e-mesh for Renewables

Unmatched Synergies
Agenda

New energy ecosystem 01
Grid Edge Solutions 02
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New energy ecosystem
Digitalization accelerating the change
New energy ecosystem

**Generation mix**
- Renewable share: ~40% of capacity by 2035
- Greater volatility, less predictability
- More feed-in nodes

**Power transmission and distribution**
- Increasing complexity
- Control/ information flow is key value driver
- Transmission: Longer distances, higher voltages

**Consumers and prosumers**
- Growth in distributed energy resources
- Control & optimization at "local" level
- Customer profile change from static to dynamic
- Maximum value extraction & flexibility from DERs

**Big shift in the electrical value chain**
Renewables, grid edge technologies and digitalization drive the evolution of future power systems
Evolving ecosystem due to growth in distributed capabilities

- Grid operators need to respond to a complex & distributed network
- Energy provider landscape expanding with new business models
- Growth in DERs
- Bi-directional power and information flows
- Consumers become “prosumers”, want maximum value from their assets
New energy ecosystem

Evolving ecosystem due to growth in distributed capabilities

Digital solutions enable:
- Maximized customer value
- System performance optimization
- Grid reliability
- Energy services
- New business opportunities for energy providers

- Generation
- Transmission

Wholesale markets
- Retail

Advanced distribution network management

- Aggregation
- Energy Management Solution
- Blockchain
- Comms, Cyber Security & Asset Health

Transactive energy

Physical Assets
- Generation
- Flexible Demand
- Energy Storage

Consumers / prosumers
- Residential
- Commercial
- Industrial
- Community
Grid Edge Solutions
Enabling the future of energy
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**
- **90+ countries with 200 offices**
- **~250 years’ heritage combined**
- **5,500 sales employees & field engineers**
- **2,000 engineers & scientists in R&D**
Global technology and market leader

**Grid Automation**
- 50% of the top 250 global electric utilities supported by our leading portfolio

**Grid Integration**
- Technology HVDC leader in power quality and grid connection solutions and services
- Leader in HVDC* systems with 200 GW installed

**High Voltage Products**
- 1 in every 4 high-voltage switchgear installed in the world
- More than 1M circuit-breakers installed in the world

**Transformers**
- World's largest installed base of power, distribution, traction transformers
- Technology leader in transformer applications for HVDC, renewables and digitalization

**Services**
- Maintaining and modernizing the world's largest installed base
- More than 200 service centers and 1,500 field engineers worldwide

~$4 trillion mission-critical infrastructure assets managed with our software solutions

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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 700 MW and 220 references.

Hitachi Energy helps customers increase profitability and unlock new revenue streams by reducing energy cost, maximizing renewable integration and lowering CO₂
Enabling new business opportunities while improving reliability and performance
Grid Edge Solutions

Applications & services

- Monitoring and reporting
- Energy optimization
- 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
Grid Edge Solutions

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

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

Remote Communities

- Stabilization

Urban & Commercial

- Optimize self-consumption
Our customers

- 90+ Countries supported with Service and Sales organizations
- 30+ Years of experience
- 700+ MW of global references of Grid Edge solutions including microgrids and BESS
- 220+ Projects delivered worldwide

Pioneer in technology, solutions and projects execution
e-mesh portfolio
Digital solutions for distributed energy resources
Applications
SaaS Apps for improved performance
- e-mesh Analytics
- e-mesh Optimizer
- e-mesh Service
- e-mesh Premium

Monitor
Cloud enabled remote monitoring and control
- Monitoring and control
- Bi-directional data flow
- Remote access

EMS
On-premises energy management solution
- Monitoring & control
- Optimal energy production
- Operational & maintenance cost reduction

SCADA
On-premises plant automation solution
- Renewable power generation grid code compliance
- Network voltage control
- Feeder & Load demand management

Control
Intelligent and efficient power management
- Smart battery energy storage solution
- Support for various applications including islanding, seamless transition, black start, spinning reserve, etc.

PowerStore
Smart battery energy storage solution
- Energy forecast, production and optimization planning
- Business KPI dashboards and reports
- Improved productivity and profitability

In the cloud
- e-mesh Monitor

On premises
- e-mesh EMS op
- e-mesh SCADA
- e-mesh Control
- e-mesh PowerStore

Real Time Communication
- Network
- Feeder
- Traditional Generator
- Solar
- EV Charging
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 PowerStore**

**PowerStore Integrated : PS250 & PS500: Ideal in C&I & <5 MW PV**

The complete PCS and battery modules are integrated into a single outdoor enclosure*.

**PowerStore Modular: PS1000: Ideal for utility-scale PV and Wind**

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

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* Enclosure images for illustrative purposes only.

