SolarCity

# Response to Request for Proposals by the Towns of Bristol and Barrington for a Partnership for On-Site Solar Projects

# Bid #850

**Prepared by:**

SolarCity Corporation
70 Centre of New England Blvd
Coventry, RI 02816

**SolarCity Contact:**

Justin Selmanoff
Sr. Project Development Manager
jselmanoff@solarcity.com
410.340.6632

**Town of Bristol Contact:**

Diane M. Williamson
Director of Community
Development Department
dianew@bristolri.us
(401) 253-7000

Town Clerk's Office
Town Hall
10 Court Street
Bristol, RI 02809

November 30, 2016

Dear Mrs. Williamson,

On behalf of SolarCity, I would like to thank you for taking the time to review our proposal in response to the Towns of Bristol and Barrington ("the Towns") request for the development of on-site solar projects in a public-private partnership. We have carefully read and understand the provisions of the RFP, and have put forth five (5) project proposals that we are confident will provide the greatest value to the Towns.

**Town of Bristol**

For the Town of Bristol, we are proposing two financing options for the installation of a 3.5 MWdc ballasted ground-mounted system on the closed landfill. The first financing option is a land lease under the state's Renewable Energy Growth Program, and the second is a Virtual Net Metered Power Purchase Agreement (PPA) utilizing the state's Renewable Energy Fund grant program. The details of our technical and financial offerings for the Town of Bristol begin on Page 18.

**Town of Barrington**

For the Town of Barrington, we are proposing the deployment of 2.4 MWdc of rooftop and carport installations at Town-owned properties as well as an indicative option for a 2.8 MWdc privately-owned offsite ground-mounted installation. The first financing option for the Town-owned properties is a land lease under the state's Renewable Energy Growth Program, and the second is a PPA utilizing the state's Renewable Energy Fund program. For the privately-owned offsite installation, we are proposing a Virtual Net Metered PPA using the state's Renewable Energy Fund grant program. SolarCity has extensive resources available to acquire land assets to help meet the Towns generation capacity and welcome the opportunity to customize this approach if chosen as vendor. The details of our technical and financial offerings for the Town of Barrington begin on Page 25.

SolarCity's pricing was calculated using Prevailing Wage rates for both the Town of Bristol and the Town of Barrington proposals. While time constraints prevented us from recalculating our pricing for the Towns using Standard Wage rates upon reception of Addendum #5, SolarCity would be happy to re-price with improved figures upon the Towns' request.

As America's #1 full-service solar power provider, SolarCity has the requisite experience necessary to execute the Towns' projects quickly and efficiently. SolarCity has installed 2,547 MW[1] of PV solar capacity since our incorporation in 2006, and has more than 2,000[2] commercial and government customers across the United States including Walmart, the U.S. Military, Hewlett Packard, and Intel. We also have the privilege of having completed over 500 installations in the state of Rhode Island, totaling over 4,200 kWdc of PV capacity.[3]

[1] As of September 30, 2016
[2] As of September 30, 2015
[3] As of September 30, 2016

**Justin Selmanoff | Sr. Project Development Manager | jselmanoff@solarcity.com | 410.340.6632**
**SolarCity Corporation** | 70 Centre of New England Boulevard, Coventry, RI 02816 | RC38313 | www.solarcity.com

Our vertically-integrated approach allows SolarCity to utilize some of the most efficient and cost-effective products on the market in our installations. Our in-house developed ZS Peak ballasted racking system is among the lightest and most efficient to install, reducing stress on the Towns' rooftops. This racking system also requires significantly fewer roof penetrations than do typically ballasted racking systems, and can allow for 20-50% more panels to be installed on a roof area. We will also utilize our in-house developed ZS Beam carport racking system, which allows panels to be attached to parking lot shading structures faster, more safely, and at a lower cost than was previously possible. SolarCity not only manufactures its own racking, but will soon be the largest manufacturer of highly-efficient solar panels in the United States. Lastly, our proprietary DemandLogic battery energy storage system is a market leader in demand response solutions. After provision of utility interval data for each facility, we may be able to offer additional savings to the Towns by integrating DemandLogic with our proposed PV systems. Please see Appendix A for more information regarding DemandLogic.

We offer our sincere thanks for the opportunity to provide a proposal for the Town's solar systems. In submitting this response, we acknowledge that we have received and understood the Town's RFP and all addenda to that document, including Addenda 1, 2, 3, 4, and 5. We certify that, if selected to negotiate the contract with the Towns, we will be prepared to promptly and actively participate in such negotiations. If any additional information would be helpful in assessing the value of our offering, we hope you will reach out to us to request it.

Justin Selmanoff will be the dedicated Senior Project Development Manager for the Towns' solar projects. Please direct any questions regarding this proposal to him at 410.340.6632, or at jselmanoff@solarcity.com

SolarCity requests that all information provided in this proposal be treated as proprietary and confidential. Consequently, please contact Justin for approval prior to publicly releasing any portion of this proposal.

Pricing is valid until February 26, 2017. SolarCity will make every effort to honor pricing proposals beyond this time period as long as market conditions and commodity prices allow. If the Towns anticipate a longer time frame will be needed, please contact Justin.

We look forward to working with the Towns on these exciting and innovative projects.

Sincerely,

Bob Rudd
Vice President, Project Development
SolarCity Corporation

LEGAL APPROVED
INITIAL JH/BC
DATE 11-28-16
RFP

## Table of Contents

Bidder's Background ..... 6

About SolarCity ..... 6
Commitment to Rhode Island ..... 7
Experience ..... 8

Nationwide Experience ..... 8
Experience in New England ..... 9

Qualifications ..... 10

Financial Stability ..... 10
Production Performance Guarantee ..... 11
Operations & Maintenance ..... 12
Monitoring Solution ..... 14

Bidder's References ..... 15
SolarCity's Proposal for the Town of Bristol ..... 18

Landfill Considerations ..... 18
SolarCity's Price Proposal – Town of Bristol ..... 19

Buyout and Termination Values ..... 21

SolarCity's Technical Proposal – Town of Bristol ..... 22

System Design ..... 22
Production Estimate ..... 24

SolarCity's Proposal for the Town of Barrington ..... 25

SolarCity's Price Proposal – Town of Barrington ..... 25

Buyout and Termination Values ..... 29

SolarCity's Technical Proposal – Town of Barrington ..... 30

System Design ..... 30
Production Estimates ..... 35

Appendices and Supporting Information ..... 38

a. DemandLogic Energy Storage Value-Add Offering ..... 39
b. Required Forms ..... 41

Bid Form – Town of Bristol ..... 42
Bid Form – Town of Barrington ..... 43
Non-Collusion Affidavit ..... 44
Bidder's Statement Regarding Insurance Coverage ..... 46
Bidder's Statement of Relevant Experience ..... 47
Contractor Registration ..... 48

c. Production Estimates ..... 49

Town of Bristol .....50
Town of Barrington .....55

d. Preliminary Project Schedules .....72

Town of Bristol .....73
Town of Barrington .....74

e. Component Datasheets .....75
f. End Notes .....103

# Bidder's Background

## About SolarCity

SolarCity is a wholly owned subsidiary of Tesla Motors, Inc. (as of November 21, 2016). SolarCity was founded by Lyndon and Peter Rive in June 2006 with the mission to transform the way energy is delivered in the 21st century through cleaner, more affordable distributed solar generation. With 2,547 MW of installed solar capacity[i] SolarCity is the largest full-service solar provider in the country by a wide margin.

Innovative financing, technology, project management, and supply volume have allowed SolarCity to provide the highest quality installations at competitive prices to hundreds of thousands of homeowners, businesses, schools, governments, and non-profit organizations. SolarCity has installed 520 MW of solar systems[ii] for commercial and government customers including the United States Military, Walmart, eBay, MillerCoors, and Hewlett Packard, along with New England municipalities such as the Town of Glastonbury, the City of New Britain, and the Town of East Bridgewater.

The table below contains a summary of SolarCity's current position:

**Company Information**

| | |
|---|---|
| **Name of Corporation** | SolarCity Corporation |
| **Date and State of Incorporation** | June 21, 2016, in Delaware |
| **Ownership Status** | Wholly Owned Subsidiary of Tesla Motors, Inc. (NASDAQ: TSLA) |
| **Corporate Headquarters** | 3055 Clearview Way<br>San Mateo, CA 94402 |
| **Local Address** | 70 Centre of New England Boulevard<br>Coventry, RI 02816 |
| **Number of Warehouses** | 90+ (as of May 17, 2016) |
| **Number of Employees** | Nationwide: ≈13,000 (as of June 30, 2016)<br>New England: 1,000+ (as of September 30, 2016) |
| **Cumulative PV Solar Installed** | 2,547 MW (as of September 30, 2016) |
| **Cumulative Commercial PV Installed** | 520 MW (as of September 30, 2016) |
| **Cumulative Installed Customers** | 305,936 (as of September 30, 2016) |
| **Cumulative Commercial Solar Projects** | Over 2,000 (as of September 30, 2015) |
| **Cumulative Rhode Island Installations** | 500+ (as of September 30, 2016) |
| **Cumulative Rhode Island PV Installed** | 4+ MW (as of September 30, 2016) |
| **Cumulative Energy Contracts Signed** | 322,897 (as of December 31, 2015) |
| **Undeployed Tax Equity Capacity** | $490 million (as of September 30, 2016) |
| **Target Client Sector** | Commercial, Industrial, Government, Utility, Education, and Residential |
| **Custom Services Offered** | In-house design, engineering, financing, monitoring, energy storage, operations, and maintenance |

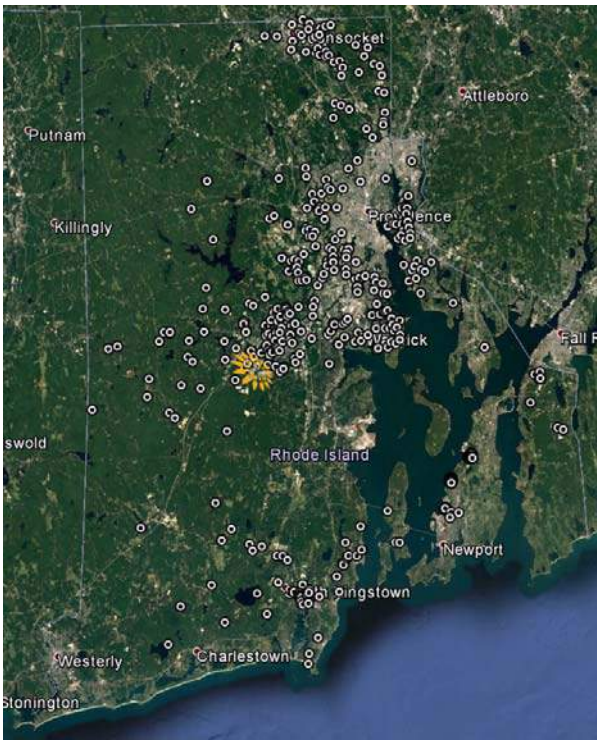
## Commitment to Rhode Island

SolarCity has been operating in the commercial and residential sectors in New England for many years. With 12 regional offices in the area, we are proud to have launched a full hiring initiative for our Coventry, Rhode Island, location and already have more than 30[iii] locally employed. When fully staffed, the Coventry location could employ 75 to 200 people, as do other similar centers in New England. "We are grateful that Governor Raimondo and the Rhode Island Legislature support clean energy and the solar business economy by signing legislation (H. 8354A) that expands net metering and makes solar more accessible for Rhode Islanders," said SolarCity CEO Lyndon Rive. "We look forward to increasing our solar product offerings in the Ocean State."

### Rhode Island Airport Corporation

SolarCity and the Rhode Island Airport Corporation (RIAC) have partnered to develop the largest commercial solar project in Rhode Island to date. Upon completion, the project will consist of PV systems with a cumulative capacity of approximately 17 MW across four airports in the state: Newport State Airport, North Central State Airport, Quonset State Airport, and T.F. Green Airport. SolarCity is working in collaboration with Stantec Consulting Services to prepare environmental assessments to ensure that the PV systems are optimally suited for their locations.

The RIAC solar project represents SolarCity's first major commercial project in Rhode Island, and will likely result in greater statewide investment in solar to achieve the State's Renewable Energy Standard. Given the high visibility of RIAC in the community at large, these systems will be a showcase for solar in the surrounding communities and promote greater interested in renewable energy. SolarCity is also currently working with the Rhode Island Governor's office to enact solar policies that will further promote solar development in the state.



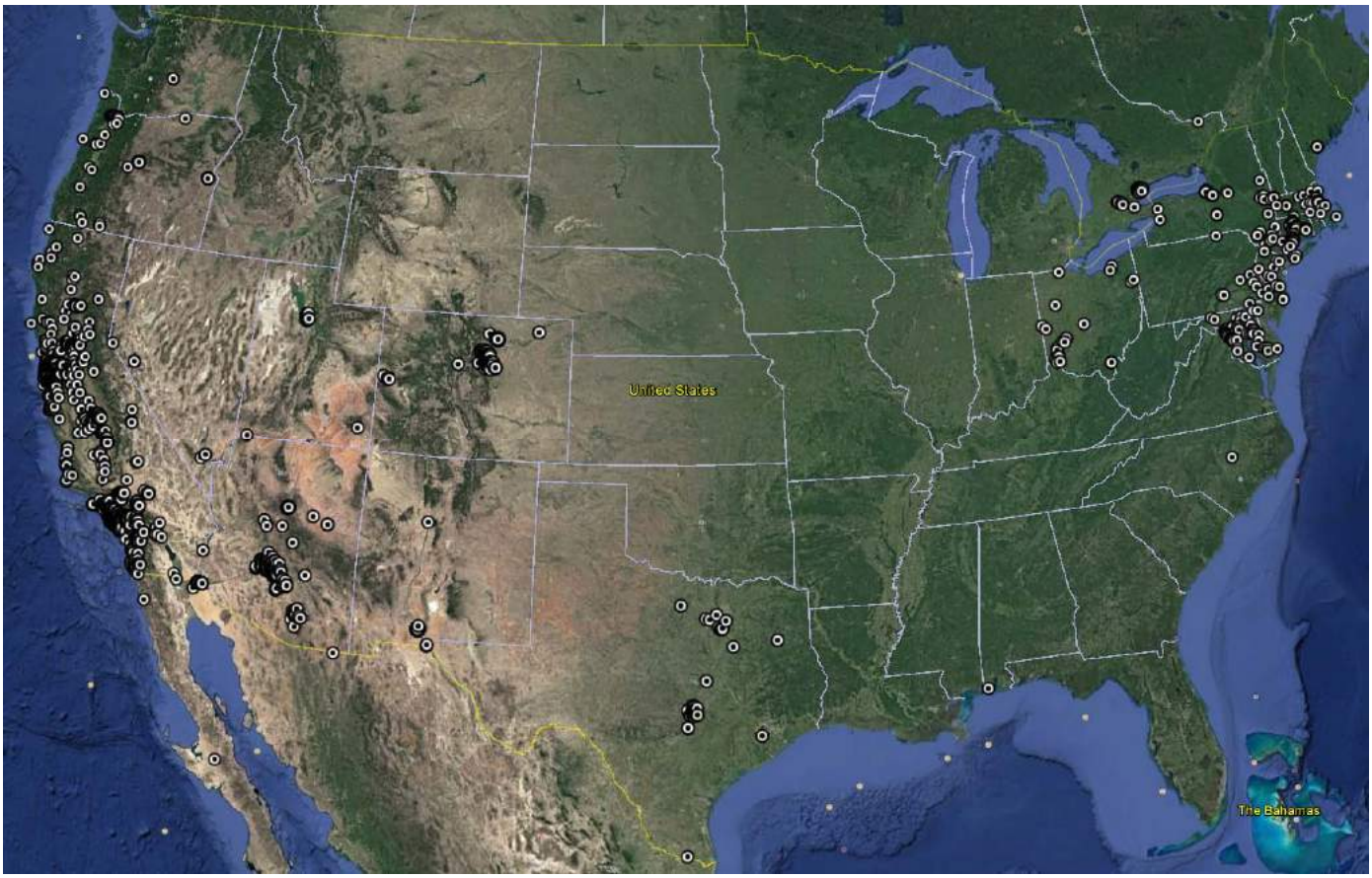

*Map showing SolarCity's 500+ installations totaling over 4,200 kWdc of PV capacity in Rhode Island*[iv]

# Experience

## Nationwide Experience

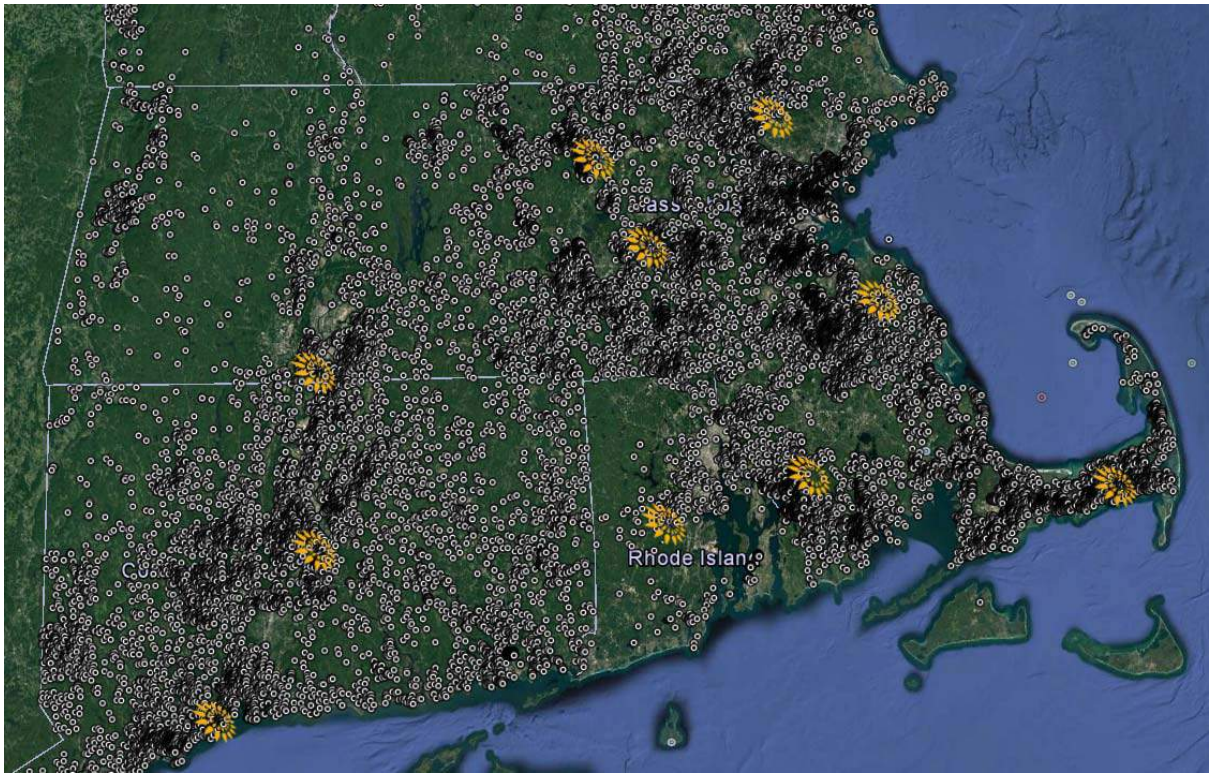
Our diverse project portfolio has propelled us to become America's #1 full-service solar provider in just 9 years. SolarCity has installed 2,547 MW[v] of PV systems and signed more than 320,000[vi] energy contracts across the country. Our cumulative portfolio has seen growth of more than thirty-fold from the 58 MW that we had installed as of 2010.

As a full-service solar provider, SolarCity provides Operations & Maintenance (O&M) services for our projects for the life of the systems. Our incredible growth has enabled us to develop a rigorous O&M program to ensure that our systems are performing as intended. The image below shows the commercial and government projects that SolarCity has deployed, most of which are also under our O&M care. Our O&M staff and fleet of thousands[vii] of vehicles that are spread across our more than 90[viii] warehouses provide support for PV systems under our care.




*Map showing SolarCity's commercial and government installations across the country, totaling 520 MW[ix] of PV capacity*

## Experience in New England




*Map showing some of SolarCity's installations (circles) and warehouses (suns) in New England*

SolarCity has 12 warehouses in the New England region, including one in Coventry, Rhode Island, and has amassed more than 28,000 PV installations[x] comprising over 240 MW of PV capacity[xi] in the region. With extensive experience with permitting and incentive procurement in New England, as well as employing over 1,000 workers[xii] in the New England states, SolarCity is poised to cater to an area of the country that is rapidly increasing in solar energy usage.

A sample of completed commercial and government projects in New England is listed below.

| Customer Name | System Size (kWdc) | No. of Sites | Installation Type | State |
|---|---|---|---|---|
| Town of Needham | 3,592.90 | 1 | Ground Mount | MA |
| Town of East Bridgewater | 2,446.08 | 1 | Ground Mount | MA |
| Town of Lexington | 2,228.31 | 1 | Carport, Ground | MA |
| Advance Auto Parts | 1,170 | 1 | Roof | CT |
| Yale University | 1,342.00 | 1 | Roof | CT |
| City of New Britain | 1,243.78 | 4 | Ground, Roof | CT |
| Bowdoin College | 1,242.195 | 4 | Ground, Roof | ME |
| Town of Glastonbury | 1,184.32 | 9 | Carport, Ground, Roof | CT |
| South Central Connecticut Wastewater Authority | 1,000 | 1 | Ground | CT |

# Qualifications

## Financial Stability

In operation for over 10 years, SolarCity has a long track record of growth and success. SolarCity's financing structures are designed to ensure that its PV systems will be maintained for the lifetime of the Towns' contracts. Through its PPA and lease options, SolarCity establishes multi-year contracts that provide energy savings to its customers and a highly reliable, long-term stream of revenue to SolarCity.

In November 2016, SolarCity was acquired by Tesla Motors, Inc., with the goal of creating the world's first vertically-integrated, end-to-end sustainable energy company. As a wholly owned subsidiary, SolarCity will work with Tesla to provide customers with an aesthetically beautiful and simple one-stop solar and energy storage experience.

SolarCity's investors and lenders include some of the largest and most-trusted financial institutions in the world. SolarCity has installed 2,547 MW[xiii] since it first began operating in 2006 in multiple industry segments including residential, commercials, government, and utility-scale solar. This diverse portfolio of projects provides steady installation activity and mitigates potential risk from changes in any single industry segment. As a testament to SolarCity's reliability and the ease with which customers can make the switch to solar, SolarCity has 2.3 GW[xiv] of PV capacity deployed under energy contracts including all residential, commercial, and government leases, power purchase agreements, and consumer loan agreements.

### Experience Raising Funds

SolarCity's in-house financing team is an industry leader in raising funds for solar projects. SolarCity raises project funds on an ongoing basis, which means that it can start construction once permits are secured. While project funding for individual projects cannot be confirmed in advance of signing a contract, SolarCity's track record of successfully funding projects is extremely solid; SolarCity has raised more than $1 billion in project financing in the 120 days prior to November 1, 2016, including five tax equity funds, an SREC financing facility, solar loan financing, and a second cash equity transaction. By combining various forms of financing facilities, SolarCity is able to finance projects with a lower overall cost of capital and is able to provide a competitive PPA rate for the Towns.

The upfront cost of the proposed projects will be funded through a combination of SolarCity's tax equity financing[4] and SolarCity's existing equity. Typically, once the project has achieved commercial operation, SolarCity will use its existing financing aggregation facilities to secure debt against project cash flows. SolarCity and the project tax equity sponsor will monetize the federal Investment Tax Credit and the Modified Accelerated Cost Recovery System (MACRS) depreciation tax benefits from the Towns' projects, passing the value of these tax incentives through to the Towns in the form of decreased PPA rates.

### SolarCity's Detailed Financial Report

Per SEC regulations, SolarCity is required to regularly release relevant financial and operating information. SolarCity's audited annual reports and consolidated financials are available on the company's investor web page at: http://investors.solarcity.com/sec.cfm.

[4] SolarCity has $490 million in undeployed tax equity financing as of September 30, 2016

## Production Performance Guarantee

As the owner of the system, SolarCity is committed to ensuring that it performs as expected. As a sign of our commitment, SolarCity is pleased to provide the Towns with a non-weather-adjusted 100% Production Performance Guarantee at no additional cost. We guarantee that the Towns' systems will produce 100% of the estimated kWh production of the final system design. While many of our competitors offer performance guarantees, very few match SolarCity's 100% guarantee, which is designed to be simple, transparent, and easy to administer.

### How It Works

SolarCity will use industry-standard modeling data and tools to create an energy production estimate for each site based on the as-built conditions of each PV system after construction is complete. Throughout the contract term, SolarCity will monitor the systems to verify that they are operating properly. At regular 5-year intervals, SolarCity will compare the total expected kWh energy production with the actual production of the systems. In the event that performance does not match expectations, SolarCity will reimburse the Towns at the rate agreed to in the Performance Guarantee Agreement (which is a separate contract from the Power Purchase Agreement). The expected output of the PV system, including the adjusted production values for normal degradation, and the guaranteed energy price will be recorded in the Performance Guarantee Agreement.

### Example of the Performance Guarantee

For purposes of this example, we have set a $0.02/kWh rate for the guaranteed energy price.[5] In the scenario below, the system had a production shortfall of 50,000 kWh during the first 5-year term; therefore, SolarCity would reimburse the customer for the loss of production at the end of the first 5-year interval.

| Term | Guaranteed Production | Actual Production | Production Shortfall | Guaranteed Energy Price | Example Payment to Customer |
|---|---|---|---|---|---|
| Years 1-5 | 1,000,000 kWh | 950,000 kWh | 50,000 kWh | $0.02/kWh | $1,000.00 |

The amount reimbursed to the customer at the end of the 5-year term is determined by the following calculation:

*Guaranteed Energy Price x Production Shortfall = Amount Reimbursed*

In this example, the payout to the customer for the first true-up term would be $1,000.

*$0.02/kWh x 50,000 kWh = $1,000*

[5] Please note that the rate in this example is not the actual rate that is being offered to the Towns. The actual offered rate is dependent on site conditions and will be agreed upon prior to finalizing the Performance Guarantee Agreement. Guaranteed production takes normal PV degradation of 0.5% per year into account.

## Operations & Maintenance

*We have developed a comprehensive O&M plan to ensure that all of our systems achieve maximum energy output over their lifetimes*

SolarCity's commitment to our customers extends beyond the point at which their systems begin to produce energy. We understand that realizing the benefits of clean energy depends on the ability of the system to perform as or better than expected. With that in mind, SolarCity has developed a comprehensive operations and maintenance (O&M) plan to ensure that all of our systems achieve the highest production output possible over their lifetime, partnering with our customers to guarantee mutual, long-term success.

In the event that a system's performance is largely impaired, SolarCity will notify the customer and dispatch a highly-trained commercial field service technician who will attempt to resolve the issue on site. SolarCity field technicians aim to respond in less than 48 hours from one of our more than 90 warehouses,[xv] the closest of which is located in Coventry, Rhode Island.

All O&M activity on the Towns' sites will be performed in accordance with standard safety procedures and applicable codes. During annual preventative maintenance visits, our qualified technicians will perform comprehensive tests and inspections to ensure the proper operation of the system. SolarCity maintains a robust O&M program and keeps an O&M manual, which covers the following:

| **Preventative Maintenance** | **Frequency: As Scheduled** |
|---|---|
| General Inspection – SolarCity conducts a full visual and physical inspection of all system components and their immediate surroundings in accordance with inspection checklists. | |
| Structure Maintenance – When necessary, SolarCity performs preventative maintenance on the system's structural components to ensure continued safe and effective operation. | |
| Electrical System Testing – SolarCity troubleshoots components via standard electrical tests (voltage, current, resistance, continuity) to isolate and verify performance. | |
| **Corrective Maintenance** | **Frequency: As Necessary** |
| Troubleshooting – SolarCity performs remote diagnostics to determine the symptoms or root cause of equipment failure. If on-site troubleshooting is required, SolarCity will dispatch a technician. | |
| Solution Verification – Our energy analysts review any underperforming systems weekly and verify that the corrective actions that we have taken are effective. | |
| Low Performance and Hardware Failure – SolarCity replaces failed components based on workmanship or manufacturer's warranty. We work closely and directly with our manufacturing partners and our technicians receive the same training as do factory technicians. | |
| Inspection Checklist – SolarCity ensures that all aspects of the system are in proper working order. | |

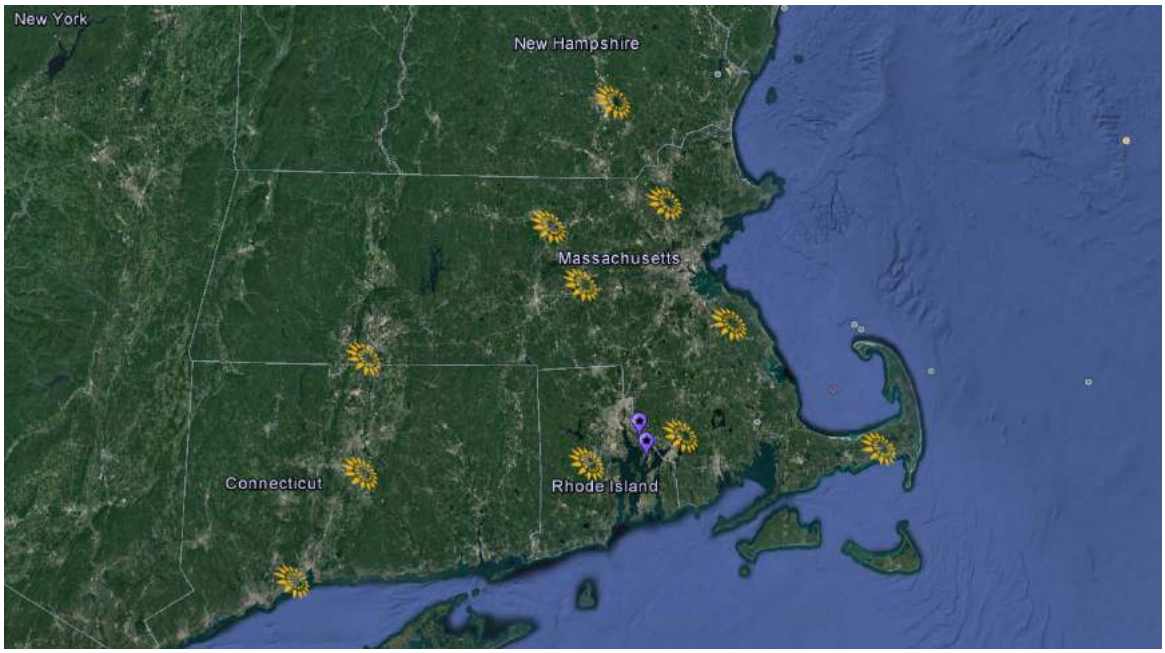
### Inverter and Array Tests and Inspections

The solar array itself consists of many small components and is installed over a large physical area. Array components are typically simple in design, and less prone to failure than are inverters. Failure of these components is difficult to detect and usually results in incremental loss in production. SolarCity's O&M process is designed to identify and prevent failures that can occur over the long term.

The inverters are by far the most complex and critical pieces of equipment for any solar system; a failed inverter prevents the solar modules from producing energy and presents the greatest downtime risk for the system. SolarCity takes great care in maintaining inverters according to manufacturer warranty requirements to ensure proper operation of the system.

Preliminary inspections of solar arrays and inverters include mechanical, visual, electrical, operational, and cleanliness checks as outlined below.

- **Visual**: Interior and exterior of the inverter is inspected to prevent issues related to wire management. Combiner boxes are inspected for heat discoloration, moisture entry, rodent ingress, and continuity of weatherproof seals.
- **Electrical**: Infrared scans are performed to identify hot spots and potential failure points of inverter components. These checks prevent issues with performance and ensure overcurrent protection.
- **Mechanical**: All conductor terminations in the inverter and combiner boxes are physically checked for proper torque.
- **Operational**: Inverter power ratings and input and output voltages are recorded to verify that the inverter is operating normally.
- **Cleanliness**: Fans are cleaned and filters are replaced to ensure ambient inverter design temperature limits. Areas of heavy soiling are identified and evaluated for possible cleaning.




*Map showing some of SolarCity's 12 warehouse locations in New England in relation to the towns of Barrington and Bristol (purple)*

## Monitoring Solution

SolarCity remotely monitors all of our installed solar electric systems to ensure maximum system performance for our customers. With a large and growing fleet of systems, SolarCity has developed proprietary monitoring software called PowerGuide to track system performance. Normalizing for regional weather patterns, the O&M team can rapidly identify failures and identify systems that may be underperforming in order to dispatch service teams appropriately.

### Accurate Tracking of Financial Performance

PowerGuide uses revenue-grade equipment that reports energy performance to within 99.8% of actual production, meeting stringent utility and investor reporting requirements. This high level of accuracy enables our customers to realize the full financial benefits of the PV system by using real-time energy data to inform smarter choices about how and when electricity should be used at each facility. Monitoring data is stored for the life of the system on a secure server with regular backup to ensure accountability.

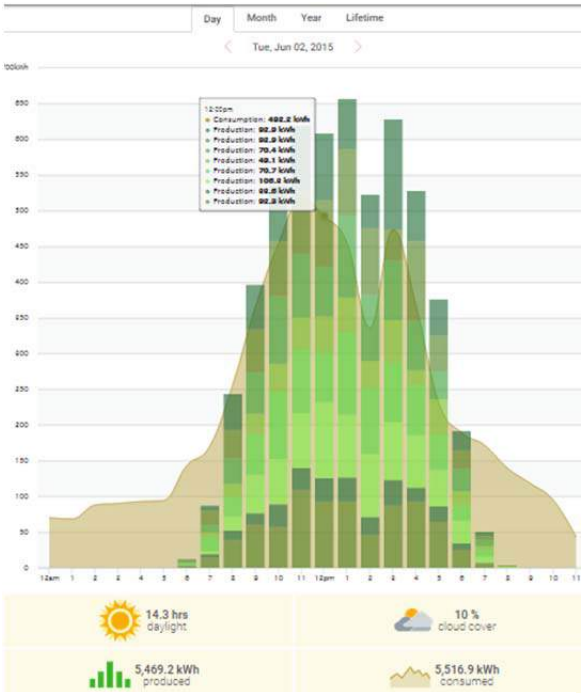
### Real-Time Energy Tracking

Every 15 minutes, the system records information from our installations and transmits it to SolarCity's central headquarters and data servers. PowerGuide provides customers with access to the following data:

- PV System Production (kWh)
- AC Voltage
- AC Current

### Fully-Integrated Customer Support

SolarCity's System Diagnostics Department views energy production data for the fleet every three hours, identifying and evaluating system failures and abnormalities for service calls as required. We can typically dispatch a technician onsite within 48 hours of problem detection. The seamless integration of our monitoring system, System Diagnostics, and field service technicians helps to ensure that the PV system that we provide performs optimally and that our customers receive the highest level of support.




