



Rathbun Area Solid Waste Commission  
 EMS Air to Air Heat Pumps and Solar Project  
 #21-G550-13EMS  
 July 1, 2023

In November 2021, RASWC installed solar panels with the goal of fully supplying the energy consumption needs of RASWC's office, education center, and appliance demanufacturing building in Centerville, Iowa. In addition, grant funds were used for purchasing and installing an air-to-air heat pump system which operates from electricity produced from the solar energy system to provide heat for the buildings.

#### EMS Objective/Target Association

<b>Component Area</b>	Greenhouse gas reduction		
<b>Target</b>	Reduce greenhouse gas emissions from RASWC facility energy usage		
<b>Metric</b>	Metric tons of CO2, converted from kwh and therms.		
<b>Target Quantity</b>	0 mte CO2	<b>Baseline Quantity</b>	14.9 mte CO2
<b>Target Timeframe</b>	FY 2023	<b>Baseline Timeframe</b>	FY 2021

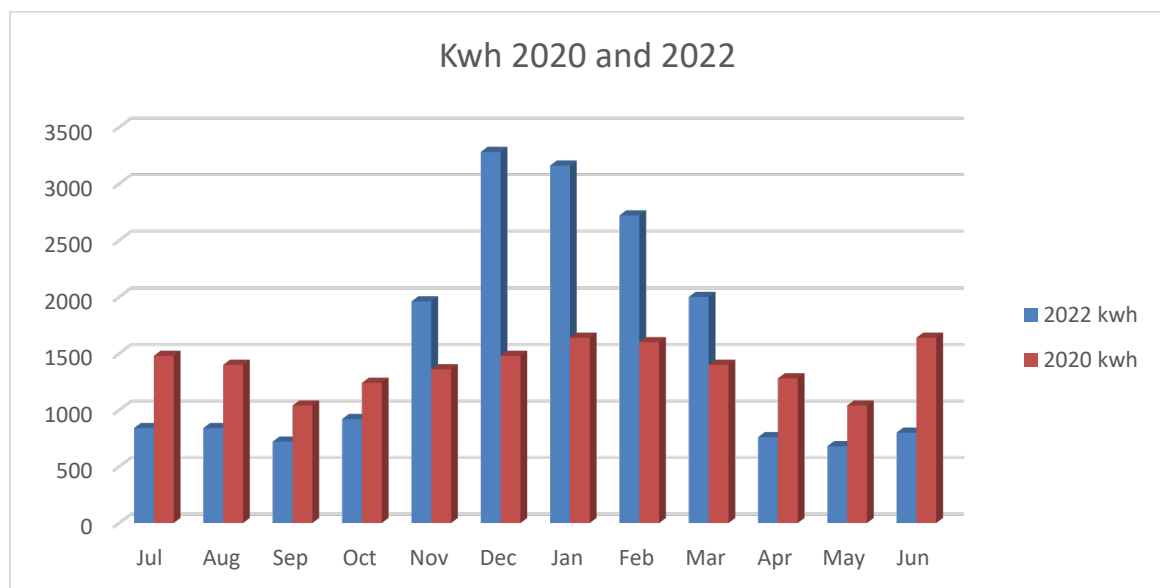
The solar array was sized and supplied by 3E Electrical Engineering based on records of our past usage. It was determined by them that an 11.2kw-dc system consisting of 28 400w panels would be sufficient to accommodate our electricity needs. This system was then installed by Superior Electrical & Data. After the system was installed and inspected we were given permission to operate on November 29, 2021. The other part of this project was to install air to air heat pumps in our office education center and appliance demanufacturing building. These were all sized supplied and installed by Weston Heating and Cooling. These systems are 9k and 24k BTU.

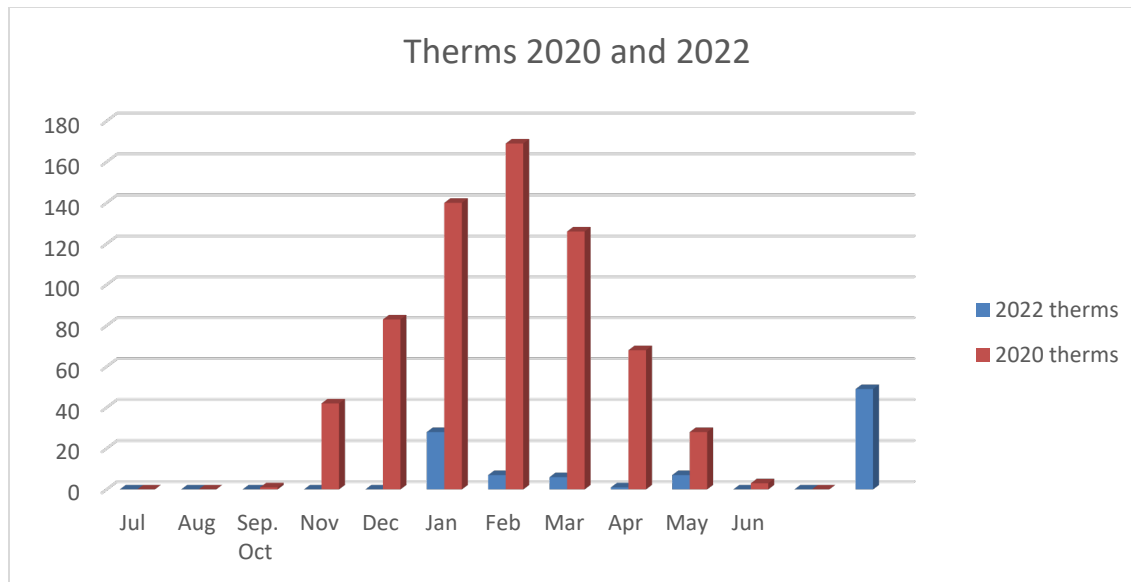
Below are the actual amounts of usage for FY 20-21 and 22-23

