



414 Nicollet Mall
Minneapolis, MN 55401

June 19, 2014

—Via Electronic Filing—

Burl W. Haar
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101

RE: REPLY COMMENTS
COMMUNITY SOLAR GARDENS PROGRAM
DOCKET NO. E002/M-13-867

Dear Dr. Haar:

Northern States Power Company, doing business as Xcel Energy, submits the attached Reply to parties' Comments submitted in the above-noted docket regarding our May 1 Motion to Show Cause.

We have electronically filed this document with the Minnesota Public Utilities Commission, and copies have been served on the parties on the attached service list.

Please contact Holly Hinman at holly.r.hinman@xcelenergy.com or 612-330-5941 if you have any questions regarding this filing.

Sincerely,

/s/

CHRISTOPHER B. CLARK
REGIONAL VICE PRESIDENT
RATES AND REGULATORY AFFAIRS

Enclosures
c: Service List

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

Beverly Jones Heydinger	Chair
David Boyd	Commissioner
Nancy Lange	Commissioner
Dan Lipschultz	Commissioner
Betsy Wergin	Commissioner

IN THE MATTER OF THE PETITION OF
NORTHERN STATES POWER COMPANY
FOR APPROVAL OF ITS PROPOSED
COMMUNITY SOLAR GARDENS PROGRAM

DOCKET No. E002/M-13-867

REPLY COMMENTS

OVERVIEW

Northern States Power Company, doing business as Xcel Energy, submits to the Minnesota Public Utilities Commission these Reply Comments in response to parties' comments submitted June 2, 2014 on our Motion to Show Cause. We appreciate the opportunity to respond to parties and to provide additional input on our calculation of the Value of Solar (VOS) rate and Motion to Show Cause.

On April 1, 2014, the Commission issued an Order in Docket No. E999/M-14-65 approving a VOS methodology. On April 7, 2014, the Commission issued its Order in this Docket rejecting the Company's proposed community solar gardens tariffs and program plan. The Order required that within 30 days of the Commission's VOS Order, Xcel Energy shall either file a VOS tariff for use in our community solar gardens program or make a filing to include the VOS rate calculation and show cause why the rate should not be implemented. On May 1, 2014, the Company filed its Motion to Show Cause with its calculation of the VOS rate.

Between June 2 and June 10, 2014, parties filed Comments on our Motion. Comments were filed by the Department of Commerce, the City of Minneapolis, Minnesota Solar Energy Industries Association (MnSEIA), solar interveners¹, Interstate Renewable Energy Council (IREC), Minnesota Community Solar, Sundial Solar, Novel Energy Solutions, the Rural Renewable Energy Alliance, SoCore Energy, and Innovative Power Systems.

¹ Solar interveners include Fresh Energy, Environmental Law & Policy Center, Institute for Local Self-Reliance, and Izaak Walton League of America.

REPLY COMMENTS

In these Reply Comments, we address the key issues raised by parties, including comments on our calculation of the VOS rate and a process for annual updates to a VOS rate for community solar gardens.

A. Calculation of the VOS Rate

The Department commented on the Company's calculation of the VOS rate. The Department noted where it believes the Company correctly applied its methodology and where the Company deviated from it. Where the Department noted a deviation from the methodology, it provided additional guidance and a recalculation. We appreciate the Department's careful review of the Company's submission. The Department provided a restated VOS rate calculation totaling \$0.126/kWh.

The Company is the first utility to apply the approved methodology and we made a good faith effort to implement the series of calculations based on the descriptions available in the Department's report. In these Reply Comments, we note our responses to each of the Department's comments on our calculation. We note the instances where we agree with the Department's assessment that we departed from the methodology. These are instances where we were required to make judgments about its proper application or where the methodology does not provide explicit guidance and we made reasonable inferences in the calculation. We appreciate the Department's careful review and their comments on our calculations are helpful. We now have a more thorough understanding of the Department's application of the VOS, and our calculations have been updated according to the Department's clarifications. The updated calculations are included at Attachment A and reflect our new VOS rate calculation of \$0.1208/kWh.

1. *Peak Load Reduction*

The Department noted an inconsistency in our calculation of the Peak Load Reduction Loss Savings Factor. We have incorporated the correction into our revised calculation.

2. *Fuel Price Overhead and Heat Rate Degradation*

a. Fuel Price Overhead

The Department commented that the Company’s calculation of fuel price overhead deviated from the Commission-approved methodology.

The Company calculated the system average cost to deliver fuel from the Henry Hub to our natural gas plants using Strategist. By using a simulation model, we were able to estimate a weighted average overhead cost based on how much fuel consumption is reduced at each plant. The Department’s comments indicate that their preferred approach to the methodology is to use an estimate of fuel overhead for a single representative plant. Using market data for basis differential and actual contract rates for two of our newest power plants, we calculate the representative fuel overhead cost (\$/MMBtu) as follows.

Ventura vs. Henry Hub Basis Differential	Delivery Charge From Ventura Hub to Plant	Fuel Taxes	Total Fuel Overhead
(\$0.18)	\$0.14	\$0.00	= (\$0.04)

We make note of the following inputs to the fuel overhead cost.

- Basis Differential – The Ventura Hub in Iowa typically trades at lower prices than the NYMEX Henry Hub in Louisiana. The value used by the Company is based on actual forward trades made recently in the Intercontinental Exchange (ICE).
- Delivery Charge – The delivery charge used here is based on the current rates paid at our Blue Lake CT and Riverside CC plants. The rates include fixed \$/MMBtu rates and charges based on a percentage of the price paid at the Ventura Hub. The 25-year levelized rates for each plant were weighted based on the Solar Heat Rate used elsewhere in the VOS calculations.
- Taxes – The Company does not pay fuel consumption taxes in Minnesota.

The VOS model included with these reply comments reflects this revised fuel overhead price estimate.

b. Heat Rate Degradation

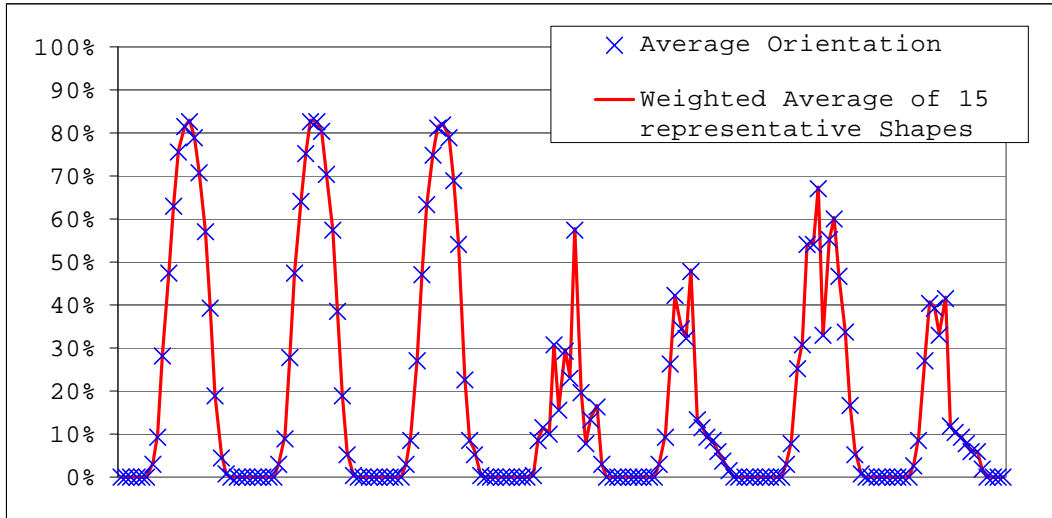
In its approach to heat rate degradation, the Company simulated the impact of solar using our Strategist model. The model results provided a beginning solar heat rate and a projection of how that heat rate changes over time. We found that as our system grows and baseload plants retire, the implied solar heat rate in our system would gradually increase.

Consistent with the fuel price overhead input, the Department's approach to calculating heat rate degradation uses a single representative natural gas plant. If the Company were to use the "representative plant" approach, we would specify a lower rate of heat rate degradation in line with the Department's suggestion of 0.1%. This is because when we plan and budget for a new natural gas plant, we include annual operations and maintenance (O&M) and periodic overhauls designed to keep a plant operating at its original performance parameters with no degradation over time. Our estimates of O&M and our capacity price amortization calculations supplied in our Motion to Show Cause reflected these investments to maintain performance. As we have updated the model with the Department's preferred approach to Fuel Price Overhead, we also update the model with respect to the Department's recommendation for capacity price amortization and heat rate degradation estimate of 0.1% per year. This downward adjustment is responsible for the majority of the difference from our initial calculation as filed in our Motion to Show Cause and our recalculated VOS rate at Attachment A.

3. *Fleet Modeling*

The Department's comments on fleet modeling correctly note that we first calculated the average panel orientation in the NSP system and then simulated solar production for that average orientation. Since filing our Motion to Show Cause, we have also estimated the solar fleet shape using the Department's recommended simulated solar shapes for each of the 15 representative panel orientations. We then calculated the weighted average solar shape based on installed capacity.

