The Utility Playbook: Turning EV Grid Risk into a **$30 Billion Opportunity**

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Contents

About this report

This report was prepared by ev.energy, with research support provided by The Brattle Group. It is intended as a practical guide to support the continued development and scaling of EV managed charging across the industry.

About ev.energy

ev.energy exists to connect everyone to greener, cheaper, simpler EV charging — managing the world's EV charging, everywhere. ev.energy provides a scalable, inclusive, and proven end-to-end platform that turns electric vehicles and other distributed energy resources into flexible grid assets, unlocking real value for energy providers, customers, and the planet. With a global base of utility, vehicle OEM, and EVSE partners, ev.energy is the leading force in smart charging.

About The Brattle Group

The Brattle Group answers complex economic, finance, and regulatory questions for corporations, law firms, and governments around the world. We are distinguished by the clarity of our insights and the credibility of our experts, which include leading international academics and industry specialists. Brattle has 500 talented professionals across North America, Europe, and Asia-Pacific.

Authoring Team

William Goldsmith
Director of Market Intelligence, ev.energy

Geraldine Michel
VP of Demand Generation, ev.energy

Nick Woolley
CEO and Co-Founder, ev.energy

James Pratley
Senior Content Manager, ev.energy

Alice Woolliscroft
Brand Designer, ev.energy

Supporting Research

Kate Peters
Energy Research Associate, The Brattle Group

Ryan Hledik
Principal, The Brattle Group

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About this report

"**This essential playbook** from ev.energy and The Brattle Group underscores the **$30 billion opportunity for vehicle-grid integration solutions. The Cost-Avoidance Stack offers a clear, data-driven roadmap for utilities and regulators to leverage EVs beyond mobility as critical, scalable grid resources**. It's a must-read guide to building a more affordable, resilient, and reliable energy future."

Zach Woogen,
Executive Director, VGIC

" Past analyses have shown that **Virtual Power Plants** can deliver reliable power at costs up to 60% **lower than traditional generators**. This new research goes further—offering a rigorous, quantitative framework that confirms **EV flexibility as a critical, cost-effective tool** for preserving both grid reliability and affordability."

Ryan Hledik, Principal,
The Brattle Group.

Foreword:
The Grid's Inflection Point Requires Bold, Coordinated Action

For the first time in a generation, utility leaders are facing two simultaneous demand shocks: the exponential growth of data centers and the electrification of transportation. This isn't a distant forecast; it's a present-day reality pushing local distribution grids to their breaking point. It's a system-wide transformation that comes with incredibly high stakes.

This inflection point presents a stark choice. One path leads to a reactive cycle of premature transformer failures, costly emergency upgrades, risky bets on slow-to-deliver centralized technologies and rising customer bills. The other leads to a more controlled, decentralized, optimized, and affordable grid. The difference lies in how we approach the largest new source of flexible load: the electric vehicle.

But what if this new load wasn't a liability? What if the millions of EVs connecting to your grid were, in fact, a massive energy asset hiding in plain sight? What if their charging could be orchestrated to support the grid instead of straining it?

This playbook provides the answer to those questions. It is a practical guide grounded in rigorous analysis, developed with research support from The Brattle Group and experts across the industry. Inside, you will find the Cost-Avoidance Stack — a framework that quantifies an annual $30 billion national opportunity by 2035 to lower energy costs — along with actionable roadmaps for both utilities and regulators to begin capturing this value today.

This is our opportunity to unlock a true win-win, where we grow the size of our energy system, and reduce delivery costs for consumers — delivering 10% bill savings by 2035.

We wrote this for you — the planners, program managers, regulators, and operators who are building our energy future. The challenge is significant, but the opportunity is greater. Let's build it together.

Nick Woolley, CEO & Co-Founder of ev.energy

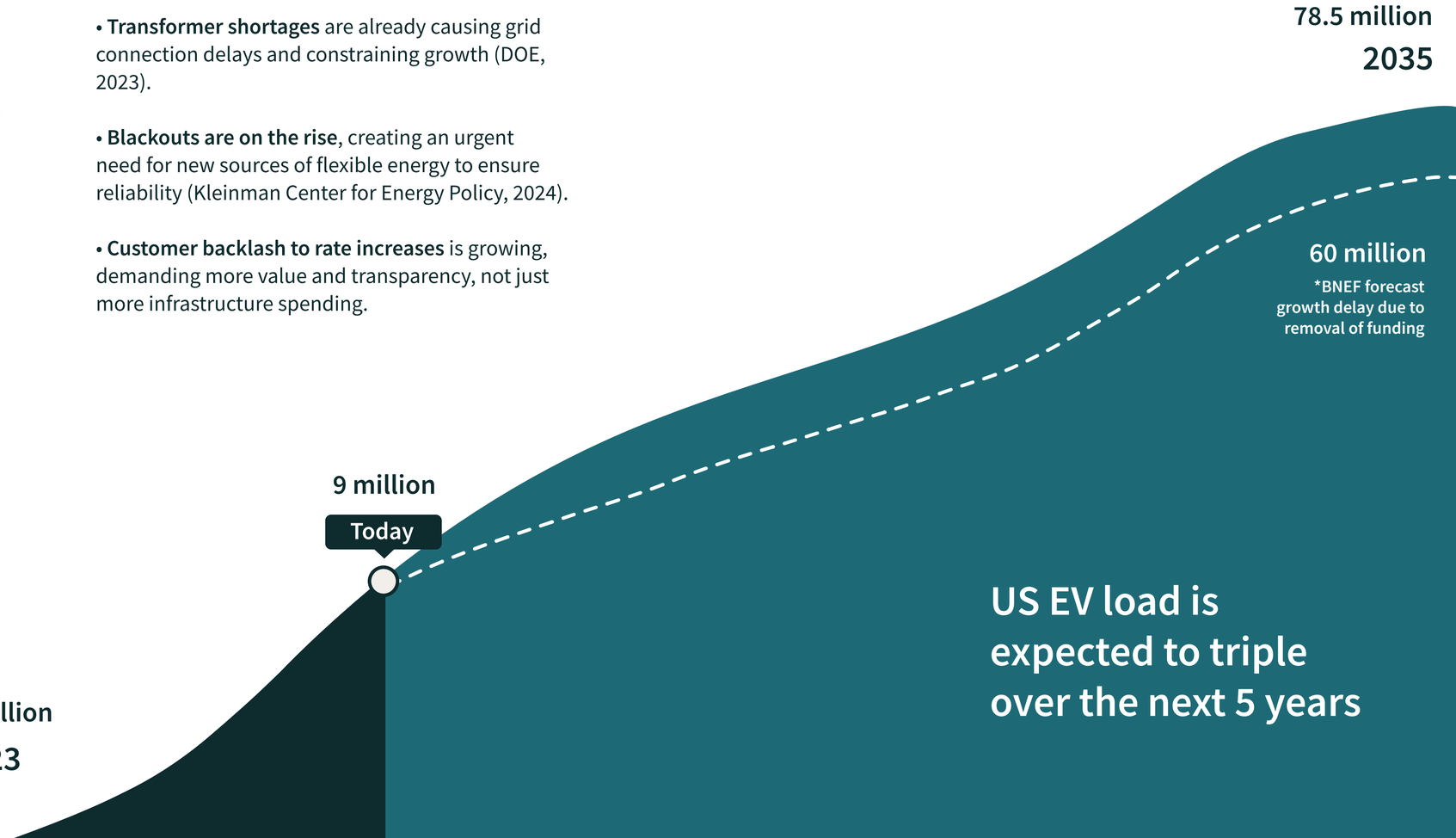
Executive Summary:
Turning a Grid Challenge into a $30 Billion Opportunity

The North American grid is at a turning point. After two decades of flat load growth, demand is rising dramatically from electrified transportation, heating, and digital infrastructure, with the U.S. Energy Information Administration forecasting a 15% increase in peak demand by 2030. In parallel, utility capital investment is soaring, with distribution system spending alone growing over 60% in less than a decade (Edison Electric Institute, 2022).

Electric Vehicles represent a massive portion of this surge. While some forecasts predict a near-term slowdown, even conservative estimates project a 1400% increase to 60 million EVs by 2035 (Bloomberg, 2025), while others expect nearly 80 million (Edison Electric Institute, 2024). Without a strategy, this unmanaged load becomes a ticking clock on every local circuit.

This new demand is arriving at the same time as major reliability and affordability pressures:

- **Transformer shortages** are already causing grid connection delays and constraining growth (DOE, 2023).
- **Blackouts are on the rise**, creating an urgent need for new sources of flexible energy to ensure reliability (Kleinman Center for Energy Policy, 2024).
- **Customer backlash to rate increases** is growing, demanding more value and transparency, not just more infrastructure spending.



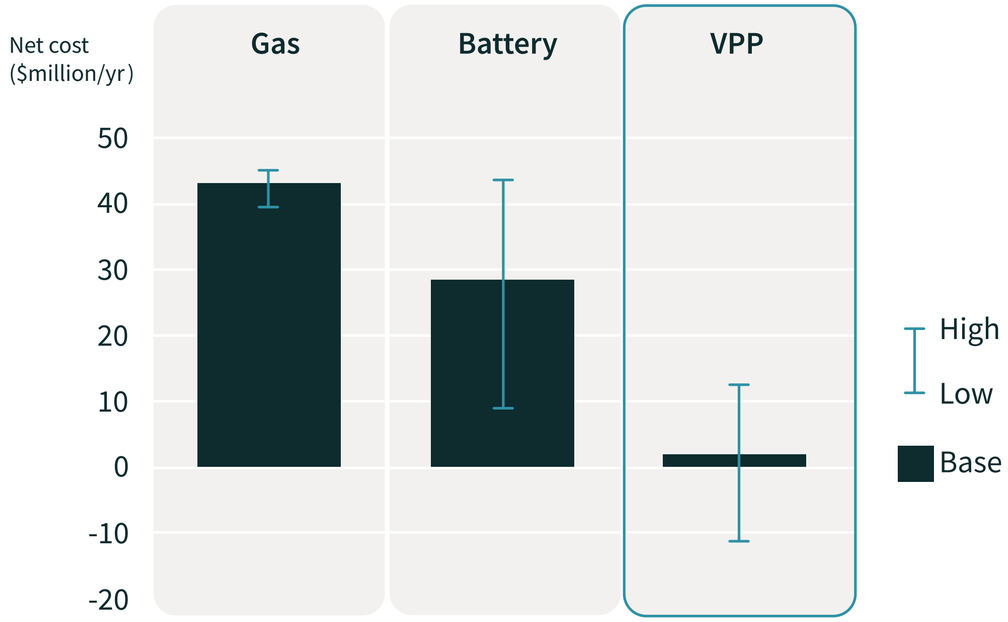
Virtual Power Plants:
A Better Path to Reliability

To meet rising demand, the U.S. has spent over $120 billion on new capacity in the last decade, primarily in gas-fired generators (Brattle, 2023). A more efficient and cost-effective solution is emerging: Virtual Power Plants (VPPs).

A VPP is a portfolio of customer-owned devices, including EVs, that can be orchestrated to support the grid. According to analysis by Brattle, VPPs offer a superior path to resource adequacy because they are **40-60% less expensive** than alternatives, require **no utility capital expenditure** on new generation, and can be deployed rapidly without lengthy interconnection queues.

Net Cost Providing 400 MW of Resource Adequacy

(Range observed across all sensitivity cases)



Note: Costs shown in 2022 dollars. Costs are net of societal benefits (i.e. GHG emissions, avoidance and resilience value) and power system benefits (energy, ancillary services, and T&D deferral value).

