

August 11, 2021

**To:** Council President Brendmoen and members of the Saint Paul City Council  
**From:** Samantha Henningson, Project Manager, EV Spot Network

This memo summarizes recommended price structures for the Level 2 and DC Fast Charging (DCFC) public electric vehicle (EV) charging stations that will comprise the EV Spot Network.

**Recommended pricing structure and rates:** With support from the American Cities Climate Challenge (ACCC) technical support team, including Natural Resources Defense Council Electric Vehicle Strategist Kelly Blynn and Electrification Coalition staff members Cher Griffith-Taylor, Jared Walker, and Matt Stephens-Rich, we modeled and analyzed several factors, including known maintenance and operating costs and estimated utilization rates, to arrive at the following recommended pricing structure and rates:

- Rates based on electricity usage (kWh) since EV charging times vary widely across different vehicle models.
- Overnight per kWh discount (2.5 cents) to align with Xcel tariff (9pm-9am)
- Per session connection fee to recover fixed costs, with a higher connection fee for DCFC which has higher fixed costs.
- A dwell-time penalty to cover the costs of deploying, maintaining, and operating the EV Spot Network, as well as to help encourage turnover. The dwell-time penalty would kick in following a 10-min grace period, with a cap of \$50 per session. Snow emergency rules would apply regardless.
- To help ensure the long-term viability of publicly supported electric vehicle carshare, companies utilizing City-leased vehicles for carshare are exempted from dwell time penalties and receive a 20% discount on the connection fee.

**Principles and considerations:** Priority principles and considerations that informed these recommendations include:

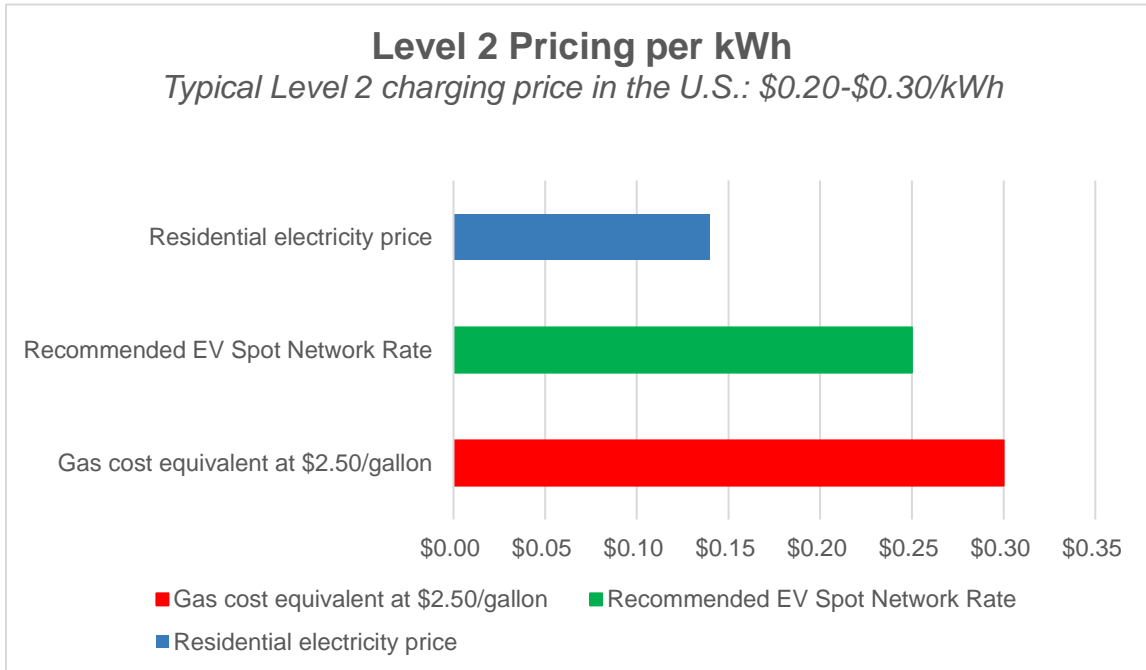
- Cover operating costs to be cost neutral
- Incentivize EV by maintaining affordable charging rates
- Maintain competitive rates with nearby chargers
- Establish a fair rate structure across different types of electric vehicles
- Encourage home charging where possible
- Incentivize turnover of EV charging spaces
- Ensure ease of understanding

