BEFORE THE MISSOURI PUBLIC SERVICE COMMISSION

In the Matter of a Proposed Rulemaking)
Regarding Electric Utility Renewable) Case No. EX-2010-0169
Energy Standard Requirements)

Date: Monday, April 05, 201

COMMENTS OF THE MISSOURI SOLAR ENERGY INDUSTRIES ASSOCIATION (MOSEIA)

MOSEIA is comprised of the following members:

Aaron Cromwell
Cromwell Environmental
825 Vermont Lawrence, KS
785-749-6020

Aur Beck
Advanced Energy Solutions
Pomona, IL
618-893-1717

Barry Dicker
Decent Energy, Inc.
Kansas City. MO
800-358-5790 ext 521

Bill Loesch
Solar 1 - Saint Louis Solar
9905 Vasel DR. St. Louis, MO
63123
314-631-1094

Bob Solger
The Energy Savings Store
Two locations:146 W. Lockwood
Ave. Webster Groves, MO 63119
636-699-9540 STL 913-495-9434
KC

Charles Welegala
Heartland Alternative Energy
17631 Lisa Valley
314-616-3691

Dane Glueck
Straight Up Solar
9666 Olive Blvd. Suite#625 St.
Louis, MO 63132
314-991-4254

Frank Kraemer
Frank Kraemer Electric
3955 Wedde Rd, Barnhart, MO
63012
314-574-6535

Gil Werner
Tech Power Systems
2520 Holmes Street, KC MO
816-931-3009

Henry Rnetz
Missouri Valley Renewable Energy
2378 Berkemeyer Road Hermann,
MO 65041
573-486-5709

Jeff Lewis
Mid America Solar
5029 Countryside Drive, Imperial,
MO 63052
(314) 602-1595

Jenifer Elam
US Solar Distributing
1644 main Ave. acramento, CA
95838
843-290-9046

Jerry Boer
The Sound Room
11641 Olive Blvd
St. Louis, MO 63141
636-537-0999

Kevin Good
Good Energy Solutions
520 West 103rd Street Box 264
Kansas City, MO 64114
816 841-4981

PJ Wilson
Renew Missouri
708 Clayton, Columbia MO 65203
417-459-7468

Nathan Jones
Power Source Solar
615 W Walnut Sprinfield, MO
65806
417- 833-4274

Patrick Gerring
Mid-America Renewable Energy
Solutions
914 NW 1971 Road Lone Jack, MO
64070
816-524-5616

Paul Roberts
Amerigy
713 S. Farm Rd. 197, Springfield,
MO 65809
417-429-1678

Rick Hunter
Microgrid Energy
314-657-0955

Vaughn Prost
Missouri Solar Applications LLC.
P.O. Box 1727 Jefferson City, MO
65102
573-659-8657

Zeke Fairbank
Alternative Energy Company
2733 East Battlefield Rd, #246
Springfield, MO 65804
417-520-0624 877-258-7664

Comments on the Renewable Energy Standard (RES)

The Missouri Solar Energy Industries Association (MOSEIA) is comprised of twenty-two businesses around the state who are directly involved in the solar industry. Most are small to medium-sized businesses, and all are locally owned.

The current draft rules require only a few additional changes to ensure that the RES actually results in orderly growth of solar in Missouri. These important changes are summarized below, and detailed throughout the rest of this document.

MOSEIA'S RECOMMENDATIONS FOR PROPOSED RULES OF RES

	CONCEPT	SECTION	DETAIL
	Important to Change		
1	Market Segmentation		Solar economics is very different on a small, medium, and large scale. Adjusting incentives to appropriately incentivize all three sizes of solar markets is crucial for the orderly growth of solar in Missouri.
2	Establishing a predictable value for SRECs		The rules are silent on how a value for SRECs should be determined. Without guidance from the PSC, the small and medium-scale solar markets will suffer from SREC prices that are unpredictable.
3	Retail Rate Impact	5	The Renewable Energy Standard statute is silent on the time period for the 1% rate impact. It's crucial that the utilities be able to average this rate impact over a long time period – we suggest averaging over 20 years.
4	Geographic Sourcing	2(A)	With a 1.25 multiplier and a 2% carve-out, it's clear that the RES intends for solar to come from Missouri. Solar should come from within or very close to the borders of Missouri.
5	Standard Offer Contract (SOC)	4(H)	Needs to be modified to ensure up-front payments actually occur up-front, term of contract is 10 years, and option is given to customer to take SREC payments up-front or over time.
6	Customer-Generator Definition	1(D)	Currently could be interpreted as preventing any third-party ownership or lease agreements; this would also prevent PPA's (power-purchase agreements).
7	Empire Exemption	9	Exemption for Empire Electric Co is not grounded. Legally, Prop C passed more recently in time and requires ALL investor-owned utilities to participate in all elements of Prop C.
8	Estimating production for small systems	4(H)	Draft language (unintentionally, we believe) could be interpreted as requiring metering for small systems when estimation is actually intended
9	Definition of "Full Operation"	4(K)	Language could be misinterpreted; clarifying with "substantial production" is called for.
10	Minimum 500W Requirement	4 (para 1)	Remove minimum system size. Current technology makes installations of systems under 500W viable.
11	Grandfather systems for Standard Offer Contract	4(H)	Systems interconnected after December 31st 2009 and before these rules are implemented shall be offered a Standard-Offer Contract for electricity produced from the time the system came online, at the same price as is offered upon enactment of these rules.

	Important to Keep As-Is:		
1	Rebate applies to new or expanded systems, up to 25kW	4(D)	Important to keep this language as-is so it's clear that if a rebate-eligible customer installs a 5kW system and later wants to expand, the rebate still applies, up to 25kW.
2	AC/DC	4 (para 1)	The RES calls explicitly for a rebate based on installed capacity - "installed watts", not on generation. Solar panel capacity is measured in DC watts.
3	Requirement for use of new equipment with manufacturer warranties	4(D)	New equipment is assumed in incentive valuation, and allowing used equipment to qualify for utility incentives could encourage shoddy business practices and gaming of the system

BACKGROUND

MOSEIA's mission is to strengthen and expand the solar industry and establish a sustainable energy future for all Missourians. The solar industry is steadily growing and is prepared for significant expansion in Missouri. We strongly believe in the need for clear and fair implementation of Proposition C to create sustainable jobs for Missourians and a cleaner future for the next generations.

We greatly appreciate the Commission's work to implement Proposition C. Our comments and recommendations are outlined below and reflect commendable portions of the current rules and areas that we believe would benefit from changes and / or clarification.

Changes 1 & 2 - Establishing the value of SRECs - Sections (2, 4, 8), & Market Segmentation

With no change in the draft rules, the only requirement is that 2% of each renewable energy goal come from solar electricity. The amount of solar development at the small (net metered systems under 25kW), medium (net metered systems larger than 25kW), and large scales (systems larger than net metering allows for) is not addressed – there is no current market segmentation.

Without market segmentation, the amount of development in each of the solar markets would be unpredictable and difficult to affect by the PSC in future. Smooth development requires solar to grow orderly in all three markets, and if this doesn't happen, the PSC will have no way to influence this in the future.

We recognize the challenges to determining an appropriate price for SRECs in a developing solar market. We also recognize the value of determining an SREC price as soon as possible so that implementation of the RES happens in a timely fashion.

We therefore recommend that the Commission establish an initial SREC price using the criteria outlined here, set an initial fixed price for SRECs from net-metered systems, and then revisit the SREC valuation on an annual basis with input from stakeholders. Because of the fact that utilities are already expected to comply with the RES, but are without rules, we suggest using the criteria below to determine initial SREC values, to be published in these rules.

FREQUENCY & METHOD OF SREC DETERMINATION

We recommend that the SREC value be set by the PSC on an annual basis, published by **September 30** of each year starting with 2011, and going into effect on January 1st

of each calendar year. The PSC should hold a workshop within the 30 days leading up to Sep 30, leaving adequate time for stakeholder input from local installers, utilities, Office of Public Council, the public, and others. As the Missouri solar market matures, the SREC value is expected to be adjusted to ensure growth across the three sectors is orderly and meets the RES standard.

INTENT OF SOLAR PROVISIONS

Proposition C is clearly intended to result in more renewable electricity in Missouri than would have otherwise happened without its passage. Also included in this intent is a specific desire to ensure the significant expansion of smaller scale, distributed-generation solar technology in Missouri.

This is evidenced by the 1.25 multiplier for all in-state renewable generation, the 2% carve-out for solar specifically, and the inclusion of minimum rebates only for the first 25kW of system capacities of 100kW or less. Therefore, it is appropriate for the implementation of Prop-C at the regulatory level to include strong incentives for net-metered systems.

