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EV PREPAREDNESS STARTS WITH EV INTELLIGENCE

Reimagining the possible and unlocking value with BTM data and analytics

OCTOBER 2023

EV INTELLIGENCE: PROVIDING ESSENTIAL DETECTION LEAD TIME

Conversations about utility readiness for the coming EV wave often center upon infrastructure deployment, load management and grid planning. And while each of these is an important part of the transportation electrification transformation, there is a fundamental first step in the process that can't be overlooked: EV Intelligence.

The simple truth is that utilities can't successfully manage the EVs on their grids until they know precisely how many EV owners they have in their territory, where and when they are plugging in to charge, the KWh energy they are consuming, and how this consumption maps to existing grid assets, like feeders, transformers and substations.

MIT Engineering professor Yossi Sheffi is the author of a book entitled *The Power of Resilience: How the Best Companies Manage the Unexpected*. While Sheffi's book focuses primarily on best practices to mitigate supply chain disruptions, his thesis holds true for transportation electrification as well.

Sheffi points out that risk management experts often categorize potential disruptions according to two dimensions: how likely it is that the disruption will occur and the magnitude of its impact. He argues that a third dimension is equally important: **detection lead time**. Detection lead time is the warning time between when an organization recognizes a disruption will take place and when they feel the disruption's first impacts. Logically, the greater the detection lead time, the more a company can do to prepare. The key to maximizing detection lead time, he says, is enhanced detection made possible by timely data and situational awareness that provides a maximum preparation head start.

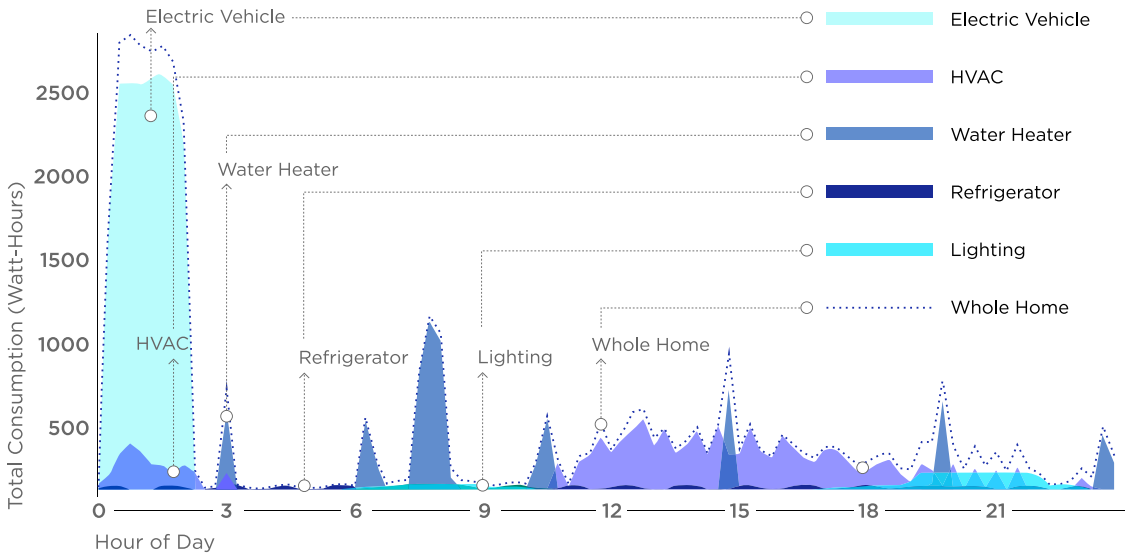
Transportation electrification poses arguably the largest disruption to global utilities in a generation. To successfully manage its impacts on the grid and utility operations more broadly, EV detection and enhanced situational awareness are critically important.

THE SCIENCE OF EV DETECTION

According to the U.S. Department of Energy, 80 percent of EV charging happens at home, making behind-the-meter charging data one of the most essential data inputs in a utility's EV detection strategy.

Historically, determining the location of an EV and its charging load has been difficult. Few customers self-report through surveys. DMV data lacks granularity and is often out of date. Customer-provided methods like telematics provide a limited view of actual energy consumption and there will always be a body of consumers who resist having their vehicles actively managed. But now, today's most sophisticated AI-powered analytics are able to detect EV charging signatures hidden within AMI data with remarkable accuracy.

