Sierra Pacific Power Co	NV	RFP	All Renewable	PV, CSP, CPV	1000 MW	N/A	16-Dec-10	http://www.solarindustrymag.com/e107_plugins/content/content.php?content.6634
Pacific Gas & Electric	CA	RFP	All Renewable	PV, CSP, CPV	1 MW	N/A	15-Jun-11	
Penn Power (First Energy)	PA	RFP	Solar Only	PV	N/A	N/A	10-Feb-11	
PPL Electric Utilities	PA	RFP	Solar Only	PV, CSP, CPV	24000 MWh	24000 MWh	27-Jun-11	http://www.pennfuture.org/UserFiles/File/Energy/Solar_Policy_PUC_20100916.pdf
PPL Electric Utilities	PA	RFP	Solar Only	PV	27000 MWh	27000 MWh	11-Apr-11	http://teampa.com/2011/06/ppl-to-

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								purchase-solar-credits/
Rocky Mtn Power (PacifiCorp)	UT	RFP	All Renewable	PV, CPV	N/A	N/A	1-Jul-11	
Roseville Electric	CA	RFP	All Renewable	PV, CSP, CPV	N/A	N/A	26-Jul-11	
San Francisco PUC	CA	RFP	All Renewable	PV, CSP, CPV	N/A	N/A	6-Oct-10	
Southern California Edison	CA	RFP	All Renewable	PV, CSP, CPV	1 MW	N/A	27-Jun-11	
Arizona Public Service	AZ	RFP	Solar Only	PV	17 MW	17 MW	30-Nov-11	
Arizona Public Service	AZ	RFP	Solar Only	PV	14 MW	14 MW	30-Apr-12	
Salt River Project	AZ	RFP	Solar Only	PV	N/A	50 MW	15-Sep-11	
CPS Energy	TX	RFP	Solar Only	PV	N/A	50 MW	31-May-11	
Southern California Edison	CA	RFP	All Renewable	PV	N/A	N/A	11-Jul-11	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Pedernales Electric Co-op	TX	RFP	All Renewable	PV	N/A	30 MW	15-Jul-11	
Avista Utilities	WA	RFP	All Renewable	PV	N/A	35 MW	2-Mar-11	
South Mississippi El Pwr Assn	MS	RFP	All Renewable	PV	N/A	N/A	1-Jul-11	
Conn. Light & Power (Northeast Utilities)	CT	RFP	All Renewable	PV	100 kW	2000 kW	12-Jun-12	
PNM - New Mexico	NM	RFP	All Renewable	PV	N/A	150 MWh	10-Feb-12	
Duke Energy Indiana	IN	RFP	All Renewable	PV	N/A	400 MW	30-Mar-12	
Silicon Valley Power	CA	RFP	Solar Only	PV	N/A	15 MW	9-Jun-12	
Holy Cross Energy	CO	RFP	Solar Only	PV	100 kW	300 kW	4-Jun-12	
Denton Municipal Electric	TX	RFP	All Renewable	PV	10 MW	20 MW	21-Feb-12	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Pacific Power (PacifiCorp)	OR	RFP	Solar Only	PV	500 kW	5 MW	11-Jun-13	http://www.pacificorp.com/sup/rfps/rsolar2013.html
PNM - New Mexico	NM	RFP	All Renewable	PV, CSP, CPV	100 MWh	375000 MWh	31-Jan-13	http://www.solarindustrymag.com/e107_plugins/content/content.php?content.11636
Southern California Edison	CA	RFP	Solar Only	PV	500 kW	10 kW	2-Dec-13	http://www.pv-magazine.com/news/details/beitrag/southern-california-edison-launches-solicitation-for-mid-sized-behind-the-meter-solar-pv_100016765/#axzz3K6lZn8nl
Pennsylvania Electric Company	PA	RFP	Solar Only	PV	N/A	N/A	24-Oct-13	
Met-Ed (FirstEnergy)	PA	RFP	Solar Only	PV	N/A	N/A	24-Oct-13	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Pennsylvania Power Co	PA	RFP	Solar Only	PV	N/A	N/A	24-Oct-13	
Austin Energy	TX	RFP	Solar Only	PV	N/A	50 MW	3-Dec-13	
Southern California Edison	CA	RFP	All Source	PV	N/A	N/A	16-Dec-13	
Public Service Electric & Gas Co. Long Island	NY	RFP	All Source	PV	N/A	N/A	31-Mar-14	
People's Electric Cooperative	OK	RFP	Solar Only	PV	2 MW	15 MW	25-Nov-13	http://www.peoplesrfp.com/15MW/default.aspx
PNM - New Mexico	NM	RFP	All Renewable	PV, CSP, CPV	N/A	150000 MWh	10-Jan-14	
National Grid	MA	RFP	Solar Only	PV	N/A	20 MW	1-May-14	
Duke Energy Carolinas	NC	RFP	Solar Only	PV	5 MW	300 MW	28-Mar-14	http://www.pv-magazine.com/news/details/beitrag/duke-energy-issues-300-mw-solar-energy-

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								request-in-north-carolina_100014258/#axzz3K6lZn8nI
Georgia Power (Southern Co)	GA	RFP	Solar Only	PV, CSP, CPV, SWH	N/A	495 MW	30-Apr-14	
Southern California P A	CA	RFP	All Renewable	PV, CSP, CPV	N/A	N/A	31-Dec-14	
Lyndonville Village of	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Orleans Village of	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Village of Swanton	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Washington Electric Coop Inc	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Vermont Electric Cooperative, Inc.	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Jacksonville Village of	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Central Vermont PSC	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Barton Village, Inc	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Green Mountain Power	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Village of Ludlow	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Village of Morrisville	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Hyde Park Village of	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Village of Enosburg Falls	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Town of Readsboro	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Town of Stowe	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Village of Northfield	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
City of Burlington-Electric	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Town of Hardwick	VT	RFP	All Renewable	PV, CSP, CPV	10 kW	100 kW	9-May-14	
Xcel Energy - MN	MN	RFP	Solar Only	PV, CSP, CPV, SWH	5 MW	100 MW	20-Jun-14	
Northern States Power Co	MN	RFP	Solar Only	PV, CSP, CPV, SWH	5 MW	100 MW	20-Jun-14	
Black Hills Energy	CO	RFP	All Renewable	PV, CSP, CPV, SWH	N/A	60 MW	31-Jul-14	
Pacific Gas & Electric	CA	RFP	All Source	PV	N/A	N/A	31-Dec-13	
Xcel Energy - MN	MN	RFP	Solar Only	PV	N/A	150 MW	1-Jun-14	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Austin Energy	TX	RFP	Solar Only	PV	N/A	4 MW	29-Apr-14	
Arizona Public Service	AZ	RFP	Solar Only	PV	N/A	20 MW	28-Jul-14	http://www.pv-magazine.com/news/details/beitrag/arizona-public-service-unveils-plans-to-install-20-mw-of-solar-pv-on-customer-rooftops_100015891/#axzz3K6lZn8nI
United Illuminating	CT	RFP	All Source	PV	N/A	9 MW	14-Jul-14	http://www.solarindustrymag.com/e107_plugins/content/content.php?content.14225
Constellation NewEnergy, Inc	MD	RFP	Solar Only	PV	N/A	1 MW	18-Jul-14	http://www.chestertown.com/gov/pdf/RFPsolar.pdf
Southern California Edison	CA	RFP	All Renewable	PV, CSP,	N/A	N/A	31-Jan-14	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
				CPV, SWH				
Xcel Energy - CO	CO	RFP	Solar Only	PV	N/A	100 MW	20-Jun-14	http://www.renewableenergyworld.com/rea/blog/post/2014/04/northern-states-power-company-issues-100-mw-solar-rfp
NV Energy	NV	RFP	Solar Only	PV, CSP, CPV, SWH	N/A	20 MW	21-Mar-14	
Gainesville Regional Utilities	FL	RFP	Solar Only	PV	N/A	1 MW	31-Oct-10	
Maui Electric Co	HI	RFP	All Renewable	PV	200 MW	N/A	N/A	
Southern Maryland Elec Co-op	MD	RFP	Solar Only	PV	N/A	10 MW	N/A	http://www.smeco.coop/news/14-04-16/SMECO_Announces_Second_Solar_Project.aspx

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
La Plata Electric Assn	CO	RFP	Solar Only	PV	N/A	N/A	29-Jun-12	
Palo Alto Utilities	CA	RFP	Solar Only	PV	1 MW	3 MW	12-Aug-14	
Pacific Gas & Electric	CA	RFP	Solar Only	PV	N/A	21 MW	10-Jun-14	
El Paso Electric	TX	RFP	All Source	PV	N/A	N/A	28-Apr-13	
Plumas-Sierra REC	CA	RFP	Solar Only	PV	N/A	2 MW	31-Jul-14	
PEPCO	MD	RFP	Solar Only	PV	3 MW	N/A	5-Sep-14	http://www.montgomerycountymd.gov/DOT-Parking/Resources/Files/MCDOTSolarRFEP_FINAL.pdf
Baltimore Gas & Electric (Exelon)	MD	RFP	Solar Only	PV	3 MW	N/A	5-Sep-14	
Allegheny Energy Supply Co LLC	MD	RFP	Solar Only	PV	3 MW	N/A	5-Sep-14	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Washington Gas Energy Services	MD	RFP	Solar Only	PV	3 MW	N/A	5-Sep-14	
National Grid	RI	RFP	All Renewable	PV, CSP, CPV, SWH	N/A	90 MW	5-Aug-14	
Southwestern Public Service Company	NM	RFP	All Source	PV	N/A	2 MW	10-Sep-10	
Public Service Co of NH	NH	RFP	All Renewable	PV, SWH	N/A	100 kW	7-Jun-14	
Potomac Edison (FirstEnergy)	MD	RFP	All Source	PV, CSP, CPV	N/A	536 MW	8-Jun-15	
Baltimore Gas & Electric (Exelon)	MD	RFP	All Source	PV, CSP, CPV	N/A	N/A	N/A	
Baltimore Gas & Electric (Exelon)	MD	RFP	All Source	PV, CSP, CPV	N/A	2251 MW	8-Jun-15	
Delmarva Power (PEPCO)	MD	RFP	All Source	PV, CSP, CPV	N/A	330 MW	8-Jun-15	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
PEPCO	MD	RFP	All Renewable	PV, CSP, CPV	N/A	967 MW	8-Jun-15	
San Diego Gas & Electric	CA	RFP	All Source	PV, CSP, CPV	N/A	800 MW	5-Jan-15	
City of Burlington-Electric	VT	RFP	Solar Only	PV	N/A	N/A	6-Oct-14	
NV Energy	NV	RFP	All Renewable	PV, CSP, CPV	10 MW	100 MW	12-Nov-14	
Pennsylvania Electric Company	PA	RFP	Solar Only	PV, CSP, CPV, SWH	N/A	N/A	6-Nov-14	
Penn Power (First Energy)	PA	RFP	Solar Only	PV, CSP, CPV, SWH	N/A	N/A	6-Nov-14	
Met-Ed (FirstEnergy)	PA	RFP	Solar Only	PV, CSP, CPV, SWH	N/A	N/A	6-Nov-14	
Oncor	TX	RFP	All Renewable	PV, CSP, CPV	30 MWh	N/A	17-Dec-14	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
South Carolina Electric & Gas	SC	RFP	Solar Only	N/A	N/A	4 MW	3-Oct-14	https://www.sceg.com/about-us/newsroom/2014/08/21/sce-g-issues-request-for-proposals-to-supply-solar-energy-on-its-system
Puget Sound Energy	WA	RFP	All Source	N/A	N/A	N/A	1-Nov-11	
NorthWestern Energy	MT	RFP	All Renewable	N/A	N/A	45 MW	14-Jul-14	http://www.landsenergy.com/wp-content/uploads/2014/06/NorthWestern-2014-CREP-RFP.pdf
Indianapolis Power & Light	IN	RFP	All Source	N/A	550 MW	725 MW	10-Sep-12	http://www.reuters.com/article/2013/05/13/utilities-aes-coal-idUSL2N0DU1PH20130513
Seattle City Light	WA	RFP	All Renewable	N/A	N/A	150 MWh	15-Oct-12	http://powerlines.seattle.gov/2012/09/10

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								/seattle-city-light-seeks-proposals-on-renewable-energy/
San Diego Gas & Electric	CA	RFP	All Renewable	N/A	N/A	72 MW	27-Jun-14	
El Paso Electric	TX	RFP	Solar Only	N/A	80 MW	200 MW	8-Aug-11	
Arizona Public Service	AZ	RFP	Solar Only	N/A	N/A	10 MW	24-Jul-14	
Hawaiian Electric Co	HI	RFP	All Renewable	N/A	N/A	200 MW	29-Jul-13	
Pacific Gas & Electric	CA	RFP	Solar Only	N/A	N/A	N/A	27-Nov-13	
Conn. Light & Power (Northeast Utilities)	CT	RFP	All Source	N/A	N/A	N/A	31-Dec-13	
Green Mountain Power	VT	RFP	Solar Only	N/A	N/A	N/A	6-Dec-13	
Kaua'i Island Utility Co-op	HI	RFP	All Renewable	N/A	N/A	N/A	18-Apr-14	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Palo Alto Utilities	CA	RFP	Solar Only	N/A	1 MW	3 MW	12-Aug-14	
San Diego Gas & Electric	CA	RFP	All Renewable	N/A	20 MW	100 MW	29-Jan-14	http://www.sdge.com/renewable-portfolio-standard-rfo-december-2013
Xcel Energy - CO	CO	RFP	All Renewable	N/A	N/A	2 MW	3-Sep-14	
Austin Energy	TX	RFP	All Renewable	N/A	N/A	4 MW	14-May-14	http://austinenergy.com/wps/wcm/connect/e275cee1-32d8-4f8b-b36f-5d9d9c3927e7/CommunitySolarRFPfinal-rev05072014.pdf?MOD=AJPERES
Hawaiian Electric Co	HI	RFP	All Renewable	N/A	60 MW	200 MW	21-Jul-14	http://cleantechnica.com/2014/05/14/200-mw-energy-storage-proposed-hawaii/