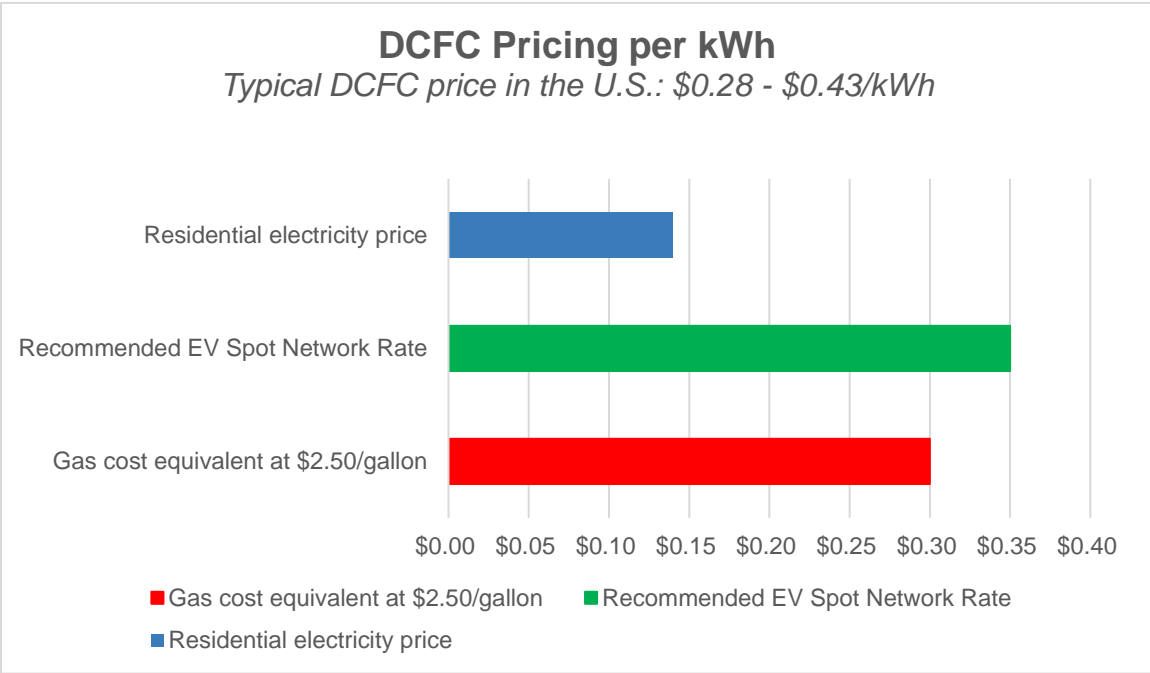
The following table summarizes the recommended initial rates (including sales tax).

	Level 2		DCFC	
	Price to consumer	Revenue to City per transaction	Price to consumer	Revenue to City per transaction
<i>Components -- SALES TAX INCLUDED</i>				
<b>Per kWh rate – Daytime</b>	\$0.25	\$0.23	\$0.35	\$0.32
<b>Per kWh rate – Overnight</b>	\$0.23	\$0.21	\$0.33	\$0.30
<b>Per session connection fee</b>	\$1.25	\$1.16	\$2.50	\$2.00

<b>Dwell time penalty</b>	\$10/hour (maximum \$50 fee per session)	\$9.27	\$0.25/minute (\$15/hour; maximum \$50 fee per session)	\$0.23
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The rates proposed compare to the price of driving a gasoline vehicle, charging at home, or charging at other public charging stations as follows:





**Pricing structure policy recommendations:** To account for the uncertainty of actual network utilization, costs, and revenues, and to allow the City flexibility to adjust course over time to meet the project’s goals, we also recommend the following policies to guide subsequent updates to the pricing structure:

- Revisit pricing regularly, or as needed.
- Consider demand-based pricing (e.g., for major events) when revisiting price structure after 2 years.

