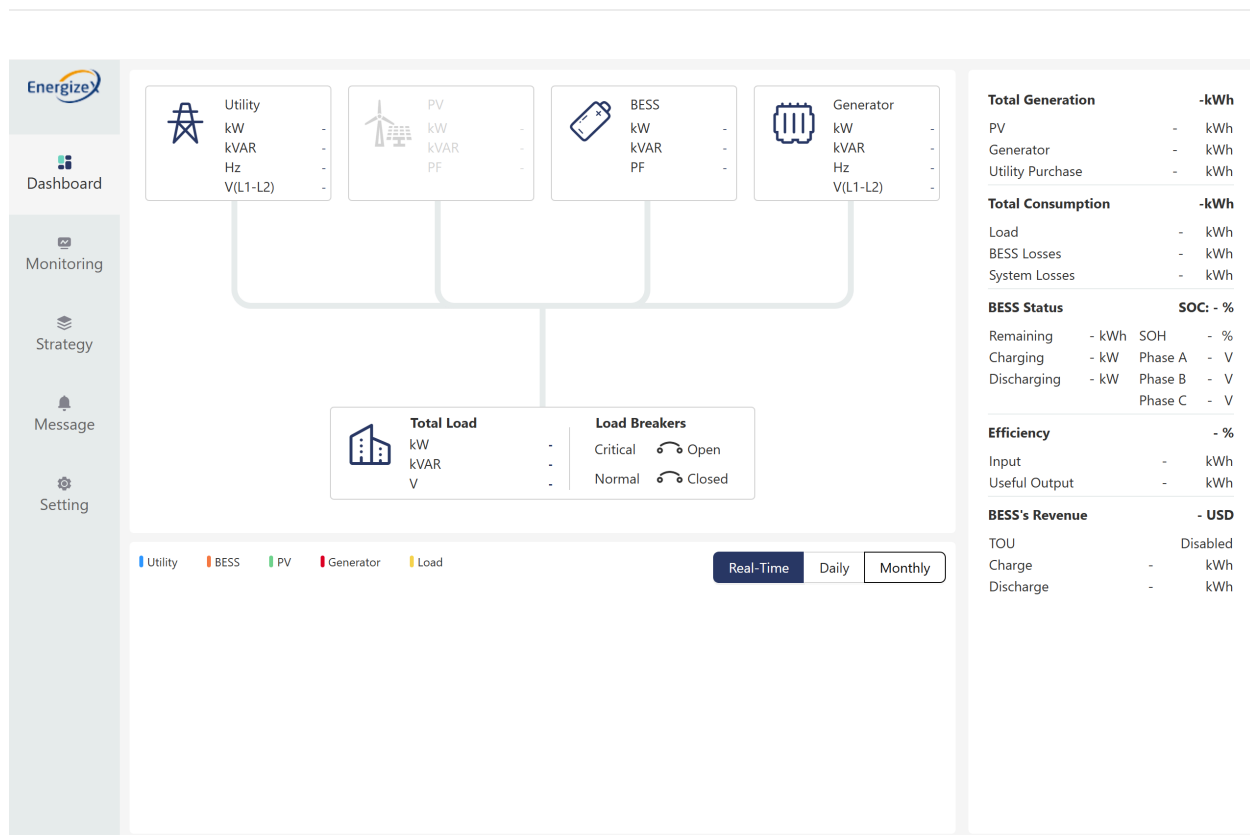


EnergizeOS™ Intelligent EMS



Industrial & Commercial Microgrid and Energy Storage Control Platform | Strategy-Based Subscription Control Engine

Version 1.0 available | Version 2.0 Coming Q4 2025



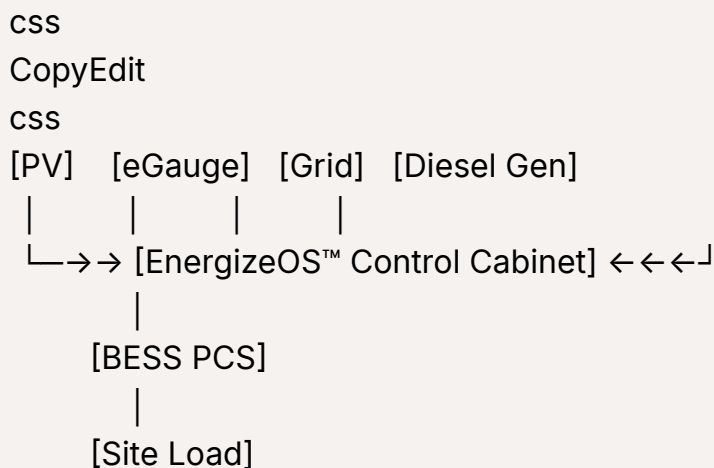
◆ Chapter 1: Product Positioning & Architecture Overview




EnergizeOS™ is a collaborative control platform tailored for industrial and commercial energy storage and microgrid applications, supporting a flexible deployment model with "one-time hardware purchase + strategy subscription authorization".

