



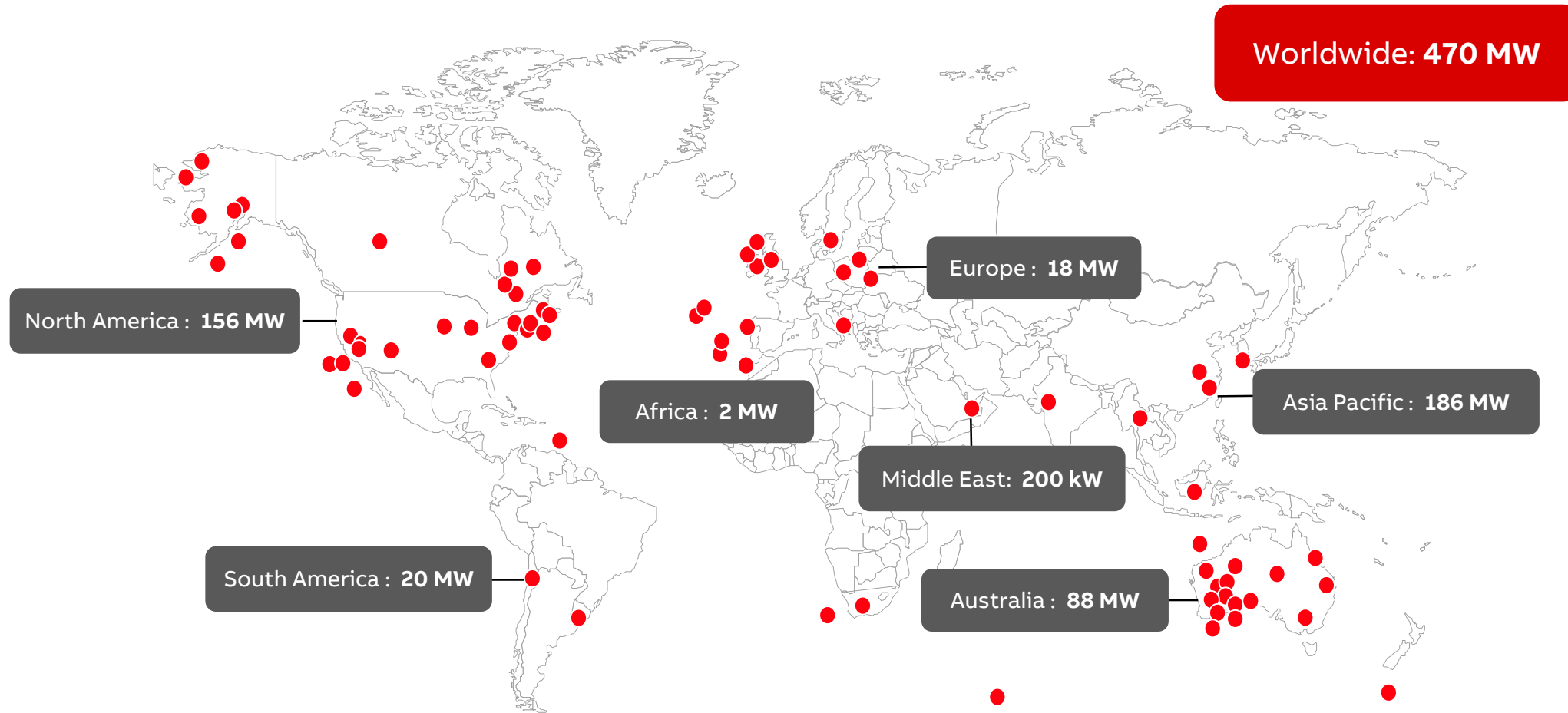
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# **Microgrid, Battery Energy Storage and Distributed Generation Solutions**

Global Customer References

# Global installed base

## Microgrids and BESS





# Microgrid Solutions





# Island Utilities

# Island utilities

## Porto Santo, PowerStore/PV/Wind

### About the Project

- **Project name:** Porto Santo
- **Location:** Porto Santo Island – Madeira, Portugal
- **Customer:** Empresa de Electricidade da Madeira (EEM)

### Solution

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**The resulting Microgrid system consists of:**

- PowerStore Battery (4 MW/3 MWh)
  - Microgrid Plus Control System
  - Solar PV (2.25 MW<sub>p</sub>)
  - Wind (1.5 MW)
  - Diesel (4 x 4 MW)
- 

### Customer Benefits

- Increase the share 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



[Press release](#)

ABB's Microgrid and energy storage technology to enable the island of Porto Santo to achieve clean-energy goals

# Island utilities

## Jamaica Public Service (JPS), Wind/PV

### About the Project

- **Project name:** JPS Grid Stability
- **Location:** Jamaica
- **Customer:** Jamaica Public Services Company Ltd
- **Year:** 2018

### Solution

- The resulting Microgrid system consists of:**
- PowerStore Battery (21.5 MW / 16.6 MWh)
  - PowerStore Flywheel ((3 x 1) MW / 16.5 MWs)

### Customer Benefits

- Maximum utilization of solar and wind energy
- Reliable power to 5 million populace in the island
- Power availability during intermittency of renewable sources
- Reduced dependency on fossil fuels and lower carbon footprint



[Press Release](#)

# Island utilities

## WEB Aruba, Wind/PV/Thermal

### About the Project

- **Project name:** WEB Aruba
- **Location:** Aruba, Southern Caribbean
- **Customer:** WEB Aruba N.V

### Solution

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**The resulting Microgrid system consists of:**

- Microgrid Plus Control System
  - Solar PV (1 x 6 MW<sub>p</sub>)
  - Wind (20 x 3 MW)
  - Steam turbine (1 x 136 MW)
  - Gas turbine (1 x 20 MW)
  - Reciprocating engine (10 x 9 MW)
- 

