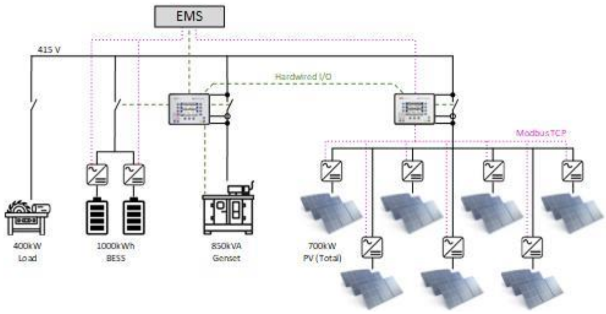
Morgan Sawmill Solar
Dublin Offgrid | Australia

Off-grid Power with Solar, Battery Energy Storage and Back-Up Diesel Genset

Customer Background:



The customer runs a facility specializing in the production of wooden pallets for industrial applications. Situated in a remote location where connecting to the electrical grid is cost-prohibitive, the company sought an innovative solution to meet its energy needs. To address this, they implemented an off-grid microgrid system to ensure reliable and sustainable power for their operations.

Problem Statement:

Due to the facility's remote location, accessing the electrical grid was not a financially viable option. The owner required a cost-effective, reliable energy solution capable of supporting production demands while maintaining operational efficiency and minimizing downtime.

Solution:

The off-grid microgrid solution integrates three primary components:

- **Battery Energy Storage** System (BESS)
- **Solar Photovoltaic** (PV) System
- **Generator Set** (Genset)

These components collectively meet the facility’s average power demand of 400 kW. The detailed equipment breakdown is provided in the following Table.

Device	Manufacturer	Model	Quantity	Total Capacity
BESS	Sungrow	ST535kWh-250 kW	2	1000 kWh-500kW-2h
PV Inverter	Fronius	TAURO 100-3-D	7	700 kW
Generator	CAT	DE850E0-850 kVA	1	850 kVA

Key Features of the Microgrid

1.Power Supply Management:

- The BESS serves as the primary device to maintain stable voltage at 410 V.
- The genset provides backup energy, operating in either grid-following or grid-forming mode based on system needs.

2.Control and Communication:

- The Energy Management System (EMS) and BESS are managed by Sungrow.
- Woodward's easYi and easYgen products control the PV inverters and genset, respectively.
- Communication is established via Modbus TCP/IP (for EMS, easYi, and PV inverters) and hardwired connections (for EMS, easYgen, and the genset).

3.Operational Workflow:

- Under normal operation, the BESS and PV system supply the facility's load demand, with the EMS managing the system.
- If the BESS's State of Charge (SoC) is low and PV output is insufficient, the EMS signals easYgen to start the genset in grid-following mode.
- In cases where the EMS fails (e.g., due to communication issues), the easYgen immediately disconnects the BESS and PV from the busbar and switches the genset to grid-forming mode to supply power to the site load.
- Once the EMS resumes operation, the system reverts to normal operation, with the BESS and PV system taking over.

4.Redundancy:

- The system is designed with redundancy, ensuring continuous power supply to the facility's loads using either the BESS/PV system or the genset, depending on availability.

During normal operation, the Battery Energy Storage System (BESS) and photovoltaic (PV) system work in tandem to supply power and meet the facility's load demands. The Energy Management System (EMS) actively manages the BESS and communicates with the PV system through the easYi controller, using the Modbus TCP/IP protocol to ensure a balance between power generation and consumption.

If the BESS's State of Charge (SoC) drops to a low level and the PV output is insufficient to meet the load, the EMS directs the easYgen controller to activate the genset in grid-following mode. In this configuration, the genset simultaneously supplies power to the load and recharges the BESS, ensuring uninterrupted operation.

In the event of an EMS failure, such as a communication breakdown, the easYgen automatically disconnects the BESS and PV system from the busbar and transitions the genset to grid-forming mode. This makes the genset the sole power source for the site, maintaining reliable supply to the load.

Once the EMS regains functionality, the system seamlessly returns to normal operation. The easYgen shuts down the genset, while the BESS and PV system resume their roles in regulating voltage and frequency, restoring the balance between power generation and demand.

Impact:

The implementation of the off-grid microgrid delivered significant benefits:

1.Cost Savings:

- Eliminated the high costs associated with extending the utility grid to the remote site.
- Provided a more economical solution by leveraging renewable energy sources and on-site power generation.

2.Environmental Benefits:

- Reduced reliance on fossil fuels by integrating solar energy into the system.
- Lowered greenhouse gas emissions, supporting sustainable energy practices.

3.Energy Resiliency:

- Eliminated dependence on the main utility grid, ensuring energy self-sufficiency.