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
NSTAR (Northeast Utilities)	MA	RFP	Solar Only	N/A	5 MW	N/A	28-Jun-13	
Los Angeles DWP	CA	RFP	All Renewable	N/A	N/A	N/A	11-Nov-11	
Baltimore Gas & Electric (Exelon)	MD	RFP	All Source	N/A	1831 MW	N/A	31-Oct-13	
Tennessee Valley Authority	TN	RFP	All Renewable	N/A	N/A	N/A	13-Mar-15	
Sacramento Municipal Utility Dist.	CA	RFP	Solar Only	N/A	N/A	200 MW	1-Jul-13	
Alliant Energy	WI	RFP	All Renewable	N/A	N/A	600 MW	25-Jul-14	
Inland Power & Light	WA	Net Metering	All Renewable	N/A	N/A	N/A	N/A	
Wyandotte Municipal Serv Comm	MI	Net Metering	All Renewable	N/A	N/A	N/A	N/A	
Central Virginia Electric Coop	VA	Net Metering	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
CoServ Electric	TX	Net Metering	All Source	PV, CPV, SWH	N/A	N/A	N/A	
Washington Electric Coop Inc	VT	Net Metering	N/A	N/A	N/A	N/A	N/A	
Sacramento Municipal Utility Dist.	CA	Net Metering	N/A	N/A	N/A	N/A	N/A	
Central Electric Coop Inc	OR	Net Metering	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Sulphur Springs Valley EC	AZ	Net Metering	All Renewable	N/A	N/A	N/A	N/A	
Delta Montrose Electric Assn	CO	Net Metering	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Delta Montrose Electric Assn	CO	Net Metering	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Inland Power & Light	WA	Net Metering	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Truckee Donner PUD	CA	Net Metering	All Renewable	PV, CSP, CPV	N/A	1000 kW	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
St. George Energy Svcs. Dept.	UT	Net Metering	All Renewable	PV, CSP, CPV, SWH	N/A	N/A	N/A	
St. George Energy Svcs. Dept.	UT	Net Metering	Solar Only	PV	N/A	250 kW	N/A	
La Plata Electric Assn	CO	Net Metering	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Consumers Power	OR	Net Metering	All Renewable	PV, SWH	N/A	N/A	N/A	
Imperial Irrigation District	CA	Net Metering	All Renewable	PV	N/A	N/A	N/A	
Lompoc Electric Utility	CA	Net Metering	Solar Only	PV	N/A	N/A	N/A	
Silicon Valley Power	CA	Net Metering	All Renewable	PV	N/A	1 MW	N/A	
Sulphur Springs Valley EC	AZ	Net Metering	N/A	PV	N/A	N/A	N/A	
United Power	CO	Net Metering	N/A	PV	N/A	N/A	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Pacific Power (PacifiCorp)	OR	Net Metering	N/A	PV	N/A	N/A	N/A	
Sulphur Springs Valley EC	AZ	Net Metering	N/A	PV	N/A	N/A	N/A	
West Penn Power (FirstEnergy)	PA	Net Metering	N/A	PV	N/A	N/A	N/A	
Ameren Missouri	MO	Net Metering	N/A	PV	N/A	N/A	N/A	
Trico Electric Co-op	AZ	Net Metering	N/A	PV	N/A	N/A	N/A	
Central Electric Coop Inc	OR	Net Metering	N/A	PV	N/A	N/A	N/A	
Columbia Water & Light	MO	Net Metering	N/A	PV	N/A	N/A	N/A	
NV Energy	NV	Net Metering	N/A	PV	N/A	1 MW	N/A	
Sierra Pacific Power Co	NV	Net Metering	N/A	PV	N/A	1 MW	N/A	
Pacific Power (PacifiCorp)	WA	Net Metering	N/A	PV	N/A	N/A	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Pacific Gas & Electric	CA	Net Metering	N/A	PV	N/A	N/A	N/A	
Snohomish County PUD	WA	Net Metering	N/A	PV	N/A	N/A	N/A	
Southern Indiana Gas & Elec Co	IN	Net Metering	N/A	PV	N/A	N/A	N/A	
Rocky Mtn Power (PacifiCorp)	WY	Net Metering	N/A	PV	N/A	N/A	N/A	
Puget Sound Energy	WA	Net Metering	N/A	PV	N/A	N/A	N/A	
Western Massachusetts Elec Co	MA	Net Metering	N/A	PV	N/A	N/A	N/A	
Western Massachusetts Elec Co	MA	Interconnection	N/A	PV	N/A	N/A	N/A	
Puget Sound Energy	WA	Interconnection	N/A	PV	N/A	N/A	N/A	
Seattle City Light	WA	Interconnection	N/A	PV	N/A	N/A	N/A	
Rocky Mtn Power (PacifiCorp)	WY	Interconnection	N/A	PV	N/A	N/A	N/A	
Pacific Gas & Electric	CA	Interconnection	N/A	PV	N/A	N/A	N/A	http://www.pge.com/en/m

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								ybusiness/services/nonpge/generateownpower/netenergymetering/standardnem/index.page
[Pacific Power (PacifiCorp)]()	WA	Interconnection	N/A	PV	N/A	N/A	N/A	https://www.pacificpower.net/content/dam/pacificorp/doc/Transmission/Transmission_Services/Generation_Interconnection/PC_Interconnection_LrgCust_Brochure.pdf
[Sierra Pacific Power Co]()	NV	Interconnection	N/A	PV	N/A	1 MW	N/A	
[NV Energy]()	NV	Interconnection	N/A	PV	N/A	1 MW	N/A	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=NV09R&re=0&ee=0
[Columbia Water & Light]()	MO	Interconnection	N/A	PV	N/A	N/A	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Ellensburg Electric Utility	WA	Interconnection	N/A	PV	N/A	N/A	N/A	
Florida Power & Light	FL	Interconnection	N/A	PV	N/A	N/A	N/A	
Consumers Energy	MI	Interconnection	N/A	PV	N/A	N/A	N/A	
Entergy New Orleans	LA	Interconnection	N/A	PV	N/A	N/A	N/A	
Dover Electric Dept.	DE	Interconnection	N/A	PV	N/A	N/A	N/A	
United Power	CO	Interconnection	N/A	PV	N/A	N/A	N/A	
Silicon Valley Power	CA	Interconnection	All Renewable	PV	N/A	1 MW	N/A	
Sulphur Springs Valley EC	AZ	Interconnection	Solar Only	PV	N/A	N/A	N/A	
Lompoc Electric Utility	CA	Interconnection	Solar Only	PV	N/A	N/A	N/A	
Wyandotte Municipal Serv Comm	MI	Interconnection	Solar Only	PV, CPV, SWH	N/A	N/A	N/A	http://www.wyan.org/Energy-Programs/PDF/ExpeditedGe

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								neratorInterconnection2012.aspx
Imperial Irrigation District	CA	Interconnection	All Renewable	PV	N/A	N/A	N/A	
Southern Maryland Elec Co-op	MD	Interconnection	Solar Only	PV	N/A	10 MW	N/A	
Consumers Power	OR	Interconnection	All Renewable	PV, SWH	N/A	N/A	N/A	
La Plata Electric Assn	CO	Interconnection	All Source	PV, CPV, SWH	N/A	N/A	N/A	
Truckee Donner PUD	CA	Interconnection	Solar Only	PV	N/A	1000 kW	N/A	
Verendrye Electric Co-op	ND	Interconnection	All Source	PV, SWH	N/A	N/A	N/A	
Hickman-Fulton Counties RECC	KY	Interconnection	All Source	PV, CPV, SWH	N/A	N/A	N/A	
Town of Middletown	DE	Interconnection	All Renewable	PV	N/A	N/A	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Rocky Mtn Power (PacifiCorp)	UT	Interconnection	N/A	PV, CPV	N/A	N/A	N/A	
St. George Energy Svcs. Dept.	UT	Interconnection	All Renewable	PV, CSP, CPV, SWH	N/A	N/A	N/A	
Inland Power & Light	WA	Interconnection	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Inland Power & Light	WA	Interconnection	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Sulphur Springs Valley EC	AZ	Interconnection	All Renewable	N/A	N/A	N/A	N/A	
Central Electric Coop Inc	OR	Interconnection	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Florida Keys Electric Co-op	FL	Interconnection	Solar Only	PV, CPV, SWH	N/A	N/A	N/A	
Florida Keys Electric Co-op	FL	Interconnection	Solar Only	PV, CPV, SWH	N/A	N/A	N/A	
Florida Keys Electric Co-op	FL	Interconnection	Solar Only	PV, CPV, SWH	N/A	N/A	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Central Virginia Electric Coop	VA	Interconnection	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Fort Loudoun Electric Co-op	TN	Interconnection	All Renewable	PV, SWH	N/A	N/A	N/A	
Fort Loudoun Electric Co-op	TN	Interconnection	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Peninsula Light Co	WA	Interconnection	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Sacramento Municipal Utility Dist.	CA	Interconnection	All Renewable	N/A	N/A	N/A	N/A	
CoServ Electric	TX	Interconnection	All Source	PV, CPV, SWH	N/A	N/A	N/A	
Imperial Irrigation District	CA	Interconnection	All Renewable	N/A	N/A	N/A	N/A	
Inland Power & Light	WA	Interconnection	All Renewable	N/A	N/A	N/A	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Kit Carson Electric Co-op	NM	Interconnection	All Renewable	N/A	N/A	10 kW	N/A	
Georgia Power (Southern Co)	GA	Interconnection	All Renewable	N/A	N/A	25 kW	N/A	
Southern Maryland Elec Co-op	MD	Interconnection	N/A	PV, CSP, CPV, SWH	N/A	N/A	N/A	
Sacramento Municipal Utility Dist.	CA	Energy Purchases (PPA)	All Renewable	N/A	N/A	N/A	N/A	
Duke Energy Carolinas	NC	Energy Purchases (PPA)	Solar Only	PV	N/A	52 MW	N/A	http://www.duke-energy.com/news/releases/2014030601.asp
Rocky Mtn Power (PacifiCorp)	UT	Energy Purchases (PPA)	N/A	PV, CPV	N/A	N/A	N/A	
La Plata Electric Assn	CO	Energy Purchases (PPA)	Solar Only	PV, CPV, SWH	N/A	N/A	N/A	http://www.easycleanenergy.com/ShowNews.aspx?ID=86ac9b38-e7a2-4402-a2d4-

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								52e187d5b612
Southern Maryland Elec Co-op	MD	Energy Purchases (PPA)	Solar Only	PV	N/A	10 MW	N/A	
Anaheim Public Utilities	CA	Energy Purchases (PPA)	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Pacific Gas & Electric	CA	Energy Purchases (PPA)	N/A	PV	N/A	N/A	N/A	
Southern California Edison	CA	Energy Purchases (PPA)	N/A	PV	N/A	N/A	N/A	
CPS Energy	TX	Energy Purchases (PPA)	N/A	PV	N/A	N/A	N/A	
NV Energy	NV	Energy Purchases (PPA)	N/A	PV	20 MW	20 MW	N/A	
Hawaiian Electric Co	HI	Energy Purchases (PPA)	Solar Only	PV	20 MW	20 MW	N/A	http://www.hawaiianelectric.com/heco/_hidden_Hidden/CorpComm/Hawaiian-Electric-and-Ka-La-Nui-Solar-sign-

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
								agreement-for-new-project?cpsextcurrchannel=1
El Paso Electric	TX	Energy Purchases (PPA)	N/A	PV	10 MW	10 MW	N/A	http://investor.firstsolar.com/releasedetail.cfm?releaseid=769487
Austin Energy	TX	Energy Purchases (PPA)	N/A	PV	N/A	N/A	N/A	
Georgia Power (Southern Co)	GA	Energy Purchases (PPA)	N/A	PV	N/A	N/A	N/A	
North Carolina Eastern M P A	NC	Energy Purchases (PPA)	N/A	PV	N/A	N/A	N/A	
Pacific Gas & Electric	CA	Energy Purchases (PPA)	N/A	PV	N/A	N/A	N/A	
Southern California Edison	CA	Energy Purchases (PPA)	N/A	PV, CSP, CPV	N/A	N/A	N/A	
Pacific Gas & Electric	CA	Energy Purchases (PPA)	N/A	PV	N/A	N/A	N/A	

Utility	State	Procurement Topic	Type	Technologies	Min. Size	Max. Size	Deadline	Program Details
Palo Alto Utilities	CA	Energy Purchases (FIT)	N/A	PV	N/A	N/A	N/A	
Gainesville Regional Utilities	FL	Energy Purchases (FIT)	N/A	PV	N/A	N/A	N/A	
Public Service Electric & Gas Co. Long Island	NY	Energy Purchases (FIT)	All Renewable	PV	N/A	N/A	N/A	
Southern California Edison	CA	Energy Purchases (FIT)	All Renewable	PV, CSP, CPV, SWH	N/A	N/A	N/A	
Anaheim Public Utilities	CA	Energy Purchases (FIT)	All Renewable	PV, CPV, SWH	N/A	N/A	N/A	
Truckee Donner PUD	CA	Energy Purchases (FIT)	All Renewable	PV, CSP, CPV	N/A	1000 kW	N/A	
Sacramento Municipal Utility Dist.	CA	Energy Purchases (FIT)	N/A	N/A	N/A	N/A	N/A	
Public Service Electric & Gas Co. Long Island	NY	Energy Purchases (FIT)	All Renewable	N/A	100 kW	2000 kW	N/A	