The costs and revenue forecasts developed for the project draw heavily on several assumptions about utilization, which only real-world implementation experience will bear out. Periodic review of actual utilization and user trends will provide a more accurate basis from which staff and policymakers can adjust the network pricing structure to cover operating costs and plan for the future of the charging network.

**Overview of EVSE Pricing Options and Best Practices**

**EVSE Pricing Principles and Considerations**

The following principles and considerations were taken into account to create the proposed pricing structures for the EV Spot Network. Given the variety of objectives in setting the pricing structure, the final recommendations ultimately seek to balance covering operating costs while providing affordable, fair access to the EV charging stations.

Principle/ Consideration	Details
<p><b>Cover operating costs to be cost neutral to the cities</b></p>	<ul style="list-style-type: none"> <li>Given both fixed and variable operational costs, a <b>combination of a price per session plus cost per kWh</b> can help ensure costs are covered. Moreover, a dwell time fee will help to cover the costs of deploying, maintaining, and operating the EV Spot Network, as well as help encourage turnover.</li> </ul>
<p><b>Incentivize EVs over conventional vehicles by maintaining affordable charging rates</b></p>	<ul style="list-style-type: none"> <li><b>\$0.40/kWh</b> or more for electricity to fuel an EV would be more expensive than <b>\$3/gallon</b> of gas. At <b>\$2.50/gallon</b> gas, that threshold is likely closer to <b>\$0.30/kWh</b>. <i>Current MN gas average: \$2.36</i></li> </ul>
<p><b>Maintain competitive rates with nearby chargers</b></p>	<ul style="list-style-type: none"> <li>Many chargers are still available for free (Level 2), but for those that do charge, rate structures vary widely.</li> <li>Typical costs range from <b>\$0.20-\$0.30/kWh for Level 2</b>, and <b>\$0.28-\$0.43/kWh for DCFC</b>.</li> </ul>
<p><b>Establish a fair rate structure</b></p>	<ul style="list-style-type: none"> <li><b>Charging per kWh</b>, instead of by time increment. Different vehicles accept different rates of charge, so charging by time means some vehicles will pay more for the same amount of electricity.</li> </ul>
<p><b>Encourage home charging where possible</b></p>	<ul style="list-style-type: none"> <li>Encourage residents who can charge more affordably at home to do so. Average residential electricity rates (Xcel): <b>\$0.14/kWh</b></li> </ul>
<p><b>Ensure ease of understanding</b></p>	<ul style="list-style-type: none"> <li>Strive to keep rate structure simple and easy to understand for users.</li> </ul>

**Pros and Cons of EVSE Pricing Approaches and Elements:**

Charging providers can decide to bill by the amount of time a vehicle is plugged into the station, the amount of electricity delivered, or a combination of these factors. Billing can also be structured as a membership fee, comparable to a monthly (unlimited) data mobile phone plan. There are also examples of charging stations that are free to use but require a parking fee. All these approaches to pricing were evaluated for the Twin Cities EV Spot Network, the primary goal of which is to provide convenient, affordable access to Level 2 and DCFC stations for residents, commuters, and visitors.

A rate based solely on time is simple to understand for users, but this approach is disconnected from the actual product (electricity) being delivered. This method may also be perceived as unfair since different EVs charge at variable speeds, charging speeds vary by the state of charge of a vehicle’s battery, and charging can be slowed in colder temperatures.

Charging by energy delivered (kWh) reflects accurate consumption, and since it is similar to filling up with gasoline at the pump, it is a straightforward approach that is easily understood by EV drivers. However,

users should additionally be required to pay a small session initiation/connection fee combined with a price per kWh, to offset some fixed station operations and maintenance costs. In addition to this per kWh charge, including a time-based dwell time fee component will help to cover the costs of deploying, maintaining, and operating the EV Spot Network, as well as to help encourage turnover. At level 2 chargers EV drivers will be given a maximum 4 hours per session during the day before a dwell time fee is assessed, with no overnight parking maximum as we want to encourage those who can't charge at home to utilize EV Spots overnight when rates are lower and renewable energy more plentiful. At DCFC/fast chargers, EV drivers will be given a maximum of 2 hours before a dwell time fee is assessed. Users of stations who leave their vehicle parked for longer than the allotted time will be given a short grace period to return to their vehicle and move to another parking space before this dwell penalty is assessed, and the recommendation is to cap dwell fees at \$50 per session.

