Grid Edge Solutions e-mesh
Infinite insight
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Grid Edge Solutions
Enabling the future of energy
Who we are

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 800 MW and 250 references.

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

Enabling new business opportunities while improving reliability and performance

- EV charging integration and management
- Energy management for sites portfolio including microgrid
- Renewable Automation
- Communications & Asset management
- Utility operations ADMS / DERMS
- Energy storage
- Cyber security
- Digital Substations
- Aggregation (VPP, demand response)
- Grid Edge Solutions e-mesh portfolio
- Other PGGA Solutions
Grid Edge Solutions

Applications & services

- Monitoring and reporting
- Energy optimization
- Monitoring and reporting
- Energy optimization
- Transactive energy
- Virtual power plant
- Demand response
- Collaborative operations
- ADMS / DERMS

Smart site → Smart district → Smart city

Edge

Gateway

Cyber-secure communications

Connected devices

- Onsite Generation
- Flexible demand
- Energy Storage

Enabling the future of energy – smart anything
**e-mesh value proposition**

Scalable vertically integrated digital ecosystem managing and optimizing energy at all levels with wide range of applications from the field to the boardroom, on cloud and on premises.

**e-mesh enables:**
- Availability of reliable and resilient power
- Reduction in carbon footprint
- Improved energy costs
- Maximizing integration of renewables
- Enhanced revenue and ROI through “value stacking”

Enabling energy management and optimization with e-mesh portfolio
Grid Edge Solutions

Maximize renewable integration and improve sustainability

Increase operating reliability & resilience

Increase revenues with grid ancillary services

Reduce energy costs

Postpone T&D investments

Prosumer market participation

From the cold of the Antarctic to the heat of the Australian outback, we support our customers to...
Serving customers across multiple segments

**Summary**
- Applications across multiple segments
- Improved economic viability
- Key enabler of new business models
- Value stacking increases ROI
- Digital capabilities enable advanced applications
- Enabling further renewables deployment

**Utilities & Renewables (Generation)**
- Integration of distributed renewables & EV
- Postponement of grid upgrades
- Dispatchable renewables

**Utilities (Grid Ancillary Services)**
- Integration of distributed renewables & EV
- Ancillary grid services

**Industrial**
- Reduced fees from harmonic pollution & demand peaks

**Transportation**
- Higher reliability rail and e-bus network

**Urban & Commercial**
- Optimize self-consumption

**Remote Communities**
- Stabilization
Global references

Experience and innovative solutions worldwide

Worldwide: > 800 MW

Americas: > 200 MW

EMEA: > 150 MW

Asia Pacific: > 200 MW

Australia: > 200 MW
Our customers

90+
Countries supported with Service and Sales organizations

30+
Years of experience

800+
MW of global references of Grid Edge solutions including microgrids and BESS

250+
Projects delivered worldwide

Pioneer in technology, solutions and projects execution
e-mesh portfolio
Digital solutions for distributed energy resources
e-mesh portfolio

Applications
SaaS Apps for improved performance

Digital Platform
Cloud enabled

EMS
On-premises energy management solution

SCADA
On-premises plant automation solution

Control
Intelligent and efficient power management

PowerStore
Smart battery energy storage solution

- Energy forecast, production and optimization planning
- Business KPI dashboards and reports
- Improved productivity and profitability

- Monitoring and control
- Bi-directional data flow
- Remote access

- Monitoring & control
- Optimal energy production
- Operational & maintenance cost reduction

- Renewable power generation grid code compliance
- Network voltage control
- Feeder & Load demand management

- Smart battery energy storage solution
- Support for various applications including islanding, seamless transition, black start, spinning reserve, etc.