System Highlights:






- Five-layer modular architecture (Strategy Engine / Control Core / Communication Layer / UI / Security Mechanism)
- Flexible strategy subscription and activation
- Supports complex scenarios: grid instability, demand shaving, diesel optimization
- Factory pre-configured, ready for turnkey deployment

◆ Chapter 2: Typical Turnkey Deployment Structure



-  DO/DI wiring, Modbus address mapping, and strategy loading are preconfigured at factory
-  Plug-and-play on arrival, auto-start upon power-up
-  Cloud platform supports OTA strategy activation, remote diagnostics, and log rollback

◆ Chapter 3: Control Cabinet Hardware Comparison

 Feature	 Lite Version	 Pro Version
Size	300×400×150 mm – Compact design	800×600×250 mm – Industrial-grade, spacious
CPU	Industrial-grade IPC (heat-resistant, compact form)	Industrial-grade IPC (ruggedized, performance-grade)
Communication	Built-in switch + industrial Ethernet ports	Built-in switch + industrial Ethernet ports
Interface	Modbus TCP , basic DI/DO (fixed)	Modbus TCP , expandable RS485 , CAN , extra I/O
Power Supply	AC110–230V input + UPS with 24VDC output	Same as Lite, with optional 24VDC external feed
Display	7" / 10" Industrial Touchscreen (optional)	7" / 10" Industrial Touchscreen (default included)
Cooling System	 No active cooling — for indoor use	 Active cooling with temp/humidity sensor — outdoor use
I/O Capacity	Fixed I/O only – for standard microgrid setups	Expandable – supports large-scale and complex scenarios
Deployment	Indoor rooms, labs, pilot projects	Harsh sites, rooftops, 24/7 outdoor systems



◆ Chapter 4: Strategy Engine Modules (15 Total)

No.	Strategy Name (CN/EN)
01	TOU Arbitrage
02	Demand Charge Management
03	Energy Arbitrage
04	SOC Floor Enforcement
05	Battery Balancing Control
06	Renewable Self-Consumption
07	Renewable Battery Priority
08	Anti-Backfeed Protection
09	Overload Protection
10	Emergency Shutdown
11	Grid-Tie/Island Transition
12	Anti-Islanding Protection
13	Diesel Generator Coordination

No.	Strategy Name (CN/EN)
14	Remote Stop / Manual Control
15	Flexible Strategy Triggering

◆ Chapter 5: Function Module Overview

Module	Description
Strategy Engine	Parametric configuration, interlock logic, version control
Control Core	Manages BESS, PV, DG, breakers
Access Control	Admin / Operator roles
Communication Protocols	MQTT / WebSocket / RESTful API
Logging & Diagnostics	Strategy logs + alarm exports
Local/Cloud UI	Browser-based UI + industrial touchscreen
Security Mechanism	Whitelist, OTA signature, tamper-proof logs

◆ Chapter 6: Business Model & Subscription Licensing

Component	Business Model	Notes
Control Cabinet (Lite/Pro)	One-time purchase	Preloaded with wiring map & strategy templates
Control Engine	Annual subscription	Includes access control, log system, OTA features
Strategy Modules	Per-module subscription	Subscribed annually per strategy
OTA Cloud Service	Included by default	For pushing strategies and version updates
Cloud Management	Value-added service	Multi-site configuration and analytics





📌 Activation Methods:

- **Online Subscription:** Instant activation via Stripe credit card
- **Offline Authorization:** One-time license key binding
- **Lifetime License:** Available for government or enterprise clients

◆ Chapter 7: Typical Deployments & Savings

Scenario	Strategy Set	Result
Caribbean Microgrid	DG Optimization + Grid-Tie	48% diesel savings
US East Data Center	TOU + SOC Management	12% electricity cost reduction
Middle East Industrial Park	Multi-site + OTA Updates	Saved 10+ man-days/month
Southern California Project	Anti-Islanding + Anti-Backfeed	Passed Rule 21 interconnection quickly

◆ Chapter 8: Standards & Compliance

-  Complies with Rule 21 (California Interconnection)
-  Meets IEEE 1547 Grid Interconnection Standard
-  Cabinets meet UL/CSA structural requirements
-  Strategy modules include field validation and version locking

