



Renewable Energy Options Evaluation



Independence Power & Light

Renewable Energy Study

Project No. 81397

Preliminary Report

November 25, 2014

Renewable Energy Options Evaluation

prepared for

**Independence Power & Light
Renewable Energy Study
Independence, Missouri**

Project No. 81397

**Preliminary Report
November 25, 2014**

prepared by

**Burns & McDonnell Engineering Company, Inc.
Kansas City, Missouri**

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LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Term/Phrase/Name</u>
AEP	Annual energy production
BMcD	Burns & McDonnell Engineering Company, Inc.
COP	Coefficients of Performance
CW&L	Columbia Water & Light
DSAT	Distributed Wind Site Analysis Tool
EIA	Energy Information Association
HCRP	Heating/Cooling Rebate Program
IBRP	Installation Based Rebate Program
IPL	Independence Power & Light
ITC	Investment Tax Credit
kV	Kilovolt
kW	Kilowatt
LCOE	Levelized Cost of Energy
m	Meter
m/s	Meters per second
MACRS	Modified Accelerated Cost Recovery System
MW	Megawatt
NPV	Net Present Value
NREL	National Renewable Energy Laboratory
O&M	Operations and maintenance
PBRP	Production Based Rebate Program
PPA	Power Purchase Agreement
PTC	Production Tax Credit

Abbreviation**Term/Phrase/Name**

PV

Photovoltaic

RReDC

Renewable Resource Data Center

SAM

NREL's System Advisor Model

Study

Renewable Energy Options Evaluation

STATEMENT OF LIMITATIONS

In preparation of this Study, BMcD has relied upon information provided by IPL. While BMcD has no reason to believe that the information provided, and upon which BMcD has relied, is inaccurate or incomplete in any material respect, BMcD has not independently verified such information and cannot guarantee its accuracy or completeness.

Estimates and projections prepared by BMcD relating to performance and costs are based on BMcD's experience, qualifications, and judgment as a professional consultant. Since BMcD has no control over weather, cost and availability of labor, material and equipment, labor productivity, contractors' procedures and methods, unavoidable delays, economic conditions, government regulations and laws (including interpretation thereof), competitive bidding, market conditions, or other factors affecting such estimates or projections, BMcD does not guarantee the accuracy of its estimates or predictions.

1.0 EXECUTIVE SUMMARY

1.1 Introduction

Burns & McDonnell Engineering Company, Inc. was retained by Independence Power & Light to conduct an evaluation of renewable energy options and an evaluation of potential renewable energy incentives and sustainable programs in accordance with City Resolution 5933.

1.2 Study Description

Burns & McDonnell conducted two analyses that were provided in Resolution 5933: (i) an evaluation of feasibility, practicality and economics of the use of renewable energy options at City-owned facilities; and (ii) an evaluation of potential incentives and sustainable programs which can be provided to customers for the use of renewable energy options. Per the request of IPL, Burns & McDonnell included energy efficiency programs in addition to renewable energy options as part of the second evaluation.

IPL staff provided a list of 29 City-owned buildings/sites for review. BMcD screened the list to 11 buildings/sites to visit and verify the screening. The economics of solar PV potential was evaluated for each building/site to estimate the levelized cost of energy for deploying solar PV at each building/site. Wind and geothermal were also reviewed but the economics and land requirements of each did not merit significant review.

To determine potential renewable energy incentive programs for IPL, BMcD identified 10 utilities that had programs established. BMcD attempted to contact all the utilities to discuss their programs with the intent of understanding which programs may be of interest to IPL and seven of the utilities responded.

1.3 Conclusions

Based on the renewable energy study of the City's buildings, BMcD concludes the following:

- Wind should not be considered a viable renewable generation for any of the building/sites at this time. This is primarily due to poor economics due to the relatively high upfront capital and low capacity factors of the wind turbines located in the Independence area. In addition, there is a lack of land area at the City-owned sites which would allow for construction of larger wind turbines.
- IPL should not pursue geothermal technologies at this time unless there is a capital program and need for replacing existing inefficient heating and cooling systems at the City-owned buildings and there is sufficient green space for installation of the heat transfer wells. When this situation occurs, IPL should evaluate the specifics regarding such building and the economics of such

potential installation of a geothermal system as compared to a traditional heating and cooling system.

- BMcD recommends IPL investigate further the viability of solar PV generation for the following buildings: Rock Creek, IPL Service Center, Public Works Maintenance, and Fire Station 7. The differentiating factor for these buildings was the increase availability of ground mounted arrays.

BMcD evaluated and discussed existing incentive programs with utility companies implementing the programs and has identified the following recommendations.

- **Utility Purchased Efficiency Program:** As an example, the LED Buy-Down Program offered by CPS Energy discussed in this Study, provides benefits to both the utility and customers with no long term contracts or obligations between entities. In this program, the utility buys equipment in bulk at a reduced price and directly sells the material to customers interested in purchasing. However, these programs are generally used to reduce load which is the revenue source of the utility. In the instance of the LED Program, assuming the 200,000 LED lights are installed, they provide a load reduction of approximately 9,900 kW per hour of operation. The revenue lost from this program is approximately \$1,300 for every hour all light bulbs are used (assuming a cost per kWh of \$0.13).
- **Community Solar Program:** A Community Solar Program provides customers the opportunity to purchase energy from solar without impacting the structure of their houses and without the utility financing the development of a potentially costly project. This program allows the projects to be financed through a power purchase agreement with the developer and passes the cost directly to the customers participating in the program. This program also provides the benefit of having one interconnection location compared to sporadic rooftop residential solar which allows utilities to better manage the stability of inconsistencies with the solar energy produced. Additionally, this program is becoming widely popular with other utilities in Missouri as well as Austin Energy and CPS Energy which have both stated they are currently developing these programs.
- **Energy Efficiency Loan Program:** Although IPL currently has an Energy Efficiency Loan Program (HELP), BMcD recommends further review and potentially refining the program based on the recommendations provided by CW&L. From CW&L's experience with their program, they recommended that IPL include enough protection to the utility in case the customer does not pay the loan. One example is to incorporate a clause in the loan agreement which gives the utility the authority to turn off the power to the customer if the customer does not pay the loan.
- **Program Marketing:** From communications with several utilities, the most common challenge in implementing their programs was marketing. Most utilities recommended increasing marketing

efforts to better promote and make customers aware of what programs are available to them and increase participation. Therefore, it is recommended that IPL look at ways to increase marketing efforts related to their existing programs plus any new programs that are put in place.

- **Rate Review:** It is recommended that IPL review their current rate structure to eliminate or reduce any rate subsidization issues. Deploying programs prior to a rate structure review could result in program costs being subsidized by customers not participating in programs.

2.0 INTRODUCTION

2.1 Study Objectives

Burns & McDonnell Engineering Company, Inc. (BMcD) was retained by Independence Power & Light (IPL), to conduct a 2-phase study (Study) in accordance with City Resolution 5933; provide as Attachment A. Phase 1 was an evaluation of the feasibility, practicality and economics of renewable energy options at City-owned facilities. Phase 2 was an evaluation of potential incentives and sustainable programs which can be provided to customers for the use of renewable energy options. Per the request of IPL, BMcD included energy efficiency programs in addition to renewable energy as part of Phase 2.

Burns & McDonnell was provided with data on 29 city buildings for review including address locations, estimate of the type of roof on each building and other data. Utility bills for each building/location were provided and the monthly bills were aggregated to determine the annual building electrical load and the average cost per kilowatt hour (kWh).

2.2 Organization of Report

This report is organized into several separate chapters and supporting appendices. These individual sections are listed below, along with a brief description of their contents.

- **Section 1.0 - Executive Summary:** An executive summary of the Study.
- **Section 2.0 - Introduction:** A description of the Study's objectives, the documents reviewed by BMcD in the completion of the Study, and the structure of this report.
- **Section 3.0 - Phase 1—Building Review:** A description of the analysis conducted to determine the feasibility of renewables at several buildings within Independence, Missouri.
- **Section 4.0 - Phase 2—Renewable Energy Incentive Programs:** A description of the data gathering and analysis of various renewable energy and energy efficiency incentive programs.
- **Section 5.0 - Summary and Recommendations:** Summary of the Study, conclusions and/or recommendations.

3.0 PHASE 1—BUILDING REVIEW

3.1 Renewable Energy Technologies

3.1.1 Solar

Buildings and sites were reviewed to determine if solar photovoltaic (PV) panels would be feasible at the location. Solar PV is technically feasible where there is plenty of sunlight availability, minimal shading potential and large areas for solar PV installations.

3.1.2 Wind

Wind technologies come in a multitude of sizes from 1 kilowatt (kW) to 3 megawatts (MW). Buildings or city locations cannot typically take advantage of MW-sized wind turbines. These large turbines can produce more energy than required for a single building and can be considered a safety hazard due to their large size and because of ice throw from their blades in winter conditions. Therefore, MW-sized wind turbines are not optimal for city locations.

The smaller kW-sized turbines can be more effectively utilized in city locations but are much less efficient and are not typically economic due to their significant up-front costs and low energy production. In addition, lower average wind speeds and obstructions within city areas make these smaller wind turbines difficult to justify economically.

3.1.3 Geothermal

Geothermal heat pumps work by circulating water into underground wells to either transfer heat into the ground or absorb heat from it. These systems are difficult to justify economically, especially for existing buildings. Geothermal systems require a very large up front capital investment, which is driven by the underground piping/well field. The equipment and systems installed within buildings as a retrofit are similar in price to conventional heating and air conditioning systems, but the drilling and installation of the underground heat transfer systems makes them less economical versus a conventional system. However, if government incentives are available and if the current heating and cooling system is inefficient and in need of replacement (typically a very old system), the economics of the geothermal system may be justified.

3.2 Buildings Reviewed

IPL identified 29 City-owned buildings/sites for review as identified in Table 3-1.

Table 3-1: Buildings and/or Sites Reviewed

No.	Building Name	Address
1	Adventure Oasis	2100 S. Hub Drive
2	City Hall	111 E. Maple
3	Fire Station 1	950 N. Spring St.
4	Fire Station 2	14510 E. 39th St.
5	Fire Station 3	10219 E. Winner Rd.
6	Fire Station 4	202 W. 23rd Street
7	Fire Station 5	11301 E. 35th St.
8	Fire Station 6	17707 E. Bundschu
9	Fire Station 7	2206 Hub Drive
10	Fire Station 8	21300 E. Truman Rd.
11	Fire Station 9	1411 N. M-7 Hwy.
12	Fire Station 10	3303 RD Mize Rd.
13	George Owens Park	1601 S. Speck Road
14	Health Department	515 S. Liberty
15	National Frontier Trail Museum	318 W. Pacific
16	Palmer Center	2018A N. Pleasant St.
17	Park Maint. Facility	320 E. Lexington
18	Police Building	223 N. Memorial Dr.
19	Independence Event Ctr.	19100 E. Valley View Parkway
20	Police Traffic Safety	14609 E. Truman Rd.
21	Public Works Maintenance	1030 S. Crysler
22	Sermon Center	201 N. Dodgion St.
23	Truman Memorial Building	416 W. Maple
24	Water Department	11610 E. Truman Rd.
25	Water Pollution Control/Rock Creek	9600 Norledge
26	Water Pollution Control Maintenance	14919 E. Truman Rd.
27	Woodlawn Cemetery	701 S. Noland Rd.
28	IPL Service Center	21500 E. Truman Rd.
29	IPL Plant	21500 E. Truman Rd.

3.3 Evaluation Approach

Each City-owned building/site was evaluated based on the estimated square footage of rooftop, the type of rooftop and the roofing orientation, i.e. was the rooftop facing south so the solar PV panels could be placed and oriented on the rooftop for maximum efficiency. The surrounding area was also reviewed as a potential location for a ground mounted solar PV array, small wind turbine and/or geothermal wells. Large parking lots were seen as having positive potential for solar PV car ports.

The orientation of the rooftop along with potential shading and/or wind obstructions was also reviewed. The age of the heating and cooling system of a building was considered where that data was available. If it wasn't available, geothermal feasibility was ranked low. Based on these criteria, the buildings/sites

were scored and those with the highest scores were rated as having the most potential for renewable energy technology deployment.

All the buildings/sites were initially reviewed using Google Earth imagery (see Attachment B) and were scored based on what could be seen in that imagery. These scores were put into a weighted evaluation matrix which was used to calculate an overall score based on the reviews.

Once all buildings/sites were reviewed and scored in the matrix, the building/sites were sorted from highest to lowest score. Those that ranked in the top 10 were identified for further review and site visits. In practice, Burns & McDonnell identified 11 buildings/sites that were visited. The site visits were conducted to confirm the initial evaluation and/or revise the evaluation score as appropriate based on what was seen or learned during the site visit.

3.4 Building Evaluation Results

The results of the scoring matrix are shown in Table 3-2. The evaluation scoring model is contained in Attachment F. In the evaluation model, a five represented a score that indicated a renewable technology was likely feasible and a one indicated that a renewable technology was not likely feasible. The model was used to reduce the buildings reviewed to the top 10; however, Burns & McDonnell chose to review those buildings/sites with a score of 3.3 or greater which made the list 11 buildings/sites for site visits and further analysis.

Table 3-2: Scoring Matrix Results

No.	Building Name	Address	Score
25	Water Pollution Control/Rock Creek	9600 Norledge	4.4
2	City Hall	111 E. Maple	4.1
23	Truman Memorial Building	416 W. Maple	4.1
3	Fire Station 1	950 N. Spring St.	3.8
14	Health Department	515 S. Liberty	3.8
19	Independence Event Ctr.	19100 E. Valley View Parkway	3.8
28	IPL Service Center	21500 E. Truman Rd.	3.8
21	Public Works Maintenance	1030 S. Crysler	3.5
26	Water Pollution Control Maintenance	14919 E. Truman Rd.	3.5
1	Adventure Oasis	2100 S. Hub Drive	3.3
9	Fire Station 7	2206 Hub Drive	3.3
17	Park Maintenance Facility	320 E. Lexington	3.1
24	Water Department	11610 E. Truman Rd.	3.1
29	IPL Plant	21500 E. Truman Rd.	3.0
18	Police Building	223 N. Memorial Dr.	2.9
22	Sermon Center	201 N. Dodgion St.	2.9
15	National Frontier Trail Museum	318 W. Pacific	2.7

No.	Building Name	Address	Score
7	Fire Station 5	11301 E. 35th St.	2.5
16	Palmer Center	2018A N. Pleasant St.	2.4
5	Fire Station 3	10219 E. Winner Rd.	1.7
10	Fire Station 8	21300 E. Truman Rd.	1.6
13	George Owens Park	1601 S. Speck Road	1.6
20	Police Traffic Safety	14609 E. Truman Rd.	1.6
4	Fire Station 2	14510 E. 39th St.	1.3
6	Fire Station 4	202 W. 23rd Street	1.3
12	Fire Station 10	3303 RD Mize Rd.	1.0
8	Fire Station 6	17707 E. Bundschu	1.0
11	Fire Station 9	1411 N. M-7 Hwy.	1.0
27	Woodlawn Cemetery	701 S. Noland Rd.	1.0

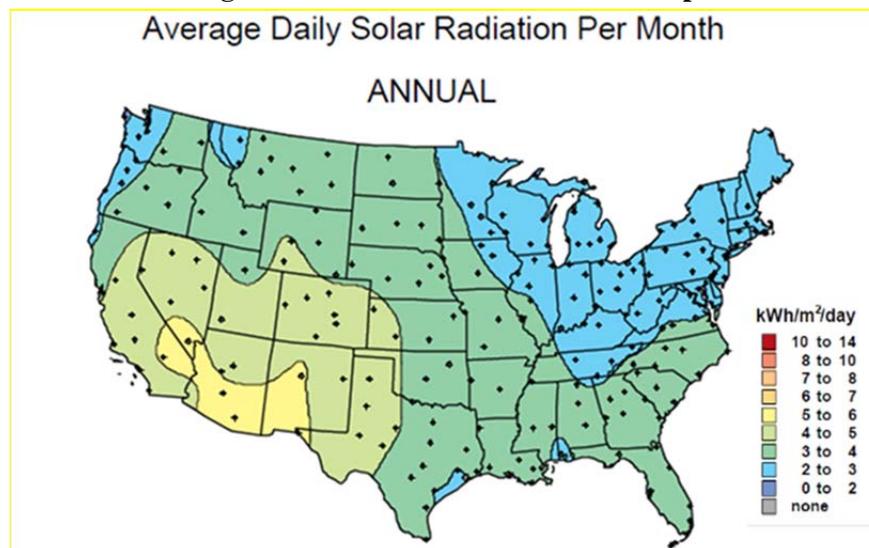
3.5 Renewable Energy Evaluation

Technologies considered for viability in this Study include solar PV, wind, and geothermal sources. Energy technologies and incentives are continuously evolving; therefore reevaluation of technology and market factors is necessary. In addition, incentives vary depending on ownership and cost structuring, making it necessary to evaluate technologies under various ownership and financing structures.

3.5.1 Methodology

3.5.1.1 Solar PV

Economic suitability of solar PV generation is dependent upon a number of factors, though the driving factors include annual solar radiation, local utility electric rates, and available incentives. The National Renewable Energy Laboratory's (NREL) Renewable Resource Data Center (RReDC) provides access to renewable energy resource data, maps and tools. Figure 3-1 below provides a national map of average daily solar radiation per month. Based on the average annual solar radiation data, IPL receives between 3 to 4 kWh/m²/day. This amount of radiation places IPL in a below average region of the United States, making solar economic feasibility more difficult.

Figure 3-1: NREL Solar Radiation Map

Electric rates are an important factor in determining economic viability of solar PV implementation. Current electric rates determine the avoided cost to the consumer, providing the necessary return on investment to accommodate the upfront capital costs of system purchase and installation. Based on conversations with IPL staff and available bill analysis, BMcD found IPL's average electric rate for commercial customers to be \$0.1319 per kWh for the buildings/sites reviewed. Actual average costs by building are provided within Table 3-7.

Current solar PV incentives available include investment tax credits (ITC) and Modified Accelerated Cost Recovery System (MACRS) form of depreciation. For the purpose of this study, BMcD considered two ownership structures; first being IPL owns and operates all renewable generation, therefore making these incentives unobtainable due to the absence of taxes imposed on IPL, and secondly a power purchase agreement (PPA) structure where a third party owns and operates the renewable generation selling the energy at an agreed upon rate to IPL. In the second scenario, the third party owner would be eligible for these incentives, which would lower the levelized cost of energy (LCOE) and drive down the necessary rate charged to IPL to generate desired returns on investment. Levelized cost of energy calculates the equal annualized cost of power on a \$/kWh basis, given upfront costs, reoccurring annual costs, study period, and applicable discount rate. For the purpose of this study, LCOE for solar and wind scenarios were compared against an assumed LCOE for IPL retail rates. Assumed IPL LCOE rates were calculated as the annualized payment of the net present value of today's all-in \$/kWh rate at each building inflated 3 percent per year at a discount rate of 5.06 percent.

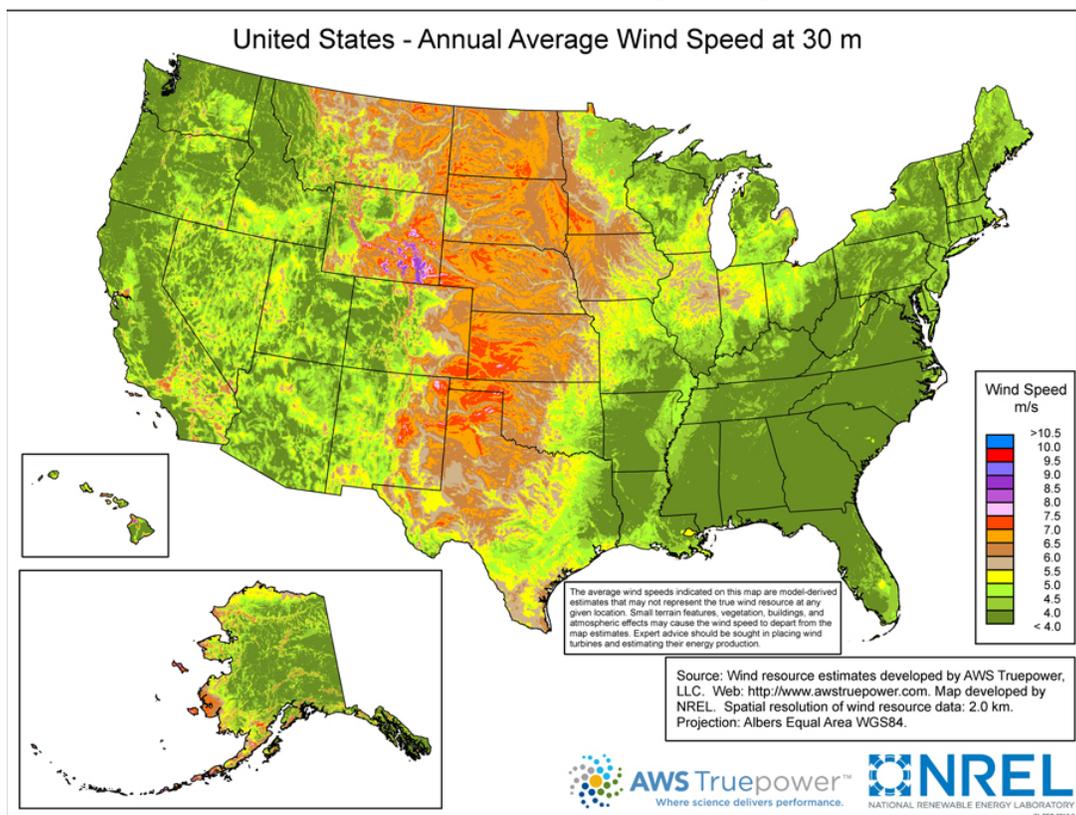
3.5.1.2 Wind

Much like solar PV generation, wind generation viability is dependent upon local utility electric rates. Generation capabilities are determined by equipment installed and average wind velocities available on site. NREL produces geographical representations of annual average wind speeds throughout the country, as shown in Figure 3-2. Using the Distributed Wind Site Analysis Tool (DSAT) from NREL, the average wind speed in Independence, Missouri is about 5 m/s which is the fourth lowest wind speed category.

The wind ITC and production tax credits (PTC) have expired and have not yet been renewed, however MACRS incentives are still available to third party ownership financing model for wind generation. Large-scale wind generation is generally not well suited for high density residential and commercial areas due to its size, turbulence created by an urban environment and safety (e.g. ice throw).

It is more difficult to achieve economic efficiency through small scale wind generation, although like solar technology, wind technology is continuously evolving, costs are going down, and available incentive programs are growing, therefore it is necessary to continually reevaluate wind viability.

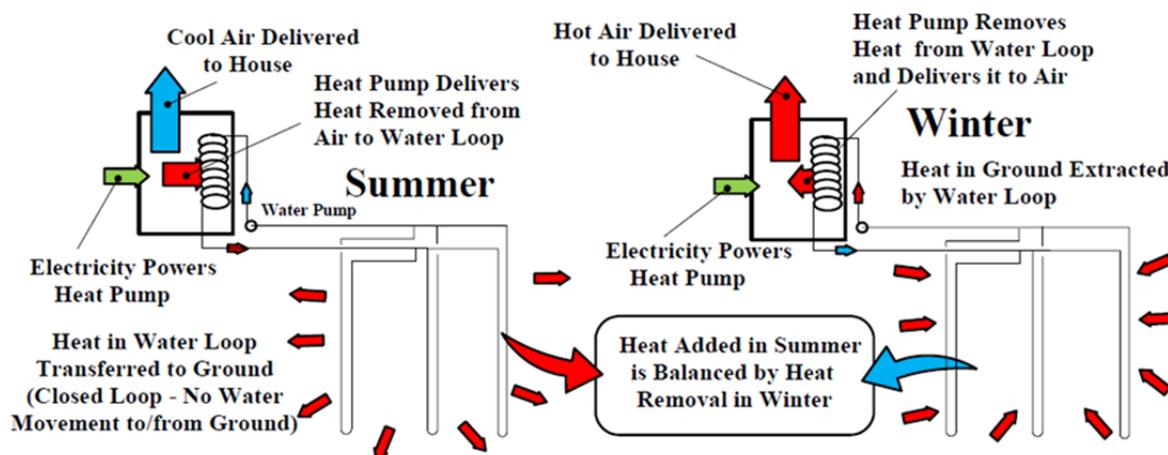
Figure 3-2: NREL Wind Speed Map



3.5.1.3 Geothermal

Geothermal renewable resources allow for a clean alternative to heating and cooling buildings. For the purpose of this Study, geothermal systems are assumed to be vertical ground source heating and cooling by way of electric heat pumps. Heat pumps refer to a system in which refrigeration equipment is used to both heat and cool a space. As opposed to generating heat or cooling, a heat pump simply transfers heat from one medium to another. This leads to efficiencies greater than 100 percent, therefore heat pumps are typically measured in coefficients of performance (COP), calculated as the amount of energy transferred divided by energy input required to operate equipment. The medium for which heat is transferred to or from is assumed to be water for this Study. Water source heat pumps have COP's ranging from 4-5 in heating operation. Process diagrams explaining ground source geothermal heating and cooling are provided in Figure 3-3.

Figure 3-3: Geothermal Heating and Cooling Process Diagram



3.5.2 Assumptions

In order to conduct economic analyses for potential renewable energy resources, assumptions were made for the economic evaluation. Assumptions included inflation, discount and interest rates, term duration, and capital and O&M costs specific to each technology. All technologies were assumed to be 100 percent debt financed over a 25 year term. In addition, inflation and discount rates were assumed to be 3 percent and 5 percent, respectively. Scenarios were generated, considering a capital structure where IPL owns and operates the generation as well as a scenario where a third party owns and operates the generation and structures a PPA with IPL.