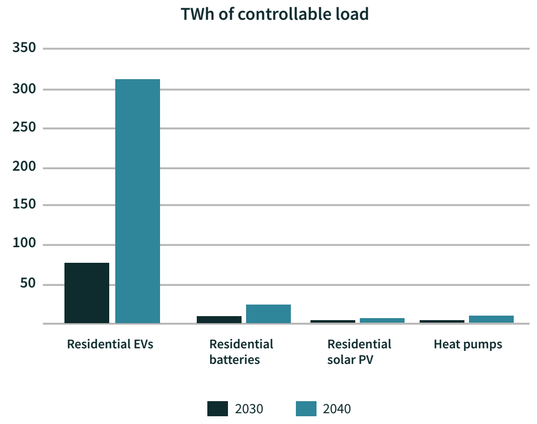
Visual - Recreated from Brattle report - Real Reliability, The Value of Virtual Power Plants

EVs: The Ultimate Building Block for a Flexible Grid

Utilities are increasingly working with Distributed Energy Resources (DERs)—customer-owned devices like rooftop solar, home batteries, and smart thermostats. By digitally bundling these resources together, they can be operated as a single VPP to support the grid.

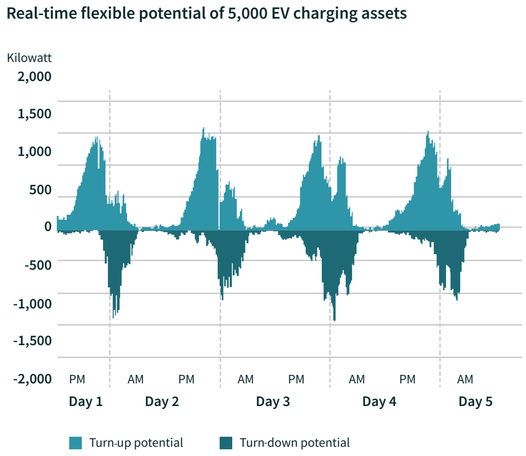
While all DERs have a role to play in VPPs, EVs are emerging as the most powerful building block for several key reasons:

- **Massive Scale:** By 2040, the manageable energy from EVs is projected to be 30 times greater than all other home devices combined. That's enough flexible capacity to power a state the size of California.

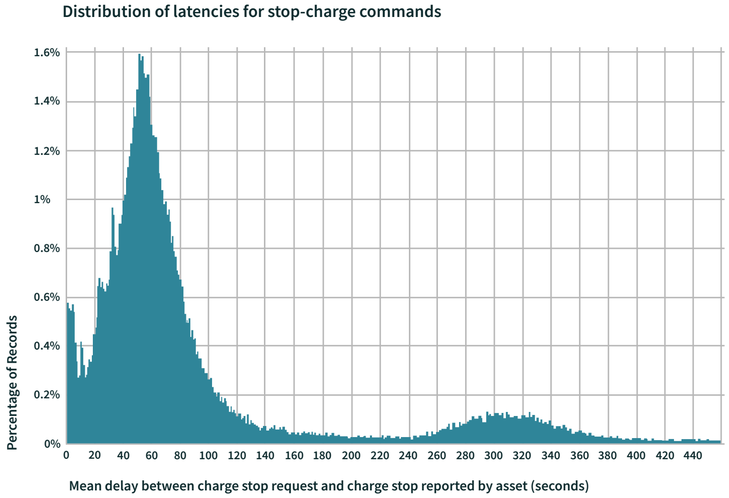


- **Unrivaled Flexibility:** EVs create a massive window for grid support. While plugged in for 14 hours each day, the average driver only needs about 3 hours of charging to replenish their daily use, offering a long, flexible period to manage charging when it is most beneficial for the grid.

- **Simple, Powerful Control:** Without needing advanced two-way (V2X) technology, smart charging allows utilities to remotely manage demand. They can slow down or pause ('turn down') charging during peak hours or start or speed up ('turn up') charging to absorb cheap, clean energy. This provides a powerful tool for grid planning and real-time operations that can be leveraged with zero disruption to drivers.



- **Rapid Response:** EVs can respond to grid needs almost instantly. In real-world programs, the majority of vehicles react to a signal in under 60 seconds, providing the rapid response that is crucial for keeping the power grid stable.



- **High Customer Engagement:** The connection people have with their cars is powerful—**70% of Americans** feel an emotional attachment to their vehicle (AAA, 2023). That personal bond builds a unique level of trust, making EV drivers incredibly committed and reliable partners in a VPP.

Managed Charging:
The Engine of EV-Centric Virtual Power Plants

The inherent flexibility of EVs is the foundation of their value, but it is **managed charging** that turns that potential into a dispatchable grid asset. In simple terms, managed charging is the technology that ensures vehicles charge at the best possible time for the grid and the lowest-cost period for the customer. Crucially, this optimization happens automatically in the background, without requiring the driver to change their behavior or sacrifice their mobility needs.

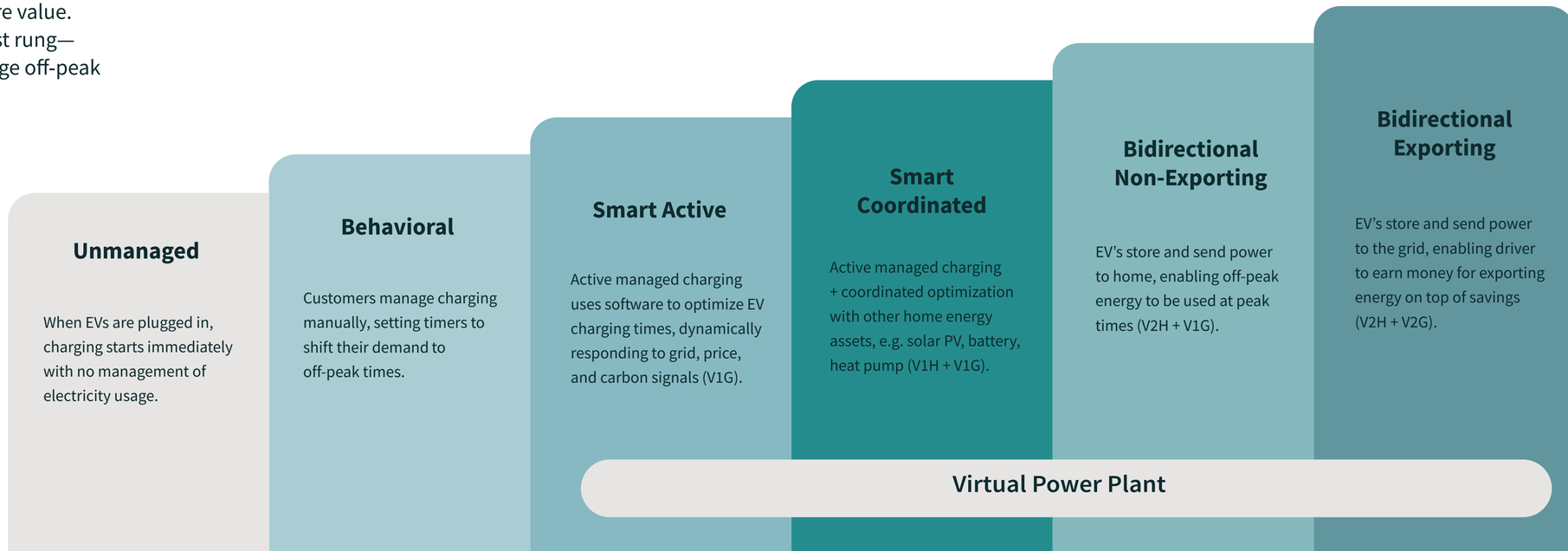
However, not all managed charging is created equal. The industry is on a journey up a "ladder" of maturity, with each step unlocking more value. Most utility programs today are on the first rung—simple behavioral programs that encourage off-peak charging.

This approach can be an effective first step, but it can be costly at large-scale enrollment. Simplistic strategies like Time-of-Use (TOU) rates can actually accelerate grid problems by creating new, sharp "timer peaks" as all EVs begin charging at the exact same moment. These new peaks can be even more damaging to local transformers than doing nothing at all.

The true, multi-billion-dollar opportunity of the **Cost-Avoidance Stack** is only captured on the higher rungs through active, dynamic optimization.

With less than 10% of U.S. residents having access to any utility managed charging program today, there is a massive opportunity not only to expand access but to leapfrog directly to the higher-value stages that turn EVs into powerful grid resources.

The 5 Stages of Managed Charging



The Tipping Point is Here:
Why Action is Required Now

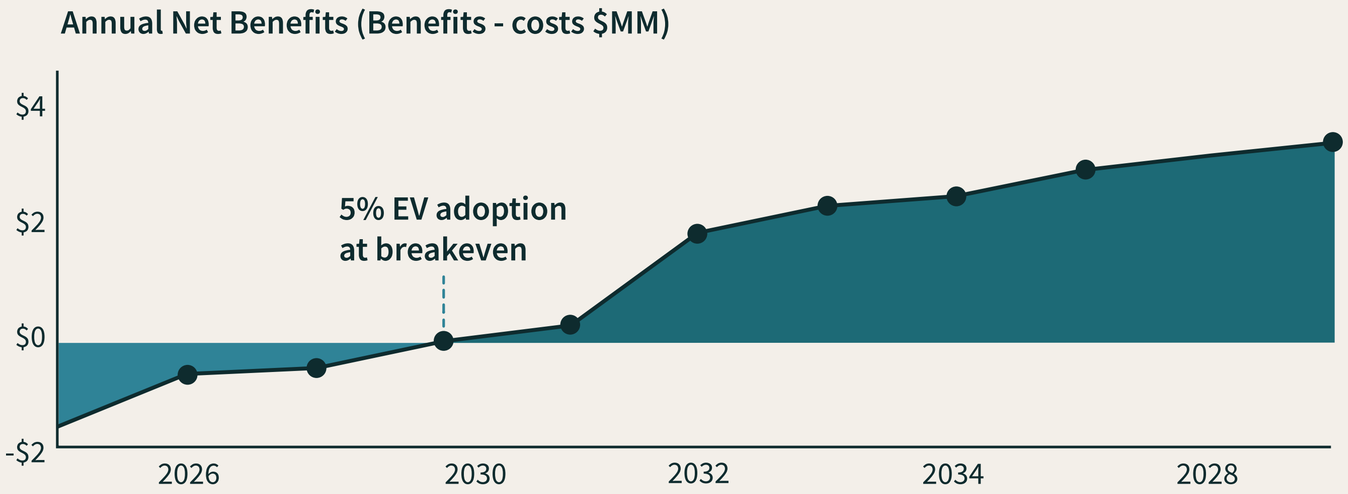
For years, many utilities have viewed scaling managed charging as a future concern. A groundbreaking analysis from **AES Indiana**, however, has proven that assumption is dangerously outdated. It revealed that the "EV tipping point"—the moment the benefits of managed charging outweigh its costs—occurs at a surprisingly low **5% residential EV adoption** (AES, Camus, 2024).

The reality is that for over 800 U.S. utilities*, this tipping point is not a future milestone; it's here.

Waiting is no longer a viable strategy. Every day of inaction exposes utilities to a cascade of real and growing risks:

- **Affordability:** Unmanaged charging creates system costs that ultimately land on every customer's bill.
- **Reliability:** Uncoordinated EV load growth leads to steeper peaks and higher transformer failure rates on local circuits.
- **Operational Rollout:** Without scaled managed charging, connection delays will increase, angering customers and constraining growth.

*Modelled from AFDC vehicle registration counts and EIA electricity customers by utility.



The good news is that a clear, data-driven path forward exists.

