VOTE SOLAR

COMMUNITY SOLAR: READY TO WORK FOR NEW JERSEY

Jobs and Economic Impact Assessment

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1. INTRODUCTION

The New Jersey legislature passed community solar enabling legislation in 2018. Signed into law by Governor Murphy, the legislation requires the implementation of a Community Solar Energy Pilot Program ("Pilot Program" or "Pilot") and the establishment of a permanent program after 36 months. The enabling legislation (A3723) does not specify the size of the pilot program; however, it does require the "rules and regulations adopted by the board shall establish", among other requirements, "a capacity limit for individual solar energy projects to a maximum of five megawatts per project" and "an annual capacity limit for all solar energy projects under the pilot program."[1]

The purpose of this report is to analyze the potential employment, earnings and economic impacts as well as the costs associated with a pilot program capacity of 450 megawatts (MW) over the three-year period.[2]

An initial three-year program of 450 MW is a reasonable starting point for bringing clean energy access to those New Jerseyans who have not been able to access clean energy to date. Indeed, nearly 100,000 customers in the state have been able to adopt a solar system at their home or business.[3] An initial 450 MW community solar program would serve approximately 32,000 customers[4], bringing access to some of those who have not been part of the early solar adopters in the state. A 450 MW program is just a first step towards reaching the 50% by 2030 RPS requirement; the permanent program will be a key component of reaching this goal while continuing to deliver in-state investment and jobs.

Vote Solar used the Jobs and Economic Impact (JEDI) Model developed by the National Renewable Energy Laboratory (NREL) to reasonably estimate the employment, earnings and economic impacts from the construction and operation of the solar energy facilities that could be expected if New Jersey adopts this minimum needed target. The Solar Photovoltaic JEDI model has been used extensively by decision makers to assess the expected impacts of solar energy projects, proposed programs and policy decisions.

For the cost impact aspect of the analysis, Vote Solar relied on analysis from the Coalition for Community Solar Access (CCSA). CCSA used data from the New Jersey distribution utilities, leading financial firms, and PJM to arrive at total expected costs by utility for the 450 MW program and then subtracted the utilities' avoided costs for the program, thereby calculating the remaining costs to New Jerseyans. These assumptions and methodologies are detailed in Section 3 of this report.

[1] https://www.njleg.state.nj.us/bills/BillView.asp?BillNumber=A3723

[2] Any reference throughout this report to a 450 MW Community Solar Energy Pilot Program all refer to a program capacity number in alternating current (AC).

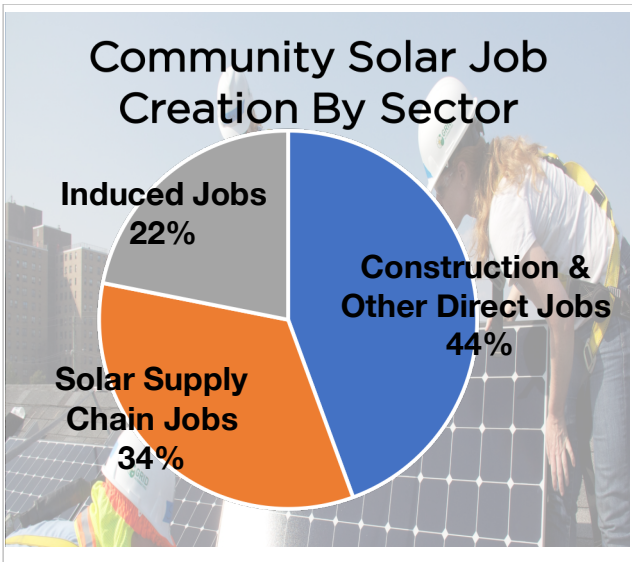
[3] New Jersey Board of Public Utilities, Office of Clean Energy, "Solar Frequently Asked Questions". Data current as of last update (July 31st, 2018). Available at: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs

[4] Assumes the program serves 50% residential and small commercial customers and 50% large customers, with 32,143 small customers having an average subscription size of 7kW and 225 large customers having subscription sizes of 1MW.

2. SUMMARY OF FINDINGS

New Jersey can expect the following economic benefits from 450 MW of distributed community solar installed between 2019 – 2021:

- **1,778 sustained full-time jobs** during construction and an additional 41 sustained full-time jobs associated with operations and maintenance.
- **$414.7 million** in earnings for those employed.
- **$797.9 million** in local economic benefits for the state, excepting local tax revenues.
- **$3.3 million** from property tax revenues in the first year alone.



The above statistics yield an average of $48.5 million/year of economic benefit *each year* during the 25-year minimum life of the solar projects.