Real Time Communication

In the cloud

On premises

- Monitoring and control
- Bi-directional data flow
- Remote access

- Monitoring & control
- Optimal energy production
- Operational & maintenance cost reduction

- Renewable power generation grid code compliance
- Network voltage control
- Feeder & Load demand management

- Smart battery energy storage solution
- Support for various applications including islanding, seamless transition, black start, spinning reserve, etc.
e-mesh 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**

- Frequency regulation
- Spinning reserve
- Seamless transition between on and off-grid
- Centralized or decentralized control
- Base load leveling
- Peak shaving
- Optimal battery technologies based on the application
- Renewable integration

---

IPP : Independent Power Producers / MTBF: Mean Time Between Failure

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e-mesh PowerStore

PowerStore Integrated: PS250 & PS500
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.

* Enclosure images for illustrative purposes only.
** In the outdoor batteries option, the controller is delivered in a separate enclosure.
PowerStore Integrated

Highlights

- Designed for Industrial and commercial, institutions & campuses
- For installations with a power requirement up to 500 kW -670KWh
- Pre-configured automation
- Cloud-based remote monitoring and control system
- Fulfill health, safety and environmental requirements
- Standardized enclosure for easy and fast transportation

Key components

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

Energy storage with a compact footprint
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

* In the outdoor option, the controller is delivered in a separate enclosure
**Seamless Transition**

Seamless transition from grid connection to islanded mode

Meet the challenges for robust power supply in isolation from national grid infrastructure and gain control of your power needs on ‘local’ level

**Grid Stabilization**

Reliable and affordable flow of power whenever it is required

Stabilizes an electricity network by rapidly absorbing power surges or by injecting power to make up for short-term decline, in order to maintain high quality

**Standalone**

Driving the transition to a carbon neutral tomorrow, today

Acts as “Virtual Generator” and can form the grid, handling up to 100% renewable energy.

**Advanced control algorithms enabling revenue stacking to maximizing return on investment**
e-mesh PowerStore

Load leveling

Ancillary services

Integration of renewable resources

Peak shaving

Power quality

Spinning reserve
Highlights

- Emulate traditional generator behaviors & interact with the power system the same way as traditional synchronous machines.
- Enables seamless transfer between grid connected & off-grid
- Creates islanded grid by controlling its own voltage and frequency
- Overload capability ensuring availability during transient loads
- Inherent Black starting capability
- LVRT & HVRT capability
- Grid code compliance for worldwide acceptance

Conventional Generator

Virtual Generator

Versatile inverter platform with virtual generator functionality
e-mesh Control

Highlights

• Asset control ranging from renewable power plants, microgrids, energy storage and substations
• Productized libraries and application customization
• Seamless integration into existing substations with RTU500 technology
• 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
Solution Integration and Compliance

- Seamless integration into existing substations
- Standardized protocols and logic to manage all the assets as a single controllable point
- Functionalities to connect with popular ERP systems to ensure efficient operations
- Grid code compliance by supporting all international & local communication protocols
- Renewable fleet performance analysis as per IEC guidelines
- Compliant to: IEC60870-5-104/101, DNP3, MODBUS, IEC61850.
- Tested by: KEMA, DNVGL
e-mesh Control

HITACHI

100 years of know-how in power automation

Protection

Factory tested against Cyber Security threats

World market leader in medium and large RTU applications

More than 2,200 customers buy around 10,000 RTUs per year.

More than 150,000 installed RTUs

spread over more than 100 countries active portfolio since 45 years

RTU500 series platform

World market leader in medium and large RTU applications
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
## Energy Assets Controller Application

<table>
<thead>
<tr>
<th>Energy Assets</th>
<th>Controller</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>e-mC-P</td>
<td>PV inverters</td>
</tr>
<tr>
<td>Battery</td>
<td>e-mC-E</td>
<td>BESS*</td>
</tr>
<tr>
<td>Fossil fuel</td>
<td>e-mC-G</td>
<td>Fossil fuel generators</td>
</tr>
<tr>
<td>Wind turbines</td>
<td>e-mC-W</td>
<td>Wind turbines</td>
</tr>
<tr>
<td>Load feeders</td>
<td>e-mC-F</td>
<td>Load feeders</td>
</tr>
<tr>
<td>Grid / network interface</td>
<td>e-mC-N</td>
<td>Grid / network interface</td>
</tr>
<tr>
<td>Renewable Power plant</td>
<td>e-mC-RA</td>
<td>Renewable Power plant control</td>
</tr>
</tbody>
</table>

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**Dedicated controller for any type of asset**

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[Diagram showing e-mesh Control]
A unique product managing multiple assets both on-grid and off-grid
e-mesh PPC

Renewable insight

e-mesh PPC is a grid code compliant productize control solution for utility scale renewable power plants.