Table 3-3 displays assumptions made regarding the PPA structuring within the models. Under this format, the third party owner would provide IPL with a contract and a proposal for first year energy cost, with an agreement that subsequent year energy rates will increase at the stated PPA inflation rate. Values provided in Table 3-3 are indicative of prior solar purchase power agreements BMcD has reviewed.

Table 3-3: PPA Assumptions

PPA Structuring	
Term	25 Years
Third Party Interest Rate	7%
Required I.R.R.	12%
Annual PPA Inflation	3%

3.5.2.1 Solar Assumptions

For the purpose of this Study, BMcD considered 11 different buildings/sites within the IPL service territory for potential solar PV arrays. Solar arrays could be roof, ground, or car port mounted. A summary table of the locations and array capacities by mount type is summarized in Table 3-4. Associated capital cost assumptions are provided in Table 3-5.

Table 3-4: Potential Array Locations

City Building	Rooftop Capacity	Ground Capacity	Car Port Capacity
	<i>(kW)</i>	<i>(kW)</i>	<i>(kW)</i>
Water Pollution Control/Rock Creek	72	367	82
City Hall	95	0	260
Truman Memorial Building	72	0	36
Health Department	73	0	59
Fire Station 1	72	0	0
Independence Event Ctr.	331	203	3979
IPL Service Center	242	726	374
Public Works Maint.	162	0	0
Water Pollution Control Maint	121	0	146
Adventure Oasis	0	0	217
Fire Station 7	90	0	16

Table 3-5: Solar Cost Assumptions

Roof top solar	
Installation Cost	3.50 \$/W-dc
Capacity Available	12.00 W-dc/sq. ft.
% Usable Roof Top	60%
Capacity Available	7.20 W-dc/sq. ft.
O&M	0.02 \$/(W-dc * yr)
Solar car port	
Installation Cost	4.00 \$/W-dc
Capacity Available	12.00 W-dc/sq. ft.
Parking Space Area	200.00 sq. ft.
% Usable Car Port	95%
Capacity Available	2.28 kW-dc/parking space
O&M	0.02 \$/(W-dc * yr)
Ground mount solar	
Installation Cost	1.80 \$/W-dc
Capacity Available	12.00 W-dc/sq. ft.
% Usable Ground Area	45%
Capacity Available	5.40 W-dc/sq. ft.
O&M	0.02 \$/(W-dc * yr)
Solar Radiation for IPL	1,404 kWh/kW-dc

3.5.2.2 Wind Assumptions

For the purpose of this Study it was assumed that a potential wind generation installation would consist of a single 5 kW wind turbine. Specific buildings or locations for installation were not assumed, as space requirements and available wind velocities will not vary materially. Therefore, a single economic assessment was conducted under both IPL ownership and a third party PPA structure. Economic assumptions included identical inflation and discount rates to those used in the solar analysis. Installation and equipment costs for the wind analysis were assumed to be approximately \$5,000/kW installed (Source: Bergey.com and AWEA.org). These assumptions are summarized below in Table 3-6.

Table 3-6: Wind Cost Assumptions

Project Size	5 kW
Installation Cost	\$5,000 \$/kW-dc
Total Cost	\$25,000
Financing Term	25 Years
Average Electric Cost to Building	\$ 0.1250 \$/kWh
Average Wind Speed	5 m/s

3.5.2.3 Geothermal Assumptions

Primary costs associated with geothermal heating and cooling relate to the excavation and piping required for circulation of the water underground. Typical residential and commercial geothermal systems cost between \$20,000 and \$30,000 more than a conventional package air conditioning system and gas furnace.

For the purpose of this Study, BMcD assumed a geothermal system would have an incremental capital cost of \$30,000 above a standard high efficiency gas furnace and split DX AC system.

3.5.3 Results

Results within this section considered two financial scenarios; first, IPL owns and operates each of the renewable energy technologies and second, a third party owner sells generation to IPL through a PPA structure. For the purposes of this Study, BMcD utilized NREL’s System Advisor Model (SAM) to model technical and economic output for each of the proposed technologies. Primary metrics utilized in evaluating each technology included the annual energy production, LCOE, and net present value (NPV) of each scenario.

3.5.3.1 Solar Economic Results

Results from the solar economic analysis are shown below in Table 3-7 and Table 3-8. Supporting analysis for these tables is provided within Attachment E of this Study. Average electric costs were calculated for each building through inspection of actual historical twelve month’s bills. These values were then converted into nominal LCOE values as shown in the Retail LCOE column below. The Retail LCOE values were used for comparison against the Solar LCOE value (calculated in nominal terms) for the study period of 25 years. Differences between average electric costs and LCOE are reported within the Variance column. Positive values denote higher energy costs due to solar implementation while negative variances denote savings.

Table 3-7: Solar Economic Results (IPL Ownership)

<u>City Building</u>	<u>Annual Production</u> <i>(kWh/year)</i>	<u>Install Costs</u> <i>(\$)</i>	<u>Avg. El. Costs</u> <i>(\$/kWh)</i>	<u>Retail LCOE</u> <i>(Nominal \$/kWh)</i>	<u>Solar LCOE</u> <i>(Nominal \$/kWh)</i>	<u>Variance</u> <i>(\$/kWh)</i>	<u>Payback</u> <i>(Years)</i>	<u>NPV</u> <i>(\$)</i>
Water Pollution Control/Rock Creek	694,800	\$ 1,241,280	\$ 0.1215	\$ 0.1643	\$ 0.1594	\$ (0.0049)	14.6	\$ 39,000
City Hall	543,400	\$ 1,370,430	\$ 0.0997	\$ 0.1349	\$ 0.2504	\$ 0.1155	>25.0	\$ (792,700)
Truman Memorial Building	163,300	\$ 397,920	\$ 0.0993	\$ 0.1343	\$ 0.2387	\$ 0.1044	>25.0	\$ (216,700)
Health Department	198,700	\$ 494,160	\$ 0.1310	\$ 0.1773	\$ 0.2420	\$ 0.0647	20.7	\$ (168,500)
Fire Station 1	104,500	\$ 252,000	\$ 0.1206	\$ 0.1631	\$ 0.2286	\$ 0.0655	21.3	\$ (90,600)
Independence Event Ctr.	6,949,700	\$ 17,438,100	\$ 0.1250	\$ 0.1691	\$ 0.2498	\$ 0.0807	22.4	\$ (7,122,400)
IPL Service Center	1,838,000	\$ 3,648,768	\$ 0.1225	\$ 0.1657	\$ 0.1818	\$ 0.0161	16.6	\$ (446,800)
Public Works Maint.	239,300	\$ 567,000	\$ 0.1380	\$ 0.1867	\$ 0.2290	\$ 0.0423	18.6	\$ (135,700)
Water Pollution Control Maint	405,900	\$ 1,007,040	\$ 0.1378	\$ 0.1864	\$ 0.2592	\$ 0.0728	21.0	\$ (379,000)
Adventure Oasis	336,900	\$ 866,400	\$ 0.1344	\$ 0.1818	\$ 0.2658	\$ 0.0840	22.1	\$ (345,700)
Fire Station 7	155,500	\$ 378,386	\$ 0.1332	\$ 0.1802	\$ 0.2400	\$ 0.0598	20.2	\$ (121,100)

Table 3-8: Solar Economic Results (PPA Structuring)

<u>City Building</u>	<u>Annual Production</u> (kWh/year)	<u>Install Costs</u> (\$)	<u>Avg El. Costs</u> (\$/kWh)	<u>Retail LCOE</u> (Nominal \$/kWh)	<u>PPA Price</u> (\$/kWh)	<u>Variance</u> (\$/kWh)
Water Pollution Control/Rock Creek	694,800	\$ 1,241,280	\$ 0.1215	\$ 0.1643	\$ 0.1349	\$ (0.0294)
City Hall	543,400	\$ 1,370,430	\$ 0.0997	\$ 0.1349	\$ 0.2083	\$ 0.0734
Truman Memorial Building	163,300	\$ 397,920	\$ 0.0993	\$ 0.1343	\$ 0.1986	\$ 0.0643
Health Department	198,700	\$ 494,160	\$ 0.1310	\$ 0.1773	\$ 0.2011	\$ 0.0238
Fire Station 1	104,500	\$ 252,000	\$ 0.1206	\$ 0.1631	\$ 0.1904	\$ 0.0273
Independence Event Ctr.	6,949,700	\$ 17,438,100	\$ 0.1250	\$ 0.1691	\$ 0.2077	\$ 0.0386
IPL Service Center	1,838,000	\$ 3,648,768	\$ 0.1225	\$ 0.1657	\$ 0.1516	\$ (0.0141)
Public Works Maint.	239,300	\$ 567,000	\$ 0.1380	\$ 0.1867	\$ 0.1901	\$ 0.0034
Water Pollution Control Maint	405,900	\$ 1,007,040	\$ 0.1378	\$ 0.1864	\$ 0.2034	\$ 0.0170
Adventure Oasis	336,900	\$ 866,400	\$ 0.1344	\$ 0.1818	\$ 0.2148	\$ 0.0330
Fire Station 7	155,500	\$ 378,386	\$ 0.1332	\$ 0.1802	\$ 0.1942	\$ 0.0140

Economic results are more favorable for PPA structuring, due to the third party's ability to utilize the ITC and MACRS depreciation federal incentive programs. Favorability should be given to buildings with a negative variance between Retail LCOE and PPA Price. The PPA Prices were assumed to be constant throughout the 25 year contract, thereby providing a good comparison against Retail LCOE.

3.5.3.2 Wind Economic Results

Results for the wind economic analysis are shown in Table 3-9. Supporting analysis for these tables is provided within Attachment E of this Study. Specific buildings were not identified in the wind economic analysis due to lack of variability in potential results between buildings. Therefore, the average electric cost avoided by the building by installing a wind turbine was assumed to be \$0.1250 per kWh; this average electric cost was used in calculating the nominal Retail LCOE value of \$0.1691 per kWh shown below. Based on BMcD's analysis LCOE for wind generation is approximately double the assume Retail LCOE for IPL during the study period.

Table 3-9: Wind Economic Results

<u>IPL Ownership Results</u>	
Interest Rate	5.06%
Incentives	None
Retail LCOE (Nominal)	\$ 0.1691 \$/kWh
Wind LCOE (Nominal)	\$ 0.3350 \$/kWh
Variance	\$(0.1659) \$/kWh
Payback	>25.0 Years
NPV	\$(14,800)
<u>PPA Results</u>	
Interest Rate	7.00%
Incentives	MACRS ITC
Retail LCOE (Nominal)	\$ 0.1691 \$/kWh
Wind LCOE (Nominal)	\$ 0.3079 \$/kWh
Variance	\$(0.1388) \$/kWh

3.5.3.3 Geothermal Economic Results

Geothermal technology currently is not economically viable due to low costs of natural gas and availability of high efficiency furnace and AC units. Up front installation costs prove to be too great compared to avoided heating costs of natural gas in the winter months and cooling costs of electricity during the summer months. A summary of the economic results is provided in Table 3-10. Analysis for the geothermal assessment is provided within Attachment E of this Study.

Table 3-10: Geothermal Economic Results

Incremental Cost Above Gas	
Furnace/Split DX AC	\$ 30,000.00
Annual Savings (Year 1)	\$ 1,262
Inflation Factor Assumed	3%
Discount Factor	5%
Term (years)	25
Payback (years)	18.2
NPV	(\$5,781)

3.6 Recommendations

Wind should not be considered a viable renewable generation for any of the building/sites at this time. This is primarily due to relatively high upfront capital, lack of locations with significant amounts of area, and low wind speeds in the western Missouri area.

IPL should not pursue geothermal technologies at this time. Excavation and installation costs related to geothermal technologies are too high relative to low offsetting natural gas prices. In addition, alternative options have become available through technological advancements in furnace and AC design which provide high furnace efficiencies and AC SEER ratings at a fraction of the cost to install geothermal systems.

Given the economic results provided within this section, BMcD recommends IPL investigate further the viability of solar PV generation for the following buildings: Rock Creek, Service Center, Public Works Maintenance, and Fire Station 7. The differentiating factor for these buildings was the increase availability of ground mounted arrays. Because ground mounting is assumed most economical on a \$/Watt install basis, buildings with large available footprints should be considered. While this analysis provides an appropriate comparison of technological viability between renewable options, further investigation at a more granular level would be necessary to verify projected installation costs, available solar radiation, as well as a request for bids from solar PV companies. In addition, IPL should pursue a PPA structure to capture the tax incentives related to solar installations.

4.0 PHASE 2—INCENTIVE PROGRAM REVIEW

4.1 Overview

In conjunction with the above analysis, BMcD was retained by IPL to evaluate current renewable and energy efficiency incentive programs provided by other utilities. The purpose of this evaluation was to both provide details of existing programs and determine the most appropriate programs to be considered by IPL.

4.2 Methodology

BMcD reviewed the current programs provided by IPL. Additionally, BMcD identified ten (10) utilities to be contacted regarding current and planned incentives and sustainable programs offered. The following are the ten (10) utilities approved by IPL and contacted by BMcD.

Table 4-1: Utilities Contacted

#	Company	Location
1	San Diego Gas and Electric (SDGE)	San Diego, California
2	Sacramento Municipal Utility District (SMUD)	Sacramento, California
3	Xcel Energy (Xcel)	Colorado, Minnesota, Michigan, Wisconsin
4	Austin Energy	Austin, Texas
5	CPS Energy	San Antonio, Texas
6	Columbia Water & Light (CW&L)	Columbia, Missouri
7	City Utilities of Springfield	Springfield, Missouri
8	Kansas City Power & Light (KCP&L)	Kansas City, Missouri
9	KC- Board of Public Utilities (KCBPU)	Kansas City, Kansas
10	City of Sunset Valley	Sunset Valley, Texas

BMcD was able to contact seven (7) of the above companies. The remaining three (3) including San Diego Gas and Electric, Sacramento Municipal Utility District, and Xcel Energy were non-responsive. After contacting the utilities, BMcD evaluated the economic viability of the programs offered by these utilities to determine the most appropriate incentives for IPL. The following sections include a summary of IPL's current programs, contacted utilities' programs, and an economic evaluation of the programs provided by the contacted utilities.

4.3 IPL Renewable and Energy Efficiency Programs

The following sections include summaries of the existing IPL renewable and energy efficiency programs. These summaries were provided to BMcD by IPL.

4.3.1 Renewable Incentive Programs

Customer Generator Net Metering Tariff

“Net metering” is a billing arrangement where customers who produce their own energy from renewable sources (solar, wind, biomass, hydrogen fuel cell) receive the full retail rate for the energy produced up to their monthly usage. For energy produced greater than the customer’s monthly usage that flows back into IPL’s distribution system is eligible for a credit at IPL’s “avoided” energy costs. As an example, a customer normally uses 1,500 kWh of electricity each month. This customer installs a 15 kilowatt solar panel. This solar panel produces 1,200 kWh of energy in a month. The customer will be billed for 300 kWh for that month. In effect, the customer is being paid for the 1,200 kWh at the full retail electric rate (around 13 cents per kWh). If, during any month, the customer generator produces more electricity than the customer uses, then IPL will pay for this excess electricity at its “avoided” energy costs. These avoided costs are determined by a specified formula in net metering tariff and are typically around 3 to 4 cents per kWh.

4.3.2 Energy Efficiency Programs

Home Energy Loan Program

Home Energy Loan Program (HELP), provides a non-secured low-interest loan up to \$15,000 for energy efficiency improvements which historically have been new heating, ventilating, and air conditioning (HVAC) systems and home insulation. The HELP program is a partnership between the City and the City Credit Union and the Metropolitan Energy Center. Interest rates can be as low as 3% and repayment may be as long as 120 months. Qualifying measures include replacement air conditioners, furnaces, heat pumps, water heaters, windows, and doors that meet or exceed Energy Star specifications, as well as adding insulation up to certain levels. Program is available to all IPL customers that are owner/occupants of their home. There is no maximum income limit to participate in this program.

Residential Energy Efficiency Rebate Program

Residential energy efficiency rebate program is available for residential customers that install energy star high efficiency central air conditioner, electric heat pumps (including fossil-fuel backup), and electric heat pump water heaters. Rebates range from \$109 to \$701 depending on the equipment installed.

New Homes Program with Energy Star

The New Homes Program with Energy Star (NHPES) is designed to encourage builders to construct energy efficient homes meeting the current Energy Star standards. Homes having this certification are

more efficient, have improved resale values, and help me make the home more affordable for its owner. Rebates up to \$1,300 can be achieved depending on the equipment installed.

Commercial/Industrial Rebate Program

This program provides assistance to the commercial/industrial customers that upgrade their electrical equipment to more efficient systems. The program is designed to help implement energy efficiency measures that can reduce electric use and operating costs by offering rebates to offset the initial investment of the equipment. All new construction projects are eligible to receive up to 30% of the incremental costs over standard equipment costs up to \$20,000. Measures can include lighting, HVAC systems, pumps, motors or any other electrical equipment.

Low-Income Weatherization Program

This is a federal program administered through the Missouri Department of Natural Resources. The current provider in our area is United Services. Program is open to all residents in Jackson County who meet the program criteria. IPL promotes this program to their customers.

Energy Assessments

IPL staff responds to inquiries from residential and commercial customers about energy use. The issues can range from old, inefficient appliances, poor insulation and appliances not operating optimally (a/c units being dirty and/or needing service). Staff meets with the customer at their location, inspects and reviews the electrical equipment and provides information on energy efficiency measures they can do to help lower their bill.

In addition, IPL provides a free web based service (Home Depot) to help residential customers save energy and money in the home. This partnership with Home Depot provides customer free access to the following tools:

- An Energy Library that provides information on energy saving opportunities
- An e-mail link to an Energy Advisor who can answer technical questions regarding home energy efficiency
- An Energy Savings Calculator that shows costs of operating various types of electric appliances
- A Comparison Tool which allows users to compare annual operating energy costs of different types of space heating and water heating systems

- An on-line Energy Audit that provides a tailored evaluation of home energy use and energy savings opportunities

Infrared Scanning

IPL offers infrared scanning for equipment, motors and electrical systems for commercial and industrial utility customers, to help minimize the cost, downtime and power interruptions caused by unexpected repairs to equipment. Infrared scanning helps identify hot spots in order for preventive maintenance to be done. The temperature values shown in infrared scanning are reviewed and analyzed to identify problem areas, which would otherwise be undetectable.

4.4 Renewable and Energy Efficiency Programs from Contacted Utilities

The following sections include summaries of the existing renewable and energy efficiency programs from the utilities contacted (shown in Table 4-1). The following summaries are based on information provided through company websites, dsireusa.org, and conversations with the utilities. A complete list of the programs can be found in Attachment C. Interview questionnaires are included as Attachment D.

4.4.1 Renewable Incentive Programs

Renewable Installation Based Rebate Programs

Installation Based Rebate Programs (IBRPs) are a type of rebate program which provide rebates based on installation of renewable systems, commonly solar, only and no benefit for the energy produced by the system. For instance, PV Residential Retrofit Buy-Down Program, provided by Sacramento Municipal Utility District (SMUD), offers cash incentives for installation of solar photovoltaic systems based on the nameplate capacity (megawatts) equal to \$0.30 per watt of the installed project but not on the hourly production of the system. SMUD offers this program with a size limit of up to 10kW or \$3,000 per applicant.

Renewable Production Based Rebate Programs

Production Based Rebate Programs (PBRPs) are a type of rebate program which provide rebates to customers who provide energy to the community. This rebate is most commonly associated with solar systems that have a net production greater than energy consumed by customer. For instance, the Solar Rewards Program, provided by Xcel Energy Minnesota, offers customers \$0.08 per kilowatt-hour for excess solar energy produced from the solar facility with a restriction that the system size may not exceed 20 kilowatts. This program is similar to IPL's Customer Generator Net Metering Tariff which pays

customers at its defined avoided energy costs, typically \$0.03 to \$0.04 per kWh, for energy in excess to what the customer is consuming.

Energy Saved Rebate Programs

Energy Saved Rebate Programs (ESRPs) include programs such as the Solar Hot Water Rebate Program, provided by CPS Energy, which incentivizes customers to install solar water heaters and provides rebates based on the energy saved from using the solar water heaters with a maximum incentive value of \$2,000. The rebate is calculated according to the annual savings estimated using the Solar Savings formula developed by the Solar Rating & Certification Corporation (SRCC) as applied in the San Antonio area. Estimated annual electricity savings is then multiplied by a standard rate of \$0.60 per kWh in order to determine the value of the one-time rebate. This rebate is expressed as a credit on the customer's utility bill.

Community Solar Programs

Community Solar Programs are considered a Utility-Scale Renewable Program which allows customers to purchase a portion of the solar project at a fixed price over a fixed amount of time. Several utilities in Texas have already adopted this type of program with strong participation from the local communities. In addition, City Utilities of Springfield has adopted this program in the past year. These programs are typically financed by a third party developer through a power purchase agreement with the utility using a non-indexed payment rate. The principal behind this program is that the initial cost of energy is higher than the current electric rate; however, given the fixed price the price is expected to be cheaper than future energy costs.

The City Utilities of Springfield negotiated a power purchase agreement with a third party developer for a 4.95 MW solar farm on 40 acres of utility-owned land. Under the Community Solar Program, the utility will allow customers the option to have their power exclusively sourced from the solar facility by paying a 20-year fixed rate which is higher than the customer's current electric rate but is expected to be cheaper than future energy costs. From conversations with City Utilities of Springfield, this program has produced a strong participation rate from customers with majority of program subscribers including commercial customers and some upper-middle class customers.

4.4.2 Energy Efficiency Programs

Utility Purchased Efficiency Program

Utility Purchased Efficiency Programs (UPEPs) allow customers to purchase energy efficiency appliances at a reduced cost due to bulk purchasing by the utility. For instance, CPS Energy implemented a UPEP called the LED Buy-Down Program which provides customers LED lights at a reduced cost. CPS Energy was able to provide customers with reduced cost LEDs because they purchased 200,000 LEDs at a substantially reduced rate from \$7.00 to \$1.00 per bulb by bulk purchasing. Assuming the LED light has a luminance equivalent to a 60 watt light bulb and consumes 10.5 Watts; this program would provide a load reduction of 49.5 watts per hour per light fixture of operation and provide a demand reduction with minimal cost to the utility. Assuming the cost per kWh is \$0.13 and 1,825 hours of operation per year, this is a savings to the customer of \$11.74 per year per LED light.

Construction Based Rebate Programs

Construction Based Rebate Programs (CBRPs) are used to incentivize developers by giving rebates for installing new, energy efficient appliances for new residential homes. The New Home Energy Star Rebate Program, provided by Columbia Water & Light, offers homeowners and home developers a \$1,000 rebate for the construction of new homes which achieve certification as Energy Star Homes. This program is similar to IPL's current New Homes Program with Energy Star, however, the IPL program provides customers up to \$1,300 for new home construction.

Energy Efficiency Installation Based Rebate Programs

Energy efficiency IBRPs include programs such as the Residential Energy Efficiency Rebate Program, provided by Austin Energy, which offers incentives to its residential customers for replacing old appliances and/or installing energy efficient (ENERGY STAR) equipment for lighting, refrigeration, HVAC, windows and other household components. This program is similar to IPL's current Energy Efficiency Rebate Program, which focuses on replacing air conditioning units and water heating specifically.

Another specific example is the Residential Rewards and Enhanced Rewards Program, offered by Xcel Energy Wisconsin, which provides benefits to customers who want to reduce their thermal energy consumption. This rebate program focuses on reducing energy consumption during seasonal demand periods. Some companies, including Xcel Energy, also refine the rebate to installations using equipment from specific companies such as local state-based companies to promote local economic benefits.

Demand Response Programs

Demand response (DR) programs are used to control the timing and interval periods of which energy is consumed by customers, with programs targeting reducing energy consumption during peak periods through installation of programmable equipment which controls the operation periods of certain devices or allows the utility to directly turn on or off the devices for demand shedding during peak periods. As an example, CPS Energy adopted the Peak Saver Program which provides customers with free installation of programmable thermostats which can be controlled by CPS Energy. The program's main benefit to customers is a slightly reduced monthly bill due to less energy purchased at demand period rates with a second benefit of receiving an advanced thermostat with no cost to the customer. However, in order to participate in this program, customers must allow CPS Energy to turn off their thermostat for 33% of every hour. Additionally, CPS Energy also offers a free energy management system through the Home Manager Program which allows customers to control their energy usage from large devices such as an air conditioner, water heater, pool pump using their computer. One of the drawbacks to this program is that it requires customers to be able to operate and learn specific software rather than program a much simpler programmable thermostat.

These programs typically provide more benefit to the utility rather than the customers. Due to the smaller benefits to customers, these programs have less participation from customers than energy efficiency programs. The utility benefits by the reduced energy use during peak periods thereby delaying the need to build new generating capacity. Additionally, the reduction in energy sales under most DR programs is not as significant as energy efficiency programs.

Energy Efficiency Loan Programs

Programs can be financed by customers either through self-financing or through a loan. Most programs are self-financed; however, loan programs do exist and can be through select banks or provided through the utility. For instance, Columbia Water & Light (CW&L) provides loans to both commercial and residential customers directly. The Energy Efficiency Loan Program provided by CW&L gives loans up to \$15,000 to residential customers with interest rates of 1%, 3%, and 5% depending on the repayment term of 1 year, 5 years, or 10 years, respectively. This program is similar to IPL's Home Energy Loan Program which provides \$15,000 to residential customers who undertake energy efficiency measures on their home such as replacement of air conditioners, furnaces, water heaters, windows, doors and insulation at an interest rate as low as 3% for a repayment term of 10 years. IPL's loan program is a partnership between the City and the City Credit Union and the Metropolitan energy Center.

