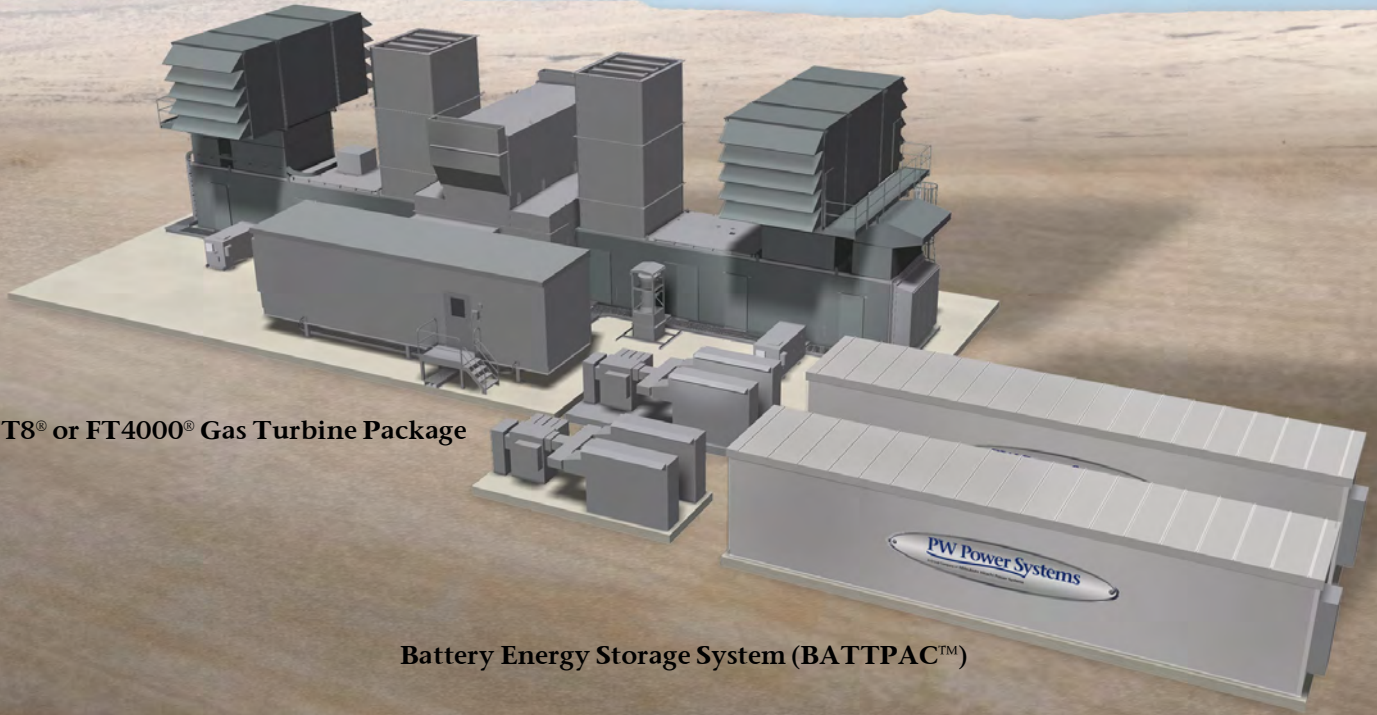


BATTPAC™

Flexible and Environmentally Friendly Gas Turbine + Energy Storage Hybrid System



FT8® or FT4000® Gas Turbine Package

Battery Energy Storage System (BATTPAC™)

Challenge

To reduce carbon emissions, organizations are adding solar, wind, and other renewables to power grids around the globe. When there is too little sun or insufficient wind, operators face supply disruptions, forcing new approaches to power generation. Existing thermal plants need to become faster and more flexible to compensate for this variability in renewable generation.

Solution

FT4000® and FT8® flexible gas turbine packages already compliment renewable generation, improving grid stability through quick start-ups and rapid response to load variations. To further address today's challenges, the FT4000 or FT8 unit's speed and flexibility is greatly enhanced by incorporating the BATTPAC™ battery system, giving your plant a response time of less than 0.1 second.

