Clean Energy Services Accelerates Utility-Scale BESS & Solar Site Onboarding with N3uron at the Edge

Clean Energy Services (CES) was launched in 2022 specifically to provide best-in-class operations and maintenance for utility-scale battery storage and solar projects across the U.S. From the very beginning, creating a unified, real-time data platform was a core part of the company vision — not a side project, but a strategic necessity. The data and technology team was formed to build exactly that capability.

The team's objective was straightforward but ambitious: create a single, unified data acquisition and monitoring platform capable of connecting to a rapidly growing fleet of utility-scale battery storage and solar sites nationwide, regardless of manufacturer or protocol.

The Challenge

The platform had to reliably collect, normalize, secure, and forward data to the cloud while supporting real-time visualization, advanced alarming, and analytics. Security, high availability, and the ability to operate in hardened environments were non-negotiable.

N3uron's broad protocol support, edge processing capabilities, and robust security model made it the *"clear choice"* to serve as the *"foundation of this company-wide initiative,"* according to VP of Data Engineering at CES Kris Zawada.

Solving Pain Points

When CES evaluated virtually every major edge data platform on the market, N3uron won for a long list of reasons that directly addressed the realities of CES' nationwide, multi-OEM rollout. Said Kris Zawada: *"After evaluating multiple options, we selected N3uron as the edge data platform that could scale with our national footprint and give us the control we needed, making its deployment one of the foundational technology decisions for the company."*

N3uron provided true cross-platform support (Windows and Linux), added Kris, and its *"modern, fully web-based UI felt lightyears ahead of the traditional clunky Windows-only industrial applications that CES tested."* N3uron's container-ready architecture (Docker/Kubernetes) fit perfectly into CES' hardened, repeatable gateway images.

The flexible billing model also met CES' needs. N3uron's granular, per-module licensing with one-time purchase pricing provided unmatched flexibility and cost predictability when CES onboarded new sites with unknown protocol requirements. N3uron, said Zawada, also enables *"extremely rapid configuration of new protocols and modules — what usually takes days or weeks with competing products is routinely done in hours with N3uron."*

Zero-risk evaluation was another pain point N3uron addressed. Said Kris Zawada: *"We can download the full product, spin up a trial instance in minutes, and receive a 30-day evaluation license — allowing us to prove technical fit in the field before any purchase commitment."*

Finally, N3uron provided the quick technical support CES needed — the team observed that complex issues submitted through the support portal are consistently answered in depth within 24 hours, often much faster.

"In short, N3uron was the only platform that combined modern software design, genuine deployment flexibility, transparent pricing, and elite support — all of which were non-negotiable for a company that has to move as fast as we do," said Kris Zawada.

A Powerful Solution for Central Data Orchestration at the Edge

CES has active N3uron deployments at multiple customer projects, with a large pipeline of new sites already in the rollout queue for 2026 and beyond. The project currently encompasses some dozen utility-scale battery storage and solar sites across multiple regions. There is one N3uron node per site (edge-deployed for maximum reliability and minimum latency).

Tag counts vary significantly by OEM and site complexity — ranging from tens of thousands up to several hundred thousand tags per site, typically exposed through OPC UA, Modbus, DNP3, or IEC 61850. All normalized data is securely forwarded to a cloud-based time-series database that serves CES' Remote Operations Center and customer-facing analytics platforms.

CES designed a standardized, secure edge gateway deployed at every site. Each gateway consists of a rugged industrial computer running a hardened, purpose-built OS image with N3uron pre-installed and pre-configured.

N3uron serves as the central data orchestration layer at the edge, fulfilling four vital functions. First, it connects to existing site SCADA and control systems using the exact protocols required. Second, N3uron extracts, filters, and contextualizes only the data points that are relevant for operations and customer reporting. Third, N3uron normalizes the data using Derived Tags and other transformation tools. Finally, it securely exposes a clean, unified data model via the built-in OPC UA Server and pushes historical and real-time data to CES' cloud platform.

"This edge-first approach minimizes on-site configuration time, eliminates dependency on customer SCADA upgrades, and gives our Houston Remote Operations Center and our customers a single, consistent data source regardless of the wide variety of OEM controllers and SCADA systems we encounter in the field," said Kris Zawada.

The Modular Flexibility Advantage for Rapid Scaling

To meet the wide variety of field conditions they encounter across utility-scale BESS and solar sites, CES relies on the following N3uron core modules in virtually every deployment:

- **OPC UA Client and OPC UA Server:** N3uron's OPC UA Client and OPC UA Server non-invasively read from locked-down site SCADA systems and expose a clean, unified data model northbound.
- **Modbus Client and DNP3 Client:** The N3uron Modbus and DNP Client modules provide a reliable way of connecting to sites or subsystems that still use these legacy protocols.
- **Derived Tags:** N3uron's Derived Tags module enables custom logic, advanced calculations, and data aggregation for operational data analysis at the edge. CES uses Derived Tags to create calculated values, aggregations, and customer-specific points at the edge without touching the original controllers.
- **Historian:** N3uron's Historian — a high-performance, scalable, and cost-efficient industrial data historian — enables flexible and consistent access to historical data across the ecosystem. CES uses Historian for guaranteed local buffering and backfilling of high-resolution data.
- **MQTT:** N3uron's MQTT Client connects to any MQTT broker to send and receive events. CES uses this module for secure, low-bandwidth transport to its cloud platform.

