



Warner Municipal Solar Array

Town Meeting

March 9, 2016





Warner Municipal Solar Array

2012 – NH Legislature passed Net Metering Law – RSA 362-A:9

- Allows for electric customers to generate renewable green electricity and sell it back to the electric company.
- Like running the meter in reverse for all usage based charges – e.g. Delivery and Power charges
- Provides for a reconciliation of usage
- Applies to an individual electric meter.



Warner Municipal Solar Array

2013 – NH Legislature passed Group Net Metering

Enhances the net metering law with the following:

- Allows a customer with generating capabilities to act as a host for a group of customers.
- The customer generating electricity offsets the power consumed by their meter as well as the members of the group

2014 – NH Public Utilities Commission adopted rules governing group net metering



Warner Municipal Solar Array Committee

June 2014 – Energy Committee, Select Board, Village District Commissioners

Members:

- Jim Bingham – Warner Town Administrator
- Darren Blood – Energy Committee Representative
- Clyde Carson – Selectmen’s Representative
- Ray Martin – Village District Representative
- Neil Nevins – Public Member, Mainstreet Bookends

Goal: A project proposal ready to bring to Town Meeting in March 2015.



Warner Municipal Solar Array- Timeline

September 2014

- Issued an RFQ to several solar companies and posted it on solar websites
- 2 Responses for Power Purchase Arrangements
- Payback for the town was not favorable
- We decided not to go forward with a proposal, but learned much in the process



Warner Municipal Solar Array- Timeline

July 2015 – Revised RFQ

- Specified specific sites at the Transfer Station and Waste Treatment
- Specified 100 Kw size for each array to stay within the small generator definition
- Companies had the option of proposing either an array owned by the town / precinct, a power purchase arrangement or both.
- 3 companies responded
- Solar Array Committee selected 2 companies for further review & presentations
- Harmony Energy Works of Hampton selected



Harmony Energy Works

- ★ **Started in 2008**
- ★ **Nationally Certified – NABCEP Solar Photovoltaic Professional**






Recent Ground-Mount Installations



Brochu Nurseries, Concord, NH



Recent Ground-Mount Installations




The future is now brighter at Squamscot Beverages.

After successfully completing our 150th year of business in 2013 we wanted to set another goal. It couldn't be just waiting for another anniversary to celebrate. We knew that it had to be ground breaking for well ... us.

We figured the best thing we could do was cut down on our carbon footprint. Already trying to do the right thing on a day to day basis, proper recycling, watching our fuel consumption for delivery trucks and trying our best to source local to name a few. We needed something that effected our entire operation.

SOLAR. Use the sun to power our building. It seemed like the natural option. Many hours were spent on the internet reviewing solar projects across the country and how well they performed.

In the spring of 2014 we teamed up with George Horrocks from Harmony Energy Works out of Hampton, NH. George came to our location, took notes, looked at our buildings and property and set off designing us a solar array. What George came back with was very impressive on paper, and it showed to be even more impressive in real life.




After spending countless hours prepping roofs and adjusting grade levels on the ground, we have ended up with 156 solar panels split between two roof arrays and one large ground array. Inside the building we have four DC to AC inverters and hundreds if not thousands of feet of wire strung through what seems like endless feet of conduit. Tuesday, January 20, 2015 was the day to throw the switch. We are now powered by the SUN!

project took almost a year from start to finish. There was construction equipment digging the holes and men pouring concrete for the ground array. It seemed like there were endless trucks delivering various solar equipment. There were two electricians completely reworking our main power panel and, several workers hanging conduit in our daily work space. It was loud, messy and frustrating at times, but well worth the effort.

We must admit this project wasn't painless. We spent \$200,000.00! For a company of 5 employees and a history of running old, well used equipment, this is a large amount of money for us. Fortunately, we qualified for a USDA grant of \$50,000.00, and received a rebate from the State of NH in the amount of \$30,000.00. This

Along with the solar project, we also chose to invest just under \$10,000.00 in power saving efforts in our plant. Currently 95% of our lights have been converted to LED bulbs and 3 of our large refrigeration compressors have been replaced with new energy efficient models. While this was a big undertaking, it was rewarding and satisfying to know that the changes would have long-lasting effects that will continue to make an impact for years to come.