The following table summarizes the main options for pricing EV charging stations, some of which can be combined. The final pricing recommendation ultimately employs a structure based primarily on energy delivered (pricing per kWh), but also including a price per session to cover fixed operating costs and a dwell time fee to cover costs and encourage turnover.

Element	Description	Pros	Cons
<b>Price per kWh (energy)</b>	Pricing billed on a per kWh basis, based on the amount of energy used	<ul style="list-style-type: none"> <li>Directly relates to the amount of energy delivered, fair for vehicles that charge at lower speeds.</li> </ul>	<ul style="list-style-type: none"> <li>Without other fees or policies, does not provide an incentive for drivers to move their vehicle when charging is complete</li> </ul>
<b>Price per Hour/Minute (time)</b>	Pricing billed on length of time for EV charging session	<ul style="list-style-type: none"> <li>Encourages lower dwell-time at chargers in high-traffic areas</li> <li>Easy to understand</li> <li>Simpler to integrate into existing time-based parking fees</li> </ul>	<ul style="list-style-type: none"> <li>Does not directly correlate with the amount of energy delivered.</li> <li>May be considered unfair to drivers with vehicles that charge at lower speeds.</li> </ul>
<b>Price per Session</b>	Flat fee to access charger, per session	<ul style="list-style-type: none"> <li>Ensures minimum pricing for an EV charging session and can help cover fixed costs.</li> <li>Simple to communicate</li> </ul>	<ul style="list-style-type: none"> <li>Doesn't charge for the actual energy usage</li> <li>Disincentivizes charging for short periods of time</li> </ul>
<b>Dwell time fee</b>	Penalty levied for vehicles left beyond allowed charging time.	<ul style="list-style-type: none"> <li>Helps to cover the costs of deploying, maintaining, and operating the EV Spot Network, as well as encourage turnover at chargers.</li> </ul>	<ul style="list-style-type: none"> <li>Ultimately, parking enforcement must ensure that vehicles do not violate posted parking/charging time limits in order to enable other users to use the chargers.</li> </ul>

