DCS SYSTEMS FOR PV AND MICROGRIDS

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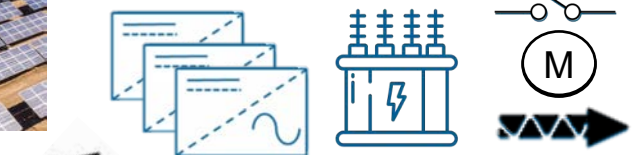
Renewable Energy Education for a Sustainable Future

Distributed Control System

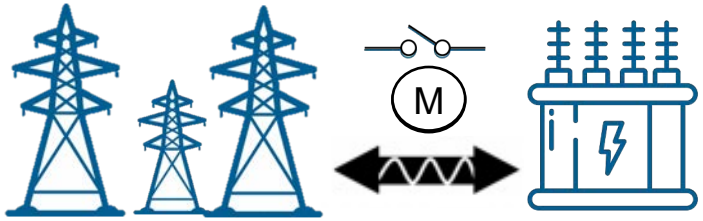
- Control system that coordinates and supervise an entire plant of many varying process
- "SCADA"
- Process oriented system with close loop control
- Network Profinet (Ethernet/Fiber Optic)

- **Operator/Engineering Stations:** Graphic UI, logic, alarm management, reports, etc
- **Servers:** Dataserver, historian, cybersecurity, etc
- **Controllers:** Functional logic, IO coordinator
- **Field devices:** Modules, meters, process points communication.

