A Shared Future: Electrification and Renewable Energy

featuring
Example State Legislation to Support Electrification Strategies
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AWEA Electrification and Utility Education Task Force Members

Paul Loeffelman, American Electric Power, Task Force Chair
Cary Kottler, Pattern Energy, Task Force Co-Chair
Brad Viator and Taylor Beis, Edison Electric Institute
Retired Kansas Representative Tom Sloan
Retired Maryland Delegate Sally Jameson
Retired Washington State Utilities and Transportation Commissioner and NARUC President Phil Jones
Noah Garcia, Pamela MacDougall, and Pierre Delforge, Natural Resources Defense Council

These contributions are meant to inspire, but not constrain policymakers, electricity providers, and other stakeholders as they work on electrification issues. In addition, policy and program news and updates from readers and stakeholders are welcome. They may be sent to Hannah Hunt at hhunt@awea.org.
### Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
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<tr>
<td>AELP</td>
<td>Alaska Electric Light &amp; Power</td>
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<td>AEP</td>
<td>American Electric Power</td>
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<td>BNEF</td>
<td>Bloomberg New Energy Finance</td>
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<td>CAISO</td>
<td>California Independent System Operator</td>
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<td>CEO</td>
<td>Colorado Energy Office</td>
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<tr>
<td>CPCN</td>
<td>certificate of public convenience and necessity</td>
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<td>DC</td>
<td>direct current</td>
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<td>DOE</td>
<td>Department of Energy</td>
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<td>DOT</td>
<td>Department of Transportation</td>
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<td>EPRI</td>
<td>Electric Power Research Institute</td>
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<td>ERCOT</td>
<td>Electric Reliability Council of Texas</td>
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<tr>
<td>ESP</td>
<td>Electric Security Plan</td>
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<tr>
<td>EV</td>
<td>electric vehicle (includes battery electric vehicles and plug-in hybrid electric vehicles)</td>
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<tr>
<td>EVSE</td>
<td>electric vehicle supply equipment</td>
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<td>GM</td>
<td>General Motors</td>
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<td>GW</td>
<td>gigawatt</td>
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<td>INL</td>
<td>Idaho National Laboratory</td>
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<td>ISO</td>
<td>Independent System Operator</td>
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<td>ISO-NE</td>
<td>ISO New England</td>
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<td>kW</td>
<td>kilowatt</td>
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<td>kWh</td>
<td>kilowatt hour</td>
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<td>L2</td>
<td>Level 2</td>
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<td>MISO</td>
<td>Mid-Continent Independent System Operator</td>
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<td>MUD</td>
<td>municipal utility district</td>
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<tr>
<td>MWh</td>
<td>megawatt hour</td>
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<td>NARUC</td>
<td>National Association of Regulatory Utility Commissioners</td>
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<td>NCSL</td>
<td>National Conference of State Legislatures</td>
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<td>NREL</td>
<td>National Renewable Energy Laboratory</td>
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<td>NYPA</td>
<td>New York Power Authority</td>
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<td>PG&amp;E</td>
<td>Pacific Gas &amp; Electric</td>
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<td>PGE</td>
<td>Portland General Electric</td>
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<td>PJM</td>
<td>PJM Interconnection</td>
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<td>PPA</td>
<td>power purchase agreement</td>
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<td>PSC</td>
<td>public service commission</td>
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<td>PUC</td>
<td>public utility commission</td>
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<td>PUCO</td>
<td>Public Utilities Commission of Ohio</td>
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<td>RIM</td>
<td>Ratepayer Impact Measure</td>
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<td>ROE</td>
<td>return on equity</td>
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<td>RTP</td>
<td>real-time pricing</td>
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<td>SEPA</td>
<td>Smart Electric Power Alliance</td>
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<td>SMUD</td>
<td>Sacramento Municipal Utility District</td>
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<td>SPP</td>
<td>Southwest Power Pool</td>
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<tr>
<td>TOU</td>
<td>time-of-use</td>
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<tr>
<td>TRC</td>
<td>Total Resource Cost</td>
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<tr>
<td>ZEV</td>
<td>zero-emission vehicles</td>
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Key Points for Modernizing State Electricity System Infrastructure to Accelerate End-Use Benefits for Consumers

1. Electrification provides multiple benefits that are in the long-term public interest of consumers and state economies.

2. Consumers are driving the nation towards an increasingly electrified future supported by a growing share of renewable energy including wind.

3. Building an electricity grid that supports these evolving consumer expectations requires infrastructure investments to be made, including but not limited to EV charging infrastructure, renewable energy additions, and transmission expansion.

4. The smartest way to approach these investments is to develop a comprehensive electrification strategy.

5. Electricity providers play a central role in managing the grid and delivering electricity to consumers, so they are well positioned to design and manage this strategy.

6. This support document is a resource for a growing number of electricity providers, state legislators, regulators, and other stakeholders developing electrification strategies and enabling critical infrastructure investments. As of December 2018, EV programs were established in approximately 20 states. Sample legislation, existing policies to date, and established electricity provider programs are provided in this document for stakeholders to customize to their specific needs and circumstances, especially where conflicting provisions already exist.
Executive Summary

In the past, electricity providers needed to provide reliable, adequate, and affordable energy to consumers through utility investments that were guided by legislatures and approved by regulators. While this is still true, consumers are now demanding additional benefits from their electricity grid and energy providers; namely, a system that also operates in a smart, clean, secure, and resilient manner. For example, consumers now want the grid to support electric vehicles (EV) and renewable energy.

Policymaker associations, including the National Association of Regulatory Utility Commissioners (NARUC) and the National Conference of State Legislatures (NCSL), recently adopted policies encouraging state-level actions by their members to meet these evolving consumer expectations through accelerated investments in electricity infrastructure modernization.¹²

Certain investments will increase electricity demand. Wind energy is ideally suited to meet that demand. This guidance document provides the tools and resources needed to help electricity providers, state legislatures, and public utility commissions (PUC) create and approve electrification programs, with a focus on how to effectively structure an electrification deployment program coupled with renewable capacity additions and transmission investment at the same time.³ Specifically, it includes example legislation which may be referenced as a tool for states considering enabling legislation for the first time or updating their existing laws.

The tools and resources in this guidance document are consistent with the Transportation Electrification Accord, a statement of principles signed by automobile manufacturers, electricity providers, industry organizations, and other businesses.⁴ The Accord outlines how policymakers can provide electricity consumers with transportation electrification benefits at the same time as they support a cleaner grid and EV charging infrastructure development.

Our focus is on helping to prepare electricity providers to meet evolving consumer expectations in a cost-effective and responsible manner. This means developing the infrastructure needed to meet increased consumer demand for EVs and renewable energy. This proposal provides the framework for a future where renewable energy powers electrification while integrating with traditional fuel sources in our diverse energy mix.
**Hand in Hand: The Rise of Electrification and the Growth of Renewable Energy**

Electrification, also known as energy conversion, is commonly described as the transition to electricity-powered end-use technologies, including EVs, air source heat pumps, heat pump water heaters, and other devices. Importantly, the electrification dialogue today focuses on applications for which electrification achieves other benefits such as cost savings for consumers, net reduction in overall energy use, and emissions reductions across multiple industries. Electrification that achieves some or all of these outcomes is often framed as "efficient electrification" or "beneficial electrification."

There is a growing body of evidence that electrification of the U.S. transportation, building, and industrial sectors will increase U.S. electricity demand in the long term. For example, the National Renewable Energy Laboratory (NREL) estimates in its 2018 Electrification Futures Study that electrification could boost electricity load growth up to 38% nationwide in comparison to a 2050 Reference Scenario baseline. In certain states, particularly in the Northeast, electricity demand increases over 50% against the baseline. The Electric Power Research Institute (EPRI) also estimates in its 2018 U.S. National Electrification Assessment that efficient electrification could lead cumulative electricity load in the U.S. to grow up to 52% from a 2015 baseline by 2050.