From the same program, New Jersey can expect the following costs:

- $27.8 million/year of net cost to New Jerseyans after the utilities' avoided costs are accounted for, specifically, the reduction in energy, and the capacity and Class 1 RECs that would otherwise be purchased to serve customers. While this cost is modest, it is nonetheless an overstatement of the net cost as it does not account for other avoided costs afforded by distributed solar, such as avoided distribution and transmission investment.
- Assuming the projects serve 50% residential customers at minimum, this would equal residential rate increase of less than half of 1% (specifically ranging from 0.22-0.39%, depending on the utility). For an average household across the state, this would mean a cost of $0.19-0.42 per month, which is less than the cost of one postage stamp per month.

From this analysis, we conclude that the economic benefits from a 450 MW initial community solar program are substantial and greatly outweigh the costs.

3. ASSUMPTIONS

Economic Benefit Analysis

Any pilot program should support a diversity of project types and sizes. Although the enabling legislation authorized projects up to 5 MW in the Pilot Program, siting constraints are likely to result in a range of project sizes.[5] For the purposes of modeling the economic impact of the pilot program, a key assumption is the system size of projects. An average system size of 2.5 MW DC was used for purposes of the report analysis to serve as a proxy for the variety of project sizes expected as part of the pilot program.

Analysis conducted by GTM Research was used as the basis for installed cost assumptions. In a report entitled, *The Vision for U.S. Community Solar: A Roadmap by 2030,* GTM Research included installed costs estimated for a baseline year (2017), 2020, 2025 and 2030. Installed costs for years 2019 and 2021 were extrapolated from the publicly available information (Reference Graph 1).[6] However, this program is intended to serve a diversity of customers, including many residential and small commercial customers. Indeed, jointly filed Comments by Vote Solar, GRID Alternatives, Earthjustice, Ironbound Community Corporation, and Environment New Jersey recommend that New Jersey's community solar program include programmatic requirements to ensure the Pilot expands access to a diversity of customer types. These Comments recommend that the Pilot Program rules implement a requirement that each project serve 50% residential and small commercial customers, something that is typically accomplished through a 50% small customer participation requirement of 25 kW or less.

Serving these small customers results in additional costs above and beyond those incurred by a similarly-sized community solar project with only a few subscribers. To capture the additional cost of meeting policy objectives of A3723, specifically "standards to ensure the ability of residential and commercial customers to participate in solar energy projects, including residential customers in multifamily housing", Vote Solar refers to comments filed by CCSA as part of BPU Docket No. Q018060646 regarding one time and ongoing customer acquisition costs for community solar.

According to CCSA, the Sustainable Energy Advantage (SEA) in consultancy for the Rhode Island Office of Energy Resource surveyed the industry to ascertain customer acquisition cost associated with projects that serve at least 50% of their capacity to subscriptions of 25 kW or less.[7] Analysis by SEA found that the upfront (one time) customer acquisition cost associated with these projects are about $0.25/Watt (W), the ongoing (annual) cost associated with customer replacement is $0.02/W/year, and the ongoing (annual) cost of customer management and billing is about $0.01/W/year.[Error! Bookmark not defined.8]

[5] Siting constraints typically refer to limitations on available roof space or land to physically install the solar facility.
[6] GTM Research (2018). The Vision for U.S. Community Solar: A Roadmap to 2030. Available online: http://www.votesolar.org/csvision
[7] Sustainable Energy Advantage, LLC et. al, Rhode Island Renewable Energy Growth Program, September 2016, http://sos.ri.gov/documents/publicinfo/omdocs/minutes/6154/2016/49211.pdf
[8] All Rhode Island cost references for capacity are direct current (DC).

The additional upfront (one time) customer acquisition costs associated with community solar projects that meaningfully serve residential and small commercial customers is added to GTM's base installed cost data, which did not assume a 50% per project small customer requirement. Table 1 outlines specific assumptions used for JEDI model inputs.

