



Grid Edge Analytics

SMUD Benchmarks NET2GRID EnergyAI® Edge on Itron Riva

CHALLENGE: UNLOCKING TRUE BEHIND-THE-METER INTELLIGENCE AT THE GRID EDGE

As distributed energy resources (DERs) such as electric vehicles (EVs), heat pumps and rooftop PV continue to scale rapidly, utilities face a growing visibility gap at the low-voltage network level. While smart meters provide high-resolution consumption data, they offer limited insight into which assets are operating behind the meter and how they affect local grid conditions. Typically gaining such visibility from devices themselves is a costly and time-consuming process that involves multiple point-to-point integrations with an evolving landscape of vendors. Sacramento Municipal Utility District (SMUD) recognized that NET2GRID EnergyAI Edge®, an advanced disaggregation analytics application, could unlock DER awareness with low operating costs at the grid edge for all households in their service territory leveraging their distributed intelligence meters and network. NET2GRID EnergyAI® Edge, when combined with Itron Riva meters, delivers granular, household-level intelligence in real-time with unparalleled accuracy and performance, and is designed to make these insights available across the utility's entire application landscape.



Solution: NET2GRID EnergyAI® Edge on Itron Riva Meters:

To meet this demand, SMUD initiated a rigorous field validation of the NET2GRID EnergyAI® Edge EV Awareness solution.

This solution transforms the smart meter from a passive data collector into an active, intelligent asset, providing SMUD with near real-time insights that can benefit both grid operations and customer programs. Specifically, SMUD conducted field validation of:

NET2GRID's EnergyAI® Edge EV Awareness:

- » A cutting-edge disaggregation and analytics application capable of processing high-frequency energy data directly within the meter, detecting EV presence and identifying charging events and energy consumption in real time.

Itron Riva meters and GenX network:

- » Powerful edge-computing meters and communications that provide the secure and scalable environment necessary to host advanced applications like NET2GRID's EnergyAI® Edge.

CUSTOMER

Sacramento Municipal Utility District (SMUD)

OVERVIEW

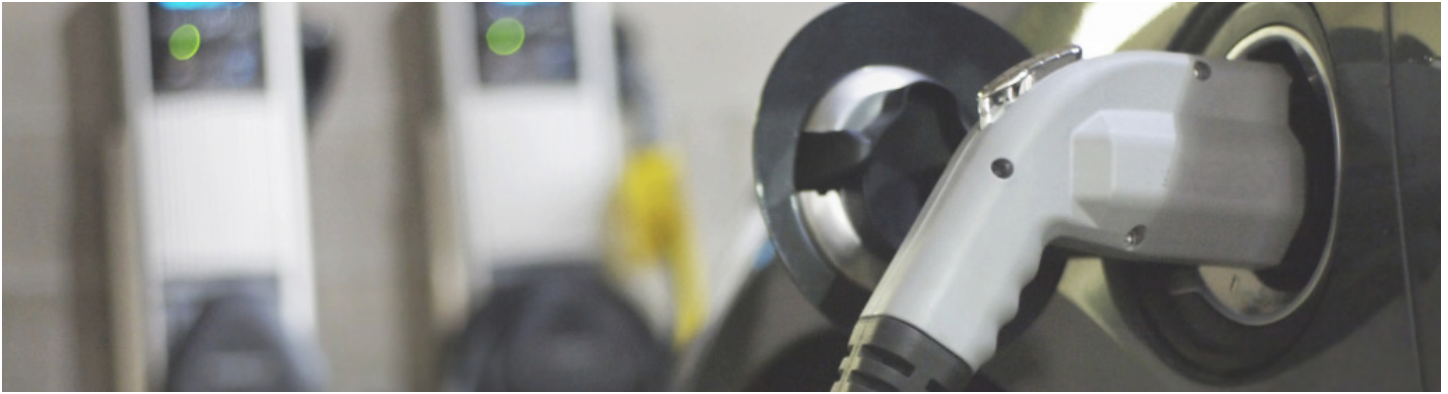
- » Headquartered in Sacramento, CA
- » Serving 1.5 million people
- » 900-square-mile service territory
- » Sixth-largest community-owned electric utility

GOALS

- » Improve visibility into behind-the-meter DERs
- » Identify residential EV presence and charging activity
- » Eliminate reliance on DMV data and customer self-identification
- » Validate accuracy and performance of meter-based EV detection

SOLUTION

NET2GRID EnergyAI® Edge EV Awareness deployed on Itron Riva distributed intelligence meters and GenX network



NET2GRID ENERGYAI® EDGE VALUE PROPOSITION

NET2GRID EnergyAI® Edge delivers high-accuracy DER detection and enhances grid intelligence in real-time, while minimizing deployment and operational complexity. Key benefits include:

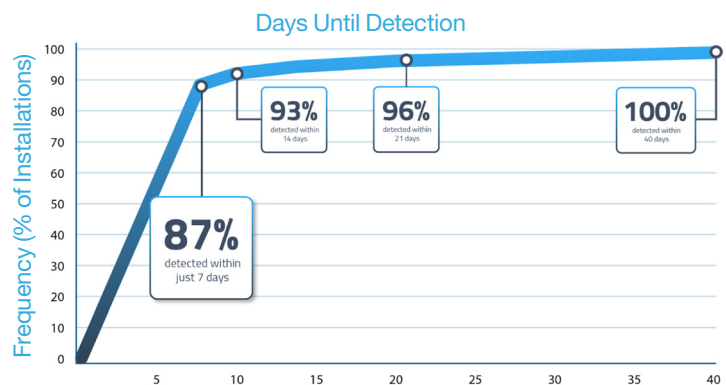
- » **Plug-and-play deployment:** Operating entirely inside Itron Riva meters, the application requires no historical data, no training and no additional infrastructure or connectivity — enabling rapid rollout across large meter fleets.
- » **Low operational cost:** Running entirely inside the meter eliminates cloud computing expenses, reduces data storage needs and ensures privacy without sacrificing performance.
- » **Real-time, actionable insights:** Utilities gain immediate visibility into behind-the-meter DER activity (within minutes of a charge session start/stop), enabling faster, more effective grid management; targeted demand response; Time-of-Use rate notifications; and better-informed planning.
- » **Fast time-to-value:** Rapid detection of DERs, such as EV charging, allows utilities to act on insights within days, rather than months.
- » **Easy integration:** DER data is readily available via both a UI and APIs, allowing the data to be easily leveraged by multiple downstream grid and customer systems.

By combining high accuracy, operational simplicity and cost-effectiveness, EnergyAI® Edge provides measurable value to utilities, enabling a smarter, more resilient and more flexible grid.

Field-Proven Performance: Validation Results

The primary objective of the SMUD field test was to rigorously quantify the performance, accuracy and operational stability of the NET2GRID application in real-world utility deployment. The results demonstrate a significant leap forward in edge analytics capabilities as compared to traditional back-office load disaggregation solutions.

Rapid Time-to-Value: Out of 840 participating households, NET2GRID EnergyAI® Edge identified frequent EV home-charging in 387 homes, corresponding to a 97% detection rate based on the available ground-truth dataset. Notably, 87% of these homes were detected within just seven days of deploying the application on the meter, delivering the fastest time-to-insight in the market without any dependency on cloud computing or historical data. Prior to deployment of NET2GRID EnergyAI® Edge, SMUD relied on indirect and lagging indicators—such as DMV registration data and customer self-identification through EV programs—to understand EV adoption, as residential EV charging was not directly observable through utility systems; by contrast, legacy solutions required at least three months of data to infer EV presence. EV detection continued for homes with less frequent charging behavior, reaching 93% within 14 days, 96% within 21 days and 100% within 40 days, as illustrated in the figure below.



EV telematics data was available for a subset of participating households and used to validate detection performance. Within this group, EV presence was correctly identified for 138 out of 143 homes (97%). For the remaining households, independent confirmation of EV ownership was not available.



Detection Accuracy: Performance is evaluated against the most rigorous standard: telematics ground truth data directly from the vehicles. Industry-standard metrics, such as Precision and Recall, are used and a comprehensive F1-score to ensure transparent and reliable measurement of the application’s ability to accurately identify and capture all EV charging events.

- » Precision refers to the number of detected events that are EV charging sessions.
- » Recall measures the percentage of EV sessions that were correctly detected.
- » F1-score is the harmonic mean of precision and recall, giving equal weight to both metrics.

In addition to detecting individual charging events, the application was evaluated on the energy and duration of each charging event, providing a detailed view of event-level performance. This distinction is critical: many back-office solutions report accuracy only in terms of total kWh over long time periods (e.g., monthly), which cannot support real-time operational decisions.

The results presented below, demonstrate unmatched performance in real-world deployment. NET2GRID EnergyAI® Edge delivers high accuracy at the individual EV charging event level, capturing not just the occurrence, but also the energy and duration of each session. This precise, household-level insight with fine time granularity enables true near-real-time grid operations, including congestion management, transformer protection, dynamic tariff signaling and targeted demand response.

	PRECISION	89%
	RECALL	93%
	F1	90%
	DURATION ACCURACY	97%
	ENERGY ACCURACY	85%

EnergyAI Edge® EV Awareness event-level performance metrics
 NOTE: The available ground-truth dataset contains partial coverage of EV charging activity, as not all EVs are enrolled in managed programs and therefore cannot be independently observed by the utility. As a result, validation was performed using a carefully selected subset of 86 households with the most reliable and complete telematics data available.

CONCLUSION: DISTRIBUTED INTELLIGENCE POWERS A SMARTER GRID

The successful validation by SMUD confirms that the deployment of the NET2GRID EnergyAI® Edge agent on Itron Riva meters is a highly performant, accurate and valuable distributed intelligence application. This joint solution enables multiple use-cases that contribute to an intelligent, more efficient and more resilient electrical grid:

- » **Data-driven system planning:** Utilize DER behavioral insights to update feeder-level models of DER and load growth.
- » **Targeted demand response (DR) programs:** Identify and engage DER owners and their detailed usage patterns for DR initiatives.
- » **Optimized real-time control:** Orchestrate EVs and behind-the-meter DERs as part of a virtual power plant (VPP) while safeguarding distribution transformer health.
- » **Enhanced DER awareness and engagement:** Provide consumers with actionable, real-time insights, including TOU and behavioral DR notifications, delivering personalized experiences and encouraging flexible energy use.

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