** In the outdoor batteries option, the controller is delivered in a separate enclosure.
e-mesh PowerStore

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

- 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
**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
e-mesh Control for PV and Hybrid Plants: Grid-code compliance

Highlights

• Asset control ranging from renewable power plants, microgrids, energy storage and substations
• Ensure asset grid code compliance (active, reactive power management, closed-loop, as a function of grid status and in compliance with local grid-codes)
• 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

Ensuring reliable and economical power supply with reduced carbon footprint
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
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
Renewables Monitoring & Controls: The IPP, GenCo and Investors Challenge: Disjoint Monitoring and Controls by Technology

Classical original intentions:

- **Modernize the power generation fleet**, often starting with substations for conventional generation, then wind plants + substations, then solar + substations, now BESS

- **Mistakenly “saving costs”** (“CAPEX ONLY” perspective)
  - “Got PV Monitoring for free from PV inverter manufacturer”
  - “Got Wind Controls as part of Wind OEM”
  - “Tried Monitoring + Controls as a pilot from a start-up”

- Different systems + teams built or sourced over time for:
  - PV Monitoring + Controls
  - Wind Monitoring + Controls
  - BESS Monitoring + Controls
  - Substation Monitoring + Controls

- Teams pursuing different goals, e.g.:
  - PV output maximization
  - CO2 savings
  - Lifetime extensions

Unintended Effects:

- Unexpectedly high O&M costs
- Frustration between “expert teams” talking different languages, using different systems and KPIs
- Conflicting controls / commands
- Operational risks of unsynchronized management of various assets
- Lack of legacy for inverter monitoring + controls w bankrupt OEMs leading to “blind eyes”
- Need a “re-set” in Renewables Monitoring + Controls for the future
e-mesh SCADA  
One solution for PV, Wind, Hydro and Hybrid Renewables Plants

**Highlights**

- Provides **real-time monitoring and open-loop controls** of all your plant components into one single plant SCADA, particularly relevant for “Hybrid Power Plants” or “BESS co-location”
- Generation plants (PV, Wind, Hydro, Biomass)
- Generator substations
- Supporting components (BESS, STATCOM, GenSets)
- Auxiliaries (Weather stations etc)
- **Compliance with major communication protocols** (Modbus, DNP3, IEC, OPC and others)
- **Granular view** into sub-components, e.g.: PV panels, PV trackers, PV combiner boxes
- Productized libraries simplify application customization for **maximum flexibility**
- Quickly locates issues in the plant
- Maximizes safety and allows reduction in operator error

**Simplify site energy operations & maximize return on investments**
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
e-mesh SCADA for PV, Wind, Hydro and Hybrid Renewables Fleets

Highlights

• **Maximum synergies in operations** through integration of multi-tech and multi-OEM fleets into one single remote monitoring + controls solution

  • Wind: Vestas, Siemens, Nordex, GE, Enercon, others configurable

  • PV: Fimer, SMA, Sungrow, Huawei, and most other PV inverter OEMs supporting classical protocols like Modbus, DNP-3, IEC104

  • BESS: Hitachi ABB Power Grids, others upon discussion

  • Hydro, Biomass: All major generator manufacturers

• Future-proof, **cybersecure** solution (vs. e.g. in-house xls-based, historically grown solutions)

• Maximizes safety and allows reduction in operator error

Simplify site energy operations & maximize return on investments
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

Site energy management optimization
e-mesh EMS for Hybrid Plants (BESS, co-located w Renewables)

**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
e-mesh Monitor for Renewables and Hybrid Plants and Fleets

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 and integrate various loads
- Extend using it on your handheld devices and interface through secured APIs

Asset insights
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
Highlights

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

Cloud, analytics and machine learning to accelerate business performance
e-mesh Applications for Advanced Analytics and Operations

**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**
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
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 helps 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 reference cases
Successful implementation around the globe
Global references

Experience and innovative solutions worldwide

Worldwide: > 700 MW
Americas: > 190 MW
EMEA: > 130 MW
Asia Pacific: > 210 MW
Australia: > 170 MW
Chitose Hokkaido: Utilities

About the project

• **Project name:** Chitose Hokkaido
• **Location:** Japan
• **Customer:** Japan’s Energy Products Corporation and Korea Electric Power Corporation
• **Completion date:** 2017

Solution

• Solar PV (28 MWp)
• PowerStore Battery (17 MW / 8MWh)
• e-mesh Control system

Customer benefits

• Enabling Shin Chitose Solar plant to adhere to the stringent grid code requirements of a ramp rate of ±1%/minute of local utility
• Ensuring reliable integration of renewables into the main power grid
• Helping Shin Chitose plant to generate power to 11,000 local households

Shin Chitose Solar needed to comply with local grid codes to reduce power fluctuation and improve renewable integration. With e-mesh, Shin Chitose is now able to meet a significant Japanese renewable initiative to generate 35 gigawatt-hours for 11,000 households.

