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Minneapolis, MN 55401

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September 1, 2023

—Via Electronic Filing—

Will Seuffert  
Executive Secretary  
Minnesota Public Utilities Commission  
121 7<sup>th</sup> Place East, Suite 350  
St. Paul, MN 55101

RE: 2024 VOS CALCULATION  
COMMUNITY SOLAR GARDENS PROGRAM  
DOCKET NO. E002/M-13-867

Dear Mr. Seuffert:

Northern States Power Company, doing business as Xcel Energy, submits the enclosed Value of Solar (VOS) calculation for vintage year 2024. Minn. Stat. § 216B.1641 (the Community Solar Garden (CSG) Statute) was amended in the 2023 legislative session and the VOS no longer applies to CSGs that have not been approved before January 1, 2024. In other words, VOS applicability to CSGs ends with the 2023 VOS Vintage Year.<sup>1</sup> The March 4, 2020 Order in this docket requires that we submit an annual VOS update filing. In this filing, we include a request to end the VOS update filing requirements.

The levelized rate for the 2024 VOS Vintage Year Bill Credit Rate is calculated to be 12.49 cents per kWh. This compares to a levelized rate of 13.23 cents per kWh for the 2023 VOS Vintage Year Bill Credit Rate. On an annual basis (non-levelized), the bill credit for the 2024 VOS Vintage Year ranges from 9.90 cents per kWh for production in Year 1 to 18.03 cents per kWh for production in Year 25. This calculation represents a per kWh decrease of 0.68 cents for year 1 and a decrease of 0.85 cents in year 25 from the 2023 VOS Vintage calculation of 10.58 cents per kWh in the first year and 18.88 cents per kWh in the final year. The decrease in pricing is primarily driven by the decrease to effective load-carrying capacity (ELCC) which resulted from Midcontinent Independent System Operator's (MISO) change from an annual to seasonal construct and lower New

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<sup>1</sup> We further discussed the impacts of the changes to the CSG Statute and request corresponding tariff changes in our August 28, 2023, Response and concurrently filed Petition for Tariff Changes filed in this docket and Docket No. E002/CI-23-335. Included in the tariff change request is a request to change tariff sheet 9-64.104 to close out 2023 VOS Vintage Year availability.

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York Mercantile Exchange (NYMEX) natural gas prices and is partially offset by environmental cost escalation, loss savings metrics, and reserve planning margin.

Because the legislative change to the CSG Statute ends the VOS applicability with the 2023 VOS Vintage Year and the 2024 VOS Vintage Year rates will never become effective, we are proposing to not update our Solar\*Rewards Community program tariff sheets.

Below is a list of the attachments included in the 2024 VOS filing:

- Attachment A – 2024 VOS Model LIVE
- Attachment B – 2024 Distribution Capacity Value LIVE
- Attachment C – Fleet Data LIVE
- Attachment D – Fuel Price Overhead LIVE TRADE SECRET
- Attachment E – PLR LIVE
- Attachment F – Loss Saving Energy LIVE
- Attachment G – ELCC and Loss Savings LIVE
- Attachment H – NYMEX NG Forward Pricing 2023-34 LIVE
- Attachment I – Transmission Capacity MISO OATT 5YR Calculation LIVE
- Attachment J – 2023 Treasury Rates LIVE
- Attachment K – General and Fuel Price Escalation LIVE
- Attachment L – Environmental Costs LIVE<sup>2</sup>
- Attachment M – Tariff Sheets (not applicable)
- Attachment N – List of Input Changes LIVE
- Attachment O – Production Data LIVE
- Attachment P – Compliance Matrix

Please note, Attachment D contains Not Public information protected by the Minnesota Data Practices Act. That information has economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by other persons and is subject to efforts by the Company to protect the information from public disclosure. Xcel Energy maintains this information as a trade secret based on its economic value from not being generally known and not being readily ascertainable by proper means by other persons who can obtain economic value from its disclosure or use. For this reason, we ask that the data be treated as non-public data pursuant to Minn. Stat. § 13.37, subd. 1(b).

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<sup>2</sup> We are aware of the activity around the federal social cost of carbon. Because a formal change has not yet been accepted, the Company continued with our previous approach and will do so until there is a formal change.

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**A. Filing Requirements**

See Attachment P – Compliance Matrix.

**B. VOS Input Parameters**

- a. A list of all changed parameters as permitted by the approved VOS Methodology, and any updated input values.*

Please see Attachment N for a list of input changes, reasons for the change and the impact of the change.

- b. A discussion—along with any necessary tables, charts, and explanations—of how these changes will affect the VOS rate, as well as variables within the rate.*

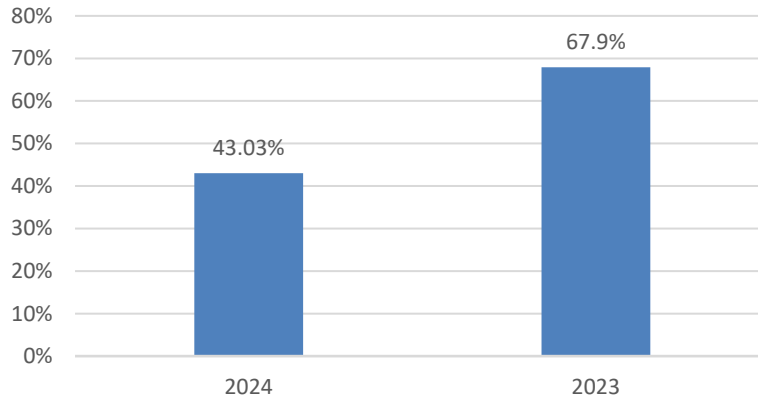
Most of the changes to the VOS inputs represent an update of annual data due to the passage of time and have a minimal impact on the VOS calculation results. In this section we discuss the major drivers of the price change from the 2023 VOS as well as our approach to several data inputs for this filing.

**i. VOS Price Change Driver: ELCC Percentage**

For the 2024 VOS, we used the same methodology as the 2023 VOS. MISO's change from an annual to a seasonal construct caused a large decrease in the ELCC. The production is measured at the hours identified in the MISO Business Practices Manual for all seasons. This results in a decrease to the ELCC Proxy from 67.91% to 43.03%, see Figure 1. The result is a 1.89 cent decrease to the 2024 VOS.

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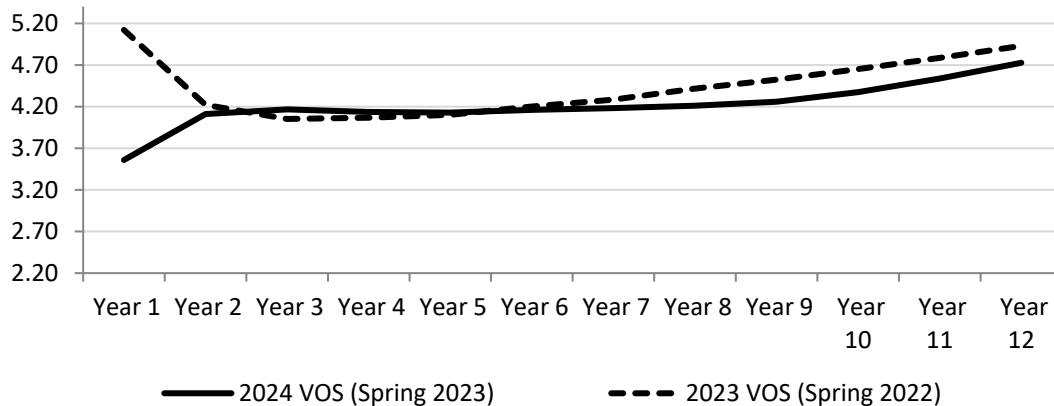
**Figure 1 – ELCC Proxy**



ii. VOS Price Change Driver: NYMEX Natural Gas Futures and Fuel Price Overheads

The NYMEX natural gas futures decreased 5 percent from the prices used in the 2023 VOS calculation, see Figure 2. The result is a 0.20 cent decrease in the 2024 VOS. NYMEX prices are based on the price at the Henry Hub trading point. The Company does not trade at Henry Hub, but at other trading points that typically trade at lower prices. The Fuel Price Overhead component adjusts for this difference and results in a 0.09 cent decrease in the 2024 VOS. The combined result is a 0.29 cent decrease in the 2024 VOS.

