groSolar
AN EDF RENEWABLE ENERGY COMPANY

RESPONSE TO RFP

TOWNS OF BRISTOL AND BARRINGTON

Request for Proposals,
Public-Private Partnership for On-site Solar Projects
Bid #850

800.374.4494 | info@grosolar.com | www.groSolar.com

205 Billings Farm Road, Building 4
White River Junction, VT 05001

9175 Guilford Road, Suite 202
Columbia, MD 21046

November 30, 2016

Diane Williamson
Director, Town of Bristol Community Development Department
9 Court St.
Bristol, RI 02809

RE: Public – Private Partnership for On-Site Solar Projects – Bid #850

Dear Ms. Williamson,

groSolar is pleased to submit the enclosed response to the Towns of Bristol and Barrington and their Request for Qualification/Request for Proposals for Public – Private Partnership for On-Site Solar Projects along with all addenda. We are ideally suited to collaborate with the Towns in the development, financing, construction, and operation of the solar projects. groSolar has over 17 years of award winning solar development, engineering, and construction experience and has developed and constructed numerous solar projects across the country for many different customer segments.

Earlier this year, groSolar was acquired by EDF Renewable Energy, one of the leading renewable energy companies in North America. groSolar operates as wholly-owned subsidiary and serves as EDF RE's platform for distributed generation solar projects including those projects for corporations, municipals, and utilities. Our partnership with EDF combines one of the most respected companies in distributed solar with the backing and breadth of one of the leading energy solution companies in the world.

Our team affords its clients:

- A single point of contact and partner through the development, design, construction, and operation of the solar PV plants
- Broad experience in project design and interconnections across the United States using a variety of solar technologies
- Additional support of EDF RE to deploy complimentary solutions (e.g. battery storage, demand management) with solar as appropriate

We have a long-standing reputation for delivering award winning projects on time, on budget, and of the highest quality. Our clients have included many utilities and leading investors. Recent awards include:

- *PV America 2015 National Project of Distinction*- Stafford Hill Solar Project (VT); Solar Energy Industries Association & Solar Electric Power Association (2.5 MW)
- *2015 Project of Distinction Award – Cambridge Solar (MD) - Mid*-Atlantic Solar Energy Association – Cambridge Solar (4.3MW)

- *Photovoltaic Project of Distinction Award*- Keystone Solar (PA); Solar Energy Industries Association & Solar Electric Power Association (6MW)
- *Honorable Mention, PV Project of Distinction*- Camden Solar Center (NJ); Solar Energy Industries Association & Solar Electric Power Association (1.8MW modified carport structure)
- *Novogradic Tax Journal featured project* – Two brownfield projects in Indiana (5.4MW)

Thank you for this opportunity. Please treat the entirety of this proposal as confidential. Do not hesitate to contact me directly with any questions. Our team looks forward to working with the Towns of Bristol and Barrington in developing and constructing this exciting project.

Sincerely,

Myles Burnsed
Director of New Markets
(802) 272-6112

groSolar Project Proposal

groSolar is proposing two options to the Towns of Bristol and Barrington for a solar PV project at the Miniturn Farm Landfill in Bristol. The two proposal options: (1) REG (Renewable Energy Growth) Program Enrollment or (2) Net Metering (NM) project owned on behalf of a public entity, provide different benefits to the Towns. groSolar will work with the Towns to determine the best option for developing the landfill based on their ultimate goals for the project. Please note that, due to uncertainty regarding whether or not prevailing wage will be required of the project, groSolar has provided pricing for either scenario. We will add that the REG Enrollment Option is subject to a competitive bidding process under the REG Program and this proposal is contingent upon the project successfully being awarded a Certificate of Eligibility. Please find the project proposals summarized below:

Miniturn Farm Landfill (REG Enrollment Option)

Summary of Proposal	
Project Size (kWac)	3,840
Project Size (kWdc)	4,976
Annual Production (kWh; Year One)	7,057,000
Term of the Lease Agreement	25 Years; Option(s) to extend up to 10 years
Annual Lease Payment	$50,000/yr.
Annual Lease Payment*	$40,000/yr.
Aggregate Lease Revenues	$1,000,000
Aggregate Lease Revenues*	$800,000
Bid Price into the REG Program	$0.1075/kWh
Bid Price into the REG Program*	$0.111/kWh

Miniturn Farm Landfill (Net Metering Option)

Summary of Proposal	
Project Size (kWac)	5,000
Project Size (kWdc)	6,480
Annual Production (kWh; Year One)	8,963,000
Term of the Agreements (Lease and Power Purchase Agreement)	20 years; Option(s) to extend up to 15 years
Lease Payment	$1.00/yr.
Net Metering Credit Price with groSolar	$0.0855/kWh
Net Metering Credit Price with groSolar*	$0.091/kWh
Net Metering Credit Value (with NGrid)**	$0.16665/kWh
Aggregate Estimated Electricity Savings***	$23,477,078
Aggregate Estimated Electricity Savings*,***	$22,536,604

*Assumes prevailing wage is required

** Renewable Net Metering Credit value calculated based off of 2015 & 2016 Rates under C-06 with National Grid

*** Assumes a 3% escalation in electricity rates per annum.

Pricing Assumptions and Terms

The "all-in" energy price for these projects include the following assumptions with regard to project financing and pricing:

1. Sale of all net metering credits (kilowatt hours) to the Towns
2. Retention of all capacity, environmental attributes (including RECs), and ancillary service benefits by project owner
3. Full Utilization of the Federal Investment Tax Credit (ITC) and MACRs Depreciation
4. All project Interconnection Costs including system upgrades, metering, controls and relays (as necessary), and transformers covered in proposed pricing
5. No sales or use tax on equipment
6. Any sale or use tax imposed on electricity to be recovered within the PPA
7. No performance security or guarantee in the Power Purchase Agreement
8. Assumed usage of areas indicated within project Conceptual Layouts
9. All Solar PV EPC and development cost
10. Use of groSolar form of PPA contract and lease agreement
11. Rhode Island General Contractor's license is in the process of being obtained by groSolar and will be in hand well before project construction.
12. Please find groSolar's comments and exceptions to the Towns provided Terms and Conditions attached as Appendix A.

Property Taxes

Due to the anticipated timing of the project, groSolar has assumed payment of property taxes for the tangible property installed at the landfill site in proportion to the kWac size of the project, as required per recent legislative change. Under a project proposed to be enrolled in the REG Program, this would be $19,200 per year to the Town of Bristol. Under the proposal where the project would be owned and operated by a third-party on behalf of the Towns, this would amount to $25,000 per year to the Town of Bristol. Note that some developers do not adequately address property tax concerns in the financial proformas behind their proposal offers.

Savings Analyses

Please find groSolar's project savings analyses for each of the net metering proposals attached within Appendix B of this proposal.

Project Buyout

If the Towns are interested in a project buyout, they must specify at which time they would be interested in doing so. According the RFP Q&A, it appears that the Town of Bristol is not interested in purchasing a project and the Town of Barrington would only contemplate this option for rooftop projects. Further clarity and discussion on such an option are required to provide accurate information to the Towns.

Proposed Site Layout

Please find a conceptual layout for each of the proposed projects attached as Appendix C of this proposal.

Energy Production Modeling

Please find groSolar's energy model using the industry standard PVSyst software attached as Appendix D of this proposal.

Proposed Equipment

groSolar is technology agnostic and only selects equipment from Tier 1 manufacturers with bankable warranties that are financeable and that meet all UL and IEEE equipment compliance requirements under the NEC.

The following table describes proposed equipment and warranty lengths that our team proposes for this project. Please find equipment specification sheets for potential equipment attached in Appendix E.

Major Equipment	Manufacturer*	Standard Warranty
Racking	RBI, Solar Flex Rack or Comparable	10-20 Years
Modules	Hanwha Solar, Trina Solar, LG, Jinko, Suniva or Comparable	10 Years product, 25 Years Linear Power
Inverter	Solectria, Fronius, SMA or Comparable	10 Years
Data Acquisition System	AlsoEnergy, Locus, Draker, or Comparable	5 Years

*Notes: *groSolar team reserves the right to replace specific equipment manufacturers with equivalents due to pricing, availability, or technological improvements*

Statement of Qualifications

About groSolar

groSolar is an industry-leading, large commercial and utility-scale solar developer and engineering, procurement, and construction firm specializing in projects greater than 1MW in capacity. For over 17 years, groSolar has been dedicated to high quality, on time, and on budget project performance. With numerous award winning multi-megawatt projects and over 2,000 installations nationwide, groSolar's experience spans a broad spectrum of applications. These include the development and installation of solar projects at brownfields/landfills, commercial, educational, and municipal utility facilities, and manufacturing plants. groSolar provides turnkey services for solar projects from development services and financing through construction, product procurement, and long-term operations and maintenance. Earlier this year, groSolar was acquired by EDF Renewable Energy and now operates as wholly-owned subsidiary serving as EDF RE's platform for distributed generation solar projects for corporations, municipalities, and utilities nationwide.

groSolar Company Data	
Company Name	Global Resource Options, Inc. d/b/a groSolar
State of Incorporation	Delaware
Year Founded	1998
Ownership	Subsidiary of EDF Renewable Energy
Main Offices	White River Junction, VT and Columbia, MD
Target Sectors	Municipal, Commercial, Industrial, Agricultural, and Utility
Markets	Nationwide
Employees	20 in New England ; 55 Nationwide

groSolar works with clients to consider the varying ways to optimize the economics of system size, energy production and long-term operational costs of a PV system according to the site, off-take, and utility constraints. groSolar utilizes sophisticated software to incorporate specific terrain features and other issues influencing system design and energy production forecasts. groSolar has a positive history and lengthy track record of integrating PV systems with many utilities and is knowledgeable in navigating interconnection requirements and the due diligence items required for successful utility interconnection.

Our team affords its clients:

- Industry leading electricity pricing achieved through low cost of capital, buying power, and standardized design
- Unrivaled experience in complex project design and interconnections across the United States
- Nationwide project experience with local expertise, incorporating knowledge of local permitting, zoning, utility interconnection and building code requirements

- Integration of the best available technology through direct relationships with top manufacturers, ensuring proper technology for each project and fulfillment of client requirements
- Professional staff with extensive solar PV and billions of dollars of large-scale general construction and project management experience
- Expertise developing PV projects atop technically challenging sites such as brownfields, municipal solid waste (MSW), landfill caps, and open waste water tanks – many of which have sensitive 24x7 operations that cannot be disturbed during construction or O&M
- Broad experience with large-scale, turnkey commercial and utility solar projects for many diverse sites and clients, including agricultural sites, real estate development, military bases, educational institutions, and manufacturing, industrial and office buildings
- Extensive operation & maintenance capability assuring the system owner of continued project support after construction during long-term system operation

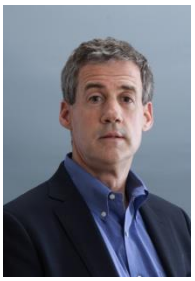
Project Awards

groSolar has a long track record of developing and constructing award winning projects. Our recent Stafford Hill Landfill Project constructed for the utility Green Mountain Power was recently awarded the PV America 2015 National Project of Distinction and combines landfill solar PV project, energy storage, and a micro-grid installation for the City of Rutland, VT. In addition to our recent award for the Stafford Hill Landfill Project, our team has also received the following awards:

- *Photovoltaic Project of Distinction Award*- Keystone Solar (PA); Solar Energy Industries Association & Solar Electric Power Association
- *Diamond Award Certificate*- Longwood Gardens (PA); American Council of Engineering Companies
- *Honorable Mention, PV Project of Distinction*- Camden Solar Center (NJ); Solar Energy Industries Association & Solar Electric Power Association
- *Novogradic Tax Journal featured project* – Two brownfield projects in Indiana

Team Members for this Project

Our team consists of the some of the brightest and most well respected professionals in the solar industry. groSolar's senior management and executive team are actively involved in every aspect of our projects. While our team is constantly growing, the following key individuals will be involved for the duration of the project.



Jamie Resor, CEO

(802) 359-6524
jamie.resor@grosolar.com

Mr. Resor is groSolar's CEO and a Member of the Board of Directors. Prior to joining groSolar in 2007, Mr. Resor had 20 years of experience across all major corporate functions in large organizations, start-up companies, and real estate development. He spent the first part of his career with Bankers Trust and Mercer Management Consulting working with Fortune 1000 clients. During the 1990s, Mr. Resor developed and directed the pioneering Conservation Finance program for World Wildlife Fund, raising more than $150 million for environmental conservation projects through debt-for-nature swaps and other cross-border financing transactions in Africa, Asia, and Latin America. He also advised on the restructuring of more than $1 billion of debt owed to the U.S. Government from various countries in Latin America. Mr. Resor is a frequent speaker at solar industry events and has testified before Congress on behalf of the Solar Energy Industry Association. He received his undergraduate degree from Dartmouth College and MBA from Stanford University Graduate School of Business.