The results of the two approaches were similar, with a mean absolute difference between the two solar shapes of 1.4%. The following chart shows the estimated solar shapes for the first week of July. Since there is no discernable difference between the approaches and because the Department accepted our original approach, we have not updated the solar shape in our current VOS calculation.



4. *Avoided Fuel Costs*

The Department noted the Company calculated avoided fuel costs correctly, except for the impact of the heat rate degradation and fuel price overhead discussed above.

5. *Avoided Fixed O&M Costs*

We agree with the Department’s adjustment of our avoided fixed O&M costs and have updated our calculation which results in an increase in the value from \$0.0008 to \$0.0009.

6. *Avoided Variable O&M Costs*

The Department agreed with the Company’s avoided variable O&M cost calculation.

7. *Avoided Generation Capacity Costs*

a. *Solar Weighted Capacity Cost*

In its Comments, the Department stated that the Company did not apply the solar weighted capacity cost. We disagree with this assessment. In the VOS model we provided to the Department, on the ‘Avoided Gen Cap’ tab in cell P-17, we calculated the weighted average capacity costs. Instead of using one equation as the Department does in its Equation 17, we separated the calculation into two steps. In step one, we calculated the weighting based on heat rates. In step two, we multiplied the generation cost by the relevant weights. To verify our result, we recalculated the weighted average cost of capacity using Equation 17, which resulted in exactly the

same value as our two-step approach in cell P-17. We have made the adjustment to reflect the Department's approach, however, and have relied on Equation 17 in our attached calculation.

b. Solar Weighted Capacity Cost Amortization

The Department stated that the Company did not follow the methodology by failing to amortize the solar weighted capacity cost over the generation life in its calculation. We used Strategist to simulate calculations of the amortization. The Department uses a principal/interest-type amortization calculation, similar to a mortgage amortization schedule. Based on the Department's methodology clarification, we have updated the calculation to reflect the Department's approach.

8. *Avoided Reserve Cost*

The Department concluded that we applied the methodology correctly with respect to avoided reserve cost, though its concerns with the capacity pricing calculation flow through this calculation. We address our capacity pricing approach above.

9. *Avoided Transmission Capacity Costs*

The Department correctly notes that the avoided transmission capacity costs were calculated in error. We have incorporated this correction in our updated calculation.

10. *Avoided Distribution Capacity Costs*

In its Comments, the Department discusses the inclusion of a deferrable cost factor in calculating the avoided distribution capacity costs. We estimate that only 5.1% of distribution projects could have been avoided by the addition of solar. After eliminating capacity projects that would still have occurred, we had calculated that 5.1% is the percent deferrable distribution cost factor attributable to solar, and the use of this factor is the key difference between the Company's approach and the Department's approach to avoided distribution capacity costs.

The Department rejects the use of this factor, and we have updated our calculation accordingly. We also note the Peak Load Reduction loss factor flows through this calculation, and its revision has an impact on our updated calculation of the avoided distribution capacity costs.

11. *Avoided Environmental Costs*

We received the Department’s updated environmental cost schedules and have updated our calculation accordingly.

12. *First Year VOS*

In our Motion to Show Cause, we relied on Table 18 of the methodology to calculate the first year VOS. We have updated our calculation to reflect the Department’s approach in Equation 17.

Table 1 illustrates the 25 year levelized and first year bill credit values for the VOS rate, as calculated by both the Company and the Department.

Table 1: Comparison of 25-Year Levelized Values

	<i>25-Year Levelized Values (¢/kwh)</i>		
	Xcel Energy	DOC	
VOS Component Description	Reply Comments	Comments	Difference
Avoided Fuel Cost	\$0.0405	\$0.0461	(\$0.0056)
Avoided Plan O&M - Fixed	\$0.0009	\$0.0009	\$0.0000
Avoided Plan O&M - Variable	\$0.0017	\$0.0018	(\$0.0001)
Avoided Gen Capacity Cost	\$0.0237	\$0.0238	(\$0.0001)
Avoided Reserve Capacity Cost	\$0.0017	\$0.0017	\$0.0000
Avoided Trans Capacity Cost	\$0.0152	\$0.0151	\$0.0001
Avoided Distribution Capacity Cost	\$0.0083	\$0.0083	\$0.0000
Avoided Environmental Cost	\$0.0288	\$0.0288	\$0.0000
Avoided Voltage Control Cost			
Solar Integration Cost	-	-	
TOTAL	\$0.1208	\$0.1264	(\$0.0056)
First Year Bill Credit Rate	\$0.0940	\$0.0984	(\$0.0044)

B. Use of the VOS for Community Solar Gardens

1. Public Interest Review of VOS Rate

In its April 1 Order approving the VOS methodology, the Commission noted certain goals. It states, “A correctly calculated Value of Solar should compensate solar PV customers in a way that does not advantage or disadvantage them relative to other customers or other forms of generation.”²

We agree that this is a fundamental goal for a successful VOS. We also note that there are significant unknowns with respect to the future of distributed solar and to the marketplace response to community solar gardens. Because of these uncertainties, we continue to believe that if the Commission orders the use of the VOS rate for community solar gardens, the Commission might consider setting a period to review the rate once implemented. The Commission may wish to observe the rate over a period of time, perhaps the initial two years of its use, and then determine whether the goals of the methodology are met, whether additional benefits and costs need to be quantified, and whether the continued use of the VOS rate is in the public interest. We believe a review period provides a necessary checkpoint for this untested rate mechanism and a beneficial opportunity for course correction if warranted.

In its VOS Briefing Papers, staff noted that it “agrees that it is consistent with Commission practice and process to actively evaluate the effectiveness of a new rate.”³ Staff gave examples of other instances where reports and periodic evaluations are required by the Commission at the outset when instituting a new rate or program. Staff also noted that the mechanics of a possible revision to the VOS methodology are unclear and it noted, “The Commission may not need to decide this matter now and can take it up when an evaluation is made.”

We note that the rate has shifted materially since the Department proposed the methodology, attributable in part to inconsistencies in our application and in part to reasonable differences in approaches where the methodology does not direct a single approach. This movement alone might cause the Commission to seek a review period to address any potential instability within the rate.

² *Order Approving Distributed Solar Methodology*, April 1, 2014, Docket No. E-999/M-14-65, p. 1.

³ Staff Briefing Papers for Docket E-999/M-14-65 for March 12, 2014; page 25.

2. *Incentive*

Parties emphasize the statutory provision requiring that the community solar gardens program “reasonably allow for the creation, financing and accessibility” of gardens.⁴ Parties including IREC, MnSEIA, and the solar interveners suggest that the Commission consider the use of a limited incentive to enrich the rate if needed to enable the reasonable creation, financing, and accessibility of gardens. We note that gardens are already eligible for up to \$20 million worth of incentives annually under either of two existing programs, Made in Minnesota and Solar*Rewards.⁵ We also note that other states offer solar programs at rates below the contemplated VOS rate and applicable retail rate without additional subsidy.

Should the Commission find that additional compensation is required beyond the VOS bill credit and other incentive programs, the Commission may wish to solicit comments on how an additional incentive can be appropriately designed. We believe the appropriate time for such discussions follows an initial review period after the rate has been implemented and has an opportunity to be market tested.

3. *Rate Certainty*

We are sensitive to parties’ concerns about the potential for uncertainty with respect to rates. We do not intend to propose any midstream changes that would alter rate structures for an existing garden. The Company will propose annual updates to its rates consistent with the rate structure adopted by the Commission. Any structural changes to rate offerings would be made to new gardens only and would not upset the agreements under which existing gardens operate, unless the Commission orders otherwise.

The Commission may wish to carefully consider whether allowing an existing garden to “cut over” between an existing to a newly available rate is in the public interest.

4. *Bill Crediting Availability*

We also note that if we are ordered to use the VOS in our community solar gardens program, significant billing system development is required to accommodate its “yearly vintage” structure. This may require the full 180 days from program approval until bill crediting is available, as allowed by Minn. Stat. § 216B.1641(g).

⁴ Minn. Stat. § 216B.1641 (e)(1).

⁵ Incentives available under these programs range from \$.08 per kWh up to \$.39 per kWh

C. VOS Update Process

The Department's comments included recommendations regarding the process to update the VOS, if the Commission orders its use.

1. *Annual Inflation Adjustment Process*

The Department recommends that utilities update VOS rates annually with an inflation adjustment based on the U.S. Bureau of Labor Statistics Urban Consumer Price Index (CPI). The Company supports the use of this data set to determine the annual inflation adjustment.

2. *March 1 Annual Filing*

The Department recommends that utilities file updated inflation-adjusted rate tariffs by March 1 annually. While we do not oppose this recommendation, some time will be needed prior to this date to incorporate the Department's adjustments to the future year vintage. Thus, it would be helpful if the Department could commit to provide the required inputs, which include fixed assumptions and environmental costs, by no later than January 15 annually. This would ensure that the Company has adequate time to meet the March 1st deadline.

