**BEFORE THE STATE CORPORATION COMMISSION
OF THE STATE OF KANSAS**

In the matter of the General Investigation to Examine Issues Surrounding Rate Design For Distributed Generation Customers	)))	Docket No. 16-GIME-403-GIE

**INITIAL COMMENTS OF CROMWELL ENVIRONMENTAL, INC.
DOCKET NO. 16-GIME-403-GIE**

1. Cromwell Environmental, Inc. presents its comments from the perspective of a retail supplier and installer of rooftop solar photovoltaic systems. In this capacity, Cromwell has observed both the promise and the pitfalls that PV offers. The past few years have seen tremendous change in the industry with systems becoming much more efficient, affordable, and visually attractive, but the rate of change makes predictions about future market penetration difficult, and assumptions about solar usage unreliable.

2. Cromwell notes at the outset that the Commission should take the time needed to complete a thorough evaluation of the issues related to PV usage and impacts. Kansas law provides sound protection against any sudden or unforeseen impacts by including a cap of 1% on solar market penetration,[1] meaning that should solar PV reach this level of usage, the utility can refuse connection thereby stopping any potential adverse impacts. The current level of PV market is .11%, or only one-tenth the ceiling established by law.

3. These comments will first focus upon the changes that are currently being experienced in the solar industry. Cromwell submits that the Commission must remain mindful that the solar industry is still in its infancy, and consequently can be volatile with disproportionate response to regulatory policy.

[1] K.S.A. 66-1265.

4. The second section of these comments will focus upon actual customer usage among customers of Cromwell. The experience to date of these customers demonstrates a wide range of customer usage patterns that are not susceptible to simple generalizations as to customer characteristics and usage.

5. The final section of these comments will consider the need for a Kansas-specific detailed study of solar usage. Cromwell submits that previous studies in other states have shown the diversity that exists between different geographical regions and different customers. Only by examining Kansas conditions and actual Kansas usage can the Commission obtain reliable information for determining whether special rates are needed, and if so, how such rates should be structured. This docket is a start by examining the costs and benefits; an actual study will provide the detail needed to evaluate the true impact of PV on Kansas electric utility operating systems.

1. Recent changes in the solar industry.

6. The solar PV industry has seen a marked decline in costs of solar rooftop installations in recent years. The costs per installed kW of capacity for residential arrays has declined from $8 to $3 per kW since 2008. Not only has the cost of installed capacity declined, there have been significant operational improvements as well. One such change just reaching the market place is dramatic improvement in integrated energy storage which will bring affordable options for storing solar-generated electricity to reduce peak consumption.

7. With these changes in cost and reliability, it should come as no surprise that the solar market has experienced significant growth in recent years. The declining costs of installation of small scale rooftop solar has in turn led to significant growth. By year end 2016, small rooftop solar nationally produced 19,467,000 MWh of electric power, an increase of

37.7% over 2015. Of this total residential solar accounted for 10,466,000MWh, an increase of 67.8% over 2015. [2]

8. The growth of the solar industry has produced over 260,000 jobs nationwide, a growth of 178% since 2010. In Kansas, there are approximately 467 solar-related jobs with a growth of 66% in from 2015 to 2016.[3]

9. Despite this growth, solar PV represents a very small portion of Kansas utility electric load. According to responses of Westar in Docket No. 15-WSEE-115-RTS,[4] Westar had a total of 328 distributed generation customers, of which 202 are net metered solar customers.[5] All distributed generation customers at that time accounted for 2,638.283 kW of demand which was only .006% of the peak demand for Westar (2014) of 4,362 MW.[6]

2. The Diverse Characteristics of Solar Photovoltaic Usage in Kansas

10. Cromwell submits that the characteristics of solar PV customers are as diverse as utility customers in general. Solar customers, like utility customers in general, have a variety of peak usages – some with their highest loads in the summer, others with winter peaks. While there are customers who strive to offset 100% of the electricity they purchase from the utility, the reality is that most customers offset considerably less. Since the net metering rules were changed in 2014, arrays are now smaller for residential solar users. Not only was the maximum size limit changed from 25 kW to 15 kW, but excess generation is now only rolled over daily for the course of a billing period instead of for a full year. For solar customers who want to offset as