Frank Griffin, Executive VP Engineering & Construction

(802) 359-6512
frank.griffin@grosolar.com

Mr. Griffin is groSolar's Executive Vice President of Engineering and Construction with responsibility for EPC (Engineering, Procurement and Construction) and O&M (Operations and Maintenance) of commercial and utility-scale projects. He joined groSolar in 2008, and under his direction groSolar has successfully completed design and construction of solar PV projects on the East Coast, Midwest and in California. Mr. Griffin has over 30 years of project development and project management experience. Prior to joining groSolar, he was Vice President and Regional Development Manager for Lane Company, a multi-family real estate developer where he developed projects valued in excess of $200 million. He was Senior Manager at Mesirow Financial Real Estate, Inc., dedicated to the University of Illinois at Chicago, South Campus Development, a $1.2 billion mixed-use redevelopment. Mr. Griffin's landfill and brownfield remediation experience includes capping of more than 300 acres of landfills in four states and design-build of liquid and gas treatment systems. Mr. Griffin received his BS in Civil Engineering from Lehigh University and received an MBA from the Pennsylvania State University.

Stephen Remen, Executive Vice President of Business Development

(802) 359-6514
steve.remen@grosolar.com

Mr. Remen joined groSolar in 2012 as Executive Vice President of Business Development and brings deep energy sector experience starting as an engineer and project manager, completing large scale generation projects with a broad range of utility, corporate, financial, and government partners. In addition to serving as the Massachusetts Commissioner of Energy where he had responsibility for energy policy and programs within the state, Mr. Remen started and grew two successful sales and marketing organizations providing energy services and commodity supply to large energy users nationwide, generating revenues in excess of $300 million annually. He's also highly experienced in project development, having developed several power generation facilities totaling more than $250 million in value. Mr. Remen has an MBA from Boston University and a BS in Mechanical Engineering from Worcester Polytechnic Institute and held Registered Professional Engineer licenses in the states of New Hampshire, Connecticut, and Florida.

Rod Viens, Executive Vice President of Operations

(802) 359-6520
rod.viens@grosolar.com

Mr. Viens is groSolar's Executive Vice President of Operations and manages PV equipment procurement and logistics as well project management and development in much of the Northeast. Prior to the Company's sale of its residential division in 2011, Mr. Viens oversaw the direct residential & small commercial installation operations which constructed multiple megawatts of solar in ten states. Mr. Viens' commercial project management experience at groSolar has included multi-residential commercial buildings, schools, the Air National Guard and agricultural sites ranging in size from 50kW to 3 MW. Prior to joining groSolar, he was Vice President of Operations and Business Development for Yankee Barn Homes, a nationally distributed post and beam home manufacturer, where he established and oversaw the installation construction division, and was charged with improving overall company processes. Mr. Viens graduated from Keene State College with a BS in Management.

Myles Burnsed, Director of New Markets

(802) 272-6112
mburnsed@grosolar.com

Mr. Burnsed directs new market strategy and development for groSolar and brings over a decade of experience in management consulting, engineering, and renewable energy development. He is a well-respected solar industry leader who is responsible for the development of more than 50 MW of distributed generation and utility scale solar projects. Prior to joining groSolar, Mr. Burnsed served as Director of Business Development for ECS Energy and Vice President of Operations at HelioSage (now Coronal Development Services). Mr. Burnsed draws on a deep and diverse engineering background which is complemented by experience in finance and risk management. Prior to entering the renewable energy industry, Mr. Burnsed was a Senior Consultant Engineer at FM Global where he managed and assisted a $5 billion book of clients in identifying and solving risk management challenges. Mr. Burnsed holds a BS in Chemical Engineering with High Distinction from the University of Virginia where he was elected a member of Tau Beta Pi and an MBA from the Darden Graduate School of Business Administration where he received the Faculty Award for Academic Excellence.

Jay Miller, Director of Engineering

(802) 359-6576
jay.miller@grosolar.com

Mr. Miller has over 20 years' experience in power generation, including 11 years' experience in commercial and utility-scale PV solar generation facilities at BP Solar. At BP Solar, Mr. Miller was responsible for performance modeling, performance measurement, module reliability and solar PV manufacturing. Mr. Miller's specialties include energy production modeling, data acquisition system design, and utility interconnection. Mr. Miller holds a Bachelor of Science degree from Carnegie-Mellon University and is a registered professional engineer in Maryland.

Thomas Lyman, Director of Project Management

(802) 359-6539
tom.lyman@grosolar.com

Mr. Lyman has been responsible for some of groSolar's larger and more complex solar projects. Prior to joining groSolar, he was a Senior Project Manager for EllisDon Corporation, an international construction management company. He worked for EllisDon in Michigan; Florida; Anguilla, BWI; and Athens, Greece. Selected projects which he was responsible for include the design, build, operate, and dismantle for the 15,000 square foot Province of Ontario exhibition at the 2010 Vancouver Olympic Games; the $130 million Infinity at Brickell, Condo,

Miami, FL; the $85 million Olympic Basketball, Swordplay & Handball Stadiums for the 2004 Athens Olympic Games; and the $21 million Huron, MI, waste water treatment plant expansion. Prior to EllisDon, Mr. Lyman worked for Consumers Power at the J.H. Campbell Power Plant in Grand Haven, MI, where he managed the earthwork subcontracts for the company's first Dry (Coal) Ash Storage Facility (earth dike construction with HDPE lining). He received his Bachelor of Science degree in Civil Engineering from Lehigh University, Bethlehem, PA, and is a member of the American Society of Civil Engineers.

Joseph Johnson, Director of Structured Finance

(802) 359-6531
joseph.johnson@grosolar.com

Joseph Johnson, Director of Structured Finance, draws upon his 13 years of experience to lead groSolar's valuation and project finance execution efforts. Prior to joining groSolar in 2015, Joe worked as an investment professional at GE Energy Financial Services and Washington Gas focusing on renewable energy and oil & gas partnership investments and had previously been an investment banker at Merrill Lynch in New York. He also served for five years as an officer in the United States Marine Corps. Joe received a Bachelor's of Science degree in Economics from the United States Naval Academy in Annapolis, MD, and an MBA from the University of Michigan's Ross School of Business.

Foad Alvandi, Senior Design Engineer

(802) 359-6586
foad.alvandi@grosolar.com

Mr. Alvandi has over 30 years of experience in practice and teaching of electrical engineering and engineering related technical disciplines, including 6 years of experience in residential, commercial and utility-scale PV solar generation facilities design and installation. Mr. Alvandi has received his Master of Science degree in Electrical and Computer Engineering from George Mason University in Fairfax Virginia, and is a registered professional engineer in several Mid Atlantic and New England states. He is a NABCEP Certified PV Installation Professional.

Pete Byron, General Superintendent

(802) 359-6519
peter.byron@grosolar.com

Mr. Byron has over 30 years of experience in electrical design and installation. He is a licensed electrician in the State of New Jersey, a certified OSHA Instructor, and certified in High Voltage Splicing up to 35kV. Mr. Byron serves as the Senior Site Superintendent on the majority of groSolar's technically challenging projects including those on landfills. Prior to joining groSolar, Mr. Byron owned his own

electrical contracting business and prior to that served numerous roles for Spencer Electric Co. He holds a Bachelor of Science in Business Administration from the University of Massachusetts.

Peter Bay, Project Developer

(802) 272-6519
peter.bay@groSolar.com

Mr. Bay has five years of experience supporting renewable energy projects in New England, supplemented by a strong academic background in the industry. He has provided services to a diverse spectrum of renewable energy technologies through various stages of project development in the region, including Wind Power, Hydropower, and solar PV projects. His expertise on these projects ranges from site identification and feasibility analysis to negotiation of power purchase agreements and management of utility interconnection processes. Most recently, Mr. Bay has managed site due diligence and project permitting efforts on numerous utility-scale solar projects at groSolar in New England and the Midwest. He holds a Bachelor of Science in Environmental Science from Endicott College.

Bidder Contact Information

Primary Contact	Myles Burnsed
Title	Director of New Markets
Address:	groSolar 9175 Guilford Rd., Suite 202 Columbia, MD 21046
Telephone	(802) 272-6112
Email	mburnsed@grosolar.com

Secondary Contact Information

Secondary Contact	Peter Bay
Title	Project Developer
Address:	groSolar 205 Billings Farm Road, Building 4 White River Junction, VT 05001
Telephone	(802) 272-6519
Email	Peter.bay@grosolar.com

Peter will serve as the Project Developer for a project awarded under this proposal and is locally based in Beverly, Massachusetts. Peter is frequently in Rhode Island, as he is the project developer of the Riverside Solar Partners, LLC project which was recently awarded a Certificate of Eligibility under the 2016 Renewable Energy Growth Program with National Grid. Once the project proposed to the Towns has received all relevant permits and approvals, it will proceed to the construction period. At that time, the project will be managed on-site by a Project Manager and Site Superintendent on groSolar's construction team whom are dedicated to the project.

Previous Experience

Overview of Experience

groSolar's portfolio of constructed projects is constantly growing. Our team has constructed thousands of projects across the country including projects for ESPN, the National Aquarium, major pharmaceuticals companies, investor owned and Municipal Utilities, and financial institutions. The sections below detail projects with similarities to this proposed project and represent some of groSolar's most significant accomplishments to date. If the you would like any further detail on any specific project including a specific reference, we are happy to provide this information. Note that groSolar was the lead developer and/or EPC contractor for each of these projects.

Solar Experience for Utilities

groSolar is an industry leader at constructing distributed generation solar PV projects serving and supplying utility companies – both large and small. Recently, we have constructed projects serving several of Municipal Utility Companies in the North East, Green Mountain Power, and Constellation Energy. We are currently developing and/or building projects for Oklahoma Gas and Electric, Green Mountain Power, the Lansing (MI) Board of Water and Light, and JEA (Jacksonville, FL). Additionally, our team has constructed projects owned by utilities and energy services companies throughout the country including Green Mountain Power, Integrys Energy Services, Duke Energy, and INDU.

Project Name	Utility Company	Size (kW)	Type	Cost ($)	Financing	Completion
Riverside Solar Partners	National Grid (RI)	4,999	GM	$8.15 MM	Third Party	Under Contract and Under Development; Construction 2017
Delta Solar Power	Lansing Board of Water and Light (MI)	29,280	SAT	$40.0MM	Third Party	Under Contract and Under Development; Construction Late 2016
Northwest Jacksonville Solar Partners	JEA (FL)	9,453	SAT	$15.7 MM	Third Party	Under Construction
Flambeau Solar Partners	Dairyland Power (WI)	3,270	SAT	$5.1 MM	Third Party	Under Construction
GMP Portfolio	Green Mountain Power (VT)	29,970	SAT and GM	$49.0MM	Partnership Flip with Utility and Tax Equity Provider	Under Construction

Marion County Solar	Indiana Power & Light (IN)	7,100	GM	$13.0MM	Third Party	December 2015
Mustang Solar	OG&E (OK)	3,300	GM and SAT	$6.2MM	Customer Owned	August 2015
Cambridge Solar	Constellation Energy (MD)	4,300	GM	$7.7MM	Third Party	June 2015
Yield Co Pair	Green Mountain Power (VT)	5,600	GM	$10.2MM	Third party	July 2015
Stafford Hill Landfill	Green Mountain Power (VT)	2,500	GM	$5.4MM	Customer Owned	December 2014
Templeton	Templeton Municipal Light and Water Plant (MA)	4,500	GM	$7.8MM	Third Party Financed	December 2014
Ashburnham	Ashburnham Municipal Electric Light Plant (MA)	4,000	GM	$8.3MM	Third Party Financed	March 2014
Lake County Solar	NIPSCO (IN)	5,400	GM	$11.7MM	Third Party Finance	September 2013
Berkley East	Taunton Municipal Light Plant (MA)	3,900	GM	$9.0MM	Third Party Financed	Aug 2013
Sterling	Sterling Municipal Light Department (MA)	2,400	GM	$5.8MM	Third Party Financed	March 2013

Keystone Solar	Exelon	6,000	GM	$15.6	Third Party Financed	September 2012
Camden Solar Center	CCMUA (NJ)	1,800	Custom	$7.0MM	Third Party Financed	July 2012

Experience at Environmentally Sensitive Sites

groSolar is also one of the industry leading experts at developing projects at challenging sites including landfills, brownfields, waste water treatment plants, and other underutilized sites. Our staff has managed the capping of more than 300 acres of landfills and has extensive experience on waste disposal sites and Superfund sites. groSolar has overcome substantial hurdles in projects using innovative solutions to deploy solar systems at challenging sites.

