UNIVERSITY OF MINNESOTA

Twin Cities Campus *Hubert H. Humphrey School of Public Affairs* *130 Hubert H. Humphrey Center*
301–19th Avenue South
Minneapolis, MN 55455

www.hhh.umn.edu

December 13th, 2018

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

RE: Reply Comments on Xcel Energy's 2019 VOS Calculation and Proposed 2019 Vintage Year Bill Credit Tariff Sheets (Docket No. M-13-867)

Dear Mr. Wolf,

Assistant Professor Gabriel Chan, Center for Science, Technology, and Environmental Policy and the Humphrey School of Public Affairs, University of Minnesota, hereby provides comments regarding PUC Docket No. M-13-867, which involve responses to comments previously submitted in regards to Xcel Energy's 2019 Value of Solar (VOS) calculation and proposed 2019 vintage year bill credit tariff sheets. These comments are in reference to the notice of extended reply comment period published on December 6, 2018. Matthew Grimley and Nick Stumo-Langer, Graduate Research Assistants of the Center for Science, Technology, and Environmental Policy, University of Minnesota, join as co-signers of these comments.

In providing reply comments to Xcel Energy's 2019 VOS calculation, we are responding in part to Question 1 of Information Request No. 46, requested by Susan Mackenzie (MN Public Utilities Commission) and responded to by Xcel Energy on November 5, 2018 during the initial comment period on the 2019 vintage Value of Solar. Our comments are written to help inform the discussion of the total program cost of Xcel Energy's community solar program. The Commission and program stakeholders have appealed to notions of total program cost and cross-subsidization (the incidence of costs and benefits to subscribers versus. non-subscribers) in the context of the VOS and its recently approved residential adder. We intend to provide additional analysis to inform these discussions.

In summary, we argue that the VOS provides an established procedure for considering the total cost of the community solar program that accounts for all forms of cross-subsidy. We conduct analysis based on the program's performance in July 2017 - June 2018 to establish the following cost impacts based on different interpretations of avoided costs, summarized in the table below:

Table 1. Summary of Total CSG Program Costs by "Cost Concepts"

CSG Cost Concept	Program Cost (cents/kWh of CSG generation) for July 2017 - June 2018
A. Total bill credits and unsubscribed energy payments, averaged (based on E999/AA-18-373, Section 9, Schedule 2, Line 6)	10.34
B. "Above market costs" - portion of A that represents increases to the ordinary fuel clause (based on E999/AA-18-373, Section 9, Schedule 2, Line 5)	7.84
Cost Concept	**Program Cost (cents/kWh), Accounting for Avoided Costs in Value of Solar**
C. Above Short-Term Market Cost - based on avoided marginal costs in VOS - comparable to C (calculation based on 2018 VOS for 2018 bill credits)	7.73
D. Above Long-Term Market Cost - based on all future avoided costs in Xcel system (calculation based on 2018 VOS for 2018 bill credits)	3.40
E. Cost Above Total Value of Program - inclusive of all avoided societal costs in VOS (calculation based on 2018 VOS for 2018 bill credits)	0.58

1. Background: Short- and Long-Term Avoided Costs within the Established Value of Solar Methodology

The background goals for the VOS methodology are important to recognize. In a 2014 filling in Docket No. E999/M-14-65, Xcel Energy detailed that a proper valuation "will level the playing field for distributed solar, such that the utility and customers are indifferent from a cost perspective as to whether their energy comes from distributed solar or from the broader energy mix."[1] Commenters agreed with this formulation from Xcel that a properly designed rate will yield fair returns for solar and non-solar customers.

1 https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B5D1AFDC4-B46B-4A5D-841F-852F33F87F38%7D&documentTitle=20142-96427-01

Referring to Xcel Energy's comments, we see that the ideal situation for solar valuation is "when the amount customers are paying for distributed solar equals the costs that are avoided."[2] This notion is also reflected in Bonbright's Ratemaking Criteria (1988)[3]:

> *A public utility rate should be a "reflection of all the present and future private and social costs and benefits occasioned by a service's provision (i.e., all internalities and externalities.)*

These reply comments seek to live in the spirit of that approach. Determining the cost of the CSG program is a complex process because full cost accounting requires tabulation of all avoided costs. Long- and short-term avoided costs are often broken down simultaneously and are not easily identifiable. Total cost does not always equal ratepayer impact, as long-term avoided costs such as avoided costs from not building a new power plant or avoiding a case of asthma are never truly realized. However, this calculation is exactly the process established by the Value of Solar methodology.