◆ Chapter 9: Technical Case & Trust Anchor

Reference Case | PepsiCo SDG&E Grid-Connected Storage Project (California)

- **Project Name:** PepsiCo Campus Energy Storage Project
- **Client:** B&V (on behalf of PepsiCo)
- **Location:** San Diego, California, USA
- **Scale:** 1MW / 2.064MWh Storage + 480V Grid-Tied

EnergizeOS™ Strategies:

- Grid-Tie/Island Transition Control
- C1-C7 Interlock Logic
- Compliant with Rule 21 / UL1741 SB
- Redundant Judgement via Relay + eGauge

Value Delivered:

- Passed SDG&E inspection
- Closed-loop strategy execution with logs
- Minimized auto-close violations
- Established foundation for future Pro deployments

Reference Case | ABB & GridBeyond – AI-Optimized BESS-as-a-Service Deployment

- **Project Name:** ABB-GridBeyond-Tallarna BESSaaS Commercial Rollout
- **Partners:** ABB (BESS Technology), GridBeyond (AI Optimization), Tallarna (Climate FinTech)
- **Location:** United Kingdom & EU Expansion Sites
- **Scale:** Modular deployments, including 7.5MW at Northwold Solar

Strategy Highlights:

- AI-driven price forecasting and trade optimization
- Zero CapEx deployment with full lifecycle service
- Stacked value streams: TOU arbitrage, frequency response, DR
- Integrated financial risk modeling for project bankability
- Vendor-paid-on-performance service model

Value Delivered:

- Enabled rapid C&I adoption without capital outlay
- Improved dispatch accuracy and asset ROI via AI

- Created investable energy infrastructure for funds
 - Reduced lifecycle degradation with predictive optimization
-

◆ Chapter 10: Risk Control & Debugging Fail-safes

✓ Factory Acceptance Test (FAT):

- DO/DI control loop test
- Modbus communication validation
- UPS power loss simulation
- C1-C7 strategy interlock check
- Close-failure protection + red light alert + logging





 Includes test reports, photos, videos, signature summary

✓ Remote Debugging:

- VPN / remote backend UI
 - Strategy pause / rollback (last 3 versions kept)
 - Forced UI mode (Bypass)
 - Watchdog auto-recovery
 - Log export + fault codes
 - 14-day remote commissioning window + 4hr Tier-1 response
-

◆ Chapter 11: Delivery Training & Support

Training Formats:

-  User Manual (PDF / Web)
-  Video Tutorials (20–40 mins)
-  Live Demos (Zoom / Teams)
-  In-UI Configuration Tips & Guidance

- 📁 USB/ZIP full training package

📦 Delivery Documents:

- Wiring diagrams + interface definitions
- Strategy registry + parameter definitions
- UI guide + button map
- Factory test records + log snapshots
- OTA & strategy update manuals

🧑 Tech Support:

- 📧 Email: 24h response
- 🛠️ OTA updates quarterly (priority for subscribers)
- 📞 Tier-1 issues: 4-hour response
- 🧩 Premium Support: 24/7 hotline, project manager checks, custom strategies

◆ Chapter 12: Typical Config Templates & Selection Guide

✅ Sample Customer Bundles:

Scenario	Version	Strategy Set	Price
Peak shaving + Diesel Saving	Lite	TOU + Diesel	\$8K-\$12K
Rooftop PV + Microgrid	Lite	PV + Grid-Tie	\$9K-\$13K
PV-DG-Storage Cogen	Pro	PV + DG + TOU + Grid-Tie	\$15K-\$22K
Hotel Islanding + PV	Pro	PV + Load Limit + Islanding	\$18K-\$25K
DEMO	Lite/Pro	Single Strategy	From \$6K

📌 Includes cabinet + setup + 1-year subscription

Feature Checklist:

Feature Need	Module	Suggestion
Save on Electricity Bills	TOU	Price gap > 5 cents/hr
Has Diesel Generator	Diesel	Requires control signal
Has PV	PV	Use meter + SOC recommendation
Requires Island/Grid-Tie	Grid-Tie	Setup interlock logic
Export Charts	UI + Logs	Supported by all versions

◆ Chapter 13: System Roadmap & Lifecycle Commitment

Technology Roadmap (2024–2026)