Entity	Size (MW)	State	Completion	Challenges
Tannery Road Landfill	2.8	NY	2016	Capped Landfill with a challenging National Grid interconnection
Rome Steel Solar	2.8	NY	2016	Brownfield with a unique National Grid interconnection
Stafford Hill Landfill	2.5	VT	Dec-14	Capped landfill with 4 MW of storage
Ashburnham Municipal Light Plant	4.0	MA	Mar-14	Rocky terrain requiring extensive civil work and planning
Taunton Municipal Lighting Plant	3.9	MA	Aug-13	Rocky terrain, adjacent to protected turtle habitat and cranberry bogs
Northern Indiana Public Service Company	5.4	IN	Sept-13	System designed with concrete ballast to reduce soil disturbance, built adjacent to existing wetlands and waterways
Sterling Municipal Light Department	2.4	MA	Mar-13	Built on a former hayfield, installation with little environmental disturbance
Camden County Municipal Utility Authority	1.8	NJ	Jun-12	Constructed over operating wastewater tanks at a wastewater treatment facility
Clean Harbors Landfill	1.5	NJ	May-11	Built on a capped landfill with working pumping facility on site

References

We have provided a summary table below of customer and project references for your benefit in evaluating groSolar's experience and credentials. If there are any issues reaching one of the references, please contact our team and we will facilitate an introduction on your behalf. The contact information is sensitive; please use with discretion.

1. Reference Project No. 1 – Stafford Hill Landfill Project	
Reference Contact Information:	Kirk Shields, Director of Business Development (Energy Innovation), Green Mountain Power, (802) 770-4246
Location:	City of Rutland, VT
Project Start Date:	July 2014
Project In Service Date:	December 2014
Project Rated Capacity:	2.51 MWdc
Total Project Value:	$5.4 MM (solar PV scope only)
Major Equipment Manufacturers:	Modules: Suniva Racking: Patriot Solar (ballasted GM) Inverters: Dynapower
Approximate Project Footprint:	10 Acres
Average Annual Output/Predicted Annual Output	Confidential; Full Year of Operational Data Not Available
Common Key Team Members between Projects	Jamie Resor, CEO Steve Remen, EVP of Business Development Rod Viens, EVP of Operations Frank Griffin, EVP of Engineering and Construction Jay Miller, PE, Director of Engineering Tom Lyman, Director of Project Management Pete Byron, Senior Site Superintendent

The Stafford Hill Landfill project is a 2.51 MW ballasted ground mount, utility scale micro-grid solar PV project constructed on the former Rutland City Landfill by groSolar for the utility Green Mountain Power. The project was recently awarded the PV America 2015 National Project of Distinction. The project incorporates 4MWh of battery storage and allows for advanced voltage regulation, peak shifting, and "islanding" and energy security in in emergency situations.

Reference Project No. 2 – Berkley East	
Reference Contact Information:	Michael Horrigan, General Manager, (508) 824-5844
Location:	Berkley, MA
Project Start Date:	May 2013
Project In Service Date:	August 2013
Project Rated Capacity:	3.88 MW
Total Project Value:	$9.0 MM
Major Equipment Manufacturers:	Modules: Canadian Solar Racking: Schletter (post driven GM) Inverters: Advanced Energy
Approximate Project Footprint:	24 Acres
Average Annual Output/Predicted Annual Output	System Performance Meets or Exceeds Predicted Output; Exact Performance Data Confidential per System Owner
Common Key Team Members between Projects	Jamie Resor, CEO Steve Remen, EVP of Business Development Rod Viens, EVP of Operations Frank Griffin, EVP of Engineering and Construction Jay Miller, PE, Director of Engineering Tom Lyman, Director of Project Management Pete Byron, Senior Site Superintendent

The Berkley East Solar Project is a 3.88 MW ground mount, utility scale solar PV project constructed by groSolar on the undeveloped and environmentally sensitive land located in Berkley, MA. The project is jointly owned by Canadian Solar and INDU Solar Holdings – a joint venture between subsidiaries of Duke Energy and Integrys Energy Services. The project is surrounded by cranberry bogs and turtle habitat and supplies power to the Taunton Municipal Lighting Plant (TMLP) via Power Purchase Agreement. TMLP is the largest municipal electric utility in the Commonwealth of Massachusetts.

Reference Project No. 3 – Sterling	
Reference Contact Information:	Sean Hamilton, General Manager, (978) 422-8267
Location:	Sterling, MA
Project Start Date:	October 2013
Project In Service Date:	December 2013
Project Rated Capacity:	2.4 MW
Total Project Value:	$5.8 MM
Major Equipment Manufacturers:	Modules: Canadian Solar Racking: Schletter (post driven GM) Inverters: Advanced Energy
Approximate Project Footprint:	24 Acres
Average Annual Output/Predicted Annual Output	System Performance Meets or Exceeds Predicted Output; Exact Performance Data Confidential per System Owner
Common Key Team Members between Projects	Jamie Resor, CEO Steve Remen, EVP of Business Development Rod Viens, EVP of Operations Frank Griffin, EVP of Engineering and Construction Jay Miller, PE, Director of Engineering Tom Lyman, Director of Project Management Pete Byron, Senior Site Superintendent

The Sterling Solar Project is a 2.4 MW ground mount, utility scale solar PV project constructed by groSolar on a former hayfield in Sterling, MA. The project was developed by Community Energy Solar and is jointly owned by Canadian Solar and INDU Solar Holdings – a joint venture between subsidiaries of Duke Energy and Integrys Energy Services. The project beat the odds of holiday schedules and both extreme rain and snow to be completed on an exceptionally tight schedule. The project supplies power to the Sterling Municipal Light Department via Power Purchase Agreement.

Credit and Financial Ability to Perform

groSolar maintains excellent credit terms with its suppliers and has sufficient bonding capability for projects in our target market. We are also able to assist with construction financing as needed and required for a given project. The table below summarizes our bonding capability.

Bonding Company	Metayer Bonding and Associates
Contact	Michael Metayer (800) 811-5557
Address of Bonding Company	200 Fisher Dr., Avon, CT 06001
Bonding Capacity Per Project ($)	$40 MM

Project Finance

groSolar and EDF RE are able to self-finance solar projects through Power Purchase Agreements and Leases. Our financing approach involves the use of our own capital as well as capital from a team of investment partners. Our investors on a particular project will vary as we conduct a competitive process in the selection of which investor fits a specific project most compatibly.

Our self-funding approach is geared towards providing the most competitive and lowest cost financing available. Some of our competitors do not have the ability to self-fund projects and must commit to one source of permanent financing in the early stages of the project, resulting in conditions unfavorable to the client and power prices that are not competitive. groSolar considers this a competitive advantage in that we are not overly reliant on one source of capital and can sometimes accommodate less-standard client requests in our project agreements.

groSolar has a team of project investment partners that are utilized in order to finance the long-term ownership of third party projects developed under a Power Purchase Agreement or Lease Structure. Our investors on a particular project will vary as we conduct a competitive process in the selection of which investor fits a specific project most compatibly.

Subcontractors

Much as the Towns of Bristol and Barrington go to RFP to establish the best proposal for its Solar Project, groSolar conducts a competitive subcontractor bid selection. As such, groSolar has not selected its subcontractor's for this project at this time. Our subcontractor selection process occurs only after bid ready construction drawings have been produced. Our subcontractor selection process is described below.

Subcontractor Selection Process

Our subcontractor selection process includes the following steps:

1. Request a list of potential subcontractors from the Towns; our team prefers to utilize subcontractors that are most familiar with our client's facility.
2. Refine the list into a group of prequalified subcontractors based on their qualifications, interest level, and operational availability.
3. Evaluate all prequalified subcontractors on the following criteria:
    a. Safety.
    b. MBE/WE status.
    c. Management team and capabilities.
    d. Experience working on similar projects and projects of similar scale.
4. Confirm that the shortlist of subcontractors is acceptable to the towns.
5. Confirm subcontractor scope and request competitive bids from shortlist subcontractors.
6. Select subcontractors and negotiate subcontractor contracts.

Potential Subcontractors and Qualifications

As the leading solar Developer and Construction contractor in the region, groSolar has well established relationships with local firms that will be selected to perform the subcontracted work. Several firms that we will consider for this project are listed below with short statements of qualification provided by the potential subcontractor.

Electrical Contractors

G & B Electrical Services – Serving NH, MA, ME, VT

G&B Electrical is a full service electrical contracting firm with over 40 years of experience, servicing Mass, NH, Maine and Vermont.

We specialize in utility and commercial solar installations in addition to a wide range of services in the commercial, healthcare and residential market sectors. Our team is dedicated to providing exceptional service and quality workmanship. We are equipped with a fleet of specialized vehicles and state of the art equipment allowing us to keep projects on schedule and on budget.

Peck Solar

A division of Peck Electrical Company, is committed to bringing you the best solar installations in Vermont. We are a full service solar contractor capable installing residential system to a multi-megawatt commercial or municipal system.

Racking Vendor & Installers

RBI Solar

We take single source responsibility to complete your solar racking installation project. With in-house project management and installation crews; this approach reduces duplication of efforts throughout the enterprise, focused on delivering projects on time and within budget.

With experience of completing multiple solar installations for commercial, institutional and utility customers, RBI Solar is the most trusted name when it comes to solar racking installation. Our highly-trained project managers and solar installation crews work with your on-site engineers to install custom engineered solar racking systems in record time. Intelligently designed modular components enable us to save both solar racking installation time and labor cost on your project.

Evergreen Solar Services

Evergreen Solar Services is a team of solar industry professionals dedicated to providing high quality and innovative service to maximize your solar project ROI and achieve the lowest LCOE. We have applied our 40 years of experience from the electrical and general construction industries to provide excellence in solar development and construction services. We are proud of our long list of satisfied customers and numerous repeat customers who have placed their trust in our ability to deliver high quality solar projects at competitive rates.

With over 135 MW of ground mounted PV installations, Evergreen's philosophy of providing dedicated, high quality, and innovative service permeates throughout our organization. We have developed proven methods for solar project construction, management, quality control, and safety resulting in a continuous run of successful projects that have been delivered on time and on budget.

Operations and Maintenance

As a full-service project developer and Engineering, Procurement, and Construction (EPC) Contractor, groSolar provides ongoing Operations and Maintenance (O&M) servicing for the majority of projects that it constructs and develops. The PPA pricing for this project includes the ongoing operations and maintenance of the project. Please find a summary of active projects under groSolar's Operations and Maintenance program attached as Appendix F.

groSolar Asset Management

groSolar's Asset Management division is headquarter in our Columbia, MD office. In this office, we have the capability to monitor all aspects of system performance and dispatch both regional and local area operational and maintenance personal as needed.

Standard Operation and Maintenance Activities

While groSolar tailors the Operation & Maintenance services of a project to meet each individual project's unique characteristics, the table below describes the standard level of service for most projects.

Item	**Service Description**	Frequency / Response Time
1	Monitoring of the solar system from a control point through internet connection: Including the setup of alarm points for abnormal inverter shutdowns / faults	Daily (minimum 5 days per week)
2	Remote response to inverter / system faults and remote inverter resets when the fault is understood	As needed. Initial remote response: Same business day
3	On-site response to inverter / system faults when a resolution cannot be accomplished remotely. This extends past inverter issues to include open circuit, shorted cabling, opened/blown fuse scenarios, tracker problems including gear box and motor replacements, and grounding issues. Prior to site visits by groSolar or groSolar subcontractors, clear and safe access to the array and PV equipment must be provided by others, including, but not limited to snow clearing, vegetation removal, and gate and fence maintenance as needed.	As needed. Initial remote response within 48 hours of fault / problem. Once it is determined that an on-site response is required: next business day
4	Response to warranty claim items.	As needed. Initial response within 48 hours of fault / problem.
5	Coordinate with the Utility to safely turn off the solar system for Utility provided maintenance, repair and or replacement of utility equipment. Safely reactivate the system after Utility has completed their work and confirmed the system can be reactivated.	Annually

	Preventive Maintenance	
6	Visually inspect entire solar system: Record, correct, apparent problems.	Annually
7	Visually inspect solar panels: Record if panels are properly affixed in racking system, correct if panels are not firmly affixed.	Annually
8	Visually inspect overall racking structure connections (including lateral links).	Annually
9	Visually inspect racking foundation and Powerstation foundations	Annually
10	Visually test for grounding continuity between frames and racking structure on a sampling of PV panels. Visually inspect for corrosion at grounding wire connection.	Annually
11	Inspect weather station components and verify operation with operations center.	Annually
12	Verify the points where array wiring enters into conduit are secure, sealed to prevent rain from entering and free of abrasion on the wire insulation.	Annually
13	Check connections within combiner boxes. Verify combiner boxes are free of water/moisture.	Annually
14	Verify DC means of disconnection are free of damage, corrosion or arc evidence and that they open and close freely.	Annually
15	Verify AC means of disconnection are free of damage, corrosion or arc evidence and that they open and close freely.	Annually
16	Test each string for proper short circuit current (Isc) and open circuit voltage (Voc) using IV Trace test.	Annually
17	Verify conduit is structurally supported and secured.	Annually
18	Verify conduit junctions and box connectors are secure and sealed.	Annually
19	Coordinate with inverter manufacturer so that its annual service obligations are undertaken (e.g. replacement of the air inlet filters on the inverters, cleaning of air intakes at powerstations, check power capacitors for signs of damage, charging resistors at inverters).	Annually or as recommended in O&M Manual
20	Inspect and clean the inside of the inverter for dirt deposits and water penetrations. Seal penetrations if found.	Annually
21	Inspect all cooling fans, test for functionality, replace if warranted.	Annually

