ZETA EDUCATION FUND

POLICY BRIEF

Powering the EV Market: How Electricity Providers are Planning for the Future

Contributing Authors: ZETA Communications and Policy Teams with the support of our members

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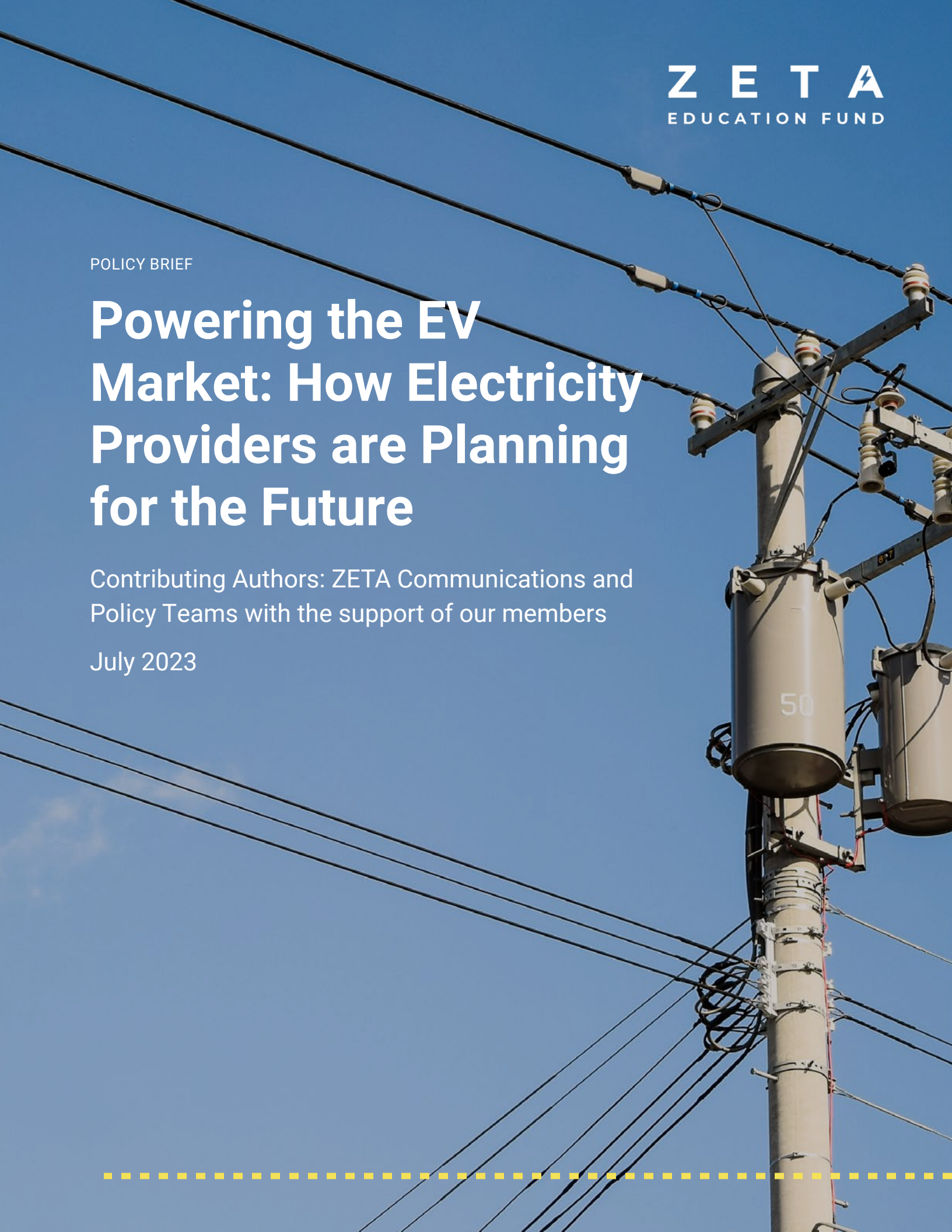


Contents

Abstract

This policy brief discusses the key energy considerations associated with growing EV adoption in the United States. The passage of the Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA) have significantly accelerated adoption of electric vehicles and planned deployment of electric vehicle charging infrastructure in the United States. These laws provided funding to support growth of domestic manufacturing and distribution of electric vehicles, as well as the construction of a nationwide electric vehicle charging network. The result of these laws and recently proposed regulatory actions on tailpipe emissions will be a significant shift from gasoline and diesel to electricity as a transportation fuel over the next decade. The challenge of delivering that electricity falls on the nation's electricity providers, many of whom have been planning for this transition for years. This is a challenge they are prepared to meet. Electricity providers are experts in infrastructure development and have a history of working with federal, state, and local regulators to deliver affordable and reliable electricity to their customers.

This policy brief outlines several case studies that showcase the important role electricity providers play in simplifying widespread EV adoption by strengthening charging infrastructure, managing charging loads during peak energy demand periods, and supporting customers throughout their EV transition. The brief also highlights ways federal policymakers can support regulated electric companies in their efforts to grow energy generation and optimize distribution. Chief among these is proactively working to prepare the grid for future transportation electrification efforts while maintaining reliability, resiliency, and affordability for customers.

Glossary

BEV	Battery Electric Vehicle
CAISO	California Independent System Operation
CARB	California Air Resources Board
CEC	California Energy Commission
DCFC	Direct Current Fast Charging stations
EV	Electric Vehicle
EVC	EV Community
GHG	Greenhouse Gas
ICEV	Internal Combustion Engine Vehicle
IEPR	Integrated Energy Policy Report
IIJA	Infrastructure Investment and Jobs Act
IRA	Inflation Reduction Act
MHDV	Medium- and Heavy-Duty Vehicles
MSS	Multiple Source Strategy
MY	Model Year
PHEV	Plug-in Hybrid Electric Vehicle
VGI	Vehicle to Grid Integration

1. Introduction

In 2022, electric vehicles (EVs) accounted for 5.8% of all light-duty vehicle sales, a 57% increase from 2021.[1] President Biden further set a target to make 50% of all new vehicles sold in 2030 zero-emission. Transitioning from internal combustion engine vehicles (ICEVs) to battery electric vehicles (BEVs) will increase American drivers' electricity consumption and change distribution strategies for electricity providers. Although the transportation sector will not reach 100% electri ication overnight, recent trends suggest that drivers are heading in that direction: the number of EVs on the road tripled in the past three years and will continue to grow.[2]

Transitioning to zero-emission transportation offers a unique challenge to energy companies, who will need to ensure they have ample electricity supply to match EV-driven demand. This will require making investments in the distribution and transmission systems to enable the deployment of electric vehicle supply equipment (EVSE). In some instances, this may also require investing in new energy generation sources and associated grid infrastructure to accommodate major EV centers like medium- and heavy-duty vehicle (MHDV) depots and other amenity co-locating.

