MOVE THE WORLD FORW>RD MITSUBISHI HEAVY INDUSTRIES GROUP

STORAGE

# **BATTERY ENERGY STORAGE SYSTEM**

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Mitsubishi Power Europe GmbH

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# MITSUBISHI HEAVY INDUSTRIES OVERVIEW



- HQ Location: Yokohama, Japan
- ▶ Worth of orders: €25b
- Employees: approx. 80,000
- Revenue: €27.7b

#### Mitsubishi Power EMEA

- HQ Location: London (UK) and Duisburg (DE)
- Employees: approx. 1,000
- Market Region: Europe,
   Middle East, Africa (EMEA)





## **100%** Mitsubishi Power Europe

## MITSUBISHI POWERS RESPONSE TO CHANGING MARKETS





**Turnkey Projects, Products und Services for:** 

- Combined Cycle Gas Turbine Plants (CCGT)
- Integrated Gasification Combined Cycle (IGCC)
- Coal-fired Boilers
- Waste-to-Energy Boilers
- Industrial Boilers

+ Expanding our Portfolio

#### Decarbonisation of Energy Industry and Industrial Sectors

Turnkey Projects, Products und Services for:

- Hydrogen Gas Turbines
- Power-to-X (Heat Pumps, Green Hydrogen)
- Energy Storage
- Solid Oxide Fuel Cells
- CO<sub>2</sub> capture/utilization
- Digital Solutions

## BATTERY ENERGY STORAGE SYSTEM



Grid services Safety

**Renewable Energy Integration** 

Reliability Energy Resiliency

**Commercial and Industrial Use** 

Energy Arbitrage ENERGY EFFICIENCY

Reserve Capacity
System Adequacy
FLEXIBILITY Power Quality





## MITSUBISHI POWER OFFERING FLEXIBLE TECHNOLOGIES, DELIVERING SOLUTIONS





## **BESS FUNCTION DIAGRAM**





## **BESS APPLICATIONS**





## MITSUBISHI POWER OFFERING DIVERSE APPLICATIONS





# BESS INTEGRATED WITH GRID SERVICES







#### **Standard Situation**

- High demand or supply.
- Costly TSO or DSO assets installation to treat occasionally peak demand.
- Distribution circuit experiencing load growth.
- Grid outages.
- Voltage unbalance events.

#### **BESS Applications**

- Frequency regulations
- Voltage control and Power quality
- Black start
- Spinning reserve

#### **BESS Advantages**

- Reduce the cost for backup fossil fuel-based generation ancillary services.
- Fast response under load variations.
- Providing black start services for conventional generating plant.
- Save the operational costs in powering the grid.
- Reduce the cost to provide frequency regulation and spinning reserve services.
- Balance between supply and demand.
- Protection against voltage fluctuations and defects on facility components.

# BESS INTEGRATED WITH HYBRID POWER PLANTS





#### **Standard Situation**

- Limited use of diesel generators or gas engine to black start capabilities.
- Slow power plant response to grid fluctuations.
- Increase or decrease of the demand needs below the minimum run threshold of the power plant.
- Load changes.

#### **BESS Applications**

- Black start and support of grid restorage.
- Spinning reserve for peak power.
- Stabilization of ramp loads in case of imbalances in the grid.
- Islanding and off-grid services (industrial power plants).

#### **BESS Advantages**

- Offering large number of application opportunies in addition to black start capabilities.
- Fast response (<1 sec) of power supply to the grid until the gas turbine take over.
- Stablizing of gas and steam turbines during grid outages.
- Reduce the stress on the gas and steam turbine.
- Reduce CO2 emissions.
- Reduce the maintenance and fuel costs.
- Offering regulation capacities for the power plant.

# **BESS INTEGRATED WITH RENEWABLE ENERGY**





#### Standard Situation

- Renewable energy fluctuations.
- The use of high-cost generators (e.g. gas plants)
- High generation in off-peak time
- Limited RE generation during peak time.