- **WebUI:** WebUI, the interface used to configure N3uron and monitor data collected by N3uron, is used by CES for browser-based configuration, diagnostics, and occasional on-site troubleshooting.

- **REST API Client:** CES uses REST API Client when they need to pull data from certain inverter or EMS web services. This module allows quickly and easily connecting N3uron to any RESTful API server.

"The ability to enable exactly the modules we need (and only those modules) on a per-site basis — often decided and licensed after the gateway is already in the field — has been a massive enabler for rapid, standardized scaling," said Kris Zawada.

Challenges Overcome and Platform Functionalities Enabled

With N3uron, CES was able to overcome every major roadblock that traditionally slows down or prevents monitoring of utility-scale energy storage and solar assets:

- **Ultra-fast prototyping and field validation:** CES can ship a gateway, discover the real protocols on-site, and have everything running in days instead of months.

- **True plug-and-play modularity:** Adding or changing protocols and features is just a matter of enabling a new module and applying a license, often remotely.

- **A modern, cross-platform Web UI that feels intuitive and responsive:** N3uron's WebUI achieved a night-and-day improvement over the outdated Windows-only tools that dominate the industrial space.

- **World-class technical support:** Complex issues are resolved in hours or same-day via the support portal, which kept CES' momentum unbroken even during the toughest integrations.

- **No need for costly, time-consuming SCADA upgrades or replacements at customer sites:** N3uron simply layers on top and delivers everything CES and its customers need.

"Taken together," said Zawada, *"these advantages have dramatically accelerated our ability to bring new sites online while keeping costs, risk, and engineering effort under control."*

N3uron Edge Deployment Delivering Transformative Results

N3uron has been in active production across multiple customer sites for well over a year, with deployments continuing at a rapid pace of several new sites per quarter. *"N3uron deployment has delivered transformative results for Clean Energy Services, enabling us to scale our Remote Operations Center capabilities nationwide while slashing onboarding timelines and operational costs,"* said Kris Zawada.

Using N3uron has achieved time savings on deployment and configuration. What once took 1–2 weeks per site with traditional platforms (including hardware setup, software installation, and manual tag mapping) now takes just 2–4 hours with N3uron. This includes pulling the Docker image from Docker Hub, installing on CES' ruggedized gateways, logging into the intuitive Web UI, and fully configuring the node — often remotely without sending engineers on-site.

Deploying N3uron accelerated tag import and organization. For complex sites with thousands of points (e.g., from Modbus register lists or DNP3 Excel maps), CES can dump specs to CSV and bulk-import tags in under 30 minutes, then organize them into a logical tree structure via drag-and-drop in the UI. This has cut CES' per-site engineering effort by 80–90% compared to manual scripting or point-by-point entry in legacy tools.

By eliminating the need for external integrators or consultants, CES has reduced integration costs by over 70% on average. Additionally, faster onboarding means new revenue-generating sites come online weeks earlier, translating to tens of thousands in avoided opportunity costs per project.

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– Kris Zawada,
VP of Data Engineering at Clean Energy Services.

"Overall, N3uron hasn't just met our initial goals; it's become a key driver of our growth, allowing us to handle a rapidly expanding fleet with a lean team and deliver superior monitoring services at utility scale," said Kris Zawada.

Enabling Additional Unexpected Use Cases

One of the pleasant surprises with N3uron has been how quickly it enabled CES to discover and implement new use cases that significantly improved the company's operational awareness.

A great example is real-time notification whenever communication with a critical data source is lost. Being able to detect and alert on connectivity issues immediately has proven extremely valuable for maintaining system reliability and reducing downtime. CES was able to achieve this functionality relatively quickly thanks to N3uron's flexibility.

Future Plans Using N3uron

"N3uron is now one of the leading solutions in Clean Energy Services' monitoring and data strategy," said Kris Zawada, *"Going forward, every new utility-scale BESS and solar site we bring under management — both greenfield projects and existing fleets migrating to CES — will be deployed with N3uron at the edge as the standard data acquisition and normalization layer."*

CES also plans to continue expanding its use of advanced N3uron capabilities (enhanced edge analytics, custom scripting, and tighter integration with CES' cloud platform) to deliver even greater operational insight and faster response times for its customers across the country.

"Overall, the platform's extensibility and responsiveness to real-world needs have been key reasons this project has delivered more value than we initially anticipated," said Kris Zawada.