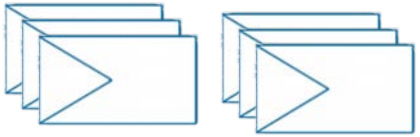
PV utility scale system



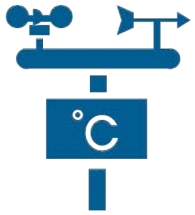
Main Substation

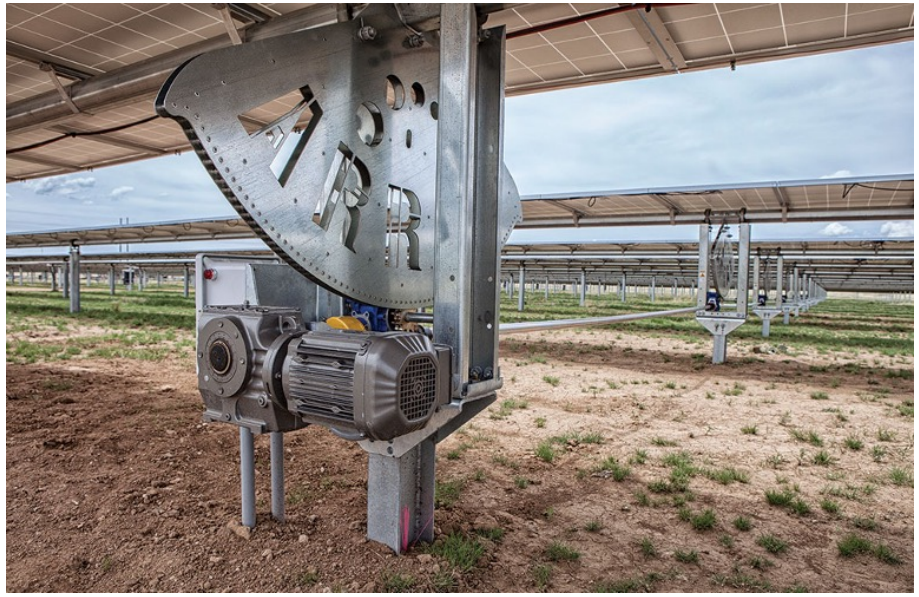


Electric Grid

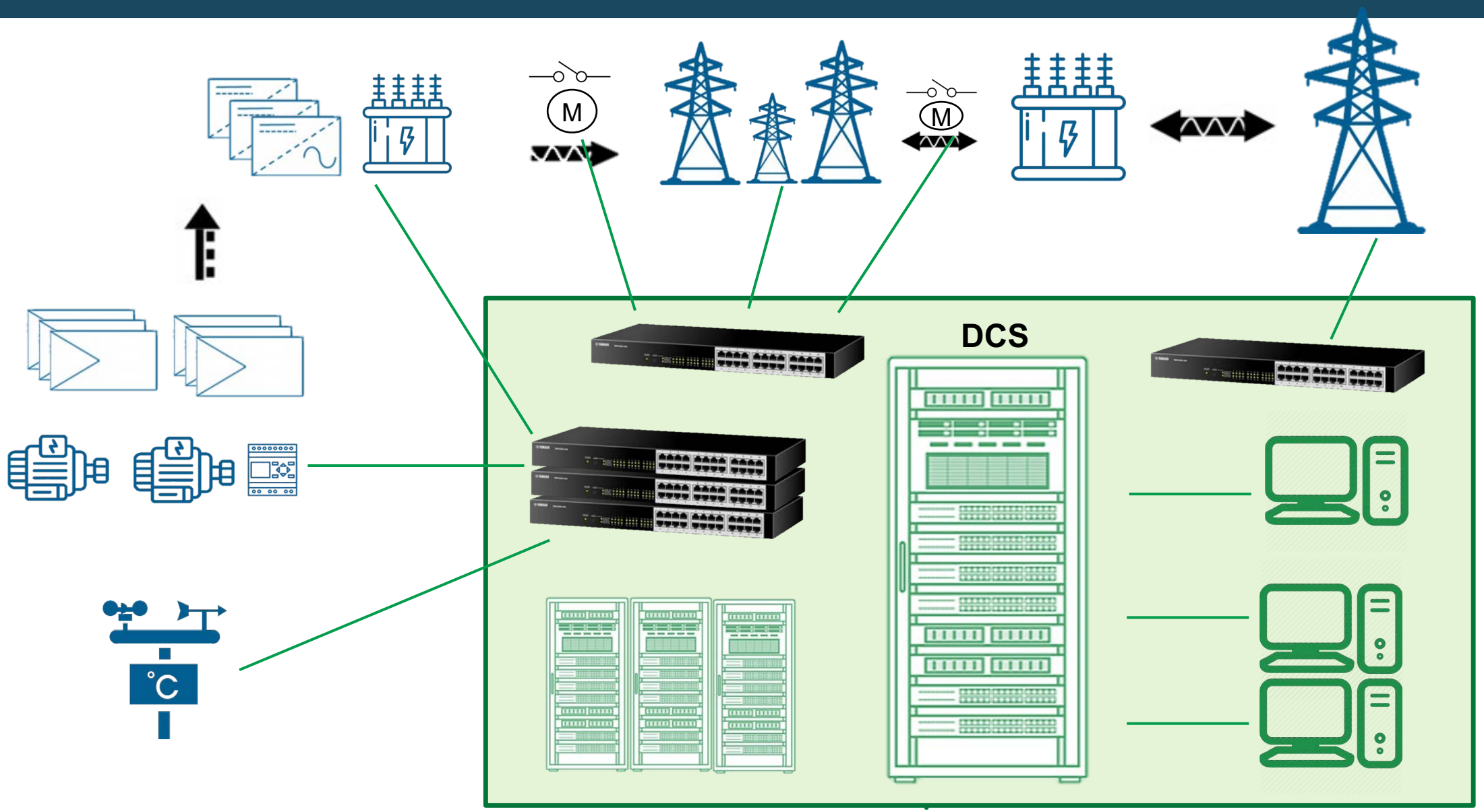


Solar Trackers





DCS- Solar Farm



DCS- Solar Farm