**Figure 2 – NYMEX Natural Gas Prices (per MMBTU)**



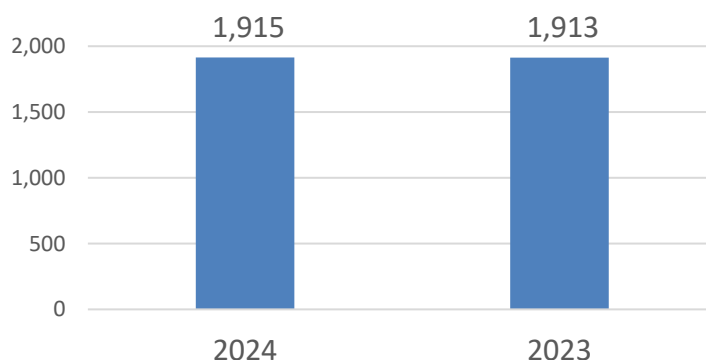
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iii. Hourly PV Fleet Production Data

For the 2024 VOS, we used the same methodology as the 2023 VOS and the PV Energy Production component remained relatively stable.

The PV Fleet Production first-year annual energy input increased from 1,913 MWh/MW to 1,915 MWh/MW, see Figure 3. The result is a 0.01 cent decrease to the 2024 VOS.

**Figure 3 – PV Production (MWh/MW)**



iv. Avoided Distribution Costs

The Company has incorporated the five-year average of per-kW distribution spending to calculate the avoided distribution cost for the 2024 VOS rate, as approved by the Commission.<sup>3</sup> The cost increased from \$300.15/kWh to \$320.39/kWh. The result is a 0.03 cent increase to the 2024 VOS. The Company is not proposing a deferral-reduction factor for the 2024 VOS rate.

v. Solar Weighted Heat Rate (SWHR)

The Company continues to use the calculation laid out in the VOS Methodology. The PLEXOS generation production modeling software is used to run a base model simulation using the NSP system as currently modeled, including all natural gas generators available to the system, for a period of the upcoming year. A second model run (Free Solar) includes the base model plus the addition of 100 MW of solar, available at no cost to the system. The Free Solar model simulation incorporates the solar addition prior to dispatching natural gas generators,

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<sup>3</sup> December 3, 2019 Order, Docket Nos. E999/M-13-867 and E-999/M-14-65.

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resulting in reduced natural gas generation. From these model runs, the SWHR is calculated as follows:

The BASE simulation data is used to determine the base single year heat rate:

$$\text{BASE Total Natural Gas Fuel input (MMBTU)} \div \text{BASE Total Natural Gas Generation (MWh)}$$

The FREE SOLAR simulation data is used to determine the change case first year heat rate:

$$\text{FREE SOLAR Total Natural Gas Fuel input (MMBTU)} \div \text{FREE SOLAR Total Natural Gas Generation (MWh)}$$

The SWHR uses the fuel input of the BASE output and the natural gas generation of the FREE SOLAR output.

$$\text{BASE Total natural gas fuel input (MMBTU)} \div \text{FREE SOLAR total natural gas generation (MWh)}$$

All natural gas units are included in these modeling runs; this includes Company owned units as well as power purchase agreements for combustion turbines and combined cycle units. The model output is reflective of a single year of operation, therefore the heat rates reflected are for Year 1. Subsequent heat rate degradation is addressed in the VOS Methodology through the Heat Rate Degradation Factor. Changes to the SWHR will impact Avoided Fuel Cost, Avoided Generation Capacity Cost, and Avoided Environmental Cost.

Table 1 below identifies the modeled outputs and SWHR calculation for both 2024 VOS and the prior year 2023 VOS.

**Table 1 – Solar Weighted Heat Rate**

		2024 VOS SWHR		2023 VOS SWHR	
		Base Case	Free Solar	Base Case	Free Solar
MMBTU NG	(A)	86,792	86,165	68,939	68,690
NG GWh	(B)	11,291	11,200	9,072	9,040
Margin Plant HR	(C)=(A)/(B)	7.69	7.69	7.60	7.60
		SWHR		SWHR	
Base ND MMBTU	(A1) BASE	86,792		68,939	
FREE Solar NG MWh	(B1) FREE SOLAR	11,200		9,040	
SWHR	(C1)=(A1)/(B1)	7.750		7.626	
Input to VOS	(C1)*1000	7,750		7,626	

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The 2024 SWHR modeling incorporated the PV Fleet Shape production profile for Community Solar Garden (CSG) resources. The increase in natural gas GWh as a percent of total generation is attributable to an overall increase in total forecasted generation and the retirement of Sherco Unit 2. The percent of renewable generation (solar, wind, small hydro) increased also. The result is a 0.08 cent increase to the 2024 VOS.

- vi. Avoided Plant Heat Rate, Capital, and O&M Costs (Fixed and Variable)

The VOS inputs related to generation capacity heat rate and cost, and operations and maintenance costs (fixed and variable) represent the next installed unit in the VOS Methodology. This data is updated and maintained to reflect recent and relevant technology improvements, and operational hours by the Energy Supply area of the Company. The most recent analysis was completed in early 2019 and are represented in 2018 dollars. These values are the basis for the 2020-2034 IRP generic unit modeling and are escalated from the base year 2018 to the evaluation period.

### **C. Stakeholder Discussion**

The Company presented the 2024 Value of Solar preliminary calculation at the quarterly Solar\*Rewards Community Implementation Workgroup hosted on July 26, 2023. The presentation detailed the items discussed above. The presentation will be filed with the meeting minutes in this docket once they are approved in an upcoming workgroup session.

Since the July 26 workgroup, we discovered an error in the VOS calculation, which has been updated in this filing. The environmental costs escalation input from Attachment L was updated.

### **D. Request to End Filing Requirements**

As mentioned above, the CSG Statute was amended in the 2023 legislative session and ended CSGs subject to the VOS effective with the 2023 VOS Vintage Year. As detailed in Attachment P, the requirements to submit annual VOS update filings and hold annual stakeholder meetings come from the March 4, 2020 Order in this docket. The Company requests the Commission end the requirements listed in Attachment P with this filing and issue an order stating that the Company no longer needs to file updated VOS calculations. Consistent with past practice, we expect that the Commission will issue a comment period on this request.

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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 [Nick.Paluck@xcelenergy.com](mailto:Nick.Paluck@xcelenergy.com) or (612) 330-2905 or Martha Hoschmiller at [Martha.E.Hoschmiller@xcelenergy.com](mailto:Martha.E.Hoschmiller@xcelenergy.com) or (612) 330-5973 if you have any questions regarding this filing.

Sincerely,

/s/

NICK PALUCK  
MANAGER, REGULATORY ANALYSIS

Enclosures  
cc: 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**

<i>25 Year Levelized Values</i>	<b>Economic Value (\$/kWh)</b>	<b>Load Match (No Losses) (%)</b>	<b>Distributed Loss Savings (%)</b>	<b>Distributed PV Value (\$/kWh)</b>
Avoided Fuel Cost	\$0.0313		10.2%	\$0.0344
Avoided Plant O&M - Fixed	\$0.0024	43.0%	10.2%	\$0.0011
Avoided Plant O&M - Variable	\$0.0014		10.2%	\$0.0016
Avoided Generation Capacity Cost	\$0.0328	43.0%	10.2%	\$0.0156
Avoided Reserve Capacity Cost	\$0.0059	43.0%	10.2%	\$0.0028
Avoided Transmission Capacity Cost	\$0.0287	43.0%	10.2%	\$0.0136
Avoided Distribution Capacity Cost	\$0.0110	42.5%	-2.3%	\$0.0045
Avoided Environmental Cost	\$0.0465		10.2%	\$0.0512
Avoided Voltage Control Cost				
<u>Solar Integration Cost</u>				
<b>TOTAL</b>				<b>\$0.1249</b>