Press release
About the project

- **Project name:** ESCRI-SA Dalrymple BESS
- **Location:** Australia
- **Customer:** ElectraNet
- **Completion date:** 2018

Solution

- Wind (91 MW)
- Distributed rooftop solar (3+ MWp)
- PowerStore Battery (30 MW / 8 MWh)
- e-mesh Control System

Customer benefits

- Improve the overall reliability of power supply in the region
- Deliver enough power to run around 400 homes for 24 hours without the input from renewable generators
- Uninterrupted power supply during transmission line outage

Customers of ElectraNet often experienced reliability issues due to lightning strikes. The utility reduced outages from 11 hours down to 30 minutes in the first two years of operation. The solution improved network reliability, minimizing renewable curtailment, and brought in new revenue to achieve payback within two years.

Web Story / Business Case
Blog / In the media
Electricidade de Madeira sought to increase the share of renewables in the energy mix from 15 to 30 percent, while meeting the enhanced electricity demand in the Summer when the population increases from 5000 to more than 20000. The BESS enables increased adoption of renewable energy while stabilizing the system and reducing voltage fluctuation.

**Press release / Video**

### About the project
- **Project name:** Porto Santo
- **Location:** Porto Santo Island, Madeira, Portugal
- **Customer:** Empresa de Electricidade da Madeira
- **Completion date:** 2019

### Customer benefits
- Increase the contribution of renewables in the energy mix from 15 to 30 percent
- Stabilize the power system to address frequency and voltage fluctuations
- Reliable power supply, supported by renewable energy
- Meet the enhanced electricity demand during summers with a high inflow of tourists

### Solution
- Solar PV (2.25 MWp)
- Wind (1.5 MW)
- Diesel (4 x 4 MW)
- PowerStore Battery (4 MW / 3 MWh)
- e-mesh Control System
- Network Manager
Skagerak Arena: Commercial facilities

About the project

• **Project name:** Skagerak Arena
• **Location:** Skien, Norway
• **Customer:** Skagerak Energi
• **Completion date:** 2019

Solution

• Solar PV (800 kWp)
• PowerStore Battery (800kW / 1MWh)
• e-mesh Control System
• e-mesh EMS energy management system

Customer benefits

• Optimal integration of renewables and energy management with advanced grid automation
• Optimal use of renewable (PV) assets even when sun light is low
• Reduced energy import and peak load cost
• Availability of locally produced electricity to the surrounding neighborhoods

A first-of-its-kind project, Skagerak Energilab includes solar-powered grid edge solution. The system not only powers floodlights in the stadium, but also provides the neighborhood with locally produced electricity. Together this solution sets Skagerak up for new opportunities like Vehicle to Grid (V2G) integration.

Press release
Cordova Electric Cooperative: Remote Communities

CEC established a hybrid microgrid to enable the adoption of renewable power, including two new hydro projects. One of the key components was a battery energy storage system (BESS) to regulate the electrical system and maximize the use of locally produced power. CEC was able to reduce its dependence on diesel and move closer to its goals for sustainability and reliability.

Web story / Video

About the project

- **Project name:** Cordova
- **Location:** Alaska, USA
- **Customer:** Cordova Electric Cooperative
- **Completion date:** 2019

Solution

- Hydro (7.25 MW)
- Diesel (2 MW)
- PowerStore Battery (1 MW / 1 MWh)
- e-mesh Control System

Customer benefits

- Reduce its dependence on diesel and move closer to its goals for sustainability (Diesel expect it to save between 40,000 and 50,000 gallons of diesel fuel a year)
- Maximize the use of locally produced hydroelectric power
- Recover the hydropower lost during transition periods
Bontang: Industrial segment

Indo Tambangraya Megah (ITM)’s Bontang Mine in Indonesia had relied entirely on fossil fuels for their operations. Now, the largest microgrid in the region, the integration of solar photovoltaic (PV) and a PowerStore battery energy storage system (BESS) dramatically reduced fuel consumption & CO₂ emissions.

It maximizes renewable penetration, driving both energy efficiency & sustainable growth, with improved reliability.

