

First annual production report for the Minot Sleeper Library **solar array in Bristol NH, Oct '13-Sept '14**

The solar array on Minot-Sleeper Library, Bristol's municipal library, has successfully completed its first year of operation with pleasing results. The array generated an equivalent of 87% the library's power needs from October 2013 through September 2014. Most of this was applied to the immediate needs with 10% applied to bank/reserve account for the upcoming year. The array is poised to continue producing at these rates, for the next 30 plus years.

During the four winter months December 2013 through March 2014, the partially snow-covered array did produce power, but the library did need supplemental power from the utility grid, 22% of its annual needs. Even in low-light December 2013, the array produced 25% of the required power. In March 2014, the first month of spring, it was producing 65% of the library's power needs. From spring through to November 2014, the array produced 100% or more of the power needs for the library. From the over-production in the months of longer available light, the array was able to bank 1920 Kilowatt hours, to be used to offset the lower production months, this winter.

The equivalent or offset power cost to the Town would be \$2753 per year, at discounted utility rates. While the actual cost of the power was \$610 for the year (22% of the potential cost, lowered to 10%-12% in succeeding years, because of the carry forward banked kilowatt hours). The Library Trustees anticipate generating quarterly revenues from the sale of Renewable Energy Certificates (REC's) on the New England REC market, beginning in 2015. This revenue, on the order of \$1000 per year, depending on market rates, will be set aside for array maintenance and future upgrades. When this is taken into account, the return on the \$36K investment, (ROI), made from the Trustee-managed Library fund, is 11.5 years. This ROI number is 16.8 years, if the money generated by REC's was not forthcoming, or included in the calculation and if utility rates were to remain fixed at 2013/2014 rates.

For this first operational year, October 2013 through September 2014, the array had a production of 19,264 Kilowatt Hours from which 1,770 hours were banked, while the library used 22,174 Kilowatt hours. The Kilowatt hours 'Generated to Used' ratio is 87%. The extrapolated savings or offset cost to power expenditures ratio, is 78/22 percent for this first year of operation. The differential 9% (87%-78%, 1770 Kilowatt hours) being banked, not being attributable to this first operational calendar year. Each year there will be a subsequent savings carried forward in the 'bank' for allocation in the follow-on year. These ratios will vary from year to year depending on the annual available light, which is anticipated to vary within a range of 5% per year. (See the attached spreadsheet compiled from PSNH monthly billing and Tigo monthly reports where these numbers are derived).

The monthly Peak Demand Cost (listed separately), is set by the highest power draw from the utility exceeding 5 Kilowatts, in any 15 minute increment. This is seasonally variable, from the heating demands in winter to the cooling demands in summer, to minimal demands in spring and fall. These range from \$21 for a low to \$64 for a high and total \$487 for the year. This cost can be reduced or eliminated by the installation of a power-on-delay sequencer on the 3 heater/AC pumps that provide the heating and cooling ventilation of the building. It is recommended that this be done as soon as possible.

This deployment of an array on a municipal building is a solid example that solar arrays can be deployed in New Hampshire with beneficial results to the community, both fiscally and environmentally. The environmental savings to date are equivalent to offsetting 15 tons of carbon dioxide from the atmosphere or planting 444 trees. These environmental savings will continue to accumulate, for the 30+ years of anticipated commercial life of the array. Bristol's Minot Sleeper Trustees are to be commended for their forward thinking, community mindedness and environmental stewardship.

William Dowey.
Bristol Energy Chairman,
MS Library Solar Array Project Engineer.