



# SB ELECTRONICS ENGINEERING & CONTROL (PVT) LTD

*what gets measured, gets managed*

SB Electronics Engineering and Control (Pvt) Ltd. (SBEEC) is a reputable name in the market for **energy management solutions**. SBEEC is a premium energy services company established in 1996 as an **energy services business**.

We offer solutions based on **cutting-edge technologies** involving Artificial Intelligence, Machine Learning, and Data Analytics driven by decades of experience in the energy market with a presence across Pakistan. SBEEC currently provides a wide **range of energy solutions**, including the design and implementation of energy-saving projects, energy management, energy infrastructure outsourcing, energy supply, and risk management.

## What is a Microgrid?

A group of **interconnected loads** and **distributed energy resources** within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect and disconnect from the grid to enable it to operate in both **grid-connected** or **island-mode**.



A microgrid can be a few **kW to 10s of MW** but mainly it is a **self-sufficient energy system** that serves a discrete geographic footprint, such as a college campus, hospital complex, business center, Industry, Industrial Parks, or residential Communities.

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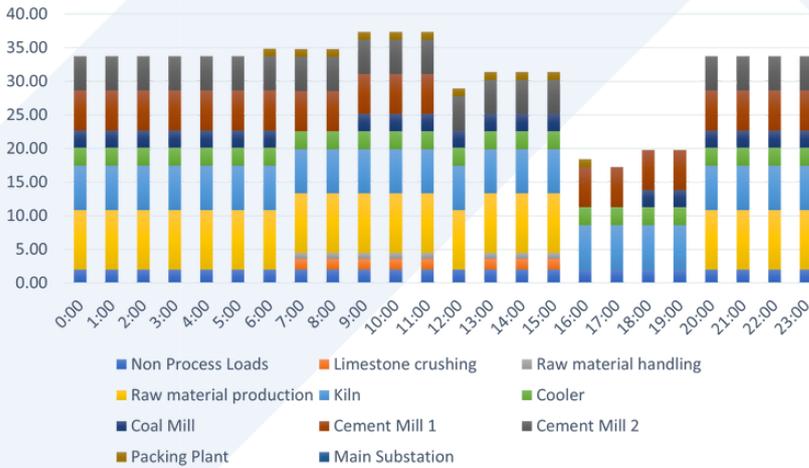


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# AC Primary Load Modeling

The MG development starts with first modeling your **AC load** both active and reactive requirements while making considerations for both the steady-state energy requirements and the transient behavior of the load. An Energy system should be first designed for **optimizing** its steady **State operation** and then the **transient considerations** including protection and control integrated to ensure system Stability, Safety, and a sustainable and resilient operation.



## Benefit

Cost-effective operation with system stability and safety ensured.

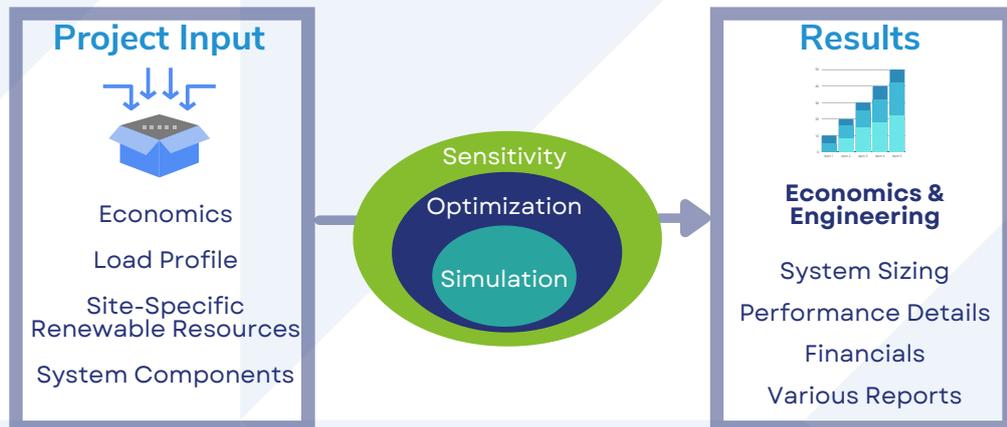
## AC PRIMARY LOAD

<b>Annual Units</b>	249.081	GWH/YR
<b>Daily Units</b>	682	MWH/DAY
<b>Peak Value</b>	37.308	MW
<b>Working Days</b>	330	DAYS
<b>Standby Load</b>	2	MW

# MG - Feasibility Assessment

The financial, resilience and sustainability impacts will be different for each Microgrid.