3. *Average Approach*

MnSEIA proposed two new approaches to developing a bill credit rate for use in community solar gardens. It suggests building from the VOS rate calculated by the Company in its Motion to Show Cause, and then averaging the rate across 25 years and applying either a 2.75% or 3.25% escalation rate. Alternatively, it proposes that the Commission could order an incentive to layer onto a rate to bring the rate to a \$0.15/kWh floor.

We are unable to verify the calculations in MnSEIA's comments and we are unsure if its suggested approaches are in alignment with the Department's methodology. For these reasons, we do not support either approach at this time.

CONCLUSION

We appreciate the opportunity to respond to parties with detail on our calculation of the VOS, to provide an updated calculation, and to comment on considerations for possible VOS implementation in community solar gardens. For the reasons presented in this filing, we believe that if the Commission determines the use of the VOS rate is appropriate for community solar gardens, public interest considerations support a review period for the new rate mechanism. If the Commission determines the VOS rate is appropriate for use in community solar gardens, we have included a revised VOS rate calculation that could be used as part of our community solar gardens tariff.

Dated: June 19, 2014

Northern States Power Company

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Table 13. Economic value of avoided transmission capacity cost.

Table 13. Economic value of avoided transmission capacity cost.

Table 14. Determination of deferrable costs.

Table 15. Economic value of avoided distribution capacity cost. (two pages)

Table 17. Economic value of avoided environmental costs

Table 18. Calculation of the inflation-adjusted VOS

Note: Table 1, 2 and 16 were not included as they are not required for the VOS calculation. Table 7 (Losses to be considered) are included in Fig. ES-1

Figure ES-1. Vos Calculation Table: economic value, load match, loss savings and distributed PV value

CURRENT POSITION <i>25 Year Levelized Values</i>	Economic Value (\$/kWh)	Load Match (No Losses) (%)	Distributed Loss Savings (%)	Distributed PV Value (\$/kWh)
Avoided Fuel Cost	\$0.0369		9.8%	\$0.0405
Avoided Plan O&M - Fixed	\$0.0016	48.6%	10.8%	\$0.0009
Avoided Plan O&M - Variable	\$0.0016		9.8%	\$0.0017
Avoided Gen Capacity Cost	\$0.0441	48.6%	10.8%	\$0.0237
Avoided Reserve Capacity Cost	\$0.0032	48.6%	10.8%	\$0.0017
Avoided Trans Capacity Cost	\$0.0283	48.6%	10.8%	\$0.0152
Avoided Distribution Capacity Cost	\$0.0133	55.2%	13.2%	\$0.0083
Avoided Environmental Cost	\$0.0262		9.8%	\$0.0288
Avoided Voltage Control Cost				
<u>Solar Integration Cost</u>				
TOTAL				\$0.1208

Figure ES-2. VOS Rate Table: Rate calculation for each year of the 2014 VOS period

Year	Discount Factor	Escalation Factor	VOS Levelized	Disc.	VOS Inflation Adj. (\$/kWh)	Disc
2014	1.000	1.000	\$0.121	\$0.121	\$0.0940	0.094
2015	0.939	1.028	\$0.121	\$0.113	\$0.0966	0.091
2016	0.881	1.056	\$0.121	\$0.106	\$0.0992	0.087
2017	0.828	1.085	\$0.121	\$0.100	\$0.1020	0.084
2018	0.777	1.115	\$0.121	\$0.094	\$0.1048	0.081
2019	0.730	1.145	\$0.121	\$0.088	\$0.1076	0.079
2020	0.685	1.177	\$0.121	\$0.083	\$0.1106	0.076
2021	0.685	1.209	\$0.121	\$0.083	\$0.1136	0.078
2022	0.685	1.242	\$0.121	\$0.083	\$0.1168	0.080
2023	0.567	1.277	\$0.121	\$0.068	\$0.1200	0.068
2024	0.532	1.312	\$0.121	\$0.064	\$0.1233	0.066
2025	0.500	1.348	\$0.121	\$0.060	\$0.1267	0.063
2026	0.469	1.385	\$0.121	\$0.057	\$0.1301	0.061
2027	0.440	1.423	\$0.121	\$0.053	\$0.1337	0.059
2028	0.414	1.462	\$0.121	\$0.050	\$0.1374	0.057
2029	0.388	1.502	\$0.121	\$0.047	\$0.1412	0.055
2030	0.388	1.544	\$0.121	\$0.047	\$0.1451	0.056
2031	0.342	1.586	\$0.121	\$0.041	\$0.1491	0.051
2032	0.321	1.630	\$0.121	\$0.039	\$0.1532	0.049
2033	0.302	1.674	\$0.121	\$0.036	\$0.1574	0.047
2034	0.283	1.720	\$0.121	\$0.034	\$0.1617	0.046
2035	0.266	1.768	\$0.121	\$0.032	\$0.1661	0.044
2036	0.250	1.816	\$0.121	\$0.030	\$0.1707	0.043
2037	0.234	1.866	\$0.121	\$0.028	\$0.1754	0.041
2038	0.220	1.918	\$0.121	\$0.027	\$0.1802	0.040
				\$1.586		\$1.596

Table 3. Fixed Assumptions to be used for 2014 VOS calculations

Fuel Prices			Environmental Externalities	
Guaranteed NG Fuel Prices			Environmental Discount Rate	5.83% per year
2014	\$4.50	\$/mmBtu	Environmental Costs	separate table
2015	\$4.26	\$/mmBtu	Economic Assumptions	
2016	\$4.20	\$/mmBtu	General Escalation Rate	2.75% per year
2017	\$4.27	\$/mmBtu	Treasury Yields	
2018	\$4.37	\$/mmBtu	1 Year	0.13%
2019	\$4.49	\$/mmBtu	2 Year	0.29%
2020	\$4.69	\$/mmBtu	3 Year	0.48%
2021	\$4.86	\$/mmBtu	5 Year	1.01%
2022	\$5.00	\$/mmBtu	7 Year	1.53%
2023	\$5.09	\$/mmBtu	10 Year	2.14%
2024	\$5.15	\$/mmBtu	20 Year	2.92%
2025	\$5.24	\$/mmBtu	30 Year	3.27%
Fuel Price Escalation	2.75%			
PV Assumptions				
PV Degradation Rate	0.50%			
PV Life	25			

Table 4. Environmental costs by year.

Year	Analysis Year	CO2 Cost \$/mmBtu	PM 10 Cost \$/mmBtu	CO Cost \$/mmBtu	NOx Cost \$/mmBtu	Pb Cost \$/mmBtu	Total Cost \$/mmBtu
2014	0	\$2.219	\$0.03	\$0.00	\$0.04	\$0.00	\$2.290
2015	1	\$2.342	\$0.03	\$0.00	\$0.04	\$0.00	\$2.414
2016	2	\$2.469	\$0.03	\$0.00	\$0.05	\$0.00	\$2.544
2017	3	\$2.602	\$0.03	\$0.00	\$0.05	\$0.00	\$2.679
2018	4	\$2.741	\$0.03	\$0.00	\$0.05	\$0.00	\$2.819
2019	5	\$2.885	\$0.03	\$0.00	\$0.05	\$0.00	\$2.966
2020	6	\$3.035	\$0.03	\$0.00	\$0.05	\$0.00	\$3.118
2021	7	\$3.190	\$0.03	\$0.00	\$0.05	\$0.00	\$3.276
2022	8	\$3.353	\$0.03	\$0.00	\$0.05	\$0.00	\$3.440
2023	9	\$3.521	\$0.03	\$0.00	\$0.06	\$0.00	\$3.612
2024	10	\$3.697	\$0.04	\$0.00	\$0.06	\$0.00	\$3.790
2025	11	\$3.879	\$0.04	\$0.00	\$0.06	\$0.00	\$3.975
2026	12	\$4.069	\$0.04	\$0.00	\$0.06	\$0.00	\$4.167
2027	13	\$4.181	\$0.04	\$0.00	\$0.06	\$0.00	\$4.282
2028	14	\$4.384	\$0.04	\$0.00	\$0.06	\$0.00	\$4.487
2029	15	\$4.594	\$0.04	\$0.00	\$0.07	\$0.00	\$4.701
2030	16	\$4.813	\$0.04	\$0.00	\$0.07	\$0.00	\$4.922
2031	17	\$5.041	\$0.04	\$0.00	\$0.07	\$0.00	\$5.153
2032	18	\$5.277	\$0.04	\$0.00	\$0.07	\$0.00	\$5.392
2033	19	\$5.523	\$0.04	\$0.00	\$0.07	\$0.00	\$5.641
2034	20	\$5.778	\$0.05	\$0.00	\$0.08	\$0.00	\$5.899
2035	21	\$6.043	\$0.05	\$0.00	\$0.08	\$0.00	\$6.167
2036	22	\$6.318	\$0.05	\$0.00	\$0.08	\$0.00	\$6.446
2037	23	\$6.603	\$0.05	\$0.00	\$0.08	\$0.00	\$6.735
2038	24	\$6.900	\$0.05	\$0.00	\$0.08	\$0.00	\$7.035

Table 5. VOS Data table -- required format showing example parameters used in the example calculation.

