STATE OF MICHIGAN
BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

In the matter, on the Commission's own motion, to open a docket that will be used to collaboratively consider issues related to both the deployment of plug-in electric vehicle charging facilities and to examine issues germane to the use of compressed natural gas as a motor vehicle transportation fuel in Michigan in a Commission sponsored technical conference.	))))))))	Case No. U-18368

COMMENTS OF SIERRA CLUB, NATURAL RESOURCES DEFENSE COUNCIL, THE ECOLOGY CENTER AND ENVIRONMENTAL LAW & POLICY CENTER

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I. Introduction

Sierra Club, Natural Resources Defense Council, The Ecology Center, and Environmental Law & Policy Center (collectively, "Commenters") appreciate the opportunity to provide comments to the Michigan Public Service Commission on the role for electric utilities in supporting the electric vehicle ("EV") market. We commend the Commission for initiating this important discussion, and respectfully submit these comments in response to the Commission's *Order* dated April 28, 2017.[1]

Transportation Electrification ("TE") is a critical means for Michigan to reduce its reliance on oil, improve public health, grow the local economy, and control the emissions of greenhouse gases ("GHGs"). TE also represents an enormous opportunity to improve our electricity sector, as flexible EV charging load can be leveraged to facilitate the integration of renewable generation and reduce electricity rates by increasing grid efficiency and reliability, among other grid services. Michigan's electric utilities are uniquely situated to support large-scale, strategic and equitable siting of EV charging infrastructure, to conduct market education and outreach, and to enable EV grid services that can deliver benefits for all utility customers, regardless of what kind of vehicle they drive.

Commenters have deep experience addressing the issues that arise at the intersection of the electric transportation and electric utility sectors. Sierra Club, Natural Resources Defense Council ("NRDC"), The Ecology Center, and Environmental Law & Policy Center ("ELPC") are all members of Charge Up Midwest, a coalition group focused on accelerating transportation electrification through policy and advocacy efforts in several Midwestern states, including Michigan. Sierra Club, NRDC, and ELPC have previously addressed the role for utilities with

[1] *Order Commencing a Collaborative Technical Conference* at 8, Case No. U-18368, In the matter, on the

respect to EVs before this Commission in the Consumers Energy proceeding (U-17990), which gave rise to this working case. Similarly, The Ecology Center was a participant in the MPSC's PEV Task Force, organized by former Chairman Isiogu, as well as the Department of Energy-funded Plug-In Ready Michigan project team, which resulted in the Plug-In Ready Michigan EV Preparedness Plan.

Sierra Club and NRDC have also intervened and/or provided briefing or comments on issues identical or similar to those raised here before utility regulatory bodies in a number of states across the country, including Missouri, Ohio, Kentucky, Utah, Nevada, Connecticut, Oregon, Washington, New York, Massachusetts, and California, and ELPC has participated in cases in the Midwest, including Ohio.

As a preliminary matter, to ensure that the Technical Conference and collaborative process is meaningful for the Commission, transparent for all stakeholders, and leads to concrete action, we recommend that Staff compiles and makes available a Final Report. The Final Report should include a review of the Technical Conference and written stakeholder comments, as well as recommendations on next steps for the Commission (e.g., additional workshops or working groups on specific issue areas, tariff revisions, Commission decisions or rulings). We further recommend that Stakeholders be given an opportunity to comment on Staff's Final Report.

Several other states have completed or continue to conduct investigatory dockets to evaluate and provide regulatory guidance or certainty on the role for utilities in advancing TE. Their results or processes may be instructive for the Commission. Most recently, the Washington Utilities and Transportation Commission ("UTC") issued a policy statement clarifying its jurisdiction and regulation EV charging services offered by electric utilities.[2] The statement

[2] *See Policy and Interpretive Statement Concerning Commission Regulation of Electric Vehicle Charging Stations,* Docket UE-160799, In the Matter of Amending and Adopting Rules in WAC 480-100

covers the universe of electricity sector-EV issues, and is a good example of a Commission-led stakeholder process that resolved core regulatory issues and established a framework for addressing more nuanced issue areas. Other states have conducted similar stakeholder processes, issuing rulings on threshold questions of jurisdiction or standards of review.[3]

II. Overview of Comments

Our comments briefly address each of the broad topic areas identified by the Commission in its *Order*. First, in Sections III through V, we review the quickening pace of EV market growth, detail the ratepayer, public health and energy security benefits of EVs, and identify remaining barriers to EV adoption. Then, in Section VI, we explain the range and design of utility roles to advance vehicle electrification, with a focus on strategic deployment of infrastructure, issues related to market competition, and integration of new EV load in a manner that maximizes benefits for ratepayers and the public. Our comments draw upon lessons learned in other jurisdictions as well as foundational EV research.

We also include two attachments. The first is an analysis benefits of vehicle electrification in Michigan completed by MJ Bradley & Associates, which is described in the ratepayer benefits section and labeled as Attachment A. The topline results of the study reveal that widespread vehicle electrification is a boon for the state; market forecasts estimate that Michigan could have 5.4 million EVs on the road by 2050, resulting in $2.6 billion in reduced

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Rulemaking to consider policy issues related to the implementation of RCW 80.28.360, electric vehicle supply equipment (filed June 14, 2017), Washington Utilities and Transportation Commission.