Importantly, transportation electrification is expected to provide the most significant demand increases, both in the near term and through 2050. NREL estimates that the U.S. could have as many as 240 million light-duty EVs, 7 million medium- and heavy-duty electric trucks, and 80,000 battery electric transit buses on the road by the middle of the century. Bloomberg New Energy Finance (BNEF), in its annual EV forecast, expects to see EVs capture 55% of global light-duty vehicle sales by 2040.

In the nearer term, the Rocky Mountain Institute estimates that there could be approximately 2.9 million EVs on the road in the U.S. by 2022, bringing over 11,000 gigawatt-hours of new demand to the electricity grid. Annual EV sales in the U.S. are already increasing rapidly, particularly in comparison to previous years. Approximately 200,000 EVs were sold in the U.S. in 2017, a significant increase from the approximately 17,000 vehicles sold in 2011. In addition, a 2018 AAA survey shows that 50 million Americans, or one out of every five drivers, will likely purchase an EV for their next vehicle purchase.

Transportation electrification is expected to provide the most significant demand increases, both in the near term and through 2050.
The Edison Electric Institute’s “Electric Transportation State Regulatory Overview and Framework” report summarizes the major benefits driving demand for EVs:

- **Consumer Benefits:** EVs have lower fuel and maintenance costs than traditional vehicles. The overall costs to purchase EVs are also falling rapidly, driven by a 79% reduction in lithium-ion battery prices over the past seven years. A proliferation of new models will make it increasingly easier for consumers to purchase EVs, with BNEF expecting 289 EV models to be available for purchase by 2022.

- **Environmental Benefits:** EVs help to reduce our carbon footprint. EPRI estimates 48%-70% greenhouse gas emissions reductions from 2015-2050 in a widespread transportation electrification scenario, assuming continued renewable energy growth over time.

- **Energy Grid Benefits:** EVs with managed charging capabilities offer flexible electricity demand and the ability to shift energy use across time. Load management through demand response and energy storage results in a more efficient and cost-effective electricity grid.

- **National Security Benefits:** EVs are powered by a mix of domestic energy sources. Policymakers at the state and local level across the country are recognizing their constituencies’ growing preference for EVs, as well as the benefits that come from transportation electrification, and are setting ambitious targets in response. In California, Governor Jerry Brown signed an executive order in 2018 calling for 5 million zero-emission vehicles (ZEV) to be on the road in California by 2030, equivalent to 20 percent of the 25.4 million automobiles registered in the state at the beginning of 2018. The 2018 Colorado EV Plan aims to have 940,000 EVs in Colorado by 2030. States that have adopted the California ZEV program model require an increasing number of ZEV sales – primarily EVs – through 2025. For example, the state of Maryland’s goal is to put 300,000 ZEVs on the road by 2025. At the local level, nearly 200 mayors have also committed to increasing the use of EVs in their communities.

As support grows for transportation electrification, and its long-term effects on electricity demand are better understood, we also see dramatic growth in and support for renewable energy generation across the power sector, with ample room to grow. Renewable energy provided a record A 2018 AAA survey shows that 50 million Americans, or one out of every five drivers, will likely purchase an EV for their next vehicle purchase.
17.6% of the nation’s electricity in 2017. Wind energy specifically provided a record 6.3% of total generation with solar energy providing an additional 1.9%. Looking to the past five years, renewable energy accounted for the majority of new capacity installations in the U.S. or approximately 60% of new installations.

Electric utilities are procuring renewable energy because of its well-documented contributions to grid reliability and affordability. A 2018 survey of approximately 700 U.S. electric utilities found that 76% of survey respondents expect to add a moderate to significant amount of wind energy to their resource mix over the next 10 years. Grid operators like the Southwest Power Pool (SPP) agree they can reliably and efficiently handle large amounts of wind energy on their system. "Ten years ago we thought hitting even a 25 percent wind-penetration level would be extremely challenging, and any more than that would pose serious threats to reliability," said Bruce Rew, Vice President of Operations for SPP. "Now we have the ability to reliably manage greater than 50 percent. It’s not even our ceiling." Wind power’s costs dropped by more than two-thirds in the past nine years, making it the cheapest source of new generation in certain regions of the country including Texas, the Plains States, and the Upper Midwest. An ever-increasing number of commercial and industrial customers are also investing in renewable energy because it provides stable, cost-competitive prices while helping to achieve internal sustainability goals. Renewable energy also receives broad and bipartisan consumer support. The Pew Research Center reported in 2018 that among American adults, 85% supported increased reliance on wind power, including 79% of Republicans and 91% of Democrats.

Importantly, it is possible to continue growing renewable energy in a reliable, resilient, and efficient manner. According to the Department of Energy’s (DOE) Wind Vision, wind energy can grow to supply approximately 10% of U.S. electricity demand by 2020, 20% by 2030, and 35% by 2050. Over a dozen wind integration studies by U.S. grid operators and others have found wind energy can grow to reliably supply at least 20-30% of total electricity on an annual basis, with some studies finding wind energy can provide 40% or more of total electricity. There are already four states today that reliably generate more than 30% of their electricity from wind power (Iowa, Kansas, Oklahoma, and South Dakota).

Continued growth depends on critical transmission investment to serve all energy sources. Transmission helps consumers access lower-cost electricity, facilitates robust electricity markets, improves electric reliability and resiliency, and contributes to a balanced and flexible grid. Importantly, evidence shows transmission upgrades more than pay for themselves in the long run as a result of increased reliability and economic benefits. For example, the Mid-Continental Independent System Operator (MISO) found transmission upgrades created benefits 2.6 to 3.9 times greater than their cost, equaling between $275-$1,000 for each person MISO serves. Transmission not only facilitates renewable energy integration but also brings economic and environmental benefits to consumers.
In the same manner that transmission investment helps to integrate renewable energy, electrification also enables continued renewable energy growth. Flexible electricity demand from transportation electrification, as well as demand-responsive electric water heating and space heating, provide controllable sources of electricity demand. These demand sources can help balance power system supply and demand, provide energy storage over short periods of time, and reduce incidences of peak demand. As a result, electrification paves the way for a continued transition to renewable energy.

Transportation electrification and renewable energy are not solely connected in the ways listed above. It is also well-documented that EV drivers are more likely to be interested in the source of their electricity and are more likely to support renewable energy integration. This preference is based on both the environmental and the economic benefits that come from using renewable energy to charge EVs.

Coincidentally, wind generation aligns well with demand from transportation electrification. In many areas, onshore wind generation tends to be strongest at night. The chart above illustrates average hourly wind generation across five U.S. Independent System Operators (ISO) across multiple regions of the country. Wind generation is shown to be consistent throughout the day, ramping up in the early evening hours, providing steadily higher output throughout the night into the early morning hours. These output changes are forecasted and planned for well in advance, with grid operators today having the technology and experience necessary to forecast and prepare for output changes in a manner that maintains grid reliability. In fact, modern weather forecasting technology provides a level of predictability to changes in wind and solar energy output. Wind energy generation also tends to be strongest in the winter months in most regions of the country. Residential and industrial sector electrification are expected to grow and shift peak electricity demand to the winter months in the coming decades, particularly in the Midwest and Northeast.