As background, we summarize the request posed to Xcel Energy in IR No. 46 which reflects this tension:

> *Please indicate whether there were avoided costs associated with the CSG energy and capacity during the 2017/2018 AAA reporting period, or costs associated with this energy and capacity anticipated to be avoided in future years (e.g. avoided fuel cost, avoided generation capacity costs, avoided transmission capacity costs, avoided environmental cost etc.).*

Xcel Energy responded with the following summary:

1. Avoided Natural Gas Cost
    a. "Energy produced by Community Solar Garden ("CSG") causes the Company to avoid fuel cost and/or purchase power costs at the time solar is produced...the avoided fuel cost was $10.9M[4]"
2. Avoided Generation Costs
    a. "...the Company is not aware of any realized avoided generation or avoided reserve capacity cost savings in the reporting period. The Company will begin avoiding generation and reserve capacity when the CSG facilities cause the Company to avoid adding future generation assets."
3. Avoided Transmission Costs

---

[2] Ibid.

[3] As adapted from: Morgan, P., and Crandall, K. (2017). New Uses for an Old Tool: Using Cost of Service Studies to Design Rates in Today's Electric Utility Service World. EQ Research, LLC. Retrieved from https://eq-research.com/eq-publications/new-uses-old-tool/

[4] We believe that this figure should actually be $10.6M, as reflected in Docket No. E999/AA-18-373, Part H, Section 9, Schedule 2, row 4.

    a. "The Company is unaware of any Transmission costs that have been avoided by CSGs in the reporting period… It is possible future transmission projects may be impacted by solar generated on the NSP distribution system."
4. Avoided Distribution Costs
    a. "The Company is not aware of deferred distribution costs during the reporting period. Solar production built downstream of capacity constraints may defer future distribution project costs."
5. Environmental Costs
    a. "To the extent solar energy displaces fossil fuel energy production, environmental emissions are avoided; however, the Company did not avoid any environmental costs in the reporting period."

The costs above are enumerated when they are short-term avoided costs to Xcel Energy, such as the Company's avoided natural gas cost, and described as "future" costs or costs not avoided by the Company when they are long-term avoided costs. The distinctions between short-term and long-term costs -- and between costs to the Company, costs to ratepayers, and costs to society -- are important: total long-term social cost has been appealed to in deliberations surrounding the CSG program since its inception and is the conceptual underpinning of the Value of Solar methodology.

Most recently, the difficulty in conceptualizing total program cost was evidenced by the issues company representatives had in calculating the relevant costs during the commission hearing on October 11th, 2018 regarding the residential adder.[5] Commission Chair and company representatives spent over ten minutes attempting to determine the cost of the program at the hearing. Commenters share with the company the intention that "the components of the VOS rate be clearly measurable, trackable, and defensible."[6] This clearly extends not only from the development of the methodology, but through the annual re-working of the formula.

2. Rate Impacts vs. Total Costs in the Short- and Long-Term

In sum, we believe it helpful to break apart assumptions of avoided cost principles to focus attention on the complexity of these calculations and the necessity of a transparent and accurate process for calculating these values:

As we say above, there is an important distinction between short-term avoided costs and long-term avoided costs. Xcel Energy recovers the total cost of the community solar program by increasing the total fuel clause in proportion to all bill credits (inclusive of REC payments, plus unsubscribed energy payments, less developer late fees). Xcel has established the impact of

[5] Details 2014-031 ** E002/M-13-867 Northern States Power Company d/b/a Xcel Energy In the Matter of the Petition of Northern States Power Company, d/b/a Xcel Energy, for Approval of Its Proposed Community Solar Garden Program. (Stream available: http://minnesotapuc.granicus.com/MediaPlayer.php?view_id=2&clip_id=776, 1:14:30 to 1:23:00.)

[6] https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7B5D1AFDC4-B46B-4A5D-841F-852F33F87F38%7D&documentTitle=20142-96427-01

the solar garden program on the fuel clause (with both decreases due to avoided fuel purchases and increases due to cost recovery). However, this is not equivalent to the total long-term rate impact of the program, as requested in Information Request 46. Instead, the total rate impact also includes avoided transmission, distribution, and generation capacity costs, which will only be reflected in other parts of rates. Again, the VOS establishes a procedure for estimating these long-term impacts.