22	Check the condition of AC and DC surge suppressors	Annually
23	Measure and record phase to phase input voltages and currents by means of inverter data and DAS.	Annually
24	Measure the output of all power supplies to be within tolerances.	Annually
25	Record and clear all faults on the inverters.	As needed
26	Verify the operation of the ground fault monitor at each inverter	Annually
27	Check fuses for open or signs of heating (inverter and string combiners). Inverters by inverter manufacturer technician. String combiners by Operator.	Annually
28	Inspect sub-assemblies, and major components including powerstation electrical equipment, walls, floor, ceiling, lights, doors, etc. Empty water in oil containment compartment through drain valve and inspect inside of tank through clean out openings. Clean inside of powerstations as needed	Annually
29	Mowing of grass and weed control, erosion and sediment control and module washing is **excluded**. groSolar will provide notice to system owner at the time of annual onsite inspections if array vegetation or site improvements (roads, fencing, etc.) require maintenance. Observations of the appearance/soiling level of the modules will also be provided.	Annually
30	Identify deficiencies that could affect production, equipment operability, or be reasonably expected to cause an unsafe condition at the Site. Report such deficiencies to Owner Representative to determine resolution.	As needed.
	Exclusions	
31	Mowing and vegetation maintenance	Excluded
32	Module washing and cleaning of powerstation exterior walls	Excluded
33	Powerstation roof maintenance	Excluded
34	Access drive and fence maintenance	Excluded
35	Maintenance of any Utility or Telecommunications Company equipment	Excluded
	Reporting	
36	Provide quarterly reports, each describing:	Quarterly

	• performance results of system compared to production estimates • maintenance providing during the quarter • inspection logs/reports for quarter • summary of upcoming scheduled maintenance	
37	Company shall provide to System Manager a copy of Legal Documents which may include: • Site Lease Agreement • Power Purchase Agreement • Other documents required by System Manager	Prior to execution of this Agreement

Appendix A

TERMS AND CONDITIONS

ASSIGNMENT OF RIGHTS OR OBLIGATIONS. Except as noted hereunder, Successful Bidder may not assign, transfer or sell any rights or obligations resulting from this solicitation without first obtaining the specific written consent of the Town of Bristol and/or the Town of Barrington.

ATTORNEY FEES. In the event a suit or action is instituted in connection with any controversy arising out of this contract, the prevailing party shall be entitled to receive, in addition to its costs, such sum as the court may adjudge reasonable as to attorney's fees and costs.

AUTHORITY OF THE TOWN. Subject to the power and authority of the Town as provided by law in this contract, the Town shall in all cases determine the quantity, quality, and acceptability of the work, materials and supplies for which payment is to be made under this contract. The Town of Bristol or the Town of Barrington shall decide the questions that may arise relative to the fulfillment of the contract or the obligations of the contractor hereunder.

Cancellation without cause by Town is subject to review; may be accepted in limited circum-stances.

CANCELLATION OF THE CONTRACT. [***Without cause***, the Town of Bristol and/or the Town of Bristol may cancel this contract at any time with thirty- (30) days written notice to the supplier/contractor.] ***With cause***, the Town of Bristol and/or the Town of Barrington may cancel this contract at any time with ten- (10) days written notice to the Bidder. Cancellation for cause shall be at the discretion of the Town of Bristol and shall be, but is not limited to, failure to supply the materials, or service specified within the time allowed or within the terms, conditions or provisions of this contract. [The successful Bidder may not cancel this contract without prior written consent of the Town of Bristol Town Administrator and/or the Town of Barrington Town Administrator.]

Contractor may require limited right to cancel contract prior to con-struction based on due diligence, permitting, and similar, including inability to finance due to such matters.

CHANGES IN WORK. The Town of Bristol or the Town of Barrington may, at any time work is in progress, by written order, make alterations in the terms of work as shown in the specifications, require the performance of extra work, decrease the quantity of work, or make such other changes as the Town may find necessary or desirable. The Contractor shall not claim forfeiture of contract by reasons of such changes by the Town. Changes in work and the amount of compensation to be paid to the Contractor for any extra work as so ordered shall be determined upon mutual agreement with Contractor.

COMPLIANCE WITH OR DEVIATION FROM SPECIFICATIONS. Bidder hereby agrees that the material, equipment or service offered will meet all the requirements of the specifications in this solicitation unless deviations from them are clearly indicated in the Bidder's response**.** Bidder may submit an attachment entitled "Exceptions to Specifications", which must be signed by Bidder's authorized representative. An explanation must be made for each item in which an exception is taken, giving in detail the extent of the exception and the

reason for which it is taken. Bids failing to comply with this requirement will be considered non-responsive. Submittal of brochure or other manufacturer literature is desirable but may not be a substitution for this requirement.

CONTRACT INCORPORATION. This contract embodies the entire contract between the Town of Bristol and the Contractor and between the Town of Barrington and the Contractor. The parties shall not be bound by or be liable for any statement, representation, promise, inducement or understanding of any kind or nature not set forth herein. No changes, amendments, or modifications of any of the terms or conditions of the contract shall be valid unless reduced to writing and signed by both parties. The complete contract shall include the entire contents of the Bid solicitation, all addenda, all of Bidder's successful submittal, supplemental agreements, change orders, performance bond(s), and any and all written agreements which alter, amend or extend the contract.

FORMATION OF CONTRACT. Bidder's signed Bid and Town of Bristol's and/or Town of Barrington's written acceptance shall constitute a binding contract. ***The Town's may elect to choose the same respondent, or different respondent, or reject all respondentss.***

LAWS GOVERNING CONTRACT. This contract shall be in accordance with the laws of the State of Rhode Island and Providence Plantations. The parties stipulate that this contract was entered into in the County of Bristol, in the State of Rhode Island and Providence Plantations. The parties further stipulate that the County of Bristol, Rhode Island, is the only appropriate forum for any litigation resulting from a breach hereof or any questions risen here from.

SEVERABILITY. If any provisions, or portion of any provision, of this contract are held invalid, illegal or unenforceable, they shall be severed from the contract and the remaining provisions shall be valid and enforceable.

SPECIFICATIONS, CHANGES TO. The parties shall not be bound by or be liable for any statement, representation, promise, inducement or understanding of any kind or nature not set forth herein or by written amendment. No changes, amendments, or modifications of any of the terms or conditions of the specification shall be valid unless reduced to writing and signed by both parties.

SPECIFICATIONS, DEFINITION. The term "specification" or "Bid specification" as used in this solicitation shall be interpreted to mean all the pages that make up this solicitation.

Appendix B

Miniturn Farm Landfill Project (No Prevailing Wage)

Generation	Year	Credit Value	Cost to Towns	Value	Cost	Savings
8,963,000	1	$ 0.16665	$ 0.08550	$ 1,493,648	$ 766,337	$ 727,312
8,918,185	2	$ 0.17165	$ 0.08550	$ 1,530,765	$ 762,505	$ 768,260
8,873,594	3	$ 0.17679	$ 0.08550	$ 1,568,805	$ 758,692	$ 810,112
8,829,226	4	$ 0.18210	$ 0.08550	$ 1,607,790	$ 754,899	$ 852,891
8,785,080	5	$ 0.18756	$ 0.08550	$ 1,647,743	$ 751,124	$ 896,619
8,741,155	6	$ 0.19319	$ 0.08550	$ 1,688,690	$ 747,369	$ 941,321
8,697,449	7	$ 0.19898	$ 0.08550	$ 1,730,653	$ 743,632	$ 987,022
8,653,962	8	$ 0.20495	$ 0.08550	$ 1,773,660	$ 739,914	$ 1,033,747
8,610,692	9	$ 0.21110	$ 0.08550	$ 1,817,736	$ 736,214	$ 1,081,522
8,567,638	10	$ 0.21744	$ 0.08550	$ 1,862,906	$ 732,533	$ 1,130,373
8,524,800	11	$ 0.22396	$ 0.08550	$ 1,909,200	$ 728,870	$ 1,180,329
8,482,176	12	$ 0.23068	$ 0.08550	$ 1,956,643	$ 725,226	$ 1,231,417
8,439,765	13	$ 0.23760	$ 0.08550	$ 2,005,266	$ 721,600	$ 1,283,666
8,397,566	14	$ 0.24473	$ 0.08550	$ 2,055,097	$ 717,992	$ 1,337,105
8,355,579	15	$ 0.25207	$ 0.08550	$ 2,106,166	$ 714,402	$ 1,391,764
8,313,801	16	$ 0.25963	$ 0.08550	$ 2,158,504	$ 710,830	$ 1,447,674
8,272,232	17	$ 0.26742	$ 0.08550	$ 2,212,143	$ 707,276	$ 1,504,867
8,230,871	18	$ 0.27544	$ 0.08550	$ 2,267,115	$ 703,739	$ 1,563,375
8,189,716	19	$ 0.28370	$ 0.08550	$ 2,323,452	$ 700,221	$ 1,623,232
8,148,768	20	$ 0.29221	$ 0.08550	$ 2,381,190	$ 696,720	$ 1,684,471

Savings Total $ 23,477,078

NEC Credit Value (Small Commercial C-06)

	Supply	$ 0.0973560
7/1/15:12/31/15	$ 0.116590	
4/1/15:6/30/15	$ 0.115680	
1/1/15:3/31/15	$ 0.086910	
4/1/16:9/30/16	$ 0.08364	
10/1/16:3/31/17	$ 0.083960	
	D & T	
Distribution	$ 0.038550	$ 0.069290
Transmission	$ 0.025660	
Transition	$ 0.005080	
		$ 0.16665

Miniturn Farm Landfill Project (Prevailing Wage)

Generation	Year	Credit Value	Cost to NBC	Value	Cost	Savings
8,963,000	1	$ 0.16665	$ 0.0910	$ 1,493,648	$ 815,633	$ 678,015
8,918,185	2	$ 0.17165	$ 0.0910	$ 1,530,765	$ 811,555	$ 719,210
8,873,594	3	$ 0.17679	$ 0.0910	$ 1,568,805	$ 807,497	$ 761,308
8,829,226	4	$ 0.18210	$ 0.0910	$ 1,607,790	$ 803,460	$ 804,330
8,785,080	5	$ 0.18756	$ 0.0910	$ 1,647,743	$ 799,442	$ 848,301
8,741,155	6	$ 0.19319	$ 0.0910	$ 1,688,690	$ 795,445	$ 893,244
8,697,449	7	$ 0.19898	$ 0.0910	$ 1,730,653	$ 791,468	$ 939,186
8,653,962	8	$ 0.20495	$ 0.0910	$ 1,773,660	$ 787,511	$ 986,150
8,610,692	9	$ 0.21110	$ 0.0910	$ 1,817,736	$ 783,573	$ 1,034,163
8,567,638	10	$ 0.21744	$ 0.0910	$ 1,862,906	$ 779,655	$ 1,083,251
8,524,800	11	$ 0.22396	$ 0.0910	$ 1,909,200	$ 775,757	$ 1,133,443
8,482,176	12	$ 0.23068	$ 0.0910	$ 1,956,643	$ 771,878	$ 1,184,765
8,439,765	13	$ 0.23760	$ 0.0910	$ 2,005,266	$ 768,019	$ 1,237,247
8,397,566	14	$ 0.24473	$ 0.0910	$ 2,055,097	$ 764,179	$ 1,290,918
8,355,579	15	$ 0.25207	$ 0.0910	$ 2,106,166	$ 760,358	$ 1,345,808
8,313,801	16	$ 0.25963	$ 0.0910	$ 2,158,504	$ 756,556	$ 1,401,948
8,272,232	17	$ 0.26742	$ 0.0910	$ 2,212,143	$ 752,773	$ 1,459,370
8,230,871	18	$ 0.27544	$ 0.0910	$ 2,267,115	$ 749,009	$ 1,518,105
8,189,716	19	$ 0.28370	$ 0.0910	$ 2,323,452	$ 745,264	$ 1,578,188
8,148,768	20	$ 0.29221	$ 0.0910	$ 2,381,190	$ 741,538	$ 1,639,652