This is not the first time electricity providers have navigated increases in electricity demand brought on by new technologies: similar spikes accompanied the popularity of now-standard appliances like refrigerators and in-home air conditioners.[3] Still, it will be important to ensure that providers and government agencies can work within their regulatory frameworks to test solutions and upgrade the grid to prepare for future demand increases accompanying greater EV adoption.

This policy brief will discuss the growing and emerging energy demands associated with EV adoption and new potential hotspots for energy demand. It will also use case studies to highlight how electricity providers are preparing for this transition. These case studies showcase solutions that have the potential to revolutionize energy consumption and highlight how electricity providers support customer EV adoption through incentive programs, building infrastructure, and other initiatives. Finally, the brief will outline ways federal policymakers can foster EV adoption in the United States by supporting a strong national grid.

2. Growing Energy Demands that Come with EVs

2.1 Power Generation: How Much More Energy Do We Need?

In 2021, the U.S. fleet of electric vehicles used 6.1 terawatt hours (TWhs) of electricity to travel 19.1 billion miles.[4] That accounted for just 0.15% of the total national energy generation that year.[5] In 2022, the United States produced 4,243 trillion-Watt hours (TWhs). To meet the demand of electrification, more generation will be needed to service electric vehicles and electrified technologies. Estimates suggest that an additional 15-27 TWh (0.3%-0.6% capacity per year) of annual new power generation will be needed between now and 2050.[6] History has proven increases of this magnitude to be accomplishable. In the past, nearly 100 TWh have been added in a single year. Even so, this annual increase in demand will require significant strategy as electric providers are transitioning to renewable, carbon free resources.

Figure 1. Annual power generation needs.
Source: ZETA

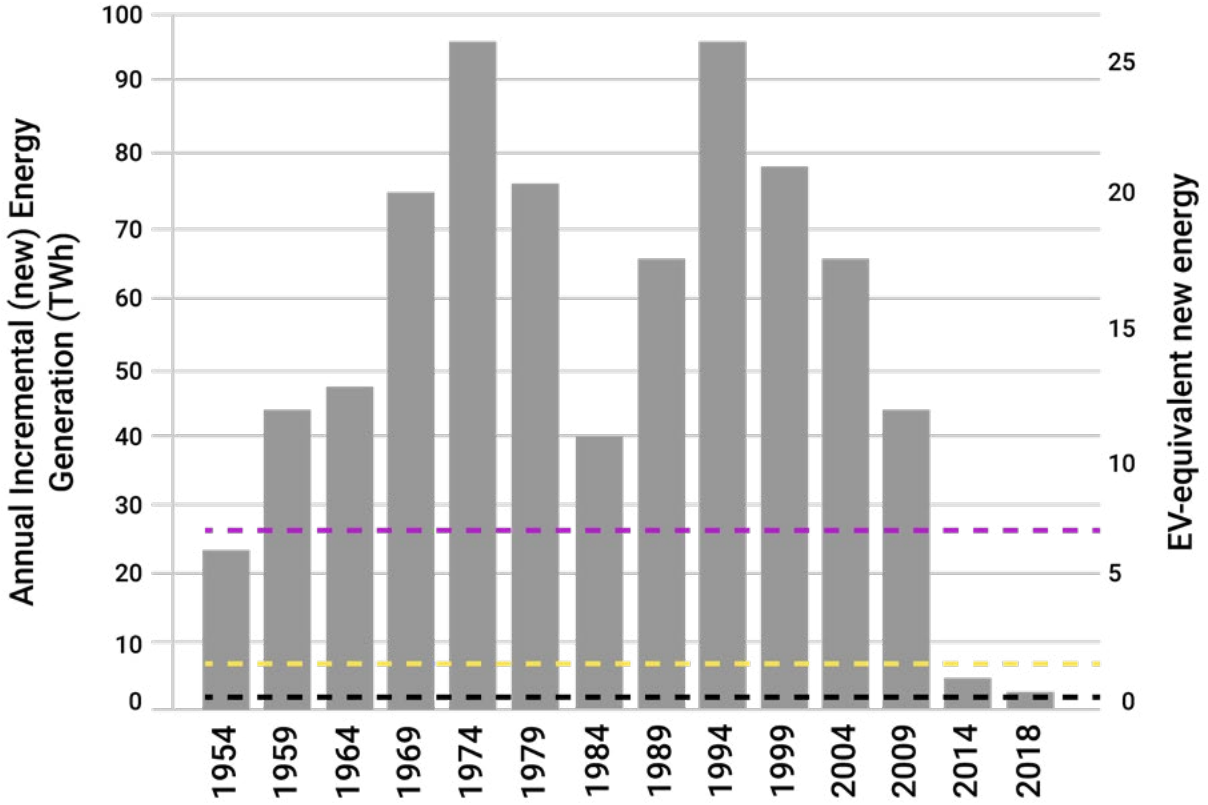


Figure 2: Historical increase in U.S. annual energy generation. Dashed lines show energy generation needs in 2030 for low (black), medium (yellow), and high (purple) EV adoption scenarios.
Source: The U.S. DRIVE Grid Integration Technical Team (GITT) and Integrated Systems Analysis Technical Team (ISATT) Summary Report on EVs at Scale and the U.S. Electric Power System.

The key to meeting these energy requirements will be the expansion of renewable energy resources and the addition of new, zero-emitting load following resources like advanced nuclear, carbon capture, long-duration energy storage and green hydrogen. In 2022, electricity generated from renewable sources surpassed coal for the first time in U.S. history.[7] At the same time, electricity providers are looking at ways to add low-cost energy storage (see page 14) to increase the availability of non-dispatchable renewable generation such as solar and wind. Currently, renewable energy generates about 20% of all electricity production in the U.S,[8] and renewable sources like solar and wind are expected to account for the majority of new utility-scale electricity generation going forward.[9] Already, available renewable energy resources in the U.S. are estimated to amount to more than 100 times the nation's current electricity needs.[10]

2.2 Power Distribution: Managing Demand

Power generation is only part of the calculus when preparing for 100% electric transportation. In particular, the industry needs to further its ability to precisely manage demand in real time, including by accurately predicting when and where increases in demand will occur.

It is important to note that energy demand is not constant. Instead, it consists of relatively predictable peaks and troughs throughout the day. High demand consistently occurs between 5:00

PM and 8:00 PM each day, as customers return home, turn up their climate control systems, begin cooking dinner, and turn on other devices.[11] System demand peak is typically between 5:00-6:00 PM during the summer, and 7:00-8:00 AM in the winter. As such, EV charging poses minimal impacts to the winter peak hours, but could increase summer peaks without managed charging. By studying the energy needs of their customers, electricity providers are looking at ways to reduce the impact of EV charging on these spikes in energy demand.

Several case studies in this report (see page 11 and see page 16) focus on addressing customers' specific needs by developing new approaches to power forecasting and researching the habits of consumers and fleet operators. Identifying where customers need increased charging infrastructure and at what level (e.g., DCFC or Level 2) will be key to planning out infrastructure upgrades in the coming years.