*PowerGuide view of daily system production (green) and consumption (brown)*

### Visualize Your Production at Any Time

Monitoring data is available to customers through an online web interface accessible from any computer or mobile device. Data may be viewed in the following increments: half hour, hour, day, week, month, and year of system operation. The online interface also enables users to export all available data in 15-minute increments in Excel, or in ASCII comma separated format for detailed analysis.

### Solar Energy Production and Total Facility Load

In addition to system production data, SolarCity also provides the energy consumption data for the same meter at which the PV is interconnected with the grid, subject to design constraints. This allows the Towns to see their overall energy profile at a glance. The combined data can enable a customer to better understand the opportunities for reducing grid electricity through demand management and load shifting strategies.

# Bidder's References

## Town of Centreville

| | | | |
|---|---|---|---|
| ***Client Name*** | Town of Centreville | ***Date Completed*** | 2013 |
| ***Location*** | Centreville, MD | ***Contact Name*** | Steve Walls |
| ***Capacity*** | 1 MW, 2 Sites | ***Contact Telephone*** | 410.490.4019 |
| ***Project Type*** | Ground Mount | | |

***Project Description***

The Town of Centreville continues to push to reduce carbon emissions by installing solar panels at its Waste Water Spray Irrigation facility. The 1 MW solar project consists of two arrays totaling 4,172 solar panels across five acres of farmland. Over the next 20 years, the Town of Centreville's solar system is expected to provide an estimated 1.3 million kWh annually, enough to offset more than 40 million pounds of $CO_2$.

Centerville's Power Purchase Agreement with SolarCity enables the Town to save money on electricity without needing upfront capital. Through the PPA, Centreville buys power that the solar system generates at a lower rate than what they would have paid the local utility company. The system is projected to save residents over $1 million over 20 years. The arrays will also help defray the cost to operate the wastewater spray irrigation system, water treatment plants, and other facilities owned by the town.

## Town of East Bridgewater

| | | | |
|---|---|---|---|
| ***Client Name*** | Town of East Bridgewater | ***Date Completed*** | 2013 |
| ***Location*** | East Bridgewater, MA | ***Contact Name*** | Jim Ross |
| ***Capacity*** | 2.45 MW | ***Contact Telephone*** | 403.660.8659 |
| ***Project Type*** | Ground Mount | | |

***Project Description***

A town that supported the American Revolution is now part of the solar revolution. East Bridgewater's 2.45-megawatt solar project is one of the largest in the state. The amount of energy that the 10,000-panel array is expected to product each year is enough to power about 350 homes and save as much as $2 million on energy costs over the next 25 years.

SolarCity installed the project at no cost to the town and is supplying electricity at a lower rate than the local utility company. The energy is sent to National Grid, resulting in net metering credits that reduce the town's electricity bills.

"The residents of East Bridgewater will enjoy the benefits of this agreement for decades to come," said Brian Connors, Chair of the East Bridgewater Board of Selectmen.

## Town of Glastonbury

| | | | |
|---|---|---|---|
| ***Client Name*** | Town of Glastonbury | ***Date Completed*** | 2015 |
| ***Location*** | Glastonbury, CT | ***Contact Name*** | David Sacchitella |
| ***Capacity*** | 1+ MW, 7 Sites | ***Contact Telephone*** | 860.652.7706 |
| ***Project Type*** | Carport, Ground Mount, Roof Mount | | |

***Project Description***

Looking to lower the town's energy costs and provide valuable protection against future utility price increases, Glastonbury decided to evaluate options for solar systems.

Glastonbury partnered with SolarCity to assess the town's energy consumption and overall energy needs, and strategically place solar arrays in locations most beneficial from both a savings and safety perspective. The town started with three projects at their town hall, high school, and maintenance yard. It later expanded its portfolio to include installations at two elementary schools and the bus yard, as well as at a parks and recreation facility.

Together, the systems total 1 megawatt of solar generation capacity, enough to produce 1.27 million kilowatt hours of electricity for the town each year. In total, the solar panels are expected to avoid approximately 27 million pounds of $CO_2$ emissions, and prevent the waste of 1.6 million gallons of water that would otherwise be used to generate electricity from other sources over the lifetime of the project.

# SolarCity's Proposal for the Town of Bristol

## Landfill Considerations

SolarCity commends the Town of Bristol for choosing to transform a closed landfill site into a source of renewable energy, and we look forward to working with you on this project. In many ways, solar photovoltaic projects on landfills are handled similarly to those sited on greenfields. Because the landfills undergo rigorous environmental evaluation, environmental challenges are generally known ahead of time and are well documented. Furthermore, development on a brownfield or closed landfill site avoids many environmental impacts experienced at greenfield sites including disturbance to wetlands and waters of the United States, tree clearing, and disturbance to habitats of Rare, Threatened, and Endangered species. Consequently, landfills are often ideal spots for ground-mounted solar arrays and have the potential to have fewer environmental and permitting challenges than do non-landfill projects.

Based on SolarCity's vast experience in designing solar projects of all kinds, we have developed a custom due diligence and development process for landfill projects including the following steps:

| | |
|---|---|
| Initial site assessment | Detailed historical review of past operational history |
| Structural engineering review of cap design | Extensive geotechnical analysis |
| Solar racking and foundation evaluation, selection, and design | Thorough documentation of all existing environmental conditions |
| Professional Engineer oversight, documentation, and certification of entire construction process | Stormwater and sediment control plans, when required by AHJ |
| Field verification of all assumptions | |

*SolarCity's installed 3,593 kWdc capped landfill ground mount for the Town of Needham in Massachusetts*

**Justin Selmanoff | Sr. Project Development Manager | jselmanoff@solarcity.com | 410.340.6632**
**SolarCity Corporation** | 70 Centre of New England Boulevard, Coventry, RI 02816 | RC38313 | www.solarcity.com

## SolarCity's Price Proposal – Town of Bristol

SolarCity is proposing a solar Power Purchase Agreement (PPA) wherein the Town of Bristol purchases electricity output from SolarCity's PV system as opposed to buying or leasing the system itself. The PPA provides the Town with immediate savings on electrical costs while also ensuring that SolarCity will take care of all operations and maintenance for the system at no extra cost. The PPA comes with a 100% non-weather-adjusted Production Performance Guarantee wherein SolarCity reimburses the Town for any production shortfalls at an agreed-upon rate.

Pricing is valid until February 26, 2017. SolarCity will make every effort to honor pricing proposals beyond this time period as long as market conditions and commodity prices allow. If the Town anticipates needing a longer time frame, please contact Justin Selmanoff at 410.340.6632 or at jselmanoff@solarcity.com.

SolarCity's pricing was calculated using Prevailing Wage rates. While time constraints prevented us from recalculating our pricing for the Town of Bristol using Standard Wage rates upon reception of Addendum #5, SolarCity would be happy to re-price with improved figures upon the request of the Town.

**Summary of SolarCity's PPA Price Proposal**

| Solar PPA Rate | System Size | Estimated First-Year Production | Annual PPA Escalator | Estimated First-Year Savings | Estimated 20-Year Savings (NPV) |
|---|---|---|---|---|---|
| $0.096/kWh | 3,523.08 kWdc | 4,523,635 kWh | 0.0% | $230,705 | $3,768,030 |

Alternatively, SolarCity is also proposing a 20-year land lease under the state's Renewable Energy Growth Program for the Town of Bristol landfill site. The lease rate for this option is as follows:

**SolarCity's Land Lease Proposal**

| | Town of Bristol Landfill Site |
|---|---|
| **Annual Lease Rate** | $70,000/year |
| **Annual Escalation Rate** | 0% |

SolarCity used the following assumptions when determining our price offering:

- Prevailing wage rates were used
- Pricing includes SolarCity's standard O&M package
- Ground mount prices include the cost of mowing
- Pricing does not include any tax on property or electricity sales

# Town of Bristol

## Closed Landfill - Ground Mount - SolarCity PPA Savings Cash Flow Table

SolarCity

### Town of Bristol

Closed Landfill
Bristol RI, 02809
System Size: 3523.08 kW DC

National Grid
Rate Plan: Small Commercial

### Results Summary

| | | |
|---|---|---|
| Year 1 Net Savings: | $ | 230,705 |
| Total Net Savings: | $ | 7,076,572 |
| NPV of Total Net Savings: | $ | 3,768,030 |

### Model Assumptions

| | |
|---|---|
| Grid Avoided Cost ($/kWh) | $0.147 |
| Discount Rate* | 6.00% |
| Annual Reduction in Production | 0.50% |
| PPA Escalation Rate | 0.00% |
| PPA Term | 20 |
| Utility Escalation Rate | 2.00% |

| YEAR | SOLAR PRODUCTION (kWh) | GRID AVOIDED COST ($/kWh) | ANNUAL UTILITY SAVINGS FROM SOLAR KWH | SOLARCITY PPA RATE ($/kWh) | ANNUAL SOLARCITY PPA EXPENSE | TOTAL SAVINGS | CUMULATIVE CASH FLOW | PRESENT VALUE OF CASH FLOW | PRESENT VALUE CUMULATIVE CASH FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| 1 | 4,523,635 | $ 0.147 | $ 664,974 | $ 0.096 | $ (434,269) | $ 230,705 | $ 230,705 | $ 217,647 | $ 217,647 |
| 2 | 4,501,017 | $ 0.150 | $ 674,882 | $ 0.096 | $ (432,098) | $ 242,785 | $ 473,490 | $ 216,078 | $ 433,724 |
| 3 | 4,478,511 | $ 0.153 | $ 684,938 | $ 0.096 | $ (429,937) | $ 255,001 | $ 728,491 | $ 214,104 | $ 647,828 |
| 4 | 4,456,119 | $ 0.156 | $ 695,144 | $ 0.096 | $ (427,787) | $ 267,356 | $ 995,848 | $ 211,771 | $ 859,599 |
| 5 | 4,433,838 | $ 0.159 | $ 705,501 | $ 0.096 | $ (425,648) | $ 279,853 | $ 1,275,701 | $ 209,122 | $ 1,068,722 |
| 6 | 4,411,669 | $ 0.162 | $ 716,013 | $ 0.096 | $ (423,520) | $ 292,493 | $ 1,568,194 | $ 206,196 | $ 1,274,918 |
| 7 | 4,389,611 | $ 0.166 | $ 726,682 | $ 0.096 | $ (421,403) | $ 305,279 | $ 1,873,473 | $ 203,028 | $ 1,477,946 |
| 8 | 4,367,663 | $ 0.169 | $ 737,510 | $ 0.096 | $ (419,296) | $ 318,214 | $ 2,191,687 | $ 199,651 | $ 1,677,597 |
| 9 | 4,345,824 | $ 0.172 | $ 748,498 | $ 0.096 | $ (417,199) | $ 331,299 | $ 2,522,986 | $ 196,096 | $ 1,873,693 |
| 10 | 4,324,095 | $ 0.176 | $ 759,651 | $ 0.096 | $ (415,113) | $ 344,538 | $ 2,867,524 | $ 192,388 | $ 2,066,081 |
| 11 | 4,302,475 | $ 0.179 | $ 770,970 | $ 0.096 | $ (413,038) | $ 357,932 | $ 3,225,456 | $ 188,554 | $ 2,254,635 |
| 12 | 4,280,962 | $ 0.183 | $ 782,457 | $ 0.096 | $ (410,972) | $ 371,485 | $ 3,596,941 | $ 184,617 | $ 2,439,252 |
| 13 | 4,259,558 | $ 0.186 | $ 794,116 | $ 0.096 | $ (408,918) | $ 385,198 | $ 3,982,140 | $ 180,596 | $ 2,619,848 |
| 14 | 4,238,260 | $ 0.190 | $ 805,948 | $ 0.096 | $ (406,873) | $ 399,075 | $ 4,381,215 | $ 176,511 | $ 2,796,359 |
| 15 | 4,217,069 | $ 0.194 | $ 817,957 | $ 0.096 | $ (404,839) | $ 413,118 | $ 4,794,333 | $ 172,380 | $ 2,968,739 |
| 16 | 4,195,983 | $ 0.198 | $ 830,144 | $ 0.096 | $ (402,814) | $ 427,330 | $ 5,221,663 | $ 168,217 | $ 3,136,956 |
| 17 | 4,175,003 | $ 0.202 | $ 842,514 | $ 0.096 | $ (400,800) | $ 441,713 | $ 5,663,376 | $ 164,037 | $ 3,300,993 |
| 18 | 4,154,128 | $ 0.206 | $ 855,067 | $ 0.096 | $ (398,796) | $ 456,271 | $ 6,119,647 | $ 159,852 | $ 3,460,844 |
| 19 | 4,133,358 | $ 0.210 | $ 867,808 | $ 0.096 | $ (396,802) | $ 471,005 | $ 6,590,652 | $ 155,673 | $ 3,616,517 |
| 20 | 4,112,691 | $ 0.214 | $ 880,738 | $ 0.096 | $ (394,818) | $ 485,920 | $ 7,076,572 | $ 151,512 | $ 3,768,030 |
| | | | 15,361,513 | | | **$ 7,076,572** | $ 7,076,572 | | **$ 3,768,030** |

This analysis is illustrative only and has been prepared in good faith by SolarCity to provide conceptual project modeling. These numbers are not for contract, nor are they binding.

Analysis valid until 02/26/2017

* Model Assumptions are inputs that should be mutually agreed upon by the customer and SolarCity. The customer may request any changes to more closely model their specific situation.
SolarCity has used good faith efforts to represent the savings from this project before state and federal income tax.
Please consult your tax advisor regarding your specific tax situation.

## Buyout and Termination Values

The following are SolarCity's proposed Buyout and Termination Values for the Town of Bristol's system.

### Buyout Values

| Year | Buyout Value |
|---|---|
| 6 | $6,303,073 |
| 10 | $5,616,645 |
| 20 | Fair Market Value |

### Termination Values

| Year | Termination Value |
|---|---|
| 1 | $12,342,304 |
| 2 | $10,862,971 |
| 3 | $8,931,544 |
| 4 | $7,389,943 |
| 5 | $6,079,164 |
| 6 | $4,743,009 |
| 7 | $4,284,061 |
| 8 | $4,007,950 |
| 9 | $3,723,012 |
| 10 | $3,428,795 |
| 11 | $3,124,824 |
| 12 | $2,868,027 |
| 13 | $2,600,456 |
| 14 | $2,321,562 |
| 15 | $2,030,767 |
| 16 | $1,727,466 |
| 17 | $1,411,025 |
| 18 | $1,080,776 |
| 19 | $736,019 |
| 20 | $376,017 |

**Justin Selmanoff | Sr. Project Development Manager | jselmanoff@solarcity.com | 410.340.6632**
**SolarCity Corporation** | 70 Centre of New England Boulevard, Coventry, RI 02816 | RC38313 | www.solarcity.com

# SolarCity's Technical Proposal – Town of Bristol

## System Design

SolarCity is proud to propose a 3.5 MWdc ballasted ground-mounted solar array at the closed Landfill site. This single array will create 4,523.635 MWh of energy in the first year, and will offset 99.2% of the Town of Bristol's total usage.

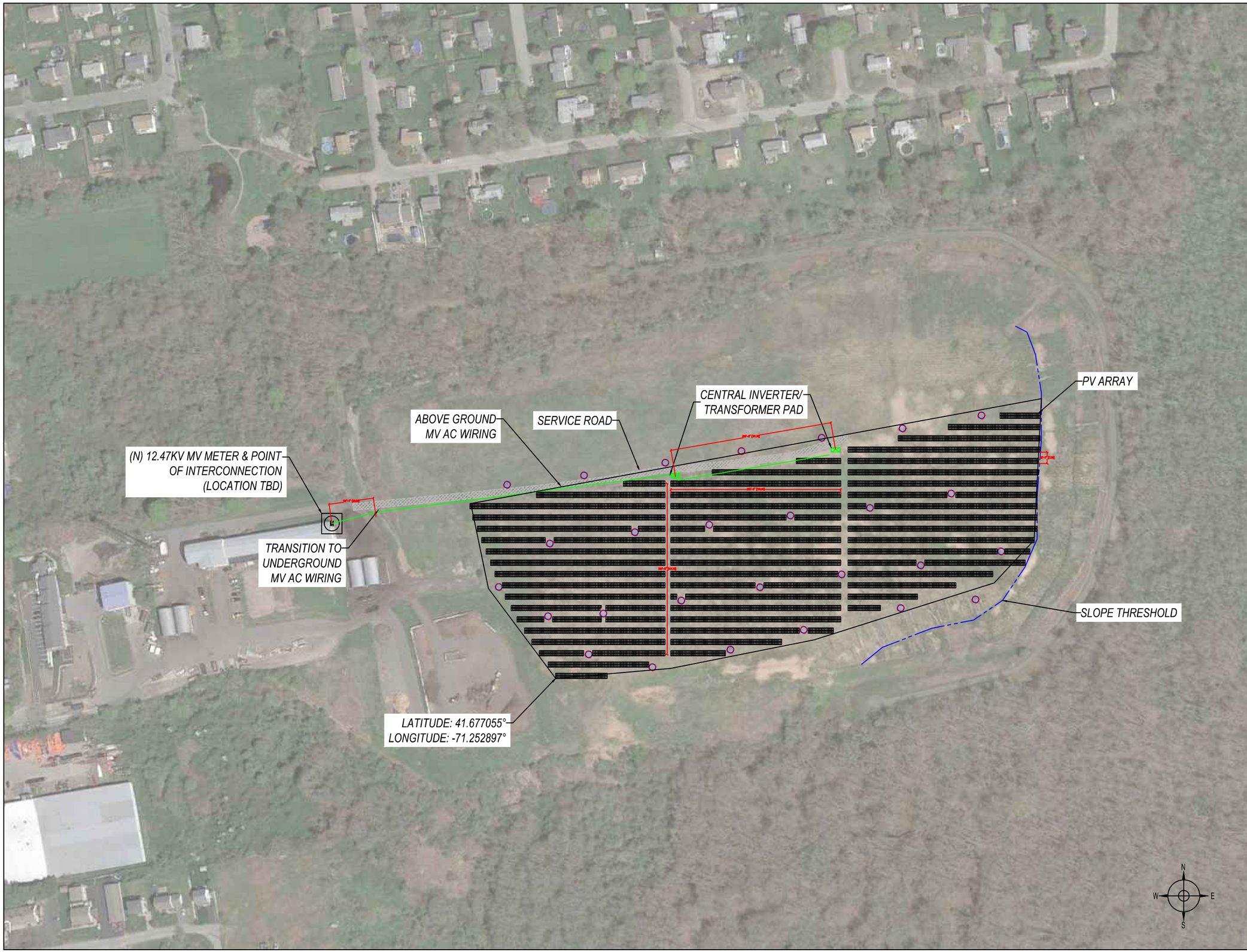
SolarCity's proposed system will be net metered and employ high-efficiency 330 W monocrystalline Trina TSM-330DD14(II) photovoltaic modules. These high-power output modules offer industry-leading product quality and offer added cost savings by decreasing the balance of the system components. The PV modules will be installed as strings of 17 on a GameChange concrete ballasted, fixed tilt, ground-mounted racking system set at an azimuth angle of 180°, and a tile angle of 20°. The integrity of the landfill cap is paramount and the cap will be analyzed by our in-house civil and geotechnical engineering team to ensure that our ballasted system is compliant with existing conditions.

DC output wiring from the modules will converge at fused combiner boxes placed throughout the array field. These combined DC output will then be routed in above-ground cable trays to fused positions within the central inverters. Four Solectria 750XTM central inverters with integrated AC disconnects will be split between two separately located pads. One 308 V / 12.47 kV step-up transformer per pad will combine the two inverter outputs in preparation for export to the grid. These transformers will be loop fed, and the medium voltage wire run will be routed via an above-ground cable tray from the array field, then through a short underground PVC trench to a utility pole. Elbow arrestors and a pole-mounted switchgear / res closer (as per utility requirements) will handle final connections to the grid. This will be our point of interconnection and common coupling with the new 12.47 kV utility service. Locations are assumed to be as indicated on the layout.

A summary of the proposed system is found below. A visual layout is on the following page, and datasheets for the equipment have been provided in Appendix D of this proposal.

**Proposed System Design Summary**

| | |
|---|---|
| **System Size (kWdc)** | 3,523.08 kWdc |
| **System Size (kWac)** | 3,000.00 kWac |
| **Module Model** | Trina Solar TSM-330DD14(II) |
| **Module Power** | 330 W |
| **No. of Modules** | 10,676 |
| **Module Racking Method and Supplier** | GameChange, Fixed-Tilt, Concrete Ballasted Ground Mount |
| **Tilt Angle** | 20° |
| **Azimuth Angle** | 180° |
| **Inverter Model** | Solectria 750XTM |
| **Inverter Power** | 750 kW |
| **Inverter Output Voltage** | 308 V |
| **No. of Inverters** | 4 |
| **First-Year Yield** | 1,284 kWh/kW |
| **First-Year Production** | 4,523.635 MWh |




# CLOSED LANDFILL
# TOWN OF BRISTOL

| | |
|---|---|
| SYSTEM SIZE: | 3523.08 KW DC, 3000 KW AC |
| SITE ADDRESS: | Minturn Farm Rd |
| | Bristol, RI 02809, USA |
| DATE: | 11/3/2016 |
| MODULE: | MONO 330W |
| INVERTER: | GRID-TIED |
| DRAWN BY: | DBREZA |

**DESCRIPTION:**

PV ARRAY

BALLASTED GROUND MOUNTED RACKING SYSTEM

STRINGS OF 17 MODULES

PRELIMINARY DRAWING - NOT FOR CONSTRUCTION

**ASSUMPTIONS:**

1. PREVAILING WAGE RATES.ASSUMES SYSTEM DESIGNED TO NEC 2014. ASSUMES GRID-DIRECT (DISTRIBUTION SYSTEM) INTERCONNECTION TYPE.ASSUMES SYSTEM INTERCONNECTED AT 12470V.ASSUMES NO UTILITY UPGRADES.ASSUMES ALLOWANCE NOT TO EXCEED $0 FOR UTILITY APPLICATION FEES, STUDIES, AND/OR UPGRADES.ASSUMES NO SERVICE OR MAIN PANEL UPGRADES REQUIRED TO SUPPORT PV SYSTEM.ASSUMES $213697 ALLOWANCE FOR SERVICE UPGRADE AND/OR MAIN PANEL UPGRADE.ASSUMES SOILS SUITABLE FOR DRIVEN PIER FOUNDATIONS.ASSUMES ALLOWANCE NOT TO EXCEED $84000 FOR ENVIRONMENTAL PERMITTING, ENGINEERING, AND/OR SURVEYING.MARINE CONDITIONS DO NOT APPLYAREA IS ENCLOSED BY A 7FT FENCE AND HAS A SECURITY CHECKPOINT

ARRAY INFORMATION

| MOUNTING METHOD | MODULE COUNT | TILT | AZIMUTH | KW DC |
|---|---|---|---|---|
| BALLASTED | 10676 | 20° | 180° | 3523.08 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

GENERAL NOTES

1. THIS SYSTEM IS GRIDINTERTIED VIA A UL-LISTED POWER-CONDITIONING INVERTER.
2. ALL INVERTERS AND ARRAYS ARE NEGATIVELY GROUNDED.
3. SOLAR MOUNTING FRAMES ARE TO BE GROUNDED.
4. ALL WORK TO BE DONE TO 2012 IBC
5. ALL ELECTRICAL WORK SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE.

SHEET NOTES

1. INVERTER
2. DEDICATED PV SYSTEM METER
3. AC DISCONECT
4. UTILITY METER
5. DC DISCONNECT

LEGEND

- (E) UTILITY METER
- INVERTER W/ INTEGRATED DC DISCO & WARNING LABELS
- DC DISCONNECT
- AC DISCONNECT
- JUNCTION BOX
- DC COMBINER BOX
- DISTRIBUTION PANEL
- LOAD CENTER
- DEDICATED PV SYSTEM METER
- CONDUIT RUN ON EXTERIOR
- CONDUIT RUN ON INTERIOR
- GATE
- INTERIOR EQUIPMENT

3055 CLEARVIEW WAY
SAN MATEO, CA 94402
(888)-SOL-CITY (765-2489)
WWW.SOLARCITY.COM

SolarCity

## Production Estimate

Solar production for the project was estimated using the proposed system design and the local weather files via PVsyst, an industry-standard simulation software tool. The following table illustrates the projected system output on a monthly basis for the entire array.

**Projected Monthly Production**

| Month | Estimated Production (MWh) |
|---|---|
| January | 241.7 |
| February | 287.8 |
| March | 399.9 |
| April | 371.4 |
| May | 506.7 |
| June | 519.9 |
| July | 494.1 |
| August | 469.1 |
| September | 407.7 |
| October | 351.8 |
| November | 250.9 |
| December | 221.9 |
| **First-Year Total** | **4,522.9** |

SolarCity completed performance simulations for the Town's system using PVsyst. PVsyst is the industry's leading performance simulation software program allowing users to accurately model system performance through the specification of numerous inputs including project location, make and model of PV modules and inverters, module tilt angle and orientation, and number DC and AC loss factors. Users also select the source of the weather data for the simulation. SolarCity uses only TMY3 (Typical Meteorological Year) datasets. TMY3 datasets, which were developed by the National Renewable Energy Laboratory, consist of full-year hourly data representing "typical" (similar to average) weather for the location. The datasets are constructed from weather measurements taken from 1,020 weather stations across the United States from roughly 30 years of measurements. To ensure modeling accuracy, SolarCity exclusively uses Class I and II TMY3 datasets. Class I and II datasets have the lowest uncertainty of TMY3 dataset types. As an additional means of ensuring modeling accuracy, when available, SolarCity uses PVsyst module files (.PAN files) and inverter files (.OND files) that have been third-party verified.

# SolarCity's Proposal for the Town of Barrington

## SolarCity's Price Proposal

SolarCity is proposing a solar Power Purchase Agreement (PPA) wherein the Town of Barrington purchases electricity output from SolarCity's PV system as opposed to buying or leasing the system itself. The PPA provides the Town with immediate savings on electrical costs while also ensuring that SolarCity will take care of all operations and maintenance for the system at no extra cost. The PPA comes with a 100% non-weather-adjusted Production Performance Guarantee wherein SolarCity reimburses the Town for any production shortfalls at an agreed-upon rate.

Pricing is valid until February 26, 2017. SolarCity will make every effort to honor pricing proposals beyond this time period as long as market conditions and commodity prices allow. If the Town anticipates needing a longer time frame, please contact Justin Selmanoff at 410.340.6632 or at jselmanoff@solarcity.com.

SolarCity's pricing was calculated using Prevailing Wage rates. While time constraints prevented us from recalculating our pricing for the Town of Barrington using Standard Wage rates upon reception of Addendum #5, SolarCity would be happy to re-price with improved figures upon the request of the Town.

**Summary of SolarCity's PPA Price Proposal – School Portfolio**

| Site Name | Solar PPA Rate | System Size | Estimated First-Year Production | Annual PPA Escalator | Estimated First-Year Savings | Estimated 20-Year Savings (NPV) |
|---|---|---|---|---|---|---|
| Various Schools | $0.088/kWh* | 2,041.1 kWdc | 2,414,213 kWh | 0% | $68,081 | $1,265,693 |

*The Solar PPA Rate for the school portfolio is a blended weighted average of all four school sites

Alternatively, SolarCity is also proposing a land lease under the state's Renewable Energy Growth Program for the Town of Barrington schools. The lease rates for this option are as follows, by site:

**SolarCity's Land Lease Proposal – School Portfolio**

| | High School | Primrose Hill | Nayatt Elementary | Hampden Meadows |
|---|---|---|---|---|
| Annual Lease Rate | $10,000 | $7,000 | $7,000 | $15,000 |

The lease option includes a 20-year term, and does not include an annual escalator.

SolarCity is further proposing a Power Purchase Agreement at a privately-owned offsite ground mount. We are proposing a Virtual Net Metered PPA using the state's Renewable Energy Fund grant program.

**Summary of SolarCity's PPA Price Proposal – Offsite Ground Mount**

| Site Name | Solar PPA Rate | System Size | Estimated First-Year Production | Annual PPA Escalator | Estimated First-Year Savings | Estimated 20-Year Savings (NPV) |
|---|---|---|---|---|---|---|
| Offsite Ground Mount | $0.103/kWh | 2,836.4 kWdc | 3,780,921 kWh | 0% | $166,361 | $2,857,048 |

SolarCity used the following assumptions when determining our price offerings:

- Prevailing wage rates were used
- Pricing includes SolarCity's standard O&M package
- Ground mount prices include the cost of mowing
- Pricing does not include any tax on property or electricity sales

Please find detailed savings analyses for both PPA options on the following pages.

# Town of Barrington

## Various Schools - Rooftop & Carport - SolarCity PPA Savings Cash Flow Table

SolarCity

### Town of Barrington

Various Schools
Barrington RI, 02806
System Size: 2041.1 kW DC

National Grid
Rate Plan: Commercial Rate

### Results Summary

| | | |
|---|---|---|
| Year 1 Net Savings: | $ | 68,081 |
| Total Net Savings: | $ | 2,425,477 |
| NPV of Total Net Savings: | $ | 1,265,693 |

### Model Assumptions

| | |
|---|---|
| Grid Avoided Cost ($/kWh) | $0.116 |
| Discount Rate* | 6.00% |
| Annual Reduction in Production | 0.50% |
| PPA Escalation Rate | 0.00% |
| PPA Term | 20 |
| Utility Escalation Rate | 2.00% |

| YEAR | SOLAR PRODUCTION (kWh) | GRID AVOIDED COST ($/kWh) | ANNUAL UTILITY SAVINGS FROM SOLAR KWH | SOLARCITY PPA RATE ($/kWh) | ANNUAL SOLARCITY PPA EXPENSE | TOTAL SAVINGS | CUMULATIVE CASH FLOW | PRESENT VALUE OF CASH FLOW | PRESENT VALUE CUMULATIVE CASH FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| 1 | 2,414,213 | $ 0.116 | $ 280,049 | $ 0.088 | $ (211,968) | $ 68,081 | $ 68,081 | $ 64,227 | $ 64,227 |
| 2 | 2,402,142 | $ 0.118 | $ 284,221 | $ 0.088 | $ (210,908) | $ 73,313 | $ 141,394 | $ 65,249 | $ 129,476 |
| 3 | 2,390,131 | $ 0.121 | $ 288,456 | $ 0.088 | $ (209,854) | $ 78,603 | $ 219,997 | $ 65,996 | $ 195,472 |
| 4 | 2,378,181 | $ 0.123 | $ 292,754 | $ 0.088 | $ (208,804) | $ 83,950 | $ 303,947 | $ 66,496 | $ 261,969 |
| 5 | 2,366,290 | $ 0.126 | $ 297,116 | $ 0.088 | $ (207,760) | $ 89,356 | $ 393,303 | $ 66,772 | $ 328,741 |
| 6 | 2,354,458 | $ 0.128 | $ 301,543 | $ 0.088 | $ (206,721) | $ 94,822 | $ 488,125 | $ 66,846 | $ 395,586 |
| 7 | 2,342,686 | $ 0.131 | $ 306,036 | $ 0.088 | $ (205,688) | $ 100,349 | $ 588,474 | $ 66,738 | $ 462,324 |
| 8 | 2,330,973 | $ 0.133 | $ 310,596 | $ 0.088 | $ (204,659) | $ 105,937 | $ 694,411 | $ 66,466 | $ 528,790 |
| 9 | 2,319,318 | $ 0.136 | $ 315,224 | $ 0.088 | $ (203,636) | $ 111,588 | $ 805,999 | $ 66,049 | $ 594,839 |
| 10 | 2,307,721 | $ 0.139 | $ 319,921 | $ 0.088 | $ (202,618) | $ 117,303 | $ 923,302 | $ 65,501 | $ 660,340 |
| 11 | 2,296,183 | $ 0.141 | $ 324,688 | $ 0.088 | $ (201,605) | $ 123,083 | $ 1,046,385 | $ 64,839 | $ 725,179 |
| 12 | 2,284,702 | $ 0.144 | $ 329,526 | $ 0.088 | $ (200,597) | $ 128,929 | $ 1,175,314 | $ 64,074 | $ 789,253 |
| 13 | 2,273,278 | $ 0.147 | $ 334,436 | $ 0.088 | $ (199,594) | $ 134,842 | $ 1,310,156 | $ 63,219 | $ 852,472 |
| 14 | 2,261,912 | $ 0.150 | $ 339,419 | $ 0.088 | $ (198,596) | $ 140,823 | $ 1,450,979 | $ 62,286 | $ 914,758 |
| 15 | 2,250,602 | $ 0.153 | $ 344,476 | $ 0.088 | $ (197,603) | $ 146,873 | $ 1,597,852 | $ 61,285 | $ 976,043 |
| 16 | 2,239,349 | $ 0.156 | $ 349,609 | $ 0.088 | $ (196,615) | $ 152,994 | $ 1,750,846 | $ 60,226 | $ 1,036,269 |
| 17 | 2,228,152 | $ 0.159 | $ 354,818 | $ 0.088 | $ (195,632) | $ 159,186 | $ 1,910,032 | $ 59,116 | $ 1,095,385 |
| 18 | 2,217,012 | $ 0.162 | $ 360,105 | $ 0.088 | $ (194,654) | $ 165,451 | $ 2,075,483 | $ 57,965 | $ 1,153,350 |
| 19 | 2,205,927 | $ 0.166 | $ 365,470 | $ 0.088 | $ (193,680) | $ 171,790 | $ 2,247,273 | $ 56,779 | $ 1,210,128 |
| 20 | 2,194,897 | $ 0.169 | $ 370,916 | $ 0.088 | $ (192,712) | $ 178,204 | $ 2,425,477 | $ 55,565 | $ 1,265,693 |
| | | | 6,469,381 | | | **$ 2,425,477** | $ 2,425,477 | | **$ 1,265,693** |

This analysis is illustrative only and has been prepared in good faith by SolarCity to provide conceptual project modeling. These numbers are not for contract, nor are they binding.
Analysis valid until 02/26/2017
* Model Assumptions are inputs that should be mutually agreed upon by the customer and SolarCity. The customer may request any changes to more closely model their specific situation.
SolarCity has used good faith efforts to represent the savings from this project before state and federal income tax.
Please consult your tax advisor regarding your specific tax situation.