Furthermore, development of small-scale solar means more small, visible systems will appear on rooftops around the state, which is very important for the broad adoption of solar generation. To that end, we urge the commission to encourage development of net metering eligible systems (currently 100kW and less – market segmentation should be revisited during annual workshop if net metering law changes in the future) in creating and implementing Proposition C rules and regulations.

We recognize that an SREC price should promote not only solar energy, but also steady economic and job growth. The established SREC price should also be objective, predictable, and appropriate for Missouri.

SREC METHODOLOGY

We recommend considering the following factors when calculating an appropriate annual SREC value for Missouri:

1. Recognize that the purpose of solar incentives is to accelerate the solar market faster than would have happened without the incentives.
2. Acknowledge the overarching goal of fostering the orderly growth of the solar industry in Missouri.
3. Base the forecasted growth of solar markets on the reasonable assumption that the majority of Missourians will begin to consider putting up solar projects when the payback (time at which their financial return equals their initial financial investment) is as close as possible to:
    a. For residential systems, 8-10 years
    b. For commercial systems, 2-5 years
4. Set the initial SREC price high enough so that it is expected to decline with time, rather than go up, creating a smooth market implementation and avoiding as much as possible lumpy investment, stop-start markets, or market freezes.

In determining reasonable payback periods, include the following factors:

ASSUMPTIONS	VALUE	COMMENT	SOURCE
Power Output	1,330	kWh produced per kW of capacity	See ATTACHMENT 7
Rebate Rate	$2.00	per Watt DC	Statutory minimum
Electric Cost - Residential[1]	$0.065	$/KWh	Ameren Rate Tariff (ATTACHMENT 6)
Electric Cost – Commercial[1]	$0.055	$/KWh	Ameren Rate Tariff (ATTACHMENT 6)
Annual Electric Rate Increase	5%	per year	Energy Information Administration (ATTACHMENT 5)
System cost per watt	$6.75	per rated DC Watt	Public Bid and Installer Survey Table 3
Inverter replacement Cost	$0.30 - $0.50	per W	Published retail prices (ATTACHMENT 8)
Degradation of System Output	1.0%	per year	Manufacturer warranties (ATTACHMENT 9) NREL system modeling (PV Watts)
Insurance - Commercial	$0.35	dollars per hundred coverage	Current Quotes
Insurance - Residential	$0.30	dollars per hundred coverage	Current Quotes
Sales Tax Rate	--	Included in System Cost Above	State and local sales and use tax regulations
Property Tax Rate	--	Property tax apparently not assessed at this time	Local tax regulations

These rates will not match published average rates because solar generations offsets energy from the upper tiers first. These upper tiers are at rates substantially lower than the average. Savings at published average rates only occurs when a customer's entire bill is offset.

TABLE 1

The SREC value should be set annually at a workshop, and announced far enough in anticipation of the new calendar year for proper planning purposes, but not so far in advance as to create a market-freeze while customers wait for an incentive level to change.

The attached spreadsheet *(ATTACHMENT 1)* details calculations that consider typical installed costs and expected payback for residential and commercial applications less than 100 kW using the values listed above. Results of the payback spreadsheets are shown in the chart below.

	Large Commercial	Small Commercial	Residential	
System Size:	100	25	5	kW
Tax Rate:	41%	41%	34%	28% or 35% fed 6% state
S-REC Value	$330.00	$330.00	$330.00	$/MWh
System cost	$6.25	$6.75	$7.67	per rated DC Watt
Electric Rate Increase	5%	5%	5%	per year
Average Electric Cost	$0.055	$0.055	$0.065	$/KWh
PAYBACK:	**7.5**	**2.8**	**18.9**	Years

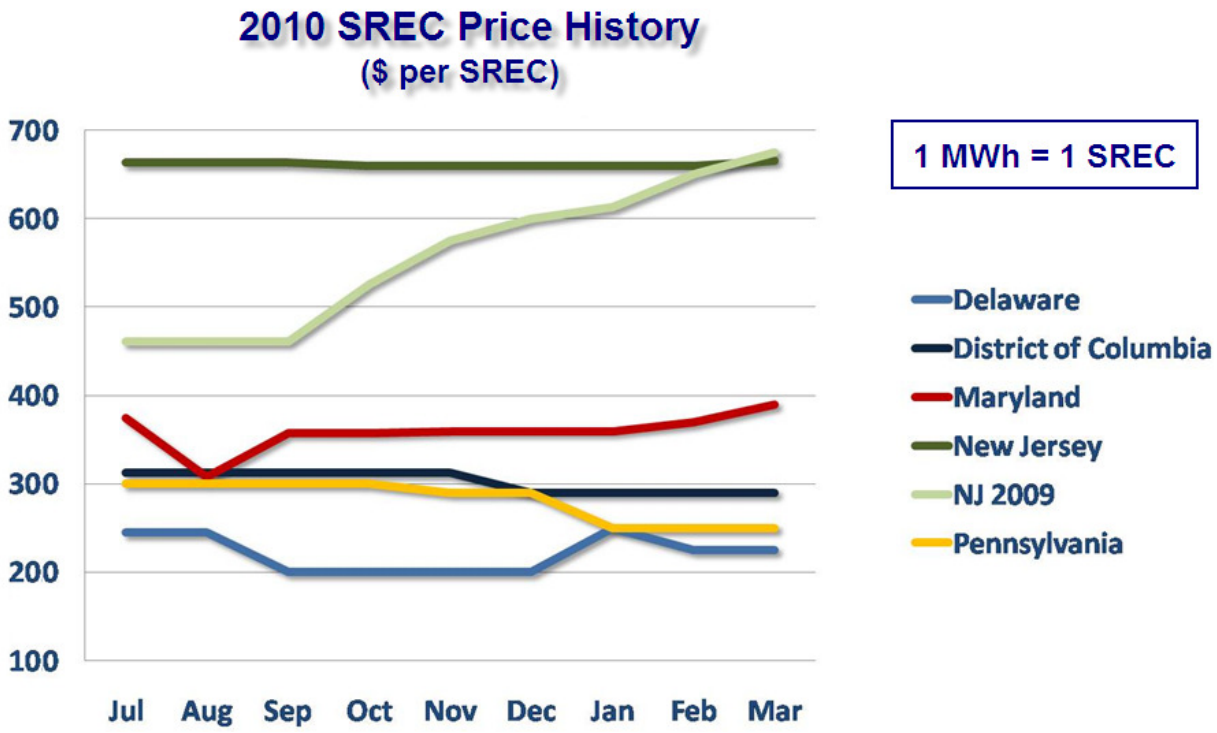
TABLE 2

PAYBACK METHOD

Commercial and residential customers are very attuned to payback periods and seem to use that much more than any other investment evaluation method. Therefore, a target payback period is most likely to be a suitable basis for determining an SREC value that will motivate solar development.

Based on the attached financial models, we recommend that an initial SREC of $330 be published in the final Prop-C Rules and used until the Fall 2011 workshop. This value should produce projected payback periods of around 18.9 years for residential customers, 2.8 years for small commercial customers, and 7.5 years for medium commercial, as shown above. Note that these paybacks are based on each utility's providing a lump-sum payment for 10 years of SRECs on the first 25kW of capacity, as specified by the current rules.

The $330 initial figure reflects the value used in other states, as shown by the following graph.



Source: April 2010 Auction History Report
hwww.srectrade.com/auctionhistory.php

The SREC value set is not a long-term value and is expected to be adjusted annually as installed system prices, incentives, and other factors fluctuate. Note that the most effective incentive programs are designed to start with a high enough SREC value that, over time, the SREC price decreases. This incentivizes the market and minimizes the "wait and see" effect that a rising SREC price tends to produce on anyone contemplating development of solar generation.

Which brings us to the next key factor: installed cost.

MISSOURI SYSTEM COSTS FOR VARIOUS SIZES

Several well-developed solar markets exist throughout the United States. California, Arizona, New Mexico, Maryland, New Jersey, and Colorado, are a few. These states are typically over 5 years into their RES programs and the results are very encouraging.

MOSEIA recently performed an informal survey among its members and confirmed the following average system prices:

SYSTEM SIZE (kW)	MARCH 2010 INSTALLED COST ($ per DC watt)
4	$7.75
10	$7.25
16.5*	$7.2
25	$6.75
100	$6.25

* Price of a recently awarded MoDOT project, with 5% added to reflect marketing and sales overhead not typically included in government/municipal projects. (ATTACHMENT 3)

TABLE 3

KCP&L is also publishing costs in this range on their web site at http://www.kcplsave.com/residential/programs_and_services/solar_rebates/faqs.html

These are 2010 costs for initial use in the SREC valuation. Future system costs used in the payback model should be based on then-current market installed rates, determined by public bids and a survey of solar installers.