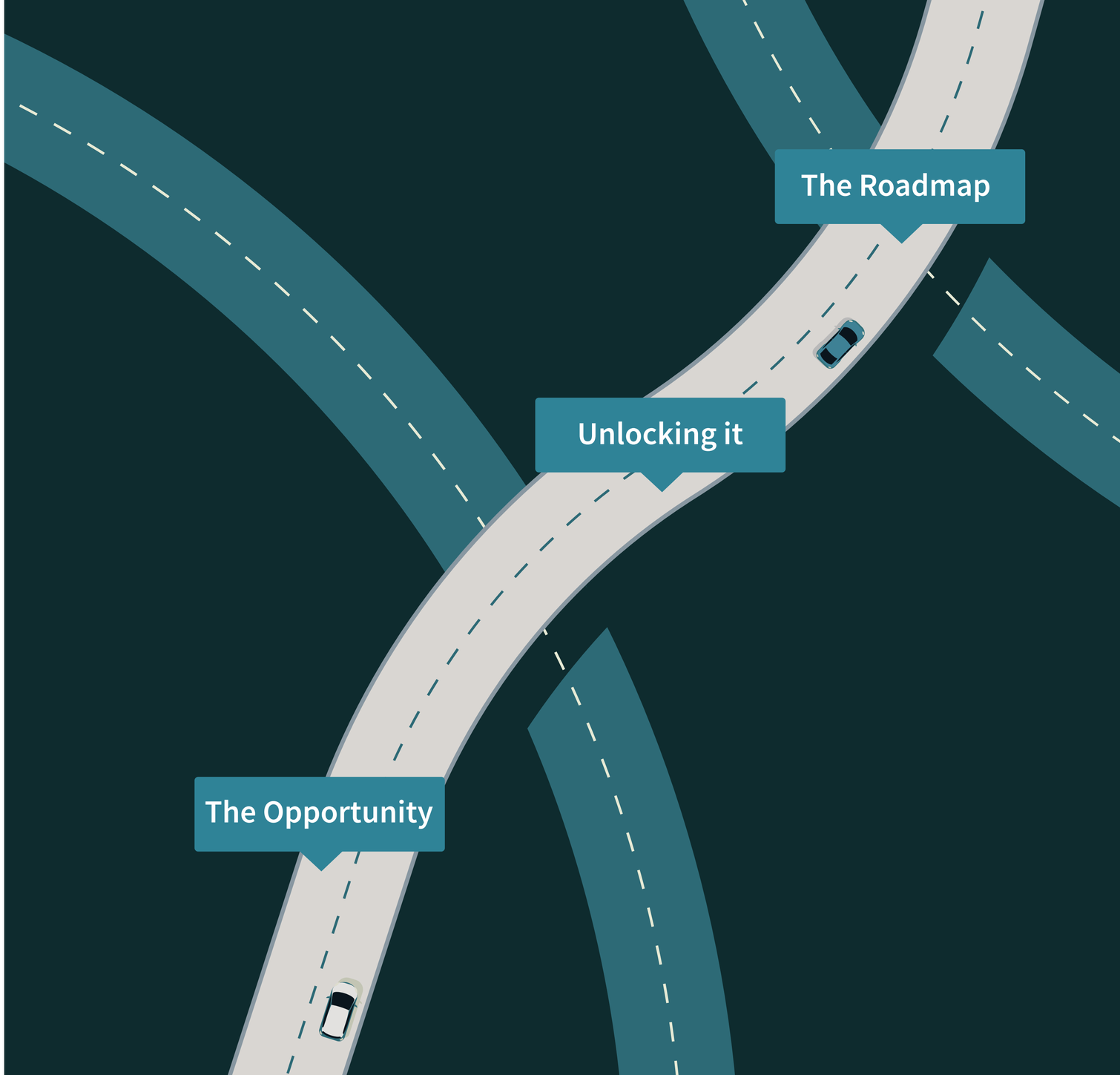
The following section introduces the **Cost-Avoidance Stack**—the definitive framework for quantifying the value at stake and the blueprint for turning this urgent challenge into a multi-billion-dollar opportunity.

The $30 Billion Opportunity: How Managed Charging Lowers Energy Costs for All

As we have established, utilities face the inevitable and rapid load growth of transportation electrification, driven by EVs. The temptation is to react with narrow fixes—focusing only on simple peak-shifting or isolated distribution-level problems. This approach, however, is incomplete. It addresses just a fraction of the challenge, makes things worse, and leaves billions in **avoidable costs** on the table by risking unnecessary **capital spending** today.

To provide the roadmap for capturing these avoided costs, we partnered with the experts at The Brattle Group who provided research support to develop **The Cost-Avoidance Stack**. This data-driven framework is centered on active managed charging, the core engine of a VPP, which uses automated load optimization to respond to dynamic grid conditions. It quantifies how each actively managed EV can create up to **$575 in annual avoided costs** across six distinct layers of the grid.

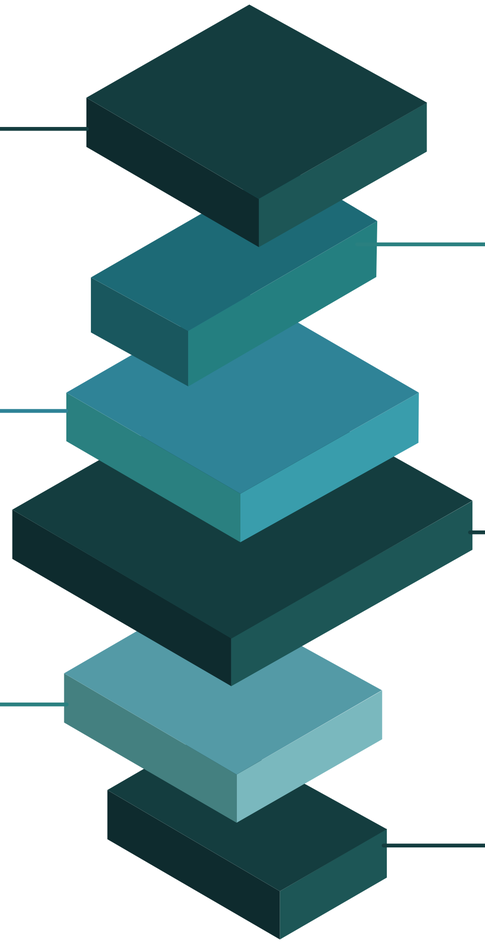
The full opportunity is only unlocked through a holistic view, combining behavioral, active, and bidirectional managed charging. Our analysis shows this represents a **$30 billion annual cost-avoidance opportunity by 2035**—the equivalent of a 10% reduction in energy costs or a $200 annual bill savings for every household in the country.



The Cost-Avoidance Stack: A Blueprint for Grid Savings

The table below breaks down each layer of the stack, providing a clear blueprint for turning your largest new liability into your most flexible and valuable asset. The avoided cost per EV is based on a one-directional, active managed program. Further value will be extracted with the rollout of V2G-capable vehicles and chargers. To understand how this works in a multi-tiered program across behavioral, active, and bidirectional stages, see page 26.

The Full Cost-Avoidance Potential of an Actively Managed EV



Generation Capacity

$60-$140/EV

Avoid building expensive peaker plants. By reliably shifting demand away from the top 100 critical peak hours, managed EVs act as a 'virtual power plant,' reducing the need to build and maintain expensive, fossil-fuel-burning peaker plants for resource adequacy. Based on PJM/CAISO capacity prices.

Transmission System

$20-$55/EV

Reduce the need for large-scale grid buildouts. Consistent, large-scale load shifting reduces stress on the high-voltage transmission system, helping to defer multi-decade, billion-dollar capital projects driven by system-wide peak demand. Based on CA Avoided Cost Calculator & ConEd MCOS forecasts, with a 50% derate.

Distribution System

$5-$300/EV

Defer costly local upgrades. By actively managing charging to reduce load on specific feeders and transformers during local peaks, utilities can defer multi-million-dollar capital upgrades triggered by EV clusters. This is the most immediate and localized grid risk from EVs. Value ranges from SEPA report & ANL modeling.

Energy Procurement

$100-$180/EV

Lower wholesale energy costs for all ratepayers. Dynamic managed charging shifts EV load to hours when energy is cheapest, reducing the utility's average wholesale procurement cost. These savings can be passed on to all customers. Based on 2023 wholesale price arbitrage in NY, CO and CA.

Ancillary Services

$0-$80/EV

Enhance reliability and prepare for future revenue. Ancillary services like non-spinning reserve and frequency regulation ensure moment-to-moment grid stability. While direct market access is evolving, building this capability now enhances reliability and prepares you to capture future revenue from these essential grid services.

Customer Operations

$7-$10/EV

Lower service costs and improve satisfaction. Proactive managed charging programs improve the customer experience, leading to higher CSAT scores and fewer costly service calls. Based on the APPA report on utility admin spend.

Average Stackable Cost-Avoidance per Active Managed EV*	$145 - $575*

Understanding Our Projections

Our Cost-Avoidance Stack model is centered on active managed charging, the core engine of a VPP, which uses automated load optimization to respond to dynamic grid conditions.

The stack will vary for each utility depending on it's jurisdiction and system conditions. ev.energy enables utilities to develop their unique stack and deliver a roadmap to unlock the full value. It is important to understand the assumptions that ground this analysis. The framework for value remains robust even in a shifting landscape.

- **Our model does not account for future grid strain.** The projections, shown in 2024 U.S. dollars, assume today's electricity costs remain constant. They do not factor in the higher expenses utilities will inevitably face for grid upgrades in a future with widespread, unmanaged EV charging. The true avoided costs will therefore likely be greater.

- **We account for co-optimization.** The average stackable benefit is calculated with a 25% discount factor applied to account for times when capturing one benefit (like low energy cost) isn't perfectly aligned with capturing another (like peak grid capacity). The ev.energy platform enables utilities to optimize simultaneously for multiple system needs, maximizing stackable value.

- **The business case holds true even with slower EV uptake.** Our model uses the established 2024 EEI forecast (78.5 million EVs by 2035). However, the fundamental per-vehicle value is so significant that the business case for managed charging remains urgent even under more conservative adoption scenarios, such as those highlighted in recent industry reports.

Taken together, these factors mean the figures presented in the Cost-Avoidance Stack represent a realistic baseline for the value you can unlock today and in the years to come.

How Stacking Unlocks Greater Value

A common myth in grid services is that allowing a single asset to provide multiple "stacked" benefits creates complexity or hidden costs. In reality, the opposite is true. Prohibiting stacking is a flawed market design that leads to worse outcomes for ratepayers.

This concept is not new; RMI analysis from nearly a decade ago highlighted the significant value of stacking for stationary storage. While implementation has proven challenging, the impending scale of EV adoption now makes it a critical and worthwhile priority for utilities. *Source: Rocky Mountain Institute, The Economics of Battery Energy Storage, 2015.*

While the value is not always fully additive (for example, the moment of a local distribution peak may not perfectly align with the moment of a system-wide capacity peak), EVs can and should provide multiple value streams simultaneously. A well-designed market ensures there is no "double counting" of services, as demonstrated by frameworks like New York's Value of Distributed Energy Resources (VDER) tariff, which already compensates resources for their stacked value today.

Stacking allows a single flexible asset to solve multiple problems at once. This strengthens the business case, accelerates competition, and ultimately lowers the total cost of grid services for everyone, more quickly.

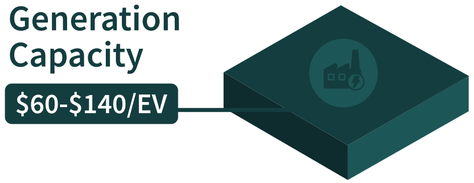
Unpacking the Stack: A Deep Dive into the Six Layers of Avoided Costs

The previous section outlined the Cost-Avoidance Stack, a framework quantifying $145 to $575 in annual avoided costs per actively managed EV, including co-optimization derating. Now, let's explore a detailed breakdown of that framework, unpacking the mechanics, assumptions, and real-world examples behind each of the six layers.

Remember, our analysis moves beyond simple peak-shifting to provide a holistic view of the benefits unlocked by managed charging—from local distribution circuits to the bulk power system. The following figures represent a realistic range of avoided costs achievable in various U.S. jurisdictions today.

These are not just abstract numbers; they are tangible costs that can be deferred or avoided entirely, with the resulting system-wide benefits ultimately flowing back to all ratepayers. Use this deep dive to understand the specific opportunities within your own system and to inform the business case for scaling your managed charging portfolio.