From discussions with CW&L, they recommended that any utility wanting to implement this program should make sure there is enough protection to the utility in case the customer does not pay the loan. One recommended method was to add a clause in the loan agreement which gives the utility the authority to turn off the power to the customer if the customer does not pay the loan.

4.5 Economic Evaluation

BMcD evaluated the economic viability and methods of financing these programs based on information provided by other utilities.

4.5.1 Economic Impacts of Energy Efficiency Programs

Energy efficiency programs aim to reduce energy consumption through the replacement or installation of more efficient equipment, such as Energy Star products. As an example of how the program benefits the customers, assume a customer has a refrigerator which consumes approximately 1,285 kWh annually. If the customer were to replace this refrigerator with an Energy Star qualified refrigerator, the customer could save approximately 880 kWh per year. Assuming the cost per kWh is \$0.13, this is a savings to the customer of \$114.40 per year (these values are for demonstration purposes and should not be used as exact references). The benefit to the utility may be a reduced energy demand during peak hours due to the reduced energy usage from the new refrigerator.

The potential negative aspect of energy efficiency programs to the utility and its entire customer base, is the decreased revenues due to the lost energy sales. For instance, assuming the 200,000 LED lights purchased by CPS Energy were sold to customers and saved the customers 49.5 watts per hour with a utility charge of \$0.13 per kWh, the energy sales lost would be \$1,287 per hour all bulbs are burning. Assuming a typical light burns for five hours a day, that is an annual sales decrease of approximately \$2,350,000. Depending upon the utility's rate structure, these decreased sales can put pressure on rates and require rate increases to compensate the lost sales. In effect, customers that do not take or cannot take advantage of the energy efficiency programs may subsidize (i.e., pay higher electric bills) the customers that do take advantage of the customer incentive program. It is very important that the utility has a rate structure in place that collects revenues commensurate with the cost to serve customers (i.e., customer/demand charges that collect fixed costs and energy charges to collect variable costs).

4.5.2 Methods of Financing

Nearly all of the renewable energy and energy efficiency programs require some form of funding. There are several methods which utilities can use to fund programs. The most common method is additional rate charge to the utility's entire customer. For instance, CPS Energy finances its programs from a fuel

adjustment charge which is a variable charge to customers. CPS Energy determined the variable charge based on a threshold limit determined by evaluating the previous year's expenses and future rate impact. Since CPS Energy is categorized as a not-for-profit utility, it has some flexibility with rate charges so long as they provide reasonable efforts to minimize rates. Another example is Kansas City Power & Light. They have a line item charge on the customer's bill (Demand Side Incentive Program charge) which is currently \$3.11 per month for customers that use 1,000 kWh.

For loan programs, some utilities such as CW&L utilize a recycling fund. In the case of CW&L the recycling fund includes \$5,000,000 which is distributed to customers requesting the loan. As customers repay the loans, the payments go back into the fund and can be used for loans to other customers. This method of recycling funds is useful so long as the loan contracts have enough security in case customers are unable to make payments. Once the fund has been loaned, no loans are given until the fund is rejuvenated by customer payments.

For community solar programs, specifically, the facility can be financed either by the utility or by a development company through the use of a power purchase agreement with the utility. City Utilities of Springfield plans to finance its community solar project via a 25-year power purchase agreement with the developer with payments being a pass-through at a high premium to customers who receive the solar energy.

4.5.3 Economic Viability of Programs

BMcD evaluated the benefit-to-cost expectations for each of the renewable energy and energy efficiency incentives identified above. Table 4-2 shows the evaluation matrix used to evaluate the potential benefits to IPL and methods of financing. Benefits were categorized as benefits to reducing demand, providing additional energy, and providing additional capacity. Costs were categorized into common sources of program financing such as a recycling fund, rate charge to customers, and direct costs to customers (i.e., customer financed installations).

Table 4-2: Evaluation Matrix

Program	Benefit			Cost		
	Demand Reduction	Energy Benefit	Capacity Benefit	Recycling Fund	Additional Rate Charges	Direct Cost to Customer
Renewable Incentive Programs						
Installation Based Rebate Programs	X				X	
Production Based Rebate Programs	X	X			X	
Energy Saved Rebate Programs	X				X	
Community Solar Program		X	X			X
Energy Efficiency Incentive Programs						
Utility Purchased Efficiency Programs	X			X		
Construction Based Rebate Programs	X				X	
Installation Based Rebate Programs	X				X	
Demand Response Programs	X				X	
Energy Efficiency Loan Programs	X			X		

The most significant benefit from energy efficiency programs comes from peak demand reduction. These programs can be financed in different methods such as a recycling fund (bulk purchasing and customer cost reduction) or additional rate charges. The benefits of peak demand reduction can be greater for those utilities that need to build new generating capacity in the near future. The benefit may be less for those utilities that currently have sufficient generating capacity and/or are in a period of stagnant load growth as is the case currently with IPL. However, it must be understood that the appropriate rate structure be established in order to collect revenues commensurate with the cost to serve customers to reduce the risk of subsidization from customers not participating in the programs and to make the program sustainable over the long term.

Renewable programs provide the utility the opportunity of additional energy and capacity as well as demand reduction. However, it is important to note that these are not straight benefits. There are some drawbacks to sporadic small scale solar installations on a network and not all capacity can be considered for available network capacity due to the technology's inconsistency in hourly performance or facility size. Outside of state and federal funding, these programs are typically financed through rate charges. However, the rate charges do not have to be incorporated into all customers' rates. For instance, Community Solar Programs are generally financed through a power purchase agreement from the solar developer with the costs of energy only given to customers interested in purchasing solar energy. As for the renewable rebates, these are primarily financed through increased rate charges. Again, it must be understood that the appropriate rate structure be established in order to collect revenues commensurate with the cost to serve customers to reduce the risk of subsidization from customers not participating in the programs and to make the program sustainable over the long term.

4.6 Recommendations

From the evaluation, BMcD identified several recommendations for IPL. Several of the evaluated programs illustrate that the funding is provided through additional rate charges to customers. BMcD's recommendations are based on programs which can be implemented with the least impact to customer rates and without being subsidized by customers not participating in the program.

- **Utility Purchased Efficiency Program:** As an example, the LED Buy-Down Program offered by CPS Energy discussed in this Study, provides benefits to both the utility and customers with no long term contracts or obligations between entities. In this program, the utility buys equipment in bulk at a reduced price and directly sells the material to customers interested in purchasing. However, these programs are generally used to reduce load which is the revenue source of the utility. In the instance of the LED Program, assuming the 200,000 LED lights are installed, they

provide a load reduction of approximately 9,900 kW per hour of operation. The revenue lost from this program is approximately \$1,300 for every hour all light bulbs are used (assuming a cost per kWh of \$0.13).

- **Community Solar Program:** A Community Solar Program, similar to the program offered by City Utilities of Springfield, provides customers the opportunity to purchase energy from solar without impacting the structure of their houses and without the utility financing the development of a potentially costly project. This program allows the projects to be financed through a power purchase agreement with the developer and passes the cost directly to the customers participating in the program. This program also provides the benefit of having one interconnection location compared to sporadic rooftop residential solar which allows utilities to better manage the stability of inconsistencies with the solar energy produced.
- **Energy Efficiency Loan Program:** Although IPL currently has an Energy Efficiency Loan Program (HELP), BMcD recommends further review and potentially refining the program based on the recommendations provided by CW&L. From CW&L's experience with their program, they recommended that IPL include enough protection to the utility in case the customer does not pay the loan. One example is to incorporate a clause in the loan agreement which gives the utility the authority to turn off the power to the customer if the customer does not pay the loan.
- **Program Marketing:** From communications with several utilities, the most common challenge in implementing their programs was marketing. Most utilities recommended increasing marketing efforts to better promote and make customers aware of what programs are available to them and increase participation. Therefore, it is recommended that IPL look at ways to increase marketing efforts related to their existing programs plus any new programs that are put in place.
- **Rate Review:** It is recommended that IPL review their current rate structure to eliminate or reduce any rate subsidization issues. Deploying programs prior to a rate structure review could result in program costs being subsidized by customers not participating in programs.

5.0 SUMMARY AND RECOMMENDATIONS

5.1 Summary

Burns & McDonnell conducted two analyses: (i) an evaluation of feasibility, practicality and economics of the use of renewable energy options at City-owned facilities; and (ii) an evaluation of potential incentives and sustainable programs which can be provided to customers for the use of renewable energy and energy efficiency options.

IPL provided a list of 29 City-owned buildings/sites for review. BMcD screened the list to 11 buildings/sites to visit and verify the screening. The economics of solar PV potential was evaluated for each building/site to estimate the levelized cost of energy for deploying solar PV at each building/site. Wind and geothermal were also reviewed but the economics and land requirements of each did not merit significant review.

To determine potential renewable energy and energy efficiency incentive programs for IPL, BMcD identified 10 utilities that had customer programs established. BMcD attempted to contact all the utilities to discuss their programs with the intent of understanding which programs may be of interest to IPL and seven of the targeted utilities responded.

5.2 Recommendations

Based on the renewable energy study of the City's buildings, BMcD concludes the following:

- Wind should not be considered a viable renewable generation for any of the building/sites at this time. This is primarily due to poor economics due to the relatively high upfront capital and low capacity factors of the wind turbines located in the Independence area. In addition, there is a lack of land area at the City-owned sites which would allow for construction of larger wind turbines.
- IPL should not pursue geothermal technologies at this time unless there is a capital program and need for replacing existing inefficient heating and cooling systems at the City-owned buildings and there is sufficient green space for installation of the heat transfer wells. When this situation occurs, IPL should evaluate the specifics regarding such building and the economics of such potential installation of a geothermal system as compared to a traditional heating and cooling system.
- BMcD recommends IPL investigate further the viability of solar PV generation for the following buildings: Rock Creek, IPL Service Center, Public Works Maintenance, and Fire Station 7. The differentiating factor for these buildings was the increase availability of ground mounted arrays.

BMcD evaluated and discussed existing incentive programs with utility companies implementing the programs and has identified the following recommendations.

- **Utility Purchased Efficiency Program:** As an example, the LED Buy-Down Program offered by CPS Energy discussed in this Study, provides benefits to both the utility and customers with no long term contracts or obligations between entities. In this program, the utility buys equipment in bulk at a reduced price and directly sells the material to customers interested in purchasing.
- **Community Solar Program:** A Community Solar Program, similar to the program offered by City Utilities of Springfield, provides customers the opportunity to purchase energy from solar without impacting the structure of their houses and without the utility financing the development of a potentially costly project. This program allows the projects to be financed through a power purchase agreement with the developer and passes the cost directly to the customers participating in the program. This program also provides the benefit of having one interconnection location compared to sporadic rooftop residential solar which allows utilities to better manage the stability of inconsistencies with the solar energy produced.
- **Energy Efficiency Loan Program:** Although IPL currently has an Energy Efficiency Loan Program (HELP), BMcD recommends further review and potentially refining the program based on the recommendations provided by CW&L. From CW&L's experience with their program, they recommended that IPL include enough protection to the utility in case the customer does not pay the loan. One example is to incorporate a clause in the loan agreement which gives the utility the authority to turn off the power to the customer if the customer does not pay the loan.
- **Program Marketing:** From communications with several utilities, the most common challenge in implementing their programs was marketing. Most utilities recommended increasing marketing efforts to better promote and make customers aware of what programs are available to them and increase participation. Therefore, it is recommended that IPL look at ways to increase marketing efforts related to their existing programs plus any new programs that are put in place.
- **Rate Review:** It is recommended that IPL review their current rate structure to eliminate or reduce any rate subsidization issues. Deploying programs prior to a rate structure review could result in program costs being subsidized by customers not participating in programs.

ATTACHMENT A: CITY RESOLUTION 5933

RESOLUTION BILL NO. 14-758

RESOLUTION NO. 5933

A RESOLUTION DECLARING THE CITY COUNCIL'S SUPPORT FOR RENEWABLE ELECTRIC ENERGY, IDENTIFYING THE CITY COUNCIL'S GOALS REGARDING RENEWABLE ENERGY AND PROVIDING DIRECTION TO THE CITY MANAGER REGARDING CITY PROGRAMS AND POLICIES RELATED TO RENEWABLE ELECTRIC ENERGY.

WHEREAS, the City of Independence owns and operates its own electric utility; and,

WHEREAS, the City of Independence owns and operates facilities which consume significant amounts of electric energy, including the Rock Creek Sanitary Sewer Treatment Plant, the Independence Events Center and various other public buildings; and,

WHEREAS, the City has implemented programs to reduce the need for generation of electric energy, such as the conversion of the City's streetlamps to Light Emitting Diodes (LEDs); and,

WHEREAS, the City Council desires to set a goal to have 10% of the electric energy provided by the City's electric utility supplied from sources that are not carbon-based (i.e. coal and natural gas) by the year 2018, which goal conforms to the Renewable Portfolio Standard in Missouri for Investor-Owned Utilities; and,

WHEREAS, the City Council desires to increase that goal to 15% by the year 2021; and,

WHEREAS, the City plans to remodel an office building for the electric utility's administrative offices;

NOW, THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF INDEPENDENCE, MISSOURI, AS FOLLOWS:

SECTION 1. That the City Manager is hereby authorized and directed to assure the design of the remodeled electric utility office building incorporates features and designs to minimize energy use and utilize renewable energy options to supplement the power needs of the building.

SECTION 2. That the City Manager is hereby authorized and directed to develop and present to the City Council a feasibility study to determine the practicality and economics of the use of renewable energy options such as solar, wind and geo-thermal at City-owned facilities to help achieve the stated renewable energy goal.

SECTION 3. That the City Manager is hereby authorized and directed to develop and present to the City Council a study to evaluate potential incentives and sustainable programs which can be provided to customers for the use of renewable energy options.

SECTION 4. That the City Manager is hereby authorized and directed to submit status reports regarding the projects identified in Section 1, Section 2 and Section 3 as soon as practical, with a preliminary report by November 30, 2014, and further report the status of the projects on a regular basis to the City Council.

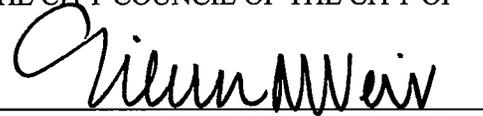
SECTION 5. That the City Manager is hereby authorized and directed to end production of energy at the Missouri City power plant by January 31, 2016 in compliance with the Industrial Boiler MACT rule.

SECTION 6. That the City Manager is hereby authorized and directed to produce a report outlining the options and associated estimated costs for the disposition of the Missouri City Power Plant, ranging from retirement to demolition by July, 2015.

SECTION 7. That the City Manager is hereby authorized and directed to cease the use of coal as a fuel source at the Blue Valley Power Plant by January 2016.

SECTION 8. That the City Manager is hereby authorized and directed to do a rate study of electric rates for residential, commercial and industrial customer classes including provisions to incorporate renewable energy programs identified by the study included in Section 3 of this Resolution and report back to the City Council by May 2015.

PASSED THIS 21st DAY OF JULY, 2014, BY THE CITY COUNCIL OF THE CITY OF INDEPENDENCE, MISSOURI.



Presiding Officer of the City Council
of the City of Independence, Missouri

ATTEST:



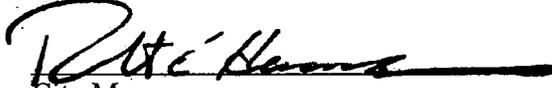
City Clerk

APPROVED AS TO FORM AND LEGALITY:



City Counselor

REVIEWED BY:



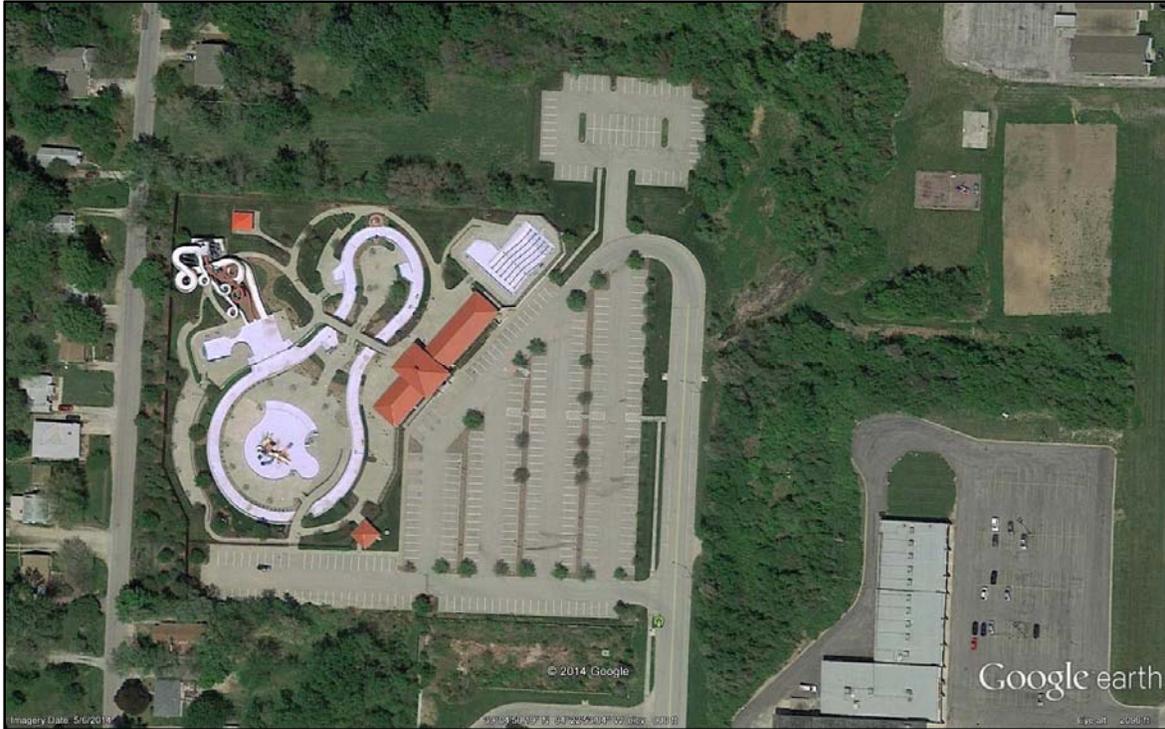
City Manager

ATTACHMENT B: CITY-OWNED BUILDINGS AND/OR SITES REVIEWED

ATTACHMENT B**City-owned Buldings and/or Sites Reviewed**

No.	Building Name	Address
1	Adventure Oasis	2100 S. Hub Drive
2	City Hall	111 E. Maple
3	Fire Station 1	950 N. Spring St.
4	Fire Station 2	14510 E. 39th St.
5	Fire Station 3	10219 E. Winner Rd.
6	Fire Station 4	202 W. 23rd Street
7	Fire Station 5	11301 E. 35th St.
8	Fire Station 6	17707 E. Bundschu
9	Fire Station 7	2206 Hub Drive
10	Fire Station 8	21300 E. Truman Rd.
11	Fire Station 9	1411 N. M-7 Hwy.
12	Fire Station 10	3303 RD Mize Rd.
13	George Owens Park	1601 S. Speck Road
14	Health Department	515 S. Liberty
15	National Frontier Trail Museum	318 W. Pacific
16	Palmer Center	2018A N. Pleasant St.
17	Park Maint. Facility	320 E. Lexington
18	Police Building	223 N. Memorial Dr.
19	Independence Event Ctr.	19100 E. Valley View Parkway
20	Police Traffic Safety	14609 E. Truman Rd.
21	Public Works Maintenance	1030 S. Crysler
22	Sermon Center	201 N. Dodgion St.
23	Truman Memorial Building	416 W. Maple
24	Water Department	11610 E. Truman Rd.
25	Water Pollution Control/Rock Creek	9600 Norledge
26	Water Pollution Control Maintenance	14919 E. Truman Rd.
27	Woodlawn Cemetery	701 S. Noland Rd.
28	IPL Service Center	21500 E. Truman Rd.
29	IPL Plant	21500 E. Truman Rd.

1: Adventure Oasis Water Park, 2100 S. Hub Drive



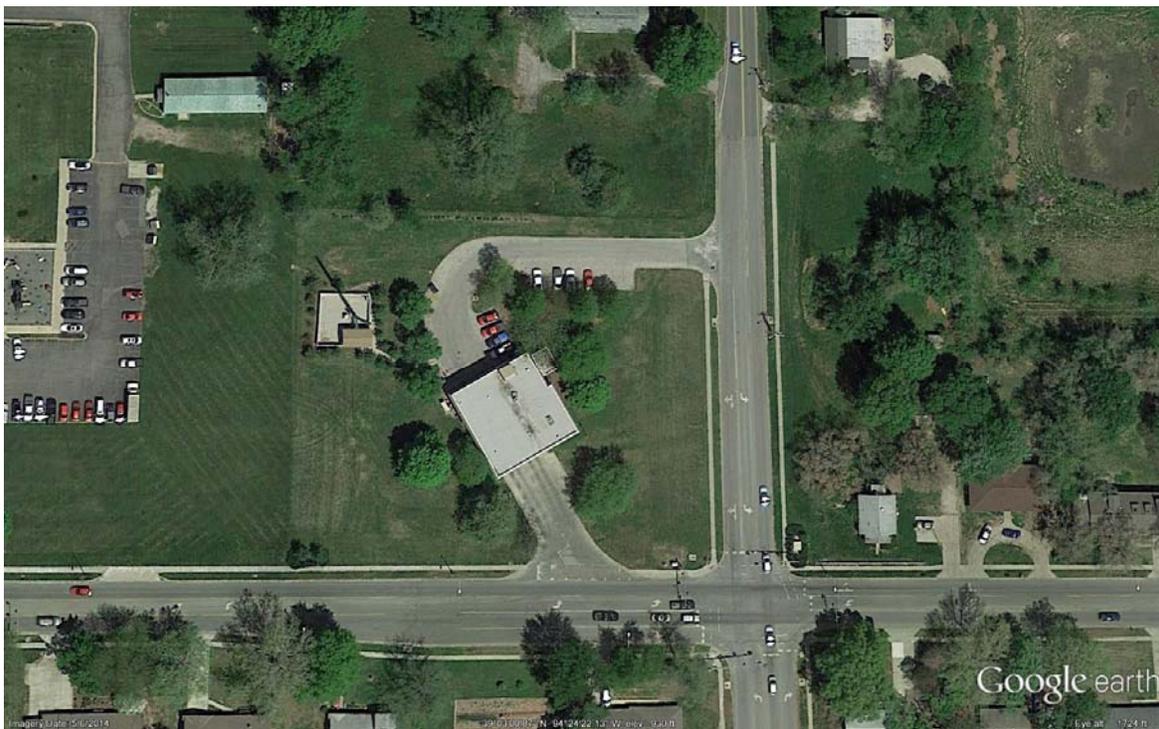
2: City Hall, 111 E. Maple Avenue



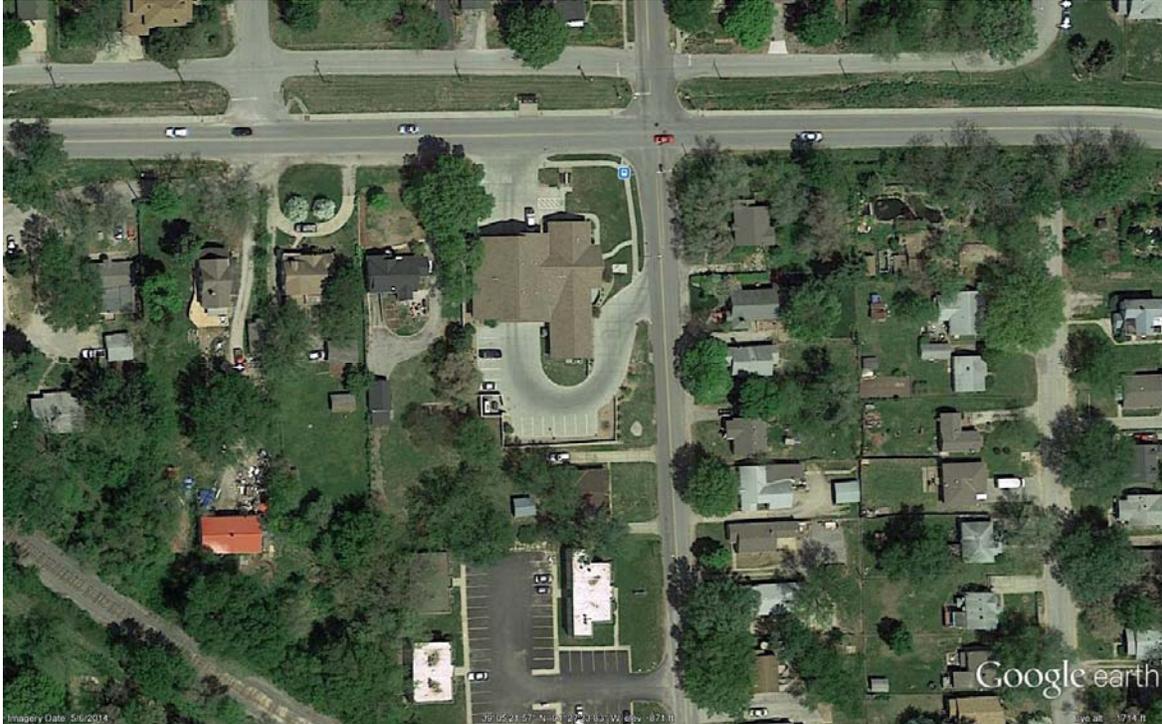
3: Fire Station 1, 950 N. Spring Street



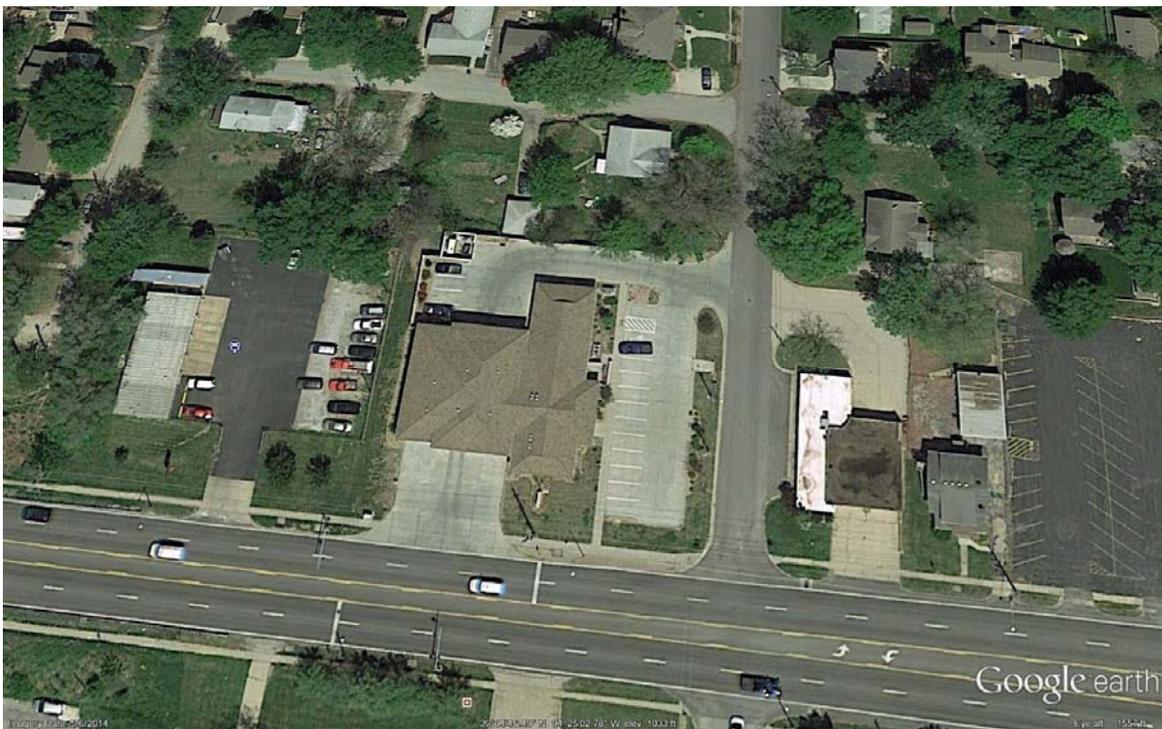
4: Fire Station 2, 14510 E. 39th Street



5: Fire Station 3, 10219 E. Winner Rd.