Utility	Unregulated Activities
Alabama Power (Southern Co)	http://www.southerncompany.com/about-us/our-business/southern-power/home.cshtml
Pacific Power (PacifiCorp)	http://www.berkshirehathawayenergyco.com/our-businesses/midamerican-renewables
SDG&E	http://www.semprausgp.com/
Southern California Edison	http://www.socoreenergy.com/
Gulf Power (Southern Co)	http://www.southerncompany.com/about-us/our-business/southern-power/home.cshtml
Florida Power & Light	http://www.nexteraenergyresources.com/home/index.shtml
Duke Energy Florida	http://www.duke-energy.com/commercial-renewables/default.asp
Georgia Power (Southern Co)	http://www.southerncompany.com/about-us/our-business/southern-power/home.cshtml
Rocky Mountain Power (Pacificorp)	http://www.berkshirehathawayenergyco.com/our-businesses/midamerican-renewables
ComEd(Exelon)	http://www.constellation.com/pages/default.aspx
Duke Energy Kentucky	http://www.duke-energy.com/commercial-renewables/default.asp
Baltimore Gas & Electric (Exelon)	http://www.constellation.com/pages/default.aspx
Mississippi Power (Southern Co)	http://www.southerncompany.com/about-us/our-business/southern-power/home.cshtml
Sierra Pacific Power Co	http://www.berkshirehathawayenergyco.com/our-businesses/midamerican-renewables
NV Energy	http://www.berkshirehathawayenergyco.com/our-businesses/midamerican-renewables

Utility	Unregulated Activities
PSEG	https://pseg.com/family/holdings/global/solar_source/index.jsp
Con Edison	http://www.conedsolutions.com/About.aspx
Orange & Rockland Utilities (Con Ed)	http://www.conedsolutions.com/About.aspx
Rockland Electric Co	http://www.conedsolutions.com/About.aspx
Duke Energy Carolinas	http://www.duke-energy.com/commercial-renewables/default.asp
Duke Energy Progress	http://www.duke-energy.com/commercial-renewables/default.asp
Duke Energy Ohio	http://www.duke-energy.com/commercial-renewables/default.asp
Pacific Power (PacifiCorp)	http://www.berkshirehathawayenergyco.com/our-businesses/midamerican-renewables
Pike County Light & Power (Con Ed	http://www.conedsolutions.com/About.aspx
PECO (Exelon)	http://www.constellation.com/pages/default.aspx
Rocky Mountain Power (Pacificorp)	http://www.berkshirehathawayenergyco.com/our-businesses/midamerican-renewables
Pepco Energy Services	No Url/Info
Pacific Power (PacifiCorp)	http://www.berkshirehathawayenergyco.com/our-businesses/midamerican-renewables

Utility	Property Leasing
Arizona Public Service	http://www.aps.com/en/residential/accountservices/apsfyi/Pages/luke-air-force-base-and-aps-partner-on-new-solar-facility.aspx
San Diego Gas & Electric	http://www.sdge.com/environment/sustainable-communities-overview
Miami Electric Co	http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=bc759f5b0e9f0210VgnVCM1000005c011bacRCRD&vgnextfmt=default&cpsextcurrchannel=1
Hawaii Electric Light Co	http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=bc759f5b0e9f0210VgnVCM1000005c011bacRCRD&vgnextfmt=default&cpsextcurrchannel=1
Detroit Edison (DTE Energy)	https://www2.dteenergy.com/wps/portal/dte/aboutus/environment/details/Renewable%20Energy/Solar%20Energy/!ut/p/b1/hZLZbqNAEEW_JR_g0CxN40eWNgZDsxPgBWEbE7PEELBZvn6c0USazChOvbV0TpWqblMJFVHJW3Y7F9lwvrxl9cc74VNWMEgIA8vx3ZADGpKgRwQTCJC5A_EdAN-UCL76hkbDDx_Ius7TANB__AfAo_kO-vQt0fW4DwAADDQ3VOztTmBVE_3kv1CRH7OSctFGLIZp6-aWn10ZIHFEKEgXX2Vm3OhdjIfukm5v5OA4ZWrO1XzIQOQFdentrNZ6y4SgG69ljrR42I1m3dpemiDNPDiVi5tsvnS5XeT7kMmdBb_zxVskGUajyivZnuxwEeNYsBFzrpdbfpY6S2WlLFPXDgxR57AWX0HHPLSK8YJ2oJ3U5TqN6RASN_n3fv8v-EN-OpWc983zeGiewTOANESARYhBkGYADe_nSX53eBTww4gF_hP4PiKyvTQ5Fd8x9Fcfk98AjegK5v0AqDJP-VQEuNQr51ZbqsUtwQxMXC394rD0PtSIH_nExzRZyzRRvJHGtEGUeOz3MjCNHTDJyT6GbiCJourrL9rX1RHPMCwLOIEBEME1S4VlzCOl10YF379FMKhNP_X

Utility	Property Leasing
	d1i3FsysT_kCTjZ57FeunJe06bjCax2Zl3eKpTpcMc8GAwVzVuBv2pOZnwa1K9xrLZMP6W1d0tkTU6_ebLLFT0lQN1-70dF9ds8tpsl8PUYgj2inhop8vp4Jbi6vAH9xXZt2P12WsjqDBYhJtjhZbSYKfzqk9WZ12cuJ-jvYynq8KEwJ1luVtVPiF3ZFjebJhtnLmefWqOiukwz5fxOKJapsgCG4G1PFJiRbx6Re8scA8/dl4/d5/L2dBISEvZ0FBIS9nQSEh/
Hawaiian Electric Co	http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=bc759f5b0e9f0210VgnVCM1000005c011bacRCRD&vgnextfmt=default&cpsextcurrchannel=1
Public Service Elec & Gas	https://www.pseg.com/family/pseandg/solar4all/index.jsp
Duke Energy Carolinas	https://www.duke-energy.com/north-carolina/renewable-energy/nc-solar-distributed-generation-program.asp
Dominion VA	https://www.dom.com/

Utility	Solar Rates
Sacramento Municipal Utility Dist.	https://www.smud.org/en/residential/environment/solar-for-your-home/solarshares/
Salt River Project	http://www.srpnet.com/menu/solar/SRPcommunitysolar.aspx
Tucson Electric Power (UNS Energy)	https://www.tep.com/renewable/home/bright/
Arizona Public Service	http://www.aps.com/en/communityandenvironment/environment/solarinitiatives/Pages/home.aspx

Utility	Solar Rates
Los Angeles DWP	https://www.ladwp.com/ladwp/faces/ladwp/partners/p-gogreen/p-gg-localrenewableenergyprogram;jsessionid=cpX2J0yDYGfy04BzC1tp17v6wyQ2p2lKqx55mGYn3VYJghhQH7LC!-408981786?_afrWindowId=null&_afrLoop=386269216634456&_afrWindowMode=0&_adf.ctrl-state=7m84b1ko4_17
Palo Alto Utilities	http://www.cityofpaloalto.org/gov/depts/utl/business/sustainability/clean.asp
United Power	http://www.unitedpower.com/mainNav/greenPower/solPartners.aspx
Holy Cross Energy	http://apps3.eere.energy.gov/greenpower/news/news_template.shtml?id=1564
Fort Collins Utilities	http://www.fcgov.com/utilities/residential/conserve/renewables
Lee County Electric Co-op, INC	https://www.lcec.net/energy-efficiency/net-metering-program
Gainesville Regional Utilities	https://www.gru.com/TabID/3824/Default.aspx
Orlando Utilities Commission	http://www.ouc.com/environment-community/solar/community-solar
Maui Electric Co	http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=0b0a8618ce4f7210VgnVCM1000005c011bacRCRD&vgnextfmt=default&cpsextcurrchannel=1
Hawaii Electric Light Co	http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=0b0a8618ce4f7210VgnVCM1000005c011bacRCRD&vgnextfmt=default&cpsextcurrchannel=1

Utility	Solar Rates
Hawaiian Electric Co	http://www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=0b0a8618ce4f7210VgnVCM1000005c011bacRCRD&vgnextfmt=default&cpsextcurrchannel=1
Indianapolis Power & Light	http://www.iplpower.com/uploadedFiles/iplpowercom/Business/Programs_and_Services/Rate%20REP-Apr%2010.pdf
Nstar Community Power	http://www.easycleanenergy.com/communitysolarprojects.aspx
National Grid	http://www.easycleanenergy.com/communitysolarprojects.aspx
Consumers Energy	http://www.consumersenergy.com/content.aspx?id=4844
DTE Energy	https://www2.dteenergy.com/wps/portal/dte/aboutus/environment/details/Renewable%20Energy/Solar%20Energy/!ut/p/b1/hZLZbqNAEEW_JR_g0CxN40eWNgZDsxPgBWEbE7PEELBZvn6c0USazChOvbV0TpWqblMJFVHJW3Y7F9lwvrxl9cc74VNWMEgIA8vx3ZADGpKgRwQTCJC5A_EdAN-UCL76hkbDDx_Ius7TANB__AfAo_kO-vQt0fW4DwAADDQ3VOztTmBVE_3kv1CRH7OSctFGLIZp6-aWn10ZIHFEKEgXX2Vm3OhdjIfukm5v5OA4ZWrO1XzIQOQFdentrNZ6y4SgG69ljrR42I1m3dpemiDNPDiVi5tsvnS5XeT7kMmdBb_zxVskGUajyivZnuxwEeNYsBFzrpdbfpY6S2WlLFPXDgxR57AWX0HHPLSK8YJ2oJ3U5TqN6RASN_n3fv8v-EN-OpWc983zeGiewTOANESARYhBkGYADe_nSX53eBTww4gF_hP4PiKyvTQ5Fd8x9Fcfk98AjegK5v0AqDJP-VQEuNQr51ZbqsUtwQxMXC394rD0PtSIH_nExzRZyzRRvJHGtEGUeOz3MjCNHTDJyT6GbiCJourrL9rX1RHPMCwLOIEBEME1S4VlzCOl10YF379FMKhNP_Xd1i3FsysT_kCTjZ57FeunJe06bjCax2Zl3eKpTpcMc8GAwVzVuBv2p

Utility	Solar Rates
	OZnwa1K9xrLZMP6W1d0tkTU6_ebLLFT0lQN1-70dF9ds8tpsl8PUYgj2inhop8vp4Jbi6vAH9xXZt2P12WsjqDBYhJtjhZbSYKfzqk9WZ12cuJ-jvYynq8KEwJ1luVtVPiF3ZFjebJhtnLmefWqOiukwz5fxOKJapsgCG4G1PFJiRbx6Re8scA8/dl4/d5/L2dBISEvZ0FBIS9nQSEh/
TVA	http://www.tva.com/greenpowerswitch/providers/
Austin Energy	http://austinenergy.com/wps/wcm/connect/c6c8ad20-ee8f-4d89-be36-2d6f7433edbd/ResidentialSolar.pdf?MOD=AJPERES
CPS Energy	http://www.solarsanantonio.org/wp-content/uploads/2010/07/SolartricityFAQsFinalv4-12-2010.pdf
Dominion VA	https://www.dom.com/
Wisconsin Electric Power Co	http://www.we-energies.com/business/altenergy/rateschedule_cgs-pv.pdf
Madison Gas & Electric	http://www.mge.com/customer-service/home/elec-rates-res/clean-power.htm

Utility	Utility Ownership
Arizona Public Service	No URL; PucDocket #: E-01345A-10-0166, E-01345A-11-0264
Tuscon Electric Power (UNS Energy	https://www.tep.com/pages/SolarStats/SolarTech.html
San Diego Gas & Electric	http://www.sdge.com/node/710
Florida Power & Light	http://www.fpl.com/environment/solar/projects.shtml

Utility	Utility Ownership
Trico Electric Co-op	http://www.trico.coop/
PG&E	http://www.pge.com/en/b2b/energysupply/wholesaleelectricsuppliersolicitation/PVRFO2012/index.page
United Power	http://www.unitedpower.com/mainNav/greenPower/solPartners.aspx
Delta Montrose Electric Assn	http://www.dmea.com/index.php?option=com_content&view=article&id=156&Itemid=101
Grand Valley Rural Power Line	http://www.gvp.org/content/solar-farm
Newark Electric Dept.	http://cityofnewarkde.us/index.aspx?nid=900
Florida Keys Electric Co-op	http://www.fkec.com/Green/simplesolar.cfm
Coastal EMC	http://www.coastalemc.com/CoastalElectricRenewables.aspx
Georgia Power (Southern Co)	http://www.georgiapower.com/about-energy/energy-sources/solar/solar-projects/3x30.cshtml
Hawaiian Electric Co	http://www.marketwatch.com/story/hawaiian-electric-requests-approval-to-move-forward-with-15-megawatt-solar-energy-project-2013-10-24?reflink=MW_news_stmp
Kaua"I Island Utility Co-op	http://website.kiuc.coop/content/solar
Farmers Electric Co-op	https://sites.google.com/site/feckalona/services/documents/pdf-files/flyer500-c.pdf.pdf?attredirects=1
Southern Maryland Electric Co-op	No Url: Southern Maryland Electric Cooperative's (SMECO) 5.5 MW solar project is located on 47 acres of utility-owned land. The solar farm was developed to help comply with Maryland RPS, which requires RECs to be generated within Maryland beginning in 2012. SMECO's solar farm will supply all of the utility's REC obligations for 2013.