## Pricing Recommendations for EV Spot Network

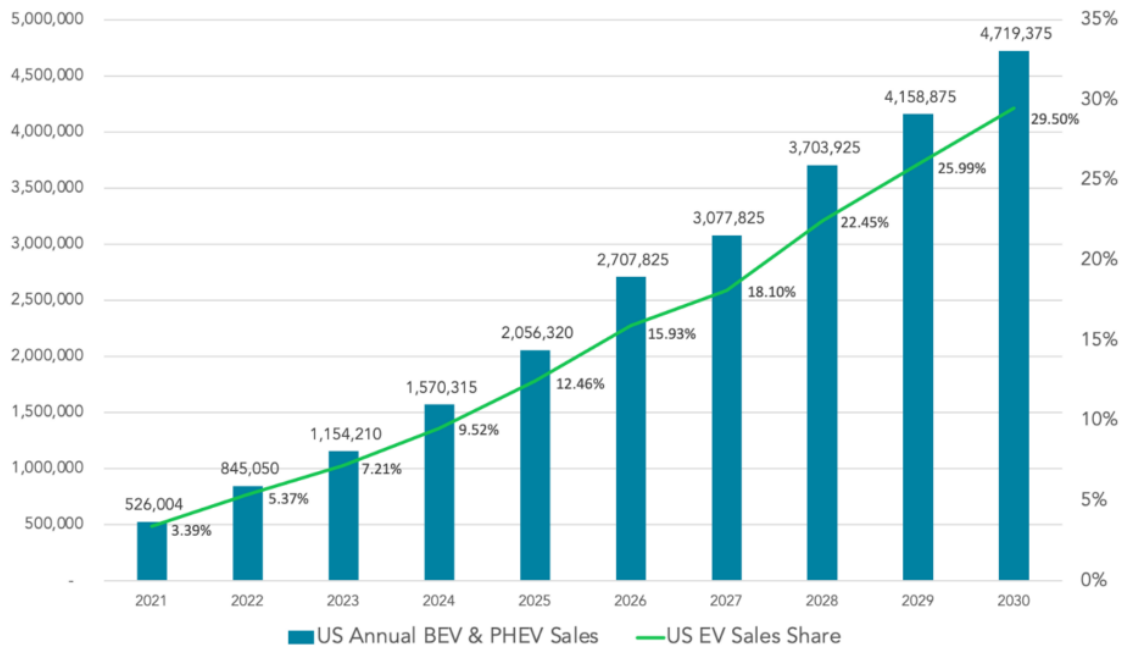
### Key Inputs and Assumptions

The rate of EV Spot station utilization is a key assumption upon which the ACCC team based its analysis, informed by estimated utilization from HOURCAR vehicles and available utilization data from the charging station vendor (ZEF Energy). A conservative, "middle-of-the-road" scenario has been employed in determining inputs.

Description	Input (source)
<b>Station utilization per dual port charger in year one</b>	0.5 sessions per day in Year 1 (per Level 2 station), 1.0 session per day (DCFC) ( <i>assumption - estimated HOURCAR usage plus half average ZEF use</i> )
<b>Increase in utilization per year</b>	12% ( <a href="#">NYSERDA</a> )
<b>On-peak utilization (9am-9pm)</b>	60% - Level 2, 75% - DCFC ( <i>assumption</i> )
<b>Average charge time</b>	2 hours (L2), 25 mins (50 kW DCFC), 20 mins (120 kW) ( <i>assumption based on studies from <a href="#">NYSERDA</a>, <a href="#">Idaho National Labs</a></i> )
<b>Transaction cut to ZEF</b>	10% for credit card fees on public charging transactions ( <i>contract with ZEF</i> )
<b>% of Sessions that Incur Dwell Time Fee</b>	5% of L2 users incur a 1-hour dwell time fee 5% of DCFC users incur a 15-min dwell time fee ( <i>assumption</i> )

While assumptions made are conservative for the purpose of setting budgets, the trend lines for electric vehicle adoption are positive. This trend should accelerate in Minnesota once the State Clean Cars rulemaking go into effect potentially with vehicle model year 2025.

## US EVs (BEV & PHEV) Sales & Sales Share Forecast: 2021-2030



Historical Sales Data: GoodCarBadCar.net, InsideEVs, IHS Markit / Auto Manufacturers Alliance, Advanced Technology Sales Dashboard | Research & Chart: Loren McDonald/EVAdoption

### Summary of Operating Costs to Recover

The table below summarizes the anticipated operating costs of the EV Spot network over the next ten years, which include a combination of fixed and variable costs. Relatively fixed costs include a monthly electricity customer charge per hub, monthly demand charges billed at the peak electricity use per hub, networking fees, and anticipated maintenance costs. Some fixed costs begin in later years of the project, as some costs have been pre-paid up front. Variable costs consist of the cost per kWh of electricity used at the hubs. The hubs will be on a specially designed tariff for public EV charging that provides a small discount (2.5 cents per kWh) overnight, and will also opt in to Windsource, Xcel's wind energy option, so that the hubs will be renewably powered.

