Micro-grid’s: Challenges and Solutions

Tony Siebert
ZBB Energy
Micro Grid Conventional Architecture

Off Grid Non-Modular Power Plant

Each Wind Turbine
Each PV
Always On Gen Set
Energy Storage
Energy Storage

Master System Controller

Power Flows

Control kW and/or kVAR to ZERO

Circuit Breakers & Meters

“Micro” Grid & Loads
480VAC, 3PH, 50/60 Hz

kW
kVAR
Micro Grid Conventional Architecture
Off Grid Non-Modular Power Plant

• Not a factory integrated and tested Energy Storage and Power Conversion System (PCS)

• Customer required to set up control dispatch or for load following

• Energy Storage suffers extra ‘round-trip’ across inverters (6 to 10% efficiency lost)

• Multiple inverters from various manufacturer’s

• Challenging to expand or change given typical microprocessor controls

• At least one (1) gen set is required to ALWAYS run to provide voltage & frequency regardless of load on it.
Micro Grid Conventional Architecture
Off Grid Non-Modular Power Plant

Operating independent of the grid and face these challenges?

• Often entirely reliant on diesel generation sets with their high costs of supply and maintenance

• Desire to have wind or solar as a main energy source but they are too variable

• Remote area with no connection to grid resources and no back up

• Integration of multiple and various supplies of technology, leads to conflicting requirements and needs

Need for a platform configuration that supports your electrical demands – while meeting your requirements for operating independent of the grid.
Optimized Micro-Grid Solution
Optimized Micro-Grid Solution

• Factory Integrated and tested Energy Storage and Power Conversion System (PCS) with connections for multiple power inputs

• Fully managed energy and power between the generation and the load demand

• Energy Storage provides “after hours” power plant operation

• Complete Reactive and Active Power supply for the load and/or grid demand

• Can be equipped & configured to operate ‘independently’ of the grid (as an EPS) or even have the grid as a power input
Optimized Micro-Grid Solution
ZBB EnerSection™
Power & Energy Control Center

- **ZBB EnerSection** - “Cisco router” for power
- Microgrid-in-a-box
- Patented common DC bus
- Identical power modules; software configured
- Easily expanded in the field
- Proprietary inverters to 125 kW; ETL certified to UL 1741
- -30°C to +50°C temperature range
ZBB EnerStore™ Energy Storage System

- Zinc-bromide flow batteries
  - Lowest long-term cost of ownership
  - Wide temperature range
  - 1-8 hour discharge times
  - 5x energy density of vanadium flow batteries
- Modular and transportable
- Scalable from 50kWh and up
- Environmentally friendly, easy to permit
- Multiple patents and trade secrets
Optimized Micro-Grid Solution

- The ZBB EnerStore™ Zinc-bromide flow batteries or other energy storage devices, the platform creates an expandable system that independently optimizes the supply of each generating source while providing a grid-forming, load following steady-state power output to the electrical loads.

- The ZBB EnerSystem integrated energy management platform:
  - Provides a continuous supply of energy and optimizes all of the interconnected resources
  - Reduces the dependence on gen sets and minimizes fuel consumption
  - Eliminates the variable output of renewable energy sources
  - Easily integrates one or multiple energy generation sources now and in the future
  - Provides storage devices for both inexpensive and premium application needs
  - Uses off-grid inverters or inverter sets that form their own highly reliable micro-grid
The ZBB EnerSystem is a solution that creates an independent power plant that:

- Ensures constant voltage and frequency
- Eliminates the need for ramp control of the renewable energy supply
- Gives you control over your active/reactive power dispatch, regardless of your generation sources
- Provides hybrid combinations of storage with generator start/stop signaling
- Minimizes the headaches from fuel supply bottlenecks and market pricing fluctuations

Optimized Micro-Grid Solution
Thank you

Tony Siebert
ZBB Energy Corporation
www.zbbenergy.com

TEL: +1 262 253 9800 ext. 153
MOBILE: +1 262 389 7215