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Minneapolis, MN 55401

**PUBLIC DOCUMENT –
TRADE SECRET DATA EXCISED**

March 1, 2016

—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 Value of Solar (VOS) calculation in compliance with the Commission's September 17, 2014 Order.

The first-year VOS rate for 2016 is calculated at 9.95 cents per kWh, which is a decrease of 0.8 cents per kWh from the 2015 first-year VOS rate of 10.75 cents per kWh. The decrease is driven by the reduction in the avoided distribution capacity cost component. That component was reduced to zero in the calculation, due to the negative peak growth of -0.62% experienced over the 10-year period specified by the VOS rate methodology. The adjustment reduced the 2016 VOS rate by roughly 1.8 cents per kWh. The key offsetting upward adjustment of the VOS rate was higher avoided fuel and environmental costs of 1.0 cent per kWh. The upward adjustment in these components was driven by an upward adjustment in the solar weighted heat rate.

Please note, Attachment D contains Trade Secret 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

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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).

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 | Economic Value (\$/kWh) | Load Match (No Losses) (%) | Distributed Loss Savings (%) | Distributed PV Value (\$/kWh) |
|------------------------------------|--------------------------------|-----------------------------------|-------------------------------------|--------------------------------------|
| <i>25 Year Levelized Values</i> | | | | |
| Avoided Fuel Cost | \$0.0376 | | 9.8% | \$0.0412 |
| Avoided Plan O&M - Fixed | \$0.0024 | 48.6% | 10.8% | \$0.0013 |
| Avoided Plan O&M - Variable | \$0.0030 | | 9.8% | \$0.0033 |
| Avoided Gen Capacity Cost | \$0.0360 | 48.6% | 10.8% | \$0.0194 |
| Avoided Reserve Capacity Cost | \$0.0027 | 48.6% | 10.8% | \$0.0015 |
| Avoided Trans Capacity Cost | \$0.0332 | 48.6% | 10.8% | \$0.0178 |
| Avoided Distribution Capacity Cost | \$0.0000 | 55.2% | 13.2% | \$0.0000 |
| Avoided Environmental Cost | \$0.0359 | | 9.8% | \$0.0394 |
| Avoided Voltage Control Cost | | | | |
| <u>Solar Integration Cost</u> | | | | |
| TOTAL | | | | \$0.1239 |

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

| Year | Discount Factor | Escalation Factor | VOS Levelized | Disc. | VOS Inflation Adj. (\$/kWh) | Disc. |
|------|-----------------|-------------------|---------------|---------|-----------------------------|---------|
| 2016 | 1.000 | 1.000 | \$0.124 | \$0.124 | \$0.0995 | 0.099 |
| 2017 | 0.940 | 1.024 | \$0.124 | \$0.116 | <i>\$0.1019</i> | 0.096 |
| 2018 | 0.883 | 1.049 | \$0.124 | \$0.109 | <i>\$0.1043</i> | 0.092 |
| 2019 | 0.830 | 1.074 | \$0.124 | \$0.103 | <i>\$0.1069</i> | 0.089 |
| 2020 | 0.780 | 1.100 | \$0.124 | \$0.097 | <i>\$0.1094</i> | 0.085 |
| 2021 | 0.733 | 1.126 | \$0.124 | \$0.091 | <i>\$0.1121</i> | 0.082 |
| 2022 | 0.688 | 1.154 | \$0.124 | \$0.085 | <i>\$0.1148</i> | 0.079 |
| 2023 | 0.688 | 1.181 | \$0.124 | \$0.085 | <i>\$0.1175</i> | 0.081 |
| 2024 | 0.688 | 1.210 | \$0.124 | \$0.085 | <i>\$0.1204</i> | 0.083 |
| 2025 | 0.571 | 1.239 | \$0.124 | \$0.071 | <i>\$0.1233</i> | 0.070 |
| 2026 | 0.537 | 1.269 | \$0.124 | \$0.067 | <i>\$0.1262</i> | 0.068 |
| 2027 | 0.504 | 1.299 | \$0.124 | \$0.062 | <i>\$0.1293</i> | 0.065 |
| 2028 | 0.474 | 1.331 | \$0.124 | \$0.059 | <i>\$0.1324</i> | 0.063 |
| 2029 | 0.445 | 1.363 | \$0.124 | \$0.055 | <i>\$0.1356</i> | 0.060 |
| 2030 | 0.418 | 1.396 | \$0.124 | \$0.052 | <i>\$0.1389</i> | 0.058 |
| 2031 | 0.393 | 1.429 | \$0.124 | \$0.049 | <i>\$0.1422</i> | 0.056 |
| 2032 | 0.393 | 1.464 | \$0.124 | \$0.049 | <i>\$0.1456</i> | 0.057 |
| 2033 | 0.347 | 1.499 | \$0.124 | \$0.043 | <i>\$0.1491</i> | 0.052 |
| 2034 | 0.326 | 1.535 | \$0.124 | \$0.040 | <i>\$0.1527</i> | 0.050 |
| 2035 | 0.307 | 1.572 | \$0.124 | \$0.038 | <i>\$0.1564</i> | 0.048 |
| 2036 | 0.288 | 1.610 | \$0.124 | \$0.036 | <i>\$0.1602</i> | 0.046 |
| 2037 | 0.271 | 1.649 | \$0.124 | \$0.034 | <i>\$0.1641</i> | 0.044 |
| 2038 | 0.254 | 1.689 | \$0.124 | \$0.032 | <i>\$0.1680</i> | 0.043 |
| 2039 | 0.239 | 1.729 | \$0.124 | \$0.030 | <i>\$0.1721</i> | 0.041 |
| 2040 | 0.225 | 1.771 | \$0.124 | \$0.028 | <i>\$0.1762</i> | 0.040 |
| | | | | \$1.638 | | \$1.648 |

VOS values that are italicized and shaded in gray are estimates of potential out-year VOS values for this VOS vintage. The estimate is based on the current 25-year escalation rate. Actual out-year values will be dependent on actual year-over-year observed CPI rates. Please see page 6 ("Annual VOS Update") and page 45 ("VOS Example Calculation") of the VOS methodology.