The following six layers represent direct, tangible avoided costs to the utility system. They are the core components of the business case for managed charging, representing opportunities to defer or entirely avoid spending on grid infrastructure, from the power plant to the local circuit.



This first layer of the stack addresses one of the largest and most strained capital expenses a utility faces: ensuring there is enough power generation to meet demand on a handful of critical peak hours each year. Today, this challenge is intensifying. A combination of **supply chain constraints, long interconnection queues for new resources, and rapid load growth** has made available capacity increasingly scarce and expensive.

To meet this need, utilities and grid operators (like regional RTOs such as SPP and MISO) must secure capacity, which often means building or contracting with multi-million-dollar "peaker plants." The cost of this standby power is significant; recent market prices show utilities paying upwards of **$100 per kilowatt-year**. This means a utility must pay $100 every year just to have one kilowatt of power available on standby, whether it's used or not.

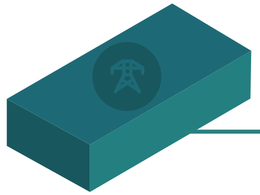
Managed charging directly addresses this issue. By acting as a clean, cost-effective virtual power plant, a fleet of managed EVs shifts demand away from these critical peaks. This provides a reliable capacity resource that allows utilities to avoid the significant capital cost of building new power plants and sidestep the high prices of a constrained capacity market.

CASE STUDY EXAMPLE

El Paso Electric (EPE) Defers Generation Needs

Facing significant load growth, El Paso Electric needed a solution to help manage its summer peaks. Through its managed charging program, EPE actively shifts residential EV charging load out of the critical 4-hour afternoon peak window (2 PM - 6 PM).

This program provides EPE with a reliable, dispatchable resource that directly reduces peak demand. By doing so, it helps EPE defer the need for future investments in expensive generation assets that would otherwise be required to meet this growing demand.



Transmission System

$20-$55/EV

Moving from the power plant down the line, the Transmission layer focuses on the ‘highways’ of the grid—the high-voltage system built to handle system-wide peak demand. By managing EV charging at scale to flatten system-wide peaks, utilities can reduce congestion on these critical assets and delay the need for costly and disruptive upgrades.

While attributing the deferral of a specific transmission project purely to EV management is challenging, grid operators have established methods for quantifying this value. In New England, for example, ISO-NE’s analysis of distributed energy resources uses the Regional Network Service (RNS) charge, which has been valued at around **$115/kW-yr.** Managed charging can directly offset this charge.

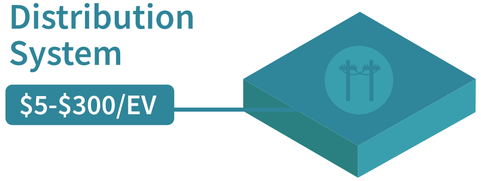
Our analysis applies a conservative 50% derate to these higher-end values to arrive at the **$20 - $55 per EV** figure, acknowledging that transmission planning is influenced by many factors beyond peak load alone.

Where Transmission Value Matters Most

• **Congestion Relief:** In markets like Texas (ERCOT) or California, where population centers draw power from remote generation, managed charging can ease transmission constraints during critical hours, preventing overloads and avoiding the costly redispatch of power plants.

• **Deferring Localized Upgrades:** For smaller or remote communities served by a single, capacity-constrained transmission line, managed charging can keep load below critical thresholds, effectively deferring the need for an upgrade until it is truly essential.

Distribution System



At the most local level, unmanaged charging poses its most immediate and acute risk. This is where the Distribution layer can deliver the largest single component of the Cost-Avoidance Stack. A handful of EVs charging simultaneously in one neighborhood can push local transformers and feeders beyond their limits, forcing costly, emergency capital upgrades. Brattle's recent report (New York Grid of the Future, 2025) found utility marginal distribution costs as high as $220/kW-yr in some areas.

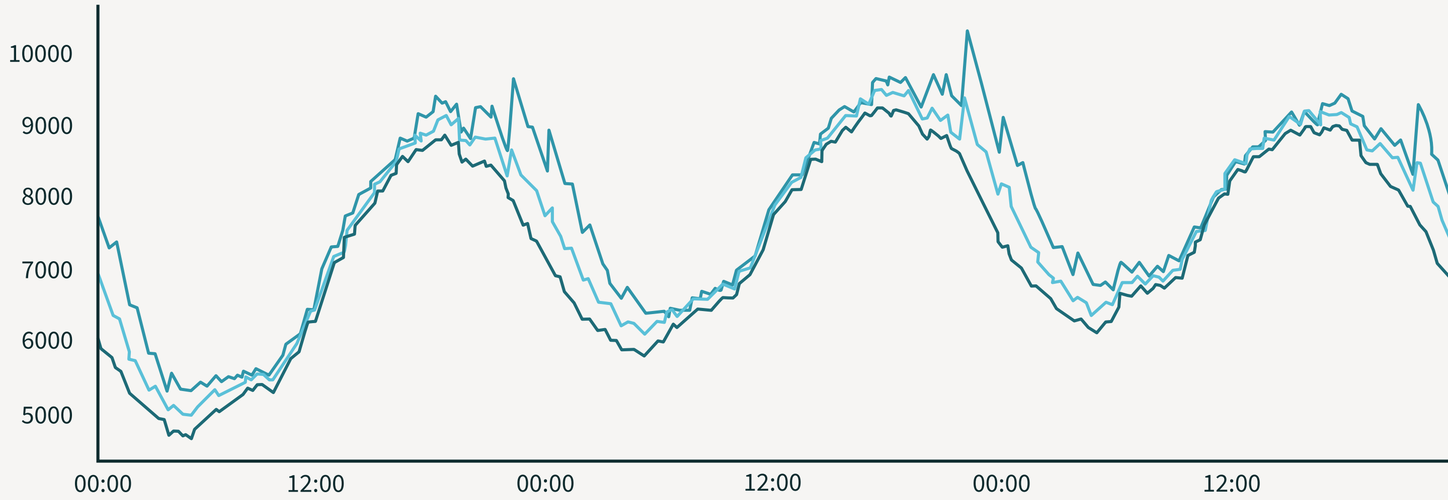
Active managed charging provides a surgical solution, allowing utilities to manage load on these specific, constrained circuits. This directly defers capital spending and prevents premature asset failure, providing an immediate return while opening the door to capturing the rest of the value in the stack.

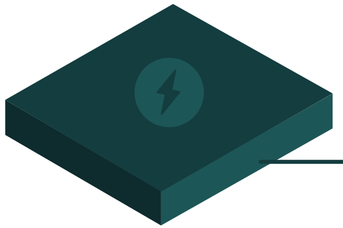
The Tipping Point: When TOU Rates Start to Backfire

While simple Time-of-Use (TOU) rates can be effective at very low EV adoption levels, they have a critical flaw as penetration grows. Studies, such as the one conducted by **AES and Camus Energy**, show that a tipping point can be reached where the new, simultaneous charging peak created by the TOU window becomes large enough to overload local distribution circuits.

This means a tool designed to help the grid can begin to actively harm its most vulnerable assets. This is why **active, dynamic management**—which smooths out charging within the off-peak window—becomes essential as EV adoption scales.

Time-of-use rates can trigger earlier equipment upgrades





Energy Procurement

$100-$180/EV

Shifting from capital deferral to direct operational costs, the Energy Procurement layer focuses on the variable ‘fuel cost’ of electricity that a utility pays on the wholesale market. By automatically shifting EV charging away from high-priced evening peaks to hours when wholesale energy is cheapest, utilities can significantly lower their average energy procurement cost.

The value of this energy shifting varies by region, depending on the local generation mix. For example, in California, the greatest opportunity is often shifting load to midday to absorb abundant, low-cost solar power. In the Midwest, it may be shifting to overnight hours to align with powerful wind generation. Active managed charging dynamically optimizes for these lowest-cost hours each day, reducing costs for the entire ratepayer base.

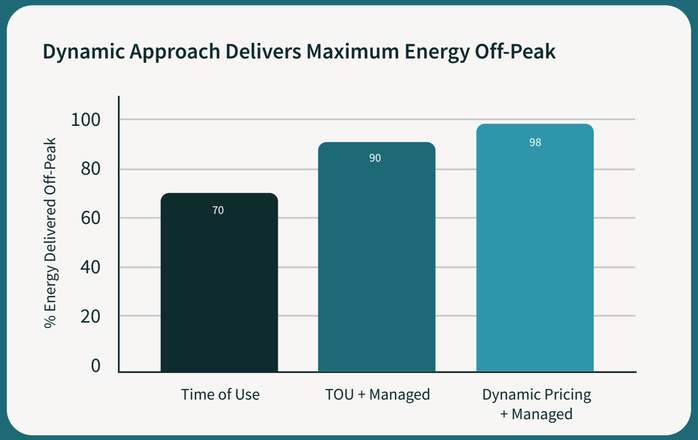
CASE STUDY EXAMPLE

California’s Dynamic Charging Pilot Outperforms TOU

The ChargeWise California pilot, funded by the California Energy Commission, demonstrated this benefit clearly. The program, serving customers of MCE and Silicon Valley Clean Energy (SVCE), used active managed charging to automatically optimize charging for the lowest-cost hours.

The results were definitive:

- **Precision Shifting: 98%** of all EV charging was delivered during off-peak hours, compared to just 60-70% for customers on a standard Time-of-Use (TOU) rate.
- **Solar Alignment: 30%** of all charging was successfully shifted to midday hours to absorb excess solar generation.
- **Customer Equity:** The program saw rapid adoption, with over 1,000 enrollments in two months, 50% of whom were from **disadvantaged communities.**



“Automating EV charging optimization against a dynamic price signal builds beyond ToU rates. This hourly dynamic concept used in ChargeWise keeps things simple while transferring more value to customers than a ToU rate”

Justin Zagunis,
SVCE

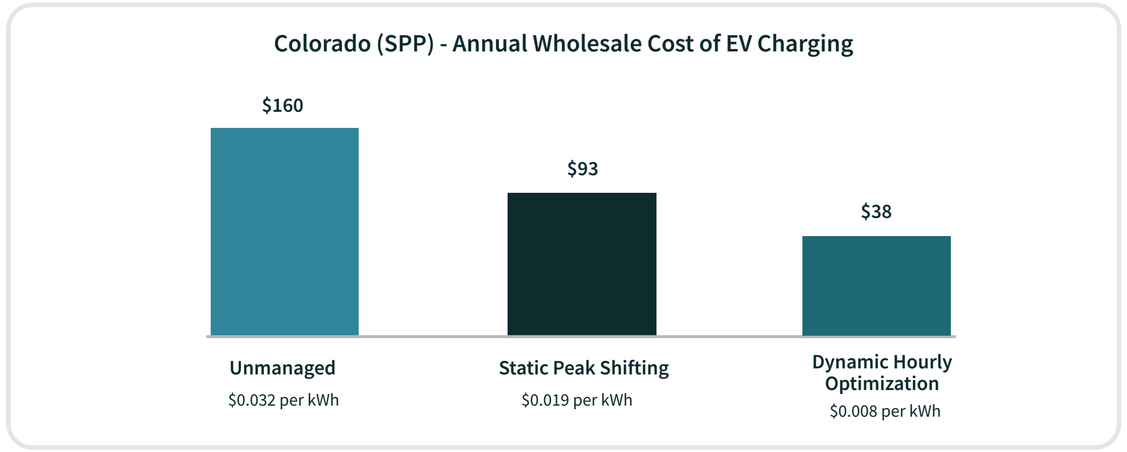
The Bottom Line: Active Management Captures the Value TOU Rates Leave Behind