Utility	Utility Ownership
Nantucket Electric Co	No Url: National Grid companies, Massachusetts Electric Company and Nantucket Electric Company propose to build own and operate 5 MW of PV on 5 different utility-owned properties. Most of the locations are underutilized, former manufactured gas plants (MGP). The five individual projects will range in size from .62 MW to 1.3 MW and will total 5 MW. National Grid will solicit competitive bids for construction. The development of these facilities will have no impact on retail choice and the costs and benefits will be spread across all customers.
National Grid	National Grid companies, Massachusetts Electric Company and Nantucket Electric Company propose to build own and operate 5 MW of PV on 5 different utility-owned properties. Most of the locations are underutilized, former manufactured gas plants (MGP). The five individual projects will range in size from .62 No Url: MW to 1.3 MW and will total 5 MW. National Grid will solicit competitive bids for construction. The development of these facilities will have no impact on retail choice and the costs and benefits will be spread across all customers.
Western Massachusetts Electric	https://www.wmeco.com/energywise/largescalesolar.aspx
DTE Energy	https://www2.dteenergy.com/wps/portal/dte/aboutus/environment/details/Renewable%20Energy/Solar%20Energy/!ut/p/b1/hZLZbqNAEEW_JR_g0CxN40eWNgZDsxPgBWEbE7PEELBZvn6c0USazChOvbV0TpWqblMJFVHJW3Y7F9lwvrxl9cc74VNWMEgIA8vx3ZADGpKgRwQTCJC5A_EdAN-UCL76hkbDDx_Ius7TANB__AfAo_kO-vQt0fW4DwAADDQ3VOztTmBVE_3kv1CRH7OSctFGLIZp6-aWn10ZIHFEKEgXX2Vm3OhdjIfukm5v5OA4ZWrO1XzIQOQFdentrNZ6y4SgG69ljrR42I1m3dpemiDNPDiVi5tsvnS5XeT7kMmdBb_zxVskGUajyivZnuxwEeNYsBFzrpdbfpY6S2WlLFPXDgxR57AWX0HHPLSK8YJ2oJ3U5TqN6RASN_n3fv8v-EN-OpWc983zeGiewTOANESARYhBkGYADe_nSX53eBTww4gF_hP4PiKyvTQ5Fd8x9Fcfk98AjegK5v0AqDJP-

Utility	Utility Ownership
	VQEuNQr51ZbqsUtwQxMXC394rD0PtSIH_nExzRZyzRRvJHGtEGUeOz3MjCNHTDJyT6GbiCJourrL9rX1RHPMCwLOIEBEME1S4VlzCOl10YF379FMKhNP_Xd1i3FsysT_kCTjZ57FeunJe06bjCax2Zl3eKpTpcMc8GAwVzVuBv2pOZnwa1K9xrLZMP6W1d0tkTU6_ebLLFT0lQN1-70dF9ds8tpsl8PUYgj2inhop8vp4Jbi6vAH9xXZt2P12WsjqDBYhJtjhZbSYKfzqk9WZ12cuJ-jvYynq8KEwJ1luVtVPiF3ZFjebJhtnLmefWqOiukwz5fxOKJapsgCG4G1PFJiRbx6Re8scA8/dl4/d5/L2dBISEvZ0FBIS9nQSEh/
Lake Region Electric Co-op	http://www.lrec.coop/solar
Public Service Electric & Gas	https://www.pseg.com/family/pseandg/solar4all/index.jsp
PNM New Mexico	No Url: PNM issued an RFP for Customer-Sited Utility-Owned (CSUO) PV installations in August 2009 with responses due in September 2009. The New Mexico Public Regulation Commission denied approval for the program in August 2010 due to program costs. The purpose of the CSUO program was to help PNM meet New Mexico RPS. Only systems between 3 kW and 4 MW were eligible. Projects where material cost and workforce were based in New Mexico were favored, in order to assist the New Mexico economy. Once projects were completed, ownership would be transferred to PNM.
Con Edison	No Url: ConEd's Solar Energy Pilot Program was developed to spur the development of 12 MW of PV in 18 months, better understand the grid impacts of distributed generation, integrate with Smart Grid and wholesale capacity markets, test market mechanisms, engage customers and stakeholders, and reduce greenhouse gases. The petition was initially filed with NYPSC February 27, 2009 with a clarification March 11, 2009. The program would initially cost $20-25 million, with $3 million per year ongoing. There are three main program segments. First, installing

Utility	Utility Ownership
	customer-owned solar located on customer property, which would target 2 day-peaking networks and 3-5 feeders. The second component is utility-owned solar on utility property, seeking to value of benefits to offset program costs. The third aspect is third-party-owned solar purchased via PPAs. This aspect would examine transmission or distribution-side resources. The utility would take the energy, capacity, and renewable attributes from this program.
Duke Energy Carolinas	https://www.duke-energy.com/north-carolina/renewable-energy/nc-solar-distributed-generation-program.asp
Ashland Electric Dept.	http://www.ashland.or.us/Page.asp?NavID=14017
Portland General Electric	https://www.portlandgeneral.com/community_environment/initiatives/renewable_energy/solar_power.aspx
Duck River EMC	http://www.dremc.com/community/solar-farm/
Dixie Escalante REA	http://www.sgsunsmart.com/index.htm
St. George Energy Service Dept	http://www.sgsunsmart.com/index.htm
Dominion Va	www.dom.com
Seattle City Light	http://www.seattle.gov/light/solarenergy/commsolar.asp
Ellensburg Electric Utility	http://www.ci.ellensburg.wa.us/index.aspx?NID=310
EAU Claire Electric Co-op	No Url: Eau Claire is planning to offer its members the option to buy one or more solar panels from a roughly 1 MW project. Panels are expected to cost between $625 and $750 each. The project still requires approval of the co-op board of directors, which is not expected to happen until 2015.

The below examples demonstrate solar on the grid within the service territory of each utility, classified by utility type: investor owned utility (IOU), municipal utility or “muni”, and cooperative, or “co-op”. An investor-owned utility (IOU) is operated by a public corporation whose shares are owned by investors. A municipal utility ('muni') is owned and operated, in varying forms, by a municipal (or county) government. A utility cooperative ('coop') is a customer- owned, non-profit utility type that tends to serve rural areas. The below examples are courtesy of the Solar Electric Power Association (SEPA) Utility Database. Note the distributed PV that is already a part of these utilities' energy portfolio.

Utility Name	Location	Type of Utility	All Solar Total (MW)	CSP (MW)	Total PV (MW)	Distributed PV (MW)	Utility PV (MW)
Pacific Gas & Electric	California	IOU	3082.7	125	2957.7	1042.8	1914.9
Duke Energy Florida	Florida	IOU	15.6	0	15.597	15.59	0.007
Arizona Public Service	Arizona	IOU	733.1	250	483.083	272.58	209.425
Georgia Power	Georgia	IOU	67.6	0	67.63	25.88	41.75
Indianapolis Power & Light	Indiana	IOU	43.2	0	43.244	0.353	42.891
Public Service Electric & Gas (PSEG)	New Jersey	IOU	547	0	547	414.7	132.3
Duke Energy Carolinas	North Carolina	IOU	129.9	0	129.831	6.694	123.137
NV Energy	Nevada	IOU	234.8	69	165.753	47.761	117.992
Excel Energy	Colorado	IOU	239	0	238.995	151.287	87.708
Ohio Power Company	Ohio	IOU	20	0	19.98	11.916	8.064
CPS Energy	Texas	Muni	92.7	0	92.743	11.909	80.834
Los Angeles DWP	California	Muni	92.5	0	92.548	90.116	2.433
Salt River Project	Arizona	Muni	92.7	1	91.704	59.556	32.148
Seattle City Light	Washington	Muni	4.7	0	4.72	4.72	0
Orlando Utilities Comm	Florida	Muni	7.8	0	7.846	3.116	4.73
Holyoke Gas & Electric Department	Massachusetts	Muni	3.6	0	3.607	0.007	3.6
Memphis Light, Gas and Water	Tennessee	Muni	3.5	0	3.496	0.847	2.649
Omaha Public Power District	Nebraska	Muni	0.3	0	0.347	0.347	0
Colorado Springs Utilities	Colorado	Muni	6.4	0	6.401	6.401	0
Starkville Electric Dept	Mississippi	Muni	0.3	0	0.255	0.242	0.013
Kaua'I Island Utility Co-op	Hawaii	co-op	21	0	20.953	13.708	7.245
Delaware Electric Co-op	Delaware	co-op	7.6	0	7.609	3.248	4.361
Trico Electric Co-op	Arizona	co-op	7.6	0	7.591	7.41	0.181
Santee Electric Co-op	South Carolina	co-op	2.9	0	2.915	0.119	2.796

Southern Maryland Elec Co-op	Maryland	co-op	8.4	0	8.434	4.034	4.4
West Kentucky Rural Electric Cooperative Corporation	Kentucky	co-op	1.8	0	1.759	1.759	0
Holy Cross Energy	Colorado	co-op	3.7	0	3.725	2.077	1.648
Middle Tennessee Electric Membership Corporation	Tennessee	co-op	3.6	0	3.619	3.619	0
Kit Carson Electric Co-op	New Mexico	co-op	6.4	1.125	5.31	0	5.31
Cullman Electric Co-Op	Alabama	co-op	0.3	0	0.325	0.325	0

Here are several press releases on solar projects for some of the utilities listed above. These press releases highlight some of the key facts about the solar projects.

Pacific Gas & Electric (IOU):
http://www.pge.com/en/about/newsroom/newsdetails/index.page?title=20091026_pge_to_buy_500_megawatts_of_clean_solar_power_from_nextera_and_abengoa_solar

Duke Energy Florida (IOU): http://www.duke-energy.com/news/releases/2009101301.asp

Georgia Power (IOU): http://southerncompany.mediaroom.com/index.php?s=43&item=3456

NV Energy (IOU): http://www.solarreserve.com/pressReleases/Tonopah_PPA_Press_ReleaseFINAL.pdf

CPS Energy (muni): http://www.renewableenergyworld.com/rea/news/article/2014/10/how-the-right-kind-of-electric-utility-can-increase-solar-energy-and-jobs

Los Angeles DWP (muni): http://investor.firstsolar.com/releasedetail.cfm?ReleaseID=834730

Kaua'l Island Utility Co-op (co-op): http://kauai.coopwebbuilder.com/content/work-start-54-million-kiuc-solar-project-anahola

Delaware Electric Co-op (co-op): http://www.delaware.coop/news/press-releases/co-op-solar-farm-now-producing-power

The following CSP projects in the US represent a new generation of technology that can help states meet EPA's carbon emission goals. The two projects that include thermal energy storage (Solana and Crescent Dunes) provide the additional benefits of helping maintain grid reliability through the dispatch of electricity whenever it is most needed, providing ancillary services such as spinning and non-spinning reserves, as well as reactive power.

	Solana	**Ivanpah**	**Genesis**	**Crescent Dunes**	**Mojave**
Technology	Trough w/ 6 hours storage	Steam Towers	Trough	Salt Tower w/ 10 hrs storage	Trough
Capacity (MW, gross)	280	392	280	110	280
Approx. Annual Output (GWh)	945	1,080	560	500	600
CO_2 Saved (Metric Tons/yr)	475,000	400,000	330,000	290,000	350,000

PACIFICORP

2013 Solar RFP

This solar request for proposal (RFP) (2013S Solar RFP) seeks acquisition of solar resources to meet the Company's remaining Oregon solar capacity mandate goal of 6.7 MW_{AC}. Bids must comply with specific RFP criteria including; meeting company solar specifications, individual project capacity greater than 500 kW_{AC} and up to 5.0 MW_{AC}, commercial operation date on or before December 31, 2014, fixed price power purchase agreement or asset purchase and sale agreement only, and delivery to PacifiCorp's system on firm basis.

Information for the Request For Proposal (RFP) process is outlined below. More information will be made available as it is released. For questions or more information, please send an email to RFPSolar@PacifiCorp.com.

Schedule

Event	Estimated Timeline
2013S issued	April 30, 2013
Bidder/stakeholder meeting	May 13, 2013
Responses due	June 11, 2013
Bid evaluation completed	July 16, 2013
Shortlist selection	July 19, 2013
Best and final pricing update by shortlist	August 6, 2013
Bidder negotiations completed	September 30, 2013
Final selection	October 4, 2013
Project commercial operation date	December 31, 2014

Documents

PacifiCorp Request for Proposal Solar Resources (RFP 2013S)

Appendices

Appendix A Technical Specification and Appendix A Exhibits (A-J)

Appendices B-K

Appendix E-2 - Power Purchase Agreement (PPA)

Appendix F-2 - Asset Purchase and Sale Agreement (APSA) & Appendices

Appendix F-2 - EPC Agreement and Appendices

Appendix H - Form 1 - Pricing Input Sheet

Appendix J - Qualifying Reporting Entity (QRE) Agreement

Appendix K - General Services Contract-O&M Services for Photovoltaic Project

Presentations

2014 rooftop solar program proposal

We have filed two proposals with the Arizona Corporation Commission for adding clean, sustainable solar energy to help power Arizona's future.

One proposal would continue our successful AZ Sun program and build a 20-megawatt community-scale solar plant near Tonopah.