An initial feasibility assessment by a qualified team will uncover the benefits and challenges you can expect from your system.



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# Microgrid Operations

## HOW DOES A MICROGRID WORK ?

**Intelligent controls** and **Management software** are at the core of Microgrids. Many control systems can track the energy needs of the facility and determine how to supply the needed energy. These control systems consider and evaluate **factors** such as **cost, fuel supply, weather, and energy load required** to decide which **Distributed Energy Resources DERs** to utilize.

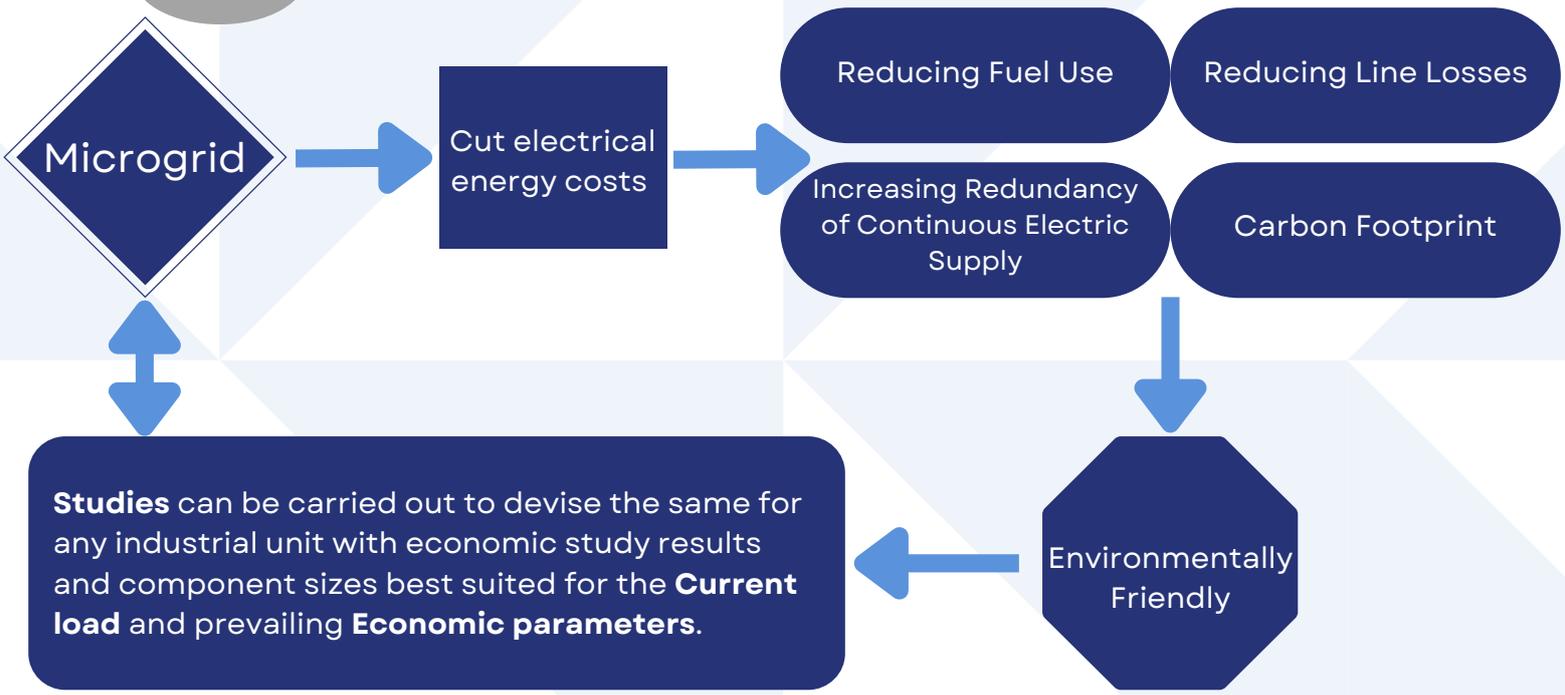
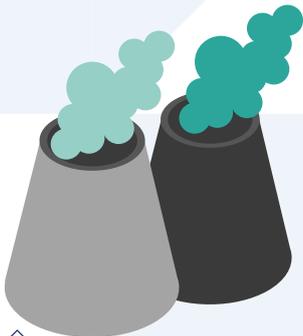


