



414 Nicollet Mall
Minneapolis, MN 55401

March 2, 2015

—Via Electronic Filing—

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101

RE: VOS CALCULATION
COMMUNITY SOLAR GARDENS PROGRAM
DOCKET NO. E002/M-13-867

Dear Mr. Wolf:

Northern States Power Company, doing business as Xcel Energy, submits this updated VOS calculation in compliance with the Commission's September 17, 2014 Order.

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 me at amy.a.liberkowski@xcelenergy.com or (612) 330-6613 if you have any questions regarding this filing.

Sincerely,

/s/

AMY A. LIBERKOWSKI
MANAGER, RATES AND REGULATORY AFFAIRS

Enclosures
c: Service List

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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	\$0.0319		9.8%	\$0.0350
Avoided Plan O&M - Fixed	\$0.0022	48.6%	10.8%	\$0.0012
Avoided Plan O&M - Variable	\$0.0028		9.8%	\$0.0031
Avoided Gen Capacity Cost	\$0.0473	48.6%	10.8%	\$0.0255
Avoided Reserve Capacity Cost	\$0.0034	48.6%	10.8%	\$0.0018
Avoided Trans Capacity Cost	\$0.0308	48.6%	10.8%	\$0.0166
Avoided Distribution Capacity Cost	\$0.0365	55.2%	13.2%	\$0.0228
Avoided Environmental Cost	\$0.0277		9.8%	\$0.0304
Avoided Voltage Control Cost				
<u>Solar Integration Cost</u>				
TOTAL				\$0.1364

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
2015	1.000	1.000	\$0.136	\$0.136	\$0.1075	0.107
2016	0.939	1.026	\$0.136	\$0.128	\$0.1103	0.104
2017	0.881	1.053	\$0.136	\$0.120	\$0.1132	0.100
2018	0.828	1.081	\$0.136	\$0.113	\$0.1161	0.096
2019	0.777	1.109	\$0.136	\$0.106	\$0.1192	0.093
2020	0.730	1.138	\$0.136	\$0.100	\$0.1223	0.089
2021	0.685	1.168	\$0.136	\$0.093	\$0.1255	0.086
2022	0.685	1.198	\$0.136	\$0.093	\$0.1288	0.088
2023	0.685	1.230	\$0.136	\$0.093	\$0.1322	0.091
2024	0.567	1.262	\$0.136	\$0.077	\$0.1356	0.077
2025	0.532	1.295	\$0.136	\$0.073	\$0.1392	0.074
2026	0.500	1.329	\$0.136	\$0.068	\$0.1428	0.071
2027	0.469	1.364	\$0.136	\$0.064	\$0.1466	0.069
2028	0.440	1.400	\$0.136	\$0.060	\$0.1504	0.066
2029	0.414	1.436	\$0.136	\$0.056	\$0.1543	0.064
2030	0.388	1.474	\$0.136	\$0.053	\$0.1584	0.061
2031	0.388	1.513	\$0.136	\$0.053	\$0.1625	0.063
2032	0.342	1.552	\$0.136	\$0.047	\$0.1668	0.057
2033	0.321	1.593	\$0.136	\$0.044	\$0.1712	0.055
2034	0.302	1.635	\$0.136	\$0.041	\$0.1756	0.053
2035	0.283	1.677	\$0.136	\$0.039	\$0.1802	0.051
2036	0.266	1.721	\$0.136	\$0.036	\$0.1850	0.049
2037	0.250	1.766	\$0.136	\$0.034	\$0.1898	0.047
2038	0.234	1.813	\$0.136	\$0.032	\$0.1948	0.046
2039	0.220	1.860	\$0.136	\$0.030	\$0.1999	0.044
				\$1.790		\$1.801

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
2015	\$2.96	\$/mmBtu	Environmental Costs	separate table	
2016	\$3.33	\$/mmBtu	Economic Assumptions		
2017	\$3.60	\$/mmBtu	General Escalation Rate	2.62%	per year
2018	\$3.73	\$/mmBtu	Treasury Yields		
2019	\$3.84	\$/mmBtu	1 Year	0.20%	
2020	\$3.94	\$/mmBtu	2 Year	0.57%	
2021	\$4.04	\$/mmBtu	3 Year	0.92%	
2022	\$4.16	\$/mmBtu	5 Year	1.39%	
2023	\$4.28	\$/mmBtu	7 Year	1.69%	
2024	\$4.36	\$/mmBtu	10 Year	1.89%	
2025	\$4.43	\$/mmBtu	20 Year	2.22%	
2026	\$4.54	\$/mmBtu	30 Year	2.47%	
Fuel Price Escalation	2.62%				
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
2015	0	\$2.364	\$0.03	\$0.00	\$0.05	\$0.00	\$2.440
2016	1	\$2.489	\$0.03	\$0.00	\$0.05	\$0.00	\$2.567
2017	2	\$2.620	\$0.03	\$0.00	\$0.05	\$0.00	\$2.700
2018	3	\$2.756	\$0.03	\$0.00	\$0.05	\$0.00	\$2.838
2019	4	\$2.897	\$0.03	\$0.00	\$0.05	\$0.00	\$2.982
2020	5	\$3.044	\$0.03	\$0.00	\$0.05	\$0.00	\$3.130
2021	6	\$3.196	\$0.03	\$0.00	\$0.05	\$0.00	\$3.285
2022	7	\$3.355	\$0.03	\$0.00	\$0.06	\$0.00	\$3.446
2023	8	\$3.519	\$0.04	\$0.00	\$0.06	\$0.00	\$3.612
2024	9	\$3.690	\$0.04	\$0.00	\$0.06	\$0.00	\$3.786
2025	10	\$3.867	\$0.04	\$0.00	\$0.06	\$0.00	\$3.965
2026	11	\$4.051	\$0.04	\$0.00	\$0.06	\$0.00	\$4.152
2027	12	\$4.242	\$0.04	\$0.00	\$0.06	\$0.00	\$4.346
2028	13	\$4.440	\$0.04	\$0.00	\$0.07	\$0.00	\$4.546
2029	14	\$4.646	\$0.04	\$0.00	\$0.07	\$0.00	\$4.755
2030	15	\$4.767	\$0.04	\$0.00	\$0.07	\$0.00	\$4.880
2031	16	\$4.986	\$0.04	\$0.00	\$0.07	\$0.00	\$5.101
2032	17	\$5.214	\$0.05	\$0.00	\$0.07	\$0.00	\$5.332
2033	18	\$5.449	\$0.05	\$0.00	\$0.07	\$0.00	\$5.570
2034	19	\$5.694	\$0.05	\$0.00	\$0.08	\$0.00	\$5.818
2035	20	\$5.947	\$0.05	\$0.00	\$0.08	\$0.00	\$6.075
2036	21	\$6.210	\$0.05	\$0.00	\$0.08	\$0.00	\$6.341
2037	22	\$6.483	\$0.05	\$0.00	\$0.08	\$0.00	\$6.617
2038	23	\$6.765	\$0.05	\$0.00	\$0.09	\$0.00	\$6.903
2039	24	\$7.058	\$0.05	\$0.00	\$0.08	\$0.00	\$7.193

