

STATE OF MINNESOTA
PUBLIC UTILITIES COMMISSION

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August 10, 2018

**In the Matter of Residential Electric Vehicle
Charging Tariff – Annual Compliance Filings**

Docket No. E015/M-15-120

**INITIAL COMMENTS OF FRESH ENERGY, MINNESOTA CENTER FOR ENVIRONMENTAL
ADVOCACY, AND INSTITUTE FOR LOCAL SELF-RELIANCE**

Fresh Energy, Minnesota Center for Environmental Advocacy, and the Institute for Local Self-Reliance submit these initial comments in response to the Commission's June 11, 2018 [Notice of Comment Period](#).

Minnesota Power's annual electric vehicle tariff compliance filing proposed changes to its existing electric vehicle tariff. While these modifications would be an improvement, they will likely have a limited impact on participation, as they do not address the tariff's fatal flaw: the requirement that participating customers install a second meter.

There are several technologies available today that allow for subtractive billing without requiring a second meter. Smart charging provides metering cost savings in the near-term, and in the long-term it will also allow utilities to use electric vehicle charging as a grid resource, minimizing fuel costs for electric vehicle owners and putting downward pressure on rates for all customers.

The Commission should require Minnesota Power to file a smart charging pilot that eliminates the requirement for a second meter and uses a technology that is capable of managed charging.

A Tale of Two Loads

The prospect of new electricity demand from electric vehicles parallels the iconic incipit of Charles Dickens' *A Tale of Two Cities*: it could be the best of loads or the worst of loads. Whether electric vehicles become a tremendous grid asset or a serious grid liability will depend on *when* they are charged.

Rate design is the key to harnessing the benefits of new electric vehicle load. Electric vehicles are the ultimate in flexible and manageable load; as long as their car is fully charged by the time they plan to leave in the morning, most electric vehicle drivers do not care whether their car began charging at 5pm or 2am.¹ But without price signals directing electric vehicle drivers to charge overnight, most drivers will

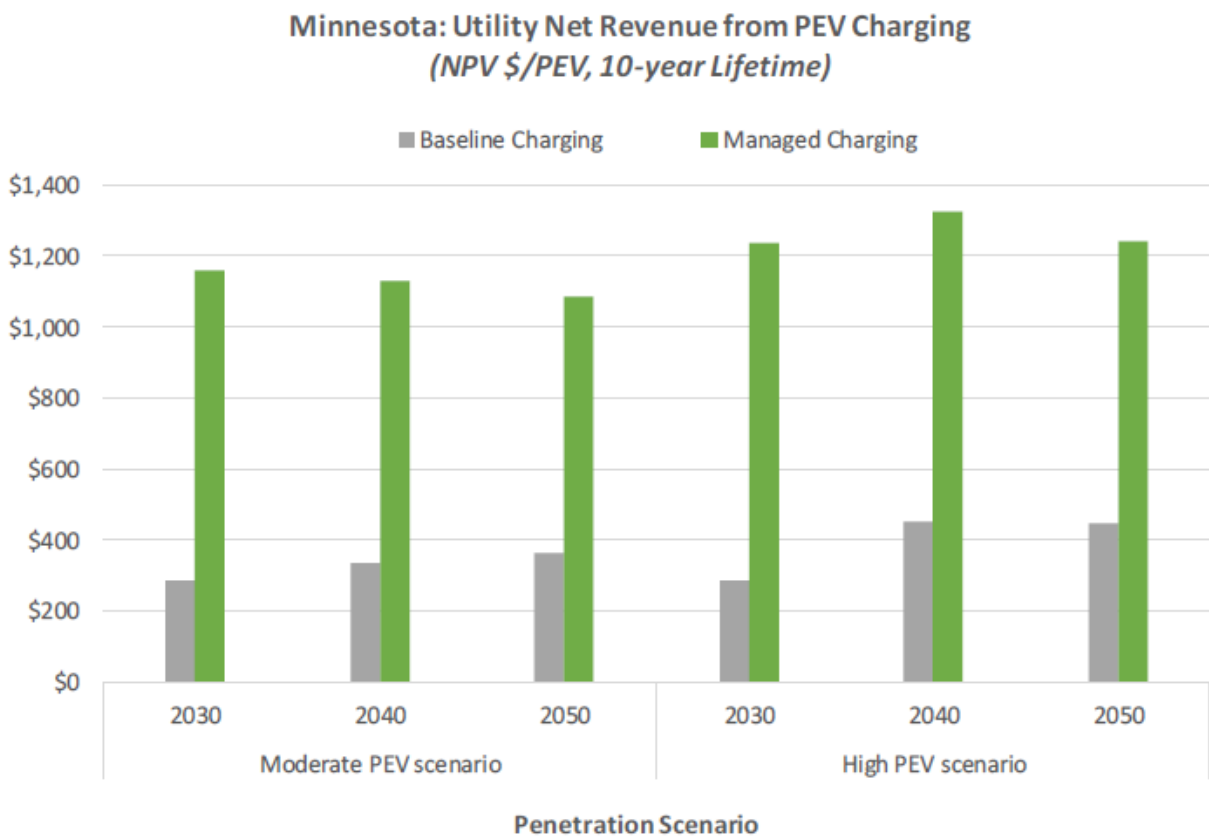
¹ See, e.g., Regulatory Assistance Project, "In the Driver's Seat: How Utilities and Consumers Can Benefit From the Shift to Electric Vehicles," April 2015 ([link](#)) at 4-7; CAISO, "California Vehicle-Grid Integration (VGI) Roadmap: Enabling Vehicle-Based Grid Services," February 2014 ([link](#))