At the same time, research shows that EV drivers charge their vehicles most often overnight. An Idaho National Laboratory (INL) report evaluated the usage rate of 12,356 public and private charging stations located across nine states plus the District of Columbia over the course of one year. INL found that the percentage of charging stations with vehicles connected to them steadily increased overnight, approximately following the average hourly wind generation curve. These results occurred both during the week and on the weekend.

The INL report also assessed the charging behaviors of Wind power’s costs dropped by more than two-thirds in the past nine years, making it the cheapest source of new generation in certain regions of the country including Texas, the Plains States, and the Upper Midwest.
4,038 Nissan Leaf drivers over a 15-month period and found that the majority (68%) of all charging events were performed at home overnight. Those overnight home charging events also consumed much more energy per charging event than did the individual daytime charging events.

Overnight charging tended to occur without policies in place like time-of-use (TOU) rates and real-time pricing (RTP). Of course, these policies can be effectively used to further encourage specific charging behaviors. For example, INL examined the TOU rate San Francisco-based Pacific Gas & Electric (PG&E) offers to its consumers. INL found PG&E consumers significantly shifted their charging times in response to the TOU rate, whose off-peak rates began at midnight.

In addition, the DOE studied consumer charging behavior across multiple electricity providers and found consumers consistently took advantage of TOU rates when they were offered. It is evident that transportation electrification demand and renewable energy production complement one another.

The Need to Modernize the Grid with an Electrification Strategy

Consumers have made it clear they want their electricity grid to support both EVs and renewable energy. However, doing so will require investments to modernize our electricity infrastructure, including EV charging infrastructure, renewable energy additions, and transmission expansion. The smartest way to approach these investments is to develop a comprehensive electrification strategy - an electrification deployment program coupled with renewable capacity additions and transmission investment at the same time. It is in the best interest of the consumer that these investments occur in a balanced, secure, reliable, resilient, efficient, and affordable manner. Electricity providers play a central role in managing the grid and delivering electricity to consumers. Therefore,
with proper planning, they are well positioned to design and manage an electrification strategy.

A sense of urgency to act arises in part from a critical need for EV charging infrastructure across the country. The California Energy Commission estimates that, in order to reach current ZEV goals, the state will need up to 279,000 charging stations at workplaces, public locations, and multi-unit dwellings by 2025, far more than the 14,000 public charging stations available in the state at the end of 2017. Looking across the country, there were approximately 48,000 public charging stations installed at the end of 2017. NREL estimates that the U.S. will need millions more to support the number of light-duty EVs estimated to be on the road by 2050.

However, the Smart Electric Power Alliance (SEPA) reported in 2018 that most electricity providers (75%) are still in what SEPA defines as an “early” stage of planning for transportation electrification. These companies are exploring program options and assessing grid optimization opportunities but have mostly limited their proactive actions to acquiring fleet EVs and providing employee charging stations infrastructure. These activities rarely require regulatory approval due to the low level of investment required. An additional 23% of electricity providers were reported to be in what SEPA defines as an “intermediate” stage of planning, meaning they have developed and implemented at least one electrification deployment program such as an EV charging infrastructure incentives or a TOU rate. It is important to note that a large percentage of these programs were pilot or demonstration projects, not full-scale implementation. A much smaller share of electricity providers (3%) were reported to be in what SEPA defines as a “late” stage of planning, meaning they had developed long-term, strategic transportation electrification goals and designed an electrification deployment program aligned with applicable state legislature and PUC policies (see Appendix B for examples of approved electrification deployment programs).

There is also a time-sensitive need for transmission investment. The nation’s high-voltage transmission system represents one of the most critical national infrastructure priorities. A recent DOE Staff Report states that “transmission investments provide an array of benefits that include providing reliable electricity service to consumers, relieving congestion, facilitating robust wholesale market competition, enabling a diverse and changing energy portfolio, and mitigating damage and limiting consumer outages (resilience) during adverse conditions.” The report confirms significant near-term investment and development is needed, with inadequate transmission being reflected in current lengthy and costly interconnection queues across the country. To explain, all power projects must enter interconnection queues during the development process.

Case Study: General Motors

General Motors (GM) is a leader in the transportation sector, guided by a vision for a future with zero crashes, zero emissions, and zero congestion, addressing societal and environmental challenges while transforming the future of mobility. GM is the only U.S. automotive company committed to 100% renewable energy by 2050. The company currently purchases 371 MW of renewable energy, and by the end of 2018, renewables will power 20% of the company’s global electricity use. GM understands the nexus between renewable energy, EVs, and ultimately ZEVs. In October 2018, it was announced that the plant in Arlington, Texas, where it makes large SUVs operates on 100% renewable energy. This was made possible by the opening of the new Cactus Flats Wind Farm in Eden, Texas, that will power all GM offices and facilities in Texas, where about 10,000 people are employed. Wind and solar power investments not only help to green the grid that the fleet of EVs will rely on as their fuel, but also the power required to produce those vehicles. GM will add to its current fleet by launching at least 20 new, all-electric models by 2023, positioned to lead in key EV markets (U.S. and China).

GM’s vision for EVs ties back to its overall view of sustainability. According to the new GM sustainability report, their portfolio will be built on an all-new modular EV platform with agile battery technology. This allows a building block approach that meets changing consumer demands and supports multiple drive configurations across geographic regions at lower costs. They see the flexibility of this approach as crucial in driving towards a future that is both all-electric and profitable.

GM recognizes the value in partnerships with energy suppliers to build robust charging infrastructure and to improve the percentage of renewable power sources in the grid to maximize the value of EVs. GM is an active voice promoting and supporting public policy enablers for EVs such as harmonized industry standards, electrician training programs, advocacy for supportive state policies, utility engagement, sustainable infrastructure solutions, and EV awareness-building campaigns.
and be approved in order to connect to the grid. There were approximately 180 gigawatts (GW) of wind capacity and 188 GW of solar capacity waiting in interconnection queues nationwide at the end of 2017. A significant percentage of these projects will not be realized due to a lack of available transmission capacity. Although proactive transmission planning is time-intensive and complex, it is critical for grid operators, electric utilities, and PUCs to coordinate as soon as possible on transmission investment to fully realize the benefits that renewable resources could provide for all electricity consumers.

Of course, for electric companies considering the right time to procure renewable energy, the time is now. Wind energy has reached historically low prices according to the DOE. Average wind power purchase agreement (PPA) prices fell to approximately $20/megawatt hour (MWh) nationwide in 2017. This represents a two-thirds cost reduction since 2009. To illustrate, Xcel Energy’s recent Colorado solicitation for new energy resources resulted in over 400 bids for mostly renewable energy projects. Wind projects offered the lowest median bid of $18.10/MWh followed by wind with solar at $19.90/MWh and wind with battery storage at $21.00/MWh.

The Role of the Electricity Provider

Electric utilities play a central role in managing the grid and delivering electricity to consumers. Infrastructure development is a core competency for these organizations. With proper planning, electricity providers are well positioned to design and manage a comprehensive electrification strategy focused on an electrification deployment program coupled with renewable capacity additions and transmission investment at the same time:

- Electricity providers can procure renewable energy needed to serve electrification demand, either through PPAs or through direct investment and ownership. They can also make critical transmission investments needed to bring wind and solar resources to consumers, and coordinate with grid operators on proactive transmission planning strategies.
- Electricity providers can leverage capital resources to fund an electrification deployment program. Whether the utility chooses to pursue direct investment and ownership of charging infrastructure, or an alternative business model partnering with third parties, the charging infrastructure market benefits in all scenarios. Capital investment encourages competition to provide charging products and services, supporting the overall market. This is particularly true in market segments that might not otherwise be able to deploy charging infrastructure, such as in multi-unit dwellings, direct

Georgia Power

Georgia Power first witnessed a wave of customers purchasing EVs after the state legislature passed a tax credit worth up to $5,000 for a single EV purchase. With over 20,000 EV drivers registered across the state today, the utility supports this new demand for charging infrastructure with a number of innovative programs.