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	2015		Peaking CT, simple cycle		
Discount Rate (WACC)	6.51%	per year	Installed Cost	\$618	\$/kW
			Heat Rate	9,942	BTU/kWh
Load Match Analysis			Intermediate CCGT		
ELCC (no loss)	48.6%	% of rating	Installed Cost	\$950	\$/kW
PLR (no loss)	55.2%	% of rating	Heat Rate	6,822	BTU/kWh
Loss Savings - Energy	9.8%	% of PV output	Other		
Loss Savings - PLR	13.2%	% of PV output	Solar weighted Heat Rate	7,001	BTU per kWh
Loss Savings - ELCC	10.8%	% of PV output	Fuel Price Overhead	-\$0.034	\$ 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
			O&M cost (first year) - Fixed	\$2.64	per kW-yr
			O&M cost (first year) - Variable	\$0.002	\$ per kWh
Transmission			O&M cost escalation rate	1.98%	per year
Capacity-related transmission capital cost	\$44.37	\$ per kW	Reserve planning margin	7.1%	
			Years until new Generation is needed	0	
			Distribution		
			Capacity-related distribution capital costs	\$928	\$ per kW
			Distribution capital cost escalation	1.98%	per year
			Peak Load	6,659	MW
			Peak Load Growth	0.40%	per year

Table 6. Azimuth and Tilt Angles

	Array KW	% of Total	Azimuth	Tilt	
1	31	0.3%	67	25	
2	146	1.4%	143	31	
3	377	3.5%	168	28	
4	598	5.6%	180	15	
5	892	8.3%	180	20	
6	2,079	19.3%	180	26	
7	1,280	11.9%	180	30	
8	732	6.8%	180	35	
9	301	2.8%	180	39	
10	3,439	32.0%	180	45	
11	193	1.8%	183	27	
12	150	1.4%	194	26	
13	319	3.0%	207	28	
14	191	1.8%	222	24	
15	23	0.2%	239	33	
TOTAL	10,753	100%	180.7	32.6	Weighted Average

Table 8. Economic Value of Avoided Fuel Costs.