Table 1: Model Assumptions for Average System Size, Base Installed Cost, and Number of Systems

PROJECT SCALE	COMMUNITY SOLAR
Pilot Program Size (AC)	450 MW
Pilot Program Size (DC)	475 MW [9]
Average System Size	2,500 kW DC
Base Installed Cost 2017	$2.270 / W
Base Installed Cost 2019 (year 1 of Pilot)	$2.115 / W
Base Installed Cost 2020 (year 2 of Pilot)	$1.960 / W
Base Installed Cost 2021 (year 3 of Pilot)	$1.883 / W
Expected Number of Systems Per Year during Pilot	63 per year
Solar Cell/Module Material	Crystalline Silicon
System Tracking	Fixed Mount
Money Value – Year in which costs are based (for consistency)	2018

[9] NREL's JEDI tool requires solar photovoltaic capacity inputs in MW DC (direct current). The inverter efficiency can be used to calculate expected DC capacity from AC (alternating current) capacity. Given 450 MW AC Pilot Program Size and 95% efficient inverters, a conservative calculation of 475 MW DC was calculated. 475 MW DC multiplied by 95% is approximately 450 MW AC. A 475 MW DC Pilot results in approximately 158 MW install per year. Assuming 2.5 MW system sizes, New Jersey could expect approximately 63, 2.5-MW installation per year.

Cost Impact Analysis

The data for this analysis included the following:

- Current default residential retail rates from the New Jersey Investor-Owned Distribution Utilities – Public Service Electric and Gas, Jersey Central Power & Light, Atlantic City Electric, and Rockland Electric Company
- Utilities' reported annual residential and commercial electricity sales figures for both bundled and retail-supply customers
- Forecasted PJM locational based marginal price (LBMP) energy prices and capacity prices for New Jersey from Ventyx, an ABB company, and S&P Global
- Forecasted Class 1 REC prices
- Standard annual solar production forecasts using a 13.4% capacity factor and 95% optimization of site orientation and shading

With the above data, the cost impact of the proposed 450 MW program size was modeled at the end of the 3rd year when all capacity would be operational. The 450 MW was distributed between the utilities based on their share of the New Jersey peak load as proposed by CCSA, Vote Solar, GRID Alternatives, Earthjustice, Ironbound Community Corporation, and Environment New Jersey. For each utility, the annual electricity production (kWh) was multiplied by the proposed compensation in each utility territory (residential retail rate + Class 1 RECs) minus the avoided utility costs (the energy, capacity, and Class 1 RECs the utilities would no longer have to procure in the wholesale market). The resulting non-avoidable costs per utility territory were then spread across the kWh sales to two main customer classes, with 50% being allocated to residential customers. This reflects an assumption that projects will have a commercial anchor tenant and then serve small customers with the remaining half of the project's capacity. The resulting cost per kWh was then divided by current residential retail rates in each territory, and then modeled into a cost per month or year based on the average household electricity usage of 7,000 kWhs annually.

4. DETAILED RESULTS

The JEDI model assesses the job, earnings and economic impacts derived from a 450 MW Community Solar Energy Pilot Program. Direct, indirect, and induced impacts to employment, earnings and economic impacts were calculated. Employment impact figures typically represent full-time equivalents (FTE), or 2080-hour units of labor (job years). However, it is assumed that solar jobs will be maintained over the 3-year Pilot Program period, thereby making these sustained jobs. Earnings reflect wages, salary compensation, and benefits paid to workers. Economic output refers to economic activity or the value of production in the state or local economy, and it is reported in 2018 dollars.

NREL's JEDI model calculates jobs, earnings, and output distributed across three categories:[8]

- **Direct Impacts.** Direct impacts arise from solar project development, design, permitting, construction, and onsite labor. This category also assesses economic impacts from continued onsite work over the course of solar array operations and maintenance.
- **Indirect Impacts.** Investments into PV solar projects stimulate economic impacts in industries outside of onsite construction and maintenance activities. Indirect impacts refer to changes in local revenue and industry impacts across the PV supply chain for local construction activities and ongoing operations and maintenance.
- **Induced Impacts.** Induced impacts result from reinvestment in the local economy, and spending of earnings by direct and indirect beneficiaries of solar projects. Examples of induced impacts include money spent on restaurants, gas and groceries.[10] The JEDI model captures the additional induced job creation and economic benefits during both construction activities and ongoing operations and maintenance.

Taken as a whole, these metrics of job impacts and output offer a comprehensive snapshot of the impacts of a 450 MW community solar Pilot Program in New Jersey. Results are grouped into three main categories reflecting employment impacts, earnings impacts, and economic outputs. In addition, the expected costs of a 450 MW community solar Pilot Program in New Jersey are also detailed below.

Note: Totals included in the summary tables may not add up due to independent rounding.

4.1 Employment Impacts During Construction and Operations and Maintenance

Solar installations require significant upfront private investment in capital and labor. Once installed and commercially operable, solar installations require a workforce for continued operation and maintenance.

While the JEDI model typically reports jobs in FTE, this analysis recognizes that the Pilot will result in incremental renewable energy capacity over a three-year period as well as incremental sustained jobs. Table 2 shows employment impacts as sustained jobs. These were calculated by dividing the total FTE jobs by the number of years in the Pilot Program.