The utility launched a two-year pilot program in 2014 offering business consumers a $500 rebate for installing L2 chargers. Through that and other programs, the utility incentivized over 1,300 commercial charging stations and 1,000 residential charging stations to be built. It also invested in 37 DC fast charging stations placed in the Atlanta metro area and neighboring highway corridors.

Georgia Power also offers a TOU rate to residential customers. Those who charge their EVs during super-off-peak hours (between 11 PM - 7 AM) receive the lowest-cost rate available. In addition, Georgia Power offers day-ahead and hour-ahead RTP to customers that reach a minimum demand threshold. Georgia Power’s incentives and rate structures are amplified through proactive consumer education and outreach. For example, its “Will it Work™” program partners with EV manufacturers to provide demonstration vehicles for consumers to use and evaluate, either on-site or at Georgia Power’s Customer Care Center in Atlanta. Georgia Power also partnered with Lyft in 2018 to encourage EVs in rideshare applications.

Georgia Power serves multiple large consumers with ambitious electrification strategies and renewable energy procurement goals. For example, UPS plans to add electric delivery trucks to their Atlanta fleet in the near term and has a company-wide goal to be 25 percent renewable energy powered by 2025. For those with renewable energy goals, the Georgia PSC approved the Renewable Energy Development Initiative in 2017. The program allows the utility to procure up to 200 MW of renewable energy for eligible consumers to purchase for up to 30 years at a time.
Of course, for electric companies considering the right time to procure renewable energy, the time is now. Wind energy has reached historically low prices according to the DOE.
Creating an Electrification Deployment Program that Policymakers Will Approve for Consumers

An electrification deployment program will have a higher chance of success if it follows the principles below taken from the Transportation Electrification Accord, which reflects broad stakeholder support. There is no one perfect way to design an electrification program, but following these principles can increase the likelihood of investment approvals:

- There is a clear case for electrifying transportation, which can provide benefits to all consumers (including the socioeconomically disadvantaged), advance economic development, create jobs, provide grid services, integrate more renewable energy, and cut air pollution and greenhouse gases.
- Electrified transportation should include, not only light-duty passenger cars, but also larger vehicles (e.g., transit buses and delivery trucks), as well as off-road equipment (e.g., airport and port electrification equipment).
- Accelerating an appropriate deployment of EV charging infrastructure based on market penetration projections along highway corridors, as well as throughout local cities and towns, is a critical element of electrifying transportation.
- It is critical to support electric transportation at the state and local government levels, whether it be through governors, state legislators, state commissions, state transportation agencies, state energy offices, mayors, or local governments.
- Electric utilities regulated by state and local commissions and boards, who serve the interests of the state and the public at large, have made substantial progress in accelerating the retirement of costly and less efficient fossil generation, and are poised to continue to make progress in promoting innovation, spurring greater grid efficiencies, and reducing harmful air pollution.
- Under appropriate rules, it is in the public interest to allow investor-owned and publicly-owned utilities to participate in and facilitate the deployment of EV supply equipment (EVSE) and/or supporting infrastructure for residential and commercial applications in their service territories to accomplish state and local policy goals. The distribution grid is incorporating new grid-edge features such as advanced demand response and distributed energy storage. In that broader context, utilities are well positioned to ensure that installed EVSE, whether owned by utilities or other parties, maximizes the public benefits of these innovations, through appropriate integration of these technologies in order to maximize electrical system benefits for all classes of consumers.
- The build-out of EVSE must optimize charging patterns to improve system load shape, reduce local load pockets, facilitate the integration of renewable energy resources, and maximize grid value. Using a combination of time-based rates, smart charging and rate design, load management practices, demand response, and other innovative applications, EV loads should be managed in the interest of all electricity consumers.
- To drive innovation and foster competition in the transportation electrification space, it is vital that open charging standards or protocols are adopted for both front-end and back-end interoperability. An open system also promotes greater transparency of vital data and information, which can be shared with a variety of innovative companies. The guidelines developed by the Open Charge Alliance should be used as the baseline. Data developed by third parties from behind-the-meter devices should also be made available to utilities for use in planning system architecture and EVSE.
- Consumers and EV owners will benefit greatly from a smart, efficient, and open architecture throughout the EV infrastructure. Ensuring interoperability throughout the EV architecture means that consumers should be able to roam easily among the different networks, with a common identification and authentication process, with as little hassle as possible. In addition, key consumer protection principles should be adhered to for all deployed EVSE regardless of the EVSE owner, including transparent pricing and open access policies. Drivers who charge in a manner consistent with grid conditions should realize fuel cost savings. Mapping locations and signage of the stations should also be provided for all consumers.
- Utilities should proactively engage their regulators, consumers, and all stakeholders in developing rate designs, infrastructure deployment programs, and education and outreach efforts that benefit all utility customers and allow reasonable cost recovery, while accelerating widespread transportation electrification that supports a reliable and robust grid.
- Best practices, standards, and codes should be a priority for all transportation electrification infrastructure installations. As new open standards and more advanced security measures are developed, these should be implemented in a timely manner by all operators of EVSE. It is critical that industry participants continue to collaborate on consistent communication protocols between the vehicle, infrastructure, and grid to ensure system safety, security, and reliability.
In addition to the principles laid out in the Transportation Electrification Accord, there are other important elements to consider when designing an electrification program:

- Recognize that electric companies are all different, with unique geographies and consumer demographics. Utilities will need to customize their approaches according to on-the-ground circumstances, goals, and constraints, with no one-size-fits-all strategy.
  - The electric utility sector includes over 3,000 public, private, and cooperative utilities. Investor-owned utilities serve the majority of the U.S. population, with the remainder served by municipal utilities, public utility districts, rural electric cooperatives, and others. Certain companies are vertically integrated, meaning they provide the full suite of generation, transmission, and distribution services to their retail consumers. Others provide a subset of the full services listed above. All have a unique consumer base with specific consumer classes, including residential, commercial, industrial, and agricultural consumers, among others. These electricity providers also exist within regulatory structures that differ by state. Most are required, either through state legislation or regulation, to submit planning and investment efforts to state PUCs for review. These review processes vary significantly, however, and state-specific regulations will affect individual electrification programs and timelines.

Utilities will need to customize their approaches according to on-the-ground circumstances, goals, and constraints, with no one-size-fits-all strategy.

- Regulators, legislators, consumer advocates, and other stakeholders should recognize that an electrification program will impact both the company and its consumers.
  - Similar to other grid modernization activities, electricity providers should conduct efficient and
Case Study: Siemens

Siemens Corporation is a global company focused on electrification, automation, and digitization. Siemens is uniquely positioned to bridge the transportation, energy, and technology sectors to create solutions for the advanced energy economy. Siemens is a leading provider of eMobility technologies: hardware, software, and services from electric vehicle chargers through grid interconnection to full integration with utility operations and wholesale power markets. At Siemens, it is referred to as Plug to Grid™.

Recently Siemens announced its new eMobility Calculator tool, which will help to estimate the infrastructure requirements and potential effects of eMobility in cities over the next 30 years. This tool helps cities plan for the growing electrification of transportation, by identifying EV charging infrastructure requirements and showing how to minimize impacts on power grids and roads. The tool provides crucial estimates on the number of chargers required to facilitate various levels of EV deployment. The eMobility calculator forecasts that a city like Los Angeles would need to begin today, installing up to 100 EV chargers per week to meet the rapidly growing demand for eMobility. Through increasing the electrification of personal and public transportation, including associated ride sharing, the city could potentially even reclaim land now dedicated to parking. This is part of a larger Siemens’ study on “Powering the Future of Urban Mobility.” This report looks at long-term sustainability planning in cities and the complex topic of the evolution of transportation.