Year				Prices		p.u. PV Production (kWh)	Costs		Discount Factor (risk free)	Disc. Costs	
	Guaranteed NG Price	Burner Tip NG Price	Heat Rate	Utility	VOS		Utility	VOS		Utility	VOS
	\$/mmBtu	\$/mmBtu	mmBtu/MWh	\$/kWh	\$/kWh		(\$)	(\$)		(\$)	(\$)
2015	\$2.96	\$2.93	7,001	\$0.021	\$0.0319	1,452	\$30	\$46	1.000	\$30	\$46
2016	\$3.33	\$3.30	7,008	\$0.023	\$0.0319	1,444	\$33	\$46	0.998	\$33	\$46
2017	\$3.60	\$3.57	7,015	\$0.025	\$0.0319	1,437	\$36	\$46	0.989	\$36	\$45
2018	\$3.73	\$3.70	7,022	\$0.026	\$0.0319	1,430	\$37	\$46	0.973	\$36	\$44
2019	\$3.84	\$3.80	7,029	\$0.027	\$0.0319	1,423	\$38	\$45	0.955	\$36	\$43
2020	\$3.94	\$3.90	7,036	\$0.027	\$0.0319	1,416	\$39	\$45	0.933	\$36	\$42
2021	\$4.04	\$4.00	7,043	\$0.028	\$0.0319	1,409	\$40	\$45	0.913	\$36	\$41
2022	\$4.16	\$4.12	7,050	\$0.029	\$0.0319	1,402	\$41	\$45	0.889	\$36	\$40
2023	\$4.28	\$4.23	7,057	\$0.030	\$0.0319	1,395	\$42	\$45	0.870	\$36	\$39
2024	\$4.36	\$4.32	7,064	\$0.031	\$0.0319	1,388	\$42	\$44	0.850	\$36	\$38
2025	\$4.43	\$4.39	7,071	\$0.031	\$0.0319	1,381	\$43	\$44	0.829	\$36	\$37
2026	\$4.54	\$4.50	7,078	\$0.032	\$0.0319	1,374	\$44	\$44	0.811	\$35	\$36
2027	\$4.66	\$4.62	7,085	\$0.033	\$0.0319	1,367	\$45	\$44	0.793	\$35	\$35
2028	\$4.78	\$4.74	7,093	\$0.034	\$0.0319	1,360	\$46	\$43	0.774	\$35	\$34
2029	\$4.91	\$4.86	7,100	\$0.035	\$0.0319	1,353	\$47	\$43	0.756	\$35	\$33
2030	\$5.04	\$4.99	7,107	\$0.035	\$0.0319	1,347	\$48	\$43	0.737	\$35	\$32
2031	\$5.17	\$5.12	7,114	\$0.036	\$0.0319	1,340	\$49	\$43	0.718	\$35	\$31
2032	\$5.31	\$5.25	7,121	\$0.037	\$0.0319	1,333	\$50	\$43	0.700	\$35	\$30
2033	\$5.45	\$5.39	7,128	\$0.038	\$0.0319	1,326	\$51	\$42	0.681	\$35	\$29
2034	\$5.59	\$5.53	7,135	\$0.039	\$0.0319	1,320	\$52	\$42	0.663	\$35	\$28
2035	\$5.73	\$5.68	7,142	\$0.041	\$0.0319	1,313	\$53	\$42	0.645	\$34	\$27
2036	\$5.88	\$5.83	7,150	\$0.042	\$0.0319	1,307	\$54	\$42	0.627	\$34	\$26
2037	\$6.04	\$5.98	7,157	\$0.043	\$0.0319	1,300	\$56	\$41	0.610	\$34	\$25
2038	\$6.20	\$6.14	7,164	\$0.044	\$0.0319	1,294	\$57	\$41	0.594	\$34	\$25
2039	\$6.36	\$6.30	7,171	\$0.045	\$0.0319	1,287	\$58	\$41	0.577	\$34	\$24

Validation: Present Value	\$873	\$873
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Table 9. Economic value of avoided plant O&M - fixed

Year				Prices		p.u. PV Production (kWh)	Costs		Discount Factor	Disc. Costs	
	O&M Fixed	Utility Capacity	PV Capacity	Utility	VOS		Utility	VOS		Utility	VOS
	\$/kW	per unit		\$/kWh	\$/kWh		(\$)	(\$)		(\$)	(\$)
2015	\$2.64	1.00	1.00	\$0.0018	\$0.0022	1,452	\$2.64	\$3.17	1.000	\$2.64	\$3.17
2016	\$2.69	0.999	0.995	\$0.0019	\$0.0022	1,444	\$2.68	\$3.15	0.939	\$2.52	\$2.96
2017	\$2.74	0.998	0.990	\$0.0019	\$0.0022	1,437	\$2.72	\$3.14	0.881	\$2.40	\$2.77
2018	\$2.80	0.997	0.985	\$0.0020	\$0.0022	1,430	\$2.76	\$3.12	0.828	\$2.29	\$2.58
2019	\$2.85	0.996	0.980	\$0.0020	\$0.0022	1,423	\$2.81	\$3.11	0.777	\$2.18	\$2.41
2020	\$2.91	0.995	0.975	\$0.0020	\$0.0022	1,416	\$2.85	\$3.09	0.730	\$2.08	\$2.26
2021	\$2.91	0.994	0.970	\$0.0021	\$0.0022	1,409	\$2.84	\$3.08	0.685	\$1.95	\$2.11
2022	\$2.91	0.993	0.966	\$0.0021	\$0.0022	1,402	\$2.83	\$3.06	0.685	\$1.94	\$2.10
2023	\$3.09	0.992	0.961	\$0.0022	\$0.0022	1,395	\$2.99	\$3.05	0.685	\$2.05	\$2.09
2024	\$3.15	0.991	0.956	\$0.0022	\$0.0022	1,388	\$3.03	\$3.03	0.567	\$1.72	\$1.72
2025	\$3.21	0.990	0.951	\$0.0023	\$0.0022	1,381	\$3.08	\$3.01	0.532	\$1.64	\$1.60
2026	\$3.27	0.989	0.946	\$0.0024	\$0.0022	1,374	\$3.13	\$3.00	0.500	\$1.56	\$1.50
2027	\$3.34	0.988	0.942	\$0.0024	\$0.0022	1,367	\$3.18	\$2.98	0.469	\$1.49	\$1.40
2028	\$3.40	0.987	0.937	\$0.0025	\$0.0022	1,360	\$3.23	\$2.97	0.440	\$1.42	\$1.31
2029	\$3.47	0.986	0.932	\$0.0025	\$0.0022	1,353	\$3.28	\$2.96	0.414	\$1.36	\$1.22
2030	\$3.47	0.985	0.928	\$0.0025	\$0.0022	1,347	\$3.27	\$2.94	0.388	\$1.27	\$1.14
2031	\$3.61	0.984	0.923	\$0.0027	\$0.0022	1,340	\$3.38	\$2.93	0.388	\$1.31	\$1.14
2032	\$3.68	0.983	0.918	\$0.0027	\$0.0022	1,333	\$3.44	\$2.91	0.342	\$1.18	\$1.00
2033	\$3.75	0.982	0.914	\$0.0028	\$0.0022	1,326	\$3.49	\$2.90	0.321	\$1.12	\$0.93
2034	\$3.83	0.981	0.909	\$0.0028	\$0.0022	1,320	\$3.55	\$2.88	0.302	\$1.07	\$0.87
2035	\$3.90	0.980	0.905	\$0.0029	\$0.0022	1,313	\$3.60	\$2.87	0.283	\$1.02	\$0.81
2036	\$3.98	0.979	0.900	\$0.0030	\$0.0022	1,307	\$3.66	\$2.85	0.266	\$0.97	\$0.76
2037	\$4.06	0.978	0.896	\$0.0031	\$0.0022	1,300	\$3.72	\$2.84	0.250	\$0.93	\$0.71
2038	\$4.14	0.977	0.891	\$0.0031	\$0.0022	1,294	\$3.78	\$2.82	0.234	\$0.89	\$0.66
2039	\$4.22	0.976	0.887	\$0.0032	\$0.0022	1,287	\$3.83	\$2.81	0.220	\$0.84	\$0.62