Microgrids can be made up of many different assets. These control systems are the key element to manage the dispatch of the **best asset** based on these factors.



Microgrids may also feature **energy storage systems** to capture the energy produced at one time for use later.

## WHY WOULD AN INDUSTRY CHOOSE TO CONNECT TO MICROGRIDS?



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# Microgrid - HOMPS

## Hybrid Optimization of Multi Power Sources

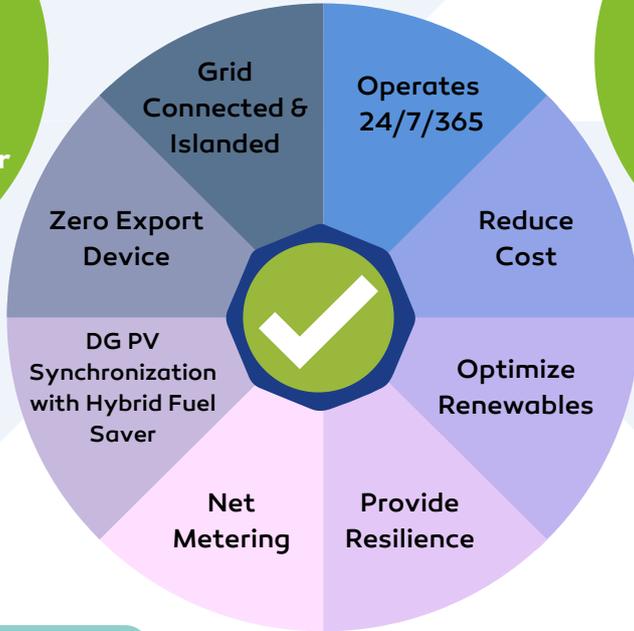
### Benefits

**Other Energy resources**

- Grid Supply
- Solar
- Reciprocating Engines
- Turbines
- Combined heat & Power

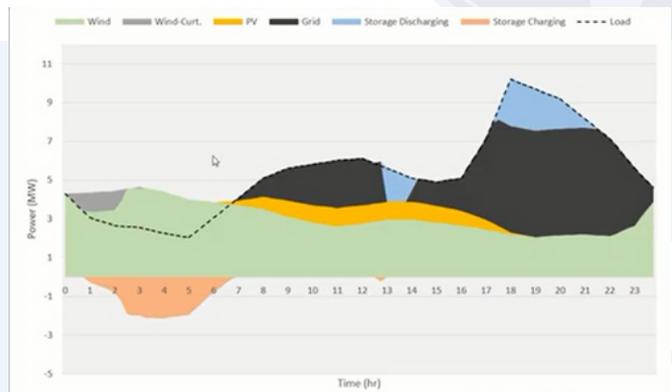
**Microgrid is**

- Local
- Independent
- Intelligent



### MG Controller

- Optimal Dispatch
- Minimize Costs
- Peak shaving
- Curtail Renewables
- Intelligent Load Shedding



### Objectives

- Grid Stability
- Renewable Optimization
- Managed Loads
- Critical Resiliency

### Challenges

- System Design
- Protection & Automation
- Integration & Operation
- Black Start
- Resiliency