Charging equipment for EVs is classified by the rate at which the battery is charged. Alternating Current (AC) Level 1 chargers provide charging through a 120 volt (V) AC plug, most commonly referred to as trickle chargers.[12] Level 2 chargers provide a faster charge and are the standard installed charger in most homes, as well as longer dwell time commercial locations and DCFCs are a preferred option for shorter dwell time commercial locations. Figure 3 provides a detailed overview of each charger type.

EV CHARGING TYPES

Charger Type	Level 1	Level 2	DC Fast Charger
Voltage	120	240	480
Kilowatts	1.3	11.5	250
Rate of recharge	2 - 5 mph	10-20 mph	180-240 mph

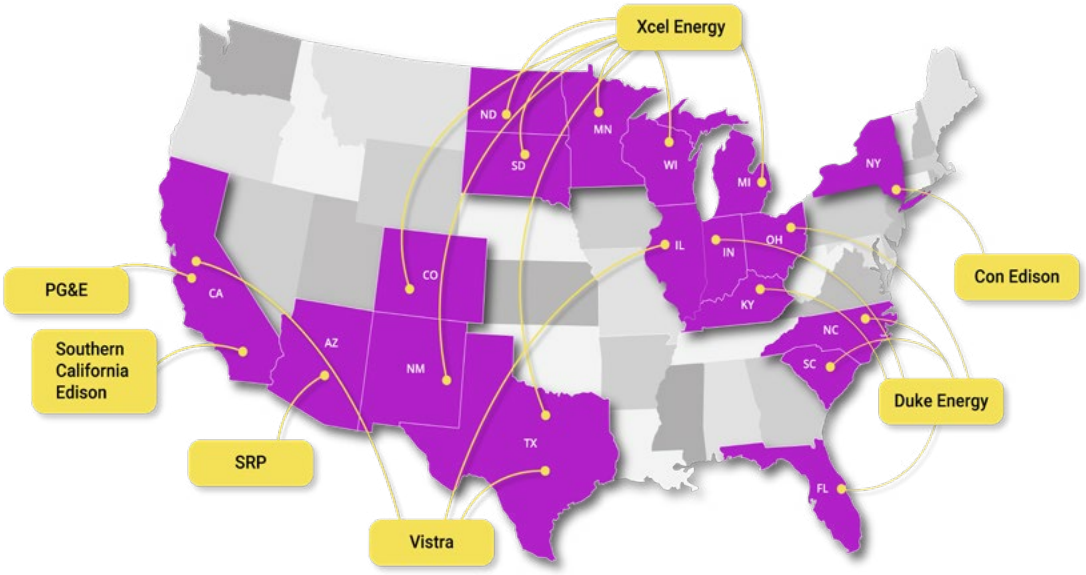
Figure 3: EV charger types.
Source: ZETA

In many cases, charging companies can install EVSE for Level 2 (L2) charging in municipalities without the need for electrical upgrades; however, installing DCFC sometimes requires additional utility-scale infrastructure improvements.[13] In residential areas, the charging load from EVs is distributed across several households, minimizing impacts on the grid. The charging of medium-

and heavy-duty vehicles, especially at centralized depots, could require several MWs of power at a single location, dependent on the same substation. Continuing to monitor the impact of larger-scale charging on the local grid level will be important in planning any necessary grid upgrades for future EV deployment.

Another one of the case studies below (see page 17) shows how one provider is encouraging their customers to charge during low-demand periods to distribute and minimize peak energy demand. For the customer's benefit, charging in off-peak hours is generally a lower rate. Meanwhile, in another case (see page 18), one provider describes how it is assessing the EV charging needs of its customers through a novel customer engagement strategy. Through these approaches, providers are able to manage the energy needs of their service areas while also increasing the efficiency of their resources.

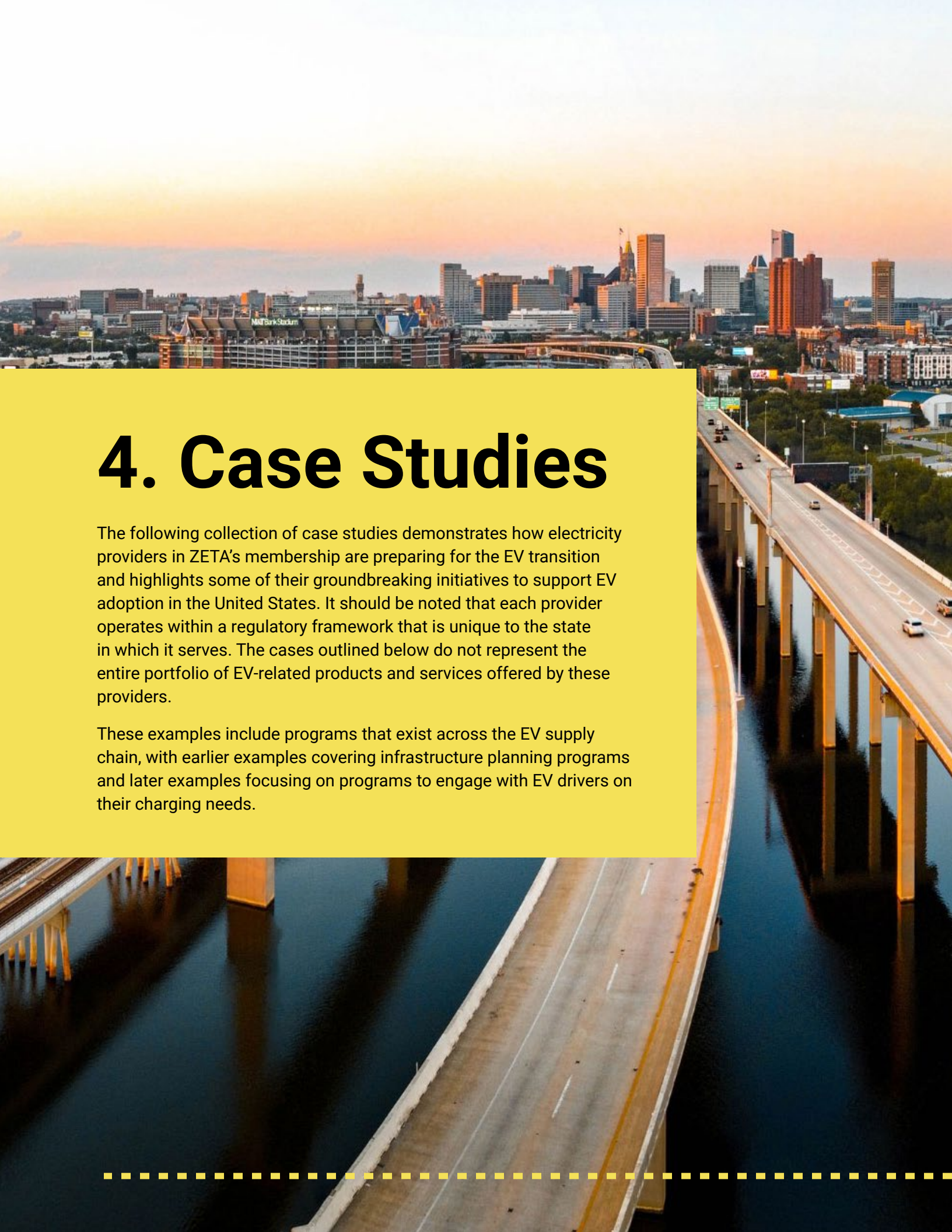
3. Electricity Provider Map



To effectively enable fleet electrification, electric providers will need to utilize both new programs and new paradigms to accommodate the forecasted increase in electricity demand.