Operational Benefits

- Instantaneous full output capability of the battery (less than 0.1 second)
- Meets synchronized spinning reserve requirements
- Achieves base load in less than five minutes
- Boosts megawatt power output (simple-cycle)
- Allows for clean black start (no liquid fuel requirement)
- Improves fault-ride-through capability
- Enables real time frequency regulation

Commercial Benefits

- Increases revenue opportunities
- Saves fuel and lowers greenhouse gas emissions
- Optimizes ROI
 - Utilizes existing interconnect and equipment
 - Lower installation cost
 - Further expands ancillary services revenue

PW Power Systems

A Group Company of  MITSUBISHI POWER

 **ENERGY SERVICES**

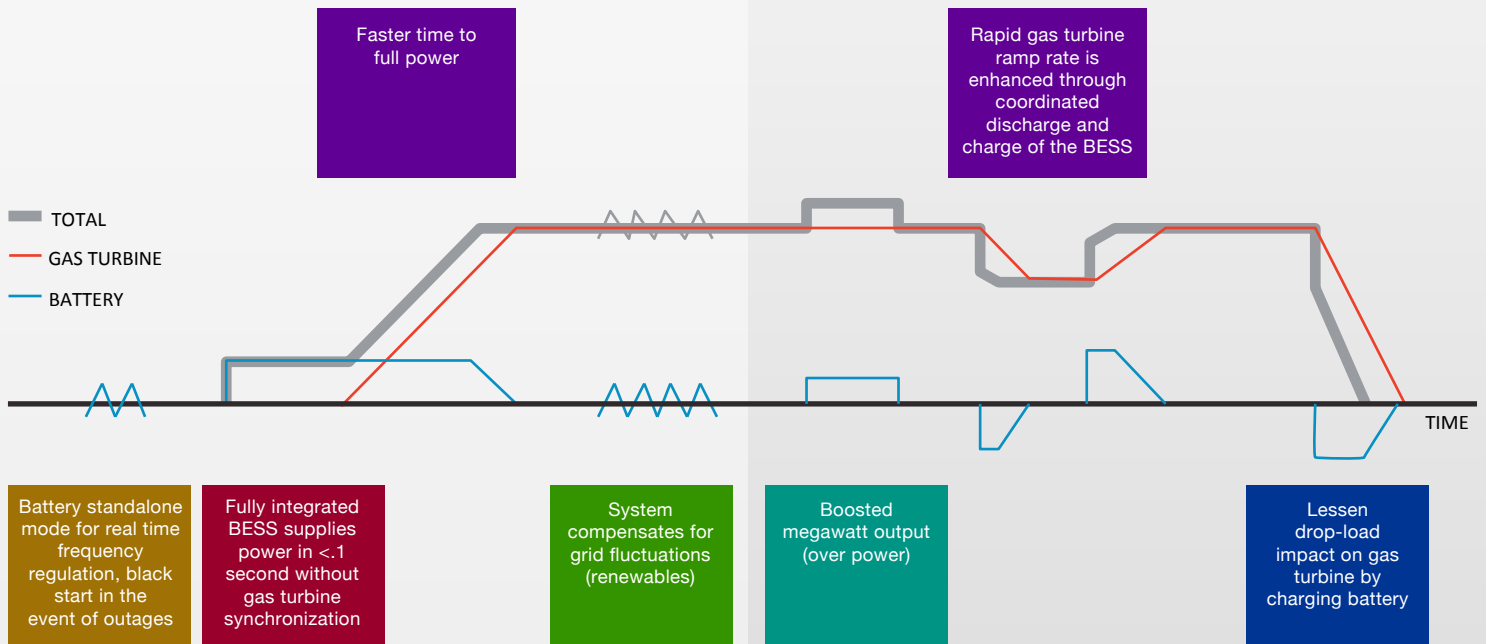
System Overview

The BATTAC™ combines a fast, flexible gas turbine with the near instantaneous responsiveness of a battery energy storage system to facilitate the integration of renewable energy assets. This improves operational efficiency, economic returns, and environmental performance.

Main Components

1. PWPS FT4000 or FT8 gas turbine (open-cycle)
2. Lithium-ion battery energy storage system
3. Medium voltage power station
4. Hybrid system controller

Optimized Gas Turbine and Battery Energy Storage System Operations



Aero-derivative Gas Turbine

- Start-up in less than five minutes
- Output: Single- and dual-engine

FT8	30 MW / 60 MW
FT4000	70 MW / 140 MW
- Rapid ramping

FT8	50% in one minute
FT4000	50% in one minute
- Synchronous Condenser Operation Mode (without gas turbine operation)

Battery Energy Storage System

- Standard power: 5 MW/4.3 MWh
- Standard footprint: 53' x 32' x 9'
- Alternate battery sizes can be customized to maximize customer value

Please contact us for a tailored solution:

BATTAC@pwps.com
888-677-1618