Change 3 – Retail Rate Impact – Section 5

The Renewable Energy Standard section 393.1030.2(1) specifies how the rate impact shall be determined but does not specify a time period. We recommend that the rate impact be averaged over a 20-year time horizon to match with the Integrated Rate Planning process, and allow for the best planning for the utilities.

Change 4 - Geographic Sourcing – Section (2)A

We believe the intent of Proposition C is to establish a clean energy future for Missourians that provides jobs and promotes the growth of clean energy in our state. We therefore recommend including clear language that reflects that the RECs from solar-derived electricity come from energy that is delivered and distributed directly to Missouri customers and does not allow compliance from outside of any direct Missouri distribution grid. (For example, electricity produced from anywhere on MISO or SPP's transmission grid, but hundreds of miles away from Missouri, does not meet the intent of Proposition C. See ATTACHMENT 4.) The current definition of "sold" to Missouri customers may meet the intent of our above comments. However, we feel a clearer definition of geographic sourcing for solar benefits all Missourians through the growth of Missouri's solar industry.

The electric industry draws a clear distinction between transmission and distribution lines within the delivery system, where distribution lines operate at 46kV or below. This provides a precise definition for determining if a generator is delivering energy to Missouri customers.

Therefore, we recommend defining "energy delivered to" and "energy sold to" Missouri customers as ***"energy that is generated in Missouri or fed directly into distribution lines that serve primarily Missouri customers."*** This definition has the advantage of being geographically specific and is also universally applicable to any segment of the electric grid, regardless of the utility, RTO, or ISO operating in a given area of Missouri or surrounding states.

Change 5 - Section (4) Solar Rebate – Standard Offer Contract

We commend the inclusion of the standard offer contract. The standard offer contract helps ensure the installation of residential and small commercial projects and improves the ability to meet the RES requirements. To ensure the fullest success of this key element in the Prop-C rules, we recommend the following language:

"***4(H) At the time of the rebate payment and anytime thereafter, the electric utility shall offer the customer-generator a Standard Offer Contract for the current fixed price for S-RECs associated with the first 25kW of system capacity for a period of ten (10) years, paid as a one-time lump sum, or annually at the customer's discretion. A Standard Offer Contract for SRECs associated with system capacity above 25kW shall be offered to owners of net-metering eligible systems; this Standard Offer Contract shall be for the current fixed price for a period of 10 years, paid annually or monthly, at the owner's discretion.***"

See ATTACHMENT 9 for the sequence of changes that lead to this final language.

These changes achieve the following results:

- Removes the lump-sum payment from the definition of "Standard Offer Contract."
- Ensures that the Standard Offer Contract is offered timely to all solar rebate recipients.
- Clarifies that the SREC sale price is fixed, and the contract duration is 10 years.
- Limits Standard Offer Contracts with a lump-sum option to the first 25kW of system capacity.
- Allows customers the option to spread SREC income over many years and manage their tax liability and other income-related issues. (Those on early Social Security are limited to $14,160 annual income, for example.)

- **Change 6 - Definition of Customer-generator -- Section (1)D**

We recommend the following revision to the language of Section (1)(D) 2 that allows third party ownership through a lease or power purchase agreement within the customer-generator definition. Leases and Power Purchase Agreements (PPAs) have been a very popular and successful way to provide an additional financing mechanism for projects in other states and strengthens Missouri's ability to meet the RES.

> ***Customer-generator means the owner or operator of an electric energy generation unit that meets all of the following criteria:***
>
> ***1. Is powered by a renewable energy resource;***
>
> 2. Is located on premises that are owned, operated, leased, or otherwise controlled by the party as retail account holder and which corresponds to the service address for the retail account;

- Section 4, Solar Rebates, also refers to "***customer-owned solar generating equipment***". We further recommend that the phrase "customer-owned" be removed from this paragraph to eliminate conflict with the definition of customer-generator.

Change 7 - Solar Energy Exemptions – Section (9)A

We recommend that the Commission strike Section (9) allowing a utility with 15% existing renewable generation to be exempt from developing solar resources. A law can only be amended or modified if it exists. Therefore, the later statute modifies the former. In this case, 393.1050 is nullified and Proposition C stands.

Proposition C applies to all electrical corporations under PSC jurisdiction equally, clearly stating in section 393.1030.3 "***Each electric utility*** shall make available to its retail customers a standard rebate offer…". [emphasis added]

Change 8 - Section (4) Solar Rebate – Estimated Production

Current language unintentionally requires that production metering be used on systems under 10kW if such equipment is available. To correct this, we should strike the phrase "***unless such smaller systems are equipped with monitoring technology to track actual production.***"

Change 9 - Section (4) Solar Rebate – Full Operation

Slightly modify "full operation" definition in Section (4) K to include the word "substantial" to clarify that production is based on expected output of the system after accounting for typical losses and is not only based on the absolute rating of the system. Wording to accomplish this is:

"***Full operation means ... substantial production of rated electrical generation***."

Change 10 – Section (4) – Minimum System Size

Current micro-inverter technology allows for system installation of as small as a single solar panel. While a minimum system size of 500W would have been appropriate in the past, the existence of a minimum would be unnecessarily prohibitive if it were there today, and looking forward.

Change 11 – Section 4(H) - Allow Grandfathering

Systems activated after December 31st 2009 and before these rules are implemented shall be offered a Standard-Offer Contract for electricity produced from the time the system came online, at the same price as is offered upon enactment of these rules.

We also recommend the following sections be retained as currently written without revision:

- Section (4) – AC / DC. The RES calls explicitly for a rebate based on installed capacity,"***installed watts***", not on generation. Solar panel and photovoltaic system capacity is measured in DC watts.
- Section (4) "***Solar electric systems installed by retail account holders must consist of equipment that is commercially available and factory new when installed.***"
- Section (4) "***Retail accounts which have been awarded rebates for an aggregate of less than twenty-five (25) kW shall qualify to apply for rebates for system expansions up to an aggregate of twenty-five (25) kW***" and the entire sentence thereafter.

ATTACHMENT 1 . 1

LARGE COMMERCIAL PAYBACK ASSUMPTIONS

ASSUMPTIONS		
Power Output	1,330	kWh produced per kW of capacity
Electric Rate Increase	5%	per year
Average Electric Cost	$0.055	$/KWh
System Aging	1.0%	per year
Rebate Rate	$2.00	per Watt DC
Insurance		
Commercial	$0.35	dollars per hundred coverage
Inverter Replacement Cost	$0.35	per W
Property Tax Basis - Cost	$625,000	Full system cost
Property Tax Basis - Income	$208,878	Annual Income
Property Tax Assessment - RES	19%	Residential
Property Tax Assessment - COM	32%	Commercial
Property Tax Rate	6%	
DERIVED INPUTS		
Annual Energy Produced	133,000	kWh
System cost per watt	$6.25	per rated DC Watt
System Price	$625,000	Before incentives
Annual System Aging	1,330	kWh
Inverter Replacement Cost	$35,000	
Operation Cost	$625.00	0.1% of system price
Depreciation Basis	$531,250	85% of system price is depreciable
Rebate	$50,000	
LOAN - System (10 Yrs)	N/A	
LOAN - Construction	N/A	

BASIC INPUTS

System Size:	**100**	**kW**
Tax Rate:	**41%**	**(35% fed + 6% state)**
S-REC Value ($/MWh)	**$330.00**	
Take Lump-Sum on first 25kW	☑	**YES**

ATTACHMENT 1 . 1

LARGE COMMERCIAL PAYBACK TABLE

BASIC INPUTS

System Size:	100	kW
Tax Rate:	41%	(35% fed + 6% state)
S-REC Value ($/MWh)	$330.00	
Take Lump-Sum on first 25kW	☑	YES

Large Commercial System (100 kW)