**Figure ES-2. 1st-Year VOS Rate calculation**

Year	Discount Factor	Escalation Factor	VOS Levelized	Disc.	VOS Inflation Adj. (\$/kWh)	Disc
2024	1.000	1.000	\$0.125	\$0.125	\$0.0990	0.099
2025	0.940	1.025	\$0.125	\$0.117	\$0.1015	0.095
2026	0.884	1.051	\$0.125	\$0.110	\$0.1041	0.092
2027	0.831	1.078	\$0.125	\$0.104	\$0.1067	0.089
2028	0.781	1.105	\$0.125	\$0.098	\$0.1094	0.086
2029	0.735	1.133	\$0.125	\$0.092	\$0.1122	0.082
2030	0.691	1.162	\$0.125	\$0.086	\$0.1150	0.079
2031	0.649	1.191	\$0.125	\$0.081	\$0.1179	0.077
2032	0.611	1.221	\$0.125	\$0.076	\$0.1209	0.074
2033	0.574	1.252	\$0.125	\$0.072	\$0.1240	0.071
2034	0.540	1.284	\$0.125	\$0.067	\$0.1271	0.069
2035	0.508	1.316	\$0.125	\$0.063	\$0.1303	0.066
2036	0.477	1.350	\$0.125	\$0.060	\$0.1336	0.064
2037	0.449	1.384	\$0.125	\$0.056	\$0.1370	0.061
2038	0.422	1.419	\$0.125	\$0.053	\$0.1405	0.059
2039	0.397	1.455	\$0.125	\$0.050	\$0.1440	0.057
2040	0.397	1.491	\$0.125	\$0.050	\$0.1477	0.059
2041	0.351	1.529	\$0.125	\$0.044	\$0.1514	0.053
2042	0.330	1.568	\$0.125	\$0.041	\$0.1552	0.051
2043	0.310	1.608	\$0.125	\$0.039	\$0.1592	0.049
2044	0.291	1.648	\$0.125	\$0.036	\$0.1632	0.048
2045	0.274	1.690	\$0.125	\$0.034	\$0.1673	0.046
2046	0.258	1.733	\$0.125	\$0.032	\$0.1716	0.044
2047	0.242	1.777	\$0.125	\$0.030	\$0.1759	0.043
2048	0.228	1.821	\$0.125	\$0.028	\$0.1803	0.041
				\$1.644		\$1.654

**Table 3. Fixed Assumptions to be used for the VOS calculations**

<b>Fuel Prices</b>			<b>Environmental Externalities</b>		
Guaranteed NG Fuel Prices			Environmental Discount Rate	5.61%	per year
2024	\$3.559	\$/mmBtu	Environmental Costs	separate table	
2025	\$4.111	\$/mmBtu	<b>Economic Assumptions</b>		
2026	\$4.168	\$/mmBtu	General Escalation Rate	2.53%	per year
2027	\$4.136	\$/mmBtu	<b>Treasury Yields</b>		
2028	\$4.128	\$/mmBtu	1 Year	4.88%	
2029	\$4.161	\$/mmBtu	2 Year	4.27%	
2030	\$4.182	\$/mmBtu	3 Year	3.99%	
2031	\$4.212	\$/mmBtu	5 Year	3.73%	
2032	\$4.259	\$/mmBtu	7 Year	3.68%	
2033	\$4.375	\$/mmBtu	10 Year	3.61%	
2034	\$4.539	\$/mmBtu	20 Year	3.94%	
2035	\$4.727	\$/mmBtu	30 Year	3.80%	
Fuel Price Escalation	2.53%				
<b>PV Assumptions</b>					
PV Degradation Rate	0.50%				
PV Life	25				

Table 4. Environmental costs by year.

Year	Analysis Year	CO2 Cost \$/mmBtu	PM 2.5 Cost \$/mmBtu	CO Cost \$/mmBtu	NOx Cost \$/mmBtu	Pb Cost \$/mmBtu	SO2 Cost \$/mmBtu	Total Cost \$/mmBtu
2024	0	\$3.598	\$0.023	\$0.000	\$0.315	\$0.000	\$0.004	\$3.939
2025	1	\$3.754	\$0.023	\$0.000	\$0.323	\$0.000	\$0.004	\$4.104
2026	2	\$3.916	\$0.024	\$0.000	\$0.331	\$0.000	\$0.004	\$4.275
2027	3	\$4.084	\$0.024	\$0.000	\$0.339	\$0.000	\$0.004	\$4.452
2028	4	\$4.258	\$0.025	\$0.000	\$0.348	\$0.000	\$0.004	\$4.635
2029	5	\$4.438	\$0.026	\$0.000	\$0.356	\$0.000	\$0.004	\$4.824
2030	6	\$4.624	\$0.026	\$0.000	\$0.365	\$0.000	\$0.005	\$5.020
2031	7	\$4.836	\$0.027	\$0.000	\$0.375	\$0.000	\$0.005	\$5.242
2032	8	\$5.055	\$0.028	\$0.000	\$0.384	\$0.000	\$0.005	\$5.472
2033	9	\$5.283	\$0.028	\$0.000	\$0.394	\$0.000	\$0.005	\$5.710
2034	10	\$5.519	\$0.029	\$0.000	\$0.404	\$0.000	\$0.005	\$5.956
2035	11	\$5.763	\$0.030	\$0.000	\$0.414	\$0.000	\$0.005	\$6.212
2036	12	\$6.016	\$0.030	\$0.000	\$0.425	\$0.000	\$0.005	\$6.477
2037	13	\$6.279	\$0.031	\$0.000	\$0.435	\$0.000	\$0.005	\$6.751
2038	14	\$6.550	\$0.032	\$0.000	\$0.446	\$0.000	\$0.006	\$7.034
2039	15	\$6.832	\$0.033	\$0.000	\$0.458	\$0.000	\$0.006	\$7.328
2040	16	\$7.123	\$0.034	\$0.000	\$0.469	\$0.000	\$0.006	\$7.632
2041	17	\$7.401	\$0.035	\$0.000	\$0.481	\$0.000	\$0.006	\$7.923
2042	18	\$7.688	\$0.035	\$0.000	\$0.493	\$0.000	\$0.006	\$8.223
2043	19	\$7.985	\$0.036	\$0.000	\$0.506	\$0.000	\$0.006	\$8.533
2044	20	\$8.292	\$0.037	\$0.000	\$0.518	\$0.000	\$0.006	\$8.854
2045	21	\$8.609	\$0.038	\$0.000	\$0.532	\$0.000	\$0.007	\$9.186
2046	22	\$8.965	\$0.039	\$0.000	\$0.545	\$0.000	\$0.007	\$9.556
2047	23	\$9.333	\$0.040	\$0.000	\$0.559	\$0.000	\$0.007	\$9.939
2048	24	\$9.715	\$0.041	\$0.000	\$0.573	\$0.000	\$0.007	\$10.336

**Table 5. VOS Data table -- required format showing assumptions used in the VOS calculation.**

	Input Data	Units		Input Data	Units
<b>Economic Factors</b>			<b>Power Generation - Continued</b>		
Start Year for VOS applicability	2024	Year	Other		
Discount Rate (After-tax WACC)	6.36%	Percentage	Solar weighted Heat Rate	7,750	BTU per kWh
<b>Load Match Analysis</b>			Fuel Price Overhead	-\$0.560	\$ per MMBtu
ELCC (no loss)	43.03%	% of rating	Generation life	40	years
PLR (no loss)	42.51%	% of rating	Heat Rate degradation	0.10%	per year
Loss Savings - Energy	10.16%	% of PV output	O&M cost (first year) - Fixed	\$3.77	per kW-yr
Loss Savings - PLR	-2.32%	% of PV output	O&M cost (first year) - Variable	\$0.00120	\$ per kWh
Loss Savings - ELCC	10.19%	% of PV output	O&M cost escalation rate	2.00%	per year
			Reserve planning margin	18.1%	
			Years until new Generation is needed	0	
<b>PV Energy</b>			<b>Distribution</b>		
Actual first year annual energy production	1,915	kWh per kW-AC	Capacity-related distribution capital costs -System	\$320.39	\$ per kW
<b>Transmission</b>			Capacity-related distribution capital costs - Mpls	N/A	\$ per kW
Capacity-related transmission capital cost	\$54.49	\$ per kW	Capacity-related distribution capital costs - Mtka	N/A	\$ per kW
<b>Power Generation</b>			Capacity-related distribution capital costs -Edina	N/A	\$ per kW
Peaking CT, simple cycle			Capacity-related distribution capital costs - SE	N/A	\$ per kW
Installed Cost	\$526	\$/kW	Capacity-related distribution capital costs -MG	N/A	\$ per kW
Heat Rate	9,746	BTU/kWh	Capacity-related distribution capital costs - Newport	N/A	\$ per kW
Intermediate CCGT			Capacity-related distribution capital costs - St. Paul	N/A	\$ per kW
Installed Cost	\$1,133	\$/kW	Capacity-related distribution capital costs - NW	N/A	\$ per kW
Heat Rate	6,472	BTU/kWh	Capacity-related distribution capital costs - WBL	N/A	\$ per kW
			Distribution capital cost escalation	2.41%	per year
			Peak Load (Weather Normalized)	6,589	MW
			Peak Load Growth (10yr)	-8.00%	per year