\$0.0022

Validation: Present Value	\$40	\$40
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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		(\$)	(\$)		(\$)	(\$)
2015	\$0.002	\$0.0028	1,452	\$3	\$4	1.000	\$3	\$4
2016	\$0.002	\$0.0028	1,444	\$3	\$4	0.939	\$3	\$4
2017	\$0.002	\$0.0028	1,437	\$3	\$4	0.881	\$3	\$4
2018	\$0.002	\$0.0028	1,430	\$4	\$4	0.828	\$3	\$3
2019	\$0.003	\$0.0028	1,423	\$4	\$4	0.777	\$3	\$3
2020	\$0.003	\$0.0028	1,416	\$4	\$4	0.730	\$3	\$3
2021	\$0.003	\$0.0028	1,409	\$4	\$4	0.685	\$3	\$3
2022	\$0.003	\$0.0028	1,402	\$4	\$4	0.643	\$2	\$3
2023	\$0.003	\$0.0028	1,395	\$4	\$4	0.604	\$2	\$2
2024	\$0.003	\$0.0028	1,388	\$4	\$4	0.567	\$2	\$2
2025	\$0.003	\$0.0028	1,381	\$4	\$4	0.532	\$2	\$2
2026	\$0.003	\$0.0028	1,374	\$4	\$4	0.500	\$2	\$2
2027	\$0.003	\$0.0028	1,367	\$4	\$4	0.469	\$2	\$2
2028	\$0.003	\$0.0028	1,360	\$4	\$4	0.440	\$2	\$2
2029	\$0.003	\$0.0028	1,353	\$4	\$4	0.414	\$2	\$2
2030	\$0.003	\$0.0028	1,347	\$4	\$4	0.388	\$2	\$1
2031	\$0.003	\$0.0028	1,340	\$4	\$4	0.365	\$2	\$1
2032	\$0.003	\$0.0028	1,333	\$4	\$4	0.342	\$1	\$1
2033	\$0.003	\$0.0028	1,326	\$4	\$4	0.321	\$1	\$1
2034	\$0.003	\$0.0028	1,320	\$4	\$4	0.302	\$1	\$1
2035	\$0.003	\$0.0028	1,313	\$5	\$4	0.283	\$1	\$1
2036	\$0.004	\$0.0028	1,307	\$5	\$4	0.266	\$1	\$1
2037	\$0.004	\$0.0028	1,300	\$5	\$4	0.250	\$1	\$1
2038	\$0.004	\$0.0028	1,294	\$5	\$4	0.234	\$1	\$1
2039	\$0.004	\$0.0028	1,287	\$5	\$4	0.220	\$1	\$1

Validation: Present Value	\$50	\$50
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Table 11. Economic value of avoided generation capacity cost.

