

**BESS • BATTERY ENERGY STORAGE SYSTEM**

**JEMS • JELEC ENERGY MANAGEMENT SYSTEM**



 **Jelec**

# BESS: Jelec Battery Energy Storage System

In the transition to a decarbonized electric power system, variable renewable energy (VRE) resources such as wind and solar photovoltaics play a vital role due to their availability, scalability, and affordability. However, the degree to which VRE resources can be successfully deployed to decarbonize the electric power system hinges on the future availability and cost of energy storage technologies.

Battery Energy Storage Systems help make better use of electricity system assets, including wind and solar farms, natural gas power plants, and transmission lines. They can defer or eliminate unnecessary investment in these capital-intensive assets.

Jelec's Battery Energy Storage System (BESS) is a comprehensive and proven solution that includes battery units and battery management system software. This ensures maximum efficiency and safety for each customer.

The Jelec Battery Energy Storage System consists of, lithium-ion batteries, a Battery / Energy Management System, any necessary DC/DC, or DC/AC power conversion / charging Equipment, a filter to mitigate the level of harmonics, and a reliable Power Management System.



## JEMS: Jelec Energy Management System



### Battery Management System

Battery Management Systems (BMS) monitor and regulate the charging and discharge of batteries. The battery characteristics that are monitored include voltages, temperature, capacity, state of charge (SoC), power consumption, remaining operating time, charging cycles, and some advanced indicators like State of health (SoH).

The task of battery management systems is to ensure the optimal and safe use of the battery. To avoid loading the batteries, BMS systems protect the batteries from deep discharge and over-voltage. The battery management system also provides a cell balancing function to ensure that different battery cells stay equal, keeping the system in peak performance condition at all times.



### Automatic Power Management System

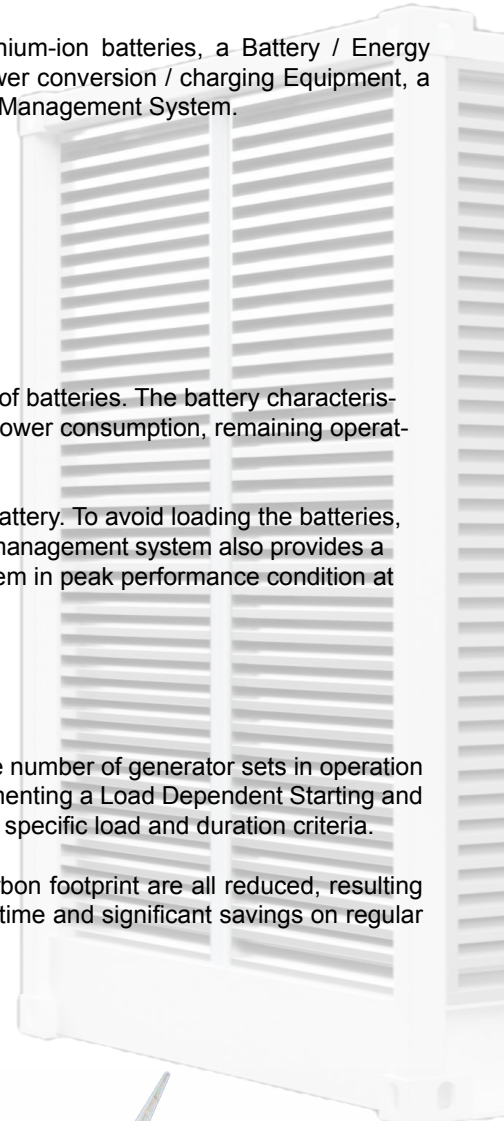
The Jelec Automated Power Management System (JAPMS) is a solution to optimize the number of generator sets in operation and increasing the average efficiency of each generator set. This is achieved by implementing a Load Dependent Starting and Stopping System (LDSS) that automatically turns on and off generator sets based upon specific load and duration criteria.

When excess generator usage is eliminated, fuel consumption, running hours, and carbon footprint are all reduced, resulting in significant operating cost savings. Reduced engine hours also result in less rig downtime and significant savings on regular maintenance costs.



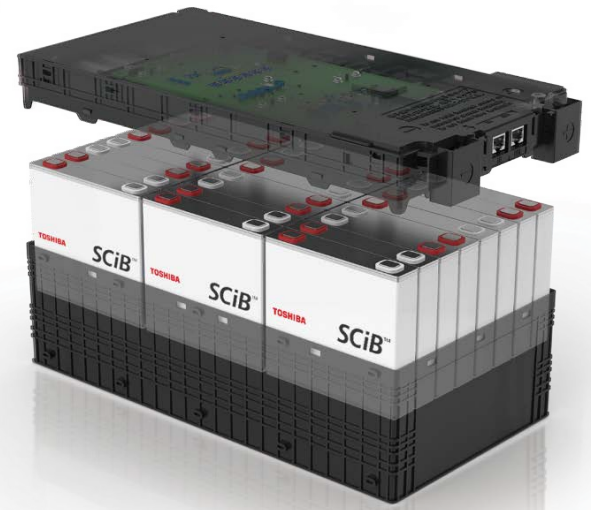
### Features:

- Generators are speed and voltage controlled, in isochronous, to offer fast and optimal load sharing.
- Continuous monitoring of Real Power (kW) and Total Power (kVA).
- JAPMS allows individual engines/generators to operate in manual or automatic modes and only starts and stops engines that are in automatic mode of operation.
- Automatic start of standby generators to meet power demand.



