SOLAR PV PROJECT FEASIBILITY STUDY

REPORT

S&W FACILITIES SOLAR PROPOSAL

PREPARED FOR:
TOWN OF BRISTOL, NH

REPORT DATE
NOVEMBER 16, 2020

Document Number: 617.17.20/167

DATE OF ISSUE: November 16, 2020

VERSION HISTORY:

Date	Version	Description	Author	Reviewer
11/16/2020	Final	Feasibility Study Report	L Loomans	R Lockhart

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TABLE OF CONTENTS **PAGE**

ACUITY POWER GROUP™

ABOUT ACUITY POWER GROUP, INC.

Acuity Power Group, Inc. is an independent third-party consulting company, which provides PV quality assurance services, energy modeling, design review and feasibility consulting specifically for photovoltaic power plants. We are not an independent engineering firm (IE), though we do provide independent, non-biased consulting services. Services are designed to provide increased transparency into PV system design, modeling, safety, and quality for developers, installers, financiers, long-term owners, and other project stakeholders.

Headquartered in Massachusetts, Acuity provides services to provide performance and financial modeling for PV system options.

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1. STUDY SCOPE AND BACKGROUND

SCOPE

To assess the economic and technical viability of the project proposed by Barrington Power. Match the solar array to the demand of the facility and analyze the economic payback and return on investment. The project has been initially positioned as a Power Purchase Agreement. This method was considered, as well as the option of funding the effort with a municipal bond. Financial analysis for both options are provided in the analysis with payback periods and cost savings forecasts.

BACKGROUND

Some analysis had already been performed that indicated the site and proposed system are well suited to meet the power requirements of the Bristol Sewer & Water Facility. However, this needed to be reviewed and more detail added to determine the exact technical requirements.

SUBMITTALS:

12 months of utility bills indicating the following:

a) monthly energy usage,

b) monthly demand charges,

c) utility and bill rate code / structure, time of use, seasonal rates, etc.

Power purchase agreement rate and escalator.

Barrington Power Proposal details.

Measured power demand readings for the facility.

2. PROPOSED PROJECT SITE REVIEW AND ANALYSIS

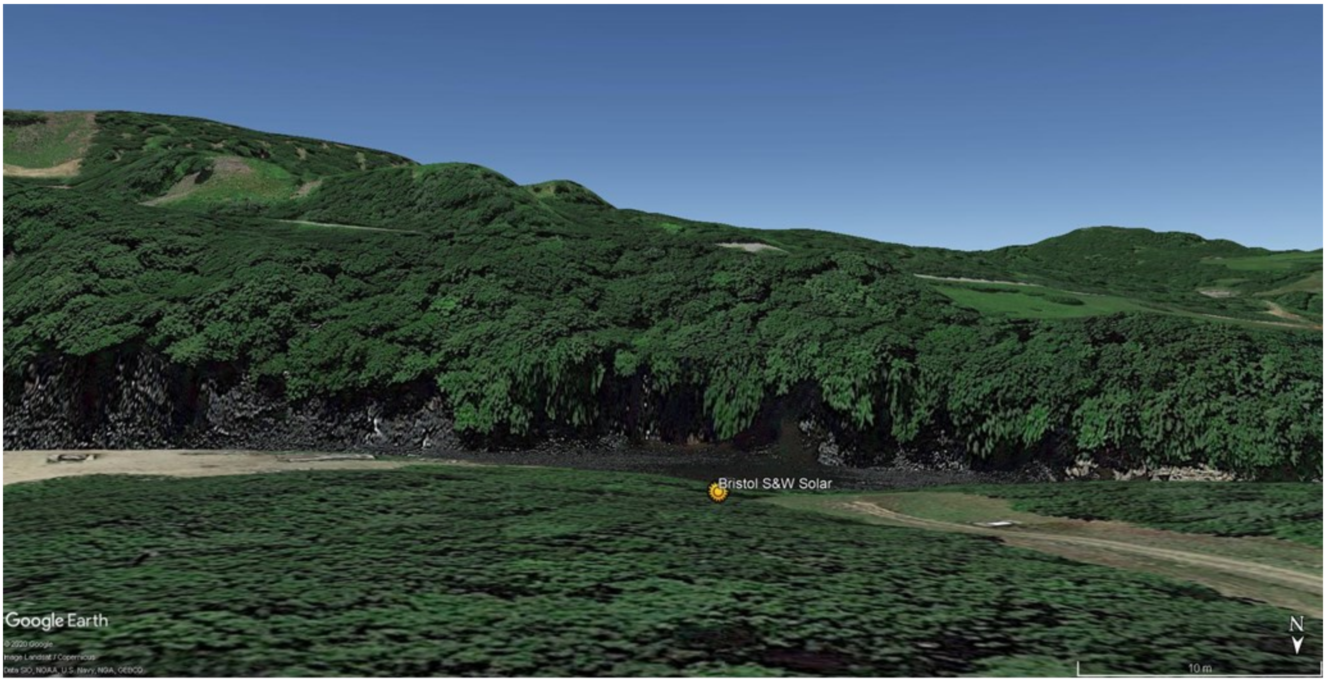
Review the project site and analyze the proposed system array layout and orientation, using PVsyst software:

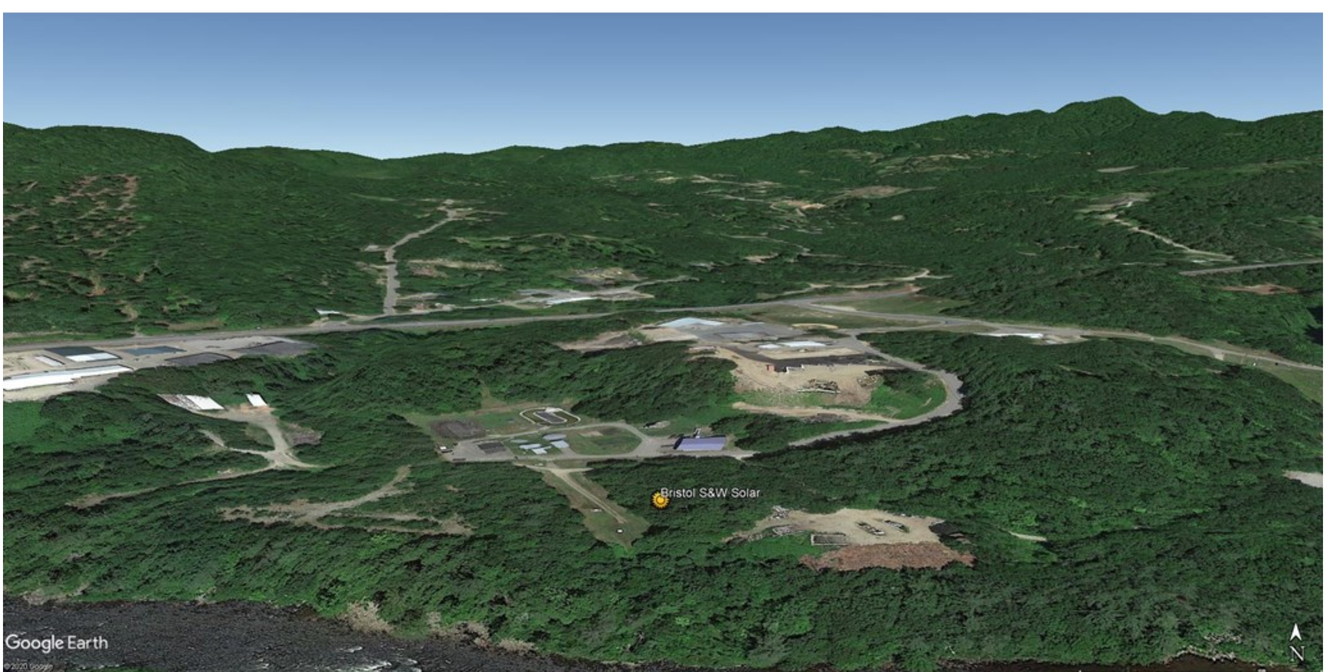
- Determine the optimum module tilt for year-round energy production at this location, including the benefit of increased tilt for snow shedding.

- Determine the optimum module orientation (portrait or landscape) to minimize row-to-row shading losses for this location, using the same array footprint as the proposed system.

Aerial overview of Ayer's Island Road Facilities and surroundings from the North

Aerial site from N and S. Marker indicates general location of the PV array.





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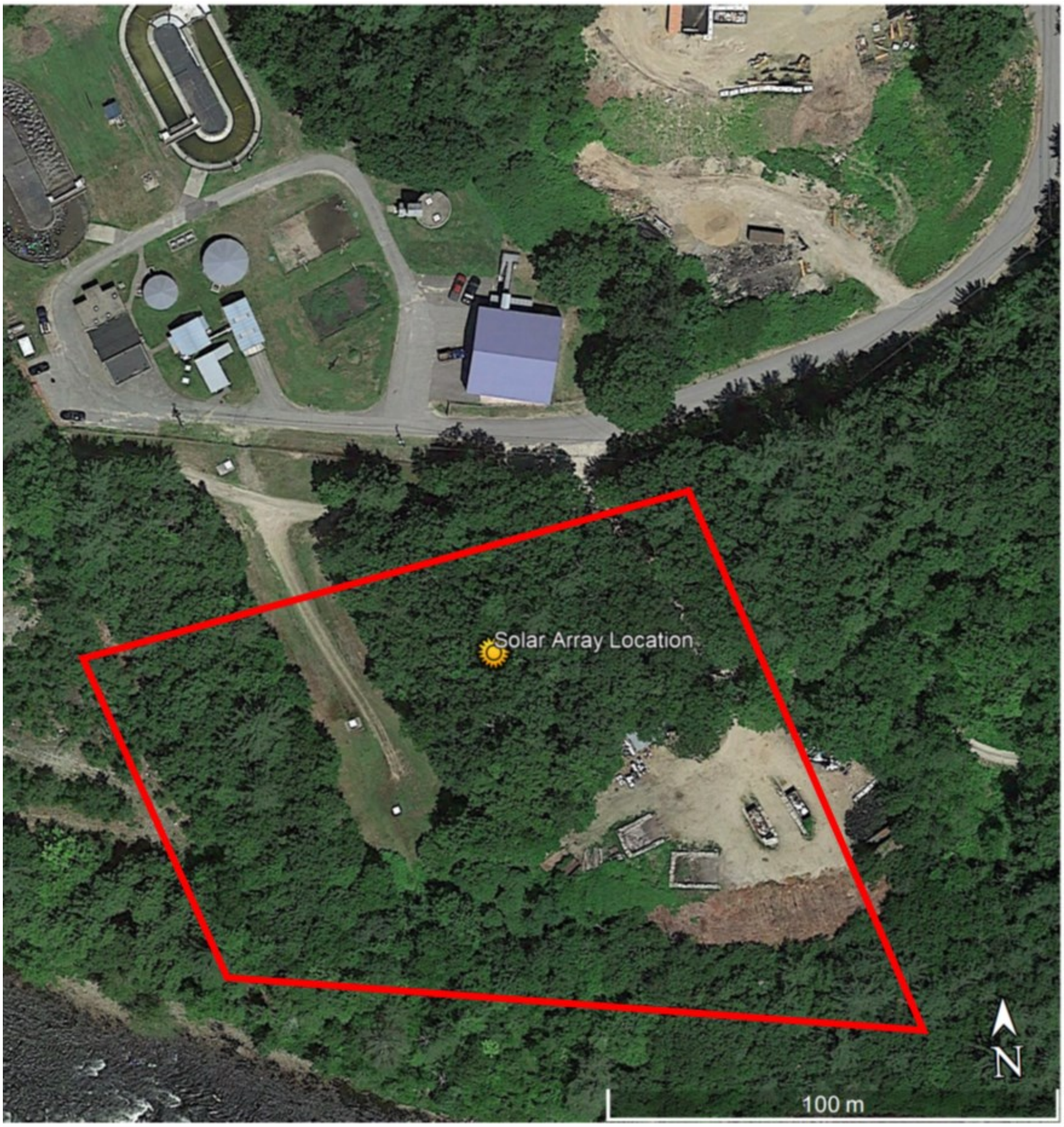
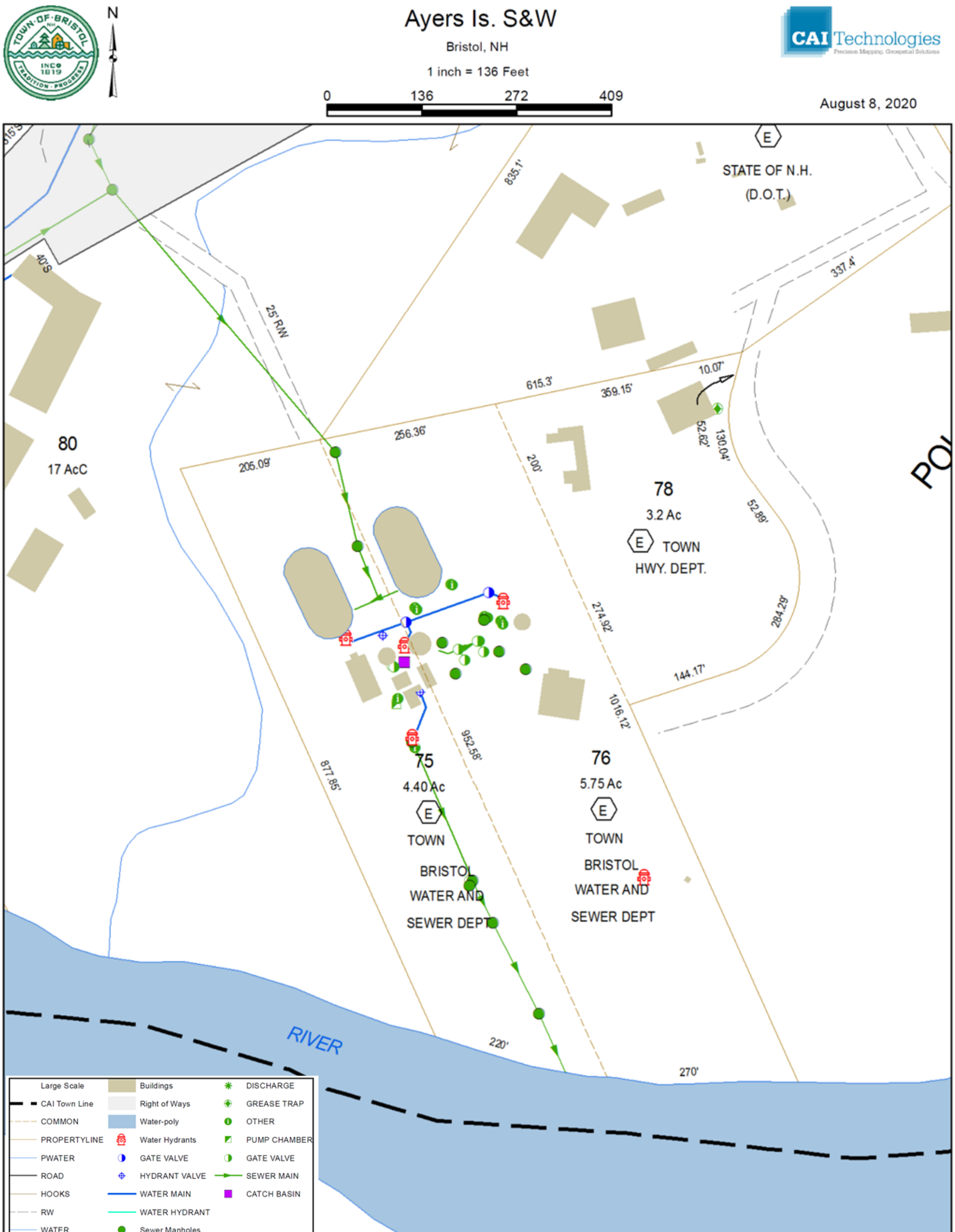
Project Array Location Aerial View

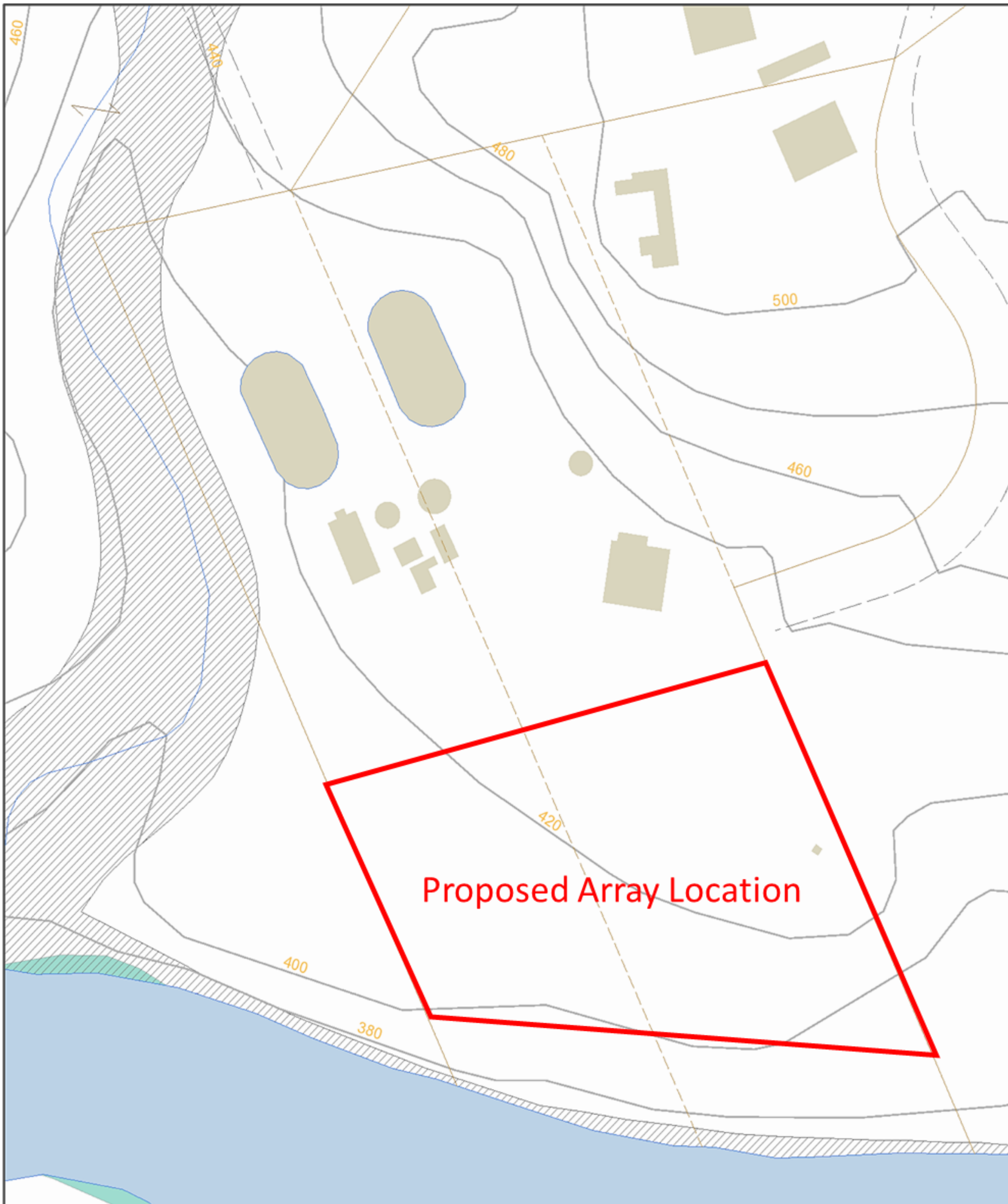


Ayer's Island Rd. WWTF property includes approx. 3.5 acres being considered for locating a solar PV generating plant. The partly forested hillside slopes downhill approx. 3 degrees to Southwest, getting steeper as it approaches the north bank of the Pemigewasset River.

WW Treatment Property and Infrastructure



Array Area & Contours

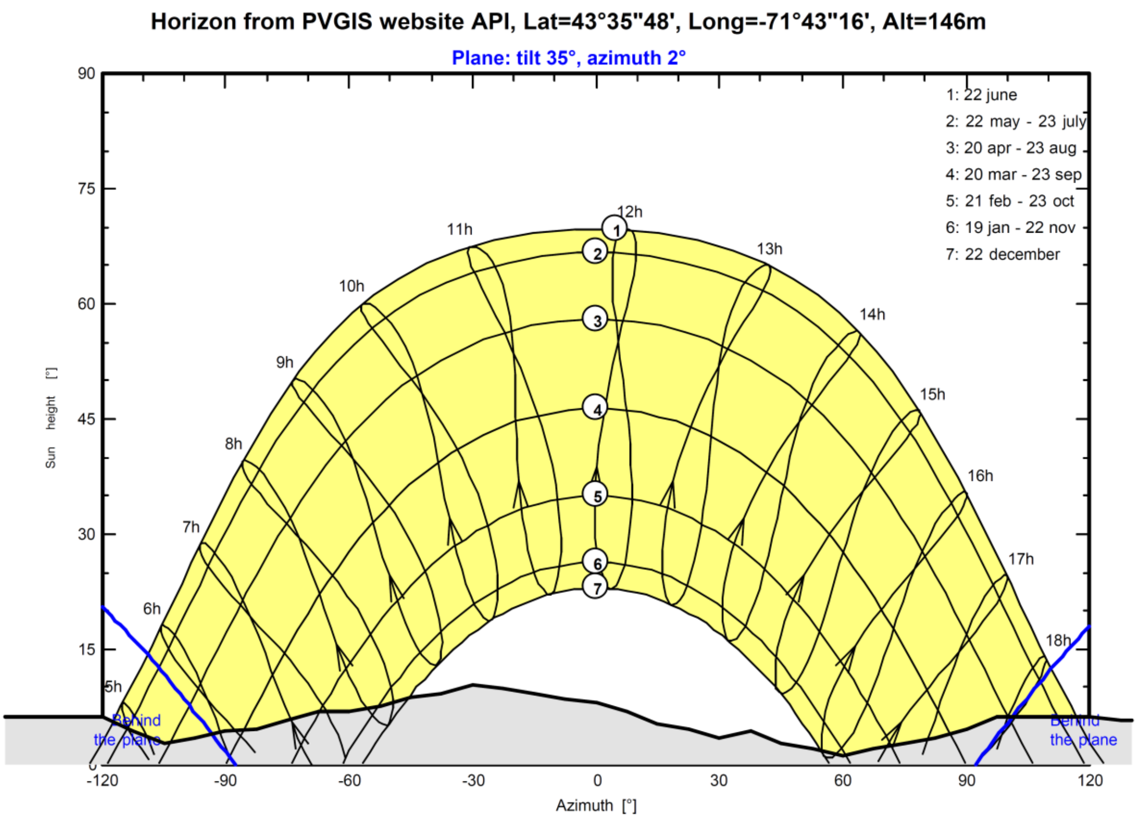


Horizon and Solar Window

Horizon

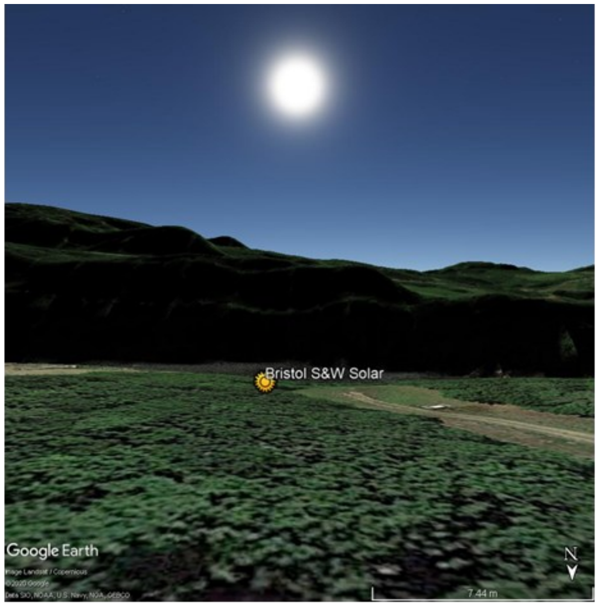
Average Height 5.7° Diffuse Factor 0.95
Albedo Factor 100% Albedo Fraction 0.67

Height [°]	6.1	6.1	4.2	2.7	3.4	4.2	4.6	5.7	6.9	6.9	7.6	8.8
Azimuth [°]	-180	-120	-113	-105	-98	-90	-83	-75	-68	-60	-53	-45
Height [°]	9.2	10.3	9.9	9.2	8.4	8.0	6.9	5.3	4.6	3.4	4.2	2.7
Azimuth [°]	-38	-30	-23	-15	-8	0	8	15	23	30	38	45
Height [°]	1.9	1.1	1.9	2.7	3.4	4.6	6.1	6.1	5.7	5.7	6.1	6.1
Azimuth [°]	53	60	68	75	83	90	98	120	128	135	143	180



The PVGIS database provided Azimuth and Height values for the horizon surrounding the site, shown here superimposed over the Solar Window. The horizon data correlates closely with the winter solstice sunrise and sunset times predicted by a Google Earth daily simulation, shown on the following page.

Horizon & Sun Views on Winter Solstice (Dec. 21)

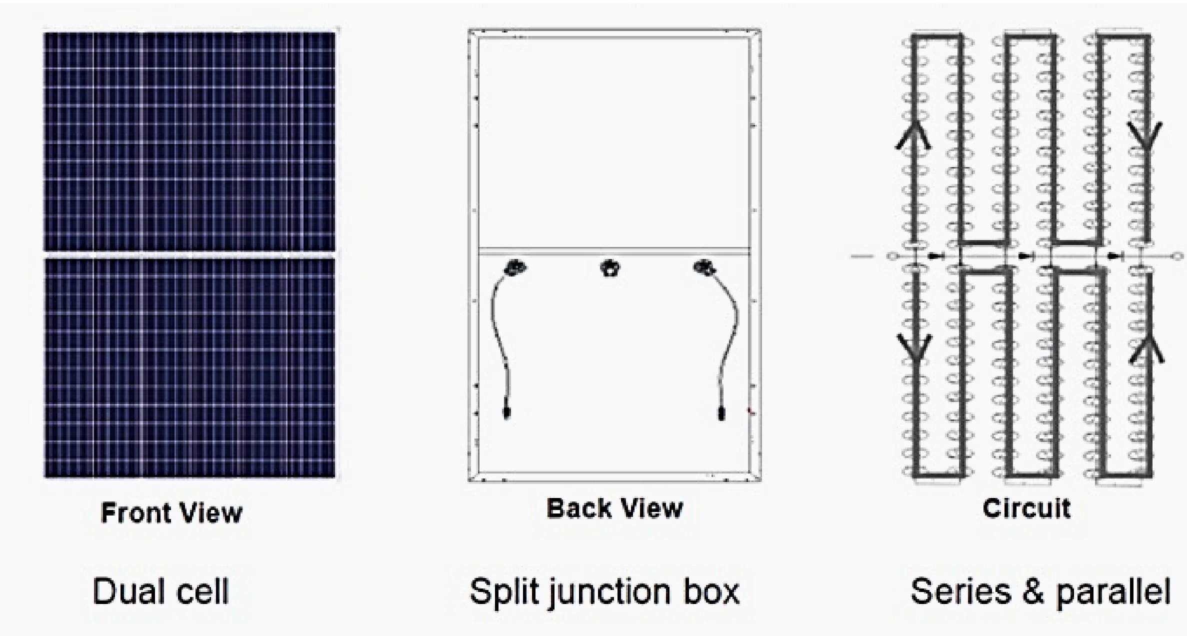


View to South: Solar Noon 11:45 pm EST

View to SE: Sunrise 8:20am EST

View to SW: Sunset 4:00pm EST

3. PV ARRAY OPTIMIZATION

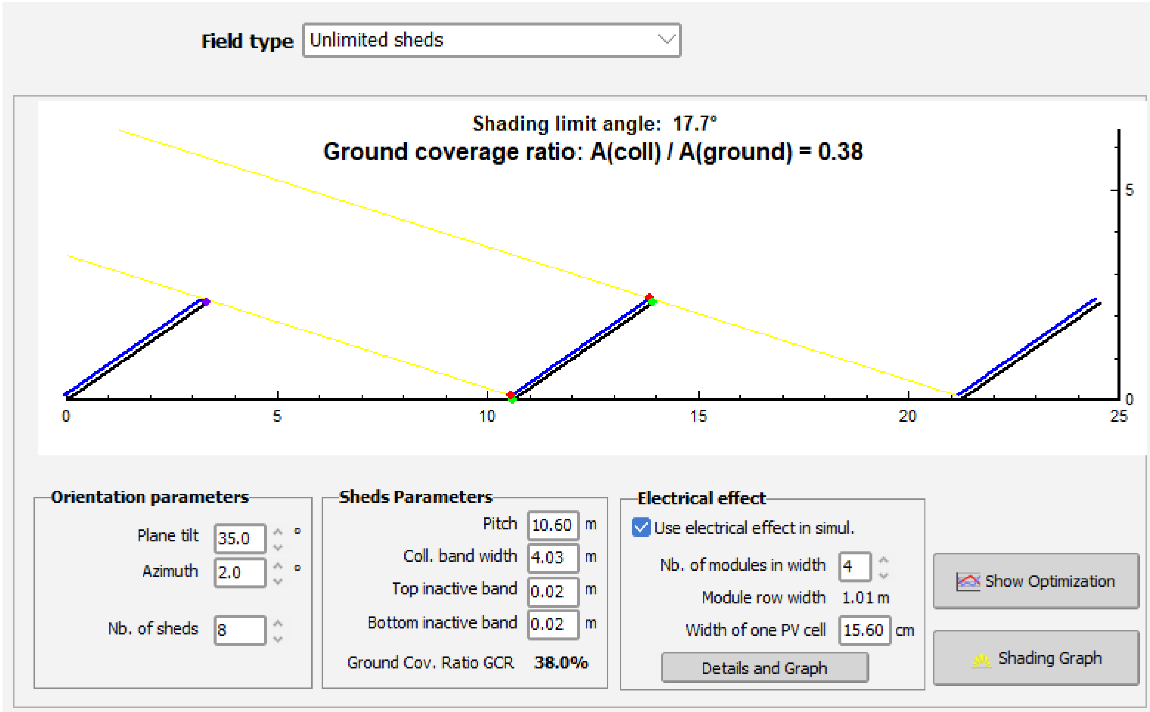


The modules proposed for this project are of the 'twin half-cut cell' type, also known as dual cell or DUO modules. These modules use standard size square PV cells cut in half, and then series connected in two separate strings sharing the same (3) bypass diodes, as shown above.

One of the advantages of this arrangement is that half a module can be shaded and only reduce current (and thus power) in one of the two cell strings, while the other string remains at full power. When ground-mounted in a portrait configuration, as proposed, they significantly reduce inter-row shading effects, since only the bottom half of the module is affected. In standard 'full-cell' modules, all 72 cells in the module are in one series string, so shading on any single cell affects the entire module output.

The PVsyst model accounts for this by considering each half of these modules as separate, so the two-up in portrait modules are treated electrically as four-up, and the inter-row shading on the lower edge only affects the bottom of the four modules.

The side elevation of the proposed array field 'sheds' is shown on the next page, along with the optimization analysis and results.