Figure 4: Service areas covered by the electricity providers in this report. Map shows states where energy providers are active. Providers do not necessarily serve the entire state.
Source: ZETA

Energy providers should continue to include creative customer programs that simplify EV adoption for customers while simultaneously helping grid operators manage EV charging during periods of peak demand. Electricity providers will also need to further their development of new internal capabilities to forecast and plan for EV-related load growth as well as to manage EVs through innovative technology like vehicle to grid integration (VGI). Electric providers should be encouraged to make targeted, proactive upgrades to the distribution grid to accommodate this growth in a reasonable timeframe. Finally, in cases of large commercial fleet centers, additional generation capacity may be necessary. State regulators should recognize the importance of these considerations and support electricity providers to make these investments accordingly. The electricity providers included in this policy brief provide services to American households and businesses across the nation.



4. Case Studies

The following collection of case studies demonstrates how electricity providers in ZETA's membership are preparing for the EV transition and highlights some of their groundbreaking initiatives to support EV adoption in the United States. It should be noted that each provider operates within a regulatory framework that is unique to the state in which it serves. The cases outlined below do not represent the entire portfolio of EV-related products and services offered by these providers.

These examples include programs that exist across the EV supply chain, with earlier examples covering infrastructure planning programs and later examples focusing on programs to engage with EV drivers on their charging needs.

Pacific Gas and Electric Company

PG&E

GEOSPATIAL EV FORECASTING

As California's largest electric provider, PG&E continues to play an important role in advancing electric vehicle adoption in support of the state's broad climate goals. PG&E works in collaboration with the California Energy Commission and California Public Utilities Commission to plan and approve grid infrastructure upgrades to support this shift to zero-emission transportation.

With nearly 500,000 EVs sold in its service area—one in every seven of all EVs on the road throughout the nation—expansion of PG&E's EV charging network in Northern and Central California is critical to support the State's transition to a clean transportation future. **Over the last half-decade, the provider has deployed more than 5,000 EV charging ports across its service area.** Additionally, it offers a variety of resources to help accelerate EV adoption among customers, and PG&E is working collaboratively with vehicle manufacturers to develop vehicle grid-integration technologies.

Grid planning requires precise forecasts to ensure electric infrastructure is available to support future demand. Pre-existing electricity demand (load) forecasts did not provide the geographical granularity needed to best plan for grid investments. PG&E could allocate the load to residential charging locations; however, larger charging loads that are often not associated with existing service points—such as public charging systems—lacked a methodology to be accounted for in long-term forecasting efforts. **Without the ability to identify future EV demand with geographic and temporal accuracy, PG&E was limited in its ability to plan future grid capacity.**

Lacking a long-term forecasting methodology, PG&E was primarily dependent on customer requests for service to inform where EV load would materialize. This reliance on customer requests led PG&E to reactively develop capacity solutions to serve load requests. Given the long lead times often associated with capacity projects and the relatively fast pace at which customers wish to

build EV charging infrastructure, there would be instances where energization timelines exceeded the requested energization date from customers. This can occur with large load applications associated with public DCFC charging stations or large fleets, which have the potential to exceed the maximum capacity of existing electrical infrastructure in those areas.

Identifying a need for a more proactive approach, PG&E set out to improve its forecasting abilities to increase the clarity of where and when EV loading is most likely to materialize. This enables PG&E to build capacity in advance of service applications being received. Although research indicates that customer preference for EVs is increasing, and there are many regulations and incentives which further support the transition to EVs, there are still uncertainties around the pace of adoption. This impacts how the EV load will manifest on the electric grid. For this reason, a solution capable of supporting a variety of forecast scenarios was necessary for success. PG&E commissioned a multi-faceted project focused on three common categories of EV charging load: 1) public DCFC & Level 2 charging stations, 2) residential EV charging, and 3) fleet charging.

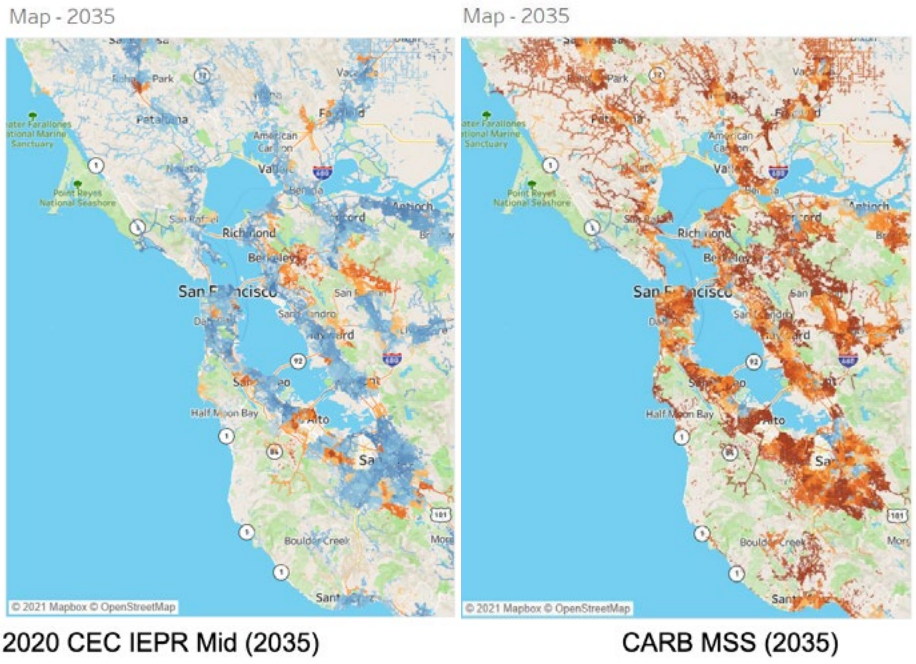


Figure 5: EV load requirements based on low and high EV adoption rates. Source: PG&E

Detailed analysis and machine learning modeling and testing were applied to each of these focus areas to predict where EV charging is most likely to occur. These analyses were performed at the premise level and resulted in over 5 million potential growth points across PG&E's service territory that were integrated into existing distribution planning software. This created a dynamic tool that can adapt to a variety of forecast inputs, such as system-level adoption forecasts, EV charging behaviors, and charging infrastructure assumptions. These scenarios can be integrated into PG&E's distribution planning processes.