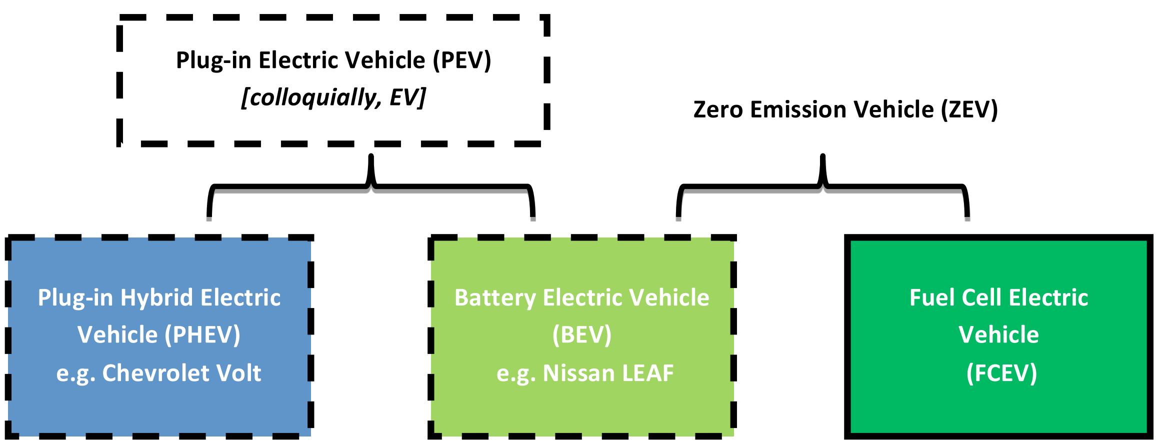
[3] *See, e.g., Vote and Order Opening Investigation*, DPU 13-182-A, Investigation by the Department of Public Utilities upon its own Motion into Electric Vehicles and Electric Vehicle Charging (filed December 23, 2013), Massachusetts Department of Public Utilities; *Declaratory Ruling on Jurisdiction Over Publicly Available Electric Vehicle Charging Stations*, Case 13- E-0199, In the Matter of Electric Vehicle Policies (filed November 22, 2013), New York Public Service Commission.

electricity bills, $23.1 billion in fuel and maintenance costs, and $5.7 billion in GHG benefits.[4] It is important to note that these benefits are maximized by policies that facilitate EV adoption and encourage the bulk of EV charging to occur off-peak, when spare grid capacity is available. Attachment B is a short set of guiding principles for the design of utility programs intended to advance vehicle electrification, which was prepared by NRDC.

III. Trends in the EV Market: EVs are Coming

First, it is important to clarify vehicle category terminology, which rivals the traditional utility policy world in its use of acronyms. The figure below harmonizes the categories of vehicle technology described in sources referenced in these comments.

Plug-in Electric and Zero Emission Vehicle Types



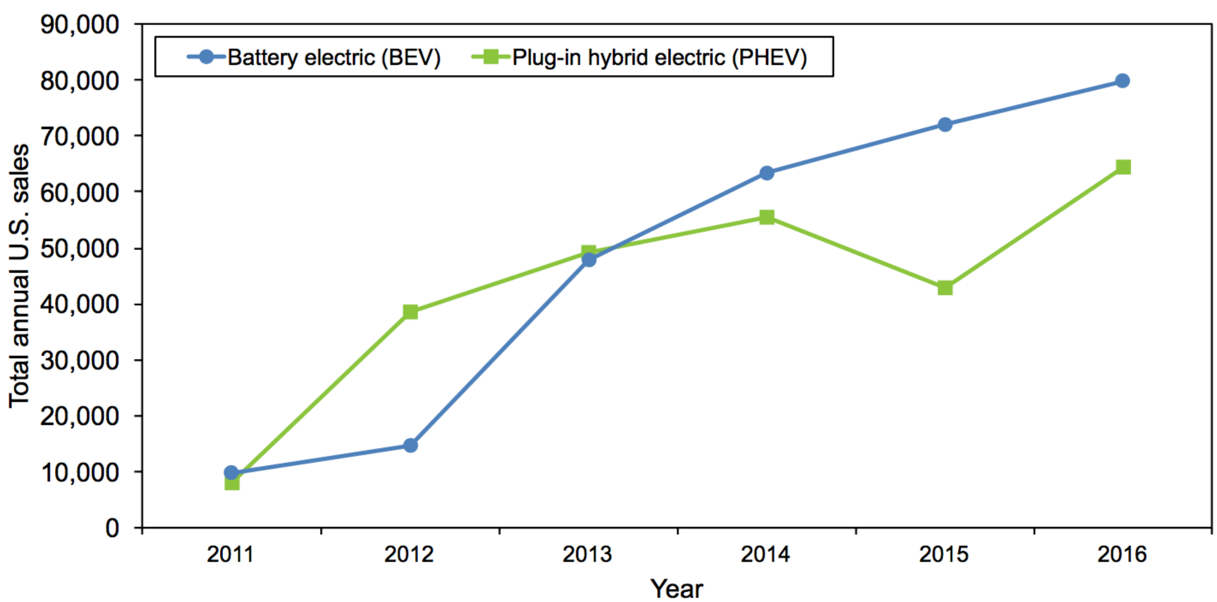
The Commission's Technical Conference is primarily focused on issues related to plug-in electric vehicles ("PEVs"), commonly referred to as "electric vehicles" or "EVs," which can be charged with electricity from the electric grid. This includes both Battery Electric Vehicles ("BEVs") that rely entirely upon electricity for fuel and Plug-in Hybrid Electric Vehicles

[4] *Electric Vehicle Outlook 2017*, Bloomberg New Energy Finance, July, 2017, available at: https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF_EVO_2017_ExecutiveSummary.pdf

("PHEVs") that rely upon electricity for daily driving needs, but use gasoline for longer trips. While PHEVs can be driven primarily on electricity, because they have tailpipe emissions when operating on gasoline, they are not referred to as Zero Emission Vehicles (ZEVs). Compressed natural gas (CNG) vehicles do not use electricity as fuel and produce tailpipe emissions, placing them outside of both the "EV" and "ZEV" categories.

a. Electric Vehicle Sales

Sales of plug-in electric light-duty vehicles have seen a steady 5-year climb since 2011, when the Chevy Volt (a "PHEV") and Nissan Leaf (a "BEV") were first brought to market. Annual U.S. sales of EVs in 2016 topped more than 150,000, close to 1% of all vehicle sales, with cumulative EV sales reaching more than 700,000.