likely begin charging when they get home from work. This will further increase the residential peak and could necessitate expensive distribution system upgrades where there are clusters of electric vehicles charging during peak times.

If, on the other hand, customers have an incentive to charge overnight, new electric vehicle load can improve the efficiency of a utility’s system and lower rates for all customers. A recent study by the research firm MJ Bradley & Associates quantified these potential savings for Minnesota, finding total utility bill reductions could **exceed \$10 billion** by 2050 and total electric vehicle benefits could **exceed \$30 billion** by 2050.² This is not surprising: if most electric vehicle charging takes place during off-peak hours, utilities will add sales revenue without costly distribution system upgrades or new generation capacity, which puts downward pressure on electric rates for all customers.

Notably, the amount of the benefit depends on *when* the vehicles are charged; as the chart below shows, moving electric vehicle charging to off-peak hours results in *four times* the savings for non-participating customers. When charged overnight, each electric vehicle will help push down electric rates by roughly \$1,200 over a 10-year lifetime.

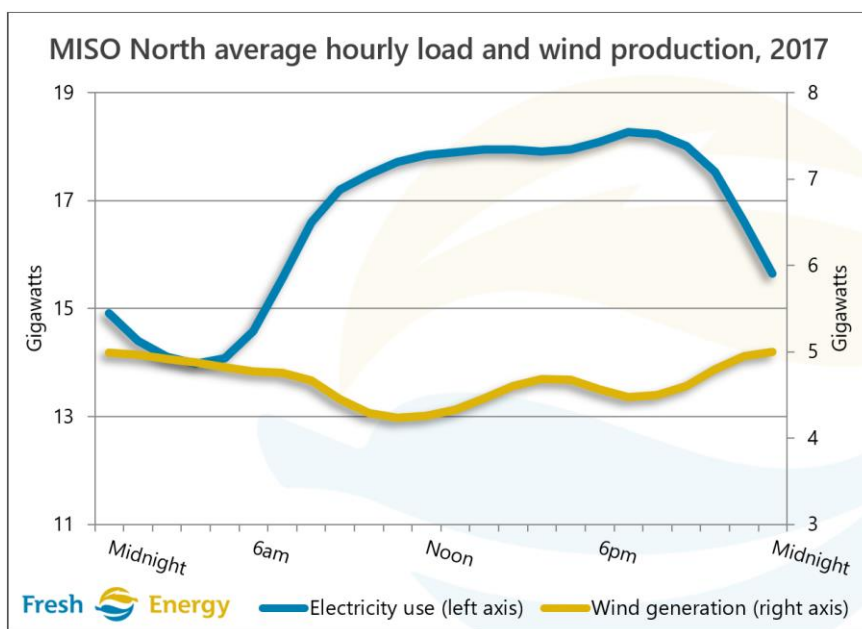
Figure 12 NPV of Projected Life-time Utility Net Revenue per PEV