The company’s work extends to sophisticated management of energy storage devices. Siemens recognizes the role a growing number of EVs could provide for the grid. Their batteries can be used for load shifting to take advantage of solar and wind energy at times of abundance, backup power for homes during outages, and even sending electricity back onto the grid as needed. Siemens has various software solutions that enable this by adjusting the battery charging based on fluctuations in the grid and controlling the direction of power flows. The result is a stabilizing effect during times of peak demand and enabling the transition to a higher penetration of renewable energy on the grid. Siemens has expertise across the value chain for renewable energy including majority-owned Siemens Gamesa Renewable Energy, which is focused on wind. Siemens’ expertise supports both policymakers and customers in realizing their vision for the future of transportation, and the nexus between eMobility and renewable energy.
• Providing data privacy protections as needed
• Reforming outdated regulations that prevent or discourage electricity providers from incentivizing electrification
• In regard to charging infrastructure, consider all technology applications with a focus on providing a cost-effective and optimal mix of options
  ◦ Charging station technologies that are currently commercially available include Level 1 (L1) and Level 2 (L2) chargers as well as DC fast chargers. All EVs have L1 chargers that plug into a standard wall outlet, but this method requires a significant amount of time to provide a full charge and provides less load management capabilities to the grid. L2 and DC fast chargers significantly reduce charging time, with DC fast chargers providing the fastest charging time at the highest cost of installation.
  ◦ Other near-future technology charging options exist but are not currently commercially available. Policymakers, regulators, consumer advocates, and electricity providers should examine the costs and benefits associated with investing in near-future technologies, balancing these investment opportunities with an imperative to provide a cost-effective and optimal mix of options. More advanced technologies may include certain forms of catenary charging, inductive or wireless charging, and battery swapping. Most of these technologies are more applicable to electric bus fleets or freight transportation than they are to light-duty vehicles.

Of course, an electrification deployment program is just one component of a comprehensive electrification strategy. A comprehensive strategy better acknowledges the need for infrastructure modernization and responds to consumer demand for the grid to support both EVs and renewable energy.

As stated in the Accord, under appropriate rules, it is in the public interest to allow electricity providers to participate in and facilitate the deployment of EV charging infrastructure in their service territories.
Example State Legislation to Support Electrification Strategies

As stated above, state legislatures are a critical stakeholder for electricity providers as they pursue electrification strategies. The example legislation below was drafted with the intention of enabling each state to tailor the legislation according to its own needs and circumstances. As such, existing conflicting legislative provisions should be modified or eliminated that would prohibit or impede electrification defined by the sample legislation.

Example State Legislation: Grid Modernization and Consumer Benefit Act

Intent

The Public Utility Commission (PUC) may, in addition to previously enacted requirements, evaluate and approve proposed electric utility investment plans, rate filings, and other filings in terms of accelerated activities related to the multi-year or long-term public interest in a sensible program including but not limited to:

- Consumer use patterns and expectations related to end-use technological innovations that are being adopted by state residents
- Evolving economic development opportunities requiring infrastructure deployment prior to the formal development investments being made
- Validation, in terms of technical performance and addressing, as appropriate, the safety, security, reliability, resiliency, efficiency, and other consumer benefits, of the technological innovations to serve the public interests
- Changes to the design, operation, and maintenance of the electric system to serve the public interest

The Commission may authorize alternative rate recovery mechanisms, including but not limited to forward-looking test years. The forward-looking test years would be designed to permit the electric utility to project the impact of anticipated and documented evolving consumer use patterns and expectations, as well as changing electric utility and/or consumer technologies.

Title I: Findings

The Commission is responsible for ensuring that proposed electric utility investment plans, rate filings, and other filings are in the long-term public interest, and that all related costs are prudently incurred and recovered in a just and reasonable manner that provides consumer benefits. Those consumer benefits include but are not limited to a modern electricity grid that operates in a safe, secure, resilient, reliable, and efficient manner.

In order to provide said benefits in a modern age, where technological innovations including but not limited to electric vehicles (EV) are being adopted by state residents at a rapid pace, it is increasingly necessary for electric utilities to plan infrastructure investments that meet evolving consumer use patterns and expectations. Given that these infrastructure investments have capabilities including but not limited to load management through demand response and energy storage capabilities, these investments can enhance and contribute to a more modern and efficient electricity grid.

And as the Commission is focused on the long-term public interest, these infrastructure investments provide opportunity to proactively invest in technological innovations with mid- to long-term consumer benefits, not just short-term benefits. Making said investments and upgrades on an accelerated basis in sensible programs approved by Commissions will further enhance consumer benefits in the most expeditious manner possible, provided the Commission ensures they are in the long-term public interest, and that all related costs are prudently incurred and recovered in a just and reasonable manner that provides consumer benefits.

It is in the public interest that electric utilities make investments in their electric transmission and distribution systems to accommodate the rapid pace of technological developments and meet increasing consumer demand and expectations of benefits from an electric system. As such, it is expected that the PUC will work to support electric utilities’ sensible programs for all technology innovations, in addition to those specifically described in this legislation.

Alternative rate-recovery mechanisms that include, but are not limited to, forward-looking test years may help eliminate near-term financial barriers of traditional ratemaking policies and provide consumer benefits at the same time.

Title II: Staying Up to Date on Technology Innovations

It is in the public interest for the Commission to have all necessary and up-to-date information on technological innovations being adopted by state residents, including validation of the technological innovations to serve the public interests.

As such, a coordinated stakeholder process will be developed and used by the Commission, and led by a state agency, preferably the Commission, to educate the Commission, the legislative branch, the executive branch,
Chief among them are products and services around EV charging. Thus, discussions with EV charging equipment manufacturers, installers, convenience stores, rest stops, environmental stakeholders, and others should all be part of the discussion about building new infrastructure.

- Consumer education: With new technology comes a need for product awareness. This is not limited to events like ride and drives, but also includes familiarization with the technologies that charge the vehicles, discussions about the simplification of the motors that drives these vehicles, and subsequent reduction in vehicle maintenance, lowering their total energy cost.

- Charging infrastructure deployment: One of the primary barriers to broader EV adoption is access to charging infrastructure. Electric companies can help. A charging infrastructure strategy should include an assessment of needs and identification of potential providers. Given the expertise electric companies have in all things electricity, including them in the conversation and giving them the chance to participate in the market may make sense.

- Environmental impact: With tailpipe emissions now accounting for more carbon in the atmosphere than any other source, attention should be given to reducing those emission impacts. EVs emit 54% fewer carbon dioxide emissions per mile than the average new gasoline car, with potential to produce even less over time as renewable energy generation increases.74

Further, electric transportation should be a broader conversation than just EVs. To ensure equitable access to these clean vehicles, consideration should be given to the electrification of the mass transit fleet to include city buses, school buses, and light rail.

**Title IV: Investment Recovery Approvable by the Commission**

The Legislature recognizes that Commission decisions should support electric utilities’ efforts to meet consumer expectations, provided the Commission ensures they are in the long-term public interest, and that all related costs are prudently incurred and recovered in a just and reasonable manner.