	Input Data	Units		Input Data	Units
Economic Factors			Power Generation		
Start Year for VOS applicability	2014		Peaking CT, simple cycle		
Discount Rate (WACC)	6.51%	per year	Installed Cost	\$640	\$/kW
			Heat Rate	9,796	BTU/kWh
Load Match Analysis			Intermediate CCGT		
ELCC (no loss)	48.6%	% of rating	Installed Cost	\$882	\$/kW
PLR (no loss)	55.2%	% of rating	Heat Rate	6,777	BTU/kWh
Loss Savings - Energy	9.8%	% of PV output	Other		
Loss Savings - PLR	13.2%	% of PV output	Solar weighted Heat Rate	6,950	BTU per kWh
Loss Savings - ELCC	10.8%	% of PV output	Fuel Price Overhead	-\$0.040	\$ per MMBtu
PV Energy			Generation life	35	years
First year annual energy	1,452	kWh per kW-AC	Heat Rate degradation	0.10%	per year
	16.6%		O&M cost (first year) - Fixed	\$2.00	per kW-yr
			O&M cost (first year) - Variable	\$0.001	\$ per kWh
Transmission			O&M cost escalation rate	1.66%	per year
Capacity-related transmission capital cost	\$40.72	\$ per kW	Reserve planning margin	7.3%	
			Years until new Generation is needed	0	
			Distribution		
			Capacity-related distribution capital costs	\$336	\$ per kW
			Distribution capital cost escalation	2%	per year
			Peak Load	7,284	MW
			Peak Load Growth	1.14%	per year

Table 6. Azimuth and Tilt Angles

	Array KW	% of Total	Azimuth	Tilt	
1	32	0.4%	91	26	
2	254	2.9%	146	31	
3	282	3.3%	169	28	
4	514	5.9%	180	15	
5	637	7.4%	180	20	
6	682	7.9%	180	26	
7	1,144	13.2%	180	30	
8	561	6.5%	180	35	
9	388	4.5%	180	39	
10	3,365	38.8%	180	45	
11	300	3.5%	183	27	
12	206	2.4%	195	26	
13	189	2.2%	208	32	
14	91	1.1%	221	27	
15	24	0.3%	272	23	
TOTAL	8,669	100%	180.1	34.3	Weighted Average

Table 8. Economic Value of Avoided Fuel Costs.

Year	Guaranteed NG Price	Burner Tip NG Price	Heat Rate	Prices		p.u. PV Production	Costs		Discount Factor	Disc. Costs	
				Utility	VOS		Utility	VOS		Utility	VOS
				\$/mmBtu	\$/mmBtu		mmBtu/MWh	\$/kWh		\$/kWh	(kWh)
2014	\$4.50	\$4.46	6,950	\$0.031	\$0.0369	1,452	\$45	\$54	1.000	\$45	\$54
2015	\$4.26	\$4.22	6,957	\$0.029	\$0.0369	1,444	\$42	\$53	0.997	\$42	\$53
2016	\$4.20	\$4.16	6,964	\$0.029	\$0.0369	1,437	\$42	\$53	0.994	\$41	\$53
2017	\$4.27	\$4.23	6,971	\$0.029	\$0.0369	1,430	\$42	\$53	0.986	\$42	\$52
2018	\$4.37	\$4.32	6,978	\$0.030	\$0.0369	1,423	\$43	\$52	0.971	\$42	\$51
2019	\$4.49	\$4.45	6,985	\$0.031	\$0.0369	1,416	\$44	\$52	0.951	\$42	\$50
2020	\$4.69	\$4.64	6,992	\$0.032	\$0.0369	1,409	\$46	\$52	0.927	\$42	\$48
2021	\$4.86	\$4.81	6,999	\$0.034	\$0.0369	1,402	\$47	\$52	0.899	\$42	\$46
2022	\$5.00	\$4.95	7,006	\$0.035	\$0.0369	1,395	\$48	\$51	0.872	\$42	\$45
2023	\$5.09	\$5.04	7,013	\$0.035	\$0.0369	1,388	\$49	\$51	0.841	\$41	\$43
2024	\$5.15	\$5.09	7,020	\$0.036	\$0.0369	1,381	\$49	\$51	0.809	\$40	\$41
2025	\$5.24	\$5.19	7,027	\$0.036	\$0.0369	1,374	\$50	\$51	0.786	\$39	\$40
2026	\$5.38	\$5.33	7,034	\$0.037	\$0.0369	1,367	\$51	\$50	0.762	\$39	\$38
2027	\$5.53	\$5.48	7,041	\$0.039	\$0.0369	1,360	\$52	\$50	0.737	\$39	\$37
2028	\$5.68	\$5.63	7,048	\$0.040	\$0.0369	1,353	\$54	\$50	0.712	\$38	\$36
2029	\$5.84	\$5.78	7,055	\$0.041	\$0.0369	1,347	\$55	\$50	0.687	\$38	\$34
2030	\$6.00	\$5.94	7,062	\$0.042	\$0.0369	1,340	\$56	\$49	0.662	\$37	\$33
2031	\$6.17	\$6.10	7,069	\$0.043	\$0.0369	1,333	\$58	\$49	0.637	\$37	\$31
2032	\$6.34	\$6.27	7,076	\$0.044	\$0.0369	1,326	\$59	\$49	0.612	\$36	\$30
2033	\$6.51	\$6.44	7,083	\$0.046	\$0.0369	1,320	\$60	\$49	0.587	\$35	\$29
2034	\$6.69	\$6.62	7,090	\$0.047	\$0.0369	1,313	\$62	\$48	0.562	\$35	\$27
2035	\$6.87	\$6.80	7,098	\$0.048	\$0.0369	1,307	\$63	\$48	0.543	\$34	\$26
2036	\$7.06	\$6.99	7,105	\$0.050	\$0.0369	1,300	\$65	\$48	0.523	\$34	\$25
2037	\$7.26	\$7.18	7,112	\$0.051	\$0.0369	1,294	\$66	\$48	0.504	\$33	\$24
2038	\$7.46	\$7.38	7,119	\$0.053	\$0.0369	1,287	\$68	\$47	0.485	\$33	\$23

Validation: Present Value	\$969	\$969
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Table 9. Economic value of avoided plant O&M - fixed

Year	O&M Fixed	Utility Capacity	PV Capacity	Prices		p.u. PV Production	Costs		Discount Factor	Disc. Costs	
				Utility	VOS		Utility	VOS		Utility	VOS
				\$/kWh	\$/kWh		(\$)	(\$)		(\$)	(\$)
2014	\$2.00	1.00	1.00	\$0.0014	\$0.0016	1,452	\$2.00	\$2.34	1.000	\$2.00	\$2.34
2015	\$2.04	0.999	0.995	\$0.0014	\$0.0016	1,444	\$2.03	\$2.33	0.939	\$1.91	\$2.19
2016	\$2.07	0.998	0.990	\$0.0014	\$0.0016	1,437	\$2.06	\$2.32	0.881	\$1.81	\$2.04
2017	\$2.11	0.997	0.985	\$0.0015	\$0.0016	1,430	\$2.08	\$2.30	0.828	\$1.72	\$1.91
2018	\$2.14	0.996	0.980	\$0.0015	\$0.0016	1,423	\$2.11	\$2.29	0.777	\$1.64	\$1.78
2019	\$2.18	0.995	0.975	\$0.0015	\$0.0016	1,416	\$2.13	\$2.28	0.730	\$1.56	\$1.66
2020	\$2.18	0.994	0.970	\$0.0015	\$0.0016	1,409	\$2.12	\$2.27	0.685	\$1.46	\$1.56
2021	\$2.18	0.993	0.966	\$0.0015	\$0.0016	1,402	\$2.12	\$2.26	0.685	\$1.45	\$1.55
2022	\$2.29	0.992	0.961	\$0.0016	\$0.0016	1,395	\$2.21	\$2.25	0.685	\$1.52	\$1.54
2023	\$2.32	0.991	0.956	\$0.0017	\$0.0016	1,388	\$2.24	\$2.24	0.567	\$1.27	\$1.27
2024	\$2.36	0.990	0.951	\$0.0017	\$0.0016	1,381	\$2.27	\$2.23	0.532	\$1.21	\$1.18
2025	\$2.40	0.989	0.946	\$0.0017	\$0.0016	1,374	\$2.30	\$2.21	0.500	\$1.15	\$1.11
2026	\$2.44	0.988	0.942	\$0.0018	\$0.0016	1,367	\$2.33	\$2.20	0.469	\$1.09	\$1.03
2027	\$2.48	0.987	0.937	\$0.0018	\$0.0016	1,360	\$2.36	\$2.19	0.440	\$1.04	\$0.97
2028	\$2.52	0.986	0.932	\$0.0018	\$0.0016	1,353	\$2.39	\$2.18	0.414	\$0.99	\$0.90
2029	\$2.52	0.985	0.928	\$0.0018	\$0.0016	1,347	\$2.38	\$2.17	0.388	\$0.92	\$0.84
2030	\$2.61	0.984	0.923	\$0.0019	\$0.0016	1,340	\$2.45	\$2.16	0.388	\$0.95	\$0.84
2031	\$2.65	0.983	0.918	\$0.0020	\$0.0016	1,333	\$2.48	\$2.15	0.342	\$0.85	\$0.74
2032	\$2.70	0.982	0.914	\$0.0020	\$0.0016	1,326	\$2.51	\$2.14	0.321	\$0.81	\$0.69
2033	\$2.74	0.981	0.909	\$0.0020	\$0.0016	1,320	\$2.54	\$2.13	0.302	\$0.77	\$0.64
2034	\$2.79	0.980	0.905	\$0.0021	\$0.0016	1,313	\$2.57	\$2.12	0.283	\$0.73	\$0.60
2035	\$2.83	0.979	0.900	\$0.0021	\$0.0016	1,307	\$2.60	\$2.11	0.266	\$0.69	\$0.56
2036	\$2.88	0.978	0.896	\$0.0022	\$0.0016	1,300	\$2.64	\$2.10	0.250	\$0.66	\$0.52
2037	\$2.93	0.977	0.891	\$0.0022	\$0.0016	1,294	\$2.67	\$2.08	0.234	\$0.63	\$0.49
2038	\$2.98	0.976	0.887	\$0.0023	\$0.0016	1,287	\$2.70	\$2.07	0.220	\$0.59	\$0.46