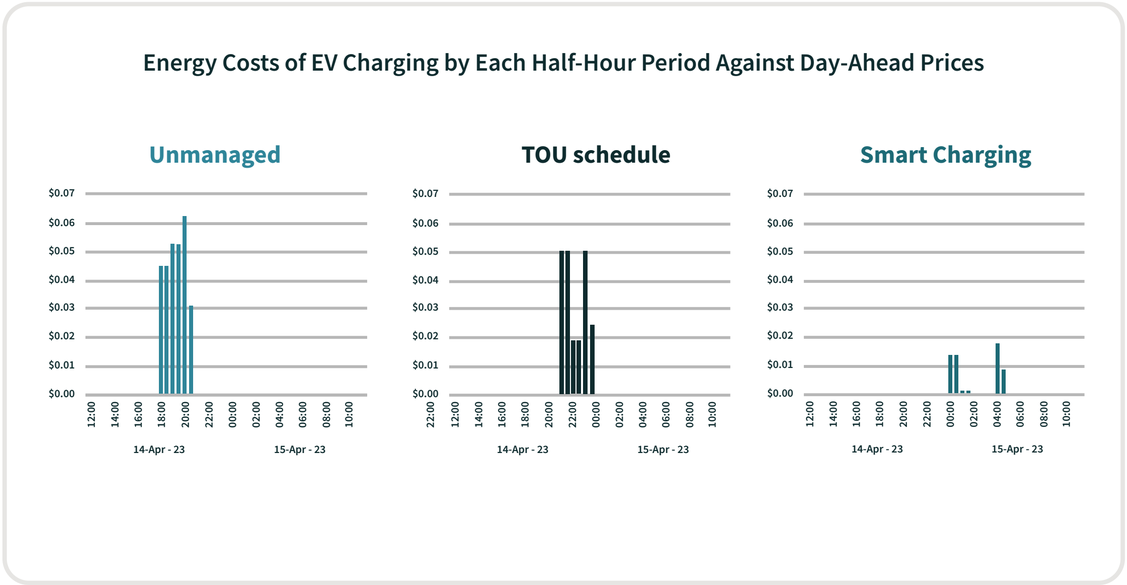
This case study highlights why simple TOU rates are an incomplete solution. A TOU rate creates a wide, fixed “off-peak” window. It cannot differentiate between a cheap hour and the cheapest hour within that window.

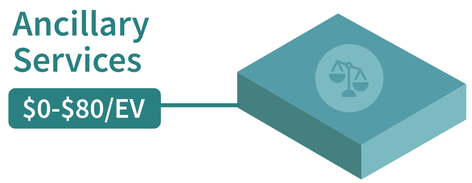
As ChargeWise proved, active management is more intelligent. It saw that midday solar was often the cheapest, cleanest power available and precisely shifted 30% of charging there—something a standard overnight-focused TOU rate is completely blind to. This dynamic capability is the key to capturing the full value of the energy stack.

Static Peak Shifting = Time of Use

Dynamic Hourly Optimization = Active Managed Charging







Ancillary services are real-time adjustments that grid operators use to ensure moment-to-moment stability. They represent a significant opportunity for managed EV fleets. While U.S. market access is still developing, fleets in Europe are already actively participating. In the Netherlands, for example, this is estimated to generate the equivalent of $80 per EV per year.

Unlocking this value in the U.S. requires an evolution in market rules, particularly around metering and procurement. By following the path of European grid operators—moving toward a market-led, real-time approach—utilities can access the fast and precise flexibility of EVs to enhance grid reliability and lower balancing costs for all customers.

CASE STUDY EXAMPLE

Operational Metering Trial

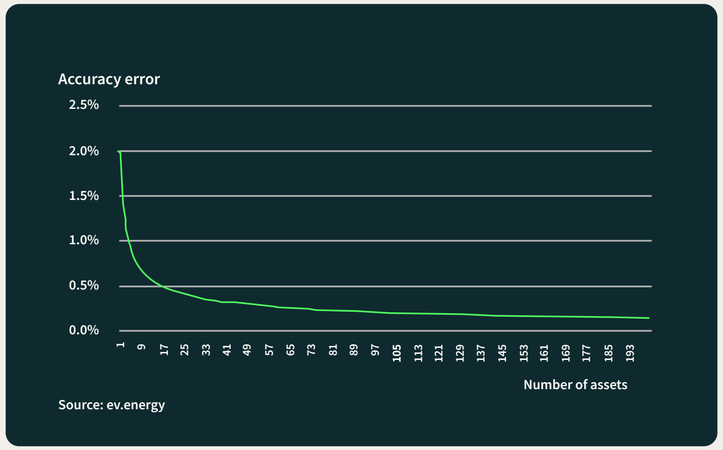
The British Operational Metering Trial, led by ev.energy and the National Electricity System Operator, demonstrated how aggregated metering from thousands of EV chargers can provide the accurate power readings needed by grid control rooms.

This successful trial helped inform adaptations to metering requirements, enabling EV virtual power plants to participate in the UK's Balancing Mechanism alongside traditional assets like gas peakers and grid-scale batteries.

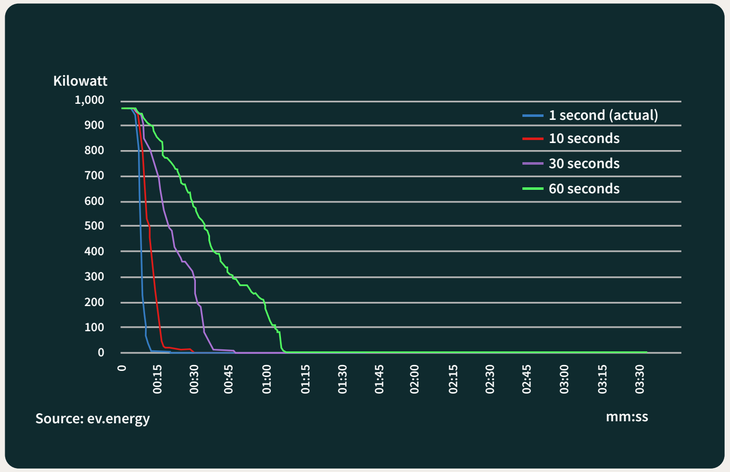
Findings from the trial were captured in the Metering Matters Report (ev.energy, 2024). The first figure shows how the accuracy error of individual power readings can improve exponentially when sub-metering is aggeregated.

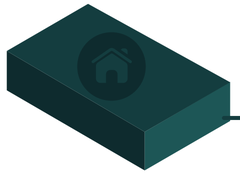
The second figure shows live test results of EV charging response times. When ramping down, the aggregation of EV assets shed 95% of its load within 10 seconds and fully reached zero after 20 seconds. These response times are comparable to or quicker than fast-acting conventional generators, which shows that EV charging can be an effective resource for ancillary services.

1. Improving Aggregate Accuracy Error



2. Live EV VPP Turn-Down Testing by Varying Asset Reporting Intervals





Customer Operations

$7-$10/EV

An often-overlooked challenge with the rise of EVs is the increase in customer service costs; customers with a strong emotional, practical, and financial connection to their vehicle want to ensure they are getting the best value. Without an effective strategy, EV drivers are left to manually monitor complex utility rates to avoid high bills—a confusing and frustrating experience that inevitably leads to increased calls and complaints. An effective managed charging program automates this entire process and reduces support costs by preempting billing issues and reducing the burden on customer service teams.

Furthermore, these programs can reduce customer service effort by offering simple, predictable rate structures. When customers have confidence and certainty about their EV charging costs, they are far less likely to generate billing inquiries, creating further operational efficiencies for the utility and improving overall satisfaction.

Decarbonization: Enabling a Cleaner, More Efficient Energy System

While the approach to valuing carbon in the utility system varies widely by jurisdiction, the environmental value of managed charging is a critical societal benefit and an increasingly important driver for regulatory and policy goals.

By shifting EV charging to align with periods of low-carbon generation, utilities can maximize the use of clean resources. This means absorbing abundant wind power overnight or solar power during the day; energy that might otherwise be curtailed. This directly reduces the reliance on fossil-fuel peaker plants to meet demand, lowering system-wide greenhouse gas emissions. These savings can be significant, estimating a reduction of **0.1 to 2.5 tons of CO_2 per EV, per year**, depending on the regional grid mix (DOE, NREL, 2021).

Furthermore, by reducing the need to run the oldest, highest-emitting peaker plants during grid emergencies, managed charging also provides local air quality benefits by cutting NOx and particulate emissions.

From Social Cost to Real Value

While not all markets have a direct price on carbon, its societal cost is significant. To bridge this gap, innovative policies are emerging.

The Massachusetts Clean Peak Standard creates a financial incentive for utilities to use clean resources—including demand response from managed EV charging—to shift electricity demand away from peak periods. Clean energy resources that help meet this target earn “Clean Peak Credits.” While the value of these credits fluctuates based on market conditions, an EV participating in managed charging for 3,500 kWh per year can generate more than $115 in value, based on the Alternative Compliance Payment.

Programs like this create a tangible value stream for decarbonization, encouraging utilities to prioritize clean, flexible assets over traditional fossil-fuel resources.

Investing the Savings: How Avoided Costs Fund Customer Benefits

The up to $575-per-EV in avoided costs detailed in the previous section is not just a number on a spreadsheet; it is the financial engine that powers a new, mutually-beneficial relationship between the utility and its customers.

This creates a fundamental shift in the traditional utility model. Instead of sending money to out-of-state fuel providers or remote power plants, the avoided costs from managed charging allow utilities to directly invest in their own customers, compensating them for the value their EVs provide through smarter charging.

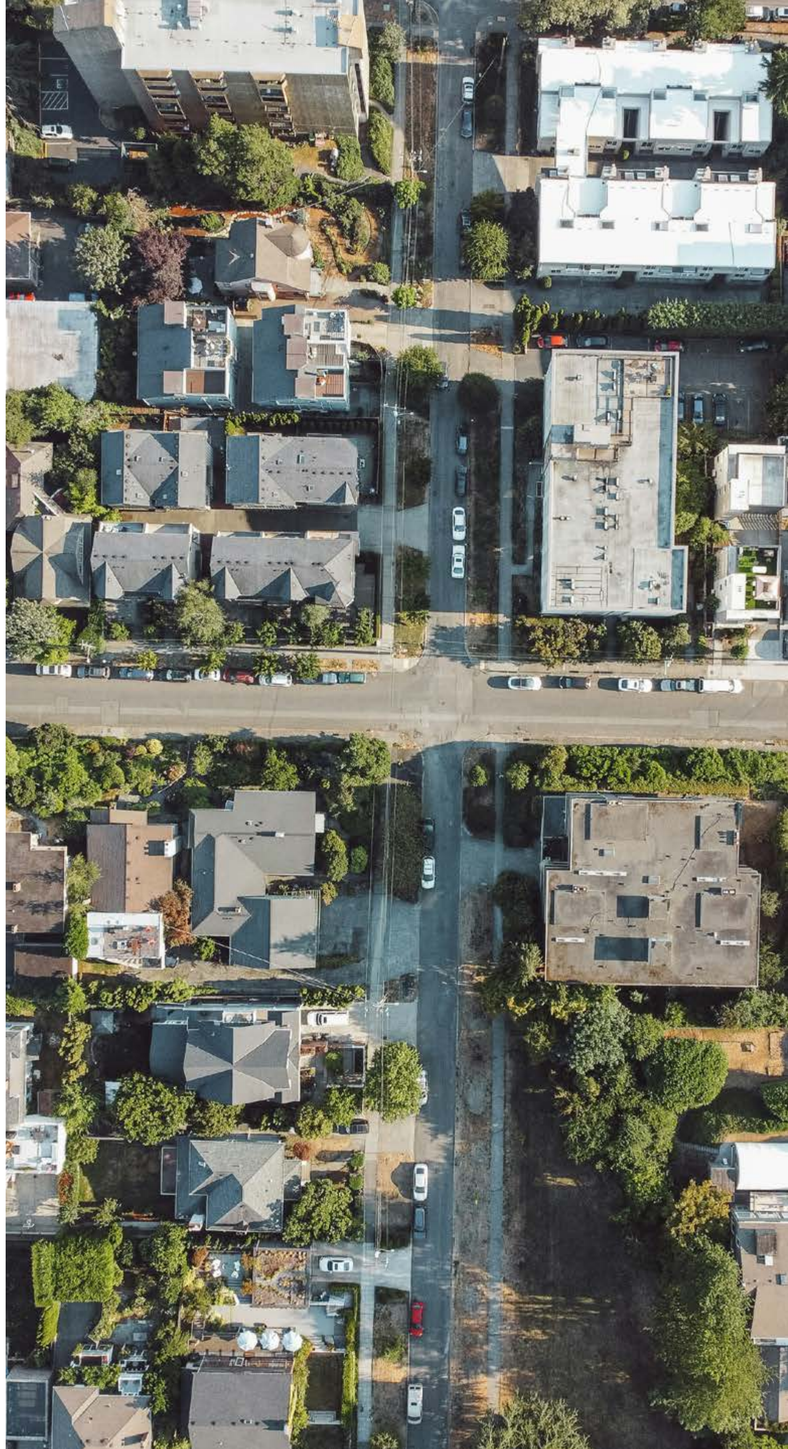
The great news is that once a utility has incentivized EV customers to participate in managed charging, there should be plenty left over to help reduce the cost of energy for other ratepayers. This creates a true win-win-win: the grid gets access to lots of cheap flexible load, customers who provide that load are fairly compensated, and other rate payers see a significant reduction in their cost of energy.