For example, Bidgely's UtilityAI™ data science platform separates out (disaggregates) EV charging signatures from the "noise" of household energy use, enabling utilities to detect EVs at the premises level with a benchmarked accuracy of 90 percent.



This approach can provide remarkable outcomes in delivering the "full truth" when it comes to EVs on the grid (as well as exposing the limitations of alternative methodologies).

Phoebe Chang, Distribution Asset Manager at Hydro One, recently shared an example of this order of magnitude.

> We had always relied upon customer survey information, which we only run once a year," Chang said. "Of course, those surveys only capture people who are open to completing surveys, which is roughly six percent of our customers. About 900 of our customers reported that they own an EV through our annual survey. Looking at AMI data analytics, we were able to identify 20,000 EV owners. So that's a huge difference in the number of accounts that we were able to detect."
>
> *Phoebe Chang*
> *Distribution Asset Manager*

That's a 2122% difference!

THE BUILDING BLOCKS OF EV INTELLIGENCE

The most advanced true disaggregation reveals five key EV data points:

1. Detection of Level 1, 2, and 3 chargers

2. Amplitude of chargers

3. Charging behavior, hour by hour for each EV customer

4. Average hourly charging patterns

5. Geographic patterns of EV charging and growth

This granular, precise and always-current EV data provides utilities with a household-level view of how energy is flowing on their grids. This visibility allows grid management home-by-home and vehicle-by-vehicle — from the meter up rather than the transformer down — preventing outages, reliably meeting energy and charging demand and providing a view into future demand and infrastructure requirements.

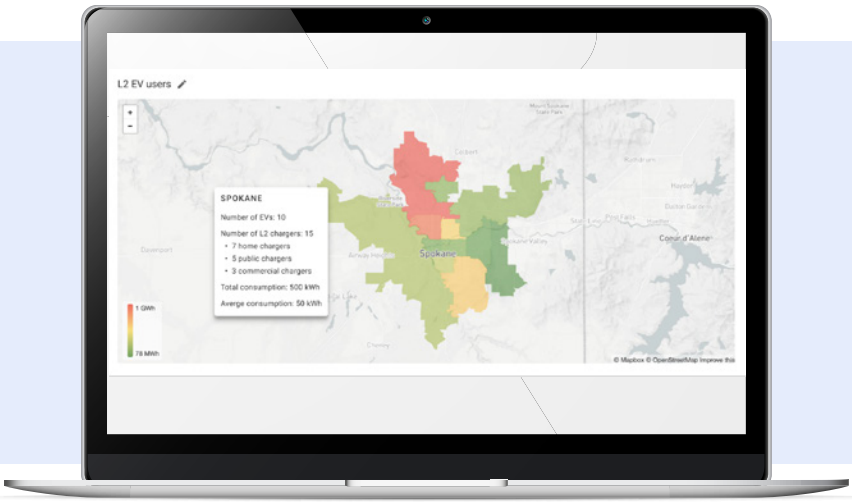
Or, as Yossi Sheffi would phrase it, utilities that are able to leverage enhanced detection in the form of timely data and situational awareness will benefit from a maximum preparation head start.

Utilities like NV Energy, HydroOne and Avista, understand this.

> The first thing we really have to do is understand where our customer base is," says Adam Grant, Director of Electrification and Energy Services at NV Energy. "We leverage DMV data for electric vehicle registrations, but it doesn't tell us anything about driver charging habits."
>
> NVEnergy
>
> *Adam Grant*
> *Director of Electrification and Energy Services*

Since 2017, NV Energy has implemented a wide range of AMI-data-driven programs to boost customer engagement and energy efficiency. Engaging EV drivers through a better understanding of their home charging habits is the utility's latest innovation.

With EV Intelligence, utilities are also better able to anticipate how EV charging will grow and identify feeder lines and individual transformers that could come under strain due to EV proliferation. Utilities have come to realize that EV adoption is rarely geographically uniform. With AMI-based EV detection, utilities are able to visualize EV loads over time to identify high growth EV pockets and determine where constraints may exist or develop.