It is delivered already pre-configured, requiring no specific programming knowledge.

The user-friendly HMI means that the user only needs to enter the specific system parameters for its commissioning.

e-mesh PPC cabinets are designed to operate even in harsh environments.

Lite version

Suitable for small to medium plants, ranging from 10MW to 15MW with optional connectivity.

Premium version

Designed for large installations with built-in redundancy; scalable when required.

Power Plant Controller for renewable plants
Validated simulation models for GIS and consultancy

Tested and documented models supporting the most popular power systems simulation tools

Supported products
- e-mesh PowerStore (both RMS and EMT)
- e-mesh Control
- RA PPC
- BESS PPC
- Microgrid

Supported tools
- DlgSILENT Powerfactory
- PSCAD
- PSS/E
What is it

A real-time platform for reliable operation:

- Data Concentrator
- Communication Gateway
- HMI
- Historian
- Distribution Management

MicroSCADA X Platform

Controlling the power supply to

**hundreds of millions** of people.

14,000+ systems in operation

Installed in **170** countries.

On the market over **30** years.

Why customers need it

- Central visibility & control of electrical power network
- Connecting operational data to network control center
- Connecting asset data to enterprise asset management software
Highlights

• Provides real-time control and monitoring of all your assets
• Data acquisition from field assets such as BESS, EVs, renewables and other distributed resources.
• Productized libraries simplify application customization
• Compliance with major communication protocols
• Quickly locates issues in the plant
• Maximizes safety and allows reduction in operator error
Benefits

- **Comprehensive energy assets monitoring**
- **Diagnostics & control of energy assets**
- **Usability and ergonomy**
- **Integration of all energy assets into single system**

- **Optimized operations & Maintenance**
- **Easy to customize and configure**
- **Scalability in size and functionality with low life-cycle costs**
- **Protects your assets and interests with Cyber Security compliance**

- **Future-proofed with wide protocol compliance**
- **Monitor assets across locations**
- **Manage access control for data security**
- **Global After-sales support**
E-mesh SCADA

<table>
<thead>
<tr>
<th>SCADA</th>
<th>Application</th>
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<tbody>
<tr>
<td>RA-Solar</td>
<td>Renewable Automation: Solar PV</td>
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<tr>
<td>BESS</td>
<td>Battery energy storage solutions</td>
</tr>
<tr>
<td>RA-Wind</td>
<td>Renewable Automation: Wind</td>
</tr>
<tr>
<td>MG</td>
<td>Microgrid solutions</td>
</tr>
</tbody>
</table>

Dedicated SCADA for any type of application
e-mesh EMS

Highlights

e-mesh Energy Management System (EMS), an optimizer suite that provides additional features for **optimal energy management of distributed energy resources**.

- Minimize OPerating Expenses 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 market participation and energy trading
e-mesh EMS

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

Forecast
• Collects and harmonizes forecast data for the EMS Optimize module
• Supports energy trading and bid generation by providing actionable insights

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 trading systems

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

DER: Distributed energy resources / KPI: Key Performance Indicator / API: Application Programming Interface
<table>
<thead>
<tr>
<th>Enables</th>
<th>Maximizes</th>
<th>Minimizes</th>
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<tr>
<td>Integration &amp; optimization of renewables</td>
<td>System reliability &amp; resilience</td>
<td>Operational &amp; maintenance costs</td>
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<tr>
<td>Forecasting, planning &amp; reporting</td>
<td>Revenue streams</td>
<td>Carbon footprint</td>
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<tr>
<td>EV/critical loads management</td>
<td>Energy efficiency and transparency (ISO 50001)</td>
<td>Peak load costs</td>
</tr>
<tr>
<td>Participation in energy/ancillary markets</td>
<td>Renewable penetration</td>
<td>Renewable curtailment</td>
</tr>
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</table>
EMS Optimize