The other option, filed July 28, proposes a new residential rooftop solar program. The rooftop program would enable about 3,000 customers across Arizona to add rooftop solar to their homes and receive a $30 bill credit each month through the life of a 20-year agreement with APS. Eligible customers will be able to participate without paying any fees for the panels.

proposed details

- If approved, the program is open to approximately 3,000 customers, totaling 20 MW of residential rooftop solar throughout APS service territory.
- Participating customers receive a $30 monthly credit on their bill through the life of the 20-year program, totaling to $7,200.
- We are partnering with reputable installers who will ensure all participating customer rooftops meet specific requirements.
- Arizona solar installers will be given preference and selected through a competitive bidding process – keeping jobs and money in the state.

benefits of proposed program

- no upfront fees for installation or maintenance of the system
- guaranteed bill savings
- provides another option for customers to install rooftop solar
- makes rooftop solar available to customers who would not otherwise be able to afford it
- uses local rooftop solar installers
- contributes to Arizona's national solar leadership

additional information

- The proposal is expected to be heard at the Arizona Corporation Commission (ACC) in the Fall of 2014.
- To learn more about Arizona's solar leadership, visit azenergyfuture.com.

- There is not a wait list for the program but we will contact customers on the interest list if the program is approved. Please sign up for our interest list below if you would like to be notified.

frequently asked questions

interest list

october 2014

luke air force base and aps partner on new solar facility

We are proud to announce that we have partnered with Luke Air Force Base on a new solar power plant that will create more renewable energy for our customers, as well as benefits for the Air Force. The plant is being built on 106 acres of land leased from Luke, which will save the Air Force money and help both Luke and APS meet renewable energy generation goals.

"The solar plant will be highly visible and will set a great example of Arizona's solar leadership for people from all over the world who live, work and train on Base," said James Piotrowski, APS Manager Solar Generation. "Plus, we are proud to support the Air Force and bring more solar energy to our customers."

Another benefit of the new plant will be the more than 200 local jobs created during construction, which is expected to begin later this year. By summer 2015, our customers should be experiencing the energy benefits of this new solar project.

> "We are proud to support the Air Force and bring more solar energy to our customers.
>
> - James Piotrowski, APS Manager Solar Generation

Duke Energy Renewables acquires two solar projects from Infigen Energy, adding 40 megawatts to its California portfolio

March 6, 2014

CHARLOTTE, N.C. - Duke Energy Renewables, a commercial business unit of Duke Energy, today announced its acquisition of two 20-megawatt (MW) AC California solar projects from renewable energy developer Infigen Energy.

The construction-ready Pumpjack and Wildwood Solar Power Projects, located in Kern County near Bakersfield, represent Duke Energy Renewables' third and fourth utility-scale solar power projects in the state. Once the projects are complete, the company will own and operate more than 65 megawatts of solar power in California.

"The acquisition of Pumpjack and Wildwood will more than double our solar power capacity in California," said Duke Energy Renewables President Greg Wolf. "We're pleased to provide an increasing supply of affordable, clean energy to the nation's number one solar market."

The solar energy generated from the two projects will be sold through 20-year power purchase agreements with Southern California Edison.

Infigen's U.S. CEO, Craig Carson, said, "We are very pleased that our first development efforts in solar PV have succeeded in bringing together strong counterparties such as Southern California Edison and Duke Energy. We expect that the experience gained and the relationships created through these solar projects will deliver significant benefits for our future development opportunities."

In 2013, Duke Energy Renewables built the 21-MW Highlander Solar Power Project in Twentynine Palms and acquired the 4.5-MW Sunset Reservoir project in San Francisco. Within the year, once Pumpjack and Wildwood reach commercial operation, the projects will push Duke Energy Renewables' total U.S. installed solar capacity to 185 MW at 23 utility-scale facilities across the country.

In 2011, INDU, a partnership between Duke Energy Renewables and Integrys Energy, constructed eight 1-MW rooftop solar projects in southern California.

About Duke Energy Renewables

Duke Energy Renewables, part of Duke Energy's Commercial Businesses, is a leader in developing innovative wind and solar energy generation projects for customers throughout the United States. The company's growing portfolio of commercial renewable assets includes 15 wind farms and 21 solar farms in operation in 12 states, totaling almost 1,800 megawatts in electric-generating capacity. Learn more at **www.duke-energy.com/renewables (http://www.duke-energy.com/renewables)**.

Headquartered in Charlotte, N.C., Duke Energy is a Fortune 250 company traded on the New York Stock Exchange under the symbol DUK. More information about the company is available on the Internet at: **www.duke-energy.com (http://www.duke-energy.com)**.

About Infigen Energy

Infigen Energy is a specialist renewable energy business. We have interests in 24 wind farms across Australia and the United States. With a total installed capacity in excess of 1,600MW (on an equity interest basis), we currently generate enough renewable energy per year to power over half a million households. As a fully integrated renewable energy business in Australia, we develop, build, own and operate energy generation assets and directly manage the sale of the electricity that we produce to a range of customers in the wholesale market.

Infigen Energy trades on the Australian Securities Exchange under the code IFN.

For further information please visit our website: **www.infigenenergy.com (http://www.infigenenergy.com)**

Duke Energy contact: Tammie McGee or Luke Currin
Office: 980.373.8812 | Office: 980.373.1849

Infigen Energy U.S. contact: Kelly Kimberly
Office: 713.328.5151

Infigen Energy Australia contact: Richard Farrell
Office: +61 2 8031 9900

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- Business Services
- Customer Login

- Customer Service
- Energy Efficiency
- Renewable Energy
- Education

Newman Solar Facility

Renewable Energy > Renewable Energy Projects

-
- Renewable Energy Interconnection
  - Interconnection of facilities less than 10 kW
  - Interconnection of facilities greater than 10 kW and less than 100 kW
  - NM Interconnection of Facilities Greater Than 100kW and up to 1,000 kW
- Renewable Energy Projects
  - Renewable Energy Education Projects
  - El Paso Electric-Owned Solar Projects
  - Purchased Power Agreement Projects
- U.S. Solar Facilities Maps
- Sign-up New Mexico
- EPE Renewable Energy Procurement Plan
  - 2014 Renewable Energy Procurement Plan Application
  - 2013 Renewable Energy Procurement Plan
- Contact Us
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-

Newman Solar Facility

Newman Solar facility, located in northeast El Paso, Texas, will be a 10 MW AC ground mounted single-axis tracking PV system that will interconnect to a dedicated EPE's 13.8-kV distribution feeder. The Purchase Power Agreement is between Newman Solar, LLC (owned by PSEG) and El Paso Electric (EPE).

Project Highlights:

- Contract life: 30-year power purchase agreement
- Construction Ground Break: April 2014
- Expected Commercial Operation Date: December 2014

All Renewable Energy Certificates (REC) associated with the solar energy will be owned by EPE. Newman Solar facility will generate enough clean energy to power more than 3,800 average homes.

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Renewable Energy Projects

View Energy Tracker

Roadrunner Solar Generating Facility

Project Type: Solar thin-film panels provided by FirstSolar
Project Location: Santa Teresa, New Mexico
Project Owner: NRG
Fuel Source: Solar
Project Capacity: 20 MW

Commercial Operation Date: August 2011

View Photo Gallery

El Paso Electric purchases 20 MW of electricity generated from solar power from the Roadrunner Solar Generating Facility located in Santa Teresa, New Mexico. The Roadrunner Solar Facility, which began operations in August 2011, is owned by NRG. The Solar Roadrunner Plant uses thin-film panels provided by FirstSolar and single-axis tracking of the sun to capture solar rays and convert them into electricity.

This site's production over the past 12 hours.

13,037 Kw

12:00pm - 11/25/2014

Energy

53,390,000 kwh (Yearly Projection)

Power Output Number of Homes Powered
Power (kw)
18,000
16,000
14,000
12,000
10,000
8,000
6,000
4,000
2,000
Hours in Mountain Standard Time (MST) - 11/25/2014

* Number of homes powered for the year based on average home yearly energy consumption.
** Number of homes being powered based on average home hourly energy consumption.

Residential

- Customer Service
- Energy Efficiency
- Renewable Energy
- Education

Business

- Customer Service
- Energy Efficiency
- Renewable Energy
- Education

Inside El Paso Electric

- About El Paso Electric
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53,300,000 kwh (Yearly Projection)
47,266,847 kwh (Year to Date)

Simple Solar:
Cooperative Offers Hassle-Free Solar Energy

Florida Keys Electric Cooperative consumer-members interested in solar energy now have an innovative new green power option.

The **Simple Solar Program** is available only to FKEC members and is part of the cooperative's dedication to the environment and the future.

Co-op members who support alternative energy but don't want the hassle of designing, permitting, building, maintaining and insuring their own residential solar arrays can now lease panels in FKEC's existing array.

In return for leasing one or more panels for $999 each, members receive monthly bill credits for the full retail value of the electricity generated by their leased panel(s) for 25 years.

"This program was designed for environmentally-conscious individuals who want an easy, affordable alternative to installing their own renewable energy source," said CEO Scott Newberry. "By leasing our panels, you instantly add solar energy to your home without any hassles."

One of the major advantages of the program is that FKEC will maintain the solar array so the consumer only pays the one-time cost of the panel.

"The cost of energy is expected to increase in years to come in the wake of both pending Climate Change legislation and the depletion of the fuels that run traditional power plants," Newberry said, "so the retail value of the energy produced by these panels is expected to increase over time. When this happens, the bill credits will also increase to reflect the current retail value of electricity."

Each 175-watt panel will generate around $36 in bill credits in the initial year. Assuming a 3% annual increase in the retail price of electricity, the $999 investment per panel should return about $1,280 in total credits.

SIMPLE SOLAR

"Your one-time lease will also fund future alternative energy generation, so if you support green energy, it's really win-win."

- CEO Scott Newberry

LIVE SOLAR ARRAY DATA

Links

- FAQ's
- About FKEC's Arrays
- How Solar Energy Works
- Download Contract (pdf)

FKEC's Marathon array consists of 552 panels and the Crawl Key array adds and additional 120 panels. When a panel is leased, the leasing member will receive the panel's serial number and location. That panel's actual production will then be credited to the leasing member for 25 years.

"FKEC is proud to be exploring green energy solutions and we really see our cooperative solar farm as a first step in the right direction," Newberry said.

"We are also interested in wind power and the possibilities of tidal energy development. This solar panel lease program will help us fund the next generation of 'green' power as we work towards adding more and more renewable energy to our local power supply."

Simple Solar At-A-Glance:

- Lease FKEC's existing solar panels
- Panels are located on FKEC's property
- One time $999 investment for each 175-watt panel
- In return for your investment, receive bill credits for actual retail value of your leased panel(s) for 25 years
- No limit on number of panels that can be leased per member or business
- Monitor the live production of the solar array anytime on FKEC's website
- If you move your electric service to a different location within FKEC's service territory anywhere from North Key Largo to Marathon, you still receive the monthly bill credits from your solar panels

This Program is Ideal for:

- Anyone who wants to support alternative energy generation in the Upper and Middle Florida Keys
- Consumers whose homes or roofs are not properly sited for solar installations
- Consumers who rent their homes or office spaces
- Anyone who would like to install solar panels but can't afford the large upfront investment to design and install on-site
- Anyone who would like to offset their traditional power usage with green power
- Business owners and "green" organizations committed to making environmentally sensitive choices and to promoting sustainable actions through renewable energy

Program Benefits:

- FKEC has already installed the solar array and it has performed above expectations
- FKEC assumes all responsibility for maintenance and insurance
- Allows people at all income levels to support solar energy and participate in the future of energy generation
- Your investment funds future alternative energy generation
- Clean power with no carbon emissions

Hawaiian Electric and Ka La Nui Solar sign agreement for new project

FOR IMMEDIATE RELEASE
October 10, 2014

Download printable version (pdf)

Contact:
Peter Rosegg
Phone: (808) 543-7780
Email: peter.rosegg@hawaiianelectric.com

HONOLULU, Oct. 10, 2014 – Hawaiian Electric Company has submitted a power purchase agreement (PPA) for the 15-megawatt Ka La Nui Solar project in Waianae to the Hawaii Public Utilities Commission for review and approval.

This and other solar projects will benefit all utility customers with lower prices and help support Hawaiian Electric's goal to lower customer electric bills.

Ka La Nui Solar will consist of approximately 61,000 fixed photovoltaic panels and associated equipment on 75 acres leased from Mountain View Dairy west of the Waianae Valley Road and Piliuka Place intersection.

Ka La Nui Solar, LLC, a subsidiary of NextEra Energy Resources, will build, own and operate the project.

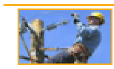
Ka La Nui has conducted extensive outreach in the Waianae community since early 2013 and plans to continue public outreach through the permitting, design, and construction phases.

NextEra responded to a February 2013 Hawaiian Electric invitation for renewable energy projects on Oahu at a low levelized cost, generally below 17 cents per kilowatthour. The PUC approved Hawaiian Electric's request to negotiate with responding developers outside of the lengthier competitive bidding process.

Pricing for the Ka La Nui Solar contract has been provided to the PUC, but is not public at this time while negotiations with other responding solar developers continue. This will help ensure Hawaiian Electric can negotiate the best possible pricing for our customers. Prices will become public after other negotiations are completed. The low cost per kilowatt-hour is locked in for the 22-year duration of the contract.

The final contract also awaits completion of an Interconnection Requirements Study to tie the solar facility to Hawaiian Electric's 46 kV sub-transmission line along Farrington Highway in Leeward Oahu.

To capture full value of the federal investment tax credit for Hawaiian Electric's customers, the project is proposed to be in service by the end of 2016. Beginning in 2017, the tax credits are due to decline from 30% to 10%.



7

SMECO News

Find useful information about your electric service and keep up to date on events at SMECO.

All news

SMECO Announces Second Solar Project

April 16, 2014

Southern Maryland Electric Cooperative (SMECO) has entered into a power purchase agreement with an affiliate of juwi solar Inc. (JSI) to develop, design and construct the 10.0-megawatt (MW) Rockfish Solar facility. JSI will construct and operate the facility through a wholly-owned subsidiary, and SMECO will purchase all generated energy, capacity, and solar renewable energy credits for the next 20 years.