> Our Spokane, Washington AMI territory is very different when you look at communities in the north, south, east or west," says Andrew Barrington, Products and Services Manager at Avista Utilities. "We looked at a feeder in our South Hill region, which is typically higher income, and we saw that the EV adoption rate was five-to-one compared to communities in north Spokane. Now with that insight, we're able to get to the feeder and substation level, and identify varied growth models across our entire service territory."
>
> *Andrew Barrington*
> *Products and Services Manager*

Forward-thinking utility executives understand the requirement for this enhanced level of granularity. EV adoption is almost never geographically uniform in nature. In order to conduct grid planning with confidence, teams need reliable data inputs detailing the location and charging behaviors of EV ownership across the entire service territory.

EV Intelligence quantitatively and accurately guides utility investments and timelines in connection with staged grid upgrades, charging infrastructure deployments, and targeted roll outs of EV rates or controlled chargers to encourage load shifting as EV adoption expands. It also allows a level of personalized EV owner engagement that brings customers on board as utility partners to help manage grid load.

EV INTELLIGENCE IN PRACTICE:

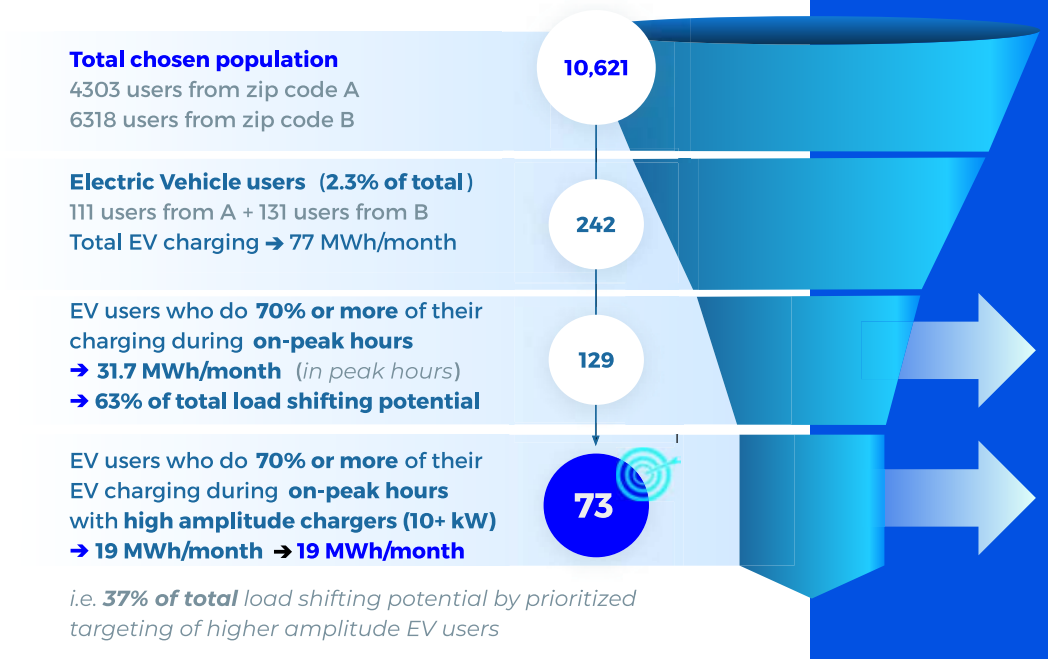
How Industry Leaders Are Using BTM EV Charging Data To Manage Transformation

Data-driven EV management strategies can help you reimagine the possible.

For example, a Tier 1 Utility sought to answer the question:

"Where is my maximum potential for EV load-shift?"

Analyzing behind-the-meter energy use data across two zip codes, the utility was able to discover exactly which households conducted 70 percent or more of their EV charging during on-peak hours with high amplitude chargers.



*i.e. **37% of total** load shifting potential by prioritized targeting of higher amplitude EV users*

The data revealed that 242 customers are currently charging on a level 2 charger.

Of those 242 customers, 129 of them were charging during on-peak hours.

These are the high-value targets for load-shift programs.

380 MWh per year could be shifted to off peak charging if these 129 customers were engaged in a managed charging program.

228 MWh per year could be shifted to off peak charging if these 73 customers were engaged in a managed charging program.

The most advanced analytics platforms equip utility teams to complete this analysis in minutes. In this case, the team produced actionable data that dramatically reduced load shifting cost while increasing the magnitude of load shifted. A win-win scenario.

Typical Cost Savings

3X

more cost-effective programs for EV load management.

Typical Load Shift

75%

peak charging reduction.