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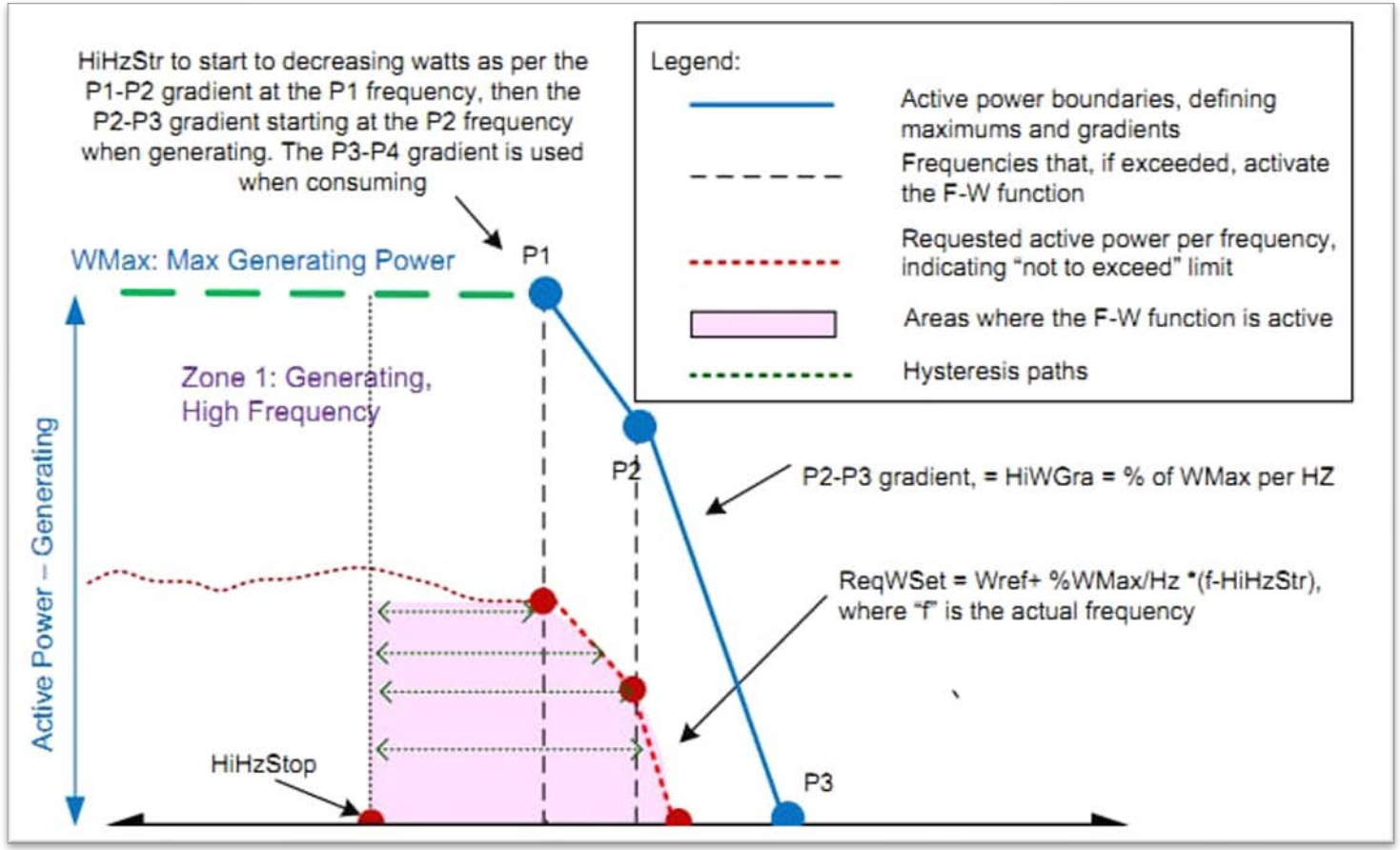
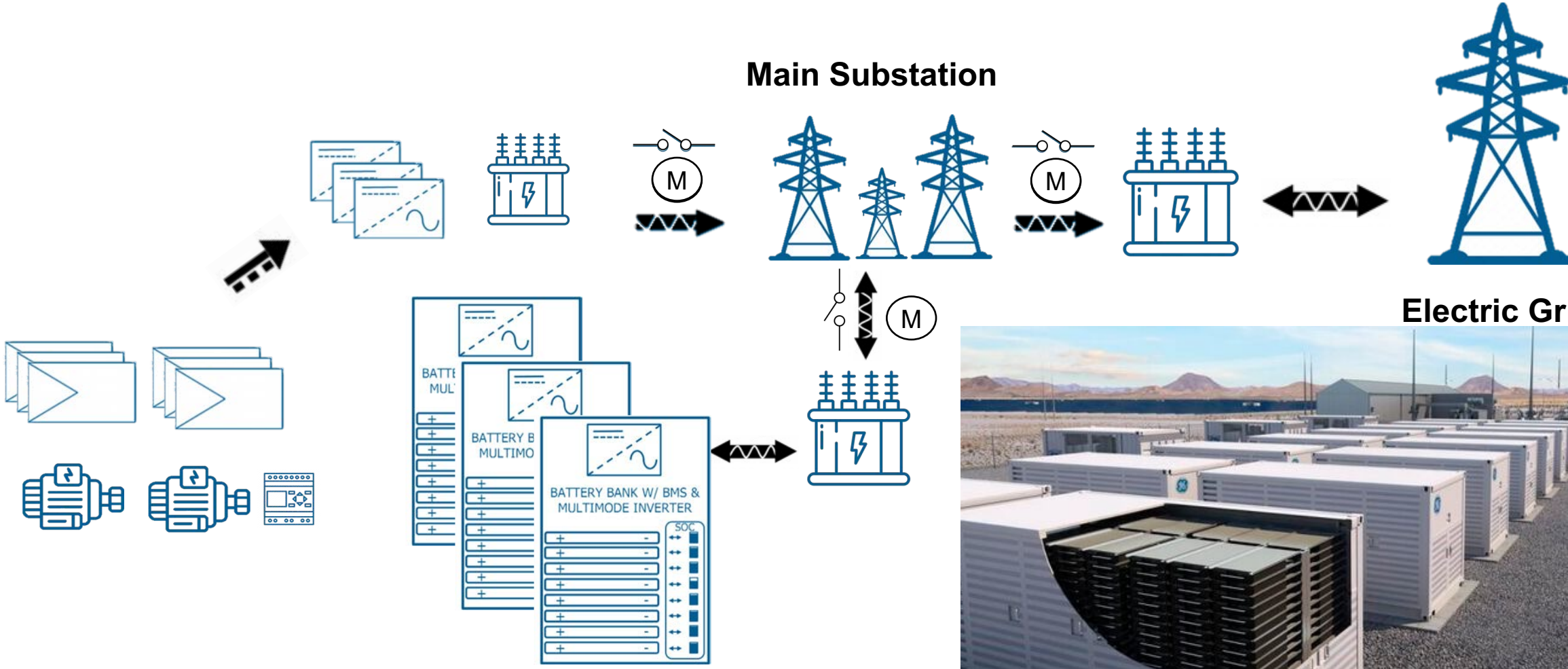
- PV Tracker optimization
- Substation Control and metering
- Global/individual inverter setpoints
- PV input data readings for troubleshooting
- Met station forecast and efficiency optimization
- Network status visualization