# Town of Barrington

## Offsite - Ground Mount - SolarCity PPA Savings Cash Flow Table

SolarCity

### Town of Barrington

Offsite
Barrington RI, 02806
System Size: 2836.4 kW DC

National Grid
Rate Plan: Small Commercial

### Results Summary

| | | |
|---|---|---|
| Year 1 Net Savings: | $ | 166,361 |
| Total Net Savings: | $ | 5,409,780 |
| NPV of Total Net Savings: | $ | 2,857,048 |

### Model Assumptions

| | |
|---|---|
| Grid Avoided Cost ($/kWh) | $0.147 |
| Discount Rate* | 6.00% |
| Annual Reduction in Production | 0.50% |
| PPA Escalation Rate | 0.00% |
| PPA Term | 20 |
| Utility Escalation Rate | 2.00% |

| YEAR | SOLAR PRODUCTION (kWh) | GRID AVOIDED COST ($/kWh) | ANNUAL UTILITY SAVINGS FROM SOLAR KWH | SOLARCITY PPA RATE ($/kWh) | ANNUAL SOLARCITY PPA EXPENSE | TOTAL SAVINGS | CUMULATIVE CASH FLOW | PRESENT VALUE OF CASH FLOW | PRESENT VALUE CUMULATIVE CASH FLOW |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | |
| 1 | 3,780,921 | $ 0.147 | $ 555,795 | $ 0.103 | $ (389,435) | $ 166,361 | $ 166,361 | $ 156,944 | $ 156,944 |
| 2 | 3,762,017 | $ 0.150 | $ 564,077 | $ 0.103 | $ (387,488) | $ 176,589 | $ 342,950 | $ 157,164 | $ 314,108 |
| 3 | 3,743,207 | $ 0.153 | $ 572,482 | $ 0.103 | $ (385,550) | $ 186,931 | $ 529,881 | $ 156,951 | $ 471,059 |
| 4 | 3,724,490 | $ 0.156 | $ 581,011 | $ 0.103 | $ (383,623) | $ 197,389 | $ 727,270 | $ 156,351 | $ 627,409 |
| 5 | 3,705,868 | $ 0.159 | $ 589,669 | $ 0.103 | $ (381,704) | $ 207,964 | $ 935,234 | $ 155,403 | $ 782,812 |
| 6 | 3,687,339 | $ 0.162 | $ 598,455 | $ 0.103 | $ (379,796) | $ 218,659 | $ 1,153,893 | $ 154,146 | $ 936,958 |
| 7 | 3,668,902 | $ 0.166 | $ 607,372 | $ 0.103 | $ (377,897) | $ 229,475 | $ 1,383,367 | $ 152,614 | $ 1,089,572 |
| 8 | 3,650,557 | $ 0.169 | $ 616,421 | $ 0.103 | $ (376,007) | $ 240,414 | $ 1,623,781 | $ 150,839 | $ 1,240,410 |
| 9 | 3,632,305 | $ 0.172 | $ 625,606 | $ 0.103 | $ (374,127) | $ 251,479 | $ 1,875,260 | $ 148,850 | $ 1,389,260 |
| 10 | 3,614,143 | $ 0.176 | $ 634,928 | $ 0.103 | $ (372,257) | $ 262,671 | $ 2,137,931 | $ 146,674 | $ 1,535,934 |
| 11 | 3,596,072 | $ 0.179 | $ 644,388 | $ 0.103 | $ (370,395) | $ 273,993 | $ 2,411,924 | $ 144,336 | $ 1,680,270 |
| 12 | 3,578,092 | $ 0.183 | $ 653,989 | $ 0.103 | $ (368,543) | $ 285,446 | $ 2,697,370 | $ 141,858 | $ 1,822,128 |
| 13 | 3,560,202 | $ 0.186 | $ 663,734 | $ 0.103 | $ (366,701) | $ 297,033 | $ 2,994,403 | $ 139,261 | $ 1,961,389 |
| 14 | 3,542,401 | $ 0.190 | $ 673,624 | $ 0.103 | $ (364,867) | $ 308,756 | $ 3,303,159 | $ 136,563 | $ 2,097,952 |
| 15 | 3,524,689 | $ 0.194 | $ 683,661 | $ 0.103 | $ (363,043) | $ 320,618 | $ 3,623,777 | $ 133,783 | $ 2,231,734 |
| 16 | 3,507,065 | $ 0.198 | $ 693,847 | $ 0.103 | $ (361,228) | $ 332,619 | $ 3,956,396 | $ 130,934 | $ 2,362,669 |
| 17 | 3,489,530 | $ 0.202 | $ 704,185 | $ 0.103 | $ (359,422) | $ 344,764 | $ 4,301,160 | $ 128,033 | $ 2,490,702 |
| 18 | 3,472,082 | $ 0.206 | $ 714,678 | $ 0.103 | $ (357,624) | $ 357,053 | $ 4,658,213 | $ 125,091 | $ 2,615,793 |
| 19 | 3,454,722 | $ 0.210 | $ 725,326 | $ 0.103 | $ (355,836) | $ 369,490 | $ 5,027,703 | $ 122,121 | $ 2,737,915 |
| 20 | 3,437,448 | $ 0.214 | $ 736,134 | $ 0.103 | $ (354,057) | $ 382,077 | $ 5,409,780 | $ 119,133 | $ 2,857,048 |
| | | | 12,839,381 | | | **$ 5,409,780** | $ 5,409,780 | | **$ 2,857,048** |

This analysis is illustrative only and has been prepared in good faith by SolarCity to provide conceptual project modeling. These numbers are not for contract, nor are they binding.

Analysis valid until 02/26/2017

* Model Assumptions are inputs that should be mutually agreed upon by the customer and SolarCity. The customer may request any changes to more closely model their specific situation.
SolarCity has used good faith efforts to represent the savings from this project before state and federal income tax.
Please consult your tax advisor regarding your specific tax situation.

## Buyout and Termination Values

The following are SolarCity's proposed Buyout and Termination Values for the Town of Barrington's systems.

### Buyout Values

| Year | Primrose Hill | Nayatt Elementary | Hampden Meadows | High School |
|---|---|---|---|---|
| 6 | $276,921 | $277,312 | $332,892 | $2,468,367 |
| 10 | $252,633 | $253,886 | $305,729 | $2,240,394 |
| 20 | Fair Market Value | Fair Market Value | Fair Market Value | Fair Market Value |

### Termination Values

| Year | Primrose Hill | Nayatt Elementary | Hampden Meadows | High School |
|---|---|---|---|---|
| 1 | $733,495 | $740,039 | $878,452 | $5,262,881 |
| 2 | $642,367 | $647,162 | $766,806 | $4,591,833 |
| 3 | $527,279 | $529,666 | $624,937 | $3,715,229 |
| 4 | $433,022 | $433,596 | $509,393 | $3,017,059 |
| 5 | $351,143 | $350,262 | $409,503 | $2,424,844 |
| 6 | $268,017 | $265,660 | $308,070 | $1,821,780 |
| 7 | $231,665 | $229,153 | $265,717 | $1,619,527 |
| 8 | $205,153 | $202,777 | $235,821 | $1,501,457 |
| 9 | $178,293 | $176,058 | $205,519 | $1,380,203 |
| 10 | $151,066 | $148,978 | $174,790 | $1,255,600 |
| 11 | $123,454 | $121,518 | $143,613 | $1,127,477 |
| 12 | $113,309 | $111,532 | $131,811 | $1,034,822 |
| 13 | $102,738 | $101,127 | $119,514 | $938,279 |
| 14 | $91,719 | $90,281 | $106,696 | $837,650 |
| 15 | $80,231 | $78,973 | $93,332 | $732,727 |
| 16 | $68,248 | $67,178 | $79,392 | $623,293 |
| 17 | $55,746 | $54,872 | $64,849 | $509,116 |
| 18 | $42,699 | $42,029 | $49,671 | $389,958 |
| 19 | $29,078 | $28,622 | $33,827 | $265,565 |
| 20 | $14,856 | $14,623 | $17,281 | $135,672 |

# SolarCity's Technical Proposal – Town of Barrington

## System Design

### School District System Summary

SolarCity is proud to propose a 2.4 MWdc combined solar array at four separate Barrington schools: Primrose Hill School, Barrington High School, Hampden Meadows School, and the Nayatt School. These arrays will be aggregated to create 2,399,413 kWh of energy in the first year, and will offset 63.45% of the Town's total electricity usage.

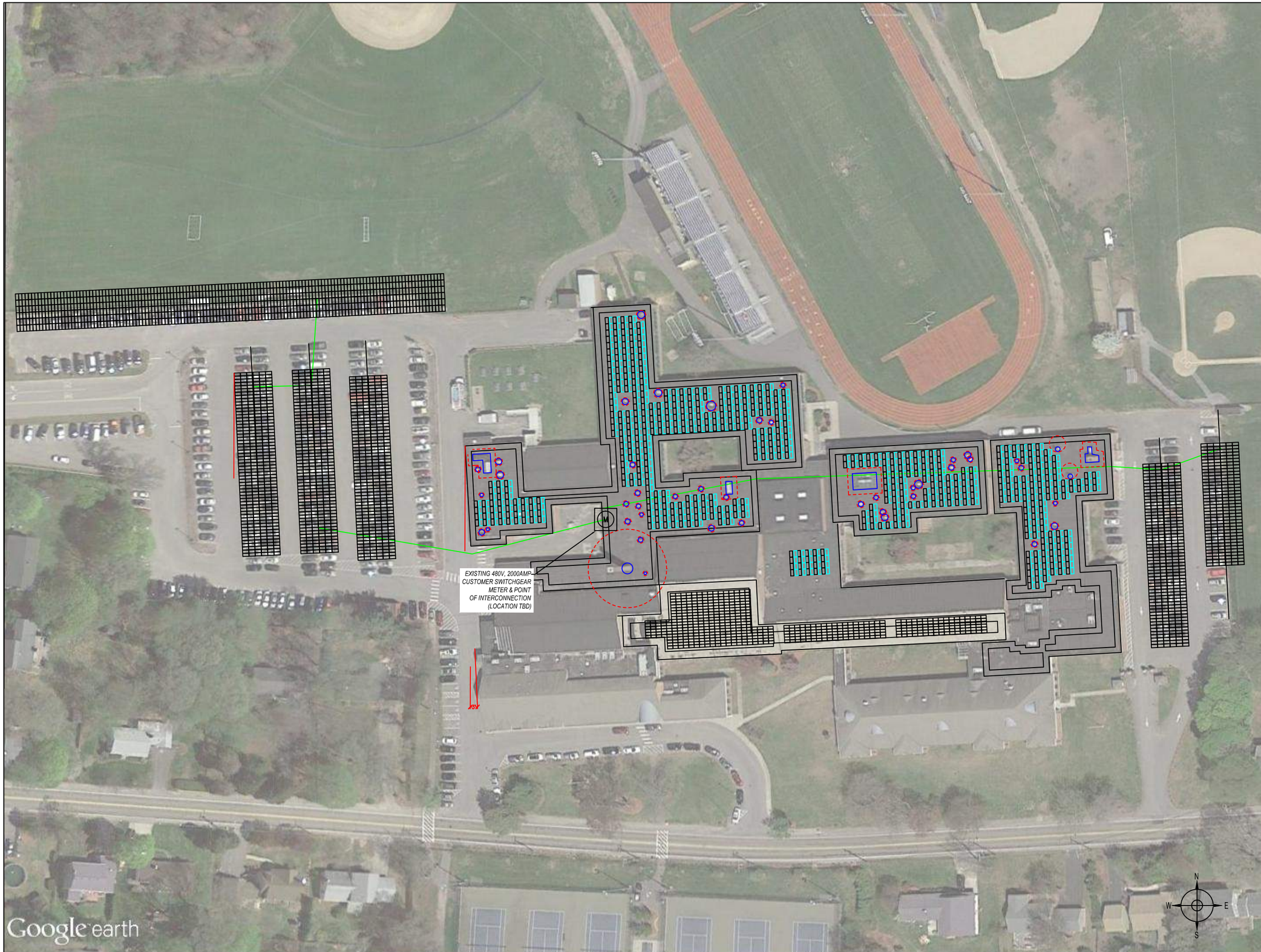
SolarCity's planned system at each school will be a behind-the-meter connection, and will employ high-efficiency 330 W monocrystalline Trina TSM-330DD14(II) photovoltaic modules. These high-power output modules offer industry-leading product quality and offer added cost savings by decreasing the balance of system components. The PV modules will be installed in strings of 17 within the roof area, and strings of 19 within the carports. Roof-mounted systems will employ SolarCity's proprietary Zep Solar ZS Peak east/west facing ballasted racking, and Zep ZS comp flush mounted racking systems. The carport racking is a Park@Sol fixed-tilt, micro pile system provided by Schletter. Roof-mounted systems will utilize Fronius Symo 24.0-3 string inverters while we have made use of Solectria PVI28TL-480 string inverters for the carport arrays.

Each system will have similar characteristics with regard to material, wiring, and theory. DC output wiring from the modules will converge in sets of 6 strings at each inverter. Inverter AC output wiring at 480 V will be routed via EMT on the roof or PVC underground to AC load centers located within the array fields. Final AC wire runs to the interconnection points will be routed within EMT above ground or PVC underground from the combiners to a pad or wall-mounted switchgear near the interconnection point. Each school with a 208 V three-phase existing service will require a pad-mounted, dry-type 480 V / 208 V step-down transformer. Final connections and our point of interconnection and common coupling with utility services will be within the school's existing switchgear and SES via a line-side tap connection, and will be recertified.

A summary of the proposed systems is found below. Visual layouts are on the following pages, and datasheets for the equipment have been provided in Appendix D of this proposal.

**Proposed System Design Summary**

| | High School | Primrose Hill | Nayatt Elementary | Hampden Meadows |
|---|---|---|---|---|
| **System Size (kWdc)** | 1,379.07 kWdc | 207.57 kWdc | 207.57 kWdc | 246.84 kWdc |
| **System Size (kWac)** | 1,020.00 kWac | 168.00 kWac | 168.00 kWac | 192.00 kWac |
| **Tilt Angle** | Carport: 7°<br>Flat Roof: 8°<br>Pitched Roof: 25° | 8° | 8° | 8° |
| **Azimuth Angle** | Carport: 177°, 267°<br>Flat Roof: 87°, 267°<br>Pitched Roof: 177° | 87°, 267° | 83°, 263° | 110°, 290° |
| **First-Year Yield** | 1,196 kWh/kW | 1,148 kWh/kW | 1,130 kWh/kW | 1,123 kWh/kW |
| **First-Year Production** | 1,649.368 MWh | 238.290 MWh | 234.554 MWh | 277.201 MWh |




# BARRINGTON HIGH SCHOOL

# TOWN OF BARRINGTON

| | |
|---|---|
| SYSTEM SIZE: | 1379.07 KW DC, XXX KW AC |
| SITE ADDRESS: | 261 Middle Hwy, |
| | Barrington, RI 02806, USA |
| DATE: | 11/3/2016 |
| MODULE: | MONO 300W |
| INVERTER: | GRID-TIED |
| DRAWN BY: | DBREZA |

**DESCRIPTION:**

PV ARRAY

RACKING SYSTEM:
ZEP ZSPEAK BALLASTED MOUNTED ROOFTOP
CONCRETE FOUNDATION FIXED CARPORT
ZEP ZS COMP ROOFTOP MOUNT

STRINGS OF 17 MODULES WITHIN ROOF AREA
STRINGS OF 19 MODULES WITHIN CARPORT AREA

PRELIMINARY DRAWING - NOT FOR CONSTRUCTION

**ASSUMPTIONS:**

1. PREVAILING WAGE RATES.ASSUMES SYSTEM DESIGNED TO NEC 2014. ASSUMES BEHIND-THE-METER INTERCONNECTION TYPE.ASSUMES SYSTEM INTERCONNECTED AT 480V.ASSUMES NO UTILITY UPGRADES.ASSUMES ALLOWANCE NOT TO EXCEED $3000 FOR UTILITY APPLICATION FEES, STUDIES ASSUMES NO SERVICE OR MAIN PANEL UPGRADES REQUIRED TO SUPPORT PV SYSTEM. ASSUMES NO STRUCTURAL UPGRADES. ASSUMES NO REROOFING INCLUDED OTHER THAN FLASHING OF ANY BUILDING PENETRATIONS.ASSUMES SOILS ARE SUITABLE FOR DRILLED PIER FOUNDATIONS.ASSUMES T-STRUCTURE CARPORTS.ASSUMES L -STRUCTURE CARPORTS.ASSUMES MIN. CLEAR HEIGHT OF 9'.ASSUMES COLUMN FINISH: GALVANIZED.ASSUMES FOUNDATIONS/FOOTINGS: WET SET W/ BOLLARD.DOES NOT INCLUDE COST TO ADDRESS PRE-EXISTING ADA NON-COMPLIANCE.ADDERS FOR MARINE CONDITIONS NOT APPLIED

## ARRAY INFORMATION

| MOUNTING METHOD | MODULE COUNT | TILT | AZIMUTH | KW DC |
|---|---|---|---|---|
| NON PENETRATING | 1224 | 8 | 87/267° | 403.92 |
| CARPORT | 798 | 7 | 177° | 263.34 |
| CARPORT | 1596 | 7 | 267° | 526.68 |
| PITCHED | 561 | 25 | 177° | 185.13 |
| | | | | |
| | | | | |

## GENERAL NOTES

1. THIS SYSTEM IS GRID-INTERTIED VIA A UL-LISTED POWER-CONDITIONING INVERTER.
2. ALL INVERTERS AND ARRAYS ARE NEGATIVELY GROUNDED.
3. SOLAR MOUNTING FRAMES ARE TO BE GROUNDED.
4. ALL WORK TO BE DONE TO 2012 IBC
5. ALL ELECTRICAL WORK SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE.

## SHEET NOTES

1. INVERTER
2. DEDICATED PV SYSTEM METER
3. AC DISCONNECT
4. UTILITY METER
5. DC DISCONNECT

## LEGEND

- (E) UTILITY METER
- INVERTER W/ INTEGRATED DC DISCO & WARNING LABELS
- DC DISCONNECT
- AC DISCONNECT
- JUNCTION BOX
- DC COMBINER BOX
- DISTRIBUTION PANEL
- LOAD CENTER
- DEDICATED PV SYSTEM METER
- CONDUIT RUN ON EXTERIOR
- CONDUIT RUN ON INTERIOR
- GATE
- INTERIOR EQUIPMENT

3055 CLEARVIEW WAY
SAN MATEO, CA 94402
(888)-SOL-CITY (765-2489)
WWW.SOLARCITY.COM

SolarCity

# PRIMROSE HILL MIDDLE SCHOOL

# TOWN OF BARRINGTON

| | |
|---|---|
| SYSTEM SIZE: | 207.57 KW DC, 168 KW AC |
| SITE ADDRESS: | 60 Middle Hwy |
| | Barrington, RI 02806, USA |
| DATE: | 11/3/2016 |
| MODULE: | MONO 330W |
| INVERTER: | GRID-TIED |
| DRAWN BY: | DBREZA |

**DESCRIPTION:**

PV ARRAY

ZEP ZSPEAK BALLASTED MOUNTED ROOFTOP RACKING SYSTEM

STRINGS OF 17 MODULES

PRELIMINARY DRAWING - NOT FOR CONSTRUCTION

**ASSUMPTIONS:**

1. PREVAILING WAGE RATES.ASSUMES SYSTEM DESIGNED TO NEC 2014. ASSUMES BEHIND-THE-METER INTERCONNECTION TYPE. WITHIN THE BUILDING ELECTRICAL ROOMASSUMES SYSTEM INTERCONNECTED AT 480V.ASSUMES NO UTILITY UPGRADES.ASSUMES ALLOWANCE NOT TO EXCEED $3000 FOR UTILITY APPLICATION FEES, STUDIESASSUMES NO SERVICE OR MAIN PANEL UPGRADES REQUIRED TO SUPPORT PV SYSTEM.ASSUMES NO STRUCTURAL UPGRADES.ASSUMES NO REROOFING INCLUDED OTHER THAN FLASHING OF ANY BUILDING PENETRATIONS.MARINE CONDITIONS NOT INCLUDEDASSUMED 50FT FROM ROOF LOADCENTER TO POI IN BUILDING

ARRAY INFORMATION

| MOUNTING METHOD | MODULE COUNT | TILT | AZIMUTH | KW DC |
|---|---|---|---|---|
| NON PENETRATING | 629 | 8° | 87/267° | 207.57 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

GENERAL NOTES

1. THIS SYSTEM IS GRID-INTERTIED VIA A UL-LISTED POWER-CONDITIONING INVERTER.
2. ALL INVERTERS AND ARRAYS ARE NEGATIVELY GROUNDED.
3. SOLAR MOUNTING FRAMES ARE TO BE GROUNDED.
4. ALL WORK TO BE DONE TO 2012 IBC
5. ALL ELECTRICAL WORK SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE.

SHEET NOTES

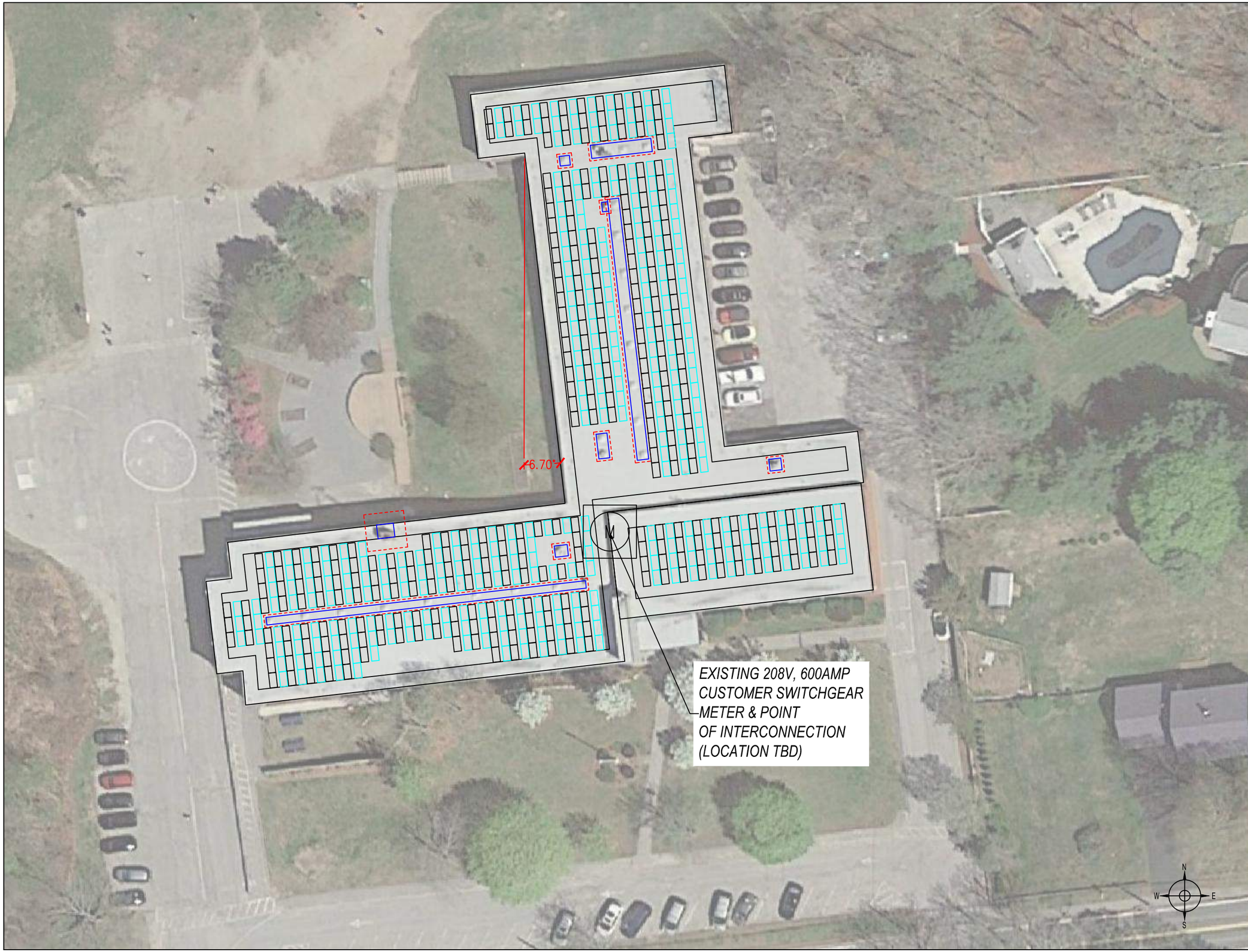
1. INVERTER
2. DEDICATED PV SYSTEM METER
3. AC DISCONNECT
4. UTILITY METER
5. DC DISCONNECT

LEGEND

- (E) UTILITY METER
- INVERTER W/ INTEGRATED DC DISCO & WARNING LABELS
- DC DISCONNECT
- AC DISCONNECT
- JUNCTION BOX
- DC COMBINER BOX
- DISTRIBUTION PANEL
- LOAD CENTER
- DEDICATED PV SYSTEM METER
- CONDUIT RUN ON EXTERIOR
- CONDUIT RUN ON INTERIOR
- GATE
- INTERIOR EQUIPMENT

3055 CLEARVIEW WAY
SAN MATEO, CA 94402
(888)-SOL-CITY (765-2489)
WWW.SOLARCITY.COM

SolarCity




# NAYATT ELEMENTARY SCHOOL

# TOWN OF BARRINGTON

| | |
|---|---|
| SYSTEM SIZE: | 207.57 KW DC, 168 KW AC |
| SITE ADDRESS: | 400 Nayatt Rd |
| | Barrington, RI 02806, USA |
| DATE: | 11/3/2016 |
| MODULE: | MONO 330W |
| INVERTER: | GRID-TIED |
| DRAWN BY: | DBREZA |

**DESCRIPTION:**

PV ARRAY

ZEP ZSPEAK BALLASTED MOUNTED ROOFTOP RACKING SYSTEM

STRINGS OF 17 MODULES

PRELIMINARY DRAWING - NOT FOR CONSTRUCTION

**ASSUMPTIONS:**

1. COPY FROM BOS TOOL, PASTE SPECIAL WITHOUT FORMATTING

## ARRAY INFORMATION

| MOUNTING METHOD | MODULE COUNT | TILT | AZIMUTH | KW DC |
|---|---|---|---|---|
| NON PENETRATING | 629 | 8° | 83/263° | 207.57 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## GENERAL NOTES

1. THIS SYSTEM IS GRID-INTERTIED VIA A UL-LISTED POWER-CONDITIONING INVERTER.
2. ALL INVERTERS AND ARRAYS ARE NEGATIVELY GROUNDED.
3. SOLAR MOUNTING FRAMES ARE TO BE GROUNDED.
4. ALL WORK TO BE DONE TO 2012 IBC
5. ALL ELECTRICAL WORK SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE.

## SHEET NOTES

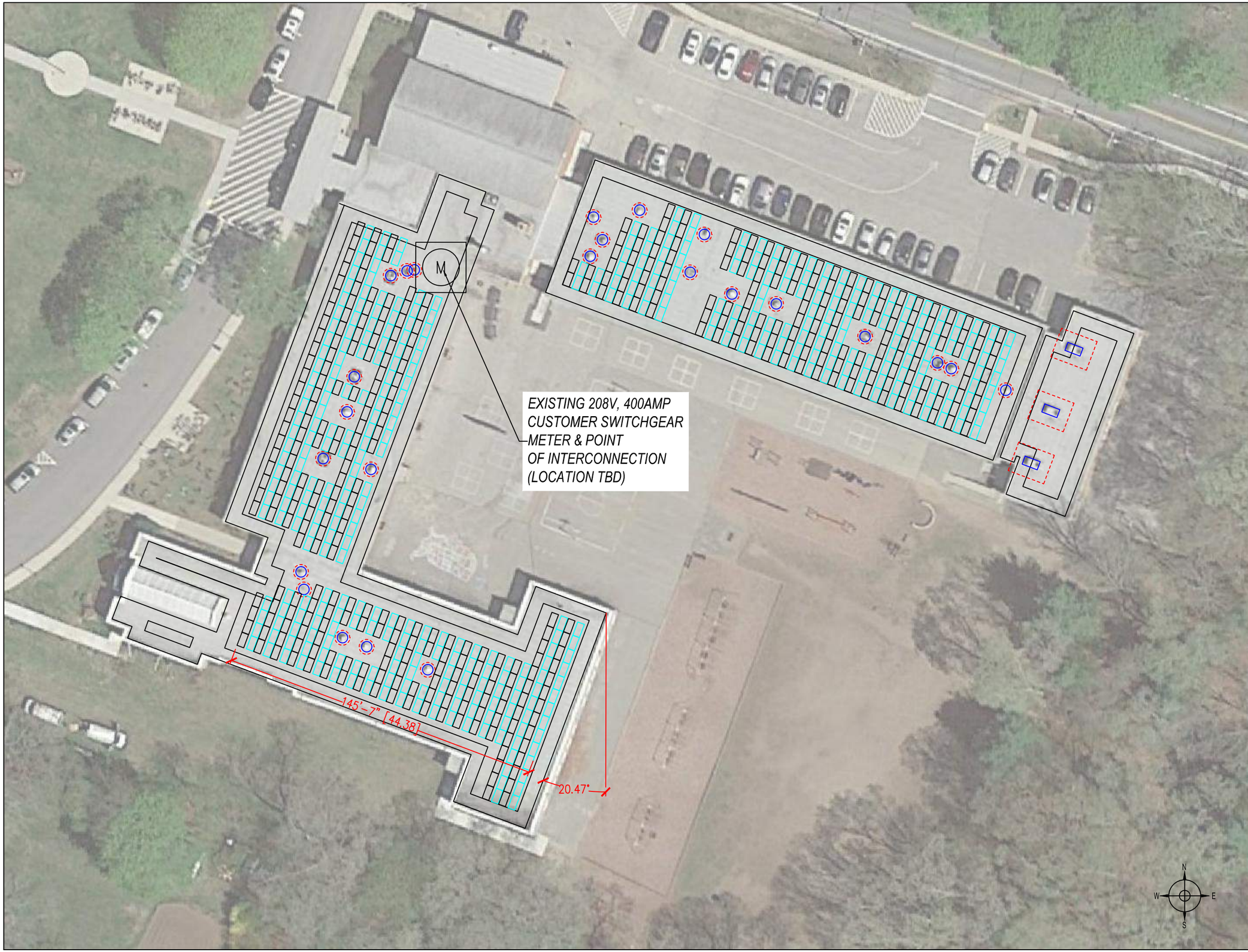
1. INVERTER
2. DEDICATED PV SYSTEM METER
3. AC DISCONECT
4. UTILITY METER
5. DC DISCONNECT

## LEGEND

- (E) UTILITY METER
- INVERTER W/ INTEGRATED DC DISCO & WARNING LABELS.
- DC DISCONNECT
- AC DISCONNECT
- JUNCTION BOX
- DC COMBINER BOX
- DISTRIBUTION PANEL
- LOAD CENTER
- DEDICATED PV SYSTEM METER
- CONDUIT RUN ON EXTERIOR
- CONDUIT RUN ON INTERIOR
- GATE
- INTERIOR EQUIPMENT

3055 CLEARVIEW WAY
SAN MATEO, CA 94402
(888)-SOL-CITY (765-2489)
WWW.SOLARCITY.COM

SolarCity




# HAMPDEN MEADOWS SCHOOL

# TOWN OF BARRINGTON

| | |
|---|---|
| SYSTEM SIZE: | 246.84 KW DC, 192 KW AC |
| SITE ADDRESS: | New Meadow Rd |
| | Barrington, RI 02806, USA |
| DATE: | 11/3/2016 |
| MODULE: | MONO 330W |
| INVERTER: | GRID-TIED |
| DRAWN BY: | DBREZA |

**DESCRIPTION:**

PV ARRAY

ZEP ZSPEAK BALLASTED MOUNTED ROOFTOP RACKING SYSTEM

STRINGS OF 17 MODULES

PRELIMINARY DRAWING - NOT FOR CONSTRUCTION

**ASSUMPTIONS:**

1. PREVAILING WAGE RATES.ASSUMES SYSTEM DESIGNED TO NEC 2014. ASSUMES BEHIND-THE-METER INTERCONNECTION TYPE. WITHIN THE BUILDING ELECTRICAL ROOMASSUMES SYSTEM INTERCONNECTED AT 208V.ASSUMES NO UTILITY UPGRADES.ASSUMES ALLOWANCE NOT TO EXCEED $3000 FOR UTILITY APPLICATION FEES, STUDIESASSUMES NO SERVICE OR MAIN PANEL UPGRADES REQUIRED TO SUPPORT PV SYSTEM.ASSUMES NO STRUCTURAL UPGRADES.ASSUMES NO REROOFING INCLUDED OTHER THAN FLASHING OF ANY BUILDING PENETRATIONS.MARINE CONDITIONS DO NOT APPLY

ARRAY INFORMATION

| MOUNTING METHOD | MODULE COUNT | TILT | AZIMUTH | KW DC |
|---|---|---|---|---|
| NON PENETRATING | 748 | 8° | 110/290° | 246.84 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

GENERAL NOTES

1. THIS SYSTEM IS GRID-INTERTIED VIA A UL-LISTED POWER-CONDITIONING INVERTER.
2. ALL INVERTERS AND ARRAYS ARE NEGATIVELY GROUNDED.
3. SOLAR MOUNTING FRAMES ARE TO BE GROUNDED.
4. ALL WORK TO BE DONE TO 2012 IBC
5. ALL ELECTRICAL WORK SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE.

SHEET NOTES

1. INVERTER
2. DEDICATED PV SYSTEM METER
3. AC DISCONNECT
4. UTILITY METER
5. DC DISCONNECT

LEGEND

- (E) UTILITY METER
- INVERTER W/ INTEGRATED DC DISCO & WARNING LABELS.
- DC DISCONNECT
- AC DISCONNECT
- JUNCTION BOX
- DC COMBINER BOX
- DISTRIBUTION PANEL
- LOAD CENTER
- DEDICATED PV SYSTEM METER
- CONDUIT RUN ON EXTERIOR
- CONDUIT RUN ON INTERIOR
- GATE
- INTERIOR EQUIPMENT

3055 CLEARVIEW WAY
SAN MATEO, CA 94402
(888)-SOL-CITY (765-2489)
WWW.SOLARCITY.COM

SolarCity

## Production Estimates

Solar production for the project was estimated using the proposed system design and the local weather files via PVsyst, an industry-standard simulation software tool. The following table illustrates the projected system output on a monthly basis for the entire array.

According to RI PUC No. 2075 Net Metering Provision, if a customer is a net-exporter of solar generated electricity, "the customer shall receive Renewable Net Metering Credits, which shall be applied to offset the Net Metering Customer's usage on Net Metered Accounts at the Eligible Net Metering System Site." In this case, the Town is eligible to allocate these credits to accounts not contiguous to the self-generator site, such as other Town accounts located away from the schools.