(AFDC, 2017g)

The number of manufacturers selling EVs and the number of models offered have also significantly increased as well. Thirteen auto manufacturers now offer some combination of PHEVs and BEVs, with nearly 150 distinct models available—though not all are sold nationwide. Increasing model availability is viewed as critical for expanding the market for EVs. To that end, Volvo recently announced that by 2019, all of the vehicles that it sells will be PHEVs or BEVs and that it will introduce five new BEV models between 2019 and 2021.[5]

Michigan is among the top 10 states in total EV sales, and top 20 by share of the total vehicle market. Michigan consumers have purchased more than 12,700 EVs since 2011, accounting for approximately .43% of total vehicle sales over the period. All states trail California, which has sold more than 250,000 EVs, accounting for approximately 3.2% of total vehicle sales. Michigan consumers have also tended to prefer PHEVs (like the Chevy Volt) to the all-electric BEVs, accounting for more than 11,000 (87% of total EVs sold in Michigan), while the split is roughly 50 – 50 nationwide.[6]

b. Vehicle Cost and Battery Prices

Upfront prices of EVs have also been slowly dropping relative to average vehicle prices as well, due in large part due to a continued decline in battery prices. Since 2010, lithium ion batteries prices have fallen more than 73% per kilowatt hour.[7] While prices for BEV and PHEV models in 2017 ranged from $5,000 to $10,000 above the median for all vehicle models, that gap is expected to be eliminated over the next 10 years, making electric vehicles cheaper to purchase off the lot than conventional internal combustion vehicles (ICEs). On a total cost of ownership basis, EVs are already competitive and in some cases cheaper to own than comparable gasoline

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[5] *Volvo Cars to go all electric*, Volvo Car Group, July 5, 2017, available at: https://www.media.volvocars.com/global/en-gb/media/pressreleases/210058/volvo-cars-to-go-all-electric

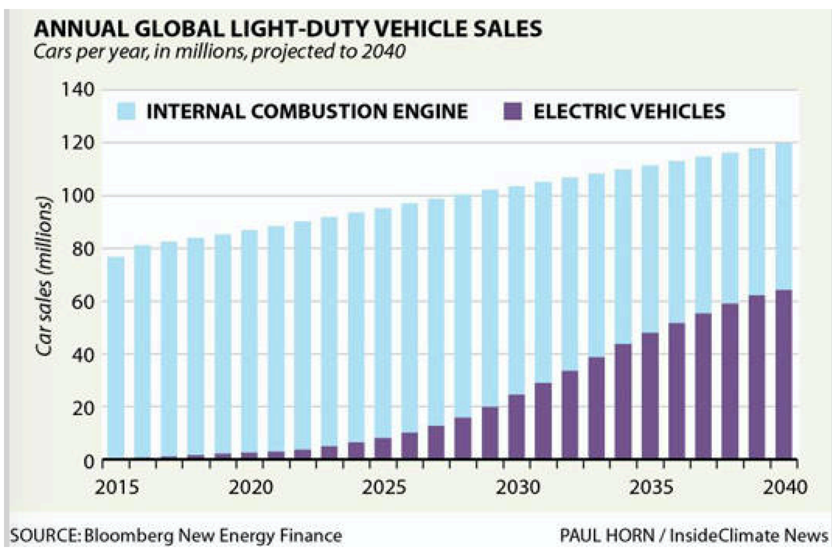
[6] Auto Alliance, *ZEV Sales Dashboard,* U.S. Light-Duty Zero Emission Vehicle (ZEV) Sales (2011-2017), Retrieved July 25, 2017 from: https://autoalliance.org/energy-environment/zev-sales-dashboard/

[7] J. Shankleman. *The Electric Car Revolution is Accelerating,* Bloomberg Businessweek, July 7, 2017, available at: https://www.bloomberg.com/news/articles/2017-07-06/the-electric-car-revolution-is-accelerating

vehicles due to substantially lower fuel and maintenance costs.[8] Federal tax credits of up to $7,500 are also available for some electric vehicles, making some EVs competitive with comparable ICEs today.

c. **Projected Market Growth**

While it is difficult to predict how fast the market for EVs will expand, most forecasters predict sustained and rapid growth over the coming decades. One recent study from Bloomberg New Energy Finance (BNEF) predicts that the pace of growth will increase in the mid 2020s as falling battery prices bring the cost of EVs into parity with ICE vehicles.[9] BNEF found that EV sales will grow to equal sales of ICEs as soon as 2040, with more than 60 million EVs sold globally.



There are other projections of EV growth that are lower, of course, but all show steady upward growth and several, including IEA, have been adjusted upward in the past year. For

[8] M. Davis. *Total Cost of Ownership Model for Current Plug-in Electric Vehicles,* Electric Power Research Institute, May, 2014, available at: https://www.epri.com/#/pages/product/000000003002004054/

[9] *Electric Vehicle Outlook 2017*, Bloomberg New Energy Finance, July, 2017, available at: https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF_EVO_2017_ExecutiveSummary.pdf

example, the International Energy Agency (IEA) more than doubled its U.S. 2030 EV forecast this year to 58 million from a previous 23 million.

A word of caution, however, is that most projections assume a corresponding growth in EV charging infrastructure that would be required to supply electricity for these cars. Potential bottlenecks in investments needed for this infrastructure could slow the EV market, or lead to uneven EV growth across the country. Bloomberg's Long Term Electric Vehicle Outlook specifically identifies charging infrastructure – particularly residential infrastructure – as a key barrier to broader growth that is "still not solved."[10] At the same time, increased availability of EV infrastructure could help to stimulate EV sales, leading to more robust EV growth outcomes.

IV. Utility Customer & Public Benefits of Vehicle Electrification

It is well known that EVs provide benefits to their drivers through reduced fuel and operations costs relative to conventional vehicles. A survey of over 16,000 EV drivers reveals that "saving money on fuel costs" is the single most important factor driving EV purchases.[11] However, widespread transportation electrification also delivers broader benefits that the Commission may wish to consider when evaluating utilities' role in electrification activities including but not limited to: downward pressure on rates and improved grid management, carbon dioxide and criteria pollutant emissions reductions, and reduced petroleum dependence.

a. Downward Pressure on Rates and Improved Grid Management

[10] *Electric Vehicle Outlook 2017*, Bloomberg New Energy Finance, July, 2017, available at: https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF_EVO_2017_ExecutiveSummary.pdf

[11] Center for Sustainable Energy (2016). California Air Resources Board Clean Vehicle Rebate Project, EV Consumer Survey Dashboard. Retrieved from http://cleanvehiclerebate.org/survey-dashboard/EV