Annual S-REC Payments		2.5	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.05	0.05	
Depreciation Rate			0.2	0.32	0.192	0.115	0.115	0.058								
YEAR		0	1	2	3	4	5	6	7	8	9	10	11	12		
Unit Electric Cost	$/kWh	$0.055	$0.058	$0.061	$0.064	$0.067	$0.070	$0.074	$0.077	$0.081	$0.085	$0.090	$0.094	$0.099		
S-REC Value	$/kWh	$0.83	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.25	$0.02	$0.02		
Annual Energy Produced	kWh		133,000	131,670	130,353	129,050	127,759	126,482	125,217	123,965	122,725	121,498	120,283	119,080		
Electric Savings			$7,681	$7,984	$8,300	$8,627	$8,968	$9,322	$9,691	$10,073	$10,471	$10,885	$11,315	$11,762		
INCOME																
MO Utility Rebate		$50,000														
REC Income		$104,917	$32,918	$32,588	$32,262	$31,940	$31,620	$31,304	$30,991	$30,681	$30,374	$30,071	$1,985	$1,965		
TOTAL INCOME		**$154,917**	**$32,918**	**$32,588**	**$32,262**	**$31,940**	**$31,620**	**$31,304**	**$30,991**	**$30,681**	**$30,374**	**$30,071**	**$1,985**	**$1,965**		
EXPENSE																
Insurance		($2,188)	($2,188)	($2,188)	($2,188)	($2,188)	($2,188)	($2,188)	($2,188)	($2,188)	($2,188)	($2,188)	($2,188)	($2,188)		
Operation/Maint			($625)	($625)	($625)	($625)	($625)	($625)	($625)	($625)	($625)	($625)	($625)	($625)		
Inverter Replacement Reserves			($2,333)	($2,333)	($2,333)	($2,333)	($2,333)	($2,333)	($2,333)	($2,333)	($2,333)	($2,333)	($2,333)	($2,333)		
Property Tax1			($1,475)	($1,533)	($1,594)	($1,656)	($1,722)	($1,790)	($1,861)	($1,934)	($2,010)	($2,090)	($2,172)	($2,258)		
Depreciation		$0	($106,250)	($170,000)	($102,000)	($61,094)	($61,094)	($30,813)	$0	$0	$0	$0	$0	$0		
TOTAL EXPENSE		**($2,188)**	**($112,871)**	**($176,679)**	**($108,739)**	**($67,896)**	**($67,961)**	**($37,748)**	**($7,006)**	**($7,080)**	**($7,156)**	**($7,236)**	**($7,318)**	**($7,404)**		
NET SYSTEM INCOME		**$152,729**	**($79,953)**	**($144,090)**	**($76,477)**	**($35,956)**	**($36,341)**	**($6,444)**	**$23,985**	**$23,601**	**$23,218**	**$22,835**	**($5,334)**	**($5,439)**		
Income Tax Savings/Payment		($62,619)	$32,781	$59,077	$31,356	$14,742	$14,900	$2,642	($9,834)	($9,677)	($9,519)	($9,362)	$2,187	$2,230		
AFTER-TAX SYSTEM INCOME2		**$90,110**	**($47,172)**	**($85,013)**	**($45,121)**	**($21,214)**	**($21,441)**	**($3,802)**	**$14,151**	**$13,925**	**$13,699**	**$13,473**	**($3,147)**	**($3,209)**		
Electric Savings			$7,681	$7,984	$8,300	$8,627	$8,968	$9,322	$9,691	$10,073	$10,471	$10,885	$11,315	$11,762		
Tax on Energy Savings			($3,149)	($3,273)	($3,403)	($3,537)	($3,677)	($3,822)	($3,973)	($4,130)	($4,293)	($4,463)	($4,639)	($4,822)		
30% Federal Tax Credit			$187,500													
Add Back Depreciation			$106,250	$170,000	$102,000	$61,094	$61,094	$30,813	$0	$0	$0	$0	$0	$0		
INITIAL INVESTMENT		($525,000)														
ANNUAL CASH FLOW		($534,890)	$251,109	$89,697	$61,775	$44,970	$44,944	$32,511	$19,868	$19,868	$19,877	$19,895	$3,529	$3,730		
CUMULATIVE CASH FLOW		($534,890)	($283,780)	($194,083)	($132,308)	($87,338)	($42,394)	($9,884)	$9,985	$29,853	$49,730	$69,624	$73,153	$76,884		
PAYBACK (7.5 yrs)									7.5							

NOTES
1. This model assumes that additional property taxes are assessed on a income basis. If this is not a valid assumption any time in the future, property tax impacts shall be evaluated and included in the SREC valuation.
2. Losses are assumed to be absorbed by other company income, not carried forward as a net loss for the year.

ATTACHMENT 1 . 2

SMALL COMMERCIAL PAYBACK ASSUMPTIONS

ASSUMPTIONS		
Power Output	1,330	kWh produced per kW of capacity
Sales Tax Rate	0%	
Electric Rate Increase	$0.050	per year
Average Electric Cost	5.5%	$/KWh
System Aging	1%	per year
Rebate Rate	$2.00	per Watt DC
Insurance		
Inverter Cost	$0.40	per W
Property Tax Basis - Cost	$168,750	Full system cost
Property Tax Basis - Income	$52,220	Annual income
Property Tax Assessment - RES	19%	Residential
Property Tax Assessment - COM	32%	Commercial
Property Tax Rate	6%	

DERIVED INPUTS		
Annual Energy Produced	33,250	kWh
System cost per watt	$6.75	per rated DC Watt
System Price	$168,750	Before incentives
Annual System Aging	333	kWh
Inverter Cost	$10,000	
Operation Cost	$168.75	0.1% of system price
Depreciation Basis	$143,438	85% of system price is depreciable
Rebate	$50,000	

LOAN - System (10 Yrs)	N/A
LOAN - Construction	N/A

BASIC INPUTS

System Size:	**25**	**kW**
Tax Rate:	**41%**	**(35% fed + 6% state)**
S-REC Value ($/MWh)	**$330.00**	
Take Lump-Sum on first 25kW	☑	**YES**

ATTACHMENT 1 . 2

SMALL COMMERCIAL PAYBACK TABLE

BASIC INPUTS

System Size:	25	kW
Tax Rate:	41%	(35% fed + 6% state)
S-REC Value ($/MWh)	$330.00	
Take Lump-Sum on first 25kW	YES	

Small Commercial System (25 kW)

Annual S-REC Payments		10.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	
Depreciation Rate			0.2	0.32	0.192	0.115	0.115	0.058								
YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12			
Unit Electric Cost	$/kWh	$0.055	$0.058	$0.061	$0.064	$0.067	$0.070	$0.074	$0.077	$0.081	$0.085	$0.090	$0.094	$0.099		
S-REC Value	$/kWh	$3.30	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.02	$0.02		
Annual Energy Produced	kWh		33,250	32,918	32,588	32,262	31,940	31,620	31,304	30,991	30,681	30,374	30,071	29,770		
Electric Savings			$1,920	$1,996	$2,075	$2,157	$2,242	$2,331	$2,423	$2,518	$2,618	$2,721	$2,829	$2,940		
INCOME																
MO Utility Rebate		$50,000														
REC Income		$104,917	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$496	$491	
TOTAL INCOME		**$154,917**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$496**	**$491**	
EXPENSE																
Insurance		($591)	($591)	($591)	($591)	($591)	($591)	($591)	($591)	($591)	($591)	($591)	($591)	($591)	($591)	
Operation/Maint			($169)	($169)	($169)	($169)	($169)	($169)	($169)	($169)	($169)	($169)	($169)	($169)	($169)	
Inverter Replacement Reserves			($667)	($667)	($667)	($667)	($667)	($667)	($667)	($667)	($667)	($667)	($667)	($667)	($667)	
Property Tax[1]			($369)	($383)	($398)	($414)	($430)	($447)	($465)	($484)	($503)	($522)	($543)	($565)	($565)	
Depreciation		$0	($28,688)	($45,900)	($27,540)	($16,495)	($16,495)	($8,319)	$0	$0	$0	$0	$0	$0	$0	
TOTAL EXPENSE		**($591)**	**($30,482)**	**($47,709)**	**($29,364)**	**($18,335)**	**($18,352)**	**($10,193)**	**($1,891)**	**($1,910)**	**($1,929)**	**($1,949)**	**($1,969)**	**($1,969)**	**($1,991)**	
NET SYSTEM INCOME		**$154,326**	**($30,482)**	**($47,709)**	**($29,364)**	**($18,335)**	**($18,352)**	**($10,193)**	**($1,891)**	**($1,910)**	**($1,929)**	**($1,949)**	**($1,473)**	**($1,499)**		
Income Tax Savings/Payment		($63,274)	$12,498	$19,561	$12,039	$7,518	$7,524	$4,179	$775	$783	$791	$799	$604	$615		
AFTER-TAX SYSTEM INCOME[2]		$91,052	($17,985)	($28,148)	($17,325)	($10,818)	($10,828)	($6,014)	($1,116)	($1,127)	($1,138)	($1,150)	($869)	($885)		
Electric Savings			$1,920	$1,996	$2,075	$2,157	$2,242	$2,331	$2,423	$2,518	$2,618	$2,721	$2,829	$2,940		
Tax on Energy Savings			($787)	($818)	($851)	($884)	($919)	($956)	($993)	($1,033)	($1,073)	($1,116)	($1,160)	($1,206)		
30% Federal Tax Credit			$50,625													
Add Back Depreciation			$28,688	$45,900	$27,540	$16,495	$16,495	$8,319	$0	$0	$0	$0	$0	$0	$0	
INITIAL INVESTMENT		($168,750)														
ANNUAL CASH FLOW		($77,698)	$62,461	$18,929	$11,439	$6,950	$6,991	$3,681	$314	$359	$407	$456	$800	$850		
CUMULATIVE CASH FLOW		($77,698)	($15,237)	$3,693	$15,132	$22,082	$29,072	$32,753	$33,066	$33,425	$33,832	$34,288	$35,088	$35,938		
PAYBACK (2.8 yrs)				2.8												

NOTES
1. This model assumes that additional property taxes are assessed on a income basis. If this is not a valid assumption any time in the future, property tax impacts shall be evaluated and included in the SREC valuation.
2. Losses are assumed to be absorbed by other company income, not carried forward as a net loss for the year.