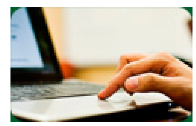
Pending approval from the Maryland Public Service Commission and local permitting, the solar farm is planned to be a 10-MW solar photovoltaic facility to be located on 80 acres in Charles County. JSI plans to employ the use of single axis tracking technology, and preliminary designs call for approximately 41,000 modules of solar panels. The project is scheduled to reach full commercial operation as early as the end of this year and is expected to generate roughly 21,000 megawatt-hours (MWh) during its first year of operation: enough to power about 1,300 homes annually. An average SMECO household uses 1,300 kilowatt-hours (kWh) a month and 15,600 kWh per year.

SMECO worked with the National Renewables Cooperative Organization (NRCO) to develop a request for proposals and evaluated about 30 submissions before selecting JSI. JSI is headquartered in Boulder, Colorado. According to Austin J. Slater, Jr., SMECO's president and CEO, "By working with NRCO and JSI, we are developing a project that will provide renewable energy right here in our service area, helping us to meet our regulatory requirements and to avoid costly transmission fees." He added, "Our customer-members will be glad to know that the cost of the energy provided by this solar project is very reasonable and will have a positive effect on customer rates."

"We are incredibly excited to be working with SMECO and NRCO to provide clean, reliable solar power to SMECO customers in a cost-effective manner," said Michael Martin, CEO of JSI. "We also eagerly anticipate breaking ground and completing our first utility-scale solar project in the state of Maryland."

This project is the second solar project and fourth renewable project that NRCO has facilitated for SMECO. SMECO developed a 5.5-MW solar farm in Hughesville which has produced more than 10 million kWh since November 2012. The new solar project is expected to produce nearly twice as much energy as the Hughesville facility. SMECO also purchases the energy and environmental attributes of two wind projects located in Pennsylvania.

Purchasing solar energy is one way SMECO works to fulfill its renewable portfolio obligation, as required by the state, at the lowest costs to its members. Utilities are obligated to purchase .5 percent of their load from



solar energy resources in 2015; that percentage increases each year until reaching two percent in 2020. Utilities that don't purchase the required amount of solar energy must pay a penalty.

Palo Alto CLEAN (Clean Local Energy Accessible Now) is a program to purchase electricity generated by solar electric systems located in CPAU's service territory, which coincides with the city boundaries. Programs like this, known in the industry as "feed-in tariff" programs, involve a utility paying a fixed price (tariff) for the power that is "fed into" their electric grid from local generation systems.

Program Update

On February 3, 2014 the Palo Alto City Council approved changes to Palo Alto CLEAN including raising the amount of capacity to be accepted. CPAU is now offering to purchase the output of up to 3 MW of new solar systems located in Palo Alto at a price of 16.5 cents per kilowatt hour (kWh) for 20 years. There is no minimum or maximum project size. Applications will be accepted in the order received. Please see the Program Handbook and Application Package below for more details.

- **Program Handbook**
- **Application Packet**

Current Program Status

- **3 MW of capacity currently available**. No applications in process.
- **Applications may be submitted by e-mail only.** Send your application to **PAClean@cityofpaloalto.org**
- Applications will be accepted in the order received.
- Please carefully review the Program Handbook to understand the application rules, particularly Section 2. **In the event the program is oversubscribed, failing to submit all necessary information may mean you do not receive a contract.**

Additional Information

- For any general questions or comments or to be put on a list to receive program updates, please contact the CLEAN representative at (650) 329-2241 or by e-mail to PAClean@cityofpaloalto.org
- For questions regarding building permits and inspections, please contact the Development Center at (650) 329-2496. To email the Building Division directly, contact building@cityofpaloalto.org

- For questions regarding generator interconnection, please contact the Electric Engineering Division at (650) 566-4502.
- For questions regarding land use and zoning requirements, please contact the Current Planning Division at (650) 329-2441 or by e-mail at plandiv.info@cityofpaloalto.org. Also, there is much information on zoning requirements available online. See the Planning Division website and the Zoning Map and Zoning Ordinance links below.

  - Zoning Map
  - Zoning Ordinance (Title 18 of the Palo Alto Municipal Code)

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Seattle City Light Seeks Proposals on Renewable Energy

Seattle City Light issued a request for proposals today for up to 150,000 megawatt-hours of renewable energy or renewable energy credits per year, beginning in 2020.

Source projects must qualify as eligible according to Washington State's renewable portfolio standard, approved by voters in 2006 as Initiative 937. City Light will require a minimum output guarantee and credit assurances. The utility will consider proposals for equity ownership.

Under the request for proposals, City Light will consider a broad range of proposals, technologies, and contractual arrangements. The utility will require potential providers to demonstrate they have the creditworthiness to develop the project(s) offered and deliver the electrical energy and/or renewable energy credits over the indicated contract length.

Any party submitting a proposal must be the owner of the eligible resource or renewable energy credits, or have written authorization from the owner to submit a proposal.

City Light prefers baseload or dispatchable resources to complement the existing supply resources that are predominately hydroelectric.

Seattle City Light is the 10th largest public electric utility in the United States. It has some of the lowest cost customer rates of any urban utility, providing reliable, renewable and environmentally responsible power to nearly 1 million Seattle area residents. City Light has been greenhouse gas neutral since 2005, the first electric utility in the nation to achieve that distinction.

For more information on submitting a proposal, contact Robert W. Cromwell, Jr., director of power contracts and resource acquisition, at **robert.cromwell@seattle.gov**, by phone at (206) 684-3856 or by FAX at (206) 386-4555.

Posted: September 10th, 2012 under Power Lines.
Tags: I-937, renewable energy, request for proposals, Seattle City Light

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THE NATION'S GREENEST UTILITY SINCE 1905 SEATTLE CITY LIGHT

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SCE&G Issues Request for Proposals to Supply Solar Energy on its System

First Solar Farms to be located in Charleston and Cayce by Early 2015

Cayce, S.C. (August 21, 2014) – Today SCE&G took another step forward in advancing its renewable energy commitment by issuing a Request for Proposals (RFP) for the first two solar farms to be constructed on its system. The RFP calls for bidders to provide solar power to the utility through purchased power agreements with the selected solar developer(s). SCE&G intends to work with solar developers to locate the solar farms on company-owned property in North Charleston and Cayce.

The North Charleston installation will be built on the 3-acre site of the former Leeds Avenue Gas Operations facility off I-526 and will have a generating capacity between 300 – 500 kilowatts. The Cayce project, located adjacent to SCANA's corporate headquarters off I-77, will be larger in scope with a generating capacity between 3 – 4 megawatts on approximately 20 acres. Completion of both sites is expected in 2015.

"After much careful planning we are excited to move forward with the construction of our first solar farms," said Kevin Marsh, chairman and CEO of SCANA, SCE&G's parent company. "Solar is an integral component of our balanced generation portfolio as we strive to reach a diversified mix of 30% natural gas, 30% nuclear, 30% scrubbed coal and 10% hydro and other renewables over the next five years."

In late 2013, SCE&G announced a new renewable energy team and committed to installing 20 megawatts of solar energy on its system by 2020. Initial plans were to build on a site near Lake Murray. That site is still on the table but may be developed at a later date.

Over the past several months, SCE&G has worked together with solar stakeholders from across the state, including conservation groups and other utilities, to develop comprehensive consensus legislation that establishes equitable net metering rules, introduces distributed energy programs and allows customers greater access to solar leasing. In June, the landmark Distributed Energy Resource Program Act was signed into law by Governor Nikki Haley, opening the door for increased solar installations across the state. The new legislation includes a provision that would allow SCE&G to add both utility-scale and customer installed solar energy to its system in addition to the 20 megawatts announced last year.

"We are proud to have been part of the collaborative process that resulted in the new legislation, which will provide a strong foundation for integrating more renewable energy in South Carolina benefitting us all," said Marcus Harris, general manager of renewable products and services for SCE&G. "These first two solar farms will demonstrate our commitment to advancing solar energy in the state."

The RFP for the new solar farms outlines technical requirements for solar developers regarding the design, installation, operation and maintenance of the solar photovoltaic distributed generation systems. To access the full RFP, bidders must be registered at www.Poweradvocate.com, the web-based platform that will be utilized by SCE&G to administer the RFP.

For bidders with an existing PowerAdvocate Supplier Account:

> Please share your interest in reviewing the RFP documents via an e-mail to SCEGSolarRFP@scana.com (must include full company name, contact name, and e-mail address). An invitation to the RFP event in Power Advocate will be forwarded following receipt of your e-mail.

For bidders who require a new PowerAdvocate Supplier Account:

> Visit www.Poweradvocate.com, click on the "Registration" link at the top of the screen, and follow the instructions to complete registration as a Supplier. Once the registration has been accepted by

Media Contacts

Contact
Public Affairs
1-800-562-9308

New Solar Farms RFP (PDF, 199KB)

RFP Response Package (PDF, 161KB)

PowerAdvocate, follow the instructions above to request access to the RFP.

All proposals must be submitted by 5 p.m. October 3, 2014. Contracts are expected to be finalized by the end of December 2014.

For more information about SCE&G's renewable energy initiatives visit www.sceg.com/solar.

About SCE&G
South Carolina Electric & Gas Company is a regulated public utility engaged in the generation, transmission, distribution and sale of electricity to approximately 684,000 customers in 24 counties in the central, southern and southwestern portions of South Carolina. The company also provides natural gas service to approximately 332,000 customers in 38 counties in the state.

Southern Power
Overview

Southern Power, a subsidiary of Southern Company, is a leading U.S. wholesale energy provider, meeting the electricity needs of municipalities, electric cooperatives and investor-owned utilities. Southern Power and its subsidiaries own and operate 18 facilities in eight states, with more than 8,900 MW of generating capacity operating or under construction in Alabama, California, Florida, Georgia, Nevada, North Carolina, Texas and New Mexico.

Announcement

October 23, 2014 - Southern Company subsidiary to top 300 MW of total solar generating capacity with acquisition of new California facility

Southern Company subsidiary Southern Power has acquired the 150-megawatt (MW) Solar Gen 2 facility in California from First Solar Inc. As the largest solar facility in the Southern Power portfolio, the Solar Gen 2 acquisition is expected to increase the total Southern Power-owned solar capacity to more than 300 MW. Southern Power has previously acquired seven solar facilities with Turner Renewable Energy. The total generation capacity of the eight projects is anticipated to be more than 400 MW.

Strategy

Southern Power is growing—expanding our footprint. Our plan is to continue increasing our operations in the competitive market. We focus our low-risk strategy of owning and operating quality generation assets under long-term contracts with creditworthy counterparties.

Environmental Responsibility

In addition to meeting all regulations through a comprehensive compliance strategy, we invest in research and technology to provide cleaner energy options for our customers. Southern Power's facilities are state-of-the-art in efficiency and environmental controls.

Standard Net Energy Metering (NEMS)

NEMS (previously Standard E-NET) is a net energy metering program for all customers with eligible solar, wind or hybrid (solar and wind) generators that are less than or equal to 30 kilowatts in size.

City and County of San Francisco ("CCSF") owned generating facilities seeking Schedule NEMCCSF and participants in the Demand Response Programs below are not eligible to participate in NEM:

- Peak Day Pricing (PDP)
- Scheduled Load Reduction Program (SLRP)
- SmartRate

NOTE: Customers must not operate any generating facility in parallel with Pacific Gas and Electric Company's (PG&E) distribution facilities until they receive written authorization from PG&E, as is required in Electric Rule 21. Unauthorized operation may result in personal injury, equipment damage and/or property damage for which the customer may be liable.

Recent Interconnection News

05/09/2014	**Transition Update:** The customer-signed 79-1101 form will continue to be accepted if and only if it is accompanied by machine-readable 79-1151A and 79-1151B forms. This will be allowable until 6/30/2014. Beginning 7/1/2014 PG&E will no longer accept the old (79-1101) form.
03/26/2014	The new forms (79-1151A and 79-1151B) posted to this website can be used immediately. However please note, effective 5/1/2014, PG&E will require interconnection requests to utilize the new forms: Agreement & Customer Authorization (79-1151A) (PDF, 214 KB) and Application (79-1151B) (PDF, 204 KB) and discontinue the use of the old form (79-1101).
02/20/2014	Load Aggregation Approved Under the NEM Tariff (PDF, 257 KB).
12/01/2013	New streamlined Standard Interconnection Agreement and Authorization Form (79-1151A) and Standard Interconnection Application Form (79-1151B) developed and approved by the CPUC.

Prepare for Your Project

PG&E's Electric Generation Interconnection Department can help you understand the steps you need to take set up your net energy metering interconnection for solar and/or wind electric generating facilities.

This website provides a variety of resources to prepare for project, including:

Webinar

Additional Info

- NEM Welcome Letter
- Net Energy Metering and Tracking
- Rates and Rules
- Distribution Interconnection Handbook
- PG&Es Greenbook
- NEM Tariff
- Rule 21

Related Links

- California Energy Commission (CEC)
- CEC Lists of Eligible Renewable Equipment
- California Public Utilities Commission (CPUC)
- U.S. Department of Energy (DOE)
- DOE Energy Efficiency and Renewable Energy

Video (approximately 35 minutes in duration) that will give you an overview to the revised process and forms. Old forms will no longer be accepted post 5/1/14.
View the Webinar »

Getting Started Guides

- Standard NEM Overview – System Built and Passed Local Jurisdiction's Final Inspection (PDF, 141 KB)
- Standard NEM Overview – System Not Yet Built (PDF, 143 KB)
- Submittal Path Guide – Summary of Required Documents (PDF, 50 KB)
- How to Fill Out Form 79-1151A (Agreement & Customer Authorization) (PDF, 173 KB)
- How to Fill Out Form 79-1151B (Application) (PDF, 170 KB)
- How to Save and Submit 79-1151A & B – Technical Difficulties? Follow this Guide (PDF, 679 KB)

Of course, you may have questions. Our Frequently Asked Questions (PDF, 102 KB) document covers additional information for you to effectively manage your project.