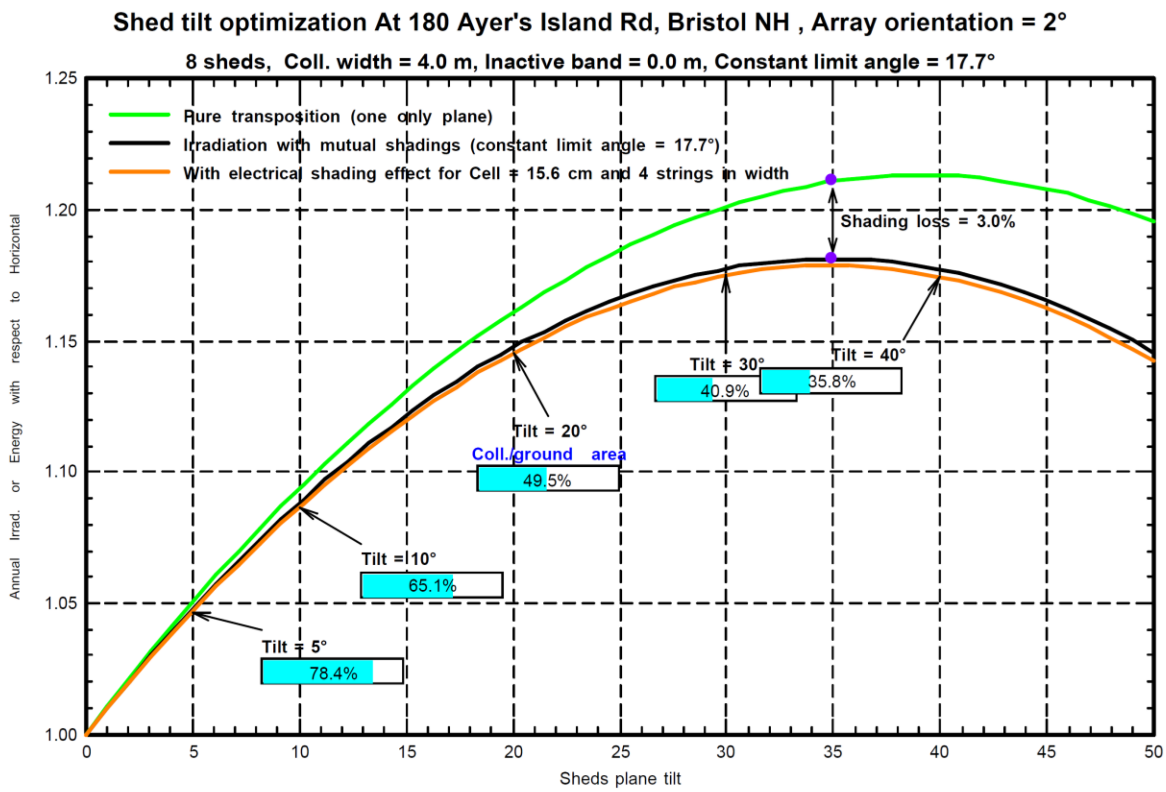
Beam and Diffuse categories of shading losses when optimizing sheds:

1. So-called "hard" shading is obstruction of any or all of the sun disc, which reduces the direct or **beam** component of irradiation. Since these shadows are determined by the sun position relative to the array sheds, they typically apply only to early morning and late afternoon when the sun is low in the sky, therefore only affecting hours of already low production (due to the low incidence angle).
2. Conversely, shading of the **diffuse** component applies continuously throughout the day, assuming an isotropic diffuse irradiance distribution. This shading factor relates to the full portion of sky 'seen' by the collectors. For sheds, the diffuse effect is particularly important, since the visible portion of the sky hemisphere is limited by the shed in front (at higher incidence angles). **Due to its permanent effect, diffuse is often the main component of the overall energy production losses from shading.**

Shed Tilt, Orientation and Total Area:

1. The array area occupation is strongly dependent on the collector tilt. For acceptable shadings, the 'shading limit' profile angle should be kept under 18° to 20°. For a 30° array shed tilt on level ground, this implies the collector area should be limited to ~45% of the total available ground area. For shed arrays mounted on downward south facing slopes, the pitch (inter-row spacing) can be decreased – depending on the slope angle – while still maintaining the minimum profile angle.
2. The mutual shading effect is also dependent on the shed orientation: when not true south, either the morning or evening performances will be more affected.

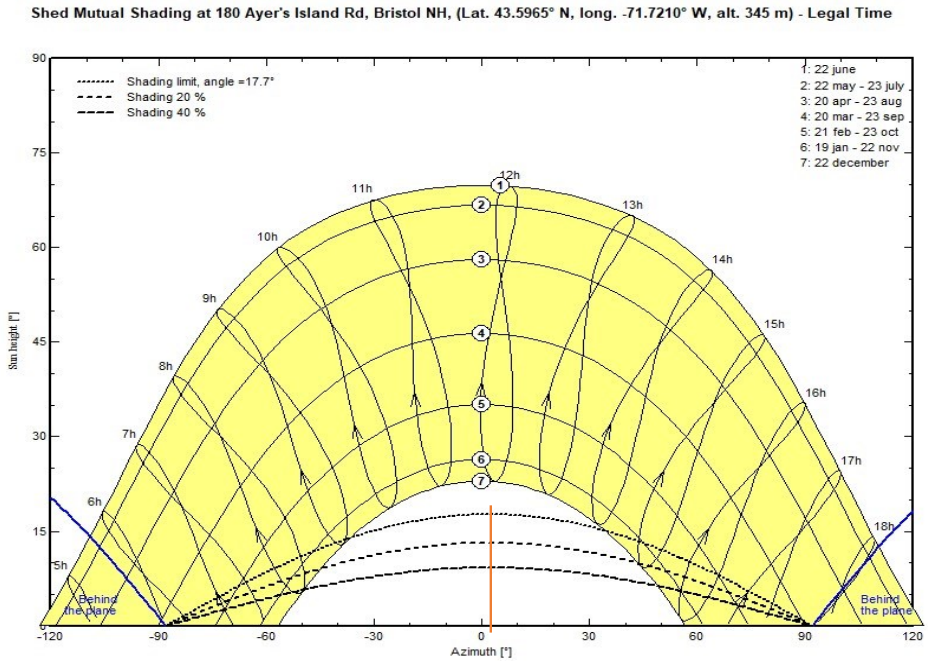
Geographical Site	**180 Ayer's Island Rd, Bristol NH**			Country	**United States**
Situation		Latitude	43.60° N	Longitude	-71.72° W
Time defined as		Legal Time	Time zone UT-5	Altitude	345 m
Collector Plane Orientation		Tilt	35°	Azimuth	2°



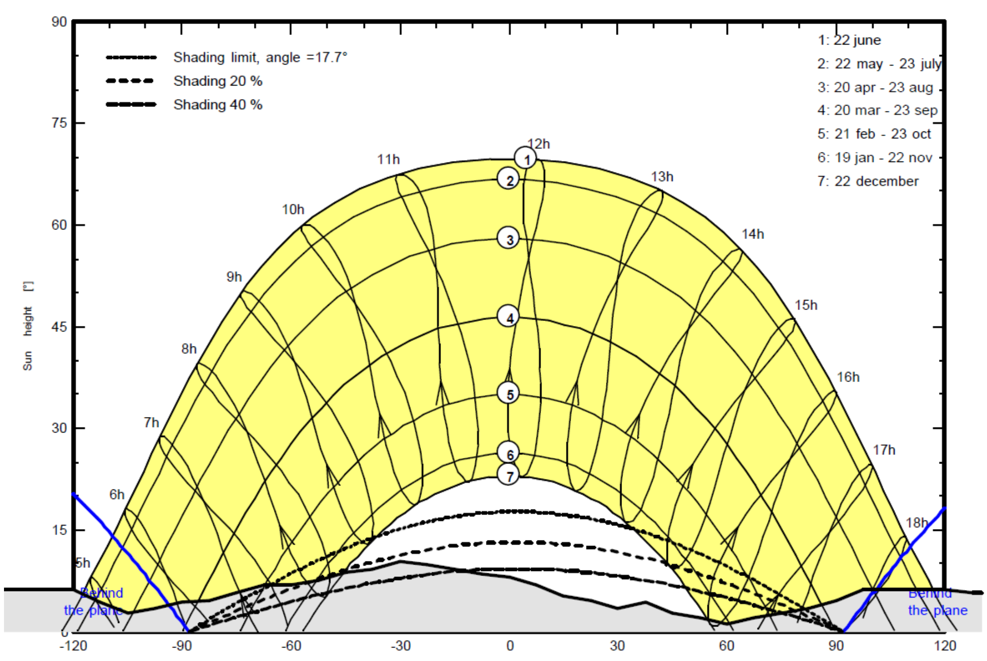
The PVsyst optimization routine for was performed for the proposed array layout of 2 high (in portrait) DUO/half-cell modules, with specified row separation of 6.1 meters, facing South on a 3° downslope to SW.

The result indicates that a 35° tilt (above horiz.) is very near optimal, with a total mutual shading loss of 3% and a collector (array) to ground area ratio of around 38.4%. A 35° tilt has also been demonstrated to significantly facilitate snow shedding, further improving runtime and energy production in winter.

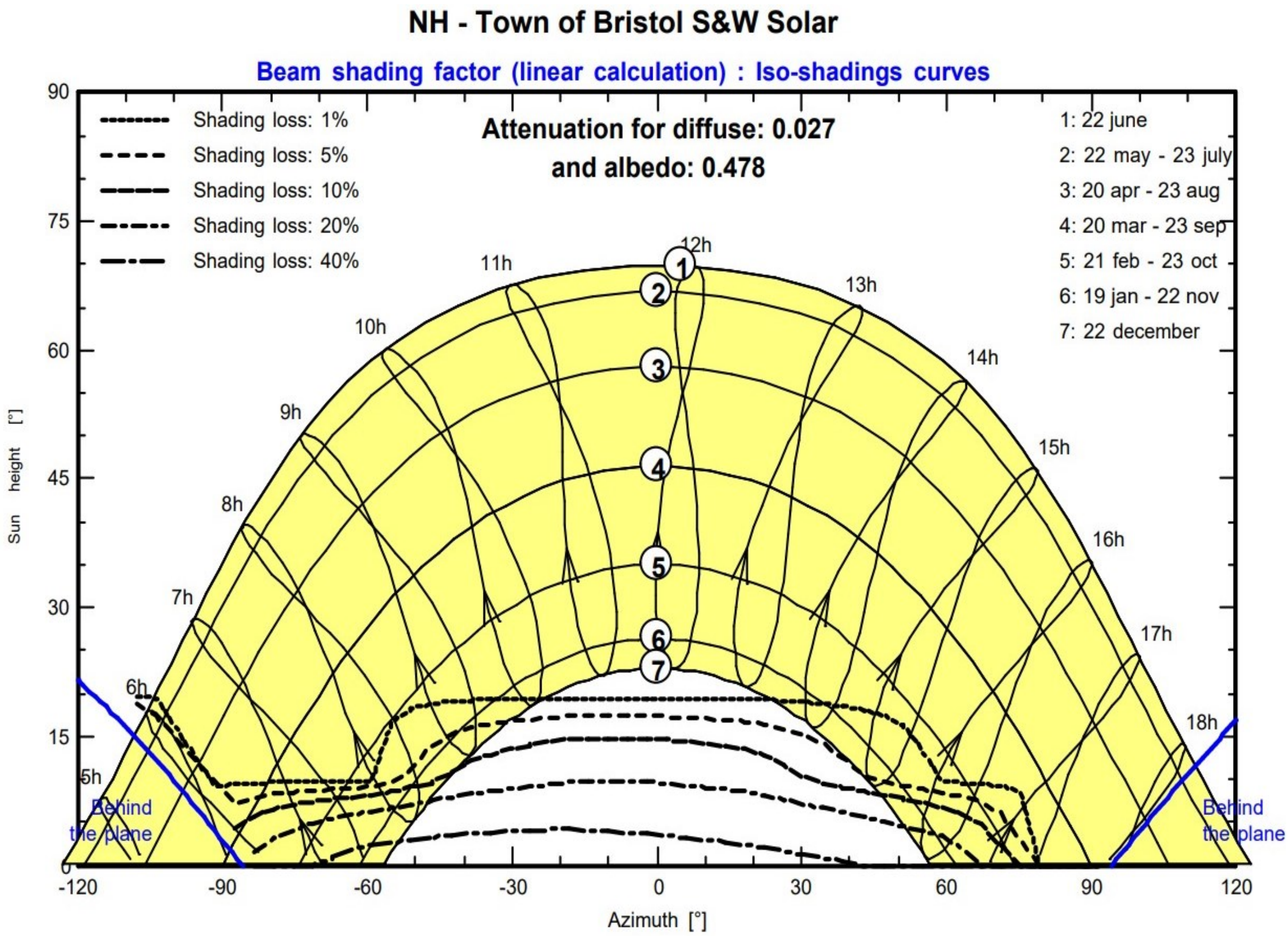
It is our opinion therefore that the proposed system array with the DUO modules in 2-high portrait profile at 35° tilt is the best optimum configuration for maximum annual energy production. Separation of rows beyond 6m has no significant effect.



Graph for shed mutual (inter-row) direct beam shading. Note the shading curves are shifted very slightly to the afternoon sun in the West. This is due to the 3° ground slope toward SW, causing the sheds to be oriented toward 2° West of South (182°).



Graph of direct beam shed mutual shading overlaid on the horizon shading.



Total Shading Factor diagram combining shed inter-row and site horizon beam shading, plus the diffuse sky component and albedo (ground reflectance) attenuations. These shading losses are incorporated into the hourly production model.

Animation showing worst case inter-row ‘shed’ shading of proposed system on Dec. 21. Due to the elevated horizon at the array site, sunrise occurs around 8:20 am and sets by 4 pm. As shown, the resulting inter-row shading only occurs for just a few weeks of the year around winter solstice and is mostly negligible in terms of annual energy production loss.

4. ORIGINAL PROPOSAL SYSTEM MODELS

PROPOSAL FOR

DESIGN, INSTALLATION, MAINTENANCE AND FINANCING OF A SOLAR ENERGY SYSTEM

LOCATED AT THE TOWN OF BRISTOL, NH WATER & SEWER FACILITY

August 16, 2019

PRESENTED BY

barringtonpower

603-973-9798

ATTN: Jack Bingham

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Excerpts from Barrington Power's August 2019 Proposed System Design:

SECTION 1. PROPOSED SYSTEM

1.1. System Specifications

System Type:	Net-metered photovoltaic power system with group net-metering
DC System size:	705,960 Watts DC
AC System size:	500,000 Watts AC
Estimated energy production:	847,000 kilowatt hours, year 1
Modules:	1,908 high-efficiency 370-watt, 72-cell modules. 25 year warranty
Mounting:	RBI Solar Mounting system, or equivalent. 20 year warranty
Inverters:	Canadian Solar CSI String inverters, or equivalent. 10 year warranty with options to extend to 20 years.
Data Acquisition System (DAS):	Solar Log or equivalent.
Balance of System Equipment:	Included
System Warranty:	The system will be free from defects in materials and workmanship for a period of five (5) years from the date of installation.

1.3. Design

The following factors influenced our design methodology. Under each factor are comments on how our design attempts to respond to those factors;

- Minimize the effects of snow soiling
  - By using a 35-degree tilt angle rather than a traditional 25-degree angle that would allow for higher energy density our design allows the panels to self-shed snow more frequently ensuring that you get maximum production from your investment.
  - We use a 42" average clearance from bottom edge of panels to the ground. While this costs us more money this extra clearance minimizes the effects from snow sliding from the panels and piling up and eventually shading the bottom edge of the panels which would create significant reduction in production.
- Design for low cost maintenance and Safety
  - Inverters will be mounted on the back of the arrays and thus easily accessible for maintenance/repair
  - We have selected equipment that we are very familiar with and that has good track record for low-cost of maintenance
- Design for expediency and low-cost
  - By keeping the system size under 500kW AC it is our understanding that Eversrouce will not require a system impact study. A system impact study will add cost and time (3-6 months) to the project.
  - We plan to disturb less than 100,000 square feet in our tree removal and construction with the intent that we will not need an Alteration of Terrain (AOT) Permit from NH DES. The AOT process will require additional ~$20k in engineering and most likely significant additional cost for installation of storm-water management measures.

INTERCONNECTING THE SOLAR ENERGY SYSTEM

Based on the size of the solar energy system and the size of the existing electrical system at the WSF it is not possible to safely interconnect the solar energy system into the existing electrical panel. Therefore we plan to interconnect using a line side tap or working with the town and the utility to move the meter to the pole where the transformers are located and to interconnect between the load and the meter. Also, it is likely that we will need to replace the existing transformers with larger transformers. We have included an allowance in our cost for Eversource to do this work.

OTHER DESIGN CONSIDERATIONS

- As discussed in the executive summary we have made a number of assumptions in putting this proposal and design together. These assumptions are based on our experience from similar projects so we are confident that they are sound assumptions however, we will not be able to verify a final design and system size until we have completed a survey and other engineering due diligence at the site. This work will allow us to know how close we can get to the river, the brook, the neighboring properties, etc.
- Our design is based on the assumption that we can put fence 5' from property lines on both sides and array 15' from fence – requires zoning variance.
- We cannot use the steep slope area that we observed during the site visit but is not apparent on the map included with the RFP. This is why the western array does not extend as close to the river as the eastern array.
- Our current design is not based on using the adjacent property owned by RP Williams but it may make sense to use some of this or clear trees on some of this property depending on what is learned during our engineering phase of the project and how much other land we do or do not have available for solar. We are happy to use this area if it works out with the owner and the town and if it helps to make a larger or better project for the town.
- We have maintained a 30' clear area between arrays for access to drain pipes
- We will install fencing to the east, south and west but use existing fencing to the north to protect the solar energy equipment.

The original PV system design and production model was subsequently updated by Barrington Power in July 2020 and shared with Acuity Power.

As shown in the following HelioScope Report, the same modules and inverters were specified in the updated system, but the module count was increased from 1,908 to 1,938, increasing DC peak capacity from 706 kW to 717 kW. This in turn increased the 1st year predicted AC production from 847 MWh/yr to 898 MWh/yr, and a Specific Yield of 1.25 kWhac/kWdc:

HelioScope — Annual Production Report produced by Jack Bingham

Design 2 Bristol, ayers island road bristol nh

Report

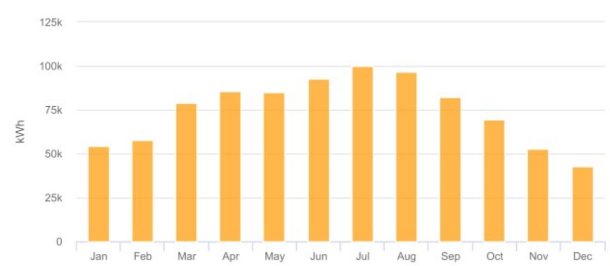
Project Name	Bristol
Project Address	ayers island road bristol nh
Prepared By	Jack Bingham jack@barringtonpower.com

System Metrics

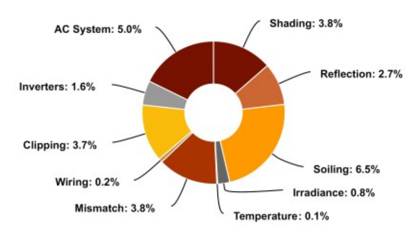
Design	Design 2
Module DC Nameplate	717.1 kW
Inverter AC Nameplate	500.0 kW Load Ratio: 1.43
Annual Production	897.8 MWh
Performance Ratio	74.9%
kWh/kWp	1,252.1
Weather Dataset	TMY, 10km Grid (43.55,-71.75), NREL (prospector)
Simulator Version	4dea4413d3-ae03d05245-26fe131b47-7aba6d3284

Project Location

Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m²)	Annual Global Horizontal Irradiance	1,383.1	
	POA Irradiance	1,670.8	20.8%
	Shaded Irradiance	1,606.9	-3.8%
	Irradiance after Reflection	1,563.5	-2.7%
	Irradiance after Soiling	1,461.3	-6.5%
	Total Collector Irradiance	**1,461.3**	**0.0%**
Energy (kWh)	Nameplate	1,047,312.1	
	Output at Irradiance Levels	1,039,283.7	-0.8%
	Output at Cell Temperature Derate	1,038,715.6	-0.1%
	Output After Mismatch	998,859.4	-3.8%
	Optimal DC Output	996,493.9	-0.2%
	Constrained DC Output	960,011.2	-3.7%
	Inverter Output	945,064.0	-1.6%
	Energy to Grid	**897,811.0**	**-5.0%**
Temperature Metrics			
	Avg. Operating Ambient Temp		9.7 °C
	Avg. Operating Cell Temp		17.1 °C
Simulation Metrics			
		Operating Hours	4688
		Solved Hours	4688

Condition Set

Description	Condition Set 1
Weather Dataset	TMY, 10km Grid (43.55,-71.75), NREL (prospector)
Solar Angle Location	Meteo Lat/Lng
Transposition Model	Perez Model
Temperature Model	Sandia Model

Temperature Model Parameters

Rack Type	a	b	Temperature Delta
Fixed Tilt	-3.56	-0.075	3°C
Flush Mount	-2.81	-0.0455	0°C
East-West	-3.56	-0.075	3°C
Carport	-3.56	-0.075	3°C

Soiling (%)

J	F	M	A	M	J	J	A	S	O	N	D
25	20	5	2	2	2	2	2	2	2	6	25

Irradiation Variance	5%
Cell Temperature Spread	4° C
Module Binning Range	-2.5% to 2.5%
AC System Derate	5.00%

Module Characterizations

Module	Uploaded By	Characterization
Q.PLUS DUO L-G5.2 370 (Hanwha)	Folsom Labs	Spec Sheet Characterization, PAN

Component Characterizations

Device	Uploaded By	Characterization
CPS SCA50KTL-DO/US-480 (Sept17) (Chint)	Folsom Labs	Spec Sheet

  July 29, 2020

Components

Component	Name	Count
Inverters	CPS SCA50KTL-DO/US-480 (Sept17) (Chint)	10 (500.0 kW)
Strings	10 AWG (Copper)	110 (20,657.4 ft)
Module	Hanwha, Q.PLUS DUO L-G5.2 370 (370W)	1,938 (717.1 kW)

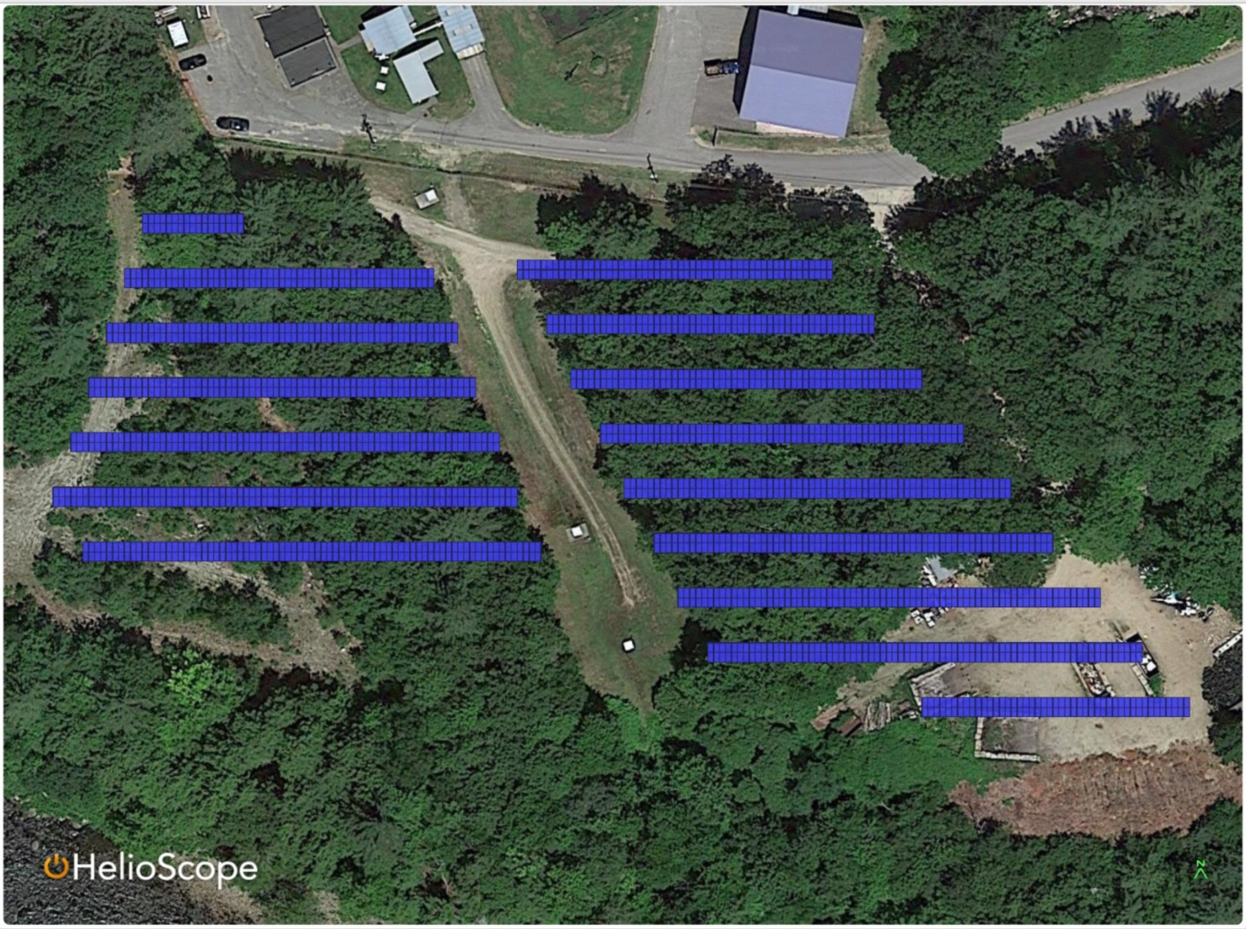
Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	13-18	Along Racking

Field Segments

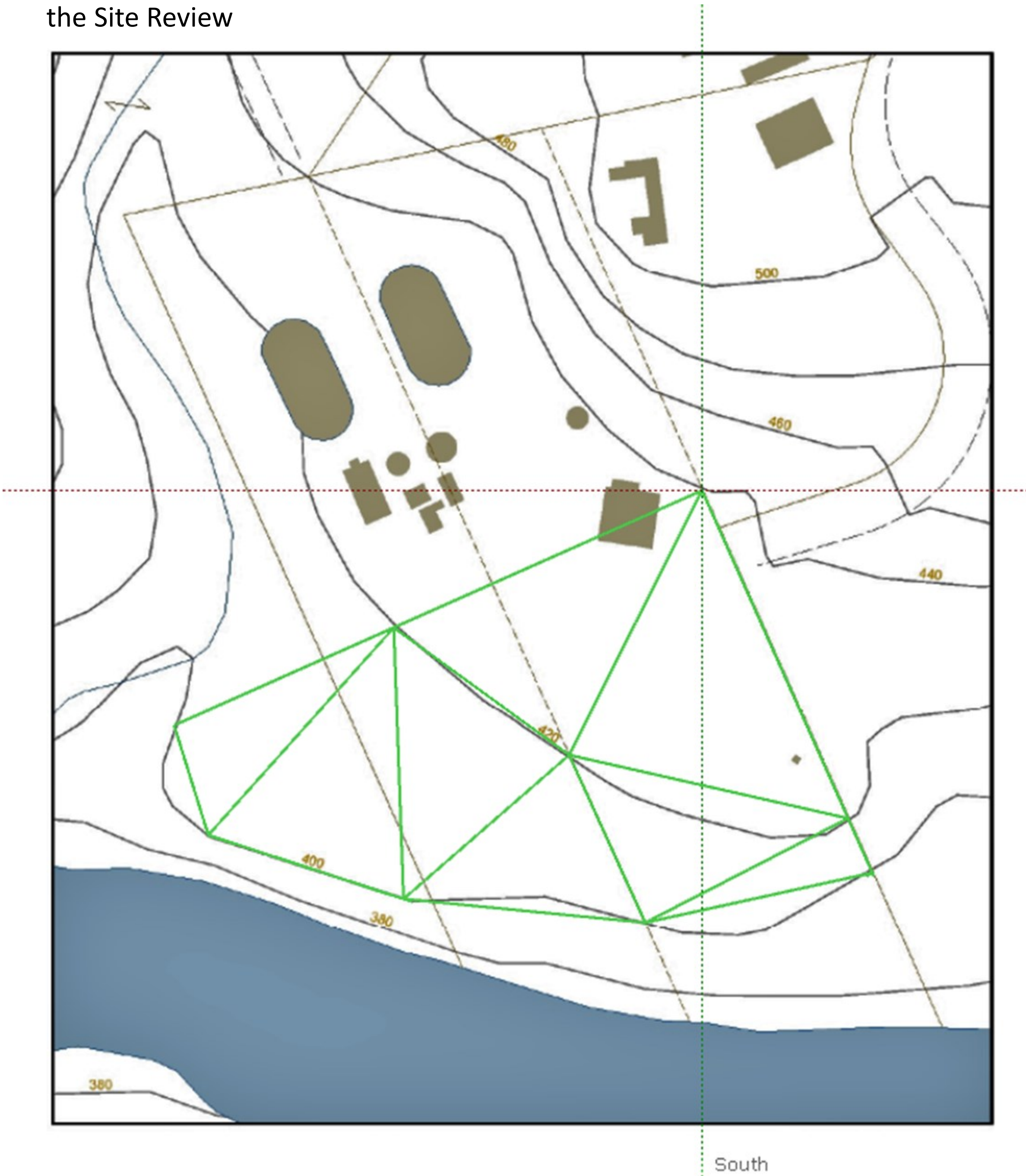
Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Portrait (Vertical)	35°	180°	20.0 ft	2x1	549	1,098	406.3 kW
Field Segment 2	Fixed Tilt	Portrait (Vertical)	35°	180°	20.0 ft	2x1	420	840	310.8 kW

Detailed Layout



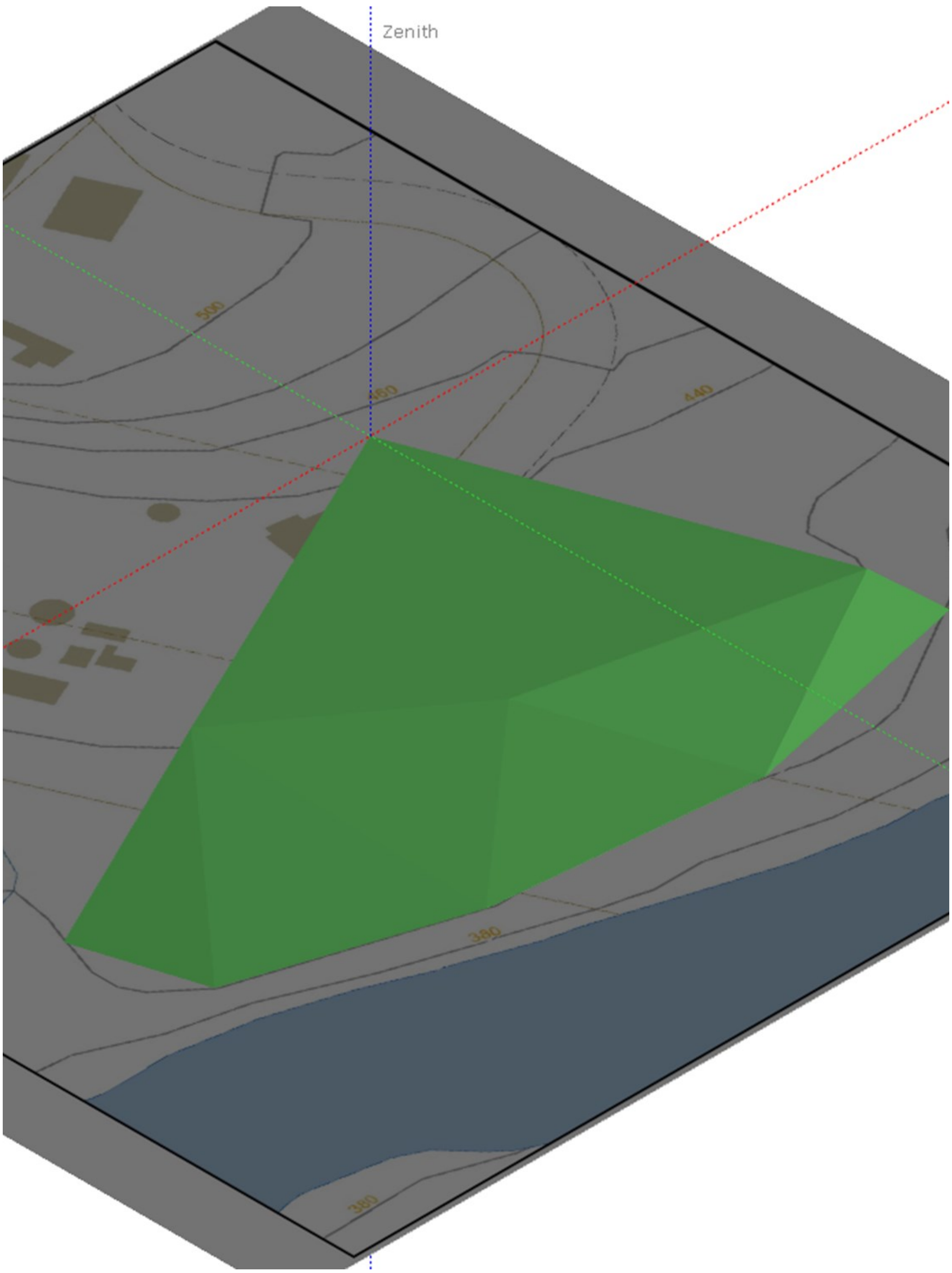
In our PVsyst model, Acuity selected the same 370W modules and 10kW inverters, but to optimize the layout and module stringing, the module count was reduced by twelve to 1,920, for (120) strings of 16 modules in series. Each string is mounted on a single 'Table' of 8 modules wide by two high in portrait, with twelve strings feeding each of the ten inverters.