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

| | | | | | |
|---------------------------|--------|----------|------------------------------------|----------------|----------|
| Fuel Prices | | | Environmental Externalities | | |
| Guaranteed NG Fuel Prices | | | Environmental Discount Rate | 5.48% | per year |
| 2016 | \$2.44 | \$/mmBtu | Environmental Costs | separate table | |
| 2017 | \$2.77 | \$/mmBtu | Economic Assumptions | | |
| 2018 | \$2.88 | \$/mmBtu | General Escalation Rate | 2.41% | per year |
| 2019 | \$2.99 | \$/mmBtu | Treasury Yields | | |
| 2020 | \$3.12 | \$/mmBtu | 1 Year | 0.56% | |
| 2021 | \$3.25 | \$/mmBtu | 2 Year | 0.91% | |
| 2022 | \$3.38 | \$/mmBtu | 3 Year | 1.16% | |
| 2023 | \$3.51 | \$/mmBtu | 5 Year | 1.54% | |
| 2024 | \$3.65 | \$/mmBtu | 7 Year | 1.87% | |
| 2025 | \$3.78 | \$/mmBtu | 10 Year | 2.10% | |
| 2026 | \$3.92 | \$/mmBtu | 20 Year | 2.51% | |
| 2027 | \$4.05 | \$/mmBtu | 30 Year | 2.87% | |
| Fuel Price Escalation | 2.41% | | | | |
| 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 |
|------|---------------|----------------------|------------------------|---------------------|----------------------|---------------------|------------------------|
| 2016 | 0 | \$2.371 | \$0.03 | \$0.00 | \$0.05 | \$0.00 | \$2.450 |
| 2017 | 1 | \$2.506 | \$0.03 | \$0.00 | \$0.05 | \$0.00 | \$2.587 |
| 2018 | 2 | \$2.647 | \$0.03 | \$0.00 | \$0.05 | \$0.00 | \$2.730 |
| 2019 | 3 | \$2.793 | \$0.03 | \$0.00 | \$0.05 | \$0.00 | \$2.878 |
| 2020 | 4 | \$2.944 | \$0.03 | \$0.00 | \$0.05 | \$0.00 | \$3.031 |
| 2021 | 5 | \$3.073 | \$0.03 | \$0.00 | \$0.06 | \$0.00 | \$3.162 |
| 2022 | 6 | \$3.205 | \$0.03 | \$0.00 | \$0.06 | \$0.00 | \$3.297 |
| 2023 | 7 | \$3.343 | \$0.04 | \$0.00 | \$0.06 | \$0.00 | \$3.437 |
| 2024 | 8 | \$3.485 | \$0.04 | \$0.00 | \$0.06 | \$0.00 | \$3.581 |
| 2025 | 9 | \$3.632 | \$0.04 | \$0.00 | \$0.06 | \$0.00 | \$3.731 |
| 2026 | 10 | \$3.785 | \$0.04 | \$0.00 | \$0.06 | \$0.00 | \$3.885 |
| 2027 | 11 | \$3.942 | \$0.04 | \$0.00 | \$0.06 | \$0.00 | \$4.045 |
| 2028 | 12 | \$4.105 | \$0.04 | \$0.00 | \$0.07 | \$0.00 | \$4.210 |
| 2029 | 13 | \$4.273 | \$0.04 | \$0.00 | \$0.07 | \$0.00 | \$4.381 |
| 2030 | 14 | \$4.447 | \$0.04 | \$0.00 | \$0.07 | \$0.00 | \$4.558 |
| 2031 | 15 | \$4.646 | \$0.04 | \$0.00 | \$0.07 | \$0.00 | \$4.759 |
| 2032 | 16 | \$4.851 | \$0.04 | \$0.00 | \$0.07 | \$0.00 | \$4.967 |
| 2033 | 17 | \$5.063 | \$0.05 | \$0.00 | \$0.07 | \$0.00 | \$5.182 |
| 2034 | 18 | \$5.283 | \$0.05 | \$0.00 | \$0.08 | \$0.00 | \$5.405 |
| 2035 | 19 | \$5.511 | \$0.05 | \$0.00 | \$0.08 | \$0.00 | \$5.636 |
| 2036 | 20 | \$5.746 | \$0.05 | \$0.00 | \$0.08 | \$0.00 | \$5.874 |
| 2037 | 21 | \$5.990 | \$0.05 | \$0.00 | \$0.08 | \$0.00 | \$6.121 |
| 2038 | 22 | \$6.242 | \$0.05 | \$0.00 | \$0.08 | \$0.00 | \$6.376 |
| 2039 | 23 | \$6.502 | \$0.05 | \$0.00 | \$0.08 | \$0.00 | \$6.640 |
| 2040 | 24 | \$6.772 | \$0.05 | \$0.00 | \$0.09 | \$0.00 | \$6.912 |

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

| | Input Data | Units | | Input Data | Units |
|--|------------|----------------|---|------------|--------------|
| Economic Factors | | | Power Generation | | |
| Start Year for VOS applicability | 2016 | | Peaking CT, simple cycle | | |
| Discount Rate (WACC) | 6.42% | per year | Installed Cost | \$631 | \$/kW |
| | | | Heat Rate | 9,942 | BTU/kWh |
| Load Match Analysis | | | Intermediate CCGT | | |
| ELCC (no loss) | 48.6% | % of rating | Installed Cost | \$971 | \$/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 | 9,158 | BTU per kWh |
| Loss Savings - ELCC | 10.8% | % of PV output | Fuel Price Overhead | \$0.123 | \$ 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 | \$2.70 | per kW-yr |
| | | | O&M cost (first year) - Variable | \$0.002 | \$ per kWh |
| Transmission | | | O&M cost escalation rate | 2.82% | per year |
| Capacity-related transmission capital cost | \$47.74 | \$ per kW | Reserve planning margin | 7.6% | |
| | | | Years until new Generation is needed | 0 | |
| | | | Distribution | | |
| | | | Capacity-related distribution capital costs | \$0 | \$ per kW |
| | | | Distribution capital cost escalation | 2.82% | per year |
| | | | Peak Load | 6,397 | MW |
| | | | Peak Load Growth | 0.36% | per year |