Savings Total $ 22,536,604

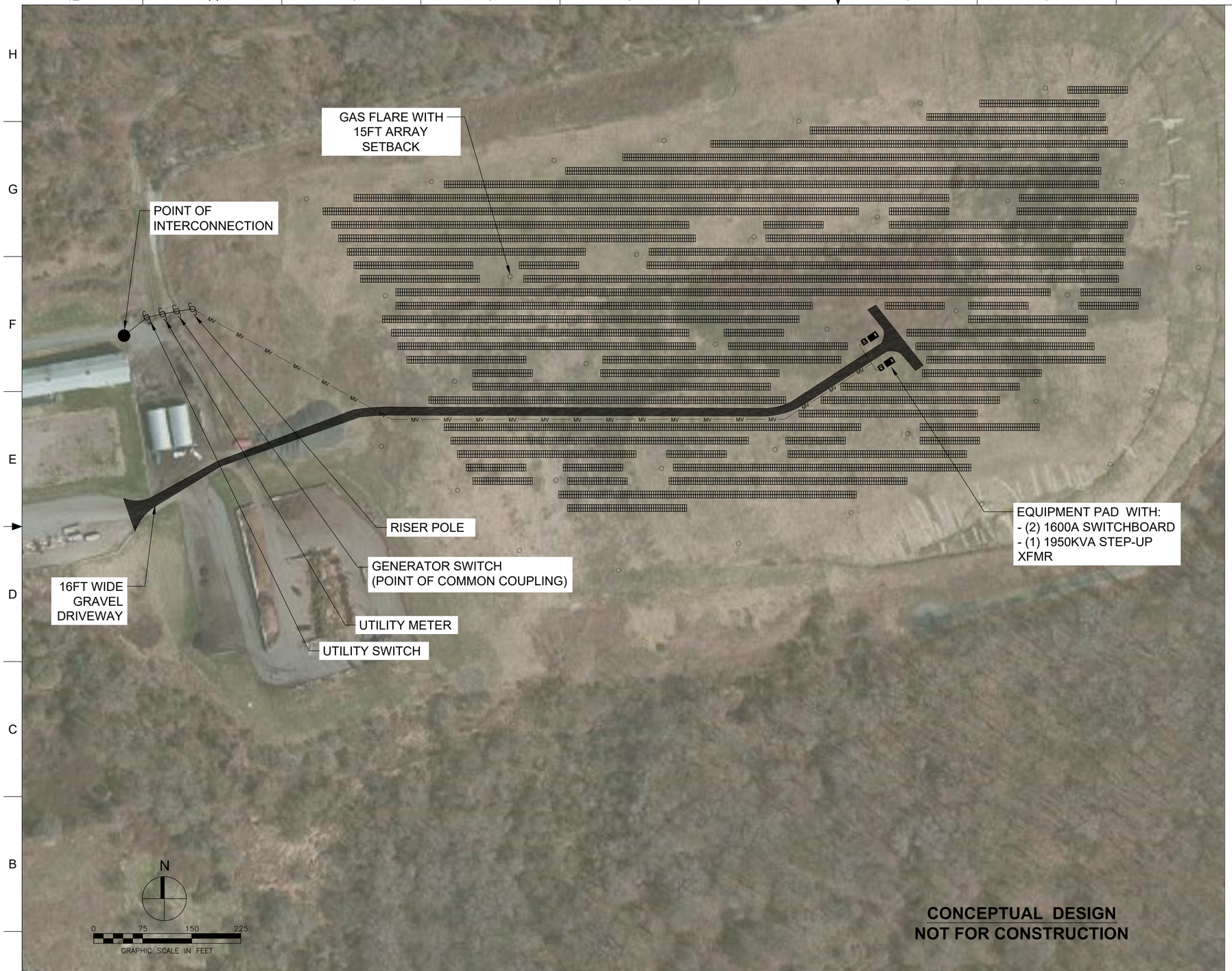
NEC Credit Value (Small Commercial C-06)

	Supply	$ 0.0973560
7/1/15:12/31/15	$ 0.116590	
4/1/15:6/30/15	$ 0.115680	
1/1/15:3/31/15	$ 0.086910	
4/1/16:9/30/16	$ 0.08364	
10/1/16:3/31/17	$ 0.083960	
	D & T	
Distribution	$ 0.038550	$ 0.069290
Transmission	$ 0.025660	
Transition	$ 0.005080	
		$ 0.16665

*groSolar Retains RECs

**Assumes 3% Utility Rate Escalation per annum

Appendix C



SYSTEM SUMMARY	
AXIS AZIMUTH	180°
ARRAY TILT	20°
MODULE WATTAGE (W)	360
NUMBER OF MODULES	13,824
NUMBER OF MODULES PER STRING	18
NUMBER OF STRINGS	768
RATED DC POWER (kWp)	4,976.6
RATED AC POWER (kWAC)	3840

LEGEND

SYMBOL	DESCRIPTION
OE	EXISTING OVERHEAD CIRCUITS
	PROPOSED 16FT GRAVEL DRIVEWAY
	PROPOSED PROJECT FENCE
AC	PROPOSED AC CONDUIT TRENCHING PATH

CONCEPTUAL LAYOUT
NOT FOR CONSTRUCTION

NOTES

1. SITE SPECIFIC FACTORS SUCH AS: TOPOGRAPHY, SHADING, ACCESS DRIVES, DRAINAGE, EXISTING BUILDINGS, PV EQUIPMENT, PAD LOCATIONS, AND OR UTILITY INTERCONNECTION AREA COULD CHANGE THE FINAL ARRAY LAYOUT AND POWER OUTPUT.
2. THE ARRAY ROW SPACING SHOWN WILL PREVENT SHADING BETWEEN 10AM-2PM ON DECEMBER 21ST.
3. FENCE LOCATION NEEDS TO BE DETERMINED AND IS EXCLUDED FROM GROSOLAR SCOPE OF WORK AS OF NOW.

REV	DESCRIPTION	DATE	RE	CHECKER
A	ISSUED FOR CONCEPTUAL LAYOUT (REG PROGRAM)	11-02-2016	AP	JMM

REVISIONS

PROJECT: BRISTOL LANDFILL SOLAR

LOCATION: 10 MINTUM FARM ROAD
BRISTOL, RI

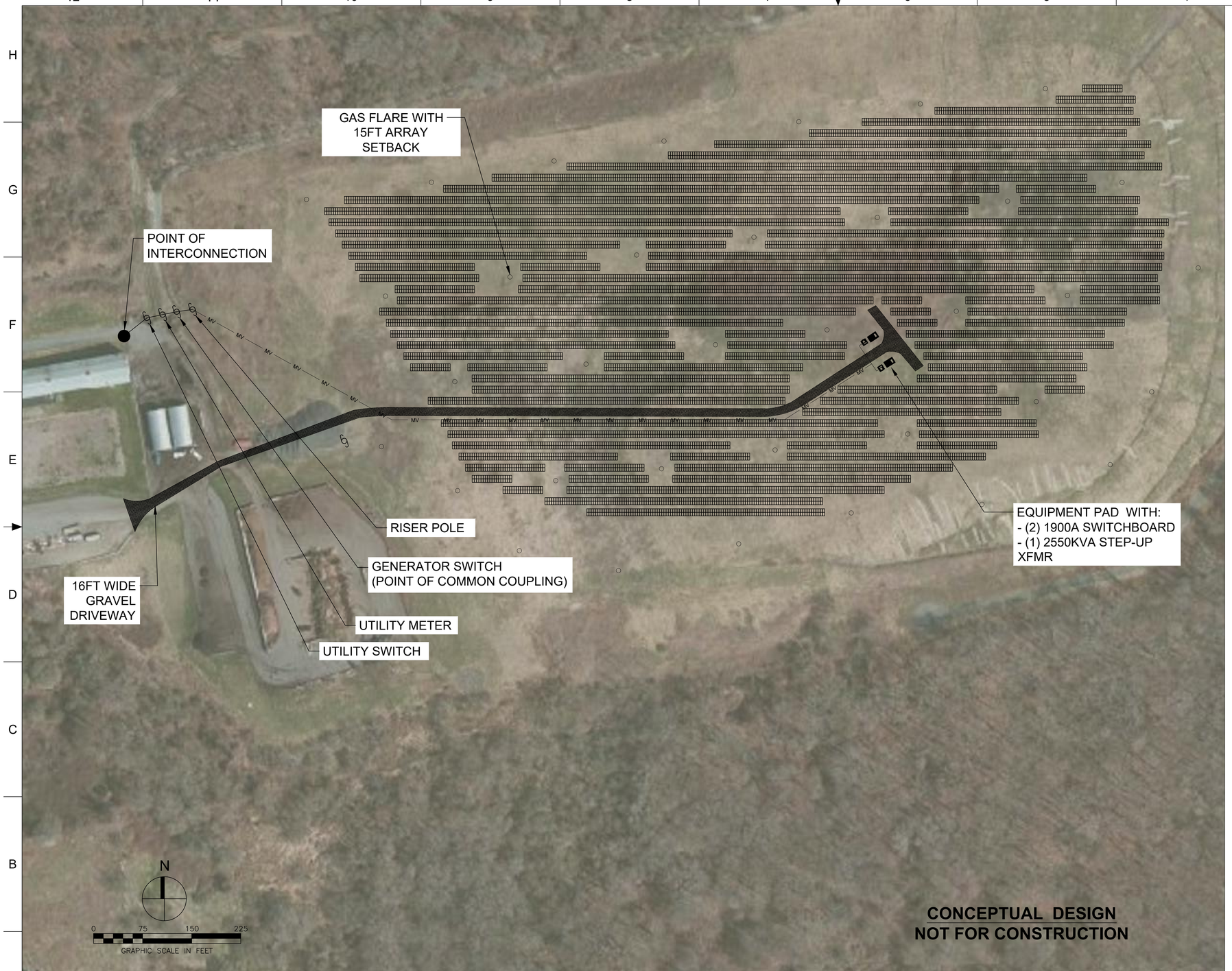
groSolar
AN EDF RENEWABLE ENERGY COMPANY
9175 GUILFORD ROAD, SUITE #202
COLUMBIA, MD 21046
800-374-4494
INFO@GROSOLAR.COM

THIS DRAWING AND SPECIFICATIONS CONTAINED HEREON IS PROPRIETARY TO GROSOLAR AND IS LOANED TO FACILITATE BIDDING, CONSTRUCTION, FABRICATION AND/OR EXECUTION OF REQUIREMENTS STATED AND IS TO BE SURRENDERED UPON REQUEST OR COMPLETION OF SERVICES

TITLE: CONCEPTUAL LAYOUT

SIZE	PROJECT NUMBER	DRAWING NUMBER	REV
D	TBD	E-1	A

DATE: 11-02-2016
SCALE: 1 IN = 75 IN
SHEET: 1 OF 1



SYSTEM SUMMARY	
AXIS AZIMUTH	180°
ARRAY TILT	15°
MODULE WATTAGE (W)	360
NUMBER OF MODULES	18,000
NUMBER OF MODULES PER STRING	18
NUMBER OF STRINGS	1000
RATED DC POWER (kWp)	6,480.0
RATED AC POWER (kWAC)	5000

LEGEND

SYMBOL	DESCRIPTION
OE	EXISTING OVERHEAD CIRCUITS
	PROPOSED 16FT GRAVEL DRIVEWAY
	PROPOSED PROJECT FENCE
AC	PROPOSED AC CONDUIT TRENCHING PATH

CONCEPTUAL LAYOUT
NOT FOR CONSTRUCTION

NOTES

1. SITE SPECIFIC FACTORS SUCH AS: TOPOGRAPHY, SHADING, ACCESS DRIVES, DRAINAGE, EXISTING BUILDINGS, PV EQUIPMENT, PAD LOCATIONS, AND OR UTILITY INTERCONNECTION AREA COULD CHANGE THE FINAL ARRAY LAYOUT AND POWER OUTPUT.
2. THE ARRAY ROW SPACING SHOWN WILL PREVENT SHADING BETWEEN AT 12PM ON DECEMBER 21ST.
3. FENCE LOCATION NEEDS TO BE DETERMINED AND IS EXCLUDED FROM GROSOLAR SCOPE OF WORK AS OF NOW.

REV	DESCRIPTION	DATE	RE	CHECKER
A	ISSUED FOR CONCEPTUAL LAYOUT (VIRTUAL NET METERING)	11-02-2016	AP	JMM

REVISIONS

PROJECT: BRISTOL LANDFILL SOLAR

LOCATION: 10 MINTUM FARM ROAD
BRISTOL, RI

groSolar
AN EDF RENEWABLE ENERGY COMPANY
9175 GUILFORD ROAD, SUITE #202
COLUMBIA, MD 21046
800-374-4494
INFO@GROSOLAR.COM

THIS DRAWING AND SPECIFICATIONS CONTAINED HEREON IS PROPRIETARY TO GROSOLAR AND IS LOANED TO FACILITATE BIDDING, CONSTRUCTION, FABRICATION AND/OR EXECUTION OF REQUIREMENTS STATED AND IS TO BE SURRENDERED UPON REQUEST OR COMPLETION OF SERVICES

TITLE: CONCEPTUAL LAYOUT

SIZE	PROJECT NUMBER	DRAWING NUMBER	REV
D	TBD	E-1	A

DATE: 11-02-2016
SCALE: 1 IN = 75 IN
SHEET: 1 OF 1

Appendix D

Grid-Connected System: Simulation parameters

Project : **RI Bristol Landfill**

Geographical Site	**Bristol Ri_sa_ghiavgmths**		Country	**United States**
Situation	Latitude	41.6°N	Longitude	71.3°W
Time defined as	Legal Time	Time zone UT-5	Altitude	18 m
	Albedo	0.20		
Meteo data:	**Bristol Ri_sa_ghiavgmths**	Solar Anywhere - TMY		