### Customer Benefits

- Integration of complex energy mix - Wind, PV and Thermal
- Maximum utilization of renewable energy
- 24 hour forecast of both renewable output and system load
- Manage the peak demand, 134 MW



[Press Release](#)  
[Infographic](#)  
[Video](#)

The microgrid solution allows for integration of a complex energy generation portfolio and maximizes the use of renewable energy; enabling WEB Aruba to meet the peak demand (134 MW) of the tourist island

# Island utilities

## Robben Island, PowerStore/PV/Diesel

### About the Project

- **Project name:** Robben Island
- **Location:** South Africa
- **Customer:** Department of Tourism, South Africa
- **Completion date:** 2017

### Solution

**The resulting Microgrid system consists of:**

- PowerStore Battery (500 kW/837 kWh)
- Microgrid Plus Control System
- Solar PV (667 kW<sub>p</sub>)
- Diesel (1 x 500 kW)

### Customer Benefits

- Lower fuel costs and carbon emissions by 75 %
- Enabling the island to run on solar power for at least 9 months of the year
- Remote monitoring of the entire system from Cape Town
- Remote set-up eliminates the need to maintain a workforce on the island



[Web Story](#)  
[Video](#)

ABB's microgrid solution enables the Robben Island to run on solar power for at least 9 months in a year



# Island utilities

## Kodiak Island, PowerStore/Wind/Hydro/Diesel

### About the Project

- **Project name:** Kodiak Island
- **Location:** Alaska, United States of America
- **Customer:** Kodiak Electric Association (KEA)

### Solution

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#### The resulting Microgrid system consists of:

- PowerStore Flywheel (2 MW/ 33 MWs)
  - Wind (6 x 1.5 MW)
  - Hydro (3 x 11 MW)
  - Diesel (1 x 17.6 MW, 1 x 9 MW, 1 x 3.6 MW, 1 x 0.76 MW)
- 

### Customer Benefits

- Stabilizing - frequency regulation
- Provide frequency support for a new crane
- Help to manage the intermittencies from a 9 MW wind farm
- Reduced reliance on diesel generators



[Press Release](#)  
[Infographic](#)  
[Video](#)

Two PowerStore Flywheels act in parallel in order to deliver optimal grid stabilization on Kodiak Island

# Island utilities

## La Gomera Island, PowerStore

### About the Project

- **Project name:** La Gomera Island
- **Location:** Canary Islands, Spain
- **Customer:** Endesa

### Solution

- The resulting Microgrid system consists of:**
- PowerStore Flywheel (500 kW/16.5 MWs)

### Customer Benefits

- Stable electricity to 22,000 Islanders
- Stabilizing - frequency and voltage regulation



[Press Release](#)  
[Video](#)

Stable, reliable and uninterrupted supply of clean electricity to 22,000 people in the Island

# Island utilities

## Faial Island, Wind/Heavy Fuel Oil

### About the Project

- **Project name:** Faial Island
- **Location:** The Azores, Portugal
- **Customer:** Electricidade dos Açores (EDA)

### Solution

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**The resulting Microgrid system consists of:**

- Microgrid Plus Control System
  - Wind (5 x 850 kW)
  - Heavy Fuel Oil (3 x 3.7 MW + 2 x 3 MW + 1 x 2 MW)
- 

### Customer Benefits

- Minimize diesel consumption - 3.5 million liters of fuel saved annually
- Minimum environmental impact - 9,400 tons CO<sub>2</sub> avoided annually



[Press Release](#)  
[Infographic](#)  
[Video](#)

The microgrid solution helps to save cost (minimize diesel consumption) and protect the environment (reduction in CO<sub>2</sub> gas emissions)

# Transmission and utilities

## ESCRI, PowerStore/PV/Wind

### About the Project

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

### Solution

#### The resulting Microgrid system consists of:

- PowerStore Battery (30 MW/8 MWh)
- Microgrid Plus Control System
- Wind (90 MW)
- Distributed rooftop solar

### 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



[Web Story](#)

The microgrid will connect the battery energy storage solution to the ElectraNet transmission system enabling the value stacking of storage in regulated energy market.





# Remote Communities

# Remote communities

## Deering, PowerStore/Wind/Diesel

### About the Project

- **Project name:** Deering and Buckland Microgrid
- **Location:** Alaska, United States of America
- **Customer:** NANA Regional Corporation, Inc
- **Year:** 2018

### Solution

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**The resulting Microgrid system consists of:**

- PowerStore Battery (200 kW/ 200 kWh)
  - Microgrid Plus Control System
  - Solar PV (30 kW<sub>p</sub>)
  - Wind (1 X 100 kW)
  - Diesel (2 X 170 kW, 1 X 100 kW)
- 

### Customer Benefits

- Stable, reliable and affordable power to the local community
- Maximum utilization of wind power
- Help communities achieve 100% renewable penetration
- Help customer to reach its goal - reduce reliance on imported diesel by up to 75 percent, by 2030



[Press Release](#)

The microgrid solution will provide stable, reliable and affordable power to the local community by maximizing the adoption of wind power

# Remote communities

## Buckland, PowerStore/Wind/Diesel

### About the Project

- **Project name:** Deering and Buckland Microgrid
- **Location:** Alaska, United States of America
- **Customer:** NANA Regional Corporation, Inc
- **Year:** 2018

### Solution

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**The resulting Microgrid system consists of:**

- PowerStore Battery (400 kW/ 400 kWh)
  - Microgrid Plus Control System
  - Solar PV ( 50 kW<sub>p</sub>)
  - Wind (2 X 100 kW)
  - Diesel (2 X 475 kW, 1 X 175 kW)
- 