Developing a solution that was easily integrated into existing distribution planning processes and software was critical for successful implementation. Involving PG&E forecasting and asset planning teams in the development of the EV forecasting tool, as well as reviewing and approval of the major inputs and assumptions used to develop forecast scenarios, ensured alignment in the scenarios generated.

In the figure above, the difference in magnitude of localized EV load can be seen in a relatively low EV adoption scenario (2020 California Energy Commission (CEC) Integrated Energy Policy Report (IEPR Mid)) and a higher policy-based scenario based on the California Air Resources Board (CARB) Multiple Source Strategy (MSS) forecast. Grid planners can use this tool to investigate and solve for circuit level impacts of EV load growth.

Using varying EV forecast scenarios, PG&E was able to assess the localized grid impacts from high EV adoption scenarios that are better aligned with state transportation electrification goals. PG&E assessed how various levels of EV adoption, as well as the impacts that changing charging behaviors (such as on vs. off-peak charging), can have on grid needs. Early analysis has indicated that off-peak charging can reduce near-term grid constraints. In the future, this may lead to new circuit peaks and capacity constraints that must be addressed.

Results from these analyses were helpful in advocating for approval of higher transportation electrification forecasts with regulators and the state energy commission, which are ultimately used for electric grid planning. PG&E has also used these forecasts to produce directional assessments of the resources needed to support capacity investments included in their long-term capital planning. **PG&E continues to work to improve its forecasting and planning capabilities.** Still, the solutions implemented to date have enabled a more robust approach that will enable PG&E to continue to support its customers' electrification transition.

Vistra

POWER GENERATION, RENEWABLES, AND ENERGY STORAGE

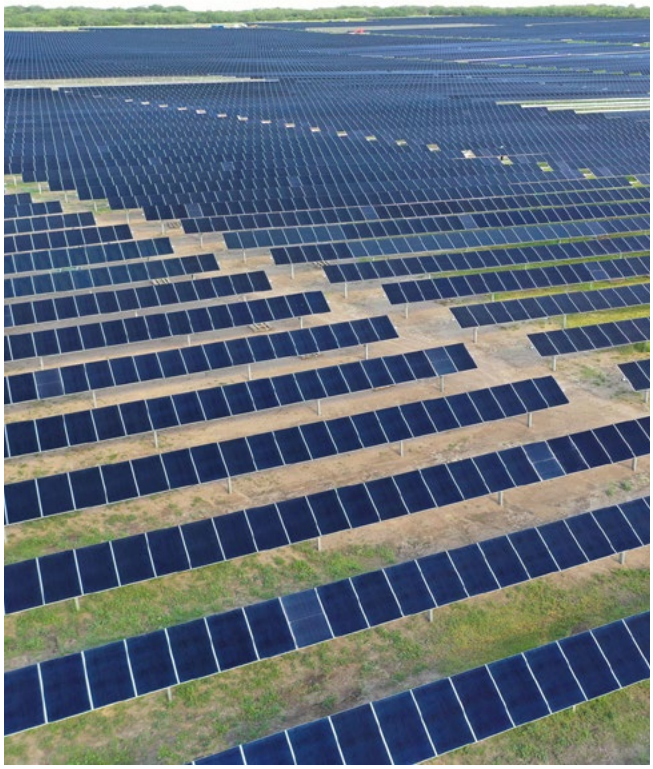
Electricity generators are making the transition to low- and no-carbon-emitting sources of energy as quickly as possible in response to investor, regulator, policymaker, and customer expectations. This transition is backed by a strong business case for doing so, as renewables and battery storage systems are able to compete ectively with ossil uel generation and provide benefits to the power grid. The International Energy Agency expects renewable energy resources to provide 18% of the world's power by 2030, up from 11.2% in 2019.[14] However, certain renewable energy sources —such as solar and oshore/onshore wind—are dependent on weather conditions and the time o day. This means deploying these resources at scale will require accompanying battery technology to ensure electric grid reliability.

Energy storage allows for the integration of more intermittent resources by storing electricity until it is needed. It also augments existing energy generation by allowing excess energy to be produced when low demand is stored until demand peaks. **Energy storage can provide benefits beyond emissions reduction, including cost-savings for consumers, reliability, and backup and startup power during extreme events.**

Vistra operates the Moss Landing Energy Storage Facility in California, the largest of its kind in the world, and is pursuing an expansion that will bring 750 MW online in the second quarter of 2023.[15] This facility is particularly valuable in California, where the swift transition to renewable energy, paired with a constantly growing demand for electricity, illustrates the need for reliability in the electric grid and the role energy storage can play. As of 2021, non-hydroelectric renewables provide approximately 35% of California's electricity, and electricity demand has increased due to a variety of factors, including severe weather events, widespread electrification, and electric vehicle deployment.[16] This combination was put to the test in September 2022, when the state faced its most extreme September heat event in recorded history. This weather event put

unprecedented strain on the electric grid and set records for electricity demand. To the surprise of many, the lights stayed on. During that event, batteries, including Vistra's Moss Landing facility, provided about 4% o supply—over 3,360 MW, more than the Diablo Canyon nuclear power plant (the state's largest electricity generator)—during the peak demand, averting rolling blackouts. **A report from the California Independent System Operation (CAISO) following the September 2022 event specifically highlighted the increase in energy storage resources as a key factor that supported the grid's reliability**.[17] As a comparison, the August 2020 heat wave, which occurred when California's energy storage resources were few and far between, resulted in rolling blackouts over multiple days.

Recognizing that the replacement of fossil fuel-powered assets with zero-carbon resources is not a one-to-one exchange, Vistra is working to maintain reliability by using energy storage and installing zero-carbon investments on the sites of retired or soon-to-be-retired fossil fuel plants. This also ensures that communities do not lose key energy supplies or ongoing tax revenue. Vistra is also focused on ensuring that existing zero-carbon generation remains online, such as the Comanche Peak Nuclear Power Plant in Texas, which is currently going through the Nuclear Regulatory Commission's relicensing process to continue operations through 2053. This high-performing plant is able to produce power—rain, snow, or shine—increasing grid reliability or Texans and making it a keystone generator for the Electric Reliability Council of Texas (ERCOT) grid. Alongside the transition to cleaner generation resources, **Vistra has been able to maintain reliability for its consumers and ensure that individuals and businesses are able to keep their lights on, even during extreme weather events.** During Winter Storm Uri in Texas in 2021, Vistra's plants produced between 25-30% of the power on the grid during the storm, far beyond its ~18% market share.



As the energy supply mix shifts toward low- and zero-carbon resources, energy storage will fill the reliability gap and allow that mix to evolve more reliably and flexibly. The Inflation Reduction Act provides new tax incentives for investment in energy storage technologies and resources to support the R&D of advanced and long-duration energy storage technologies. These investments will enable the deployment of utility-scale energy storage and add reliability to the grid, no matter what the future energy generation mix looks like. It is crucial that the United States continues to make the transition to a carbon-neutral economy and electric grid in a way that ensures the continued reliability of the grid at a reasonable cost to consumers.

