MAINE SOLAR SOLUTIONS

Genie & Mark Nakell
76 Mackworth Rd
Portland ME 04103

July 9, 2014

Dear Genie & Mark,

It was nice to meet with you last week. Thank you for the opportunity to present this initial proposal for a photovoltaic (PV) array for your home.

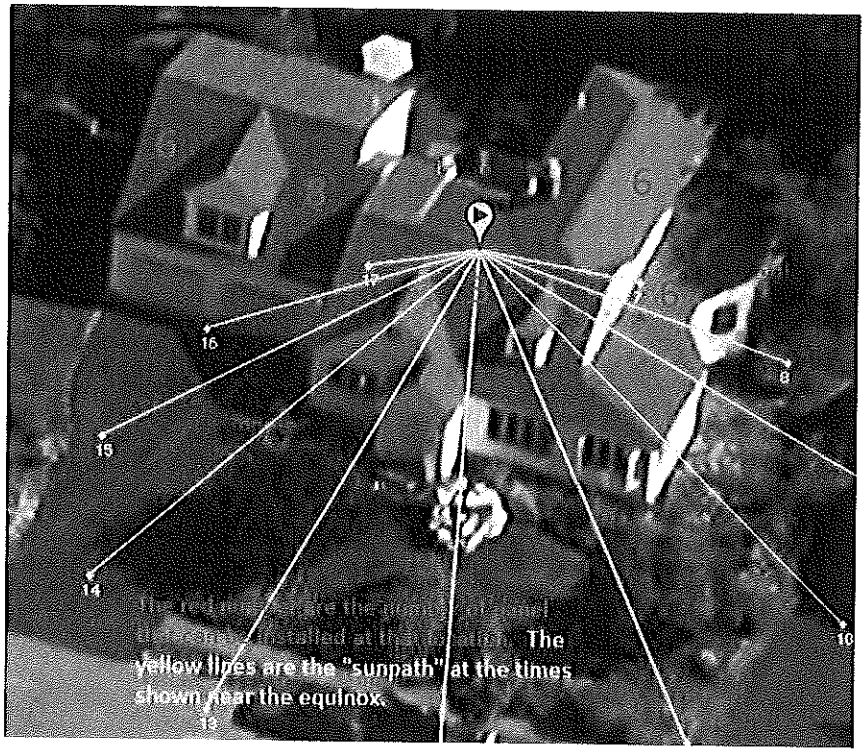
There are many options available when designing a system. Based on our conversation and in consideration of the impact of shading on your roof we have specified US made SolarWorld panels paired with Enphase micro-inverters.

Designing a system to meet your budget and your energy production goals is dynamic process. We offer a consultative approach when working with our prospective customers. We welcome your feedback regarding pricing and specification so that we can work with you to present a proposal that meets your budget and you renewable energy goals.

Array Location

This proposal is based on an array mounted on your home's south west and east/south east roof surfaces. This roof will fit 31 or 32 panels.

I would recommend installing panels on the garage roof first and then the two eastern roofs. 5 more can be fit on the "main" roof on either side of the dormer.



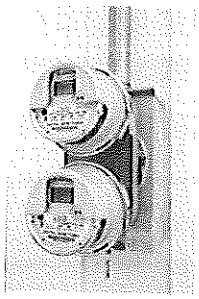
A Scalable Solution

The system architecture we have specified for your home allows for easy expansion. You can start off with panels on the garage and east facing roofs and then add panels to the front of the house at a later date. This will allow you to see how the system performs.

Array Sizing

PV arrays are typically sized to offset a percentage of annual electrical usage. We typically suggest an array sized to offset no more than 90% of your average annual usage. Your electricity usage averages 12,500 kwhr/year.

A grid tied, net metered system



This system will be a grid tied net metered system. Electricity produced by the array in excess of your electrical load during the day, will be credited on a kwhr to kwhr basis for power that is drawn from the grid during the evening. Excess kwhrs produced during the summer months are credited towards the greater draw from the utility expected during the shorter days of the winter months.