Table 6. Azimuth and Tilt Angles

| | Array KW | % of Total | Azimuth | Tilt | |
|--------------|---------------|-------------|--------------|-------------|-------------------------|
| 1 | 79 | 0.5% | 62 | 26 | |
| 2 | 360 | 2.2% | 140 | 29 | |
| 3 | 630 | 3.9% | 168 | 27 | |
| 4 | 1,003 | 6.2% | 180 | 15 | |
| 5 | 1,406 | 8.7% | 180 | 21 | |
| 6 | 3,726 | 23.1% | 180 | 26 | |
| 7 | 2,332 | 14.4% | 180 | 30 | |
| 8 | 1,110 | 6.9% | 180 | 35 | |
| 9 | 454 | 2.8% | 180 | 42 | |
| 10 | 3,556 | 22.0% | 180 | 45 | |
| 11 | 371 | 2.3% | 185 | 27 | |
| 12 | 284 | 1.8% | 198 | 25 | |
| 13 | 523 | 3.2% | 213 | 26 | |
| 14 | 282 | 1.7% | 228 | 28 | |
| 15 | 24 | 0.1% | 271 | 27 | |
| TOTAL | 16,141 | 100% | 180.5 | 30.9 | 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 | | (\$) | (\$) | | (\$) | (\$) |
| 2016 | \$2.44 | \$2.57 | 9,158 | \$0.023 | \$0.0376 | 1,452 | \$34 | \$55 | 1.000 | \$34 | \$55 |
| 2017 | \$2.77 | \$2.89 | 9,167 | \$0.027 | \$0.0376 | 1,444 | \$38 | \$54 | 0.994 | \$38 | \$54 |
| 2018 | \$2.88 | \$3.01 | 9,176 | \$0.028 | \$0.0376 | 1,437 | \$40 | \$54 | 0.982 | \$39 | \$53 |
| 2019 | \$2.99 | \$3.13 | 9,186 | \$0.029 | \$0.0376 | 1,430 | \$41 | \$54 | 0.966 | \$40 | \$52 |
| 2020 | \$3.12 | \$3.26 | 9,195 | \$0.030 | \$0.0376 | 1,423 | \$43 | \$53 | 0.948 | \$40 | \$51 |
| 2021 | \$3.25 | \$3.39 | 9,204 | \$0.031 | \$0.0376 | 1,416 | \$44 | \$53 | 0.927 | \$41 | \$49 |
| 2022 | \$3.38 | \$3.52 | 9,213 | \$0.032 | \$0.0376 | 1,409 | \$46 | \$53 | 0.904 | \$41 | \$48 |
| 2023 | \$3.51 | \$3.66 | 9,222 | \$0.034 | \$0.0376 | 1,402 | \$47 | \$53 | 0.878 | \$42 | \$46 |
| 2024 | \$3.65 | \$3.80 | 9,232 | \$0.035 | \$0.0376 | 1,395 | \$49 | \$52 | 0.857 | \$42 | \$45 |
| 2025 | \$3.78 | \$3.93 | 9,241 | \$0.036 | \$0.0376 | 1,388 | \$50 | \$52 | 0.835 | \$42 | \$44 |
| 2026 | \$3.92 | \$4.07 | 9,250 | \$0.038 | \$0.0376 | 1,381 | \$52 | \$52 | 0.812 | \$42 | \$42 |
| 2027 | \$4.05 | \$4.21 | 9,259 | \$0.039 | \$0.0376 | 1,374 | \$54 | \$52 | 0.792 | \$42 | \$41 |
| 2028 | \$4.15 | \$4.31 | 9,269 | \$0.040 | \$0.0376 | 1,367 | \$55 | \$51 | 0.772 | \$42 | \$40 |
| 2029 | \$4.25 | \$4.42 | 9,278 | \$0.041 | \$0.0376 | 1,360 | \$56 | \$51 | 0.751 | \$42 | \$38 |
| 2030 | \$4.35 | \$4.52 | 9,287 | \$0.042 | \$0.0376 | 1,353 | \$57 | \$51 | 0.731 | \$42 | \$37 |
| 2031 | \$4.46 | \$4.63 | 9,296 | \$0.043 | \$0.0376 | 1,347 | \$58 | \$51 | 0.711 | \$41 | \$36 |
| 2032 | \$4.56 | \$4.74 | 9,306 | \$0.044 | \$0.0376 | 1,340 | \$59 | \$50 | 0.690 | \$41 | \$35 |
| 2033 | \$4.67 | \$4.86 | 9,315 | \$0.045 | \$0.0376 | 1,333 | \$60 | \$50 | 0.670 | \$40 | \$34 |
| 2034 | \$4.79 | \$4.97 | 9,324 | \$0.046 | \$0.0376 | 1,326 | \$62 | \$50 | 0.650 | \$40 | \$32 |
| 2035 | \$4.90 | \$5.09 | 9,334 | \$0.048 | \$0.0376 | 1,320 | \$63 | \$50 | 0.630 | \$40 | \$31 |
| 2036 | \$5.02 | \$5.22 | 9,343 | \$0.049 | \$0.0376 | 1,313 | \$64 | \$49 | 0.610 | \$39 | \$30 |
| 2037 | \$5.14 | \$5.34 | 9,352 | \$0.050 | \$0.0376 | 1,307 | \$65 | \$49 | 0.590 | \$39 | \$29 |
| 2038 | \$5.26 | \$5.47 | 9,362 | \$0.051 | \$0.0376 | 1,300 | \$67 | \$49 | 0.571 | \$38 | \$28 |
| 2039 | \$5.39 | \$5.60 | 9,371 | \$0.053 | \$0.0376 | 1,294 | \$68 | \$49 | 0.552 | \$38 | \$27 |
| 2040 | \$5.52 | \$5.74 | 9,380 | \$0.054 | \$0.0376 | 1,287 | \$69 | \$48 | 0.534 | \$37 | \$26 |

| | | |
|---------------------------|---------|---------|
| Validation: Present Value | \$1,001 | \$1,001 |
|---------------------------|---------|---------|