ATTACHMENT 1 . 3

RESIDENTIAL PAYBACK ASSUMPTIONS

ASSUMPTIONS		
Power Output	1,330	kWh produced per kW of capacity
Current Average Electric Cost	$0.065	$/KWh
Electric Rate Increase	5%	per year
System Aging	1%	per year
Rebate Rate	$2.00	per Watt DC
Federal Tax Credit	30%	
Insurance		
Residential	$0.30	dollars per hundred coverage
Inverter Cost	$0.50	per W
DERIVED INPUTS		
Annual Energy Produced	6,650	kWh per year
System cost per watt	$7.67	per rated DC Watt
System Price:	$38,333	
Annual System Aging	67	kWh per year
Annnual Operation Cost	$38.33	0.1% of system price
Inverter Replacement Cost	$2,500	
Rebate	$10,000	

BASIC INPUTS

System Size:	5	**kW**
Tax Rate:	34%	**(28% fed + 6% state)**
S-REC Value ($/MWh)	$330.00	
Take Lump-Sum on first 25kW	☑	**YES**

ATTACHMENT 1 . 3

RESIDENTIAL PAYBACK TABLE

Residential System (5 kW)

BASIC INPUTS		
System Size:	5	kW
Tax Rate:	34%	(26% fed + 6% state)
S-REC Value ($/MWh)	$330.00	
Take Lump-Sum or first $5kW		YES

Annual S-REC Payments		10	0	0	0	0	0	0	0	0	0	0	0	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Depreciation Rate			0.2	0.32	0.192	0.115	0.115	0.058																		
YEAR	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20					
Util Electric Cost	$/kWh	$0.065	$0.069	$0.072	$0.075	$0.079	$0.083	$0.087	$0.091	$0.096	$0.101	$0.106	$0.111	$0.117	$0.123	$0.129	$0.135	$0.142	$0.149	$0.156	$0.164	$0.172				
S-REC Value	$/kWh	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02				
Annual Energy Produced	kWh	6,850	6,594	6,517	6,451	6,384	6,318	6,251	6,185	6,118	6,052	5,985	5,919	5,852	5,786	5,719	5,653	5,586	5,520	5,453	5,387					
INCOME																										
MO Utility Rebate		$10,000																								
REC Income		$20,957	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$89	$89	$97	$95	$94	$93	$92	$91	$90	$89			
TOTAL INCOME		$30,957	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$89	$89	$97	$95	$94	$93	$92	$91	$90	$89			
EXPENSE																										
Insurance		($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)	($115)			
Operation/Maint		($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)	($38)			
Inverter Replacement		($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)	($167)			
Property Tax[1]		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0			
Loan Principal																										
TOTAL EXPENSE		($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)			
NET SYSTEM INCOME		$30,842	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($320)	($231)	($223)	($225)	($226)	($227)	($228)	($229)	($230)	($231)					
Income Tax		($10,486)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0			
Electric Savings		$454	$472	$490	$510	$530	$550	$572	$594	$617	$641	$665	$691	$717	$745	$773	$802	$832	$863	$896	$929					
30% Federal Tax Credit		$11,500																								
INITIAL INVESTMENT		($38,333)																								
ANNUAL CASH FLOW		($6,477)	$134	$152	$170	$190	$210	$230	$252	$274	$297	$321	$444	$469	$494	$520	$547	$575	$604	$634	$866	$866	$866			
CUMULATIVE CASH FLOW		($6,477)	($6,343)	($6,192)	($6,021)	($5,832)	($5,622)	($5,392)	($5,140)	($4,866)	($4,569)	($4,248)	($3,804)	($3,336)	($2,842)	($2,322)	($1,775)	($1,199)	($595)	$39	$705	$1,403				
PAYBACK (19.9 yrs)																				19.9						

NOTES
1. This model assumes that additional property taxes are not assessed by any municipality. If this is not a valid assumption or any municipality includes the solar electric system in the property assessment in the future, this item shall be evaluated and included in the SREC valuation.

ATTACHMENT 3

MODOT

General Services

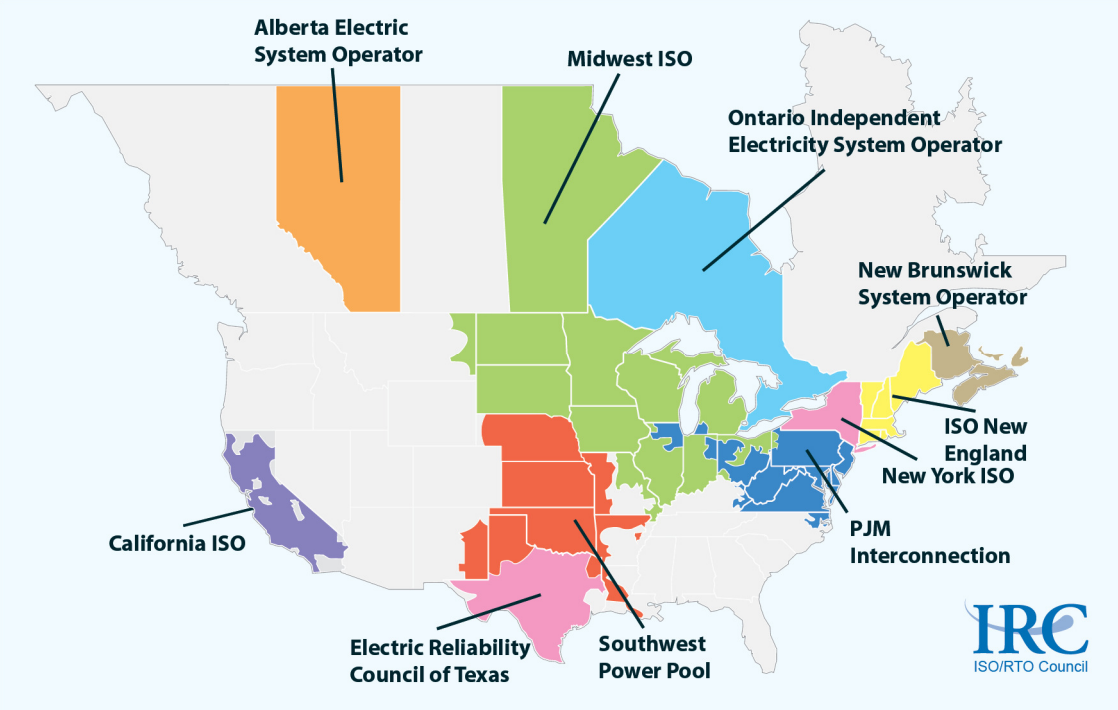
BID SUMMARY

Bid Number:	9-091125
Project Description:	District 7 – 16,500 Watt Solar System
Location:	Joplin, Missouri
Bid Opening Bid Date:	November 25, 2009 @ 3:00 PM

Contractors	Bid Amount
Friga Construction, Inc. – Springfield, MO	$129,585
Zinnel Electric – Sleepy Eye, MN	$100,100
Prost Builders, Inc. – Jefferson City, MO	$114,200
Prost Builders, Inc. – Jefferson City, MO	$111,558
Prost Builders, Inc. – Jefferson City, MO	$114,300
Missouri Solar Living, LLC – St. Louis, MO	$108,900

Total All Bids	$678,543
Average All Bids	$113,091
Average Bid $/wdc	$ 6.85
Plus Marketing and Sales Cost at 5% of Bid	$ .35
Revised Price $/wdc	$ 7.20

ATTACHMENT 4



Regional Transmission Organizations

ATTACHMENT 5 . 1

ELECTRIC RATE INCREASE

1970 to 2008

(source: U.S. Energy Information Administration)

(Annual Increase column is calculated)

YEAR	Residential Rate	Annual Increase
1970	2.20	N/A
1971	2.30	4.55%
1972	2.40	4.35%
1973	2.50	4.17%
1974	3.10	24.00%
1975	3.50	12.90%
1976	3.70	5.71%
1977	4.10	10.81%
1978	4.30	4.88%
1979	4.60	6.98%
1980	5.40	17.39%
1981	6.20	14.81%
1982	6.90	11.29%
1983	7.20	4.35%
1984	7.15	-0.69%
1985	7.39	3.36%
1986	7.42	0.41%
1987	7.45	0.40%
1988	7.48	0.40%
1989	7.65	2.27%
1990	7.83	2.35%
1991	8.04	2.68%
1992	8.21	2.11%
1993	8.32	1.34%
1994	8.38	0.72%
1995	8.40	0.24%
1996	8.36	-0.48%
1997	8.43	0.84%
1998	8.26	-2.02%
1999	8.16	-1.21%
2000	8.24	0.98%
2001	8.58	4.13%
2002	8.44	-1.63%
2003	8.72	3.32%
2004	8.95	2.64%
2005	9.45	5.59%
2006	10.40	10.05%
2007	10.65	2.40%
2008	11.36	6.67%
AVERAGE		4.55%

ATTACHMENT 5 . 2

COMMENTS BY PSC PUBLIC COUNSEL, 24 MARCH 2010

"There has been a historic number of rate cases and the magnitude of increases. There is no sign of it slowing down." [The following is paraphrased] Our utilities have had excess capacity and were able to sell the excess electricity generated to other states at a profit, passing those profits to consumers in the form of reduced rates. Off-site sales are coming to an end. This has held rates low over the years. This puts a significant upward pressure on your rates.