Simulation variant : **PVISheet Rev(A) (REG program)**

Simulation date 02/11/16 17h27

Simulation parameters

Collector Plane Orientation	Tilt	20°	Azimuth	0°
20 Sheds	Pitch	7.19 m	Collector width	4.00 m
Inactive band	Top	0.01 m	Bottom	0.01 m
Shading limit angle	Gamma	21.84 °	Occupation Ratio	55.6 %
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	**LG 360 N2W-B3_Rev2_5_LGUS**		
Custom parameters definition		Manufacturer	LG Electronics		
Number of PV modules		In series	18 modules	In parallel	768 strings
Total number of PV modules		Nb. modules	13824	Unit Nom. Power	360 Wp
Array global power		Nominal (STC)	**4977 kWp**	At operating cond.	4506 kWp (50°C)
Array operating characteristics (50°C)		U mpp	628 V	I mpp	7172 A
Total area		Module area	**27095 m²**	Cell area	24167 m²

Inverter	Model	**PVI 60TL Preliminary 5-20-16**		
Custom parameters definition	Manufacturer	Solectria Renewables		
Characteristics	Operating Voltage	300-850 V	Unit Nom. Power	60 kWac
Inverter pack	Nb. of inverters	64 units	Total Power	3840 kWac

PV Array loss factors

Array Soiling Losses

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
8.3%	3.4%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	0.93 mOhm	Loss Fraction	1.0 % at STC
Module Quality Loss			Loss Fraction	-0.8 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP

Grid-Connected System: Simulation parameters (continued)

Incidence effect, user defined profile

0°	20°	30°	40°	50°	60°	70°	80°	90°
1.00	1.00	1.00	1.00	1.00	0.99	0.93	0.76	0.00

System loss factors

AC wire loss inverter to transfo	Inverter voltage	480 Vac tri		
	Wires: 3x4000.0 mm²	250 m	Loss Fraction	2.0 % at STC
External transformer	Iron loss (24H connexion)	3915 W	Loss Fraction	0.1 % at STC
	Resistive/Inductive losses	0.6 mOhm	Loss Fraction	1.0 % at STC

User's needs : Unlimited load (grid)

Grid-Connected System: Main results

Project : **RI Bristol Landfill**

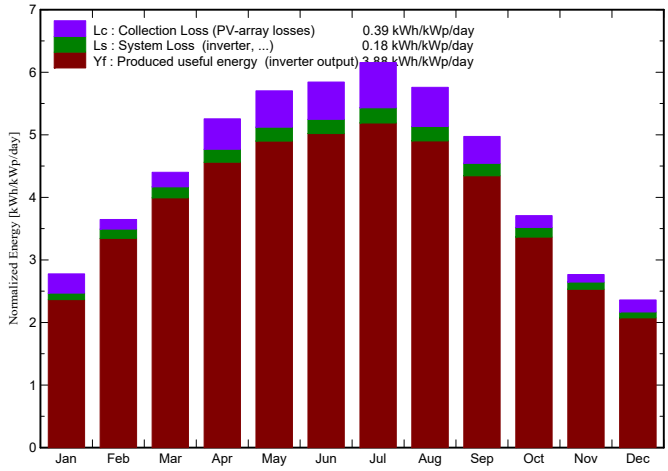
Simulation variant : **PVISheet Rev(A) (REG program)**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	Sheds disposition, tilt	20°	azimuth	0°
PV modules	Model	LG 360 N2W-B3_Rev2_5_LGUS		360 Wp
PV Array	Nb. of modules	13824	Pnom total	**4977 kWp**
Inverter	Model	PVI 60TL Preliminary 5-20-16		60.0 kW ac
Inverter pack	Nb. of units	64.0	Pnom total	**3840 kW ac**
User's needs	Unlimited load (grid)			

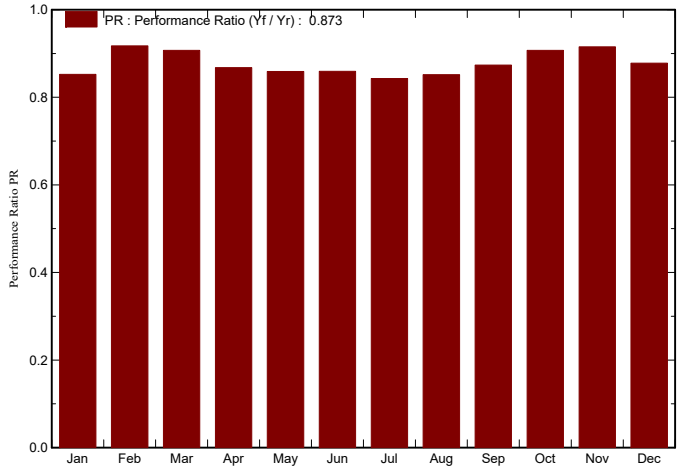
Main simulation results

System Production	**Produced Energy**	**7057 MWh/year**	Specific prod.	1418 kWh/kWp/year
	Performance Ratio PR	87.30 %		

Normalized productions (per installed kWp): Nominal power 4977 kWp



Performance Ratio PR



PVISheet Rev(A) (REG program)

Balances and main results

	GlobHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	EffArrR %	EffSysR %
January	58.9	-1.02	86.1	75.3	381.1	365.1	16.34	15.66
February	76.6	2.30	102.1	95.6	487.0	466.1	17.60	16.85
March	116.8	3.06	136.4	130.4	643.0	615.9	17.39	16.66
April	144.7	8.54	157.7	151.1	712.2	681.0	16.67	15.94
May	171.6	14.60	176.8	169.0	790.3	755.9	16.49	15.78
June	175.3	18.28	175.3	167.5	783.5	749.7	16.50	15.78
July	187.1	23.67	190.9	182.9	838.1	800.7	16.21	15.48
August	167.1	22.31	178.5	171.2	791.7	756.5	16.37	15.64
September	129.5	17.89	149.2	143.3	678.6	648.8	16.78	16.05
October	90.3	11.19	115.0	110.4	542.8	519.0	17.42	16.66
November	58.9	6.25	83.0	79.1	395.0	378.0	17.56	16.81
December	48.5	4.59	73.2	68.9	334.4	319.8	16.87	16.13
Year	1425.3	11.02	1624.2	1544.7	7377.8	7056.6	16.77	16.04

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

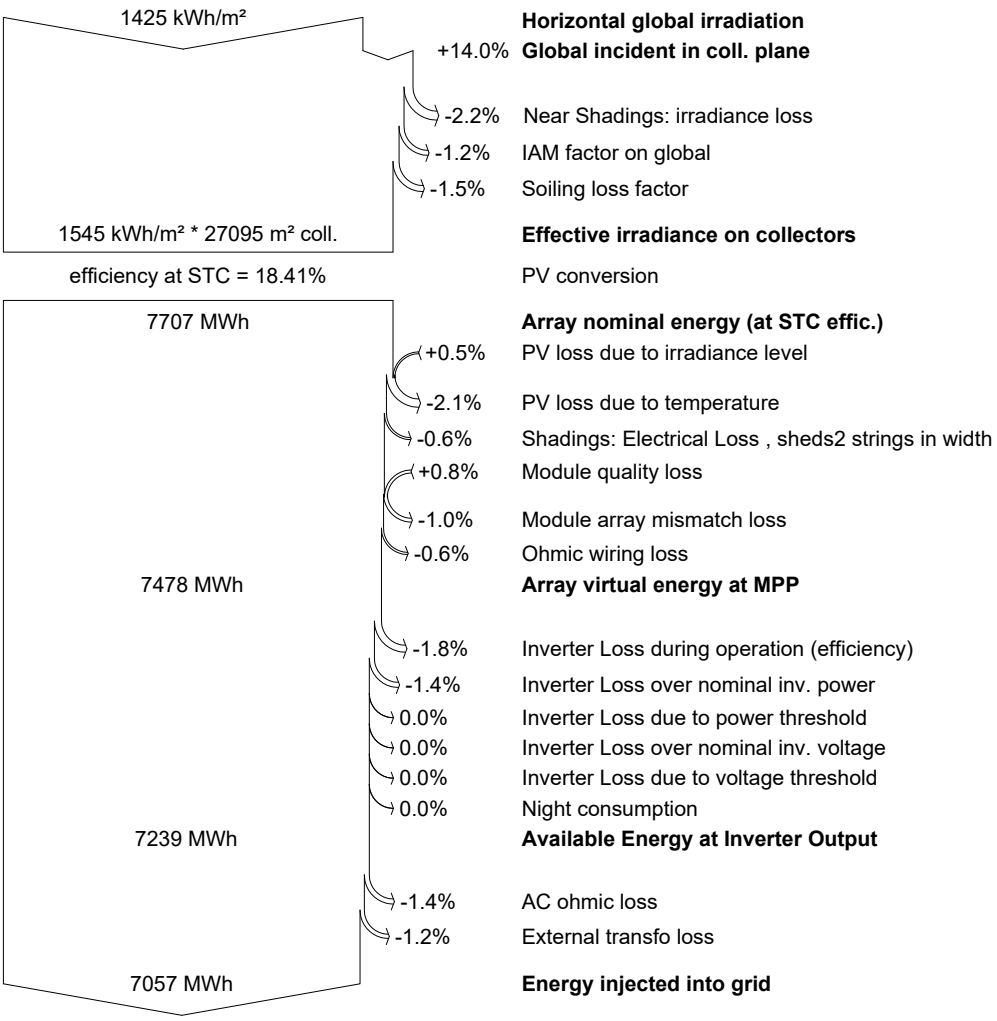
Grid-Connected System: Loss diagram

Project : **RI Bristol Landfill**

Simulation variant : **PVISheet Rev(A) (REG program)**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	Sheds disposition, tilt	20°	azimuth	0°
PV modules	Model	LG 360 N2W-B3_Rev2_5_LGUS		360 Wp
PV Array	Nb. of modules	13824	Pnom total	**4977 kWp**
Inverter	Model	PVI 60TL Preliminary 5-20-16		60.0 kW ac
Inverter pack	Nb. of units	64.0	Pnom total	**3840 kW ac**
User's needs	Unlimited load (grid)			

Loss diagram over the whole year



Grid-Connected System: Simulation parameters

Project : **RI Bristol Landfill**

Geographical Site	**Bristol Ri_sa_ghiavgmths**		Country	**United States**
Situation	Latitude	41.6°N	Longitude	71.3°W
Time defined as	Legal Time	Time zone UT-5	Altitude	18 m
	Albedo	0.20		
Meteo data:	**Bristol Ri_sa_ghiavgmths**	Solar Anywhere - TMY		

Simulation variant : **PVISheet Rev(A) (Virtual Net Metering)**

Simulation date 02/11/16 17h33

Simulation parameters

Collector Plane Orientation	Tilt	15°	Azimuth	0°
20 Sheds	Pitch	6.09 m	Collector width	4.00 m
Inactive band	Top	0.01 m	Bottom	0.01 m
Shading limit angle	Gamma	25.09 °	Occupation Ratio	65.7 %
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 Arrays Characteristics (2 kinds of array defined)

PV module	Si-mono	Model	**LG 360 N2W-B3_Rev2_5_LGUS**	
Custom parameters definition		Manufacturer	LG Electronics	
Sub-array "Sub-array #1"				
Number of PV modules	In series	18 modules	In parallel	960 strings
Total number of PV modules	Nb. modules	17280	Unit Nom. Power	360 Wp
Array global power	Nominal (STC)	**6221 kWp**	At operating cond.	5632 kWp (50°C)
Array operating characteristics (50°C)	U mpp	628 V	I mpp	8965 A
Sub-array "Sub-array #2"				
Number of PV modules	In series	18 modules	In parallel	40 strings
Total number of PV modules	Nb. modules	720	Unit Nom. Power	360 Wp
Array global power	Nominal (STC)	**259 kWp**	At operating cond.	235 kWp (50°C)
Array operating characteristics (50°C)	U mpp	628 V	I mpp	374 A
Total Arrays global power	Nominal (STC)	**6480 kWp**	Total	18000 modules
	Module area	**35280 m²**	Cell area	31467 m²

Sub-array "Sub-array #1" : Inverter	Model	**PVI 60TL Preliminary 5-20-16**		
Custom parameters definition	Manufacturer	Solectria Renewables		
Characteristics	Operating Voltage	300-850 V	Unit Nom. Power	60 kWac
Inverter pack	Nb. of inverters	80 units	Total Power	4800 kWac

Grid-Connected System: Simulation parameters (continued)

Sub-array "Sub-array #2" : Inverter	Model	**PVI 50TL Preliminary 5-20-16**		
Custom parameters definition	Manufacturer	Solectria Renewables		
Characteristics	Operating Voltage	300-850 V	Unit Nom. Power	50 kWac
Inverter pack	Nb. of inverters	4 units	Total Power	200 kWac
Total	Nb. of inverters	84	Total Power	5000 kWac

PV Array loss factors

Array Soiling Losses

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
9.2%	3.8%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%

Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Array#1	0.80 mOhm	Loss Fraction	1.0 % at STC
	Array#2	19 mOhm	Loss Fraction	1.0 % at STC
	Global		Loss Fraction	1.0 % at STC
Module Quality Loss			Loss Fraction	-0.8 %
Module Mismatch Losses			Loss Fraction	1.0 % at MPP