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 | | (\$) | (\$) | | (\$) | (\$) |
| 2016 | \$2.70 | 1.00 | 1.00 | \$0.0019 | \$0.0024 | 1,452 | \$2.70 | \$3.52 | 1.000 | \$2.70 | \$3.52 |
| 2017 | \$2.78 | 0.999 | 0.995 | \$0.0019 | \$0.0024 | 1,444 | \$2.77 | \$3.50 | 0.940 | \$2.60 | \$3.29 |
| 2018 | \$2.85 | 0.998 | 0.990 | \$0.0020 | \$0.0024 | 1,437 | \$2.83 | \$3.48 | 0.883 | \$2.50 | \$3.07 |
| 2019 | \$2.93 | 0.997 | 0.985 | \$0.0020 | \$0.0024 | 1,430 | \$2.90 | \$3.46 | 0.830 | \$2.41 | \$2.87 |
| 2020 | \$3.02 | 0.996 | 0.980 | \$0.0021 | \$0.0024 | 1,423 | \$2.97 | \$3.45 | 0.780 | \$2.32 | \$2.69 |
| 2021 | \$3.10 | 0.995 | 0.975 | \$0.0022 | \$0.0024 | 1,416 | \$3.04 | \$3.43 | 0.733 | \$2.23 | \$2.51 |
| 2022 | \$3.10 | 0.994 | 0.970 | \$0.0022 | \$0.0024 | 1,409 | \$3.03 | \$3.41 | 0.688 | \$2.09 | \$2.35 |
| 2023 | \$3.10 | 0.993 | 0.966 | \$0.0022 | \$0.0024 | 1,402 | \$3.02 | \$3.39 | 0.688 | \$2.08 | \$2.34 |
| 2024 | \$3.37 | 0.992 | 0.961 | \$0.0024 | \$0.0024 | 1,395 | \$3.27 | \$3.38 | 0.688 | \$2.25 | \$2.33 |
| 2025 | \$3.47 | 0.991 | 0.956 | \$0.0025 | \$0.0024 | 1,388 | \$3.34 | \$3.36 | 0.571 | \$1.91 | \$1.92 |
| 2026 | \$3.57 | 0.990 | 0.951 | \$0.0026 | \$0.0024 | 1,381 | \$3.43 | \$3.34 | 0.537 | \$1.84 | \$1.79 |
| 2027 | \$3.67 | 0.989 | 0.946 | \$0.0026 | \$0.0024 | 1,374 | \$3.51 | \$3.33 | 0.504 | \$1.77 | \$1.68 |
| 2028 | \$3.77 | 0.988 | 0.942 | \$0.0027 | \$0.0024 | 1,367 | \$3.59 | \$3.31 | 0.474 | \$1.70 | \$1.57 |
| 2029 | \$3.88 | 0.987 | 0.937 | \$0.0028 | \$0.0024 | 1,360 | \$3.68 | \$3.29 | 0.445 | \$1.64 | \$1.47 |
| 2030 | \$3.99 | 0.986 | 0.932 | \$0.0029 | \$0.0024 | 1,353 | \$3.77 | \$3.28 | 0.418 | \$1.58 | \$1.37 |
| 2031 | \$3.99 | 0.985 | 0.928 | \$0.0029 | \$0.0024 | 1,347 | \$3.75 | \$3.26 | 0.393 | \$1.48 | \$1.28 |
| 2032 | \$4.21 | 0.984 | 0.923 | \$0.0031 | \$0.0024 | 1,340 | \$3.95 | \$3.24 | 0.393 | \$1.55 | \$1.28 |
| 2033 | \$4.33 | 0.983 | 0.918 | \$0.0032 | \$0.0024 | 1,333 | \$4.05 | \$3.23 | 0.347 | \$1.40 | \$1.12 |
| 2034 | \$4.45 | 0.982 | 0.914 | \$0.0033 | \$0.0024 | 1,326 | \$4.14 | \$3.21 | 0.326 | \$1.35 | \$1.05 |
| 2035 | \$4.58 | 0.981 | 0.909 | \$0.0034 | \$0.0024 | 1,320 | \$4.24 | \$3.20 | 0.307 | \$1.30 | \$0.98 |
| 2036 | \$4.71 | 0.980 | 0.905 | \$0.0035 | \$0.0024 | 1,313 | \$4.35 | \$3.18 | 0.288 | \$1.25 | \$0.92 |
| 2037 | \$4.84 | 0.979 | 0.900 | \$0.0036 | \$0.0024 | 1,307 | \$4.45 | \$3.16 | 0.271 | \$1.20 | \$0.86 |
| 2038 | \$4.98 | 0.978 | 0.896 | \$0.0037 | \$0.0024 | 1,300 | \$4.56 | \$3.15 | 0.254 | \$1.16 | \$0.80 |
| 2039 | \$5.12 | 0.977 | 0.891 | \$0.0039 | \$0.0024 | 1,294 | \$4.67 | \$3.13 | 0.239 | \$1.12 | \$0.75 |
| 2040 | \$5.26 | 0.976 | 0.887 | \$0.0040 | \$0.0024 | 1,287 | \$4.78 | \$3.12 | 0.225 | \$1.07 | \$0.70 |

| | | |
|---------------------------|------|------|
| Validation: Present Value | \$44 | \$44 |
|---------------------------|------|------|

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 | | (\$) | (\$) | | (\$) | (\$) |
| 2016 | \$0.002 | \$0.0030 | 1,452 | \$3 | \$4 | 1.000 | \$3 | \$4 |
| 2017 | \$0.002 | \$0.0030 | 1,444 | \$3 | \$4 | 0.940 | \$3 | \$4 |
| 2018 | \$0.002 | \$0.0030 | 1,437 | \$4 | \$4 | 0.883 | \$3 | \$4 |
| 2019 | \$0.003 | \$0.0030 | 1,430 | \$4 | \$4 | 0.830 | \$3 | \$4 |
| 2020 | \$0.003 | \$0.0030 | 1,423 | \$4 | \$4 | 0.780 | \$3 | \$3 |
| 2021 | \$0.003 | \$0.0030 | 1,416 | \$4 | \$4 | 0.733 | \$3 | \$3 |
| 2022 | \$0.003 | \$0.0030 | 1,409 | \$4 | \$4 | 0.688 | \$3 | \$3 |
| 2023 | \$0.003 | \$0.0030 | 1,402 | \$4 | \$4 | 0.647 | \$3 | \$3 |
| 2024 | \$0.003 | \$0.0030 | 1,395 | \$4 | \$4 | 0.608 | \$2 | \$3 |
| 2025 | \$0.003 | \$0.0030 | 1,388 | \$4 | \$4 | 0.571 | \$2 | \$2 |
| 2026 | \$0.003 | \$0.0030 | 1,381 | \$4 | \$4 | 0.537 | \$2 | \$2 |
| 2027 | \$0.003 | \$0.0030 | 1,374 | \$4 | \$4 | 0.504 | \$2 | \$2 |
| 2028 | \$0.003 | \$0.0030 | 1,367 | \$4 | \$4 | 0.474 | \$2 | \$2 |
| 2029 | \$0.003 | \$0.0030 | 1,360 | \$5 | \$4 | 0.445 | \$2 | \$2 |
| 2030 | \$0.003 | \$0.0030 | 1,353 | \$5 | \$4 | 0.418 | \$2 | \$2 |
| 2031 | \$0.004 | \$0.0030 | 1,347 | \$5 | \$4 | 0.393 | \$2 | \$2 |
| 2032 | \$0.004 | \$0.0030 | 1,340 | \$5 | \$4 | 0.370 | \$2 | \$1 |
| 2033 | \$0.004 | \$0.0030 | 1,333 | \$5 | \$4 | 0.347 | \$2 | \$1 |
| 2034 | \$0.004 | \$0.0030 | 1,326 | \$5 | \$4 | 0.326 | \$2 | \$1 |
| 2035 | \$0.004 | \$0.0030 | 1,320 | \$5 | \$4 | 0.307 | \$2 | \$1 |
| 2036 | \$0.004 | \$0.0030 | 1,313 | \$5 | \$4 | 0.288 | \$2 | \$1 |
| 2037 | \$0.004 | \$0.0030 | 1,307 | \$5 | \$4 | 0.271 | \$1 | \$1 |
| 2038 | \$0.004 | \$0.0030 | 1,300 | \$6 | \$4 | 0.254 | \$1 | \$1 |
| 2039 | \$0.004 | \$0.0030 | 1,294 | \$6 | \$4 | 0.239 | \$1 | \$1 |
| 2040 | \$0.005 | \$0.0030 | 1,287 | \$6 | \$4 | 0.225 | \$1 | \$1 |

| | | |
|----------------------------------|-------------|-------------|
| Validation: Present Value | \$55 | \$55 |
|----------------------------------|-------------|-------------|