SOUTHERN CALIFORNIA EDISON®
Energy for What's Ahead®

Southern California Edison

PREPARING THE GRID FOR EV ADOPTION

About 40% of the nation's electric vehicles, more than 1.3 million, have been sold in the state of California. More than 430,000 of those are in SCE's service area alone. Many have expressed doubts that the grid is ready for the energy demand created by the need to charge so many EVs, but **electric power companies, including SCE, are keeping up with increasing levels of adoption.**

In anticipation of growing EV demand in Southern California, SCE has been taking steps to continually upgrade the grid and smooth the transition to electric transportation. The company is working to be more proactive in its approach to expanding the grid, including a new effort regarding Power Service Availability. This effort will address both long-term planning as well as identifying ways to meet more immediate grid needs.

At the same time, SCE is improving the value of EV adoption forecasts used for grid planning by assessing where, when, and how much EVs are likely to charge. SCE led the West Coast Clean Transit Corridor Initiative, composed of nine other electric utilities and two agencies representing more than two dozen municipal utilities, to conduct a multi-phase and multi-year research study to forecast EV truck populations and determine the proper number and size of highway charging sites. Subsequent phases of this initiative are supporting internal planning operations across the participating utilities.

SCE is also improving how they partner with customers to meet their needs. This includes streamlining buildout, developing deeper customer engagements that include rate planning and load management education, and right-sizing grid solutions to meet the expected charging demand growth in both the near and long term. These efforts will provide more innovative and customer-focused solutions.

In addition to grid expansion and customer project deployment, SCE has also pushed to accelerate EV adoption through customer-side infrastructure programs such as Charge Ready for light-duty vehicles. Through its Charge Ready program, SCE installs, maintains, and covers installation costs for charging infrastructure while participants own, operate, and maintain the charging stations. For those ready to invest in EV charging for medium- and heavy-duty vehicles, SCE's Charge Ready Transport program similarly offers low- to no-cost site upgrades to support the installation. The program provides funding to help electrify semi-trucks, buses, and delivery vehicles, among others.

Through its Charge Ready programs, SCE has installed more than 3,000 charging ports throughout its service area and is targeting 30,000 charging ports by 2026..

SCE's Transportation Electrification Advisory Services program is also available for commercial customers considering electric transportation options. On top of offering educational webinars and workshops, the program also offers to develop site-specific EV-readiness studies to help determine the feasibility of proposed projects and grant writing assistance to help customers secure zero-emission vehicle grants.

SCE will continue to support and help accelerate the adoption of EVs in California. **While the grid as a whole is ready for the wider adoption of EVs, there are still opportunities to address specific short-notice requests for a large volume of capacity in small geographical areas.**

Con Edison

MANAGED CHARGING WITH SMARTCHARGE NEW YORK

In 2013, New York Governor Andrew Cuomo and seven other governors signed a joint Zero Emission Vehicle Memorandum of Understanding, setting a policy target of 850,000 light-duty electric vehicles statewide by 2025. Con Edison's service territory share of those vehicles is approximately 230,000. It was clear there was a need for programs to manage the additional load that would come from the electric transportation sector.

In 2017, Con Edison launched SmartCharge New York program with the goal of instilling grid-beneficial charging behavior in parallel with the upswing in electric vehicle adoption. **The goal was to influence driver behavior at the inflection point of transitioning from combustion-engine fueling to electric battery charging and have drivers "default" to grid-optimizing charging activity**. Program participants received a free cellular-enabled device that plugs into the vehicle's diagnostic port that allowed Con Edison to track time, energy, and power consumed when charging in the utility's service territory. Incentives were initially paid off-bill through gift cards to the customer's business of choice, such as Amazon, Starbucks, or Home Depot.

The SmartCharge New York program offers incentives designed to encourage drivers to 1) avoid on-peak (2 PM -6 PM) electric vehicle charging during summer weekdays from June to September, and 2) explicitly charge during off-peak hours 12AM to 8 AM.

As electric vehicle adoption continues to rise, managing charging behavior will grow increasingly important in maintaining a healthy and reliable grid. Since its inception, SmartCharge New York program has evolved to meet customer needs and program objectives. Starting in 2023 example, the program was overhauled to allow participation through a mobile application and payments are now issued through Venmo or Paypal, in line with participant feedback. This shift also changed the way the program collects data, eschewing physical devices for a vehicle's onboard telematics or networked electric vehicle supply equipment

such as a Wi-Fi-enabled charger or charging cable.This enables the program to scale efficiently with the market and give a greater number of drivers insight into their behavior and how that activity translates to incentive earnings.

The number of light-duty electric vehicles in the Con Edison service territory has increased to over 50,000, and Enrollment in SmartCharge New York increased steadily from the program's inception. As electric vehicle adoption grows, Con Edison expects to grow the SmartCharge footprint, to the benefit of drivers and ratepayers.

SRP

EV COMMUNITY INCENTIVE PROGRAM

When EVs were still in the early stages of adoption, **SRP recognized the importance of exploring ways to identify EV households and analyze their charging behavior in order to help prepare for greater EV uptake in the future**. It was also important to begin engaging customers who were EV drivers in order to understand their interests and their charging patterns and assess ways to influence charging behaviors.

SRP Workplace EV Charging Rebate

In 2014, SRP launched "EV Community" (EVC)—a program that offers customers a $50 bill credit for each EV they register (up to two vehicles per household)—as a means to incentivize EV drivers to identify themselves and engage with SRP. Participants provide basic information about the electric vehicle and the type of charger they use. This provides a way for SRP to learn more about EV customers and their charging behavior and needs while offering them an incentive to help support EV growth in the region.

There are currently more than 7,500 customers enrolled in the EV Community program.

While EVC members only account for a small number of total EV households, they are a fair overall representation of the EV customer base since all price plans are included, as well as households with one vs. two EVs. The program offers SRP a good platform for analysis, including the type of cars they drive (PHEV, BEV, brand, etc.) and the charge levels they use. In addition, SRP found that EVC members are willing to share information and are eager to participate in future pilot programs.

The EVC program also provides SRP with a method and channel to promote their Electric Vehicle Price Plan, a special time-of-use pricing plan which offers EV drivers the most opportunity to save on EV charging costs by charging during super off-peak times (between 11 PM and 5 AM). Load

research has shown that this program has been highly effective at shifting EV charging loads away from peak periods. The EVC program has helped SRP plan and prepare the grid for widespread EV adoption by enabling them to:

- **Anticipate load growth.** A pilot study with EVC members that monitors their EV driving and charging behavior through data telematics devices enables SRP to estimate typical consumption and charging load profiles per EV.
- **Understand the impacts of EV charging on the grid.** EVC data is used to model the impacts of EV charging on the electric grid, identify when transformers and wires may need to be upgraded, and understand when and how customers need to charge.
- **Recruit for Managed Charging pilot programs.** The EVC program and channel have enabled SRP to recruit participants for additional Managed Charging pilot programs to test other active control technologies to control EV charging load on the grid.
- **Survey participants for insights.** EVC members are surveyed regularly to get more data on their charging behaviors, including their use of home, workplace, and public charging and their satisfaction with EVs overall.
- **Engagement.** EVC participants receive regular newsletters and other communications with EV-related information.