The PVsyst 'Near Shading' model includes defining the ground topography, array layout and shading objects, such as trees. The horizon is separately defined to be incorporated in the shading calculations, as was shown earlier in the Site Review

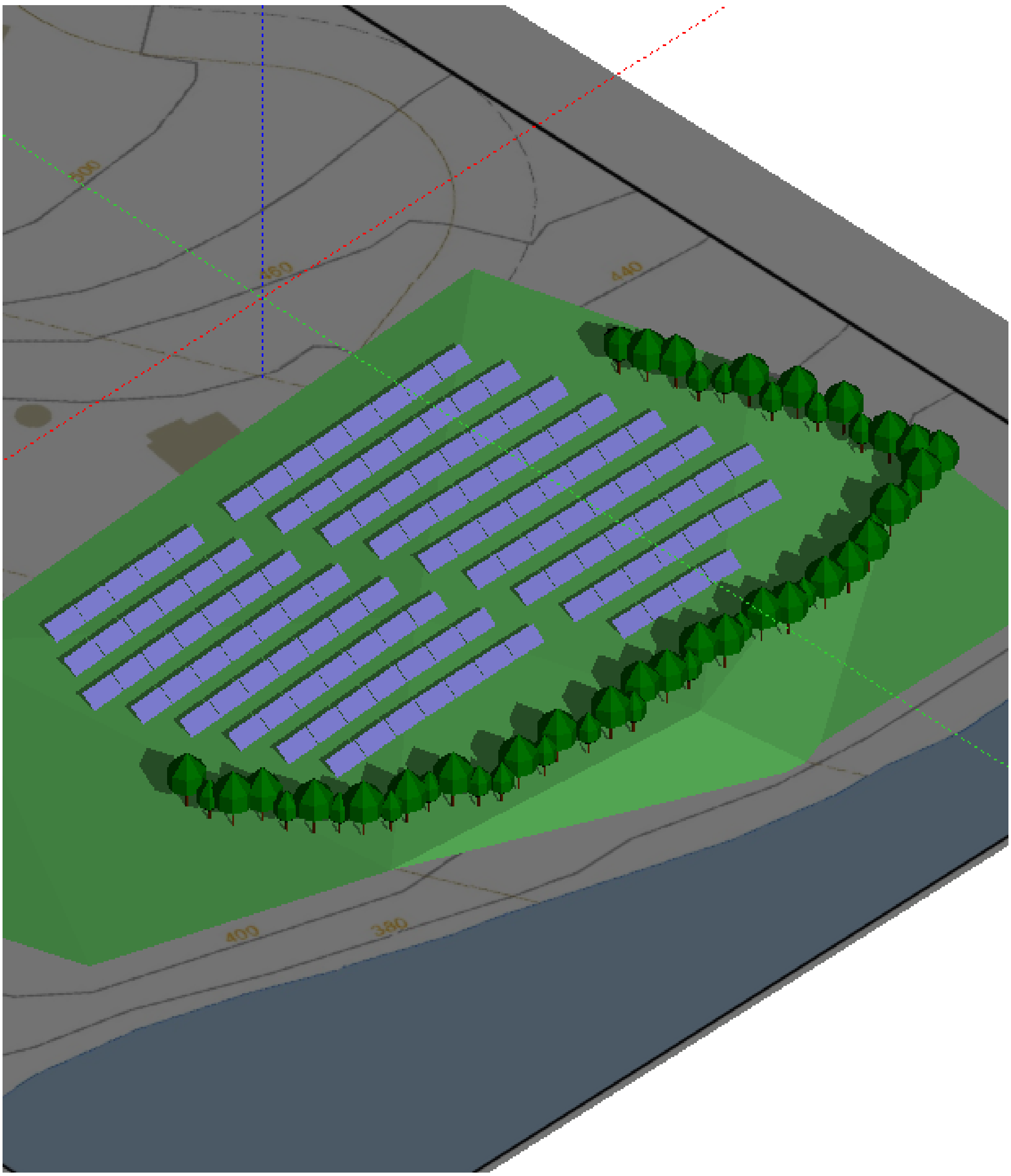


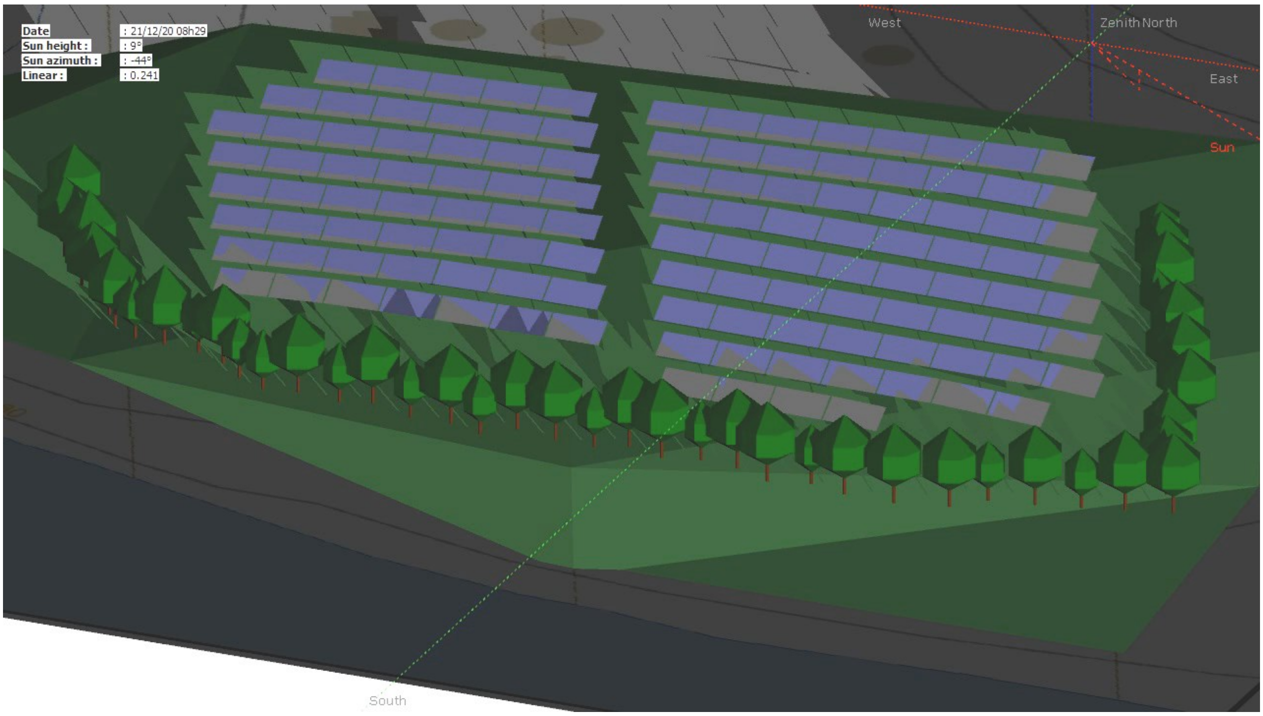
3D modeling of ground surface with extruded polygons defined by contour lines.

Rendered extruded polygon ground surface for array modeling



Rendered view of array including uncleared tree line around the perimeter.





Proposed array Shading Animation on Winter Solstice, showing combined horizon, inter-row, and tree direct shading effects

Following is the Pvsyst Model Report for the updated Barrington Power proposed system, assuming 'virtual net metering' with the grid – all power produced is exported to the grid.

Grid-Connected System: Simulation parameters

Project : **NH - Town of Bristol S&W Solar**

Geographical Site	**180 Ayer's Island Rd, Bristol NH**		Country	**United States**
Situation	Latitude	43.60° N	Longitude	-71.72° W
Time defined as	Legal Time	Time zone UT-5	Altitude	345 m
	Albedo	0.20		
Meteo data:	**(43.5966 -71.7229)**	SolarAnywhere v.3.3 - TMY		

Simulation variant : **BP Original Proposal**

	Simulation date	09/10/20 18h46
	Simulation for the	**1st year of operation**

Simulation parameters	System type	**Ground system (tables) on a hill**		
Collector Plane Orientation	Tilt	35°	Azimuth	2°
Sheds configuration	Nb. of sheds	120	Identical arrays	
	Sheds spacing	9.45 m	Collector width	4.07 m
Shading limit angle	Limit profile angle	20.9°	Ground Cov. Ratio (GCR)	43.1%
Models used	Transposition	Perez	Diffuse	Imported
			Circumsolar	separate
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
User's needs :	Unlimited load (grid)			

PV Array Characteristics

PV module Si-poly	Model	**Q.PLUS DUO L-G5.2 370**		
Custom parameters definition	Manufacturer	Hanwha Q Cells		
Number of PV modules	In series	16 modules	In parallel	120 strings
Total number of PV modules	nb. modules	1920	Unit Nom. Power	370 Wp
Array global power	Nominal (STC)	**710 kWp**	At operating cond.	644 kWp (50°C)
Array operating characteristics (50°C)	U mpp	569 V	I mpp	1133 A
Total area	Module area	**3869 m²**		
Inverter	Model	**CPS SCA50KTL-DO/US-480**		
Custom parameters definition	Manufacturer	Chint Power Systems		
Characteristics	Unit Nom. Power	**50.0 kWac**	Oper. Voltage	200-850 V
Inverter pack	Total power	**500 kWac**	Pnom ratio	1.42
	Nb. of inverters	30 * MPPT 33%		
Total	Total power	**500 kWac**	Pnom ratio	1.42

PV Array loss factors

Array Soiling Losses — Average loss Fraction 9.1 %

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
27.1%	31.3%	22.6%	3.5%	1.3%	1.3%	1.2%	1.4%	1.5%	1.3%	2.3%	14.7%

Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	8.3 m• •	Loss Fraction	1.5 % at STC

Grid-Connected System: Simulation parameters

LID - Light Induced Degradation			Loss Fraction	2.0 %
Module Quality Loss			Loss Fraction	-0.3 %
Module mismatch losses			Loss Fraction	2.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %
Module average degradation	Year no	1	Loss factor	0.4 %/year
Mismatch due to degradation	Imp RMS dispersion	0.4 %/year	Vmp RMS dispersion	0.4 %/year

Incidence effect (IAM): User defined profile

0°	20°	40°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.970	0.900	0.830	0.690	0.440	0.000

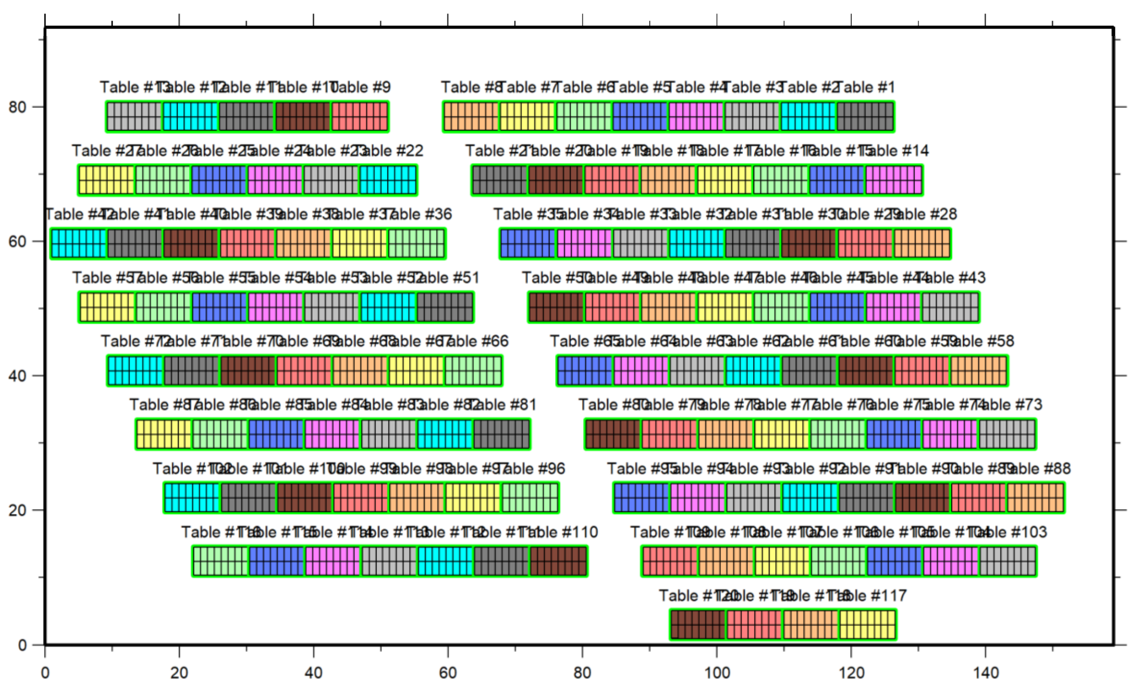
System loss factors

AC loss, inverter to injection	Inverter voltage	480 Vac tri		
	Wires: 3 x 700 mm²	75 m	Loss Fraction	0.6 % at STC
Unavailability of the system	2.5 days, 3 periods		Time fraction	0.7 %

Auxiliaries loss	constant (fans)	25 W	... from Power thresh.	0.0 kW

PV Array Characteristics

PV module	Si-poly Model	**Q.PLUS DUO L-G5.2 370**		
	Manufacturer	Hanwha Q Cells	Size	1.000 x 2.015 m²
Number of PV modules	In series	16 modules	In parallel	120 strings



Grid-Connected System: Horizon definition

Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **BP Original Proposal**

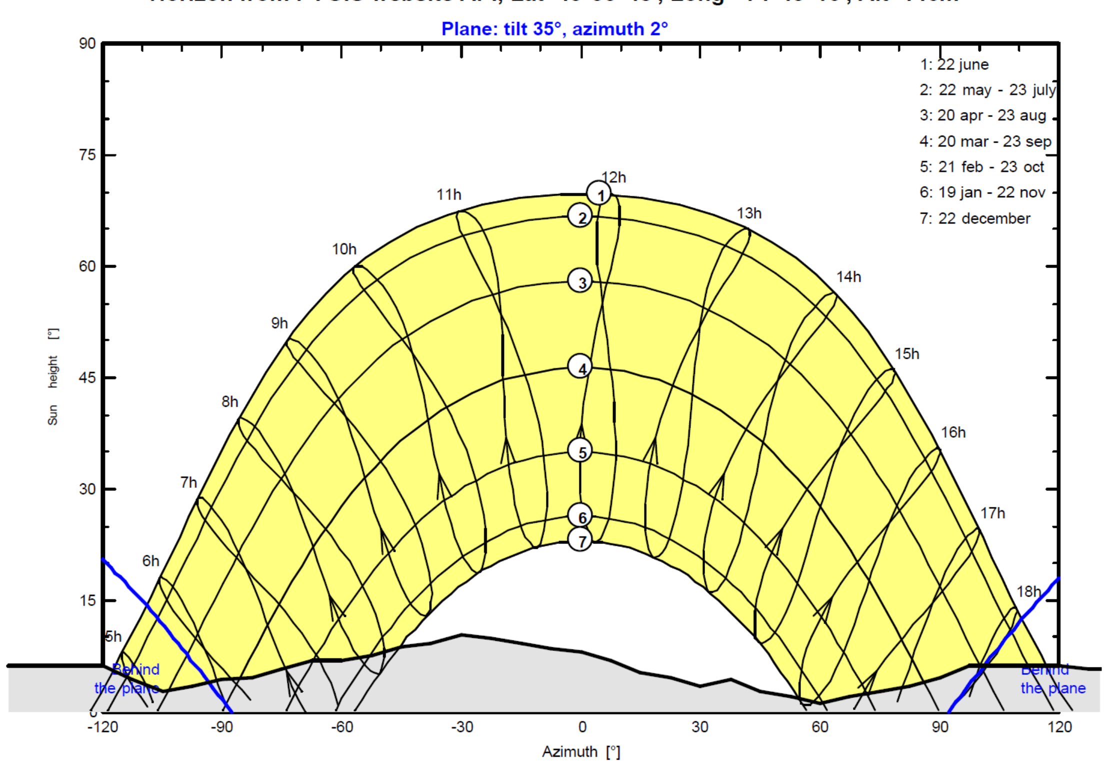
Simulation for year no: 1

Main system parameters	System type	**Ground system (tables) on a hill**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PLUS DUO L-G5.2 370	Pnom	370 Wp
PV Array	Nb. of modules	1920	Pnom total	**710 kWp**
Inverter	Model	CPS SCA50KTL-DO/US-480	Pnom	50.0 kW ac
Inverter pack	Nb. of units	10.0	Pnom total	**500 kW ac**
User's needs	Unlimited load (grid)			

Horizon	Average Height	5.7°	Diffuse Factor	0.95
	Albedo Factor	100%	Albedo Fraction	0.67

Height [°]	6.1	6.1	4.2	2.7	3.4	4.2	4.6	5.7	6.9	6.9	7.6	8.8
Azimuth [°]	-180	-120	-113	-105	-98	-90	-83	-75	-68	-60	-53	-45
Height [°]	9.2	10.3	9.9	9.2	8.4	8.0	6.9	5.3	4.6	3.4	4.2	2.7
Azimuth [°]	-38	-30	-23	-15	-8	0	8	15	23	30	38	45
Height [°]	1.9	1.1	1.9	2.7	3.4	4.6	6.1	6.1	5.7	5.7	6.1	6.1
Azimuth [°]	53	60	68	75	83	90	98	120	128	135	143	180

Horizon from PVGIS website API, Lat=43°35"48', Long=-71°43"16', Alt=146m



Grid-Connected System: Near shading definition

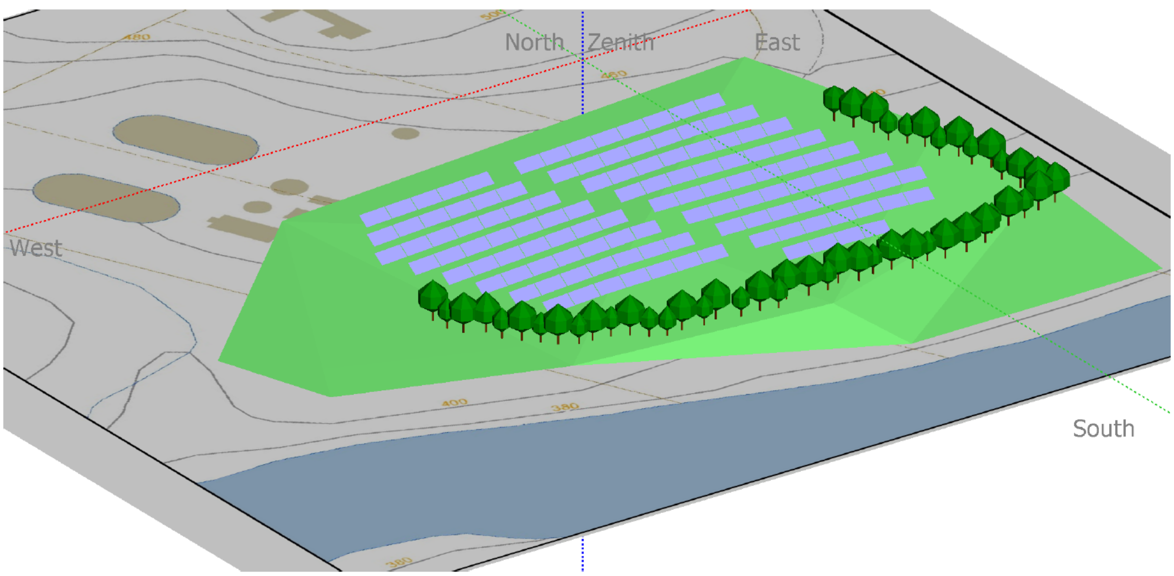
Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **BP Original Proposal**

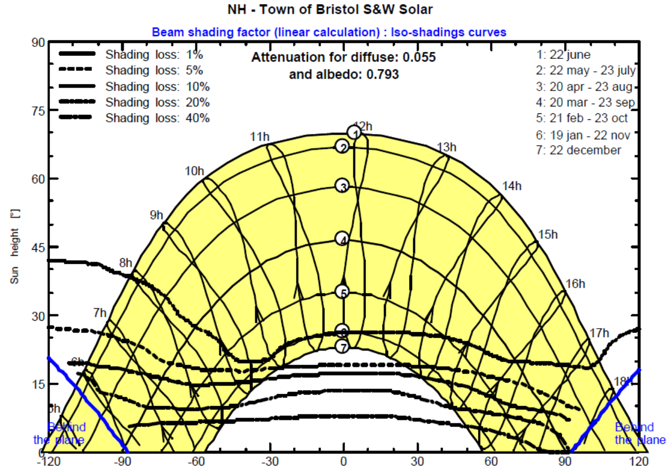
Simulation for year no: 1

Main system parameters	System type	**Ground system (tables) on a hill**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PLUS DUO L-G5.2 370	Pnom	370 Wp
PV Array	Nb. of modules	1920	Pnom total	**710 kWp**
Inverter	Model	CPS SCA50KTL-DO/US-480	Pnom	50.0 kW ac
Inverter pack	Nb. of units	10.0	Pnom total	**500 kW ac**
User's needs	Unlimited load (grid)			

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram



Grid-Connected System: Main results

Project : **NH - Town of Bristol S&W Solar**

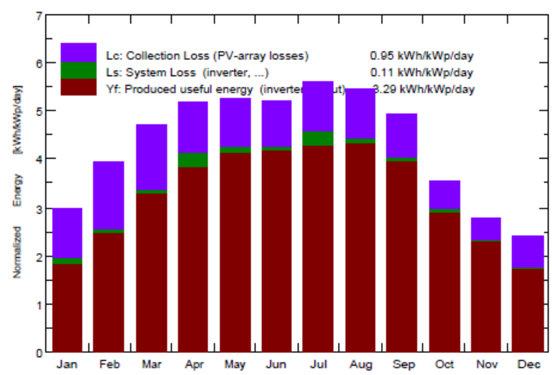
Simulation variant : **BP Original Proposal**
Simulation for year no: 1

Main system parameters	System type	**Ground system (tables) on a hill**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PLUS DUO L-G5.2 370	Pnom	370 Wp
PV Array	Nb. of modules	1920	Pnom total	**710 kWp**
Inverter	Model	CPS SCA50KTL-DO/US-480	Pnom	50.0 kW ac
Inverter pack	Nb. of units	10.0	Pnom total	**500 kW ac**
User's needs	Unlimited load (grid)			

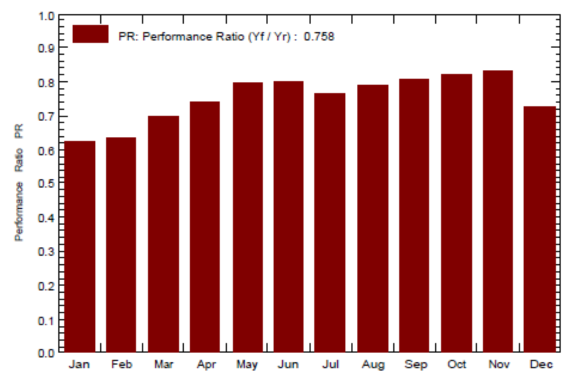
Main simulation results

System Production	**Produced Energy**	**853.8 MWh/year**	Specific prod.	1202 kWh/kWp/year
	Performance Ratio PR	75.75 %		

Normalized productions (per installed kWp): Nominal power 710 kWp



Performance Ratio PR



BP Original Proposal
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_Grid MWh	PR ratio
January	53.7	27.61	-8.73	92.7	61.8	43.3	41.08	0.624
February	74.3	36.85	-6.43	110.8	71.5	50.7	49.77	0.632
March	117.4	58.50	-1.40	146.8	107.2	74.5	73.12	0.701
April	141.7	57.71	7.20	155.8	142.4	88.2	82.12	0.742
May	163.3	70.89	13.58	162.8	151.6	93.7	91.73	0.793
June	165.3	76.57	17.97	156.8	145.5	90.9	88.99	0.799
July	178.7	76.34	20.43	174.0	162.1	100.5	94.32	0.763
August	159.4	66.10	20.46	169.4	158.4	97.5	95.42	0.793
September	121.9	52.16	15.99	148.1	138.8	86.4	84.62	0.804
October	78.9	35.83	8.84	110.4	103.2	65.9	64.54	0.823
November	50.9	24.76	3.06	83.5	76.3	50.4	49.34	0.832
December	42.2	23.08	-6.13	75.4	57.7	39.5	38.70	0.723
Year	1347.7	606.40	7.14	1586.5	1376.6	881.4	853.75	0.758

Legends:			
GlobHor	Global horizontal irradiation	GlobEff	Effective Global, corr. for IAM and shadings
DiffHor	Horizontal diffuse irradiation	EArray	Effective energy at the output of the array
T_Amb	T amb.	E_Grid	Energy injected into grid
GlobInc	Global incident in coll. plane	PR	Performance Ratio

Grid-Connected System: Special graphs

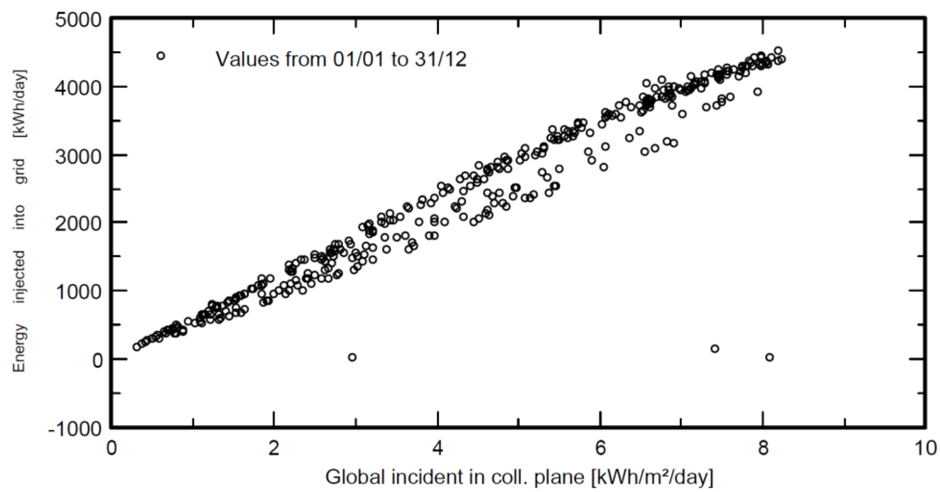
Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **BP Original Proposal**

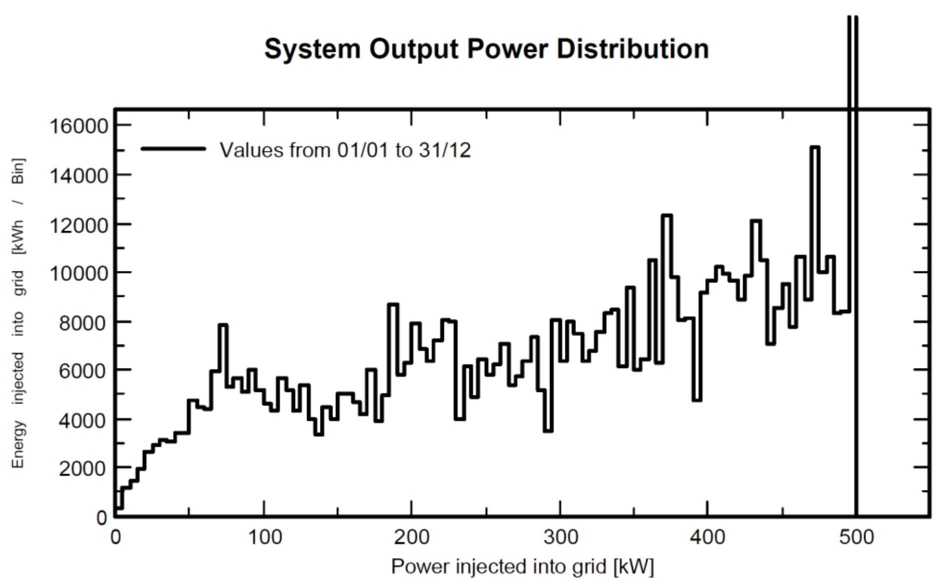
Simulation for year no: 1

Main system parameters	System type	**Ground system (tables) on a hill**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PLUS DUO L-G5.2 370	Pnom	370 Wp
PV Array	Nb. of modules	1920	Pnom total	**710 kWp**
Inverter	Model	CPS SCA50KTL-DO/US-480	Pnom	50.0 kW ac
Inverter pack	Nb. of units	10.0	Pnom total	**500 kW ac**
User's needs	Unlimited load (grid)			

Daily Input/Output diagram



System Output Power Distribution



Grid-Connected System: Loss diagram

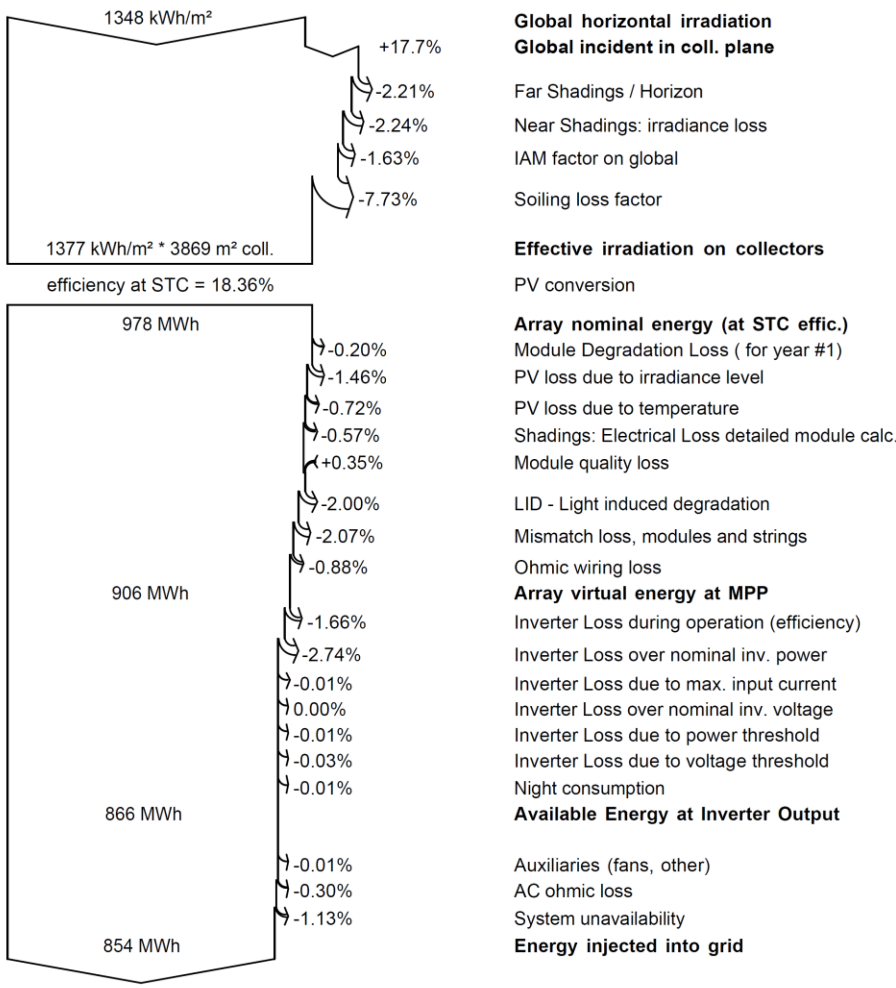
Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **BP Original Proposal**