Year	Capacity Cost	Utility Capacity	PV Capacity	Prices		PV Production	Costs		Discount Factor	Disc. Costs	
				Utility	VOS		Utility	VOS		Utility	VOS
	\$/kW-yr	pu.	kW	\$/kWh	\$/kWh	(kWh)	(\$)	(\$)		(\$)	(\$)
2015	\$68	1.00	1.00	\$0.047	\$0.0473	1,452	\$68	\$69	1.000	\$68	\$69
2016	\$68	0.999	0.995	\$0.047	\$0.0473	1,444	\$68	\$68	0.939	\$64	\$64
2017	\$68	0.998	0.990	\$0.047	\$0.0473	1,437	\$68	\$68	0.881	\$60	\$60
2018	\$68	0.997	0.985	\$0.047	\$0.0473	1,430	\$67	\$68	0.828	\$56	\$56
2019	\$68	0.996	0.980	\$0.047	\$0.0473	1,423	\$67	\$67	0.777	\$52	\$52
2020	\$68	0.995	0.975	\$0.047	\$0.0473	1,416	\$67	\$67	0.730	\$49	\$49
2021	\$68	0.994	0.970	\$0.047	\$0.0473	1,409	\$66	\$67	0.685	\$46	\$46
2022	\$68	0.993	0.966	\$0.047	\$0.0473	1,402	\$66	\$66	0.643	\$43	\$43
2023	\$68	0.992	0.961	\$0.047	\$0.0473	1,395	\$66	\$66	0.604	\$40	\$40
2024	\$68	0.991	0.956	\$0.047	\$0.0473	1,388	\$66	\$66	0.567	\$37	\$37
2025	\$68	0.990	0.951	\$0.047	\$0.0473	1,381	\$65	\$65	0.532	\$35	\$35
2026	\$68	0.989	0.946	\$0.047	\$0.0473	1,374	\$65	\$65	0.500	\$33	\$32
2027	\$68	0.988	0.942	\$0.047	\$0.0473	1,367	\$65	\$65	0.469	\$30	\$30
2028	\$68	0.987	0.937	\$0.048	\$0.0473	1,360	\$65	\$64	0.440	\$28	\$28
2029	\$68	0.986	0.932	\$0.048	\$0.0473	1,353	\$64	\$64	0.414	\$27	\$26
2030	\$68	0.985	0.928	\$0.048	\$0.0473	1,347	\$64	\$64	0.388	\$25	\$25
2031	\$68	0.984	0.923	\$0.048	\$0.0473	1,340	\$64	\$63	0.365	\$23	\$23
2032	\$68	0.983	0.918	\$0.048	\$0.0473	1,333	\$64	\$63	0.342	\$22	\$22
2033	\$68	0.982	0.914	\$0.048	\$0.0473	1,326	\$63	\$63	0.321	\$20	\$20
2034	\$68	0.981	0.909	\$0.048	\$0.0473	1,320	\$63	\$62	0.302	\$19	\$19
2035	\$68	0.980	0.905	\$0.048	\$0.0473	1,313	\$63	\$62	0.283	\$18	\$18
2036	\$68	0.979	0.900	\$0.048	\$0.0473	1,307	\$63	\$62	0.266	\$17	\$16
2037	\$68	0.978	0.896	\$0.048	\$0.0473	1,300	\$62	\$62	0.250	\$16	\$15
2038	\$68	0.977	0.891	\$0.048	\$0.0473	1,294	\$62	\$61	0.234	\$15	\$14
2039	\$68	0.976	0.887	\$0.048	\$0.0473	1,287	\$62	\$61	0.220	\$14	\$13
					\$0.0473						
Validation: Present Value										\$854	\$854

Table 12. Economic value of avoided reserve capacity cost.

Year					Prices					Disc. Costs		
	Capacity Cost	Reserve Margin	Utility Capacity	PV Capacity	Utility	VOS	PV Production	Utility	VOS	Discount Factor	Utility	VOS
	\$/kW-yr	%	pu.	kW	\$/kWh	\$/kWh	(kWh)	(\$)	(\$)		(\$)	(\$)
2015	\$68	7.1%	1.00	1.00	\$0.003	\$0.0034	1,452	\$5	\$5	1.000	\$5	\$5
2016	\$68	7.1%	0.999	0.995	\$0.003	\$0.0034	1,444	\$5	\$5	0.939	\$5	\$5
2017	\$68	7.1%	0.998	0.990	\$0.003	\$0.0034	1,437	\$5	\$5	0.881	\$4	\$4
2018	\$68	7.1%	0.997	0.985	\$0.003	\$0.0034	1,430	\$5	\$5	0.828	\$4	\$4
2019	\$68	7.1%	0.996	0.980	\$0.003	\$0.0034	1,423	\$5	\$5	0.777	\$4	\$4
2020	\$68	7.1%	0.995	0.975	\$0.003	\$0.0034	1,416	\$5	\$5	0.730	\$3	\$3
2021	\$68	7.1%	0.994	0.970	\$0.003	\$0.0034	1,409	\$5	\$5	0.685	\$3	\$3
2022	\$68	7.1%	0.993	0.966	\$0.003	\$0.0034	1,402	\$5	\$5	0.643	\$3	\$3
2023	\$68	7.1%	0.992	0.961	\$0.003	\$0.0034	1,395	\$5	\$5	0.604	\$3	\$3
2024	\$68	7.1%	0.991	0.956	\$0.003	\$0.0034	1,388	\$5	\$5	0.567	\$3	\$3
2025	\$68	7.1%	0.990	0.951	\$0.003	\$0.0034	1,381	\$5	\$5	0.532	\$2	\$2
2026	\$68	7.1%	0.989	0.946	\$0.003	\$0.0034	1,374	\$5	\$5	0.500	\$2	\$2
2027	\$68	7.1%	0.988	0.942	\$0.003	\$0.0034	1,367	\$5	\$5	0.469	\$2	\$2
2028	\$68	7.1%	0.987	0.937	\$0.003	\$0.0034	1,360	\$5	\$5	0.440	\$2	\$2
2029	\$68	7.1%	0.986	0.932	\$0.003	\$0.0034	1,353	\$5	\$5	0.414	\$2	\$2
2030	\$68	7.1%	0.985	0.928	\$0.003	\$0.0034	1,347	\$5	\$5	0.388	\$2	\$2
2031	\$68	7.1%	0.984	0.923	\$0.003	\$0.0034	1,340	\$5	\$5	0.365	\$2	\$2
2032	\$68	7.1%	0.983	0.918	\$0.003	\$0.0034	1,333	\$5	\$4	0.342	\$2	\$2
2033	\$68	7.1%	0.982	0.914	\$0.003	\$0.0034	1,326	\$4	\$4	0.321	\$1	\$1
2034	\$68	7.1%	0.981	0.909	\$0.003	\$0.0034	1,320	\$4	\$4	0.302	\$1	\$1
2035	\$68	7.1%	0.980	0.905	\$0.003	\$0.0034	1,313	\$4	\$4	0.283	\$1	\$1
2036	\$68	7.1%	0.979	0.900	\$0.003	\$0.0034	1,307	\$4	\$4	0.266	\$1	\$1
2037	\$68	7.1%	0.978	0.896	\$0.003	\$0.0034	1,300	\$4	\$4	0.250	\$1	\$1
2038	\$68	7.1%	0.977	0.891	\$0.003	\$0.0034	1,294	\$4	\$4	0.234	\$1	\$1
2039	\$68	7.1%	0.976	0.887	\$0.003	\$0.0034	1,287	\$4	\$4	0.220	\$1	\$1
						\$0.0034						
Validation: Present Value											\$61	\$61

Table 13. Economic value of avoided transmission capacity cost.