- Remarks before the general public as a member of the PSC panel at the Missouri Chamber of Commerce Conference on Missouri's Energy Future, Columbia, MO.

Average Rate Sample 1

Account Type: RESIDENTIAL
System Size: 5 kW

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
WITHOUT SOLAR PV SYSTEM	Monthly Usage	1281	1403	1008	1281	2239	2778	2806	2846	1496	1176	1209	1641	1763.5
	Rate – Tier 1	0.061	0.061	0.061	0.061	0.061	0.086	0.086	0.086	0.086	0.061	0.061	0.061	
	Rate – Tier 2	0.041	0.041	0.041	0.041	0.041	0.086	0.086	0.086	0.086	0.041	0.041	0.041	
	Cost – Tier 1	45.90	45.90	45.90	45.90	45.90	64.73	64.73	64.73	64.73	45.90	45.90	45.90	
	Cost – Tier 2	21.88	26.90	10.61	21.88	61.35	175.02	177.43	180.88	64.34	17.55	18.89	36.69	
	Monthly Charges	$67.78	$72.80	$56.51	$67.78	$107.25	$239.74	$242.16	$245.61	$129.06	$63.45	$64.79	$82.59	$119.96
	$/kW	**$0.053**	**$0.052**	**$0.056**	**$0.053**	**$0.048**	**$0.086**	**$0.086**	**$0.086**	**$0.086**	**$0.054**	**$0.054**	**$0.050**	**$0.064**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
WITH SOLAR PV SYSTEM	Monthly Usage	1281	1403	1008	1281	2239	2778	2806	2846	1496	1176	1209	1641	1763.5
	PV Production	409	439	574	640	712	723	742	708	612	547	384	342	569.3
	Net Usage	872	964	434	641	1527	2055	2064	2138	884	629	824	1298	
	Rate – Tier 1	0.061	0.061	0.061	0.061	0.061	0.086	0.086	0.086	0.086	0.061	0.061	0.061	
	Rate – Tier 2	0.041	0.041	0.041	0.041	0.041	0.086	0.086	0.086	0.086	0.041	0.041	0.041	
	Cost – Tier 1	45.90	45.90	26.53	39.24	45.90	64.73	64.73	64.73	64.73	38.51	45.90	45.90	
	Cost – Tier 2	5.03	8.82	0.00	0.00	32.02	112.58	113.43	119.81	11.54	0.00	3.05	22.59	
	Monthly Charges	50.93	54.72	26.53	39.24	77.92	177.31	178.16	184.53	76.26	38.51	48.95	68.49	
	Monthly Savings	$16.84	$18.09	$29.98	$28.54	$29.33	$62.43	$64.00	$61.08	$52.80	$24.94	$15.84	$14.10	$34.83
	$/kW Saved	**$0.041**	**$0.041**	**$0.052**	**$0.045**	**$0.041**	**$0.086**	**$0.086**	**$0.086**	**$0.086**	**$0.046**	**$0.041**	**$0.041**	**$0.058**

Average Rate Sample 2

Account Type: RESIDENTIAL
System Size: 5 kW

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
WITHOUT SOLAR PV SYSTEM	Monthly Usage	1196	1054	928	845	710	994	1676	1549	1156	759	790	989	1053.5
	Rate – Tier 1	0.061	0.061	0.061	0.061	0.061	0.086	0.086	0.086	0.086	0.061	0.061	0.061	
	Rate – Tier 2	0.041	0.041	0.041	0.041	0.041	0.086	0.086	0.086	0.086	0.041	0.041	0.041	
	Cost – Tier 1	45.90	45.90	45.90	45.90	43.42	64.73	64.73	64.73	64.73	45.90	45.90	45.90	
	Cost – Tier 2	18.38	12.52	7.31	3.89	0.00	21.01	79.87	68.95	34.99	0.35	1.63	9.83	
	Monthly Charges	$64.28	$58.42	$53.21	$49.79	$43.42	$85.74	$144.60	$133.68	$99.72	$46.25	$47.53	$55.73	$73.53
	$/kW	**$0.054**	**$0.055**	**$0.057**	**$0.059**	**$0.061**	**$0.086**	**$0.086**	**$0.086**	**$0.086**	**$0.061**	**$0.060**	**$0.056**	**$0.067**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
WITH SOLAR PV SYSTEM	Monthly Usage	1196	1054	928	845	710	994	1676	1549	1156	759	790	989	1053.5
	PV Production	409	439	574	640	712	723	742	708	612	547	384	342	569.3
	Net Usage	787	615	354	205	-2	270	934	841	544	212	405	646	
	Rate – Tier 1	0.061	0.061	0.061	0.061	0.061	0.086	0.086	0.086	0.086	0.061	0.061	0.061	
	Rate – Tier 2	0.041	0.041	0.041	0.041	0.041	0.086	0.086	0.086	0.086	0.041	0.041	0.041	
	Cost – Tier 1	45.90	37.64	21.64	12.52	-0.15	23.31	64.73	64.73	46.92	12.96	24.79	39.56	
	Cost – Tier 2	1.53	0.00	0.00	0.00	0.00	0.00	15.87	7.88	0.00	0.00	0.00	0.00	
	Monthly Charges	47.43	37.64	21.64	12.52	-0.15	23.31	80.59	72.60	46.92	12.96	24.79	39.56	
	Monthly Savings	$16.84	$20.79	$31.58	$37.27	$43.57	$62.43	$64.00	$61.08	$52.80	$33.29	$22.74	$16.17	$38.55
	$/kW Saved	**$0.041**	**$0.047**	**$0.055**	**$0.058**	**$0.061**	**$0.086**	**$0.086**	**$0.086**	**$0.086**	**$0.061**	**$0.059**	**$0.047**	**$0.065**

Average Rate Sample 3

Account Type: COMMERCIAL
System Size: 100 kW

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
WITHOUT SOLAR PV SYSTEM	Monthly Usage	27,850	25,900	22,400	22,100	23,900	35,650	73,550	52,050	31,400	37,150	51,100	67,000	39,171
	Rate – Tier 1	0.061	0.061	0.061	0.061	0.061	0.082	0.082	0.082	0.082	0.061	0.061	0.061	
	Rate – Tier 2	0.035	0.035	0.035	0.035	0.035	0.082	0.082	0.082	0.082	0.035	0.035	0.035	
	Cost – Tier 1	61.20	61.20	61.20	61.20	61.20	82.10	82.10	82.10	82.10	61.20	61.20	61.20	
	Cost – Tier 2	950.49	881.46	757.56	746.94	810.66	2844.77	5956.36	4191.21	2495.84	1279.71	1773.54	2336.40	
	Monthly Charges	$1,011.69	$942.66	$818.76	$808.14	$871.86	$2,926.87	$6,038.46	$4,273.31	$2,577.94	$1,340.91	$1,834.74	$2,397.60	$2,153.58
	$/kW	**$0.036**	**$0.036**	**$0.037**	**$0.037**	**$0.036**	**$0.082**	**$0.082**	**$0.082**	**$0.082**	**$0.036**	**$0.036**	**$0.036**	**$0.052**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
WITH SOLAR PV SYSTEM	Monthly Usage	27,850	25,900	22,400	22,100	23,900	35,650	73,550	52,050	31,400	37,150	51,100	67,000	39,171
	PV Production	8,176	8,781	11,479	12,797	14,239	14,469	14,832	14,154	12,236	10,934	7,689	6,843	11,386
	Net Usage	19,674	17,119	10,921	9,303	9,661	21,181	58,718	37,896	19,164	26,216	43,411	60,157	
	Rate – Tier 1	0.061	0.061	0.061	0.061	0.061	0.082	0.082	0.082	0.082	0.061	0.061	0.061	
	Rate – Tier 2	0.035	0.035	0.035	0.035	0.035	0.082	0.082	0.082	0.082	0.035	0.035	0.035	
	Cost – Tier 1	61.20	61.20	61.20	61.20	61.20	82.10	82.10	82.10	82.10	61.20	61.20	61.20	
	Cost – Tier 2	661.05	570.62	351.19	293.91	306.61	1656.86	4738.61	3029.12	1491.24	892.64	1501.35	2094.17	
	Monthly Charges	722.25	631.82	412.39	355.11	367.81	1738.96	4820.71	3111.22	1573.34	953.84	1562.55	2155.37	
	Monthly Savings	$289.44	$310.84	$406.37	$453.03	$504.05	$1,187.90	$1,217.75	$1,162.08	$1,004.60	$387.07	$272.19	$242.23	$619.80
	$/kW Saved	**$0.035**	**$0.035**	**$0.035**	**$0.035**	**$0.035**	**$0.082**	**$0.082**	**$0.082**	**$0.082**	**$0.035**	**$0.035**	**$0.035**	**$0.051**