First, integrated EV charging can lower electric rates for all utility customers. As described in Natural Resources Defense Council's *Driving Out Pollution: How Utilities Can Accelerate the Market for Electric Vehicles* report:

> *Charging electric vehicles predominately during off-peak electricity hours (when the electric grid is underutilized and there is plenty of spare capacity on the generation, transmission, and distribution system) allows utilities to avoid new capital investments while capturing additional revenues, lowering the average electricity cost for all their customers. This effect is the opposite of the utility "death spiral," whereby increasing costs borne by a decreasing pool of customers causes rate increases that drive away more customers, leaving those who cannot afford distributed generation or home energy storage to pay of an aging grid.*[12]

This increased electric load from EVs exerts downward pressure on rates by spreading the utilities' fixed costs over a greater amount of kilowatt-hour (kWh) sales. In the attached MJ Bradley report, Michigan utility customers can expect to cumulatively save a total of $2.6 billion by 2050 through lower electric bills with substantially increased EV adoption. It is important to note that these benefits are premised on the assumption that the majority of EV charging occurs off-peak, when the cost of serving incremental EV load is low and the net revenues associated with EV charging are greatest.[13] EV charging can also be managed to provide grid reliability services and further integrate renewables in a manner that ensures the reliable and efficient use of the grid. Strategic integration of EVs squarely dovetails with the Commission's mission to provide "safe and efficient production, distribution, and use of the State's energy…services."[14]

b. Carbon Dioxide and Criteria Pollutant Emissions Reductions

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[12] Max Baumhefner, Roland Hwang, Pierre Bull, *Driving Out Pollution: How Utilities Can Accelerate the Market for Electric Vehicles*, Natural Resources Defense Council, June 2016.

[13] MJ Bradley estimates that in 2050 alone, unmanaged EV charging (i.e. drivers plug their vehicles in at the evening peak) generates $108 million in net revenues whereas managed, off-peak charging generates $207 million in net revenues that can be used for utility customer benefit.

[14] Michigan Public Service Commission Annual Report, March 6th, 2017, available at: http://www.michigan.gov/documents/mpsc/MPSC_Annual_Report_2016_553650_7.pdf

EVs also produce zero tailpipe emissions and emit fewer greenhouse gas emissions than conventional vehicles on a well-to-wheels basis. Based on Michigan's generation mix, all-electric EVs such as the Chevy Bolt produce less than half the CO2 emissions of a conventional vehicle under similar driving conditions.[15] Accelerating the adoption of EVs aligns well with the state's recently passed legislation to expand zero-carbon renewable energy and energy efficiency in the state, as well as DTE Energy's recent announcement to decarbonize their plant operations by 80 percent by 2050 through the retirement of existing coal assets and development of new renewables, energy efficiency, and natural gas.[16] With power sector decarbonization in motion, EVs are the only vehicles on the road that get cleaner with age. MJ Bradley estimates that this widespread electrification and decarbonization of the power grid can reduce Michigan light-duty vehicle GHG emissions by 58% in 2050 from 2015 levels.

Unlike gasoline and diesel vehicles, EVs also emit none of the hazardous air pollutants that adversely affect human health.[17] Accelerating EV adoption – particularly in more densely populated areas of the state – can produce tangible health benefits to all Michiganders.

c. Reduced Petroleum Dependence

Finally, there is a public benefit to reduced petroleum dependence that EVs can provide. Michigan is not a major oil producer, and over 80 percent of petroleum that Michigan does

[15] Alternative Fuels Data Center, "Emissions from Hybrid and Plug-In Electric Vehicles," U.S. Department of Energy (accessed July 16, 2017) available at: http://www.afdc.energy.gov/vehicles/electric_emissions.php#wheel

[16] http://newsroom.dteenergy.com/2017-05-16-DTE-Energy-announces-plan-to-reduce-carbon-emissions-by-80-percent#sthash.eBRDgIpx.dpbs ; https://www.greentechmedia.com/articles/read/michigan-passes-bills-to-boost-renewables-mandate-retain-net-metering

[17] It is estimated over 50,000 Americans in the lower 48 states die prematurely from traffic pollution every year, which is over one-and-a-half times as many as die in traffic accidents. Fabio Caiazzo et al., *Air pollution and early deaths in the United States*, Atmospheric Environment, 2013; National Highway Traffic Safety Administration, Fatality Analysis Reporting System (FARS) Encyclopedia.

import goes to its transportation sector – amounting to billions spent on transportation fuels that are produced outside of the state.[18] Furthermore, despite recent increases in domestic production, the United States is still a major importer of oil.[19] Consuming less oil enhances Michigan's energy security by shielding utility customers and businesses from the volatility of global oil markets that can disproportionately impact low-income drivers.[20] In contrast, retail electricity rates are relatively low and stable over the last quarter century in real terms: it costs approximately half as much to fuel an EV in comparison to a relatively efficient gasoline vehicle.[21] Over the long-term, MJ Bradley estimates that by 2050, Michigan drivers can experience a striking $23.1 billion in cumulative fuel and maintenance cost savings by switching to electric vehicles from their gasoline counterparts. Overall, accelerating the switch from gasoline to electric fuel aligns directly with the Commission's charge to "protect the public by ensuring safe, reliable, and accessible energy and telecommunications services at reasonable rates for Michigan's residents."