### Customer Benefits

- Stable, reliable and affordable power to the local community
- Maximum utilization of wind power
- Help communities achieve 100% renewable penetration
- Help customer to reach its goal - reduce reliance on imported diesel by up to 75 percent, by 2030



[Press Release](#)

The microgrid solution will provide stable, reliable and affordable power to the local community by maximizing the adoption of wind power

# Remote communities

## Marsabit Wind Farm, PowerStore/Wind/Diesel

### About the Project

- **Project name:** Marsabit Wind Farm
- **Location:** Kenya
- **Customer:** Socabelec East Africa Ltd (SEAL)

### Solution

**The resulting Microgrid system consists of:**

- PowerStore Flywheel (500 kW/ 16.5 MWs)
- Wind (2 x 275 kW)
- Diesel (2 x 800 kW)



### Customer Benefits

- Reliable and stable power supply
- Off-grid power supply using renewables



[Press Release](#)  
[Infographic](#)

Microgrid solution provides secured & stable power supply for 5,000 people in the Marsabit community, Kenya



# Remote communities

## Nullagine, PowerStore/PV/Diesel

### About the Project

- **Project name:** Nullagine
- **Location:** Western Australia, Australia
- **Customer:** Horizon Power, Government of WA

### Solution

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**The resulting Microgrid system consists of:**

- PowerStore Flywheel (500 kW/ 16.5 MWs)
- Microgrid Plus Control System
- Solar PV (1 x 200 kW<sub>p</sub>)
- Diesel (3 x 320 kW)

### Customer Benefits

- 
- Minimize diesel consumption - 400,000 liters of fuel saved annually
  - Minimum environmental impact - 1,100 tons CO<sub>2</sub> avoided annually
  - Reliable and stable power supply
  - 60% of the day time electricity demand is generated by the PV plant



[Press Release](#)

Marble bar and Nullagine are the world's first high penetration, solar photovoltaic diesel power stations

# Remote communities

## Marble Bar, PowerStore/PV/Diesel

### About the Project

- **Project name:** Marble Bar
- **Location:** Western Australia, Australia
- **Customer:** Horizon Power, Government of WA

### Solution

---

**The resulting Microgrid system consists of:**

- PowerStore Flywheel (500 kW/ 16.5 MWs)
- Microgrid Plus Control System
- Solar PV (1 x 300 kW<sub>p</sub>)
- Diesel (4 x 320 kW)

### Customer Benefits

- 
- Minimize diesel consumption - 400,000 liters of fuel saved annually
  - Minimum environmental impact - 1,100 tons CO<sub>2</sub> avoided annually
  - Reliable and stable power supply
  - 60% of the day time electricity demand is generated by the PV plant



[Press Release](#)  
[Video](#)

Marble bar and Nullagine are the world's first high penetration, solar photovoltaic diesel power stations

# Remote communities

## Coral Bay, PowerStore/Wind/Diesel

### About the Project

- **Project name:** Coral Bay
- **Location:** Western Australia, Australia
- **Customer:** Verve Energy

### Solution

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**The resulting Microgrid system consists of:**

- PowerStore Flywheel (500 kW/18 MWs)
  - Control System
  - Wind (3 x 225 kW)
  - Diesel (7 x 320 kW)
- 



### Customer Benefits

- Minimized diesel consumption
- Reliable and stable power supply
- Allows high integration of wind energy



[Press Release](#)

Microgrid solution was implemented in Coral Bay to provide stable power supply for 140 permanent residents

# — Industrial and Commercial sites



# Industrial and commercial sites

Alinta Energy, PowerStore/Gas

## About the Project

- **Project name:** Newman Power Station BESS
- **Location:** Newman, Australia
- **Customer:** Alinta Energy - Newman Power Station

## Solution

### The resulting Microgrid system consists of:

- PowerStore Battery (30 MW/7 MWh)
- Microgrid Plus Control System
- Gas Turbines (4 x 178 MW)

## Customer Benefits

- Reliable and stable power supply
- Improved power quality and increased energy efficiency
- Ensure continuous operations of Roll Hill mining (Newman power station supplies power to the mine)
- Battery system provides spinning reserve as replacement for gas turbine operation



[Press Release](#)

ABB's solution, one of the largest battery energy microgrid installations, enables the Newman Power Station to provide high quality and uninterrupted power supply to Roll Hill mining operations

# Industrial and commercial sites

## ABB Vadodara, PowerStore, PV

### About the Project

- **Project name:** ABB Vadodara Microgrid
- **Location:** Gujarat, India
- **Customer:** ABB

### Solution

---

**The resulting Microgrid system consists of:**

- PowerStore Battery (500 kW MW/ 1 MWh)
  - Microgrid Plus Control System
  - Solar rooftop (600 kW)
  - Cloud-based remote service system
- 

### Customer Benefits

- Reliable and uninterrupted power supply
- Leverage solar energy supply to meet factory's growing power needs
- Save 1400 tonnes of CO2 every year
- Generate 2 million units of clean energy per year



[Press Release](#)

ABB installed first-of-its-kind microgrid solution, harnessing solar power, in its manufacturing campus at Vadodara, India to meet the growing power needs of expanding the factory

# Industrial and commercial sites

Woodside (oil & gas), PowerStore

## About the Project

- **Project name:** Goodwyn A
- **Location:** North West Australia
- **Customer:** Woodside Energy

## Solution

### The resulting Microgrid system consists of:

- PowerStore Battery (2.8 MW/1.43 MWh)
- Microgrid Plus Control System
- Gas Turbines (5 x 3.5 MW)
- Remote monitoring

## Customer Benefits

- Providing 'spinning reserve' to aid short term backup
- Minimize the dependency on diesel generator
- Reduce fuel gas consumption by 2000 tons per year and CO<sub>2</sub> emissions by 5%



[Press Release](#)  
[Infographic](#)