Simulation for year no: 1

Main system parameters	System type	**Ground system (tables) on a hill**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PLUS DUO L-G5.2 370	Pnom	370 Wp
PV Array	Nb. of modules	1920	Pnom total	**710 kWp**
Inverter	Model	CPS SCA50KTL-DO/US-480	Pnom	50.0 kW ac
Inverter pack	Nb. of units	10.0	Pnom total	**500 kW ac**
User's needs	Unlimited load (grid)			

Loss diagram over the whole year



Comparison of Proposed System and Models

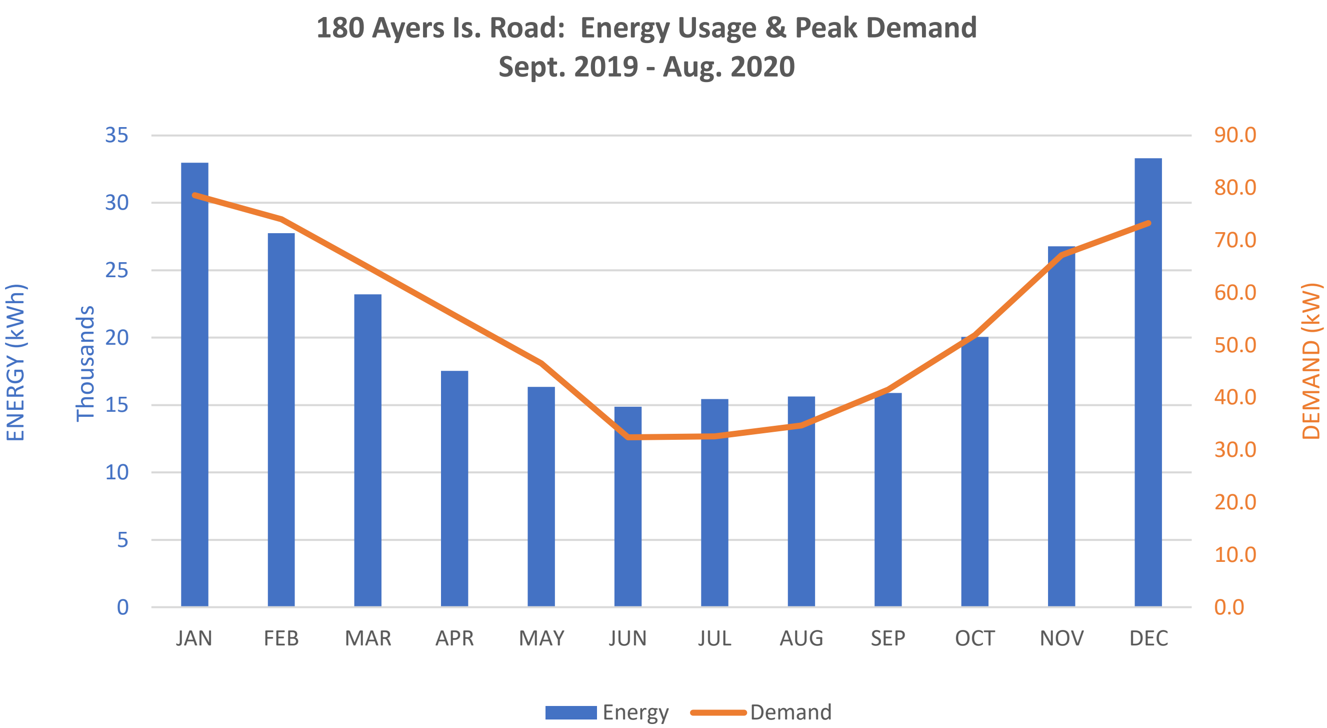
System Model Category	Barrington Power	Acuity Power	Variance	Variance %
Model Software	HelioScope 2020	PVsyst V7.0.13	-	-
Meteo Data	NREL Solar Prospector 10km TMY	Solar Anywhere v.3.3 TMY	-	-
PV Array Peak Capacity (kWdc)	**717.1**	**710.4**	**-6.7**	**-0.9%**
Horizontal global irradiation (kWh/m^2)	1,383.1	1,347.7	-113.6	-7.8%
Global incident in coll. plane	1,670.8	1,586.5	-84.3	-5.0%
Array Output Loss Factors (Annual):				
Near and far shadings	3.8%	4.5%	1.3%	
IAM factor on global	2.7%	1.6%	-1.1%	-
Array soiling loss	6.5%	7.7%	1.2%	-
Effec. Irrad on collectors (kWh/m^2 * m^2 coll.)	**1461.3**	**1376.6**	**-84.7**	**-5.8%**
PV conversion efficiency	18.8%	18.4%	-0.4%	-
Array output energy (at STC effic.) (MWh)	960.0	906.0	-54	-5.7%
Total DC and AC Operating Losses	5.0%	3.1%	-1.8%	-
1st Year AC Energy Production (MWh)	**897.8**	**853.8**	**-44**	**-4.9%**
Specific Production Yield (kWh/kWdc)	**1,252**	**1,202**	**-50**	**-4.0%**

As described, the Acuity PVsyst model was based on a very slightly smaller array (0.9%) to accommodate the stringing design. Using satellite enhanced SolarAnywhere TMY meteo data, resulted in an 8% reduction in estimated annual Global Irradiance, compared the NREL Solar Prospector TMY.

The PVsyst shading model including effects of horizon and trees calculated global irradiance losses from shading at 4.5%, compared to the HelioScope assumption of 3.8%. PVsyst also estimated higher soiling loss (including snow cover) of 7.7% compared to 6.5%. Total DC and AC operating losses, including inverter efficiency, unavailability, etc. was 5.0% for HelioScope and 3.1% for Pvsyst.

The cumulative result was a 5% less predicted AC energy injected to the grid from Acuity's PVsyst model, compared to Barrington's HelioScope prediction, with Specific Production Yield of 1,202 kWh/kWdc, compared to Barrington's 1,252.

5. WWTF LOAD PROFILE ANALYSIS



	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	**711.8**	**Ave kWh/day**
Total kWh	32969	27752	23209	17536	16351	14867	15442	15631	15894	20063	26783	33303	**259800**	**Annual kWh**
Peak kW	78.6	74.0	64.9	55.7	46.5	32.4	32.6	34.7	41.5	51.9	67.2	73.3	**54.4**	**Ave peak kW**

Eversource utility bills were provided for Aug/Sep 2019 through July/Aug 2020. Since the meter read dates occurred around mid-month, energy kWh readings were interpolated to provide totals for each calendar month, to match the PVsyst monthly load profiling method.

A portable power/energy meter was set up by BP on the Ayer's Island Road 3-phase service and collected 15-min. data sets between March 6 and April 16, 2020. Average demand measured 26.2 kW, and average energy consumption was 6.54 kWh per 15-min. period.

Summary figures: Mar 6, 2020 - Apr 16, 2020; all days of the week

Total over period	
Energy	26,362.050 kWh

Daily energy		
Maximum	783.625 kWh	on Mon, Mar 16, 2020
Average	627.668 kWh	
Minimum	484.850 kWh	on Tue, Apr 14, 2020

15-minute energy		
Maximum	14.275 kWh	on Mon, Mar 23, 2020 between 07:30 and 07:45
Average	6.538 kWh	
Minimum	3.675 kWh	on four days between 02:30 and 02:45

15-minute power		
Maximum	57.1 kW	on Mon, Mar 23, 2020 between 07:30 and 07:45
Average	26.2 kW	
Minimum	14.7 kW	on four days between 02:30 and 02:45

Highest demand recorded was 57.1 kW on Mar 23 between 7:30 – 7:45 am. This correlates very closely with the Utility bill, which shows Demand Use averaged 55.7 kW during a ½-hour period between Mar 18 and Apr 17.

Svc Addr: 180 AYERS ISLAND RD
BRISTOL NH 03222
Serv Ref: 778160006 **Bill Cycle: 13**
Service from 03/18/20 - 04/17/20 **30 Days**
Next read date on or about: May 19, 2020

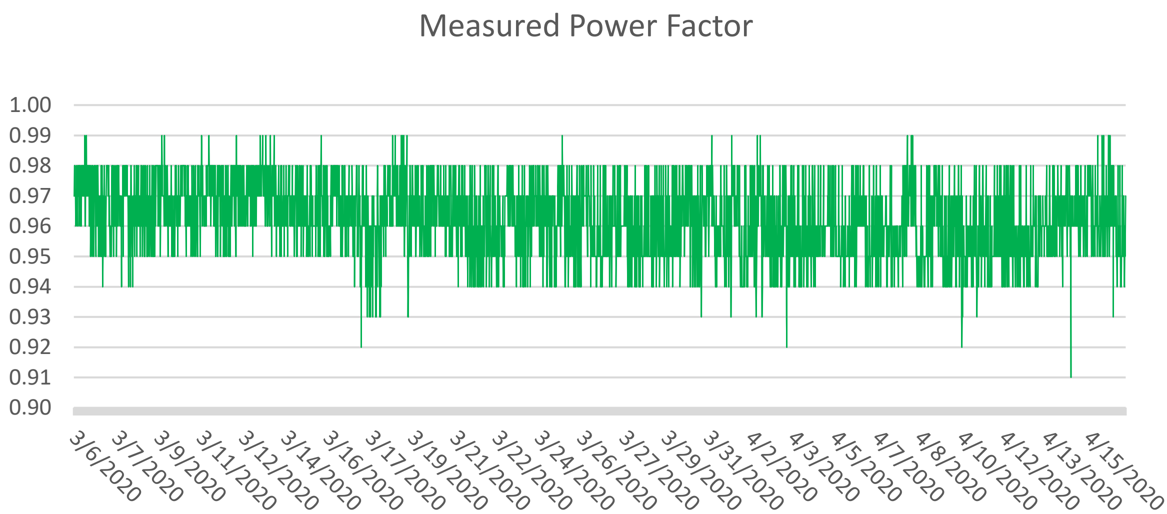
Meter Number	Current Read	Previous Read	Current Usage	Reading Type
S72922260	**12398**	**12214**	**184**	**Actual**

Cust provided ID: SEWER COMMISSION

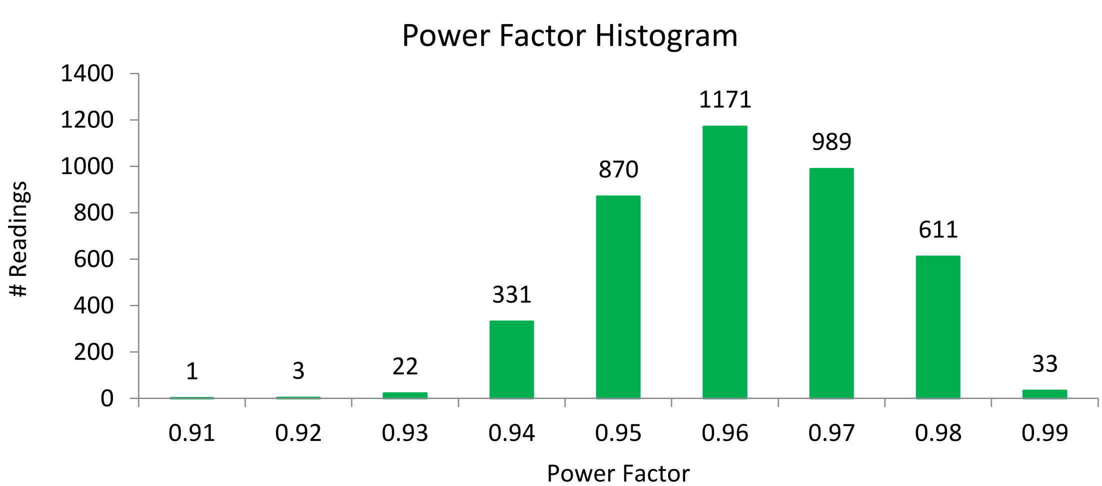
Total Demand Use = 55.70 kW

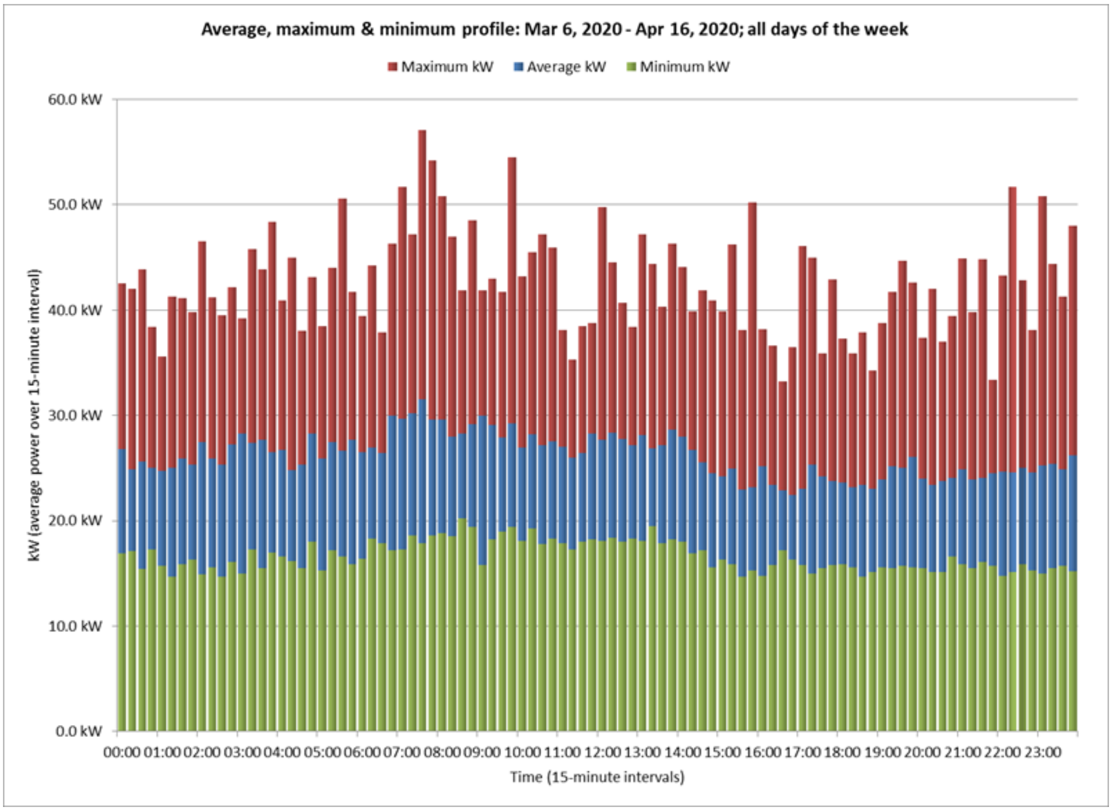
Measured Voltage, Current, & Frequency Readings

AC VOLTAGE L-N			AC CURRENT L-N			FREQ	
V1	V2	V3	I1	I2	I3	Hz	
281.2	283.8	280.3	23.9	37.8	34.4	60.0	AVE
285.4	288.4	284.7	55.3	84.2	81.4	60.0	MAX
275.7	277.5	273.5	15.0	19.3	18.3	59.9	MIN

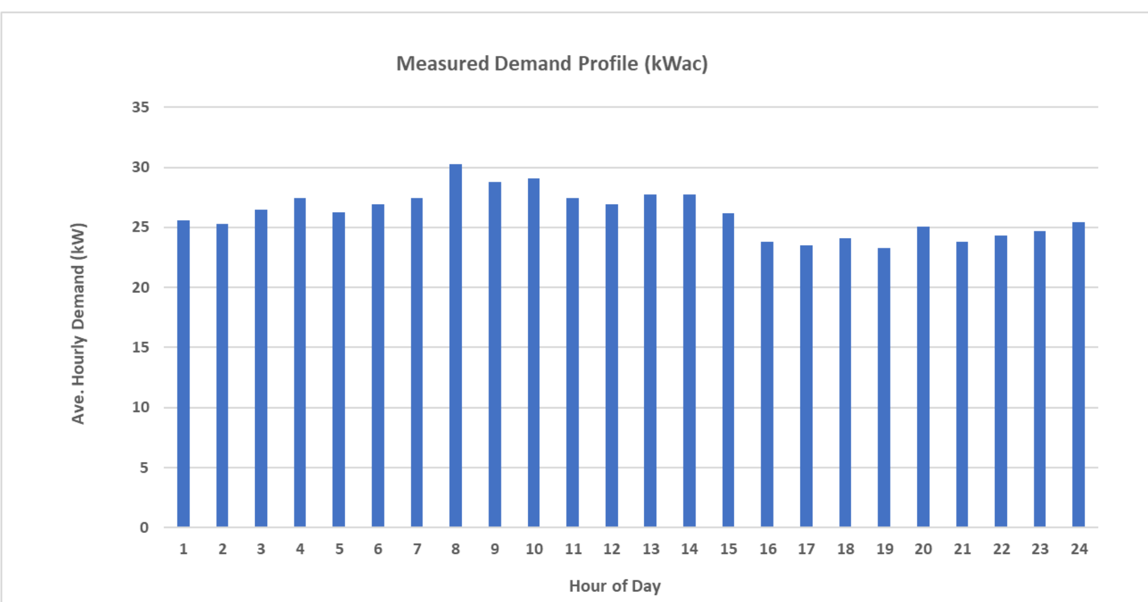


Measured Power Factor varied between 0.91 and 0.99, with an average of 0.96

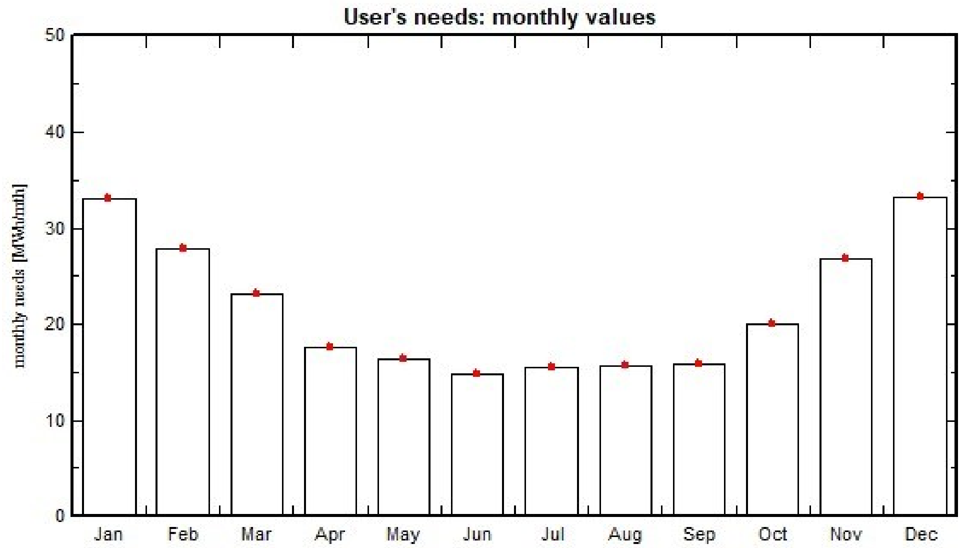




Average 15-min. readings were summed to provide the average hourly load profile, to be used in the Model:



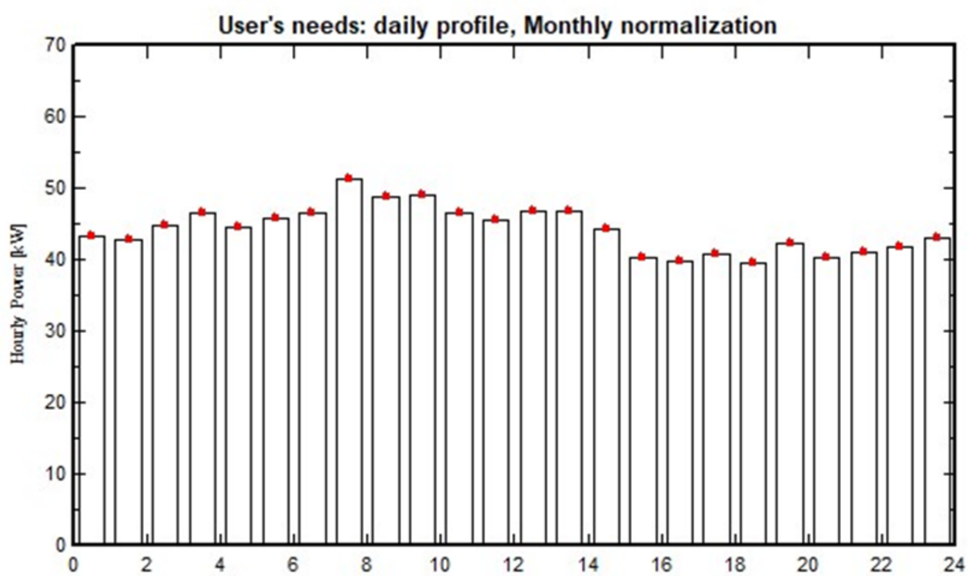
ACUITY POWER GROUP™



Monthly values

January	33.0	MWh/mth
February	27.8	MWh/mth
March	23.2	MWh/mth
April	17.5	MWh/mth
May	16.4	MWh/mth
June	14.9	MWh/mth
July	15.4	MWh/mth
August	15.6	MWh/mth
September	15.9	MWh/mth
October	20.1	MWh/mth
November	26.8	MWh/mth
December	33.3	MWh/mth
Average	**21.7**	MWh/mth
Sum	**260**	MWh

Calendar month kWh usage was entered into the PVsyst model as derived from the monthly utility billing.



Hourly values

0 h	43.4	12 h	46.9
1 h	42.9	13 h	46.9
2 h	44.9	14 h	44.4
3 h	46.6	15 h	40.3
4 h	44.6	16 h	39.8
5 h	45.7	17 h	40.8
6 h	46.6	18 h	39.5
7 h	51.3	19 h	42.3
8 h	48.8	20 h	40.3
9 h	49.1	21 h	41.2
10 h	46.6	22 h	41.8
11 h	45.6	23 h	43.2

Average	**44.3**	kW
Day sum	**1.06**	MWh/day
Month sum	**33.0**	MWh/mth

For the PVsyst model, the average daily load profile as measured was then "normalized" to each monthly kWh total, to provide the hourly load for each 8760 hours of the year. The financial modeling is based on these hourly loads and the resulting net metered power flow to/from the Utility grid at the applicable rates.

6. VIABLE SYSTEMS OPTIONS AND MODELS

Considering the options for net metering and virtual (group) net metering, two viable options emerged: supply the Wastewater Treatment Facility load only, or supply the entire Sewer & Water facilities loads.

The following two PVsyst model reports are for each of those scenarios.

The first PV system Is designed to provide just the Ayer's Is. Road facility's annual usage of 260 MWh, using the Utility grid as the net metered 'storage' for continuously importing or exporting excess demand or solar supply.

The second PV system is designed to provide the total S&W facilities' usage of approximately 500 MWh per year, using the Utility grid as a 'virtual net meter' to distribute excess solar production not immediately consumed by the WTF to the other facilities.

Acuity was notified by Barrington Power in Sept. that the Q.Peak DUO 370W modules originally proposed have improved in cell efficiency and are now commercially available as 420W models in the same dimensions and weight. This, of course, provides opportunity to reduce the module count and array footprint, for the same dc capacity. The two models are sized using these improved 420W modules:

Grid-Connected System: Simulation parameters

Project : **NH - Town of Bristol S&W Solar**

Geographical Site	**180 Ayer's Island Rd, Bristol NH**		Country	**United States**
Situation	Latitude	43.60° N	Longitude	-71.72° W
Time defined as	Legal Time	Time zone UT-5	Altitude	345 m
	Albedo	0.20		
Meteo data:	**(43.5966 -71.7229)**	SolarAnywhere v.3.3 - TMY		

Simulation variant : **Self-consumption Grid Net Metering**

	Simulation date	30/09/20 08h06
	Simulation for the	**1st year of operation**

Simulation parameters	System type	**Fixed Ground Tables on Slope**		
Collector Plane Orientation	Tilt	35°	Azimuth	2°
Sheds configuration	Nb. of sheds	32	Identical arrays	
	Sheds spacing	13.0 m	Collector width	4.20 m
Shading limit angle	Limit profile angle	14.1°	Ground Cov. Ratio (GCR)	32.3%
Models used	Transposition	Perez	Diffuse	Imported
			Circumsolar	separate
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
User's needs :	daily profile	Monthly normalization		
	average	712 kWh/Day		

PV Array Characteristics

PV module Si-mono	Model	**Q.PEAK DUO L-G8.2 420**		
Custom parameters definition	Manufacturer	Hanwha Q Cells America		
Number of PV modules	In series	16 modules	In parallel	32 strings
Total number of PV modules	nb. modules	512	Unit Nom. Power	420 Wp
Array global power	Nominal (STC)	**215 kWp**	At operating cond.	194 kWp (50°C)
Array operating characteristics (50°C)	U mpp	599 V	I mpp	323 A
Total area	Module area	**1097 m²**	Cell area	897 m²
Inverter	Model	**CPS SCA60KTL-DO/US-480**		
Custom parameters definition	Manufacturer	Chint Power Systems		
Characteristics	Unit Nom. Power	**60.0 kWac**	Oper. Voltage	200-850 V
Inverter pack	Total power	**180 kWac**	Pnom ratio	1.19
	Nb. of inverters	9 * MPPT 33%		
Total	Total power	**180 kWac**	Pnom ratio	1.19

PV Array loss factors

Array Soiling Losses — Average loss Fraction 9.1 %

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
27.1%	31.3%	22.6%	3.5%	1.3%	1.3%	1.2%	1.4%	1.5%	1.3%	2.3%	14.7%

Thermal Loss factor	Uc (const)	29.0 W/m²K	Uv (wind)	0.0 W/m²K / m/s
Wiring Ohmic Loss	Global array res.	31 m• •	Loss Fraction	1.5 % at STC

Grid-Connected System: Simulation parameters

LID - Light Induced Degradation			Loss Fraction	2.0 %
Module Quality Loss			Loss Fraction	-0.3 %
Module mismatch losses			Loss Fraction	2.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %
Module average degradation	Year no	1	Loss factor	0.4 %/year
Mismatch due to degradation	Imp RMS dispersion	0.4 %/year	Vmp RMS dispersion	0.4 %/year

Incidence effect (IAM): User defined profile

0°	20°	40°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.970	0.900	0.830	0.690	0.440	0.000

System loss factors

AC loss, inverter to injection	Inverter voltage	480 Vac tri		
	Wires: 3 x 500 mm²	435 m	Loss Fraction	1.5 % at STC
Unavailability of the system	2.5 days, 3 periods		Time fraction	0.7 %
Auxiliaries loss	constant (fans)	25 W	... from Power thresh.	0.0 kW

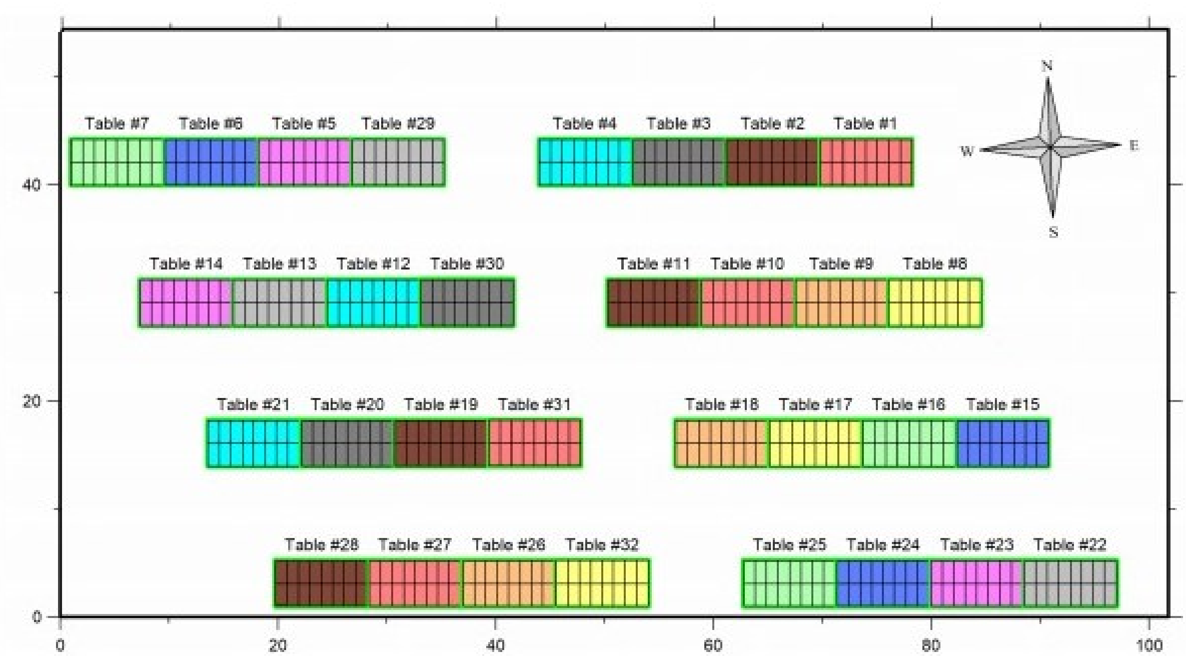
Module layout

Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption Grid Net Metering**

PV Array Characteristics

PV module	Si-mono	Model	**Q.PEAK DUO L-G8.2 420**		
		Manufacturer	Hanwha Q Cells America	Size	1.030 x 2.080 m²
Number of PV modules		In series	16 modules	In parallel	32 strings



Grid-Connected System: Near shading definition

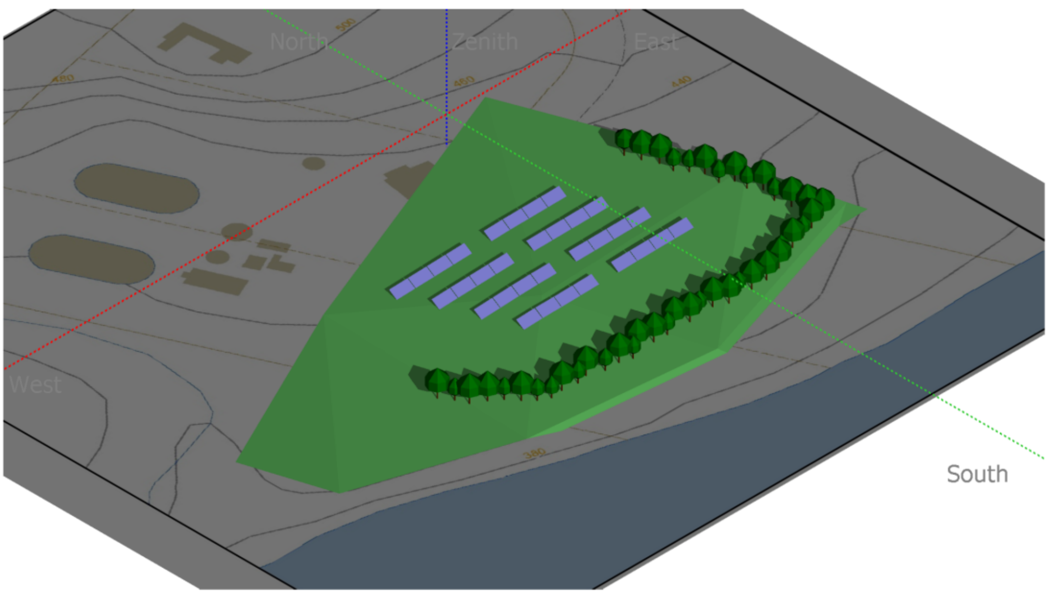
Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption Grid Net Metering**