- ❑Voltage - Active Power Correction
- ❑Frequency - Active Power
- ❑Freq/Volt Droop Control
- ❑Power Factor Compensation



Utility Scale Microgrid



DCS- Microgrid

- PV Optimization
- Substation Control and metering
- BESS Optimization protocols
- Energy compensation
- Energy cost saving modes
- Network status visualization

- ❑Volt/Freq - Reactive Power Correction
- ❑Peak Shaving
- ❑Energy cost arbitrage
- ❑Active Power Smoothing
- ❑Black start - backup

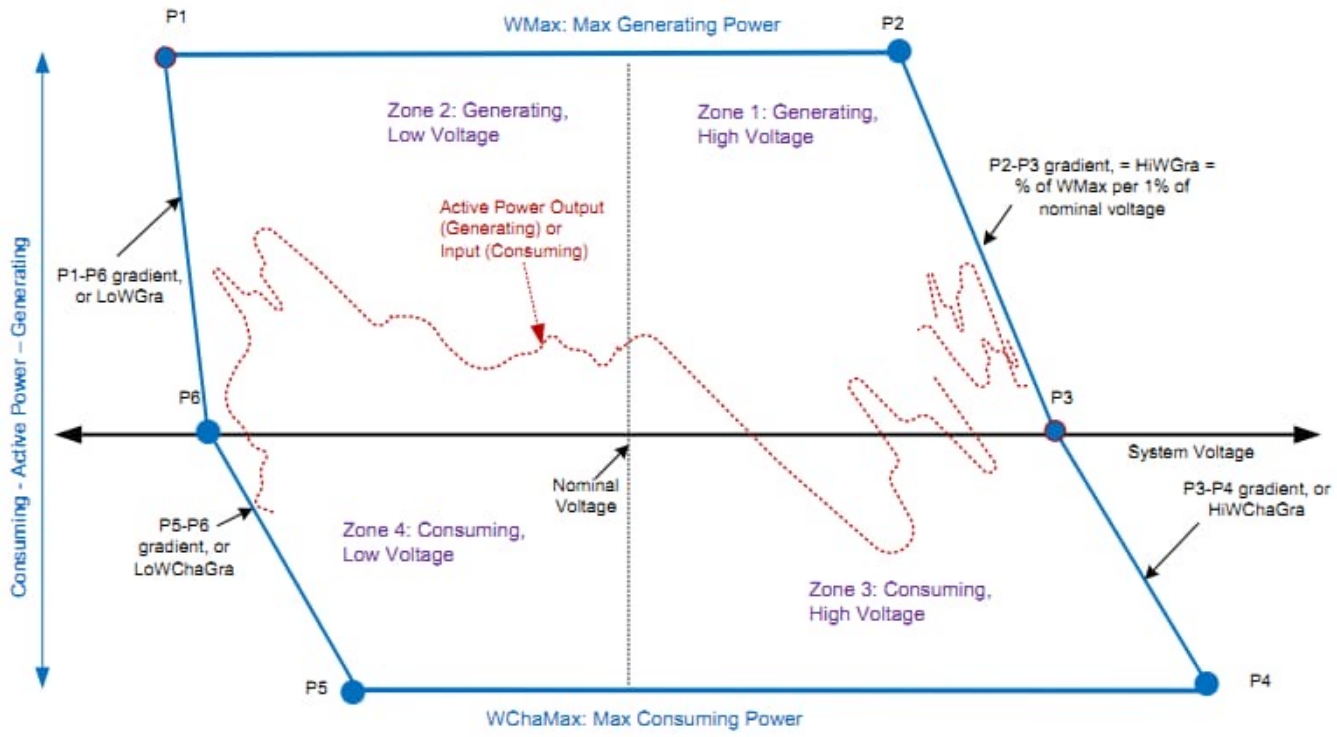


Figure 28 – Example Volt-Watt Curve

Comercial Microgrid