The Value of Solar methodology provides an established procedure for evaluating the impact of the solar garden program. The approved methodology for calculating the VOS establishes procedures for estimating the total (short-term plus long-term) avoided costs of solar garden development. This should be the basis for evaluating the total impact of the program. The separate process that establishes Xcel Energy's cost recovery provides an inappropriate basis for evaluation, as it only quantifies a portion of the short-term avoided costs to ratepayers through the fuel-clause adjustment, not all avoided costs.

Basing the reimbursement for solar gardens on the VOS is based on social optimality (zero net cross-subsidization), but some cross-subsidies still occur. The VOS is intended to approximate the incentive for solar development that would yield zero net cross-subsidization across all members of society affected by solar garden development. Basing the tariff for solar gardens on a well-estimated value of solar thereby is socially optimal, but this does not imply no cross-subsidization in the short- or long-term. Some people who enjoy the benefits of solar development may be different than those who bear the costs, but incentives become aligned for optimal social good when those making decisions account for their impacts on other actors. There are two important dimensions over which socially-optimal cross-subsidies can still occur: across time (e.g. compensating solar for its impact on future deferred investment in generation, transmission, and distribution), and through non-market environmental vectors (e.g. compensating solar for its environmental benefits to those impacted by environmental externalities). Including the full social avoided costs in the short- and long-term ensure zero net cross-subsidies, thereby correcting the "market failure" created by unpriced costs and benefits in the energy system. Acknowledging only a subset of avoided costs perpetuates market failure.

There is an important distinction between ratepayer impacts and total avoided costs. The total rate impact of the program is distinct from the total external cost of the program. Total external costs also incorporates MISO-system benefits and environmental benefits of the program which do not impact rates. Again, the VOS provides the relevant methodology by including avoided costs to multiple different parties, as far away from the development of solar projects as individuals outside of Minnesota impacted by climate change and air pollution from generation displaced by solar gardens. For example, solar displaces generation with air-pollution that impacts some people living outside of Xcel Energy's service territory -- they receive benefits from the program without paying any cost. The inclusion of the full social avoided costs of solar development reflects the theoretically efficient and responsible incentive that incorporates all of the costs and benefits of the legacy energy system that solar development displaces.

3. Comparison of Xcel's Calculation of Rate Impacts vs. VOS-Based Accounting of Avoided Costs

Here we calculate the total avoided costs of Xcel's community solar garden program based on notions of avoided cost established by the Value of Solar methodology. We compare these avoided costs to the short-term avoided natural gas costs established by Xcel in their response to Information Request 46, based on data published in Docket E999/AA-18-373.

Our basis for calculating avoided costs is the approved 2018 Value of Solar. We use the 2018 reimbursement rate of 9.76 cents/kWh, which we disaggregate in proportion to each avoided cost element's share of the levelized VOS (to account for differences in discount rates). Alternative assumptions could be used and we would be happy to share a spreadsheet with our calculations upon request. These calculations should be interpreted as broad indications of avoided costs. As we argued in our initial comments[7]:

> *The VOS methodology is highly technocratic and relies on an extensive set of parameters, theoretical concepts, and assumptions. This complexity is derived from the nature of calculating avoided costs. Fundamentally, unlike other regulatory concepts, avoided cost concepts cannot be directly measured -- they are costs that were never incurred -- they are avoided! Avoided costs are a methodological construct that form the basis for negotiating fairness between system benefits and individual benefits.*

Figure 1 displays the calculation presented by Xcel Energy of the total cost of the program based on total bill credits[8] and above-market costs. We translated the figures Xcel presented into units of per-kWh of CSG generation. The figure shows that Xcel estimates that each kWh of CSG generation incurs **7.84 cents** of above-market costs borne by ratepayers. However, this calculation only includes avoided LMP electricity and does not include the full set of avoided costs that materialize over longer time scales and to non-ratepayers (as described in Section 2 above).