How Do I Apply?

All of the below listed components, correctly filled out, constitutes a complete Standard NEM interconnection request.

Electronically filling out the requested items identified below using a computer will greatly streamline the interconnection process and allow for quicker turnaround.

If PDF fillable forms are electronically filled out using a computer, please note that when submitting the Agreement and Customer Authorization (79-1151A) form, you will need to submit both of the following:

1. The unsigned copy (form filled out in its original PDF fillable format)
2. The same form with proof of signature (locked form from qualified third party e-signature vendor or scanned PDF of wet signature)

The first document allows PG&E systems to read the form eliminating the potential for errors and rework.

Item Requested	**Why It Is Requested**
REQUIRED INFORMATION	
1. Agreement and Customer Authorization Form 79-1151A (PDF, 214 KB)	Provides important customer, contractor, system and rate information about the project. Single form that allows the customer to authorize their contractor or another Third Party to act on its behalf (i.e., fill out Application for NEM Interconnection, receive communication regarding the interconnection application, including a copy of the Permission to Operate notice).
2. Application for NEM Interconnection Form 79-1151B (PDF, 204 KB)	Provides important generating facility information, description of generating facilities and guidelines for additional documentation to submit a complete application. Application includes the basic single-line diagram.
3. Final Building Permit / Inspection Certificate	Copy of final building permit / inspection certificate that allows PG&E to know that the project has been finished and approved by local building authority. Note that we only require the final signed off permit showing that the construction has received final approval by the

	local authorities.
ADDITIONAL INFORMATION IF APPLICABLE	
4. NEM Load Aggregation Appendix Form 79-1153	Applicable only to eligible customers applying under NEM Aggregation. The Frequently Asked Questions (PDF, 440 KB)document covers additional information for you to effectively manage your NEM Aggregation project.
5. Custom Single-Line Diagram	Simple diagram for technical review. Here is an example.
6. Variance Request	The Customer or Customer's Contractor can request a Variance Request from PG&E if the project is unable to meet the requirements described in the Distribution Interconnection Handbook and Greenbook. Please see the Application for NEM Interconnection for further details on Variance Request components.
7. PV Module Equipment Spec Sheet	If the PV module is not listed on the GoSolarCalifornia.com approved equipment list, please provide a copy of the equipment spec sheet detailing the make, model, and rating.
8. Inverter Module Equipment Spec Sheet	If the inverter is not listed on the GoSolarCalifornia.com approved equipment list, please provide a copy of the equipment spec sheet detailing the make, model, and rating.

Please submit the appropriate documents via one of the methods outlined below:

1. **Email:** gen@pge.com
   **This is the preferred method as this allows PG&E to streamline the process and attend to your request more quickly.*

   OR

2. **Mail hard copies of all appropriate documents to:**
   Pacific Gas and Electric Company
   Attention: Electric Generation Interconnection
   Mail Code N7L
   245 Market St.
   San Francisco, CA 94105

Attention: PG&E may not be able to interconnect your generator if it is located in certain areas of **San Francisco** or **Oakland**. Please read our notice about Secondary Networks.

Who should I contact for additional information?

For questions about PG&E's renewable programs and NEM accounts, please view the following webpage for further details: www.pge.com/solar or contact the Gen Hotline at **(415) 972-5676**.

For questions about interconnection, you can email us at gen@pge.com or contact the Gen Hotline at **(415) 972-5676**.

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Programs

Bright Tucson Community Solar

Power your home or business with locally generated solar power.

As a TEP customer, you can purchase solar power to cover some or all of your electrical needs.

Overview | FAQs

Reserve Your Bright Tucson Solar Power Blocks

The Bright Tucson Community Solar Program offers an easy and affordable way to meet your electric needs with locally generated solar power. As a TEP customer, you now have the opportunity to purchase solar power in "blocks" of 150 kilowatt hours (kWh) per month. You can buy some or all of your power through the program, reducing or eliminating your energy from conventional resources.

Enroll Today

Sign up (/AM/redirect.php?l=communitysolarenroll)

Features and Benefits

- No up-front expenses or equipment maintenance costs
- Renewable energy option for renters and those customers whose rooftops are shaded by trees or nearby buildings

- Protection offered against future energy cost increases
- Surcharge exemption for solar energy purchases on renewable energy, fuel and purchased power
- Minimized carbon footprint and reliance on fossil fuels
- Clean, green renewable energy for an affordable price

Each block purchased will add $3.00 to your monthly electric bill. However, program blocks are exempt from two surcharges applied to other electric usage: the Renewable Energy Standard Tariff (REST) and the Purchased Power and Fuel Adjustment Clause (PPFAC), so your actual impact will be lower. Both surcharges are adjusted annually to reflect changing energy costs and other factors, so the benefit of avoiding them would increase over time if the surcharges rise.

Minimal Cost

Solar power costs more than conventional energy derived from fossil-fueled power plants, so participating in the program will increase your electric bill. Each block replaces the charges for an equivalent amount of conventional power at a rate that currently adds $3.00 to your monthly bill.

Program rates must be paid in full each month regardless of actual energy consumption. If the solar energy purchased through the program exceeds actual usage during a monthly billing period, the excess is carried forward to the next billing period as a credit. Any credit remaining after the September billing period will be paid in full as a credit on the next bill.

Calculate Solar Power (http://www.pvsim.com/tepcommunity.html)
Determine how many solar blocks you can purchase.

Eligibility

The Bright Tucson Community Solar Program is available to most residential and commercial customers in TEP's service territory.

The program is available to TEP customers on the following three rate plans:

- Residential Service (R-01)
- General Service (GS-10)
- Large General Service (LGS-13)

Limited Availability

Once the program is fully subscribed, customers may be placed on a waiting list until new local solar resources become available.

Cancel Any Time

You can purchase as many blocks as you want and cancel at any time. TEP reserves the right to limit purchases based on customers' anticipated electric use and program availability. Participants can increase or decrease the number of blocks they're buying just once in a 12-month period.

Solar Energy Source

The energy is generated by solar power systems located in the Tucson metropolitan area. As TEP expands its local solar generating capacity, new resources will become available to satisfy growing demand for the program.

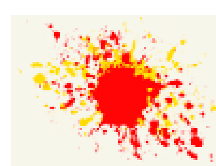
Future demands would be met through new solar power systems located in the Tucson metropolitan area.

Questions?

Please read our FAQs. Or, email us. (mailto:CS-EE_REProgramSetup@tep.com)

Ready to sign up for Bright Tucson Community Solar?

Sign up (/AM/redirect.php?l=communitysolarenroll)



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Safety and Education

About TEP

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Tell Us How We're Doing. (/survey/)

Connect with TEP (http://www.facebook.com/TucsonElectricPower) (https://twitter.com/TEPOutageInfo) (https://www.youtube.com/user/TucsonElectricPower)

Electric, Steam, Water
Cable Television and High Speed Internet
Service since 1889

Melanie L. McCoy
General Manager and Secretary
3200 Biddle Avenue, Suite 200
P.O. Box 658
Wyandotte, MI. 48192-0658
Telephone: 734.324.7100
Fax: 734.324.7119

Wyandotte Municipal Services

Expedited Generator Interconnection Requirements

INTRODUCTION

This Expedited Generator Interconnection Requirements document outlines the process, requirements, and agreements used to install or modify generation projects with generator output capacity that does not exceed 30 kW that are designed to operate in parallel with the Wyandotte Municipal Services ("Utility") electric system and are part of the Utility's Net Metering Program.

ELIGIBILITY

Any residential customer* in good standing may install, own, and operate a "Net Metered" generation source(s), interconnected in parallel with the Utility's distribution system if the following are met (subject to the requirements of the "Net Metering Agreement"):

1. Completed application describing the interconnected generation that includes a $100 application fee.

2. The generation source is solar, wind, or hydro.

3. The total nameplate capacity of the generation source is 30 kilowatts or less.

4. The generation source is located on the eligible customer's premises, is operated by said customer, and is interconnected through a single point of service.

5. The generation is used primarily to offset all or a part of the eligible customer's electric load.

6. Eligible customers shall enter into a "Net Metering Agreement" with the Utility before the generation source is allowed to interconnect to the Utility's distribution system.

7. The Utility reserves the right to limit the number of customers.

GENERAL

1. All Customer-Owned generating facility installations shall comply with any and all applicable codes and standards, including but not limited to those listed in this document.

2. Interconnection shall not be allowed to the Utility's distribution system until the installation has been approved by an authorized municipal, county, or other

* Other non-residential customers may apply at the discretion of the Utility.

governmental inspector where such inspection procedures are established.

3. Generation source shall comply with IEEE Std. 1547.

INSTALLATION AND OPERATION

1. The eligible customer shall provide proof of a qualified installation of the generation source by a licensed electrical contractor.

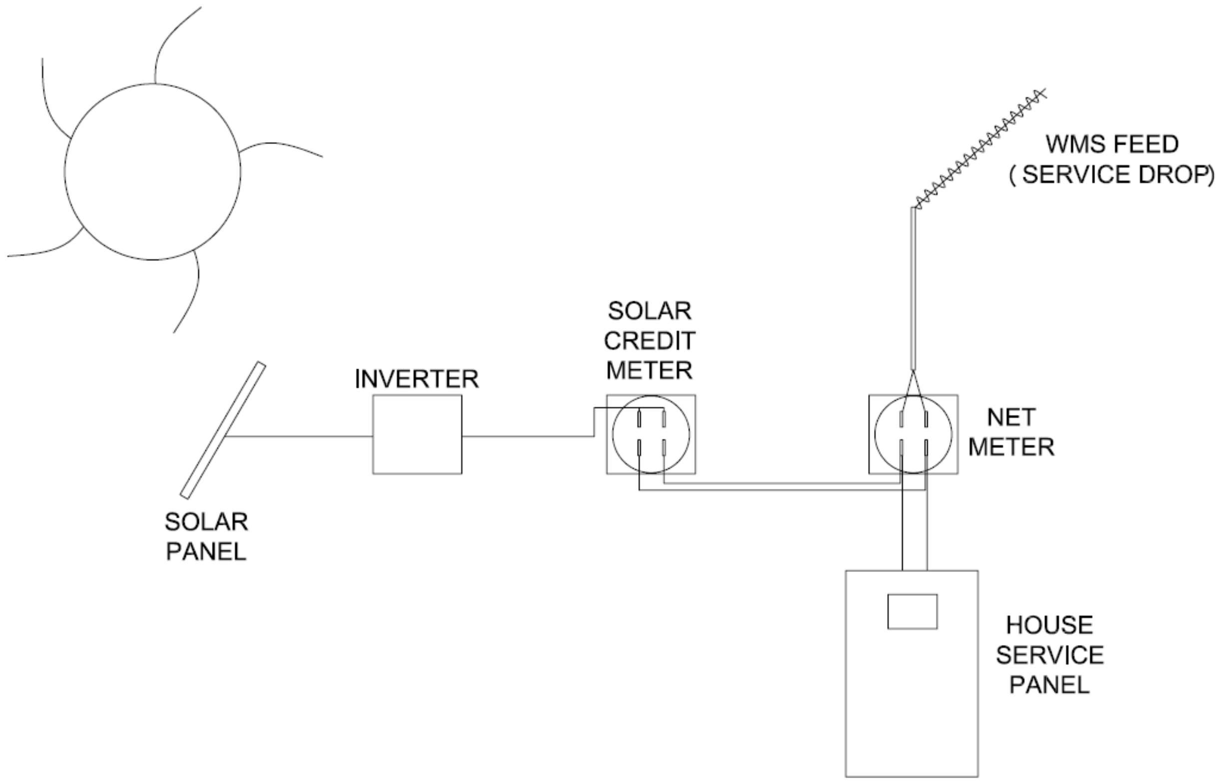
2. The eligible customer shall install, operate, and maintain the generation source in accordance with the manufacturers suggested practices.

3. A lockable manual disconnect switch with load-break capability shall be installed between the generation source and the Utility's distribution system and be accessible to Utility personnel at all times. This switch shall be labeled as follows: (See Figure 1)

"Utility-Generator Disconnect Switch"

4. The Utility may isolate the eligible customer's generation source at any time if it is believed that continued operation of the generation source will create or contribute to a system emergency, for safety purposes, or for reliability purposes.

5. The Utility may perform on-site inspections to verify the proper installation and continued safe operation of the generation source, interconnection equipment, and net metering facilities. Inspections shall be done at reasonable times and with reasonable advance notice to the eligible customer.



METERING

1. The Utility shall have the option of metering two watt-hour meters as shown above in Figure 1 or through a single bidirectional meter.

2. If a second watt-hour meter is used, one meter will measure kWh used by the eligible customer, and the other will measure the kWh exported by the customer to the Utility's distribution system. If the Utility chooses to utilize a single bidirectional meter, that meter will measure the net kWh used by the eligible customer.

Wyandotte Municipal Services

Expedited Generator Interconnection Requirements

APPLICATION

1. The undersigned Customer Generator submits this Generator Interconnection Application with the application fee to interconnect a new Project to the Utility's distribution system.