V. Barriers to Accelerating the EV Market

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[18] According to EIA, Michigan produced approximately 5.5 million barrels of oil in 2018. For reference, North Dakota produced 378.4 million barrels the same year. https://www.eia.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_a.htm; According to EIA, Michigan consumed approximately 169 million barrels of oil in 2015 and 138 million went to the transportation sector. https://www.eia.gov/state/seds/sep_fuel/html/pdf/fuel_use_pa.pdf

[19] U.S. Energy Information Agency, "U.S. Imports by Country of Origin" available at: https://www.eia.gov/dnav/pet/pet_move_impcus_a2_nus_ep00_im0_mbbl_a.htm

[20] U.S. Energy Information Agency, "Real Prices Viewer" available at: http://www.eia.gov/forecasts/steo/realprices/

[21] https://energy.gov/maps/egallon Assumes a gasoline vehicle achieves 28 mpg

Despite their many benefits, barriers to the adoption of EVs still exist. The National Academy of Sciences identifies a lack of charging infrastructure and lack of consumer education to be foundational hurdles to scaling light-duty transportation electrification.[22]

It is clear that an ecosystem of EV service providers (EVSPs) exists to provide charging infrastructure in Michigan.[23] These EVSPs have been successful in attracting early adopters of EVs, but there are barriers that may hinder their ability to deploy infrastructure necessary to prepare for widespread electrification. Unfortunately, without extremely high utilization rates, it is difficult for independent firms – whether they are site hosts or EVSPs themselves – to realize a profit in the time frame required for most private enterprises.[24] This problem may be acute for investments in DC Fast Chargers, which are much more expensive per unit than Level 1 or 2 charging stations today.[25] Next, automakers generally do not see themselves as the appropriate actor to make significant charging station investments. While Tesla has successfully built and operated a DC charging station network, we do not expect charging station deployment to become a core business of automakers, which did not enter the service station business to sell gasoline to gasoline-powered vehicles. Likewise, while state and federal programs have supported some of the existing charging network nationwide, public funding alone will likely not be sufficient to meet the scale of the challenge.

Automakers, governments, charging station companies, and other entities that deploy charging stations also currently face a market coordination problem that hampers the

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[22] Kassakian, John G., David Bodde, and Jeff Doyle. "Overcoming Barriers to Deployment of Plug-in Electric Vehicles." The National Academies Press. 2015.

[23] https://www.plugshare.com/#

[24] The EV Project, *Lessons Learned on the EV Project and DC Fast Charging,* April, 2013.

[25] For more information on the difference between Level 1, Level 2, and DC Fast Charging, please visit the U.S. Department of Energy Alternative Fuels Data Center: https://www.afdc.energy.gov/fuels/electricity_infrastructure.html

development of charging networks necessary to sustain the growing EV market. This market coordination problem – otherwise known as the "chicken and egg" dilemma – arises when the underdevelopment of one complementary or "networked" good leads to underdevelopment of the other networked good. In this specific case, low penetration of charging stations inhibits the growth of the EV market, and vice versa: *customers may be unwilling to purchase an EV if there is not sufficient charging network development, and charging station providers may be unable to build out a network with insufficient demand*. As a result, there is an under-provision of charging stations in this scenario. However, as charging stations are built out, the value of owning an electric vehicle increases and the EV market grows. This in turn may attract the deployment of additional charging stations by private entities. These trends are supported by researchers at Cornell University who analyzed network effects associated with quarterly EV sales in 353 metro areas and found, "the increased availability of public charging stations has a statistically and economically significant impact on EV adoption decisions."[26]

VI. The Role for the Commission and Utilities

The Commission's *Order* solicits input on its role in "developing alternative fuel vehicle" policies for utilities, as well as the role for utilities in "reducing/eliminating market barriers to deployment of EV charging stations."[27]

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[26] Li et al., *The Market for Electric Vehicles: Indirect Network Effects and Policy Design*, Cornell University, May, 2016 (finding that "a 10% increase in the number of public charging stations would increase EV sales by about 8% while a 10% growth in EV stock would lead to a 6% increase in charging station deployment"); Springel, *Network Externality and Subsidy Structure in Two-Sided Markets: Evidence from Electric Vehicle Incentives,* University of California, Berkeley, November 1, 2016 (finding that, in Norway, subsidies for electric vehicle charging stations were more than twice as effective at spurring EV purchases as equivalent subsidies for EVs themselves between 2010 and 2015).

[27] Commission *Order* at 6-7.

In addressing these issues, Commenters submit that the Commission should focus on three policy goals. First, to integrate EV load in a manner that maximizes the benefits of EVs to the environment, to the electric system and to utility ratepayers, while minimizing costs to the grid. Second, to address barriers to EV adoption, the Commission should focus utility efforts on the strategic deployment of infrastructure in locations that enable and support EV ownership. Finally, the Commission should ensure that utility investments support growth and innovation in the EV service providers' market, while also protecting consumers and addressing market need.

We address each in turn below.

a. Maximizing the Grid Benefits of EV Charging

As numerous studies make clear, EVs present utilities with a relatively flexible and manageable load because vehicles are only used for transportation purposes during a small fraction of the day.[28] If charging is managed to occur during off-peak periods, this new load can "fill valleys" in load without increasing overall capacity requirements. Similarly, EV load can be shifted to facilitate the integration of variable generation from renewable sources.[29] By increasing usage of standing assets, smoothing and shifting loads, and improving reliability, EV-charging can lower the marginal cost of electricity for all customers.

Maximizing these grid benefits requires treating EVs and EV charging as a distributed energy resource—like energy efficiency, distributed generation or storage—and developing policies and regulatory drivers (e.g., rate designs or demand response programs) which can capitalize on EV grid services. It also requires integrating EV charging into utility planning

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

[29] *Id.*

processes. To that end, we recommend the Commission adopt the following polices and practices:

- Develop and educate customers on EV-compatible, time-variant rate options, and require the use of time-variant rates in utility-EV programs (e.g., requiring that site hosts of charging stations take service on a time-of-use rate, or requiring customers use a time-of-use rate as a condition of receipt of a utility rebate for a home charging station);
- Require or encourage the use of networked charging stations and open standards to promote interoperability and support demand response capability in utility programs;
- Initiate demand-response programs which test EV-specific DR price points and capabilities, like those recently or currently implemented by Pepco, Southern California Edison, Pacific Gas & Electric, among others;
- Enable "Site Hosts" of EV charging stations to participate in green power programs;
- Test the use of on-site load management technologies for the deployment of Direct Current Fast Charging ("DCFC") stations, such as on-site solar and storage, to manage new and growing demand for fast charging services;
- Incorporate EVs and EV load into utilities' IRP processes, including consideration of: projected EV adoption based on vehicle registrations, vehicle sales, and/or market forecasts; EV driver charging patterns and behavior, which may be monitored through time-of-use pilots, or by reference to existing pilot reports or studies; and distribution circuit impacts based on possible or projected EV penetration.