**Table 6. Azimuth and Tilt Angles**

	Array KW	% of Total	Azimuth	Tilt	
1	3,989	5.1%	70	21	
2	3,362	4.3%	139	25	
3	3,256	4.2%	169	23	
4	21,844	28.1%	180	11	
5	4,836	6.2%	180	21	
6	7,882	10.1%	180	26	
7	10,390	13.4%	180	30	
8	3,971	5.1%	180	35	
9	1,057	1.4%	180	42	
10	5,554	7.1%	180	48	
11	2,258	2.9%	186	25	
12	1,349	1.7%	197	25	
13	2,523	3.2%	212	21	
14	2,886	3.7%	238	20	
15	2,614	3.4%	272	23	
<b>TOTAL</b>	<b>77,772</b>	<b>100%</b>	<b>178.9</b>	<b>23.4</b>	<b>Weighted Average</b>

**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/kWh	\$/kWh	\$/kWh		(\$)	(\$)		(\$)	(\$)
2024	\$3.56	\$3.00	7,750	\$0.023	\$0.0313	1,915	\$45	\$60	1.000	\$45	\$60
2025	\$4.11	\$3.54	7,758	\$0.027	\$0.0313	1,905	\$52	\$60	0.954	\$50	\$57
2026	\$4.17	\$3.58	7,766	\$0.028	\$0.0313	1,896	\$53	\$59	0.920	\$48	\$55
2027	\$4.14	\$3.53	7,773	\$0.027	\$0.0313	1,886	\$52	\$59	0.889	\$46	\$52
2028	\$4.13	\$3.51	7,781	\$0.027	\$0.0313	1,877	\$51	\$59	0.859	\$44	\$50
2029	\$4.16	\$3.53	7,789	\$0.027	\$0.0313	1,868	\$51	\$58	0.833	\$43	\$49
2030	\$4.18	\$3.53	7,797	\$0.028	\$0.0313	1,858	\$51	\$58	0.804	\$41	\$47
2031	\$4.21	\$3.54	7,804	\$0.028	\$0.0313	1,849	\$51	\$58	0.777	\$40	\$45
2032	\$4.26	\$3.57	7,812	\$0.028	\$0.0313	1,840	\$51	\$58	0.750	\$39	\$43
2033	\$4.37	\$3.67	7,820	\$0.029	\$0.0313	1,831	\$53	\$57	0.725	\$38	\$42
2034	\$4.54	\$3.82	7,828	\$0.030	\$0.0313	1,821	\$54	\$57	0.701	\$38	\$40
2035	\$4.73	\$3.99	7,836	\$0.031	\$0.0313	1,812	\$57	\$57	0.674	\$38	\$38
2036	\$4.85	\$4.09	7,844	\$0.032	\$0.0313	1,803	\$58	\$56	0.648	\$37	\$37
2037	\$4.97	\$4.19	7,851	\$0.033	\$0.0313	1,794	\$59	\$56	0.623	\$37	\$35
2038	\$5.09	\$4.30	7,859	\$0.034	\$0.0313	1,785	\$60	\$56	0.598	\$36	\$33
2039	\$5.22	\$4.41	7,867	\$0.035	\$0.0313	1,776	\$62	\$56	0.573	\$35	\$32
2040	\$5.36	\$4.52	7,875	\$0.036	\$0.0313	1,767	\$63	\$55	0.550	\$35	\$30
2041	\$5.49	\$4.63	7,883	\$0.037	\$0.0313	1,759	\$64	\$55	0.527	\$34	\$29
2042	\$5.63	\$4.75	7,891	\$0.037	\$0.0313	1,750	\$66	\$55	0.505	\$33	\$28
2043	\$5.77	\$4.87	7,899	\$0.038	\$0.0313	1,741	\$67	\$54	0.483	\$32	\$26
2044	\$5.92	\$5.00	7,906	\$0.039	\$0.0313	1,732	\$68	\$54	0.462	\$32	\$25
2045	\$6.07	\$5.12	7,914	\$0.041	\$0.0313	1,724	\$70	\$54	0.446	\$31	\$24
2046	\$6.22	\$5.25	7,922	\$0.042	\$0.0313	1,715	\$71	\$54	0.430	\$31	\$23
2047	\$6.38	\$5.38	7,930	\$0.043	\$0.0313	1,706	\$73	\$53	0.415	\$30	\$22
2048	\$6.54	\$5.52	7,938	\$0.044	\$0.0313	1,698	\$74	\$53	0.401	\$30	\$21

<b>Validation: Present Value</b>	<b>\$943</b>	<b>\$943</b>
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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		(\$)	(\$)		(\$)	(\$)
2024	\$3.77	1.00	1.00	\$0.0020	\$0.0024	1,915	\$3.77	\$4.56	1.000	\$3.77	\$4.56
2025	\$3.85	0.999	0.995	\$0.0020	\$0.0024	1,905	\$3.83	\$4.54	0.940	\$3.60	\$4.27
2026	\$3.92	0.998	0.990	\$0.0021	\$0.0024	1,896	\$3.89	\$4.52	0.884	\$3.44	\$3.99
2027	\$4.00	0.997	0.985	\$0.0021	\$0.0024	1,886	\$3.95	\$4.49	0.831	\$3.29	\$3.73
2028	\$4.08	0.996	0.980	\$0.0022	\$0.0024	1,877	\$4.02	\$4.47	0.781	\$3.14	\$3.49
2029	\$4.16	0.995	0.975	\$0.0022	\$0.0024	1,868	\$4.08	\$4.45	0.735	\$3.00	\$3.27
2030	\$4.25	0.994	0.970	\$0.0023	\$0.0024	1,858	\$4.14	\$4.43	0.691	\$2.86	\$3.06
2031	\$4.33	0.993	0.966	\$0.0023	\$0.0024	1,849	\$4.21	\$4.40	0.649	\$2.73	\$2.86
2032	\$4.42	0.992	0.961	\$0.0024	\$0.0024	1,840	\$4.28	\$4.38	0.611	\$2.61	\$2.68
2033	\$4.51	0.991	0.956	\$0.0024	\$0.0024	1,831	\$4.35	\$4.36	0.574	\$2.49	\$2.50
2034	\$4.60	0.990	0.951	\$0.0025	\$0.0024	1,821	\$4.41	\$4.34	0.540	\$2.38	\$2.34
2035	\$4.69	0.989	0.946	\$0.0026	\$0.0024	1,812	\$4.49	\$4.32	0.508	\$2.28	\$2.19
2036	\$4.78	0.988	0.942	\$0.0026	\$0.0024	1,803	\$4.56	\$4.29	0.477	\$2.17	\$2.05
2037	\$4.88	0.987	0.937	\$0.0027	\$0.0024	1,794	\$4.63	\$4.27	0.449	\$2.08	\$1.92
2038	\$4.97	0.986	0.932	\$0.0027	\$0.0024	1,785	\$4.70	\$4.25	0.422	\$1.98	\$1.79
2039	\$4.97	0.985	0.928	\$0.0028	\$0.0024	1,776	\$4.68	\$4.23	0.397	\$1.86	\$1.68
2040	\$5.18	0.984	0.923	\$0.0029	\$0.0024	1,767	\$4.85	\$4.21	0.397	\$1.92	\$1.67
2041	\$5.28	0.983	0.918	\$0.0030	\$0.0024	1,759	\$4.93	\$4.19	0.351	\$1.73	\$1.47
2042	\$5.38	0.982	0.914	\$0.0030	\$0.0024	1,750	\$5.01	\$4.17	0.330	\$1.65	\$1.37
2043	\$5.49	0.981	0.909	\$0.0031	\$0.0024	1,741	\$5.09	\$4.15	0.310	\$1.58	\$1.28
2044	\$5.60	0.980	0.905	\$0.0032	\$0.0024	1,732	\$5.17	\$4.13	0.291	\$1.51	\$1.20
2045	\$5.71	0.979	0.900	\$0.0032	\$0.0024	1,724	\$5.25	\$4.10	0.274	\$1.44	\$1.12
2046	\$5.83	0.978	0.896	\$0.0033	\$0.0024	1,715	\$5.34	\$4.08	0.258	\$1.37	\$1.05
2047	\$5.94	0.977	0.891	\$0.0034	\$0.0024	1,706	\$5.42	\$4.06	0.242	\$1.31	\$0.98
2048	\$6.06	0.976	0.887	\$0.0035	\$0.0024	1,698	\$5.51	\$4.04	0.228	\$1.25	\$0.92