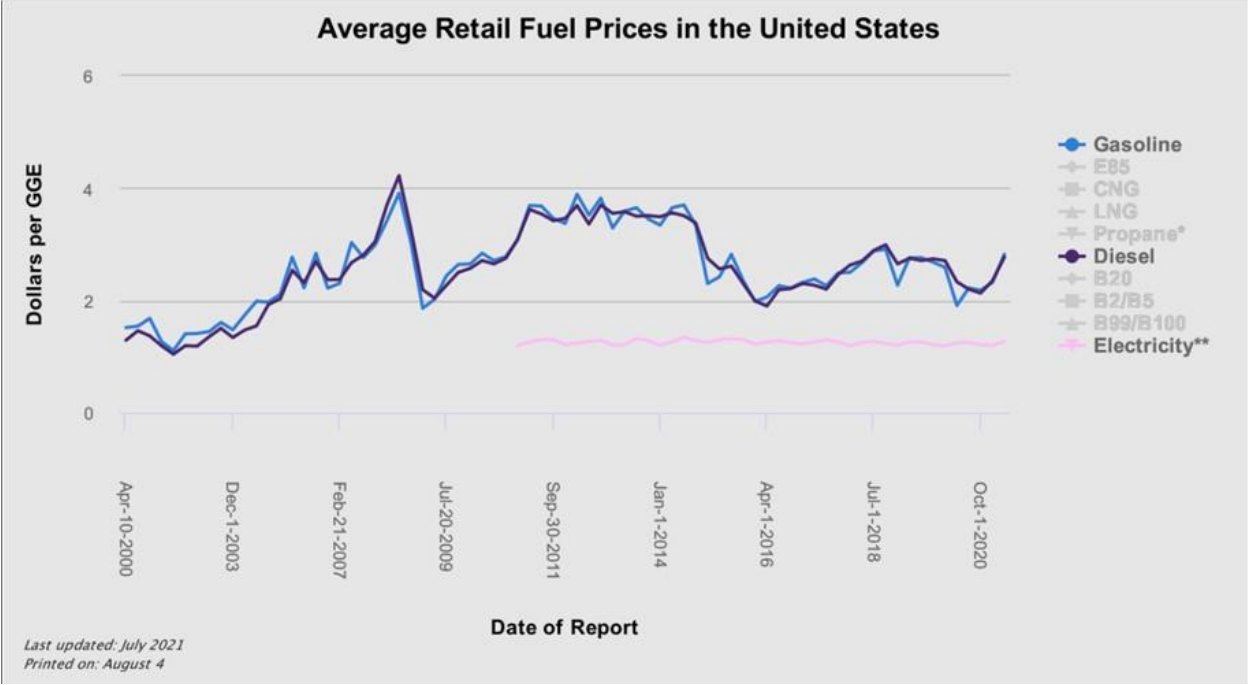
(Relatively) Fixed Costs	Value
<b>Electricity</b> - customer charge (per month)	\$30/hub
<b>Electricity</b> - demand charges (per kW per month)	\$10-\$15/kW (varies seasonally; will also vary by how many plugs at the same hub are plugged in at the same time per month)
<b>Networking</b> - per year, years 6-10 (years 1-5 paid up front)	\$280/dual port Level 2 \$500/50kW DCFC

	\$1000/120kW DCFC
<b>Maintenance</b> - total per year (estimates)	\$36k/year - years 2-10 for L2 maintenance (part time staff person) \$16,500k/year, years 2-5 for L2 parts; \$27k/year, years 6-10 for parts \$39k/year - years 6-10 for DCFC (assumes 6 DCFC in Saint Paul)
<b>Variable Costs</b>	<b>Value</b>
<b>Electricity</b> - per kWh (includes Windsource, riders - varies by time of day)	~\$0.09-\$0.12/ kWh

Costs are slightly different between the two cities, as there will be a differing number of hubs in each city. Costs are anticipated to increase over time due to 1) assumed increased utilization as EV adoption increases and awareness of the network grows, and 2) maintenance and networking costs that begin in years 2 and 6.

**Considerations on the cost of gas versus electricity:** Due to continual drafting of the pricing analysis for these recommendations over the past year, there are several numbers referenced in this memo for the cost per kWh equivalent for gas. At the time of original drafting, the average gas price was \$2.38 per gallon. \$2.50 per gallon was used as the “snapshot in time” price for gas used in the underlying pricing analysis, as well as shown in the charts comparing residential electricity rates versus recommended EV Spot Network rates vs cost of gas. Today’s average per gallon cost in Minnesota is \$2.99.

Gasoline prices change by the hour and by the day; while electricity costs are far more static (demonstrated in the chart below from <https://afdc.energy.gov/fuels/prices.html>). The gas costs underpinning this analysis were chosen as best a representative middle as possible. Whenever gas prices go up, this only means that the cost saving for electric vehicles is even greater.



\*GGE=Gasoline Gallon Equivalents



**Sponsorship possibilities:** The EV Spot Network team has had discussions with potential sponsors, and the City Attorney's Office aims to develop a means of displaying potential sponsors. Future sponsorship agreements may offset costs of operating this program.