Conner Bottling Works | 120 Exeter Road (Rt. 85) | Newfields, NH 03856 | 603-772-3376 | www.nhsoda.com



Conner Bottling Works, Newfields, NH



Commercial Installations - Experienced in NH – over 1.1 MW

959 Boys LLC, Portsmouth, NH – 28.28 KW
Al's Automotive – Exeter, NH – 59.85 KW
Applecrest Farm Orchards, Hampton Falls, NH – 39.78 KW
Brochu Nurseries – Concord, NH - 38.08 KW
Candia Woods Golf – Candia, NH - 96.1 KW
Cherry Hill Apartments – Newmarket, NH – 69.04 KW
Cochecho Veterinary – Farmington, NH - 16.80 KW
Conner Bottling Works, Newfields, NH - 43.68 KW
Derryfield School – Manchester, NH – 46.44 KW
Electric Barn – North Hampton, NH - 57 KW
Great Bay National Wildlife Refuge – Newington, NH – 13.68 KW
Hauch Storage – Newington, NH - 15.3 KW
High Knoll Equestrian Center – Rochester, NH - 47.88KW
Infinite Imaging – Portsmouth, NH - 45.08KW
MainStreet Bookends – Warner, NH - 11.52 KW
Memories Ice Cream - East Kingston, NH – 58.14 KW
Maine Drilling & Blasting – Candia, NH – 60.48 KW
MDB - Milford – 53.76 KW
Myhre Equine Clinic – Rochester, NH - 49.28 KW
North & South Construction – Barrington, NH – 46.74 KW
Riverside Garage – Somersworth, NH - 57 KW
Stone Machine – Chester, NH – 58 KW
Storage Barn – Dover, NH - 20.16 KW
Storage King – Exeter, NH - 50.4 KW
Tuckaway Farm – Lee, NH – 19.72 KW
US Drug Enforcement Agency
Vaccaro Apartments – Portsmouth, NH - 15.68 KW
Yorkfield Farm – Kensington, NH - 28.215 KW





Warner Solar Project Transfer Station Site





Warner Project Costs

Cost Assumptions		
	Solar array construction per Harmony Energy Works quote:	\$ 345,870
	Eversource upgrades to service	\$ 2,500
	Clerk of the works	\$ 4,000
	Legal	\$ 2,500
	Site preparation	<u>\$ 13,000</u>
	Total cost	\$ 367,870
Financing Assumptions		
	NH PUC Rebate	\$ 75,000
	Rural Development grant	\$ 25,400
	Town Highway Department labor	\$ 13,000
	Balance to be financed at 3.4% for 20 years	<u>\$ 254,470</u>
	Total Cost	\$ 367,870
	Monthly finance payment	\$ 1,463



Warner Solar Project – Financial Impact

Operating Assumptions			
Solar Array will produce between 140,000 and 149,000 kWh per year = Output			
Net metering credit estimate is \$.118 per kWh			
Sale of renewable energy credits estimate will yield between \$.04 and \$.055 per kWh			
Solar Array - First full year cost of electricity based on 2015 usage and cost	2015	Lower End Return	Higher End Return
Billed from Eversource - excludes street lighting	\$30,140	\$30,140	\$30,140
Annual loan repayment of \$1,463 for 12 months		\$17,553	\$17,553
Annual Insurance		\$ 300	\$300
Net metering credit = \$.118 * Output		\$ (16,520)	\$(17,582)
Renewable energy credit = REC value * Output		<u>\$ (5,600)</u>	<u>\$(8,195)</u>
Net annual cost of electricity	\$30,140	\$ 25,873	\$22,216
Net Annual Savings compared to 2015		\$4,267	\$7,924
Percent savings over 2015 costs		14%	26%



Warner Solar Project – Bottom Line

Construction will occur 2016

Expected annual savings starting in 2017:
\$4,200 and \$7,900 per year for the next 20 years

It's GREEN and the Right Thing to Do

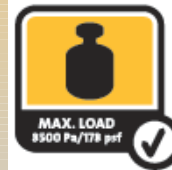
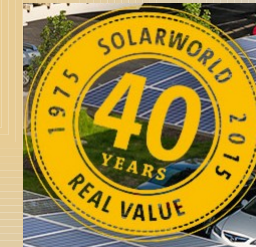


END



Technologically Superior

Sunmodule[®] Plus
SW 285-300 MONO (33mm frame, 5 busbar)



Designed to withstand heavy accumulations of snow and ice



Sunmodule Plus:
Positive performance tolerance



25-year linear performance warranty and 10-year product warranty



Glass with anti-reflective coating



Technologically Superior

- ★ DC – Optimized Design
- ★ Typically 5% - 15% Greater Energy Harvest



Traditional Inverter



SolarEdge System





Environmental Impact

- ★ Highest Cost
- ★ American
- ★ 40-yr

System Specifications

Type of Panel	Solar World	300
Number of Panels		378
Total Array Size		113.4 KW DC

25-year Environmental Return on Investment

Lbs of CO2 - the leading greenhouse gas	5,094,495 lbs
Lbs of Nitrous Oxide-smog, health effects	7,655 lbs
Lbs of SO2 - causes acid rain	23,531 lbs
or <u>Equivalent to planting acres of trees</u>	709 acres



- System Cost
- ★ 7 years ago
 - ★ Today - \$

Source: MIT-LFEE 2004-003 RP "Emissions Reductions from Solar PV Systems"
pg.ES-7