The microgrid solution will contribute to Woodside's 2020 goal of reducing carbon emissions and will help lower cost of operations and maintenance

# Industrial and commercial sites

## ICRC Logistics Center, PowerStore/PV/Diesel

### About the Project

- **Project name:** ICRC Logistics Center
- **Location:** Nairobi, Kenya
- **Customer:** International Committee of the Red Cross

### Solution

#### The resulting Microgrid system consists of:

- PowerStore Battery (150 kW/100kWh)
- Microgrid Plus Control System
- Solar PV (1 x 30 kW<sub>p</sub>)
- Diesel (1 x 150 kW)

### Customer Benefits

- Reliable and stable power supply
- Optimized renewable energy contribution
- Ability to island from the grid after an outage or faults
- Reduced diesel generator usage



[Press Release](#)

The microgrid solution enables ICRC logistics center to deliver food and other essential like medicines, relief supplies across the African continent



# Industrial and commercial sites

## Longmeadow, PowerStore/PV/Diesel

### About the Project

- **Project name:** Longmeadow
- **Location:** South Africa
- **Customer:** Longmeadow Business Estate

### Solution

---

**The Microgrid solution consists of:**

- PowerStore Battery (1 MW/380 kWh)
- Microgrid Plus Control System
- Solar PV (1 x 750 kW<sub>p</sub>)
- Diesel (2 x 600 kW)
- Remote Monitoring

### Customer Benefits

- 
- Stabilizing the grid for reliable and stable power supply
  - Optimized renewable energy contribution to the facility
  - Seamless transition from grid connection to islanding in case of an outage
  - CO<sub>2</sub> reduction: over 1,000 tons/year
  - Up to 100% renewable energy penetration



[Press Release](#)  
[Infographic](#)  
[Video](#)  
[Data Sheet](#)

The microgrid solution is for the 96,000 sqm facility in Johannesburg that houses both ABB South Africa's headquarters, as well as a manufacturing facility employing close to 1,000 employees



# Urban Communities

# Urban communities

## Odd soccer club's Skagerak Arena, PowerStore/Solar

### About the Project

- **Project name:** Odd soccer club's Skagerak Arena
- **Location:** Skien, Norway
- **Customer:** Skagerak Energi

### Solution

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**The resulting Microgrid system consists of:**

- ABB Ability™ PowerStore Battery (800 KW/1000 kWh)
- Microgrid Plus control and automation system
- Remote monitoring
- Rooftop solar

### Customer Benefits

- Power stadium floodlights during soccer games
- Meet the annual power consumption of the stadium - 375,000 kWh
- Provide electricity to 15 homes in the stadium's neighborhood
- Facilitate utility to gather insights on prosumers' power production and consumption pattern



[Press Release](#)

First-of-its kind solar-powered energy lab that will use microgrid solution coupled with a battery energy storage system to power a soccer stadium, as well as gather insight about power grids of the future

# Urban communities

## AusNet Services, PowerStore/Diesel

### About the Project

- **Project name:** AusNet Services
- **Location:** Victoria, Australia
- **Customer:** AusNet Services
- **Completion date:** 2014

### Solution

#### The resulting Microgrid system consists of:

- PowerStore Battery (1 MW/1 MWh)
- Microgrid Plus Control System
- Diesel (1 x 1 MW)

### Customer Benefits

- Active and reactive power support during high demand periods
- Transition into isolated/off-grid operation on command or in emergency cases without supply interruption
- Mobile and transportable containerized solution



[Press Release](#)  
[Video](#)

First embedded generation system with battery grid energy storage for distribution network support in Australia



# Institutions and Campuses



# Institutions and campuses

## University of Chester, Wind/PV/Thermal

### About the Project

- **Project name:** The Thornton Science Park Microgrid
- **Location:** United Kingdom
- **Customer:** University of Chester

### Solution

ABB's microgrid solution helps in maximizing the penetration of renewable energy in grid system. Also, the microgrid controller allows the university to connect or disconnect seamlessly from the main grid and operate in an islanded mode, ensuring continuity of supply in case of an outage.

### Customer Benefits

- Maximize renewable energy penetration in grid system
- Helps to operate in off-grid (islanded) mode
- Continuity of power supply during outage



[Press Release](#)

The microgrid at the Energy Centre, University of Chester is first of its kind in a UK university campus to demonstrate where new energy technologies can be developed and tested, bringing industry and academia together to drive innovation

# Battery Energy Storage Solutions

# Battery Energy Storage Solution

## Chitose Hokkaido

### About the Project

- **Project name:** Chitose Hokkaido, Li-ion batteries
- **Location:** Japan
- **Customer:** Japan's Energy Products Corporation and Korea Electric Power Corporation
- **Completion date:** 2016

### Solution

ABB's scope includes:

- 17 MW outdoor PCS
- PCS inverters, DC contactors, AC circuit breakers
- MV-LV coupling transformer
- MV switchgear
- Local controller integrating PCS, switchgear and MBMS
- Local HMI

### Customer Benefits

- Enabling Shin Chitose Solar plant to adhere to the grid code requirements of local utilities
- Ensuring reliable integration of renewables into the main power grid
- Helping Shin Chitose plant to generate power to 11,000 local households



[Press Release](#)

Enabling Japan's significant renewable initiative to generate 35 gigawatt-hours (GWh) of power for 11,000 local households

# Battery Energy Storage Solution

## Yangguang Power Plant

### About the Project

- **Project name:** Yangguang Power Plant,
- **Battery:** Li-ion batteries
- **Location:** China
- **Completion date:** 2016

### Solution

ABB's scope includes:

- 9 MW Outdoor PCS
- PCS inverters, DC contactors, AC circuit breakers
- MV-LV coupling transformer
- MV switchgear
- Local controller integrating PCS, switchgear and MBMS
- Local HMI