Figure 2 displays our own calculation of avoided costs based on the approved 2018 Value of Solar. Beginning with the same starting point for total bill credits, the VOS's avoided fuel costs and avoided variable O&M costs are **within 1.5%** of Xcel's avoided market costs: we calculate a 7.73 cents/kWh cost of the program above short-term market costs. However, incorporating the VOS's avoided costs for fixed O&M, avoided generation capacity (including reserve capacity), avoided transmission, and avoided distribution costs yields a total program cost above long-term market costs of 3.40 cents/kWh, a **57%** reduction from Xcel's estimate. Further incorporating

---

[7] https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={009A5A67-0000-CC15-BF69-3E12D10B78DD}&documentTitle=201811-148058-01

[8] "Total Bill Credits" are taken from Attachment A in Xcel Energy's Nov. 5, 2018 Responses to MPUC Information Request Nos. 46 & 47 in Docket No. E002/M-13-867. Total bill credits here, however, are not reflective of the amounts reported in the corresponding subscriber metrics of Xcel Energy's monthly compliance reports. For example, in Attachment B of the aforementioned filing, the average CSG bill credit rate is more nearly $1 million more (for July) or $800,000 less (for August) than the amount reported in the corresponding monthly subscription metrics in monthly compliance filings. The discordance may be due to the asynchronicity of a solar garden coming online in mid-month, delays in the fuel clause's true-up function, or perhaps other reasons that are not readily understandable. For clarity, we only use bill credit recovery amounts reported in Attachment A and would seek more clarity on these incongruences.

the non-market benefits of avoided environmental costs brings the cost of the program down to 0.58 cents/kWh, a **93%** reduction from Xcel's estimate.

Figure 1. Total cost (per kWh CSG generation) of CSG program, as characterized in Xcel Energy's Response to Information Request No. 46:

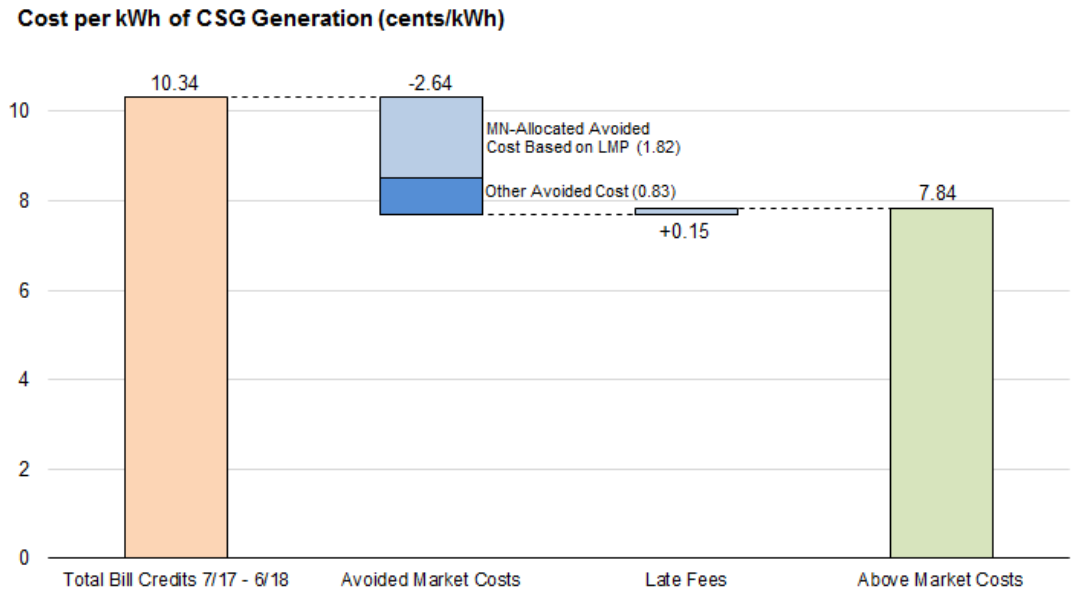
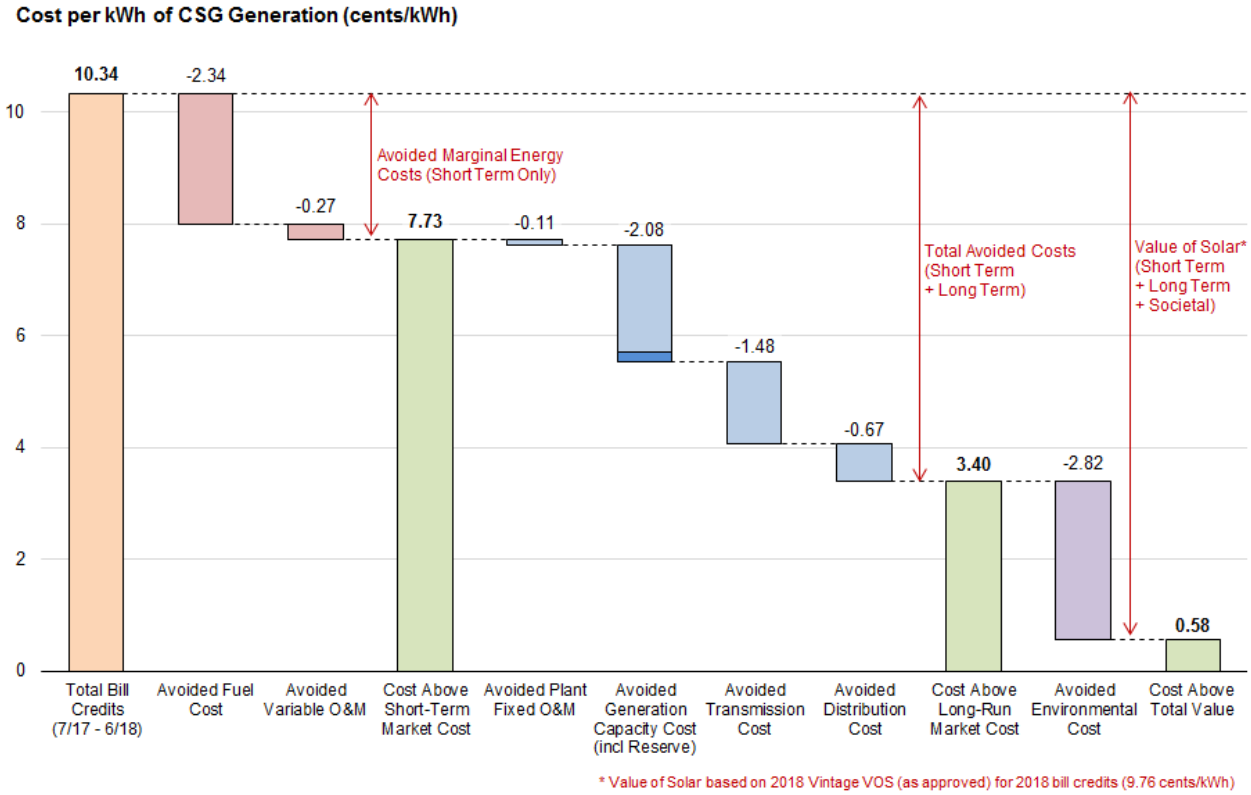