Accordingly, investment recovery options are hereby established. A variety of approaches and factors are available:

- On a biennial basis, electric utilities will develop and submit to the Commission a 5-year plan and a 10-year plan for EVs and related infrastructure investments with the goal of “widespread transportation electrification,” until such time as the Commission determines that it is no longer necessary for such plans to be filed.
Once the Commission has reviewed and approved said plans, the utility should receive a positive signal to proceed with investments, recognizing that prudence will be reviewed in a future general rate case.

At the same time, the Commission will issue policy guidance pre-rulemaking to govern both planning and market transformation and ultimately cost recovery issues.

For states with a certificate of public convenience and necessity (CPCN) requirement, capital investments in the 5-year or 10-year plan will be presumptively judged to satisfy the standards of a “need determination” and “used and useful” under a pre-approval type mechanism, or a multi-year rate year type mechanism.

For those states without a CPCN requirement, the “used and useful” standard will be waived for capital investments in the 5-year or 10-year plan, subject to Commission terms.

It will be possible to use deferred accounting treatment (ASC 980) for electric utility infrastructure investments over a multi-year period. These investments will be regarded as “intelligent investments” eligible for a return on cost recovery, subject to Commission rules, and a return on equity (ROE) approved by the Commission. Such ROE should be applied in a consistent fashion.

If using a rebate approach, it is preferable to include the rebate as a capital asset either under a deferred accounting approach or a traditional rate base approach.

For investments in zero-carbon sources of generation, such as wind and solar energy, provides cost recovery options. Investments might be linked to transportation electrification. Acquisition of the generation sources should be consistent with the electric utility’s integrated resource plan, if it exists, and the multi-year plan for EVs and related infrastructure investments. If so, the CPCN requirements will be deemed to be satisfied, and the “used and useful standard” will be waived.

Title V: Incentives

The Legislature recognizes that consumer interests in specific vehicle fuels and technologies directly and significantly impact electric utility investment decisions and that PUC decisions should support electric utilities’ efforts to meet consumer expectations. Commission decisions should also reflect electric utilities’ efforts to improve the efficiency, reliability, and resilience of the energy supply system to cost-effectively meet those consumer expectations and preferences.

Accordingly, incentive options are hereby established, including but not limited to those below, and shall be administered by the Department of Revenue.

Electric utilities will have a property tax exemption for five years for EV charging stations that are accessible to the public. For the purpose of property tax exemption, such charging stations will include the actual device necessary to connect the electric distribution or transmission system to the vehicle, the interconnection equipment, and other infrastructure as necessary to permit consumers to safely and conveniently charge their vehicles.

Electric utilities constructing EV charging stations shall be sales tax exempt for purchases directly related to the construction of the stations.

No local or state regulatory approval will be necessary if the EV charging stations are located on electric utility property, or the property of a commercial enterprise that sells other types of motor fuel, or willingly contracts for such a unit, and the utility approves the siteing on the basis of distribution system adequacy.

EV charging stations owned by an electric utility shall be price regulated by the PUC.

EV charging stations not owned by the electric utility shall not be price regulated by the PUC but shall be monitored by the Attorney General’s Consumer Protection Bureau.

Electric utilities shall have no liability for the operation of EV charging stations other than to establish interconnection protocols for physically connecting the charging station to the electric utility’s infrastructure and requiring normal maintenance of such interconnections.

Commercial enterprises that install a publicly accessible EV charging station, whose interconnection with the electric utility has been approved, shall have a property tax exemption for five years for the necessary infrastructure.

No local or state regulatory approval for a commercially owned EV charging station is required if the utility approves the siting of the facility on the basis of distribution system adequacy.

Resale of electricity through an EV charging station commercially owned shall not constitute the seller as a public utility for PUC or other regulatory purposes.

EV charging stations owned and operated by a public utility that provides electricity generated from renewable resources including but not limited to wind and solar energy shall have a 10-year property tax exemption.

EV charging stations owned and operated by a commercial enterprise that use renewable energy as defined by state statutes shall have a 10-year property tax exemption.
Electric utilities owning and operating EV charging stations that use renewable energy as defined by state statutes are authorized to earn ½ of 1 percent higher return on equity for those operations.

EV charging stations owned and operated by a commercial enterprise may directly purchase the necessary electricity from renewable energy and such purchases shall not constitute retail wheeling nor violate other PUC limitations on such purchases if the public utility has been given 60 days to provide the necessary renewable energy and is unable or unwilling to do so. The public utility shall charge Commission approved rates for the delivery of the energy to the commercial charging station.

Commission may establish rates by which electric utilities may withdraw electrons from voluntarily participating owners of EVs to serve the grid.

The Department of Revenue is authorized to develop such rules and regulations necessary to implement the Legislative intent of this bill.

Title VI: Education and Outreach

The Legislature recognizes it is in the public interest for proposed electric utility investment plans, rate filings, and other electric utility filings to include an active and ongoing education and outreach plan. The plan will educate consumers on technological innovations, accelerating market transformation as a result. The Commission may determine the appropriate parameters and associated costs for such activities.

The scope of activities in the education and outreach plan may be broad in nature, including but not limited to:

- Outreach to automobile dealers and their trade associations, automotive insurance companies, financial industries, non-profit organizations, city and county governments, school district, commercial delivery fleet companies, and EV owners
- Deliberative polling exercises
- Interactive web platforms with educational portals for consumers
Conclusion

Consumers are driving the nation towards an increasingly electrified future supported by a growing share of renewable energy. This guidance document shows how electrification, particularly in the transportation sector, will boost long-term U.S. electricity demand. At the same time, it illustrates how the power sector expects dramatic growth and support for renewable energy. The encouraging news is that wind energy is an ideal resource to meet electrification demand, thanks to its complimentary generation profile and consumer preference for the technology.

However, building an electricity grid that supports these evolving consumer expectations requires infrastructure investments to be made including EV charging infrastructure, renewable energy additions, and transmission expansion. The smartest way to approach these investments is to develop a comprehensive electrification strategy. As electricity providers play a central role in managing the grid and delivering electricity to consumers, they are well positioned to design and manage this strategy.

It is our hope that the sample legislation included in this guidance document will be used as a resource for states considering legislation that could enable critical infrastructure investments. State legislatures will be a critical stakeholder for electricity providers moving forward as they pursue their electrification strategies.

Case Study: Xcel Energy

Xcel Energy is a Minneapolis-based electric utility committed to delivering renewable energy and reducing carbon emissions. This commitment has led Xcel to launch a new initiative to promote EVs. Xcel Energy subsidiary Northern States Power Company is particularly focused on pairing their robust wind energy resources with EV charging infrastructure to provide consumers with the cleanest energy to charge their vehicles.

Xcel has a series of EV pilot projects that are targeted at three core markets: home, fleet, and public charging. Their residential service pilot launched in late August 2018 and focuses on encouraging more EV drivers to take advantage of lower rates during nighttime hours when there is more cheap wind energy on the grid. Mathias Bell, who oversees EV initiatives for the utility, states that "home charging is a good match for us...we want our customers to charge at night as much as possible." Xcel Energy operates in a geographic area with rich wind resources, which they are tapping into to provide consumers with low-cost renewable energy. More than 20% of Xcel's energy supply across their portfolio comes from wind energy—about seven times the wind generation that was on their system in 2005. They have plans to grow their wind portfolio an additional 55% by the end of 2021, including 12 new wind farms in seven states that will add nearly 3,700 MW of new wind capacity to their system.

The increasing percentage of wind energy within Xcel’s portfolio means that the electricity used to charge a growing fleet of EVs is becoming cleaner every year. Charging at home overnight also provides new demand for wind power. In 2015, the PUC approved lower retail electricity rates for consumers who charge their EVS at home overnight. Xcel set its late-night EV rate at a 40% discount compared to its normal rates.