\$0.0024

<b>Validation: Present Value</b>	<b>\$57</b>	<b>\$57</b>
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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		(\$)	(\$)		(\$)	(\$)
2024	\$0.0012	\$0.0014	1,915	\$2	\$3	1.000	\$2	\$3
2025	\$0.0012	\$0.0014	1,905	\$2	\$3	0.940	\$2	\$3
2026	\$0.0012	\$0.0014	1,896	\$2	\$3	0.884	\$2	\$2
2027	\$0.0013	\$0.0014	1,886	\$2	\$3	0.831	\$2	\$2
2028	\$0.0013	\$0.0014	1,877	\$2	\$3	0.781	\$2	\$2
2029	\$0.0013	\$0.0014	1,868	\$2	\$3	0.735	\$2	\$2
2030	\$0.0014	\$0.0014	1,858	\$3	\$3	0.691	\$2	\$2
2031	\$0.0014	\$0.0014	1,849	\$3	\$3	0.649	\$2	\$2
2032	\$0.0014	\$0.0014	1,840	\$3	\$3	0.611	\$2	\$2
2033	\$0.0014	\$0.0014	1,831	\$3	\$3	0.574	\$2	\$2
2034	\$0.0015	\$0.0014	1,821	\$3	\$3	0.540	\$1	\$1
2035	\$0.0015	\$0.0014	1,812	\$3	\$3	0.508	\$1	\$1
2036	\$0.0015	\$0.0014	1,803	\$3	\$3	0.477	\$1	\$1
2037	\$0.0016	\$0.0014	1,794	\$3	\$3	0.449	\$1	\$1
2038	\$0.0016	\$0.0014	1,785	\$3	\$3	0.422	\$1	\$1
2039	\$0.0016	\$0.0014	1,776	\$3	\$3	0.397	\$1	\$1
2040	\$0.0016	\$0.0014	1,767	\$3	\$3	0.373	\$1	\$1
2041	\$0.0017	\$0.0014	1,759	\$3	\$3	0.351	\$1	\$1
2042	\$0.0017	\$0.0014	1,750	\$3	\$3	0.330	\$1	\$1
2043	\$0.0017	\$0.0014	1,741	\$3	\$3	0.310	\$1	\$1
2044	\$0.0018	\$0.0014	1,732	\$3	\$2	0.291	\$1	\$1
2045	\$0.0018	\$0.0014	1,724	\$3	\$2	0.274	\$1	\$1
2046	\$0.0019	\$0.0014	1,715	\$3	\$2	0.258	\$1	\$1
2047	\$0.0019	\$0.0014	1,706	\$3	\$2	0.242	\$1	\$1
2048	\$0.0019	\$0.0014	1,698	\$3	\$2	0.228	\$1	\$1

<b>Validation: Present Value</b>	<b>\$35</b>	<b>\$35</b>
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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
				\$/kWh	\$/kWh		(\$)	(\$)		(\$)	(\$)
2024	\$62	1.00	1.00	\$0.033	\$0.0328	1,915	\$62	\$63	1.000	\$62	\$63
2025	\$62	0.999	0.995	\$0.033	\$0.0328	1,905	\$62	\$63	0.940	\$58	\$59
2026	\$62	0.998	0.990	\$0.033	\$0.0328	1,896	\$62	\$62	0.884	\$55	\$55
2027	\$62	0.997	0.985	\$0.033	\$0.0328	1,886	\$62	\$62	0.831	\$51	\$51
2028	\$62	0.996	0.980	\$0.033	\$0.0328	1,877	\$61	\$62	0.781	\$48	\$48
2029	\$62	0.995	0.975	\$0.033	\$0.0328	1,868	\$61	\$61	0.735	\$45	\$45
2030	\$62	0.994	0.970	\$0.033	\$0.0328	1,858	\$61	\$61	0.691	\$42	\$42
2031	\$62	0.993	0.966	\$0.033	\$0.0328	1,849	\$61	\$61	0.649	\$39	\$39
2032	\$62	0.992	0.961	\$0.033	\$0.0328	1,840	\$60	\$60	0.611	\$37	\$37
2033	\$62	0.991	0.956	\$0.033	\$0.0328	1,831	\$60	\$60	0.574	\$34	\$34
2034	\$62	0.990	0.951	\$0.033	\$0.0328	1,821	\$60	\$60	0.540	\$32	\$32
2035	\$62	0.989	0.946	\$0.033	\$0.0328	1,812	\$60	\$59	0.508	\$30	\$30
2036	\$62	0.988	0.942	\$0.033	\$0.0328	1,803	\$59	\$59	0.477	\$28	\$28
2037	\$62	0.987	0.937	\$0.033	\$0.0328	1,794	\$59	\$59	0.449	\$27	\$26
2038	\$62	0.986	0.932	\$0.033	\$0.0328	1,785	\$59	\$59	0.422	\$25	\$25
2039	\$62	0.985	0.928	\$0.033	\$0.0328	1,776	\$59	\$58	0.397	\$23	\$23
2040	\$62	0.984	0.923	\$0.033	\$0.0328	1,767	\$58	\$58	0.373	\$22	\$22
2041	\$62	0.983	0.918	\$0.033	\$0.0328	1,759	\$58	\$58	0.351	\$20	\$20
2042	\$62	0.982	0.914	\$0.033	\$0.0328	1,750	\$58	\$57	0.330	\$19	\$19
2043	\$62	0.981	0.909	\$0.033	\$0.0328	1,741	\$58	\$57	0.310	\$18	\$18
2044	\$62	0.980	0.905	\$0.033	\$0.0328	1,732	\$57	\$57	0.291	\$17	\$17
2045	\$62	0.979	0.900	\$0.033	\$0.0328	1,724	\$57	\$57	0.274	\$16	\$15
2046	\$62	0.978	0.896	\$0.033	\$0.0328	1,715	\$57	\$56	0.258	\$15	\$14
2047	\$62	0.977	0.891	\$0.033	\$0.0328	1,706	\$57	\$56	0.242	\$14	\$14
2048	\$62	0.976	0.887	\$0.033	\$0.0328	1,698	\$57	\$56	0.228	\$13	\$13
					\$0.0328						
<b>Validation: Present Value</b>										\$790	\$790