A Winning Model: Paying Customers for Grid Resources

To achieve the benefits of the Cost-Avoidance Stack, utilities need to enroll customers in managed charging programs. The primary cost of these programs is customer incentives—the payments that attract and retain participation.

Crucially, these incentive costs are not an additional expense; they are funded by the very grid costs the program is avoiding. This creates a virtuous cycle:

1. Managed charging avoids spending across the 6-layer stack
2. A portion of those **avoided costs** is used to fund customer incentives
3. Any remaining benefit after program investments can be shared with **all ratepayers** through lower overall system costs and reduced rates



Diverse Incentive Designs for Every Utility

Utilities have a wide range of proven options for structuring these incentives. The design can be tailored to meet specific regulatory environments and customer needs, from simple bill credits to dynamic rewards.

This flexibility is key. Advanced managed charging platforms can decouple the complexity of grid optimization from the customer experience. This means a utility can offer a straightforward program to drivers while capturing the full, dynamic value of the Cost-Avoidance Stack on the back end.

Here are four examples of successful incentive designs currently in the market:

The No-Cost Engagement Model

Avista's Smart Charging Program provides customers with a detailed monthly report comparing their charging costs to the equivalent cost of gasoline. This simple, educational approach successfully engages drivers and encourages off-peak charging with minimal program cost.

The “Free Fuel” Model

TXU’s Free EV Miles program takes a straightforward approach by crediting customers for the full cost of all electricity used to charge their vehicles during off-peak hours, making the value proposition simple and highly attractive.

The Fixed Credit Model

National Grid NY's EV Charge Smart Plan offers customers a flat **$15 monthly bill credit** for doing at least 80% of their charging during the off-peak window (11 PM - 7 AM). This provides a predictable and consistent reward for participation.

The Dynamic Rewards Model

MCE Sync's program offers a dynamic incentive, crediting customers between **$0 - $40 per month** based on hourly energy prices. Customers opt in to have their charging automatically optimized, and they earn more when they provide flexibility during high-value grid events.

Making the Investment: The Business Case for Your Program

Unlocking the multi-billion-dollar opportunity detailed in the Cost-Avoidance Stack requires a smart investment in the programs that create value. These program costs are a small fraction of the capital-intensive grid upgrades they help avoid, and understanding their structure is key to building a successful business case.

The investment can be broken down into two main categories:

A Critical Shift: Treating Program Costs as a Capital Investment
Traditionally, software and program administration have been treated as operational expenses (OPEX). However, a managed charging platform is a long-term, value-creating asset that enables grid management for a decade or more—much like a traditional piece of grid hardware.

A growing number of jurisdictions are recognizing this, allowing utilities to **capitalize** these platform costs. This approach properly aligns the investment with the long-term grid benefits it creates and provides a more straightforward path to regulatory approval and funding.

1. Technology & Integration

This is the digital infrastructure required to manage your fleet of EVs as a grid resource. It includes the software platform for data analytics and dispatch control, as well as any one-time costs for integrating with utility systems or automaker APIs. As programs scale, these technology costs per EV drop significantly. Furthermore, foundational investments like a Distributed Energy Resource Management System (DERMS) are not attributable solely to EVs; they are shared assets that increase the value of your entire DER portfolio.

2. Marketing & Customer Engagement

This is the investment in building participation, which is the fuel for your program's success. While marketing is a key component in the early years to build awareness, proven strategies like point-of-sale enrollment at car dealerships and targeted digital marketing can significantly increase the efficiency of customer acquisition and engagement over time.

The Payoff: A Positive Return from Day One

When viewed as a strategic investment in flexible, digital infrastructure, the business case for managed charging is compelling and immediate. **The multi-layered avoided costs delivered by the program far outweigh the operational expenses.**

By financing the initial setup costs over the program's lifetime—just as with any traditional grid asset—utilities can achieve a **positive net benefit for all ratepayers from day one.** As EV adoption grows, the return on this initial investment will continue to compound, delivering increasing value year after year.

Unlocking the Full $30bn Opportunity: A Portfolio Approach to Program Design

The Cost-Avoidance Stack represents the full potential value, but capturing it requires a flexible strategy. A “one-size-fits-all” program will not work. To engage every EV driver—from those in single-family homes to apartment dwellers and fleet operators—a multi-layered portfolio approach is essential.

This approach allows you to meet customers where they are, maximizing participation and building a foundation for deeper grid integration over time. Here’s how the layers build on each other to capture the full, multi-billion-dollar opportunity.

Foundation

Core Engine

Future-Ready

The Foundation: Behavioural Programs for Mass Engagement & Equity

Goal: To engage the maximum number of drivers quickly and equitably, including those who cannot install a smart charger at home (e.g. apartment residents, workplace chargers).

How it Works: These programs use Advanced Metering Infrastructure (AMI) data, vehicle telematics, and targeted messaging to encourage off-peak charging through simple, voluntary actions. They are the fastest and broadest way to start influencing charging behavior.

The Impact: While delivering approximately half the per-EV value of an active program, engaging **30% of drivers** via this accessible approach could unlock **$5 billion** in annual avoided costs by 2035.

The Core Engine: Active Managed Charging to Maximize Value

Goal: To deliver the deepest, most reliable grid value from drivers who have a connected charger or vehicle. This is the workhorse of a modern utility EV program.

How it Works: Advanced software platforms dynamically optimize charging across the full Cost-Avoidance Stack, responding to grid needs in real-time while always respecting driver mobility requirements.

The Impact: With **50% of EV drivers** participating in active programs*, you can unlock **$13 billion** in annual avoided costs—the largest single piece of the prize available today.

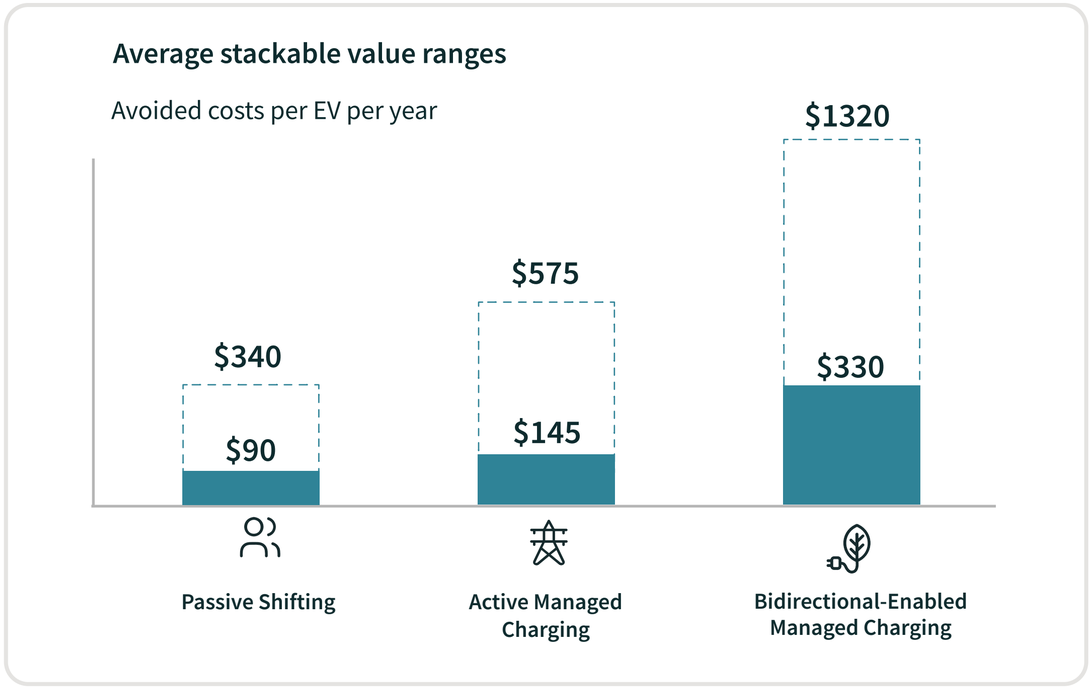
The Future-Ready Step: V2G Integration to Unlock New Grid Services

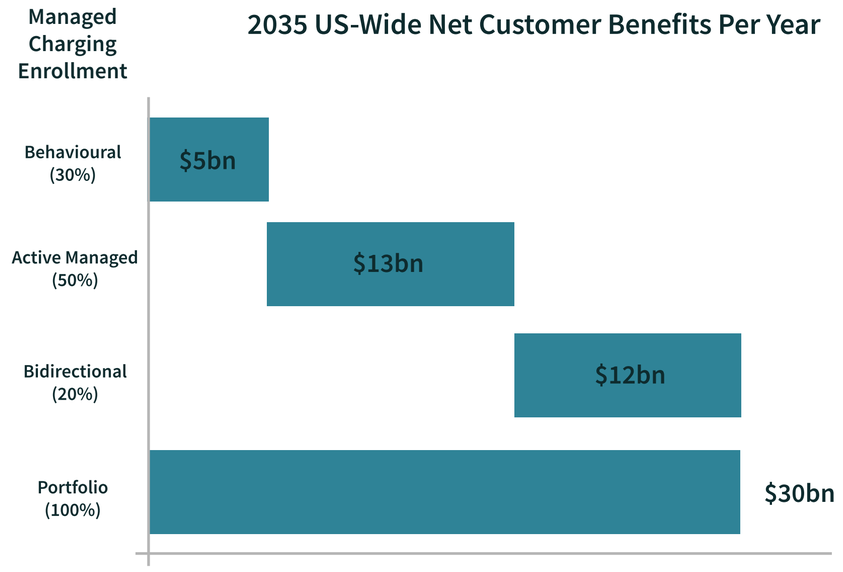
Goal: To prepare for the next frontier of grid services by leveraging the full bidirectional capability of EV batteries.

How it Works: As V2G-capable vehicles and chargers become more common, they can be integrated into your portfolio to provide export capability that increases flexibility value.

The Impact: V2G can unlock more than double the value per EV. Reaching **20% V2G enrollment by 2035** could add another $12 billion in annual grid benefits, effectively doubling the value of your entire managed charging portfolio.

Unlocking the Full $30bn Opportunity: A Portfolio Approach to Program Design





* How we calculated this scenario:The net customer benefits are calculated by taking the average of each value range, multiplied by the 2035 enrollment rates and the total number of 78.5 million EVs. Standard program administration costs were subtracted. The projected 10% bill reduction is based on these net benefits as a percentage of the total projected U.S. residential electricity market ($300 billion in 2035).

