Memorandum

To: Senior Management

CC: Michael Cuomo & Tyler Pelton

From: Michael Cazzola & Ram Gopalakrishnan

Date: 3/9/2009

Re: Power Output of the PV Array

Our task was to estimate the amount of power produced from the PV array per day. In order to simulate the array, we used the VTB 2003 software to create a model. A schematic of the model used is shown in Figure 1.

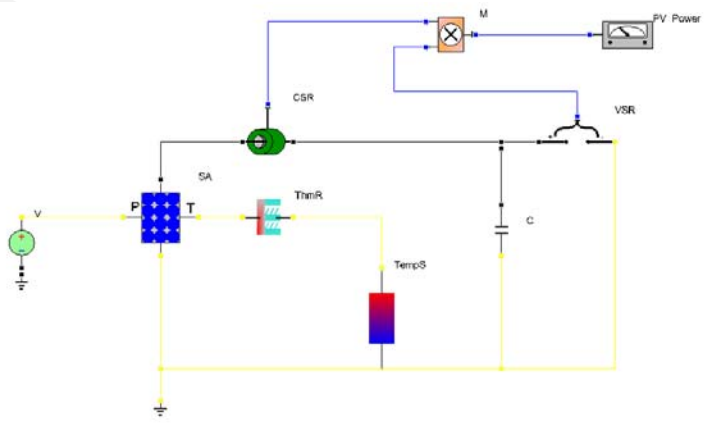

Figure 1

In order to accomplish this task, we first had to analyze the effect of temperature and insolation on the PV array. To gather our matrix of data we chose to sample data at temperatures and insolations based on Easton, PA over the course of the year. From the data gathered in the Insolation analysis, we decided to create data points varying insolation from 0 to 1000 W/m^2 in steps of 50 W/m^2. We also used temperature values of 20, 40, 50, 60, 70, and 90 ºF for all of the insolation values.

In Figure 1, the constant voltage source simulated the sun. As we ran our analysis, we varied the insolation by changing the voltage source, and varied the ambient temperature of the photovoltaic array by altering the property of the array model.

To create an estimation on the power output of the PV array per day, we used the daily insolation measurements of three extremes, July 1st, September 1st, and December 1st of 1995. For each day, we used the average temperature for the day, and compared the insolation values to the already simulated

matrix of data. Table 1 shows the amount of time (Hours) of insolation spent during each of the 3 days.

Daily Insolation Values per Month			
Insolation (+- 25W/m^2)	**JULY 1 (Hours)**	**SEPTEMBER 1 (Hours)**	**DECEMBER 1 (Hours)**
0	9.459529543	10.59974069	14.54713836
50	0.208927579	0.193369142	0.204482312
100	0.182255973	0.166697537	0.182255973
150	0.184478607	0.16892017	0.186701241
200	0.193369142	0.177810706	0.19781441
250	0.208927579	0.195591776	0.220040748
300	0.231153917	0.213372847	0.248934988
350	0.257825523	0.242267086	0.282274495
400	0.288942397	0.27338396	0.331172439
450	0.331172439	0.313391369	0.388960919
500	0.382293017	0.364511947	0.468975736
550	0.446749398	0.426745694	0.582330061
600	0.528986849	0.513428413	0.751250232
650	0.637895907	0.624560104	1.033524727
700	0.79125764	0.780144471	1.691424338
750	1.009075755	1.013521022	2.616040007
800	1.364697166	1.409149843	0
850	2.073717355	2.307093906	0
900	5.138729394	3.936284497	0
950	0	0	0
1000	0	0	0
Power Output (KWattHours/Day)	21.72522217	19.81769726	11.99581507
(KJoules/Day)	78210.7998	71343.71012	43184.93427

Table 1

Using the data of the power output, temperature and insolation gathered, we calculated the total power output for the day in KWattHours/Day.

Also shown in Table 1 is the Energy produced in (KJoules/Day). Of course these numbers ignore what will be lost due to the efficiency of the system, and only represent an estimation of the power output of the PV array.