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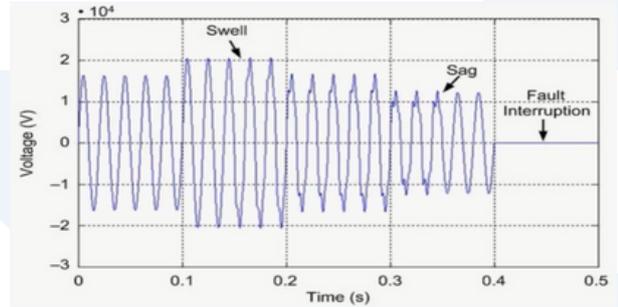
# Power Quality & Energy Monitoring



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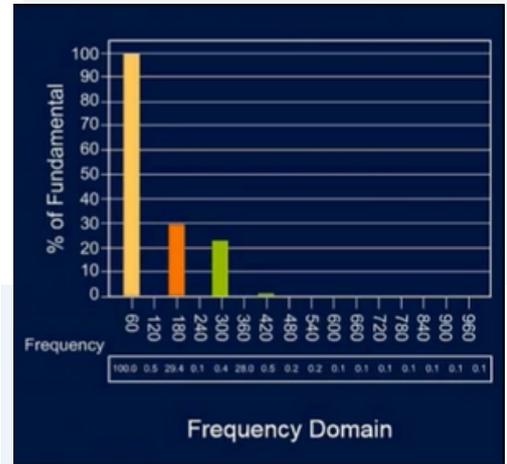
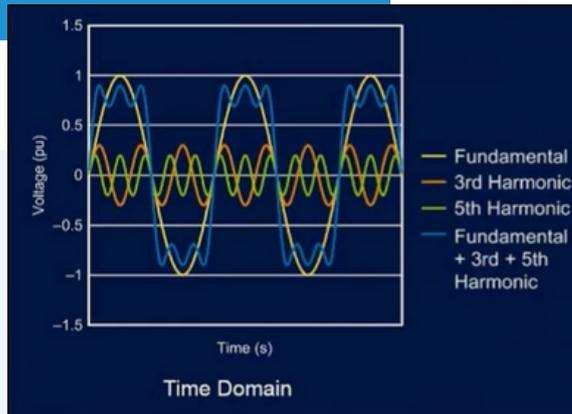
## Voltage Sags, Swells, & Interruptions



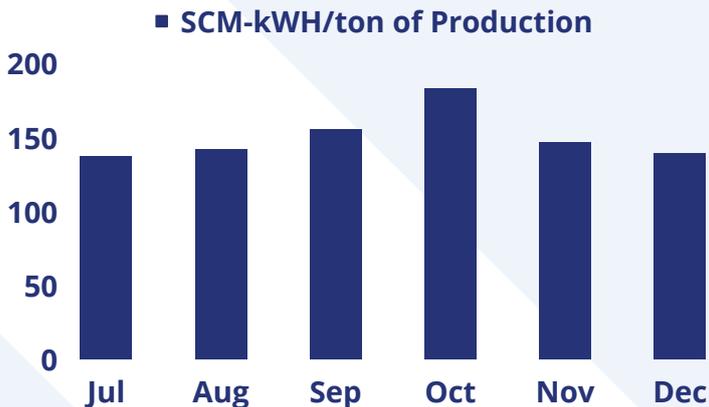
**PQ INDICATORS ASSIST IN ANALYZING THE STATE OF THE SYSTEM**

- Voltage sag, swell, and interruption (VSSI)
- Unbalance
- Harmonics
- Flicker
- Power Factor (PF)
- Crest Factor (CF)

## Harmonics



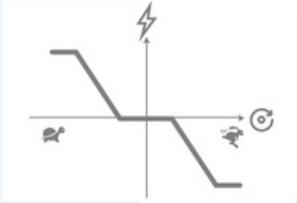
## Energy Performance Indicator (EnPI)



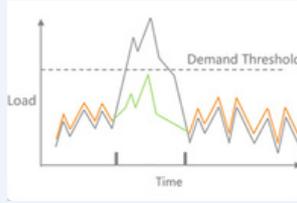
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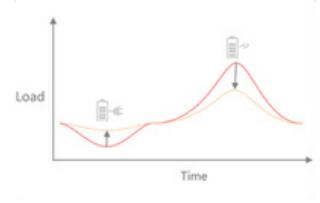
# Battery Energy Storage - BESS