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) | (\$) | (\$) | | (\$) | (\$) |
| 2016 | \$52 | 1.00 | 1.00 | \$0.036 | \$0.0360 | 1,452 | \$52 | \$52 | 1.000 | \$52 | \$52 |
| 2017 | \$52 | 0.999 | 0.995 | \$0.036 | \$0.0360 | 1,444 | \$52 | \$52 | 0.940 | \$49 | \$49 |
| 2018 | \$52 | 0.998 | 0.990 | \$0.036 | \$0.0360 | 1,437 | \$51 | \$52 | 0.883 | \$45 | \$46 |
| 2019 | \$52 | 0.997 | 0.985 | \$0.036 | \$0.0360 | 1,430 | \$51 | \$52 | 0.830 | \$43 | \$43 |
| 2020 | \$52 | 0.996 | 0.980 | \$0.036 | \$0.0360 | 1,423 | \$51 | \$51 | 0.780 | \$40 | \$40 |
| 2021 | \$52 | 0.995 | 0.975 | \$0.036 | \$0.0360 | 1,416 | \$51 | \$51 | 0.733 | \$37 | \$37 |
| 2022 | \$52 | 0.994 | 0.970 | \$0.036 | \$0.0360 | 1,409 | \$51 | \$51 | 0.688 | \$35 | \$35 |
| 2023 | \$52 | 0.993 | 0.966 | \$0.036 | \$0.0360 | 1,402 | \$50 | \$51 | 0.647 | \$33 | \$33 |
| 2024 | \$52 | 0.992 | 0.961 | \$0.036 | \$0.0360 | 1,395 | \$50 | \$50 | 0.608 | \$31 | \$31 |
| 2025 | \$52 | 0.991 | 0.956 | \$0.036 | \$0.0360 | 1,388 | \$50 | \$50 | 0.571 | \$29 | \$29 |
| 2026 | \$52 | 0.990 | 0.951 | \$0.036 | \$0.0360 | 1,381 | \$50 | \$50 | 0.537 | \$27 | \$27 |
| 2027 | \$52 | 0.989 | 0.946 | \$0.036 | \$0.0360 | 1,374 | \$50 | \$50 | 0.504 | \$25 | \$25 |
| 2028 | \$52 | 0.988 | 0.942 | \$0.036 | \$0.0360 | 1,367 | \$49 | \$49 | 0.474 | \$23 | \$23 |
| 2029 | \$52 | 0.987 | 0.937 | \$0.036 | \$0.0360 | 1,360 | \$49 | \$49 | 0.445 | \$22 | \$22 |
| 2030 | \$52 | 0.986 | 0.932 | \$0.036 | \$0.0360 | 1,353 | \$49 | \$49 | 0.418 | \$21 | \$20 |
| 2031 | \$52 | 0.985 | 0.928 | \$0.036 | \$0.0360 | 1,347 | \$49 | \$49 | 0.393 | \$19 | \$19 |
| 2032 | \$52 | 0.984 | 0.923 | \$0.036 | \$0.0360 | 1,340 | \$49 | \$48 | 0.370 | \$18 | \$18 |
| 2033 | \$52 | 0.983 | 0.918 | \$0.036 | \$0.0360 | 1,333 | \$48 | \$48 | 0.347 | \$17 | \$17 |
| 2034 | \$52 | 0.982 | 0.914 | \$0.036 | \$0.0360 | 1,326 | \$48 | \$48 | 0.326 | \$16 | \$16 |
| 2035 | \$52 | 0.981 | 0.909 | \$0.036 | \$0.0360 | 1,320 | \$48 | \$48 | 0.307 | \$15 | \$15 |
| 2036 | \$52 | 0.980 | 0.905 | \$0.036 | \$0.0360 | 1,313 | \$48 | \$47 | 0.288 | \$14 | \$14 |
| 2037 | \$52 | 0.979 | 0.900 | \$0.036 | \$0.0360 | 1,307 | \$48 | \$47 | 0.271 | \$13 | \$13 |
| 2038 | \$52 | 0.978 | 0.896 | \$0.037 | \$0.0360 | 1,300 | \$47 | \$47 | 0.254 | \$12 | \$12 |
| 2039 | \$52 | 0.977 | 0.891 | \$0.037 | \$0.0360 | 1,294 | \$47 | \$47 | 0.239 | \$11 | \$11 |
| 2040 | \$52 | 0.976 | 0.887 | \$0.037 | \$0.0360 | 1,287 | \$47 | \$46 | 0.225 | \$11 | \$10 |
| | | | | | \$0.0360 | | | | | | |
| Validation: Present Value | | | | | | | | | | \$655 | \$655 |

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) | (\$) | (\$) | | (\$) | (\$) |
| 2016 | \$52 | 7.6% | 1.00 | 1.00 | \$0.003 | \$0.0027 | 1,452 | \$4 | \$4 | 1.000 | \$4 | \$4 |
| 2017 | \$52 | 7.6% | 0.999 | 0.995 | \$0.003 | \$0.0027 | 1,444 | \$4 | \$4 | 0.940 | \$4 | \$4 |
| 2018 | \$52 | 7.6% | 0.998 | 0.990 | \$0.003 | \$0.0027 | 1,437 | \$4 | \$4 | 0.883 | \$3 | \$3 |
| 2019 | \$52 | 7.6% | 0.997 | 0.985 | \$0.003 | \$0.0027 | 1,430 | \$4 | \$4 | 0.830 | \$3 | \$3 |
| 2020 | \$52 | 7.6% | 0.996 | 0.980 | \$0.003 | \$0.0027 | 1,423 | \$4 | \$4 | 0.780 | \$3 | \$3 |
| 2021 | \$52 | 7.6% | 0.995 | 0.975 | \$0.003 | \$0.0027 | 1,416 | \$4 | \$4 | 0.733 | \$3 | \$3 |
| 2022 | \$52 | 7.6% | 0.994 | 0.970 | \$0.003 | \$0.0027 | 1,409 | \$4 | \$4 | 0.688 | \$3 | \$3 |
| 2023 | \$52 | 7.6% | 0.993 | 0.966 | \$0.003 | \$0.0027 | 1,402 | \$4 | \$4 | 0.647 | \$2 | \$2 |
| 2024 | \$52 | 7.6% | 0.992 | 0.961 | \$0.003 | \$0.0027 | 1,395 | \$4 | \$4 | 0.608 | \$2 | \$2 |
| 2025 | \$52 | 7.6% | 0.991 | 0.956 | \$0.003 | \$0.0027 | 1,388 | \$4 | \$4 | 0.571 | \$2 | \$2 |
| 2026 | \$52 | 7.6% | 0.990 | 0.951 | \$0.003 | \$0.0027 | 1,381 | \$4 | \$4 | 0.537 | \$2 | \$2 |
| 2027 | \$52 | 7.6% | 0.989 | 0.946 | \$0.003 | \$0.0027 | 1,374 | \$4 | \$4 | 0.504 | \$2 | \$2 |
| 2028 | \$52 | 7.6% | 0.988 | 0.942 | \$0.003 | \$0.0027 | 1,367 | \$4 | \$4 | 0.474 | \$2 | \$2 |
| 2029 | \$52 | 7.6% | 0.987 | 0.937 | \$0.003 | \$0.0027 | 1,360 | \$4 | \$4 | 0.445 | \$2 | \$2 |
| 2030 | \$52 | 7.6% | 0.986 | 0.932 | \$0.003 | \$0.0027 | 1,353 | \$4 | \$4 | 0.418 | \$2 | \$2 |
| 2031 | \$52 | 7.6% | 0.985 | 0.928 | \$0.003 | \$0.0027 | 1,347 | \$4 | \$4 | 0.393 | \$1 | \$1 |
| 2032 | \$52 | 7.6% | 0.984 | 0.923 | \$0.003 | \$0.0027 | 1,340 | \$4 | \$4 | 0.370 | \$1 | \$1 |
| 2033 | \$52 | 7.6% | 0.983 | 0.918 | \$0.003 | \$0.0027 | 1,333 | \$4 | \$4 | 0.347 | \$1 | \$1 |
| 2034 | \$52 | 7.6% | 0.982 | 0.914 | \$0.003 | \$0.0027 | 1,326 | \$4 | \$4 | 0.326 | \$1 | \$1 |
| 2035 | \$52 | 7.6% | 0.981 | 0.909 | \$0.003 | \$0.0027 | 1,320 | \$4 | \$4 | 0.307 | \$1 | \$1 |
| 2036 | \$52 | 7.6% | 0.980 | 0.905 | \$0.003 | \$0.0027 | 1,313 | \$4 | \$4 | 0.288 | \$1 | \$1 |
| 2037 | \$52 | 7.6% | 0.979 | 0.900 | \$0.003 | \$0.0027 | 1,307 | \$4 | \$4 | 0.271 | \$1 | \$1 |
| 2038 | \$52 | 7.6% | 0.978 | 0.896 | \$0.003 | \$0.0027 | 1,300 | \$4 | \$4 | 0.254 | \$1 | \$1 |
| 2039 | \$52 | 7.6% | 0.977 | 0.891 | \$0.003 | \$0.0027 | 1,294 | \$4 | \$4 | 0.239 | \$1 | \$1 |
| 2040 | \$52 | 7.6% | 0.976 | 0.887 | \$0.003 | \$0.0027 | 1,287 | \$4 | \$4 | 0.225 | \$1 | \$1 |
| | | | | | | \$0.0027 | | | | | | |