b. Strategic Deployment of EV Charging to Overcome Market Barriers

In order to enable EV adoption, it is critical for would-be drivers to have access to infrastructure in "long-dwell time" locations where cars are most frequently located and available for charging. The typical electric vehicle is driven 4% of the time, is parked at home 50% of the time, and is parked elsewhere 46% of the time.[30] In most cases, the majority of time parked elsewhere is at the workplace. Unsurprisingly, the National Research Council of the National Academies of Sciences characterizes home charging as a "virtual necessity" for all EV drivers, and that residences without access to electric vehicle charging "clearly [have] challenges

[30] SC-2 at Figure 3.

to overcome to make PEV ownership practical."[31] Drivers are very unlikely to purchase an EV if they cannot charge at home.[32]

The National Research Council study also reports that charging at workplaces offers an important opportunity to increase EV adoption and to increase electric miles driven.[33] Access to electricity fuel at workplaces reduces "range anxiety," improves the EV value proposition, and can facilitate renewable integration.[34] Similarly, without access to DC fast charging, vehicle range can be a limiting factor, and inter-city or distance travel is often impossible or impractical for all-electric vehicle drivers.[35] In addition to inhibiting distance travel and exacerbating range anxiety, consumer research indicates that a "lack of robust DC fast charging infrastructure is seriously inhibiting the value, utility, and sales potential" of typical pure-battery electric vehicles.[36]

In sum, the evolving paradigm for charging infrastructure that comprehensively meets the needs of EV drivers is to supply Level 1 or Level 2 charging in places where people naturally park for extended periods and to supply DC fast charging along travel corridors (e.g., at highway rest stops) to enable extended travel.

c. Ensuring Utility Investments in EV Charging Support an Innovative and Competitive Market for EV Charging, While Protecting EV Drivers and Utility Ratepayers

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[31] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press at 9 (2015).

[32] *See* Adam Langton and Noel Crisotomo, *Vehicle-Grid Integration*, California Public Utilities Commission at 5 (October 2013).

[33] National Research Council of the National Academies of Sciences, *Overcoming Barriers to the Deployment of Plug-in Electric Vehicles*, the National Academies Press at 9 (2015).

[34] *Id.*

[35] Nick Nigro et al. Strategic Planning to Implement Publicly Available EV Charging Stations: A Guide for Businesses and Policymakers (2015) at 11.

[36] PlugShare, New Survey Data: BEV Drivers and the Desire for DC Fast Charging (March 2014).

Across the country, the infrastructure-related programs initiated or proposed by electric utilities have ranged widely: from rebates for the installation of EV charging equipment at home[37] or workplaces to the establishment of pilot or utility fleet EV charging programs[38], to the deployment of public-facing EV charging equipment, with costs fully borne by or divided among shareholders,[39] site hosts of charging equipment,[40] and utility ratepayers.[41]

For the latter category—where utilities have invested in public-facing charging infrastructure at multi-unit dwellings, workplaces, or in public locations and along charging corridors—there are several program models for utility investment and ownership. The so-called "make-ready" approach, referenced in the Commission's *Order*[42], provides one model for the ownership of EV charging stations and supporting infrastructure in context of a utility infrastructure investment. It can be contrasted with an "end-to-end" utility ownership approach. Each utility ownership model, as well as a third, "hybrid" model which incorporates elements of both, have been approved by the California Public Utilities Commission in three separate programs now being implemented by the state's investor-owned utilities: Southern California

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[37] *See, e.g.*, Letter from Kevin Queen, Manager, Regulatory Affairs, Georgia Power, to Reece McAlister, Executive Secretary, Georgia Public Service Commission (Oct. 24, 2014) (Doc. No. 155507), available at http://www.psc.state.ga.us/factsv2/Document.aspx?documentNumber=155507.Los Angeles Department of Water and Power

[38] *See, e.g.*, *PG&E and BMW Partner to Extract Grid Benefits from Electric Vehicles*, PG&E (January 5, 2015).

[39] *See supra* note 39.

[40] *See* Application of Louisvile Gas & Electric Company And Kentucky Utilities Company To Install And Operate Electric Charging Stations In Their Certified Territories, For Approval Of An Electric Vehicle Supply Equipment Rider, An Electric Vehicle Supply Equipment Rate, An Electric Vehicle Charging Rate, Depreciation Rate, And For A Deviation From The Requirements Of Certain Commission Regulations, Case No. 2015-00355 (filed November 13, 2015), Kentucky Public Service Commission.

[41] *See, e.g., Decision Regarding Underlying Vehicle Grid Integration Application and Motion to Adopt Settlement Agreement*, D.16-01-045 (filed January 28, 2016), California Public Utilities Commission.

[42] Commission *Order* at 6.

Edison (SCE), San Diego Gas & Electric (SDG&E), and Pacific Gas & Electric (PG&E).[43] These models have been replicated in programs that have been approved[44] or implemented[45] in other states, as well as several under consideration[46], and should provide a useful reference for the Commission. A fourth option may exist in the form of a rebate program, where a utility-granted rebate would cover part or all of the costs of an EV charging station and its supporting infrastructure, but such a model has yet to be implemented on any scale. With any approach, there is an important role for the Commission in ensuring the management of new EV load and protecting consumers, in addition to supporting the market for EV equipment and services.

First, in considering the utility role and ownership models, it is important to understand in some detail the structure of costs for vehicle charging and relation to the electric grid. The following diagram is a useful reference for discussion.