EMS Optimize processes and collects information from EMS Forecast, enabling…

- Planning, scheduling and deployment of assets in the most optimal way to minimize operational cost and CO₂ footprint
- Evaluation of multiple optimization scenarios and deployment of the best fit with maximum benefits
- Participation in electricity markets by applying suggested economic dispatch programs
Benefits

• Reduce operational costs and CO2 emissions depending on the strategy

Features

• A new optimization is executed every 15 minutes with a fixed optimization horizon of 24 hours
• Optimization results consist of 96 active power dispatch setpoints for all assets (only the 1st control action is applied)
• Optimization can be executed in background without sending setpoints to the field
Benefits

• Know exactly how assets will operate within the next 24 hours
• Optimize operation by planning ahead of time for the next day without impacting current operations
• Participate in wholesale electricity markets for energy trading
• Plan for maintenance and operation accordingly

Features

• Dedicated webpage for planning day-ahead activities
• Overview of day-ahead economic dispatch according to forecast data
• Participation in electricity markets per suggested economic dispatch programs
• Offline optimization set-up, without sending setpoints to field devices until validated
e-mesh EMS

Benefits

• Select and simulate special predefined scenarios to optimize performance
• Design custom scenarios, plan and schedule short-term activities such as maintenance and repairs

Features

• Scenario architect: enables operators to build, update, delete off-line forecast profiles (PCC, load, renewables and energy prices) and asset availability (storage, generators and renewable) scenarios
• Scenario simulation: enables operators to select and simulate predefined scenarios
• No setpoints sent to field devices until the scenario is validated and changes applied
Benefits

• Select the right optimization strategy based on individual requirements and expected business outcomes

Features

• Select the most convenient configuration depending on the end goal, such as CO2 reduction, or cost optimization

Multiple optimization strategies
Benefits
• Flexible configuration of assets for optimal operation

Features
• Dedicated webpage for easy configuration of asset parameters
• Secure access to authorized personnel with user groups and roles settings
• Automatic updates, imported and managed by intra-day, day ahead simulation/optimization
• Input data validation to ensure accuracy (check for permitted characters)
• Visualization mode: to view settings
• Configuration mode: to update parameters or add/remove assets
**How we offer it?**

- **Software as a Service (SaaS)**

**Is it black box?**

- Interoperable and secured Web API interfaces

---

**e-mesh Monitor & e-mesh Apps**

**Which are your benefits?**

- Transition from time based to predicting optimal operational actions
- Reduced IT infrastructure CAPEX & OPEX
- Flexibility to select service tier matching your needs
- No more manual data reporting, all managed by one click
- Benefit from our continuous delivery of features updates and e-mesh App Store without operation interruptions

---

**Informative Insights for certain uncertainty management**

IT = Information Technology / API = Application Protocol Interface
e-mesh Monitor

Highlights

e-mesh Monitor is a **cloud-based digital platform**, exclusively designed to aggregate data from distributed energy assets and turn it into actionable business insights.

- Data collection & aggregation from assets using an IoT edge device
- Data analysis & storage in a secured cloud Real-time monitoring of distributed energy assets from anywhere, anytime
- Alarms, historical analysis and performance analytics reporting
- Act as the hosting platform for the e-mesh Software as a Service (SaaS) Applications
- Handle multiple DERs
- Extend using it on your handheld devices and interface through secured APIs

Asset insights
Functionalities

Collection, aggregation, and centralization
- Secure data collection from DERs
- Aggregate and centralize collected data securely on cloud side

Monitor
- Real time visibility over all connected assets
- Avoid site interruptions with a flexible alarms handling mechanism

Descriptive Analytics
- Performance analysis for connected DERs
- Historical trending of key performance indicators