The Road to $30 Billion: A Playbook for Action

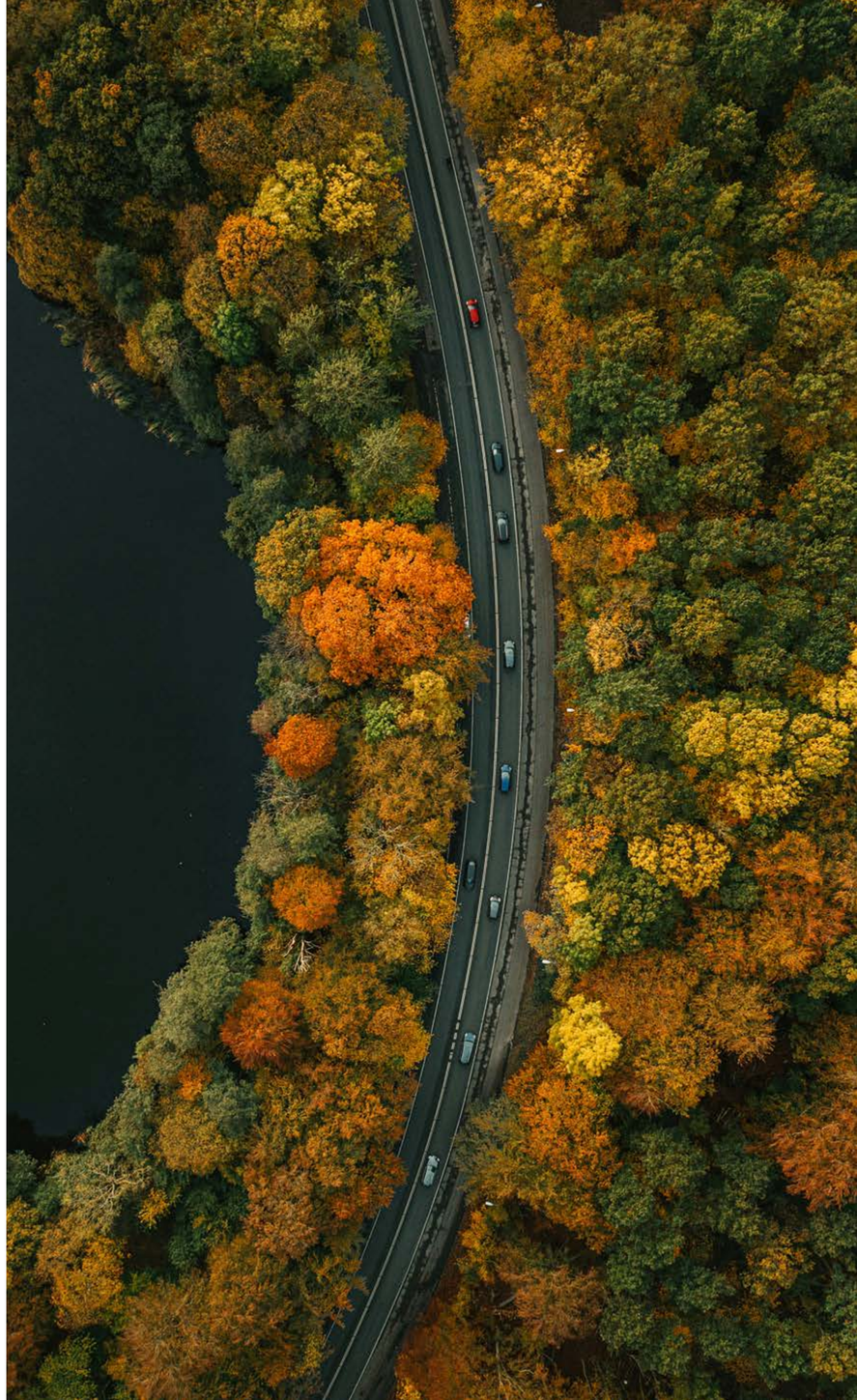
The $30 billion annual opportunity by 2035 from the Cost-Avoidance Stack is not an idea for tomorrow; it is achievable with the tools and technologies available today, and realizing it requires action today. Focused, parallel action must come from the two key groups who operate and shape our grid: utilities and regulators.

This final section provides a practical playbook for both. It condenses the key ingredients and policy needs into two clear, actionable roadmaps designed to accelerate the journey from today's potential to tomorrow's grid-wide benefits.

The Utility Roadmap: From Discovery to a Grid-Wide Virtual Power Plant (VPP)

The journey from concept to a grid-wide asset doesn't require a leap of faith; it requires a practical roadmap. Here's how your utility can begin today, using the teams and tools you already have to unlock the value of the Cost-Avoidance Stack, one step at a time.

While presented in steps, this roadmap is a flexible guide, not a rigid sequence. Depending on your utility's starting point and strategic priorities, some steps may be pursued in parallel or in a different order.



Phase 1:
The First 90 Days - Building your Foundation

This initial phase is about moving quickly to build a data-driven business case and gain hands-on experience.

Discovery & Business Case Definition

Your first step is discovery. Engage stakeholders across your organization—from grid planning to customer programs—to assess all potential value streams. Use the Cost-Avoidance Stack framework to quantify the opportunity for your specific territory, including grid reliability benefits, asset deferral, and potential grid services in wholesale markets. This data will form the core of your business case.

Design & Launch a Targeted Pilot

With clear goals, design and launch a targeted pilot. You don't need to start with a massive, complex program. A pilot can test multiple tiers (e.g., a simple behavioral program alongside an active managed charging tier) to gather baseline data and understand customer response. **Crucially, begin engaging with your regulators at this stage** to ensure the framework for a future **Virtual Power Plant (VPP)** is understood and supported.

Analyze & Plan for Scale

Analyze the data from your pilot. You now have real-world proof of the value you can deliver and the customer experience required for success. Use these initial findings to refine your business case and develop the formal proposal for a full-scale, uncapped program, framed as a proven Non-Wires Alternative.

Phase 2:
The First Year & Beyond – Scaling Your VPP

With a successful pilot and a proven business case, the focus shifts to strategic growth and maximizing value.

Scale with Confidence & Targeted Outreach

Now that you've built trust with early adopters, expand your reach. Deploy marketing and growth techniques using known EV driver lists from **Department of Motor Vehicles (DMV)** data, **Advanced Metering Infrastructure (AMI)** detection, and customer data from your charger installation programs.

- **Target LMI Communities:** Ensure equity by connecting to a broad range of devices (both EVs and chargers) and using targeted outreach to low- and moderate-income (LMI) areas.

- **Unlock Multi-Family Dwellings:** Up to 30% of U.S. adults live in multi-family housing (U.S. Census Bureau, 2019). Deploying managed charging at these sites is a massive, untapped opportunity to capture value from residents who may not even have a direct utility account.

Deploy Dynamic Optimization to Capture the Full Stack

As your VPP grows, it's time to maximize its grid benefit. Move beyond simple peak avoidance to full, dynamic optimization. Integrate live market signals, local grid constraints, and renewable energy forecasts to consistently reduce system peaks and shape load precisely where it's needed most—unlocking the full value of the Generation, Transmission, and Distribution layers.

Integrate V2G and Other DERs

The final step is to scale your VPP by adding new technologies. Integrate other **Distributed Energy Resources (DERs)** like rooftop solar and home batteries into your program. Introduce **Vehicle-to-Grid (V2G)** charging, which has the potential to multiply the value per EV by more than 2x, turning your VPP into a powerful, multi-asset resource that can ensure grid reliability for years to come.

This roadmap is not about perfection; it's about progress. Each step builds momentum, expands value, and brings your grid closer to what it must become—flexible, affordable, and powered by the community it serves.

The Regulatory Roadmap: Policies to Unlock the Full Value Stack

To move beyond small pilots, regulators can provide the certainty and incentives needed for utilities to invest at scale. This isn't about rewriting the rulebook from scratch, but about adopting modern principles that foster an open, equitable, and effective ecosystem. The following recommendations provide a practical path forward.

1

Focus on Performance, Not Prescriptive Pathways

The most effective regulatory frameworks set clear goals and then give utilities the flexibility to find the most innovative and cost-effective ways to achieve them.

- **Prioritize EV Flexibility as a Grid Resource:** Formally recognize managed charging in core utility planning processes like **Integrated Resource Plans (IRPs)** and **Distribution System Plans (DSPs)**. This ensures EV flexibility is valued alongside traditional "poles and wires" investments as a Non-Wires Alternative (NWA).

- **Modernize Ratemaking to Reward Outcomes:** Adopt **Performance-Based Regulation (PBR)** frameworks or targeted **Performance Incentive Mechanisms (PIMs)** that reward utilities for achieving specific outcomes, like peak load reduction or GHG (Greenhouse Gas) abatement, rather than simply for capital spending.

2

Champion Customer Choice and Equity

An equitable rollout ensures that all customers can participate in and benefit from the programs their rates help fund.

- **Protect Customer Choice:** Policy should protect a customer's right to securely share their own data with trusted third-party providers of their choice, fostering a competitive and customer-centric market.

- **Design for Inclusion:** Ensure program benefits reach all communities through targeted enrollment support, multilingual education, and dedicated outreach to low- and moderate-income (LMI) and multi-family housing residents.

3

Mandate an Open and Interoperable Market

Interoperability is the key to achieving the scale needed to unlock the full $30 billion opportunity. A managed charging ecosystem built on closed, proprietary platforms or limited to specific hardware dramatically narrows participation and stifles competition.

- **Prevent Vendor Lock-in:** Regulators should promote policies that require hardware-agnostic platforms and support open standards like OCPP and OpenADR.

- **Ensure a Level Playing Field:** By avoiding prescriptive technical mandates for specific pathways, regulators can ensure that the most effective and efficient solutions can thrive, delivering maximum value to the grid and all energy consumers.