| | | |
|----------------------------------|------|------|
| Validation: Present Value | \$50 | \$50 |
|----------------------------------|------|------|

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 | | (\$) | (\$) | | (\$) | (\$) |
| 2016 | \$48 | 1.00 | 1.00 | \$0.033 | \$0.0332 | 1,452 | \$48 | \$48 | 1.000 | \$48 | \$48 |
| 2017 | \$48 | 0.999 | 0.995 | \$0.033 | \$0.0332 | 1,444 | \$48 | \$48 | 0.940 | \$45 | \$45 |
| 2018 | \$48 | 0.998 | 0.990 | \$0.033 | \$0.0332 | 1,437 | \$47 | \$48 | 0.883 | \$42 | \$42 |
| 2019 | \$48 | 0.997 | 0.985 | \$0.033 | \$0.0332 | 1,430 | \$47 | \$47 | 0.830 | \$39 | \$39 |
| 2020 | \$48 | 0.996 | 0.980 | \$0.033 | \$0.0332 | 1,423 | \$47 | \$47 | 0.780 | \$37 | \$37 |
| 2021 | \$48 | 0.995 | 0.975 | \$0.033 | \$0.0332 | 1,416 | \$47 | \$47 | 0.733 | \$34 | \$34 |
| 2022 | \$48 | 0.994 | 0.970 | \$0.033 | \$0.0332 | 1,409 | \$47 | \$47 | 0.688 | \$32 | \$32 |
| 2023 | \$48 | 0.993 | 0.966 | \$0.033 | \$0.0332 | 1,402 | \$46 | \$46 | 0.647 | \$30 | \$30 |
| 2024 | \$48 | 0.992 | 0.961 | \$0.033 | \$0.0332 | 1,395 | \$46 | \$46 | 0.608 | \$28 | \$28 |
| 2025 | \$48 | 0.991 | 0.956 | \$0.033 | \$0.0332 | 1,388 | \$46 | \$46 | 0.571 | \$26 | \$26 |
| 2026 | \$48 | 0.990 | 0.951 | \$0.033 | \$0.0332 | 1,381 | \$46 | \$46 | 0.537 | \$25 | \$25 |
| 2027 | \$48 | 0.989 | 0.946 | \$0.033 | \$0.0332 | 1,374 | \$46 | \$46 | 0.504 | \$23 | \$23 |
| 2028 | \$48 | 0.988 | 0.942 | \$0.033 | \$0.0332 | 1,367 | \$45 | \$45 | 0.474 | \$22 | \$21 |
| 2029 | \$48 | 0.987 | 0.937 | \$0.033 | \$0.0332 | 1,360 | \$45 | \$45 | 0.445 | \$20 | \$20 |
| 2030 | \$48 | 0.986 | 0.932 | \$0.033 | \$0.0332 | 1,353 | \$45 | \$45 | 0.418 | \$19 | \$19 |
| 2031 | \$48 | 0.985 | 0.928 | \$0.033 | \$0.0332 | 1,347 | \$45 | \$45 | 0.393 | \$18 | \$18 |
| 2032 | \$48 | 0.984 | 0.923 | \$0.033 | \$0.0332 | 1,340 | \$45 | \$44 | 0.370 | \$17 | \$16 |
| 2033 | \$48 | 0.983 | 0.918 | \$0.033 | \$0.0332 | 1,333 | \$45 | \$44 | 0.347 | \$15 | \$15 |
| 2034 | \$48 | 0.982 | 0.914 | \$0.033 | \$0.0332 | 1,326 | \$44 | \$44 | 0.326 | \$14 | \$14 |
| 2035 | \$48 | 0.981 | 0.909 | \$0.034 | \$0.0332 | 1,320 | \$44 | \$44 | 0.307 | \$14 | \$13 |
| 2036 | \$48 | 0.980 | 0.905 | \$0.034 | \$0.0332 | 1,313 | \$44 | \$44 | 0.288 | \$13 | \$13 |
| 2037 | \$48 | 0.979 | 0.900 | \$0.034 | \$0.0332 | 1,307 | \$44 | \$43 | 0.271 | \$12 | \$12 |
| 2038 | \$48 | 0.978 | 0.896 | \$0.034 | \$0.0332 | 1,300 | \$44 | \$43 | 0.254 | \$11 | \$11 |
| 2039 | \$48 | 0.977 | 0.891 | \$0.034 | \$0.0332 | 1,294 | \$44 | \$43 | 0.239 | \$10 | \$10 |
| 2040 | \$48 | 0.976 | 0.887 | \$0.034 | \$0.0332 | 1,287 | \$43 | \$43 | 0.225 | \$10 | \$10 |
| | | | | | \$0.0332 | | | | | | |
| Validation: Present Value | | | | | | | | | | \$603 | \$603 |