**Projected Monthly Production (kWh)**

| Month | High School | Primrose Hill | Nayatt Elementary | Hampden Meadows | School Total |
|---|---|---|---|---|---|
| January | 78,300 | 10,422 | 10,119 | 11,992 | **110,833** |
| February | 98,500 | 13,451 | 13,175 | 15,588 | **140,714** |
| March | 144,600 | 20,227 | 19,918 | 23,516 | **208,261** |
| April | 164,600 | 20,554 | 20,274 | 23,923 | **229,351** |
| May | 202,900 | 29,478 | 29,169 | 34,387 | **295,934** |
| June | 211,100 | 30,658 | 30,356 | 35,787 | **307,901** |
| July | 201,100 | 28,972 | 28,666 | 33,862 | **292,600** |
| August | 185,100 | 26,608 | 26,302 | 31,071 | **269,081** |
| September | 151,200 | 21,272 | 20,975 | 24,800 | **218,247** |
| October | 120,700 | 16,526 | 16,222 | 19,182 | **172,630** |
| November | 82,500 | 11,005 | 10,714 | 12,685 | **116,904** |
| December | 70,000 | 9,066 | 8,766 | 10,365 | **98,197** |
| **First-Year Total** | **1,710,400** | **238,241** | **234,656** | **277,158** | **2,460,455** |

SolarCity completed performance simulations for the Town's system using PVsyst. PVsyst is the industry's leading performance simulation software program allowing users to accurately model system performance through the specification of numerous inputs including project location, make and model of PV modules and inverters, module tilt angle and orientation, and number DC and AC loss factors. Users also select the source of the weather data for the simulation. SolarCity uses only TMY3 (Typical Meteorological Year) datasets. TMY3 datasets, which were developed by the National Renewable Energy Laboratory, consist of full-year hourly data representing "typical" (similar to average) weather for the location. The datasets are constructed from weather measurements taken from 1,020 weather stations across the United States from roughly 30 years of measurements. To ensure modeling accuracy, SolarCity exclusively uses Class I and II TMY3 datasets. Class I and II datasets have the lowest uncertainty of TMY3 dataset types. As an additional means of ensuring modeling accuracy, when available, SolarCity uses PVsyst module files (.PAN files) and inverter files (.OND files) that have been third-party verified.

# SolarCity's Technical Proposal – Offsite Ground Mount

SolarCity is proud to propose an indicative 2.836 MWdc fixed-tilt ground-mounted solar array at an offsite location procured by SolarCity. This single array will create roughly 3,713 MWh of energy in the first year, and will offset around 98.2% of the Town of Barrington's total electrical usage.

This site will be remotely net metered and employ high efficiency 330 W monocrystalline Trina TSM-330DD14(II) photovoltaic modules similar to the other offered powerplants. The PV modules will be installed as strings of 17 on an RBI Solar fixed-tilt, pile-driven ground-mounted racking system set at an azimuth angle of 180° and a tilt of 20°. DC output wiring from the modules will converge at Fronius 24 kW, 480 V inverters located throughout the array field. Inverter AC outputs will be routed in underground PVC conduit and 5 inverters will merge in 14 225 amp load centers. Final load center low-voltage AC wiring will continue within PVC conduit underground to 2 separate 1,600 amp recombiner pads. Each pad will hold 1 480 V / 12.47 kV step-up transformers per pad in preparation for export to the grid. These transformers will be loop fed, and the medium voltage wire run will be routed underground within PVC conduit from the array field to a pole-mounted switchgear / reclosure (as per utility requirements). This will be our point of interconnection and common coupling with the new 12.47 kV utility service. Locations are assumed as indicated on the layout.

A summary of the proposed system is found below. A visual layout is on the following page, and datasheets for the equipment have been provided in Appendix D of this proposal.

**Proposed System Design Summary**

| | |
|---|---|
| **System Size (kWdc)** | 2,836.11 kWdc |
| **System Size (kWac)** | 1,992.00 kWac |
| **Module Model** | Trina Solar TSM-330DD14(II) |
| **Module Power** | 330 W |
| **No. of Modules** | 8,466 |
| **Module Racking Method and Supplier** | RBI Fixed-Tilt, Pile-Driven Ground Mount |
| **Tilt Angle** | 20° |
| **Azimuth Angle** | 180° |
| **Inverter Model** | Fronius Symo 24.0-3 |
| **Inverter Power** | 24 kW |
| **Inverter Output Voltage** | 480 V |
| **No. of Inverters** | 83 |
| **First-Year Yield** | 1,309 kWh/kW |
| **First-Year Production** | 3,713 MWh |

# LAND LEASE - TOWN OF BRISTOL AND BARRINGTON

| | |
|---|---|
| SYSTEM SIZE: | 2836.11 KW DC, 1992 KW AC |
| SITE ADDRESS: | BARRINGTON, RI |
| | |
| DATE: | 10/19/2016 |
| MODULE: | POLY 335W |
| INVERTER: | GRID-TIED |
| DRAWN BY: | DBREZA |

**DESCRIPTION:**

PV ARRAY

PILE DRIVEN, FIX TILT, GROUND MOUNTED RACKING SYSTEM

STRINGS OF 17 MODULES

PRELIMINARY DRAWING - NOT FOR CONSTRUCTION

## ARRAY INFORMATION

| MOUNTING METHOD | MODULE COUNT | TILT | AZIMUTH | KW DC |
|---|---|---|---|---|
| FIX TILT | 8266 | 20° | 180° | 2836.11 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## GENERAL NOTES

1. THIS SYSTEM IS GRID-INTERTIED VIA A UL-LISTED POWER-CONDITIONING INVERTER.
2. ALL INVERTERS AND ARRAYS ARE NEGATIVELY GROUNDED.
3. SOLAR MOUNTING FRAMES ARE TO BE GROUNDED.
4. ALL WORK TO BE DONE TO 2012 IBC
5. ALL ELECTRICAL WORK SHALL COMPLY WITH THE NATIONAL ELECTRIC CODE.

## SHEET NOTES

1. INVERTER
2. DEDICATED PV SYSTEM METER
3. AC DISCONNECT
4. UTILITY METER
5. DC DISCONNECT

## LEGEND

- (E) UTILITY METER
- INVERTER W/ INTEGRATED DC DISCO & WARNING LABELS.
- DC DISCONNECT
- AC DISCONNECT
- JUNCTION BOX
- DC COMBINER BOX
- DISTRIBUTION PANEL
- LOAD CENTER
- DEDICATED PV SYSTEM METER
- CONDUIT RUN ON EXTERIOR
- CONDUIT RUN ON INTERIOR
- GATE
- INTERIOR EQUIPMENT

3055 CLEARVIEW WAY
SAN MATEO, CA 94402
(888)-SOL-CITY (765-2489)
WWW.SOLARCITY.COM

SolarCity

# Appendices and Supporting Information

## a. DemandLogic Energy Storage Value-Add Offering

### Overview

SolarCity is pleased to offer the opportunity to save even more money on electricity costs by integrating battery storage into your solar project. Battery storage optimizes the technical and financial performance of a solar system and offers the opportunity to maximize savings above and beyond what is possible with a "solar only" system by reliably reducing expensive demand charges.

Parallel to SolarCity's PPA, DemandLogic requires $0 upfront investment, generating immediate savings by selling demand reduction capabilities at a rate below what is charged by the local distribution utility for demand. Additionally, SolarCity's rate is locked in for the project term, while utility costs will remain volatile and continue to increase. Finally, SolarCity guaranteed DemandLogic's performance such that if the system were to underperform, SolarCity would compensate the Towns for any shortfall.

### Underlying Technology

*A 250 kW / 500 kWh battery system*

DemandLogic evolved from SolarCity's long-term collaboration with Tesla to develop stationary energy storage projects for a variety of applications. The underlying technology embodied in the stationary storage systems is the same lithium-ion battery used in Tesla's vehicles. Lithium-ion batteries are a widely field-proven technology, virtually ubiquitous in consumer electronics. The specific cell used by Tesla in these energy storage systems is also the power source for over 50,000 vehicles on the road which have completed over 1 billion miles of driving.

The underlying Tesla hardware has been deployed for a variety of applications including optimizing the energy demand of buildings, enabling microgrids, providing demand-response to ISOs, firming up intermittent renewable generation, and demonstrating advanced grid-tied functionality such as load management and real-time dispatch.

### How Does DemandLogic Work?

The DemandLogic system is a fully-integrated solution containing DC battery packs with self-contained thermal management systems, bidirectional inverters, and a monitoring and controls system. Tesla manufactures a modular and scalable energy storage solution optimally designed for large-scale commercial and utility scale deployments. The basic building block for a storage system is a DC battery pack, which is delivered preassembled with battery, thermal management system, and required DC wiring.

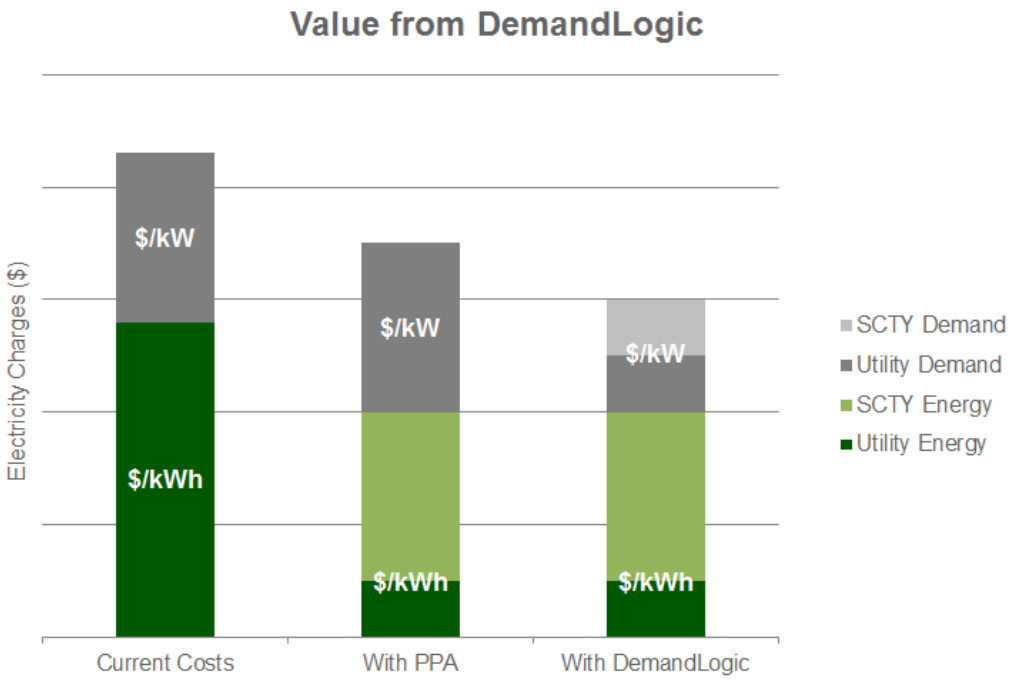
The battery packs are connected to a 250 kVA bidirectional inverter to form an inverter block, with battery pack quantities scaling based on the required energy of the system. The inverter block forms the basic AC building block used to build up a multi-megawatt Hour (MWh) grid-tied energy storage solution. Tesla offers a DNP3 compliant platform allowing for easy and secure dispatch by the operator. The overall system is monitored and controlled via a Site Master Controller (SMC), also provided by Tesla.

The Tesla hardware is controlled by a proprietary SolarCity software suite, which has real-time learning algorithms that dynamically charge and discharge the battery system to reduce periods of high electrical demand. On a continuous basis, SolarCity meters the generation of the solar system as well as the native load of the site, and

proactively discharges the battery if a 15-minute interval is tracking to be the highest in the billing period, effectively reducing billable demand.

### How DemandLogic Generates Value

Electric utilities often charge for both the *quantity* of energy consumed (measured in kWh) as well as the maximum *rate* at which energy is consumed (called "demand", measured in kW). As demand is typically measured on a 15-minute basis, and facilities are billed for the single highest measurement in a billing period (meaning that there are 3,000+ intervals in a billing period), it is impractical to assume that conventional load management, or even installing a behind-the-meter solar project, can effectively reduce demand charges significantly or reliably. However, by integrating battery storage along with solar, the combined system can reliably reduce demand charges. With DemandLogic, you can save both on $/kWh and $/kW costs from the local utility, maximizing total savings.




### Financing and Contracting for DemandLogic

As a leader in renewable energy financing, SolarCity has multiple funds available to deploy DemandLogic projects. Rather than contracting for separate solar and energy storage projects, SolarCity's DemandLogic is financed under the same vehicle and contracted for with a single agreement; a rarity amongst competing energy storage solutions. Integrating DemandLogic into a conventional solar project requires the addition of a simple, 1-page exhibit to a conventional solar Power Purchase Agreement.

## b. **Required Forms**

TOWN OF BRISTOL and TOWN OF BARRINGTON, RI

INVITATION FOR RFQ/RFP
BID #850
PUBLIC-PRIVATE PARTNERSHIP FOR ON-SITE SOLAR PROJECTS

**Attachment A**
**Town of Bristol**

**BID FORM**

**NAME AND ADDRESS OF BIDDING FIRM:**

SolarCity Corporation

3055 Clearview Way

San Mateo, CA 94402

**I herein agree to abide by all requirements as detailed in the "Invitation for Bid #850".**

Signature: _____

Printed Name & Title: Bob Rudd, Vice President of Project Development

Date: November 30, 2016

LEGAL APPROVED
INITIAL JH/BC
DATE 11-28-16
RFP

TOWN OF BRISTOL and TOWN OF BARRINGTON, RI

INVITATION FOR RFQ/RFP
BID #850
PUBLIC-PRIVATE PARTNERSHIP FOR ON-SITE SOLAR PROJECTS

**Attachment A**
**Town of Barrington**

**BID FORM**

**NAME AND ADDRESS OF BIDDING FIRM:**

SolarCity Corporation

3055 Clearview Way

San Mateo, CA 94402

**I herein agree to abide by all requirements as detailed in the "Invitation for Bid #850".**

Signature: _____

Printed Name & Title: Bob Rudd, Vice President of Project Development

Date: November 30, 2016

LEGAL APPROVED
INITIAL JH/BC
DATE 11-28-16
RFP

TOWN OF BRISTOL and TOWN OF BARRINGTON, RI

INVITATION FOR RFQ/RFP
BID #850
PUBLIC-PRIVATE PARTNERSHIP FOR ON-SITE SOLAR PROJECTS

**ATTACHMENT B**
**Non-COLLUSION AFFIDAVIT**
**To Be Completed, Notarized, and Submitted With Bid**

State of Rhode Island
County of Bristol

"SolarCity Corporation, Bidder, being first duly sworn, deposes and says that he or she is Owner of the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the Bidder has not directly or indirectly induced or solicited any other Bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any Bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the Bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the Bidder or any other Bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other Bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the Bidder has not , directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid."

November 28, 2016
Date

11/28/2016
(Signed at)

SolarCity Corporation
Bidder name
(Person, Firm, Corp.)

Authorized Representative

3055 Clearview Way
Address

Bob Rudd
Representative's Name

San Mateo, CA 94402
City, State, Zip

Vice President of Project Development
Representative's Title

LEGAL APPROVED
INITIAL JH/BC
DATE 11-28-16
RFP

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

# CALIFORNIA JURAT

State of California )

County of San Francisco )

Subscribed and sworn to (or affirmed) before me on this 28 day

of November, 20 16, by Bob Rudd

_____,

proved to me on the basis of satisfactory evidence to be the person(s) who appeared before me.

Signature Priscilla L

PRISCILLA LEE
COMM. #2121081
Notary Public - California
San Mateo County
My Comm. Expires July 27, 2019
NRO1 NRO1

(Seal)

## OPTIONAL INFORMATION

*Although the information in this section is not required by law, it could prevent fraudulent removal and reattachment of this jurat to an unauthorized document and may prove useful to persons relying on the attached document.*

### Description of Attached Document

This certificate is attached to a document titled/for the purpose of

Town of Bristol & Town of Barrington, RI
Non-Collusion Affidavit

containing _____ pages, and dated _____.

### Additional Information

Method of Affiant Identification

Proved to me on the basis of satisfactory evidence:
○ form(s) of identification ○ credible witness(es)

Notarial event is detailed in notary journal on:
Page # _____ Entry # _____

Notary contact: _____

Other

☐ Affiant(s) Thumbprint(s) ☐ Describe: _____

© Copyright 2007-2014 Notary Rotary, Inc. PO Box 41400, Des Moines, IA 50311-0507. All Rights Reserved. Item Number 101884. Please contact your Authorized Reseller to purchase copies of this form.

TOWN OF BRISTOL and TOWN OF BARRINGTON, RI

INVITATION FOR RFQ/RFP
BID #850
PUBLIC-PRIVATE PARTNERSHIP FOR ON-SITE SOLAR PROJECTS

## ATTACHMENT C

## BIDDER'S STATEMENT REGARDING INSURANCE COVERAGE

BIDDER HEREBY CERTIFIES that the Bidder has reviewed and understands the insurance coverage requirements specified in the Invitation for Bid No. 850, Public – Private Partnership for On-Site Solar Projects. Should the Bidder be awarded the contract for the work, Bidder further certifies that the Bidder can meet the specified requirements for insurance and agrees to provide the Town with a certificate of insurance which names the Town of Bristol and the Town of Barrington as an Additional Insured for the work specified.

Insurance Required:

- Workman's Compensation in compliance with statutory limits
- Comprehensive General Liability Insurance of at least $1,000,000.

SolarCity Corporation
Name of Bidder (Person, Firm, or Corporation)

Signature of Bidder's Authorized Representative

Bob Rudd, Vice President of Project Development
Name & Title of Authorized Representative

November 30, 2016
Date of Signing

LEGAL APPROVED
INITIAL JH/BC
DATE 11-28-16
RFP

TOWN OF BRISTOL and TOWN OF BARRINGTON, RI

INVITATION FOR RFQ/RFP
BID #850
PUBLIC-PRIVATE PARTNERSHIP FOR ON-SITE SOLAR PROJECTS

## ATTACHMENT D

## BIDDER STATEMENT OF RELEVANT EXPERIENCE

List three (3) references for which your firm provided service within the last five years.

I hereby certify that I have performed the work listed below.

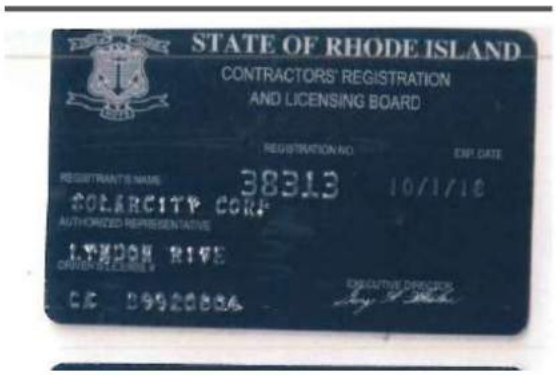
_____
Signature of Bidder

| DESCRIPTION | DATES | CONTRACT AMOUNT | CUSTOMER CONTACT | CUSTOMER TELEPHONE |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |

Detailed references are included in the "Bidder's References" section of the proposal.

LEGAL APPROVED
INITIAL JH/BC
DATE 11-28-16
RFP

## Contractor Registration



## C. Production Estimates

**Town of Bristol**

# Grid-Connected System: Simulation parameters

**Project :** **Town of Bristol & Barrington RFP**

**Geographical Site** **Providence T F Green State Ar** Country **United States**

**Situation** Latitude 41.7°N Longitude 71.4°W
Time defined as Legal Time Time zone UT-5 Altitude 16 m
Monthly albedo values

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albedo | 0.55 | 0.55 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.55 |

**Meteo data:** **Providence T F Green State Ar** NREL: TMY3 hourly DB (1991-2005) - TMY

**Simulation variant :** **Landfill 20deg tilt**

Simulation date 02/11/16 10h46

**Simulation parameters**

**Collector Plane Orientation** Tilt 20° Azimuth 0°

**25 Sheds** Pitch 7.79 m Collector width 3.91 m
Inactive band Top 0.00 m Bottom 0.00 m
Shading limit angle Gamma 18.00 ° Occupation Ratio 50.2 %
Shadings electrical effect Cell size 15.6cm Strings in width 2

**Models used** Transposition Perez Diffuse Imported

**Horizon** Free Horizon

**Near Shadings** Mutual shadings of sheds Electrical effect

**PV Array Characteristics**

**PV module** Si-mono Model **TSM-330DD14A(II)**
Custom parameters definition Manufacturer Trina Solar
Number of PV modules In series 17 modules In parallel 628 strings
Total number of PV modules Nb. modules 10676 Unit Nom. Power 330 Wp
Array global power Nominal (STC) **3523 kWp** At operating cond. 3179 kWp (50°C)
Array operating characteristics (50°C) U mpp 574 V I mpp 5537 A
Total area Module area **20715 m²** Cell area 18617 m²

**Inverter** Model **SGI 750XTM**
Custom parameters definition Manufacturer Solectria Renewables
Characteristics Operating Voltage 545-820 V Unit Nom. Power 750 kWac
Inverter pack Nb. of inverters 4 units Total Power 3000 kWac

**PV Array loss factors**

Array Soiling Losses

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 4.0% | 3.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 3.0% |

Thermal Loss factor Uc (const) 29.0 W/m²K Uv (wind) 0.0 W/m²K / m/s
Wiring Ohmic Loss Global array res. 3.5 mOhm Loss Fraction 3.0 % at STC

# Grid-Connected System: Simulation parameters (continued)

| | | | | |
|---|---|---|---|---|
| LID - Light Induced Degradation | | | Loss Fraction | 2.0 % |
| Module Quality Loss | | | Loss Fraction | 0.2 % |
| Module Mismatch Losses | | | Loss Fraction | 1.0 % at MPP |
| Incidence effect, ASHRAE parametrization | IAM = | 1 - bo (1/cos i - 1) | bo Param. | 0.04 |

**System loss factors**

| | | | | |
|---|---|---|---|---|
| AC wire loss inverter to transfo | Inverter voltage | 380 Vac tri | | |
| | Wires: 3x4000.0 mm² | 55 m | Loss Fraction | 0.6 % at STC |
| External transformer | Iron loss (24H connexion) | 6921 W | Loss Fraction | 0.2 % at STC |
| | Resistive/Inductive losses | 0.5 mOhm | Loss Fraction | 1.2 % at STC |
| Unavailability of the system | 3.6 days, 1 periods | | Time fraction | 1.0 % |

**User's needs :** Unlimited load (grid)

# Grid-Connected System: Main results

**Project :** **Town of Bristol & Barrington RFP**

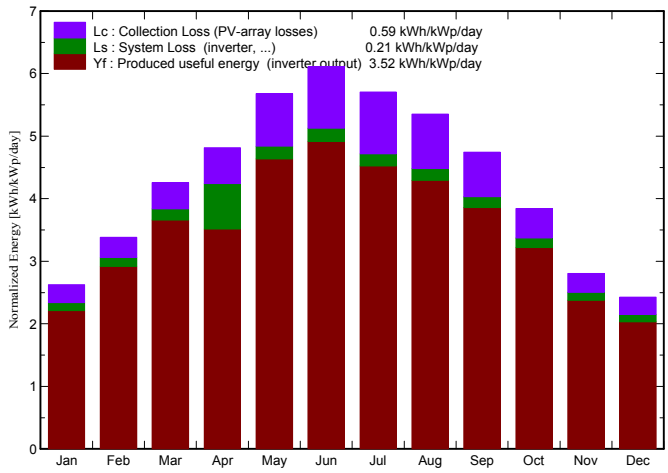
**Simulation variant :** **Landfill 20deg tilt**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| PV Field Orientation | Sheds disposition, tilt | 20° | azimuth | 0° |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 10676 | Pnom total | **3523 kWp** |
| Inverter | Model | SGI 750XTM | Pnom | 750 kW ac |
| Inverter pack | Nb. of units | 4.0 | Pnom total | **3000 kW ac** |
| User's needs | Unlimited load (grid) | | | |

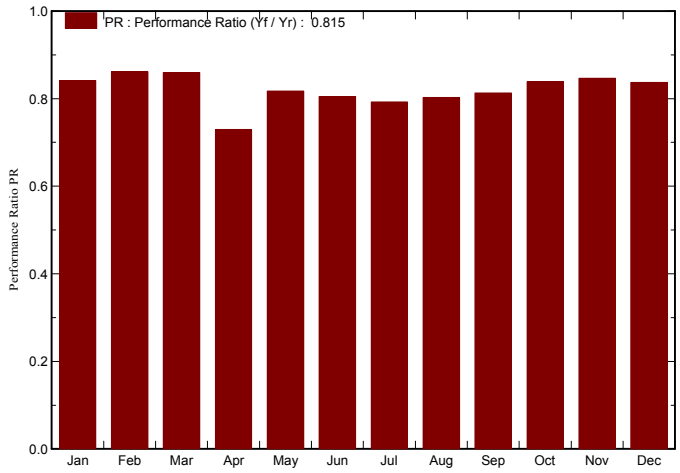
**Main simulation results**

| | | | | |
|---|---|---|---|---|
| System Production | **Produced Energy** | **4523 MWh/year** | Specific prod. | 1284 kWh/kWp/year |
| | Performance Ratio PR | 81.5 % | | |

**Normalized productions (per installed kWp): Nominal power 3523 kWp**




**Performance Ratio PR**




**Landfill 20deg tilt**

**Balances and main results**

| | GlobHor kWh/m² | T Amb °C | GlobInc kWh/m² | GlobEff kWh/m² | EArray MWh | E_Grid MWh | EffArrR % | EffSysR % |
|---|---|---|---|---|---|---|---|---|
| **January** | 57.8 | -1.59 | 81.5 | 73.5 | 255.5 | 241.7 | 15.13 | 14.31 |
| **February** | 73.1 | 0.15 | 94.8 | 87.1 | 302.0 | 287.8 | 15.38 | 14.66 |
| **March** | 111.0 | 3.81 | 132.0 | 124.4 | 419.0 | 399.9 | 15.32 | 14.62 |
| **April** | 132.7 | 8.47 | 144.5 | 136.0 | 448.5 | 371.4 | 14.98 | 12.41 |
| **May** | 172.1 | 15.12 | 176.0 | 165.3 | 528.5 | 506.7 | 14.49 | 13.90 |
| **June** | 182.6 | 19.21 | 183.3 | 172.7 | 541.9 | 519.9 | 14.27 | 13.69 |
| **July** | 174.5 | 23.27 | 176.9 | 166.3 | 515.2 | 494.1 | 14.06 | 13.48 |
| **August** | 157.7 | 21.57 | 165.9 | 155.8 | 489.5 | 469.1 | 14.24 | 13.65 |
| **September** | 124.1 | 18.30 | 142.4 | 134.0 | 426.2 | 407.7 | 14.45 | 13.83 |
| **October** | 93.4 | 11.90 | 119.1 | 111.9 | 368.5 | 351.8 | 14.94 | 14.26 |
| **November** | 61.2 | 5.85 | 84.1 | 78.5 | 264.5 | 250.9 | 15.18 | 14.40 |
| **December** | 49.8 | -0.50 | 75.2 | 68.1 | 234.8 | 221.9 | 15.07 | 14.24 |
| Year | 1390.0 | 10.52 | 1575.8 | 1473.7 | 4794.1 | 4522.9 | 14.69 | 13.86 |

Legends:

| | | | |
|---|---|---|---|
| GlobHor | Horizontal global irradiation | EArray | Effective energy at the output of the array |
| T Amb | Ambient Temperature | E_Grid | Energy injected into grid |
| GlobInc | Global incident in coll. plane | EffArrR | Effic. Eout array / rough area |
| GlobEff | Effective Global, corr. for IAM and shadings | EffSysR | Effic. Eout system / rough area |

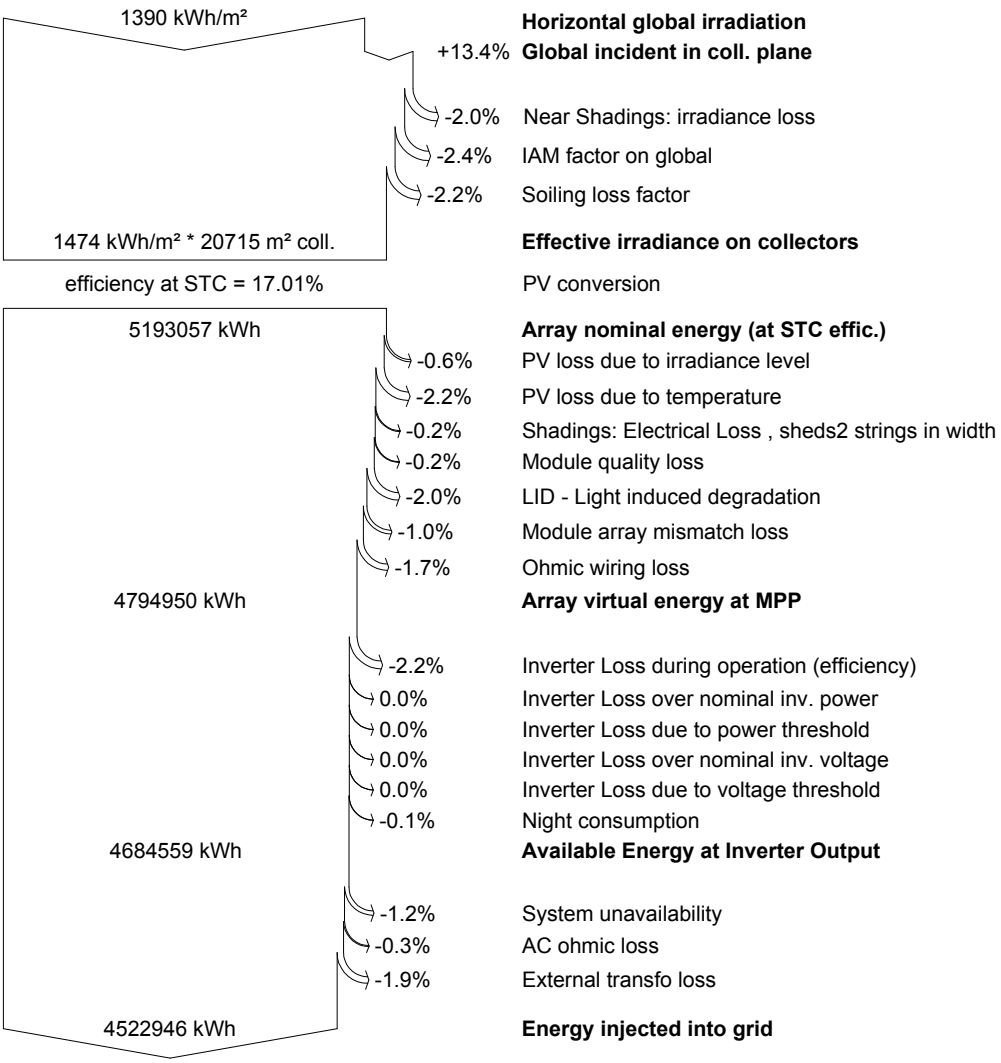
# Grid-Connected System: Loss diagram

**Project :** **Town of Bristol & Barrington RFP**

**Simulation variant :** **Landfill 20deg tilt**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| PV Field Orientation | Sheds disposition, tilt | 20° | azimuth | 0° |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 10676 | Pnom total | **3523 kWp** |
| Inverter | Model | SGI 750XTM | Pnom | 750 kW ac |
| Inverter pack | Nb. of units | 4.0 | Pnom total | **3000 kW ac** |
| User's needs | Unlimited load (grid) | | | |

**Loss diagram over the whole year**



**Town of Barrington**

# Grid-Connected System: Simulation parameters

**Project :** **Town of Bristol & Barrington RFP**

**Geographical Site** **Providence T F Green State Ar** Country **United States**

**Situation** Latitude 41.7°N Longitude 71.4°W
Time defined as Legal Time Time zone UT-5 Altitude 16 m
Monthly albedo values

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albedo | 0.55 | 0.55 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.55 |

**Meteo data:** **Providence T F Green State Ar** NREL: TMY3 hourly DB (1991-2005) - TMY

**Simulation variant :** **BARRINGTON HIGH SCHOOL**

Simulation date 03/11/16 12h16

**Simulation parameters**

**5 orientations** Tilts/Azimuths 8°/-93°, 8°/87°, 7°/-3°, 7°/87°, 25°/-3°

**Models used** Transposition Perez Diffuse Imported

**Horizon** Free Horizon

**Near Shadings** No Shadings

**PV Arrays Characteristics (4 kinds of array defined)**

**PV module** Si-mono Model **TSM-330DD14A(II)**
Custom parameters definition Manufacturer Trina Solar

| | | | | |
|---|---|---|---|---|
| **Sub-array "BALLASTED"** | Mixed orient. | #1/2: 35/34 strings | Tilt/Azimuth | 8°/-93°, 8°/87° |
| Number of PV modules | In series | 17 modules | In parallel | 69 strings |
| Total number of PV modules | Nb. modules | 1173 | Unit Nom. Power | 330 Wp |
| Array global power | Nominal (STC) | **387 kWp** | At operating cond. | 349 kWp (50°C) |
| Array operating characteristics (50°C) | U mpp | 574 V | I mpp | 608 A |
| **Sub-array "carport 177 azimuth"** | Mixed orient. | #3 | Tilt/Azimuth | 7°/-3° |
| Number of PV modules | In series | 19 modules | In parallel | 42 strings |
| Total number of PV modules | Nb. modules | 798 | Unit Nom. Power | 330 Wp |
| Array global power | Nominal (STC) | **263 kWp** | At operating cond. | 238 kWp (50°C) |
| Array operating characteristics (50°C) | U mpp | 642 V | I mpp | 370 A |
| **Sub-array "carport 267 azimuth"** | Mixed orient. | #4 | Tilt/Azimuth | 7°/87° |
| Number of PV modules | In series | 19 modules | In parallel | 84 strings |
| Total number of PV modules | Nb. modules | 1596 | Unit Nom. Power | 330 Wp |
| Array global power | Nominal (STC) | **527 kWp** | At operating cond. | 475 kWp (50°C) |
| Array operating characteristics (50°C) | U mpp | 642 V | I mpp | 741 A |
| **Sub-array "PITCHED"** | Mixed orient. | #5 | Tilt/Azimuth | 25°/-3° |
| Number of PV modules | In series | 17 modules | In parallel | 33 strings |
| Total number of PV modules | Nb. modules | 561 | Unit Nom. Power | 330 Wp |
| Array global power | Nominal (STC) | **185 kWp** | At operating cond. | 167 kWp (50°C) |
| Array operating characteristics (50°C) | U mpp | 574 V | I mpp | 291 A |
| **Total** Arrays global power | Nominal (STC) | **1362 kWp** | Total | 4128 modules |
| | Module area | **8010 m²** | Cell area | 7199 m² |