Figure 2. Total cost (per kWh CSG generation) of CSG program, as characterized by avoided costs in Value of Solar



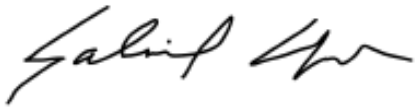
3.1. Impact of the CSG Program Moving Forward

As the community solar program transitions to the Value of Solar for reimbursement, community solar projects receiving VOS-reimbursement will net zero cross-subsidization. In other words, the total cost of new CSG programs will be zero. While there will still be a fuel-clause increase (due to the gap between short-term market costs and total costs) and there will still be a rate-impact of the CSG program (due to the gap between long-term market costs and total value), reimbursement under the VOS represents the socially optimal reimbursement level that yields no net cross-subsidization.

The recently approved residential adder (justified on the basis of the legislative requirement for accessibility of the program) could marginally increase cross-subsidization, in as much as residential subscriptions do not create additional social value. However, we estimate the impact of the residential adder to be quite small relative to the total cost of projects reimbursed under the applicable retail rate (calculated above as 0.58 cents/kWh). Under a very optimistic scenario of 100 MW of residential subscriptions, we estimate that the cost of the residential adder would be less than 5% of the total cost of ARR-reimbursed projects, as we calculated above.

If you have any questions regarding the information or opinions provided in this filing, please contact me at 612-626-3292 or gabechan@umn.edu.

Sincerely,



Gabriel Chan, PhD (gabechan@umn.edu)
Assistant Professor of Public Affairs
University of Minnesota

Matthew Grimley (griml011@umn.edu)
Graduate Research Assistant
University of Minnesota

Nick Stumo-Langer (stum2056@umn.edu)
Graduate Research Assistant
University of Minnesota