² These results are consistent with the findings from similar studies for eight other states: [Connecticut](#), [Colorado](#), [Illinois](#), [Maryland](#), [Massachusetts](#), [Michigan](#), [New York](#), and [Pennsylvania](#).

Real world data demonstrate that time-varying rates are extremely effective at shifting electric vehicle load to off-peak hours. The Department of Energy’s “EV Project” found that, in jurisdictions without price signals encouraging off-peak charging, electric vehicle customers typically plug in and charge immediately upon returning home from work. But, in jurisdictions with effective utility education and outreach and time-variant price signals, the vast majority of electric vehicle charging occurs during off-peak hours.³ Here in Minnesota, on average 92 percent of the charging on Xcel Energy’s Residential Electric Vehicle Service tariff has occurred off-peak.⁴ This is consistent with data from California: electric vehicle owners in Pacific Gas & Electric’s and Southern California Edison’s territories who take service on “whole-home” time-of-use rates consume less during on-peak hours than the average residential customer, and only 7 to 12 percent of electric vehicle load on separate-meter time-of-use rates occurs during on-peak hours.

Electric vehicles offer additional customer benefits in Minnesota, as they can help integrate low-cost wind generation. The Great Plains have some of the best wind resource in the world,⁵ and utilities in the region have been routinely securing power purchase agreements for new wind farms (with capacity factors over 50 percent) with leveled costs under \$20/MWh.⁶ But, while wind is the lowest-cost generation available in Minnesota, wind speeds are not constant, so wind turbines produce



more electricity at some times than at others. In the upper Midwest, wind production tends to be the highest overnight, when demand is lowest, as shown in the graph to the right.⁷ Shifting more flexible load to overnight hours will improve the economics of wind development by increasing market prices overnight and reducing curtailments, which would allow more wind to be added to the grid.

Now is the time to develop rate designs that incentivize beneficial electric vehicle charging. With new and improved electric vehicle models coming to the market, Minnesota is poised for a dramatic uptake in electric vehicle sales. If improved tariffs are in place *before* electric vehicle adoption accelerates, then customers will be able to set up their new cars to charge during the specific times; in other words, they can “set it and forget it.” This will be much more effective than trying to change customer behavior down the road.

³ See <http://www.theevproject.com/documents.php>

⁴ Xcel Energy, “2018 Electric Vehicle Tariff Report,” filed June 1, 2018 in Docket 15-111, at page 3 ([link](#))

⁵ See, e.g.: the National Renewable Energy Laboratory’s “U.S. Wind Power Resource at 100-meter Hub Height” ([link](#))

⁶ See, e.g.: Ryan Wiser and Mark Bolinger, “2016 Wind Technologies Market Report,” U.S. Department of Energy, August 2017, at page 59 ([link](#))

⁷ Data source: MISO [Market Reports](#), Historical Generation Fuel Mix and Historical Regional Forecast and Actual Load.

Smart Charging

Minnesota Power’s electric vehicle tariff has a major barrier to participation: customers must pay to have a second meter installed—which can cost thousands of dollars up front—and then pay an additional \$51 a year (in perpetuity) for the second meter itself. This is a significant deterrent to participation. Moreover, the second meter provides no intrinsic value to a customer; it is simply a means to get lower-cost electricity overnight.

Recently, Xcel Energy acknowledged a similar problem with its electric vehicle tariff and proposed a creative solution: using the revenue-grade submeter embedded in a “smart” electric vehicle charger in lieu of a second meter. With a smart charger, customers receive additional benefits beyond lower-cost electricity: they will be able to charge their electric vehicle much faster than they would using the “level 1” charger that comes standard with most electric vehicles, and they will also get access to [apps and features](#) that improve their electric vehicle experience. Many customers may still have to pay for wiring upgrades to enable faster charging, but they would get more *value* from their investment.