Press Release / Infographic
Video / Business case

About the project

- **Project name:** Bontang PV Hybrid
- **Location:** East Kalimantan, Indonesia
- **Customer:** ITM Banpu Group
- **Completion date:** 2020

Customer benefits

- Renewable Smoothing (ramp rate control)
- Dynamic Stability:
  - Frequency Support
  - Generator overload/underload control
- Spinning Reserve
- Renewable Limits
- Feeder monitoring

Solution

- Solar PV (3 MWp)
- STGs (2 x 7 MW)
- Diesel (8 x 0.8 MW)
- PowerStore Battery (2MW / 2MWh)
- e-mesh Control System
- e-mesh EMS energy management system
Monitoring & Controls Track Record:

>25’000 MW in Hydro, Wind, PV

- 12 GW Hydro
- 12 GW Wind
- 1.5 GW Solar
- 0.1 GW BESS with utility-scale Renewables («Hybrid»)
- 0.5 GW BESS + MG systems (often co-located w Renewables)
Volta Green Energy, a wind farm operator in Italy with over 350 MW of wind farms and 16 MW of solar photovoltaic systems, implemented an e-mesh control and automation solution for distributed energy resources. As part of the project, VGE updated five wind farms and their remote-control center with advanced e-mesh monitoring solution.

**Press release**

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**Veronagest & VGE: Renewables**

**About the project**

- **Project name:** VGE remote control center
- **Location:** Italy
- **Customer:** Veronagest / Volta Green Energy
- **Completion date:**
  - 2011 (Veronagest)
  - 2019 (VGE Upgrade)

**Solution**

- Wind farms (350 MW)
- Solar PV (16 MW)
- e-mesh SCADA
- Remote Management System
- Redundant system

**Customer benefits**

- Improved reaction time through structuring and visualization of critical data in a high-level display
- Effective monitoring, control and operations of fleet of plants with scalable and versatile automation solutions
- Reduction in operational cost by managing all assets using a fully integrated automation system
About the project

- **Project name:** Al Badiya PV-BESS Hybrid
- **Location:** Jordan
- **Customer:** Philadelphia Solar
- **Completion date:** 2020

Customer benefits

- Central plant controller coordinates all inverters (both centralized and string) to achieve the required control command (active/reactive power)
- Intuitive HMI visualizing all relevant process data from plant, grid connection and weather stations
- PV panel string current monitoring
- Performance & production ratio (PR) at plant level
- PV time-shifting from noon into evening hours

Solution

- Solar PV (23 MWp)
- BESS (23MW/12.6MWh)
- e-mesh Control system
- e-mesh SCADA

Philadelphia Solar is the only MEA-based company that manufactures, develops, designs, constructs, owns and operates utility-scale photovoltaic plants. As an EPC contractor specialized in design and execution of solar power plants, Philadelphia Solar places special emphasis on the “on-time and on-budget” construction and delivery of its projects, optimized to deliver superior output.
### About the project

- **Project name:** Ile de Romainville PV-BESS Hybrid
- **Location:** Seychelles
- **Customer:** Masdar
- **Completion date:** 2020

### Solution

- Solar PV (5 MWp)
- BESS (5MW/3.3MWh)
- e-mesh Control system
- e-mesh SCADA

### Customer benefits

- Central plant controller coordinating all inverters to achieve required control command (active / reactive power)
- Intuitive HMI visualizing all relevant process data from plant, grid connection and weather stations
- PV panel string current monitoring
- Performance & production ratio (PR) at plant level
- PV time-shifting from noon into evening hours

On the Seychelles, Masdar has built the 6 MW Port Augusta wind park, supplying power to main Island Mahe since 2016 and was selected to expand the portfolio on the by a PV-BESS hybrid. Funded by the Abu Dhabi Fund for Development Fund (ADFD), the project is a contribution to the Seychelles’ goal of reducing fossil fuel imports by achieving 15% of Renewables by 2030.
Angola Solar 1: Renewables

The Angola Solar 1 project, with 7 sites and 370 MWp, is expected to benefit around 1.2 million families, allowing access to cleaner and more economical electricity both in extremely populated regions and rural areas, while reducing the usage of diesel generators, supporting the UN's Sustainable Development Goal 7.

Press release

About the project

- **Project name:** Angola Solar 1
- **Location:** Angola
- **Customer:** MCA Group & Sun Africa consortium
- **Completion date:** estimated 2022

Solution

- Solar PV (370 MWp)
- Diesel Generators in 2 of the 7 Sites
- e-mesh PPC
- e-mesh Control system
- e-mesh SCADA

Customer benefits

- Intuitive HMI to visualize all relevant process data from the plant, grid connection and weather stations
- Highly granular PV plant monitoring + controls incl. PV inverters, PV solar irradiation sensors, combiner boxes, PV panel strings and Diesel GenSets
- Performance and Production Ratio (PR) at plant, section, transformation center and inverter level
Your Contacts for Digitally Integrating Renewables
Integrating to Energy Markets, Power Grids, Asset Management

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+ 10 years in Wind
+ 7 years in Solar
+ 5 years in Energy Storage
HITACHI
Inspire the Next