As shown in Table 2, the JEDI model reveals that nearly 1,800 sustained jobs will be needed to support just the construction of 450 MW of community solar from 2019 – 2021. Approximately 44% of jobs created are direct jobs, reflecting on-site labor related to the construction and operation of PV arrays. Indirect jobs, or employment associated with the supply chain of PV array construction, accounts for 34%. The remaining 22% of jobs are attributed to induced jobs, or labor and spending resulting from both direct and indirect earnings in local economies.

[10] The Solar Foundation (2017). U.S. Solar Industry Added $184 Billion to U.S. GDP in 2016. Accessed online, http://www.thesolarfoundation.org/solar-jobs-census/economic-impacts-report-2016/.

In summary, the creation of 450 MW community solar Pilot Program in New Jersey could result in the creation of over 1,800 sustained jobs during the construction and operations of these facilities across the state.

Table 2: Sustained Direct, Indirect, and Induced Employment During Construction and Operations & Maintenance, from 2019 - 2021

Categories of employment	During construction	During operations & maintenance	Total
Direct	779	29	**808**
Indirect	607	7	**613**
Induced	393	5	**398**
Total Employment	**1,778**	**41**	**1,819**

4.2 Earnings from a Statewide Community Solar Program

The JEDI model also captures the expected employee salaries, wages and earnings during the construction and operation of community solar projects in New Jersey. Table 3 illustrates that a robust community solar program would support tremendous earnings potential among New Jersey's citizens. Solar installation, operations and maintenance jobs are well-paying jobs, and significantly above minimum wage.

NREL's JEDI analysis indicates that the 1,819 sustained jobs over the Pilot Program Period can earn a total of nearly $415 million in earnings, or roughly $76,000/year or $36.52/hour.[11]

These economic benefits significantly contribute to New Jersey's overall economy, both in terms of personal wealth creation and induced economic impacts from well-paying jobs in the clean energy sector.

Table 3: Labor Earnings During Construction and Operations of Distributed Solar Projects expected During 2018 - 2023

	During Construction	During Operations & Maintenance	Total
Direct	$182.4 million	$5.3 million	$187.7 million
Indirect	$143.4 million	$1.8 million	$145.2 million
Induced	$80.7 million	$1.1 million	$81.8 million
Total	**$406.5 million**	**$8.2 million**	**$414.7 million**

[11] Consistent with NREL's definition of a full time equivalent job, each FTE is assumed to work 2,080 hours per year.

4.3 Economic Output in New Jersey's Economy

The majority of the economic benefit is derived from the direct, indirect and induced impacts during the construction period. The addition of 450 MW of community solar in New Jersey is expected to create over $785 million in economic benefits simply during the construction period of the solar installations. An estimated $12.7 million of economic activity is expected during the continued operations and maintenance period, as referenced in Table 4.

Overall, the JEDI model calculates the total economic impact of adding 450 MW of community solar from 2019 – 2021 to be nearly $798 million.

Table 4: Economic Output During Construction & Operations of 4.8 GW Installed 2018 - 2023

	During Construction	During O&M	Total
Direct	$261.9 million	$5.3 million	$267.2 million
Indirect	$316 million	$4.6 million	$320.6 million
Induced	$207.2 million	$2.8 million	$210 million
Total Economic Output	**$785.2 million**	**$12.7million**	**$797.9 million**

4.4 Property Tax Revenue during Initial System Operating Year

Community solar facilities also contribute to New Jersey's economy through the payment of local property taxes for each year over the 25-year operating life of the installed systems. Property tax rates differ across New Jersey based on a project's location. Due to the fact that these community solar installations will be spread across the state, a standard factor of $7,000/MW(DC) installed was used for this analysis.[12]

Using this calculation, the State of New Jersey can expect to receive approximately $3.3 million in property tax revenues in just the first year of system operation.

Table 6: Local Property Tax Revenue During Operations and Maintenance

Cumulative Capacity	475 MW DC
Estimated Factor to Assess Local Property Taxes	$7,000/MW DC installed
Total Year 1 Property Tax Revenue	**$3.3 million**

[12] According to local solar industry, a standard factor of $7,000/MW(DC) is reasonable. Projects in New Jersey have property tax rates both above and below $7,000/MW (DC).

