e-mesh for electric mobility

Increase electrical reliability, reduce energy costs, and increase sustainability

Energy Management Solutions to enable electric mobility and more
About Hitachi Energy

Headquarters in Zurich, Switzerland

Customers
- Transport & Infrastructure
- Industry
- Utilities

Offering
- Services
- Software & Automation
- Systems
- Products

Geographies
- Asia, Middle East & Africa
- Americas
- Europe

Four Business Units
- Grid Automation
- High Voltage Products
- Grid Integration
- Transformers

- 38,000 employees
- ~250 years’ heritage combined
- 5,500 sales employees & field engineers
- 2,000 engineers & scientists in R&D

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Grid Automation

Grid Integration

High Voltage products

Transformers

Automation and Communication

Enterprise Software Solutions

Grid Edge Solutions

e-mesh™ Energy Storage

e-mesh™ Automation

e-mesh™ Digital & Service

Grid Edge Solutions
Grid Edge Solutions

As a pioneer in energy management and optimization, Hitachi Energy Grid Edge Solutions is a trusted partner in the evolving global energy ecosystem.

Our Grid Edge Solutions are leading energy innovation and transition

The e-mesh™ portfolio includes energy storage and digital automation solutions. Our global footprint covers more than 250 references.

Hitachi Energy helps customers increase profitability and unlock new revenue streams by reducing energy cost, maximizing renewable integration and lowering CO₂
Our customers

Pioneer in technology, solutions and projects execution
What is the value of a microgrid?

A microgrid is a set of Distributed Energy Resources (DER), including generation, storage, and/or loads, that are controlled so that they can island and operate autonomously from the grid.

A microgrid provides:
- Ability to operate islanded
- Control and management of DER
- Reliable and resilient power

Grid Edge Solutions represent an evolution of microgrid technologies, focused on new services and new value
GES Products
Introducing the e-mesh portfolio
e-mesh Portfolio enhances value stacking benefits

Customer values

**Digital**
- Enable XaaS
- Maximize asset performance
- Maximize revenue streams

**Automation**
- Flexible applications
- Maximize asset value
- Maximize revenue streams

**Power**
- Optimized CAPEX
- Scalable
- High reliability

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**Applications**

- e-mesh Analytics
- e-mesh Service
- e-mesh Trading
- e-mesh VPP
- e-mesh Monitor
- e-mesh EMS
- e-mesh SCADA
- e-mesh Control
- e-mesh PowerStore
- e-mesh Network
- e-mesh Feeder
- Traditional Generator
- Solar
- EV Charging

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**Energy Hub**

- Service Hub
- Energy Hub

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**PowerStore**

- Smart BESS
- Power Management
- Real Time Communication

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**Monitor**

- e-mesh EMS op
- e-mesh SCADA
- e-mesh Control

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**Control**

- e-mesh PowerStore
- Network
- Feeder
- Traditional Generator
- Solar
- EV Charging

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**In the cloud**

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**On premises**

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e-mesh Portfolio

“Flexible scope adapting to each customer needs”

01 Digital

02 Automation

03 Power

End-to-end Solution

Stand-Alone Automation & Energy Platform

State of the art vertically integrated Control, SCADA and digital platforms, related engineering tool and software rich with domain knowledge and industry expertise.

Flexible to interface 3rd party equipment

Customer selected electronic power converter and battery can be integrated in a standardized automation and digital solutions.