Average Rate Sample 4

Account Type: COMMERCIAL
System Size: 60 kW

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
WITHOUT SOLAR PV SYSTEM	Monthly Usage	12104	10666	9386	8546	7180	10054	16956	15676	11694	7676	7990	10004	10661
	Rate – Tier 1	0.061	0.061	0.061	0.061	0.061	0.082	0.082	0.082	0.082	0.061	0.061	0.061	
	Rate – Tier 2	0.035	0.035	0.035	0.035	0.035	0.082	0.082	0.082	0.082	0.035	0.035	0.035	
	Cost – Tier 1	449.64	449.64	449.64	449.64	439.42	603.20	603.20	603.20	603.20	449.64	449.64	449.64	
	Cost – Tier 2	168.38	117.51	72.19	42.45	0.00	222.25	788.89	683.79	356.85	11.64	22.75	94.04	
	Monthly Charges	$618.02	$567.15	$521.83	$492.10	$439.42	$825.45	$1,392.09	$1,286.99	$960.05	$461.29	$472.39	$543.68	$715.04
	$/kW	**$0.051**	**$0.053**	**$0.056**	**$0.058**	**$0.061**	**$0.082**	**$0.082**	**$0.082**	**$0.082**	**$0.060**	**$0.059**	**$0.054**	**$0.065**

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AVG
WITH SOLAR PV SYSTEM	Monthly Usage	12104	10666	9386	8546	7180	10054	16956	15676	11694	7676	7990	10004	10661
	PV Production	4906	5268	6888	7678	8543	8681	8899	8493	7342	6561	4613	4106	6832
	Net Usage	7198	5398	2499	868	-1363	1373	8057	7183	4352	1115	3376	5898	
	Rate – Tier 1	0.061	0.061	0.061	0.061	0.061	0.082	0.082	0.082	0.082	0.061	0.061	0.061	
	Rate – Tier 2	0.035	0.035	0.035	0.035	0.035	0.082	0.082	0.082	0.082	0.035	0.035	0.035	
	Cost – Tier 1	440.50	330.36	152.92	53.11	-83.42	112.71	603.20	589.74	357.29	68.26	206.63	360.96	
	Cost – Tier 2	0.00	0.00	0.00	0.00	0.00	0.00	58.25	0.00	0.00	0.00	0.00	0.00	
	Monthly Charges	440.50	330.36	152.92	53.11	-83.42	112.71	661.44	589.74	357.29	68.26	206.63	360.96	
	Monthly Savings	$177.52	$236.79	$368.91	$438.98	$522.84	$712.74	$730.65	$697.25	$602.76	$393.02	$265.76	$182.73	$444.16
	$/kW Saved	**$0.036**	**$0.045**	**$0.054**	**$0.057**	**$0.061**	**$0.082**	**$0.082**	**$0.082**	**$0.082**	**$0.060**	**$0.058**	**$0.045**	**$0.062**

ATTACHMENT 7

Field Production Data

	Quaker Oats	Speedy Gas & Car Wash	
	Columbia, MO	Ballwin, MO	
Apr-09	610.2	265.4	kWh
May-09	807.9	354.8	kWh
Jun-09	832.9	377.2	kWh
Jul-09	812.4	343.6	kWh
Aug-09	745.6	364.8	kWh
Sep-09	605.1	312.4	kWh
Oct-09	372.2	176.4	kWh
Nov-09	354.4	191.3	kWh
Dec-09	219.3	110.5	kWh
Jan-10	230.9	141.6	kWh
Feb-10	351.4	168.0	kWh
Mar-10	538.4	274.4	kWh
TOTAL	6480.7	3080.4	kWh
kW	5.04	2.45	kW
kWh/kW	**1285.9**	**1257.3**	kWh per kW
NOTES	Nonoptimal array tilt	Nonoptimal array tilt	

1020 RENEWABLE ENERGY REPORT, COLUMBIA WATER & LIGHT

> "There is a solar production site at the West Ash Pump Station and one at Quaker Oats. Each is rated at a 5 kilowatt capacity. There were 6,522 kilowatt hours of energy produced at the utility's site last year and 6,801 kilowatt hours produced at Quaker for a total of 13,323 kilowatt hours."
> - page 6, paragraph 3

13,323 kWh / 10kW = **1.332 kWh per kW of capacity.**

ATTACHMENT 8

Inverter Replacement Cost

Inverter Pricing (Mfr: SMA)

Description	Part #	Capacity (Watt)	Price	Price per Watt
Sunny Tower ST48 48 kW	4402	**48,000**	$24,138	**$0.50**
Sunny Tower ST42 42 kW	3173	**42,000**	$22,437	**$0.53**
Sunny Tower ST36 36 kW	3172	**36,000**	$20,736	**$0.58**
SB 8000US	4386	**8,000**	$4,393	**$0.55**
SB 7000US	690	**7,000**	$3,759	**$0.54**
SB 6000US	2967	**6,000**	$3,449	**$0.57**
SB 5000US	2966	**5,000**	$3,239	**$0.65**
SB 4000US	3310	**4,000**	$2,479	**$0.62**
SB 3000US	3309	**3,000**	$1,999	**$0.67**
SB 700U	2770	**700**	$1,227	**$1.75**

Source: Published prices on 4 April 2010 at www.affordable-solar.com/solar.inverters.grid.tied.htm

NOTE: in predicting inverter replacement cost for payback modeling, it has been assumed that equipment prices will fall due to advances in technology and economies of scale though higher-volume manufacturing.

ATTACHMENT 8

System Aging Basis

Mfr: Schott Solar
Doc: Limited Warranty, Double Glass Modules (Rev March 4, 2004)

SCHOTT Solar further warrants the specified power output of its standard solar cell modules for a period of twenty (20) years from the date of shipment. During such time, RWE SCHOTT Solar will…repair, replace, or add additional modules in order to make up for any power loss greater than ten percent (10%) during the first ten (10) years and twenty percent (20%) during the first twenty (20) years.

Mfr: Sanyo
Doc: Limited Power Output Warranty (Rev 1 Dec 2009)

Table 1. Limited Power Output Warranty

Period	Remarks
At the Time of Purchase	100% of the Maximum Power (Pmax) stated in Product Data Sheets
Within 10 Years from Purchase Date	90% of the Minimum Power (Pmin)
Within 20 Years from Purchase Date	80% of the Minimum Power (Pmin)

Mfr: Trina
Doc: PS-M-0020 Rev I , Limited Warranty Policy for Trina Solar Brand Crystalline Solar Photovioltaic Module

The warranty period with respect to power output continues for a total of 25 years from date of delivery, the first 10 years at 90% of the power output as specified in Trina Soar's Product Specification…and the balance of 15 years at 80% of the power output

Mfr: Kaneka
Doc: G-SA060.001, Limited Warranty and Specifications

80% of the specified minimum output of the module for a **25-year** period after shipment from Kaneka

ATTACHMENT 9

Changes to Standard Offer Contract Language, Section (H)

CHANGE 1

"(H) At the time of the rebate payment **and** ~~or~~ anytime thereafter, the electric utility shall offer a one-time lump sum payment, called a Standard Offer Contract, for the current ~~ten (10) year~~ fixed price for associated S-RECs **for a period of ten (10) years**."

CHANGE 2

"(H) At the time of the rebate payment and anytime thereafter, the electric utility shall offer ~~**a one-time lump sum payment, called**~~ a Standard Offer Contract~~,~~ for the current fixed price for associated S-RECs for a period of ten (10) years**, payable as a one-time lump sum**."