Year				Prices					Disc. Costs		
	Capacity Cost	Utility Capacity	PV Capacity	Utility	VOS	PV Production	Utility	VOS	Discount Factor	Utility	VOS
	\$/kW-yr	pu.	kW	\$/kWh	\$/kWh	(kWh)	(\$)	(\$)		(\$)	(\$)
2015	\$44	1.00	1.00	\$0.031	\$0.0308	1,452	\$44	\$45	1.000	\$44	\$45
2016	\$44	0.999	0.995	\$0.031	\$0.0308	1,444	\$44	\$45	0.939	\$41	\$42
2017	\$44	0.998	0.990	\$0.031	\$0.0308	1,437	\$44	\$44	0.881	\$39	\$39
2018	\$44	0.997	0.985	\$0.031	\$0.0308	1,430	\$44	\$44	0.828	\$36	\$36
2019	\$44	0.996	0.980	\$0.031	\$0.0308	1,423	\$44	\$44	0.777	\$34	\$34
2020	\$44	0.995	0.975	\$0.031	\$0.0308	1,416	\$43	\$44	0.730	\$32	\$32
2021	\$44	0.994	0.970	\$0.031	\$0.0308	1,409	\$43	\$43	0.685	\$30	\$30
2022	\$44	0.993	0.966	\$0.031	\$0.0308	1,402	\$43	\$43	0.643	\$28	\$28
2023	\$44	0.992	0.961	\$0.031	\$0.0308	1,395	\$43	\$43	0.604	\$26	\$26
2024	\$44	0.991	0.956	\$0.031	\$0.0308	1,388	\$43	\$43	0.567	\$24	\$24
2025	\$44	0.990	0.951	\$0.031	\$0.0308	1,381	\$43	\$43	0.532	\$23	\$23
2026	\$44	0.989	0.946	\$0.031	\$0.0308	1,374	\$42	\$42	0.500	\$21	\$21
2027	\$44	0.988	0.942	\$0.031	\$0.0308	1,367	\$42	\$42	0.469	\$20	\$20
2028	\$44	0.987	0.937	\$0.031	\$0.0308	1,360	\$42	\$42	0.440	\$19	\$18
2029	\$44	0.986	0.932	\$0.031	\$0.0308	1,353	\$42	\$42	0.414	\$17	\$17
2030	\$44	0.985	0.928	\$0.031	\$0.0308	1,347	\$42	\$42	0.388	\$16	\$16
2031	\$44	0.984	0.923	\$0.031	\$0.0308	1,340	\$42	\$41	0.365	\$15	\$15
2032	\$44	0.983	0.918	\$0.031	\$0.0308	1,333	\$41	\$41	0.342	\$14	\$14
2033	\$44	0.982	0.914	\$0.031	\$0.0308	1,326	\$41	\$41	0.321	\$13	\$13
2034	\$44	0.981	0.909	\$0.031	\$0.0308	1,320	\$41	\$41	0.302	\$12	\$12
2035	\$44	0.980	0.905	\$0.031	\$0.0308	1,313	\$41	\$40	0.283	\$12	\$11
2036	\$44	0.979	0.900	\$0.031	\$0.0308	1,307	\$41	\$40	0.266	\$11	\$11
2037	\$44	0.978	0.896	\$0.031	\$0.0308	1,300	\$41	\$40	0.250	\$10	\$10
2038	\$44	0.977	0.891	\$0.031	\$0.0308	1,294	\$40	\$40	0.234	\$9	\$9
2039	\$44	0.976	0.887	\$0.031	\$0.0308	1,287	\$40	\$40	0.220	\$9	\$9
					\$0.0308						
Validation: Present Value										\$556	\$556

Table 14. Determination of deferrable distribution costs.

Year	Distribution Project Costs	% Capacity Related	Capacity Related		
	\$	%	\$		
2014	155,453,317	21.4%	33,321,571		
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%	15,617,571		
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%	<u>12,231,129</u>		
TOTAL 10-YEAR PERIOD	1,294,021,779		237,141,721		