Xcel Energy’s leadership on renewable energy complements their growing efforts to support EV expansion within their service area. EVs that are charged at strategic, convenient times for consumers have the potential to pair with renewable energy by making use of the grid when there is abundant low-cost renewable energy.
Appendix A:
Examples of Enabling State Legislation, Regulatory Orders, and Other Policies

Colorado

In 2013, the Colorado Energy Office (CEO) and Regional Air Quality Council (RAQC) created the Charge Ahead Colorado program to provide grants for EVs and community-based charging stations. The grant program funds up to 80% of the cost of chargers, including up to $9,000 for L2 chargers and $30,000 for Level 3 chargers. As of January 2018, the program had installed 600 charging stations. Colorado has provided a state tax credit in addition to the federal tax credit for residents purchasing an EV since 2014. In 2016, the Colorado General Assembly passed House Bill 16-1332 to allow residents to receive the $5,000 state credit at the time of the purchase instead of retroactively. Colorado signed the Regional EV West Memorandum of Understanding, along with seven other states, agreeing to begin developing plans to build transportation corridors with DC fast chargers. The CEO mapped out six transportation corridors to build DC fast chargers for EVs and awarded a $10.33 million grant to ChargePoint to build DC fast chargers across Colorado.82

Maryland

In December 2016, the Maryland Public Service Commission (PSC) initiated Public Conference 44 to review the state’s electricity distribution system to ensure it remains focused on providing consumers with “affordable, reliable, and environmentally sustainable energy”. The Commission identified EVs as one of the seven topics for consideration. This proceeding spurred the collaboration between utilities, environmental groups, and EV charging companies in the state to create a proposal for the “Statewide EV Portfolio.” The $104 million proposal plans for the build out of 24,000 chargers and includes rebates for chargers at residential, municipal utility district (MUD), workplace, and public locations as well as utility plans for TOU rates. The proposed program also includes funding for educational outreach, $5.1 million for consumer events, social media campaigns and community presentations. Participants praised the stakeholder process, saying that the wide range of contributors brought important perspectives to the discussion. This plan is in support of Maryland’s goal to reduce greenhouse gas emissions by 80 percent by 2050 and have 300,000 registered ZEVs on the road by 2025.85

Michigan

In April 2017, the Michigan PSC launched a collaborative process to review EV issues across the state, including a technical conference on alternative fuel vehicles. In August 2017, the PSC cohosted the conference with the Michigan Agency on Energy to discuss the deployment of EVs in the state along with the necessary charging infrastructure. The PSC specifically requested comments on whether utilities should create pilot programs to increase EV deployment, and if so, best practices that utilities should follow. In 2018, both Consumers Energy and DTE Energy submitted three-year plans to the PSC to invest in charging infrastructure.

Consumers Energy’s plan includes a $500 rebate for consumers when they purchase a new EV and sign up for the Nighttime Savers Rate, incentivizing consumers to charge at home overnight. The plan also includes a $5,000 rebate for a public L2 charger which can be located at workplaces, MUDs, or other locations and up to a $70,000 rebate for the installation of a DC fast charger. DTE Energy’s $13 million pilot program includes a $500-$2,800 rebate for residential EV consumers who purchase an L2 charger. In order to be eligible for the rebate, consumers must sign up for the TOU rate and other demand response programs the utility could implement over time. The pilot also includes $2,500 rebates for L2 chargers installed at MUDs, workplaces or other public locations and $20,000 rebates for DC fast chargers. The utility estimates that 32 DC fast chargers and 1,000 L2 ports will be installed over the three-year pilot program.

NARUC

In July 2018, the NARUC Board of Directors adopted Policy Resolution CI-1/EL-2 “Resolution Supporting Infrastructure Modernization Programs” to encourage state regulators to review opportunities for alternative rate recovery mechanisms for new technologies. The resolution recognizes the rapid development of renewable energy and EV technology as well as the investment required to ensure a smart, resilient, and efficient electric system. NARUC acknowledged that financial barriers can be avoided with alternative rate recovery mechanisms allowing investment in a modern grid.

NCSL

In August 2018, the NCSL Natural Resources and Infrastructure Committee adopted the “Reducing Barriers of Smart Community Infrastructure Advancement” policy resolution that promotes Smart Community technology that allows for more efficient transportation and renewable energy use. The resolution recognizes the benefits communities receive from these technology advancements and calls on federal agencies, including the DOE and the Department of Transportation (DOT), to create grant programs to support cities and states investing in Smart Communities. The resolution specifically calls for the reinstatement of the DOT’s 2015 “Smart City Challenge.” The program called on cities to pitch plans to advance their...
transportation systems to be cheaper, cleaner, and more efficient. Columbus, the winning city, received $40 million to implement its plan and additional $1-$6 million grants were provided to other finalist cities. Each finalist’s plan had an electrification component including investments in charging infrastructure; converting buses, garbage trucks and government fleets to EVs; and providing tax exemptions for EV customers. The plans listed air pollution as a leading reason to support electrification in their cities, citing health and safety concerns.

Ohio

The Public Utilities Commission of Ohio (PUCO) created PowerForward Ohio: A Roadmap to Ohio’s Electricity Future in order to review grid modernization steps for the state to facilitate innovation and improve consumer experience. As part of the process of creating PowerForward, Commissioners learned from over 120 speakers about consumer segmentation, utility needs, grid engineering, cybersecurity, and distributed resources like EVs and energy storage. The Commission noted that utility plans to modernize the grid must consider the power needs of EVs, specifically the increased demand with more residential charging stations and the need for transportation corridors with DC fast charging infrastructure. The roadmap acknowledged that because EV adoption is still in early stages, utilities can play an important role in developing EV charging infrastructure. The Commission plans to continue to monitor adoption rates of EVs and the effect they have on the system. PUCO noted the importance of regional planning of transportation corridor charging routes and hopes to facilitate utility participation in this planning process. As part of PowerForward, PUCO created working groups that will continue to advise the Commission on EV charging, battery storage, and distributed resource planning to inform future regulatory proceedings.

Oregon

Oregon’s Go Electric strategy plan is a holistic approach to encourage consumers, businesses, and utilities to invest in EVs and charging infrastructure. Oregon currently has 17,000 registered EVs in the state but has set a goal of reaching 50,000 by 2020. House Bill 2017 created a $1,500 rebate for customers purchasing or leasing new EVs and a Charge Ahead rebate of $2,500 for low- and moderate-income customers purchasing an EV. The state is using funds from the Volkswagen settlement to help invest in charging infrastructure along popular interstates including I-5 and I-84. The Oregon PUC is overseeing the implementation of Senate Bill 1547, passed in 2016, that requires utilities to design electrification programs to build EV charging infrastructure. The Oregon Department of Administrative Services includes charging stations as a priority for new parking lots as well as visitor parking lots.

Pennsylvania

In June 2018, Governor Tom Wolf signed Act 58 of 2018 into law to allow the PUC to approve alternative ratemaking by the electric, gas and water utilities it oversees. Utilities will now be able to submit proposals with alternative ratemaking mechanism like decoupling mechanisms, performance-based rates, formula rates or multiyear rate plans. Vice Chairman Place was quoted supporting alternative ratemaking mechanisms in order to allow energy markets to evolve with energy efficiency advancements and demand for EVs.
Appendix B:
Examples of Approved Electricity Provider Programs

Alaska Electric Light & Power
In November 2016, Alaska Electric Light & Power (AELP) extended their 2011 pilot program to provide EV charging rates for residential and commercial consumers. AELP's Rate 93 program provides a discounted rate for consumers that charge their vehicles between 10 PM - 5 AM, estimating that the average consumer could save $125-150 annually. Consumers who participate in this program are also eligible to rent an L2 charging station from the utility for $10.86/month.