CHANGE 3

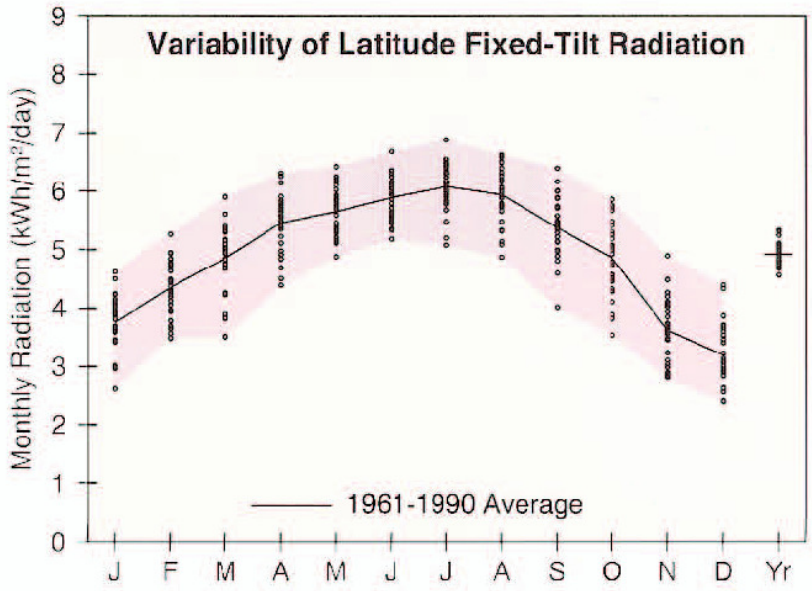
"(H) At the time of the rebate payment and anytime thereafter, the electric utility shall offer a Standard Offer Contract for the current fixed price for ~~**associated**~~ S-RECs **generated by the first 25kW of system capacity** for a period of ten (10) years, payable as a one-time lump sum. **A Standard Offer Contract for SRECs generated by system capacity above 25kW shall be offered to owners of net-metering eligible systems; this Standard Offer Contract shall be for the current fixed price for a period of 10 years, payable annually**."

Columbia, MO

WBAN NO. 03945

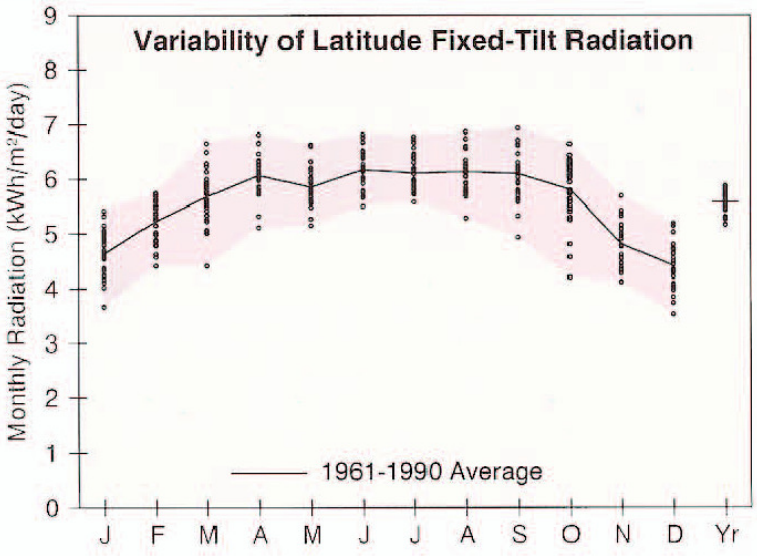
LATITUDE: 38.82° N
LONGITUDE: 92.22° W
ELEVATION: 270 meters
MEAN PRESSURE: 986 millibars

STATION TYPE: Primary



Solar Radiation for Flat-Plate Collectors Facing South at a Fixed Tilt (kWh/m²/day), Uncertainty ±9%

Tilt (°)		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
0	Average	2.2	3.0	4.0	5.2	6.0	6.6	6.6	5.9	4.6	3.5	2.3	1.9	4.3
	Min/Max	1.8/2.6	2.6/3.4	3.2/4.7	4.3/5.9	5.2/6.8	5.8/7.5	5.5/7.5	5.0/6.5	3.7/5.3	2.9/4.1	2.0/2.8	1.5/2.3	4.1/4.6
Latitude -15	Average	3.3	4.0	4.7	5.6	6.0	6.4	6.6	6.2	5.3	4.5	3.2	2.8	4.9
	Min/Max	2.4/4.0	3.3/4.7	3.5/5.7	4.5/6.4	5.2/6.8	5.6/7.3	5.5/7.4	5.1/6.8	4.1/6.3	3.4/5.4	2.6/4.3	2.2/3.7	4.6/5.3
Latitude	Average	3.8	4.4	4.9	5.5	5.6	5.9	6.1	5.9	5.4	4.9	3.6	3.2	4.9
	Min/Max	2.6/4.6	3.5/5.3	3.5/5.9	4.4/6.3	4.9/6.4	5.2/6.7	5.1/6.9	4.9/6.6	4.0/6.4	3.5/5.9	2.8/4.9	2.4/4.4	4.6/5.3
Latitude +15	Average	4.0	4.5	4.8	5.1	5.0	5.1	5.3	5.4	5.1	4.9	3.8	3.4	4.7
	Min/Max	2.7/5.0	3.5/5.5	3.4/5.8	4.0/5.8	4.3/5.7	4.5/5.7	4.5/6.0	4.4/6.0	3.8/6.2	3.5/6.0	2.9/5.2	2.5/4.8	4.3/5.1
90	Average	3.7	3.9	3.5	3.2	2.7	2.5	2.7	3.1	3.5	3.9	3.3	3.2	3.3
	Min/Max	2.4/4.7	3.0/4.9	2.6/4.3	2.5/3.6	2.4/2.9	2.3/2.7	2.4/2.9	2.6/3.5	2.6/4.2	2.7/4.8	2.5/4.7	2.2/4.6	2.9/3.6



Colorado Springs, CO

WBAN NO. 93037

LATITUDE: 38.82° N
LONGITUDE: 104.72° W
ELEVATION: 1881 meters
MEAN PRESSURE: 811 millibars

STATION TYPE: Secondary

Solar Radiation for Flat-Plate Collectors Facing South at a Fixed Tilt (kWh/m²/day), Uncertainty ±9%

Tilt (°)		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year
0	Average	2.5	3.4	4.5	5.7	6.2	6.9	6.7	6.0	5.1	4.0	2.8	2.3	4.7
	Min/Max	2.2/2.8	3.0/3.7	3.7/5.1	4.8/6.3	5.5/7.0	6.2/7.7	6.1/7.4	5.2/6.7	4.3/5.8	3.2/4.5	2.5/3.1	2.0/2.5	4.5/4.9
Latitude -15	Average	4.0	4.7	5.5	6.2	6.2	6.7	6.6	6.4	6.0	5.4	4.2	3.7	5.5
	Min/Max	3.2/4.6	4.0/5.2	4.3/6.3	5.2/6.9	5.5/7.1	6.0/7.4	6.0/7.3	5.5/7.1	4.9/6.8	4.0/6.1	3.7/4.9	3.0/4.3	5.1/5.7
Latitude	Average	4.6	5.2	5.7	6.1	5.9	6.2	6.1	6.1	6.1	5.8	4.8	4.4	5.6
	Min/Max	3.7/5.4	4.4/5.7	4.4/6.7	5.1/6.8	5.2/6.6	5.5/6.8	5.6/6.8	5.3/6.9	4.9/6.9	4.2/6.6	4.1/5.7	3.5/5.2	5.2/5.9
Latitude +15	Average	5.0	5.4	5.6	5.6	5.2	5.3	5.3	5.6	5.9	5.9	5.1	4.8	5.4
	Min/Max	3.9/5.9	4.5/6.0	4.3/6.6	4.8/6.3	4.6/5.8	4.7/5.8	4.9/5.8	4.8/6.2	4.7/6.7	4.2/6.8	4.3/6.1	3.8/5.7	4.9/5.7
90	Average	4.7	4.6	4.2	3.5	2.7	2.5	2.6	3.2	4.0	4.8	4.6	4.6	3.8
	Min/Max	3.5/5.5	3.8/5.1	3.4/4.9	3.0/4.0	2.5/3.0	2.3/2.6	2.4/2.8	2.8/3.5	3.2/4.5	3.3/5.5	3.8/5.6	3.7/5.4	3.4/4.0

Table 5. U.S. Average Monthly Bill by Sector, Census Division, and State 2007

Residential

Census Division State	Number of Consumers	Average Monthly Consumption (kWh)	Average Retail Price (Cents per Kilowatthour)	Average Monthly Bill (Dollar and cents)
MO	2,666,181	1,121	7.69	$86.22
CO	2,068,901	710	9.25	$65.72

	MO	CO	Increase	Net
Sun Hrs	4.9	5.6	114.3%	137.5%
Elec Rate	7.69	9.25	120.3%	