Kansas City Power & Light

Renewables Cost Effectiveness Analysis

The purpose of this report is to summarize the analysis of 12 different Renewable Energy technologies for their cost effectiveness. The field modeling of the Renewable technologies was completed by Mr. Bob Solger of The Energy Savings Store based on his experience having sized and installed many of these technologies in the Kansas City area. His results, summarized in a separate report, were used as inputs in the DSMore cost effectiveness modeling tool to determine the cost effectiveness test results.

The technologies analyzed were:

- Solar Photovoltaic (PV) System 2.16 kW – Northeast Kansas City
- Solar PV System 3.024 kW – Northeast Kansas City
- Solar PV System 2.16 kW – Southwest Overland Park, KS
- Solar PV System 3.024 kW – Southwest Overland Park
- Wind Turbine 1.8 kW System North
- Wind Turbine 10 kW System North
- Wind Turbine 1.8 kW System Southwest
- Wind Turbine 10 kW System Southwest
- Solar Hot Water System – Northeast Kansas City
- Solar Hot Water System – Southwest Kansas City
- Solar Air Heating System – Northeast Kansas City
- Solar Air Heating System – Southwest Kansas City

All systems were applied to a residential single family home. The PV and Wind technologies were modeled assuming that any excess power generated from the system and not needed by the home would be sold back to the utility by reversing the meter. The value of these kWh to the customer is equal to the value of the retail kWh rate. The value to the utility is the avoided cost of the saved energy during that time. Load summaries by hour were generated for these technologies indicating when the power was generated, used or sold back to the utility. These load summaries were then averaged across the year by hour to create load curves for the DSMore model to use. In addition the standard deviations were generated for these curves and also placed into the model. Two examples are below.