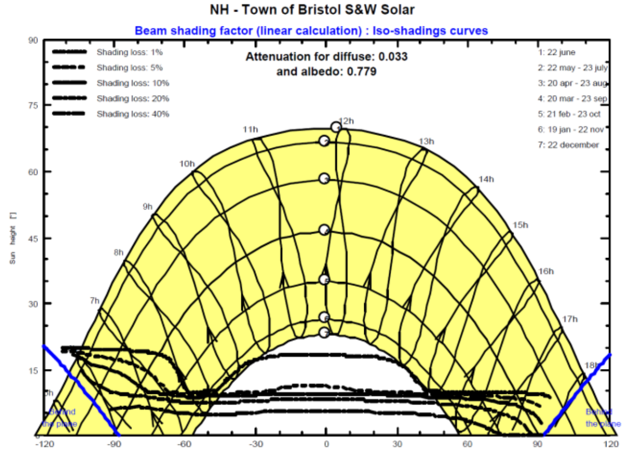
Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PEAK DUO L-G8.2 420	Pnom	420 Wp
PV Array	Nb. of modules	512	Pnom total	**215 kWp**
Inverter	Model	CPS SCA60KTL-DO/US-480	Pnom	60.0 kW ac
Inverter pack	Nb. of units	3.0	Pnom total	**180 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram



Grid-Connected System: Detailed User's needs

Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption Grid Net Metering**

Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PEAK DUO L-G8.2 420	Pnom	420 Wp
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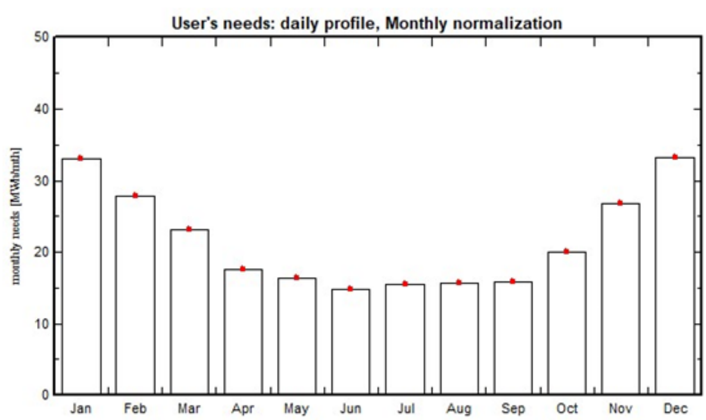
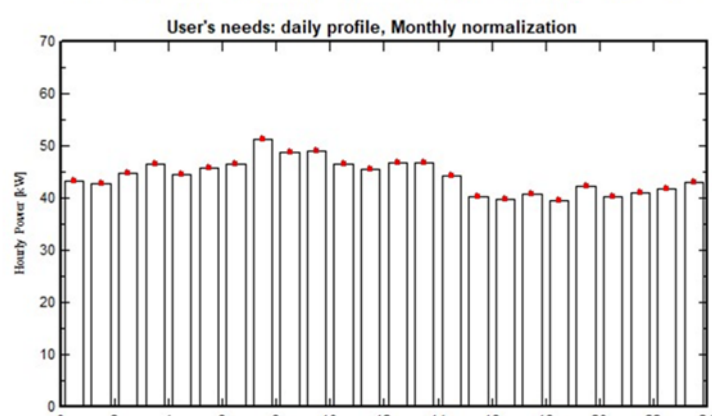
Inverter pack	Nb. of units	3.0	Pnom total	**180 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

daily profile, Monthly normalization, average = 712 kWh/day

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year	
33.0	27.8	23.2	17.5	16.4	14.9	15.4	15.6	15.9	20.1	26.8	33.3	260	MWh

	0 h / 12 h	1 h / 13 h	2 h / 14 h	3 h / 15 h	4 h / 16 h	5 h / 17 h	6 h / 18 h	7 h / 19 h	8 h / 20 h	9 h / 21 h	10 h / 22 h	11 h / 23 h	
Hourly load	30.53	30.17	31.60	32.80	31.37	32.20	32.80	36.13	34.34	34.58	32.80	32.08	kW
	33.02	33.02	31.25	28.38	28.02	28.74	27.79	29.81	28.38	28.98	29.45	30.41	kW





Grid-Connected System: Main results

Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption Grid Net Metering**

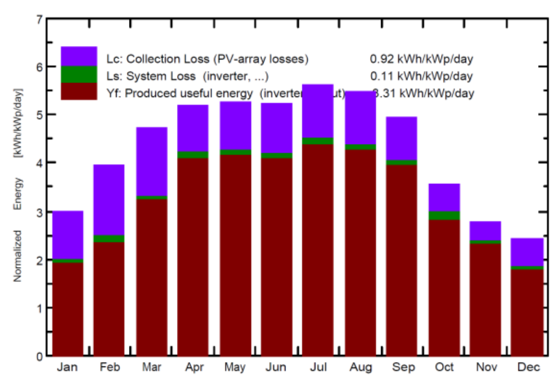
Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PEAK DUO L-G8.2 420	Pnom	420 Wp
PV Array	Nb. of modules	512	Pnom total	**215 kWp**
Inverter	Model	CPS SCA60KTL-DO/US-480	Pnom	60.0 kW ac
Inverter pack	Nb. of units	3.0	Pnom total	**180 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

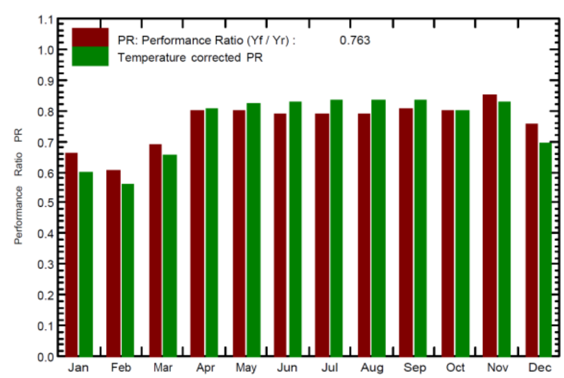
Main simulation results

System Production	**Produced Energy**	**261.4 MWh/year**	Specific prod.	1216 kWh/kWp/year
	Performance Ratio PR	76.25 %	Solar Fraction SF	36.28 %

Normalized productions (per installed kWp): Nominal power 215 kWp



Performance Ratio PR and Weather corrected PR



Self-consumption Grid Net Metering

Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_User MWh	E_Solar MWh	E_Grid MWh	EFrGrid MWh
January	53.7	27.61	-8.73	92.6	63.8	13.47	32.97	8.473	4.66	24.50
February	74.3	36.85	-6.43	110.8	72.5	15.18	27.75	8.831	5.54	18.92
March	117.4	58.50	-1.40	146.8	108.2	22.34	23.21	9.421	12.27	13.79
April	141.7	57.71	7.20	155.8	143.3	27.41	17.54	7.901	18.76	9.64
May	163.3	70.89	13.58	162.8	152.6	28.70	16.35	8.104	19.78	8.25
June	165.3	76.57	17.97	156.8	146.6	27.32	14.87	7.703	18.84	7.16
July	178.7	76.34	20.43	174.0	163.2	30.23	15.44	7.966	21.40	7.48
August	159.4	66.10	20.46	169.4	159.4	29.45	15.63	7.482	21.13	8.15
September	121.9	52.16	15.99	148.1	139.8	26.28	15.89	6.963	18.59	8.93
October	78.9	35.83	8.84	110.4	104.2	20.18	20.06	6.860	12.02	13.20
November	50.9	24.76	3.06	83.4	77.8	15.64	26.78	6.953	8.26	19.83
December	42.2	23.08	-6.13	75.4	60.1	12.55	33.30	7.601	4.62	25.70
Year	1347.7	606.41	7.14	1586.4	1391.5	268.74	259.80	94.258	165.87	165.54

Legends:

GlobHor	Global horizontal irradiation	GlobEff	Effective Global, corr. for IAM and shadings
DiffHor	Horizontal diffuse irradiation	EArray	Effective energy at the output of the array
T_Amb	T amb.	E_User	Energy supplied to the user
GlobInc	Global incident in coll. plane	E_Solar	Energy from the sun
		E_Grid	Energy injected into grid
		EFrGrid	Energy from the grid

Grid-Connected System: Special graphs

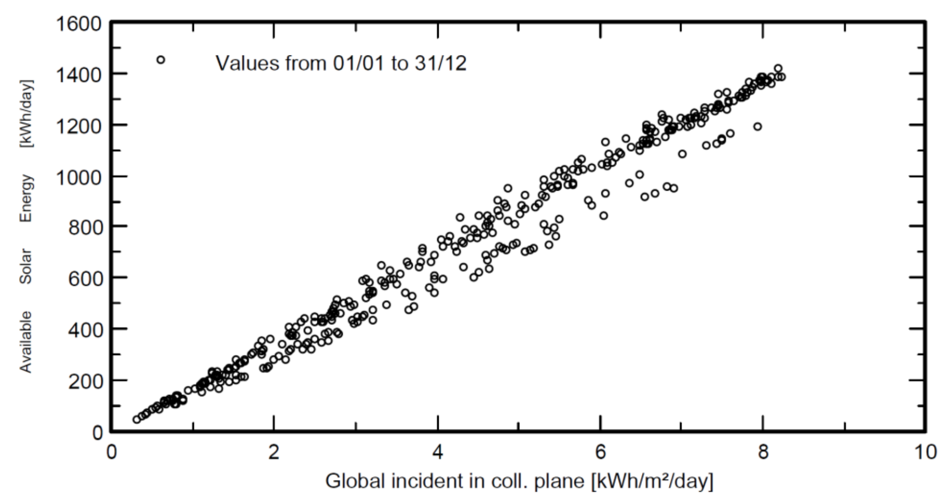
Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption Grid Net Metering**

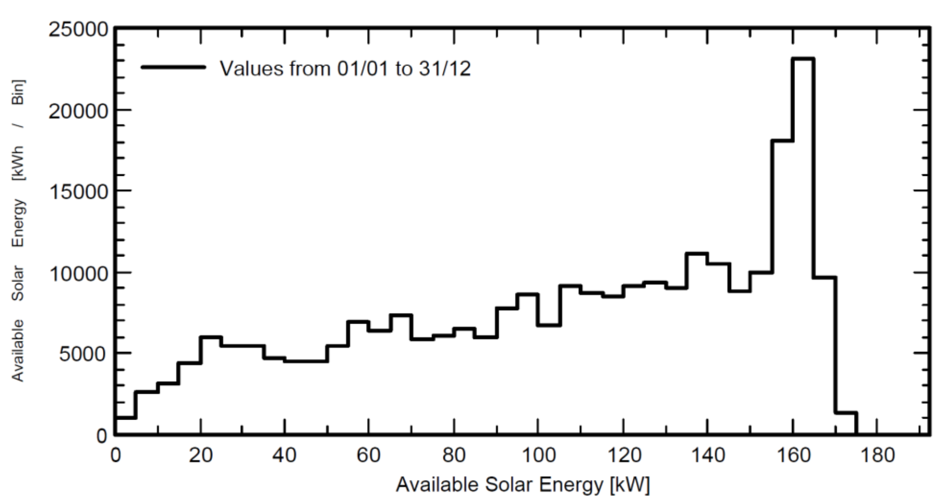
Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PEAK DUO L-G8.2 420	Pnom	420 Wp
PV Array	Nb. of modules	512	Pnom total	**215 kWp**
Inverter	Model	CPS SCA60KTL-DO/US-480	Pnom	60.0 kW ac
Inverter pack	Nb. of units	3.0	Pnom total	**180 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

Daily Input/Output diagram



System Output Power Distribution

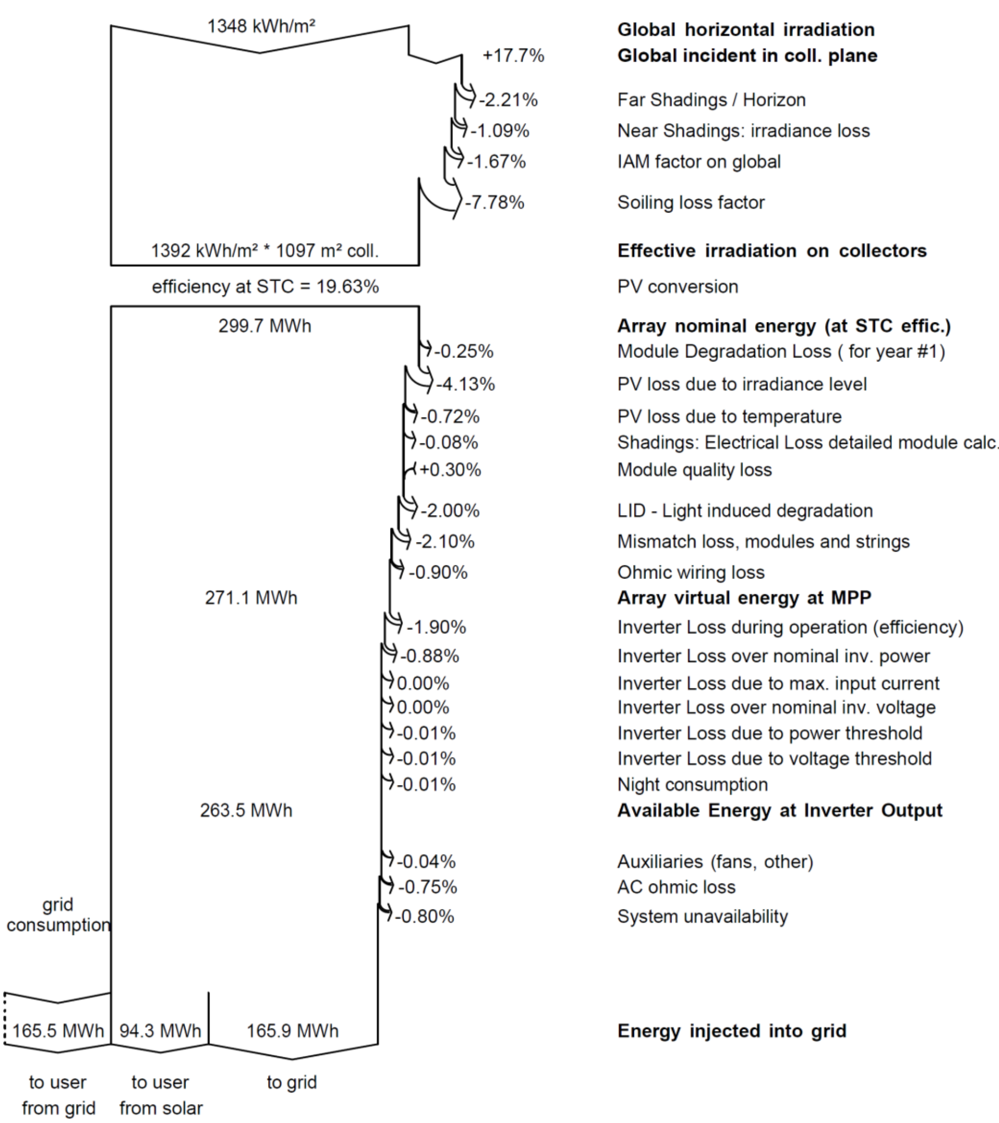


Grid-Connected System: Loss diagram

Project :	**NH - Town of Bristol S&W Solar**
Simulation variant :	**Self-consumption Grid Net Metering**
	Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PEAK DUO L-G8.2 420	Pnom	420 Wp
PV Array	Nb. of modules	512	Pnom total	**215 kWp**
Inverter	Model	CPS SCA60KTL-DO/US-480	Pnom	60.0 kW ac
Inverter pack	Nb. of units	3.0	Pnom total	**180 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

Loss diagram over the whole year



As shown, the PVsyst model for the 'Self-consumption Grid Net Metering' system for meeting the WWTF load is comprised of a 215 kWdc PV array of (32) strings of (16) series-connected 420W modules on a table, feeding (3) 60 kW inverters, for an AC/DC ratio of 1.19. The array 'footprint', as shown, is approx. 3,600 m^2 or 39,000 ft^2 .

The predicted 1st year energy production is 259.8 MWh/yr, of which 94.3 MWh/yr are consumed directly by the facility and the excess 165.9 MWh/yr are net metered to the grid for supplying the remaining 165.5 MWh/yr of the load (330 kWh/yr is the export/import distribution loss - about 0.24%). The Specific Production Yield is 1,216 kWh/kWp/year.

Grid-Connected System: Simulation parameters

Project : **NH - Town of Bristol S&W Solar**

Geographical Site **180 Ayer's Island Rd, Bristol NH** Country **United States**

Situation Latitude 43.60° N Longitude -71.72° W
Time defined as Legal Time Time zone UT-5 Altitude 345 m
Albedo 0.20
Meteo data: **(43.5966 -71.7229)** SolarAnywhere v.3.3 - TMY

Simulation variant : **Self-consumption + Virtual Net Metering**

Simulation date 04/10/20 11h29
Simulation for the **1st year of operation**

Simulation parameters System type **Fixed Ground Tables on Slope**

Collector Plane Orientation Tilt 35° Azimuth 2°

Sheds configuration Nb. of sheds 60 Identical arrays
Sheds spacing 10.00 m Collector width 4.20 m
Shading limit angle Limit profile angle 20.2° Ground Cov. Ratio (GCR) 42.0%

Models used Transposition Perez Diffuse Imported
Circumsolar separate

Horizon Average Height 5.7°

Near Shadings Detailed electrical calculation (acc. to module layout)

User's needs : daily profile Monthly normalization
average 712 kWh/Day

PV Array Characteristics
PV module Si-mono Model **Q.PEAK DUO L-G8.2 420**
Custom parameters definition Manufacturer Hanwha Q Cells America
Number of PV modules In series 16 modules In parallel 60 strings
Total number of PV modules nb. modules 960 Unit Nom. Power 420 Wp
Array global power Nominal (STC) **403 kWp** At operating cond. 363 kWp (50°C)
Array operating characteristics (50°C) U mpp 599 V I mpp 606 A
Total area Module area **2057 m²** Cell area 1682 m²

Inverter Model **CPS SCA60KTL-DO/US-480**
Custom parameters definition Manufacturer Chint Power Systems
Characteristics Unit Nom. Power **60.0 kWac** Oper. Voltage 200-850 V
Inverter pack Total power **360 kWac** Pnom ratio 1.12
Nb. of inverters 18 * MPPT 33%

Total Total power **360 kWac** Pnom ratio 1.12

PV Array loss factors
Array Soiling Losses Average loss Fraction 9.1 %

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
27.1%	31.3%	22.6%	3.5%	1.3%	1.3%	1.2%	1.4%	1.5%	1.3%	2.3%	14.7%

Thermal Loss factor Uc (const) 29.0 W/m²K Uv (wind) 0.0 W/m²K / m/s
Wiring Ohmic Loss Global array res. 16 m• • Loss Fraction 1.5 % at STC

Grid-Connected System: Simulation parameters

LID - Light Induced Degradation			Loss Fraction	2.0 %
Module Quality Loss			Loss Fraction	-0.3 %
Module mismatch losses			Loss Fraction	2.0 % at MPP
Strings Mismatch loss			Loss Fraction	0.10 %
Module average degradation	Year no	1	Loss factor	0.4 %/year
Mismatch due to degradation	Imp RMS dispersion	0.4 %/year	Vmp RMS dispersion	0.4 %/year

Incidence effect (IAM): User defined profile

0°	20°	40°	60°	70°	75°	80°	85°	90°
1.000	1.000	1.000	0.970	0.900	0.830	0.690	0.440	0.000

System loss factors

AC loss, inverter to injection	Inverter voltage	480 Vac tri		
	Wires: 3 x 500 mm²	235 m	Loss Fraction	1.5 % at STC
Unavailability of the system	2.5 days, 3 periods		Time fraction	0.7 %
Auxiliaries loss	constant (fans)	25 W	... from Power thresh.	0.0 kW

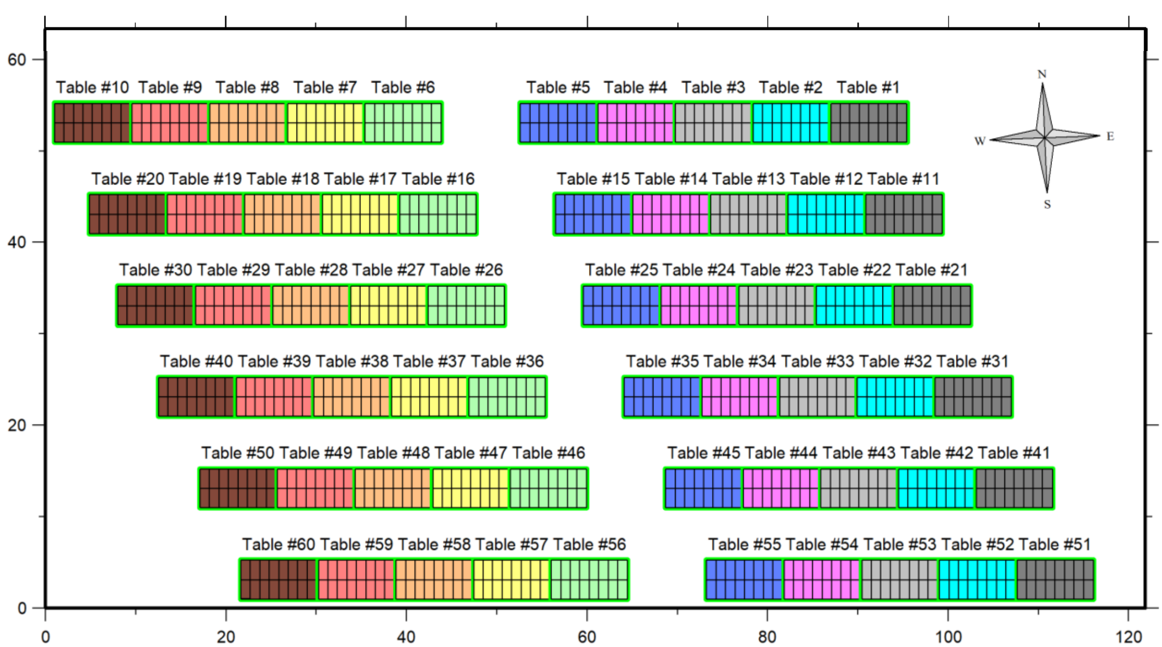
Module layout

Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption + Virtual Net Metering**

PV Array Characteristics

PV module	Si-mono	Model	**Q.PEAK DUO L-G8.2 420**		
		Manufacturer	Hanwha Q Cells America	Size	1.030 x 2.080 m²
Number of PV modules		In series	16 modules	In parallel	60 strings



Grid-Connected System: Near shading definition

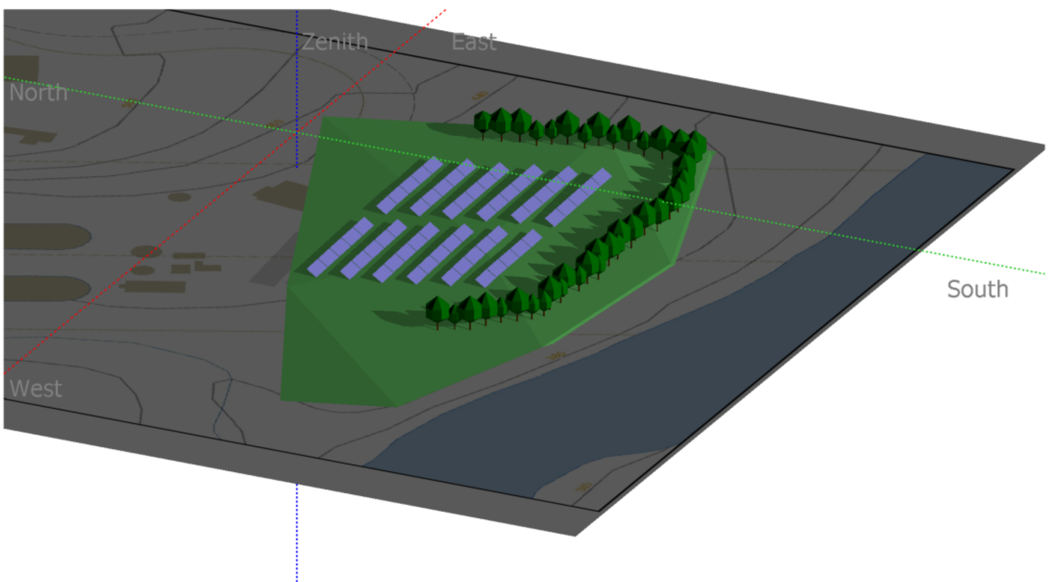
Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption + Virtual Net Metering**

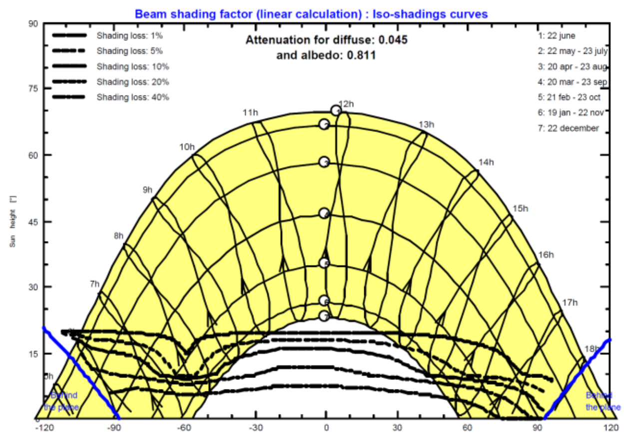
Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PEAK DUO L-G8.2 420	Pnom	420 Wp
PV Array	Nb. of modules	960	Pnom total	**403 kWp**
Inverter	Model	CPS SCA60KTL-DO/US-480	Pnom	60.0 kW ac
Inverter pack	Nb. of units	6.0	Pnom total	**360 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

Perspective of the PV-field and surrounding shading scene



Iso-shadings diagram



Grid-Connected System: Detailed User's needs

Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption + Virtual Net Metering**

Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
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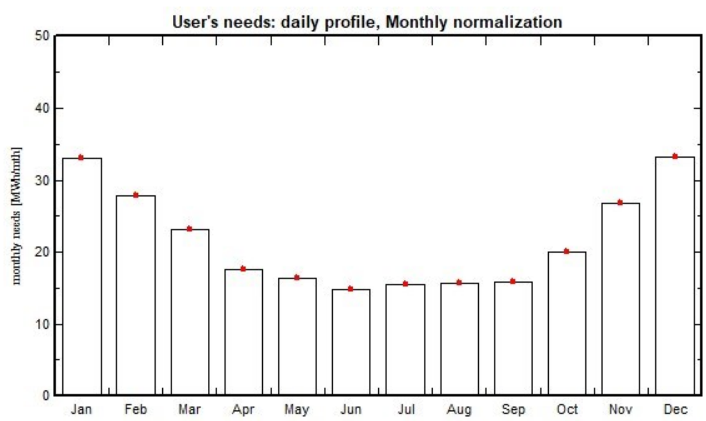
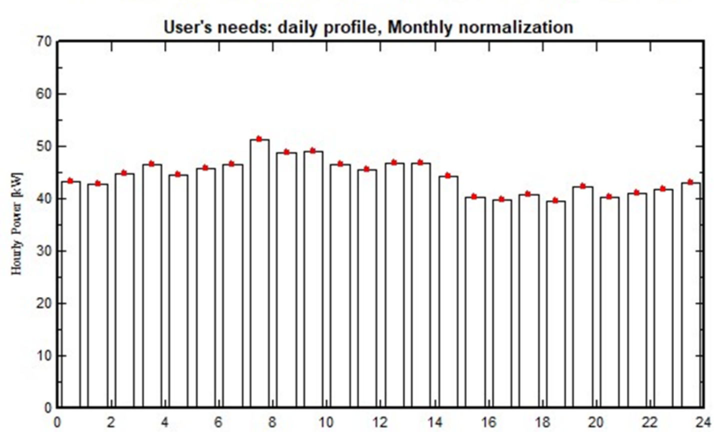
Inverter pack	Nb. of units	6.0	Pnom total	**360 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

daily profile, Monthly normalization, average = 712 kWh/day

Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year	
33.0	27.8	23.2	17.5	16.4	14.9	15.4	15.6	15.9	20.1	26.8	33.3	260	MWh/mth

	0 h / 12 h	1 h / 13 h	2 h / 14 h	3 h / 15 h	4 h / 16 h	5 h / 17 h	6 h / 18 h	7 h / 19 h	8 h / 20 h	9 h / 21 h	10 h / 22 h	11 h / 23 h	
Hourly load	43.4	42.9	44.9	46.6	44.6	45.7	46.6	51.3	48.8	49.1	46.6	45.6	kW
	46.9	46.9	44.4	40.3	39.8	40.8	39.5	42.4	40.3	41.2	41.8	43.2	kW





Grid-Connected System: Main results

Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption + Virtual Net Metering**
Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
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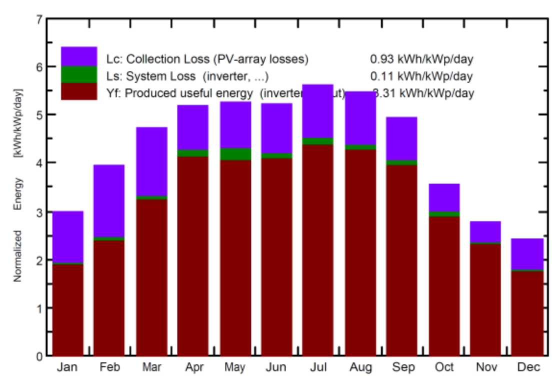
PV Array	Nb. of modules	960	Pnom total	**403 kWp**
Inverter	Model	CPS SCA60KTL-DO/US-480	Pnom	60.0 kW ac
Inverter pack	Nb. of units	6.0	Pnom total	**360 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

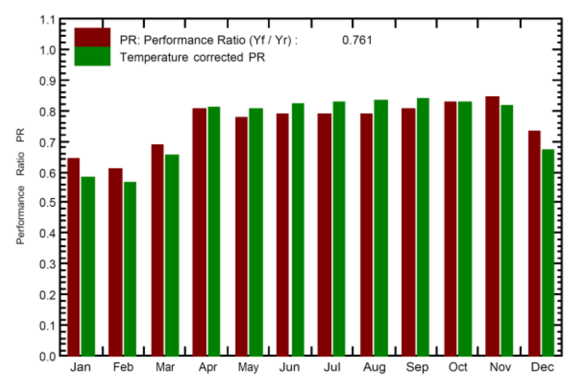
Main simulation results

System Production	**Produced Energy**	**488.7 MWh/year**	Specific prod.	1212 kWh/kWp/year
	Performance Ratio PR	76.09 %	Solar Fraction SF	40.29 %