Incidence effect, user defined profile

0°	20°	30°	40°	50°	60°	70°	80°	90°
1.00	1.00	1.00	1.00	1.00	0.99	0.93	0.76	0.00

System loss factors

AC wire loss inverter to transfo	Inverter voltage	480 Vac tri		
	Wires: 3x4000.0 mm²	192 m	Loss Fraction	2.0 % at STC
External transformer	Iron loss (24H connexion)	5099 W	Loss Fraction	0.1 % at STC
	Resistive/Inductive losses	0.5 mOhm	Loss Fraction	1.0 % at STC

User's needs : Unlimited load (grid)

Grid-Connected System: Main results

Project : **RI Bristol Landfill**

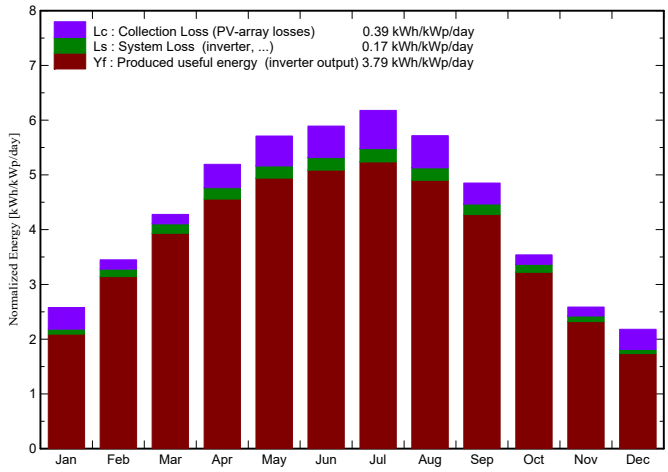
Simulation variant : **PVISheet Rev(A) (Virtual Net Metering)**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	Sheds disposition, tilt	15°	azimuth	0°
PV modules	Model	LG 360 N2W-B3_Rev2_5_LGUS		360 Wp
PV Array	Nb. of modules	18000	Pnom total	**6480 kWp**
Inverter	Model	PVI 60TL Preliminary 5-20-16		60.0 kW ac
Inverter	Model	PVI 50TL Preliminary 5-20-16		50.0 kW ac
Inverter pack	Nb. of units	84.0	Pnom total	**5000 kW ac**
User's needs	Unlimited load (grid)			

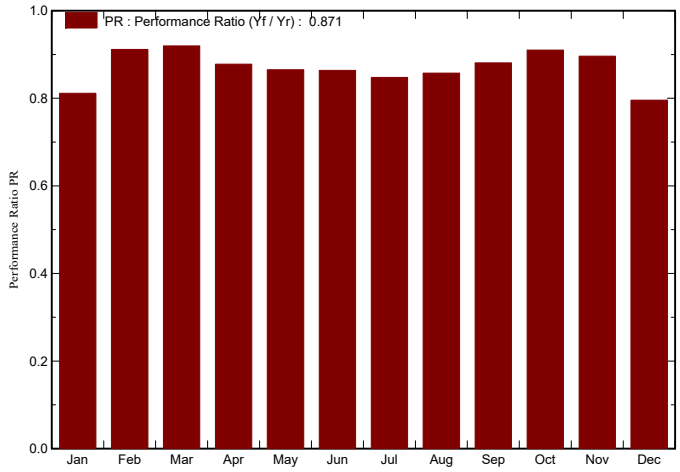
Main simulation results

System Production	**Produced Energy**	**8963 MWh/year**	Specific prod.	1383 kWh/kWp/year
	Performance Ratio PR	87.10 %		

Normalized productions (per installed kWp): Nominal power 6480 kWp



Performance Ratio PR



PVISheet Rev(A) (Virtual Net Metering)

Balances and main results

	GlobHor kWh/m²	T Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	EffArrR %	EffSysR %
January	58.9	-1.02	79.9	68.8	439	420	15.55	14.90
February	76.6	2.30	96.5	90.0	595	570	17.47	16.74
March	116.8	3.06	132.6	127.1	825	790	17.63	16.89
April	144.7	8.54	155.8	149.8	927	886	16.86	16.13
May	171.6	14.60	177.0	170.0	1038	993	16.61	15.89
June	175.3	18.28	176.7	169.6	1034	989	16.58	15.86
July	187.1	23.67	191.6	184.4	1101	1052	16.29	15.57
August	167.1	22.31	177.2	170.6	1030	985	16.48	15.75
September	129.5	17.89	145.6	140.2	869	831	16.92	16.18
October	90.3	11.19	109.7	105.5	676	647	17.46	16.72
November	58.9	6.25	77.6	73.7	471	451	17.19	16.46
December	48.5	4.59	67.6	62.8	364	348	15.27	14.62
Year	1425.3	11.02	1588.0	1512.5	9367	8963	16.72	16.00

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

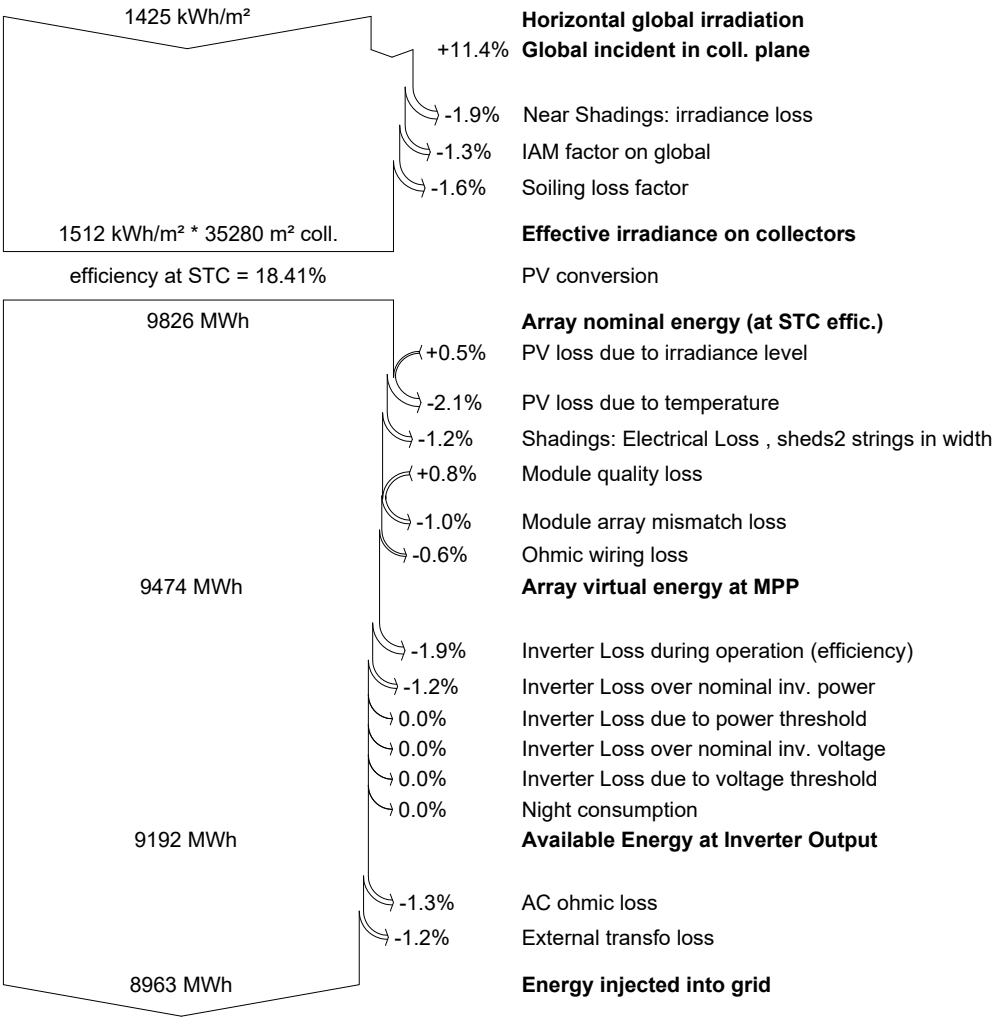
Grid-Connected System: Loss diagram

Project : **RI Bristol Landfill**

Simulation variant : **PVISheet Rev(A) (Virtual Net Metering)**

Main system parameters	System type	**Grid-Connected**		
PV Field Orientation	Sheds disposition, tilt	15°	azimuth	0°
PV modules	Model	LG 360 N2W-B3_Rev2_5_LGUS		360 Wp
PV Array	Nb. of modules	18000	Pnom total	**6480 kWp**
Inverter	Model	PVI 60TL Preliminary 5-20-16		60.0 kW ac
Inverter	Model	PVI 50TL Preliminary 5-20-16		50.0 kW ac
Inverter pack	Nb. of units	84.0	Pnom total	**5000 kW ac**
User's needs	Unlimited load (grid)			

Loss diagram over the whole year



Appendix E

Q.PLUS L-G4.2 330-340

Q.ANTUM SOLAR MODULE

The Q.ANTUM solar module Q.PLUS L-G4.2 with power classes up to 340 Wp is the strongest module of its type on the market globally. Powered by 72 Q CELLS solar cells Q.PLUS L-G4.2 was specially designed for large solar power plants to reduce BOS costs. Only Q CELLS offers German engineering quality with our unique triple Yield Security.

LOW ELECTRICITY GENERATION COSTS

Higher yield per surface area and lower BOS costs thanks to higher power classes and an efficiency rate of up to 17.4 %.

INNOVATIVE ALL-WEATHER TECHNOLOGY

Optimal yields, whatever the weather with excellent low-light and temperature behavior.

ENDURING HIGH PERFORMANCE

Long-term yield security with Anti-PID Technology[1], Hot-Spot-Protect and Traceable Quality Tra.Q™.

LIGHT-WEIGHT QUALITY FRAME

High-tech aluminum alloy frame, certified for high snow (5400 Pa) and wind loads (2400 Pa).

A RELIABLE INVESTMENT

Inclusive 12-year product warranty and 25-year linear performance guarantee[2].

EUPD RESEARCH TOP BRAND PV MODULES EUROPE 2015

Q CELLS YIELD SECURITY
- ANTI PID TECHNOLOGY (APT)
- HOT-SPOT PROTECT (HSP)
- TRACEABLE QUALITY (TRA.Q™)

Photon Q CELLS Best polycrystalline solar module 2013 Q.PRO-G2 235 151 modules tested

[1] APT test conditions: Cells at -1000 V against grounded, with conductive metal foil covered module surface, 25 °C, 168 h

[2] See data sheet on rear for further information.

THE IDEAL SOLUTION FOR:

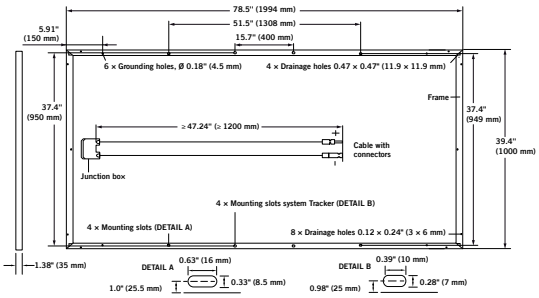
Ground-mounted solar power plants

Engineered in **Germany**

Q CELLS

MECHANICAL SPECIFICATION

Format	78.5 in × 39.4 in × 1.38 in (including frame) (1994 mm × 1000 mm × 35 mm)
Weight	52.9 lb (24 kg)
Front Cover	0.13 in (3.2 mm) thermally pre-stressed glass with anti-reflection technology
Back Cover	Composite film
Frame	Anodised aluminum
Cell	6 × 12 Q.ANTUM solar cells
Junction box	3.35-4.13 in × 2.36-3.15 in × 0.59-0.67 in (85-105 mm × 60-80 mm × 15-17 mm), Protection class ≥ IP67, with bypass diodes
Cable	4 mm² Solar cable; (+) ≥ 47.24 in (1200 mm), (-) ≥ 47.24 in (1200 mm)
Connector	Amphenol H4 UTX, IP68

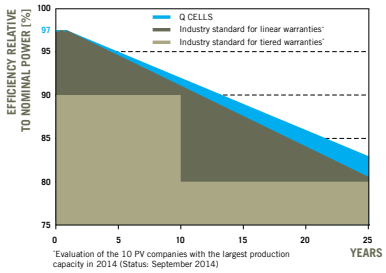


ELECTRICAL CHARACTERISTICS

POWER CLASS				330	335	340
MINIMUM PERFORMANCE AT STANDARD TEST CONDITIONS, STC[1] (POWER TOLERANCE +5 W / -0 W)						
Minimum	Power at MPP[2]	P_{MPP}	[W]	330	335	340
	Short Circuit Current*	I_{SC}	[A]	9.49	9.54	9.59
	Open Circuit Voltage*	V_{OC}	[V]	46.55	46.81	47.07
	Current at MPP*	I_{MPP}	[A]	8.91	8.97	9.03
	Voltage at MPP*	V_{MPP}	[V]	37.02	37.33	37.63
	Efficiency[2]	η	[%]	≥ 16.5	≥ 16.8	≥ 17.1
MINIMUM PERFORMANCE AT NORMAL OPERATING CONDITIONS, NOC[3]						
Minimum	Power at MPP[2]	P_{MPP}	[W]	244.7	248.4	252.1
	Short Circuit Current*	I_{SC}	[A]	7.65	7.69	7.73
	Open Circuit Voltage*	V_{OC}	[V]	43.44	43.68	43.92
	Current at MPP*	I_{MPP}	[A]	6.99	7.04	7.09
	Voltage at MPP*	V_{MPP}	[V]	35.01	35.29	35.56

[1] 1000 W/m², 25°C, spectrum AM 1.5 G [2] Measurement tolerances STC ± 3%; NOC ± 5% [3] 800 W/m², NOCT, spectrum AM 1.5 G * typical values, actual values may differ

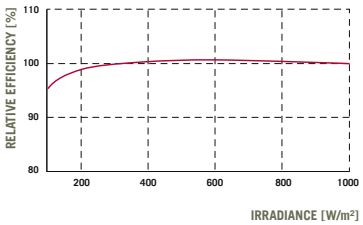
Q CELLS PERFORMANCE WARRANTY



At least 97 % of nominal power during first year. Thereafter max. 0.6 % degradation per year.
At least 92 % of nominal power after 10 years.
At least 83 % of nominal power after 25 years.