### Customer Benefits

- Integration with coal fired power plant 300 MW
- Achieve frequency regulation



Battery energy storage solution for a 9 MW power plant in China

# Battery Energy Storage Solution

KIUC Anahola

## About the Project

- **Project name:** KIUC Anahola
- **Battery:** Li-ion batteries (6 MW - 4 MWh)
- **Location:** Hawaii, USA
- **Completion date:** 2015

## Solution

ABB's scope includes:

- PCS rated at 6 MW integrated in (2) 20'ISO containers
  - 6 MW converters and HVAC
- EssPro controller
  - Frequency regulation
  - Voltage regulation
  - Firming

## Customer Benefits

- Help integrate solar power on the network
- Frequency and voltage regulation; spinning reserve



Battery energy storage solution (6 MW) for a Hawaiian customer



# Battery Energy Storage Solution

## Southern Company BESS

### About the Project

- **Project name:** Southern Company BESS
- **Battery:** Li-ion batteries (1000 kW - 2000 kWh)
- **Location:** USA
- **Completion date:** 2015

### Solution

ABB's scope includes:

- PCS 1000 kW / 1500 kVA integrated in (1) NEMA 3R enclosure
- EssPro Vantage Controller
  - Frequency regulation
  - Voltage regulation
  - Firming
  - Load shifting

### Customer Benefits

- Achieve load leveling and peak shaving



Battery energy storage solution (1.5 MW) for a microgrid in USA

# Battery Energy Storage Solution

BESS Integrator / PJM

## About the Project

- **Project name:** BESS Integrator / PJM
- **Location:** USA
- **Battery:** Li-ion batteries
- **Completion date:** 2014

## Solution

ABB's scope includes:

- 20 MW outdoor PCS / 35kV
- Includes inverters, dc circuit breakers, AC circuit breakers, control, protection and external isolation / step-up transformer to 35 kV grid
- Metering / data management
- Noise suppression

## Customer Benefits

- Achieve frequency regulation
- Enable to operate in the PJM regulation market



20MW BESS used for PJM Market Participation

# Battery Energy Storage Solution

ENEL

## About the Project

- **Project name:** ENEL
- **Location:** Italy
- **Battery:** Li-ion batteries
- **Completion date:** 2014

## Solution

ABB's scope includes:

- Turnkey BESS providing 2 MW for 30 minutes including system studies and specification
- Containerized solution incl. converter, transformer, switchgear, control and protection systems
- Standard control algorithms

## Customer Benefits

- Battery energy storage system connected to the distribution grid



BESS (2 MW) connected to the distribution grid for a well-known energy company

# Battery Energy Storage Solution

Tehachapi

## About the Project

- **Project name:** Tehachapi
- **Location:** USA
- **Battery:** Li-ion batteries
- **Completion date:** 2013

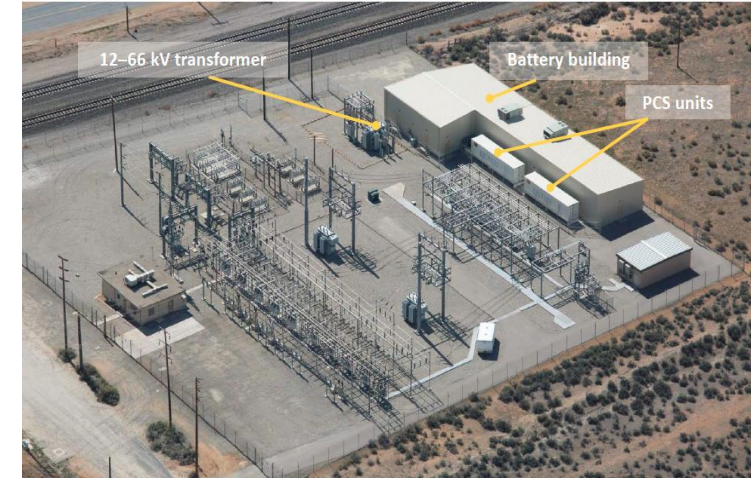
## Solution

ABB's scope includes:

- 8 MW / 9 MVA PCS100 for BESS
- EssPro Vantage Controller
- DC bus and protection circuit breakers
- System models, RTDS and simulations
- Commissioning, training and installation supervision

## Customer Benefits

- Establish smart grid program
- Assess the capability and effectiveness of storage to support 13 operational applications



Battery energy storage solution ( 8 MW) for BESS use case analysis and performance

# Battery Energy Storage Solution

EKZ

## About the Project

- **Project name:** EKZ
- **Location:** Switzerland
- **Battery:** Li-ion batteries
- **Completion date:** 2012

## Solution

ABB's scope includes:

- Turnkey BESS providing 1 MW for 15 minutes including system studies and specification
- Containerized solution including converter, transformer, switchgear, control and protection systems
- Standard and advanced control algorithms

## Customer Benefits

- Battery energy storage facility connected to the distribution grid, with integrated solar panels and e-mobility charging stations



Turnkey BESS providing 1 MW for 15 minutes



# Battery Energy Storage Solution

## Utility

### About the Project

- **Project name:** Utility
- **Location:** USA
- **Battery:** Li-ion batteries
- **Completion date:** 2012

### Solution

ABB's scope includes:

- Supplied 500 kW PCS, including inverters, circuit breakers, isolation transformer, disconnect switch and metering cabinet
- Ongoing development of control algorithms with US utility and University in the area

### Customer Benefits

- Helped in demand reduction
- Achieve smooth PV integration (firming)



Battery energy storage solution for a US based 500 kW Utility

# Battery Energy Storage Solution

Hawaiian Utility

## About the Project

- **Project name:** Hawaiian Utility
- **Location:** USA
- **Battery:** Li-ion batteries
- **Completion date:** 2012