Smart charging will also add valuable functionality as electric vehicle adoption increases. Smart chargers are capable of two-way communication, which means the timing and rate of electric vehicle charging can be modulated in order to meet a local or regional system need. Likewise, electric vehicles themselves come with all the “smarts” and communications capabilities needed to dynamically manage charging, as demonstrated by the “iChargeForward” program in California, where Pacific Gas & Electric manages electric vehicle charging in response to grid conditions and rewards customers accordingly.⁸ The Electric Power Research Institute’s “Open Vehicle Grid Integration Platform” could also be used to enable smart charging with either smart charging stations or “dumb” charging stations paired with smart cars.⁹

Using these types of technologies, electric vehicles can be remotely controlled to match renewable generation or staggered in areas of high electric vehicle adoption to avoid costly distribution system upgrades. While this functionality may not be cost-effective in Minnesota Power’s system today, these services will only become more valuable as renewable generation and electric vehicle adoption increase. Gaining familiarity with the technology today will aid the transition to managed charging in the future.

Minnesota Power’s Electric Vehicle Tariff

Minnesota Power’s annual report provides a description of the various promotional activities that Company has engaged in over the previous year. We applaud the efforts the Company has made to promote electric vehicle adoption in northern Minnesota.

However, more than four years after the legislature required investor-owned utilities to offer electric vehicle tariffs, there are *just two* customers on the Company’s electric vehicle tariff. This is especially

⁸ BMW i ChargeForward: PG&E’s Electric Vehicle Smart Charging Pilot ([link](#))

⁹ EPRI, “Open Vehicle-Grid Integration Platform: Systems Approach to Standards and Interoperability,” Palo Alto, CA: 2016. 3002008866. ([link](#))

noteworthy considering that Minnesota Power's customers would presumably benefit from an electric vehicle rate more than customers of Minnesota's other investor-owned utilities: nearly all of the Minnesota Power's residential customers are on an Increasing Block Rate, in which customers pay higher per-kWh rates as their electricity consumption increases. Because switching from a gas car to an electric vehicle would add electric load, the charging would push more of the customer's usage into the higher blocks; in effect, the electric vehicle charging would all be done in the customer's most expensive block, regardless of when in the day the car was charged. This not only provides no incentive for off-peak charging, it also hinders the economics of electric vehicles. Notably, a survey of over 16,000 electric vehicle owners revealed the single most important factor in purchasing an electric vehicle is "saving money on fuel costs."¹⁰

In short, in spite of Minnesota Power's promotional efforts, it is clear that customers simply are not interested in its electric vehicle tariff. We believe that the fault lies not with the Company's efforts, but with the tariff itself.

Alternative Metering

In its 2018 annual filing, Minnesota Power acknowledged that the significant upfront costs are a barrier to participation in its electric vehicle tariff. It also recommended changes to improve its current electric vehicle tariff: increasing the duration of the off-peak period, allowing for on-peak charging, and reducing the off-peak energy charge.

While we believe Minnesota Power's proposed changes would improve its existing electric vehicle tariff, they fail to address the tariff's fatal flaw: the requirement of a second meter.

The Commission recognized the burden imposed by the requirement of a second meter in its Order following Minnesota Power's 2017 annual electric vehicle report, requiring the Company to file "an evaluation of options to reduce the upfront cost burden for customers looking to opt into the electric vehicle tariff, a discussion of sub-metering technologies available, and a timeline for filing a pilot program or implementation of another feasible alternative."¹¹

In its 2018 annual report, the Company included a discussion of alternative metering, including a description of its preferred option—a combination of Advanced Metering Infrastructure, a Customer Information System, and a Meter Data Management system—which it believes will "modernize the customer experience in many of the Company's product and service offerings for all customer classes, but especially its residential customers."¹²

¹⁰ Center for Sustainable Energy, "California Air Resources Board Clean Vehicle Rebate Project, EV Consumer Survey Dashboard." Accessed August 6, 2018 ([link](#))

¹¹ Minnesota Public Utilities Commission, "Order Accepting 2017 Annual Reports and Establishing Requirements for Next Annual Reports," filed October 26, 2017 in Docket 15-120 ([link](#)), at page 4

¹² At page 16.