# Grid-Connected System: Simulation parameters (continued)

| | | | | |
|---|---|---|---|---|
| **Sub-array "BALLASTED" : Inverter** | Model | **Symo 24.0-3 / 480 Single MPPT** | | |
| Custom parameters definition | Manufacturer | Fronius USA | | |
| Characteristics | Operating Voltage | 200-800 V | Unit Nom. Power | 24.0 kWac |
| Inverter pack | Nb. of inverters | 12 units | Total Power | 288 kWac |
| **Sub-array "carport 177 azimuth" : Inverter** | Model | **PVI 28TL 480V Single MPPT** | | |
| Custom parameters definition | Manufacturer | Solectria Renewables | | |
| Characteristics | Operating Voltage | 500-800 V | Unit Nom. Power | 28.0 kWac |
| Inverter pack | Nb. of inverters | 7 units | Total Power | 196 kWac |
| **Sub-array "carport 267 azimuth" : Inverter** | Model | **PVI 28TL 480V Single MPPT** | | |
| Custom parameters definition | Manufacturer | Solectria Renewables | | |
| Characteristics | Operating Voltage | 500-800 V | Unit Nom. Power | 28.0 kWac |
| Inverter pack | Nb. of inverters | 14 units | Total Power | 392 kWac |
| **Sub-array "PITCHED" : Inverter** | Model | **Symo 24.0-3 / 480 Single MPPT** | | |
| Custom parameters definition | Manufacturer | Fronius USA | | |
| Characteristics | Operating Voltage | 200-800 V | Unit Nom. Power | 24.0 kWac |
| Inverter pack | Nb. of inverters | 6 units | Total Power | 144 kWac |
| **Total** | Nb. of inverters | 39 | Total Power | 1020 kWac |

**PV Array loss factors**

Array Soiling Losses

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0% | 3.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 3.0% |

| | | | | |
|---|---|---|---|---|
| Thermal Loss factor | Uc (const) | 24.0 W/m²K | Uv (wind) | 0.0 W/m²K / m/s |
| Wiring Ohmic Loss | Array#1 | 7.4 mOhm | Loss Fraction | 0.7 % at STC |
| | Array#2 | 14 mOhm | Loss Fraction | 0.7 % at STC |
| | Array#3 | 6.8 mOhm | Loss Fraction | 0.7 % at STC |
| | Array#4 | 15 mOhm | Loss Fraction | 0.7 % at STC |
| | Global | | Loss Fraction | 0.7 % at STC |
| LID - Light Induced Degradation | | | Loss Fraction | 2.0 % |
| Module Quality Loss | | | Loss Fraction | 0.2 % |
| Module Mismatch Losses | | | Loss Fraction | 1.0 % at MPP |
| Incidence effect, ASHRAE parametrization | IAM = | 1 - bo (1/cos i - 1) | bo Param. | 0.04 |

**System loss factors**

| | | | | |
|---|---|---|---|---|
| | Wires: 3x2000.0 mm² | 201 m | Loss Fraction | 3.3 % at STC |
| Unavailability of the system | 3.6 days, 1 periods | | Time fraction | 1.0 % |

**User's needs :** Unlimited load (grid)

# Grid-Connected System: Main results

**Project :** **Town of Bristol & Barrington RFP**

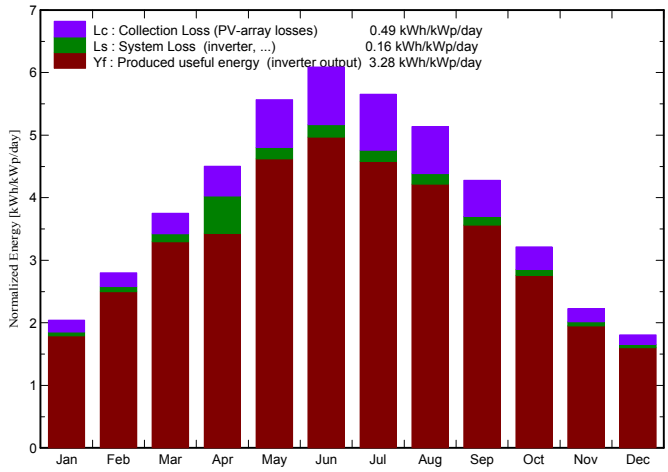
**Simulation variant :** **BARRINGTON HIGH SCHOOL**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| 5 orientations | Tilt/Azimuth | 8°/-93°, 8°/87°, 7°/-3°, 7°/87°, 25°/-3° | | |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 4128 | Pnom total | **1362 kWp** |
| Inverter | Model | Symo 24.0-3 / 480 Single MPPT | | 24.00 kW ac |
| Inverter | Model | PVI 28TL 480V Single MPPT | | 28.00 kW ac |
| Inverter pack | Nb. of units | 39.0 | Pnom total | **1020 kW ac** |
| User's needs | Unlimited load (grid) | | | |

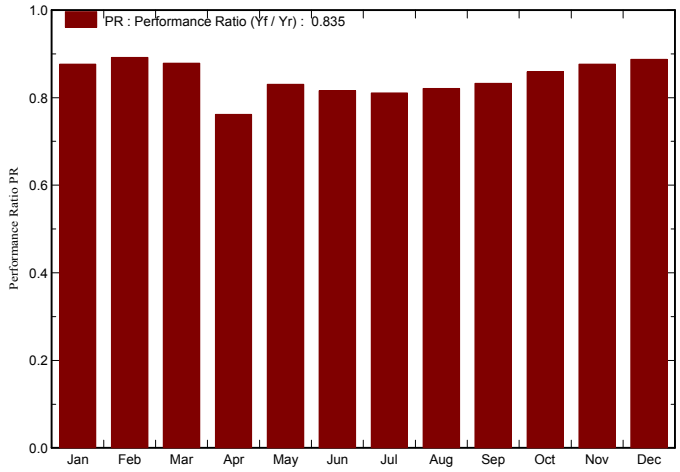
**Main simulation results**

| System Production | **Produced Energy** | **1630 MWh/year** | Specific prod. | 1196 kWh/kWp/year |
|---|---|---|---|---|
| | Performance Ratio PR | 83.5 % | | |

**Normalized productions (per installed kWp): Nominal power 1362 kWp**




**Performance Ratio PR**




**BARRINGTON HIGH SCHOOL**

**Balances and main results**

| | GlobHor | T Amb | GlobInc | GlobEff | EArray | E_Grid | EffArrR | EffSysR |
|---|---|---|---|---|---|---|---|---|
| | kWh/m² | °C | kWh/m² | kWh/m² | MWh | MWh | % | % |
| **January** | 57.8 | -1.59 | 63.4 | 57.3 | 78.3 | 75.6 | 15.43 | 14.90 |
| **February** | 73.1 | 0.15 | 78.4 | 72.9 | 98.5 | 95.2 | 15.69 | 15.17 |
| **March** | 111.0 | 3.81 | 116.3 | 110.4 | 144.6 | 139.3 | 15.52 | 14.94 |
| **April** | 132.7 | 8.47 | 135.1 | 128.6 | 164.6 | 140.3 | 15.21 | 12.96 |
| **May** | 172.1 | 15.12 | 172.5 | 164.5 | 202.9 | 195.1 | 14.68 | 14.12 |
| **June** | 182.6 | 19.21 | 182.6 | 174.6 | 211.1 | 203.0 | 14.43 | 13.88 |
| **July** | 174.5 | 23.27 | 175.3 | 167.3 | 201.1 | 193.5 | 14.32 | 13.78 |
| **August** | 157.7 | 21.57 | 159.3 | 151.8 | 185.1 | 178.2 | 14.51 | 13.96 |
| **September** | 124.1 | 18.30 | 128.3 | 121.9 | 151.2 | 145.6 | 14.70 | 14.16 |
| **October** | 93.4 | 11.90 | 99.6 | 94.0 | 120.7 | 116.5 | 15.13 | 14.61 |
| **November** | 61.2 | 5.85 | 66.8 | 62.5 | 82.5 | 79.8 | 15.41 | 14.90 |
| **December** | 49.8 | -0.50 | 56.0 | 51.5 | 70.0 | 67.7 | 15.60 | 15.10 |
| Year | 1390.0 | 10.52 | 1433.7 | 1357.3 | 1710.4 | 1629.8 | 14.89 | 14.19 |

| Legends: | | | | |
|---|---|---|---|---|
| | GlobHor | Horizontal global irradiation | EArray | Effective energy at the output of the array |
| | T Amb | Ambient Temperature | E_Grid | Energy injected into grid |
| | GlobInc | Global incident in coll. plane | EffArrR | Effic. Eout array / rough area |
| | GlobEff | Effective Global, corr. for IAM and shadings | EffSysR | Effic. Eout system / rough area |

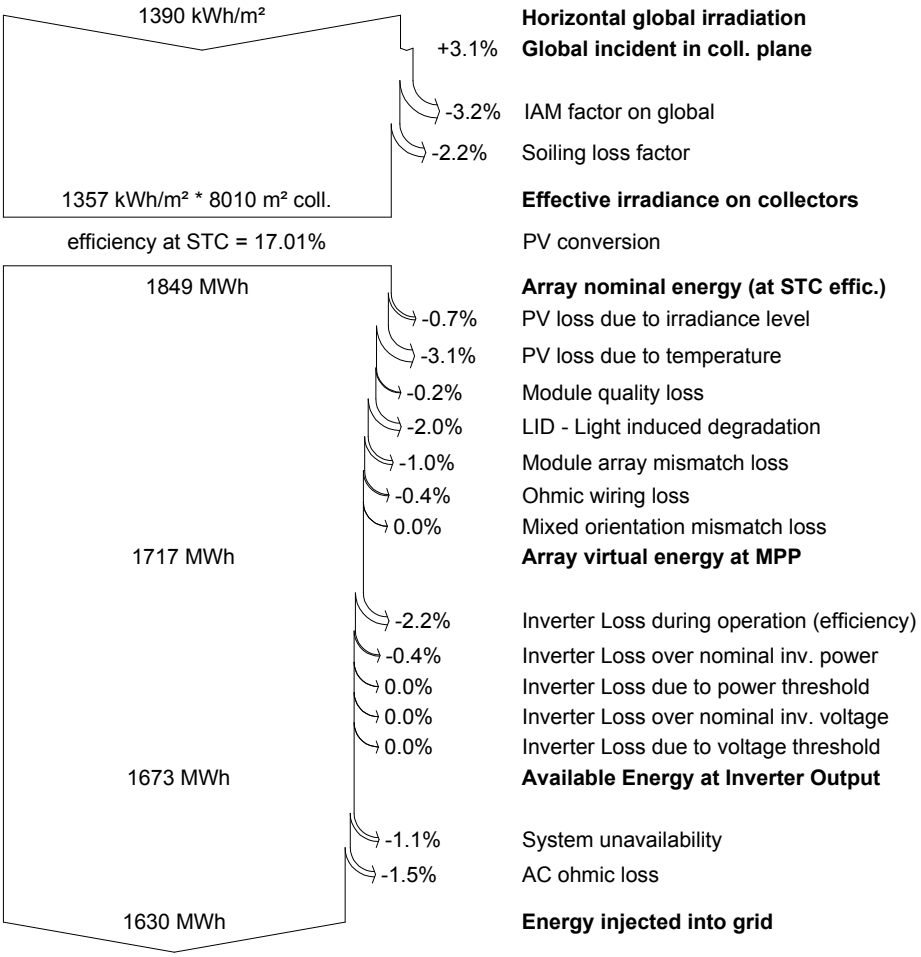
# Grid-Connected System: Loss diagram

**Project :** **Town of Bristol & Barrington RFP**

**Simulation variant :** **BARRINGTON HIGH SCHOOL**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| 5 orientations | Tilt/Azimuth | 8°/-93°, 8°/87°, 7°/-3°, 7°/87°, 25°/-3° | | |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 4128 | Pnom total | **1362 kWp** |
| Inverter | Model | Symo 24.0-3 / 480 Single MPPT | | 24.00 kW ac |
| Inverter | Model | PVI 28TL 480V Single MPPT | | 28.00 kW ac |
| Inverter pack | Nb. of units | 39.0 | Pnom total | **1020 kW ac** |
| User's needs | Unlimited load (grid) | | | |

**Loss diagram over the whole year**



# Grid-Connected System: Simulation parameters

**Project :** **Town of Bristol & Barrington RFP**

**Geographical Site** **Providence T F Green State Ar** Country **United States**

**Situation** Latitude 41.7°N Longitude 71.4°W
Time defined as Legal Time Time zone UT-5 Altitude 16 m
Monthly albedo values

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albedo | 0.55 | 0.55 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.55 |

**Meteo data:** **Providence T F Green State Ar** NREL: TMY3 hourly DB (1991-2005) - TMY

**Simulation variant :** **PRIMROSE HILL MIDDLE SCHOOL**

Simulation date 02/11/16 11h58

**Simulation parameters**

**2 orientations** Tilts/Azimuths 8°/-93° and 8°/87°

**Models used** Transposition Perez Diffuse Imported

**Horizon** Free Horizon

**Near Shadings** No Shadings

**PV Array Characteristics**

**PV module** Si-mono Model **TSM-330DD14A(II)**
Custom parameters definition Manufacturer Trina Solar

| | | | | |
|---|---|---|---|---|
| Number of PV modules | In series | 17 modules | In parallel | 37 strings |
| Total number of PV modules | Nb. modules | 629 | Unit Nom. Power | 330 Wp |
| Array global power | Nominal (STC) | **208 kWp** | At operating cond. | 187 kWp (50°C) |
| Array operating characteristics (50°C) | U mpp | 574 V | I mpp | 326 A |
| Total area | Module area | **1220 m²** | Cell area | 1097 m² |

**Inverter** Model **Symo 24.0-3 / 480 Single MPPT**
Custom parameters definition Manufacturer Fronius USA

| | | | | |
|---|---|---|---|---|
| Characteristics | Operating Voltage | 200-800 V | Unit Nom. Power | 24.0 kWac |
| Inverter pack | Nb. of inverters | 7 units | Total Power | 168 kWac |

**PV Array loss factors**

Array Soiling Losses

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0% | 3.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 3.0% |

| | | | | |
|---|---|---|---|---|
| Thermal Loss factor | Uc (const) | 20.0 W/m²K | Uv (wind) | 0.0 W/m²K / m/s |
| Wiring Ohmic Loss | Global array res. | 16 mOhm | Loss Fraction | 0.8 % at STC |
| LID - Light Induced Degradation | | | Loss Fraction | 2.0 % |
| Module Quality Loss | | | Loss Fraction | 0.2 % |
| Module Mismatch Losses | | | Loss Fraction | 1.0 % at MPP |
| Incidence effect, ASHRAE parametrization | IAM = | 1 - bo (1/cos i - 1) | bo Param. | 0.04 |

**System loss factors**

| | | | | |
|---|---|---|---|---|
| Wiring Ohmic Loss | Wires: 3x300.0 mm² | 91 m | Loss Fraction | 1.5 % at STC |

PVsyst Licensed to SolarCity Corporation (United States)

# Grid-Connected System: Simulation parameters (continued)

| | | | |
|---|---|---|---|
| Unavailability of the system | 3.6 days, 1 periods | Time fraction | 1.0 % |

**User's needs :** Unlimited load (grid)

# Grid-Connected System: Main results

**Project :** **Town of Bristol & Barrington RFP**

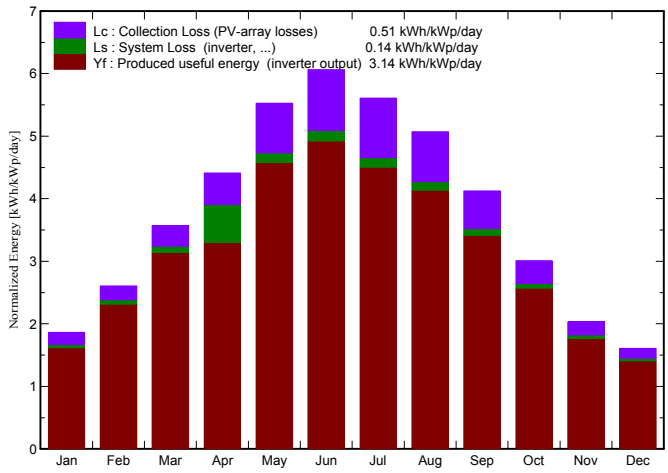
**Simulation variant :** **PRIMROSE HILL MIDDLE SCHOOL**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| PV Field Orientation | 2 orientations | Tilt/Azimuth = 8°/-93° and 8°/87° | | |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 629 | Pnom total | **208 kWp** |
| Inverter | Model | Symo 24.0-3 / 480 Single MPPT | | 24.00 kW ac |
| Inverter pack | Nb. of units | 7.0 | Pnom total | **168 kW ac** |
| User's needs | Unlimited load (grid) | | | |

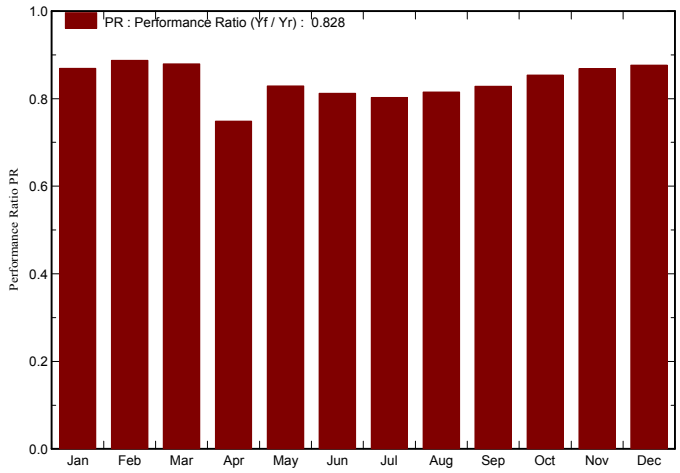
**Main simulation results**

| | | | | |
|---|---|---|---|---|
| System Production | **Produced Energy** | **238241 kWh/year** | Specific prod. | 1148 kWh/kWp/year |
| | Performance Ratio PR | 82.8 % | | |

**Normalized productions (per installed kWp): Nominal power 208 kWp**




**Performance Ratio PR**




**PRIMROSE HILL MIDDLE SCHOOL**

**Balances and main results**

| | GlobHor kWh/m² | T Amb °C | GlobInc kWh/m² | GlobEff kWh/m² | EArray kWh | E_Grid kWh | EffArrR % | EffSysR % |
|---|---|---|---|---|---|---|---|---|
| **January** | 57.8 | -1.59 | 57.8 | 51.9 | 10751 | 10422 | 15.25 | 14.78 |
| **February** | 73.1 | 0.15 | 73.0 | 67.6 | 13861 | 13451 | 15.55 | 15.09 |
| **March** | 111.0 | 3.81 | 110.8 | 104.8 | 20866 | 20227 | 15.43 | 14.96 |
| **April** | 132.7 | 8.47 | 132.3 | 125.8 | 24367 | 20554 | 15.09 | 12.73 |
| **May** | 172.1 | 15.12 | 171.4 | 163.4 | 30458 | 29478 | 14.56 | 14.09 |
| **June** | 182.6 | 19.21 | 181.9 | 173.8 | 31696 | 30658 | 14.28 | 13.81 |
| **July** | 174.5 | 23.27 | 173.9 | 165.9 | 29958 | 28972 | 14.12 | 13.65 |
| **August** | 157.7 | 21.57 | 157.2 | 149.7 | 27499 | 26608 | 14.33 | 13.87 |
| **September** | 124.1 | 18.30 | 123.7 | 117.3 | 21968 | 21272 | 14.54 | 14.08 |
| **October** | 93.4 | 11.90 | 93.2 | 87.6 | 17040 | 16526 | 14.97 | 14.52 |
| **November** | 61.2 | 5.85 | 61.1 | 56.7 | 11354 | 11005 | 15.24 | 14.77 |
| **December** | 49.8 | -0.50 | 49.8 | 45.4 | 9346 | 9066 | 15.36 | 14.90 |
| Year | 1390.0 | 10.52 | 1386.1 | 1309.9 | 249162 | 238241 | 14.73 | 14.08 |

| Legends: | | | | |
|---|---|---|---|---|
| | GlobHor | Horizontal global irradiation | EArray | Effective energy at the output of the array |
| | T Amb | Ambient Temperature | E_Grid | Energy injected into grid |
| | GlobInc | Global incident in coll. plane | EffArrR | Effic. Eout array / rough area |
| | GlobEff | Effective Global, corr. for IAM and shadings | EffSysR | Effic. Eout system / rough area |

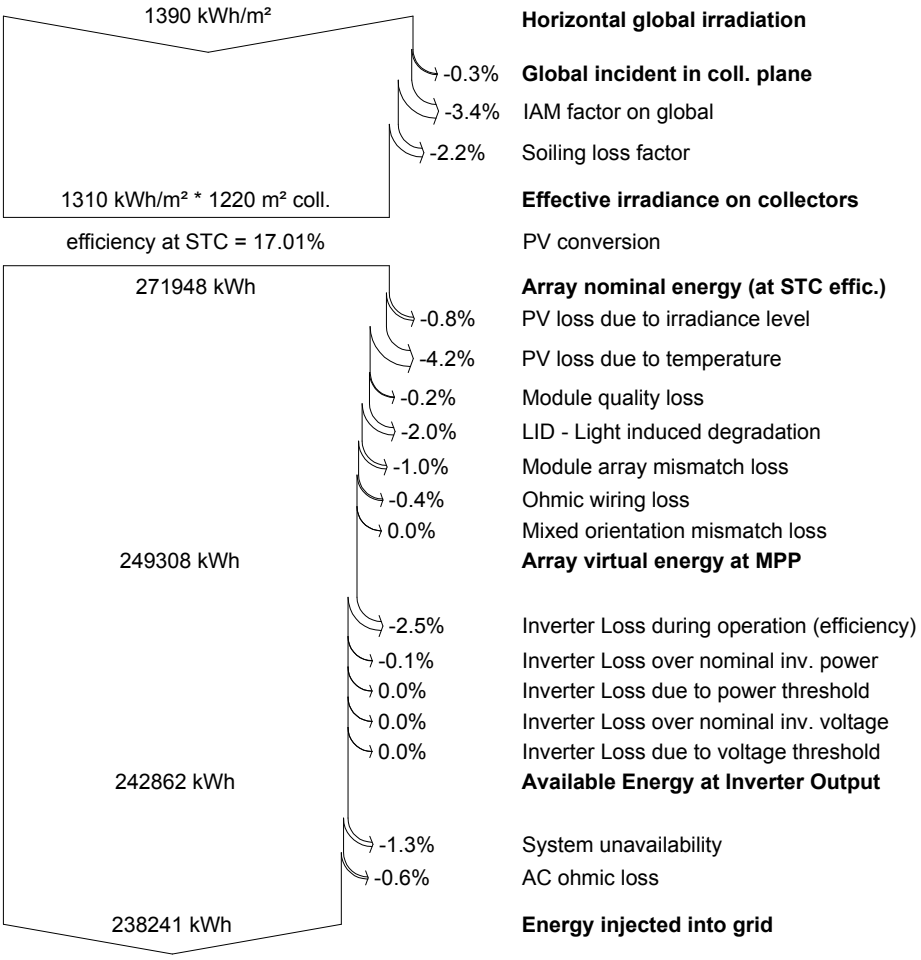
# Grid-Connected System: Loss diagram

**Project :** **Town of Bristol & Barrington RFP**

**Simulation variant :** **PRIMROSE HILL MIDDLE SCHOOL**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| PV Field Orientation | 2 orientations | Tilt/Azimuth = 8°/-93° and 8°/87° | | |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 629 | Pnom total | **208 kWp** |
| Inverter | Model | Symo 24.0-3 / 480 Single MPPT | | 24.00 kW ac |
| Inverter pack | Nb. of units | 7.0 | Pnom total | **168 kW ac** |
| User's needs | Unlimited load (grid) | | | |

**Loss diagram over the whole year**



# Grid-Connected System: Simulation parameters

**Project :** **Town of Bristol & Barrington RFP**

**Geographical Site** **Providence T F Green State Ar** Country **United States**

**Situation** Latitude 41.7°N Longitude 71.4°W
Time defined as Legal Time Time zone UT-5 Altitude 16 m
Monthly albedo values

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albedo | 0.55 | 0.55 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.55 |

**Meteo data:** **Providence T F Green State Ar** NREL: TMY3 hourly DB (1991-2005) - TMY

**Simulation variant :** **NAYATT ELEMENTARY SCHOOL**

Simulation date 02/11/16 13h18

**Simulation parameters**

**2 orientations** Tilts/Azimuths 8°/-97° and 8°/83°

**Models used** Transposition Perez Diffuse Imported

**Horizon** Free Horizon

**Near Shadings** No Shadings

**PV Array Characteristics**

**PV module** Si-mono Model **TSM-330DD14A(II)**
Custom parameters definition Manufacturer Trina Solar

| | | | | |
|---|---|---|---|---|
| Number of PV modules | In series | 17 modules | In parallel | 37 strings |
| Total number of PV modules | Nb. modules | 629 | Unit Nom. Power | 330 Wp |
| Array global power | Nominal (STC) | **208 kWp** | At operating cond. | 187 kWp (50°C) |
| Array operating characteristics (50°C) | U mpp | 574 V | I mpp | 326 A |
| Total area | Module area | **1220 m²** | Cell area | 1097 m² |

**Inverter** Model **Symo 24.0-3 / 480 Single MPPT**
Custom parameters definition Manufacturer Fronius USA

| | | | | |
|---|---|---|---|---|
| Characteristics | Operating Voltage | 200-800 V | Unit Nom. Power | 24.0 kWac |
| Inverter pack | Nb. of inverters | 7 units | Total Power | 168 kWac |

**PV Array loss factors**

Array Soiling Losses

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0% | 3.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 3.0% |

| | | | | |
|---|---|---|---|---|
| Thermal Loss factor | Uc (const) | 20.0 W/m²K | Uv (wind) | 0.0 W/m²K / m/s |
| Wiring Ohmic Loss | Global array res. | 9.8 mOhm | Loss Fraction | 0.5 % at STC |
| LID - Light Induced Degradation | | | Loss Fraction | 2.0 % |
| Module Quality Loss | | | Loss Fraction | 0.2 % |
| Module Mismatch Losses | | | Loss Fraction | 1.0 % at MPP |
| Incidence effect, ASHRAE parametrization | IAM = | 1 - bo (1/cos i - 1) | bo Param. | 0.04 |

# Grid-Connected System: Simulation parameters (continued)

**System loss factors**

| | | | | |
|---|---|---|---|---|
| AC wire loss inverter to transfo | Inverter voltage | 277 Vac tri | | |
| | Wires: 3x300.0 mm² | 45 m | Loss Fraction | 0.7 % at STC |
| External transformer | Iron loss (24H connexion) | 406 W | Loss Fraction | 0.2 % at STC |
| | Resistive/Inductive losses | 4.5 mOhm | Loss Fraction | 1.2 % at STC |
| Unavailability of the system | 3.6 days, 1 periods | | Time fraction | 1.0 % |

**User's needs :** Unlimited load (grid)

# Grid-Connected System: Main results

**Project :** **Town of Bristol & Barrington RFP**

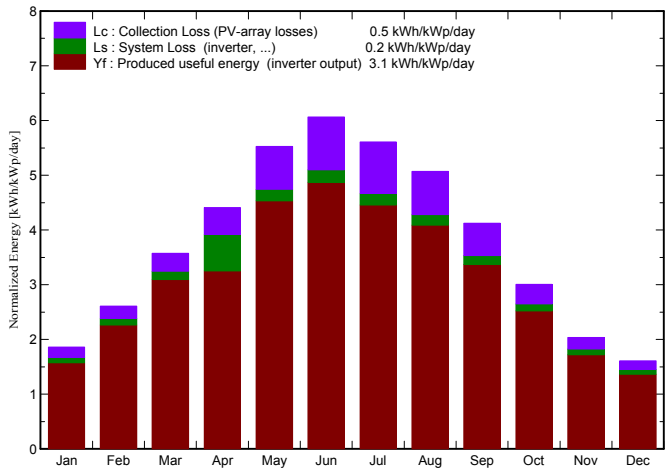
**Simulation variant :** **NAYATT ELEMENTARY SCHOOL**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| PV Field Orientation | 2 orientations | Tilt/Azimuth = 8°/-97° and 8°/83° | | |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 629 | Pnom total | **208 kWp** |
| Inverter | Model | Symo 24.0-3 / 480 Single MPPT | | 24.00 kW ac |
| Inverter pack | Nb. of units | 7.0 | Pnom total | **168 kW ac** |
| User's needs | Unlimited load (grid) | | | |

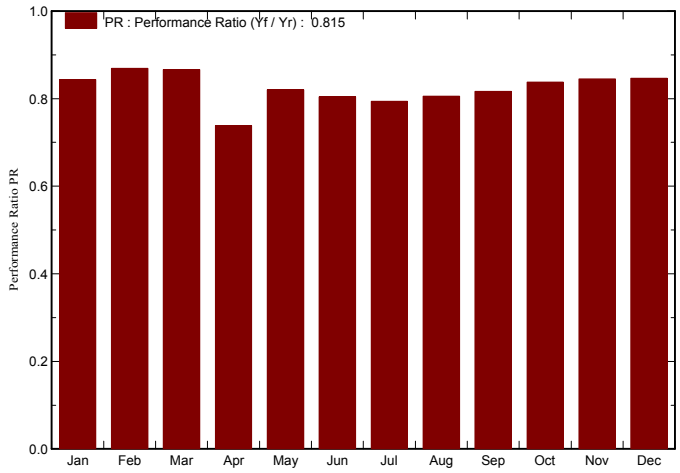
**Main simulation results**

| | | | | |
|---|---|---|---|---|
| System Production | **Produced Energy** | **234656 kWh/year** | Specific prod. | 1130 kWh/kWp/year |
| | Performance Ratio PR | 81.5 % | | |

**Normalized productions (per installed kWp): Nominal power 208 kWp**




**Performance Ratio PR**




**NAYATT ELEMENTARY SCHOOL**

**Balances and main results**

| | GlobHor kWh/m² | T Amb °C | GlobInc kWh/m² | GlobEff kWh/m² | EArray kWh | E_Grid kWh | EffArrR % | EffSysR % |
|---|---|---|---|---|---|---|---|---|
| **January** | 57.8 | -1.59 | 57.8 | 51.9 | 10763 | 10119 | 15.26 | 14.35 |
| **February** | 73.1 | 0.15 | 73.0 | 67.7 | 13879 | 13175 | 15.57 | 14.78 |
| **March** | 111.0 | 3.81 | 110.8 | 104.8 | 20906 | 19918 | 15.46 | 14.73 |
| **April** | 132.7 | 8.47 | 132.3 | 125.8 | 24412 | 20274 | 15.12 | 12.56 |
| **May** | 172.1 | 15.12 | 171.4 | 163.4 | 30519 | 29169 | 14.59 | 13.94 |
| **June** | 182.6 | 19.21 | 181.9 | 173.8 | 31763 | 30356 | 14.31 | 13.67 |
| **July** | 174.5 | 23.27 | 173.9 | 165.9 | 30019 | 28666 | 14.15 | 13.51 |
| **August** | 157.7 | 21.57 | 157.2 | 149.7 | 27552 | 26302 | 14.36 | 13.71 |
| **September** | 124.1 | 18.30 | 123.8 | 117.3 | 22006 | 20975 | 14.57 | 13.89 |
| **October** | 93.4 | 11.90 | 93.3 | 87.6 | 17065 | 16222 | 14.99 | 14.25 |
| **November** | 61.2 | 5.85 | 61.1 | 56.7 | 11369 | 10714 | 15.25 | 14.37 |
| **December** | 49.8 | -0.50 | 49.9 | 45.4 | 9358 | 8766 | 15.37 | 14.40 |
| Year | 1390.0 | 10.52 | 1386.3 | 1310.1 | 249610 | 234656 | 14.75 | 13.87 |

| Legends: | | | | |
|---|---|---|---|---|
| | GlobHor | Horizontal global irradiation | EArray | Effective energy at the output of the array |
| | T Amb | Ambient Temperature | E_Grid | Energy injected into grid |
| | GlobInc | Global incident in coll. plane | EffArrR | Effic. Eout array / rough area |
| | GlobEff | Effective Global, corr. for IAM and shadings | EffSysR | Effic. Eout system / rough area |

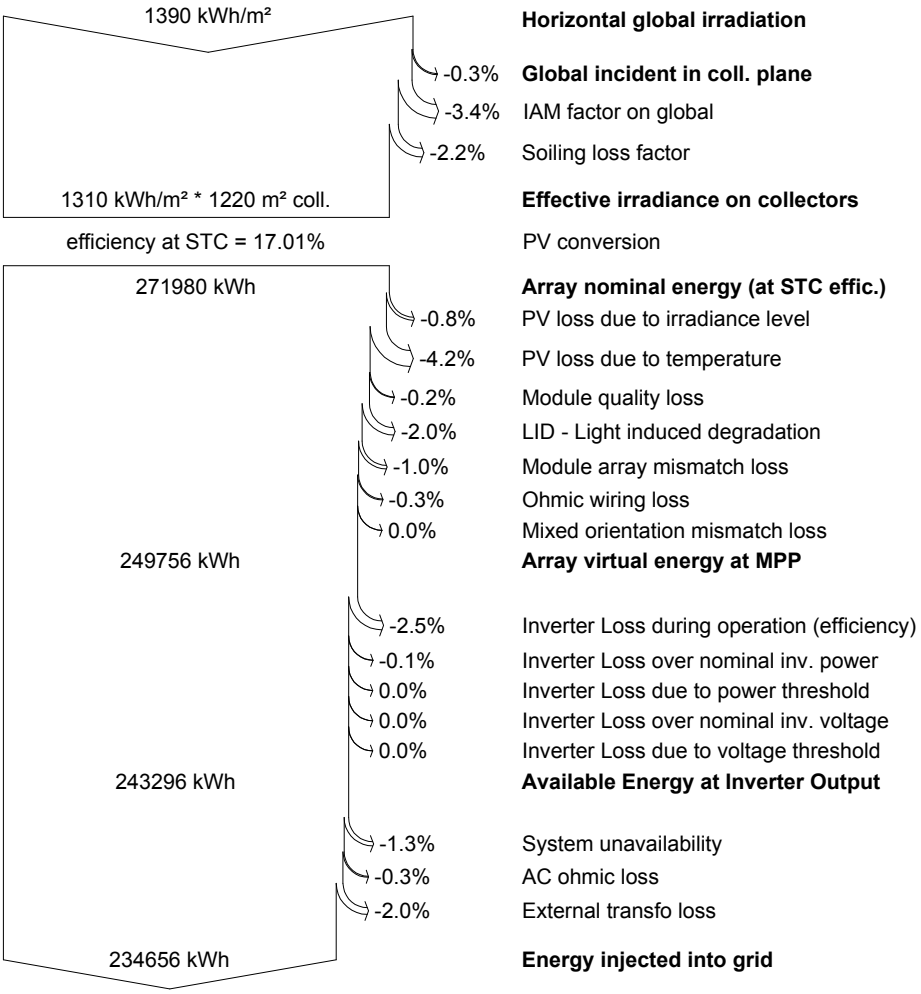
# Grid-Connected System: Loss diagram

**Project :** **Town of Bristol & Barrington RFP**

**Simulation variant :** **NAYATT ELEMENTARY SCHOOL**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| PV Field Orientation | 2 orientations | Tilt/Azimuth = 8°/-97° and 8°/83° | | |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 629 | Pnom total | **208 kWp** |
| Inverter | Model | Symo 24.0-3 / 480 Single MPPT | | 24.00 kW ac |
| Inverter pack | Nb. of units | 7.0 | Pnom total | **168 kW ac** |
| User's needs | Unlimited load (grid) | | | |