## Solution

ABB's scope includes:

- 100 kW / 240 kWh BESS for two sites - West Health Civic Center and Koyo Bottling Company
- Indoor 100 kW PCS including inverters, DC contractors, AC circuit breakers, control and isolation transformer
- Dynamic control algorithms

## Customer Benefits

- Demand reduction and voltage support
- Load shifting / PV integration



Battery Energy Storage solution for rooftop solar integration and demand reduction

# Battery Energy Storage Solution

Angamos

## About the Project

- **Project name:** Angamos
- **Location:** Chile
- **Battery:** Li-ion batteries
- **Completion date:** 2011

## Solution

ABB's scope includes:

- 20 MW PCS containers
- Each containing inverters, circuit breakers, step up transformers, control, MV disconnect switch

## Customer Benefits

- Achieve spinning reserve and frequency regulation



Battery energy storage solution (20 MW) to ensure the grid reliability against transmission or generation losses

# Battery Energy Storage Solution

NYPA, Garden City

## About the Project

- **Project name:** NYPA, Garden City
- **Location:** USA
- **Battery:** NaS battery technology
- **Completion date:** 2006

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ABB's scope includes:

- Powered gas compressors during the day and recharge at night
- Shift compressor demand to night, lowers daytime peak demand rates
- BESS provides backup power supply

## Solution

## Customer Benefits

- Achieve load leveling and peak shaving



Battery energy storage solution (1 MW) to provide back up power supply

# Battery Energy Storage Solution

Fairbanks

## About the Project

- **Project name:** Fairbanks, Alaska
- **Location:** USA
- **Completion date:** 2003

## Solution

ABB's scope includes:

- Turnkey BESS including converter, transformer, Ni-Cd batteries (battery supplier SAFT), metering, protection and control devices and service equipment
- 27 MW - 15 minutes / 46 MW - 5 minutes
- BESS operation at temperatures as low as -52°C

## Customer Benefits

- Improve reliability of electricity services
- Emergency power source to feed energy to the grid until backup generation can come online
- 15 minutes power boost to get generators online, leading to 90 percent reduction of power blackouts due to grid faults
- Cost-effective and reduced carbon emission solution



World's oldest BESS in service and also has held 2 world records in the BESS market



# — Distributed Generation Solutions

# Global Key References

Plant + Fleet Monitoring + Controls solutions for Renewables: >7 GW track record globally.



# Soposa & Cohesa

## Plant SCADA for Valle & Nacaome PV plant

### About the Project

- Supply of the complete monitoring and control solution of two 50 MW PV plants
- Completion date: 2015

### Solution

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ABB's scope includes:

- Plant SCADA
    - MicroSCADA Pro
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant, section, transformation center and inverter level



# Sputnic

## Plant SCADA for Bugulchanskaya & Buribaevskaya PV plants

### About the Project

- Supply of the complete motoring and control solution for (15 MVA) PV plants
- Completion date: 2015
- Location: Russia

### Solution

---

ABB's scope includes:

- Plant SCADA
    - MicroSCADA
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant, section, transformation center and inverter level



# Origis

## Sumrall & Tallahassee PV plants, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 1 x 52 MVA + 1 x 20 MVA PV plants
- Completion date: 2018
- Location: USA

### Solution

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ABB's scope includes:

- Plant SCADA
    - MicroSCADA
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant, section, transformation center and inverter level





# Vaughin

## Ayrshire PV plant, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 20 MVA PV plants
- Completion date: 2018
- Location: USA

### Solution

ABB's scope includes:

- Plant SCADA
  - MicroSCADA
- Plant controller
  - RTU500

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant, section, transformation center and inverter level



# FRV

## Mafraq & Empire PV plants, Plant Controller

### About the Project

- Supply of the control solution for (1 x 52 MVA + 1 x 52 MVA) PV plants
- Completion date: 2018
- Location: Jordan

### Solution

ABB's scope includes:

- Plant controller
  - RTU500

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)



# Green Source Investment

## RJAF Mafrq PV plant, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 10 MVA PV plant
- Completion date: 2018
- Location: Jordan

### Solution

---

ABB's scope includes:

- Plant SCADA
    - MicroSCADA
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant level



# Fortius

## Zacoalco PV plants (8MW and 6MW), Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 6 MVA PV plant
- Completion date: 2017
- Location: Mexico

### Solution

ABB's scope includes:

- Plant SCADA
  - MicroSCADA
- Plant controller
  - RTU500

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant level
- String currents monitoring



# Masdar

## Toshka 1 and Toshka 2 PV plants, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 1 x 10 MVA + 1 x 10 MVA PV plants
- Completion date: 2017
- Location: Egypt

### Solution

ABB's scope includes:

- Plant SCADA
  - MicroSCADA
- Plant controller
  - RTU500

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant level





# Sterling & Wilson

## Benban 1, 2, 3, 4 PV plants, Plant Controller

### About the Project

- Supply of the control solution for 4 x 50 MW PV plants
- Location: Egypt

### Solution

ABB's scope includes:

- Plant controller
  - RTU500

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)



# Kawar energy

## Khaldieh, Training center and Mafrq PV plants, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 1 x 6 MW + 1 x 6 MW + 1 x 17 MW PV plants
- Location: Jordan

### Solution

---

ABB's scope includes:

- Plant SCADA
    - MicroSCADA
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant level



# Philadelphia Solar

## Al Badiyah PV plant with BESS, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 13 MW PV plant
- Location: Jordan

### Solution

---

ABB's scope includes:

- Plant SCADA
    - MicroSCADA
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant level
- String currents monitoring



# Toji Group JSC

## Bac Phoung PV plant, Plant Controller

### About the Project

- Supply of the control solution for 34 MW PV plant
- Location: Vietnam

### Solution

---

ABB's scope includes:

- Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Grid Code Compliance



# FTC Solar

## Quang Ngai - Thiên Tân PV plant, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 19 MW PV plant
- Location: Vietnam

### Solution

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ABB's scope includes:

- Plant SCADA
    - MicroSCADA
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant level
- String currents monitoring





# EVN Group - Electricity of Vietnam

## Thung Nam PV plant, Plant Controller

### About the Project

- Supply of the control solution for 140 MW PV plant
- Location: Vietnam

### Solution

ABB's scope includes:

- Plant controller
  - RTU500

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Grid Code Compliance



# QUYNH QUANG REAL ESTATE INVESTMENT

## Vinh Hao PV plant, Plant Controller

### About the Project

- Supply of the control solution for 34 MW PV plant
- Location: Vietnam

### Solution

ABB's scope includes:

- Plant controller
  - RTU500

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Grid Code Compliance



# TTC Group

## Duc Hue 2 PV plant, Plant Controller

### About the Project

- Supply of the control solution for 50 MW PV plant
- Location: Vietnam

### Solution

ABB's scope includes:

- Plant controller
  - RTU500

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Grid Code Compliance



# Wärtsilä Finland Oy

## Al Manakher PV plant, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 44 MW PV plant
- Location: Jordan

### Solution

---

ABB's scope includes:

- Plant SCADA
    - MicroSCADA
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant level
- String currents monitoring



# Masdar

## Romanville PV plant, Plant SCADA & Plant Controller

### About the Project

- Supply of the complete motoring and control solution for 5 MW PV plant
- Location: Seychelles

### Solution

---

ABB's scope includes:

- Plant SCADA
    - MicroSCADA
  - Plant controller
    - RTU500
- 

### Customer Benefits

- Central plant controller coordinates all inverters to achieve the required control command (active/reactive power)
- Intuitive HMI to visualize all relevant process data from the plant, grid connection and/or weather stations
- Performance and Production Ratio (PR) at plant level
- String currents monitoring





# Enel Green Power

## Plant SCADA for Hydro Power Plants and Wind Farms

### About the Project

- Supply of plant automation solution to 37 renewable plants (more than 1300MW) in multiple US & Canada locations
- Completion date: 2015
- Location: USA and Canada

### Solution

ABB's scope includes:

- Plant SCADA
- Store & forward capabilities
- Redundant systems

### Customer Benefits

- Plant layout simplified using a unique platform for collecting data and sending commands to the wind turbine generator and to the Substation
- Integrated plant monitoring with unified information model for the upper level system (Remote control centers)
- Allowing swift plant management even if connection with the upper level system is lost



# Veronagest / Volta Green Energy

## Plant SCADA for Wind Farms

### About the Project

- Supply of the plant automation solution to the entire Veronagest wind fleet (more than 300MW)
- Completion date: 2011 (for Veronagest). Upgrade: 2019 (for Volta)
- Location: Italy (Sicily)

---

ABB's scope includes:

### Solution

- Plant SCADA
  - MicroSCADA Pro

### Customer Benefits

- 
- Plant layout simplified using a unique platform for collecting data and sending commands to the wind turbine generator and to the substation
  - Integrated plant monitoring with unified information model for the upper level system (Remote control centers)
  - Allowing swift plant management even if connection with the upper level system is lost
  - Upgrade of plant controls 8 years after installation with new features:
    - State of the Art SCADA, the same used for the Remote Control Center, that allows to reduce OPEX



 Veronagest

Volta g.e.  
green energy

# Enel Green Power

## Plant SCADA for Wind Farms

### About the Project

- Supply of plant automation solution to 26 wind farms (more than 500MW) in multiple locations
- Completion date: 2011

---

ABB's scope includes:

### Solution

- Plant SCADA
  - MicroSCADA Pro

### Customer Benefits

- 
- Plant layout simplified using a unique platform for collecting data and sending commands to the wind turbine generator and to the Substation
  - Integrated plant monitoring with unified information model for the upper level system (Remote control centers)
  - Allowing swift plant management even if connection with the upper level system is lost



## Plant SCADA for Wind Farms

### About the Project

- Supply of the plant automation solution to 6 wind farms (more than 700 MW) spread across Italy
- Completion date: 2007
- Location: Italy

### Solution

ABB's scope includes:

- Plant SCADA

### Customer Benefits

- Plant layout simplified using a unique platform for collecting data and sending commands to the wind turbine generator and to the substation
- Integrated plant monitoring with unified information model for the upper level system (remote control centers)
- Allowing swift plant management even if connection with the upper level system is lost



# Veronagest / Volta Green Energy

## Remote control center – Wind farms

### About the Project

- The entire Veronagest fleet (5 Wind Farms, more than 300MW) is controlled and monitored by a single remote control system
- Completion date: 2011 (for Veronagest). Upgrade: 2019 (for Volta)
- Location: Italy

---

ABB's scope includes:

- Remote management SCADA
  - MicroSCADA Pro
- Redundant system
- Power Generation Curtailment

### Solution

### Customer Benefits

- 
- Improved operations + maintenance reaction time through structuring and visualization of critical data in a high level display
  - Effective real time monitoring, control and operations of fleet of plants in >1000 km distance btw plants and remote monitoring + control center with scalable and versatile automation solutions
  - Reduction in operational cost by managing all assets using a fully integrated automation system
  - Managing TSO requests
  - Upgrade:
    - State of the Art SCADA, same used for Plant SCADA (OPEX reduction)
    - Advanced wind farm management and analytics through e-mesh® applications: Wind Farm Efficiency (WFE) application for optimal performance management and minimal production losses per turbine



 Veronagest

Volta g.e.  
green energy

# Enel Green Power

## Remote control center – Wind Farms

### About the Project

- The entire wind fleet of the customer is controlled and monitored by one remote control systems supervising 25 Wind Farms
- Completion date: 2016
- Location: Italy