[2] Electric Power Monthly February 2017, US Energy Information Administration, Table ES1.B. www.eia.gov/electricity/monthly/pdfepm.pdf.
[3] National Solar Jobs Census 2016, The Solar Foundation, www.solarjobscensus.org. (February 2017)
[4] Cromwell will update this figure as well as supplement figures for other Kansas utilities through discovery conducted in this docket as the discovery responses are available.
[5] Docket No. 15-WSEE-115-RTS Response of Westar to TASC DR #27, Showing 202 solar customers with capacity of 2638.283 kW.
[6] Docket No. 1-WSEE-115-RTS Response of Westar to TASC DR#85 stating 2014 peak load demand of 4632MW.

much of their electricity as is economically possible, the upper limit is no longer 100%, but is based instead on how their solar profile matches up with their known consumption patterns to ensure they do not overproduce much, if any electricity, in any given month.

11. The following three tables show a small sample of electricity consumers. Table 1 compares two customers with similar electricity usage, each averaging around 1,000 kWh per month, but with different peak demand needs and annual profiles. One has a summer peak in consumption, while the other has a winter peak.

12. Table 2 compares two customers with higher energy consumption. These consumers use approximately twice the electricity annually as those shown in Table 1. The customer with a summer peak, however, has peak demand needs that are less than the customer in Table 1 with a winter peak.

Table 1: Examples of two consumers with average monthly electricity consumption

	Modest demand, summer peak			Heat pump with high winter demand	
Month	Usage (kWh)	Demand (kW)		Usage (kWh)	Demand (kW)
January	862	9.92		2,937	28.03
February	517	5.63		2,635	27.71
March	1,774	9.2		1,588	20.9
April	1,623	7.33		555	14.45
May	974	9.18		294	10.91
June	1,507	10.55		323	10.03
July	1,467	9.78		336	10.36
August	1,154	7.89		463	9.59
September	988	6.91		294	8.08
October	591	6.52		275	13.8
November	724	6.7		1,457	21.33
December	756	7.06		1,887	21.97
	12,937	8.06 (Avg)		13,044	16.43 (Avg)

Table 2: Examples of Moderate Energy users with varying monthly consumption and demand.					
	Summer peak, Lower demand			Winter peak, higher demand	
Month	Usage (kWh)	Demand (kW)		Usage (kWh)	Demand (kW)
January	3,130	15.66		5011	29.42
February	2,781	14.00		5,177	31.46
March	2,370	13.65		3,452	27.4
April	1,427	10.55		1,410	29.15
May	1,850	11.38		639	25.72
June	2,454	12.85		767	12.93
July	2,540	13.00		957	12.48
August	2,951	15.94		1,069	13.6
September	1,795	14.26		574	11.02
October	1,275	10.40		454	19.85
November	1,855	9.83		3,111	28.36
December	2,829	11.11		4,134	28.83
	27,257	12.72		26,755	22.52

13. Table 3 features two customers with solar arrays offsetting some of their electricity use. The customer with an 8.25 kW array uses considerably less electricity annually than the consumers in Tables 1 and 2, but has demand needs that aren't dissimilar from one of the Table 1 consumers. The consumer with the 5.72 kW array has total consumption that is higher than the two consumers listed in Table 1.

Table 3: Two customers with installed solar with varying monthly consumption					
	Summer peak and 8.25 kW solar array			Summer peak and 5.72 kW solar array	
Month	Usage (kWh)	Demand (kW)		Usage (kWh)	Demand (kW)
January	**453**	9.78		**692**	**NA**
February	**280**	9.83		**307**	**NA**
March	**138**	8.25		**319**	**NA**
April	**-79**	8.67		**592**	**NA**
May	**159**	9.85		**1,381**	**NA**
June	**710**	11.28		**2,378**	**NA**
July	**546**	11.95		**2,316**	**NA**
August	**576**	13.26		**1,766**	**NA**
September	**243**	10.95		**1,044**	**NA**
October	**78**	9.17		**827**	**NA**