This approach is insufficient in several ways. First, and most importantly: *this option would still require a second meter* to offer an electric vehicle tariff.¹³ In other words, the Minnesota Power’s preferred option would not solve the problem the Commission required it to report on. Further, the Company did not provide a timeline for filing a pilot program as required by the Order. When asked when it could begin offering an electric vehicle tariff using its preferred technology, the Company was unable to give a response, citing the uncertainty around the implementation timeline for their Meter Data Management system.¹⁴ This uncertainty is understandable, given the significant transition the Company is going through. Regardless, it will likely be three to four years before the Company could implement its preferred option; frankly, that is not good enough.

Conclusion

Electric vehicles have tremendous potential to improve the efficiency of the grid, clean our air, and reduce electric rates for all customers. However, without utility action, most electric vehicle owners will likely begin charging when they get home, exacerbating the residential peak and necessitating expensive distribution system upgrades. While Minnesota Power proposes changes that would improve its existing electric vehicle tariff, the Company does not address the heart of the issue—the requirement of a second meter—and, thus, its proposed changes will likely have minimal impact on participation levels. Moreover, Minnesota Power’s preferred long-term metering alternative would not be available for three to four years and *would still require a second meter*.

There are several smart charging options available that allow for subtractive billing without requiring a second meter. These options are not only beneficial in the near-term, they will also allow utilities to maximize the benefits of electric vehicles through managed charging. The Commission should require Minnesota Power to file a smart charging pilot that eliminates the requirement for a second meter and will permit managed charging in the future.

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¹³ See: Minnesota Power’s response to Fresh Energy Information Request #1, included as Appendix A, below.

¹⁴ See: Minnesota Power’s response to Fresh Energy Information Request #3, included as Appendix B, below.

Appendix A

Fresh Energy Information Requests 1-3

Docket Number: E015/M-15-120
Requestor: Andrew Twite
Requested From: Minnesota Power
Date of Request: June 29, 2018
Response Due: July 9, 2018

If you believe your responses are proprietary, please indicate.

On pages 11-12 of the Company's 2018 annual compliance filing, Minnesota Power outlines the submetering option "METER DATA MANAGEMENT SYSTEM + ADVANCED METERING INFRASTRUCTURE + CUSTOMER INFORMATION SYSTEM." Information requests 1-3, below, refer to this option.

Request Number	
#1	Under this option, would a separate meter still be required to offer an off-peak electric vehicle tariff that would comply with Minn. Stat. § 216B.1614?

Response:

MDM+AMI+CIS would eliminate the need for a second service (service drop from transformer to second metering point). This option would still require a second meter and second meter socket, and would receive its energy from the primary meter/service. Minn. Stat. § 216B.1614, subd. 2(c)(4) requires each public utility to "incorporate the cost of metering or submetering within the rate charged to the customer" which Minnesota Power's submetering option would be in compliance.

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Department: Regulatory Affairs
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Appendix B

Fresh Energy Information Requests 1-3

Docket Number: E015/M-15-120
Requestor: Andrew Twite
Requested From: Minnesota Power
Date of Request: June 29, 2018
Response Due: July 9, 2018

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Request Number	
#3	Under the Company's current timeline for deployment of AMI, CIS, and MDMS, when is the soonest date an electric vehicle tariff employing this option could be offered to all Minnesota Power residential customers?

Response:

Minnesota Power is currently completing a request for proposal process and MDM selection, along with finalizing a path forward for implementation. The MDM implementation timeline is dependent upon capital project schedules, available resources, and budgets. The MDM will also need to be fully implemented and tested before offering a rate of this nature to customers.

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