(*) e-mesh PowerStore: Grid code compliant PCS able to operate grid following / grid forming, together with standardized and qualified battery suppliers.
e-mesh Power: PowerStore

Highlights

- Designed for both grid-connected and off-grid applications
- Grid codes and standards compliant
- Intelligent and efficient power management system
- Pre-configured automation functionalities
- Productized design allows faster implementation
- Assures high level of cyber security
- Available in different sizes and configurations, based on two variants: Integrated and Modular

Energy storage system – enabling resilient and cost-effective access to power
e-mesh Power: PowerStore

PowerStore Integrated: PS250 & PS500

Intended for small and medium applications, the complete PCS and battery modules are integrated into a single outdoor enclosure.*

PowerStore Modular: PS1000

The PCS and battery are housed in separate enclosures* to achieve flexible power and energy ratings.
PowerStore Modular

Highlights

- Modular systems in 1MW blocks, up to 100 MW+
- 2 battery enclosure options depending on technology: containerized or outdoor cabinets
- Individual selection based on application and customer requirements
- Can connect to all voltage levels via external transformer
- Cloud-based remote monitoring and control system
- Fulfill health, safety and environmental requirements

Key components

- e-mesh Control
- Grid-forming power converter
- AC and DC protection
- Battery racks and BMS
- Fire detection and suppression

Flexible & scalable energy storage system
e-mesh Automation

- Future proof product line
- Increased efficiency
- Global after sales service

- Complies to OT & IT standards
- Intelligent SoC management
- Greater flexibility & scalability

- Voltage & Frequency Support
- Black start automation
- Active / Reactive power management

- Integrated operational safety
- Complies to cyber security
Highlights

- Asset control ranging from renewable power plants, microgrids, energy storage and substations
- Productized libraries and application customization
- Seamless integration into existing Substation Automation installations
- Network voltage control, feeder & load demand management
- Resilient cyber security features
- Complies with major communication protocols (3rd party equipment)
- Implements IEC 61131 standard for PLC languages
- Ensure asset grid code compliance

Ensuring reliable and economical power supply with reduced carbon footprint
e-mesh Automation: Control for Microgrid and DERs

Benefits

• Max efficiency of traditional & distributed energy assets
• Platform scalability to reduce cost of future expansion
• Reduces cost of operation
• Maximizes renewables utilization
• Standard, pre-tested configurations to save commissioning time
• Secure and authorization authentication for energy assets access

Ensuring reliable and economical power supply with reduced carbon footprint

RTU: Remote Terminal Unit
e-mesh Automation: EMS

Highlights

- e-mesh Energy Management System (EMS), an optimizer suite that provides **optimal energy management of distributed energy resources and electric vehicles fleets**.
- Minimize energy charges, peak demand charges and CO2 emissions through day-ahead and intra-day optimal dispatch
- Take full advantage of renewables power generation and loads power consumption forecast data
- Enables the creation of insightful and handy reports for business executives
- Enhanced visibility into energy saving methods compliant with ISO 50.001
- Supports e-mobility use cases providing Charging Management Systems (CMS) functionalities and interfacing EV charging infrastructure via OCPP
e-mesh Automation: EMS

**Optimize**

- Helps in planning, scheduling and setting of operating profiles for sites, DERs and EV fleets
- Evaluate custom optimization scenarios and implement the best solution
- Available planning horizons include intra-day and offline optimization

**Forecast**

- Collects and harmonizes forecast data for the EMS Optimize module
- Provides site upward/downward regulation capacity to support demand response use cases

**Report**

- Provides operational and business reports such as revenues from energy sales, cost of energy purchased, carbon emission, business-as-usual benchmark, etc.
- Past, current & next-day KPIs are stored locally and can be accessed through a web user interface or secured web APIs

**Connect**

- Provides connectivity for integration to SCADA and other 3rd party systems such as forecast providers and aggregators
- Provides connectivity to EV charging infrastructure via OCPP

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Four modules to optimize performance, improve energy efficiency and minimize costs

DER: Distributed energy resources / KPI: Key Performance Indicator / API: Application Programming Interface
e-mesh Digital: Energy Platform solution ecosystem

Customer segments:
- C&I Prosumers
- Utility energy producers
- Grid Operators
- EV operators

Distributed energy resources

Integration with 3rd Party Systems:
- Utility systems: accounting, data sources, portfolio management, …
- Grid operators: DERMS & Dispatching
- EV operators: Fleet & operations management

Electricity markets:
- Balancing & ancillary services
- Energy wholesale market

Monitoring & descriptive analytics
Asset analytics & performance management
Trading Auto bidding VPP with trading
Aggregation & VPP optimization w/o trading
e-mesh for e-mobility
Optimized grid-to-plug energy and charge management for e-mobility

Electrification of transportation is driving change for how energy must be managed.