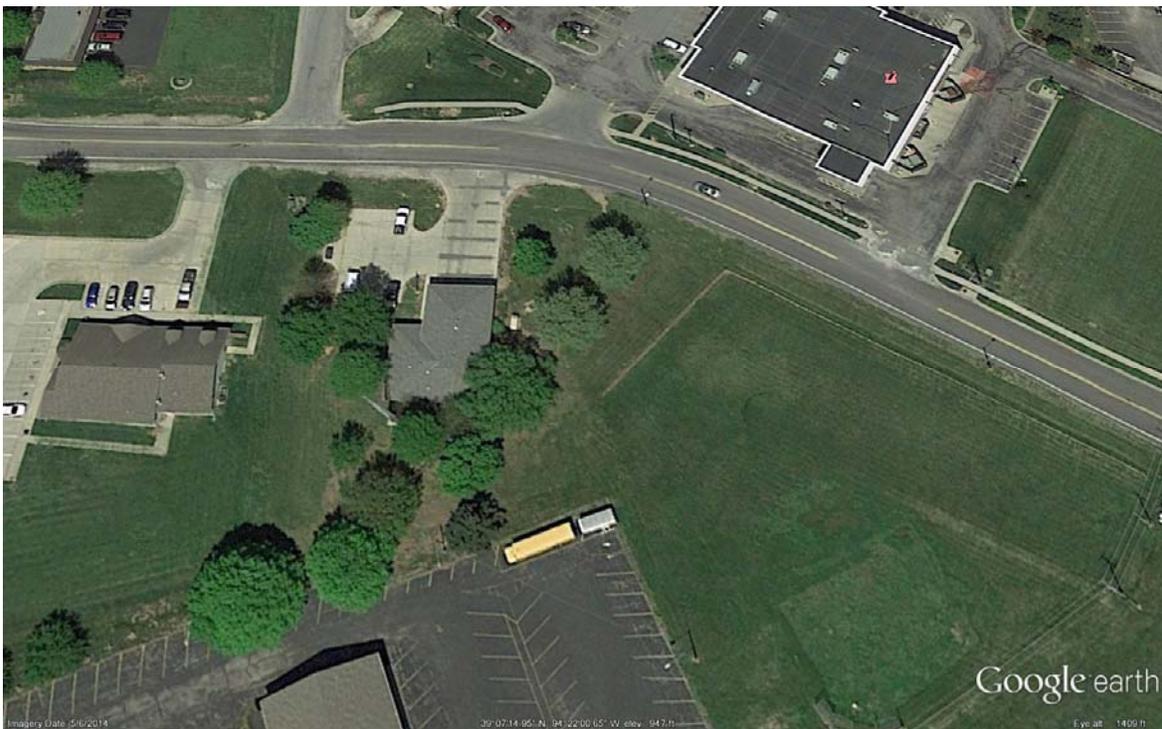
6: Fire Station 4, 202 West 23 St.



7: Fire Station 5, 11301 E. 35th Street



8: Fire Station 6, 17707 East Bundschu Rd.



9: Fire Station 7, 2206 Hub Drive



10: Fire Station 8, 21300 E. Truman Rd.



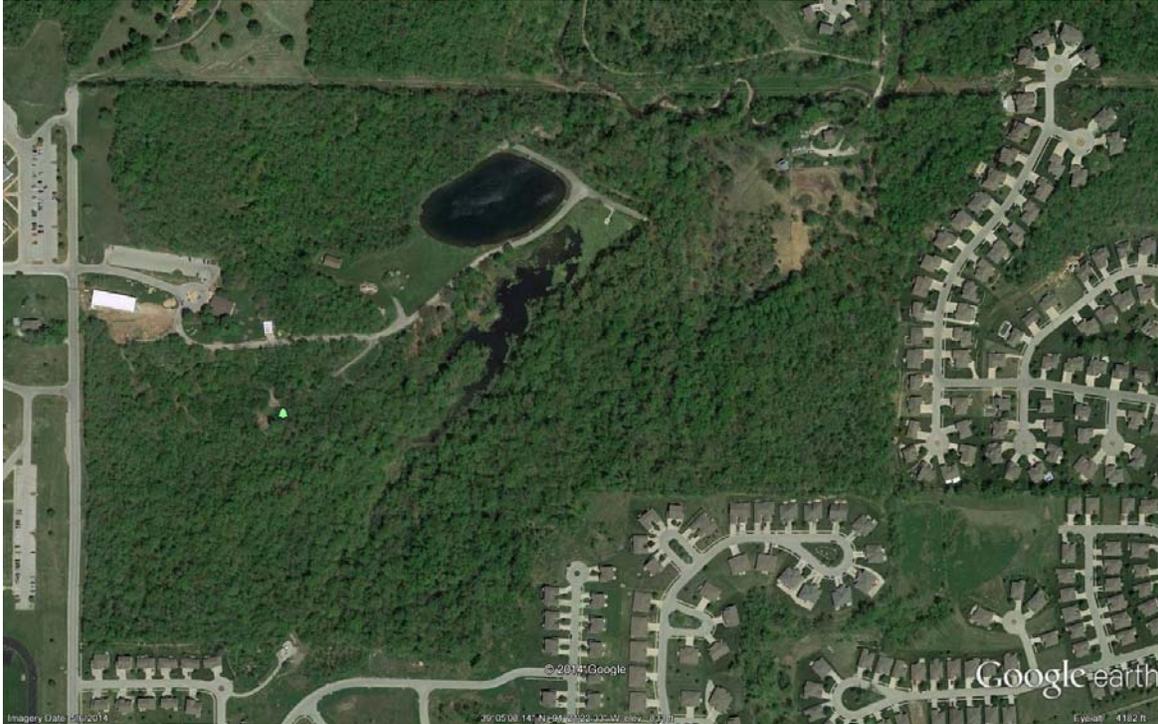
11: Fire Station 9, 1411 Missouri 7 Highway



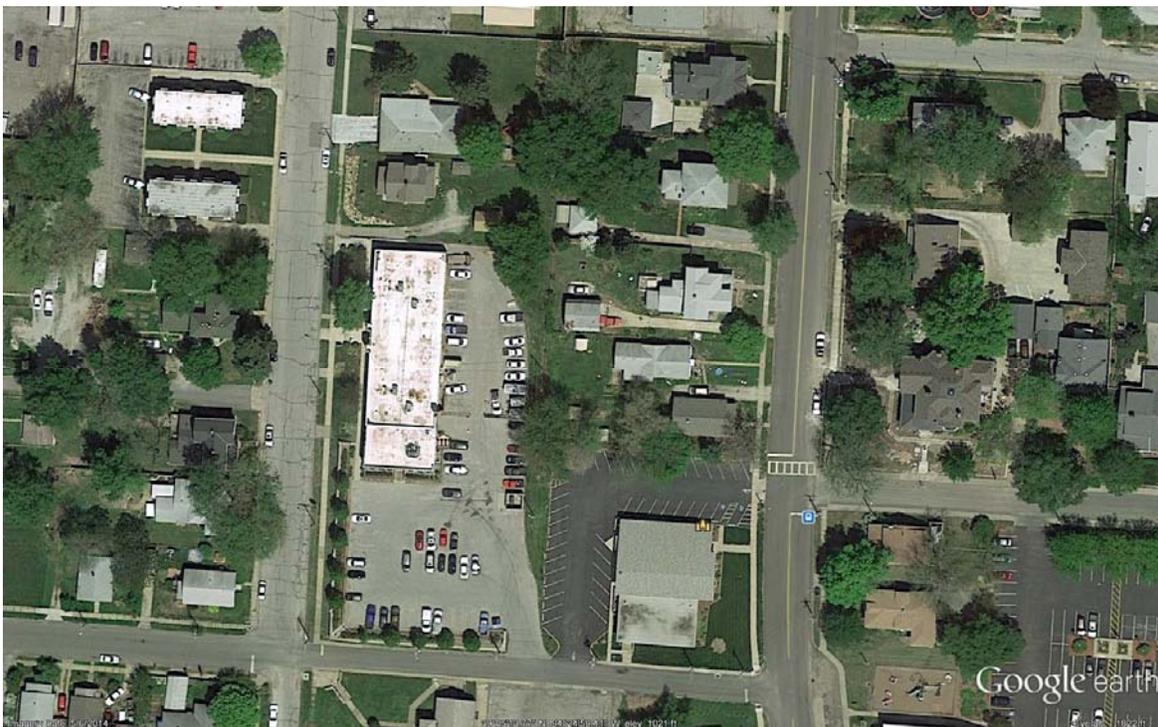
12: Fire Station 10, 3303 RD Mize Rd.



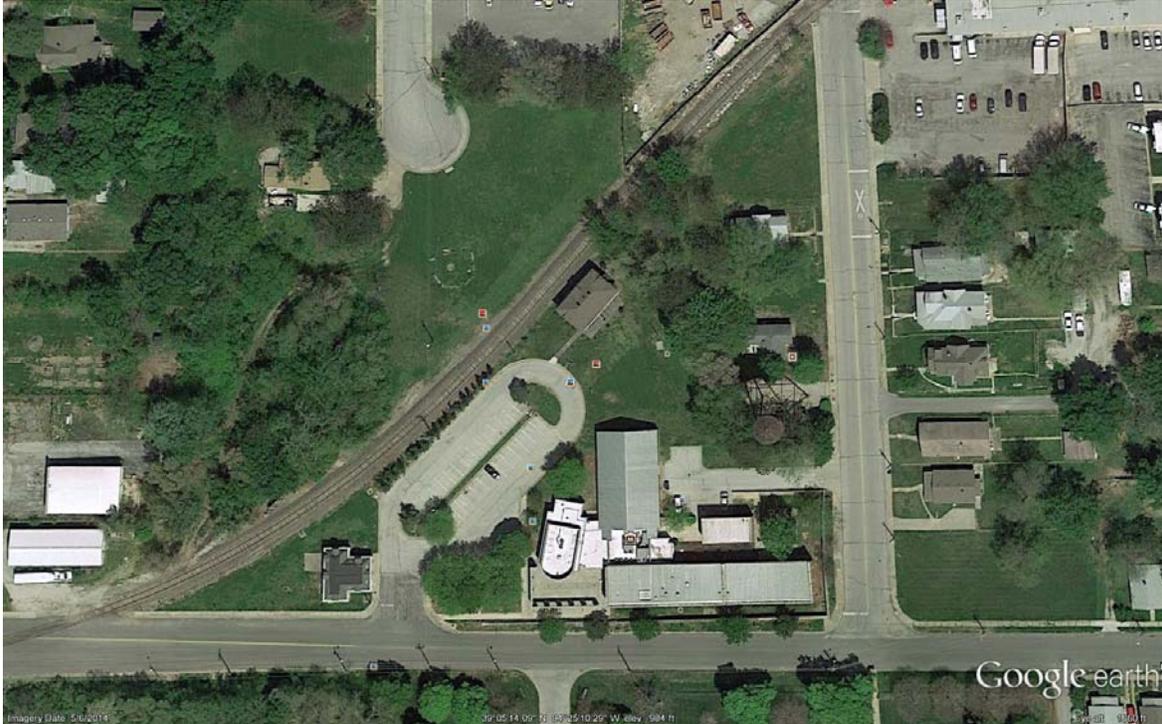
13: George Owens Park, 1601 S. Speck Rd.



14: Health Administration, 515 S. Liberty



15: National Frontier Trail Museum, 318 W. Pacific



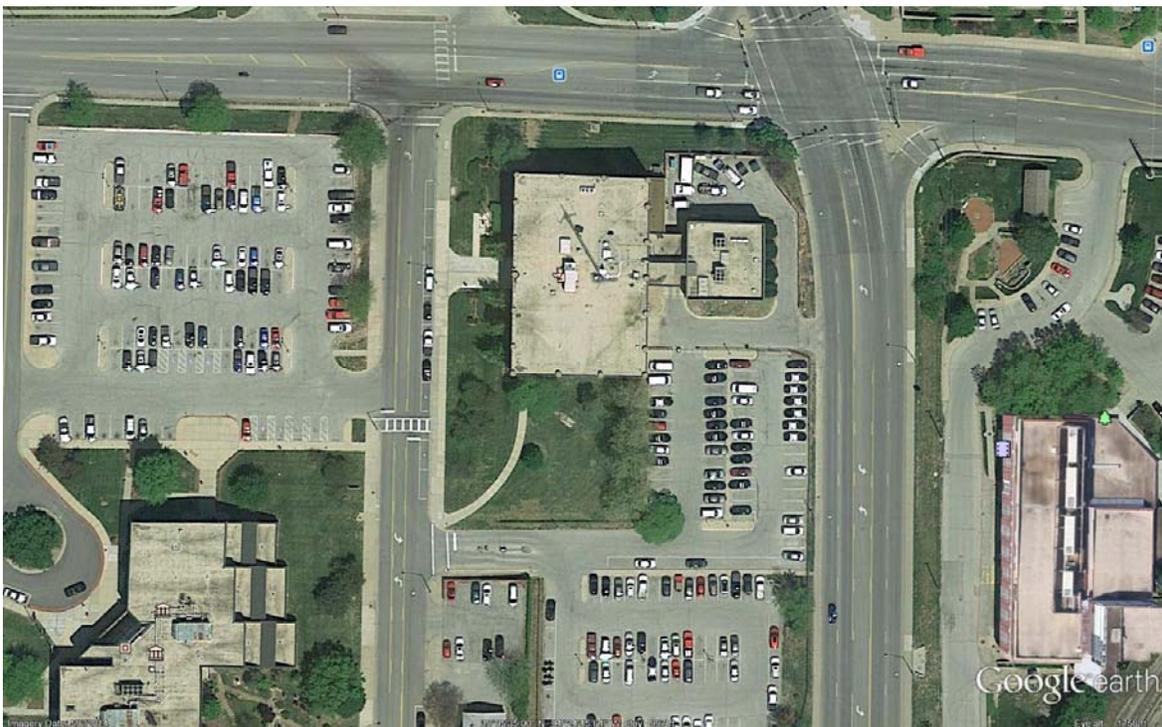
16: Palmer Center, 2018A N. Pleasant St.



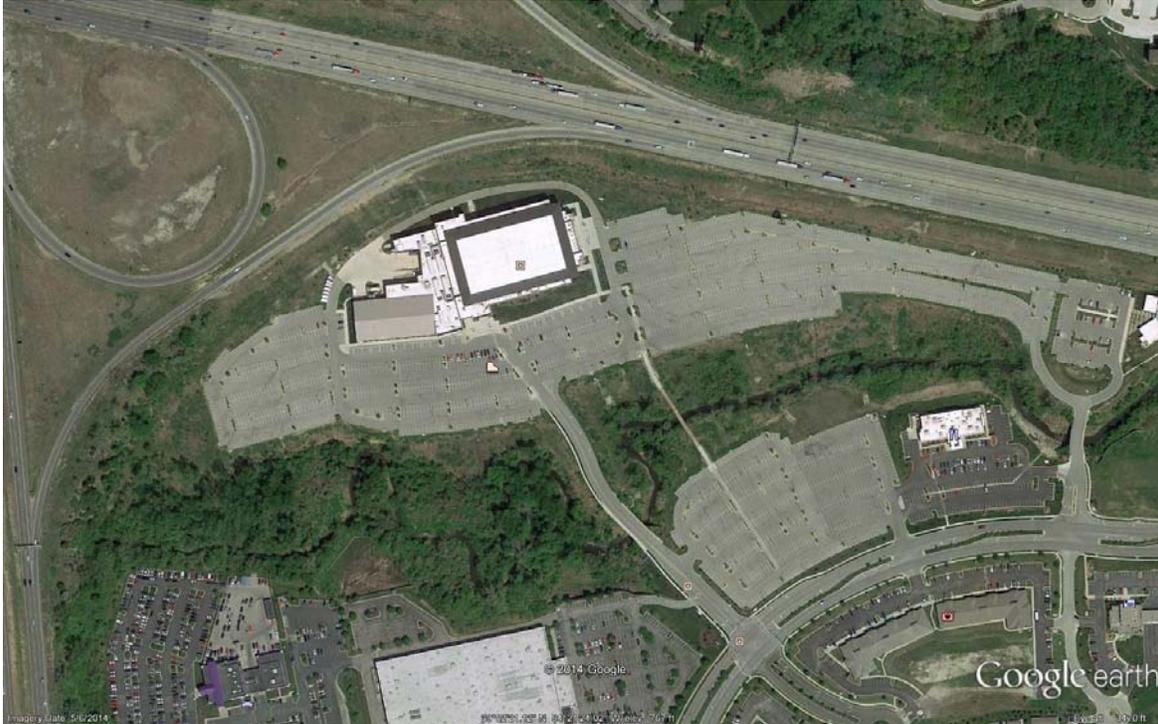
17: Park Maintenance Facility, 320 E. Lexington



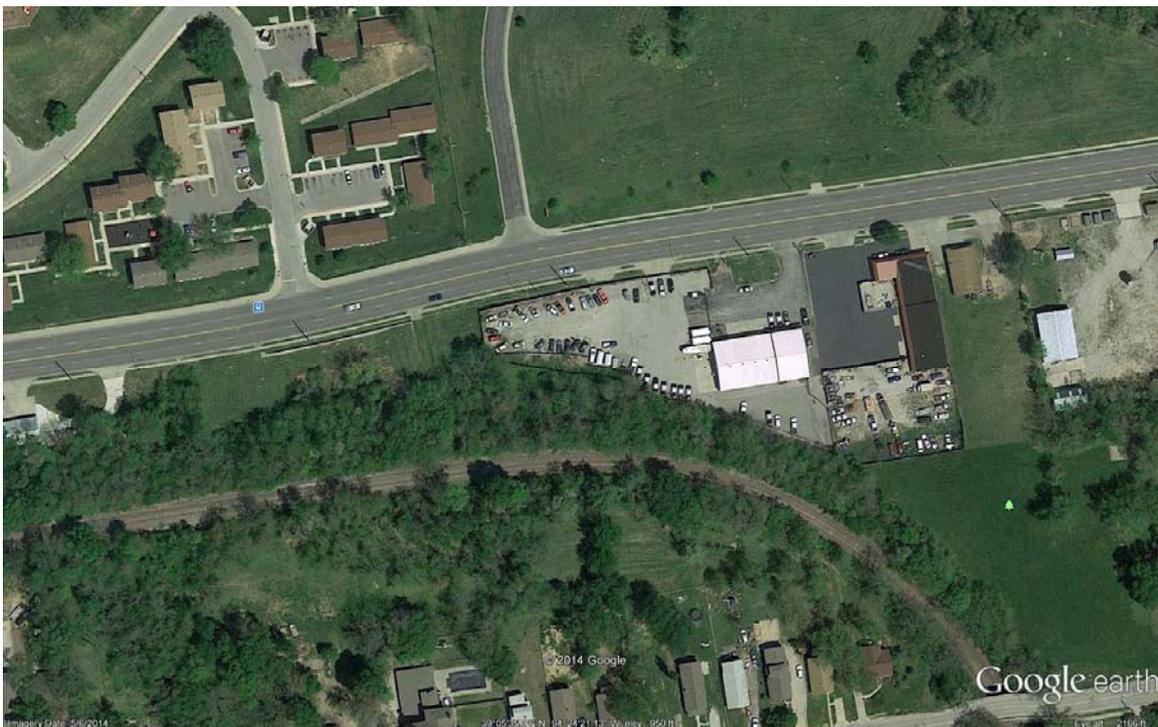
18: Police Building, 223 N. Memorial Drive



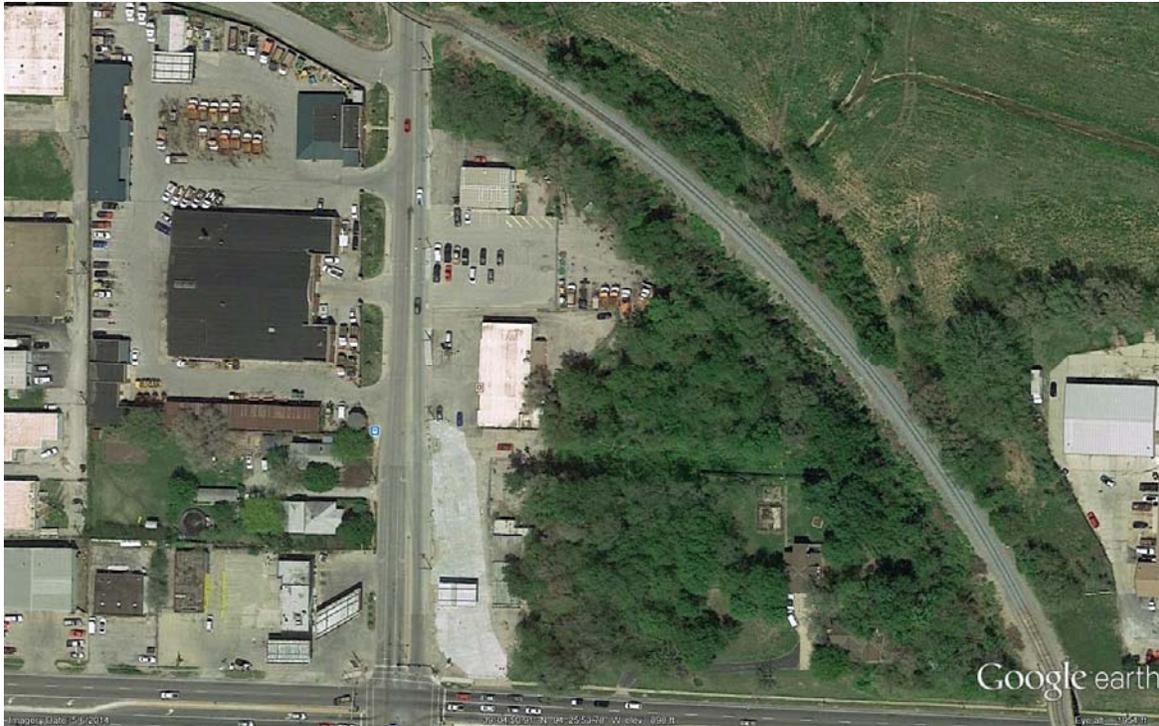
19: Independence Event Center, 19100 E. Valley View Parkway.