Another utility sought to answer the question:

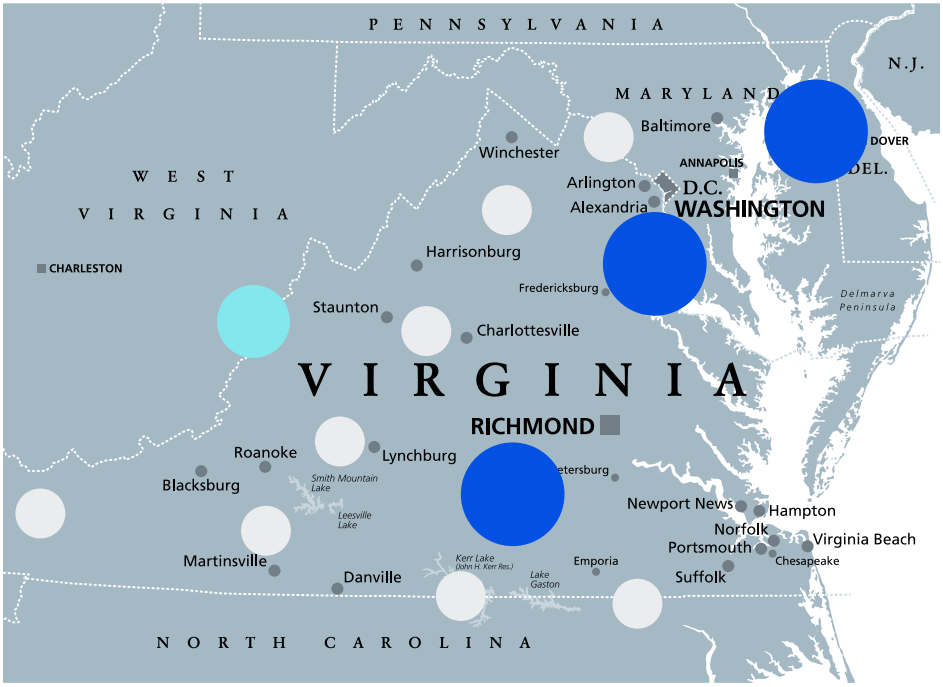
"Which of my grid assets are most at risk from EV growth and modeled future energy consumption levels?"

By mapping grid assets and applying BTM data-driven scenarios, the utility was rapidly able to drill down to the feeder and substation level, and identify varied growth models across its entire service territory. The analysis provided critical insights as to where infrastructure investments will be required, and where non-wires alternatives (NWAs) had the potential to defer millions in infrastructure costs.

No investment needed

Investing in infrastructure to prevent reliability issues. Right size, Right time.

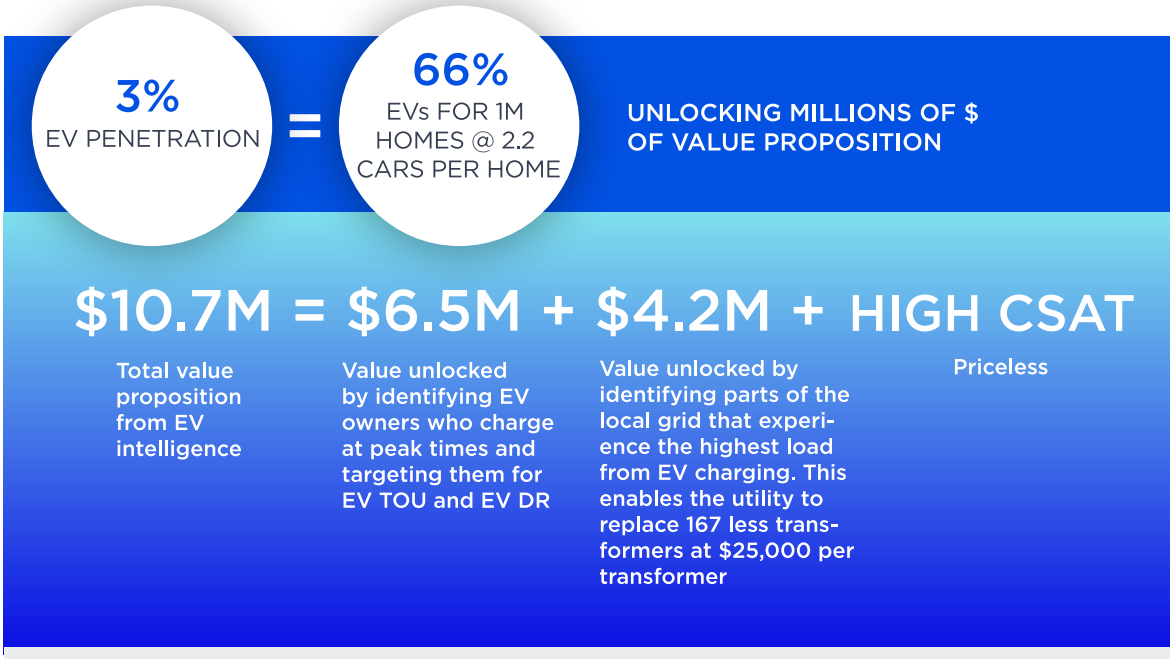
NWA deferring millions in infrastructure costs