**Loss diagram over the whole year**



# Grid-Connected System: Simulation parameters

**Project :** **Town of Bristol & Barrington RFP**

**Geographical Site** **Providence T F Green State Ar** Country **United States**

**Situation** Latitude 41.7°N Longitude 71.4°W
Time defined as Legal Time Time zone UT-5 Altitude 16 m
Monthly albedo values

| | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Albedo | 0.55 | 0.55 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.55 |

**Meteo data:** **Providence T F Green State Ar** NREL: TMY3 hourly DB (1991-2005) - TMY

**Simulation variant :** **HAMPDEN MEADOWS MIDDLE SCHOOL**

Simulation date 02/11/16 13h16

**Simulation parameters**

**2 orientations** Tilts/Azimuths 8°/-70° and 8°/110°

**Models used** Transposition Perez Diffuse Imported

**Horizon** Free Horizon

**Near Shadings** No Shadings

**PV Array Characteristics**

**PV module** Si-mono Model **TSM-330DD14A(II)**
Custom parameters definition Manufacturer Trina Solar

| | | | | |
|---|---|---|---|---|
| Number of PV modules | In series | 17 modules | In parallel | 44 strings |
| Total number of PV modules | Nb. modules | 748 | Unit Nom. Power | 330 Wp |
| Array global power | Nominal (STC) | **247 kWp** | At operating cond. | 223 kWp (50°C) |
| Array operating characteristics (50°C) | U mpp | 574 V | I mpp | 388 A |
| Total area | Module area | **1451 m²** | Cell area | 1304 m² |

**Inverter** Model **Symo 24.0-3 / 480 Single MPPT**
Custom parameters definition Manufacturer Fronius USA

| | | | | |
|---|---|---|---|---|
| Characteristics | Operating Voltage | 200-800 V | Unit Nom. Power | 24.0 kWac |
| Inverter pack | Nb. of inverters | 8 units | Total Power | 192 kWac |

**PV Array loss factors**

Array Soiling Losses

| Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5.0% | 3.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 2.0% | 3.0% |

| | | | | |
|---|---|---|---|---|
| Thermal Loss factor | Uc (const) | 20.0 W/m²K | Uv (wind) | 0.0 W/m²K / m/s |
| Wiring Ohmic Loss | Global array res. | 13 mOhm | Loss Fraction | 0.8 % at STC |
| LID - Light Induced Degradation | | | Loss Fraction | 2.0 % |
| Module Quality Loss | | | Loss Fraction | 0.2 % |
| Module Mismatch Losses | | | Loss Fraction | 1.0 % at MPP |
| Incidence effect, ASHRAE parametrization | IAM = | 1 - bo (1/cos i - 1) | bo Param. | 0.04 |

# Grid-Connected System: Simulation parameters (continued)

**System loss factors**

| | | | | |
|---|---|---|---|---|
| AC wire loss inverter to transfo | Inverter voltage | 277 Vac tri | | |
| | Wires: 3x300.0 mm² | 86 m | Loss Fraction | 1.7 % at STC |
| External transformer | Iron loss (24H connexion) | 483 W | Loss Fraction | 0.2 % at STC |
| | Resistive/Inductive losses | 3.8 mOhm | Loss Fraction | 1.2 % at STC |
| Unavailability of the system | 3.6 days, 1 periods | | Time fraction | 1.0 % |

**User's needs :** Unlimited load (grid)

# Grid-Connected System: Main results

**Project :** **Town of Bristol & Barrington RFP**

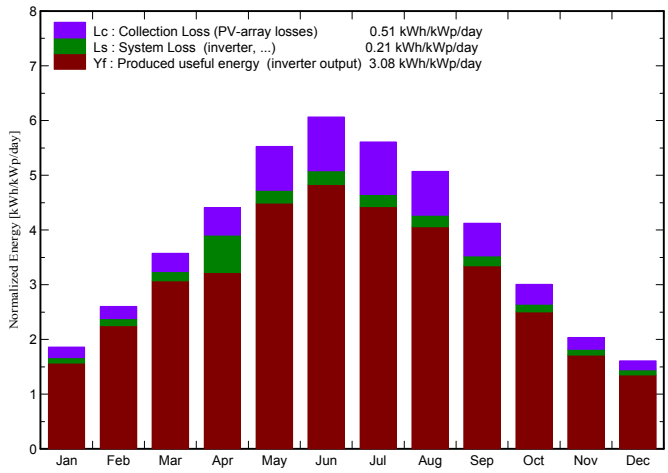
**Simulation variant :** **HAMPDEN MEADOWS MIDDLE SCHOOL**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| PV Field Orientation | 2 orientations | Tilt/Azimuth = 8°/-70° and 8°/110° | | |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 748 | Pnom total | **247 kWp** |
| Inverter | Model | Symo 24.0-3 / 480 Single MPPT | | 24.00 kW ac |
| Inverter pack | Nb. of units | 8.0 | Pnom total | **192 kW ac** |
| User's needs | Unlimited load (grid) | | | |

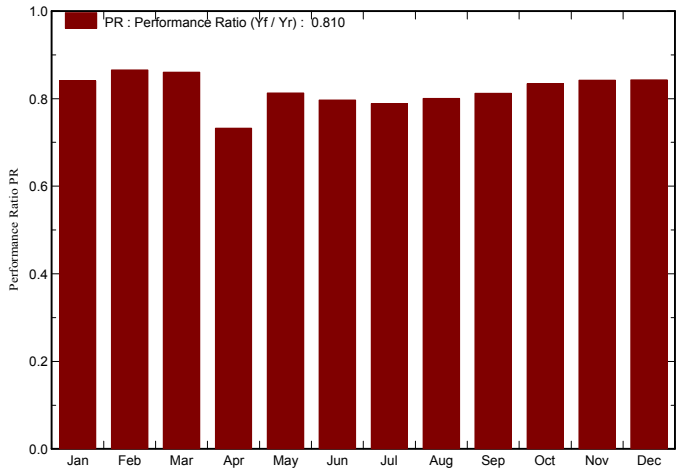
**Main simulation results**

| | | | | |
|---|---|---|---|---|
| System Production | **Produced Energy** | **277158 kWh/year** | Specific prod. | 1123 kWh/kWp/year |
| | Performance Ratio PR | 81.0 % | | |

**Normalized productions (per installed kWp): Nominal power 247 kWp**




**Performance Ratio PR**




**HAMPDEN MEADOWS MIDDLE SCHOOL**

**Balances and main results**

| | GlobHor kWh/m² | T Amb °C | GlobInc kWh/m² | GlobEff kWh/m² | EArray kWh | E_Grid kWh | EffArrR % | EffSysR % |
|---|---|---|---|---|---|---|---|---|
| **January** | 57.8 | -1.59 | 57.8 | 51.9 | 12783 | 11992 | 15.24 | 14.30 |
| **February** | 73.1 | 0.15 | 73.0 | 67.6 | 16474 | 15588 | 15.55 | 14.72 |
| **March** | 111.0 | 3.81 | 110.7 | 104.7 | 24786 | 23516 | 15.42 | 14.63 |
| **April** | 132.7 | 8.47 | 132.3 | 125.8 | 28940 | 23923 | 15.07 | 12.46 |
| **May** | 172.1 | 15.12 | 171.4 | 163.4 | 36147 | 34387 | 14.53 | 13.82 |
| **June** | 182.6 | 19.21 | 181.9 | 173.9 | 37629 | 35787 | 14.25 | 13.55 |
| **July** | 174.5 | 23.27 | 173.9 | 165.9 | 35642 | 33862 | 14.12 | 13.42 |
| **August** | 157.7 | 21.57 | 157.2 | 149.6 | 32687 | 31071 | 14.32 | 13.62 |
| **September** | 124.1 | 18.30 | 123.7 | 117.3 | 26122 | 24800 | 14.55 | 13.81 |
| **October** | 93.4 | 11.90 | 93.2 | 87.5 | 20246 | 19182 | 14.97 | 14.18 |
| **November** | 61.2 | 5.85 | 61.0 | 56.7 | 13494 | 12685 | 15.23 | 14.32 |
| **December** | 49.8 | -0.50 | 49.8 | 45.3 | 11088 | 10365 | 15.33 | 14.33 |
| Year | 1390.0 | 10.52 | 1385.9 | 1309.6 | 296038 | 277158 | 14.72 | 13.78 |

Legends:

| | | | |
|---|---|---|---|
| GlobHor | Horizontal global irradiation | EArray | Effective energy at the output of the array |
| T Amb | Ambient Temperature | E_Grid | Energy injected into grid |
| GlobInc | Global incident in coll. plane | EffArrR | Effic. Eout array / rough area |
| GlobEff | Effective Global, corr. for IAM and shadings | EffSysR | Effic. Eout system / rough area |

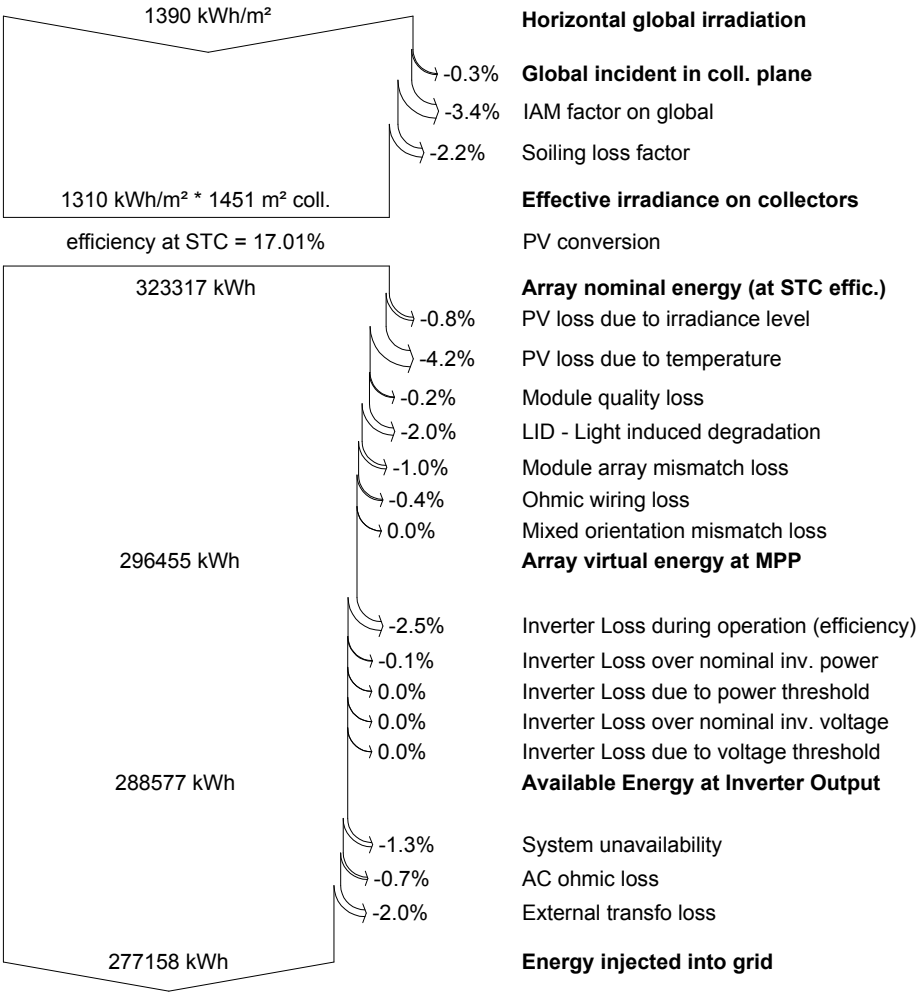
# Grid-Connected System: Loss diagram

**Project :** **Town of Bristol & Barrington RFP**

**Simulation variant :** **HAMPDEN MEADOWS MIDDLE SCHOOL**

| **Main system parameters** | System type | **Grid-Connected** | | |
|---|---|---|---|---|
| PV Field Orientation | 2 orientations | Tilt/Azimuth = 8°/-70° and 8°/110° | | |
| PV modules | Model | TSM-330DD14A(II) | Pnom | 330 Wp |
| PV Array | Nb. of modules | 748 | Pnom total | **247 kWp** |
| Inverter | Model | Symo 24.0-3 / 480 Single MPPT | | 24.00 kW ac |
| Inverter pack | Nb. of units | 8.0 | Pnom total | **192 kW ac** |
| User's needs | Unlimited load (grid) | | | |

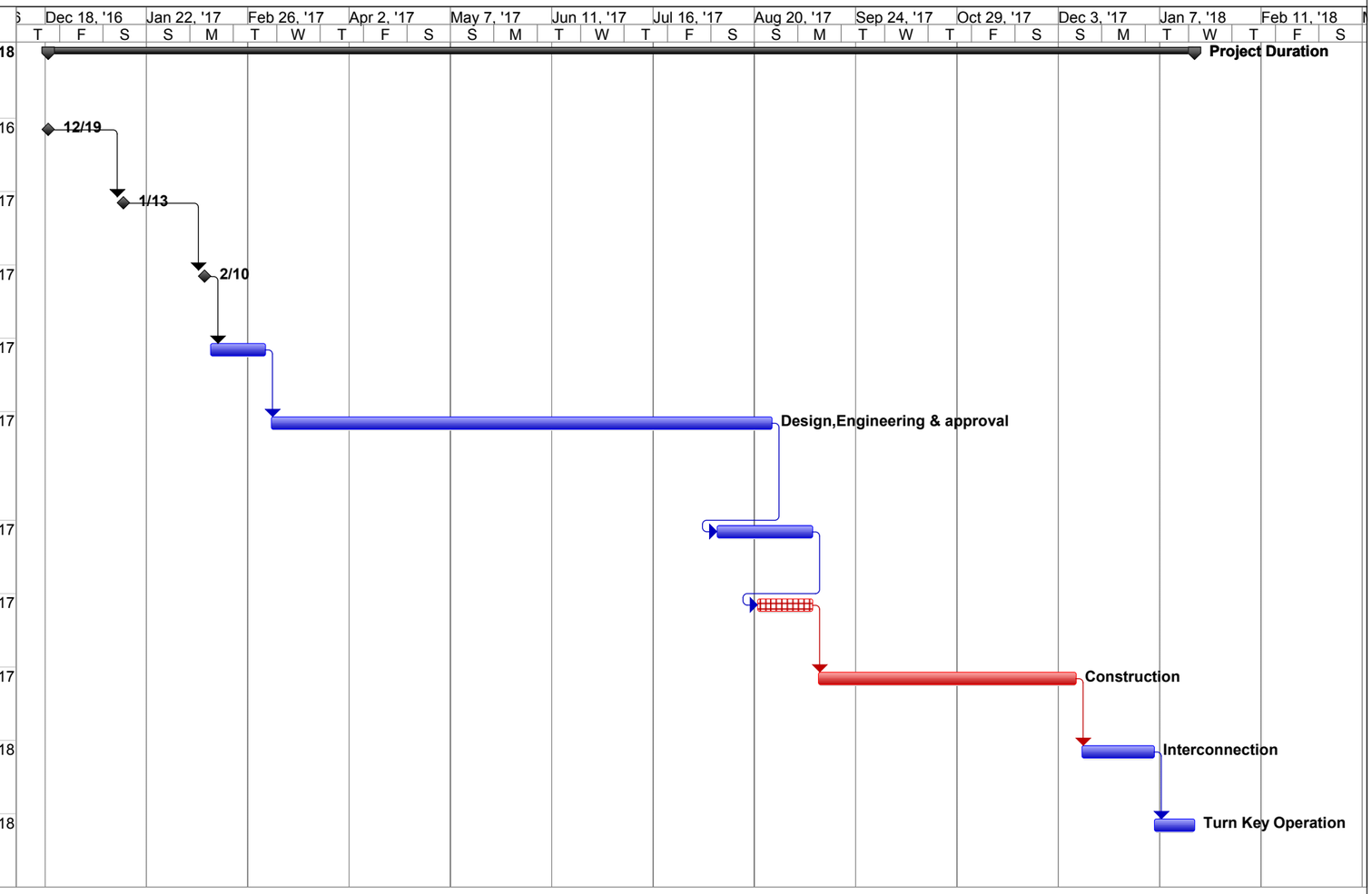
**Loss diagram over the whole year**



## d. Preliminary Project Schedules

# Town of Bristol - Landfill - PV Array Preliminary Schedule

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | **3523 KW Ground Mount Sample Schedule** | **284 days** | **Mon 12/19/16** | **Thu 1/18/18** |
| 2 | Project Award | 0 days | Mon 12/19/16 | Mon 12/19/16 |
| 3 | Preliminary Contract Award | 0 days | Fri 1/13/17 | Fri 1/13/17 |
| 4 | PPA's Executed | 0 days | Fri 2/10/17 | Fri 2/10/17 |
| 5 | Solar City Internal Job Prep | 15 days | Mon 2/13/17 | Fri 3/3/17 |
| 6 | Utility Interconnection Study, Structural, Electrical, Environmental Engineering Design & Permit | 125 days | Mon 3/6/17 | Fri 8/25/17 |
| 7 | Materials Procurement | 25 days | Mon 8/7/17 | Fri 9/8/17 |
| 8 | On Site Construction Prep | 15 days | Mon 8/21/17 | Fri 9/8/17 |
| 9 | Construction | 65 days | Mon 9/11/17 | Fri 12/8/17 |
| 10 | System Interconnection | 19 days | Mon 12/11/17 | Thu 1/4/18 |
| 11 | Project Completion | 10 days | Fri 1/5/18 | Thu 1/18/18 |




Date: Mon 11/7/16

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Task | | Project Summary | | Inactive Milestone | | Manual Summary Rollup | | Progress | |
| Split | | External Tasks | | Inactive Summary | | Manual Summary | | Deadline | |
| Milestone | | External Milestone | | Manual Task | | Start-only | | | |
| Summary | | Inactive Task | | Duration-only | | Finish-only | | | |

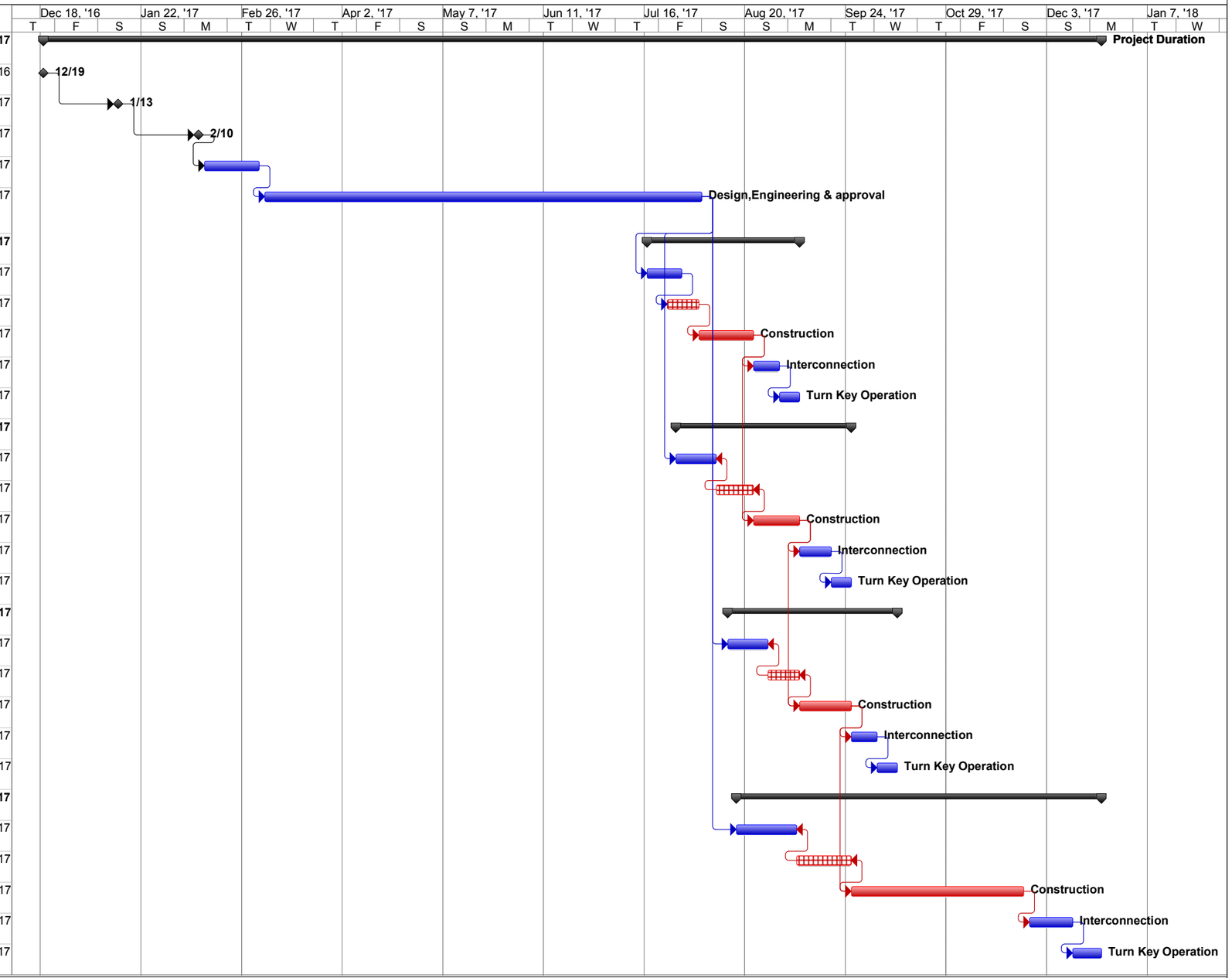

SolarCity
3055 Clearview Way
San Mateo, CA 94402


**Draft copy: NOT APPROVED FOR CONSTRUCTION**

SolarCity

# Town of Barrington - Multiple location - PV Array Preliminary Schedule

| ID | Task Name | Duration | Start | Finish |
|---|---|---|---|---|
| 1 | **2041 KW Barrington Schools - Sample Schedule** | **264 days** | **Mon 12/19/16** | **Thu 12/21/17** |
| 2 | Project Award | 0 days | Mon 12/19/16 | Mon 12/19/16 |
| 3 | Preliminary Contract Award | 0 days | Fri 1/13/17 | Fri 1/13/17 |
| 4 | PPA's Executed | 0 days | Fri 2/10/17 | Fri 2/10/17 |
| 5 | Solar City Internal Job Prep | 15 days | Mon 2/13/17 | Fri 3/3/17 |
| 6 | Utility Interconnection Study, Structural, Electrical, Environmental Engineering Design & Permit | 110 days | Mon 3/6/17 | Fri 8/4/17 |
| 7 | **Primrose Elementary School** | **39 days** | **Mon 7/17/17** | **Thu 9/7/17** |
| 8 | Materials Procurement | 10 days | Mon 7/17/17 | Fri 7/28/17 |
| 9 | On Site Construction Prep | 9 days | Mon 7/24/17 | Thu 8/3/17 |
| 10 | Construction | 13 days | Fri 8/4/17 | Tue 8/22/17 |
| 11 | System Interconnection | 7 days | Wed 8/23/17 | Thu 8/31/17 |
| 12 | Project Completion | 5 days | Fri 9/1/17 | Thu 9/7/17 |
| 13 | **Nyatt School** | **43 days** | **Thu 7/27/17** | **Mon 9/25/17** |
| 14 | Materials Procurement | 10 days | Thu 7/27/17 | Thu 8/10/17 |
| 15 | On Site Construction Prep | 9 days | Thu 8/10/17 | Wed 8/23/17 |
| 16 | Construction | 12 days | Wed 8/23/17 | Thu 9/7/17 |
| 17 | System Interconnection | 7 days | Fri 9/8/17 | Mon 9/18/17 |
| 18 | Project Completion | 5 days | Tue 9/19/17 | Mon 9/25/17 |
| 19 | **Hampden Meadows School** | **43 days** | **Mon 8/14/17** | **Wed 10/11/17** |
| 20 | Materials Procurement | 10 days | Mon 8/14/17 | Mon 8/28/17 |
| 21 | On Site Construction Prep | 9 days | Mon 8/28/17 | Fri 9/8/17 |
| 22 | Construction | 12 days | Fri 9/8/17 | Mon 9/25/17 |
| 23 | System Interconnection | 7 days | Tue 9/26/17 | Wed 10/4/17 |
| 24 | Project Completion | 5 days | Thu 10/5/17 | Wed 10/11/17 |
| 25 | **Barrington High School** | **91 days** | **Thu 8/17/17** | **Thu 12/21/17** |
| 26 | Materials Procurement | 15 days | Thu 8/17/17 | Thu 9/7/17 |
| 27 | On Site Construction Prep | 13 days | Thu 9/7/17 | Tue 9/26/17 |
| 28 | Construction | 44 days | Tue 9/26/17 | Fri 11/24/17 |
| 29 | System Interconnection | 11 days | Mon 11/27/17 | Mon 12/11/17 |
| 30 | Project Completion | 8 days | Tue 12/12/17 | Thu 12/21/17 |




Date: Mon 11/7/16

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Task | | Summary | | External Milestone | | Inactive Summary | | Manual Summary Rollup | | Finish-only | |
| Split | | Project Summary | | Inactive Task | | Manual Task | | Manual Summary | | Progress | |
| Milestone | | External Tasks | | Inactive Milestone | | Duration-only | | Start-only | | Deadline | |


SolarCity
3055 Clearview Way
San Mateo, CA 94402


**Draft copy: NOT APPROVED FOR CONSTRUCTION**

SolarCity

## e. Component Datasheets

Mono Multi Solutions

# THE TALLMAX™ PLUS+ MODULE

## 72 CELL
MONOCRYSTALLINE MODULE

## 330-355W
POWER OUTPUT RANGE

## 18.3%
MAXIMUM EFFICIENCY

## 0~+5W
POSITIVE POWER TOLERANCE

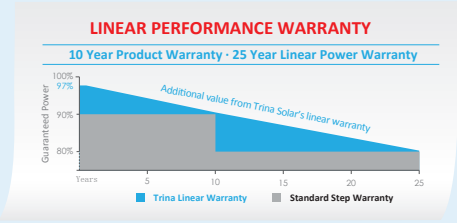
### Maximize limited space with top-end efficiency
- Up to 183 W/m² power density
- Low thermal coefficients for greater energy production at high operating temperatures

### Highly reliable due to stringent quality control
- Over 30 in-house tests (UV, TC, HF, and many more)
- In-house testing goes well beyond certification requirements
- 100% EL double inspection

### Certified to withstand challenging enviromental conditions
- 2400 Pa wind load
- 5400 Pa snow load
- 35 mm hail stones at 97 km/h

As a leading global manufacturer of next generation photovoltaic products, we believe close cooperation with our partners is critical to success. With local presence around the globe, Trina is able to provide exceptional service to each customer in each market and supplement our innovative, reliable products with the backing of Trina as a strong, bankable partner. We are committed to building strategic, mutually beneficial collaboration with installers, developers, distributors and other partners as the backbone of our shared success in driving Smart Energy Together.

**Trina Solar Limited**
www.trinasolar.com




## Comprehensive products and system certificates

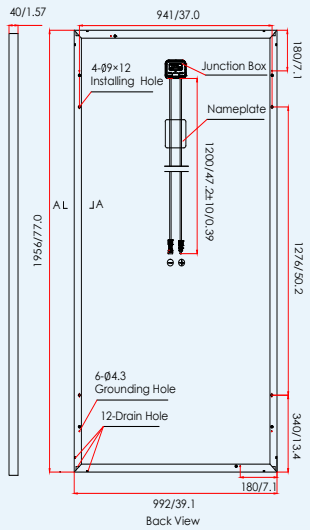
- IEC 61215/ IEC 61730/ UL 1703/ IEC 61701/IEC 62716
- ISO 9001: Quality Management System
- ISO 14001: Environmental Management System
- ISO 14064: Greenhouse Gases Emissions Verification
- OHSAS 18001: Occupation Health and Safety Management System

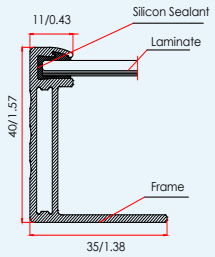
Trinasolar
Smart Energy Together

# THE TALLMAX™ PLUS+ MODULE

# TSM-DD14A(II)

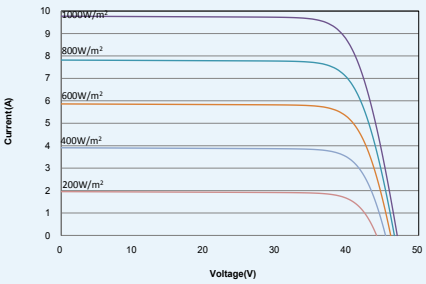
## DIMENSIONS OF PV MODULE
unit:mm/inches



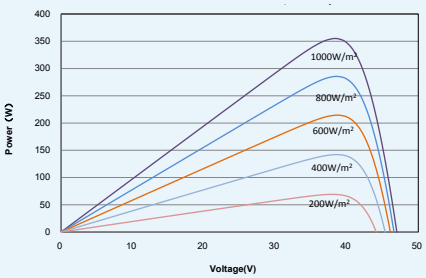




A-A

## I-V CURVES OF PV MODULE(355W)




## P-V CURVES OF PV MODULE(355W)




## ELECTRICAL DATA (STC)

| | | | | | | |
|---|---|---|---|---|---|---|
| Peak Power Watts-$P_{MAX}$ (Wp)* | 330 | 335 | 340 | 345 | 350 | 355 |
| Power Output Tolerance-$P_{MAX}$ (W) | 0~+5 | | | | | |
| Maximum Power Voltage-$V_{MPP}$ (V) | 37.8 | 37.9 | 38.2 | 38.4 | 38.5 | 38.7 |
| Maximum Power Current-$I_{MPP}$ (A) | 8.73 | 8.84 | 8.90 | 9.00 | 9.09 | 9.17 |
| Open Circuit Voltage-$V_{OC}$ (V) | 46.2 | 46.3 | 46.5 | 46.7 | 46.9 | 47.0 |
| Short Circuit Current-$I_{SC}$ (A) | 9.27 | 9.36 | 9.45 | 9.50 | 9.60 | 9.69 |
| Module Efficiency $\eta_m$ (%) | 17.0 | 17.3 | 17.5 | 17.8 | 18.0 | 18.3 |

STC: Irradiance 1000 W/m², Cell Temperature 25°C, Air Mass AM1.5.
*Test tolerance: ±3%.

## ELECTRICAL DATA (NOCT)

| | | | | | | |
|---|---|---|---|---|---|---|
| Maximum Power-$P_{MAX}$ (Wp) | 246 | 250 | 253 | 257 | 261 | 264 |
| Maximum Power Voltage-$V_{MPP}$ (V) | 34.9 | 35.1 | 35.2 | 35.5 | 35.6 | 35.8 |
| Maximum Power Current-$I_{MPP}$ (A) | 7.04 | 7.12 | 7.19 | 7.25 | 7.33 | 7.40 |
| Open Circuit Voltage-$V_{OC}$ (V) | 43.0 | 43.1 | 43.2 | 43.4 | 43.5 | 43.7 |
| Short Circuit Current-$I_{SC}$ (A) | 7.49 | 7.56 | 7.63 | 7.67 | 7.75 | 7.82 |

NOCT: Irradiance at 800 W/m², Ambient Temperature 20°C, Wind Speed 1 m/s.

## MECHANICAL DATA

| | |
|---|---|
| Solar Cells | Monocrystalline 156 × 156 mm (6 inches) |
| Cell Orientation | 72 cells (6 × 12) |
| Module Dimensions | 1956 × 992 × 40 mm (77.0 x 39.1 x 1.57 inches) |
| Weight | 26.0 kg (57.3 lb) |
| Glass | 4.0 mm (0.15 inches), High Transmission, AR Coated Tempered Glass |
| Backsheet | White |
| Frame | Silver Anodized Aluminium Alloy |
| J-Box | IP 67 or IP 68 rated |
| Cables | Photovoltaic Technology Cable 4.0mm² (0.006 inches²), 1200 mm (47.2 inches) |
| Connector | MC4 Compatible or Amphenol H4/UTX |
| Fire Type | Type 1 or Type 2 |

## TEMPERATURE RATINGS

| | |
|---|---|
| Nominal Operating Cell Temperature (NOCT) | 44°C(± 2°C) |
| Temperature Coefficient of $P_{MAX}$ | - 0.39%/°C |
| Temperature Coefficient of $V_{OC}$ | - 0.29%/°C |
| Temperature Coefficient of $I_{SC}$ | 0.05%/°C |

## MAXIMUM RATINGS

| | |
|---|---|
| Operational Temperature | -40~+85°C |
| Maximum System Voltage | 1000V DC (IEC)<br>1000V DC (UL) |
| Max Series Fuse Rating | 15A |

## WARRANTY

10 year Product Workmanship Warranty

25 year Linear Power Warranty

(Please refer to product warranty for details)

## PACKAGING CONFIGURATION

Modules per box: 26 pieces

Modules per 40' container: 572 pieces

TSM_EN_2016_B

Trinasolar
Smart Energy Together

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.
© 2016 Trina Solar Limited. All rights reserved. Specifications included in this datasheet are subject to change without notice.