Normalized productions (per installed kWp): Nominal power 403 kWp



Performance Ratio PR and Weather corrected PR



Self-consumption + Virtual Net Metering
Balances and main results

	GlobHor kWh/m²	DiffHor kWh/m²	T_Amb °C	GlobInc kWh/m²	GlobEff kWh/m²	EArray MWh	E_User MWh	E_Solar MWh	E_Grid MWh	EFrGrid MWh
January	53.7	27.61	-8.73	92.6	63.1	24.56	32.95	9.90	14.03	23.05
February	74.3	36.85	-6.43	110.8	72.2	28.31	27.74	10.13	17.10	17.61
March	117.4	58.50	-1.40	146.7	107.8	41.75	23.20	10.15	30.57	13.05
April	141.7	57.71	7.20	155.8	143.0	51.78	17.53	8.68	41.66	8.84
May	163.3	70.89	13.58	162.8	152.2	54.00	16.34	8.76	42.27	7.58
June	165.3	76.57	17.97	156.8	146.1	51.17	14.86	8.29	41.42	6.57
July	178.7	76.34	20.43	174.0	162.8	56.63	15.43	8.46	46.56	6.97
August	159.4	66.10	20.46	169.4	159.0	55.22	15.62	8.01	45.62	7.61
September	121.9	52.16	15.99	148.1	139.4	49.35	15.89	7.46	40.51	8.42
October	78.9	35.83	8.84	110.4	103.9	37.90	20.05	7.85	28.82	12.20
November	50.9	24.76	3.06	83.4	77.4	29.06	26.77	7.99	20.27	18.78
December	42.2	23.08	-6.13	75.4	59.3	22.81	33.29	8.93	13.26	24.35
Year	1347.7	606.40	7.14	1586.3	1386.3	502.54	259.68	104.62	382.09	155.06

Legends:

GlobHor	Global horizontal irradiation	GlobEff	Effective Global, corr. for IAM and shadings
DiffHor	Horizontal diffuse irradiation	EArray	Effective energy at the output of the array
T_Amb	T amb.	E_User	Energy supplied to the user
GlobInc	Global incident in coll. plane	E_Solar	Energy from the sun
		E_Grid	Energy injected into grid
		EFrGrid	Energy from the grid

Grid-Connected System: Special graphs

Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption + Virtual Net Metering**

Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
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PV modules	Model	Q.PEAK DUO L-G8.2 420	Pnom	420 Wp
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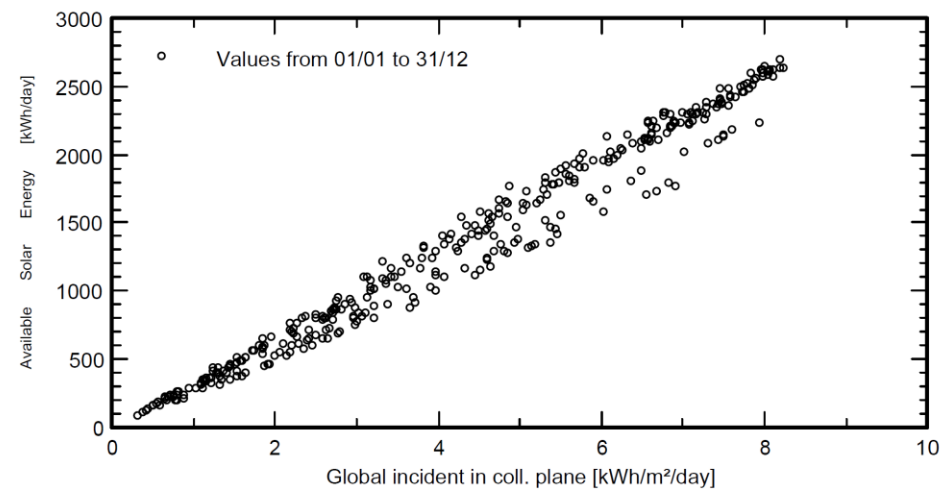
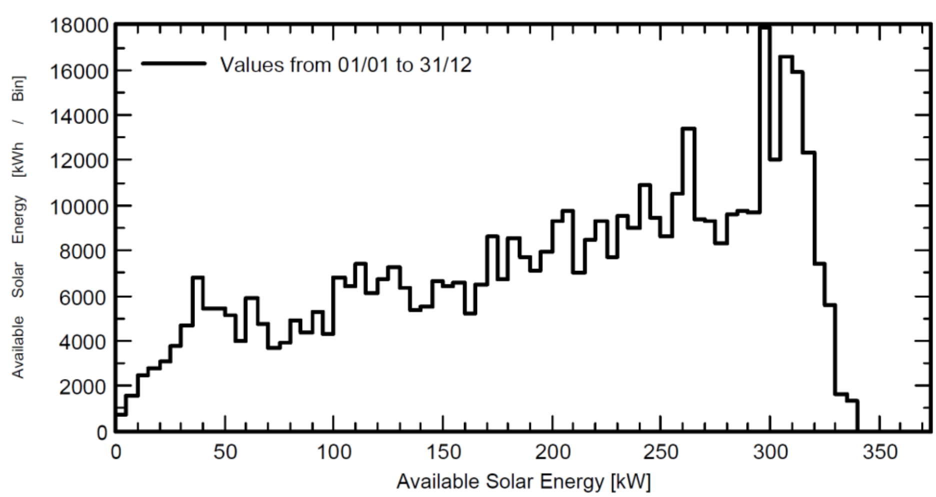
Inverter pack	Nb. of units	6.0	Pnom total	**360 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

Daily Input/Output diagram



System Output Power Distribution



Grid-Connected System: Loss diagram

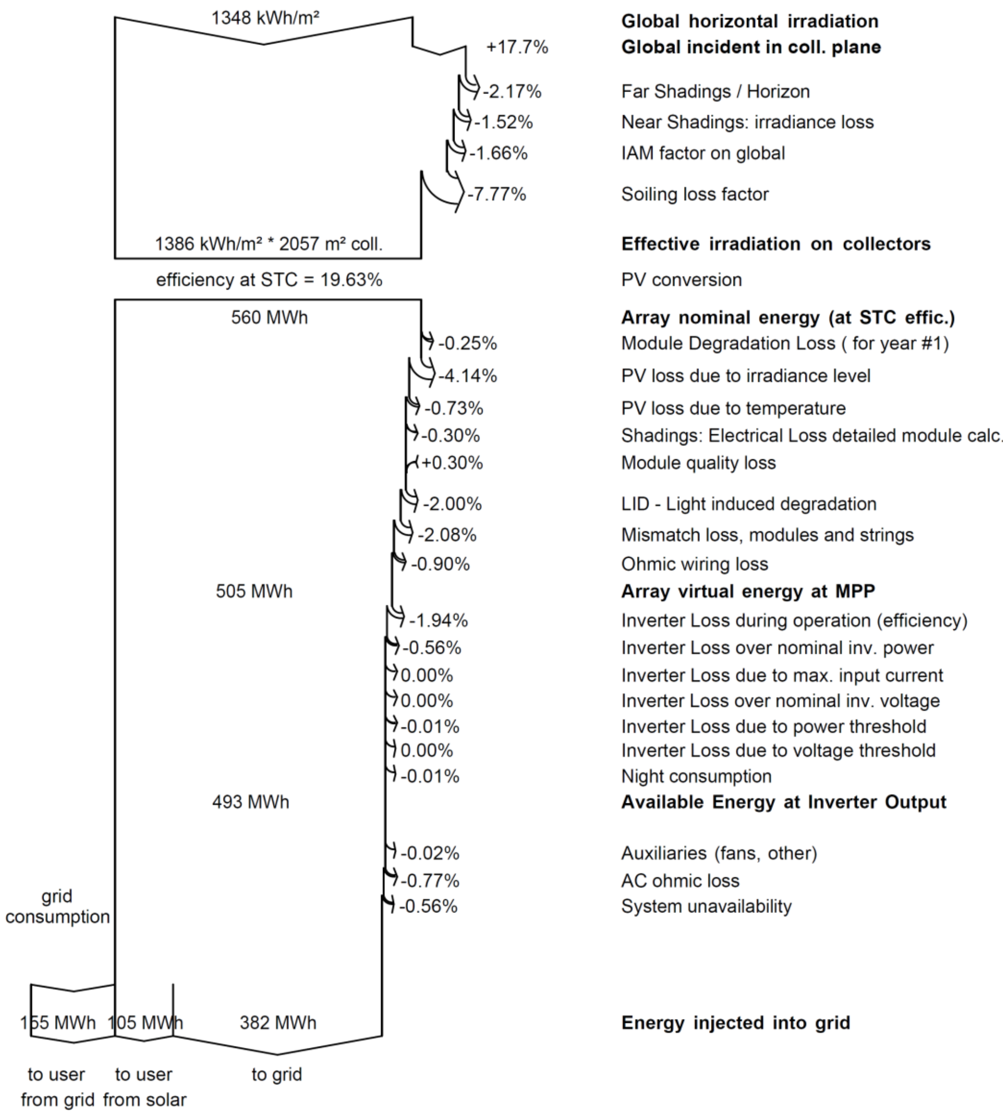
Project : **NH - Town of Bristol S&W Solar**

Simulation variant : **Self-consumption + Virtual Net Metering**

Simulation for year no: 1

Main system parameters	System type	**Fixed Ground Tables on Slope**		
Horizon	Average Height	5.7°		
Near Shadings	Detailed electrical calculation	(acc. to module layout)		
PV Field Orientation	tilt	35°	azimuth	2°
PV modules	Model	Q.PEAK DUO L-G8.2 420	Pnom	420 Wp
PV Array	Nb. of modules	960	Pnom total	**403 kWp**
Inverter	Model	CPS SCA60KTL-DO/US-480	Pnom	60.0 kW ac
Inverter pack	Nb. of units	6.0	Pnom total	**360 kW ac**
User's needs	daily profile	Monthly normalization	Global	260 MWh/year

Loss diagram over the whole year



As shown, the PVsyst model for the Self-consumption + Virtual (Group) Net Metering system to provide the total S&W facilities' usage of approximately 500 MWh per year is comprised of a 403 kWdc PV array of (60) strings of (16) series-connected 420W modules on a table, feeding (6) 60 kW inverters, for an AC/DC ratio of 1.12. The array 'footprint', as shown, is approx. 5,400 m^2 or 58,000 ft^2 .

The predicted 1st year energy production is 486.7 MWh/yr, of which 104.6 MWh/yr are consumed directly by the facility and the excess 382.1 MWh/yr are net metered to the grid for supplying the remaining 155.1 MWh/yr of the WWTF load, plus 227 MWh/yr for the other S&W facilities. The Specific Production Yield is 1,222 kWh/kWp/year.

7. FINANCIAL MODELS AND ANALYSIS

DISCLAIMER: This information is provided as an illustration of potential financial benefits stemming from ownership of a solar electric system and/or from entering into a power purchase agreement with a third-party owned solar electric system. This is not a production guarantee. This is not a financial guarantee. A professional accountant and/or tax advisor should confirm these estimates. Acuity Power Group, Inc., it's officers and employees do not warrant the applicability of these estimates for any particular business case, and all liability is disclaimed.

REQUESTED SCOPE

The Solar Array project has been initially positioned as a Power Purchase Agreement. This method should be considered, as well as the option of funding the effort with a municipal bond. Financial analysis for both options should be provided with payback periods and cost savings forecasts.

Model the economic analysis for two options:

1) Power Purchase Agreement - with rate and inflation escalator as provided by Barrington Power;

2) Municipal Bond – purchase through municipal bond financing.

KEY ASSUMPTIONS

1. Assumption - Net Metering of Energy Portion of Utility Bill

- The electricity supplier for Town of Bristol is Constellation NewEnergy, Inc. (Constellation), which is a third-party energy supplier and not the default service provider.
- As such, while net metering rules apply, these rules state that a third-party supplier may determine terms, conditions, and prices for energy exported to the grid.
- Several attempts were made to contact Constellation NewEnergy to ascertain the net-metering policy for New Hampshire customers with no success in finding any set policy. It is not known, but possibly indicates that net metering agreements with customers may be made on a case-by-case basis.
- A critical assumption is made in financial modeling that assumes Constellation NewEnergy would provide a similar net metering rate for energy (100%) as that of the default service provider Public Service Company of New Hampshire d/b/a Eversource Energy.
  - CHAPTER Puc 900, PART Puc 903 CONDITIONS TO INTERCONNECTION:
    - c) Any electricity supplier operating within New Hampshire that is not the default service provider shall offer net metering pursuant to Puc 900, but may provide for rates and terms as provided in RSA 362-A:9, II and Puc 903.02(g).
    - RSA 362-A:9, II.
      - Competitive electricity suppliers registered under RSA 374-F:7 and municipal or county aggregators under RSA 53-E may determine the terms, conditions, and prices under which they agree to provide generation supply to and credit, as an offset to supply, or purchase the generation output exported to the distribution grid from eligible customer-generators. The commission may require appropriate disclosure of such terms, conditions, and prices or credits. Such output shall be accounted for as a reduction to the customer-generators' electricity supplier's wholesale load obligation for energy supply as a load service entity, net of any applicable line loss adjustments, as approved by the commission. Nothing in this paragraph shall be construed as limiting or otherwise interfering with the provisions or authority for municipal or county aggregators under RSA 53-E, including, but not limited to, the terms and conditions for net metering.

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KEY ASSUMPTIONS - Continued

1. Assumption - Net Metering of Energy Portion of Utility Bill - Continued
    - Puc 903.02(g).
        - A customer-generator shall be billed for electricity under the same rate schedule that such customer-generator would be billed if it had no generation.
    - Puc 903.02(h)
        - Competitive electricity suppliers registered under RSA 374-F:7 and Puc 2000 may voluntarily determine the terms, conditions, and prices under which they shall agree to provide electric energy supply to, and purchase net electric energy output from, customer-generators.
2. Assumption – Demand Charge
    - Financial models assume demand charges are not reduced by solar.
3. Assumption – Distribution Charge
    - Financial models assume distribution rate for energy export to grid is at 25% of the energy import rate.
4. Assumption – Transmission Charge
    - Financial models assume transmission rate for energy export to grid is at 100% of the energy import rate.
5. Assumption – Stranded Cost Recovery Charge
    - Financial models assume stranded cost recovery rate for energy export to grid is at 100% of the energy import rate.
6. Assumption – Systems Benefits Charge
    - Financial models assume systems benefits rate for energy export to grid is at 100% of the energy import rate.
7. Assumption – Utility rates and rate structure are based on Eversource Energy published rates as of August 2020.
8. Assumption – Annual Electricity Inflation Rate of 2.5%.

KEY ASSUMPTIONS - Continued

9. Assumption – Discount Rate for Net Present Value (NPV) and general inflation, 3.0%.
10. Assumption – Interest Rate (cost of capital, fixed rate) of 4.5%.
11. Assumption – Project cost for 215.04 kWp DC system at $2.35/Watt; and project cost for 403.2 kWp DC system at $2.25/Watt.
12. Assumption – Inverter Replacement assumed at Year 18, $380 per kWp AC.
13. Assumption – System Maintenance Cost assumed at $5.00/kWp DC.
14. Assumption – Monitoring Cost assumed at $600 per year.
15. Assumption – Property Tax to third-party owner in PPA scenario is assumed to be waived, and Payment in Lieu of Taxes (PILOT) is assumed at a fixed rate of $3000/MWp AC. This was provided for in the Solar PPA proposal by Barrington Power.
16. Assumption – State of New Hampshire Rebate Program award is assumed at $10,000. (Rebate eligibility and rebate amount, if any, is subject to determination by, and at the discretion of, the applicable administering state agency).
17. Assumption – Renewable Energy Certificate (REC) income is assumed at $10/MWh for 3 years. (REC prices are subject to current market conditions, $0-$100/MWh).
18. Assumption – Project construction is to begin and be completed in 2021.

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CURRENT STATUS

180 AYERS ISLAND RD WWTF

Electricity Supply
Constellation NewEnergy

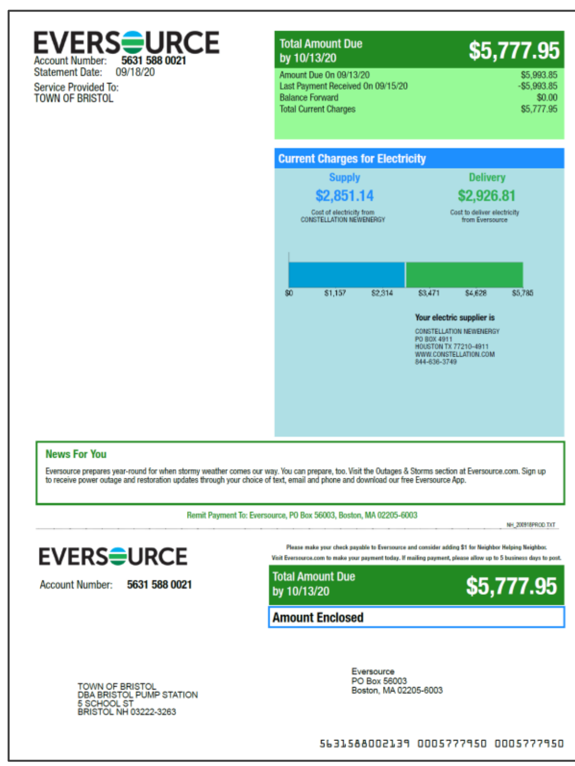
Constellation. An Exelon Company

Electricity Delivery
Public Service of NH, dba Eversource

EVERSOURCE

Current electric usage:	259,100	kWh /yr
Current rate schedule:	Rate G	Eversource Energy / Constellation NewEnergy
Average monthly bill before solar:	$3,424	1 year historical adjusted to current rates
Annual bill before solar:	$41,092	1 year historical adjusted to current rates

RATE G - GENERAL SERVICE	RATE (8/1/20 - Present)
SUPPLY	
Energy - Constellation NewEnergy	**0.08660**
DELIVERY	
Customer Chrg 3-Phase	**32.39000**
KW Distrib Chrg, (over 5.0 kW)	9.49000
KW Transmission Chrg, (over 5.0 kW)	7.77000
KW Strnd Cst Recovery Chrg	0.69000
Distribution Chrg - First 500 kWh's	0.07604
Distribution Chrg - Next 1000 kWh's	0.01884
Distribution Chrg > 1500 kWh's	0.00666
Transmission Chrg - First 500 kWh's	0.02807
Transmission Chrg - Next 1000 kWh's	0.01056
Transmission Chrg > 1500 kWh's	0.00566
Strnded Cst Recovery Chrg	0.00732
System Benefits Chrg	0.00743



EVERSOURCE
Account Number: 5631 588 0021
Statement Date: 09/18/20
Service Provided To:
TOWN OF BRISTOL

Total Amount Due by 10/13/20 $5,777.95

Amount Due On 09/13/20	$5,993.85
Last Payment Received On 09/15/20	-$5,993.85
Balance Forward	$0.00
Total Current Charges	$5,777.95

Current Charges for Electricity

Supply $2,851.14 Cost of electricity from CONSTELLATION NEWENERGY

Delivery $2,926.81 Cost to deliver electricity from Eversource

Your electric supplier is
CONSTELLATION NEWENERGY
PO BOX 4911
HOUSTON TX 77210-4911
WWW.CONSTELLATION.COM
844-636-3749

News For You
Eversource prepares year-round for when stormy weather comes our way. You can prepare, too. Visit the Outages & Storms section at Eversource.com. Sign up to receive power outage and restoration updates through your choice of text, email and phone and download our free Eversource App.

Remit Payment To: Eversource, PO Box 56003, Boston, MA 02205-6003

NH_200918PROD.TXT

EVERSOURCE
Account Number: 5631 588 0021

Please make your check payable to Eversource and consider adding $1 for Neighbor Helping Neighbor.
Visit Eversource.com to make your payment today. If mailing payment, please allow up to 5 business days to post.

Total Amount Due by 10/13/20 $5,777.95

Amount Enclosed

TOWN OF BRISTOL
DBA BRISTOL PUMP STATION
5 SCHOOL ST
BRISTOL NH 03222-3263

Eversource
PO Box 56003
Boston, MA 02205-6003

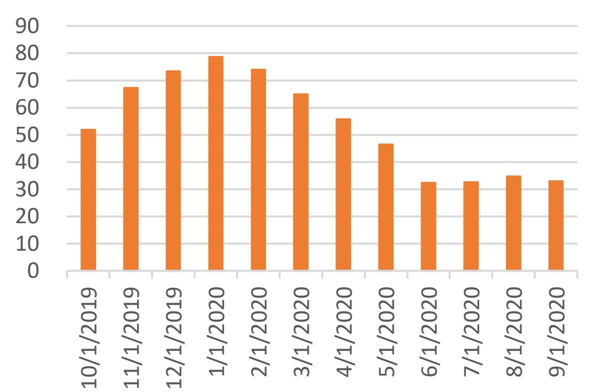
5631588002139 0005777950 0005777950

CURRENT STATUS
180 AYERS ISLAND RD WWTF

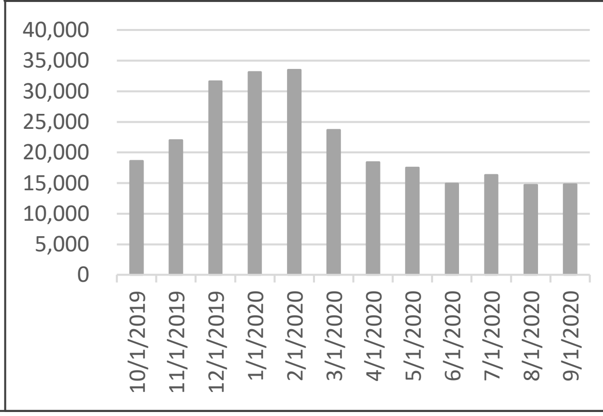
3 Main Components of Electric Utility Bill

- Fixed Customer Charge or Fixed Meter Charge
- Demand Charge (fee for standby power required to meet load potential)
- Energy-Based Charges
    - Energy Supply, Transmission, Distribution, Fees (System Benefits, Stranded Cost Recovery

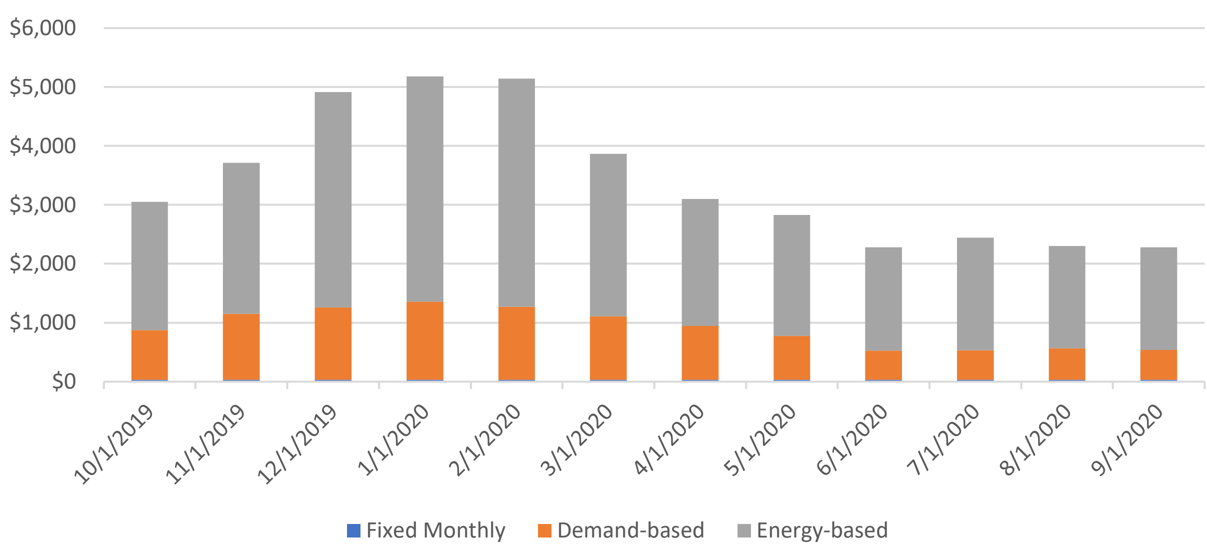
1-Year Historical Demand (kW)



1-Year Historical Energy Usage (kWh's)



1-Year Cost, Applying Historic Usage to Current Rates (rates as of 8/1/2020)



HOW SOLAR AFFECTS THE UTILITY BILL

The rate structure in New Hampshire provides for a significant decrease in cost per kWh with increased consumption. This is due to the tiered distribution and transmission rate structures. That is, the more energy is consumed, the less expensive it becomes. Solar will offset the lowest cost energy first.

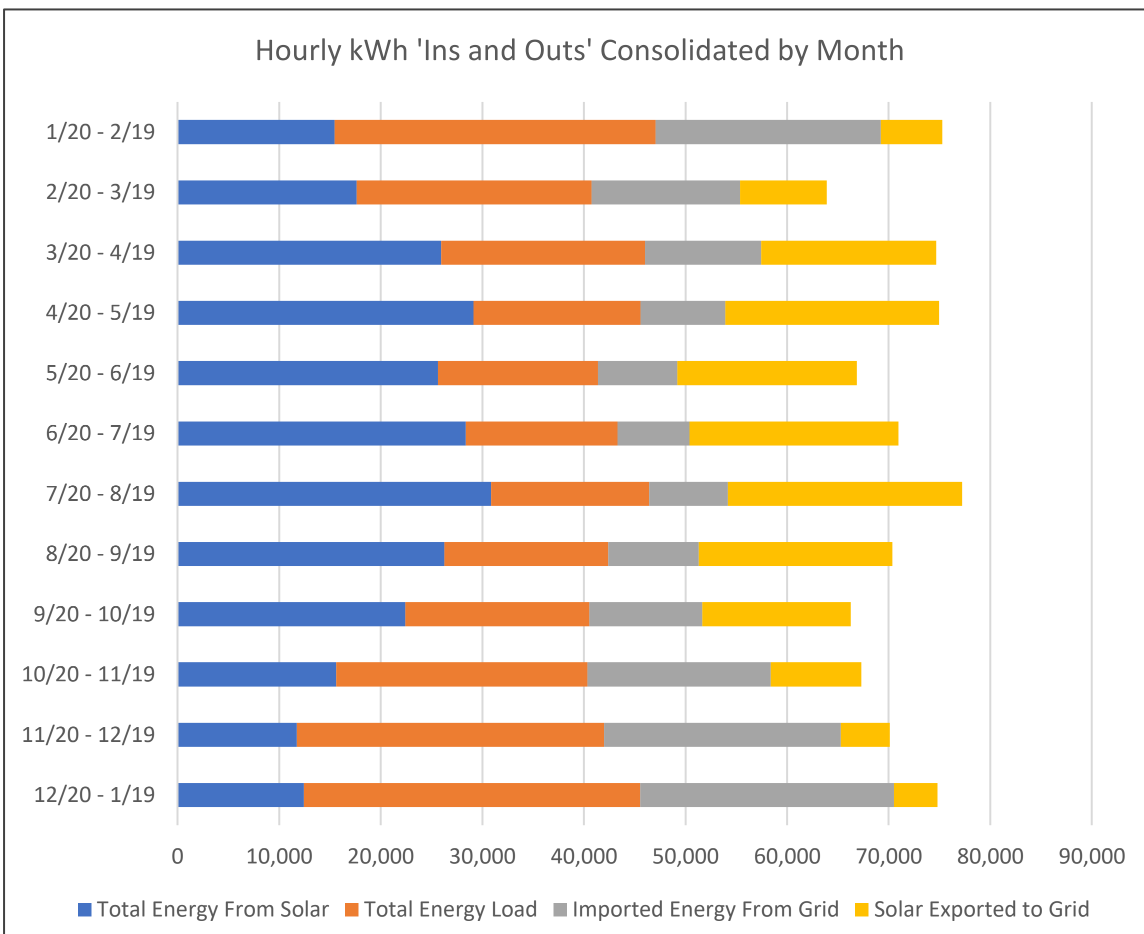
Utilty Bill Category	Rates As of August 2020	Solar's Effect on Utility Bill
SUPPLY		
Energy - Constellation NewEnergy	0.0866*	Net meter export credit at 100% *
DELIVERY		
Customer Chrg 3-Phase	32.39000	Fixed customer charge, no offset
KW Distrib Chrg, (over 5.0 kW)	9.49000	Demand charge, assume no offset
KW Transmission Chrg, (over 5.0 kW)	7.77000	Demand charge, assume no offset
KW Strnd Cst Recovery Chrg	0.69000	Demand charge, assume no offset
Distribution Chrg - First 500 kWh's	0.07604	Net meter export credit at 25%, 3rd
Distribution Chrg - Next 1000 kWh's	0.01884	Net meter export credit at 25%, 2nd
Distribution Chrg > 1500 kWh's	0.00666	Net meter export credit at 25%, 1st
Transmission Chrg - First 500 kWh's	0.02807	Net meter export credit at 100%, 3rd
Transmission Chrg - Next 1000 kWh's	0.01056	Net meter export credit at 100%, 2nd
Transmission Chrg > 1500 kWh's	0.00566	Net meter export credit at 100%, 1st
Strnded Cst Recovery Chrg	0.00732	Net meter export rate at 100%
System Benefits Chrg	0.00743	Net meter export rate at 100%

* Value is an assumption, consult with third-party energy supplier for actual net-meter rate.

HOW SOLAR AFFECTS THE UTILITY BILL

WWTF SELF-CONSUMPTION WITH GRID NET-METERING
PV SYSTEM SIZE – 215.02 STC kWp DC
ENERGY PORTION OF THE UTILITY BILL

The rate structure in New Hampshire provides for separate effective net meter rates for energy that is imported from the grid to energy that is exported to the grid. As such, energy imported from the grid is valued higher than energy exported to the grid. With solar, energy is imported and exported to and from the grid frequently. Each time this occurs, where excess solar energy is exported, then reimported later, some value of the kWh's produced by solar is lost. To assess this, modeling of hourly energy production from solar, consumption on site, and export/import to and from the grid was completed.