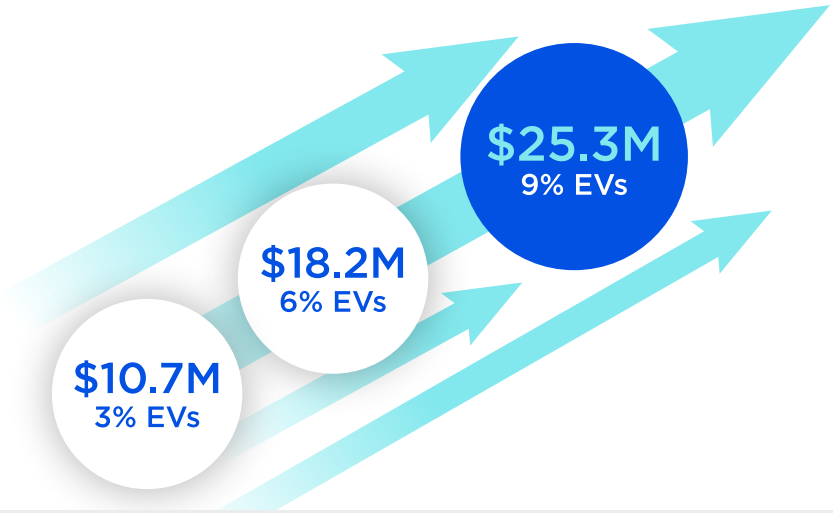
CAPTURING VALUE

A granular, BTM data-informed approach unlocks very real value. Amidst the rapid proliferation of EVs on the grid, effectively managing time-of-use (TOU) shifts and deferring infrastructure costs through NWAs translates into substantial savings — a financial benefit that compounds as adoption grows. In fact, EV intelligence can benefit utilities to the tune of tens of millions of dollars.

Consider a territory with 1 million homes, and 3 percent EV penetration.



Already the potential savings are high at $10.7 million.



But as EV adoption continues to grow, so do the savings.

As EV adoption continues to expand, ultimately displacing vehicles with combustion engines entirely, the demands on the grid will increase exponentially, requiring utilities to implement increasingly sophisticated approaches to load management and infrastructure deployment. When decision-making is grounded in EV Intelligence, utilities are in the best possible position to manage the disruption and drive ongoing value for its customer, the grid, regulators and shareholders.

HOW EV INTELLIGENCE SUPPORTS BEST PRACTICE PROGRAMS

TARGETED MARKETING FOR EV PROGRAMS Make Ready EV Managed Charging EV Rates	**CUSTOMER ENGAGEMENT FOR EV OWNERS** Tips & Tools for EV Ownership Minimize Charging Cost	**PROGRAM PLANNING** Understand Program Potential Design Programs Based on Actual Data
INFRASTRUCTURE PLANNING Know Where & How EVs Are Charging Identify Hot Spots Plan for NWAs	**GROWTH ANALYSIS** Analyze Where EV Growth is Occuring Analyze Charging Behaviors	**FORECASTING** Evaluate Low, Medium, High Growth Scenarios Propensity to Detect Customers Likely to Buy

If you cannot measure it, you cannot improve it.

Equipped with granular data about who, where, how and when behind-the-meter EV charging is taking place, utilities are able to deploy a broad range of EV load management strategies, including:

Customer Engagement for EV Owners

Every EV owner has his or her own unique charging patterns and preferences. Defining those habits through household meter data enables personalized charging recommendations and incentives, rate plan coaching, and better driver-utility cooperation in support of the grid.