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)	\$M/yr	(MW)	(\$M)	(\$M)	\$M/yr
2015	\$928	27	\$25	\$25	\$33				\$31
2016	\$946	27	\$25	\$24	\$33	27	\$25.2	\$23.7	\$31
2017	\$965	27	\$26	\$23	\$33	27	\$25.8	\$22.7	\$31
2018	\$984	27	\$27	\$22	\$33	27	\$26.4	\$21.9	\$31
2019	\$1,004	27	\$27	\$21	\$33	27	\$27.1	\$21.0	\$31
2020	\$1,023	27	\$28	\$20	\$33	27	\$27.7	\$20.2	\$31
2021	\$1,044	27	\$28	\$20	\$33	27	\$28.4	\$19.4	\$31
2022	\$1,064	27	\$29	\$19	\$33	27	\$29.0	\$18.7	\$31
2023	\$1,085	28	\$30	\$18	\$33	27	\$29.7	\$17.9	\$31
2024	\$1,107	28	\$31	\$17	\$33	28	\$30.4	\$17.3	\$31
2025	\$1,129	28	\$31	\$17	\$33	28	\$31.2	\$16.6	\$31
2026	\$1,151	28	\$32	\$16	\$33	28	\$31.9	\$15.9	\$31
2027	\$1,174	28	\$33	\$15	\$33	28	\$32.7	\$15.3	\$31
2028	\$1,197	28	\$34	\$15	\$33	28	\$33.5	\$14.7	\$31
2029	\$1,221	28	\$34	\$14	\$33	28	\$34.3	\$14.2	\$31
2030	\$1,245	28	\$35	\$14	\$33	28	\$35.1	\$13.6	\$31
2031	\$1,270	28	\$36	\$13	\$33	28	\$35.9	\$13.1	\$31
2032	\$1,295	29	\$37	\$13	\$33	28	\$36.8	\$12.6	\$31
2033	\$1,320	29	\$38	\$12	\$33	29	\$37.6	\$12.1	\$31
2034	\$1,347	29	\$39	\$12	\$33	29	\$38.5	\$11.6	\$31
2035	\$1,373	29	\$40	\$11	\$33	29	\$39.5	\$11.2	\$31
2036	\$1,400	29	\$41	\$11	\$33	29	\$40.4	\$10.7	\$31
2037	\$1,428	29	\$42	\$10	\$33	29	\$41.4	\$10.3	\$31
2038	\$1,456	29	\$43	\$10	\$33	29	\$42.4	\$9.9	\$31
2039	\$1,485	29	\$44	\$10	\$33	29	\$43.4	\$9.5	\$31
2039	\$1,515					29	\$44.4	\$9.2	
					\$401				\$383

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 (\$)
\$0.03615	\$0.0365	1,452	\$52	\$53	1.000	\$52	\$53
\$0.03619	\$0.0365	1,444	\$52	\$53	0.939	\$49	\$49
\$0.03622	\$0.0365	1,437	\$52	\$52	0.881	\$46	\$46
\$0.03626	\$0.0365	1,430	\$52	\$52	0.828	\$43	\$43
\$0.03630	\$0.0365	1,423	\$52	\$52	0.777	\$40	\$40
\$0.03633	\$0.0365	1,416	\$51	\$52	0.730	\$38	\$38
\$0.03637	\$0.0365	1,409	\$51	\$51	0.685	\$35	\$35
\$0.03641	\$0.0365	1,402	\$51	\$51	0.643	\$33	\$33
\$0.03645	\$0.0365	1,395	\$51	\$51	0.604	\$31	\$31
\$0.03648	\$0.0365	1,388	\$51	\$51	0.567	\$29	\$29
\$0.03652	\$0.0365	1,381	\$50	\$50	0.532	\$27	\$27
\$0.03656	\$0.0365	1,374	\$50	\$50	0.500	\$25	\$25
\$0.03659	\$0.0365	1,367	\$50	\$50	0.469	\$23	\$23
\$0.03663	\$0.0365	1,360	\$50	\$50	0.440	\$22	\$22
\$0.03667	\$0.0365	1,353	\$50	\$49	0.414	\$21	\$20
\$0.03671	\$0.0365	1,347	\$49	\$49	0.388	\$19	\$19
\$0.03674	\$0.0365	1,340	\$49	\$49	0.365	\$18	\$18
\$0.03678	\$0.0365	1,333	\$49	\$49	0.342	\$17	\$17
\$0.03682	\$0.0365	1,326	\$49	\$48	0.321	\$16	\$16
\$0.03686	\$0.0365	1,320	\$49	\$48	0.302	\$15	\$15
\$0.03689	\$0.0365	1,313	\$48	\$48	0.283	\$14	\$14
\$0.03693	\$0.0365	1,307	\$48	\$48	0.266	\$13	\$13
\$0.03697	\$0.0365	1,300	\$48	\$47	0.250	\$12	\$12
\$0.03701	\$0.0365	1,294	\$48	\$47	0.234	\$11	\$11
\$0.03705	\$0.0365	1,287	\$48	\$47	0.220	\$10	\$10
					-		
	\$0.0365		Validation: Present Value			\$658	\$658