Duke Energy

DEVELOPING A MICROGRID-INTEGRATED FLEET ELECTRIFICATION CENTER

Electric fleet commitments are increasing as companies with ambitious sustainability goals work to decarbonize operations. Fleet owners are also seeking ways to take advantage of the cost savings available by transitioning to EVs. However, programs for fleet electrification and managed charging options are still limited to date.

Fleet owners who have electrified fleets without consulting experts or an electric provider have likely been experiencing avoidable operational and technological issues. Long-term energy cost and performance risk are also potential issues for fleets and can hinder mainstream fleet electrification technology development if not managed correctly.

When transitioning to an electric fleet, it is important that fleet managers understand the full scope of charging multiple vehicles while maintaining fleet operations and that larger medium- and heavy-duty (MHDV) vehicles bring with them additional factors to consider.

Duke Energy's significant experience and large customer base make it well-positioned to design and implement fleet electrification and charging programs. **Duke Energy is building a first-of-its-kind performance center that will model and accelerate the development, testing, and deployment of zero-emission light-, medium-, and heavy-duty commercial electric vehicle EV fleets.** The site will be located in North Carolina at Duke Energy's Mount Holly Technology and Innovation Center and incorporate microgrid integration.

The fleet electrification center will provide a commercial-grade charging experience for fleet customers evaluating or launching electrification strategies—reinforcing reliability, clean power, and optimization by integrating solar, storage, and microgrid controls software applications. The center will be connected to both the Duke Energy grid—charging from the bulk electric system—and to 100% carbon-free resources

through the microgrid located at Mount Holly. This project is the first electric fleet depot to offer a microgrid charging option.

In addition to fleet charging, the site will also function as an innovation hub, allowing Duke Energy to collect data around charger use, performance, management, and energy integration with various generation resources. It will also allow for the development of managed charging algorithms for fleets connected to the bulk power system or integrated with renewables and storage—which can be utilized to minimize the upgrades needed to the distribution system, easing the transition to electrifying fleets. Identifying EV charging technologies and how they may be used to power any type of fleet with vehicles (ranging from class 1) will help develop a model to show the industry a clear, integrated, and cost-effective path to fleet electrification.

Duke Energy is teaming up with Daimler Truck North America and Electrada on this important work. Electrada, an electric fuel solutions company, is providing funding for research and demonstration efforts. For fleets seeking to electrify, Electrada invests all required capital "behind the meter" and delivers reliable charging to the fleet's electric vehicles through a performance contract, eliminating the complexity and risk that fleets face in transitioning to this new source of fuel. Electrada's investment in the depot allows Duke Energy to focus on programs that simplify adoption for electric fleet customers and distribution system performance to support the predictable addition of electric load over time.

By the end of 2023, fleet operators will be able to experience a best-in-class, commercial-grade fleet depot integrated with energy storage, solar, and optimization software. Moving to zero-emission vehicles in this sector allows North Carolina to seize the large economic potential of the transition and generate billions in net benefits for the state. Projects like Duke Energy's fleet performance center will be key for fleet owners across the state to take advantage of the cost savings of transitioning to electric vehicles. That said, fleet owners exploring electrification should engage their electricity provider early and often to identify and address site-specific considerations. As fleet electrification accelerates, it will be important for electricity providers and policymakers to identify best practices to proactively plan for fleet electrification, including readying the distribution grid.

Xcel Energy

ENABLING FLEET ELECTRIFICATION THROUGH COMPANY COMMITMENTS AND CUSTOMER PROGRAMS

Xcel Energy is committed to electrifying all of its light-duty fleet and 30% of its medium and heavy-duty fleet by 2030, equating to over 2,500 EVs. It's part of their vision to be a net-zero energy provider by 2050 and enable one out of five vehicles to be electric in the areas they serve by 2030. This will save customers $1 billion annually on fuel by 2030 and deliver cleaner air for everyone.

With a fleet that includes iconic bucket trucks, all-terrain service vehicles, and a host of pickup trucks and pool cars across eight states, achieving these goals will be no small feat, but an important one. There are notable hurdles, yet evolving technology presents solutions.

Electrifying the Marquee Fleet Vehicle

Xcel Energy is the first electric provider in the nation to add an all-electric bucket truck to its fleet. The truck features two electric sources: one for the drivetrain and one for the lift mechanism. It has a 135-mile driving range and can operate the bucket for an entire workday on a single charge. Crews are collecting data from real working conditions in Minnesota and Colorado that will be used to inform further improvement to the vehicle's technology and operation.

Optimizing Charging to Minimize Grid Impacts

To support a growing electric fleet, over 1,200 EV chargers must be brought into service by 2030, which will result in an electric load increase of 71 megawatts. Charge management techniques enable low-cost charging for this growing electric fleet. It's a sophisticated approach to optimize charging times by using time-of-day and grid demand efficiencies and builds on the expertise Xcel Energy has developed through offering managed charging programs to customers in multiple states.

For fleets, overnight charging schedules make the most sense. Demand and rates are lower, and renewable wind sources are ample at that time. Yet, fast charging outside of these time periods may be required to help larger vehicles make it through a workday. This is when charging schedules need to be customized and highly specific.

Enabling Cleaner Service Calls Through Bucket Truck Technology

Xcel is also taking immediate action on other high-impact emission reduction opportunities, using technologies such as electric power take-off, idle mitigation, and solar systems to power jobsite tools.

1. Electric power take-off (ePTO)

An ePTO system is a device that uses battery power. It's similar to an EV, but instead of moving the vehicle down the road, it powers equipment and tools to avoid engine idling at the job site. These devices are recharged by plugging into the same chargers that EVs use.

2. Idle mitigation

An idling truck can consume 1.5 gallons of gas each hour. Idle mitigation on Xcel Energy's utility bucket trucks works by automatically shutting down the gas-powered engine when the vehicle is not in use or when the engine is idling for too long. This helps to reduce emissions and conserve fuel.

Fleet Electrification Solutions for Customers

Xcel Energy's experience and expertise with fleet electrification doesn't stop with their own fleet. They have developed a mix of customer programs across service areas to support fleet electrification for businesses and communities. These customer-centric solutions enable sophisticated planning, lower upfront costs with various rebates and incentives, and minimize impacts to the grid.

Xcel's approach for commercial EV fleet development includes:

- **Advisory services:** Xcel offers a "white-glove service" to meet customers where they are on

their electrification journey by guiding them through customized planning for their infrastructure needs. For fleet operators, this includes a free assessment to help them determine the best path to electrify their fleet and advise them on future electric fleet considerations such as charging best practices.