# Toshiba LTO Technology Batteries

Jelec Battery Energy Storage System is equipped with Toshiba SCiB™ Battery Module using Lithium Titanium Oxide (LTO technology) to achieve excellent characteristics.



## Safe and Reliable



### Extremely low fire hazard

SCiB™ is suitable for various applications requiring high levels of safety and reliability.



### Over 20,000 cycles

Only a small degree of capacity degradation occurs even after more than 20,000 cycles of charging and discharging. Low maintenance requirement when it is used in applications that require frequent charging/discharging such as large-scale Battery Energy Storage Systems.



### Charged to 80% capacity in 14 minutes

The use of SCiB™ allows BESS to be charged as quickly as the necessary time to make a drill pipe connection. Frequent rapid charging does not cause significant deterioration in capacity.



### Rapidly achieving high power

SCiB™ can be charged and discharged at high current. Therefore, SCiB™ is perfectly suited to discharge a very large amount of power to help the power plant (e.g., drawworks peak acceleration) or charge rapidly to prevent power plant overspeed / over frequency when a large load goes away.



### Full State Of Charge (SOC)

SCiB™ can be used over the SOC range of 0% to 100%.



### Extreme temperature tolerance

SCiB™ can be charged and discharged repeatedly at temperatures as low as -30°C. Operating ambient temperature: -30°C to +45°C.



### Thermal Runaway

Thermal Runaway is SCiB™ cell based on Lithium Titanate Oxide (LTO) topology alongside with state-of-the-art monitoring devices, and with Jelec BESS Management System controlling the charge and discharge of the battery modules, greatly reduces the potential for Thermal Runaway suffered by other lithium chemistry.

## Jelec Batteries Rack & BESS Building Design



### Battery Rack

- The Batteries Racks are fully designed by Jelec using FEA (Finite Element Analysis) software for structural validation and CFD (Computational Fluid Dynamics) software to predict air flow and optimize cooling to each single battery module.
- Finger Safe Battery Racks: no exposed live parts.



### BESS Building

- Automatic Climate Control: necessity to maintain the correct building inside temperature to avoid condensation.
- Scalable in size: storage capacity can easily be adapted to meet capacity requirements.





# Applications

The Battery Energy Storage System offers highly efficient and cost-effective energy storage solutions to a wide range of customers, including renewable energy producers, conventional thermal power plant operators, transmission and distribution grid operators, industrial electricity consumers, and onshore drilling rigs and Oil & Gas service units.

- Energy Time Shift / Peak Shaving
- System Frequency Regulation and Load Balancing
- Activation and Delivery of energy resources
- Load Following and Ramping
- Additional Reserve Capabilities
- Black Start without using cold-start engine
- Extended Maintenance Intervals.

## Drilling Rigs

The Jelec Battery Energy Storage System, in association with the Jelec Automated Power Management System, provides a means of storing energy from the main generators and redistributing it to the drilling system to optimize generator load. In the event of a load spike (such as the drawworks hook load), the batteries will take on the load instead of the engines, which will as a result continue to run steadily.

### Advantages:

- Better energy efficiency and reduced greenhouse gas (GHG) and nitrogen oxides (NOx) emissions.
- Lower operation and maintenance costs.
- Greater safety and a better work environment.
- Lower operating noise level.

## Black Start

The Battery Energy Storage System has the ability to provide black start services for portions of a microgrid that are subject to possible blackouts. This includes the restarting of conventional power plants, such as those with gas turbines, without the support of external power supply or backup-fueled power generation.

## O&G Field Microgrid

To significantly decrease greenhouse gas (GHG) emissions and reduce operating costs through fuel savings, O&G operators are looking to create hybrid microgrids based on reciprocating natural gas generators and Battery Energy Storage Systems to power drilling rigs, workover and service rigs, artificial lifting installations, and more.

## Renewable Energy Shifting & Smoothing

Renewable wind and solar energy are intermittent sources of power. The combination with Battery Energy Storage System has the ability to assist system operators in smoothing short-term fluctuations and regulating the frequency to the grid.

## Momentary Outages

For customers with critical installations such as data centers, hospitals, and food centers that are equipped with standby generators in case of power grid failure, BESS is used to prevent monetary outages between the time they lose power from the grid and the time the standby generator(s) pick up the load.