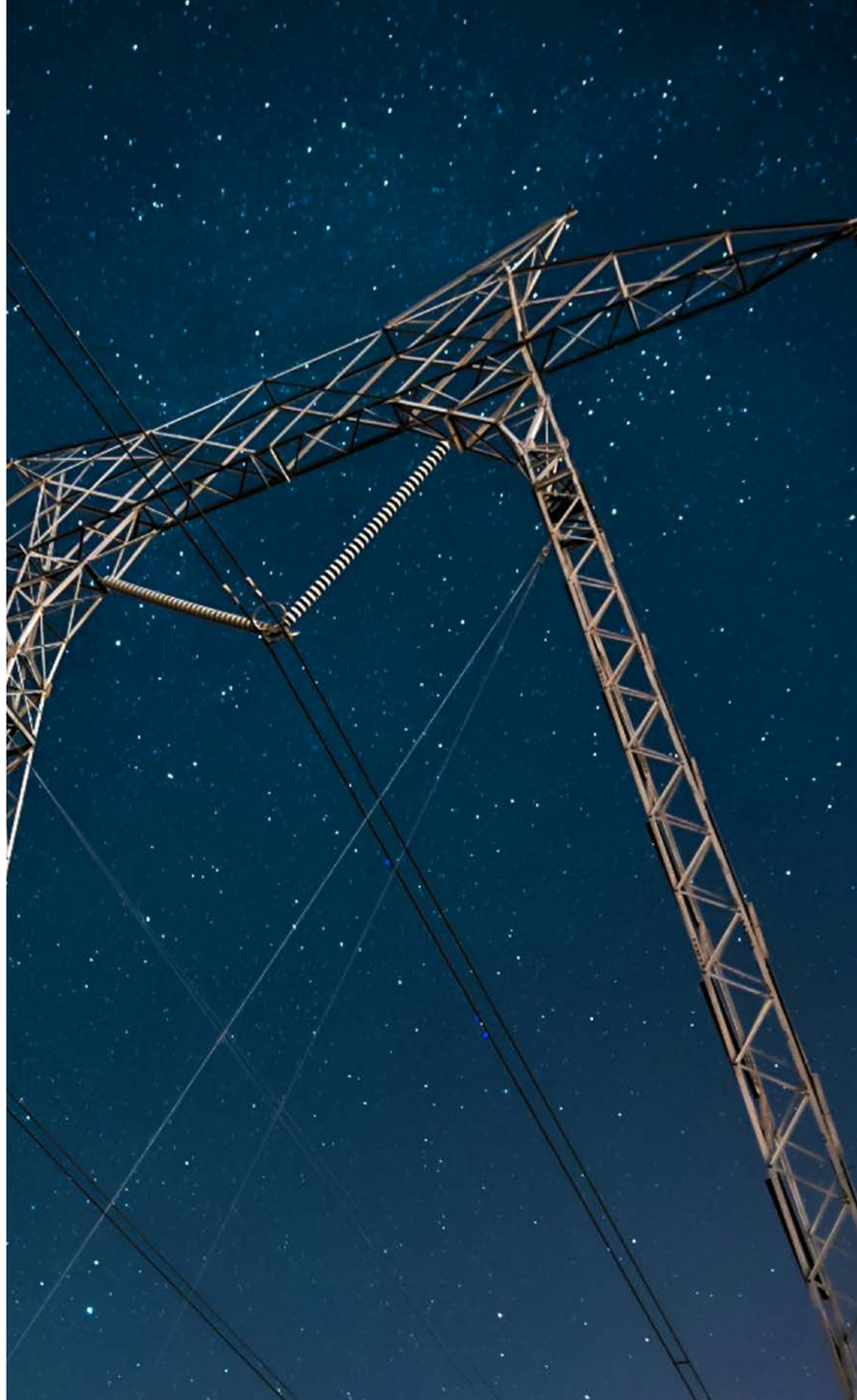
4

Create Agile Pathways for Program Approval

The traditional regulatory process can be slow, often stifling innovation in the pilot phase—a problem known as “death by pilot.” Utilities and regulators can accelerate progress by learning from successful programs and adopting more agile approval processes.

- **Enable Faster Innovation:** Regulators can provide flexible, expedited pathways for utilities to test and adopt new solutions. The **Michigan Public Service Commission’s “Expedited Pilot” process**, for example, allows for quicker evaluation and deployment, promoting faster learning and innovation that ultimately benefits customers.

Inaction carries a growing cost. The policies explored here are not checkboxes, they are invitations. They encourage utilities and regulators to help create a future where managed charging isn’t an exception, but a core system strategy—one that can scale equity, optimize investment, and support a smarter, more adaptive grid.



Conclusion

The Principles for Unlocking the $30 Billion Opportunity

The road to unlocking $30 billion in annual grid benefits is not about finding a single silver bullet. It's about a commitment to a new way of thinking, built on three core principles that have been proven throughout this playbook.

1

Adopt a Holistic, "Full Stack" View.

Success begins with moving beyond narrow, reactive fixes. Instead of focusing only on isolated distribution issues, utilities and regulators must embrace the full, multi-layered value of EV flexibility. Planning for the entire **Cost-Avoidance Stack**—from generation to the customer—is what transforms managed charging from a niche program into a core, system-wide grid resource.

2

Prioritize an Inclusive Customer Experience.

Technology and grid benefits are meaningless if customers do not participate. The most successful programs are built around a **compelling customer experience**, with simple incentives, seamless enrollment, and dedicated support. A commitment to **inclusive program design**—supporting all vehicles and chargers through an open, interoperable ecosystem—is the key to maximizing participation, ensuring equitable access, and achieving scale.

3

Build a Utility-Regulator Partnership for Innovation.

Build a Utility-Regulator Partnership for Innovation. Neither utilities nor regulators can unlock this opportunity alone. It requires a collaborative partnership dedicated to modernizing the rules of the road. As outlined in the roadmaps, this means utilities proactively building the business case, while regulators create agile pathways for program approval and adopt **performance-based incentives** that reward outcomes, not just spending.

Call to Action:
The Road to $30 Billion Starts Today

Every **electric vehicle** is a dormant energy asset. Every day without managed charging is a day of avoidable costs incurred, unnecessary grid stress, and growing inequity.

The time for isolated pilots is over. The time for scale is now. **The Cost-Avoidance Stack** is no longer a hypothetical—it's a multi-billion-dollar opportunity, quantified and validated. The cost of inaction is equally real: unnecessary capital buildout, rising rates for all, and a widening gap between a utility and the customers it serves.

This playbook is more than an analysis; it's an invitation to act.

An invitation to utilities:

The path forward is clear. Follow the Utility Roadmap outlined in these pages. The journey starts with your first 90 days. Quantify your local opportunity, launch a targeted program, and begin capturing value from the very first layer of the stack. The tools exist, the business case is clear, and the return on investment is unmissable.

An invitation to regulators:

Your partnership is essential. Embrace the Regulatory Roadmap and champion the policies that will unlock this value for everyone. Prioritize performance over prescription, mandate open standards to ensure equity, and create agile pathways for innovation. Let policy be the launchpad, not the bottleneck.

An invitation to the entire energy ecosystem:

Let's build this future together. Show up with an open mind, share results, and prove that managed charging can be inclusive, impactful, and scalable.

The next grid will not be built with wires alone. It will be built with trust, participation, and intelligent flexibility.

Managed charging is how we get there. The opportunity is here. The moment is now.

ev.energy

Unlock the full potential of EV flexibility for your utility.

ev.energy exists to connect everyone to greener, cheaper, simpler EV charging — managing the world's EV charging, everywhere. ev.energy provides a scalable, inclusive, and proven end-to-end platform that turns electric vehicles and other distributed energy resources into flexible grid assets, unlocking real value for energy providers, customers, and the planet. With a global base of utility, vehicle OEM, and EVSE partners, ev.energy is the leading force in smart charging.

The ev.energy Platform: Your Route to Managed Charging Success

Our intelligent platform makes managing EV charging better and delivers a clear return on your investment. We're not just a platform; we're your partner. With experience managing over 55 programs and coverage for 85% of EVs sold in the US, we bring the right expertise and technical maturity to ensure a perfect setup, smooth operation, and the results you need — without the headaches.

Insights
Leverage our vast global dataset — built over seven years and across hundreds of thousands of EVs — to understand charging patterns and customer behavior.

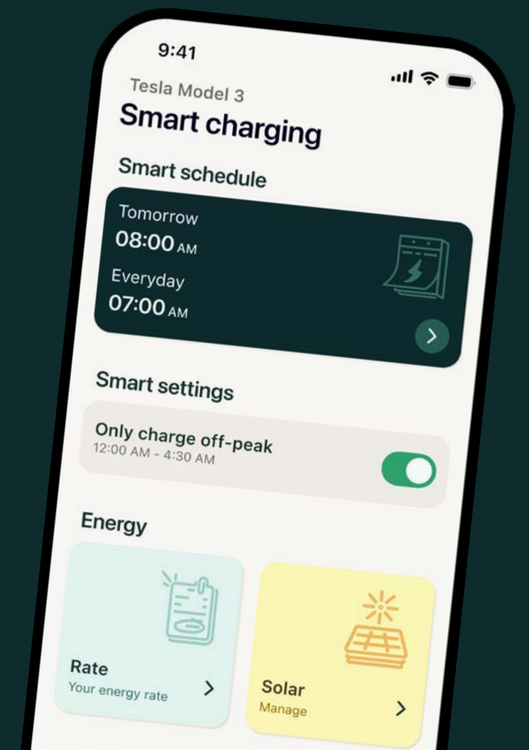
Programs
Launch tailored residential and commercial managed charging programs for any customer or scenario.

Bundles
Easily add advanced modules to your program to tackle your most pressing use cases — from distribution management and residential solar and battery, to multi-family and commercial fleets charging solutions.

Don't just meet EV demand — seize it.

Empower your utility to better serve customers, exceed regulatory mandates, and meet ambitious climate targets with the leading managed charging software platform.

Contact Us



Appendix

The Cost-Avoidance Stack: Detailed Methodology

	System Assumptions		Per Managed Vehicle ($/EV/yr)	
Category	**System Value**	**Description/notes**	**Value per EV**	**Description/notes**
Generation Capacity	$100 - $230 ($/kW-yr)	Shifting EV charging out of peak demand hours delivers resource adequacy and peaking capacity benefits valued at $100 - $230/kW-yr, based on recent PJM and CAISO capacity prices and an anticipated 15% increase due to capital expenses. Costs may rise in future years due to tariffs, supply chain constraints, and load growth.	$60 - $140	Assumptions include a 0.8kW system peak load reduction per managed EV and 75% ELCC value for EV contributions to resource adequacy, in line with RTO estimates.
Transmission System	$50 - $130 ($/kW-yr)	Shifting EV charging at scale can ease transmission congestion and, by consistently lowering system peaks, shrink long-term peak-driven transmission needs. Avoided-cost values of $50 - $130/kW-yr are taken from California's 2024 Avoided Cost Calculator (ACC) and ConEd's 2025 MCOS forecast for 2030s transmission cost estimates.	$20 - $55	A 50% derate is applied to account for coincidence with system peaks that drive transmission investment. It will vary by system, but there are likely a larger number of hours that drive transmission infrastructure investment than generation accreditation.
Distribution System	Estimated per vehicle	Active managed charging can reduce the loading on distribution feeders and secondary transformers, increasing distribution system hosting capacity and deferring upgrades on circuits that are at or near loading levels.	$5 - $300	The portion of vehicles in locations that provide distribution value will vary significantly by region due to electrification growth, system capacity, and planning standards. Distribution value range taken from SEPA report and ANL modelling within BGE and Pepco service areas.
Energy Procurement	$27 - $50 ($/MWh)	Reducing energy costs with dynamic charging optimization for hourly prices. Represents potential day-ahead arbitrage value based on real-world charging data and historic hourly 2023 wholesale prices for NY, CO and CA.	$100 - $180	Assumptions include 3,700 kWh of annual charging, 3-hour charging requirement at 7kW every two days. The model assumes charging can occur in non-consecutive hours, ensuring the vehicle is fully charged. Additional value may be unlocked intra-day.
Ancillary Services	Estimated per vehicle	Battery storage assets can participate in U.S. ancillary service markets today, though the value varies significantly by region. Few EVs provide ancillary services through V1G flexibility today, due to current market barriers.	$0 - $80	In the UK and Europe EV virtual power plants have proved capable of providing ISO energy reserve and balancing services, with value potential equivalent to $80 per EV per year if similar pathways are unlocked in U.S. markets.
Customer Operations	$15 - $20 ($/customer)	Proactive managed charging programs improve the customer experience, leading to higher CSAT scores and fewer costly service calls. The APPA report, 2024 estimates that utility expenditures on advertising, billing, collections, records, and handling inquiries and complaints range from $72 to $102/customer. Assume an even split across categories such that 20% of the costs are associated with inquiry and complaints.	$7 - $10	Assume if a customer enrolls in an EV managed charging program, customer service costs would decrease by 50% by channeling questions through the EV service provider and due to high customer satisfaction scores when enrolled in programs to keep the rates low.

Note: Developed with real-world charging data from ev.energy programs and research support from The Brattle Group. Costs shown in 2024 dollars. Value analysis based on active managed charging, leveraging the automated load optimization capabilities of the ev.energy platform. Forecasted savings remain constant through 2035 and therefore do not fully reflect the benefits that managed EV charging can provide relative to a counterfactual future world that incurs higher costs to serve the large peak growth from EV adoption. Where applicable, converting from system to per EV value streams assume 0.8kW system peak load reduction per managed EV. At the distribution level this can be greater, due to higher coincidence between peak EV load and the later distribution peak.

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2100 GENG ROAD, SUITE 210
PALO ALTO, CALIFORNIA
94303
UNITED STATES OF AMERICA