4.5 Costs of the Program

Per CCSA's analysis, the program would have modest rate impacts and overall costs per customers. The table below reflects the costs for ratepayers in each utility service territory assuming each utility builds out a portion of the program on a load-weighted basis after accounting for avoided renewable electricity certificate, energy, and capacity purchases. These costs do not include other avoided costs provided by distributed solar, such as reduced transmission and distribution costs

Table 7: Program Cost by Utility

Utility	Expected Community Solar Projects (MW)	Proposed Compensation ($/kWh)*	Non-Avoided Cost ($/kWh) **	Annual Production from total MW Installed (kWhs/yr)	% Residential Rate Increase***	Costs to Average New Jersey Household Per Year ⊥	Cost to Average New Jersey Household Per Month
Public Service Electricity and Gas	243	0.181	0.06	270,980,964	0.39%	$4.99	$0.42
Jersey Central Power & Light	144	0.147	0.03	160,581,312	0.22%	$2.31	$0.19
Atlantic City Electric	54	0.191	0.07	60,217,992	0.33%	$4.44	$0.37
Rockland Electric Company	10	0.182	0.07	11,151,480	0.30%	$3.82	$0.32
Total	**451**						

* Full volumetric residential rate + class 1 RECs

** The net of proposed compensation and non-avoided costs. Assumes energy is avoided at 3.39c/kWh, capacity is avoided at 6.68c/kWh, and RECs are avoided at 1.5 c/kWh

*** Assumes projects have a capacity factor of 13.4% and a site that is 95% optimized for orientation and shading. The non-avoided costs ($) are calculated by multiplying total production by the per-kilowatt-hour non-avoided cost to generate a total non-avoided cost. These non-avoided costs are then divided by half, assuming projects serve 50% residential customers. These costs are further divided by annual residential electricity sales (MWh) from EIA *Form 861* to arrive at a per kilowatt-hour non-avoided cost. This per-kWh non-avoided cost is then divided by the retail rate to determine the percentage increase in rates.

⊥ Assumes average residential customer consumption is 7,000kWh

5.0 CONCLUSIONS

The JEDI model provides a useful tool to estimate job and economic impacts of the addition of 450 MW of community solar as part of New Jersey's Pilot Program from years 2019 - 2021. The findings from the JEDI analysis suggest that renewable energy target would sustain over 1,819 jobs from 2019 to 2021. These sustained jobs represent a 25.6% increase in well-paying solar jobs in New Jersey.[13] In addition, expected average hourly wages of $36/hour creates an opportunity for local citizens to earn to substantial annual salaries.

Policymakers in New Jersey cannot ignore the $798 million dollars that a 450 MW community solar program could bring to the state's clean energy economy. The economic benefit to New Jersey's economy is driven by private investment, on-site labor, increased demand for professional services and supporting industries, as well as benefits from reinvestment in the state's economy. The JEDI findings clearly show that a robust Community Solar Energy Pilot Program will meaningfully contribute to New Jersey's economy both during the construction and ongoing operations and maintenance of the installed systems.

In addition, New Jersey is expected to receive over $3.3 million in property tax revenues during the first year of operation of these community solar projects. Municipalities across New Jersey use property tax revenues to fund community services such as public education, police and fire protection, and public road maintenance. As a result, New Jersey's local governments and citizens stand to benefit tremendously from the economic benefits community solar can bring to their communities.

What's most exciting though, is that a robust community solar Pilot Program offers a broad range of additional benefits to the end-users. Community solar expands access to cost-saving solar energy solutions, particularly for households, renters, businesses, and other that cannot install rooftop solar. Furthermore, as indicated in the joint Comments of Vote Solar, GRID Alternatives, Earthjustice, Ironbound Community Corporation, and Environment New Jersey, it is critical that any Pilot Program include 15% carveout, in aggregate, for low-to-moderate income community solar projects. It is important that any Pilot Program include meaningful provisions to provide access to underserved communities – low-to-moderate income households, low-income service organizations, and affordable housing subscribers. These individuals stand to benefit most from affordable and predictable energy costs. New Jersey's Community Solar Energy Pilot Program is the state's opportunity to create an inclusive clean energy economy.

New Jersey has done a great job establishing renewable energy policies and programs. But now, it's time for New Jersey to create a robust, inclusive, and forward-looking Community Solar Energy Pilot Program that can provide clean energy for all its citizens, regardless of income level or housing type, and drive new investment and economic benefits to the state.

[13] According to The Solar Foundation's March 2018 Solar Jobs Census, New Jersey currently has 7,106 solar jobs. The addition of 1,819 sustained jobs would equate to a 25.6% increase in current solar jobs in the state. Data retrieved from: https://www.thesolarfoundation.org/solar-jobs-census-factsheet-2017-nj/

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