Access securely anytime anywhere
- Accessible to authorized users from any internet browser on your laptop, tablet, or mobile
- Actionable insights at your fingertips

Functionalities and holistic view
Benefits

• Gain deep knowledge on site operations and productivity
• Ensure continuous operations of site with minimum outages
• Predict asset failures in advance and increase the lifetime value of assets
• Minimize infrastructure costs and maximize performance
• Get insightful reports on site productivity, efficiency, CO₂ emissions and system uptime

Enhanced asset visibility
• Quickly understand what is happening
• Accurate notifications for downtime and performance inefficiencies
• Visibility down to device level
• One system for monitoring performance in real time

• Instant understanding of performance indicators for different type of DER
• Avoid manual data analysis
• Track trends, analyze performance and quantify gains
• Learn from patterns to avoid downtimes

• Access remotely and understand what is happening
• Plan ahead before site visits
• Ease of access onsite through handheld devices
• Utilize alarms service to pin-point issues

Operator

Analyst

Service Team

Energy Asset Owner

System Integrators & IPPs

Energy Asset Manager

• Evaluation of ROI from intuitive reporting of actual productivity
• Evaluation of energy efficiency targets and sustainability targets
• Be connected through secure access on the go using handheld devices

• Benefit from SaaS offering to reduce IT monitoring infrastructure CAPEX & OPEX
• Create automatic reports
• Understand what is happening across your energy portfolio

• Centralize data from different sources and generate business analytics
• Spot inefficiencies and deviations from productivity targets
• Act on alarms and trigger necessary corrective actions

DER = Distributed Energy Resource / ROI = Return on Investment / CAPEX = Capital Expenditures
IT = Information Technology / IPPs = Independent Power Producers / OPEX = Operating Expenditures
Site connectivity

- Data collection from all field devices over Modbus TCP/IP
- Device specific flexible mapping into a generic Device Twin
- Secure & encrypted connectivity between site edges & the cloud
- Wi-Fi and 3G/4G connectivity (optional)
- 2 Ethernet Interfaces for dedicated connectivity to field devices and Cloud (external internet connectivity required)
- Data Buffering in case of communication interruption between edge and cloud
- Dedicated provisioning process to ensure only legitimate Edge devices can connect to cloud side
- Remote software and configuration update
Cloud data centralization and analytics

- Secure cloud-based infrastructure hosted on Microsoft Azure
- Scalable from one to multiple distributed energy resources
- Real time monitoring down to device level
- Long term data storage for historical analysis and trending
- Alarms processing, grouping and custom filtering
- Performance analytics automatically generated into dedicated dashboards
- Intuitive Web Interface to visualize and report results accessible anytime and anywhere
- Localization possibility
- Deployment of e-mesh Apps*

*e-mesh Apps are not part from release 1.0.
Cyber security

IoT Edge
- Secure Storage for private keys are generated in hardware through Trusted Platform Module (TPM) and never leaves it
- Isolation of interfaces and firewall rules preventing direct routing of traffic between internet facing and on-premise network
- Outbound connectivity, all communications are device initiated and no direct access from public internet is possible
- Secure and authenticated connections

Cloud & e-mesh Monitor
- Web application firewall
- Secured APIs and all REST APIs are exposed only via HTTPS protocol
- Authentication policies with mandatory tokens mechanism for user authentication
- Authorization policies, all data access is restricted to authorized users based on a role-based access control system

Secure navigation and full data protection
DevOps

• Highly skilled team for support
• Speed and quality driven
  
  • Rapid response using state of the art toolchain

Updates

• Continuous delivery of features and enhancements
• Fast response to business needs
  
  • Security and fixes updates

Operations Excellence

• We work together with you to find solutions that match your business needs
• Try new releases of new applications

Faster time to value

• Greater agility to act on issues
• Adapting digital services to increase reliability and availability
  
  • Covering full project lifecycle
### e-mesh Monitor

#### Starter
- Geographical location and Summary dashboard
- Monitoring for system and e-mesh Controllers
- Alarms
- Update rate up to 1 hour
- 4 concurrent user sessions
- 1 Year Secure data archiving
- e-mesh Care:
  - ✓ Plan upgrade possibility