\$0.0016

Validation: Present Value	\$29	\$29
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Table 10. Economic value of avoided plant O&M - variable

Year	Prices		p.u. PV Production (kWh)	Costs		Discount Factor (risk free)	Disc. Costs	
	Utility	VOS		Utility	VOS		Utility	VOS
	\$/kWh	\$/kWh		(\$)	(\$)		(\$)	(\$)
2014	\$0.001	\$0.0016	1,452	\$2	\$2	1.000	\$2	\$2
2015	\$0.001	\$0.0016	1,444	\$2	\$2	0.939	\$2	\$2
2016	\$0.001	\$0.0016	1,437	\$2	\$2	0.881	\$2	\$2
2017	\$0.001	\$0.0016	1,430	\$2	\$2	0.828	\$2	\$2
2018	\$0.001	\$0.0016	1,423	\$2	\$2	0.777	\$2	\$2
2019	\$0.001	\$0.0016	1,416	\$2	\$2	0.730	\$2	\$2
2020	\$0.001	\$0.0016	1,409	\$2	\$2	0.685	\$1	\$2
2021	\$0.002	\$0.0016	1,402	\$2	\$2	0.643	\$1	\$1
2022	\$0.002	\$0.0016	1,395	\$2	\$2	0.604	\$1	\$1
2023	\$0.002	\$0.0016	1,388	\$2	\$2	0.567	\$1	\$1
2024	\$0.002	\$0.0016	1,381	\$2	\$2	0.532	\$1	\$1
2025	\$0.002	\$0.0016	1,374	\$2	\$2	0.500	\$1	\$1
2026	\$0.002	\$0.0016	1,367	\$2	\$2	0.469	\$1	\$1
2027	\$0.002	\$0.0016	1,360	\$2	\$2	0.440	\$1	\$1
2028	\$0.002	\$0.0016	1,353	\$2	\$2	0.414	\$1	\$1
2029	\$0.002	\$0.0016	1,347	\$2	\$2	0.388	\$1	\$1
2030	\$0.002	\$0.0016	1,340	\$2	\$2	0.365	\$1	\$1
2031	\$0.002	\$0.0016	1,333	\$2	\$2	0.342	\$1	\$1
2032	\$0.002	\$0.0016	1,326	\$2	\$2	0.321	\$1	\$1
2033	\$0.002	\$0.0016	1,320	\$2	\$2	0.302	\$1	\$1
2034	\$0.002	\$0.0016	1,313	\$2	\$2	0.283	\$1	\$1
2035	\$0.002	\$0.0016	1,307	\$2	\$2	0.266	\$1	\$1
2036	\$0.002	\$0.0016	1,300	\$3	\$2	0.250	\$1	\$1
2037	\$0.002	\$0.0016	1,294	\$3	\$2	0.234	\$1	\$0
2038	\$0.002	\$0.0016	1,287	\$3	\$2	0.220	\$1	\$0

Validation: Present Value	\$28	\$28
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Table 11. Economic value of avoided generation capacity cost.

Year	Capacity Cost \$/kW-yr	Utility Capacity pu.	PV Capacity kW	Prices		PV Production (kWh)	Costs		Discount Factor	Disc. Costs	
				Utility \$/kWh	VOS \$/kWh		Utility (\$)	VOS (\$)		Utility (\$)	VOS (\$)
2014	\$63	1.00	1.00	\$0.044	\$0.0441	1,452	\$63	\$64	1.000	\$63	\$64
2015	\$63	0.999	0.995	\$0.044	\$0.0441	1,444	\$63	\$64	0.939	\$59	\$60
2016	\$63	0.998	0.990	\$0.044	\$0.0441	1,437	\$63	\$63	0.881	\$56	\$56
2017	\$63	0.997	0.985	\$0.044	\$0.0441	1,430	\$63	\$63	0.828	\$52	\$52
2018	\$63	0.996	0.980	\$0.044	\$0.0441	1,423	\$62	\$63	0.777	\$49	\$49
2019	\$63	0.995	0.975	\$0.044	\$0.0441	1,416	\$62	\$62	0.730	\$45	\$46
2020	\$63	0.994	0.970	\$0.044	\$0.0441	1,409	\$62	\$62	0.685	\$42	\$43
2021	\$63	0.993	0.966	\$0.044	\$0.0441	1,402	\$62	\$62	0.643	\$40	\$40
2022	\$63	0.992	0.961	\$0.044	\$0.0441	1,395	\$61	\$62	0.604	\$37	\$37
2023	\$63	0.991	0.956	\$0.044	\$0.0441	1,388	\$61	\$61	0.567	\$35	\$35
2024	\$63	0.990	0.951	\$0.044	\$0.0441	1,381	\$61	\$61	0.532	\$32	\$32
2025	\$63	0.989	0.946	\$0.044	\$0.0441	1,374	\$61	\$61	0.500	\$30	\$30
2026	\$63	0.988	0.942	\$0.044	\$0.0441	1,367	\$61	\$60	0.469	\$28	\$28
2027	\$63	0.987	0.937	\$0.044	\$0.0441	1,360	\$60	\$60	0.440	\$27	\$26
2028	\$63	0.986	0.932	\$0.044	\$0.0441	1,353	\$60	\$60	0.414	\$25	\$25
2029	\$63	0.985	0.928	\$0.044	\$0.0441	1,347	\$60	\$59	0.388	\$23	\$23
2030	\$63	0.984	0.923	\$0.044	\$0.0441	1,340	\$60	\$59	0.365	\$22	\$22
2031	\$63	0.983	0.918	\$0.044	\$0.0441	1,333	\$59	\$59	0.342	\$20	\$20
2032	\$63	0.982	0.914	\$0.045	\$0.0441	1,326	\$59	\$59	0.321	\$19	\$19
2033	\$63	0.981	0.909	\$0.045	\$0.0441	1,320	\$59	\$58	0.302	\$18	\$18
2034	\$63	0.980	0.905	\$0.045	\$0.0441	1,313	\$59	\$58	0.283	\$17	\$16
2035	\$63	0.979	0.900	\$0.045	\$0.0441	1,307	\$58	\$58	0.266	\$16	\$15
2036	\$63	0.978	0.896	\$0.045	\$0.0441	1,300	\$58	\$57	0.250	\$15	\$14
2037	\$63	0.977	0.891	\$0.045	\$0.0441	1,294	\$58	\$57	0.234	\$14	\$13
2038	\$63	0.976	0.887	\$0.045	\$0.0441	1,287	\$58	\$57	0.220	\$13	\$12
					\$0.0441						
Validation: Present Value										\$796	\$796

Table 12. Economic value of avoided reserve capacity cost.