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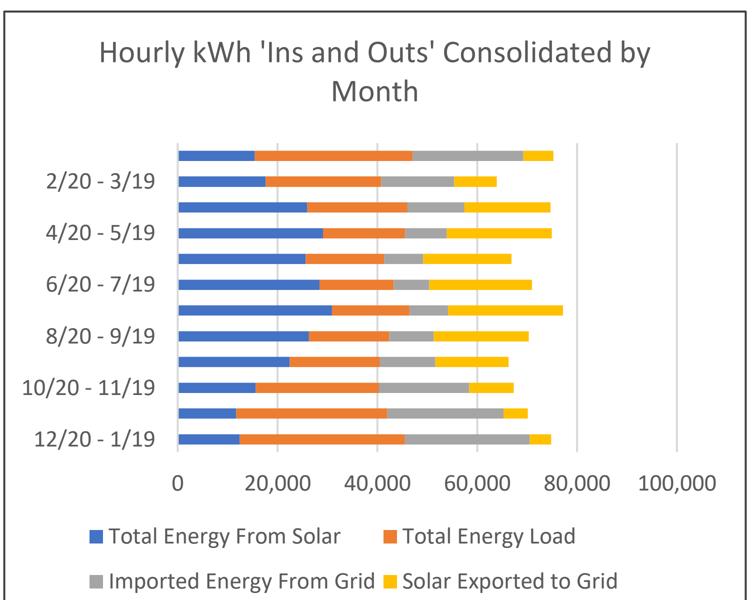
HOW SOLAR AFFECTS THE UTILITY BILL

WWTF SELF-CONSUMPTION WITH GRID NET-METERING
PV SYSTEM SIZE – 215.02 STC kWp DC
ENERGY PORTION OF THE UTILITY BILL

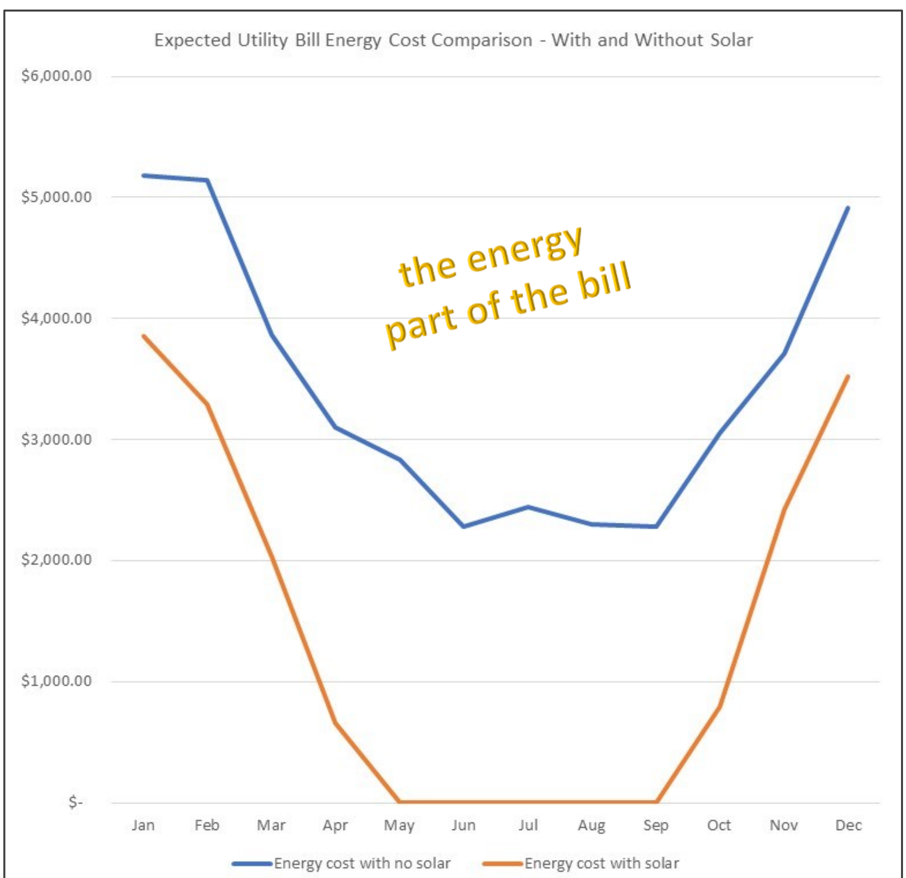
Bill Cycle	Total Energy From Solar	Total Energy Load	Imported Energy From Grid	Solar Exported to Grid
12/20 - 1/19	12,430	33,098	24,980	4,311
11/20 - 12/19	11,752	30,232	23,306	4,826
10/20 - 11/19	15,615	24,729	18,034	8,919
9/20 - 10/19	22,413	18,125	11,100	14,645
8/20 - 9/19	26,272	16,117	8,906	19,061
7/20 - 8/19	30,866	15,558	7,744	23,052
6/20 - 7/19	28,379	14,916	7,105	20,568
5/20 - 6/19	25,622	15,745	7,812	17,689
4/20 - 5/19	29,133	16,451	8,347	21,029
3/20 - 4/19	25,934	20,090	11,410	17,253
2/20 - 3/19	17,619	23,145	14,608	8,528
1/20 - 2/19	15,450	31,594	22,185	6,041



HOW SOLAR AFFECTS THE UTILITY BILL

WWTF SELF-CONSUMPTION WITH GRID NET-METERING
PV SYSTEM SIZE – 215.02 STC kWp DC
ENERGY PORTION OF THE UTILITY BILL

Once the modeling of hourly energy production from solar, consumption on site, and export/import to and from the grid was completed, we then applied the tiered energy rates for both importing energy from the grid and exporting energy to the grid. The kWh's from solar that are exported, and imported from the grid, must then be applied in the correct order for the tiered rate structure to determine the correct value of each kWh. Net metering credits from overproduction during summer months are applied to reduce October and November energy charges.



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FINANCIAL ANALYSIS - ASSUMPTIONS

WWTF SELF-CONSUMPTION WITH GRID NET-METERING
PV SYSTEM SIZE – 215.02 kWp DC

Financial			
Annual Electricity Inflation Rate		2.50%	Assumption
Discount Rate (for NPV) / General Inflation Rate		3.00%	Assumption
Debt Interest Rate or Coupon Rate		4.50%	Cost of capital, fixed rate
Tax			
Federal Tax Rate Assumption		0.00%	Assumption
State Tax Rate Assumption		0.00%	Assumption
Property Tax (Local Option)		NO	Assumption - Yes or No
Payment in Lieu of Property Taxes Agreement (PILOT)		YES	Assumption - Yes or No
Property Tax Rate	$	22.80	Published rate, per $1000
PILOT Rate	$	3,000.00	Per MWp AC per year
Federal Investment Tax Credit (ITC)		NO	Assumption - Yes or No
Year Start of Construction (for ITC)		2021	22.00%
MACRS 5 year Accelerated Federal Depreciation (%)		NO	Assumption - Yes or No
MACRS 5 year Accelerated State Depreciation (%)		NO	Assumption - Yes or No
System			
DC System size		215.040	STC kWp DC
AC System size		180.000	kWp AC
Intalled cost per STC watt DC	$	2.35	Assumption
Permits and Fees	$	2,500	Assumption
Incentives			
Rebates and Grants	$	10,000	Assumption - State of NH rebate program
Other Incentives			
Other Incentives			
Renewable Energy Certificates (RECS), $/MWh	$	10	Assumption - REC prices subject to market conditions, $0-$100/MWh
REC # of years	$	3	Assumption
Operating Expenses			
System Maintenance - $/Wp DC (STC)	$	0.005	Assumption
Inverter Replacement - Cost per kW in Year 18	$	380	Assumption
Monitoring Cost in Year 1	$	600	Assumption
Power purchase agreement (PPA)		YES	Assumption - Yes or No
PPA rate, if applicable (per kWh)	$	0.09750	Assumption - Per kWh

FINANCIAL ANALYSIS – VALUE OF kWh's

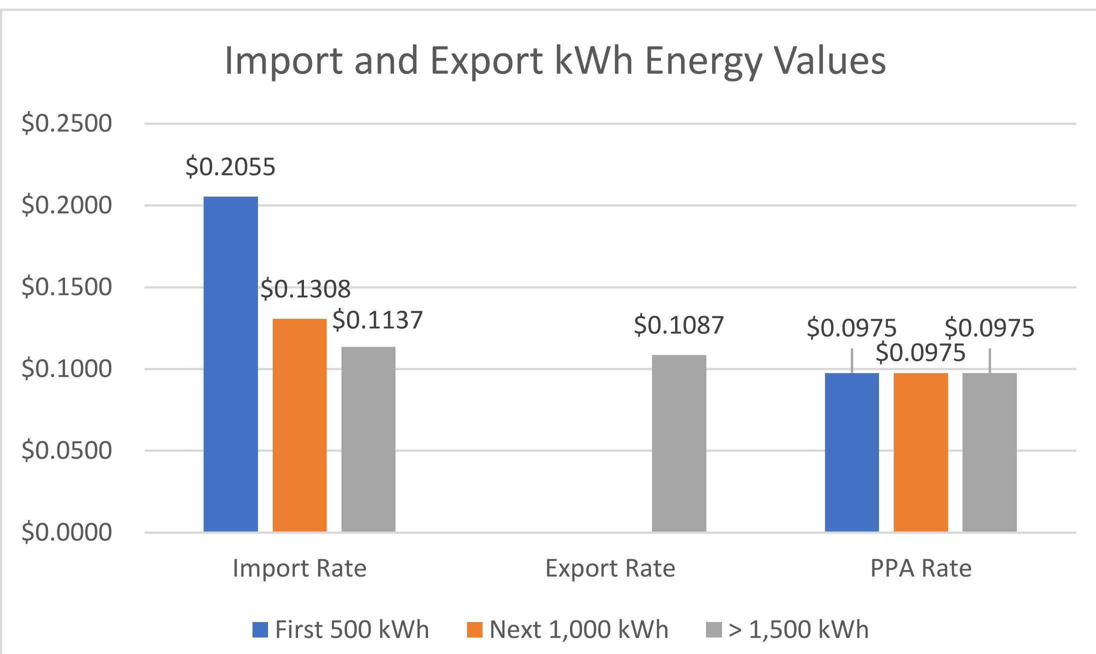
CONCEPT – VALUE OF ENERGY PORTION OF UTILITY BILL (kWh) DEPENDS ON WHEN AND HOW IT OCCURS.

Utility Rate Table – kWh Import and Export Rates

Energy ($ per kWh)	Import Rate	Export Rate	PPA Rate
Energy (Constellation New Energy)	0.08660	0.08660	0.09750
Strnded Cst Recovery Chrg	0.00732	0.00732	0.00000
System Benefits Chrg	0.00743	0.00743	0.00000
Total Non-Tiered Energy-Based Charges	**0.10135**	**0.10135**	**0.09750**

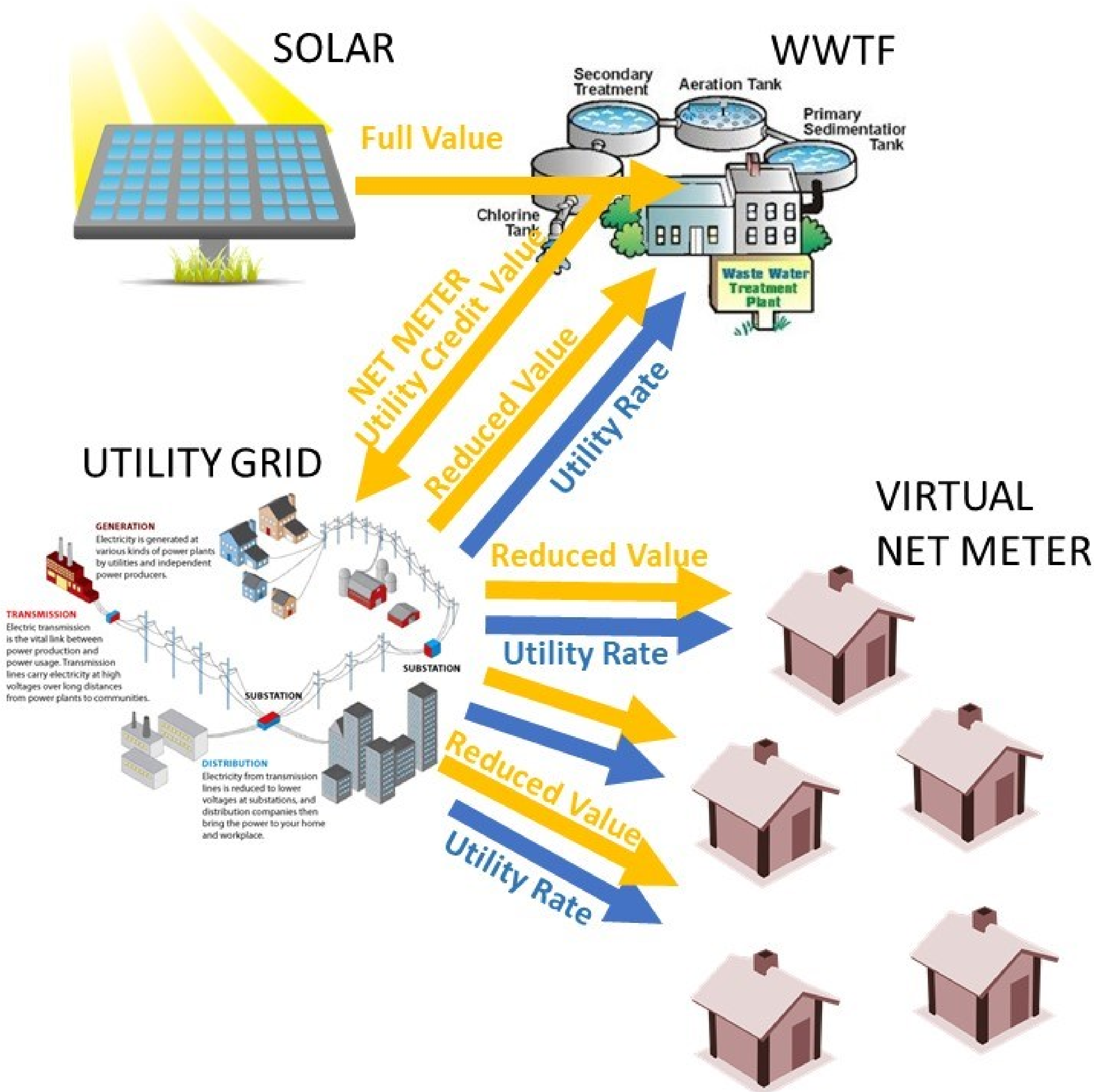
Tiered Energy-Based Charges	Import Rate	Export Rate
Distribution Chrg - First 500	0.07604	0.01901
Distribution Chrg - Next 1000	0.01884	0.00471
Distribution Chrg > 1500	0.00666	0.00167
	Import Rate	Export Rate
Transmission Chrg - First 500	0.02807	0.02807
Transmission Chrg - Next 1000	0.01056	0.01056
Transmission Chrg > 1500	0.00566	0.00566

	from Grid or Net Meter	Net Meter Credit	Self-Consumption
kWh Energy Value	Import Rate	Export Rate	PPA Rate
First 500 kWh	$0.2055	N/A	$0.0975
Next 1,000 kWh	$0.1308	N/A	$0.0975
> 1,500 kWh	$0.1137	$0.1087	$0.0975



FINANCIAL ANALYSIS – VALUE OF kWh's

CONCEPT – VALUE OF SOLAR ENERGY (kWh) DEPENDS ON WHEN IT OCCURS AND HOW IT IS USED.



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FINANCIAL ANALYSIS

Scenarios, PV System Size, and Estimated System Cost

Self-Consumption with Net Meter

System Size: 215.04 kWp DC
Annual Energy: 261,484.4 kWh
Est. System Cost: $505,344

Site(s):

180 AYERS ISLAND RD WWTF (Net Meter)

Self-Consumption with Net Meter and Virtual Net Meter

System Size: 403.20 kWp DC
Annual Energy: 488,705.1 kWh
Est. System Cost: $907,200

Site(s):

180 AYERS ISLAND RD WWTF	Host - Net Meter
866 N MAIN	Virtual Net Meter
104 PLEASANT	Virtual Net Meter
306 N MAIN	Virtual Net Meter
56 CENTRAL, S74515766	Virtual Net Meter
56 CENTRAL, S74515767	Virtual Net Meter
500 W SHORE RD, S74515353	Virtual Net Meter
500 W SHORE RD, S74516033	Virtual Net Meter
22 BRISTOL HILL RD	Virtual Net Meter
70 HALL RD	Virtual Net Meter

FINANCIAL ANALYSIS

PV System Financials Before Financing Costs

Self-Consumption & Net Meter

System Size:	215.04 kWp DC
Annual Energy:	261,484.4 kWh
Est. System Cost:	$507,844
Est. NH Rebate:	$(10,000)
Net System Cost:	$497,844

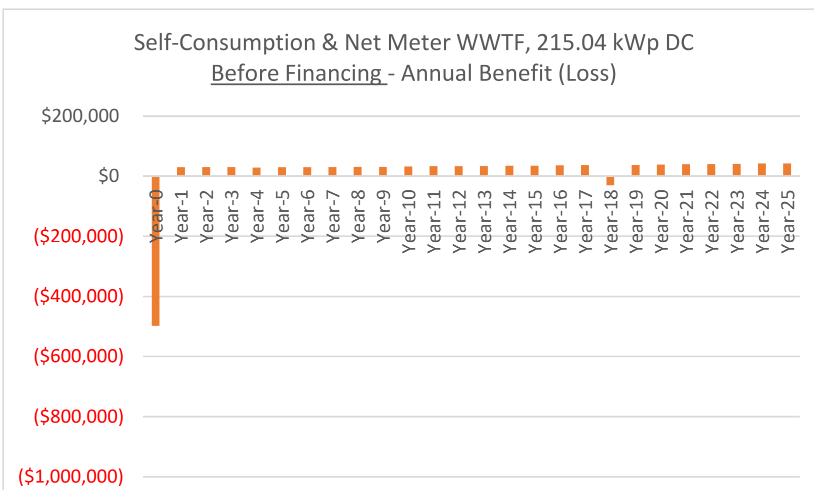
Year-1 Annual Energy Savings: $28,667
Break-even / System Payback: Year 16

Self-Consumption & Net Meter with Virtual Net Meter

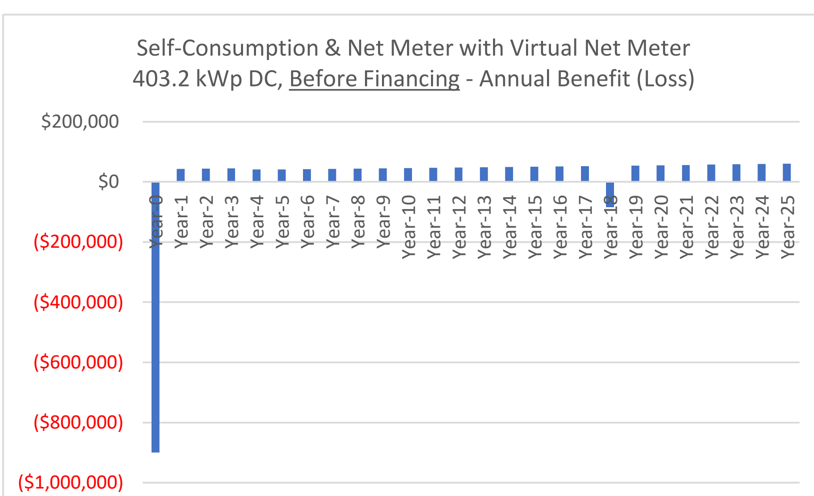
System Size:	403.20 kWp DC
Annual Energy:	488,705.1 kWh
Est. System Cost:	$909,700
Est. NH Rebate:	$(10,000)
Net System Cost:	$899,700

Year-1 Annual Energy Savings: $41,046
Break-even / System Payback: Year 22

Self-Consumption & Net Meter



Self-Consumption & Net Meter with Virtual NM



FINANCIAL ANALYSIS

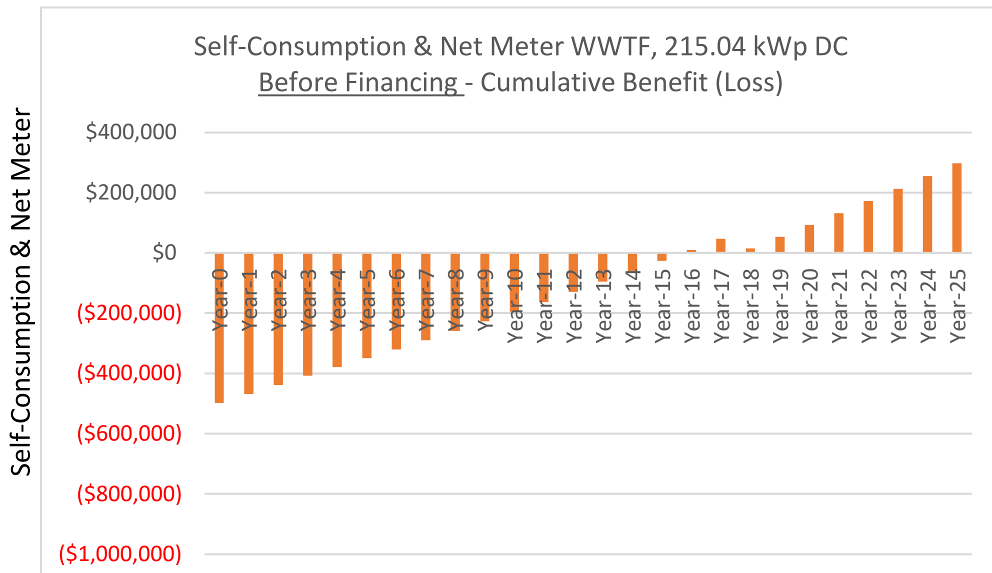
PV System Financials Before Financing Costs

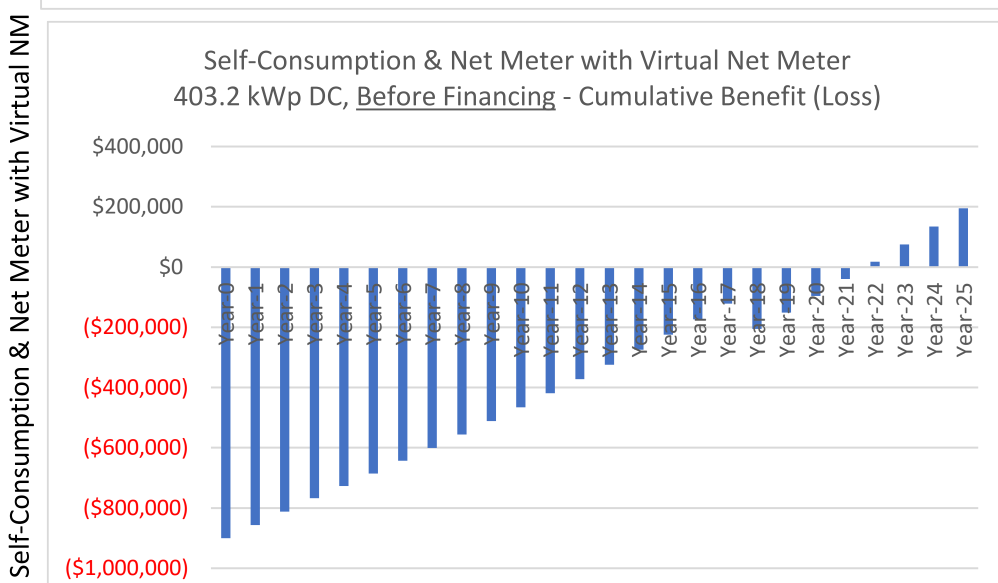
Self-Consumption & Net Meter

System Size: 215.04 kWp DC
Year-1 Annual Energy Savings: $28,667
Break-even / System Payback: Year 16

Self-Consumption & Net Meter with Virtual Net Meter

System Size: 403.20 kWp DC
Year-1 Annual Energy Savings: $41,046
Break-even / System Payback: Year 22



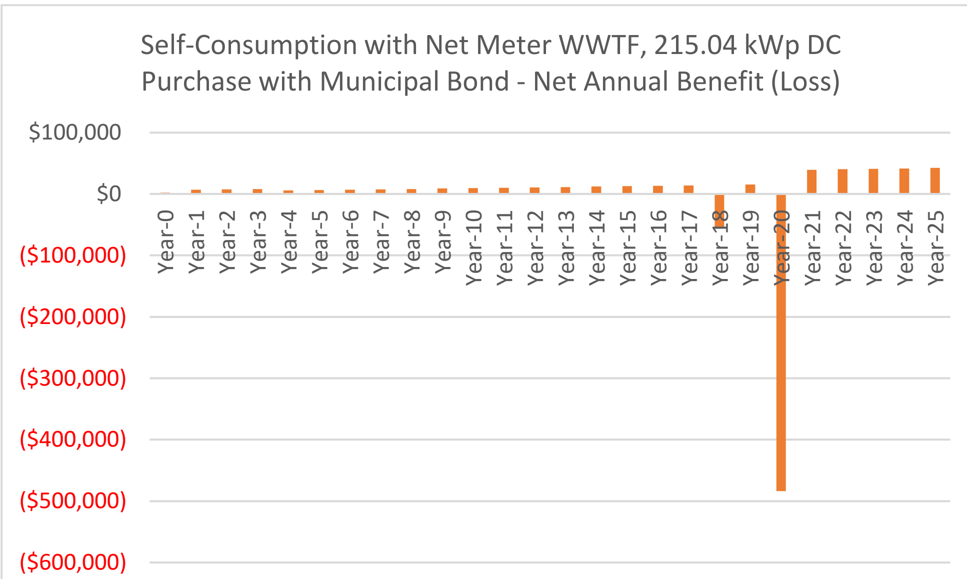


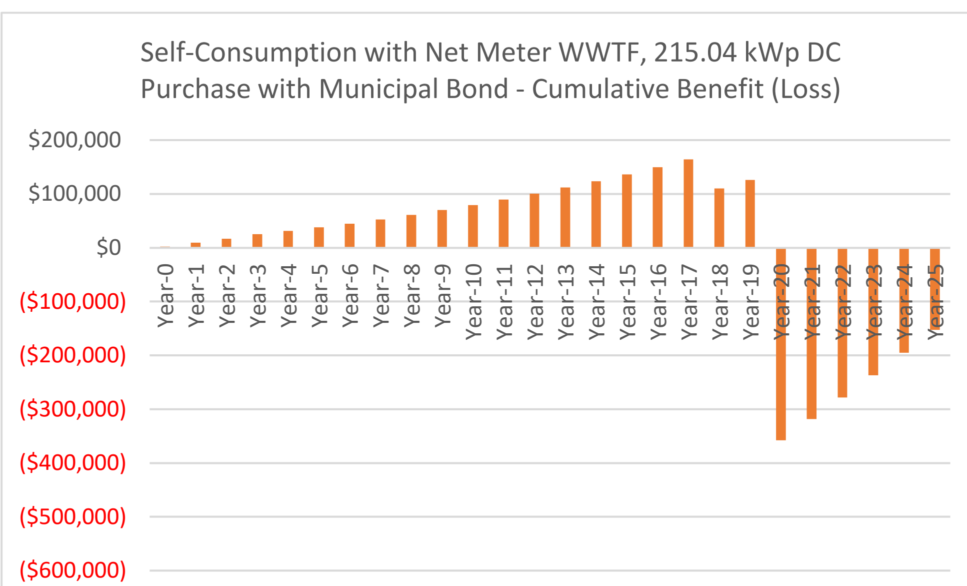
FINANCIAL ANALYSIS

Self-Consumption & Net Meter

215.04 kWp DC, Purchase with Municipal Bond

	Annual	Semi-Annual
Coupon / Interest Rate (cost of capital, fixed rate)	4.50%	2.25%
Bond - Number of Years	**20**	
Interest Payments per Year	**2**	
Total Interest Rate Payments	**40**	

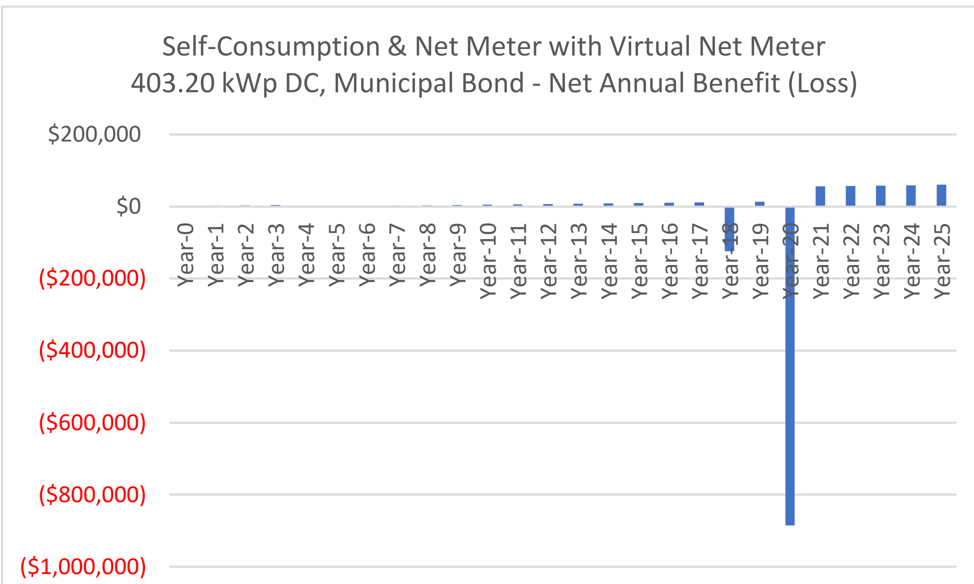


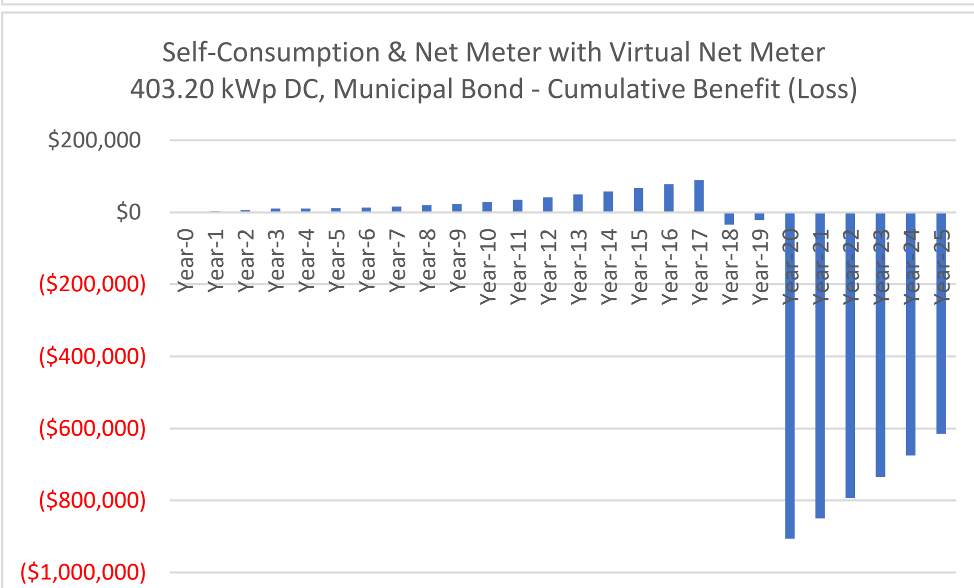


FINANCIAL ANALYSIS

Self-Consumption & Net Meter with Virtual Net Meter
403.20 kWp DC, Purchase with Municipal Bond

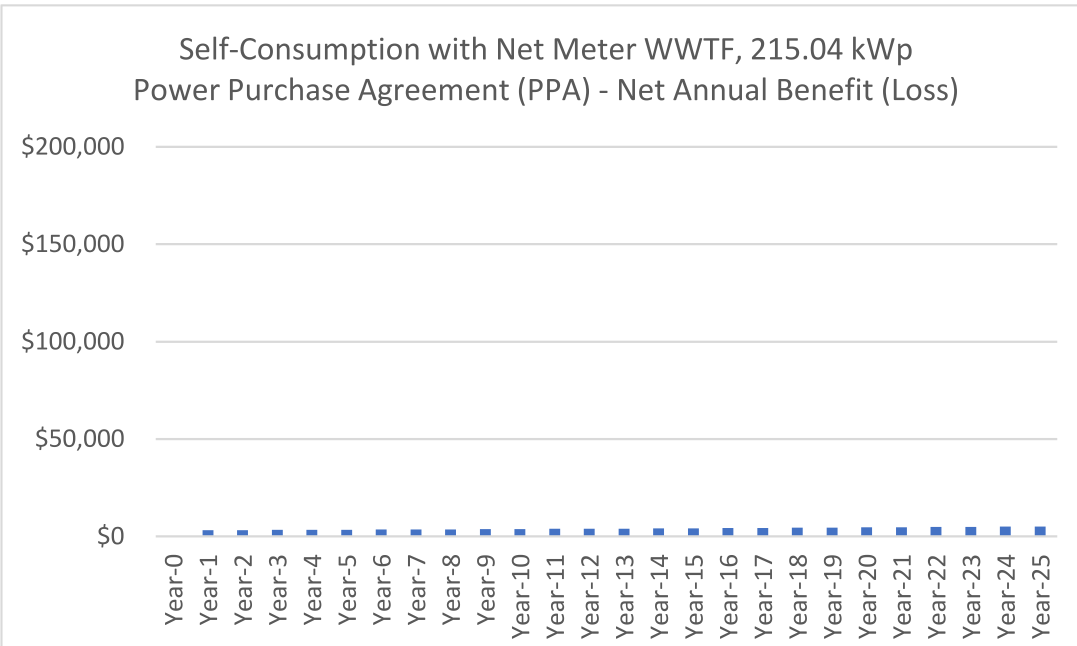
	Annual	Semi-Annual
Coupon / Interest Rate (cost of capital, fixed rate)	4.50%	2.25%
Bond - Number of Years	**20**	
Interest Payments per Year	**2**	
Total Interest Rate Payments	**40**	