- **Infrastructure installation:** Xcel designs and builds EV supply infrastructure to support charging station installations at minimal to no cost to customers.
- **Equipment recommendations and rental options:** Xcel also provides recommendations for charging equipment and offers customers the option to purchase their own qualifying vehicle chargers or rent them at a monthly fee that includes installation and maintenance.
- **Grid continuity:** Xcel designs long-term clean energy resource and distribution plans to consider the future impact of new EV load to ensure ongoing grid stability, reliability and affordability.
- **Equitable opportunities:** Xcel supports EV adoption in higher emissions communities and income-qualified neighborhoods through rebates and incentives. This includes facilitating the electrification of carshare, refuse trucks, school buses, paratransit vehicles, and other fleets operating in these disproportionately impacted communities.

Fleet electrification is a key component of Xcel Energy's larger vision, which includes enabling zero-carbon transportation by 2050 across its eight-state service footprint. This long-term strategy balances affordability with sustainability across the entire grid. It's why Xcel is dedicated to assisting fleet managers across the ecosystem in providing fleet electrification solutions that empower and inspire a clean energy future while also leading by example.

5. The Role of Public Policy in Grid Modernization

Grid modernization is a long-term initiative that will require coordination among a variety of stakeholders.

Electricity providers, grid operators, federal regulators, and state and local governments will all have a role in upgrading the electricity generation and delivery system. The Department of Energy found that by 2050, the national energy consumption could increase 38% due to economy-wide electrification.[18] Energy providers are already making strides to prepare for increased EV adoption: utilities are shoring up the grid to account for future demand through managed charging programs, microgrids, energy storage, and EV demand forecasting. In addition to these private sector initiatives, there are steps that the federal government should take to enhance electricity systems. With a coordinated private and public sector approach, the grid will be able to meet future demand.

The IRA alone provided $760 million to help with the siting of interstate transmission projects. Additional federal investment and incentives to modernize the nation's electric system will allow for the build-out of new large-scale infrastructure and continued grid reliability. Electric providers are actively seeking federal funding to help support their efforts to bolster grid resiliency and

With the passage of the IIJA and IRA, Congress has made progress toward creating a more resilient, affordable, and reliable electrical grid.

accommodate EV adoption, but further support from their state regulators is warranted.

Emerging strategies such as managed charging and time-of-use rates, among other advanced grid techniques, could effectively improve efficiency and reliability. The U.S. DOE should continue the development of cost-effective energy storage technologies, tools for transmission planning, and software to analyze grid data. Federal R&D into the future needs of the electrical grid will help advance new technology to augment the grid's effectiveness and reliability as EV adoption grows.

In addition to providing funds for large-scale grid upgrades, ZETA recommends Congress increase funding for research and development into new, more efficient systems for the delivery of electricity.

5.1 Regulatory Certainty for Proactive Grid Upgrades

The grid's ability to handle millions of additional EVs hinges on utilities' proactive planning capacity. Regulatory certainty will allow utilities to make the investments necessary to facilitate a smooth EV transition. To invest proactively, rather than in response to firm load, energy providers will need clear insight into multi-year schedules for customer electrification, approval from regulators to recover costs, and/or flexibility to serve loads with non-wire alternatives.

Granting utilities the flexibility to make proactive upgrades to the electrical grid and facilitate transportation electrification will require careful planning and coordination between regulators and stakeholders.

The EPA also has a role in ensuring fleet operators and automakers have adequate guidance before committing to electrification projects. The EPA is preparing to promulgate rules for the next phase of heavy-duty vehicle GHG standards. Known as the "Phase 3" rules, the next iteration of EPA's heavy-duty GHG regulations will govern Model Year (MY) 2027 and later vehicles. The proposed rule would set more stringent CO2 emissions for MY2028 through MY2032, emphasizing the role of adding more zero-emission vehicles to the fleet. This coincides with the growing list of states seeking to adopt the Advanced Clean Truck rule, which requires manufacturers who sell medium- and heavy-duty vehicles to sell zero-emissions vehicles as an increasing percentage of their annual sales from 2024 to 2035. With the pressing need to decarbonize this vehicle segment, EPA should ensure that its final standards are ambitious enough to drive rapid and broad electrification of vehicles in this classification beginning in MY27.

5.2 Coordination with Electricity Providers

Federal policymakers, regulators, and local stakeholders must work with electric providers to ensure streamlined permitting of EVSE projects. Relevant agencies must improve interagency and intergovernmental coordination to address planning concerns before the project breaks ground.

To effectively modernize the grid, the federal government must use tools such as the Interagency Pre-Application Process for grid transmission or create Memorandums of Understanding (MOUs) between project applicants, federal agencies, states, and Tribal governments.

Finally, a critical element of an expanded EV charging network are strong, reliable supply chains able to meet the needs of a growing electricity sector. In the last several years, lead time for grid component orders, particularly transformers, has increased. Distribution transformers—often required for the addition of new charging stations—convert high-voltage electricity from transmission lines to lower voltage for commercial and residential consumers. Owned and installed by utilities, transformers are critically important for national security. As the demand for electricity increases in the coming decades, transformers are essential to weatherizing the electrical grid, expanding domestic manufacturing capacity, and are key to the successful deployment of EV charging infrastructure. The federal government should avoid proposals that constrain transformer availability amid existing supply challenges. In order to ensure a robust supply chain of equipment and materials necessary to support the manufacturing and deployment of charging infrastructure, federal policy should prioritize manufacturing and deploying distribution transformers through the Defense Production Act.

6. Conclusion

Energy providers remain at the nexus of the clean energy and transportation electrification transition. Energy providers are continually looking for new ways to shave peak load and operationalize off-peak charging through increased customer education and utilization of existing or emerging technologies. Additionally, utilities are decarbonizing through future clean energy generation plans, electrifying their respective fleets, and educating fleet operators on how to best transition to BEVs through direct customer engagement.

Although utilities are actively planning for the emergence of electric vehicles on the road, supply chain issues and federal certainty challenges remain. Specifically, utilities are looking to prepare expanded reserves of distribution transformers required to meet the energy demands of electrified transportation, residential, and commercial systems. With a clear federal pathway in siting and permitting process, energy providers can effectively plan multi-year projects with certainty.

ZETA recommends that policymakers continue working with their regional energy providers to streamline siting and permitting processes further. We also seek additional resources for the electrical grid supply chain to prepare for extreme weather patterns, increased energy distribution, and renewable energy generation. The case studies highlighted in the policy brief showcase areas where energy providers are providing direct investments and innovation to create a robust, modern electrical grid.

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100% electric vehicle sales.

The next decade will be critical in implementing federal policies that accelerate the transition to zero emission vehicles and help address these problems head-on.

The advanced transportation sector already boasts hundreds of thousands of jobs but, if we encourage its growth, the U.S. can decisively win the global race to develop a new clean vehicle economy. This leadership will drive American prosperity and secure billions of dollars of economic benefits and job creation for generations to come.

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