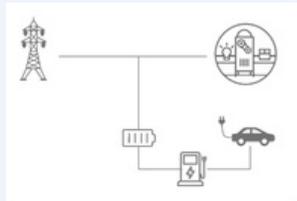
**Grid Support**



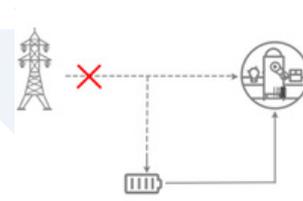
**Demand Change Management**



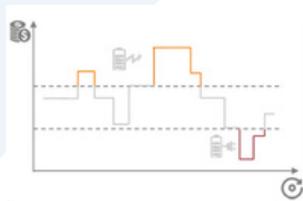
**Load Shifting**



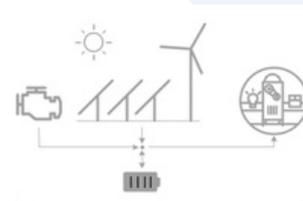
**Energy Buffer**



**Backup Power**

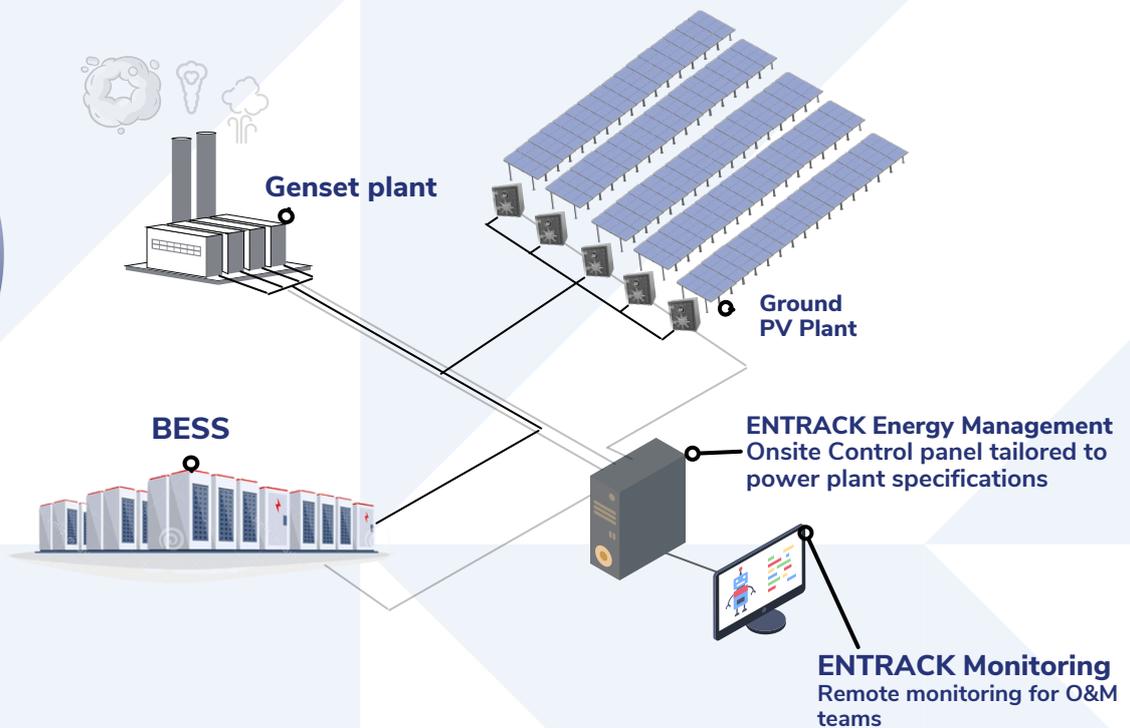


**Renewable Energy Optimization**



**Off-grid Power Supply Optimization**

## NETWORK ARCHITECTURE



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