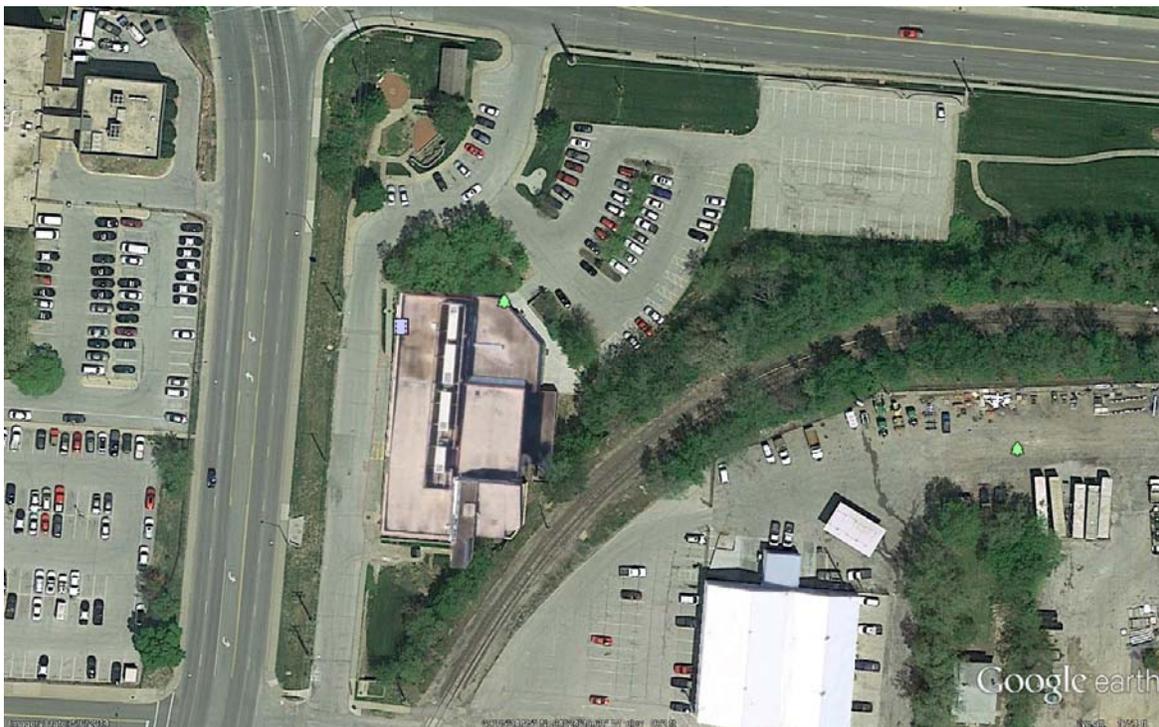
20: Police Traffic Safety, 14609 E. Truman Rd.



21: Public Works Maintenance, 1030 South Crysler.



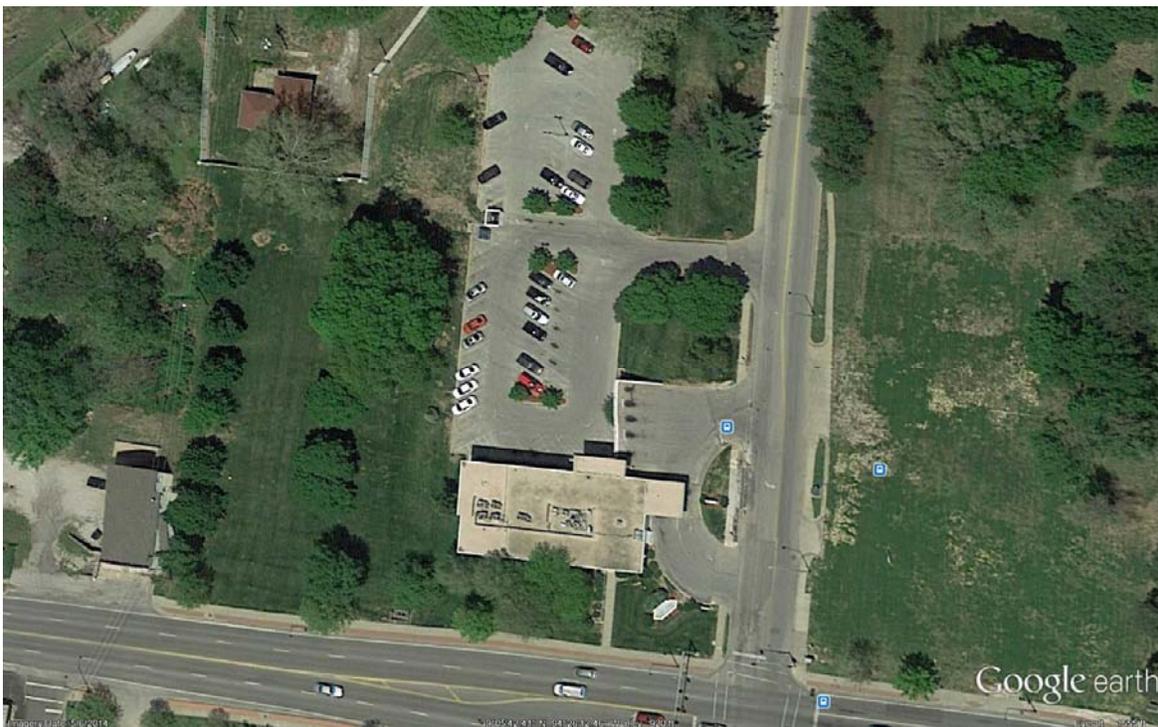
22: Roger T. Sermon Community Center, 201 N. Dodgion Street.



23: Truman Memorial Bldg., 416 W. Maple.



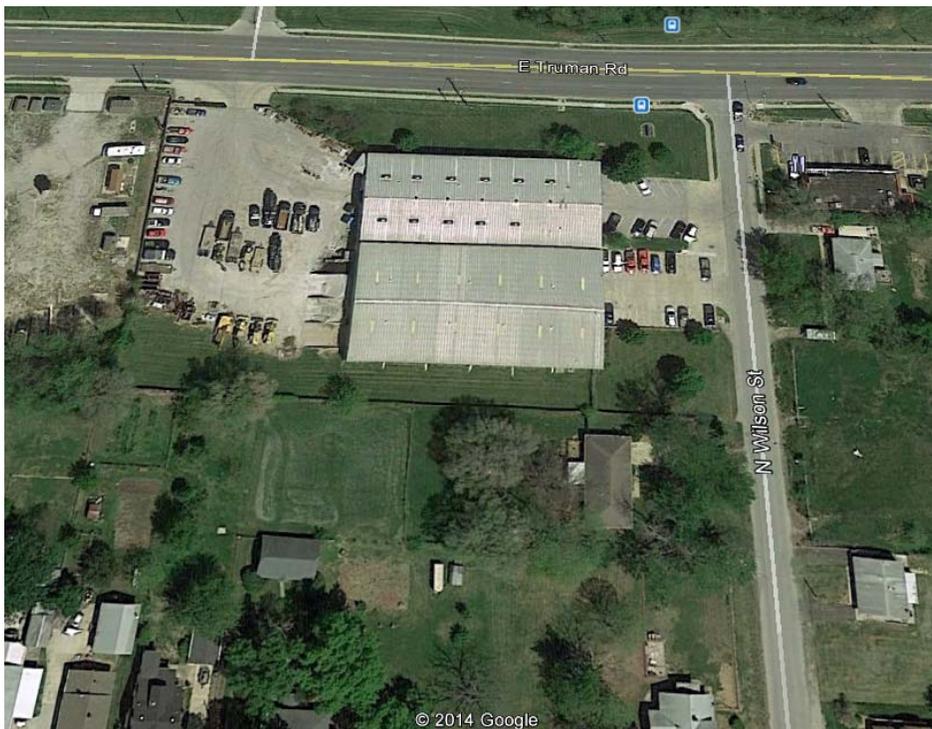
24: Independence Water Dept., 11610 E. Truman Rd.



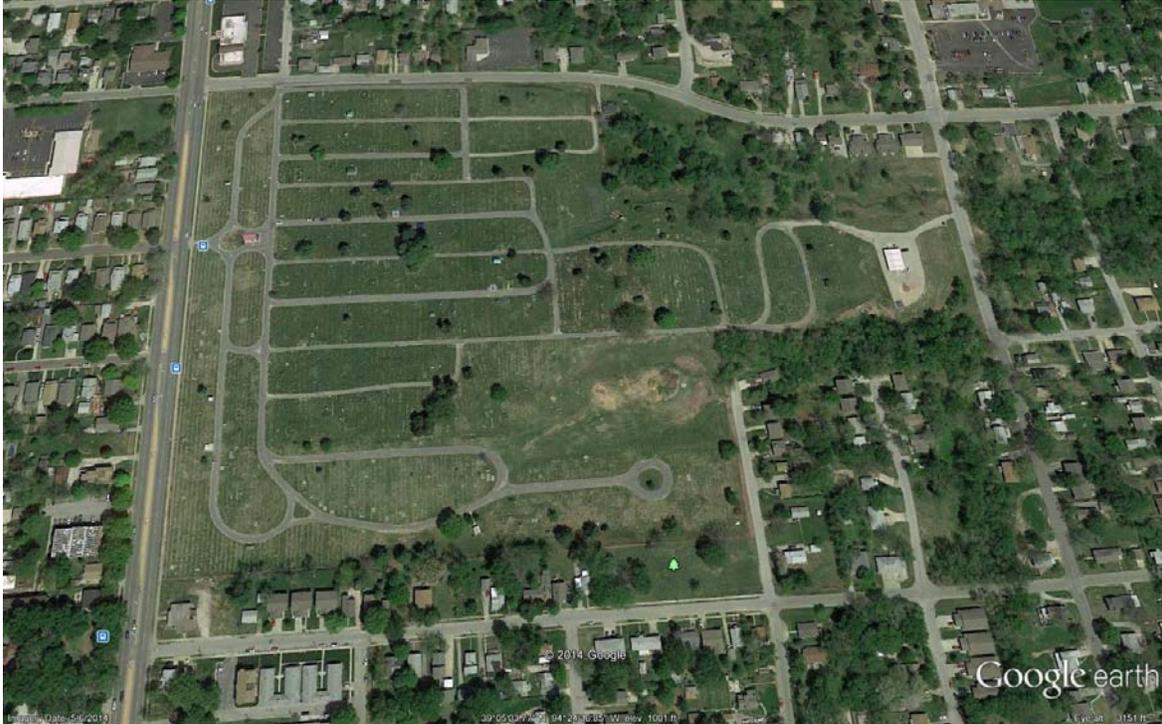
25: Water Pollution Control/Rock Creek, 9600 Norledge.



26: Water Pollution Control Maintenance, 14919 E. Truman Rd.



27: Woodlawn Cemetery, 701 S. Noland Rd.



28: IPL Service Center, 21500 E. Truman Rd.



29: IPL Plant, 21500 E. Truman Rd.



ATTACHMENT C: UTILITY PROGRAMS

Utility	State	Contact Name	Contact #	Program Name	Technology Type	Program Type	Program Details	Link
Austin Energy	Texas	Cheryl Mele	512-322-6062	Commercial New Construction Efficiency Rebate	Lighting and Thermal Storage	Construction Based Rebate Program	3 tiers of rebates that account for up to \$200,000 per site per fiscal year for customers using efficient measures and techniques through the construction process.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX63F&re=0&ee=0
Austin Energy	Texas	Cheryl Mele	512-322-6062	Free Home Energy Improvements Program	Energy Auditing	Installation Based Rebate Program	Free Home Energy Improvement Program includes insulation in attics, sealing ductwork, caulking around plumbing penetrations, weather stripping, solar screens all free to qualified applicants.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX35F&re=0&ee=0
Austin Energy	Texas	Cheryl Mele	512-322-6062	Multi-Family Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	The Austin Energy Multi-Family Program provides cash incentives to owners, developers, and property managers of apartments and other multi-family properties for making energy efficiency improvements. Rebates are available for qualified A/C systems, heat pumps, window treatments, insulation, ductwork, and lighting equipment.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX34F&re=0&ee=0
Austin Energy	Texas	Cheryl Mele	512-322-6062	Residential Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	Austin Energy offers incentives to its residential customers to encourage the use of energy efficient equipment and measures. Rebates are available for qualified HVAC equipment and weatherization improvements.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX30F&re=0&ee=0
Austin Energy	Texas	Cheryl Mele	512-322-6062	Residential Solar PV Rebate Program	Solar	Installation Based Rebate Program	Austin Energy's Solar Rebate Program offers a \$1.10 per watt incentive to eligible residential customers who install photovoltaic (PV) systems on their property. Rebates are limited to \$15,000 per home installation (not to exceed 80% of the total invoice) and a lifetime maximum of \$50,000 per residential site.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX11F&re=0&ee=0
Austin Energy	Texas	Cheryl Mele	512-322-6062	Small Business Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	Austin Energy offers a special incentive for its small-to-midsize and not-for-profit business customers to increase the energy efficiency of facilities through the Small Business Rebate Program.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX33F&re=0&ee=0
City of Sunset Valley	Texas	Caroline Meredith	512-818-9103	PV Rebate Program	Solar	Installation Based Rebate Program	Offers \$1.00/W up to 3,000W (\$3,000) for installed capacity for local homeowners. This rebate is in addition to the Austin Energy rebate of \$2.50 per Watt up to \$15,000 per installation.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX87F&re=0&ee=0
City of Sunset Valley	Texas	Caroline Meredith	512-818-9103	Solar Water Heating Rebate Program	Solar Thermal	Installation Based Rebate Program	Offers 30% of installation cost up to \$2,000 for solar water heater. Must be approved by Austin Energy solar water heater rebate program. Set budget of \$45,000	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX88F&re=0&ee=0
City Utilities of Springfield	Missouri	Cara Shaefer	417-831-8348	Commercial Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	City Utilities of Springfield offers incentives for commercial customers to increase the efficiency of eligible facilities. Rebates are available for efficient lighting upgrades, controls and for programmable thermostats. The rebate amount is based on number and type of fixture or kW saved. Maximum lighting rebate is \$5k.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO72F&re=0&ee=0
City Utilities of Springfield	Missouri	Cara Shaefer	417-831-8348	Residential Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	City Utilities of Springfield Missouri provides incentives for residential customers to increase the efficiency of eligible homes. Rebates are available for programmable thermostats, insulation upgrades, whole home upgrades and HVAC equipment. The HVAC rebates are available for single- and multi-family residential customers, as well as new home builders. Rebate is dependent upon efficiency of equipment.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO71F&re=0&ee=0
Columbia Water & Light	Missouri	Jim Windsor	574-874-6306	Solar Energy Loans	Energy Auditing	Installation Based Rebate Program	Columbia Water & Light (CWL) offers electric residential and commercial customers low-interest loans for photovoltaic (PV) systems and solar water heaters. \$15k for residential and \$30k for commercial with up to 10 year terms at 5%.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO125F&re=0&ee=0
Columbia Water & Light	Missouri	Jim Windsor	574-874-6306	Home Performance with Energy Star Rebates Program	Energy Auditing	Installation Based Rebate Program	Columbia Water and Light offers rebates to its residential customers who make certain energy efficient improvements to the home. Under the Home Performance with Energy Star program, prescriptive rebates are available for windows, doors, air conditioners, heat pumps and building insulation while rebates for air duct sealing are based on performance tests. Newly constructed homes can only apply for the New Home Energy Star Rebate. Max incentive value of \$1.2k.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO80F&re=0&ee=0
Columbia Water & Light	Missouri	Jim Windsor	574-874-6306	HVAC and Lighting Efficiency Rebates Program	Energy Auditing	Installation Based Rebate Program	Columbia Water & Light offers rebates to its commercial and industrial customers for the purchase of high efficiency HVAC installations and efficient lighting. Incentives for certain measures are based upon the size and efficiency of the installed measures. Maximum incentive is up to \$22,500.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO104F&re=0&ee=0
Columbia Water & Light	Missouri	Jim Windsor	574-874-6306	New Home Energy Star Rebate Program	Energy Auditing	Construction Based Rebate Program	Columbia Water and Light offers a \$1,000 rebate to customers for the construction of new homes that achieve certification as Energy Star homes. The Energy Star designation is given to homes that receive an 85 or less on the Home Energy Rating System (HERS) index, meaning that they can be expected to use 15% less energy on average than a standard home (i.e., the average or "standard" home has a HERS rating of 100). The rebate is only available for new homes constructed after May 15, 2008.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO79F&re=0&ee=0

Utility	State	Contact Name	Contact #	Program Name	Technology Type	Program Type	Program Details	Link
Columbia Water & Light	Missouri	Jim Windsor	574-874-6306	Residential HVAC Rebate Program	Energy Auditing	Installation Based Rebate Program	Columbia Water & Light (CWL) provides an HVAC incentive for residential customers that are replacing an older heating and cooling system. Customers should submit the mechanical permit from a Protective Inspection, a copy of the paid receipt with model numbers for the condenser, matched evaporator coil, expansion valve and any additional installed equipment.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO69F&re=0&ee=0
Columbia Water & Light	Missouri	Jim Windsor	574-874-6306	Solar Rebates Program	Solar Thermal	Installation Based Rebate Program	Columbia Water & Light (CWL) offers rebates to its commercial and residential customers for the purchase of solar water heaters and solar photovoltaic systems. Rebate is for \$500/kW from 0.25kW - 10kW systems with a maximum incentive of \$5k.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO70F&re=0&ee=0
CPS Energy	Texas	John Durland	210-353-3780	Residential Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	CPS Energy offers a variety of rebates for energy efficiency related improvements to residential homes, including: appliances, HVAC equipment, insulation, and equipment recycling.. Rebate calculation methods, limits, and equipment requirements vary by technology and sometimes by existing home characteristics.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX41F&re=0&ee=0
CPS Energy	Texas	John Durland	210-353-3780	Commercial Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	CPS Energy, San Antonio's municipal electric utility, offers energy efficiency rebates for commercial electric customers. Rebates are available for several defined energy efficiency improvements, but may also be available for customized measures that reduce electricity demand. Rebates vary by the specific improvement measure employed. Maximum incentives include 50% of HVAC project cost and 50% of lighting project cost.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX61F&re=0&ee=0
CPS Energy	Texas	John Durland	210-353-3780	New Commercial Construction Incentives	Energy Auditing	Construction Based Rebate Program	CPS Energy offers incentives for new commercial construction that is at least 15% more efficient than required by the City of San Antonio Building Code (based on IECC 2009). Maximum incentive is 35% of eligible project cost or \$250,000 per project.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX128F&re=0&ee=0
CPS Energy	Texas	John Durland	210-353-3780	New Residential Construction Incentives	Energy Auditing	Construction Based Rebate Program	CPS Energy offers incentives for new residential construction that is at least 15% more efficient than required by the City of San Antonio Building Code (based on IECC 2009). Incentive amount includes \$800/structure for Energy Star rating of 75-58 and \$1,500/structure with Energy Star rating of 57 or less.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX129F&re=0&ee=0
CPS Energy	Texas	John Durland	210-353-3780	Solar Hot Water Rebate Program	Solar	Production Based Rebate Program	CPS Energy offers rebates for solar water heaters to its customers. In general, any CPS Energy customer is eligible to receive the rebate; however, systems must be new and have a permanently installed electric back-up system. Rebates will be calculated according to the annual savings estimated by the system's Solar Rating Certification Corporation (SRCC) OG-300 table as applied in the San Antonio area. Estimated annual electricity savings will be multiplied by a standard rate of \$0.60/kilowatt-hour (kWh) in order to determine the value of the one-time rebate. The maximum rebate is \$2,000, although there are no explicit size limitations on eligible systems. The rebate is reflected as a credit on the customer's bill.	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX62F&re=0&ee=0

Utility	State	Contact Name	Contact #	Program Name	Technology Type	Program Type	Program Details	Link
CPS Energy	Texas	John Durland	210-353-3780	Solar PV Rebate Program	Solar	Installation Based Rebate Program	<p>CPS Energy offers rebates to customers who install solar photovoltaic (PV) systems on their homes, schools, or businesses. There are four rebate "tiers" available depending on customer type and whether or not the customer is using a "local" registered CPS Energy Installer.* The rebate is available to all CPS Energy customers for systems of at least 1 kilowatt (kW)-AC. CPS Energy will offer special considerations for systems larger than 100 kW, but such systems remain eligible for rebates. The following "tiers" are in place:</p> <p>Tier One Eligibility: Schools (private or public; must be accredited and nonprofit) who use local, registered CPS Energy Installers Amount: \$2.00 per watt-AC for the first 25 kilowatts (kW) and \$1.30 per watt for any additional capacity, with a maximum rebate of \$80,000.</p> <p>Tier Two Eligibility: Residential customers who use local certified CPS Energy Installers Amount: \$1.60 per watt-AC up to \$25,000 maximum or 50% of rebated equipment installation labor and material costs, whichever value is less.</p> <p>Tier Three Eligibility: Commercial customers who use local certified CPS Energy Installers Amount: \$1.60 per watt-AC for the first 25 kW-AC and \$1.30 per watt-AC for any additional capacity up to \$80,000 maximum or 50% of rebated equipment installation labor and material costs, whichever value is less.</p> <p>Tier Four Eligibility: Residential and commercial customers who do not use local, registered CPS Energy Installers Amount: \$1.30 per watt-AC up to \$25,000 maximum for residential and \$80,000 for commercial</p>	http://dsireusa.org/incentives/incentive.cfm?Incentive_Code=TX60F&re=0&ee=0
CPS Energy	Texas	John Durland	210-353-3780	Peak Saver Program		Demand Reduction Program	Provide the programmable thermostat for free that can be controlled by CPS. If customer participates in 33% of a cycling they get the thermostat for free and if they participate in 50% then they get a \$30 per year rebate. The percentage of participate is calculated as follows: if customer participated in 33%, the thermostat is controlled for 33% of an hour (33% cycling).	
CPS Energy	Texas	John Durland	210-353-3780	LED Buy-Down Program		Demand Reduction Program	CPS Energy purchased 200,000 LED light bulbs at a reduced rate due to bulk purchasing and provided the reduced cost to customers interested in purchasing LED lights. Customers are able to purchase LED lights for \$1.00 each.	
Kansas City Board of Public Utilities	Missouri	David Allen	913-573-9922	Energy Audit	Energy Auditing	Energy Assessment Program	Customers receive a discounted Energy Audit. A \$500 value for only \$50. If you make the improvements recommended during the audit within 90 days, BPU will refund the \$50 fee.	http://www.bpu.com/Portals/0/pdf/BPU_EnergyAudit_Handout.pdf
KCPL	Missouri	Kevin Brannan	816-654-1680	Commercial/Industrial Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	KCPL offers different value rebates to Greater Missouri Operations and KCPL-Missouri service areas for installing more efficient equipment with value of incentives differing by energy savings, size, weight and other equipment specific criteria.	http://www.kcpl.com/save-energy-and-money/for-business/business-rebates/mo/business-energy-efficiency-rebates
KCPL	Missouri	Kevin Brannan	816-654-1680	Energy Optimizer Programmable Thermostat Program	Energy Auditing	Installation Based Rebate Program	Kansas City Power and Light (KCP&L) offers a free Honeywell programmable thermostat, worth \$300, and free installation to qualifying customers to manage energy usage. Only residential and small commercial customers that have a central air-conditioning system or compatible heat pump system are eligible to receive this incentive. The system must also be pre-qualified by a KCP&L authorized technician. In exchange for the free thermostat, customers agree to participate in a load management program where KCP&L can send a paging signal to the thermostat to turn the air conditioning compressor on in 15-minute intervals for a maximum of four hours during peak demand periods.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO08F&re=0&ee=0

Utility	State	Contact Name	Contact #	Program Name	Technology Type	Program Type	Program Details	Link
KCPL	Missouri	Kevin Brannan	816-654-1680	ENERGY STAR New Homes Rebate Program	Energy Auditing	Installation Based Rebate Program	Kansas City Power and Light (KCP&L) offers rebates to residential customers towards the cost of an ENERGY STAR Home Energy Assessment and a portion of the installed efficiency improvements. New Construction rebate maximum of \$600.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO87F&re=0&ee=0
KCPL	Missouri	Kevin Brannan	816-654-1680	HOME Performance with ENERGY STAR Program	Energy Auditing	Installation Based Rebate Program	Kansas City Power & Light (KCP&L) offers rebates to residential customers towards the cost of an ENERGY STAR Home Energy Assessment and a portion of the installed efficiency improvements. The maximum amount of rebate is \$600.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO77F&re=0&ee=0
KCPL	Missouri	Kevin Brannan	816-654-1680	Residential Rebate Programs	Energy Auditing	Installation Based Rebate Program	Kansas City Power and Light (KCP&L) offers rebates to all residential customers for the purchase of efficient lighting and air conditioners. KCP&L Greater Missouri Operations customers are also eligible for rebates for energy efficient appliances. Rebates is for up to \$850 for central air conditioning and up to \$100 per appliance.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO76F&re=0&ee=0
KCPL	Missouri	Kevin Brannan	816-654-1680	Solar Photovoltaic Rebates Program	Solar	Installation Based Rebate Program	offer rebates to their customers for the installation of net metered photovoltaic (PV) systems on their properties. The program is available to all of KCP&L's Missouri retail customers on generally available residential, commercial, and industrial rate schedules. Only systems that become operational after December 31, 2009 are eligible for the rebate. Program funding is for \$50,000,000 in GMO and \$36,500,000 in KCPL. Rebate is based on installed capacity and COD. Installations prior to 7/1/14 get \$2/W-DC.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=MO94F&re=0&ee=0
SDGE	California			California Solar Initiative	Solar	Installation Based Rebate Program	California Solar Initiative (CSI) - offers cash back for installing a qualified PV system on your home. Rebate is based on the expected performance of the new system. Incentives or rebates are paid in "steps" which means that as more systems are installed, available rebate dollars decrease.	http://www.sdge.com/environment/solar-savings
SDGE	California			New Solar Homes Partnership Program	Solar	Construction Based Rebate Program	New Solar Homes Partnership (NSHP) - provides financial incentives and other support to home builders, encouraging the construction of new, energy-efficient solar homes.	http://www.sdge.com/environment/solar-savings
SDGE	California			Solar Water Heating Program	Solar	Installation Based Rebate Program	Solar Water Heating Program - Hot water rebate program funds solar hot water on homes and businesses.	http://www.sdge.com/environment/solar-savings
SDGE	California			Single-Family Affordable Solar Homes Program	Solar	Installation Based Rebate Program	Single-family affordable solar homes (SASH) - solar rebate program for low-income residents that own their own single-family home and meet a variety of income and housing eligibility criteria.	http://www.sdge.com/environment/solar-savings
SDGE	California			Multi-Family Affordable Solar Housing Program	Solar	Installation Based Rebate Program	Multifamily Affordable Solar Housing - solar rebate program for multifamily affordable housing.	http://www.sdge.com/environment/solar-savings
SDGE	California			California Solar Initiative Research, Development, Demonstration and Deployment	Solar	Research Based Rebate Program	CSI RD&D - A solar grant program to fund grants for research, development, demonstration and deployment (RD&D) of solar technologies.	http://www.sdge.com/environment/solar-savings