### Solution

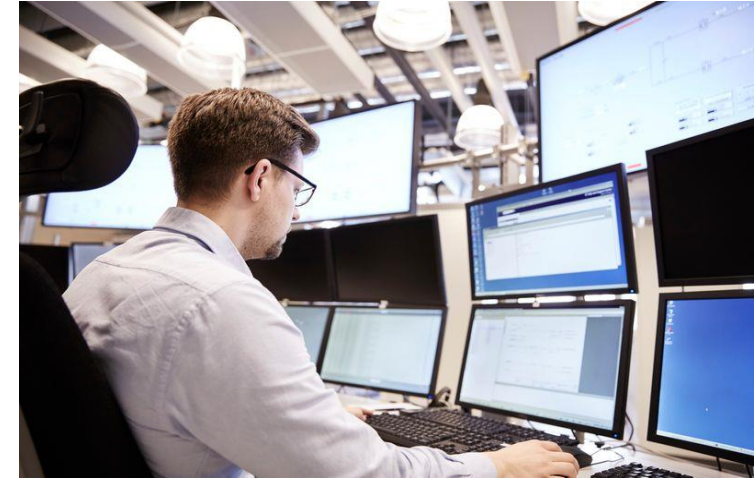
---

ABB's scope includes:

- Remote management SCADA in cloud
- Redundant system
- Power Generation Curtailment

### 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
- Managing TSO requests





# Engie

## Remote control center – Wind farms

### About the Project

- The entire Engie fleet (6 Wind Farms, more than 150MW) is controlled and monitored by a single remote control system
- Completion date: 2011
- Location: Italy

### Solution

ABB's scope includes:

- Remote management SCADA
- 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



# Enel Green Power

## Remote control center – Geothermal plant

### About the Project

- The entire Geothermal fleet of the customer is controlled and monitored by one remote control system and one disaster recovery system
- Completion date: 2016
- Location: Italy

### Solution

ABB's scope includes:

- Remote management SCADA
- Redundant system
- Disaster recovery solution

### 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



# Enel Green Power

## Remote control center – Hydro Power Plants

### About the Project

- The entire hydro fleet of the customer is controlled and monitored by five remote control systems supervising 400 hydro power plants and one disaster recovery system
- Completion date: 2011
- Location: Italy

---

ABB's scope includes:

### Solution

- Remote management SCADA
- Redundant system
- Disaster recovery solution
- Power Generation Scheduling

### 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
- Managing TSO requests



# HDE

## Remote control center – Hydro Power Plants

### About the Project

- The entire HDE fleet (23 HPPs, 1,8GW) is controlled and monitored by a single remote control system
- Completion date: 2019
- Location: Italy

### Solution

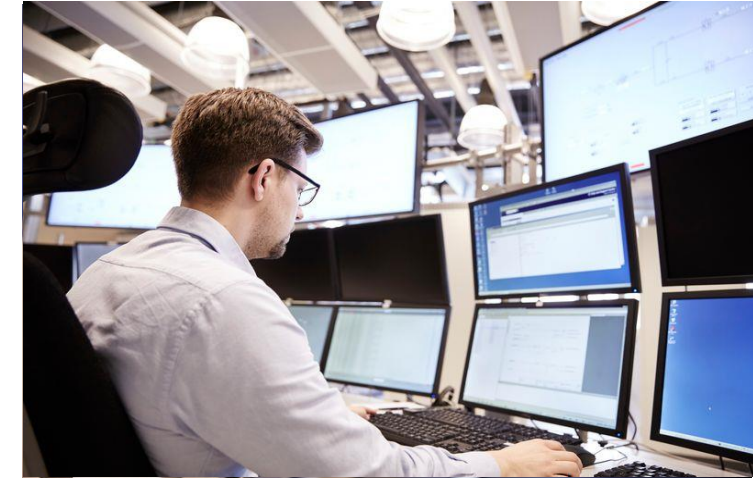
---

ABB's scope includes:

- Remote management SCADA
  - Redundant system
  - Disaster recovery solution
  - Power Generation Scheduling
- 

### 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
- Managing TSO requests



# Enel Green Power

## Remote control center – Hydro Power Plants Perú

### About the Project

- Remote Monitoring + Control for 7 hydro power plants in Peru
- Completion date: in progress
- Location: Peru

### Solution

ABB's scope includes:

- Remote management SCADA
  - MicroSCADA Pro
- Redundant system
- Disaster recovery solution

### 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



# Enel Green Power (Emgesa)

## Remote control center – Hydro Power Plants Colombia

### About the Project

- Remote Monitoring + Control for 9 hydro power plants in Colombia
- Completion date: in progress
- Location: Peru

### Solution

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ABB's scope includes:

- Remote management SCADA
  - MicroSCADA Pro
- Redundant system
- Disaster recovery solution

### 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





# CVA

## Remote control center – Hydro Power Plants

### About the Project

- The entire CVA fleet is controlled and monitored by a single remote control system
- Completion date: 2016
- Location: Italy

### Solution

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ABB's scope includes:

- Remote management SCADA
  - Redundant system
  - Power Generation Scheduling
- 

### 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
- Managing TSO requests



# ABB remote monitoring

## Solar plants across Italy – different customers

### About the Project

- Data related to more than 20 PV plants across Italy (more than 100MW) are collected in the Remote Service Portal. Each PV Plant is monitored by ABB
- Completion date: 2015
- Location: Italy

### Solution

ABB's scope includes:

- Remote Service Portal
- Data Collector

### Customer Benefits

- System delivered as a service
- Remote monitoring and diagnostic system with integrated automatic reporting and a powerful web portal to present data to the customers





**ABB**