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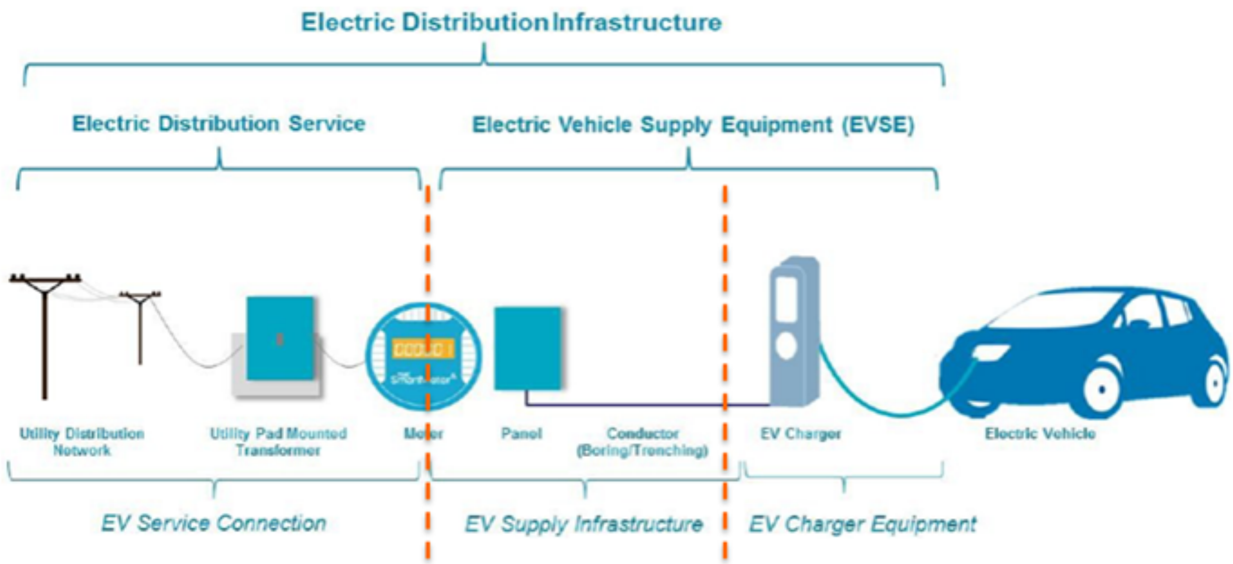
[43] SCE's program is a make-ready program; SDG&E has end-to-end ownership for its Vehicle-Grid Integration program; and PG&E's program will utilize a hybrid model, with ownership permitted in some market segments and make-ready required in others.

[44] *See, e.g., Order 01*, Docket UE-160082, Washington Utilities and Transportation Commission v. Avista Corporation d/b/a Avista Utilities (filed April 28, 2016), Washington Utilities and Transportation Commission (approving a tariff and pilot program for Avista to install, own and operate 270+ charging stations within its service territory).

[45] *See, e.g.*, Letter from Kevin Queen, Manager, Regulatory Affairs, Georgia Power, to Reece McAlister, Executive Secretary, Georgia Public Service Commission (Oct. 24, 2014) (Doc. No. 155507), available at

http://www.psc.state.ga.us/factsv2/Document.aspx?documentNumber=155507. (detailing a $12M expenditure to support its EV initiative, including investment for stations to be owned and operated by Georgia Power).

[46] *See, e.g.*, *Testimony on Grid Mod Base Commitment* at 90-124, Docket 17-05, *Petition of NSTAR Electric Company and Western Massachusetts Electric Company, each doing business as Eversource Energy, Pursuant to G.L. c. 164, § 94 and 220 C.M.R.) D.P.U. 17-05 § 5.00 et seq., for Approval of General Increases in Base Distribution Rates for Electric Service and Approval of a Performance Base Ratemaking* (describing Eversource's proposed $55 EV infrastructure investment, styled as a make-ready program).

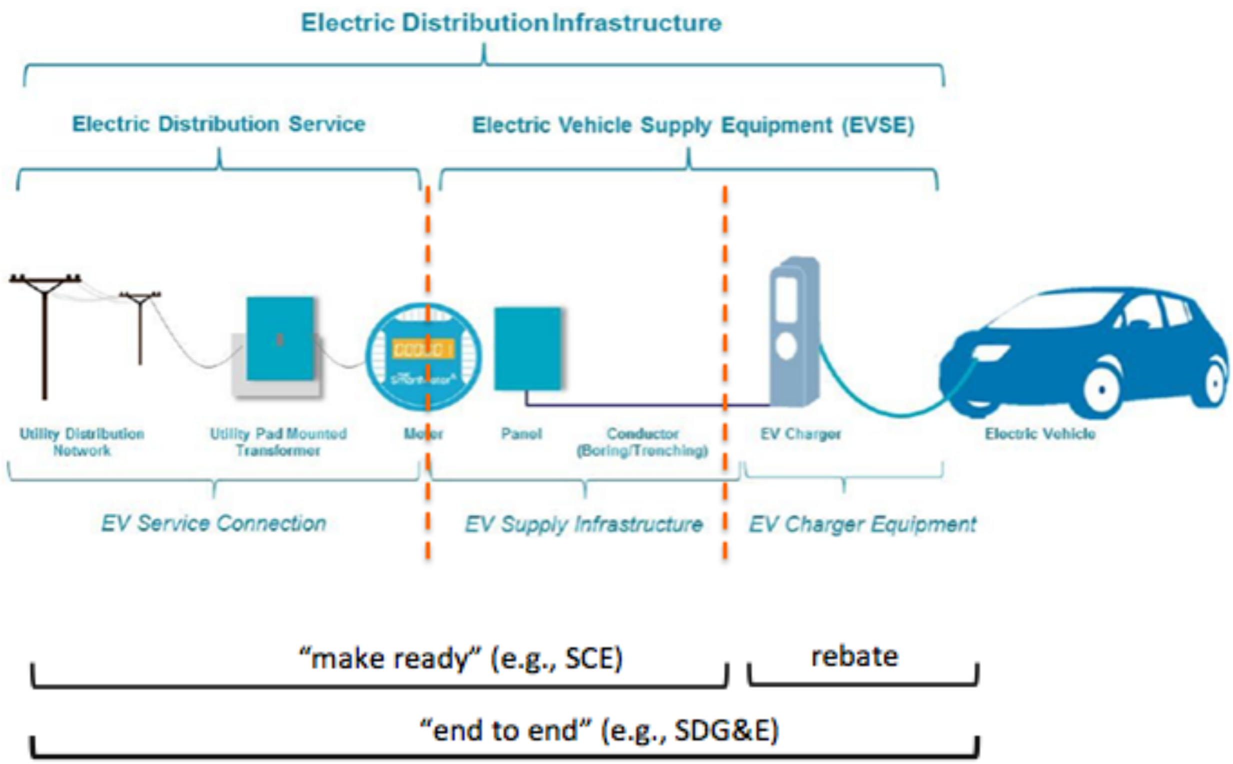


In general, EV infrastructure costs can be broken into three groups: the "EV Service Connection"; the "EV Supply Infrastructure"; and the "EV Charger Equipment." The EV Service Connection refers to that common utility distribution infrastructure, including transformers, utility services, and meters, which is ordinarily part of the regulated asset base. The EV Supply Infrastructure consists of the panels, conduits and wiring that support the EVSE. The EV Charger Equipment refers to the charging station itself (referred to elsewhere in these comments as "EVSE"). The software and hardware that comprise the EVSE are the locus of innovation in vehicle charging technology and business models.