2020-2021 Office						
Date	Total	therm	gas	kwh	electric	Column1
July	\$ 312.84	0	\$ 33.39	1480	\$ 279.45	\$ 312.84
August	\$ 292.20	0	\$ 33.39	1400	\$ 258.81	\$ 292.20
September	\$ 207.77	1	\$ 35.09	1040	\$ 172.68	\$ 207.77
October	\$ 251.80	42	\$ 58.40	1240	\$ 193.40	\$ 251.80

November	\$ 294.85	83	\$ 84.80	1360	\$ 210.05	\$ 294.85
December	\$ 348.83	140	\$ 117.18	1480	\$ 231.65	\$ 348.83
January	\$ 373.49	169	\$ 126.51	1,640	\$ 246.98	\$ 373.49
February	\$ 366.63	126	\$ 116.87	1600	\$ 249.76	\$ 366.63
March	\$ 318.32	68	\$ 89.52	1400	\$ 228.80	\$ 318.32
April	\$ 273.21	28	\$ 57.70	1280	\$ 215.51	\$ 273.21
May	\$ 207.33	3	\$ 35.92	1040	\$ 202.87	\$ 238.79
June	\$ 356.36	0	\$ 37.99	1640	\$ 318.62	\$ 356.61
<b>Totals</b>	<b>\$ 3,603.63</b>	<b>660.00</b>	<b>\$ 826.76</b>	<b>16,600.00</b>	<b>\$ 2,808.58</b>	\$ 3,635.34

2022-2023 Office						
Date	Total	therm	Gas	kwh	Electric	Column1
July	\$78.29	0	\$ 32.24	840	\$ 46.05	\$ 78.29
August	\$ 68.21	0	\$ 37.99	840	\$ 30.22	\$ 68.21
September	\$ 54.86	0	\$ 34.54	720	\$ 20.32	\$ 54.86
October	\$ 58.19	0	\$ 33.38	920	\$ 24.81	\$ 58.19
November	\$ 299.88	0	\$ 33.38	1960	\$ 266.50	\$ 299.88
December	\$ 547.52	28	\$ 68.51	3280	\$ 479.01	\$ 547.52
January	\$ 457.46	7	\$ 42.04	3160	\$ 415.42	\$ 457.46
February	\$ 387.53	6	\$ 42.49	2720	\$ 345.24	\$ 387.73
March	\$ 252.87	1	\$ 34.33	2000	\$ 218.54	\$ 252.87
April	\$ 59.24	7	\$ 39.60	760	\$ 19.64	\$ 59.24
May	\$ 60.34	0	\$ 37.99	680	\$ 22.35	\$ 60.34
June	\$ 56.68	0	\$ 35.69	800	\$ 20.99	\$ 56.68
<b>Totals</b>	<b>\$2,381.07</b>	<b>49.00</b>	<b>\$472.18</b>	<b>18,680.00</b>	<b>\$1,909.09</b>	<b>\$ 2,381.27</b>





In FY 20-21, the facility purchased 660 therms of natural gas and 16600 kwh of electricity equaling 10.7 tons of CO2 emitted before installing the solar and air-to-air heat pump system. In FY 22-23, after the installation, the facility purchased only 49 therms of natural gas but increased to 18680 kwh of electricity equaling 8.16 tons of CO2 emitted. This resulted in a net decrease of CO2 emitted by 2.54 tons and an annual savings of \$1254.07 in utility bills paid. The large increase in kwh purchased from FY 20-21 to 22-23 is due to the usage of our heat pumps for all the heating and cooling needs. I've learned that these systems can be very efficient during the spring summer and fall months but during the coldest parts of the year it would be more energy and cost efficient to switch back over to our gas forced air system to provide heat. The reasoning for this is that these heat pumps work in a way that removes the heat from the air and at temperatures below 15 degrees Fahrenheit there just isn't enough heat in the air for that process to work efficiently. Fortunately when these systems were installed our existing HVAC system was left in working order and in the future we will switch over to gas heating for December-February, although this will increase the amount of therms purchased I believe it will significantly decrease the amount of kwh we have to purchase.

The solar panel system as well as our heat pump systems are showcased during facility tours.

I think solar is a great alternative energy source that does have its limitations. Mother nature is unpredictable, overcast days and winter months where the sun isn't optimal and the energy usage is at its highest is the biggest drawback. Also some changes have been made with our energy provider from the time our first solar project was completed to this one which no longer allows you to bank energy during the the summer months when you can produce more then you would use.