**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)	(\$)	(\$)		(\$)	(\$)
2024	\$62	18.1%	1.00	1.00	\$0.006	\$0.0059	1,915	\$11	\$11	1.000	\$11	\$11
2025	\$62	18.1%	0.999	0.995	\$0.006	\$0.0059	1,905	\$11	\$11	0.940	\$11	\$11
2026	\$62	18.1%	0.998	0.990	\$0.006	\$0.0059	1,896	\$11	\$11	0.884	\$10	\$10
2027	\$62	18.1%	0.997	0.985	\$0.006	\$0.0059	1,886	\$11	\$11	0.831	\$9	\$9
2028	\$62	18.1%	0.996	0.980	\$0.006	\$0.0059	1,877	\$11	\$11	0.781	\$9	\$9
2029	\$62	18.1%	0.995	0.975	\$0.006	\$0.0059	1,868	\$11	\$11	0.735	\$8	\$8
2030	\$62	18.1%	0.994	0.970	\$0.006	\$0.0059	1,858	\$11	\$11	0.691	\$8	\$8
2031	\$62	18.1%	0.993	0.966	\$0.006	\$0.0059	1,849	\$11	\$11	0.649	\$7	\$7
2032	\$62	18.1%	0.992	0.961	\$0.006	\$0.0059	1,840	\$11	\$11	0.611	\$7	\$7
2033	\$62	18.1%	0.991	0.956	\$0.006	\$0.0059	1,831	\$11	\$11	0.574	\$6	\$6
2034	\$62	18.1%	0.990	0.951	\$0.006	\$0.0059	1,821	\$11	\$11	0.540	\$6	\$6
2035	\$62	18.1%	0.989	0.946	\$0.006	\$0.0059	1,812	\$11	\$11	0.508	\$5	\$5
2036	\$62	18.1%	0.988	0.942	\$0.006	\$0.0059	1,803	\$11	\$11	0.477	\$5	\$5
2037	\$62	18.1%	0.987	0.937	\$0.006	\$0.0059	1,794	\$11	\$11	0.449	\$5	\$5
2038	\$62	18.1%	0.986	0.932	\$0.006	\$0.0059	1,785	\$11	\$11	0.422	\$4	\$4
2039	\$62	18.1%	0.985	0.928	\$0.006	\$0.0059	1,776	\$11	\$11	0.397	\$4	\$4
2040	\$62	18.1%	0.984	0.923	\$0.006	\$0.0059	1,767	\$11	\$10	0.373	\$4	\$4
2041	\$62	18.1%	0.983	0.918	\$0.006	\$0.0059	1,759	\$11	\$10	0.351	\$4	\$4
2042	\$62	18.1%	0.982	0.914	\$0.006	\$0.0059	1,750	\$10	\$10	0.330	\$3	\$3
2043	\$62	18.1%	0.981	0.909	\$0.006	\$0.0059	1,741	\$10	\$10	0.310	\$3	\$3
2044	\$62	18.1%	0.980	0.905	\$0.006	\$0.0059	1,732	\$10	\$10	0.291	\$3	\$3
2045	\$62	18.1%	0.979	0.900	\$0.006	\$0.0059	1,724	\$10	\$10	0.274	\$3	\$3
2046	\$62	18.1%	0.978	0.896	\$0.006	\$0.0059	1,715	\$10	\$10	0.258	\$3	\$3
2047	\$62	18.1%	0.977	0.891	\$0.006	\$0.0059	1,706	\$10	\$10	0.242	\$2	\$2
2048	\$62	18.1%	0.976	0.887	\$0.006	\$0.0059	1,698	\$10	\$10	0.228	\$2	\$2
					\$0.0059							
<b>Validation: Present Value</b>											\$143	\$143

**Table 13. Economic value of avoided transmission 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 (\$)
2024	\$54	1.00	1.00	\$0.028	\$0.0287	1,915	\$54	\$55	1.000	\$54	\$55
2025	\$54	0.999	0.995	\$0.028	\$0.0287	1,905	\$54	\$55	0.940	\$51	\$51
2026	\$54	0.998	0.990	\$0.029	\$0.0287	1,896	\$54	\$54	0.884	\$48	\$48
2027	\$54	0.997	0.985	\$0.029	\$0.0287	1,886	\$54	\$54	0.831	\$45	\$45
2028	\$54	0.996	0.980	\$0.029	\$0.0287	1,877	\$54	\$54	0.781	\$42	\$42
2029	\$54	0.995	0.975	\$0.029	\$0.0287	1,868	\$53	\$54	0.735	\$39	\$39
2030	\$54	0.994	0.970	\$0.029	\$0.0287	1,858	\$53	\$53	0.691	\$37	\$37
2031	\$54	0.993	0.966	\$0.029	\$0.0287	1,849	\$53	\$53	0.649	\$34	\$34
2032	\$54	0.992	0.961	\$0.029	\$0.0287	1,840	\$53	\$53	0.611	\$32	\$32
2033	\$54	0.991	0.956	\$0.029	\$0.0287	1,831	\$53	\$53	0.574	\$30	\$30
2034	\$54	0.990	0.951	\$0.029	\$0.0287	1,821	\$52	\$52	0.540	\$28	\$28
2035	\$54	0.989	0.946	\$0.029	\$0.0287	1,812	\$52	\$52	0.508	\$26	\$26
2036	\$54	0.988	0.942	\$0.029	\$0.0287	1,803	\$52	\$52	0.477	\$25	\$25
2037	\$54	0.987	0.937	\$0.029	\$0.0287	1,794	\$52	\$51	0.449	\$23	\$23
2038	\$54	0.986	0.932	\$0.029	\$0.0287	1,785	\$52	\$51	0.422	\$22	\$22
2039	\$54	0.985	0.928	\$0.029	\$0.0287	1,776	\$51	\$51	0.397	\$20	\$20
2040	\$54	0.984	0.923	\$0.029	\$0.0287	1,767	\$51	\$51	0.373	\$19	\$19
2041	\$54	0.983	0.918	\$0.029	\$0.0287	1,759	\$51	\$50	0.351	\$18	\$18
2042	\$54	0.982	0.914	\$0.029	\$0.0287	1,750	\$51	\$50	0.330	\$17	\$17
2043	\$54	0.981	0.909	\$0.029	\$0.0287	1,741	\$50	\$50	0.310	\$16	\$15
2044	\$54	0.980	0.905	\$0.029	\$0.0287	1,732	\$50	\$50	0.291	\$15	\$14
2045	\$54	0.979	0.900	\$0.029	\$0.0287	1,724	\$50	\$49	0.274	\$14	\$14
2046	\$54	0.978	0.896	\$0.029	\$0.0287	1,715	\$50	\$49	0.258	\$13	\$13
2047	\$54	0.977	0.891	\$0.029	\$0.0287	1,706	\$50	\$49	0.242	\$12	\$12
2048	\$54	0.976	0.887	\$0.029	\$0.0287	1,698	\$49	\$49	0.228	\$11	\$11
				\$0.0287							
<b>Validation: Present Value</b>										\$691	\$691

**Table 14. Determination of deferrable distribution costs.**

Year	Distribution Project Costs	% Capacity Related	Capacity Related		
	\$	%	\$		
2022	175,490,525	4.5%	7,812,185		
2021	155,018,178	6.6%	10,270,204		
2020	165,929,956	9.6%	15,936,132		
2019	134,867,264	12.1%	16,309,114		
2018	129,899,465	16.3%	21,147,768		
2017	142,118,822	20.3%	28,825,462		
2016	109,286,058	20.8%	22,683,879		
2015	100,102,075	7.5%	7,502,291		
2014	98,267,667	11.0%	10,823,959		
2013	82,821,606	10.6%	8,749,417		
<b>TOTAL 10-YEAR PERIOD</b>	<b>1,293,801,616</b>		<b>150,060,411</b>		