Time	Goal	Status
2024 Q4	Lite/Pro Launch + 5 Key Strategies	✅ Completed
2025 Q2	OTA + C1–C7 Interlocks + Logging	✅ Completed
2025 Q4	AI Strategy Optimization (Load Modeling)	➡️ <small>SOON</small> In Progress
2026 Q1	OAuth2 / Webhook API Integration	➡️ <small>SOON</small> In Planning
2026 Q2	Multi-site Console + Multilingual UI	➡️ <small>SOON</small> In Planning

 Quarterly minor releases, biannual stable versions with OTA & version retention

Customer Co-Development:

- UI feedback channels + email suggestions
- Custom strategy API (from 2026)
- Monthly changelog on website

- Beta test program (priority for pilot sites)
- Annual "Strategy Co-Design Day"

🔗 Adopted feedback: DG close logic optimization, SOC% criteria, PV backfeed limit (10+ items)

🔒 Lifecycle Commitments:

- ≥ 5 years support per major version
- ≥ 3 years strategy upgrade support
- Cabinets support ≥ 3 future major versions
- Fully standalone local runtime (no cloud dependency)
- UPS, CPU, communication modules: 5-year serviceable availability

Case Study: Islanding Protection and Energy Strategy for PepsiCo EV Depot



1. Project Background

Client: PepsiCo

Location: North America

Partner: Black & Veatch (EPC and grid interconnection engineering)

Application: Electrified fleet depot with 56 EV chargers, operating in a high-rate utility region with frequent peak demand surges and potential grid instability.

Challenges:

- High energy bills driven by TOU pricing and demand charges
 - No backup generation on-site; full reliance on utility grid
 - Need for uninterrupted charging to support time-sensitive logistics
 - Utility compliance for safe disconnection during outages (anti-islanding)
-

2. System Deployment

PepsiCo deployed an integrated energy control and protection solution based on:

- **1000 kW / 2000 kWh BESS**
 - **56 EV chargers** (mix of Level 2 and Level 3)
 - **EnergizeOS™ EMS Control Panel (ECP)**
 - **Anti-Islanding Protection Panel (AIPP)** with smart relay and motorized breaker
 - Full system commissioned in partnership with Black & Veatch under SDG&E oversight
-

3. Strategy Design

EnergizeOS™ was configured to operate under two key scenarios:

A. Grid-Connected Optimization

- **TOU Strategy:** BESS charges during off-peak, discharges during peak rates
- **Demand Control:** Real-time peak shaving limits site demand to avoid utility penalties

- **SOC Buffering:** EMS ensures reserve capacity is maintained for emergency islanding
- **Charger Coordination:** EMS controls aggregated load to match real-time grid conditions

B. Grid-Outage Islanding

- Upon utility failure, EMS disconnects site using AIPP within 150 ms
- All 56 chargers continue operating on BESS power in full islanded mode
- Priority-based charging ensures critical fleet vehicles are served first
- System remains isolated until reconnection logic and interlocks are fully verified

4. Results

Metric	Result
Diesel-free Resilience	Full EV charging availability during outage
Energy Bill Reduction	28–35% savings through TOU + demand control
Regulatory Compliance	Passed SDG&E anti-islanding certification
Fleet Uptime Improvement	No delivery interruptions during grid loss

5. Client Feedback

“Our trucks can't wait for the grid. EnergizeOS™ gave us control, savings, and resilience—all without adding a generator.”

— Site Energy Manager, PepsiCo

6. Conclusion

This case illustrates how EnergizeOS™ and its integrated AIPP system can transform an EV fleet depot into a fully resilient, intelligent microgrid—**capable of saving on every kilowatt-hour while staying online in every blackout.**

The system is scalable, utility-compliant, and sets a benchmark for commercial fleet electrification projects across North America.

Case Study: ABB & GridBeyond – AI-Optimized BESS-as-a-Service Deployment



1. Overview






- **Partners:** ABB (Electrification & BESS Technology) + GridBeyond (AI Energy Platform) + Tallarna (Climate FinTech)
- **Launch Date:** Strategic expansion in May 2025
- **Target Clients:** Global Commercial & Industrial (C&I) users
- **Offering:** Fully managed, CapEx-free Battery Energy Storage as a Service (BESSaaS)

2. Business Model Highlights

Feature	Description
Zero CapEx Deployment	ABB provides hardware, software, and lifecycle services without upfront cost
AI-driven Optimization	GridBeyond's platform forecasts prices, manages dispatch, and improves system ROI
Stacked Revenue Streams	Participation in frequency markets, TOU arbitrage, demand response, etc.
Financial De-risking	Tallarna provides insurance and modeling to ensure bankability of each deployment
Technology-Agnostic	BESSaaS can integrate various battery brands and PCS types