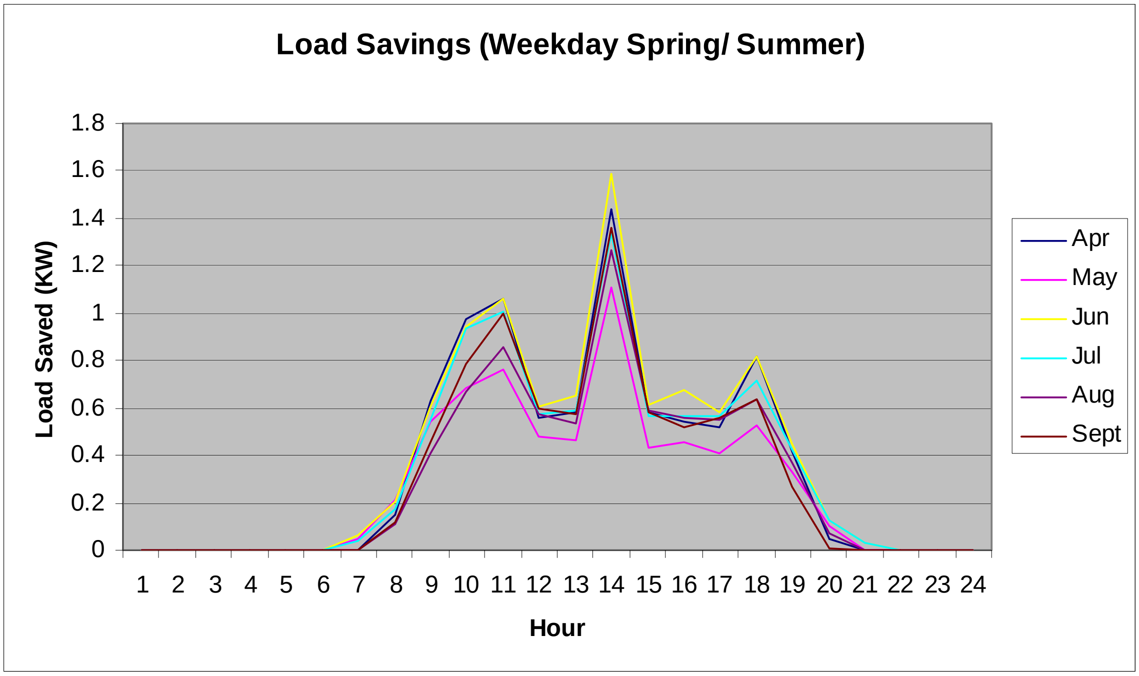

Figure 1: PV 3.024 South – Savings

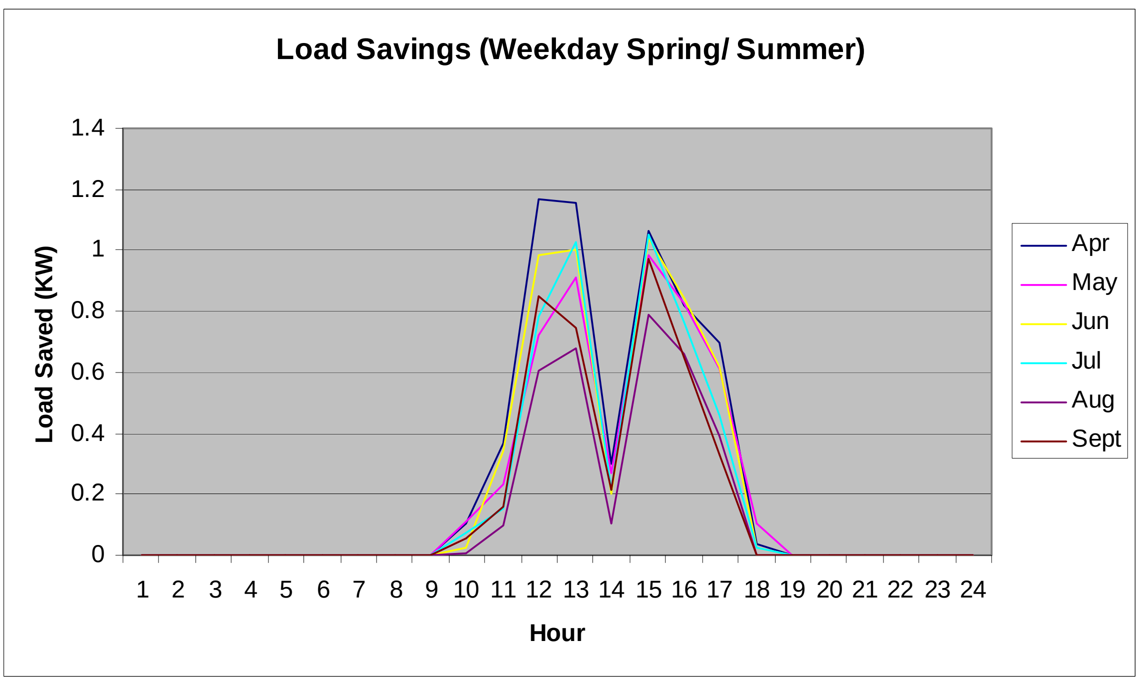

Figure 2: PV 3.024 South – Buy Back

To run the DSMore model for the PV and Wind technologies and reflect the value from both the saved energy at the home by using the generated power (avoiding purchasing kWh from the utility) and the utility “buy back” portion of the energy generated (kWh fed back through the meter), DSMore was run twice. For the first run, the “buy back” mode, DSMore uses the generated load curve for the kWh fed back into the grid (see Figure 2 above). This modeling generated the lost revenue which is the retail value to the customer for that reversal of the meter and the utility avoided cost for the amount of energy fed back into the meter. The second run of the model uses the load curve depicting the energy "saved" by the customer (see Figure 1 above) or the amount of kWh that customer did not have to buy from the utility to fulfill his internal needs. This represents the value of the retail energy sold back to the utility and is added as an incentive to the customer. In addition the value of the avoided energy to the utility was deducted from the program cost to capture that value to the utility. Technology incentives for the customer as KCP&L direct "rebates" were also included in the program cost at different rebate levels. For these initial cost effectiveness analyzes no program administrative costs were included. This is an unreal expectation but one that shows the most optimistic view of the technologies cost effectiveness potential.

Initial results of the cost effectiveness modeling are listed below. Table 1 is the results assuming that KCP&L would provide rebates of 50% of the incremental cost of the equipment. The customer also gets the buy back incentive from reversing the meter and the utility gets the benefit of the avoided cost for the buy back portion (as well as the avoided sales to the customer).

Cost Effectiveness Results - 50% Customer Incentive

	UCT	TRC	RIM	Societal	Participant
PV 2.16 NE	0.13	0.06	0.11	0.07	0.59
PV 3.024 NE	0.12	0.06	0.11	0.07	0.60
PV 2.16 SW	0.15	0.08	0.13	0.08	0.60
PV 3.024 SW	0.18	0.09	0.15	0.10	0.64
Wind 1.8 N	0.14	0.07	0.12	0.08	0.60
Wind 10 N	0.11	0.06	0.10	0.06	0.60
Wind 1.8 SW	0.13	0.06	0.11	0.07	0.58
Wind 10 SW	0.10	0.05	0.09	0.06	0.58

In no case do these measures appear cost effective for any of the tests. The incentives were then reduced to just 10% of the measure cost to see if these measures would pass the UCT test. It would have no impact on the TRC as incentives are pass-through costs in that test. The results are summarized below.

Cost Effectiveness Results - 10% Customer Incentive

	UCT	TRC	RIM	Societal	Participant
PV 2.16 NE	0.62	0.06	0.39	0.07	0.19
PV 3.024 NE	0.60	0.06	0.38	0.07	0.20
PV 2.16 SW	0.77	0.08	0.44	0.08	0.20
PV 3.024 SW	0.87	0.09	0.47	0.10	0.24
Wind 1.8 N	0.69	0.07	0.39	0.08	0.20
Wind 10 N	0.51	0.06	0.33	0.06	0.20
Wind 1.8 SW	0.61	0.06	0.37	0.07	0.18
Wind 10 SW	0.48	0.05	0.32	0.06	0.18

While the results improved, they did not pass any cost effectiveness test. Note that this includes the assumption that there were no administrative or program costs for the utility to deliver such a program. The addition of those costs to run the program would only decrease the cost effectiveness even further.

For the Solar Domestic Hot Water systems (SDHW) and the Space Heat systems (SH) DSMore was again used to analyze the technologies for cost effectiveness. For these technologies there is no “buy-back” to the utility grid system. These are thermal technologies so they only affect the thermal loads. Consequently DSMore only needed to run once to get the results and these results were applied against the standard load curve of the home to get the “savings” from these technologies. The tests were run assuming a 50% rebate for the equipment installed and no program administrative costs. The results are listed below.

Cost Effectiveness Results - 50% Customer Incentive

	UCT	TRC	RIM	Societal	Participant
SDHW NE	0.98	0.49	0.5	0.52	0.98
SDHW SW	0.98	0.49	0.5	0.52	0.98
Space Heat NE	1.77	0.89	0.6	0.95	1.49
Space Heat SW	1.77	0.89	0.6	0.95	1.49

Unlike the PV and Wind systems, these two technologies are cost effective or close under the assumed conditions and warrant continued investigation as a potential program offering. With administrative costs included for a program and adjusted incentives, these technologies have potential to be offered under a KCP&L program. For example for SDHW, if the program assumes a 30% rebate (down from 50% assumed above) and that the program implementation cost equals half the rebate amount, the UTC score is over 1. Further analysis and program discussions would be needed to finalize these numbers for a program design.

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