In SCE's "make-ready" program, the utility invests in and owns the "EV Supply Infrastructure," as well as any necessary distribution upgrades that fall into the "EV Service Connection." It earns a rate of return on those capital investments. In addition, to offset the cost of the EVSE, the utility provides a rebate to the Site Host for a percentage of its cost. The Site Host (e.g., a landlord, or office park manager) retains ownership of the EVSE and is responsible for its upkeep, and the utility recovers the rebate cost as an expense.

By contrast, in SDG&E's "end-to-end" ownership model, the utility invests in and owns the "EV Charger Equipment" in addition to the "EV Supply Infrastructure" and any needed distribution upgrades. The Site Host is required to pay a "participation fee" to partially offset the cost of the EVSE, but the utility retains ownership and responsibility for operation and maintenance.

The two ownership structures are mapped onto the diagram below:



PGE&'s hybrid approach, by contrast, permits "end-to-end" utility ownership in critical and demonstrably underserved market segments (e.g., multi-unit dwellings, and any location within disadvantaged communities) while allowing only "make-ready" ownership in other market segments (e.g., workplace and public charging).[47]

[47] Early data from the implementation SCE's "make-ready" pilot and SDGE's "Power Your Drive" programs suggests that there is some wisdom to allowing a "turn-key" approach in certain market segments, like multi-unit dwellings. Deployment in multi-unit dwellings accounts for just five percent of

A critical takeaway from the California programs is that the "make-ready" model does not, alone, ensure competition, just as "end-to-end" ownership does not inherently hinder it. In any event, programs must be properly designed to (1) leverage market competition and (2) ensure accountability of Site Hosts and/or utilities.

The California PUC's decisions, which apply a case-specific balancing test for competition in addition to a ratepayer interest test, make clear that the question of who has title to the actual EVSE *is only one element of program design that relates to potential impacts on competition*. In each of the three cases, the more critical details for the California PUC related to the transparency and inclusiveness of the utilities' solicitation of EVSE (to avoid locking in "winners and losers" in the market), the opportunity for Site Hosts to select EVSE (to provide "customer choice"), and the ability of EV service providers to offer additional services. Ultimately, the same or similar program design elements to support competition were adopted in each program, illustrating that issues related to competition are more complex than the simple question of who retains title over the EV charging station.

Finally, it is important to note that, in the context of SCE's program, the California PUC set the terms by which SCE provided rebates to Site Hosts, even though the utility itself did not own or operate that equipment, but sought to fold the rebate costs into customer rates.[48] Put another way, to ensure accountability of Site Hosts and prudent use of ratepayer dollars, the California PUC judged it critical to exercise control over the program terms, including:

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deployment in SCE's pilot, despite the utility's increased outreach to potential site hosts in that segment. By contrast, about a 30 percent of San Diego Gas & Electric's likely site hosts in the "Power Your Drive" pilot, which includes utility ownership and operation of charging stations, are multi-unit dwellings. This suggests that landlords may prefer a turn-key approach, where do not have responsibility for procuring their own charging stations or ongoing maintenance.

[48] *Decision Regarding Southern California Edison Company's Application For Charge Ready and Market Education Programs* at 6-45, D.16-01-023 (filed January 14, 2016), California Public Utilities Commission

- Utility pre-qualification of equipment and guidance on system design to ensure EVSE and software meet quality specifications and is capable of grid integration;

- Ability of utility to claw back rebate payments and/or ownership of equipment if data show it is not being maintained or it is not operational a high percentage of time;

- Standards and network protocols to ensure consistent, easy user access and experience;

- Provisions to ensure load management needed to support the electric grid and provide the opportunity for drivers to realize the fuel cost savings that motivate EV purchase decisions. This issue can be most pronounced in a make-ready model, where third-party "Site Hosts" (e.g., building manager at a multi-unit dwelling) may retain discretion to set pricing and fees. Some measure of flexibility may be important to meet site-specific needs (e.g., a host of charging stations at a retail center may wish to offer charging for free, or set fees to move vehicles and improve station utilization), but that flexibility should be subject to reasonable regulatory guidelines that protect consumers, particularly in for market segments and use cases where drivers may face a "situational monopoly."[49]

In short, all program designs require careful Commission review and an opportunity for meaningful stakeholder engagement to ensure they are successful.

VII. Conclusion

Sierra Club, NRDC, Ecology Center, and ELPC thank the Commission for the opportunity to submit these comments and looks forward to working with the Commission, Staff and other stakeholders to support the growth of EVs in Michigan in a manner that lowers barriers to EV adoption, supports innovation in the EV service provider marketplace, and maximizes the environmental, electric system and utility customer benefits of EVs.

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[49] *See, e.g.,* Citizens Utility Board, *The ABCs of EVs: A Guide for Policy Makers and Consumer Advocates* at 7 (April 2017) (noting that "[a]ny public subsidies and utility support for independent charge station operators should be conditioned on their acceptance of regulatory guidelines" and observing that "[i]n an effectively competitive public charging market, competition would constrain prices and protect consumers, but the very fact that subsidies are needed to induce market entry shows that a robust market does not exist. When shopping for gasoline, there are usually multiple choices of where to fill up, but when a driver with a low battery pulls up to a remote public charge station, she may be facing a situational monopoly, with no choice but to pay whatever fees are assessed.").

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