Year	Capacity Cost	Reserve Margin	Utility Capacity	PV Capacity	Prices		PV Production	Costs		Discount Factor	Disc. Costs	
					Utility	VOS		Utility	VOS		Utility	VOS
					\$/kWh	\$/kWh		(\$)	(\$)		(\$)	(\$)
2014	\$63	7.3%	1.00	1.00	\$0.003	\$0.0032	1,452	\$5	\$5	1.000	\$5	\$5
2015	\$63	7.3%	0.999	0.995	\$0.003	\$0.0032	1,444	\$5	\$5	0.939	\$4	\$4
2016	\$63	7.3%	0.998	0.990	\$0.003	\$0.0032	1,437	\$5	\$5	0.881	\$4	\$4
2017	\$63	7.3%	0.997	0.985	\$0.003	\$0.0032	1,430	\$5	\$5	0.828	\$4	\$4
2018	\$63	7.3%	0.996	0.980	\$0.003	\$0.0032	1,423	\$5	\$5	0.777	\$4	\$4
2019	\$63	7.3%	0.995	0.975	\$0.003	\$0.0032	1,416	\$5	\$5	0.730	\$3	\$3
2020	\$63	7.3%	0.994	0.970	\$0.003	\$0.0032	1,409	\$5	\$5	0.685	\$3	\$3
2021	\$63	7.3%	0.993	0.966	\$0.003	\$0.0032	1,402	\$5	\$5	0.643	\$3	\$3
2022	\$63	7.3%	0.992	0.961	\$0.003	\$0.0032	1,395	\$4	\$4	0.604	\$3	\$3
2023	\$63	7.3%	0.991	0.956	\$0.003	\$0.0032	1,388	\$4	\$4	0.567	\$3	\$3
2024	\$63	7.3%	0.990	0.951	\$0.003	\$0.0032	1,381	\$4	\$4	0.532	\$2	\$2
2025	\$63	7.3%	0.989	0.946	\$0.003	\$0.0032	1,374	\$4	\$4	0.500	\$2	\$2
2026	\$63	7.3%	0.988	0.942	\$0.003	\$0.0032	1,367	\$4	\$4	0.469	\$2	\$2
2027	\$63	7.3%	0.987	0.937	\$0.003	\$0.0032	1,360	\$4	\$4	0.440	\$2	\$2
2028	\$63	7.3%	0.986	0.932	\$0.003	\$0.0032	1,353	\$4	\$4	0.414	\$2	\$2
2029	\$63	7.3%	0.985	0.928	\$0.003	\$0.0032	1,347	\$4	\$4	0.388	\$2	\$2
2030	\$63	7.3%	0.984	0.923	\$0.003	\$0.0032	1,340	\$4	\$4	0.365	\$2	\$2
2031	\$63	7.3%	0.983	0.918	\$0.003	\$0.0032	1,333	\$4	\$4	0.342	\$1	\$1
2032	\$63	7.3%	0.982	0.914	\$0.003	\$0.0032	1,326	\$4	\$4	0.321	\$1	\$1
2033	\$63	7.3%	0.981	0.909	\$0.003	\$0.0032	1,320	\$4	\$4	0.302	\$1	\$1
2034	\$63	7.3%	0.980	0.905	\$0.003	\$0.0032	1,313	\$4	\$4	0.283	\$1	\$1
2035	\$63	7.3%	0.979	0.900	\$0.003	\$0.0032	1,307	\$4	\$4	0.266	\$1	\$1
2036	\$63	7.3%	0.978	0.896	\$0.003	\$0.0032	1,300	\$4	\$4	0.250	\$1	\$1
2037	\$63	7.3%	0.977	0.891	\$0.003	\$0.0032	1,294	\$4	\$4	0.234	\$1	\$1
2038	\$63	7.3%	0.976	0.887	\$0.003	\$0.0032	1,287	\$4	\$4	0.220	\$1	\$1
						\$0.0032						
Validation: Present Value											\$58	\$58

Table 13. Economic value of avoided transmission capacity cost.

Year				Prices		PV Production (kWh)	Costs		Discount Factor	Disc. Costs	
	Capacity Cost	Utility Capacity	PV Capacity	Utility	VOS		Utility	VOS		Utility	VOS
	\$/kW-yr	pu.	kW	\$/kWh	\$/kWh		(\$)	(\$)		(\$)	(\$)
2014	\$41	1.00	1.00	\$0.028	\$0.0283	1,452	\$41	\$41	1.000	\$41	\$41
2015	\$41	0.999	0.995	\$0.028	\$0.0283	1,444	\$41	\$41	0.939	\$38	\$38
2016	\$41	0.998	0.990	\$0.028	\$0.0283	1,437	\$40	\$41	0.881	\$36	\$36
2017	\$41	0.997	0.985	\$0.028	\$0.0283	1,430	\$40	\$40	0.828	\$33	\$33
2018	\$41	0.996	0.980	\$0.028	\$0.0283	1,423	\$40	\$40	0.777	\$31	\$31
2019	\$41	0.995	0.975	\$0.028	\$0.0283	1,416	\$40	\$40	0.730	\$29	\$29
2020	\$41	0.994	0.970	\$0.028	\$0.0283	1,409	\$40	\$40	0.685	\$27	\$27
2021	\$41	0.993	0.966	\$0.028	\$0.0283	1,402	\$40	\$40	0.643	\$25	\$26
2022	\$41	0.992	0.961	\$0.028	\$0.0283	1,395	\$39	\$39	0.604	\$24	\$24
2023	\$41	0.991	0.956	\$0.028	\$0.0283	1,388	\$39	\$39	0.567	\$22	\$22
2024	\$41	0.990	0.951	\$0.028	\$0.0283	1,381	\$39	\$39	0.532	\$21	\$21
2025	\$41	0.989	0.946	\$0.028	\$0.0283	1,374	\$39	\$39	0.500	\$19	\$19
2026	\$41	0.988	0.942	\$0.028	\$0.0283	1,367	\$39	\$39	0.469	\$18	\$18
2027	\$41	0.987	0.937	\$0.028	\$0.0283	1,360	\$39	\$38	0.440	\$17	\$17
2028	\$41	0.986	0.932	\$0.028	\$0.0283	1,353	\$38	\$38	0.414	\$16	\$16
2029	\$41	0.985	0.928	\$0.028	\$0.0283	1,347	\$38	\$38	0.388	\$15	\$15
2030	\$41	0.984	0.923	\$0.028	\$0.0283	1,340	\$38	\$38	0.365	\$14	\$14
2031	\$41	0.983	0.918	\$0.029	\$0.0283	1,333	\$38	\$38	0.342	\$13	\$13
2032	\$41	0.982	0.914	\$0.029	\$0.0283	1,326	\$38	\$38	0.321	\$12	\$12
2033	\$41	0.981	0.909	\$0.029	\$0.0283	1,320	\$38	\$37	0.302	\$11	\$11
2034	\$41	0.980	0.905	\$0.029	\$0.0283	1,313	\$38	\$37	0.283	\$11	\$11
2035	\$41	0.979	0.900	\$0.029	\$0.0283	1,307	\$37	\$37	0.266	\$10	\$10
2036	\$41	0.978	0.896	\$0.029	\$0.0283	1,300	\$37	\$37	0.250	\$9	\$9
2037	\$41	0.977	0.891	\$0.029	\$0.0283	1,294	\$37	\$37	0.234	\$9	\$9
2038	\$41	0.976	0.887	\$0.029	\$0.0283	1,287	\$37	\$36	0.220	\$8	\$8
					\$0.0283						

Validation: Present Value	\$510	\$510
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Table 14. Determination of deferrable distribution costs.

Year	Distribution Project Costs	% Capacity Related	Capacity Related		
	\$	%	\$		
2013	172,580,006	24.8%	42,782,338		
2012	140,736,365	24.2%	34,025,752		
2011	122,977,640	14.9%	18,286,517		
2010	129,634,955	14.1%	18,324,823		
2009	111,965,737	13.9%	<u>15,617,571</u>		
2009-2013 TOTAL			129,037,002		
2008	138,625,404	26.6%	36,826,155		
2007	108,937,389	12.1%	13,162,607		
2006	105,071,496	12.0%	12,563,257		
2005	108,039,469	11.3%	12,231,129		
2004	105,804,117	12.3%	<u>13,000,753</u>		
2004-2008 TOTAL			87,783,901		
TOTAL 10-YEAR PERIOD			216,820,903		

Table 15. Economic value of avoided distribution capacity cost.