## Energy Arbitrage

Since the price of electricity fluctuates throughout the day and year, a Battery Energy Storage System (BESS) can be charged during low-price periods and discharge when the facility's load is high to offset the cost, particularly when Time of Use (TOU) pricing is implemented. Some states' building energy efficiency standards include requirements for solar plus storage on all commercial and multifamily homes, while also mandating that all new residential construction, which already necessitates solar, be energy storage ready.



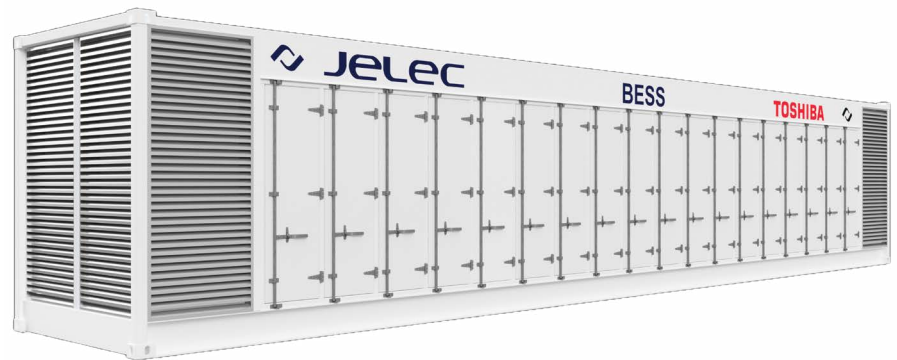
# Battery Energy Storage System



The Jelec Battery Energy Storage System is a scalable and mobile solution engineered for the harsh operating conditions of the Oil and Gas industry.

The system provides storage of electrical energy using state of the art Lithium Ion LTO Batteries to load balance the engine operation on drilling rigs (drawworks peak shaving) and to optimize the number of running diesel generators in order to reduce fuel consumption and emissions.

This solution is particularly well suited for high power cycling, high operating temperature ranges, low maintenance operations and has been designed to easily interface with existing installations.



## Highlight Features

### Reliable

The system is made of proven components with high vibration and high temperature rating. Battery life cycle characteristic is best in class.

### Scalable

The system capacity is easily increased by paralleling other power containers or adding additional battery containers.

### Mobile

The system is build on Oilfield skids in both 20ft and 40ft version for ease of transportation.

### Safe

Finger safe screens, segregation of controls and power sections combined with the LTO battery technology helps make the system safe for operators.

### Efficient

Best filtering and low internal battery resistance improves overall system efficiency.

### Accessible

Built-in remote cellular and wired ethernet connection for remote support and diagnostics from anywhere when needed.

### Quality

Built in house by Jelec with experience leveraged from packaging power houses, generator controls, liquid and air cool VFDs, driller's cabins and drilling controls for customer worldwide

### More Questions?

Please feel free to contact us.

### Specific requirements ?

We also offer custom packaging or electrical and control design to our customers.

## Electrical

### Output

#### JLB-1.2

600Vac

#### JLB-2.4

600Vac

### Frequency

50-60 Hz

50-60 Hz

### Power - Nominal

1200 kW @ PF=1.0

2400 kW @ PF = 1.0

### Power - Intermittent

1600 kW @ PF=1.0

3200 kW @ PF=1.0

### Power - Overload

1 min every 10 min

1 min every 10 min

### Energy Capacity

400 kWh

800 kWh

### Cooling

18 Tons

36 Tons

## Structural

### Frame

#### JLB-1.2

20ft Oilfield Skid

#### JLB-2.4

40ft Oilfield Skid

### Dimensions - Length

22 ft

42 ft

### Dimensions - Width

10 ft 6 in

10 ft 6 in

### Dimensions - Height

10 ft 6 in

10 ft 6 in

### Weight

46,000 lb

96,000 lb

## General

### Battery

Lithium Titanium Oxide (LTO) modules.  
Individual cell indication, continuous monitoring.  
Automatic isolation of faulty rack.

### Inverter

Air Cool Active Front End Inverters

### Cooling

Split Cooling Units, N+1 redundancy

### Efficiency

Application dependent  
Please contact us to request a sample study for your application

### Temp. - Operating

-20 ... 40 °C (standard), -40 ... 40 °C (winterized)

### Temp. - Transport

-30 ... 50 °C

### Humidity

100 % non condensing

### Convenience Features

Recessed outdoor lighting  
Recessed plug panel with access door and rain guard  
Doors with re-closing mechanism, panic hardware, sight glass, rain guard  
Emergency backup indoor lighting  
Indoor 120V service receptacles

### Paint - Indoor

Dual coat white indoor walls and ceiling  
Dual coat ANSI grey floor with diamond insulated mat (black)

### Paint - Outdoor

Triple coat outdoor white  
Non-skid white on outdoor walking area



## General Information

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