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 (\$)
2015	\$2.44	7,001	\$0.017	\$0.0277	1,452	\$25	\$40	1.000	\$25	\$40
2016	\$2.57	7,008	\$0.018	\$0.0277	1,444	\$26	\$40	0.945	\$25	\$38
2017	\$2.70	7,015	\$0.019	\$0.0277	1,437	\$27	\$40	0.893	\$24	\$35
2018	\$2.84	7,022	\$0.020	\$0.0277	1,430	\$29	\$40	0.844	\$24	\$33
2019	\$2.98	7,029	\$0.021	\$0.0277	1,423	\$30	\$39	0.797	\$24	\$31
2020	\$3.13	7,036	\$0.022	\$0.0277	1,416	\$31	\$39	0.753	\$23	\$29
2021	\$3.29	7,043	\$0.023	\$0.0277	1,409	\$33	\$39	0.712	\$23	\$28
2022	\$3.45	7,050	\$0.024	\$0.0277	1,402	\$34	\$39	0.673	\$23	\$26
2023	\$3.61	7,057	\$0.025	\$0.0277	1,395	\$36	\$39	0.636	\$23	\$25
2024	\$3.79	7,064	\$0.027	\$0.0277	1,388	\$37	\$38	0.601	\$22	\$23
2025	\$3.97	7,071	\$0.028	\$0.0277	1,381	\$39	\$38	0.567	\$22	\$22
2026	\$4.15	7,078	\$0.029	\$0.0277	1,374	\$40	\$38	0.536	\$22	\$20
2027	\$4.35	7,085	\$0.031	\$0.0277	1,367	\$42	\$38	0.507	\$21	\$19
2028	\$4.55	7,093	\$0.032	\$0.0277	1,360	\$44	\$38	0.479	\$21	\$18
2029	\$4.75	7,100	\$0.034	\$0.0277	1,353	\$46	\$37	0.452	\$21	\$17
2030	\$4.88	7,107	\$0.035	\$0.0277	1,347	\$47	\$37	0.427	\$20	\$16
2031	\$5.10	7,114	\$0.036	\$0.0277	1,340	\$49	\$37	0.404	\$20	\$15
2032	\$5.33	7,121	\$0.038	\$0.0277	1,333	\$51	\$37	0.382	\$19	\$14
2033	\$5.57	7,128	\$0.040	\$0.0277	1,326	\$53	\$37	0.361	\$19	\$13
2034	\$5.82	7,135	\$0.042	\$0.0277	1,320	\$55	\$37	0.341	\$19	\$12
2035	\$6.07	7,142	\$0.043	\$0.0277	1,313	\$57	\$36	0.322	\$18	\$12
2036	\$6.34	7,150	\$0.045	\$0.0277	1,307	\$59	\$36	0.304	\$18	\$11
2037	\$6.62	7,157	\$0.047	\$0.0277	1,300	\$62	\$36	0.287	\$18	\$10
2038	\$6.90	7,164	\$0.049	\$0.0277	1,294	\$64	\$36	0.272	\$17	\$10
2039	\$7.19	7,171	\$0.052	\$0.0277	1,287	\$66	\$36	0.257	\$17	\$9

Validation: Present Value	\$528	\$528
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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
2015	1.000	1452	1.000	\$0.136	\$198	\$0.1075	155.994
2016	0.939	1444	1.026	\$0.136	\$185	\$0.1103	149.545
2017	0.881	1437	1.053	\$0.136	\$173	\$0.1132	143.363
2018	0.828	1430	1.081	\$0.136	\$161	\$0.1161	137.436
2019	0.777	1423	1.109	\$0.136	\$151	\$0.1192	131.755
2020	0.730	1416	1.138	\$0.136	\$141	\$0.1223	126.308
2021	0.685	1409	1.168	\$0.136	\$132	\$0.1255	121.086
2022	0.685	1402	1.198	\$0.136	\$131	\$0.1288	123.638
2023	0.685	1395	1.230	\$0.136	\$130	\$0.1322	126.243
2024	0.567	1388	1.262	\$0.136	\$107	\$0.1356	106.682
2025	0.532	1381	1.295	\$0.136	\$100	\$0.1392	102.271
2026	0.500	1374	1.329	\$0.136	\$94	\$0.1428	98.044
2027	0.469	1367	1.364	\$0.136	\$87	\$0.1466	93.990
2028	0.440	1360	1.400	\$0.136	\$82	\$0.1504	90.105
2029	0.414	1353	1.436	\$0.136	\$76	\$0.1543	86.380
2030	0.388	1347	1.474	\$0.136	\$71	\$0.1584	82.809
2031	0.388	1340	1.513	\$0.136	\$71	\$0.1625	84.554
2032	0.342	1333	1.552	\$0.136	\$62	\$0.1668	76.104
2033	0.321	1326	1.593	\$0.136	\$58	\$0.1712	72.958
2034	0.302	1320	1.635	\$0.136	\$54	\$0.1756	69.942
2035	0.283	1313	1.677	\$0.136	\$51	\$0.1802	67.050
2036	0.266	1307	1.721	\$0.136	\$47	\$0.1850	64.279
2037	0.250	1300	1.766	\$0.136	\$44	\$0.1898	61.621
2038	0.234	1294	1.813	\$0.136	\$41	\$0.1948	59.074
2039	0.220	1287	1.860	\$0.136	\$39	\$0.1999	56.632
					\$2,488		\$2,488

CERTIFICATE OF SERVICE

I, Tiffany Hughes, 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 2nd day of March 2015

/s/

Tiffany Hughes
Records Analyst

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	kbradley1965@gmail.com		2837 Emerson Ave S Apt CW112 Minneapolis, MN 55408	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Michael J.	Bull	mbull@mncee.org	Center for Energy and Environment	212 Third Ave N Ste 560 Minneapolis, MN 55401	Electronic 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

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James	Denniston	james.r.denniston@xcelenergy.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	Droessler	bdroessler@iwla.org	Izaak Walton League of America-MWO	1619 Dayton Ave Ste 202 Saint Paul, MN 55104	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Betsy	Engelking	betsy@geronimoenergy.com	Geronimo Energy	7650 Edinborough Way Suite 725 Edina, MN 55435	Electronic 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	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
Tiffany	Hughes	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
John S.	Jaffray	jjaffray@jrpowers.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-egroup.com	AEG Group, LLC	260 Salem Church Road Sunfish Lake, Minnesota 55118	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Brad	Klein	bklein@elpc.org	Environmental Law & Policy Center	35 E. Wacker Drive, Suite 1600 Suite 1600 Chicago, IL 60601	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

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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
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	Electronic 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

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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 Ave S Minneapolis, MN 55408	Electronic Service	No	SPL_SL_13-867_Community Solar Garden - Xcel
Eric	Swanson	eswanson@winthrop.com	Winthrop Weinstine	225 S 6th St Ste 3500 Capella Tower Minneapolis, MN 554024629	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	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
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