All data within measurement tolerances. Full warranties in accordance with the warranty terms of the Q CELLS sales organisation of your respective country.

PERFORMANCE AT LOW IRRADIANCE



Typical module performance under low irradiance conditions in comparison to STC conditions (25 °C, 1000 W/m²).

TEMPERATURE COEFFICIENTS

Temperature Coefficient of I_{SC}	α	[%/K]	+0.04	**Temperature Coefficient of V_{OC}**	β	[%/K]	−0.29
Temperature Coefficient of P_{MPP}	γ	[%/K]	−0.40	**Normal Operating Cell Temperature**	NOCT	[°F]	113 ± 5.4 (45 ± 3 °C)

PROPERTIES FOR SYSTEM DESIGN

Maximum System Voltage V_{SYS}	[V]	1500 (IEC) / 1500 (UL)	**Safety Class**	II
Maximum Series Fuse Rating	[A DC]	15	**Fire Rating**	C / TYPE 1
Max Load (UL)[2]	[lbs/ft²]	75 (3600 Pa)	**Permitted module temperature on continuous duty**	-40 °F up to +185 °F (-40 °C up to +85 °C)
Load Rating (UL)[2]	[lbs/ft²]	33 (1600 Pa)	[2] see installation manual	

QUALIFICATIONS AND CERTIFICATES

IEC 61215 (Ed. 2); IEC 61730 (Ed. 1), Application class A
This data sheet complies with DIN EN 50380.

C Certified US
UL 1703
(254141)

PACKAGING INFORMATION

Number of Modules per Pallet	29
Number of Pallets per 40' Container	22
Pallet Dimensions (L × W × H)	81.3 × 45.3 × 46.9 in (2065 × 1150 × 1190 mm)
Pallet Weight	1671 lbs (758 kg)

NOTE: Installation instructions must be followed. See the installation and operating manual or contact our technical service department for further information on approved installation and use of this product.

Hanwha Q CELLS USA Corp.
300 Spectrum Center Drive, Suite 1250, Irvine, CA 92618, USA | TEL +1 949 748 59 96 | WEB www.q-cells.com

Engineered in **Germany**

Specifications subject to technical changes © Hanwha Q CELLS Q.PLUS L-G4.2_330-340_2015-09_Rev03_NA

YASKAWA
SOLECTRIA SOLAR

3-PH TRANSFORMERLESS
STRING INVERTERS

PVI 50TL
PVI 60TL

FEATURES

- NEC 2014 compliant (arc fault and rapid shutdown)
- 3 MPPTs with 5 inputs each
- Integrated DC and AC disconnects
- AC terminals compatible with copper and aluminum conductors
- Modbus communications
- Internal data logger
- 0 - 90° installation orientation
- Remote firmware upgrades
- Remote diagnostics

OPTIONS

- H4 wiring box
- Shade cover
- DC combiners bypass
- Web-based monitoring

3-PH TRANSFORMERLESS STRING INVERTERS

Yaskawa - Solectria Solar's PVI 50TL and PVI 60TL are grid-tied, transformerless three-phase inverters designed for ground mount, rooftop and carport arrays and can be installed from 0 - 90 degrees. The PVI 50/60TL inverters are NEC 2014 compliant and are the most reliable, efficient and cost effective in their class. They come standard with AC and DC disconnects, three MPPTs, a 15-position string combiner, remote diagnostics, remote firmware upgrades and various protection features. Options include H4 wiring box, shade cover, DC combiner fuse bypass, and web-based monitoring.

SOLECTRIA.COM

SPECIFICATIONS	PVI 50TL	PVI 60TL
DC Input		
Absolute Maximum Open Circuit Voltage	1000 VDC	
Operating Voltage Range	200-950 VDC	
Max Power Input Voltage Range (MPPT)	480-850 VDC	540-850 VDC
MPP Trackers	3	
Maximum Operating Input Current	36 A per MPPT (108 A)	38 A per MPPT (114 A)
Maximum Available PV Current (Isc x 1.25)	60 A per MPPT (180 A)	
Maximum PV Power	75 kW (25 kW per MPPT)	90 kW (30 kW per MPPT)
Start Voltage	330 V	
AC Output		
Nominal Output Voltage	480 VAC, 3ø+/PE/N	
AC Voltage Range (Standard)	-12%/+10%	
Continuous Output Power	50 kW	60 kW
Maximum Output Current	61 A	73 A
Maximum Backfeed Current	0 A	
Nominal Output Frequency	60 Hz	
Output Frequency Range	57-63 Hz	
Power Factor	Unity, ›0.99 (adjustable 0.8 leading / 0.8 lagging)	
Total Harmonic Distortion (THD) @ Rated Load	‹ 3%	
Performance		
Peak Efficiency	99.0%	
CEC Efficiency	98.5%	
Tare Loss	‹ 2 W	
Ambient Temperature Range	-22°F to +140°F (-30°C to +60°C) Derating occurs over +122°F (+50°C)	
Storage Temperature Range	-40°F to +158°F (-40°C to +70°C)	
Relative Humidity (non-condensing)	0-95%	
Audible Noise	‹ 55 dBA @ 1 m at room temperature	
Operating Altitude	13,123 ft (4,000 m) Derating from 6,561 ft (2,000 m)	
Safety Listings & Certifications	UL 1741:2010, UL 1699B, CSA-C22.2 #107.1-01, IEEE1547; FCC PART15	
Testing Agency	CSA	
Mechanical		
15 Fused Positions (5 positions per MPPT)	15 A standard (20, 25, 30 A accepted*)	
AC/DC Disconnect	Standard, fully-integrated	
Enclosure Rating	Type 4X	
Enclosure Finish	Polyester powder coated aluminum	
Mounting Method	0-90˚ from horizontal (vertical, angled, flat)	
Dimensions (H x W x D)	39.4 x 23.6 x 10.24 in. (1,000 x 600 x 260 mm)	
Weight	Inverter: 123.5 lbs (56 kg); Wiring Box: 33 lbs (15 kg)	
Communications		
Data Logger Hardware	Standard, Internal	
SolrenView Monitoring Service	Optional	
Revenue Grade Meter/Monitoring	Optional, External	
Communication Interface	RS-485 Modbus RTU	
Remote Firmware Upgrades	Standard	
Remote Diagnostics	Standard	
Features & Protections		
Arc-Fault Detection	Standard	
Smart Grid Features	L/HVRT, L/HFRT, Soft Start, Volt-Var, Frequency-Watt and Volt-Watt	
Warranty		
Standard	10 year	
Optional	15, 20 year; extended service agreement	

*Yaskawa - Solectria Solar does not supply the optional fuses

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RBI SOLAR

Solar Mounting Systems

GROUND MOUNT

DESIGN • ENGINEERING • MANUFACTURING • INSTALLATION

www.rbisolar.com

RBI Solar designs, engineers, manufactures and installs solar mounting systems. This single-source responsibility is focused on delivering value throughout the solar value chain.

Features & Benefits

- **Custom engineered to specific site conditions**
- **High strength steel with corrosion protection**
- **Designed to minimize field installation labor**
  - Reduced number of posts compared to traditional racking
  - Follows contours to mitigate civil/site work
  - Same hardware throughout
  - Optional pre-assembly
- **Design and engineering at every step of the way**
  - In-house engineers
  - Stamped drawings including foundation
- **Pile driving test available**
- **Flexible to mount any module type**
- **Nationwide installation**
- **Various foundation options**
- **UL 2703 classification available**
- **Procurement and manufacturing:**
  - Leverage with national and international facilities
  - Material certification available
  - ARRA compliant; "Made in the USA" certification available

RBI Solar Background

Family owned and operated, we pride ourselves in 80+ years of experience in commercial design-build specialty structures. RBI Solar's unique design capabilities and multiple manufacturing facilities help us develop the most economical, reliable and robust solutions for any structural solar mounting challenge. We are committed to taking single point responsibility for the entire project starting from the initial design to complete installation of solar modules.

Engineered Foundation Options

Our engineers consider many factors when determining the most reliable and cost-effective foundation solution for our projects. Incorporating and analyzing data from available certified geotechnical reports, on-site pile testing, wind tunnel testing, and all applicable codes and loading considerations, our team can provide various foundation options:

- Driven post
- Concrete pier
- Dual post
- Screw piles
- Pre-cast or cast-in-place concrete ballast
- Spread footings

Installation Services

With experience of completing multiple solar racking jobs for commercial, institutional and utility customers, RBI Solar is the most trusted name when it comes to solar racking installation. Our highly trained project managers and installation crews work with your on-site engineers to install custom engineered solar racking systems. Racking installation is essential for meeting project time and budget goals. Advantages of using RBI Solar for installation include:

- Company owned post driving equipment
- Highly skilled construction crews that specialize in solar racking
- Dedicated project managers

Technical Specifications

Description of product	Fixed tilt racking
Efficient designs	GM-I, GM-T and GM-B
Module configuration	Landscape or portrait ; designed to accomodate any module type
Tilt angle	0° to 45°
Array height	Project specific design
Ground cover ratio	Project specific design
Installation options	Posts, racking and module mounting
Geographical range	Nationwide
Grounding	Continuously bonded racking; tested by ETL to UL2703 standards (GM-I & GM-T)
Wire management	Built-in wire management options
Design criteria	Engineered to meet applicable structural codes
Warranty	20-year limited warranty

Contact Us 5513 Vine Street Cincinnati, OH 45217 | **www.rbisolar.com** *call* 513.242.2051 *email* **info@rbisolar.com**

SINGLE SOURCE PROVIDER

DESIGN

System classified to UL 2703, with in-house designers and engineers. Our focus is to deliver the most effective and efficient racking solution based upon the array layout and site conditions.

ENGINEERING

Our in-house engineers, licensed and registered in all states, provide structural calculations applying RBI proprietary wind tunnel analysis and focus on delivering appropriate racking and foundation design based on existing soil conditions.

MANUFACTURING

Multiple state-of-the-art manufacturing facilities, along with a vertically integrated procurement and manufacturing protocol, ensures overall quality of product with reduced lead times for material.

INSTALLATION

Single source responsibility, with in-house project management and installation crews. This approach reduces duplication of efforts throughout the enterprise, focused on delivering projects on time and within budget.

GROUND MOUNT • ROOF MOUNT • SPECIALTY STRUCTURES • LANDFILL

Racking questions? We are here to answer.
Contact us at info@rbisolar.com or call (513)242-2051

www.rbisolar.com

RBI SOLAR

Appendix F

Project	City	State	Zip	Size (MW)	Size (kW)	Type
Ashburnham	Ashburnham	MA	01430	4.0	3,987	GM
Berkley East	Berkley	MA	02779	3.9	3,880	GM
CCMUA	Camden	NJ	08104	1.8	1,807	WWTP
Clarendon	Clarendon	VT	05759	2.4	2,390	GM
Clean Harbors	Bridgeport	NJ	08014	1.5	1,507	GM
Keystone	Lancaster	PA	17566	6.0	6,004	GM
Lake County - East Chicago	East Chicago	IN	46312	2.7	2,690	GM
Lake County - Griffith	Griffith	IN	46319	2.7	2,690	GM
Limerick Road	Shelburne	VT	05482	3.0	2,963	GM
Longwood Gardens	Kennett Square	PA	19348	1.6	1,572	GM
Sterling	Sterling	MA	01564	2.4	2,392	GM
Templeton	Templeton	MA	01468	4.5	4,506	GM
Marion - Belmont	Maywood	IN	46253	5.2	5,189.00	GM
Marion - LNGN	Indianapolis	IN	46298	1.9	1,908.00	GM
Chester	Chester	VT	05143	0.8	750.00	GM
Royalton	Royalton	VT	05068	0.7	664.00	GM
Charter Hill	Rutland	VT	05701	1.3	1,330.00	GM
Pittsford	Pittsford	VT	05763	0.7	700.00	GM
Proctor	Proctor	VT	05765	0.7	708.70	GM
Williamstown	Williamstown	VT	05679	0.8	753	GM
	Total Projects:			Total MW:	Avg. kW:	
	20			**48.39**	**2420**	