November	**289**	11.37		**766**	**NA**
December	**919**	9.8		**1,134**	**NA**
	4,312	10.35		13,522	

14. These examples are meant to show some diversity in the consumption patterns of those with and without solar. We are aware of several customers who after installing solar later added an electric vehicle to their fleet, bringing their post-solar consumption closer in line with their pre-solar consumption. We believe some portion of customers after enjoying a period of considerably lower electric bills, experience a creeping increase in consumption as they get lax in their conservation or add new appliances. Inclusion of a sampling of before and after consumption patterns in DG customers would be a worthy part of any study to understand usage patterns of such customers.

3. A State-Specific Study is Needed to Identify Kansas Solar Usage

15. Cromwell previously proffered three separate state solar studies that reached strikingly different results, primarily because of the differing usage characteristics of solar customers within those states. Cromwell submits that only through a similar study can the Commission accurately assess the costs, benefits and potential development of solar PV in Kansas.

16. The Nevada study[7] concluded distributed solar generation was only marginally economic from both perspective of both the user and non-solar users. The Mississippi study[8] concluded that solar offered significant potential and recommended incentive rates be considered. The Maine study[9] concluded that the avoided market costs of distributed generation

[7] Nevada Net Energy Metering Impacts Evaluation, Energy and Environmental Economics, prepared for the State of Nevada Public Utilities Commission, July 2014.
[8] Stanton, E.A., J. Daniel, T. Vitolo, et al., "Net Metering in Mississippi: Costs, Benefits, and Policy Considerations", Prepared for the Public Service Commission of Mississippi, Sept. 19, 2014.
[9] Norris, B.L., P.M. Gruenhagen, et al., "Maine Distributed Solar Valuation Study", Presented to The Joint Standing Committee on Energy, Utilities and Technology, 127th Maine Legislature, March 1, 2015.

solar was $0.09/kWh with additional societal benefits of $0.092. All studies identified a number of variables that have a significant impact on solar development in the respective states, including amount of sunlight, diversity of generation capacity of affected utilities, state incentives or disincentives, wholesale market prices, fluctuations in fuel price and changes is the demand curve for each utility. Each study concluded that the rate of compensation to the solar PV customers was essential to the viability of solar development.

17. In Kansas, the characteristics of each utility vary with each of these factors. Only through a detailed analysis can a reasonable impact be determined of distributed solar PV on each system.

18. Another unknown yet potentially significant development is the rising market for all-electric vehicles (EV). The automobile industry projects adding at least 100,000 more EV in each of the next two years. By the year 2030 electric vehicles are projected to exceed 10% of the US market. These vehicles pose the potential for significant changes to the demand curve of utilities, particularly in the residential classes where electric vehicles will be recharging. A large increase in the number of vehicles regularly recharging—likely in the evening hours—could alter the peak for a utility.

3. Summary and Conclusions

19. In summary, changes within the solar industry continue at a pace that makes it difficult to project market share and usage characteristics for distributed solar generation. There is great diversity in usage characteristics among distributed solar customers. The known diversity coupled with limited data to explain usage patterns prevent reaching reliable conclusions about costs and benefits of distributed solar generation. There is further diversity in

the generation and operational characteristics of Kansas electric utilities that complicates establishment of a one size fits all distributed generation rate. It is premature to attempt to fashion a specific rate design for distributed solar generation.

20. The Commission should conclude this docket by identifying the issues that will specifically impact the development of a distributed solar rate and by launching an independent study into how those factors can be used to shape rates that reasonably reflect both the costs and benefits of distributed solar generation on each utility system.

Respectfully submitted:

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Verification

State of Kansas)
) ss
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The undersigned certifies that he has read the foregoing pleading, that he is familiar with the contents thereof, and that the statements contained therein are true and correct to the best of his knowledge and belief.

Scott W. White

Scott White

Subscribed and sworn to before me this 17th day of March, 2017.

Heather Jones

Notary Public

My Commission Expires:

HEATHER JONES
Notary Public - State of Kansas
My Appt. Expires 11/13/2017