3. AI & Optimization Capabilities

GridBeyond's AI engine powers:

-  **Real-time price forecasting**
-  **Smart charging/discharging strategy**
-  **Trade optimization & submission automation**
-  **Performance reporting & revenue tracking**
-  **Learning-based dispatch tuning per site**

This enables:

- Reduction in energy procurement cost
- Active participation in grid services
- Lifecycle performance improvements of BESS

4. Financial & Market Implications

- BESSaaS reduces adoption barrier for C&I sites lacking CapEx
- AI improves system utilization rate and speeds ROI
- Service model aligns incentives: vendor gets paid only if savings happen

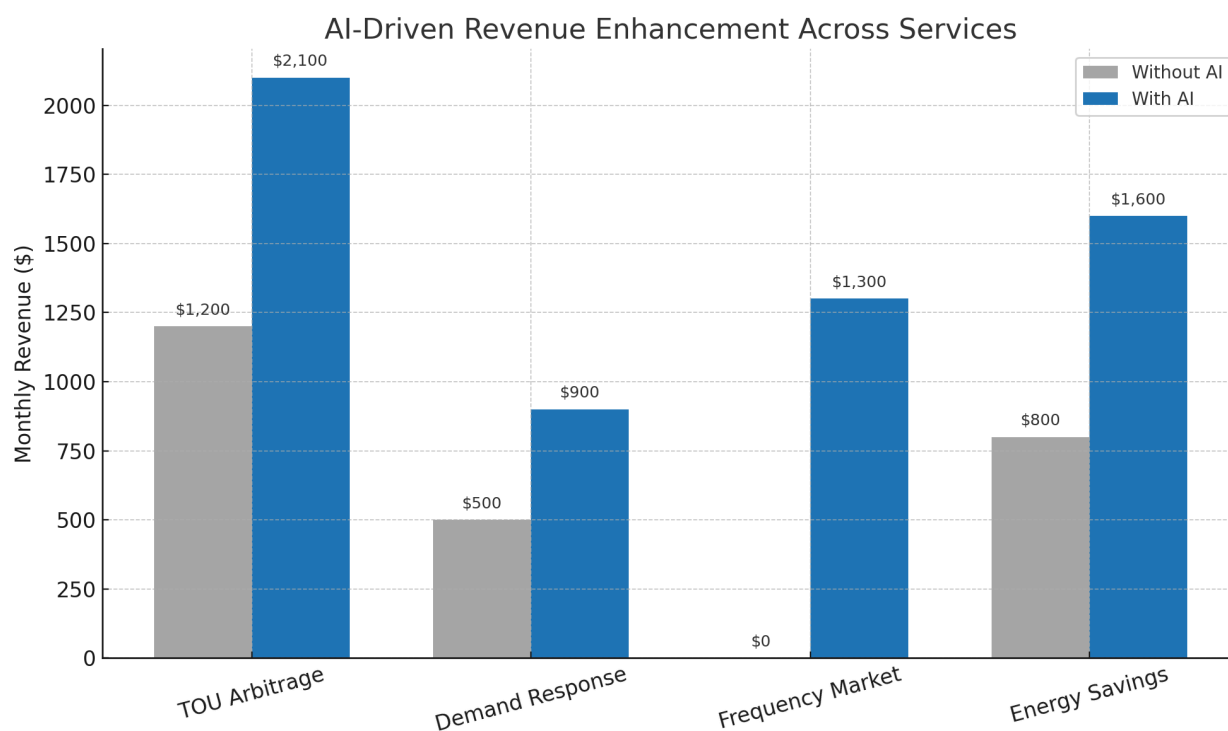
- De-risked assets open new channels for institutional investors

5. Strategic Impacts

"To truly unlock BESS value, you need accurate AI forecasting, financial modeling, and zero-barrier entry for users."

— Michael Phelan, CEO of GridBeyond

This model has already expanded with GridBeyond Storage and Triodos Energy Transition Europe Fund committing £9M, and a 7.5MW deployment at Northwold Solar (400MWp).



6. Lessons for EnergizeOS™

Learning	EnergizeOS™ Implication
BESSaaS lowers friction for market adoption	Consider bundling SaaS + Hardware for zero-CapEx deals

Learning	EnergizeOS™ Implication
AI as value driver, not accessory	Strengthen internal AI modules for dispatch, fuel saving, PV optimization
Multi-party delivery (ABB + GridBeyond + Tallarna)	Build partnership models with EPC + platform + financier
Use-case clarity (TOU, DR, frequency, etc.)	Continue strategy modularization for each revenue stream