#### Pro
- Geographical location and Summary dashboard
- Monitoring for system and e-mesh Controllers
- Alarms
- Historical trending
- Update rate up to 15 minutes
- 8 concurrent user sessions
- 2 Year Secure data archiving

#### Expert
- Geographical location and Summary dashboard
- Monitoring for system and e-mesh Controllers
- Alarms
- Historical trending
- Performance Analytics
- Automatic Reporting
- Update rate up to 1 min
- 16 concurrent user sessions
- 2 Year Secure data archiving
- e-mesh Care:
  - ✓ e-mesh Apps trial

#### Optional
- 10 additional users
- Data Intensive (5 years archiving)
- Localization (Language)

Additional functionalities coming soon:
- New Assets Connect
- Real time update rate

### Subscription Plans

Optional: additional functionalities on e-mesh Monitor that can be charged separately
e-mesh Applications are a set of **SaaS-based solution suites** that transforms data into insights to help improve business performance with the help of cloud technology, machine learning and predictive analytics.

- Extends the functionalities of e-mesh Monitor
- Available as four different suites – Analytics, optimizer, Service and Premium
- Easy-to-deploy, extendable and scalable SaaS applications
- High-end web user interface to visualize data
- Power packed features leveraging machine learning and data analysis
- Dashboards, analytics and reports for all relevant stakeholder
- Management of multiple fleets at once
- Secure deployment
**e-mesh Applications**

**Analytics**
- Diagnose and understand real-time performance of distributed energy assets
  - Perform quick health check
  - Detect micro faults anywhere in the site
  - Analyze deeper root cause
  - Predict failures in advance

**Optimizer**
- Optimize microgrids, commercial & industrial and renewable sites
  - Improve productivity and economical gains
  - Maximize power generation
  - Reduce operational costs
  - Minimize CO2 emissions
  - Optimal decision making

**Manage**
- Monitor and manage multiple sites at once – for large utilities and IPPs
  - Forecast and optimal planning
  - Business intelligence reporting
  - Geographical information system
  - Fleet management

**Service**
- Improve field service activities by visualizing site level information in no time
  - Mobile access to site details
  - Increase longevity of assets
  - Faster response time to faults
  - Extended secure interfaces with other systems

**Digitalization of grid edge operations**
e-mesh Control

• Single point of control for the entire plant or fleet
• Ready-to-use, pre-configured and type-tested for wind and PV applications
• Standardized protocols to connect all the assets into a single system
• A common hardware platform, resulting in cost reduction and minimal spare parts handling
• Scalable for future operations

e-mesh SCADA

• Simple and intuitive HMI that provides real-time updates and meaningful data display
• Quickly locates issues in the field
• Maximizes safety, allowing reduction in operator error

Optimized solution for renewables plants & remote-control centers
### Plant: On-premises control & monitoring

- Grid connected PV plant & PV + BESS
- Manage TSO dispatching command
- Grid code compliance
- Integration of Renewables & BESS
- Common solution for the whole plant and substation

### Fleet: Remote control & monitoring

- Fleet of renewable power plants & BESS
- Increased asset uptime, thus revenues
- Increased efficiency in operations & maintenance
- Manage TSO dispatching command

---

Maximum renewable utilization and operational excellence
Protection for your investment

Rapid response
We guarantee fast and flexible response to maximize your equipment uptime
24/7 support

Software & firmware lifecycle
We optimize connectivity, reliability and efficiency of your assets to increase speed and yield.