American Electric Power
In April 2018, PUCO approved American Electric Power (AEP) Ohio's Electric Security Plan (ESP) to expand EV charging and renewable energy generation. The program invests $9.5 million to provide rebates for up to 300 L2 chargers and 75 DC fast chargers; 10 percent of which will be in low-income areas. AEP Ohio estimates that an average residential consumer, using approximately 1,000 kWh/month, will see their monthly bill increase by less than $0.50 due to the ESP.

Austin Energy
Austin Energy's EV360 program allows consumers to receive a fixed rate for unlimited residential charging between 7 PM - 2 PM on weekdays and anytime on weekends as well as unlimited charging at the more than 750 Plug-In EVerywhereSM ports anytime. Consumers pay $30/month for at home charging less than 10 kW of demand and $50/month for more than 10 kilowatts (kW) of demand. Consumers can also pay $4.17/month (or $50/year) for unlimited access to public charging at Austin Energy's Plug-In EVerywhere stations. The utility also ensures that EV360 consumers receive 100% renewable energy when charging during off-peak hours. Consumers that own an EV are also eligible for a 50% rebate, up to $1,200 for an L2 residential charging station and its installation.

Avista
In 2016, Washington Utilities and Transportation Commission approved Avista's EV Charging Program to invest $3 million to install 120 residential and 80 workplace or public EV chargers. The first 240 residential utility customers and first 175 business consumers to qualify receive a 50% refund up to $1,000 on the installation cost.

Duke Energy
In November 2017, the Florida PSC approved Duke's Park and Plug program to invest $8 million in 530 L2 chargers for MUDs, workplaces, and other public locations. The program will run through 2022. Duke also launched a three-year study called Charge Florida that reviews drivers charging habits to better understand consumer needs.

Eversource
In November 2017, the Massachusetts Department of Public Utilities approved Eversource's five-year plan to invest $45 million in 4,000 L2 chargers at workplaces, MUDs, and other public locations. The utility's proposal also includes a plan to install 72 DC fast chargers along travel corridors in the state.

Georgia Power
In 2014, Georgia Power launched a two-year pilot program to offer business consumers a $500 rebate for installing L2 chargers. The utility also invested in 37 DC fast charging stations in the Atlanta metro area and highway corridors. Georgia Power offers residential consumers TOU rates, incentivizing consumers to charge their EVs during super-off-peak hours between 11 PM - 7 AM.

Kentucky Utilities and Louisville Gas & Electric
In April 2016, the Kentucky PSC approved Kentucky Utilities’ and Louisville Gas & Electric’s programs to invest in L2 public charging stations. The charging stations, operated by the utilities, will charge $2.88 and $2.85/hour, pro-rated for the exact length of charging. Non-residential customers hosting charging stations pay a monthly fee for the charger ranging between $132-$302. The utilities are required to submit reports each year to the PSC on the number and use of charging stations.

National Grid
National Grid has installed over 150 EV charging stations in Massachusetts, Rhode Island, and New York that are accessible to the public. Consumers in upstate New York can opt in to a TOU rate and reduce their energy bill by moving electric use to off-peak hours between 11 PM - 7 AM. Residential consumers using an average of 650 kWh/month for home use and 360 kWh/month for off-peak EV charging save approximately $175/year. The utility has also committed to invest in buying EVs for its fleet and to provide workplace chargers for its employees. In June 2018, National Grid launched an online EV Marketplace, partnering with Enervee and National Grid Cars. The platform allows consumers to compare cars with different fuel types and efficiency ratings and provides lists of available tax incentives and rebates.
New York Power Authority

In May 2018, Governor Cuomo announced EVolve NY, a $350 million program with the New York Power Authority (NYPA) to expand EV charging infrastructure.114 The first phase of the program invests $40 million in interstate DC fast chargers, airport DC fast chargers, and EV friendly model communities. Model communities will test EV chargers and business services to facilitate consumer adoption of EVs. NYPA plans to install 200 DC fast chargers by the end of 2019. During the second phase of the program, NYPA will work with the Metropolitan Transportation Authority to transition the public bus fleet to electric.

NV Energy

In May 2018, the Nevada PUC approved NV Energy’s proposal to include utility owned and operated charging stations in its rate base.115 In June, the PUC subsequently approved the utility’s EV Infrastructure Demonstration Program to offer incentives for workplaces, municipalities, and MUDs to install EV charging infrastructure.116 NV Energy announced that the $15 million budget for the program could help double the number of chargers in the state.

Portland General Electric

In February 2018, the Oregon PUC approved Portland General Electric’s (PGE) three pilot programs to encourage EV adoption, totaling $3.8 million.117 The three programs include six electric bus charging stations for TriMet, an educational program targeted at utility customers about vehicles and charging infrastructure, and six utility-operated charging stations. In 2016, the state legislature set a state goal to increase transportation electrification; PGE’s program was in response to that directive.118

SMUD

SMUD allows consumers to choose between a $599 incentive or an L2 charger when they purchase a new EV.119 The utility also provides EV owners with Time-of-Day rates and a 1.5¢/kWh credit when charging between 12 AM – 6 AM.120 SMUD offers consumers rebate packages for home electrification technologies for up to $5,000 for new homes and $13,750 for existing homes.121 In the summer of 2018, the utility announced an 18-month pilot program called the EV Champions Initiative to offer EV Uber drivers free charging at SMUD charging stations as well as a $1.25 credit from SMUD and a $0.25 credit from Uber for each ride.122

San Diego Gas & Electric

In May 2018, the California PUC approved San Diego Gas & Electric’s proposal to spend $137 million on rebates and installation services for residential and MUD EV charging.123 The Residential Charge Program would cover up to 60,000 consumers. Participating consumers are eligible to enroll in an EV-only hourly TOU rate.

Southern California Edison

In May 2018, the California PUC approved Southern California Edison’s Medium- and Heavy-Duty Vehicle Charging Infrastructure Program to invest $343 million in charging infrastructure for trucks, buses and other heavy duty vehicles.124 The program includes 8,500 chargers at 870 sites. In June 2018, the utility also filed a proposal to invest $760 million in EV charging stations at workplaces, university campuses, MUDs, and recreational areas. The program states that 30% of the 48,000 charging stations would be in low-income communities.

Xcel Energy

Xcel has a series of EV pilot projects that are targeted at three core markets: home, fleet, and public charging.125 Their residential service pilot launched in late August 2018 and focuses on encouraging more EV drivers to take advantage of lower rates during nighttime hours.126 Xcel Energy operates in a geographic area with low-cost wind resources, which they are tapping into to provide consumers with low-cost renewable energy. More than 20% of Xcel’s energy supply across their portfolio comes from wind energy—about seven times the wind generation that was on their system in 2005.127
Endnotes


3. For the purposes of this report, an electrification deployment program is defined as a utility program that advances transportation electrification through the deployment of charging station infrastructure that contributes to a more efficient and cost-effective electricity grid.


18. Ibid.


33. Averaged data include hourly wind generation in 2017 across the Electric Reliability Council of Texas (ERCOT), MISO, the PJM Interconnection (PJM), and ISO New England (ISO-NE), as well as an hourly wind generation profile developed for use in the California Independent System Operator (CAISO) 33% RPS studies to represent wind projects in the CAISO footprint.


38. Myers, Erika, Medha Suramprudy, and Anshul Saxena, Utilities and Electric Vehicles: Evolving to Unlock Grid Value, SEPA,

39 In this context, transmission refers to lines, transformers, substations and other equipment with voltages of 100 kilovolts and above.


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