Targeted Marketing for EV Programs

As EV adoption scales, blanket overnight charging will no longer serve the grid. Instead, it will create a new peak. Behind-the-meter EV intelligence enables utilities to be far more nimble and nuanced in their load shift approach, potentially pushing charging toward periods of higher solar production or away from periods when the grid is under strain from extreme weather.

AMI-based EV detection allows utilities to flag charging during peak periods, and target those drivers for enrollment in behavioral and managed charging programs.

Program Planning

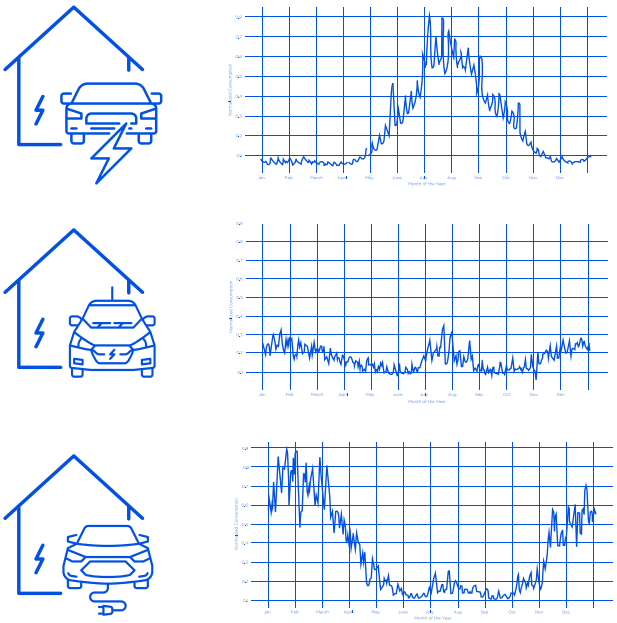
Beyond detecting EV ownership, household energy use data reveals charging patterns that should inform the design of pricing and load shift programs and incentives, and verify compliance with the terms of those programs.

Infrastructure Planning

Identifying hotspots of EV ownership makes it possible to conduct a bottom-up analysis of feeder and transformer load to determine where non-wires alternatives are an option and where and when infrastructure upgrades will be necessary.

Growth Analysis

You can map every EV owner charging at home, their charging hours, the charger's amplitude, and how frequently they charge and aggregate that data to identify growth patterns grid-asset-by-grid-asset. This empowers utility teams with a higher fidelity, more accurate and hyper-specific consumption data from which to plan for upgrades or load shifting mechanisms.



Forecasting

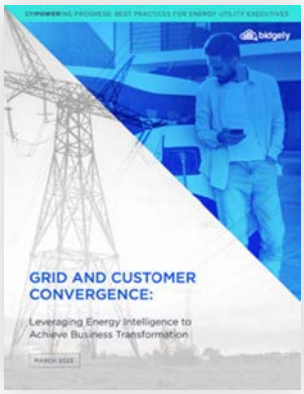
Using historic trends and near-real-time EV growth analytics, AMI-based EV detection enables load planners to run different forecast scenarios to evaluate the impacts of low, medium, and high EV growth to support grid operations. And, when paired with other key data points like input distribution, hyper-localized adoption patterns and other factors related to EV growth, EV intelligence allows transportation electrification teams to identify which customers have a higher propensity to buy an EV and which are most likely to benefit from the relevant programs the utility has to offer.

DIVE DEEPER

Dive deeper into EV Intelligence and learn more about the data science behind it, by watching our **Debunking EV Detection Myths webinar**.

Read more papers in our EmPOWERing Progress Series:

Leveraging Behind-the-Meter Intelligence to Better Inform and Achieve Clean Energy Plan Targets



Grid and Customer Convergence: Leveraging Energy Intelligence to Achieve Business Transformation

TAKING THE NEXT STEP

To learn more about how you can put EV intelligence and advanced data science to work to maximize your readiness for the coming EV wave, email **info@bidgely.com** to schedule a meeting. We look forward to learning more about how we can help you gather timely EV data, improve your EV situational awareness and achieve a maximum EV transformation preparation head start.

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Interested in exploring topics like these with other industry leaders? Learn more about Bidgely's UtilityAI Executive Innovation Collaborative at **https://www.bidgely.com/events/ueic/**