Utility	State	Contact Name	Contact #	Program Name	Technology Type	Program Type	Program Details	Link
SMUD	California			Commercial Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	Sacramento Municipal Utility District (SMUD) offers a wide array of incentives for its commercial customers to increase the energy efficiency of their facilities. Rebates are available for a for lighting equipment and controls , HVAC systems and controls, motors, food service equipment, PC and Data management systems, refrigeration equipment and controls, and whole building measures . In general, SMUD provides both custom and prescriptive ("Express") incentive packages for eligible measures. Max incentives vary: Savings By Design=\$150k, Data Center Cooling = \$100k, Server Virtualization = \$150k, Lighting Controls=\$300k, Interior Lighting = \$150k, Exterior Lighting=\$50k, Heating & Cooling=\$150k, Motors & Controls=\$150k.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA121F&re=0&ee=0
SMUD	California			Non-Residential PV Incentive Program	Solar	Installation Based Rebate or Production Based Rebate	MUD offers cash incentives to commercial, industrial, and non-profit customers who install solar photovoltaic (PV) systems. Customers have the option of taking a one-time, up-front payment through the Expected Performance Based Incentive (EPBI) or payments over the course of 5 years through the Performance Based Incentive (PBI). Offer \$0.65/kWh up to \$650k for upfront rebate or \$0.06/kWh for 10 years.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA49F&re=0&ee=0
SMUD	California			PV Residential Retrofit Buy-Down Program	Solar	Installation Based Rebate Program	SMUD offers an incentive of \$0.20 per watt (W) AC to residential customers who install grid-connected photovoltaic (PV) systems.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA48F&re=0&ee=0
SMUD	California			Renewable Energy Efficiency Rebate Program	Energy Auditing	Installation Based Rebate Program	Sacramento Municipal Utility District (SMUD) offers incentives for its residential customers to purchase and install energy efficient equipment and measures for the homes. Maximum incentives varies by equipment. Rebate includes windows, ducts, pool pumps, lights, refrigerators, dishwashers, etc.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA120F&re=0&ee=0
SMUD	California			Solar Water Heater Rebate Program	Solar Thermal	Installation Based Rebate Program	The Sacramento Municipal Utility District's (SMUD) Solar Domestic Hot Water Program provides rebates and/or loan financing to customers who install solar water heating systems. The amount of the rebate depends on how much electricity the system will offset annually: 800-1,399kWh = \$500; 1,400-2,199kWh=\$1k; and 2,200 or above=\$1.5k.	http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=CA27F&re=0&ee=0
Xcel Energy	Colorado			Solar Rewards Program	Solar	Production Based Rebate Program	Current solar incentives include payments of 3¢ per kWh for Customer-owned and 1¢ per kWh for 3rd party owned for projects less than 25kW. For projects up to 500kW, price is up to 6¢ per kWh.	http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Renewable_Energy_Programs/Solar*Rewards_-_CO
Xcel Energy	Colorado			Windsorce for Residence Program	Wind	Renewable Volunteer program	Windsorce - for only \$2.16 per month customers can help increase renewable energy by purchasing renewable energy through Windsorce.	http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Renewable_Energy_Programs/Windsorce_for_Residences_-_CO
Xcel Energy	Michigan			Windsorce for Residence Program	Wind	Renewable Volunteer program	Windsorce - for only \$1.20 per month customers can help increase renewable energy by purchasing renewable energy through Windsorce.	http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Renewable_Energy_Programs/Windsorce_for_Residences_-_MI
Xcel Energy	Minnesota			Solar Gardens Program	Solar	Production Based Rebate Program	Solar Gardens - Solar developers install solar garden projects which are connected to multiple subscribers. Xcell Energy may operate its own solar garden in the future to provide an alternative choice for customers. Subscribing customers receive credit on their monthly Xcel Energy electricity bills for their portion of solar energy produced by the solar gardens.	http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Renewable_Energy_Programs/Solar_Gardens_-_MN
Xcel Energy	Minnesota			Solar Rewards Program	Solar	Production Based Rebate Program	The new Solar*Rewards program offers an incentive based on the kWh production from the PV system, as recorded by the production meter. The incentive is paid annually at \$0.08 (8 cents) per kWh produced over 10 years.	http://www.xcelenergy.com/Save_Money_&_Energy/Residential/Renewable_Energy_Programs/Solar*Rewards_-_MN
Xcel Energy	Wisconsin			Electric Thermal Storage Incentive	Energy Thermal	Installation Based Rebate Program	Electric Thermal Storage (ETS) Incentive - ETS room units: 20% of purchase price, ETC Comfort Plus System: \$25/kW, Slab Heat Resistance Cable:\$25/kW	https://www.xcelenergy.com/Save_Money_&_Energy/Residential/Wisconsin/Electric_Thermal_Storage_Incentive_-_WI

Utility	State	Contact Name	Contact #	Program Name	Technology Type	Program Type	Program Details	Link
Xcel Energy	Wisconsin			Residential Rewards and Enhanced Rewards Program	Thermal	Heating/Cooling Rebate Program	Rebate for installing new heating and cooling elements from select providers	https://focusenergy.com/residential/efficient-products-appliances/residential-rewards
Xcel Energy	Wisconsin			Windsorce for Residence Program	Wind	Renewable Volunteer Program	Windsorce - for only \$1.33 per month customers can help increase renewable energy by purchasing renewable energy through Windsorce.	https://www.xcelenergy.com/Save_Money_&Energy/Residential/Wisconsin/Windsorce_for_Residences_-_WI
Xcel Energy	Wisconsin			Lighting & Appliance Program	Lighting	Installation Based Rebate Program	Up to \$1.50 per Energy Star qualified CFL	https://focusenergy.com/residential/efficient-products-appliances/lighting-and-appliances

ATTACHMENT D: UTILITY QUESTIONNAIRES

Date November 13, 2014

Company Name: Austin Energy

Contact Name: Cheryl Mele

Staff Telephone Number: 512-322-6062

1. What types of renewable energy programs/incentives do you offer (i.e., rebates, production, etc.)?
 - a. **Customer owned solar rebate programs. Participating customers receive a better rate for their energy.**
 - b. **Commercial performance based energy efficiency incentives and rebates.**
 - c. **Offer special incentives and rebates to non-profit organizations.**
 - d. **They have a community solar effort in the works. Hopefully will have it up and running late next year**
2. What has been the most successful aspect of your program(s)?
 - a. **Seeing success in all programs. Participation rates have been strong. Distributed solar on rooftops widely adopted with affluent customers.**
3. What program or part of your program(s) has been the least successful?
 - a. **Wouldn't say least successful but...need to be aware of the point where the company would be losing money. Most programs are meeting their budgeted amount of payouts each year.**
4. What hurdles did you overcome in developing and implementing your program?
 - a. **The initial cost of implementing a solar program. That cost has gone down a lot in recent years but when these programs were started it was a struggle**
5. What would you recommend for other utilities looking to implement a similar program, i.e. what changes would you make to your current program?
 - a. **Local solar generation has worked out very well but... you need to really think about net metering vs. the value at implementation. Also appreciate the local generation while making sure customers never get to a point where they are "free" of the utility.**
 - b. **Accurate communication to customers is very important. Make sure they know exactly what benefits they are and are not getting.**
6. How can customers finance the incentives (i.e., self-financed, loan, etc.)?
 - a. **All self-financed at this point. Loan programs have been looked at but there are certain Texas laws that make it difficult to get in place.**
 - b. **Customers have to have the cash up front to get into the solar program but make it back through the rebate/reduced rate and also some federal tax breaks.**

7. Can customers own portions of renewable energy projects? Is this program successful? What is the benefit to the customer for this program? (**Referring to their future community solar project**)
 - a. **A lot of decisions still to make on how pricing and subscriptions will work. (by kW vs by kWh)**
8. Do you give benefits to companies selling energy efficient equipment for the efficiency incentives (i.e., light bulbs, heaters, AC, etc.)? If so, is this successful?
 - a. **No**
9. Do you require customers to purchase from specific companies (i.e., solar panel manufacturers, etc.)? If so, is this successful?
 - a. **No. The decisions about the solar energy system are left completely to the customer. Completed system is inspected by the utility.**
10. What class of customer takes advantage of your programs (i.e., poverty, middle class, business owners, etc.)?
 - a. **Only the affluent residential customers are able to put forth the initial capital to install solar panels.**
 - b. **Larger companies or non-profit organizations that benefit from the additional rebates.**
11. How does the program support itself financially, i.e. is it subsidized by other rate payers that do not take advantage of the program?
 - a. **Yes all costs are eventually passed down to the customers including the customers who have not taken part of the programs**
12. (**If Applicable**) If the programs aren't subsidized through general rates, what payment mechanisms do you employ to recapture costs from the customer's taking advantage of the program?
 - a. **N/A**

Other Contacts:

Solar Program Manager at Austin Energy

Danielle Murray: 512-322-6055

Overall Manager

Denise King (no number given)

Date: November 11, 2014

Company Name: CPS Energy

Contact Name: John Durland

Staff Telephone Number: (210) 353 - 3780

1. What types of renewable energy programs/incentives do you offer (i.e., rebates, production, etc.)?

1. **Fridge recycling**
2. **Energy star fridge rebate**
3. **Peak saver thermostat**
4. **Home manager thermostat program**
5. **Commercial Demand response**
6. **NEST**
7. **Think ECO**
8. **Window unit**
9. **Central AC rebates**
10. **Duct work replacement rebates**
11. **Attic insulation**
12. **New home construction**
13. **New commercial construction**
14. **Pool pumps**
15. **Heat pump water heater**
16. **Gas appliance rebate (stove, water heater, dryer)**
17. **Electric to gas conversion**
18. **Commercial HVAC**
19. **Commercial lighting**
20. **Commercial custom**
21. **Weatherization**
22. **LED buy down**
23. **Commercial and residential solar**

New Home Construction: the 15% less than average household consumption target associated with the Construction Rebate can be evaluated using the IC3.ta.mu.edu (free tool from Texas A&M) or through a local rating agency (build San Antonio green nonprofit) to determine if they get below the average household consumption level prior to the house being constructed.

2. What has been the most successful aspect of your program(s)?

Peak Saver Program. When they call an event it turns off the AC. Provide the programmable thermostat for free that can be controlled by CPS. If customer participates in 33% of a cycling they get the thermostat for free and if they participate in 50% then they get a \$30 per year rebate. The percentage of participation is calculated as follows: if customer participated in 33%, the thermostat is

controlled for 33% of an hour (33% cycling). The Honeywell thermostat is purchased along with installation cost which is recovered with the fuel charge in the following year.

3. What program or part of your program(s) has been the least successful?

There is no program that missed its target. The target is set based on incremental cost, from incremental cost CPS can accurately determine the number of people who participate. The programs that struggle the most are the ones that are more beneficial to CPS than the customer (Home Manager Program). Home Manager Program provides control of AC unit, water heater and pool pump but uses a software program that must be accessed via a computer compared to the Honeywell thermostat which can be programmed at the thermostat. For this reason, the demographic is limited to tech savvy customers.

4. What hurdles did you overcome in developing and implementing your program?

Marketing was the biggest hurdle.

5. What would you recommend for other utilities looking to implement a similar program, i.e. what changes would you make to your current program?

If implementing solar, start with community solar and allow customers to buy energy at a rate cheaper than they can install on their roof. This will help the utility in that they solar can be grid managed better than pockets of rooftop solar which must have available capacity in case of shading. As well, this program is easier to manage for cost recovery. Currently CPS has an RFP out for 1, 3 or 5MW of solar on both land owned by utility or private land to be used for the Community Solar Program. COD of project is planned to be 2016. Also, they are giving favor to local solar manufacturers such as OCI in the hopes of getting cheaper transportation charges.

6. How can customers finance the incentives (i.e., self-financed, loan, etc.)?

Currently they utility does not provide assistance in financing projects. However, on a state and national level, there was a bill passed last year that allows people to finance but was designed for retailers and installers more than utilities. So far, this bill has been seen to target only people with bad credit.

7. Can customers own portions of renewable energy projects? Is this program successful? What is the benefit to the customer for this program? (specifically to Springfield)

Just put out a program for community solar.

8. Do you give benefits to companies selling energy efficient equipment for the efficiency incentives (i.e., light bulbs, heaters, AC, etc.)? If so, is this successful?

Just did an LED program where they bought 200,000 LED and got the cost from \$7.00 to \$1.00 which was passed to customers who wanted to install LEDs.

9. Do you require customers to purchase from specific companies (i.e., solar panel manufacturers, etc.)? If so, is this successful?

CPS Energy includes local manufacturer in their RFPs in the hopes that they will potentially help with transportation costs (OCI and South). This is specific to the community solar RFPs. No incentives are available rooftop solar. OCI is in San Antonio because they are constructing a 400MW solar facility so OCI built a manufacturing facility to accommodate for this project.

RFP gave option to use Utility land or private but must have transmission access which was reviewed and evaluated by CPS.

10. What class of customer takes advantage of your programs (i.e., poverty, middle class, business owners, etc.)?

Large-commercial is most popular.

Window unit rebate does well with poverty level. Also weatherization program has no cost to low level but these programs cannot finance themselves.

11. How does the program support itself financially, i.e. is it subsidized by other rate payers that do not take advantage of the program?

Ordinance called "Step" which has allocated \$849MM which has is recovered from a fuel adjustment which is a variable charge to customers.

The fuel charge is evaluated based on the previous year's expense so they implement a threshold predicting fuel pricing to make sure rate impact isn't too high.

12. **(If Applicable)** If the programs aren't subsidized through general rates, what payment mechanisms do you employ to recapture costs from the customer's taking advantage of the program?

Other:

Commercial DR Program is the best program you can do for peak to reduce load.

If you're worried about peak issues, solar is not the best compensator. Community Solar Program is either 1, 3, or 5MW. Also have about 200MW of community scale solar using a 25 year PPA. Financing is built into the rate.

Rooftop solar is financed based on the fuel charge which is paid by all customers even those who do not participate in the rebate program. The capacity cannot be used, nor the RECs. The rebate is buying the credit for those RECs.

STEP ordinance came from CPS was going to build a new power plant and the city enacted STEP to incentivize greener energy.

Date: November 17, 2014

Company Name: Columbia Water & Light

Contact Name: Jim Windsor

Staff Telephone Number: 573-874-6306

1. What types of renewable energy programs/incentives do you offer (i.e., rebates, production, etc.)?

Residential

Energy Efficiency Loan Program - Loans residential customers up to \$15,000. Interest rate is 1% for 3 years, 3% for 5 years, 5% for 10 years.

Performance based rebates – will provide up to \$1,200 in rebates.

HVAC rebates - Based on tonnage and specs of units that are replaced.

Commercial

Lighting Incentives – on a kW replacement basis

Energy Efficiency Loan Program – Loans commercial customers up to \$30,000.

2. What has been the most successful aspect of your program(s)?

Unknown

3. What program or part of your program(s) has been the least successful?

Unknown

4. What hurdles did you overcome in developing and implementing your program?

Originally, the interest was too high because it was indexed. Interest was later fixed and reduced which saw more customers take advantage of the program.

5. What would you recommend for other utilities looking to implement a similar program, i.e. what changes would you make to your current program?

For the loan program, recommends having a clause allowing the utility company to turn off power if they do not pay.

One issue with residential rooftop solar is making sure there is a proper rate structure that doesn't impact other customers not using PV. Make sure other customers are not subsidizing. There is an energy component that you give back to the PV customer. Make sure that the flat rate payment to the customer is budgeted based on thorough solar evaluation of the area to reduce the risk of paying too much to customer.

Columbia has a dual meter that measures what the house is requesting and what the solar panel is producing. The meter indicates the net between what the customer requested and what the solar produced. If the customer produces more energy than consumed, Columbia will pay for energy. If customer produces less, customer will pay for the additional energy needed that was not produced from the panels. Recommends making sure that the customer cannot be completely self-sustaining.

6. How can customers finance the incentives (i.e., self-financed, loan, etc.)?

Loan programs are available or can be self-financed.

The loan programs are revolving loan funds, meaning that they recycle the same amount of money. Currently, Columbia has over \$1MM available in loans with \$4MM in loans outstanding, a total fund of \$5MM.

Columbia is considering implementing a loan for PV installation but only after customer has taken advantage of the Energy Efficiency loan program and proven that their house is energy efficient.

Most of the people who take loans pay it within 3 years. Part of the loan agreement states that if a customer doesn't pay the loan; Columbia has the right to turn off the electricity. Recommends other utilities have this clause.

Columbia has been tracking customers to see how much they have been spending for the rebates. Over half of the people who receive the programs do not get loans. Majority of customers that take the loans are for more expensive equipment such as HVAC systems.

7. Can customers own portions of renewable energy projects? Is this program successful? What is the benefit to the customer for this program? (specifically to Springfield)

NA

8. Do you give benefits to companies selling energy efficient equipment for the efficiency incentives (i.e., light bulbs, heaters, AC, etc.)? If so, is this successful?

Unknown

9. Do you require customers to purchase from specific companies (i.e., solar panel manufacturers, etc.)? If so, is this successful?

Unknown

10. What class of customer takes advantage of your programs (i.e., poverty, middle class, business owners, etc.)?

Unknown

11. How does the program support itself financially, i.e. is it subsidized by other rate payers that do not take advantage of the program?

12. **(If Applicable)** If the programs aren't subsidized through general rates, what payment mechanisms do you employ to recapture costs from the customer's taking advantage of the program?

Date: November 13, 2014

Company Name City: Utilities of Springfield

Contact Name : Cara Shaefer

Staff Telephone Number: 417-831-8348

1. What types of renewable energy programs/incentives do you offer (i.e., rebates, production, etc.)?

Has a community solar program. Largest solar farm in Missouri. 4.95MW. Customers buy the chunks of energy from the farm. A large number of energy efficiency rebate programs (residential and commercial)

2. What has been the most successful aspect of your program(s)?

Having a Balanced portfolio of programs (gas, electric, water).

Promotional limited time programs have incredible participation. For example in 2012, middle of a drought, about to implement emergency water shortage plan. They Increased water efficiency rebate amount for a limited time and solved the issue before it even happened. The increased participation in the program saved millions of gallons of water a month.

3. What program or part of your program(s) has been the least successful?

Home performance with energy star rebate. The program is too complex for most home owners, specifically the full home energy audit.

4. What hurdles did you overcome in developing and implementing your program?

Educating everyone in the utility about the different programs and keeping them all on the same page. These programs affect a lot of people throughout the company from legal to financial.

5. What would you recommend for other utilities looking to implement a similar program, i.e. what changes would you make to your current program?

Take a deeper dive in into renewable and efficiency incentive programs. Have constant talks with similar/peer utilities to discover any lessons that they learned during the implementation of the programs.

6. How can customers finance the incentives (i.e., self-financed, loan, etc.)?

Self-financed.

7. Can customers own portions of renewable energy projects? Is this program successful? What is the benefit to the customer for this program? (specifically to Springfield)

Customers subscribe to a certain amount of energy from the solar farm per month. Customers do pay a premium for the energy. The solar energy is almost twice as expensive as the coal produced energy for the customer. Energy is purchased in kilowatt increments so there are 4,950 increments available to sell. Majority of the subscribers include commercial customers with some subscribers including upper-middle class customers.

8. Do you give benefits to companies selling energy efficient equipment for the efficiency incentives (i.e., light bulbs, heaters, AC, etc.)? If so, is this successful?

No

9. Do you require customers to purchase from specific companies (i.e., solar panel manufacturers, etc.)? If so, is this successful?

No

10. What class of customers take advantage of your programs (i.e., poverty, middle class, business owners, etc.)?

There are more individual upper-middle class residential customers of the solar energy. Less commercial customers but they still purchase/use a larger amount of the solar energy than residential customers.

11. How does the program support itself financially, i.e. is it subsidized by other rate payers that do not take advantage of the program?

25 year contract purchase power contract to originally build. It is a pass through cost falling down to the customers. Only customers who receive the solar energy pay for it but it is at a high premium.

12. **(If Applicable)** If the programs aren't subsidized through general rates, what payment mechanisms do you employ to recapture costs from the customer's taking advantage of the program?

N/A

Date: November 13, 2014

Company Name Kansas City Power & Light

Contact Name : Kevin Brannan

Staff Telephone Number: 816-654-1680

1. What types of renewable energy programs/incentives do you offer (i.e., rebates, production, etc.)?

15 energy efficiency programs mostly rebate based. Max \$250,000 per year per customer.

2. What has been the most successful aspect of your program(s)?

Lighting rebates: over the last 24 months LEDs are very popular and have really help increased participation.

3. What program or part of your program(s) has been the least successful?

Energy star computers: the smaller programs are for very specific things that don't get enough marketing.

4. What hurdles did you overcome in developing and implementing your program?

Awareness and marketing are the largest hurdles.

Educating others in the company on how these programs generally work.

5. What would you recommend for other utilities looking to implement a similar program, i.e. what changes would you make to your current program?

Spend time researching what other utilities are doing in this space. Learn what programs work and what programs do not.

6. How can customers finance the incentives (i.e., self-financed, loan, etc.)?

Self-financed.

7. Can customers own portions of renewable energy projects? Is this program successful? What is the benefit to the customer for this program? (specifically to Springfield)

N/A

8. Do you give benefits to companies selling energy efficient equipment for the efficiency incentives (i.e., light bulbs, heaters, AC, etc.)? If so, is this successful?

They may highlight some companies in conversations with customers but there is no additional monetary exchange.

9. Do you require customers to purchase from specific companies (i.e., solar panel manufacturers, etc.)? If so, is this successful?

No they are vendor neutral/

10. What class of customer takes advantage of your programs (i.e., poverty, middle class, business owners, etc.)?

Large commercial/industrial takes advantage the most. Smaller companies take advantage of a few. Residential customers make up a fairly small percentage of the program participants.

11. How does the program support itself financially, i.e. is it subsidized by other rate payers that do not take advantage of the program?

All customers end up paying for the programs. Pass through cost.

12. **(If Applicable)** If the programs aren't subsidized through general rates, what payment mechanisms do you employ to recapture costs from the customer's taking advantage of the program?

N/A

Other:

Kevin works on the energy efficiency side of their incentive programs, not much info to give on renewable energy programs.

Date: November 13, 2014

Company Name KC- Board of Public Utilities

Staff Telephone Number: 913-573-9922

Contact Name: David Allen

Contact Email : dallen@bpu.com

1. What types of renewable energy programs/incentives do you offer (i.e., rebates, production, etc.)?

None. No rebates/renewable programs at this time. Pushing to get lighting rebates in place

2. What has been the most successful aspect of your program(s)?

N/A

3. What program or part of your program(s) has been the least successful?

N/A

4. What hurdles did you overcome in developing and implementing your program?

The biggest hurdle is getting the initial money for the program. Multiple studies have been done and an ROI is out though it will probably be multiple years before anything comes of that. The suggested project is in the hundred million dollar plus range.

5. What would you recommend for other utilities looking to implement a similar program, i.e. what changes would you make to your current program?

N/A

6. How can customers finance the incentives (i.e., self-financed, loan, etc.)?

Any renewable energy right now is financed solely by the customers.

7. Can customers own portions of renewable energy projects? Is this program successful? What is the benefit to the customer for this program? (specifically to Springfield)

N/A

8. Do you give benefits to companies selling energy efficient equipment for the efficiency incentives (i.e., light bulbs, heaters, AC, etc.)? If so, is this successful?

9. Do you require customers to purchase from specific companies (i.e., solar panel manufacturers, etc.)? If so, is this successful?

Customers are free to buy from and use whichever company will meet their needs.

10. What class of customer takes advantage of your programs (i.e., poverty, middle class, business owners, etc.)?

All residential customers at this point take advantage of the program and a few commercial customers are starting to look into it.

11. How does the program support itself financially, i.e. is it subsidized by other rate payers that do not take advantage of the program?

N/A

12. **(If Applicable)** If the programs aren't subsidized through general rates, what payment mechanisms do you employ to recapture costs from the customer's taking advantage of the program?

N/A

Other:

The extent of their renewable programs is individual customers buying/installing solar panels and integrating that energy into their grid. The only action the utility takes is going out and inspecting the solar panels to make sure they can be safely integrated into the grid.