2. The Customer Generator requesting interconnection to the Utility distribution system must provide the following information:

   a. Description of the equipment configuration and proposed interconnection one-line diagram (one-line diagram must be attached to this Interconnection Application).

   b. Project Developer (Single Point of Contact):

      Name: ______________________________

      Address: ______________________________

      ____

      Phone Number: ______________________________

      Fax Number: ______________________________

      e-mail Address: ______________________________

      Project Site Address: ______________________________

3. This Generator Interconnection Application shall be directed to the Utility representative as indicated below:

   General Manager, Wyandotte Municipal Services

   3200 Biddle Ave, Suite 200, Wyandotte, MI 48192

4. I, the undersigned and authorized representative of the Customer Generator, submit this Generator Interconnection Application for the Utility. I understand that I shall be required to furnish certain required technical data as requested by the Utility in support of this application.

Authorized Signature: ______________________________

Printed Name: ______________________________

Title: ______________________________

Company Name: ______________________________

Date: ______________________________

INTERCONNECTION AND PARALLEL OPERATING AGREEMENT FOR EXPEDITED PROJECTS (INVERTER BASED - 10kW OR LESS)

This Interconnection and Parallel Operating Agreement ("Agreement") is entered into on _____________ (insert date of last signature from page 8) by_________________________ (the "Utility"), ___________________ (the "Customer"), and_______________________ (if applicable under Paragraph 5) (the "Property Owner"). Utility and Customer are sometimes also referred to in this Agreement collectively as "Parties" or individually as "Party." Customer shall be the "Project Developer" as used in and for purposes of the applicable Expedited Utility Interconnection Requirements ("Interconnection Requirements") approved by the Utility Board ("Board").

I. RECITALS

A. Customer is an electric service customer of Utility in good standing with the Utility.

B. Customer desires to interconnect an electric generating facility with maximum capacity of 30 kilowatts ("kW") or less (the "Customer Facility") with Utility's electric distribution system and operate the Customer Facility in parallel with Utility's distribution system, under the Utility's Expedited Utility Interconnection Requirements and Net Metering Agreement approved by the Board (the "Standards").

C. For purposes of this Agreement, "interconnect" means establishing a connection between a non-utility generating resource (in this case, the Customer Facility) and Utility's distribution system. "Operate in parallel" means generating electricity from a non-utility resource (in this case, the Customer Facility) that is connected to Utility's system. In all cases, terms shall have the meaning as defined in the Standards.

D. Interconnection of the Customer Facility with Utility's distribution system is subject to this Agreement, the Application, the Interconnection Requirements, the Standards and applicable utility tariffs approved by the Board.

E. This Agreement does not address any purchase or sale of electricity between Utility and Customer nor does it create any agency, partnership, joint venture or other business arrangement between or among Utility, Customer and/or Property Owner.

II. AGREEMENT

NOW THEREFORE, in consideration of the above recitals, the mutual covenants contained herein and for good and valuable consideration, the Parties agree as follows:

1. Description of Customer Facility

1.1 The Customer Facility must be built with the following ratings, which shall not be changed without thirty (30) days advance written notice to Utility according to the notice requirements herein:

Photovoltaic/Solar ("PV") Array Rating: ________________________________kW

Certified Test Record Number (UL1741 Scope 1.1A): ____________________ kW

Wind Turbine (WT) Rating: ____kW

Hydro Rating: ____kW

Service Type (circle one): Single Phase / Three Phase

Voltage Level: __________

Equipment Specifications: Make: __________Model: ____________

1.2 Customer Facility Location:

____
____
____
(Street Address, City, State, Zip)

If Customer is not the owner of the property identified above, the Property Owner must sign this Agreement for the purposes indicated in Paragraph 5.

1.3 Customer's Utility service account number: ___________________

Property Owner's Utility service account number (if applicable): _____________________

1.4 The Customer Facility is planned to be ready for parallel operation on or about: ______________(insert date)

2. Interconnection Facilities

If it is necessary for Utility to install certain interconnection facilities ("Interconnection Facilities") and make certain system modifications in order to establish an interconnection between the Customer Facility and Utility's distribution system, the Interconnection facilities and modifications shall be described to the Customer.

3. Design Requirements, Testing and Maintenance of Customer Facility

3.1 Customer shall be responsible for the design and installation of the Customer Facility and obtaining and maintaining any required governmental authorizations and/or permits, which may include, but shall not be limited to, easements to clear trees, and necessary rights-of-way for installation and maintenance of the Utility Interconnection Facilities. Customer shall reimburse Utility for its costs and expenses to acquire such easements / permits.

3.2 Customer shall, at its sole expense, install and properly maintain protective relay equipment and devices to protect its equipment and service, and the equipment and system of Utility, from damage, injury or interruptions, and will assume any loss, liability or damage to the Customer Facility caused by lack of or failure of such protection. Such protective equipment specifications and design shall be consistent with the applicable Expedited Generator Interconnection Requirements. Prior to the Customer Facility operating in parallel with Utility distribution system, Customer Shall provide satisfactory evidence to Utility that it has met the Expedited Generator Interconnection Requirements, including but not limited to the receipt of approval from the local building/electrical code inspector.

3.3 At its own expense, Customer shall perform operational testing at least five (5) days prior to the installation of any Interconnection Facilities by Utility. Utility may send qualified personnel to the Customer Facility to inspect the facility and observe the testing. Upon completion of such testing and inspection and prior to interconnection Customer shall provide Utility with a written report explaining all test results, including a copy of the generator commissioning test report.

Protective relay equipment shall be tested every two (2) years (unless an extension is agreed to by Utility) to verify the calibration indicated on the latest relay setting document issued by Utility. The results of such tests shall be provided to Utility in writing for review and approval. Utility may, at any time and at its sole expense, inspect and test the Customer Facility to verify that the required protective equipment is in service, properly maintained, and calibrated to provide the intended protection. This inspection may also include a review of Customer's pertinent records Inspection, testing and/or approval by Utility or the omission of any inspection, testing and/or approval by Utility pursuant to this Agreement shall not relieve the Customer of any obligations or responsibility assumed under this Agreement.

3.4 Customer shall operate and maintain the Customer Facility in a safe and prudent manner and in conformance with all applicable laws and regulations. Customer shall obtain or maintain any governmental authorizations and permits required for construction and operation of the Customer Facility.

4. Disconnection

Utility shall be entitled to disconnect the Customer Facility from Utility’s distribution system, or otherwise refuse to connect the Customer Facility, if: (a) Customer has not complied with any one of the technical requirements contained in the applicable Interconnection Requirements, (b) the electrical characteristics of the Customer Facility are not compatible with the electrical characteristics of Utility’s distribution system, (c) an emergency condition exists on Utility’s distribution system,
(d) Customer's protective relay equipment fails, (e) Utility determines that the Customer Facility is disrupting service to any Utility customer, (f) disconnection is required to allow for construction, installation, maintenance, repair, replacement, removal, investigation, inspection or testing of any part of Utility’s facilities, (g) if a required installation (*e.g.,* telephone line) fails or becomes incapacitated and is not repaired in a timely manner, as determined by Utility, or (f) Customer commits a material breach of this Agreement.

5. Access to Property

5.1 At its own expense, Customer shall make the Customer Facility site available to Utility. The site shall be free from hazards and shall be adequate for the operation and construction of the Interconnection Facilities. Utility, its agents and employees, shall have full right and authority of ingress and egress at all reasonable times on and across the property at which the Customer's Facility is located, for the purpose of installing, operating, maintaining, inspecting, replacing, repairing, and removing the Interconnection Facilities. The right of ingress and egress shall not unreasonably interfere with Customer's or (if different) Property Owner's use of the property.

5.2 Utility may enter the property on which the Customer Facility is located to inspect, at reasonable hours, Customer's protective devices and read or test meters. Utility will use reasonable efforts to provide Customer or Property Owner, if applicable, at least 24 hours' notice prior to entering said property, in order to afford Customer or Property Owner the opportunity to remove any locks or other encumbrances to entry; *provided, however*, that Utility may enter the property without notice (removing, at Customer's expense, any lock or other encumbrance to entry) and disconnect the Interconnection Facilities if Utility believes that disconnection is necessary to address a hazardous condition and/or to protect persons, Utility's facilities, or the property of others from damage or interference caused by Customer's Facility.

5.3 By executing this Agreement, Property Owner consents to and agrees to provide access to its property on which the Customer Facility is located to Utility as described in this section, but does not assume or guarantee other performance obligations of the Customer under this Agreement.

6. Indemnity and Liability

6.1 Unless caused by the sole negligence or intentional wrongdoing of the other Party, each Party to this Agreement shall at all times assume all liability for, and shall defend, hold harmless, and indemnify the other Party and its directors, officers, employees, and agents from, any and all damages, losses, claims, demands, suits, recoveries, costs, legal fees, and expenses: (a) for injury to or death of any person or persons whomsoever occurring on its own system, or (b) for any loss, destruction of or damage to any property of third persons, firms, corporations or other entities occurring on its own system, including environmental harm or damage, or (c) arising out of or resulting from, either directly or indirectly, its own Interconnection Facilities, or (d) arising out of or resulting from, either directly or indirectly, any electric energy furnished to it hereunder after such energy has been delivered to it by such other Party. The provisions of this Section shall survive termination or expiration of this Agreement.

6.2 The provisions of this Section 6 shall not be construed to relieve any insurer of its obligations to pay any insurance claims in accordance with the provisions of any valid insurance policy.

6.3 Notwithstanding anything in this Section, or any other provision of this Agreement to the contrary, any liability of a Party to the other Party shall be limited to direct actual damages, and all other damages at law or in equity are hereby waived. Under no circumstances shall a Party be liable to the other Party, whether in tort, contract or other basis in law or equity for any special, indirect, punitive, exemplary or consequential damages, including lost profits. The indemnification obligations and limits on liability in this Section shall continue in full force and effect notwithstanding the expiration or termination of this Agreement, with respect to any event or condition giving rise to an indemnification obligation that occurred prior to such expiration or termination.

7. Breach and Default

A breach of this Agreement ("Breach") shall occur upon the failure of a Party to perform or observe any material term or condition of this Agreement, if the Standards or the Interconnection Requirement. Upon a

Breach by one Party, the non-breaching Party shall give written notice of such Breach to the Breaching Party. The Party in Breach shall have 30 days from the date of the written notice to cure the Breach. If a Breach is not cured within the 30-day period provided for herein, the Party in Breach shall be deemed in default ("Default"). The non defaulting Party shall then have the right to terminate this Agreement by written notice, shall be relieved of any further obligations hereunder, and may pursue any and all remedies available to it at law or in equity.

8. Governing Law

This Agreement shall be interpreted, governed, and construed under the laws of Michigan.

9. Amendment, Modification or Waiver

Any amendments or modifications to this Agreement shall be in writing and agreed to by both Parties. The failure of any Party at any time to require performance of any provision hereof shall in no manner affect its right at a later time to enforce the same. No waiver by any Party of the breach of any term or covenant contained in this Agreement, whether by conduct or otherwise, shall be deemed to be construed as a further or continuing waiver of any such breach or a waiver of the breach of any other term or covenant unless such waiver is in writing.

10. Notices

Any notice required under this Agreement shall be in writing and mailed or personally delivered to the Party at the address below. Written notice is effective within 3 days of depositing the notice in the United States mail, first class postage prepaid. Personal notice is effective upon delivery. Written notice of any address changes shall be provided. All written notices shall refer to the Customer's Utility account number, as provided in Section 1 of this Agreement. All written notices shall be directed as follows:

Notice to Utility:

____
____
____
____

Notice to Customer:

____
____
____
____

Notice to Property Owner (if different than Customer):

____
____
____
____

11. Term of Agreement and Termination

This Agreement shall become effective upon execution by all Parties and, if applicable, the Property Owner, and it shall continue in full force and effect until terminated upon thirty (30) days' prior notice by either Party, upon Default of either Party as set forth in Section 7, upon mutual agreement of the Parties, or upon a change in ownership of either the Customer Facility or the property at which the Customer Facility is located absent a valid assignment under Section 14.

Utility may independently terminate this agreement if, after one year, the Customer Facility

12. Entire Agreement

This Agreement supersedes all prior discussions and agreements between the Parties with respect to the subject matter hereof and constitutes the entire agreement between the Parties hereto.

13. No Third Party Beneficiary

The terms and provisions of this Agreement are intended solely for the benefit of each Party, and it is not the intention of the Parties to confer third-party beneficiary rights upon any other person or entity.

14. Assignment and Binding Effect

This Agreement shall not be assigned by a Party without the prior written consent of the other Party. Any attempt to do so will be void. Subject to the preceding, this Agreement is binding upon, inures to the benefit of, and is enforceable by the Parties and their respective successors and assigns. Customer agrees to notify Utility in writing upon the sale or transfer of the Customer Facility. This Agreement shall terminate upon such notice unless Utility consents to an assignment.

15. Severability

If any provision of this Agreement is determined to be partially or wholly invalid, illegal, or unenforceable, then such provision shall be deemed to be modified or restricted to the extent necessary to make such provision valid, binding, and enforceable; or, if such provision cannot be modified or restricted in a manner so as to make such provision valid, binding or enforceable, then such provision shall be deemed to be excised from this Agreement and the validity, binding effect, and enforceability of the remaining provisions of this Agreement shall not be affected or impaired in any manner.

16. Signatures

The Parties to this Agreement hereby agree to have two originals of this Agreement executed by their duly authorized representatives. This Agreement is effective as of the later (or latest) of the dates set forth below.

UTILITY

Signature:____

Name:____

Title:____

Date:____

CUSTOMER

Signature:____

Name:____

Title:____

Date:____

PROPERTY OWNER (IF APPLICABLE)

Signature:____

Name:____

Title:____

Date:____