Year	Conventional Distribution Planning					Deferred Distribution Planning			
	Distribution Cost	New Dist. Capacity	Capital Cost	Disc Capital Cost	Amortized	Def. Dist. Capacity	Def. Capital Cost	Disc Capital Cost	Amortized
	\$/kW-yr	(MW)	(\$M)	(\$M)	\$/yr	(MW)	(\$M)	(\$M)	\$/yr
2014	\$336	50	\$17	\$17	\$24				\$23
2015	\$342	50	\$17	\$16	\$24	50	\$17.1	\$16.1	\$23
2016	\$349	51	\$18	\$16	\$24	50	\$17.5	\$15.4	\$23
2017	\$356	51	\$18	\$15	\$24	51	\$18.2	\$15.0	\$23
2018	\$363	52	\$19	\$15	\$24	51	\$18.5	\$14.4	\$23
2019	\$371	52	\$19	\$14	\$24	52	\$19.3	\$14.1	\$23
2020	\$378	53	\$20	\$14	\$24	52	\$19.7	\$13.5	\$23
2021	\$385	53	\$20	\$13	\$24	53	\$20.4	\$13.1	\$23
2022	\$393	54	\$21	\$13	\$24	53	\$20.8	\$12.6	\$23
2023	\$401	54	\$22	\$12	\$24	54	\$21.7	\$12.3	\$23
2024	\$409	55	\$22	\$12	\$24	54	\$22.1	\$11.8	\$23
2025	\$417	55	\$23	\$11	\$24	55	\$22.9	\$11.5	\$23
2026	\$426	56	\$24	\$11	\$24	55	\$23.4	\$11.0	\$23
2027	\$434	56	\$24	\$11	\$24	56	\$24.3	\$10.7	\$23
2028	\$443	57	\$25	\$10	\$24	56	\$24.8	\$10.3	\$23
2029	\$452	57	\$26	\$10	\$24	57	\$25.7	\$10.0	\$23
2030	\$461	58	\$27	\$10	\$24	57	\$26.3	\$9.6	\$23
2031	\$470	59	\$28	\$9	\$24	58	\$27.3	\$9.3	\$23
2032	\$479	59	\$28	\$9	\$24	59	\$28.3	\$9.1	\$23
2033	\$489	60	\$29	\$9	\$24	59	\$28.8	\$8.7	\$23
2034	\$499	60	\$30	\$8	\$24	60	\$29.9	\$8.5	\$23
2035	\$509	61	\$31	\$8	\$24	60	\$30.5	\$8.1	\$23
2036	\$519	62	\$32	\$8	\$24	61	\$31.6	\$7.9	\$23
2037	\$529	62	\$33	\$8	\$24	62	\$32.8	\$7.7	\$23
2038	\$540	63	\$34	\$7	\$24	62	\$33.5	\$7.4	\$23
2039	\$551					63	\$34.7	\$7.2	
					\$287				\$274.97

Continued - Table 15. Economic value of avoided distribution capacity cost.

Prices		PV Production (kWh)	Costs		Discount Factor	Disc. Costs	
Utility \$/kWh	VOS \$/kWh		Utility (\$)	VOS (\$)		Utility (\$)	VOS (\$)
\$0.01374	\$0.0133	1,452	\$20	\$19	1.000	\$20	\$19
\$0.01381	\$0.0133	1,444	\$20	\$19	0.939	\$19	\$18
\$0.01361	\$0.0133	1,437	\$20	\$19	0.881	\$17	\$17
\$0.01368	\$0.0133	1,430	\$20	\$19	0.828	\$16	\$16
\$0.01348	\$0.0133	1,423	\$19	\$19	0.777	\$15	\$15
\$0.01355	\$0.0133	1,416	\$19	\$19	0.730	\$14	\$14
\$0.01336	\$0.0133	1,409	\$19	\$19	0.685	\$13	\$13
\$0.01343	\$0.0133	1,402	\$19	\$19	0.643	\$12	\$12
\$0.01325	\$0.0133	1,395	\$18	\$19	0.604	\$11	\$11
\$0.01331	\$0.0133	1,388	\$18	\$18	0.567	\$10	\$10
\$0.01314	\$0.0133	1,381	\$18	\$18	0.532	\$10	\$10
\$0.01320	\$0.0133	1,374	\$18	\$18	0.500	\$9	\$9
\$0.01303	\$0.0133	1,367	\$18	\$18	0.469	\$8	\$9
\$0.01310	\$0.0133	1,360	\$18	\$18	0.440	\$8	\$8
\$0.01293	\$0.0133	1,353	\$18	\$18	0.414	\$7	\$7
\$0.01300	\$0.0133	1,347	\$18	\$18	0.388	\$7	\$7
\$0.01284	\$0.0133	1,340	\$17	\$18	0.365	\$6	\$6
\$0.01268	\$0.0133	1,333	\$17	\$18	0.342	\$6	\$6
\$0.01275	\$0.0133	1,326	\$17	\$18	0.321	\$5	\$6
\$0.01260	\$0.0133	1,320	\$17	\$18	0.302	\$5	\$5
\$0.01266	\$0.0133	1,313	\$17	\$17	0.283	\$5	\$5
\$0.01252	\$0.0133	1,307	\$16	\$17	0.266	\$4	\$5
\$0.01238	\$0.0133	1,300	\$16	\$17	0.250	\$4	\$4
\$0.01244	\$0.0133	1,294	\$16	\$17	0.234	\$4	\$4
\$0.01230	\$0.0133	1,287	\$16	\$17	0.220	\$3	\$4
					-		
	\$0.0133		Validation: Present Value			\$239	\$239

Table 17. Economic value of avoided environmental costs

Environmental Discount Rate

5.83%

Year	Env. Cost \$/mmBtu	Solar Weighted Heat Rate mmBtu/MWh	Prices		p.u. PV Production (kWh)	Costs		Discount Factor (risk free)	Disc. Costs	
			Utility \$/kWh	VOS \$/kWh		Utility (\$)	VOS (\$)		Utility (\$)	VOS (\$)
2014	\$2.29	6,950	\$0.016	\$0.0262	1,452	\$23	\$38	1.000	\$23	\$38
2015	\$2.41	6,957	\$0.017	\$0.0262	1,444	\$24	\$38	0.945	\$23	\$36
2016	\$2.54	6,964	\$0.018	\$0.0262	1,437	\$25	\$38	0.893	\$23	\$34
2017	\$2.68	6,971	\$0.019	\$0.0262	1,430	\$27	\$38	0.844	\$23	\$32
2018	\$2.82	6,978	\$0.020	\$0.0262	1,423	\$28	\$37	0.797	\$22	\$30
2019	\$2.97	6,985	\$0.021	\$0.0262	1,416	\$29	\$37	0.753	\$22	\$28
2020	\$3.12	6,992	\$0.022	\$0.0262	1,409	\$31	\$37	0.712	\$22	\$26
2021	\$3.28	6,999	\$0.023	\$0.0262	1,402	\$32	\$37	0.673	\$22	\$25
2022	\$3.44	7,006	\$0.024	\$0.0262	1,395	\$34	\$37	0.636	\$21	\$23
2023	\$3.61	7,013	\$0.025	\$0.0262	1,388	\$35	\$36	0.601	\$21	\$22
2024	\$3.79	7,020	\$0.027	\$0.0262	1,381	\$37	\$36	0.567	\$21	\$21
2025	\$3.97	7,027	\$0.028	\$0.0262	1,374	\$38	\$36	0.536	\$21	\$19
2026	\$4.17	7,034	\$0.029	\$0.0262	1,367	\$40	\$36	0.507	\$20	\$18
2027	\$4.28	7,041	\$0.030	\$0.0262	1,360	\$41	\$36	0.479	\$20	\$17
2028	\$4.49	7,048	\$0.032	\$0.0262	1,353	\$43	\$36	0.452	\$19	\$16
2029	\$4.70	7,055	\$0.033	\$0.0262	1,347	\$45	\$35	0.427	\$19	\$15
2030	\$4.92	7,062	\$0.035	\$0.0262	1,340	\$47	\$35	0.404	\$19	\$14
2031	\$5.15	7,069	\$0.036	\$0.0262	1,333	\$49	\$35	0.382	\$19	\$13
2032	\$5.39	7,076	\$0.038	\$0.0262	1,326	\$51	\$35	0.361	\$18	\$13
2033	\$5.64	7,083	\$0.040	\$0.0262	1,320	\$53	\$35	0.341	\$18	\$12
2034	\$5.90	7,090	\$0.042	\$0.0262	1,313	\$55	\$34	0.322	\$18	\$11
2035	\$6.17	7,098	\$0.044	\$0.0262	1,307	\$57	\$34	0.304	\$17	\$10
2036	\$6.45	7,105	\$0.046	\$0.0262	1,300	\$60	\$34	0.287	\$17	\$10
2037	\$6.74	7,112	\$0.048	\$0.0262	1,294	\$62	\$34	0.272	\$17	\$9
2038	\$7.04	7,119	\$0.050	\$0.0262	1,287	\$64	\$34	0.257	\$17	\$9

Validation: Present Value	\$501	\$501
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Table 18. Calculation of inflation-adjusted VOS