Date: November 10, 2014

Company Name: City of Sunset Valley

Contact Name: Caroline Meredith

Staff Telephone Number (512) 818 - 9103

1. What types of renewable energy programs/incentives do you offer (i.e., rebates, production, etc.)?

Rebate programs for a few different things such as water conservation.

2. What has been the most successful aspect of your program(s)?

A good number of people have put solar PV panels on their houses. A few other activities such as adding different types of grass that use less water.

3. What program or part of your program(s) has been the least successful?

Irrigation rebates like rain sensors. The lack of success may be because of poor advertising.

4. What hurdles did you overcome in developing and implementing your program?

Getting the incentives approved through the council and financing group was the most challenging hurdle.

5. What would you recommend for other utilities looking to implement a similar program, i.e. what changes would you make to your current program?

Better advertisement.

6. How can customers finance the incentives (i.e., self-financed, loan, etc.)?

All self-financed.

7. Can customers own portions of renewable energy projects? Is this program successful? What is the benefit to the customer for this program? (specifically to Springfield)

NA

8. Do you give benefits to companies selling energy efficient equipment for the efficiency incentives (i.e., light bulbs, heaters, AC, etc.)? If so, is this successful?

No

9. Do you require customers to purchase from specific companies (i.e., solar panel manufacturers, etc.)? If so, is this successful?

Any Energy Star equipment.

10. What class of customers take advantage of your programs (i.e., poverty, middle class, business owners, etc.)?

Majority of customers is Upper-middle class. Utility has approximately 600 customers.

11. How does the program support itself financially, i.e. is it subsidized by other rate payers that do not take advantage of the program?

Financing is provided through the city's general fund or city utility fund via sales taxes.

12. **(If Applicable)** If the programs aren't subsidized through general rates, what payment mechanisms do you employ to recapture costs from the customer's taking advantage of the program?

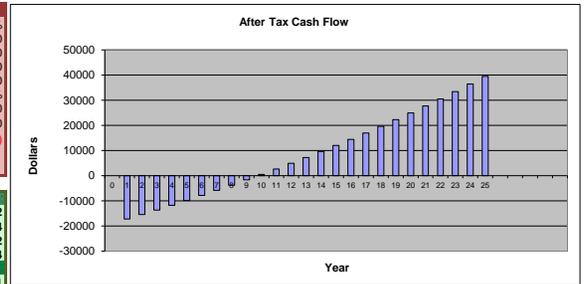
NA

ATTACHMENT E: FINANCIAL MODELS

Rock Creek (IPL Owned)

Values from SAM input pages (ok to change values in white cells)		System Costs	
Financing		Total Installed Cost \$1,301,740.00	
Analysis Parameters		Operation and Maintenance	
Analysis Period	25	Fixed O&M (\$/kW-yr)	\$20.00
Inflation Rate	3.00%	Fixed O&M Real Esc.	0%
Real Discount Rate	2.00%	Variable O&M (\$/MWh)	\$0.00
Tax and Insurance Rates		Variable O&M Real Esc.	0%
Federal Tax	0.00%	Fuel Cost (\$/MMBtu)	\$0.00
State Tax	0.00%	Fuel Cost Real Esc.	0%
Insurance	0.50%	Biomass Feedstock Cost (\$/dt)	\$0.00
Salvage Value		Biomass Feedstock Real Esc.	0%
Net Salvage Value	0.00%	Coal Feedstock Cost (\$/dt)	\$0.00
End of Analysis Period Value	\$0.00	Coal Feedstock Real Esc.	0%
Property Tax		Coal Feedstock Real Esc.	0%
Assessed Percent	100.00%	Fixed (Annual) O&M (\$/yr)	\$0.00
Assessed Value	\$1,301,740.00	Fixed (Annual) O&M Real Esc.	0%
Assessed Value Decline	0.00%	System and Annual Performance	
Property/Tax	0.00%	Availability (year 1)	100.00%
Loan Parameters		Degradation (%/year)	0.50%
Amount	\$1,301,740.00	System Size (kW)	520.905
Loan (Debt) Percent	100.00%	Heat Rate (MMBtu/MWh)	0
Term	25	First Year Annual Output (kWh)	761776
Rate	5.06%	First Year Annual Fuel Usage (kWh)	0
		First Year Biomass Feedstock Usage (dt)	0
		First Year Coal Feedstock Usage (dt)	0

Intermediate Values	
Effective Tax Rate	0.00%
Credit Basis - Fed	\$1,301,740.00
Credit Basis - State	\$1,301,740.00
Depreciation Basis - Fed	\$1,301,740.00
Depreciation Basis - State	\$1,301,740.00
Nominal Discount Rate	5.06%
First Costs	\$0.00
Adjusted Installed Costs	\$1,301,740.00
NPV(Nominal Costflow)	(\$1,622,584.31)
NPV(Nominal Output)	10,178,568.25
NPV(Real Output)	14,081,775.87
Results LCOE (¢/kWh)	
Real	11.52
Nominal	15.94
Real w/o Incentives	11.52
Nominal w/o Incentives	15.94
Results Payback (years)	
Incentives	14.61
No Incentives	14.61
Results NPV (nominal dollars)	
NPV	\$39,018.28



Values from tax and cash incentives input pages (ok to change values in white cells)				Income tax and depreciation implications (x = yes, blank = no)				
First Year Amount	Type	Value	Limits	Escalation	Taxable?	State	Reduces Depreciation basis?	
					Federal	State	Federal	State
	IBI, Federal	0	\$		x	x		
	IBI, State	0	\$		x	x		
	IBI, Utility	0	\$		x	x		
	IBI, Other	0	\$		x	x		
			Maximum					
\$0.00	IBI, Federal	0	%	1.00E+99	\$	x	x	
\$0.00	IBI, State	0	%	1.00E+99	\$	x	x	
\$0.00	IBI, Utility	0	%	1.00E+99	\$	x	x	
\$0.00	IBI, Other	0	%	1.00E+99	\$	x	x	
			Maximum					
\$0.00	CBI, Federal	0	\$/W	1.00E+99	\$	x	x	
\$0.00	CBI, State	0	\$/W	1.00E+99	\$	x	x	
\$0.00	CBI, Utility	0	\$/W	1.00E+99	\$	x	x	
\$0.00	CBI, Other	0	\$/W	1.00E+99	\$	x	x	
			Maximum					
	ITC, Federal	0	\$				x	x
	ITC, State	0	\$					
\$0.00	ITC, Federal	0	%	1.00E+99	\$		x	x
\$0.00	ITC, State	0	%	1.00E+99	\$			
			Term					
	PTC, Federal	0	\$/kwh	10	years			
	PTC, State	0	\$/kwh	10	years			
			Term		Escal.			
	PBI, Federal	0	\$/kwh	10	years	2.5	%	
	PBI, State	0	\$/kwh	10	years	2.5	%	
	PBI, Utility	0	\$/kwh	10	years	0	%	
	PBI, Other	0	\$/kwh	10	years	0	%	

Color key: Value that appears in the SAM cash flow
 Intermediate values that do not appear in the cash flow that SAM uses internally for calculations.
 Note that does not appear in the SAM cash flow

Base Case Cash Flow

Year	0	1	2	3	4	5	6	7	8	9	10
System Output (kWh) (from SAM)		761,775.00	761,775.00	761,775.00	761,775.00	761,775.00	761,775.00	761,775.00	761,775.00	761,775.00	761,775.00
Degradation (Single Input)		1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.97	0.96	0.96
Degradation (Schedule)											
Degradation		1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.97	0.96	0.96
Availability (Single Input)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Availability (Schedule)											
Availability		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Energy (kWh)		757966.125	757966.125	754176.2944	750405.4129	746653.3858	742920.1189	739205.5183	735509.4907	731831.9433	728172.7836
Energy Value (\$)	0	92,560.00	94,860.00	97,217.30	99,632.80	102,109.00	104,646.00	107,246.00	109,911.00	112,643.00	115,441.00
Note. SAM Calculates "Energy Value" for each hour using the inputs from the Utility Rates page. This spreadsheet does not display hourly data, so the hourly energy values are omitted here.											

Operating Expenses

Fixed O & M Annual (Escalated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M Annual (Schedule)											
Fixed O & M Annual	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M (Escalated)	10,418.10	10,730.64	11,052.56	11,384.14	11,725.66	12,077.43	12,439.76	12,812.95	13,197.34	13,593.26	
Fixed O & M (Schedule)											
Fixed O & M	10,418.10	10,730.64	11,052.56	11,384.14	11,725.66	12,077.43	12,439.76	12,812.95	13,197.34	13,593.26	
Variable O&M (Escalated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Variable O&M (Schedule)											
Variable O&M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fuel O & M (Escalated)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Fuel O & M (Schedule)											
Fuel O & M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Biomass Feedstock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Coal Feedstock	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Insurance	6,508.70	6,703.96	6,905.08	7,112.23	7,325.60	7,545.37	7,771.73	8,004.88	8,245.03	8,492.38	
Property Assesed Value	1,301,740.00	1,301,740.00	1,301,740.00	1,301,740.00	1,301,740.00	1,301,740.00	1,301,740.00	1,301,740.00	1,301,740.00	1,301,740.00	
Property Taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Net Salvage Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Operating Costs	16,926.80	17,434.60	17,957.64	18,496.37	19,051.26	19,622.80	20,211.48	20,817.83	21,442.36	22,085.63	
Deductible Expenses	-16,926.80	-17,434.60	-17,957.64	-18,496.37	-19,051.26	-19,622.80	-20,211.48	-20,817.83	-21,442.36	-22,085.63	
Cash Available Before Debt	-16,926.80	-17,434.60	-17,957.64	-18,496.37	-19,051.26	-19,622.80	-20,211.48	-20,817.83	-21,442.36	-22,085.63	
Debt Interest Payment	65,868.04	64,499.32	63,061.35	61,550.61	59,963.42	58,295.93	56,544.06	54,703.55	52,769.90	50,738.41	
Debt Repayment	27,049.81	28,418.53	29,856.51	31,367.25	32,954.43	34,621.93	36,373.80	38,214.31	40,147.96	42,179.44	
Total Debt Payment	92,917.86	92,917.86	92,917.86	92,917.86	92,917.86	92,917.86	92,917.86	92,917.86	92,917.86	92,917.86	

Tax Effect on Equity (State)

Deductible Expenses	-16,926.80	-17,434.60	-17,957.64	-18,496.37	-19,051.26	-19,622.80	-20,211.48	-20,817.83	-21,442.36	-22,085.63
Investment Based Incentives (IBI)	0.00									
Federal IBI	0.00									
State IBI	0.00									
Utility IBI	0.00									
Other IBI	0.00									
Capacity Based Incentives (CBI)	0.00									
Federal CBI	0.00									
State CBI	0.00									
Utility CBI	0.00									
Other CBI	0.00									
Performance Based Incentives (PBI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Federal PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
State PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Utility PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation Schedule (%)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Depreciation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest Payment	65,868.04	64,499.32	63,061.35	61,550.61	59,963.42	58,295.93	56,544.06	54,703.55	52,769.90	50,738.41
Total Incentive Income - Deductions	-82,794.84	-81,933.93	-81,018.99	-80,046.98	-79,014.69	-77,918.73	-76,755.54	-75,521.37	-74,212.26	-72,824.05
Total Taxable Incentive Income - Deductions	-82,794.84	-81,933.93	-81,018.99	-80,046.98	-79,014.69	-77,918.73	-76,755.54	-75,521.37	-74,212.26	-72,824.05
Income Taxes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Production Tax Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment Tax Credit	0.00									
Tax Savings (Liability)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Tax Effect on Equity (Federal)

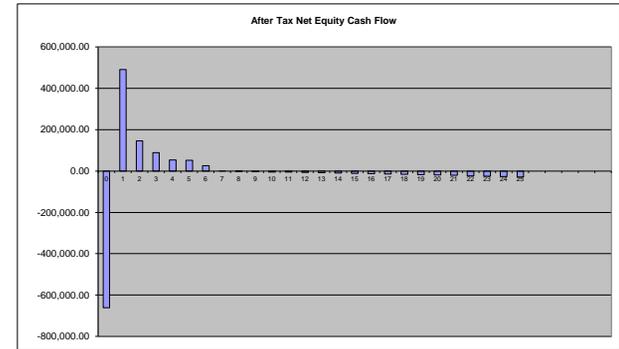
Rock Creek (PPA Structure)

Values from SAM input pages (ok to change values in white cells)		System Costs	
Financing		System Costs	
Analysis Parameters		Construction Interest	\$25,949.10
Analysis Period	25	Installed Cost	\$1,297,450.00
Inflation Rate	3.00%	Total Installed Cost	\$1,323,399.10
Real Discount Rate	2.00%	Operation and Maintenance	
Tax and Insurance Rates		Fixed O&M (\$/kW-yr)	\$20.00
Federal Tax	35.00%	Fixed O&M Real Esc.	0%
State Tax	7.00%	Variable O&M (\$/MWh)	\$0.00
Insurance	0.50%	Variable O&M Real Esc.	0%
Salvage Value		Fuel Cost (\$/MMBtu)	\$0.00
Net Salvage Value	0.00%	Fuel Cost Real Esc.	0%
End of Analysis Period Value	\$0.00	Biomass Feedstock Cost (\$/dt)	\$0.00
Property Tax		Biomass Feedstock Real Esc.	0%
Assessed Percent	100.00%	Coal Feedstock Cost (\$/dt)	\$0.00
Assessed Value	\$1,297,450.00	Coal Feedstock Real Esc.	0%
Assessed Value Decline	0.00%	Fixed (Annual) O&M (\$/yr)	\$0.00
Property Tax	1.00%	Fixed (Annual) O&M Real Esc.	0%
Loan Parameters		System and Annual Performance	
Amount	\$661,699.55	Availability (year 1)	100.00%
Loan (Debt) Percent	50.00%	Degradation (%/year)	0.50%
Term	25	System Size (kW)	519.189
Rate	7.00%	Heat Rate (MMBtu/MWh)	0
Power Purchase Agreement		First Year Annual Output (kWh)	752231
PPA Escalation	0.00%	First Year Fuel Usage (kWh)	0
		First Year Biomass Feedstock Usage (dt)	0
		First Year Coal Feedstock Usage (dt)	0

Intermediate Values	
Effective Tax Rate	39.55%
Credit Basis - Fed	\$1,323,399.10
Credit Basis - State	\$1,323,399.10
Depreciation Basis - Fed	\$1,124,899.24
Depreciation Basis - State	\$1,124,899.24
Nominal Discount Rate	5.06%
First Costs	\$661,699.55
Adjusted Installed Costs	\$1,323,399.10
NPV(Nominal.Costflow)	\$1,356,339.37
NPV(Nominal.Output)	10,051,044.70
NPV(Real.Output)	13,905,350.45

Constraints	
Internal Rate of Return	11.87%
Minimum DSCR	0.75
Minimum Cash Flow Value	(\$29,657.62)

Results LCOE (¢/kWh)	
Real LCOE	9.75
Nominal LCOE	13.49
First Year PPA	13.49
Net Present Value	\$15,366.61



Values from tax and cash incentives input pages (ok to change values in white cells)				Income tax and depreciation implications (x = yes, blank = no)				
First Year Amount	Type	Value	Limits	Escalation	Taxable?	State	Reduces Depreciation basis?	
					Federal	State	Federal	State
	IBI, Federal	0	\$		x	x		
	IBI, State	0	\$		x	x		
	IBI, Utility	0	\$		x	x		
	IBI, Other	0	\$		x	x		
			Maximum					
\$0.00	IBI, Federal	0	1.00E+99	\$	x	x		
\$0.00	IBI, State	0	1.00E+99	\$	x	x		
\$0.00	IBI, Utility	0	1.00E+99	\$	x	x		
\$0.00	IBI, Other	0	1.00E+99	\$	x	x		
			Maximum					
\$0.00	CBI, Federal	0	1.00E+99	\$/W	x	x		
\$0.00	CBI, State	0	1.00E+99	\$/W	x	x		
\$0.00	CBI, Utility	0	1.00E+99	\$/W	x	x		
\$0.00	CBI, Other	0	1.00E+99	\$/W	x	x		
	ITC, Federal	0	\$				x	x
	ITC, State	0	\$					
\$397,019.73	ITC, Federal	30	1.00E+99	\$			x	x
\$0.00	ITC, State	0	1.00E+99	\$				
			Term	Escal.				
	PTC, Federal	0	10	years	2.5	%		
	PTC, State	0	10	years	2.5	%		
			Term					
	PBI, Federal	0	10	years	0	%	x	x
	PBI, State	0	10	years	0	%	x	x
	PBI, Utility	0	10	years	0	%	x	x
	PBI, Other	0	10	years	0	%	x	x

Color key: Value that appears in the SAM cash flow
 Intermediate values that do not appear in the cash flow that SAM uses internally for calculations.
 Note that does not appear in the SAM cash flow

Base Case Cash Flow

Year	0	1	2	3	4	5	6	7	8	9	10
System Output (kWh) (from SAM)		752,231.00	752,231.00	752,231.00	752,231.00	752,231.00	752,231.00	752,231.00	752,231.00	752,231.00	752,231.00
Degradation (Single Input)		1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.97	0.96	0.96
Degradation (Schedule)											
Degradation		1.00	1.00	0.99	0.99	0.98	0.98	0.97	0.97	0.96	0.96
Availability (Single Input)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Availability (Schedule)											
Availability		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Energy (kWh)		748469.845	748469.845	744727.4958	741003.8583	737298.839	733612.3448	729944.2831	726294.5617	722663.0889	719049.7734
Energy Price (\$/kWh)		0.14	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Energy Value (\$)	0	101,474.00	100,966.00	100,462.00	99,959.20	99,459.40	98,962.10	98,467.30	97,975.00	97,485.10	96,997.70

Note. SAM Calculates "Energy Value" for each hour using the inputs from the Time of Delivery Factors page. This spreadsheet does not display hourly data, so the hourly energy values are omitted here.

Operating Expenses

Fixed O & M Annual (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M Annual (Schedule)											
Fixed O & M Annual		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M (Escalated)		10,383.78	10,695.29	11,016.15	11,346.64	11,687.04	12,037.65	12,398.78	12,770.74	13,153.86	13,548.48
Fixed O & M (Schedule)											
Fixed O & M		10,383.78	10,695.29	11,016.15	11,346.64	11,687.04	12,037.65	12,398.78	12,770.74	13,153.86	13,548.48
Variable O&M (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Variable O&M (Schedule)											
Variable O&M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel O & M (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel O & M (Schedule)											
Fuel O & M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biomass Feedstock		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coal Feedstock		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insurance		6,617.00	6,815.51	7,019.97	7,230.57	7,447.49	7,670.91	7,901.04	8,138.07	8,382.21	8,633.68
Property Assesed Value		1,297,450.00	1,297,450.00	1,297,450.00	1,297,450.00	1,297,450.00	1,297,450.00	1,297,450.00	1,297,450.00	1,297,450.00	1,297,450.00
Property Taxes		12,974.50	12,974.50	12,974.50	12,974.50	12,974.50	12,974.50	12,974.50	12,974.50	12,974.50	12,974.50
Net Salvage Value		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Operating Costs		29,975.28	30,485.30	31,010.62	31,551.71	32,109.02	32,683.06	33,274.32	33,883.31	34,510.57	35,156.66
Operating Income		71,498.72	70,480.70	69,451.38	68,407.49	67,350.38	66,279.04	65,192.98	64,091.69	62,974.53	61,841.04
Cash Available Before Debt		71,498.72	70,480.70	69,451.38	68,407.49	67,350.38	66,279.04	65,192.98	64,091.69	62,974.53	61,841.04
Debt Interest Payment		46,318.97	45,586.64	44,803.05	43,964.61	43,067.48	42,107.55	41,080.42	39,981.40	38,805.44	37,547.17
Debt Repayment		10,461.81	11,194.14	11,977.73	12,816.17	13,713.30	14,673.23	15,700.36	16,799.38	17,975.34	19,233.61
Total Debt Payment		56,780.78	56,780.78	56,780.78	56,780.78	56,780.78	56,780.78	56,780.78	56,780.78	56,780.78	56,780.78

Tax Effect on Equity (State)

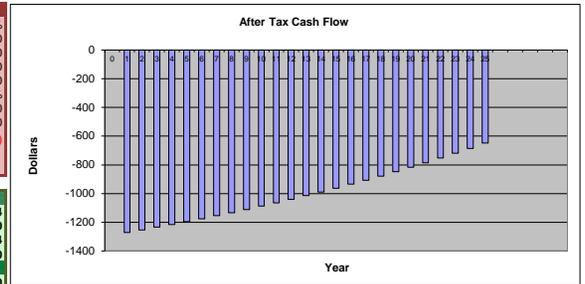
Deductible Expenses		71,498.72	70,480.70	69,451.38	68,407.49	67,350.38	66,279.04	65,192.98	64,091.69	62,974.53	61,841.04
Investment Based Incentives (IBI)		0.00									
Federal IBI		0.00									
State IBI		0.00									
Utility IBI		0.00									
Other IBI		0.00									
Capacity Based Incentives (CBI)		0.00									
Federal CBI		0.00									
State CBI		0.00									
Utility CBI		0.00									
Other CBI		0.00									
Performance Based Incentives (PBI)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Federal PBI		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
State PBI		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Utility PBI		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other PBI		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation Schedule (%)		20.00%	32.00%	19.20%	11.52%	11.52%	5.76%	0.00%	0.00%	0.00%	0.00%
Depreciation		224,977.85	359,964.56	215,978.73	129,587.24	129,587.24	64,793.62	0.00	0.00	0.00	0.00
Interest Payment		46,318.97	45,586.64	44,803.05	43,964.61	43,067.48	42,107.55	41,080.42	39,981.40	38,805.44	37,547.17
Total Incentive Income - Deductions		-199,798.09	-335,070.50	-191,330.41	-105,144.36	-105,304.34	-40,622.13	24,112.56	24,110.29	24,169.09	24,293.88
Total Taxable Incentive Income - Deductions		-199,798.09	-335,070.50	-191,330.41	-105,144.36	-105,304.34	-40,622.13	24,112.56	24,110.29	24,169.09	24,293.88
Income Taxes		-13,985.87	-23,454.93	-13,393.13	-7,360.11	-7,371.30	-2,843.55	1,687.88	1,687.72	1,691.84	1,700.57
Production Tax Credit		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment Tax Credit		0.00									
Tax Savings (Liability)		13,985.87	23,454.93	13,393.13	7,360.11	7,371.30	2,843.55	-1,687.88	-1,687.72	-1,691.84	-1,700.57

Total Income w/o incentives	-199,798.09	-335,070.50	-191,330.41	-105,144.36	-105,304.34	-40,622.13	24,112.56	24,110.29	24,169.09	24,293.88
Total Taxable Income	-199,798.09	-335,070.50	-191,330.41	-105,144.36	-105,304.34	-40,622.13	24,112.56	24,110.29	24,169.09	24,293.88
Income Taxes	-13,985.87	-23,454.93	-13,393.13	-7,360.11	-7,371.30	-2,843.55	1,687.88	1,687.72	1,691.84	1,700.57
Tax Effect on Equity (Federal)										
Deductible Expenses	71,498.72	70,480.70	69,451.38	68,407.49	67,350.38	66,279.04	65,192.98	64,091.69	62,974.53	61,841.04
Investment Based Incentives (IBI)	0.00									
Federal IBI	0.00									
State IBI	0.00									
Utility IBI	0.00									
Other IBI	0.00									
Capacity Based Incentives (CBI)	0.00									
Federal CBI	0.00									
State CBI	0.00									
Utility CBI	0.00									
Other CBI	0.00									
Performance Based Incentives (PBI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Federal PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
State PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Utility PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation Schedule (%)	0.20	0.32	0.19	0.12	0.12	0.06	0.00	0.00	0.00	0.00
Depreciation	22497784.70%	35996455.52%	21597873.31%	12958723.99%	12958723.99%	6479361.99%	0.00%	0.00%	0.00%	0.00%
Interest Payment	46,318.97	45,586.64	44,803.05	43,964.61	43,067.48	42,107.55	41,080.42	39,981.40	38,805.44	37,547.17
State Tax Savings (Liability)	13,985.87	23,454.93	13,393.13	7,360.11	7,371.30	2,843.55	-1,687.88	-1,687.72	-1,691.84	-1,700.57
Total Incentive Income - Deductions	-185,812.22	-311,615.56	-177,937.28	-97,784.25	-97,933.04	-37,778.58	22,424.68	22,422.57	22,477.25	22,593.31
Total Taxable Incentive Income - Deductions	-185,812.22	-311,615.56	-177,937.28	-97,784.25	-97,933.04	-37,778.58	22,424.68	22,422.57	22,477.25	22,593.31
Income Taxes	-65,034.28	-109,065.45	-62,278.05	-34,224.49	-34,276.56	-13,222.50	7,848.64	7,847.90	7,867.04	7,907.66
Production Tax Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment Tax Credit	397,019.73									
Tax Savings (Liability)	462,054.01	109,065.45	62,278.05	34,224.49	34,276.56	13,222.50	-7,848.64	-7,847.90	-7,867.04	-7,907.66
State and Federal Tax Savings (Liability)	476,039.87	132,520.38	75,671.18	41,584.59	41,647.87	16,066.05	-9,536.52	-9,535.62	-9,558.87	-9,608.23
Total Income w/o incentives	-185,812.22	-311,615.56	-177,937.28	-97,784.25	-97,933.04	-37,778.58	22,424.68	22,422.57	22,477.25	22,593.31
Total Taxable Income	-185,812.22	-311,615.56	-177,937.28	-97,784.25	-97,933.04	-37,778.58	22,424.68	22,422.57	22,477.25	22,593.31
Income Taxes	-65,034.28	-109,065.45	-62,278.05	-34,224.49	-34,276.56	-13,222.50	7,848.64	7,847.90	7,867.04	7,907.66
After Tax Net Equity Cash Flow	-661,699.55	490,757.82	146,220.30	88,341.77	53,211.31	52,217.46	25,564.31	-1,124.31	-2,224.71	-3,365.13
Pre-tax Debt Coverage Ratio	1.26	1.24	1.22	1.20	1.19	1.17	1.15	1.13	1.11	1.09

5 kW Wind Turbine (IPL Owned)

Values from SAM input pages (ok to change values in white cells)		
Financing		
Analysis Parameters		
Analysis Period	25	
Inflation Rate	3.00%	
Real Discount Rate	2.00%	
Tax and Insurance Rates		
Federal Tax	0.00%	
State Tax	0.00%	
Insurance	0.50%	
Salvage Value		
Net Salvage Value	0.00%	
End of Analysis Period Value	\$0.00	
Property Tax		
Assessed Percent	100.00%	
Assessed Value	\$26,250.00	
Assessed Value Decline	0.00%	
Property Tax	0.00%	
Loan Parameters		
Amount	\$26,250.00	
Loan (Debt) Percent	100.00%	
Term	25	
Rate	5.06%	
System Costs		
Total Installed Cost		\$26,250.00
Operation and Maintenance		
Fixed O&M (\$/kW-yr)		\$0.00
Fixed O&M Real Esc.		0%
Variable O&M (\$/MWh)		\$10.00
Variable O&M Real Esc.		0%
Fuel Cost (\$/MMBtu)		\$0.00
Fuel Cost Real Esc.		0%
Biomass Feedstock Cost (\$/dt)		\$0.00
Biomass Feedstock Real Esc.		0%
Coal Feedstock Cost (\$/dt)		\$0.00
Coal Feedstock Real Esc.		0%
Fixed (Annual) O&M (\$/yr)		\$0.00
Fixed (Annual) O&M Real Esc.		0%
System and Annual Performance		
Availability (year 1)		100.00%
Degradation (%/year)		0.00%
System Size (kW)		5
Heat Rate (MMBtu/MWh)		0
First Year Annual Output (kWh)		6380.31
First Year Biomass Feedstock Usage (dt)		0
First Year Biomass Feedstock Usage (dt)		0
First Year Coal Feedstock Usage (dt)		0

Intermediate Values	
Effective Tax Rate	0.00%
Credit Basis - Fed	\$26,250.00
Credit Basis - State	\$26,250.00
Depreciation Basis - Fed	\$26,250.00
Depreciation Basis - State	\$26,250.00
Nominal Discount Rate	5.06%
First Costs	\$0.00
Adjusted Installed Costs	\$26,250.00
NPV(Nominal,Costflow)	(\$29,947.19)
NPV(Nominal,Output)	89,385.45
NPV(Real,Output)	124,565.70
Results LCOE (¢/kWh)	
Real	24.04
Nominal	33.50
Real w/o Incentives	24.04
Nominal w/o incentives	33.50
Results Payback (years)	
Incentives	25.00
No Incentives	25.00
Results NPV (nominal dollars)	
NPV	(\$14,829.99)



Values from tax and cash incentives input pages (ok to change values in white cells)				Escalation		Income tax and depreciation implications (x = yes, blank = no)				
First Year Amount	Type	Value	Limits			Taxable?	State	Reduces Depreciation basis?		
						Federal		Federal	State	
	IBI, Federal	0	\$			x				
	IBI, State	0	\$			x				
	IBI, Utility	0	\$			x				
	IBI, Other	0	\$			x				
				Maximum						
\$0.00	IBI, Federal	0	%	1.00E+99	\$	x			x	
\$0.00	IBI, State	0	%	1.00E+99	\$	x			x	
\$0.00	IBI, Utility	0	%	1.00E+99	\$	x			x	
\$0.00	IBI, Other	0	%	1.00E+99	\$	x			x	
				Maximum						
\$0.00	CBI, Federal	0	\$/W	1.00E+99	\$	x			x	
\$0.00	CBI, State	0	\$/W	1.00E+99	\$	x			x	
\$0.00	CBI, Utility	0	\$/W	1.00E+99	\$	x			x	
\$0.00	CBI, Other	0	\$/W	1.00E+99	\$	x			x	
				Maximum						
	ITC, Federal	0	\$							x
	ITC, State	0	\$							x
\$0.00	ITC, Federal	0	%	1.00E+99	\$					x
\$0.00	ITC, State	0	%	1.00E+99	\$					x
				Term						
	PTC, Federal	0	\$/kwh	10	years					
	PTC, State	0	\$/kwh	10	years					
				Term						
	PBI, Federal	0	\$/kwh	0	years				x	
	PBI, State	0	\$/kwh	0	years				x	
	PBI, Utility	0	\$/kwh	0	years				x	
	PBI, Other	0	\$/kwh	0	years				x	

Color key: Value that appears in the SAM cash flow
 Intermediate values that do not appear in the cash flow that SAM uses internally for calculations.
 Note that does not appear in the SAM cash flow

Base Case Cash Flow

Year	0	1	2	3	4	5	6	7	8	9	10
System Output (kWh) (from SAM)		6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31
Degradation (Single Input)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Degradation (Schedule)											
Degradation		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Availability (Single Input)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Availability (Schedule)											
Availability		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Energy (kWh)		6380.31	6380.31	6380.31	6380.31	6380.31	6380.31	6380.31	6380.31	6380.31	6380.31
Energy Value (\$)	0	797.54	821.47	846.11	871.49	897.64	924.57	952.30	980.87	1,010.30	1,040.61

Note. SAM Calculates "Energy Value" for each hour using the inputs from the Utility Rates page. This spreadsheet does not display hourly data, so the hourly energy values are omitted here.

Operating Expenses

Fixed O & M Annual (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M Annual (Schedule)											
Fixed O & M Annual		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M (Schedule)											
Fixed O & M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Variable O&M (Escalated)		63.80	65.72	67.69	69.72	71.81	73.97	76.18	78.47	80.82	83.25
Variable O&M (Schedule)											
Variable O&M		63.80	65.72	67.69	69.72	71.81	73.97	76.18	78.47	80.82	83.25
Fuel O & M (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel O & M (Schedule)											
Fuel O & M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biomass Feedstock		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coal Feedstock		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insurance		131.25	135.19	139.24	143.42	147.72	152.15	156.72	161.42	166.26	171.25
Property Assesed Value		26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00
Property Taxes		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Net Salvage Value		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Operating Costs		195.05	200.90	206.93	213.14	219.53	226.12	232.90	239.89	247.09	254.50

Deductible Expenses		-195.05	-200.90	-206.93	-213.14	-219.53	-226.12	-232.90	-239.89	-247.09	-254.50
Cash Available Before Debt		-195.05	-200.90	-206.93	-213.14	-219.53	-226.12	-232.90	-239.89	-247.09	-254.50
Debt Interest Payment		1,328.25	1,300.65	1,271.65	1,241.19	1,209.18	1,175.56	1,140.23	1,103.11	1,064.12	1,023.16
Debt Repayment		545.47	573.07	602.07	632.53	664.54	698.16	733.49	770.60	809.60	850.56
Total Debt Payment		1,873.72	1,873.72	1,873.72	1,873.72	1,873.72	1,873.72	1,873.72	1,873.72	1,873.72	1,873.72

Tax Effect on Equity (State)

Deductible Expenses		-195.05	-200.90	-206.93	-213.14	-219.53	-226.12	-232.90	-239.89	-247.09	-254.50
Investment Based Incentives (IBI)		0.00									
Federal IBI		0.00									
State IBI		0.00									
Utility IBI		0.00									
Other IBI		0.00									
Capacity Based Incentives (CBI)		0.00									
Federal CBI		0.00									
State CBI		0.00									
Utility CBI		0.00									
Other CBI		0.00									
Performance Based Incentives (PBI)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Federal PBI		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
State PBI		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Utility PBI		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other PBI		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation Schedule (%)		0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Depreciation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Interest Payment		1,328.25	1,300.65	1,271.65	1,241.19	1,209.18	1,175.56	1,140.23	1,103.11	1,064.12	1,023.16
Total Incentive Income - Deductions		-1,523.30	-1,501.55	-1,478.58	-1,454.33	-1,428.72	-1,401.68	-1,373.13	-1,343.01	-1,311.21	-1,277.66
Total Taxable Incentive Income - Deductions		-1,523.30	-1,501.55	-1,478.58	-1,454.33	-1,428.72	-1,401.68	-1,373.13	-1,343.01	-1,311.21	-1,277.66
Income Taxes		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Production Tax Credit		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment Tax Credit		0.00									
Tax Savings (Liability)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Tax Effect on Equity (Federal)

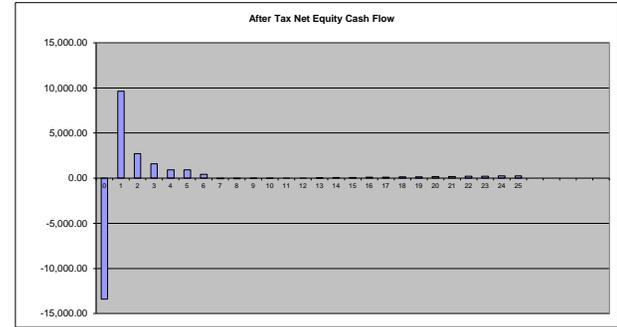
5 kW Wind Turbine (PPA Structure)

Values from SAM input pages (ok to change values in white cells)			
Financing		System Costs	
Analysis Parameters		Construction Interest	\$525.00
Analysis Period	25	Installed Cost	\$26,250.00
Inflation Rate	3.00%	Total Installed Cost	\$26,775.00
Real Discount Rate	2.00%	Operation and Maintenance	
Tax and Insurance Rates		Fixed O&M (\$/kW-yr)	\$0.00
Federal Tax	35.00%	Fixed O&M Real Esc.	0%
State Tax	7.00%	Variable O&M (\$/MWh)	\$10.00
Insurance	0.50%	Variable O&M Real Esc.	0%
Salvage Value		Fuel Cost (\$/MMBtu)	\$0.00
Net Salvage Value	0.00%	Fuel Cost Real Esc.	0%
End of Analysis Period Value	\$0.00	Biomass Feedstock Cost (\$/dt)	\$0.00
Property Tax		Biomass Feedstock Real Esc.	0%
Assessed Percent	100.00%	Coal Feedstock Cost (\$/dt)	\$0.00
Assessed Value	\$26,250.00	Coal Feedstock Real Esc.	0%
Assessed Value Decline	0.00%	Fixed (Annual) O&M (\$/yr)	\$0.00
PropertyTax	1.00%	Fixed (Annual) O&M Real Esc.	0%
Loan Parameters		System and Annual Performance	
Amount	\$13,387.50	Availability (year 1)	100.00%
Loan (Debt) Percent	50.00%	Degradation (%/year)	0.00%
Term	25	System Size (KW)	5
Rate	7.00%	Heat Rate (MMBtus/MWh)	0
Power Purchase Agreement		First Year Annual Output (kWh)	6380.31
PPA Escalation	3.00%	First Year Fuel Usage (kWh)	0
		First Year Biomass Feedstock Usage (dt)	0
		First Year Coal Feedstock Usage (dt)	0

Intermediate Values	
Effective Tax Rate	39.55%
Credit Basis - Fed	\$26,775.00
Credit Basis - State	\$26,775.00
Depreciation Basis - Fed	\$22,758.75
Depreciation Basis - State	\$22,758.75
Nominal Discount Rate	5.06%
First Costs	\$13,387.50
Adjusted Installed Costs	\$26,775.00
NPV(Nominal_Costflow)	\$27,522.93
NPV(Nominal_Output)	89,385.45
NPV(Real_Output)	124,565.70

Constraints	
Internal Rate of Return	11.93%
Minimum DSCR	0.86
Minimum Cash Flow Value	(\$73.36)

Results LCOE (¢/kWh)	
Real LCOE	22.10
Nominal LCOE	30.79
First Year PPA	22.76
Net Present Value	\$2,036.27



Values from tax and cash incentives input pages (ok to change values in white cells)				Income tax and depreciation implications (x = yes, blank = no)				
First Year Amount	Type	Value	Limits	Escalation	Taxable?	Reduces Depreciation basis?		
					Federal	State	Federal	State
	IBI, Federal	0	\$		x	x		
	IBI, State	0	\$		x	x		
	IBI, Utility	0	\$		x	x		
	IBI, Other	0	\$		x	x		
			Maximum					
\$0.00	IBI, Federal	0	%	1.00E+99	\$	x	x	
\$0.00	IBI, State	0	%	1.00E+99	\$	x	x	
\$0.00	IBI, Utility	0	%	1.00E+99	\$	x	x	
\$0.00	IBI, Other	0	%	1.00E+99	\$	x	x	
			Maximum					
\$0.00	CBI, Federal	0	\$/W	1.00E+99	\$	x	x	
\$0.00	CBI, State	0	\$/W	1.00E+99	\$	x	x	
\$0.00	CBI, Utility	0	\$/W	1.00E+99	\$	x	x	
\$0.00	CBI, Other	0	\$/W	1.00E+99	\$	x	x	
	ITC, Federal	0	\$				x	x
	ITC, State	0	\$					
\$8,032.50	ITC, Federal	30	%	1.00E+99	\$		x	x
\$0.00	ITC, State	0	%	1.00E+99	\$			
			Term	Escal.				
	PTC, Federal	0	\$/kwh	10	years	2.5		
	PTC, State	0	\$/kwh	10	years	2.5		
			Term					
	PBI, Federal	0	\$/kwh	0	years	0	x	x
	PBI, State	0	\$/kwh	0	years	0	x	x
	PBI, Utility	0	\$/kwh	0	years	0	x	x
	PBI, Other	0	\$/kwh	0	years	0	x	x

Color key: Value that appears in the SAM cash flow
 Intermediate values that do not appear in the cash flow that SAM uses internally for calculations.
 Note that does not appear in the SAM cash flow

Base Case Cash Flow

Year	0	1	2	3	4	5	6	7	8	9	10
System Output (kWh) (from SAM)		6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31	6,380.31
Degradation (Single Input)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Degradation (Schedule)											
Degradation		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Availability (Single Input)		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Availability (Schedule)											
Availability		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Energy (kWh)		6380.31	6380.31	6380.31	6380.31	6380.31	6380.31	6380.31	6380.31	6380.31	6380.31
Energy Price (\$/kWh)		0.23	0.23	0.24	0.25	0.26	0.26	0.27	0.28	0.29	0.30
Energy Value (\$)	0	1,452.03	1,495.59	1,540.46	1,586.67	1,634.27	1,683.30	1,733.80	1,785.81	1,839.39	1,894.57
Note. SAM Calculates "Energy Value" for each hour using the inputs from the Time of Delivery Factors page. This spreadsheet does not display hourly data, so the hourly energy values are omitted here.											

Operating Expenses

Fixed O & M Annual (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M Annual (Schedule)											
Fixed O & M Annual		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fixed O & M (Schedule)											
Fixed O & M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Variable O&M (Escalated)		63.80	65.72	67.69	69.72	71.81	73.97	76.18	78.47	80.82	83.25
Variable O&M (Schedule)											
Variable O&M		63.80	65.72	67.69	69.72	71.81	73.97	76.18	78.47	80.82	83.25
Fuel O & M (Escalated)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Fuel O & M (Schedule)											
Fuel O & M		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Biomass Feedstock		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coal Feedstock		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Insurance	133.88	137.89	142.03	146.29	150.68	155.20	159.85	164.65	169.59	174.68	
Property Assesed Value	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	26,250.00	
Property Taxes	262.50	262.50	262.50	262.50	262.50	262.50	262.50	262.50	262.50	262.50	
Net Salvage Value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Operating Costs	460.18	466.11	472.22	478.51	484.99	491.66	498.54	505.62	512.91	520.43	
Operating Income	991.85	1,029.48	1,068.24	1,108.16	1,149.28	1,191.64	1,235.26	1,280.19	1,326.48	1,374.14	
Cash Available Before Debt	991.85	1,029.48	1,068.24	1,108.16	1,149.28	1,191.64	1,235.26	1,280.19	1,326.48	1,374.14	
Debt Interest Payment	937.13	922.31	906.45	889.49	871.34	851.92	831.14	808.90	785.11	759.65	
Debt Repayment	211.66	226.48	242.33	259.30	277.45	296.87	317.65	339.89	363.68	389.13	
Total Debt Payment	1,148.79	1,148.79	1,148.79	1,148.79	1,148.79	1,148.79	1,148.79	1,148.79	1,148.79	1,148.79	

Tax Effect on Equity (State)

Deductible Expenses	991.85	1,029.48	1,068.24	1,108.16	1,149.28	1,191.64	1,235.26	1,280.19	1,326.48	1,374.14
Investment Based Incentives (IBI)	0.00									
Federal IBI	0.00									
State IBI	0.00									
Utility IBI	0.00									
Other IBI	0.00									
Capacity Based Incentives (CBI)	0.00									
Federal CBI	0.00									
State CBI	0.00									
Utility CBI	0.00									
Other CBI	0.00									
Performance Based Incentives (PBI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Federal PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
State PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Utility PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation Schedule (%)	20.00%	32.00%	19.20%	11.52%	11.52%	5.76%	0.00%	0.00%	0.00%	0.00%
Depreciation	4,551.75	7,282.80	4,369.68	2,621.81	2,621.81	1,310.90	0.00	0.00	0.00	0.00
Interest Payment	937.13	922.31	906.45	889.49	871.34	851.92	831.14	808.90	785.11	759.65
Total Incentive Income - Deductions	-4,497.02	-7,175.63	-4,207.89	-2,403.14	-2,343.87	-971.19	404.12	471.29	541.37	614.49
Total Taxable Incentive Income - Deductions	-4,497.02	-7,175.63	-4,207.89	-2,403.14	-2,343.87	-971.19	404.12	471.29	541.37	614.49
Income Taxes	-314.79	-502.29	-294.55	-168.22	-164.07	-67.98	28.29	32.99	37.90	43.01
Production Tax Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment Tax Credit	0.00									
Tax Savings (Liability)	314.79	502.29	294.55	168.22	164.07	67.98	-28.29	-32.99	-37.90	-43.01

Total Income w/o incentives	-4,497.02	-7,175.63	-4,207.89	-2,403.14	-2,343.87	-971.19	404.12	471.29	541.37	614.49
Total Taxable Income	-4,497.02	-7,175.63	-4,207.89	-2,403.14	-2,343.87	-971.19	404.12	471.29	541.37	614.49
Income Taxes	-314.79	-502.29	-294.55	-168.22	-164.07	-67.98	28.29	32.99	37.90	43.01

Tax Effect on Equity (Federal)

Deductible Expenses	991.85	1,029.48	1,068.24	1,108.16	1,149.28	1,191.64	1,235.26	1,280.19	1,326.48	1,374.14
Investment Based Incentives (IBI)	0.00									
Federal IBI	0.00									
State IBI	0.00									
Utility IBI	0.00									
Other IBI	0.00									
Capacity Based Incentives (CBI)	0.00									
Federal CBI	0.00									
State CBI	0.00									
Utility CBI	0.00									
Other CBI	0.00									
Performance Based Incentives (PBI)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Federal PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
State PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Utility PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Other PBI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Depreciation Schedule (%)	0.20	0.32	0.19	0.12	0.12	0.06	0.00	0.00	0.00	0.00
Depreciation	455175.00%	728280.00%	436968.00%	262180.80%	262180.80%	131090.40%	0.00%	0.00%	0.00%	0.00%
Interest Payment	937.13	922.31	906.45	889.49	871.34	851.92	831.14	808.90	785.11	759.65
State Tax Savings (Liability)	314.79	502.29	294.55	168.22	164.07	67.98	-28.29	-32.99	-37.90	-43.01
Total Incentive Income - Deductions	-4,182.23	-6,673.33	-3,913.34	-2,234.92	-2,179.80	-903.20	375.83	438.30	503.47	571.48
Total Taxable Incentive Income - Deductions	-4,182.23	-6,673.33	-3,913.34	-2,234.92	-2,179.80	-903.20	375.83	438.30	503.47	571.48
Income Taxes	-1,463.78	-2,335.67	-1,369.67	-782.22	-762.93	-316.12	131.54	153.40	176.21	200.02
Production Tax Credit	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Investment Tax Credit	8,032.50									
Tax Savings (Liability)	9,496.28	2,335.67	1,369.67	782.22	762.93	316.12	-131.54	-153.40	-176.21	-200.02
State and Federal Tax Savings (Liability)	9,811.07	2,837.96	1,664.22	950.44	927.00	384.10	-159.83	-186.39	-214.11	-243.03

Total Income w/o incentives	-4,182.23	-6,673.33	-3,913.34	-2,234.92	-2,179.80	-903.20	375.83	438.30	503.47	571.48
Total Taxable Income	-4,182.23	-6,673.33	-3,913.34	-2,234.92	-2,179.80	-903.20	375.83	438.30	503.47	571.48
Income Taxes	-1,463.78	-2,335.67	-1,369.67	-782.22	-762.93	-316.12	131.54	153.40	176.21	200.02

After Tax Net Equity Cash Flow	-13,387.50	9,654.14	2,718.65	1,583.68	909.81	927.49	426.95	-73.36	-54.99	-36.42	-17.67
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Pre-tax Debt Coverage Ratio	0.86	0.90	0.93	0.96	1.00	1.04	1.08	1.11	1.15	1.20
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Heating - GSHP

Load	MMBtu		60
COP / Efficiency			4
Energy	MMBtu		15
Energy	kWh		4,395
Energy Cost	\$/kWh	\$	0.13
Energy Cost	\$	\$	549

Heating - PACKAGED GAS FURNACE UNIT

Load	MMBtu		60
COP / Efficiency			0.9
Energy	MMBtu		67
Energy	kWh		19,533
Energy Cost	\$/MMBtu	\$	7.00
Energy Cost	\$	\$	467

Cooling - GSHP

Load	MMBtu		60
COP / Efficiency			4
Energy	MMBtu		15
Energy	kWh		4,395
Energy Cost	\$/kWh	\$	0.13
Energy Cost	\$	\$	549

Cooling - PACKAGE DX AC UNIT

Load	MMBtu		60
COP / Efficiency			1.16
Energy	MMBtu		52
Energy	kWh		15,155
Energy Cost	\$/kWh	\$	0.13
Energy Cost	\$	\$	1,894

Total Annual Cost \$ **1,099**\$ **2,361****Summary**

Incremental Cost Above Gas		
Furnace/Split DX AC	\$	30,000.00
Annual Savings (Year 1)	\$	1,262
Inflation Factor Assumed		3%
Discount Factor		5%
Term (years)		25
Payback (years)		18.2
NPV		(\$5,781)

ATTACHMENT F: BUILDING EVALUATION MODEL

Attachment F: Building Evaluation Model

	Category	Rooftop	Land	Shading	Solar Facing	Electric Consumption	Age of HVAC	
	Weight	20%	15%	20%	15%	15%	15%	100%
	No.	5=Available Space Greater than 10,000 square feet 3=Available Space between 5,000 and 10,000 square feet 1=Available Space less than 5,000 square feet	5=Surrounding land greater than 1 acre 3=Surrounding land between 0.5 and 1 acre 1=Surrounding land less than 0.5 acres	5=Low shading potential 3=moderate shading potential 1=High shading potential	5=Directly South Facing 1=Diagonal South Facing	5=Monthly average greater than \$3,000 3=Monthly average between \$1,000 and \$3,000 1=Monthly average less than \$1,000	5=Age of HVAC greater than 15 years 3=Age of HVAC between 10 and 15 years 1=Age of HVAC less than 10 years	
Adventure Oasis	1	1	5	5	3	5	1	3.3
City Hall	2	5	1	5	5	5	3	4.1
Fire Station 1	3	5	1	5	5	5	1	3.8
Fire Station 2	4	1	1	1	1	3	1	1.3
Fire Station 3	5	1	1	3	1	3	1	1.7
Fire Station 4	6	1	1	1	1	3	1	1.3
Fire Station 5	7	1	1	1	5	3	5	2.5
Fire Station 6	8	1	1	1	1	1	1	1
Fire Station 7	9	5	3	1	5	5	1	3.3
Fire Station 8	10	1	1	1	5	1	1	1.6
Fire Station 9	11	1	1	1	1	1	1	1
Fire Station 10	12	1	1	1	1	1	1	1
George Owens Park	13	1	3	1	1	3	1	1.6
Health Department	14	5	3	5	5	3	1	3.8
National Frontier Trail Museum	15	5	3	1	3	3	1	2.7
Palmer Center	16	1	1	5	5	1	1	2.4
Park Maint. Facility	17	5	5	3	1	3	1	3.1
Police Building	18	1	5	3	1	5	3	2.9
Independence Event Ctr.	19	5	5	5	5	1	1	3.8
Police Traffic Safety	20	1	1	1	5	1	1	1.6
Public Works Maint (note: there are 4 buildings at this location)	21	5	1	5	5	3	1	3.5
Sermon Center	22	3	1	1	5	5	3	2.9
Truman Memorial Building	23	5	1	5	5	5	3	4.1
Water Department	24	3	1	5	5	3	1	3.1
Water Pollution Control/Rock Creek	25	5	5	5	5	5	1	4.4
Water Pollution Control Maint	26	5	1	5	5	3	1	3.5
Woodlawn Cemetery	27	1	1	1	1	1	1	1
IPL Service Center	28	5	5	5	5	1	1	3.8
IPL Plant	29	1	5	5	5	1	1	3



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