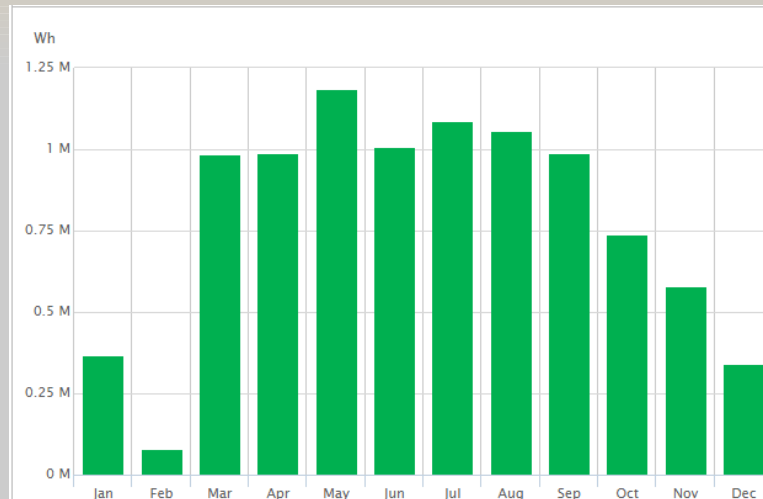
25 Year Warranties





On-Line Monitoring

	2.03 kWh	2.03 kWh	2.06 kWh	2.06 kWh	2.03 kWh	2.03 kWh	2.1 kWh	2.1 kWh	2.1 kWh	2.1 kWh	2.12 kWh	2.12 kWh	2.09 kWh	2.09 kWh	2.07 kWh	2.07 kWh	2.13 kWh	2.13 kWh	2.12 kWh	2.12 kWh
	4.1.1	4.1.1	4.1.2	4.1.2	4.1.3	4.1.3	4.1.4	4.1.4	4.1.5	4.1.5	4.1.8	4.1.8	4.1.7	4.1.7	4.1.8	4.1.8	4.1.9	4.1.9	4.1.10	4.1.10
	2.02 kWh	2.02 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.1 kWh	2.1 kWh	2.12 kWh	2.12 kWh	2.11 kWh	2.11 kWh	2.13 kWh	2.13 kWh	2.11 kWh	2.11 kWh	2.12 kWh	2.12 kWh	2.13 kWh	2.13 kWh
	4.2.10	4.2.10	4.2.9	4.2.9	4.2.8	4.2.8	4.2.7	4.2.7	4.2.6	4.2.6	4.2.5	4.2.5	4.2.4	4.2.4	4.2.3	4.2.3	4.2.2	4.2.2	4.2.1	4.2.1
	2.03 kWh	2.03 kWh	2.06 kWh	2.06 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.06 kWh	2.06 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.07 kWh	2.07 kWh
	3.3.1	3.3.1	3.3.2	3.3.2	3.3.3	3.3.3	3.3.4	3.3.4	3.3.5	3.3.5	3.3.6	3.3.6	3.3.7	3.3.7	3.3.8	3.3.8	3.3.9	3.3.9	3.3.10	3.3.10
	2.02 kWh	2.02 kWh	2.08 kWh	2.08 kWh	2.11 kWh	2.11 kWh	2.09 kWh	2.09 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.04 kWh	2.04 kWh	2.13 kWh	2.13 kWh	2.08 kWh	2.08 kWh	2.08 kWh	2.08 kWh
	3.4.10	3.4.10	3.4.9	3.4.9	3.4.8	3.4.8	3.4.7	3.4.7	3.4.6	3.4.6	3.4.5	3.4.5	3.4.4	3.4.4	3.4.3	3.4.3	3.4.2	3.4.2	3.4.1	3.4.1



- ★ Drill-down to Each Module Pair
- ★ Compare Projected/Actual Production



Town used 151,661 KwH – Dec 2014 – Nov 2015

	Meter #	3 Phase	Usage KwH	Charge
Warner Municipal Array				
Pillsbury Library	S58398616	x	31,040	\$ 5,574.90
Police Station	S72927619	x	25,372	\$ 3,888.89
Town Hall	S73046187		22,584	\$ 3,822.42
Transfer Station	S72928236	x	18,507	\$ 4,607.42
Highway Garage	S36498264	x	18,120	\$ 3,862.03
Old Graded School	S73049128		16,350	\$ 3,243.17
Fire Station	S73048758		10,861	\$ 2,253.25
Riverside Park	S69019397		6,510	\$ 1,252.08
Bagley Fields	S72288690		1,261	\$ 400.70
Highway Garage 2	S72371473		490	\$ 270.93
Transfer Station 2	G63737844		381	\$ 199.60
Old Graded School 2	S72426766		88	\$ 198.57
Riverside Park 2	S72426814		37	\$ 189.72
Silver Lake	S72431702		35	\$ 189.36
Old Fire Station	S72426788		25	\$ 187.02
			151,661	\$ 30,140.06