UTILITY-SCALE INVERTERS

# SGI **500XTM**
# SGI **750XTM**

**FEATURES**

- Compliant with NEC 2014 690.11 & 690.12 arc fault and rapid shutdown requirements when coupled with ARCCOM combiner
- 98% CEC efficiency
- 1000 VDC
- Parallel power stages
- Fuse and breaker subcombiner options
- Modbus communications
- User-interactive LCD

**OPTIONS**

- Stainless steel enclosure
- Web-based monitoring
- Built-in cellular connectivity
- AC breaker with shunt trip
- Revenue grade metering
- Air filters
- Uptime guarantee

**OPTIONS FOR UTILITIES**

- Real power curtailment
- Reactive power control
- Voltage ride through
- Frequency ride through
- Controlled ramp rates
- DMS tie-in
- Plant master controller
- Rule 21 compatible

## 1000VDC UTILITY-SCALE INVERTERS

The only 1000VDC inverter available that is compliant with NEC 2014 690.11 & 690.12 arc fault and rapid shutdown requirements. Solectria Renewables' next generation of SMARTGRID series inverters are optimized for high efficiency, reliability, and economy. Available in two power classes, 500 kW and 750 kW, these inverters are designed for direct connection to an external transformer for large commercial or utility-scale applications. They are robust, outdoor rated inverters that can be configured as 1 or 1.5 MW Solar Stations. Available utility-scale options include a plant master controller and advanced grid management features such as voltage and frequency ride through, reactive power control, real power curtailment and power factor control. Listed to 1000 VDC, with 98% CEC weighted efficiency, the SGI 500/750XTM inverters set a new standard for large scale power conversion.

Built for the real world

| SPECIFICATIONS | SGI 500XTM | SGI 750XTM |
|---|---|---|
| **DC Input** | | |
| Absolute Maximum Input Voltage | 1000 VDC | |
| Max Power Input Voltage Range (MPPT)* | 545-820 VDC | |
| Operating Voltage Range | 545-1000 VDC | |
| Maximum Operating Input Current | 965 A | 1445 A |
| Strike Voltage | 700 V | |
| **AC Output** | | |
| Native Output Voltage | 380 VAC, 3-Ph | |
| AC Voltage Range | -12/+10% | |
| Continuous Output Power | 500 kW | 750 kW |
| Continuous Output Current | 760 A | 1140 A |
| Maximum Backfeed Current | 0 A | |
| Nominal Output Frequency | 60 Hz | |
| Output Frequency Range | 57-60.5 Hz | |
| Power Factor | Adjustable - 0.8 to +0.8, factory set at 1 | |
| Total Harmonic Distortion (THD) @ Rated Load | ‹ 3% | |
| **Efficiency** | | |
| Peak Efficiency | 98.3% | |
| CEC Efficiency | 98.0% | |
| Tare Loss | 89 W | 123 W |
| **Subcombiner Options** | | |
| Fuses | 4 to 16 positions, 100-400 A | |
| Breakers | 4 to 15 positions, 125-350 A | |
| **Temperature** | | |
| Ambient Temperature Range (full power) | -40°F to +122°F (-40°C to +50°C ) | |
| Storage Temperature Range | -40°F to +122°F (-40°C to +50°C) | |
| Relative Humidity (non-condensing) | 5-95% | |
| **Data Monitoring** | | |
| Optional SolrenView Web-based Monitoring | Integrated | |
| Optional Revenue Grade Monitoring | 800 A | 1600 A |
| Optional SolZone™ Sub-Array Monitoring (DC Current) | 1 zone per protected input (up to 16 zones) | |
| Optional Cellular Communication | SolrenView AIR | |
| External Communication Interface | RS-485 SunSpec Modbus RTU | |
| **Testing & Certifications** | | |
| Safety Listings & Certifications | UL 1741/IEEE 1547, CSA C22.2#107.1 | |
| Testing Agency | ETL | |
| **Warranty** | | |
| Standard | 5 year | |
| Optional | 10, 15, 20 year; extended service agreement; uptime guarantee | |
| **Dedicated External Transformer** | | |
| Dedicated External Transformer | Required, provided by customer to Solectria's specification | |
| Transformer Type | Self cooled, step up, pad mount | |
| Output Voltage | Typical: 2.4-36.0 kV, 3-Ph | |
| **Enclosure** | | |
| DC Disconnect (integrated) | Standard | |
| AC Disconnect/Breaker (integrated) | Optional disconnect, breaker or breaker with shunt trip | |
| Dimensions (H x W x D) | 82 in. x 109 in. x 41 in. (2080 mm x 2769 mm x 1041 mm) | |
| Shading Set Back | 137" (3480 mm) at 30˚ solar elevation | |
| Shipping Weight | 3080 lbs (1397 kg) | 3570 lbs (1619 kg) |
| Enclosure Rating | Type 3R | |
| Enclosure Finish | Polyester powder coated steel; optional 316 stainless steel | |

*At nominal AC voltage

Copyright © Solectria Renewables, LLC. All information subject to change without notice. January 2015 DOCR-070245-H

3-PH TRANSFORMERLESS STRING INVERTERS

# PVI **14TL**
# PVI **20TL**
# PVI **23TL**
# PVI **28TL**

**FEATURES**

- 600 or 1000 VDC
- Best-in-class efficiency
- Three-phase transformerless inverters
- Quick and easy installation
- Dual MPP tracking zones
- Wide MPPT range
- Lightweight, compact design
- Modbus communications
- User-interactive LCD
- Wall mount configuration
- Integrated DC fused string combiner
- DC arc-fault protection

**OPTIONS**

- Web-based monitoring
- Shade cover
- DC/AC disconnect covers
- Roof mount array bracket

## 3-PH TRANSFORMERLESS STRING INVERTERS

Solectria Renewables' PVI 14TL, PVI 20TL, PVI 23TL, and PVI 28TL are compact, transformerless three-phase inverters with a dual MPP tracker. These inverters come standard with AC and DC disconnect, user-interactive LCD, and an 8-position string combiner. Its small, lightweight design makes for quick and easy installation and maintenance. These inverters include an enhanced DSP control, comprehensive protection functions, and advanced thermal design enabling highest reliability and uptime. They also come with a standard 10 year warranty with options for 15 and 20 years. Options include web-based monitoring, shade cover, DC/AC disconnect covers and roof mount array bracket.

Built for the real world

| SPECIFICATIONS | PVI 14TL | PVI 20TL | PVI 23TL | PVI 28TL |
|---|---|---|---|---|
| **DC Input** | | | | |
| Absolute Maximum Open Circuit Voltage | 600 VDC | | 1000 VDC | |
| Operating Voltage Range (MPPT) | 180-580 VDC | 260-580 VDC | 300-900 VDC | |
| Max Power Input Voltage Range (MPPT) | 300-540 VDC | 300-550 VDC | 480-800 VDC | 500-800 VDC |
| MPP Trackers | 2 with 4-fused inputs per tracker | | | |
| Maximum Operating Input Current | 25 A per MPPT (50 A) | 35 per MPPT (70 A) | 25 A per MPPT (50 A) | 29 A per MPPT (58 A) |
| Maximum Short Circuit Current | 45 A per MPPT (90 A) | 45.5 A per MPPT (91 A) | 41 A per MPPT (82 A) | 48 A per MPPT (96 A) |
| Maximum PV Power (per MPPT) | 9.5 kW | 13.5 kW | 15.5 kW | 19 kW |
| Strike Voltage | 300 V | | 330 V | |
| **AC Output** | | | | |
| Nominal Output Voltage | 208 VAC, 3-Ph | 480 VAC, 3-Ph | | |
| AC Voltage Range (Standard) | -12%/+10% | | | |
| Continuous Output Power (VAC) | 14 kW | 20 kW | 23 kW | 28 kW |
| Continuous Output Current (VAC) @ Nominal Voltage | 39 A | 24 A | 27.7 A | 33.7 A |
| Maximum Output Current @ 88% VAC | 39 A | 27.3 A | 32 A | 39 A |
| Maximum Backfeed Current | 0 A | | | |
| Nominal Output Frequency | 60 Hz | | | |
| Output Frequency Range | 59.3-60.5 (adjustable 55-65 Hz) | | | |
| Power Factor | Unity, ›0.99 (±0.8 adjustable) | Unity, ›0.99 (±0.9 adjustable) | Unity, ›0.99 (±0.8 adjustable) | |
| Total Harmonic Distortion (THD) @ Rated Load | ‹ 3% | | | |
| Grid Connection Type | 3ø+/N/GND | | | |
| **Efficiency** | | | | |
| Peak Efficiency | 96.9% | 97.4% | 98.6% | 98.5% |
| CEC Efficiency | 96.0% | 97.0% | 98.0% | |
| Tare Loss | 4 W | 2 W | 1 W | |
| **Integrated String Combiner** | | | | |
| 8 Fused Positions (4 positions per MPPT) | 15 A (fuse by-pass available) | | | |
| **Temperature** | | | | |
| Ambient Temperature Range | -13°F to +140°F (-25°C to +60°C) Derating occurs over +50°C | | -13°F to +140°F (-25°C to +60°C) Derating occurs over +45°C | |
| Storage Temperature Range | -22°F to +158°F (-30°C to +70°C) | | | |
| Relative Humidity (non-condensing) | 0-95% | | | |
| Operating Altitude | 13,123 ft/4000 m (derating from 6562 ft/2000 m) | | | |
| **Data Monitoring** | | | | |
| Optional SolrenView Web-based Monitoring | Integrated | | | |
| Optional Revenue Grade Monitoring | External | | | |
| External Communication Interface | RS-485 Modbus RTU | | | |
| **Testing & Certifications** | | | | |
| Safety Listings & Certifications | UL 1741/IEEE 1547, CSA C22.2#107.1, FCC part 15 B | | | |
| Testing Agency | ETL | | CSA | |
| **Warranty** | | | | |
| Standard | 10 year | | | |
| Optional | 15, 20 year; extended service agreement | | | |
| **Enclosure** | | | | |
| dBA (Decibel) Rating | ‹ 55 dBA @ 3m | | | |
| AC/DC Disconnect | Standard, fully-integrated | | | |
| Dimensions (H x W x D) | 41.6 in. x 21.4 in. x 8.5 in. (1057 mm x 543 mm x 216 mm) | | 39.4 in. x 23.6 in. x 9.1 in. (1000 mm x 600 mm x 230 mm) | |
| Weight | 141 lbs (64 kg) | 132 lbs (60 kg) | 122 lbs (55 kg) | |
| Enclosure Rating | Type 4 | | | |
| Enclosure Finish | Polyester powder coated aluminum | | | |

Copyright © Solectria Renewables, LLC. All information subject to change without notice. October 2014 DOCR-070252-H

/ Perfect Welding / Solar Energy / Perfect Charging

# FRONIUS SYMO

SHIFTING THE LIMITS

/ The future of commercial solar is here - Introducing the new Fronius Symo.

/ Featuring nine models ranging from 10 kW to 24 kW, the transformerless Fronius Symo is the ideal compact three-phase inverter for commercial applications. The high system voltage and wide input voltage range ensure maximum flexibility in system design. With its low roof loading, NEMA 4X, and 1000 volt DC rating, the Fronius Symo can be mounted in many different ways. The modern design is equipped with the SnapINverter mounting system, allowing for lightweight, secure and convenient installation and repair. Several industry-leading features come standard with the Fronius Symo including Wi-Fi®* and SunSpec Modbus interfaces for seamless monitoring and datalogging, field proven Arc Fault Circuit Interruption (AFCI), NEC 2014 compliant, and Fronius' superb online and mobile monitoring platform Fronius Solar.web. The Fronius Symo- the most communicative, efficient, and streamlined three phase string inverter on the market.

## TECHNICAL DATA FRONIUS SYMO

| GENERAL DATA | STANDARD WITH ALL SYMO MODELS |
|---|---|
| Dimensions (width x height x depth) | 20.1 x 28.5 x 8.9 inches |
| Degree of protection | NEMA 4X |
| Night time consumption | < 1 W |
| Inverter topology | Transformerless |
| Cooling | Variable speed fan |
| Installation | Indoor and outdoor installation |
| Ambient operating temperature range | -40°F - + 140 °F (-40 - +60 °C) |
| Permitted humidity | 0 - 100 % (non-condensing) |
| DC connection terminals | 6x DC+ and 6x DC- screw terminals for copper (solid / stranded / fine stranded) or aluminum (solid / stranded) |
| AC connection terminals | Screw terminals 14-6 AWG |
| Certificates and compliance with standards | UL 1741-2010, UL1998 (for functions: AFCI and isolation monitoring), IEEE 1547-2003, IEEE 1547.1-2008, ANSI/IEEE C62.41, FCC Part 15 A & B, NEC Article 690, C22. 2 No. 107.1-01 ( September 2001), UL1699B Issue 2 -2013, CSA TIL M-07 Issue 1 -2013 |

| GENERAL DATA | 10.0-3 208/240 | 12.0-3 208/240 | 10.0-3 480 | 12.5-3 480 | 15.0-3 480 | 17.5-3 480 | 20.0-3 480 | 22.7-3 480 | 24.0-3 480 |
|---|---|---|---|---|---|---|---|---|---|
| Weight | 91.9 lbs. | 91.9 lbs. | 76.7 lbs. | 76.7 lbs. | 95.7 lbs. | 95.7 lbs. | 95.7 lbs. | 95.7 lbs. | 95.7 lbs. |

| PROTECTIVE DEVICES | STANDARD WITH ALL FRONIUS SYMO MODELS |
|---|---|
| AFCI & 2014 NEC Ready | Yes |
| DC disconnect | Yes |
| **DC reverse polarity protection** | Yes |
| Ground Fault Protection with Isolation Monitor Interrupter | Yes |

## TECHNICAL DATA FRONIUS SYMO

| INPUT DATA | | 10.0-3 208/240 | 12.0-3 208/240 | 10.0-3 480 | 12.5-3 480 | 15.0-3 480 | 17.5-3 480 | 20.0-3 480 | 22.7-3 480 | 24.0-3 480 |
|---|---|---|---|---|---|---|---|---|---|---|
| Recommended PV power (kWp) | | 8.0 - 13.0 | 9.5 - 15.5 | 8.0 - 13.0 | 10.0 - 16.0 | 12.0 - 19.5 | 14.0 - 23.0 | 16.0 - 26.0 | 18.0 - 29.5 | 19.0 - 31.0 |
| Max. usable input current (MPPT1/MPPT 2) | | 25.0 A / 16.5 A | | | | 33.0 A / 25.0 A | | | | |
| MPP-voltage range | | 300 - 500 V | 300 - 500 V | 300 - 800 V | 350 - 800 V | 350 - 800 V | 400 - 800 V | 450 - 800 V | 500 - 800 V | 500 - 800 V |
| Operating voltage range | | 200 - 600 V | 200 - 600 V | 200 - 1000 V | 200 - 1000 V | | | | | |
| Max. input voltage | | 600 V | 600 V | 1000 V | 1000 V | | | | | |
| Nominal input voltage | 208 | 350 V | 350 V | NA | NA | NA | NA | NA | NA | NA |
| | 220 / 240 | 370 V | 370 V | NA | NA | NA | NA | NA | NA | NA |
| | 480 | NA | NA | 675 V | 685 V | 685 V | 695 V | 710 V | 720 V | 720 V |
| Admissable conductor size DC | | AWG 14 ... AWG 6 copper direct, AWG 6 aluminum direct, AWG 4 ... AWG 2 copper or aluminum with input combiner | | | | | | | | |
| Number of MPPT | | 2 | | | | | | | | |

| OUTPUT DATA | | 10.0-3 208/240 | 12.0-3 208/240 | 10.0-3 480 | 12.5-3 480 | 15.0-3 480 | 17.5-3 480 | 20.0-3 480 | 22.7-3 480 | 24.0-3 480 |
|---|---|---|---|---|---|---|---|---|---|---|
| Max. output power | 208 | 9995 VA | 11995 VA | NA | NA | NA | NA | NA | NA | NA |
| | 220 / 240 | 9995 VA | 11995 VA | NA | NA | NA | NA | NA | NA | NA |
| | 480 | NA | NA | 9995 VA | 12495 VA | 14995 VA | 17495 VA | 19995 VA | 22727 VA | 23995 VA |
| Max. output current | 208 | 31.5 A | 35.0 A | NA | NA | NA | NA | NA | NA | NA |
| | 220 / 240 | 29.7 A / 27.3 A | 35.0 A / 32.8 A | NA | NA | NA | NA | NA | NA | NA |
| | 480 | NA | NA | 13.7 A | 17.1 A | 20.5 A | 23.9 A | 27.4 A | 31.1 A | 32.8 A |
| Max. Efficiency | | 97.0 % | 97.0 % | 98.1 % | 98.1 % | 98.0 % | | | | |
| CEC Efficiency | 208 | 96.5 % | 96.5 % | NA | NA | NA | NA | NA | NA | NA |
| | 240 | 96.5 % | 96.5 % | NA | NA | NA | NA | NA | NA | NA |
| | 480 | NA | NA | 96.5 % | 96.5 % | 97.0 % | 97.5 % | 97.0 % | 97.5 % | 97.5 % |
| Admissable conductor size AC | | AWG 14 - AWG 6 | | | | | | | | |
| Grid connection ($U_{ac,r}$) | | 208/240 | 208/240 | 480 Delta +N** | 480 Delta + N** | 480 Delta + N** | | | | |
| Frequency ($f_r$) | | 60 Hz | | | | | | | | |
| Total harmonic distortion | | < 1.75 % | | | | | | | | |
| Power factor | | 0 - 1 ind./cap. | | | | | | | | |

| INTERFACES | STANDARD WITH ALL FRONIUS SYMO MODELS |
|---|---|
| Wi-Fi*/Ethernet/Serial | Wireless standard 802.11 b/g/n / Fronius Solar.web, SunSpec Modbus TCP, JSON / SunSpec Modbus RTU |
| 6 inputs and 4 digital I/Os | Load management; signaling, multipurpose I/O |
| USB (A socket) | Datalogging and inverter update possible via USB |
| 2x RS422 (RJ45 socket) | Fronius Solar Net, interface protocol |
| Datalogger and Webserver | Included |

*The term Wi-Fi® is a registered trademark of the Wi-Fi Alliance.
**+N for sensing purposes - no current carrying conductor.

**Fronius USA LLC**
6797 Fronius Drive
Portage, IN 46368
USA
pv-support-usa@fronius.com
www.fronius-usa.com

Rev. 2.9.15 USA

/ Perfect Welding / Solar Energy / Perfect Charging

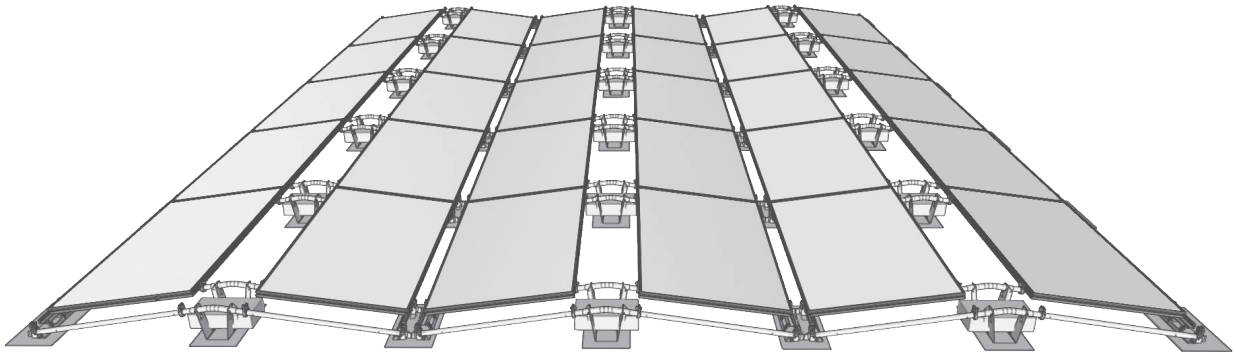
**WE HAVE THREE DIVISIONS AND ONE PASSION: SHIFTING THE LIMITS OF POSSIBILITY.**

/ Whether welding technology, photovoltaics or battery charging technology – our goal is clearly defined: to be the innovation leader. With around 3,000 employees worldwide, we shift the limits of what's possible - our record of over 1,000 granted patents is testimony to this. While others progress step by step, we innovate in leaps and bounds. Just as we've always done. The responsible use of our resources forms the basis of our corporate policy.

Further information about all Fronius products and our global sales partners and representatives can be found at **www.fronius.com**

# ZS Peak

## for commercial flat roofs



### Description

- Ballasted flat roof mounting system designed for low weight and low wind loading
- 8 degree East-West Orientation
- Works with all Zep Compatible Modules
- Fasteners snap together
- Easy access for future maintenance
- Automatic and redundant bonding system
- Intuitive assembly process reduces training time and mistakes in the field
- Install 125 modules per man-day

### Specifications

- Designed for all low slope roofs up to 5 degrees
- Minimal ballast required, mechanical roof anchors optional
- Designed to follow roof pitch changes up to 5 degrees
- Basic Wind Speed: Up to 120 mph
- System Load: 2.3 to 5 psf
- Snow Load: Up to 50 psf
- Wind tunnel report to ASCE 7-05 and 7-10 standards
- UL 2703 Compliant

### Advantages with East-West Orientation

- 20% higher power density on roof compared to south facing arrays
- Low weight due to superior aerodynamics
- Low sensitivity to Azimuth angle
- Even and longer power output allows for downsizing inverters
- Better production to load matching

zepsolar.com

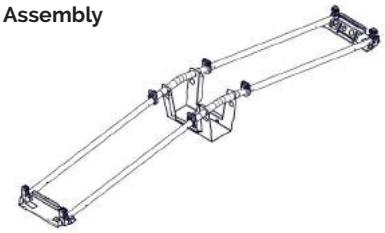
This document does not create any express warranty by Zep Solar or about its products or services. Zep Solar's sole warranty is contained in the written product warranty for each product. The end-user documentation shipped with Zep Solar's products constitutes the sole specifications referred to in the product warranty. The customer is solely responsible for verifying the suitability of ZepSolar's products for each use. Specifications are subject to change without notice. Copyright © 2010 - 2012 Zep Solar Patents and Apps: zspats.com.

# ZS Peak

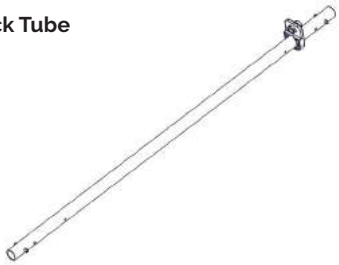
## for commercial flat roofs

### Components

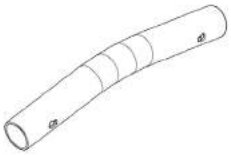
**Bridge Assembly**



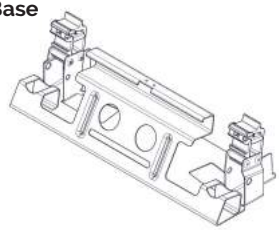
**Zep Lock Tube**



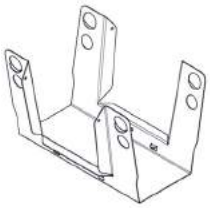
**T Connector**



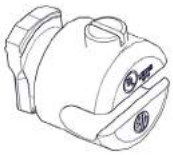
**Valley Base**



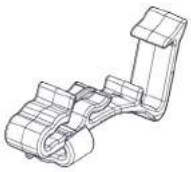
**Peak Base**



**Ground Zep**

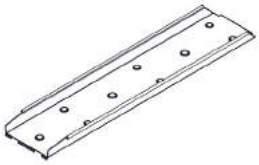


**AC/DC Cable Clip**

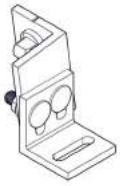


### Optional Parts

**Ballast Pan**

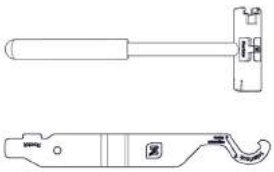


**Positive Attachment**



**Snap Bushing**

### Tools

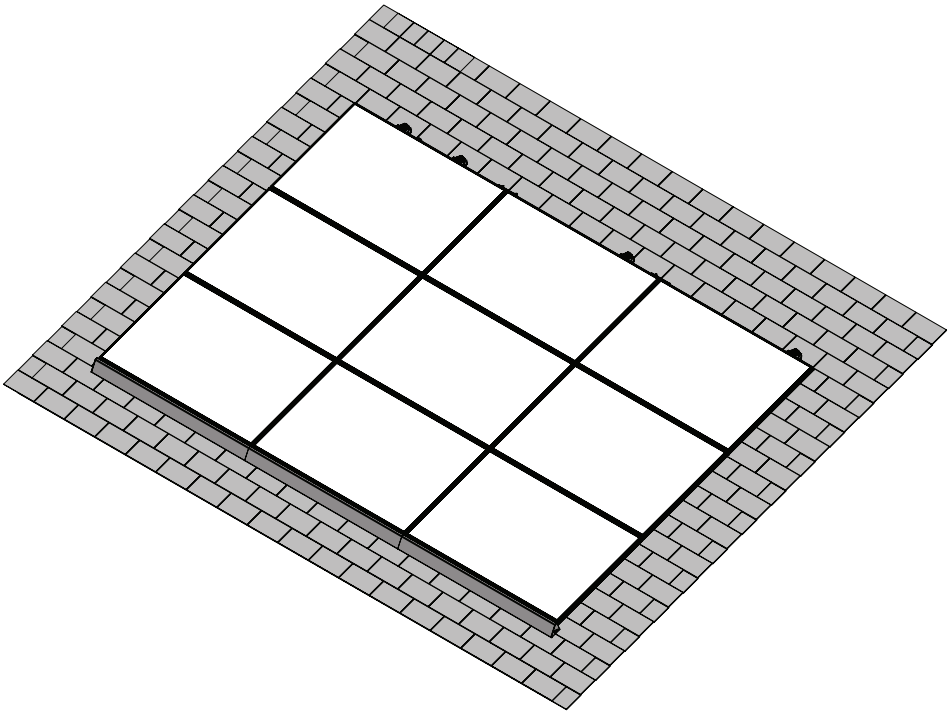


zepsolar.com

This document does not create any express warranty by Zep Solar or about its products or services. Zep Solar's sole warranty is contained in the written product warranty for each product. The end-user documentation shipped with Zep Solar's products constitutes the sole specifications referred to in the product warranty. The customer is solely responsible for verifying the suitability of ZepSolar's products for each use. Specifications are subject to change without notice. Copyright © 2010 - 2012 Zep Solar Patents and Apps: zspats.com.

# ZS Comp

for composition shingle roofs



## Description

- PV mounting solution for composition shingle roofs
- Works with all Zep Compatible Modules
- Auto bonding UL-listed hardware creates structural and electrical bond
- ZS Comp has a UL 1703 Class “A” Fire Rating when installed using modules from any manufacturer certified as “Type 1” or “Type 2”

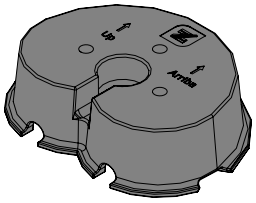
## Specifications

- Designed for pitched roofs
- Installs in portrait and landscape orientations
- ZS Comp supports module wind uplift and snow load pressures to 50 psf per UL 2703
- Wind tunnel report to ASCE 7-05 and 7-10 standards
- ZS Comp grounding products are UL listed to UL 2703 and UL 467
- ZS Comp bonding products are UL listed to UL 2703
- Engineered for spans up to 72” and cantilevers up to 24”
- Zep wire management products listed to UL 1565 for wire positioning devices
- Attachment method UL listed to UL 2582 for Wind Driven Rain

zepsolar.com

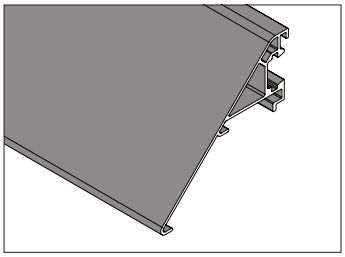
This document does not create any express warranty by Zep Solar or about its products or services. Zep Solar’s sole warranty is contained in the written product warranty for each product. The end-user documentation shipped with Zep Solar’s products constitutes the sole specifications referred to in the product warranty. The customer is solely responsible for verifying the suitability of ZepSolar’s products for each use. Specifications are subject to change without notice. Patents and Apps: zspats.com.

## Components



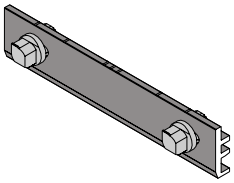
### Mounting Block

Part No. 850-1633
Listed to UL 2703 and UL 2582



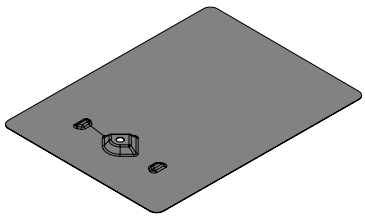
### Array Skirt

Part No. 850-1608 or 500-0113
Listed to UL 2703



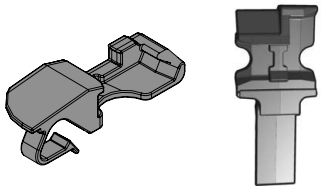
### Interlock

Part No. 850-1388 or 850-1613
Listed to UL 2703



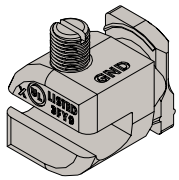
### Flashing Accessory

Part No. 850-1634
Listed to UL 2703 and UL 2582



### Grip

Part No. 850-1606 or 850-1421
Listed to UL 2703

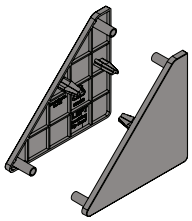



### Ground Zep V2

Part No. 850-1511
Listed to UL 467 and UL 2703

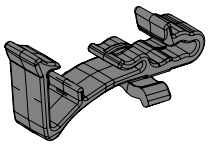
### Captured Washer Lag

Part No. 850-1631-001
850-1631-002
850-1631-003
850-1631-004



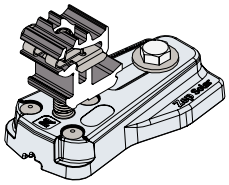
### End Cap

Part No.
(L) 850-1586 or 850-1460
(R) 850-1588 or 850-1467



### DC Wire Clip

Part No. 850-1509
Listed to UL 1565



### Leveling Foot

Part No. 850-1397
Listed to UL 2703



This document does not create any express warranty by Zep Solar or about its products or services. Zep Solar's sole warranty is contained in the written product warranty for each product. The end-user documentation shipped with Zep Solar's products constitutes the sole specifications referred to in the product warranty. The customer is solely responsible for verifying the suitability of ZepSolar's products for each use. Specifications are subject to change without notice. Patents and Apps: zspats.com.

# Modular Carports for Power Generation
## Park@Sol

SCHLETTER

# Use Real Estate Wisely
## Park@Sol®

***We put our 40 years of experience in the design and manufacturing of steel and aluminum products behind the development of Park@Sol, engineering the most versatile and economic photovoltaic (PV) mounting system on the market.***

**New Usable Surfaces for Solar Energy**

Increasing fuel costs, compulsory environmental certifications and desire for an environmental friendly image are the new realities of business. Consequently, solar PV plants on company roofs are in demand. But in many cases, the roof surface areas are too small or weak to support a PV system. Or, in some cases, roof and ground mounted systems are seen as too costly or complex a project for the business or home owner to undertake.

Solar carports offer simplified and economic alternatives in answer to such concerns, while offering a multipurpose structure.

These systems have a well established history in Europe and North America, on a scale of several hundred megawatts (MW) of installed PV systems for both commercial and residential applications.

**Park@Sol Advantages**

- Quick, easy to install while remaining cost competitive
- Tailored for most module types, orientations, and inclinations
- Customized foundation options
- Support from Schletter engineers and geotechnicans for every step of project planning
- Complete structural analysis
- Durable and corrosion-free aluminum construction
- Complete documentation and system drawings
- Individualized design and color options on request
- 20-year limited warranty*

*Warranty conditions and further information at www.schletter.us.

Park@Sol

# Foundation and Configuration Options

**Concrete Foundation**

- Concrete ground collar for collision protection
- Unobstructed car door opening
- Central foundation

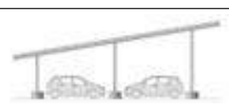
**B1** 1-row vehicle arrangement

**B2** 2-row vehicle arrangement
(max. span between supports 10 m)

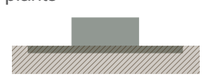
**B3** 2-row vehicle arrangement
(max. span between supports 10 m)
**Ideal for structures running N/S**

**R1** 1-row vehicle arrangement

**R2** 2-row vehicle arrangement



**Cast-in-place concrete**
The economic solution for small carport plants



**Concrete Pillars**
For residential applications requiring less excavation

**Micro-pile foundations**
Significantly reduce concrete, installation time, and labor costs.

Tailored & Innovative

# Optional Accessories

Because each project presents a unique set of requirements, Park@Sol systems are completely customizable. Plus, Schletter offers a variety of accessory options to ensure the success of each project.

Option Examples:
- Cable management
- Sub-decking
- Inverter fastenings
- Incorporation of branding
- Custom powder coating

**Design Park@Sol**

On request, our in-house industrial design team will develop customized carport designs for nearly any project requirement—even when others say it can't be done.

**Park@Sol Mounting Kit**

Take advantage of the new Park@Sol Mounting Kit available for most module sizes. Excellent for residential and small commercial applications.

Several advertising options

Cable management options

Carport lighting

Sub-decking options

**Fort Collins, Colorado**

| | |
|---|---|
| **Rack configuration:** | **CP 4V x 64 B1 10°** |
| Power: | 17.92 kW |
| Spans: | 6.03 m |
| Dimensions: | 40 m x 4.5 m |
| Customer: | Wirsol |

**Tucson, Arizona**

| | |
|---|---|
| **Rack configuration:** | **CP 11H x 28 B2 20°** |
| Power: | 69.3 kW |
| Spans: | 8.5 m |
| Dimensions: | 46.5 m x 10.9 m |
| Customer: | SOLON USA |





## Park@Sol

# Reference examples

**CLK**

| | |
|---|---|
| **Rack configuration:** | **CP 20H x 10 B2 8°** |
| Power: | 30 kW |
| Spans: | 5.40 m |
| Dimensions: | 12.1 m x 12.80 m |
| Postal code: | 97359 Schwarzach |
| Customer: | AWI Solar |

**Burger King Waghäusel**

**Different rack configurations**

| | |
|---|---|
| Power: | 52.3 kW |
| Spans: | 5.6 m and 4 m |
| Dimensions: | Various Dimensions |
| Postal code: | 68753 Langgöns |
| Customer: | Wirsol |

**Orlando**

| | |
|---|---|
| **Rack configuration:** | **CP 6V x 78 B2 5°** |
| Power: | 400 kW |
| Spans: | 8 m |
| Dimensions: | 77 m x 12 m |
| Postal code: | 32839 Orlando |
| Customer: | ESA Renewables |

**Seeg**

| | |
|---|---|
| **Rack configuration:** | **CP 8H x 13 B2 15°** |
| Power: | 37.44 kW |
| Spans: | 3.46 m |
| Dimensions: | 41 m x 7 m |
| Postal code: | 87637 Seeg |
| Customer: | Elektro Uhlemayr BV Seeg |

**Langgöns**

**Different rack configurations**

| | |
|---|---|
| Power: | 52.8 kW |
| Spans: | 5.00 - 5.50 m |
| Dimensions: | Various Sizes |
| Postal code: | 35428 Langgöns |
| Customer: | Gecko Logic BV Langgöns |

**Bergheim**

| | |
|---|---|
| **Rack configuration:** | **CP 7H X 18 B1 10° (negative)** |
| Power: | 122.5 kW |
| Spans: | 5.00 m |
| Dimensions: | 29 m x 6 m |
| Postal code: | 50126 Bergheim |

# Park@Sol
# Technical data

**Material**

Hardware, bolts: Quality steel 1.4301; Profiles: Aluminum (EN AW 6063, EN AW 6005)

**Installation**

- Quick and simple mounting
- Maximum level of pre-assembly

**Accessories**

- Cable channels, cable ducts
- Module clamps with integrated grounding

**Warranty and Certifications**

- 20-year limited warranty on all aluminum Schletter systems

**Construction**

- For framed and unframed modules
- Minimum sealing of the soil surface
- Optional waterproof substructure

**Grounding**

- Components for bonding system

**Delivery and Services**

- Project planning assistance
- Complete system drawings
- Direct delivery of complete carport system to site
- Micro-pile foundations

**Our parking lot showcases different rack configurations**

| | |
|---|---|
| Power: | 500 kW |
| Spans: | 5.60 m |
| Dimensions: | Various |
| Postal code: | 83527 Kirchdorf |
| Company: | Schletter GmbH |



# Schletter Germany
# Park@Sol

**We want to pass on our experience**

At our German office, we have equipped a total of 260 parking spaces with Park@Sol.