Table 14. Determination of deferrable distribution costs.

| Year | Distribution Project Costs | % Capacity Related | Capacity Related | | |
|-----------------------------|-------------------------------|-----------------------|---------------------|--|--|
| | \$ | % | \$ | | |
| 2015 | 165,627,655 | 12.9% | 21,289,615 | | |
| 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 | | |
| TOTAL 10-YEAR PERIOD | 1,351,609,965 | | 246,200,207 | | |

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 |
| 2016 | \$0 | 23 | \$0 | \$0 | \$0 | | | | \$0 |
| 2017 | \$0 | 23 | \$0 | \$0 | \$0 | 23 | \$0.0 | \$0.0 | \$0 |
| 2018 | \$0 | 23 | \$0 | \$0 | \$0 | 23 | \$0.0 | \$0.0 | \$0 |
| 2019 | \$0 | 23 | \$0 | \$0 | \$0 | 23 | \$0.0 | \$0.0 | \$0 |
| 2020 | \$0 | 23 | \$0 | \$0 | \$0 | 23 | \$0.0 | \$0.0 | \$0 |
| 2021 | \$0 | 23 | \$0 | \$0 | \$0 | 23 | \$0.0 | \$0.0 | \$0 |
| 2022 | \$0 | 24 | \$0 | \$0 | \$0 | 23 | \$0.0 | \$0.0 | \$0 |
| 2023 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2024 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2025 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2026 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2027 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2028 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2029 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2030 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2031 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2032 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2033 | \$0 | 24 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2034 | \$0 | 25 | \$0 | \$0 | \$0 | 24 | \$0.0 | \$0.0 | \$0 |
| 2035 | \$0 | 25 | \$0 | \$0 | \$0 | 25 | \$0.0 | \$0.0 | \$0 |
| 2036 | \$0 | 25 | \$0 | \$0 | \$0 | 25 | \$0.0 | \$0.0 | \$0 |
| 2037 | \$0 | 25 | \$0 | \$0 | \$0 | 25 | \$0.0 | \$0.0 | \$0 |
| 2038 | \$0 | 25 | \$0 | \$0 | \$0 | 25 | \$0.0 | \$0.0 | \$0 |
| 2039 | \$0 | 25 | \$0 | \$0 | \$0 | 25 | \$0.0 | \$0.0 | \$0 |
| 2040 | \$0 | 25 | \$0 | \$0 | \$0 | 25 | \$0.0 | \$0.0 | \$0 |
| 2039 | \$0 | | | | | 25 | \$0.0 | \$0.0 | |
| | | | | \$0 | | | | \$0 | |

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 (\$) |
| - | - | 1,452 | \$0 | \$0 | 1.000 | \$0 | \$0 |
| - | - | 1,444 | \$0 | \$0 | 0.940 | \$0 | \$0 |
| - | - | 1,437 | \$0 | \$0 | 0.883 | \$0 | \$0 |
| - | - | 1,430 | \$0 | \$0 | 0.830 | \$0 | \$0 |
| - | - | 1,423 | \$0 | \$0 | 0.780 | \$0 | \$0 |
| - | - | 1,416 | \$0 | \$0 | 0.733 | \$0 | \$0 |
| - | - | 1,409 | \$0 | \$0 | 0.688 | \$0 | \$0 |
| - | - | 1,402 | \$0 | \$0 | 0.647 | \$0 | \$0 |
| - | - | 1,395 | \$0 | \$0 | 0.608 | \$0 | \$0 |
| - | - | 1,388 | \$0 | \$0 | 0.571 | \$0 | \$0 |
| - | - | 1,381 | \$0 | \$0 | 0.537 | \$0 | \$0 |
| - | - | 1,374 | \$0 | \$0 | 0.504 | \$0 | \$0 |
| - | - | 1,367 | \$0 | \$0 | 0.474 | \$0 | \$0 |
| - | - | 1,360 | \$0 | \$0 | 0.445 | \$0 | \$0 |
| - | - | 1,353 | \$0 | \$0 | 0.418 | \$0 | \$0 |
| - | - | 1,347 | \$0 | \$0 | 0.393 | \$0 | \$0 |
| - | - | 1,340 | \$0 | \$0 | 0.370 | \$0 | \$0 |
| - | - | 1,333 | \$0 | \$0 | 0.347 | \$0 | \$0 |
| - | - | 1,326 | \$0 | \$0 | 0.326 | \$0 | \$0 |
| - | - | 1,320 | \$0 | \$0 | 0.307 | \$0 | \$0 |
| - | - | 1,313 | \$0 | \$0 | 0.288 | \$0 | \$0 |
| - | - | 1,307 | \$0 | \$0 | 0.271 | \$0 | \$0 |
| - | - | 1,300 | \$0 | \$0 | 0.254 | \$0 | \$0 |
| - | - | 1,294 | \$0 | \$0 | 0.239 | \$0 | \$0 |
| - | - | 1,287 | \$0 | \$0 | 0.225 | \$0 | \$0 |
| - | - | | | | - | | |
| | | Validation: Present Value | | | | \$0 | \$0 |