Electrified mobility… …requires EV charging… …that places new demands on the electric grid.

e-mesh™ solves grid supply challenges making electricity:
- More reliable
- Lower cost
- Lower risk
- More renewable
- More flexible

e-mesh™ for e-mobility
e-mesh portfolio enables better EV charging with DER

- Increases ROI by generating new revenues streams with energy market participation and V2G applications
- Maximizes integration of EV chargers with renewable generation and energy storage to reduce carbon footprint
- Ensures reliable and resilient power for mission critical infrastructure, with microgrid capabilities to avoid upgrade of existing depot feeders
- Minimizes energy costs with optimized site energy management with integrated smart charging and peak demand management

Scenario modelled includes 57 large electric vehicles with on-site solar photovoltaic generation and energy storage, all managed by e-mesh

e-mesh drives sustainable e-mobility

- Overcome substation and feeder capacity limits
- Smart EV charging and energy storage to reduce peak demand
- Optimize use of Solar PV

e-mesh reduces electric vehicle charging costs
- OPEX reduction up to 25%
- CAPEX reduction up to 35%
e-mesh for e-mobility charging hub in focus

FLEET MANAGEMENT
- Vehicle Dispatch
- Traffic Control
- Infrastructure Management
- Maintenance

DISTRIBUTED GENERATION
- Solar PV
- Back-up

EV CHARGING INFRASTRUCTURE
- L1 chargers
- L2 chargers
- DCFC
- Grid eMotion Flash and Fleet

ENERGY STORAGE
- Reduces peak demand
- Enhances flexibility
- Lowers charging costs
- Enhanced reliability, resiliency and power quality with e-mesh PowerStore

e-mesh for e-mobility
- Integrates and automates Distributed Energy Resources (DER)
- Optimizes energy for e-mobility
- De-risks energy operations for EV
- Monitors and delivers insights anywhere

Cloud and on-premise options

Grid connection infrastructure

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Interface with 3rd party
e-mesh experience: Integration across the e-mobility ecosystem

- Charger agnostic approach, including Level 1, Level 2, and DCFC
- Flexible configuration of assets for optimal operation through dedicated webpages
- Secure access to authorized personnel with user groups and roles settings
- Compatible with both utility interconnection and EV protocols (OPC UA, IEC 104, Modbus TCP/IP, OCPP)
- Access to all functionalities and data through Web APIs for e-mesh and 3rd party software interface
- Focused on cybersecurity, with options for on-premise or cloud deployment

RE DER = Renewable Energy Distributed Energy Resources (e.g. solar PV)
BESS = Battery Energy Storage System
**e-mesh experience: Insights to track fleet energy**

- Enables the creation of insightful and handy reports for business executives
- Enhanced visibility into energy cost and saving methods compliant with ISO 50.001
- Default and customizable dashboards – including vehicle and DER specific dashboards
- Detailed insights on current and future site behavior

**Definitions**

RE DER = Renewable Energy Distributed Energy Resources (e.g. solar PV)

BESS = Battery Energy Storage System
e-mesh experience: Optimized energy use and smart charging

• Minimize operating expenses through day-ahead & intra-day optimized dispatch
• Accurate forecasts of renewables power generation and load power consumption automatically imported and managed with day-ahead simulation
• Integrated Charge Station Management System (CSMS) prioritizes and controls EV fleet charging based on energy price, EV schedule, EV power needs, on-site solar PV and other DG, and on-site energy storage (PowerStore or 3rd party)
• Minimize grid power demand to reduce costs, overcome grid constraints, and maximize value of renewables integrated at depots