Year	Discount Factor	PV Production	Escallation Factor	VOS Levelized	Disc.	VOS Inflation Adj. (\$/kWh)	Disc
2014	1.000	1452	1.000	\$0.121	\$175	\$0.0940	136.438
2015	0.939	1444	1.028	\$0.121	\$164	\$0.0966	130.963
2016	0.881	1437	1.056	\$0.121	\$153	\$0.0992	125.708
2017	0.828	1430	1.085	\$0.121	\$143	\$0.1020	120.664
2018	0.777	1423	1.115	\$0.121	\$134	\$0.1048	115.822
2019	0.730	1416	1.145	\$0.121	\$125	\$0.1076	111.175
2020	0.685	1409	1.177	\$0.121	\$117	\$0.1106	106.714
2021	0.685	1402	1.209	\$0.121	\$116	\$0.1136	109.100
2022	0.685	1395	1.242	\$0.121	\$115	\$0.1168	111.540
2023	0.567	1388	1.277	\$0.121	\$95	\$0.1200	94.377
2024	0.532	1381	1.312	\$0.121	\$89	\$0.1233	90.590
2025	0.500	1374	1.348	\$0.121	\$83	\$0.1267	86.955
2026	0.469	1367	1.385	\$0.121	\$77	\$0.1301	83.466
2027	0.440	1360	1.423	\$0.121	\$72	\$0.1337	80.117
2028	0.414	1353	1.462	\$0.121	\$68	\$0.1374	76.902
2029	0.388	1347	1.502	\$0.121	\$63	\$0.1412	73.816
2030	0.388	1340	1.544	\$0.121	\$63	\$0.1451	75.467
2031	0.342	1333	1.586	\$0.121	\$55	\$0.1491	68.011
2032	0.321	1326	1.630	\$0.121	\$51	\$0.1532	65.282
2033	0.302	1320	1.674	\$0.121	\$48	\$0.1574	62.663
2034	0.283	1313	1.720	\$0.121	\$45	\$0.1617	60.148
2035	0.266	1307	1.768	\$0.121	\$42	\$0.1661	57.735
2036	0.250	1300	1.816	\$0.121	\$39	\$0.1707	55.418
2037	0.234	1294	1.866	\$0.121	\$37	\$0.1754	53.195
2038	0.220	1287	1.918	\$0.121	\$34	\$0.1802	51.060
					\$2,203		\$2,203

CERTIFICATE OF SERVICE

I, Theresa Sarafolean, hereby certify that I have this day served copies of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States mail at Minneapolis, Minnesota

xx electronic filing

Docket No. E002/M-13-867

Dated this 19th day of June 2014

/s/

Theresa Sarafolean
Administrative Assistant

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Ross	Abbey	abbey@fresh-energy.org	Fresh Energy	408 Saint Peter St Ste 220 St. Paul, MN 55102-1125	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Michael	Allen	michael.allen@allenergysolar.com	All Energy Solar	721 W 26th st Suite 211 Minneapolis, Minnesota 55405	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Julia	Anderson	Julia.Anderson@ag.state.mn.us	Office of the Attorney General-DOC	1800 BRM Tower 445 Minnesota St St. Paul, MN 551012134	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Kenneth	Bradley	ken@mncommunitysolar.com		4000 Minnehaha Ave Minneapolis, MN 55406	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Michael J.	Bull	N/A	Center for Energy and Environment	212 Third Avenue North, Suite 560 Minneapolis, MN 55401	Paper Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Jessica	Burdette	jessica.burdette@state.mn.us	Department of Commerce	85 7th Place East Suite 500 St. Paul, MN 55101	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Joel	Cannon	jcannon@tenksolar.com	Tenk Solar, Inc.	9549 Penn Avenue S Bloomington, MN 55431	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
John J.	Carroll	jcarroll@newportpartners.com	Newport Partners, LLC	9 Cushing, Suite 200 Irvine, California 92618	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Arthur	Crowell	Crowell.arthur@yahoo.com	A Work of Art Landscapes	234 Jackson Ave N Hopkins, MN 55343	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Dustin	Denison	dustin@appliedenergyinnovations.org	Applied Energy Innovations	4000 Minnehaha Ave S Minneapolis, MN 55406	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
James	Denniston	james.r.denniston@xcenergy.com	Xcel Energy Services, Inc.	414 Nicollet Mall, Fifth Floor Minneapolis, MN 55401	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Ian	Dobson	ian.dobson@ag.state.mn.us	Office of the Attorney General-RUD	Antitrust and Utilities Division 445 Minnesota Street, 1400 BRM Tower St. Paul, MN 55101	Electronic Service	Yes	SPL_SL_13-867_Community Solar Garden - Xcel
Bill	Doessler	N/A	Izaak Walton League of America-MWO	1619 Dayton Ave Ste 202 Saint Paul, MN 55104	Paper Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
John	Farrell	jfarrell@ilsr.org	Institute for Local Self-Reliance	1313 5th St SE #303 Minneapolis, MN 55414	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Sharon	Ferguson	sharon.ferguson@state.mn.us	Department of Commerce	85 7th Place E Ste 500 Saint Paul, MN 551012198	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Nathan	Franzen	nathan@geronimoenergy.com	Geronimo Energy	7650 Edinborough Way Suite 725 Edina, MN 55435	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Hal	Galvin	halgalvin@comcast.net	Provectus Energy Development llc	1936 Kenwood Parkway Minneapolis, MN 55405	Paper Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Elizabeth	Goodpaster	bgoodpaster@mncenter.org	MN Center for Environmental Advocacy	Suite 206 26 East Exchange Street St. Paul, MN 551011667	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Timothy	Gulden	info@winonarenewableenergy.com	Winona Renewable Energy, LLC	1449 Ridgewood Dr Winona, MN 55987	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel

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Lynn	Hinkle	lhinkle@mnseia.org	Minnesota Solar Energy Industries Association	2512 33rd Ave South #2 Minneapolis, MN 55406	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Jan	Hubbard	jan.hubbard@comcast.net		7730 Mississippi Lane Brooklyn Park, MN 55444	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
John S.	Jaffray	jjaffray@jirpower.com	JJR Power	350 Highway 7 Suite 236 Excelsior, MN 55331	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Eric	Jensen	ejensen@iwla.org	Izaak Walton League of America	Suite 202 1619 Dayton Avenue St. Paul, MN 55104	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Michael	Kampmeyer	mkampmeyer@a-e-group.com	AEG Group, LLC	260 Salem Church Road Sunfish Lake, Minnesota 55118	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
John	Kluempke	jwkluempke@winlectric.com	Elk River Winlectric	12777 Meadowvale Rd Elk River, MN 55330	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Jon	Kramer	jk2surf@aol.com	Sundial Solar	4708 york ave. S Minneapolis, MN 55410	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Rebecca	Lundberg	rebecca.lundberg@powerfullygreen.com	Powerfully Green	11451 Oregon Ave N Champlin, MN 55316	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Casey	MacCallum	casey@appliedenergyinnovations.org	Applied Energy Innovations	4000 Minnehaha Ave S Minneapolis, MN 55406	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Erica	McConnell	emcconnell@kfwlaw.com	Keyes, Fox & Wiedman LLP	436 14th Street, Suite 1305 Oakland, California 94612	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Thomas	Melone	Thomas.Melone@AllcoUS.com	Minnesota Go Solar LLC	222 South 9th Street Suite 1600 Minneapolis, Minnesota 55120	Electronic Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Andrew	Moratzka	apmoratzka@stoel.com	Stoel Rives LLP	33 South Sixth Street Suite 4200 Minneapolis, MN 55402	Electronic Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Martin	Morud	mmorud@trunorthsolar.com	Tru North Solar	5115 45th Ave S Minneapolis, MN 55417	Electronic Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Rolf	Nordstrom	rnordstrom@gpisd.net	Great Plains Institute	2801 21ST AVE S STE 220 Minneapolis, MN 55407-1229	Electronic Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Jeffrey C	Paulson	jeff.jcplaw@comcast.net	Paulson Law Office, Ltd.	7301 Ohms Ln Ste 325 Edina, MN 55439	Paper Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Donna	Pickard	dpickard@aladdinsolar.com	Aladdin Solar	1215 Lilac Lane Excelsior, MN 55331	Electronic Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Gayle	Prest	gayle.prest@minneapolismn.gov	City of Mpls Sustainability	350 South 5th St, #315 Minneapolis, MN 55415	Electronic Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Dan	Rogers	drogers@sunedison.com	SunEdison	N/A	Electronic Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Matthew J.	Schuerger P.E.	mjsreg@earthlink.net	Energy Systems Consulting Services, LLC	PO Box 16129 St. Paul, MN 55116	Electronic Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel
Doug	Shoemaker	dougs@mnRenewables.org	MRES	2928 5th Avenue South Minneapolis, MN 55408	Paper Service	No	SPL_SL_13- 867_Community Solar Garden - Xcel

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Chanti	Sourignavong	chantipal.sourignavong@honeywell.com	Honeywell	1985 Douglas Drive North MN10-111A Golden Valley, MN 55422-3992	Paper Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Erin	Stojan Ruccolo	ruccolo@fresh-energy.org	Fresh Energy	408 Saint Peter St Ste 220 Saint Paul, MN 55102-1125	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Thomas P.	Sweeney III	tom.sweeney@easycleanenergy.com	Clean Energy Collective	P O Box 1828 Boulder, CO 80306-1828	Paper Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
SaGonna	Thompson	Regulatory.Records@xcelenergy.com	Xcel Energy	414 Nicollet Mall FL 7 Minneapolis, MN 554011993	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Pat	Treseler	pat.jcplaw@comcast.net	Paulson Law Office LTD	Suite 325 7301 Ohms Lane Edina, MN 55439	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Jason	Willett	jason.willett@metc.state.mn.us	Metropolitan Council	390 Robert St N Saint Paul, MN 55101-1805	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Daniel	Williams	DanWilliams.mg@gmail.com	Powerfully Green	11451 Oregon Avenue N Champlin, MN 55316	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel