**Micro Wind Power Generator with Battery Energy Storage for Critical Load**

**ABSTRACT:**

In the micro-grid network, it is especially difficult to support the critical load without uninterrupted power supply. The proposed micro-wind energy conversion system with battery energy storage is used to exchange the controllable real and reactive power in the grid and to maintain the power quality norms as per International Electro-Technical Commission IEC-61400-21 at the point of common coupling. The generated micro wind power can be extracted under varying wind speed and can be stored in the batteries at low power demand hours. In this scheme, inverter control is executed with hysteresis current control mode to achieve the faster dynamic switchover for the support of critical load. The combination of battery storage with micro-wind energy generation system (μWEGS), which will synthesize the output waveform by injecting or absorbing reactive power and enable the real power flow required by the load. The system reduces the burden on the conventional source and utilizes μWEGS and battery storage power under critical load constraints. The system provides rapid response to support the critical loads. The scheme can also be operated as a stand-alone system in case of grid failure like a uninterrupted power supply. The system is simulated in MATLAB/SIMULINK and results are presented.

**KEYWORDS:**

1. Battery energy storage
2. Micro-wind energy generating system

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SOFTWARE: MATLAB/SIMULINK

BLOCK DIAGRAM:

Fig. 1. Scheme of micro-wind generator with battery storage for critical load application.
EXPECTED SIMULATION RESULTS:

Fig. 2. (a) Source current. (b) Inverter injected current. (c) Load current.

Fig. 3. (a) Source current. (b) Load current. (c) Inverter-injected current.
Fig. 4. (a) DC link voltage. (b) Rectified current of wind generator. (c) Current supplied by battery. (d) Charging-discharging of dc link capacitor.

Fig. 5. (a) Realization of transfer function. (b) Controller performance.

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Fig. 6. Source current and source voltage at PCC.

Fig. 7. (a) Source current. (b) FFT of source current.

Fig. 8. (a) Source current. (b) FFT of source current.

Fig. 9. Active and reactive power (a) at source, (b) load, and (c) inverter.
CONCLUSION:

The paper proposed micro-wind energy conversion scheme with battery energy storage, with an interface of inverter in current controlled mode for exchange of real and reactive power support to the critical load. The hysteresis current controller is used to generate the switching signal for inverter in such a way that it will cancel the harmonic current in the system. The scheme maintains unity power factor and also harmonic free source current at the point of common connection in the distributed network. The exchange of wind power is regulated across the dc bus having energy storage and is made available under the steady state condition. This also allows the real power flow during the instantaneous demand of the load. The suggested control system is suited for rapid injection or absorption of reactive/real power flow in the power system. The battery energy storage provides rapid response and enhances the performance under the fluctuation of wind turbine output and improves the voltage stability of the system. This scheme is providing a choice to select the most economical real power for the load amongst the available wind-battery-conventional resources and the system operates in power quality mode as well as in a stand-alone mode.

REFERENCES:


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