Spare parts
We offer smart spare parts pool for grid edge products and solutions

Training
We offer customized training programs and tailored courses at your site

Cyber security
We enable smarter system protection to make your utilities more efficient, more productive, and more economic
e-mesh Advisory Services

Grid edge market analysis
- Trends in energy price, tariffs
- Drivers for energy storage applications.
- Market participation revenues streams

Grid edge financial analysis
- Financial metrics, IRR, and payback
- Fuel savings
- Environmental impacts
- Sensitivity analysis
- Value stacking
- Ownership models

Grid edge technical analysis
- Comprehensive portfolio of simulation models for e-mesh PowerStore & Control
- Stability and dynamic studies
- Contingency analysis
- Power quality and reliability
- Frequency and voltage ride through

End-to-end Grid Edge decision solutions
Grid Edge Solutions e-mesh portfolio is designed and configured according to best practices and provide a broad range of cyber security measures, grouped into three main categories:

**Monitor**
It monitors the health and activity of assets across e-mesh product portfolio and provide real-time security, including networks and applications.

**Manage**
It help users manage critical activity, including configurations, changes and patches across e-mesh product portfolio.

**Protect**
Defends e-mesh product portfolio against unauthorized access, attacks, exploits and malware that compromise system availability, performance, security and compliance.

**Ever evolving security architecture to safeguard your assets round the clock**
Grid Edge Solutions

e-mesh portfolio key takeaways

Providing…
- Productized scalable Solutions
- Leading energy optimization & management
- Advanced service & digitalization

Enabling…
- Decentralization
- Decarbonization
- Digitalization

Energy storage & digital automation solutions for energy optimization and management, advanced control and monitoring
e-mesh customer stories
Successful implementation around the globe
Supporting the stability of Finland's energy network and helping to meet its climate goals

Largest off-grid energy storage system in Australia

Accelerating sustainable mobility in Denmark

Providing energy storage solution for Singapore’s first virtual power plant

Advancing energy independence for the Gull Bay First Nation

Read more

Read more

Read more

Read more

Read more
About the project

- **Project name:** Rio Tinto, BESS Spinning Reserve
- **Location:** Tom Price, Australia
- **Customer:** Rio Tinto
- **Completion date:** estimated 2022

Solution

- **Solar PV (34MWp)**
- **Load & Conventional Generation (~300MW)**
- **PowerStore Battery (45 MW / 12 MWh)**
- **e-mesh Control System**
- **Integration to Network Manager™**

Customer benefits

- The largest off-grid energy storage system in Australia will provide virtual spinning reserve to switch gas generation off
- CO₂ reduction, reduced fuel and running costs and enhanced power system stability and reliability
- The solution will reduce CO₂ emissions today, make Rio Tinto ‘renewable ready’, and contribute to Rio Tinto’s 2050 carbon-neutral vision
Gigastation “Køge”: e-mobility

About the project

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

Solution

- **EV charging (8x 300kW)**
- **Solar (0.1 MWp)**
- **PowerStore Battery (1.2 MW / 1.5 MWh)**
- **e-mesh Control System**
- **e-mesh SCADA**
- **Solar Power & EV AC-home charging (aggregated assets)**

Customer benefits

- BESS enables integration of 2.4MW EV charging
- BESS enables integration of Solar Power
- Revenue streams through Frequency Regulation
- Fast external P/Q control (<250ms)
- Modular BESS design which is simple to upgrade
- Li-ion LFP technology with +15 years lifetime
- Top Class Safe and Sustainable BESS solution

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
A flagship research project between Sembcorp and Nanyang Technological University (NTU) to develop a Virtual Power Plant (VPP) by deploying a battery energy storage system connected and powered by the grid and/or PV to provide ancillary services to Singapore Power Grid.

Press release

About the project

- **Project name**: Sembcorp Materials Recovery Facility BESS
- **Location**: Tuas, Singapore
- **Customer**: Sembcorp and NTU
- **Completion date**: Estimated 2021

Customer benefits

- To provide ancillary services such as Frequency Regulation using Automatic Generation Control (AGC) and Primary and Contingency Reserves
- To schedule and dispatch BESS by a cloud based Virtual Power Plant digital platform.
- To store excess power generated from rooftop PV system and discharge to Sembcorp MRF load

Solution

- PowerStore Battery (2 MW / 4 MWh)
- e-mesh Control System
- e-mesh SCADA
- e-mesh Monitor
- 10 years Service Level Agreement