RE DER = Renewable Energy Distributed Energy Resources (e.g. solar PV)
BESS = Battery Energy Storage System
e-mesh experience: Planning tools to enhance operations

- Select and simulate special predefined scenarios to optimize performance
- Design custom scenarios, plan and schedule short-term activities such as maintenance and repairs or preparing for threats like storms or wildfires
- Scenario architect: enables operators to build, update, delete off-line forecast profiles (feeder, load, renewables and energy prices) and asset availability (EV chargers, storage and renewable) scenarios
- Scenario simulation: enables operators to select and simulate predefined scenarios to prepare for and de-risk operation challenges
Selected e-mobility references
Customer success stories
The Brisbane Metro will set the model for how mid-sized cities can address public transport challenges with electrified metros.

The Brisbane City Council is working with vehicle manufacturer HESS, Volgren, and electric infrastructure experts Hitachi Energy to ensure efficient, sustainable, and secure electricity usage, that minimizes total cost of fleet ownership and operation.

Web story

About the project
- **Project name:** Brisbane Metro
- **Location:** Australia
- **Customer:** Brisbane City Council
- **Completion date:** Estimated 2023

Customer benefits
- Fleet electrification including both fast terminal charging and slow overnight charging
- e-bus charging optimized to meet transit fleet schedule requirements
- Minimizes energy costs and peak demand charges
- Charging optimized at depot with solar PV to maximize use of clean solar energy

Solution
- e-mesh EMS (Energy Management System)
  - Manages more than 75 chargers, including 15 flash chargers spanning multiple terminal stations and a fleet of 60 x 50kW DC-DC chargers and pedestals
  - Charging optimized both at terminal stations and at depot hosting 1MW of solar PV
Clever is the largest EV charge solution provider in Denmark with +2.300 public chargers and +20.000 private home chargers installed (2021). Clever has a target to expand the installed capacity with 500% in 2025 and enable the use of 100% renewable energy. Battery Energy Storage will be an integrated solution at all High-Power Charge locations in Denmark.

**Press release / Video**

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**About the project**
- **Project name:** Gigastation “Køge”
- **Location:** Køge – Denmark
- **Customer:** Clever A/S
- **Completion date:** 2022

**Customer benefits**
- PowerStore BESS integrated with solar PV removes constraints and reduces energy costs for 2.4 MW of EV chargers
- Additional revenue streams from participation in frequency regulation markets
- Modular BESS design that can scale with depot expansions and features +15 years lifetime
- Extremely responsive BESS supports fast external P/Q control (<250ms)

**Solution**
- EV charging (8 x 300kW)
- Solar PV (100 kWp)
- Aggregated with additional solar and home EV charging
  - PowerStore Battery (1.2 MW / 1.5 MWh)
  - e-mesh Automation
SnoPUD: Microgrid as a platform for resilient V2G

Snohomish County PUD (SnoPUD) developed a state-of-the-art microgrid with solar PV, generator and battery storage with electric vehicle-to-grid (V2G) integration. The Arlington Microgrid demonstrates all the things a microgrid can do to support an electrified future—from grid stabilization to V2G integration to ancillary services to operation on 100% renewable power.

In the media (1) / In the media (2)

About the project

• **Project name:** SnoPUD Arlington Microgrid
• **Location:** Washington, USA
• **Customer:** Snohomish Public Utility District
• **Completion date:** 2021

Customer benefits

• Reliability and resiliency for Clean Energy Center, North County Data Center, and Local Office
• Integration of community solar renewable generation
• Stacking multiple values from energy storage: microgrid, grid stabilization, renewable integration, peak shaving, renewable back-up
• Exploring the future of vehicle electrification
• Utility reliability maximizing the value of batteries

Solution

• Community Solar PV (500 kWp)
• Electric Vehicle (EV) Charging
• e-mesh PowerStore Battery (1 MW / 1.4 MWh)
• e-mesh Automation
• Back-up Genset
• Vehicle to Grid (V2G) Integration