**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
2024	\$320	50	\$16	\$16	\$11				\$10
2025	\$328	46	\$15	\$14	\$11	50	\$16.4	\$15.4	\$10
2026	\$336	42	\$14	\$13	\$11	46	\$15.5	\$13.7	\$10
2027	\$344	39	\$13	\$11	\$11	42	\$14.6	\$12.1	\$10
2028	\$352	36	\$13	\$10	\$11	39	\$13.7	\$10.7	\$10
2029	\$361	33	\$12	\$9	\$11	36	\$12.9	\$9.5	\$10
2030	\$370	30	\$11	\$8	\$11	33	\$12.2	\$8.4	\$10
2031	\$379	28	\$11	\$7	\$11	30	\$11.5	\$7.5	\$10
2032	\$388	26	\$10	\$6	\$11	28	\$10.8	\$6.6	\$10
2033	\$397	24	\$9	\$5	\$11	26	\$10.2	\$5.8	\$10
2034	\$407	22	\$9	\$5	\$11	24	\$9.6	\$5.2	\$10
2035	\$416	20	\$8	\$4	\$11	22	\$9.0	\$4.6	\$10
2036	\$426	18	\$8	\$4	\$11	20	\$8.5	\$4.1	\$10
2037	\$437	17	\$7	\$3	\$11	18	\$8.0	\$3.6	\$10
2038	\$447	16	\$7	\$3	\$11	17	\$7.6	\$3.2	\$10
2039	\$458	14	\$7	\$3	\$11	16	\$7.1	\$2.8	\$10
2040	\$469	13	\$6	\$2	\$11	14	\$6.7	\$2.5	\$10
2041	\$480	12	\$6	\$2	\$11	13	\$6.3	\$2.2	\$10
2042	\$492	11	\$5	\$2	\$11	12	\$6.0	\$2.0	\$10
2043	\$504	10	\$5	\$2	\$11	11	\$5.6	\$1.7	\$10
2044	\$516	9	\$5	\$1	\$11	10	\$5.3	\$1.5	\$10
2045	\$528	9	\$5	\$1	\$11	9	\$5.0	\$1.4	\$10
2046	\$541	8	\$4	\$1	\$11	9	\$4.7	\$1.2	\$10
2047	\$554	7	\$4	\$1	\$11	8	\$4.4	\$1.1	\$10
2048	\$567	7	\$4	\$1	\$11	7	\$4.2	\$0.9	\$10
2039	\$581					7	\$3.9	\$0.8	
					\$133				\$129

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

Prices		PV Production	Costs		Discount Factor	Disc. Costs	
Utility	VOS		Utility	VOS		Utility	VOS
\$/kWh	\$/kWh	(kWh)	(\$)	(\$)		(\$)	(\$)
\$0.00419	\$0.0110	1,915	\$8	\$21	1.000	\$8	\$21
\$0.00458	\$0.0110	1,905	\$9	\$21	0.940	\$8	\$20
\$0.00500	\$0.0110	1,896	\$9	\$21	0.884	\$8	\$18
\$0.00546	\$0.0110	1,886	\$10	\$21	0.831	\$9	\$17
\$0.00597	\$0.0110	1,877	\$11	\$21	0.781	\$9	\$16
\$0.00652	\$0.0110	1,868	\$12	\$20	0.735	\$9	\$15
\$0.00712	\$0.0110	1,858	\$13	\$20	0.691	\$9	\$14
\$0.00778	\$0.0110	1,849	\$14	\$20	0.649	\$9	\$13
\$0.00850	\$0.0110	1,840	\$16	\$20	0.611	\$10	\$12
\$0.00929	\$0.0110	1,831	\$17	\$20	0.574	\$10	\$12
\$0.01015	\$0.0110	1,821	\$18	\$20	0.540	\$10	\$11
\$0.01109	\$0.0110	1,812	\$20	\$20	0.508	\$10	\$10
\$0.01211	\$0.0110	1,803	\$22	\$20	0.477	\$10	\$9
\$0.01323	\$0.0110	1,794	\$24	\$20	0.449	\$11	\$9
\$0.01445	\$0.0110	1,785	\$26	\$20	0.422	\$11	\$8
\$0.01579	\$0.0110	1,776	\$28	\$19	0.397	\$11	\$8
\$0.01725	\$0.0110	1,767	\$30	\$19	0.373	\$11	\$7
\$0.01885	\$0.0110	1,759	\$33	\$19	0.351	\$12	\$7
\$0.02059	\$0.0110	1,750	\$36	\$19	0.330	\$12	\$6
\$0.02249	\$0.0110	1,741	\$39	\$19	0.310	\$12	\$6
\$0.02457	\$0.0110	1,732	\$43	\$19	0.291	\$12	\$6
\$0.02684	\$0.0110	1,724	\$46	\$19	0.274	\$13	\$5
\$0.02933	\$0.0110	1,715	\$50	\$19	0.258	\$13	\$5
\$0.03204	\$0.0110	1,706	\$55	\$19	0.242	\$13	\$5
\$0.03500	\$0.0110	1,698	\$59	\$19	0.228	\$14	\$4
					-		
	\$0.0110		<b>Validation: Present Value</b>			\$264	\$264



**Table 17. Economic value of avoided environmental costs**

Environmental Discount Rate 5.61%

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 (\$)
2024	\$3.94	7,750	\$0.031	\$0.0465	1,915	\$58	\$89	1.000	\$58	\$89
2025	\$4.10	7,758	\$0.032	\$0.0465	1,905	\$61	\$89	0.947	\$57	\$84
2026	\$4.27	7,766	\$0.033	\$0.0465	1,896	\$63	\$88	0.897	\$56	\$79
2027	\$4.45	7,773	\$0.035	\$0.0465	1,886	\$65	\$88	0.849	\$55	\$74
2028	\$4.63	7,781	\$0.036	\$0.0465	1,877	\$68	\$87	0.804	\$54	\$70
2029	\$4.82	7,789	\$0.038	\$0.0465	1,868	\$70	\$87	0.761	\$53	\$66
2030	\$5.02	7,797	\$0.039	\$0.0465	1,858	\$73	\$86	0.721	\$52	\$62
2031	\$5.24	7,804	\$0.041	\$0.0465	1,849	\$76	\$86	0.683	\$52	\$59
2032	\$5.47	7,812	\$0.043	\$0.0465	1,840	\$79	\$85	0.646	\$51	\$55
2033	\$5.71	7,820	\$0.045	\$0.0465	1,831	\$82	\$85	0.612	\$50	\$52
2034	\$5.96	7,828	\$0.047	\$0.0465	1,821	\$85	\$85	0.580	\$49	\$49
2035	\$6.21	7,836	\$0.049	\$0.0465	1,812	\$88	\$84	0.549	\$48	\$46
2036	\$6.48	7,844	\$0.051	\$0.0465	1,803	\$92	\$84	0.520	\$48	\$44
2037	\$6.75	7,851	\$0.053	\$0.0465	1,794	\$95	\$83	0.492	\$47	\$41
2038	\$7.03	7,859	\$0.055	\$0.0465	1,785	\$99	\$83	0.466	\$46	\$39
2039	\$7.33	7,867	\$0.058	\$0.0465	1,776	\$102	\$83	0.441	\$45	\$36
2040	\$7.63	7,875	\$0.060	\$0.0465	1,767	\$106	\$82	0.418	\$44	\$34
2041	\$7.92	7,883	\$0.062	\$0.0465	1,759	\$110	\$82	0.396	\$43	\$32
2042	\$8.22	7,891	\$0.065	\$0.0465	1,750	\$114	\$81	0.375	\$43	\$30
2043	\$8.53	7,899	\$0.067	\$0.0465	1,741	\$117	\$81	0.355	\$42	\$29
2044	\$8.85	7,906	\$0.070	\$0.0465	1,732	\$121	\$80	0.336	\$41	\$27
2045	\$9.19	7,914	\$0.073	\$0.0465	1,724	\$125	\$80	0.318	\$40	\$25
2046	\$9.56	7,922	\$0.076	\$0.0465	1,715	\$130	\$80	0.301	\$39	\$24
2047	\$9.94	7,930	\$0.079	\$0.0465	1,706	\$135	\$79	0.285	\$38	\$23
2048	\$10.34	7,938	\$0.082	\$0.0465	1,698	\$139	\$79	0.270	\$38	\$21