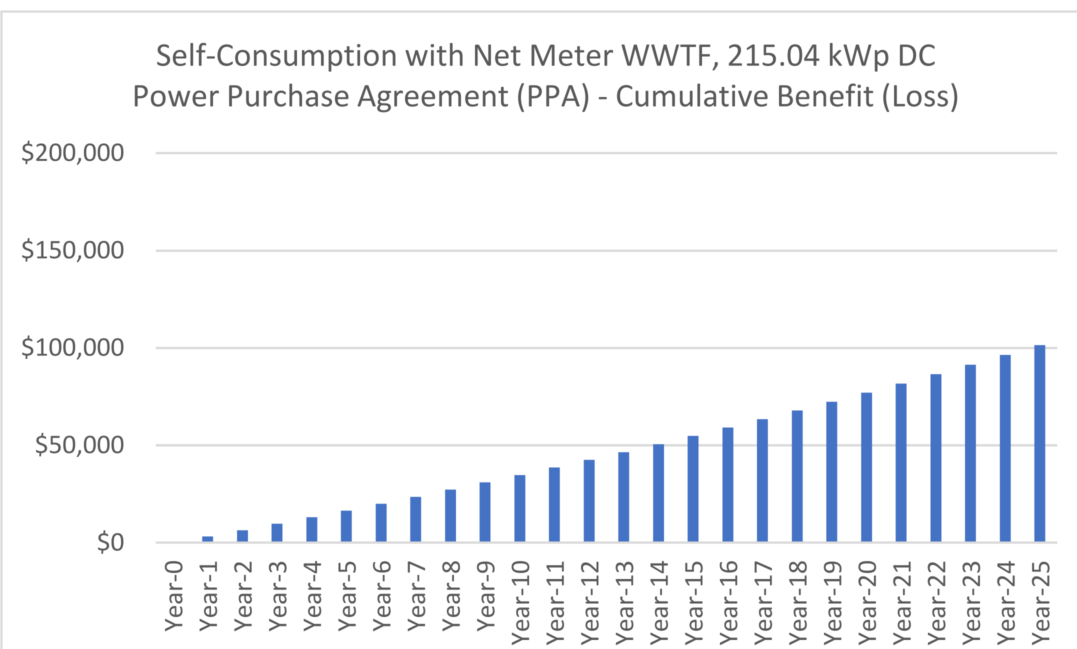




FINANCIAL ANALYSIS

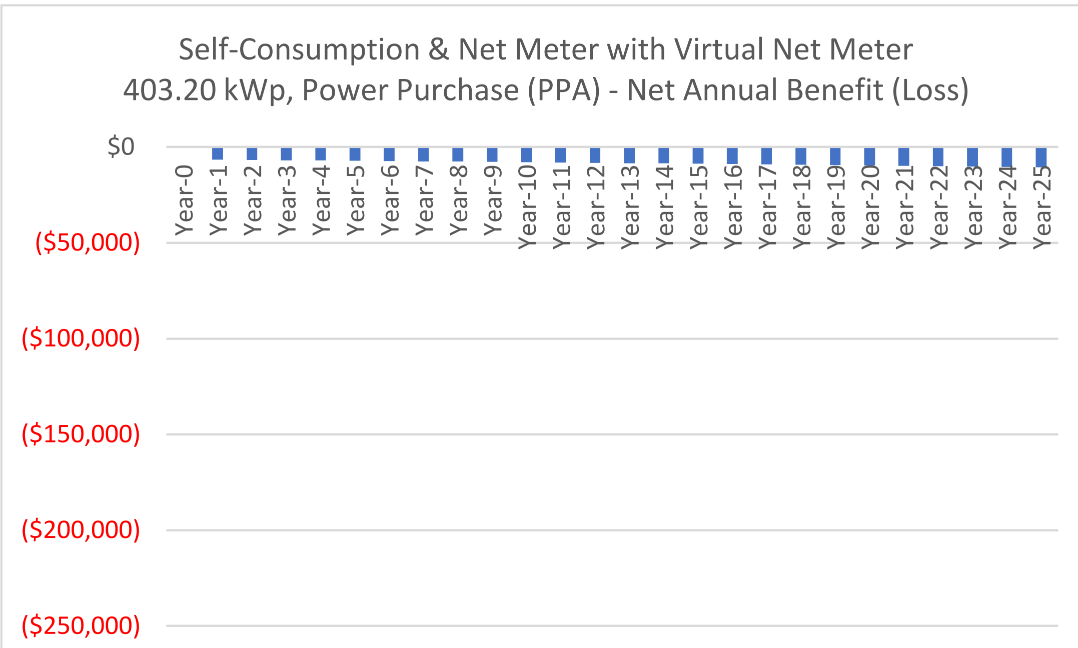
Self-Consumption & Net Meter
215.04 kWp DC, Power Purchase Agreement (PPA), $0.0975/kWh

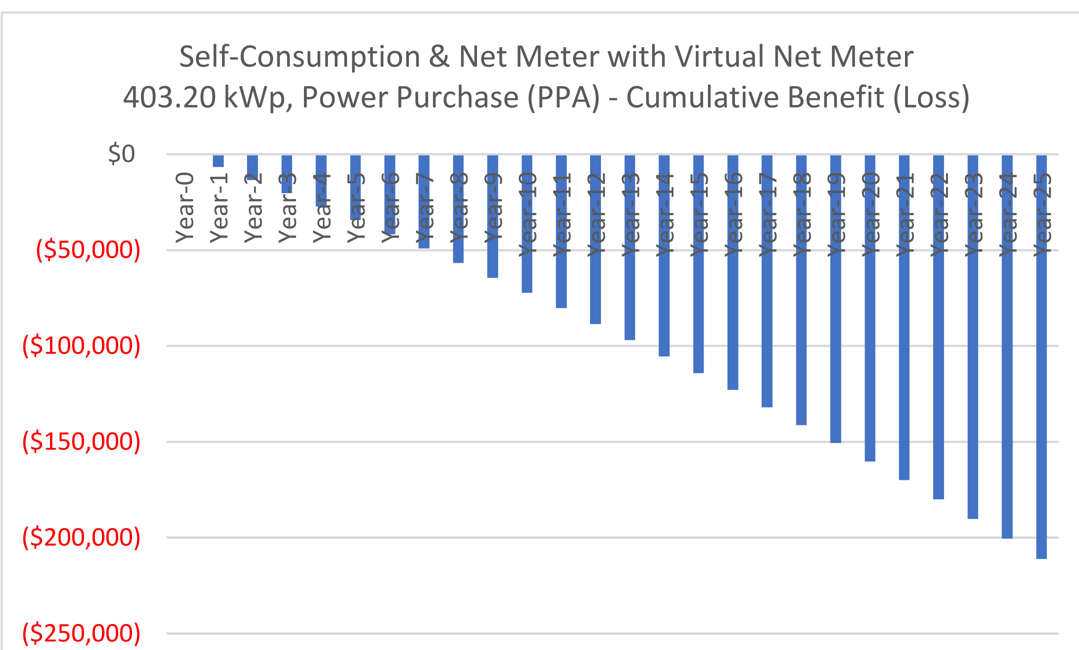




FINANCIAL ANALYSIS

Self-Consumption & Net Meter with Virtual Net Meter
403.20 kWp DC, Power Purchase Agreement (PPA), $0.0975/kWh





FINANCIAL ANALYSIS

SELF-CONSUMPTION & NET METER OR
SELF-CONSUMPTION & NET METER WITH VIRTUAL NET METER

PURCHASE WITH MUNICIPAL BOND OR
POWER PURCHASE AGREEMENT (PPA)

NET PRESENT VALUE ANALYSIS

SELF-CONSUMPTION & NET METER, 215.04 kWp DC
PURCHASE WITH MUNICIPAL BOND
NET PRESENT VALUE: ($65,469)

SELF-CONSUMPTION & NET METER, 215.04 kWp DC
POWER PURCHASE AGREEMENT (PPA)
NET PRESENT VALUE: ($68,565) ✓

SELF-CONSUMPTION & NET METER WITH VIRTUAL NET METER, 403.20 kWp DC
PURCHASE WITH MUNICIPAL BOND
NET PRESENT VALUE: ($343,802)

SELF-CONSUMPTION & NET METER WITH VIRTUAL NET METER, 403.20 kWp DC
POWER PURCHASE AGREEMENT (PPA)
NET PRESENT VALUE: ($142,708)

FINANCIAL ANALYSIS

SUMMARY

Before any decisions can be made regarding use of solar with net metering, it is essential that the third-party energy supplier, Constellation New Energy, be contacted and agree to long-term energy net metering rates at 100% of kWh offset. Under current NH law, they are under obligation to provide net metering, but there is no requirement regarding the critically important energy net metering reimbursement rate.

25-Year cumulative analysis after financing indicates that the only scenario with positive net present value (NPV), which indicates a projects financial viability, is the WWTF Self-Consumption with Net Metering scenario under a Power Purchase Agreement (PPA).

Ownership of either project size financed through municipal bonds is not profitable. While the projects may be profitable before financing, the financing costs (bond interest payments) exceed the savings benefits from solar. A major driving force behind solar project viability is the tax benefits from ownership, which cannot be realized by a tax-exempt municipality. These benefits include the Federal Investment Tax Credit (ITC), offsetting 22% of system cost, and Federal and State 5-year MACRS depreciation, which combined equal approximately one-half of total system costs in unrealized benefits. A third-party PPA supplier can realize these tax benefits, and significantly reduce the initial cost of a Solar project.

Virtual (Group) net metering, even through a power purchase agreement (PPA), is also not profitable. The energy cost from Constellation New Energy is currently priced at $0.0866 per kWh. The PPA energy cost is priced at $0.0975 per kWh, ~ $0.01 more expensive per kWh. While the benefits of a PPA make great sense to the site that is using solar power directly, it does not make sense for remote sites, that are burdened by additional utility distribution costs, and that are already paying a lower rate. If solar power is consumed directly at the site where it is produced, expensive utility transmission and distribution costs are avoided, and the economics of solar are much more favorable.

Based on financial analysis and given the current utility rate structure and State of NH net metering requirements, the benefits of solar energy are best realized when power is produced at the same location as where the energy is consumed. From a financial perspective, to power additional Town of Bristol facilities with solar, financial viability would be more likely if separate solar arrays were constructed at each location, whether ground mount or rooftop systems. It may be worth considering this as one project with multiple site locations, whereby some economies of scale could still be realized.

PROFIT AND LOSS FINANCIALS
SELF CONSUMPTION WITH NET METER, 215.04 kWp DC

Town of Bristol NH

PROJECT	WWTF
SYSTEM SCENARIO	Self Consumption with Net Meter
FINANCIAL SCENARIO 1	Purchase With Municipal Bond
FINANCIAL SCENARIO 2	Power Purchase Agreement

PROFIT & LOSS

	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10	Year-11	Year-12
Capital Costs													
System Capital Cost with Fees, Before Rebates	($507,844)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Rebates and Grants	$10,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other Incentives	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Savings													
Avoided Utility Purchases, Annual Savings	$0	$ 28,667	$29,237	$29,818	$30,411	$31,015	$31,631	$32,260	$32,901	$33,555	$34,222	$34,902	$35,596
REC Income	$0	$2,615	$2,602	$2,589	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Expenses													
System Maintenance - $/Wp DC (STC)	$0	($1,075)	($1,107)	($1,141)	($1,175)	($1,210)	($1,246)	($1,284)	($1,322)	($1,362)	($1,403)	($1,445)	($1,488)
Inverter Replacement - Cost per kW in Year 18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Monitoring Cost	$0	($600)	($618)	($637)	($656)	($675)	($696)	($716)	($738)	($760)	($783)	($806)	($831)
Operating Benefit (Loss)	**($497,844)**	**$29,607**	**$30,113**	**$30,629**	**$28,580**	**$29,129**	**$29,689**	**$30,260**	**$30,841**	**$31,433**	**$32,036**	**$32,651**	**$33,277**
Federal and State Tax Effects													
Federal Tax on Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Federal Tax on RECs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
State Tax on RECs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Federal Tax Credit Basis	$507,844												
Federal Investment Tax Credit (ITC) - 2021 = 22%		$0											
Fed. Depr. Basis: Fed Tax Credit Basis minus 1/2 the Fed Credit		$507,844											
State Depreciation Basis: System Cost after Rebate and Fees		$497,844											
		Year-1	Year-2	Year-3	Year-4	Year-5	Year-6						
MACRS 5 year Accelerated Federal Depreciation (%)		100.0%	0.0%	0.0%	0.0%	0.0%	0.0%						
MACRS 5 year Accelerated State Depreciation (%)		20.0%	32.0%	19.2%	11.5%	11.5%	5.8%						
MACRS 5 year Accelerated Federal Depreciation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00						
MACRS 5 year Accelerated State Depreciation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00						
Federal Tax on State Depreciation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00						
Total Depreciation Value	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00						
Value of lost Federal tax deduction of electricity expense	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of lost State tax deduction of electricity expense	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Fed. Tax Benefit on State deduction loss of electricity expense	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Property Tax Rate Year-1	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
(assessed value assumed at state depr. basis)													
Payment in Lieu of Taxes Agreement (PILOT)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
($3000 per MWp AC per year)													
After-Tax Net Benefit (Loss)	**($497,844)**	**$29,607**	**$30,113**	**$30,629**	**$28,580**	**$29,129**	**$29,689**	**$30,260**	**$30,841**	**$31,433**	**$32,036**	**$32,651**	**$33,277**
Cumulative	**($497,844)**	**($468,237)**	**($438,124)**	**($407,495)**	**($378,915)**	**($349,785)**	**($320,096)**	**($289,836)**	**($258,995)**	**($227,562)**	**($195,526)**	**($162,875)**	**($129,598)**

	Year-13	Year-14	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20	Year-21	Year-22	Year-23	Year-24	Year-25
Operating Savings													
Avoided Electricity Purchases Annual Savings	$36,303	$37,025	$37,761	$38,511	$39,277	$40,057	$40,853	$41,665	$42,493	$43,338	$44,199	$45,078	$45,974
REC Income	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Expenses													
System Maintenance - $/Wp DC (STC)	($1,533)	($1,579)	($1,626)	($1,675)	($1,725)	($1,777)	($1,830)	($1,885)	($1,942)	($2,000)	($2,060)	($2,122)	($2,186)
Inverter Replacement - Cost per kW in Year 18	$0	$0	$0	$0	$0	($68,400)	$0	$0	$0	$0	$0	$0	$0
Monitoring Cost	($855)	($881)	($908)	($935)	($963)	($992)	($1,021)	($1,052)	($1,084)	($1,116)	($1,150)	($1,184)	($1,220)
Operating Benefit (Loss)	**$33,915**	**$34,565**	**$35,227**	**$35,901**	**$36,588**	**($31,112)**	**$38,001**	**$38,728**	**$39,468**	**$40,222**	**$40,990**	**$41,772**	**$42,568**
Federal and State Tax Effects													
Federal Tax on RECs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
State Tax on RECs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Value of lost Federal tax deduction of electricity expense	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Value of lost State tax deduction of electricity expense	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fed. Tax Benefit on State deduction loss of electricity expense	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Property Tax Rate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Payment in Lieu of Property Taxes Agreement (PILOT)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
After-Tax Net Benefit (Loss)	**$33,915**	**$34,565**	**$35,227**	**$35,901**	**$36,588**	**($31,112)**	**$38,001**	**$38,728**	**$39,468**	**$40,222**	**$40,990**	**$41,772**	**$42,568**
Cumulative	**($95,683)**	**($61,118)**	**($25,891)**	**$10,010**	**$46,598**	**$15,487**	**$53,488**	**$92,216**	**$131,684**	**$171,906**	**$212,895**	**$254,667**	**$297,235**

ACUITY POWER GROUP™

PROFIT AND LOSS FINANCIALS
SELF CONSUMPTION WITH NET METER, 215.04 kWp DC

FINANCING

PURCHASE WITH MUNICIPAL BOND

	Annual	Semi-Annual
Coupon / Interest Rate (cost of capital, fixed rate)	4.50%	2.25%
Bond - Number of Years	20	
Interest Payments per Year	2	
Total Interest Rate Payments	40	

	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10	Year-11	Year-12
Project Cost after Rebate	($497,844)												
Bond Face Value / Par Value	$500,000												
Balance at Year's Start	$2,156												
Operating Benefit (Loss)	$2,156	$29,607	$30,113	$30,629	$28,580	$29,129	$29,689	$30,260	$30,841	$31,433	$32,036	$32,651	$33,277
Annual interest paid, semi-annual installments	$0	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)
Maturity payment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Net Annual Benefit (Loss)	**$2,156**	**$7,107**	**$7,613**	**$8,129**	**$6,080**	**$6,629**	**$7,189**	**$7,760**	**$8,341**	**$8,933**	**$9,536**	**$10,151**	**$10,777**
Cumulative Cash Flow	**$2,156**	**$9,263**	**$16,876**	**$25,005**	**$31,085**	**$37,715**	**$44,904**	**$52,664**	**$61,005**	**$69,938**	**$79,474**	**$89,625**	**$100,402**

	Year-13	Year-14	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20	Year-21	Year-22	Year-23	Year-24	Year-25
Operating Benefit (Loss)	$33,915	$34,565	$35,227	$35,901	$36,588	($31,112)	$38,001	$38,728	$39,468	$40,222	$40,990	$41,772	$42,568
Annual interest payment / coupon, semi-annual payments	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	($22,500)	$0	$0	$0	$0	$0
Maturity payment	$0	$0	$0	$0	$0	$0	$0	($500,000)	$0	$0	$0	$0	$0
Net Annual Benefit (Loss)	**$11,415**	**$12,065**	**$12,727**	**$13,401**	**$14,088**	**($53,612)**	**$15,501**	**($483,772)**	**$39,468**	**$40,222**	**$40,990**	**$41,772**	**$42,568**
Cumulative Cash Flow	**$111,817**	**$123,882**	**$136,609**	**$150,010**	**$164,098**	**$110,487**	**$125,988**	**($357,784)**	**($318,316)**	**($278,094)**	**($237,105)**	**($195,333)**	**($152,765)**

NET PRESENT VALUE (NPV) **($65,469)**

POWER PURCHASE AGREEMENT (PPA)

PPA Rate per kWh $0.0975

	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10	Year-11	Year-12
Capital Costs													
System Capital Cost with Fees, Before Rebates	$0	$0											
Rebates and Grants	$0	$0											
Other Incentives	$0	$0											
Operating Savings													
Avoided Electricity Purchases Annual Savings	$0	$ 3,172	$3,235	$3,300	$3,365	$3,432	$3,500	$3,570	$3,641	$3,713	$3,787	$3,862	$3,939
REC Income	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Expenses													
System Maintenance - $/Wp DC (STC)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Inverter Replacement - Cost per kW in Year 18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Monitoring Cost	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Benefit (Loss)	**$0**	**$3,172**	**$3,235**	**$3,300**	**$3,365**	**$3,432**	**$3,500**	**$3,570**	**$3,641**	**$3,713**	**$3,787**	**$3,862**	**$3,939**
After-Tax Net Benefit (Loss)	**$0**	**$3,172**	**$3,235**	**$3,300**	**$3,365**	**$3,432**	**$3,500**	**$3,570**	**$3,641**	**$3,713**	**$3,787**	**$3,862**	**$3,939**
Cumulative	**$0**	**$3,172**	**$6,408**	**$9,707**	**$13,073**	**$16,505**	**$20,005**	**$23,575**	**$27,216**	**$30,929**	**$34,716**	**$38,579**	**$42,518**

	Year-13	Year-14	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20	Year-21	Year-22	Year-23	Year-24	Year-25
Operating Savings													
Avoided Electricity Purchases Annual Savings	$4,017	$4,097	$4,179	$4,262	$4,346	$4,433	$4,521	$4,611	$4,702	$4,796	$4,891	$4,988	$5,088
REC Income	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Expenses													
System Maintenance - $/Wp DC (STC)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Inverter Replacement - Cost per kW in Year 18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Monitoring Cost	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Benefit (Loss)	**$4,017**	**$4,097**	**$4,179**	**$4,262**	**$4,346**	**$4,433**	**$4,521**	**$4,611**	**$4,702**	**$4,796**	**$4,891**	**$4,988**	**$5,088**
After-Tax Net Benefit (Loss)	**$4,017**	**$4,097**	**$4,179**	**$4,262**	**$4,346**	**$4,433**	**$4,521**	**$4,611**	**$4,702**	**$4,796**	**$4,891**	**$4,988**	**$5,088**
Cumulative	**$46,535**	**$50,632**	**$54,811**	**$59,073**	**$63,419**	**$67,852**	**$72,373**	**$76,984**	**$81,686**	**$86,482**	**$91,373**	**$96,362**	**$101,449**

NET PRESENT VALUE (NPV) **$68,565**

ACUITY POWER GROUP™

PROFIT AND LOSS FINANCIALS
SELF CONSUMPTION WITH NET METER, 403.20 kWp DC

Town of Bristol NH

PROJECT	WWTF
SYSTEM SCENARIO	Self Consumption & Net Meter with Virtual Net Meter
FINANCIAL SCENARIO 1	Purchase With Municipal Bond
FINANCIAL SCENARIO 2	Power Purchase Agreement

PROFIT & LOSS

	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10	Year-11	Year-12
Capital Costs													
System Capital Cost with Fees, Before Rebates	($909,700)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Rebates and Grants	$10,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Other Incentives	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Savings													
Avoided Utility Purchases, Annual Savings	$0	$ 41,046	$41,862	$42,694	$43,542	$44,408	$45,290	$46,190	$47,108	$48,045	$49,000	$49,974	$50,967
REC Income	$0	$4,887	$4,863	$4,838	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Expenses													
System Maintenance - $/Wp DC (STC)	$0	($2,016)	($2,076)	($2,139)	($2,203)	($2,269)	($2,337)	($2,407)	($2,479)	($2,554)	($2,630)	($2,709)	($2,791)
Inverter Replacement - Cost per kW in Year 18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Monitoring Cost	$0	($600)	($618)	($637)	($656)	($675)	($696)	($716)	($738)	($760)	($783)	($806)	($831)
Operating Benefit (Loss)	**($899,700)**	**$43,317**	**$44,030**	**$44,757**	**$40,684**	**$41,463**	**$42,258**	**$43,067**	**$43,891**	**$44,731**	**$45,586**	**$46,458**	**$47,346**
Federal and State Tax Effects													
Federal Tax on Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Federal Tax on RECs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
State Tax on RECs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Federal Tax Credit Basis	$909,700												
Federal Investment Tax Credit (ITC) - 2021 = 22%		$0											
Fed. Depr. Basis: Fed Tax Credit Basis minus 1/2 the Fed Credit		$909,700											
State Depreciation Basis: System Cost after Rebate and Fees		$899,700											
		Year-1	Year-2	Year-3	Year-4	Year-5	Year-6						
MACRS 5 year Accelerated Federal Depreciation (%)		100.0%	0.0%	0.0%	0.0%	0.0%	0.0%						
MACRS 5 year Accelerated State Depreciation (%)		20.0%	32.0%	19.2%	11.5%	11.5%	5.8%						
MACRS 5 year Accelerated Federal Depreciation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00						
MACRS 5 year Accelerated State Depreciation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00						
Federal Tax on State Depreciation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00						
Total Depreciation Value	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00						
Value of lost Federal tax deduction of electricity expense	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Value of lost State tax deduction of electricity expense	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Fed. Tax Benefit on State deduction loss of electricity expense	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Property Tax Rate Year-1 (assessed value assumed at state depr. basis)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Payment in Lieu of Taxes Agreement (PILOT) ($3000 per MWp AC per year)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
After-Tax Net Benefit (Loss)	**($899,700)**	**$43,317**	**$44,030**	**$44,757**	**$40,684**	**$41,463**	**$42,258**	**$43,067**	**$43,891**	**$44,731**	**$45,586**	**$46,458**	**$47,346**
Cumulative	**($899,700)**	**($856,383)**	**($812,353)**	**($767,596)**	**($726,913)**	**($685,449)**	**($643,192)**	**($600,125)**	**($556,234)**	**($511,503)**	**($465,916)**	**($419,458)**	**($372,113)**

	Year-13	Year-14	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20	Year-21	Year-22	Year-23	Year-24	Year-25
Operating Savings													
Avoided Electricity Purchases Annual Savings	$51,980	$53,013	$54,066	$55,141	$56,237	$57,355	$58,495	$59,657	$60,843	$62,052	$63,285	$64,543	$65,826
REC Income	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Expenses													
System Maintenance - $/Wp DC (STC)	($2,874)	($2,961)	($3,049)	($3,141)	($3,235)	($3,332)	($3,432)	($3,535)	($3,641)	($3,750)	($3,863)	($3,979)	($4,098)
Inverter Replacement - Cost per kW in Year 18	$0	$0	$0	$0	$0	($136,800)	$0	$0	$0	$0	$0	$0	$0
Monitoring Cost	($855)	($881)	($908)	($935)	($963)	($992)	($1,021)	($1,052)	($1,084)	($1,116)	($1,150)	($1,184)	($1,220)
Operating Benefit (Loss)	**$48,250**	**$49,171**	**$50,110**	**$51,065**	**$52,039**	**($83,769)**	**$54,041**	**$55,070**	**$56,118**	**$57,186**	**$58,273**	**$59,380**	**$60,508**
Federal and State Tax Effects													
Federal Tax on RECs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
State Tax on RECs	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Value of lost Federal tax deduction of electricity expense	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Value of lost State tax deduction of electricity expense	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Fed. Tax Benefit on State deduction loss of electricity expense	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Property Tax Rate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Payment in Lieu of Property Taxes Agreement (PILOT)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
After-Tax Net Benefit (Loss)	**$48,250**	**$49,171**	**$50,110**	**$51,065**	**$52,039**	**($83,769)**	**$54,041**	**$55,070**	**$56,118**	**$57,186**	**$58,273**	**$59,380**	**$60,508**
Cumulative	**($323,863)**	**($274,692)**	**($224,582)**	**($173,517)**	**($121,478)**	**($205,247)**	**($151,206)**	**($96,136)**	**($40,018)**	**$17,168**	**$75,441**	**$134,821**	**$195,329**

PROFIT AND LOSS FINANCIALS
SELF CONSUMPTION WITH NET METER, 403.20 kWp DC

FINANCING

PURCHASE WITH MUNICIPAL BOND

	Annual	Semi-Annual
Coupon / Interest Rate (cost of capital, fixed rate)	4.50%	2.25%
Bond - Number of Years	20	
Interest Payments per Year	2	
Total Interest Rate Payments	40	

	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10	Year-11	Year-12
Project Cost after Rebate	($899,700)												
Bond Face Value / Par Value	$900,000												
Balance at Year's Start	$300												
Operating Benefit (Loss)	$300	$43,317	$44,030	$44,757	$40,684	$41,463	$42,258	$43,067	$43,891	$44,731	$45,586	$46,458	$47,346
Annual interest paid, semi-annual installments	$0	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)
Maturity payment	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Net Annual Benefit (Loss)	**$300**	**$2,817**	**$3,530**	**$4,257**	**$184**	**$963**	**$1,758**	**$2,567**	**$3,391**	**$4,231**	**$5,086**	**$5,958**	**$6,846**
Cumulative Cash Flow	**$300**	**$3,117**	**$6,647**	**$10,904**	**$11,087**	**$12,051**	**$13,808**	**$16,375**	**$19,766**	**$23,997**	**$29,084**	**$35,042**	**$41,887**

	Year-13	Year-14	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20	Year-21	Year-22	Year-23	Year-24	Year-25
Operating Benefit (Loss)	$48,250	$49,171	$50,110	$51,065	$52,039	($83,769)	$54,041	$55,070	$56,118	$57,186	$58,273	$59,380	$60,508
Annual interest payment / coupon, semi-annual payments	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	($40,500)	$0	$0	$0	$0	$0
Maturity payment	$0	$0	$0	$0	$0	$0	$0	($900,000)	$0	$0	$0	$0	$0
Net Annual Benefit (Loss)	**$7,750**	**$8,671**	**$9,610**	**$10,565**	**$11,539**	**($124,269)**	**$13,541**	**($885,430)**	**$56,118**	**$57,186**	**$58,273**	**$59,380**	**$60,508**
Cumulative Cash Flow	**$49,637**	**$58,308**	**$67,918**	**$78,483**	**$90,022**	**($34,247)**	**($20,706)**	**($906,136)**	**($850,018)**	**($792,832)**	**($734,559)**	**($675,179)**	**($614,671)**

NET PRESENT VALUE (NPV) **($343,802)**

POWER PURCHASE AGREEMENT (PPA)

PPA Rate per kWh $0.0975

	Year-0	Year-1	Year-2	Year-3	Year-4	Year-5	Year-6	Year-7	Year-8	Year-9	Year-10	Year-11	Year-12
Capital Costs													
System Capital Cost with Fees, Before Rebates	$0	$0											
Rebates and Grants	$0	$0											
Other Incentives	$0	$0											
Operating Savings													
Avoided Electricity Purchases Annual Savings	$0	($6,603)	($6,734)	($6,868)	($7,004)	($7,144)	($7,286)	($7,430)	($7,578)	($7,729)	($7,882)	($8,039)	($8,199)
REC Income	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Expenses													
System Maintenance - $/Wp DC (STC)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Inverter Replacement - Cost per kW in Year 18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Monitoring Cost	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Benefit (Loss)	**$0**	**($6,603)**	**($6,734)**	**($6,868)**	**($7,004)**	**($7,144)**	**($7,286)**	**($7,430)**	**($7,578)**	**($7,729)**	**($7,882)**	**($8,039)**	**($8,199)**
After-Tax Net Benefit (Loss)	**$0**	**($6,603)**	**($6,734)**	**($6,868)**	**($7,004)**	**($7,144)**	**($7,286)**	**($7,430)**	**($7,578)**	**($7,729)**	**($7,882)**	**($8,039)**	**($8,199)**
Cumulative	**$0**	**($6,603)**	**($13,337)**	**($20,205)**	**($27,209)**	**($34,352)**	**($41,638)**	**($49,068)**	**($56,646)**	**($64,375)**	**($72,257)**	**($80,296)**	**($88,495)**

	Year-13	Year-14	Year-15	Year-16	Year-17	Year-18	Year-19	Year-20	Year-21	Year-22	Year-23	Year-24	Year-25
Operating Savings													
Avoided Electricity Purchases Annual Savings	($8,362)	($8,528)	($8,697)	($8,870)	($9,046)	($9,226)	($9,410)	($9,597)	($9,787)	($9,982)	($10,180)	($10,383)	($10,589)
REC Income	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Expenses													
System Maintenance - $/Wp DC (STC)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Inverter Replacement - Cost per kW in Year 18	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Monitoring Cost	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating Benefit (Loss)	**($8,362)**	**($8,528)**	**($8,697)**	**($8,870)**	**($9,046)**	**($9,226)**	**($9,410)**	**($9,597)**	**($9,787)**	**($9,982)**	**($10,180)**	**($10,383)**	**($10,589)**
After-Tax Net Benefit (Loss)	**($8,362)**	**($8,528)**	**($8,697)**	**($8,870)**	**($9,046)**	**($9,226)**	**($9,410)**	**($9,597)**	**($9,787)**	**($9,982)**	**($10,180)**	**($10,383)**	**($10,589)**
Cumulative	**($96,856)**	**($105,384)**	**($114,081)**	**($122,952)**	**($131,998)**	**($141,224)**	**($150,634)**	**($160,230)**	**($170,018)**	**($180,000)**	**($190,180)**	**($200,562)**	**($211,151)**

NET PRESENT VALUE (NPV) **($142,708)**

End of Report