#### **BESS Applications**

- Ramp rate control.
- More predictable production.
- Firming capacity.

#### **BESS Advantages**

- Increase self consumption.
- Smoothing PV power fluctuations.
- Meet the demand during peak periods or other high-risk periods.
- Ensure adequate peaking generation capacity.
- Shifting renewable energy generation for peak demand coverage.
- Reduce the use of the high cost of generators.
- Optimize the energy costs.

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# **BESS IN COMMERCIAL AND INDUSTRIAL USE**







#### **Standard Situation**

- High demand in peak times.
- Low demand in off-peak times.
- High electricity prices.
- Risk of critical load: power supply interruptions.

#### **BESS Applications**

- Power backup.
- Energy Arbitrage.
- Load leveling.
- Peak shaving.
- Demand response.

#### **BESS Advantages**

- Taking advantage of electricity prices.
- Balancing energy demand and supply.
- Protection from power quality and power supply interruptions by filtering out imperfections in grid power.
- Shifting the peak demand by charging during off-peak times and discharging during the peak times.
- Reduction of peak demand and reduction in electricity bill.

# MITSUBISHI POWER`S VALUE PROPOSITION





## System Integration

- Optimal System design
- Supply of components for long term performance
- Integration of Tier1 battery and inverter manufacturers



## Cost Effective

 Strong global supply chain partners and scale delivering cost effective solutions



## Financing

Our balance sheet and low cost of capital allows variety of financing to meet customer needs



## Long-Term Service

- Performance guarantee
- Remote monitoring
- Operation support
- ✓ Spare part management





 Ability to execute both union and nonunion EPC projects using in-house capabilities and partners

## MITSUBISHI POWER`S PERFORMANCE GUARANTEES

#### **Energy Capacity Guarantee:**

• The Energy Capacity Guarantee gives maximum acceptable reduction in system energy capacity as a function of time and as a function of system usage.

#### Availability Guarantee:

• Energy available for charge and discharge as a percentage of time.

#### Round Trip Efficiency (RTE):

• RTE is defined as the ratio between the energy charged and the energy discharged from the BESS. It is generally measured at the point of interconnection.

Performance guarantees are dependent on final selection of battery technology, power conversion systems, and SCADA systems.



## MITSUBISHI POWER CASE STUDIES



#### **Key Capture Energy: Texas BESS**

Mitsubishi Power turnkey 200 MW / 200 MWh BESS systems will provide Ancillary Services to help ERCOT meet the power and energy needs of Texas for many years to come.



#### **BESS Project Overview**

- Size: 200 MW / 200 MWh
- Mitsubishi Power Scope: Full Turnkey: All Equipment, EPC, and Permits
- Application: ERCOT Ancillary Services
- Project Life: 15 Years
- Interconnection Voltage: 138 kV
- Key Suppliers:
- Powin
- ✓ SMA
- ✓ CATL

## MITSUBISHI POWER CASE STUDIES



#### Hecate Johanna: BESS for California

Mitsubishi Power turnkey 20 MW / 80 MWh BESS systems will provide peak capacity and revenue from the CAISO merchant market for many years to come.



#### **BESS Project Overview**

- Size: 20 MW / 80 MWh
- Mitsubishi Power Scope: Full Turnkey: All Equipment and EPC
- Application: Capacity and CAISO Merchant Market
- Project Life: 10 Years
- Interconnection Voltage: 12 kV
- Key Suppliers:
- ✓ Powin

- ✓ Ingeteam
- ✓ CATL

## **BESS KEY TAKE-AWAYS**





## Providing

- Optimal and customized system design
- Project feasibility studies
- Cost-effective and agnostic solutions
- Proven partnerships with suppliers
- Turnkey solutions
- Long-term service agreement
- Performance guarantees

### Enabling

- Grid control
- Decentralization
- Integration of renewables
- Effective and high-quality project execution



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