Net metering customers are charged only for the "net" power that they use. The credits that are built up are available over a rolling 12 month period. Your utility will credit you for the excess power you generate for up to a year, but unfortunately, they will not send you a check or reserve your credits for any net excess electricity that age beyond the 12 month rolling period. Your utilities' monthly flat rate delivery is charged regardless of net energy delivered.

Calculating System Output

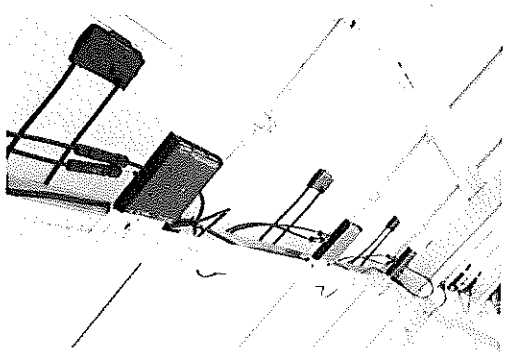
A PV array's size is typically expressed by its panel rating. A 32 panel array consisting of 275 watt panels would be described as an 8.8 kw array. The actual electricity production of a PV array is based on the array's orientation towards the south (azimuth), the mounting angle (roof pitch), geographical latitude, regional weather and system derating factors. The specification and efficiency of both the solar panels and the inverters also impact the systems output.

The industry standard PV output modeling application is PVwatts. PVwatts was developed by the National Renewable Energy Laboratory using historical weather data and the specifics of array orientation to estimate electricity production. Variations in weather from year to year will impact the actual annual kwhr output. The output estimates shown are based on a shade free, snow free array.

Incentives & Financing

There is a 30% federal tax credit available for solar electric installations. The 30% credit applies to the entire system cost, including any required electrical work, and can be applied through 2016.

We can refer you to a bank that specializes in renewable energy loans. You have the option of financing 70% long term and 30% short term.



Manufacturers and Specifications

Maine Solar Solutions can source and install nearly any manufacturer's PV modules and inverters. We offer a variety of different PV panels typically ranging in output from 245 to 280 watts. The primary variations in modules relates to their efficiency, power output, country of manufacture, warranty and cost. Greater efficiency equates to higher output per square foot of panel size and typically a higher cost per watt.

Enphase Micro-Inverters:

Each panel has a dedicated inverter installed behind it on the mounting rails. Energy is converted from DC to AC directly at the panel. This reduces DC line losses from panel to inverter. Wire runs from roof to main panel are standard household 240 volt / 20 amp AC circuits.

Each panel is able to produce maximum energy; a single panel's performance doesn't impact the other panels. The negative impact of part of your array being intermittently shaded by trees does not impact the energy production of unshaded panels.

The entire array and each panel's status and production is available to view and review via included monitoring software. The Enphase System includes lifetime, web-based monitoring; every micro-inverter and its associated solar module is monitored and managed on the web. Monitoring provides real-time performance information, historical energy production, error logging, and notification of system status to the installer and homeowner, via an intuitive graphical interface.

Featured System Design & Configuration:

The proposal shows a 31 panel Enphase micro inverter based system

Panel Specifications

- 275 watt SolarWorld modules US made (10 year workmanship, 25 year power output warranty)
- Optional: 270 watt all black SolarWorld modules for high visibility areas

Inverter Specifications

- Enphase M-250 Micro-Inverter (US) (25 year warranty)
- Includes standard monitoring (no cost for lifetime of system)
- Upgrade to module level monitoring ($250, one time upgrade fee)

Balance of System

- Installation labor, balance of system materials to ensure a safe, code compliant installation
- Aluminum roof mount rack
- Flashed roof attachment points
- *Installation of surge protection device*
- assistance with all required paperwork (permitting and net metering application)

Projected output of sub arrays:

			Avg. annual consumption 12,500 kwhr/yr
Location	# of panels	Projected power production kwhr/year	% offset
Garage	14	5,480	44%
East/SouthEast roofs	12	4,075	33%
Subtotal	26	9,555	76%
Main roof around dormer	5	1,957	16%
Total	31	11,512	96%