In just three weeks, we were able to install an additional 500 kW of solar power on our carport roofs without interrupting operations.

# Solar carports

## Advantages for Every Application

**Residential:**

- The same incentives, grants and subsidies that apply to roof systems apply to carport systems
- Excellent unit-assembly system for small installations
- Snow-free parking spaces in winter and cool, shady parking spaces in summer
- Protected loading and unloading of vehicles in case of rain
- Structural analysis included

**Municipalities:**

- Creating value in your region
- Community solar farms
- Better air quality
- Boost tourism
- Job creation as a result of electric mobility
- Active contribution to the reduction of $CO_2$ emissions

**Commercial:**

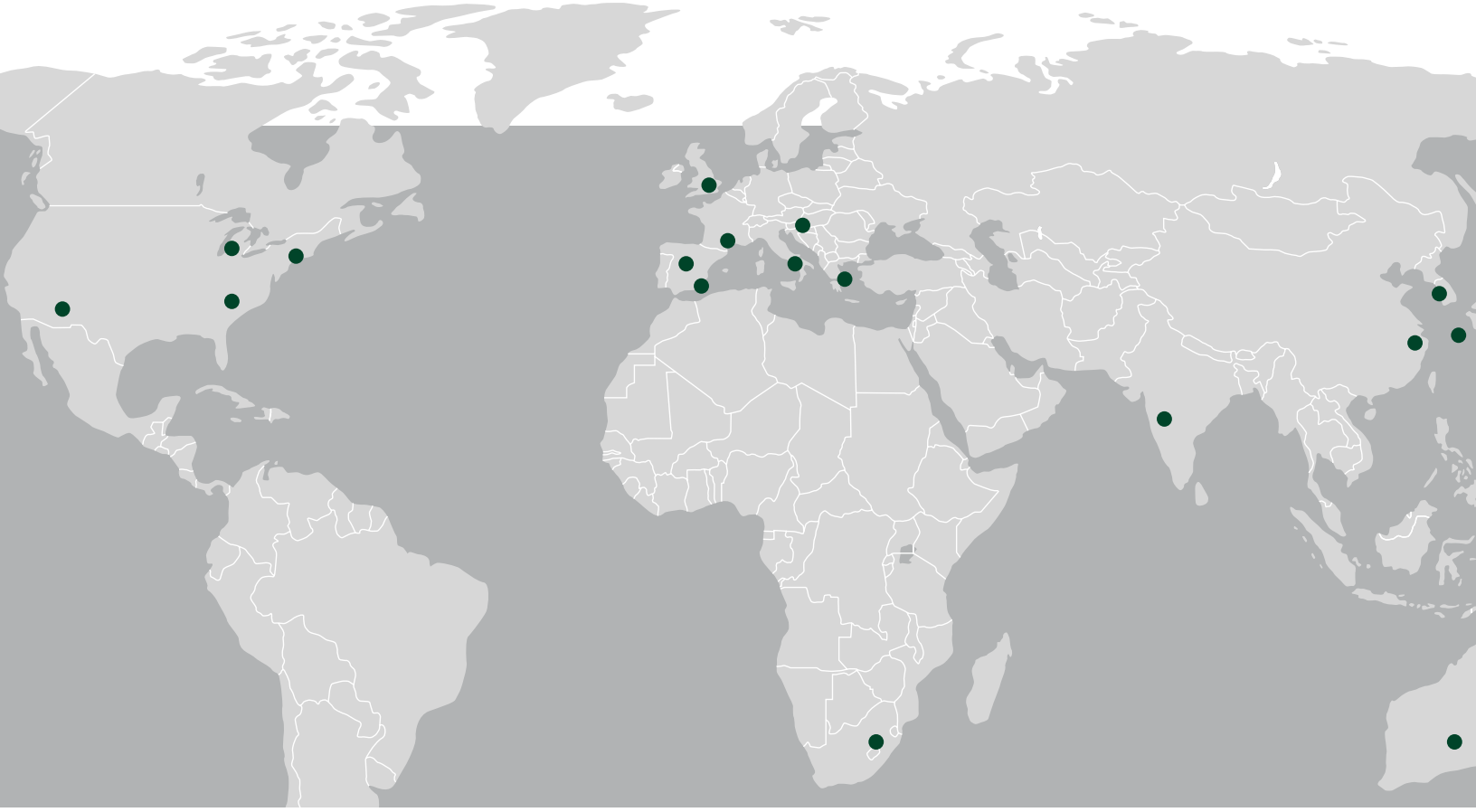
- The same incentives, grants and subsidies that apply to roof systems apply to carport systems
- Public relations opportunity
- Your customers will love snow-free parking spaces in winter and cool, shady parking spaces in summer
- Active contribution to the reduction of $CO_2$ emissions



# E-mobility

## Vision for the future

SCHLETTER



## Schletter Inc.

www.schletter.us
mail@schletter.us
(888) 608 - 0234

**North American Headquarters**
**Manufacturing and Sales**
1001 Commerce Center Drive
Shelby, NC 28150 USA
Tel: (704) 595 - 4200
Fax: (704) 595 - 4210

**West Manufacturing and Sales**
3761 E Farnuma Place
Tucson, Arizon 85706 USA
Tel: (520) 289 - 8700
Fax: (520) 289 - 8696

**Northeast Sales and Training**
99 Rainbow Road
East Granby, CT 06026
Tel: (860) 735 - 7560

## Schletter Canada, Inc.

www.schletter.ca
mail@schletter.ca

**Ontario Manufacturing and Sales**
3181 Devon Drive
Windsor, Ontario N8X 4L3 Canada
Tel: (519) 946 - 3800
Fax: (519) 946 - 3805

**Connect**
facebook.com/schletterinc
twitter.com/schletterinc
youtube.com/schletterinc

**Event/Workshop Information**
www.schletter.us/events.html
www.schletter.ca/events.html

© Schletter Inc., 062014, I400148

# Commercial and Utility Solar PV Racking

## Unbeatable Quality, Price and Install Speed

GAMECHANGE RACKING®

QUALITY. VALUE. INNOVATION.

MADE in USA

# Best Quality & Bankability

GameChange Racking has industry leading quality and the backing of Barron Group Holdings, giving us a world class level of bankability to give you the peace of mind you need.

- Financial strength: backed by Barron Group Holdings with assets over $90,000,000
- 20 year warranty
- Strict adherence to required engineering standards
- Made in the USA of superior strength metals, and meet all code requirements
- All systems wind tunnel tested by industry leader CPP
- 2703 and 467 ETL/UL tested
- Independent assessment by industry leader Black & Veatch

# Excellence in Test & Certification

GameChange's solar racking systems are built for long term durability. We give you peace of mind that every system you install is of superior quality and strength to last the test of time in harsh environmental conditions.

Safety first: boundary layer wind tunnel testing of GameChange roof and ground systems by industry leader CPP

Rigorous field testing of GC Post System StickyPile™

GC Pour-in-Place™ passes rigorous ETL/UL mechanical load testing at 45 psf upward force test

GC Pour-in-Place™ passes rigorous ETL/UL mechanical load testing at 45 psf down force test

# History

- Our owner Barron Group Holdings invested over $480,000,000, heavily in metal fabrication companies. This gives us a strong working knowledge of cost effective scale metal manufacturing processes
- Starting in 2011, Barron invested over $50,000,000 to build 10 solar power plants totaling 18.9 MW
- As these plants were built, we saw that PV mounting structures were too expensive, complicated and slow to install and needed better integrated wire management and grounding
- GameChange Racking was started in 2012 to provide the most cost effective, high quality and fast installing solar racking systems
- We have built a superior engineering team, leveraged our legacy skillset in solar system installation, design and metal fabrication, and developed the best racking systems in the industry

# Leading Customer Service

We challenge ourselves everyday to drive value to the customer not only through superior technology and pricing but also providing same day response and real time problem solving at all levels to earn repeat business and make every customer a strong reference.

In house structural, mechanical and civil engineers
Free on site field training and site supervision services

Responsiveness:
1 - 2 days for quotes
2 - 8 days for layouts

Delivery time:
2 - 4 weeks roof system
5 - 7 wks. ground systems

## Industry's Most Complete and User Friendly Layout / Permit Sets

- Complete parts list with material specifications and easy to follow install manual
- Color coded legends detailing pile lengths and locations / ballast amounts and locations
- Everything you need to make your permitting process fast and efficient
- Wet stamp drawings sets provided as well as electronic
- 24 x 36 printouts sent to site

Industry's most thorough and user friendly layout / permit drawings

# GC Max-Span™ Post System

# $.109/watt

10 MW, 315w panels 0 snow 90 wind

- Industry's best quality, test and certification and bankability
- Industry's longest spans & fewest foundations per MW reduces number of foundations & installation cost - as few as 260 per MW
- Rugged design enables 150 mph wind and 90 psf snow loads
- Post/Beam/Brace assembly has industry's lowest part count and fastest assembly
- StickyPile™ is engineered for maximum pullout resistance - 50% more total surface area and 101% more lateral than I-beams
- 20 year warranty - Made in USA
- ETL / UL 2703 tested
- Independent assessment by Black & Veatch
- Wind tunnel tested by industry leader CPP

## System Information

### Features:

Up to 4 ft. ground clearance eliminates snow & vegetation shading issues
StickyPile™: G235 galvanized steel (HDG also available), earth screws & helicals: HDG, Purlins, Beams & Braces: G90 galvanized steel
Galvanized Z purlins have integrated trays for easy wire management
Patent pending articulating purlin connection to navigate sloping terrain
Supports all double-sided glass thin film & other modules
Pre-punched holes on piles for mounting all standard combiner boxes & string inverters
Integrated grounding with star washers or teethed module clamps included - approved by ETL to UL 467
Available with robust aluminum rails with integrated wire management trays
Panels rapidly mount using T-bolts into patent pending slot feature for top mount or bolts through holes in purlins for bottom mount
5 to 35° tilt with multiple inter-row spacing options
Continuous configuration enables 8% grades with direct purlin mount option & 17% with bracket mount option
Available 2up in portrait and 4up in landscape
Stamped layout & engineering analysis for every project
Made in the U.S.A.

### Installation:

Turnkey installation, geotech & pull test available
Fast installation w/ minimum component count & simple design
5 men install 227 panels & racks per day, 15 men install 1.05 MW per week
Adjustability up to 6" east-west, 3" vertical & 1.5" north-south

### Testing & Certifications:

Wind tunnel tested by industry leader CPP & rated for 150mph wind speed
Meets IBC & ASME standards for structural loading
ETL/UL 467 GameChange top mount clamps or star washers included
ETL / UL 2703 tested
Warranty 20 years
Independent assessment by industry leader Black & Veatch

### Pricing:

Starts from $.109/watt (10MW 315 watt panels, 0 snow 90 wind)
Turnkey installation of foundations, racks & panels starts $.055/w
Free pull test on orders over 3 MW

## Technical Data

### Material:

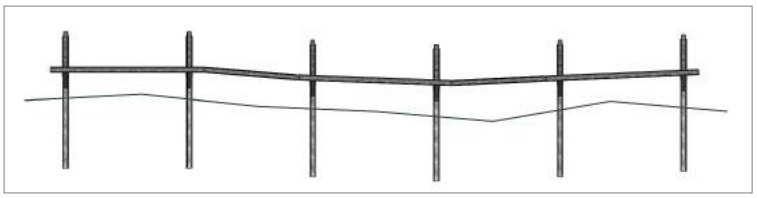
Post: G235 galvanized steel (HDG ASTM123 option also available)
Galvanized Purlins, NS Beam, Brace: G90 galvanized steel
Star washer or ETL / UL top mount teethed panel clamp: stainless steel
Associated hardware:
Magnacoat 3/8", 1/2" and 3/4" x 1" hex or serrated flange hex bolts, 3/8", 1/2" and 3/4" serrated flange nuts, 3/4" washers; stainless steel ¼ - 20 serrated flange nuts, ¼ - 20 x ¾ inch hex bolts; or if mounting panel using stainless steel panel mounting clamps: ¼ - 20 x 2.5" hex bolts, or 1.5" - 2.5" T-bolts, stainless steel ¼ - 20 serrated flange nuts;

### Calculations:

100% code compliant designs for any locality
Third-party structural PE, stamped drawings and calculations
Individual system structural calcs, Individual system design calcs based on regional load values
Design loads according to IBC 2006 or 2009

### Grounding:

Racking system has integrated grounding for panels utilizing star washers or ETL / UL 467 teethed module clamps
Grounding must be done by electrician at row ends



Direct mount on tables with articulating purlins between tables allows up to 8% east-west terrain slopes, 17% for bracket mount

Nesting components eliminate brackets, have long slots enabling 3 axes of adjustability

Patent pending articulating purlin connection to navigate sloping terrain

Fast installing direct mount purlin option
Multiple mounting holes allow 6" east-west adjustability

# Landfill Leader

## GameChange Racking is a leader in landfill solar PV racking with installations at numerous landfill and brownfield sites in multiple states nationwide

- In house structural, mechanical and civil engineers to support all aspects of complex landfill and brownfield sites
- Extensive experience working with landfill and brownfield regulatory entities and stake holders nationwide
- Ability to support projects in all states
- 33 ballasted ground systems installed in 12 States

## 6.5 MW—Three Closed Solid Waste Landfills in Western MA

Western MA - 6.5 MW Featured in WLP - 22 News

**All three sites were built on top of closed solid waste landfills, creating valuable re-use of otherwise useless land**

These western Massachusetts landfills requires very stringent design guidelines to be followed. The landfill cap was not allowed to be disturbed and all vegetation required to be left in place to required height for storm water management reasons. The sites were completed in only two months through difficult fall and winter conditions

## 2.5 MW - Largest Landfill Solar System in New York State

Clarkstown, NY - 2.5 MW Featured in "Landfill Turned into Solar Power Array in New York"

**This site is the largest solar PV installation on a landfill in NY. The install process is straightforward and quick – twelve men installed 2.5MW of racking and forms in under one week. Bobcats with pouring buckets filled the forms, then modules were mounted**

"We selected GameChange's Pour-in-Place™ Ballasted Ground System for its superior quality, value, and speed and eae of installation. It was a pleasure working with their team."

Charles Feit, CEO, OnForce Solar

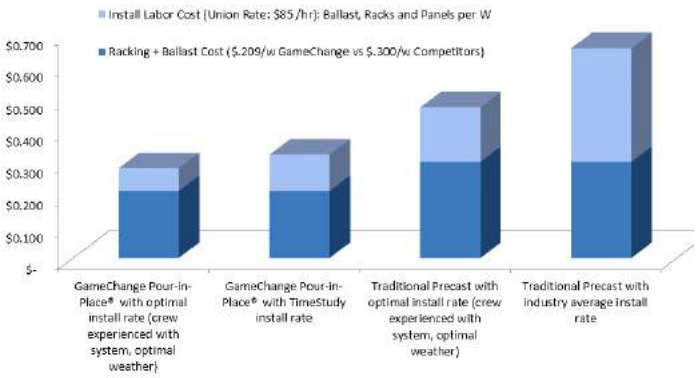
## 1.2 MW - Superfund Site in New York

Patterson, NY - 1.2 MW 12 men installed 1.2 MW racking in 3.5 days

**This site is on a 10 acre closed municipal landfill in Putnam County NY**

"Working on a landfill requires that you pay careful attention to any equipment that will contact the existing ground surface, So that the environmental integrity of the site can be maintained. Working with GameChange Racking allowed us to design this installation cost effectively to ensure that our project resulted in an overall environmental gain in the town of Patterson."

Paul Curran, Managing Director, BQ Energy




### GC Pour-in-Place™ Ballasted Ground System:

Racking Cost Drops 30%
Labor Cost Drops 68%
Total Installed Racking Cost
With Labor Drops 51%
(from $.65/watt to $.32/watt )

Example of GameChange's strong value proposition to customers (MA loading conditions and union labor rates)

# GC Pour-in-Place™ Ballasted Ground System

MADE in USA

# $.159/watt

Racks and Pour-in-Place™ Forms
10 MW 315 watt panels, 1 up
15°, 10 snow and 90 wind

$.174/watt Complete system including ballast

- Patent pending protected system with self-leveling technology: 68% faster install than precast
- Substantial labor savings by eliminating moving and shimming heavy precast blocks
- Integrated grounding and wire management
- Available in both 1 and 2 panels up in portrait
- 20 year warranty - Made in USA
- ETL / UL 2703 Tested
- Independent assessment by Black & Veatch
- Wind tunnel tested by industry leader CPP

cpp CERMAK PETERKA PETERSEN

Intertek

## System Information

### Features:

Self-leveling technology: 68% faster install than precast
Large ballast footprint reduces landfill cap loading
Leave-behind patent-pending recycled HMWPE plastic Pour-in-Place™ forms
Patent protected technology
Custom tables available for extreme slopes up to 20% utilizing rail supports of varying heights
Available in both 1 and 2 panels up in portrait
Five slots enables additional vertical adjustability, up to total of 10"
Panels rapidly mount using T-bolts and top mount clamps into slots on robust aluminum rails or bottom mount to galvanized purlins
Integrated grounding with teethed module clamps included - approved by ETL to UL 467, or star washers
5 to 35° tilt with multiple inter-row spacing options
Full layout and engineering analysis for every project
51% overall lower cost than competitors
Made in the U.S.A.

### Installation:

Fastest install of any ballasted ground system, period
Just place Pour-in-Place™ forms, place supports, bolt on and level rails, pour concrete, mount panels
Five men install 1454 panels with racks and ballast per week: fifteen men install 1.31 MW per week
Self-leveling technology enables 10" total vertical adjustability
Rapid install using concrete truck to fill Pour-in-Place™ forms around supports, or for weight sensitive landfill caps or narrow row spacing using pump or tracked bobcats with gravity feed buckets
Turnkey installation available

### Testing & Certifications:

Wind tunnel tested by industry leader CPP & rated for 150mph wind speed
Independent assessment by Black & Veatch
Rated up to 90 psf snow load
ETL/UL 2703 tested
ETL/UL 467 GameChange teethed panel mounting clamps included
Unique design innovations with patents pending
Meets IBC and ASME standards for structural loading
Warranty 20 years

### Pricing:

Starts $.159/w for panel racks & forms, $.174/w for complete system including ballast
(10 MW, 315 watt panels, 1up, 15°, 10 snow 90 wind)

## Technical Data

### Material:

Rail support structure components: G90+ galvanized steel
Panel mounting rails: 6005 aluminum, or G90+ galvanized steel
Recycled HMWPE forms
Stiffening Strips: 304 stainless steel
3/8" Magnacoat bolts and serrated flange nuts
Panel mounting hardware:
Top mount: panel mounting clips: stainless steel teethed clips
¼-20 x 1.5" to 2.5" T bolts, ¼-20 serrated flange nuts: stainless steel
Bottom mount: ¼-20 x 3/4" T bolts, ¼-20 serrated flange nuts, star washers: stainless steel
Use freeze thaw rated concrete where applicable

### Calculations:

100% code compliant designs for any locality
Structural PE, stamped drawings and calculations
Individual system structural calculations
Individual system design calculations based on regional load values
Design loads according to IBC 2006 or 2009

### Grounding:

Racking system has integrated grounding using provided teethed module clamps and jumpers
Grounding must be done by electrician at row ends

Place supports, attach rails, then shim supports to level system quickly prior to pouring concrete

Integrated wire management tray on robust aluminum rails

Pouring bucket on bobcat for concrete pouring of Pour-in-Place™ forms on sensitive landfill caps

Standard concrete pump truck has long range and fills up to 2MW of Pour-in-Place™ forms per week

# GC Ballasted Roof System

# $.089/watt

2 MW, 315w panels, 5° tilt

- Industry's best quality, price and install speed
- Just two snap-together components
- ETL / UL fire tested, durable aluminum and stainless components
- 5 and 10 degree tilts
- 20 year warranty - Made in USA
- ETL / UL 2703 tested
- Independent assessment by Black & Veatch
- Wind tunnel tested by industry leader CPP

## System Information

### Features:

Just two snap-together components
Fire proof, durable aluminum and stainless components
Robust, hi-tech wind deflectors reduce ballast, typical loading 3.0 – 4.8 psf
Aluminum & stainless steel components 5, 10 and 15° tilt
Teethed module clamps included - approved by ETL to UL 467
Custom pan sizes available with shorter row spacing for increased array density
Full layout and engineering analysis for every project
Made in the U.S.A.

### Installation:

Fastest install time; up to 50% less than competitors
Can be installed on any flat roof
All EW and NS string wiring may be done using integrated wiring features before panelizing
5 men install 200 panels, racks and ballast per day
15 men install .93 MW per week
Free on-site training and installation supervision

### Testing & Certifications:

Wind tunnel tested by industry leader CPP and rated for 60 psf snow & 120 mph wind speed
Unique design innovations with patents pending
Passed rigorous ETL/UL 2703 testing requirements
ETL/UL 467 GameChange teethed panel mounting clamps rated to 1180 amps
Meets IBC and ASME standards for structural loading
Warranty 20 years

### Pricing:

Starts from $.099/watt
(2 MW, 315 watt panels, 50 snow, 110 wind, 5° tilt)
Minimum order size 250 KW

## Technical Data

### Material:

Pan, wind deflector: 5052H32 aluminum
ETL/UL teethed panel clips: stainless steel
Hardware - ¼-20 x 2-1/2 inch bolts, serrated flange nuts, TEK 3 screws, lock washers: stainless steel, P-clip: G90 galvanized steel

### Calculations:

100% code compliant designs for any locality
Third-party structural PE stamped drawings and calculations
Individual system structural calculations
Individual system design calculations based on regional load values
Design loads according to IBC 2006 or 2009
Patent pending profile geometries with optimum material utilization

### Distribution Load:

Typical roof loading 3.0 – 4.8 lbs/sq. ft.
Pan Row Spacing:
5, 10, 15° tilt option; 8.5/16.5/24.8 inches
Pan Width:
5,10, 15° tilt options; 24/15.25/15.25 inches
Shade Angles:
5, 10, 15° tilts: 22° shade angle

### Grounding:

Racking system has integrated grounding utilizing ETL/UL teethed panel clips two corner of each array
Grounding must be done by electrician at row end at corner of array

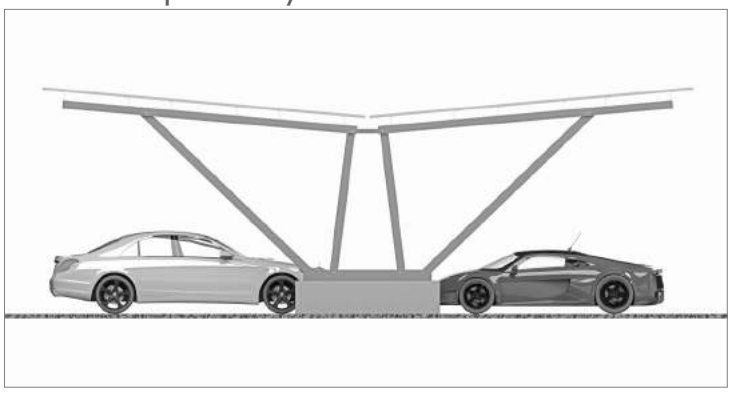
Two snap-together components enable rapid install

Robust hi-tech wind-screens enable low ballast

Easy integrated EW and NS wire management

GameChange ETL/UL 467 listed self grounding panel clamps included

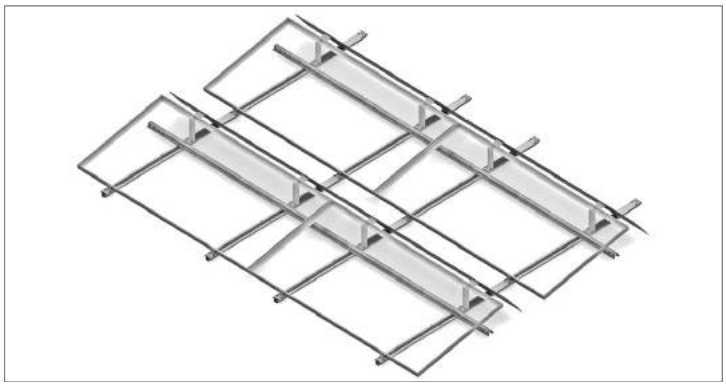
## GC Carport System



**$.299/watt** 2 MW, 310 watt panels double space, 0 snow, 90 wind

- Industry's lowest pricing through superior engineering
- Structural engineering support with complete drawing packages
- Compatible with all standard modules, offered in 0, 5, & 10°
- Integrated wire management trays
- Pre-punched mounting holes for inverters, combiner boxes and EV chargers
- Rugged design rated for 120mph wind speed and 60 psf ground snow load
- 20 year warranty - Made in USA
- Wind tunnel tested by industry leader CPP

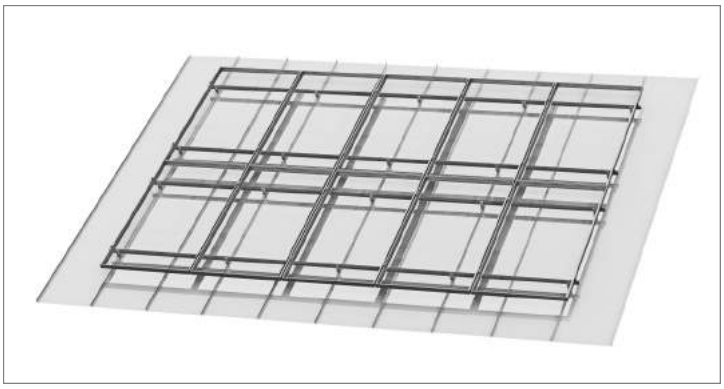
## GC Grid-Lite™ Roof System



**$.119/watt** 2 MW, 335w panels,5° tilt

- Interlocking grid design combined with next-gen wind deflector virtually eliminates ballast - as low as 0% ballast
- Typical roof loading 0 to 1 psf for ballast; 2.5 - 2.9 total load including ballast, panel and racking
- Industry's best system to handle most severe seismic conditions: may be installed with or without attachments
- Less ballast and related labor reduce total installed cost
- Fast install with minimal components
- 5 and 10 degree tilts
- 20 year warranty - Made in USA
- ETL/UL 2703 tested
- Wind tunnel testing industry leader CPP and rated for 150 mph wind speed

## GC Standing Seam Roof System

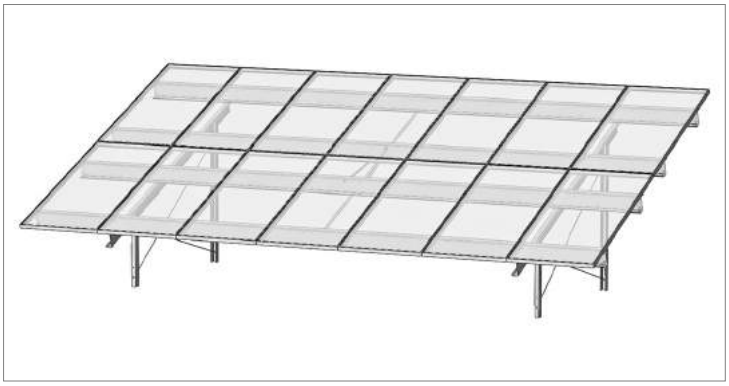


**$.039/watt** Direct Mount
2 MW, 315w panels, Flush mount

**$.089/watt** Rail Mount
2 MW, 315w panels, Flush mount

- Rail Mount option includes rails, rail jumpers, L feet, seam clamps, self grounding ETL/UL panel clamps and all hardware
- Direct Mount option includes seam clamps, panel mounting plates, self grounding ETL/UL panel clamps and all hardware
- Flush mount, 5 and 10° standoffs available with Rail Mount option
- Seam clamps available for standard metal seam roofs
- Zero ballast and no penetration
- Fast install with minimal components
- Integrated grounding
- Rated 130 mph wind and 60 psf snow loads
- 20 year warranty - Made in USA

## GC Max-Twin™ Pile System



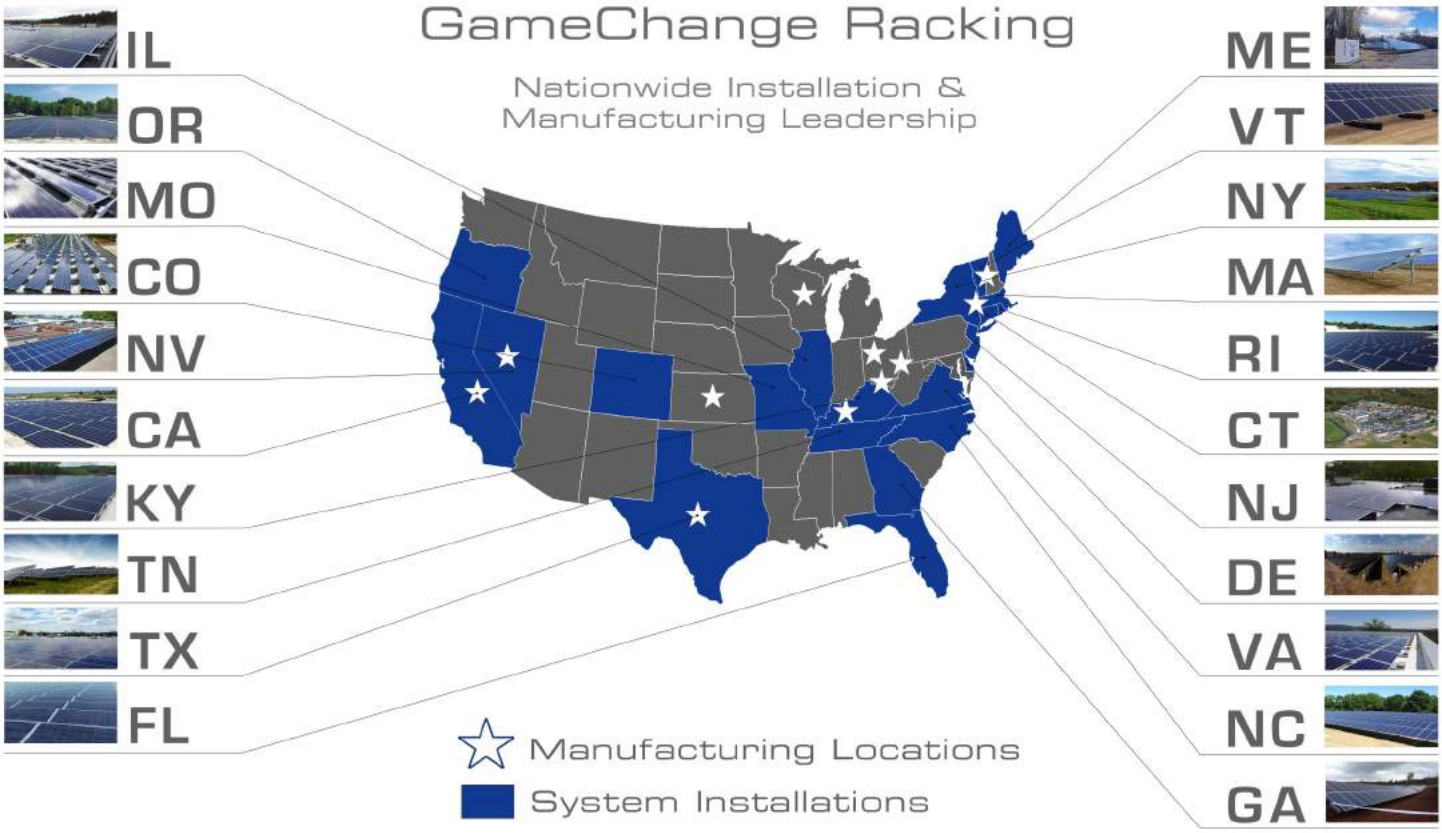
**$.099/watt** 10 MW, 315w panels 0 snow 90 wind

- Industry's lowest priced pile racking
- Optimized twin post system for lower load areas
- Rugged stainless steel and galvanized components including G180 + piles
- Fast installation with minimal components
- Meets structural loading requirements per applicable IBC 2009 & 2012 codes
- ETL / UL 2703 tested
- 20 year warranty - Made in USA
- Integrated grounding and wire management
- Wind tunnel tested by industry leader CPP

GAMECHANGE RACKING®

QUALITY. VALUE. INNOVATION.

GameChange Racking provides the industry's best solar racking systems enabled by simple innovative design and large scale volume manufacturing.



GC Pile Driven Systems 12 MW, North Carolina

GC Pile Driven System 4 MW, North Carolina

GC Pile Driven System 3.5 MW, Massachusetts

GC Pour-in-Place™ System 6.2 MW, Central MA

GC Pour-in-Place™ System 2.5 MW, New York

GC Ballasted Roof System 1.9 MW, New York

MADE in USA

730 Fifth Avenue, 16th Floor, New York, NY 10019, 212-359-0205, www.gamechangeracking.com

## f. End Notes

[i] As of September 30, 2016
[ii] As of September 30, 2016
[iii] As of September 30, 2016
[iv] As of September 30, 2016
[v] As of September 30, 2016
[vi] As of September 30, 2016
[vii] As of August 9, 2016
[viii] As of May 17, 2016
[ix] As of September 30, 2016
[x] As of September 30, 2016
[xi] As of September 30, 2016
[xii] As of September 30, 2016
[xiii] As of September 30, 2016
[xiv] As of September 30, 2016
[xv] As of May 17, 2016