Table 17. Economic value of avoided environmental costs

Environmental Discount Rate 5.48%

| 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 (\$) |
| 2016 | \$2.45 | 9,158 | \$0.022 | \$0.0359 | 1,452 | \$33 | \$52 | 1.000 | \$33 | \$52 |
| 2017 | \$2.59 | 9,167 | \$0.024 | \$0.0359 | 1,444 | \$34 | \$52 | 0.948 | \$32 | \$49 |
| 2018 | \$2.73 | 9,176 | \$0.025 | \$0.0359 | 1,437 | \$36 | \$52 | 0.899 | \$32 | \$46 |
| 2019 | \$2.88 | 9,186 | \$0.026 | \$0.0359 | 1,430 | \$38 | \$51 | 0.852 | \$32 | \$44 |
| 2020 | \$3.03 | 9,195 | \$0.028 | \$0.0359 | 1,423 | \$40 | \$51 | 0.808 | \$32 | \$41 |
| 2021 | \$3.16 | 9,204 | \$0.029 | \$0.0359 | 1,416 | \$41 | \$51 | 0.766 | \$32 | \$39 |
| 2022 | \$3.30 | 9,213 | \$0.030 | \$0.0359 | 1,409 | \$43 | \$51 | 0.726 | \$31 | \$37 |
| 2023 | \$3.44 | 9,222 | \$0.032 | \$0.0359 | 1,402 | \$44 | \$50 | 0.688 | \$31 | \$35 |
| 2024 | \$3.58 | 9,232 | \$0.033 | \$0.0359 | 1,395 | \$46 | \$50 | 0.652 | \$30 | \$33 |
| 2025 | \$3.73 | 9,241 | \$0.034 | \$0.0359 | 1,388 | \$48 | \$50 | 0.619 | \$30 | \$31 |
| 2026 | \$3.89 | 9,250 | \$0.036 | \$0.0359 | 1,381 | \$50 | \$50 | 0.586 | \$29 | \$29 |
| 2027 | \$4.05 | 9,259 | \$0.037 | \$0.0359 | 1,374 | \$51 | \$49 | 0.556 | \$29 | \$27 |
| 2028 | \$4.21 | 9,269 | \$0.039 | \$0.0359 | 1,367 | \$53 | \$49 | 0.527 | \$28 | \$26 |
| 2029 | \$4.38 | 9,278 | \$0.041 | \$0.0359 | 1,360 | \$55 | \$49 | 0.500 | \$28 | \$24 |
| 2030 | \$4.56 | 9,287 | \$0.042 | \$0.0359 | 1,353 | \$57 | \$49 | 0.474 | \$27 | \$23 |
| 2031 | \$4.76 | 9,296 | \$0.044 | \$0.0359 | 1,347 | \$60 | \$48 | 0.449 | \$27 | \$22 |
| 2032 | \$4.97 | 9,306 | \$0.046 | \$0.0359 | 1,340 | \$62 | \$48 | 0.426 | \$26 | \$20 |
| 2033 | \$5.18 | 9,315 | \$0.048 | \$0.0359 | 1,333 | \$64 | \$48 | 0.404 | \$26 | \$19 |
| 2034 | \$5.41 | 9,324 | \$0.050 | \$0.0359 | 1,326 | \$67 | \$48 | 0.383 | \$26 | \$18 |
| 2035 | \$5.64 | 9,334 | \$0.053 | \$0.0359 | 1,320 | \$69 | \$47 | 0.363 | \$25 | \$17 |
| 2036 | \$5.87 | 9,343 | \$0.055 | \$0.0359 | 1,313 | \$72 | \$47 | 0.344 | \$25 | \$16 |
| 2037 | \$6.12 | 9,352 | \$0.057 | \$0.0359 | 1,307 | \$75 | \$47 | 0.326 | \$24 | \$15 |
| 2038 | \$6.38 | 9,362 | \$0.060 | \$0.0359 | 1,300 | \$78 | \$47 | 0.309 | \$24 | \$14 |
| 2039 | \$6.64 | 9,371 | \$0.062 | \$0.0359 | 1,294 | \$80 | \$46 | 0.293 | \$24 | \$14 |
| 2040 | \$6.91 | 9,380 | \$0.065 | \$0.0359 | 1,287 | \$83 | \$46 | 0.278 | \$23 | \$13 |

| | | |
|----------------------------------|--------------|--------------|
| Validation: Present Value | \$705 | \$705 |
|----------------------------------|--------------|--------------|

Table 18. Calculation of inflation-adjusted VOS

| Year | Discount Factor | PV Production | Escalation Factor | VOS Levelized | Disc. | VOS Inflation Adj. (\$/kWh) | Disc |
|------|-----------------|---------------|-------------------|---------------|---------|-----------------------------|---------|
| 2016 | 1.000 | 1452 | 1.000 | \$0.124 | \$180 | \$0.0995 | 144.431 |
| 2017 | 0.940 | 1444 | 1.024 | \$0.124 | \$168 | <i>\$0.1019</i> | 138.294 |
| 2018 | 0.883 | 1437 | 1.049 | \$0.124 | \$157 | <i>\$0.1043</i> | 132.418 |
| 2019 | 0.830 | 1430 | 1.074 | \$0.124 | \$147 | <i>\$0.1069</i> | 126.791 |
| 2020 | 0.780 | 1423 | 1.100 | \$0.124 | \$137 | <i>\$0.1094</i> | 121.403 |
| 2021 | 0.733 | 1416 | 1.126 | \$0.124 | \$129 | <i>\$0.1121</i> | 116.245 |
| 2022 | 0.688 | 1409 | 1.154 | \$0.124 | \$120 | <i>\$0.1148</i> | 111.305 |
| 2023 | 0.688 | 1402 | 1.181 | \$0.124 | \$120 | <i>\$0.1175</i> | 113.418 |
| 2024 | 0.688 | 1395 | 1.210 | \$0.124 | \$119 | <i>\$0.1204</i> | 115.570 |
| 2025 | 0.571 | 1388 | 1.239 | \$0.124 | \$98 | <i>\$0.1233</i> | 97.711 |
| 2026 | 0.537 | 1381 | 1.269 | \$0.124 | \$92 | <i>\$0.1262</i> | 93.559 |
| 2027 | 0.504 | 1374 | 1.299 | \$0.124 | \$86 | <i>\$0.1293</i> | 89.583 |
| 2028 | 0.474 | 1367 | 1.331 | \$0.124 | \$80 | <i>\$0.1324</i> | 85.776 |
| 2029 | 0.445 | 1360 | 1.363 | \$0.124 | \$75 | <i>\$0.1356</i> | 82.132 |
| 2030 | 0.418 | 1353 | 1.396 | \$0.124 | \$70 | <i>\$0.1389</i> | 78.642 |
| 2031 | 0.393 | 1347 | 1.429 | \$0.124 | \$66 | <i>\$0.1422</i> | 75.300 |
| 2032 | 0.393 | 1340 | 1.464 | \$0.124 | \$65 | <i>\$0.1456</i> | 76.729 |
| 2033 | 0.347 | 1333 | 1.499 | \$0.124 | \$57 | <i>\$0.1491</i> | 69.037 |
| 2034 | 0.326 | 1326 | 1.535 | \$0.124 | \$54 | <i>\$0.1527</i> | 66.103 |
| 2035 | 0.307 | 1320 | 1.572 | \$0.124 | \$50 | <i>\$0.1564</i> | 63.294 |
| 2036 | 0.288 | 1313 | 1.610 | \$0.124 | \$47 | <i>\$0.1602</i> | 60.605 |
| 2037 | 0.271 | 1307 | 1.649 | \$0.124 | \$44 | <i>\$0.1641</i> | 58.029 |
| 2038 | 0.254 | 1300 | 1.689 | \$0.124 | \$41 | <i>\$0.1680</i> | 55.564 |
| 2039 | 0.239 | 1294 | 1.729 | \$0.124 | \$38 | <i>\$0.1721</i> | 53.203 |
| 2040 | 0.225 | 1287 | 1.771 | \$0.124 | \$36 | <i>\$0.1762</i> | 50.942 |
| | | | | | \$2,276 | | \$2,276 |

VOS values that are italicized and shaded in gray are estimates of potential out- year VOS values for this VOS vintage. The estimate is based on the current 25-year escalation rate. Actual out-year values will be dependent on actual year-over-year observed CPI rates. Please see page 6 ("Annual VOS Update") and page 45 ("VOS Example Calculation") of the VOS methodology.

CERTIFICATE OF SERVICE

I, SaGonna Thompson, 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 1st day of March 2016

/s/

SaGonna Thompson
Regulatory Administrator

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