<b>Validation: Present Value</b>	<b>\$1,191</b>	<b>\$1,191</b>
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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
2024	1.000	1915	1.000	\$0.125	\$239	\$0.0990	189.608
2025	0.940	1905	1.025	\$0.125	\$224	\$0.1015	181.866
2026	0.884	1896	1.051	\$0.125	\$209	\$0.1041	174.440
2027	0.831	1886	1.078	\$0.125	\$196	\$0.1067	167.318
2028	0.781	1877	1.105	\$0.125	\$183	\$0.1094	160.487
2029	0.735	1868	1.133	\$0.125	\$171	\$0.1122	153.934
2030	0.691	1858	1.162	\$0.125	\$160	\$0.1150	147.649
2031	0.649	1849	1.191	\$0.125	\$150	\$0.1179	141.620
2032	0.611	1840	1.221	\$0.125	\$140	\$0.1209	135.838
2033	0.574	1831	1.252	\$0.125	\$131	\$0.1240	130.292
2034	0.540	1821	1.284	\$0.125	\$123	\$0.1271	124.972
2035	0.508	1812	1.316	\$0.125	\$115	\$0.1303	119.869
2036	0.477	1803	1.350	\$0.125	\$107	\$0.1336	114.975
2037	0.449	1794	1.384	\$0.125	\$100	\$0.1370	110.281
2038	0.422	1785	1.419	\$0.125	\$94	\$0.1405	105.778
2039	0.397	1776	1.455	\$0.125	\$88	\$0.1440	101.459
2040	0.397	1767	1.491	\$0.125	\$88	\$0.1477	103.506
2041	0.351	1759	1.529	\$0.125	\$77	\$0.1514	93.343
2042	0.330	1750	1.568	\$0.125	\$72	\$0.1552	89.532
2043	0.310	1741	1.608	\$0.125	\$67	\$0.1592	85.876
2044	0.291	1732	1.648	\$0.125	\$63	\$0.1632	82.370
2045	0.274	1724	1.690	\$0.125	\$59	\$0.1673	79.007
2046	0.258	1715	1.733	\$0.125	\$55	\$0.1716	75.781
2047	0.242	1706	1.777	\$0.125	\$52	\$0.1759	72.687
2048	0.228	1698	1.821	\$0.125	\$48	\$0.1803	69.719
					\$3,012		\$3,012

**ATTACHMENTS B – L**  
**FILED LIVE**

**ATTACHMENT M**  
**Previously tariff sheets,**  
**which are no longer**  
**applicable.**

**ATTACHMENTS N & O**  
**FILED LIVE**

<b>Minnesota Public Utilities Commission's April 6, 2023 Order Approving Xcel's 2023 Value-of-Solar Rate</b>		
<b>Order Point</b>	<b>Current Requirements</b>	<b>Compliance</b>
2.	The Commission declines to adopt changes to the avoided distribution cost calculation component of the existing VOS methodology.	2024 VOS methodology was not changed
3.	The Commission authorizes expiration of the residential adder with the 2022 VOS vintage, recognizing that the Commission will consider the issue of the adder for the 2023 VOS vintage after Xcel files its May 2023 adder final evaluation.	5/1/23 Resi Adder Filing 7/24/23 Initial Comments 8/21/23 Reply Comments
4.	The Commission accepts the offer from developers and interested parties to file information related to the residential adder differentials by April 1, 2023.	5/1/23 Resi Adder Filing 7/24/23 Initial Comments 8/21/23 Reply Comments
5.	Xcel must work with the Department and stakeholders on possible adders including but not limited to (1) an income-qualified adder, (2) required allocation for residential/income-qualified customers, and (3) a cost-neutral mixed adder; the Commission accepts the Department's offer to file a summary by May 1, 2023.	5/1/23 Resi Adder Filing 7/24/23 Initial Comments 8/21/23 Reply Comments
6.	In its May 1, 2023, compliance filing that includes language for exempting the adder for new Building Subscription Model subscribers, Xcel must include a date for implementation; the Commission delegates authority to the Executive Secretary to approve Xcel's proposed language. If no objections to the language are filed within 30 days, Xcel must update its tariffs as needed.	5/1/23 Resi Adder Filing 7/24/23 Initial Comments 8/21/23 Reply Comments

**Minnesota Public Utilities Commission's April 6, 2022 Order Approving Xcel's 2022 Value-of-Solar Rate**

*No new compliance requirements.*

**Minnesota Public Utilities Commission's March 9, 2021 Order Approving Xcel's 2021 Value-of-Solar Rate**

<b>Order Point</b>	<b>Current Requirements</b>	<b>Compliance</b>
3.	Xcel, the Minnesota Department of Commerce, Division of Energy Resources (the Department), and stakeholders shall discuss the application of the actual photovoltaic fleet shape to effective load carrying capability, peak load reduction, loss savings, and solar-weighted heat rate, as well as the possibility of developing a new profile-based approach as described by Xcel. Xcel shall file a proposal for potential changes for the 2022 value of solar by July 1, 2021.	5/18/21 SRCMN Stakeholder Workgroup Meeting 7/1/21 PV Fleet Shape Proposal 7/2/21 PV Fleet Shape Supplement

**Minnesota Public Utilities Commission's March 4, 2020 Order Approving Xcel's Update to the 2020 Value-of-Solar Rate**

<b>Order Point</b>	<b>Current Requirements</b>	<b>Compliance</b>
3.	For future annual VOS update filings, Xcel shall do the following:	-
a.	File by September 1.	9/1/22 2024 VOS Calculation
b.	Include in the filing:	-
i.	A list of all changed parameters as permitted by the approved VOS Methodology, and any updated input values;	9/1/22 2024 VOS Calculation, Letter, Part B - VOS Input Parameters
ii.	A discussion, along with any necessary tables, charts, and explanations, of how these changes will affect the VOS rate, as well as variables within the rate;	9/1/22 2024 VOS Calculation, Letter, Part B - VOS Input Parameters
iii.	Hourly PV fleet production data for PV systems 1 MW and under in the utility service territory, including:	Commission's March 9, 2021 Order, Point 3, superseded the 2020 Order regarding PV Fleet Shape.
	synchronized, time-stamped hourly values of average	Commission's March 9, 2021 Order, Point 3, superseded the 2020 Order regarding PV Fleet Shape.
	1. power over the same load analysis period and corresponding to the same hourly intervals,	Commission's March 9, 2021 Order, Point 3, superseded the 2020 Order regarding PV Fleet Shape.
	2. data for every hour of the load analysis period, and	Commission's March 9, 2021 Order, Point 3, superseded the 2020 Order regarding PV Fleet Shape.
	a load analysis period including multiple contiguous years,	Commission's March 9, 2021 Order, Point 3, superseded the 2020 Order regarding PV Fleet Shape.
	3. with complete one-year periods, using available and correct data; and	Commission's March 9, 2021 Order, Point 3, superseded the 2020 Order regarding PV Fleet Shape.
iv.	Sufficient evidence and data to support these changes.	Provided throughout September 1, 2022 filing

**Minnesota Public Utilities Commission's March 22, 2019 Order Approving Changes to Distributed Solar Value Methodology as Modified and Requiring Further Filings**

<b>Order Point</b>	<b>Non-Expired Requirements</b>	<b>Compliance</b>
4.	For future annual VOS update filings, Xcel shall do the following:	-
c	Convene a meeting no later than August 1 to explain in detail to those in attendance each of the items identified above.	7/28/2022 Q3 SRCMN Stakeholder Workgroup Meeting; 8/9/2022 emailed revised calculation to the Solar*Rewards Community Implementation Workgroup.

**Minnesota Public Utilities Commission's December 3, 2019 Order Approving Changes to Distributed Solar Value Methodology as Modified and Requiring Further Filings**

Order Point	Current Requirements	Compliance
1.	The Commission approves Xcel's proposed methodology for calculating the avoided distribution cost component for the 2020 VOS rate applied to - the CSG program, except for the 50% deferral-reduction factor.	
b.	Xcel shall report annually on its planned and actual distribution spending, along with the placement of CSGs to assist with evaluating Xcel's avoided distribution cost calculation methodology for possible future use in locational differentiation.	Attachment B



## CERTIFICATE OF SERVICE

I, Ella Giefer, hereby certify that I have this day served copies or summaries 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 1<sup>st</sup> day of September 2023

/s/

---

Ella Giefer  
Regulatory Administrator

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