



WIND ENERGY GRID INTERCONNECTION CODE FOR LEBANON

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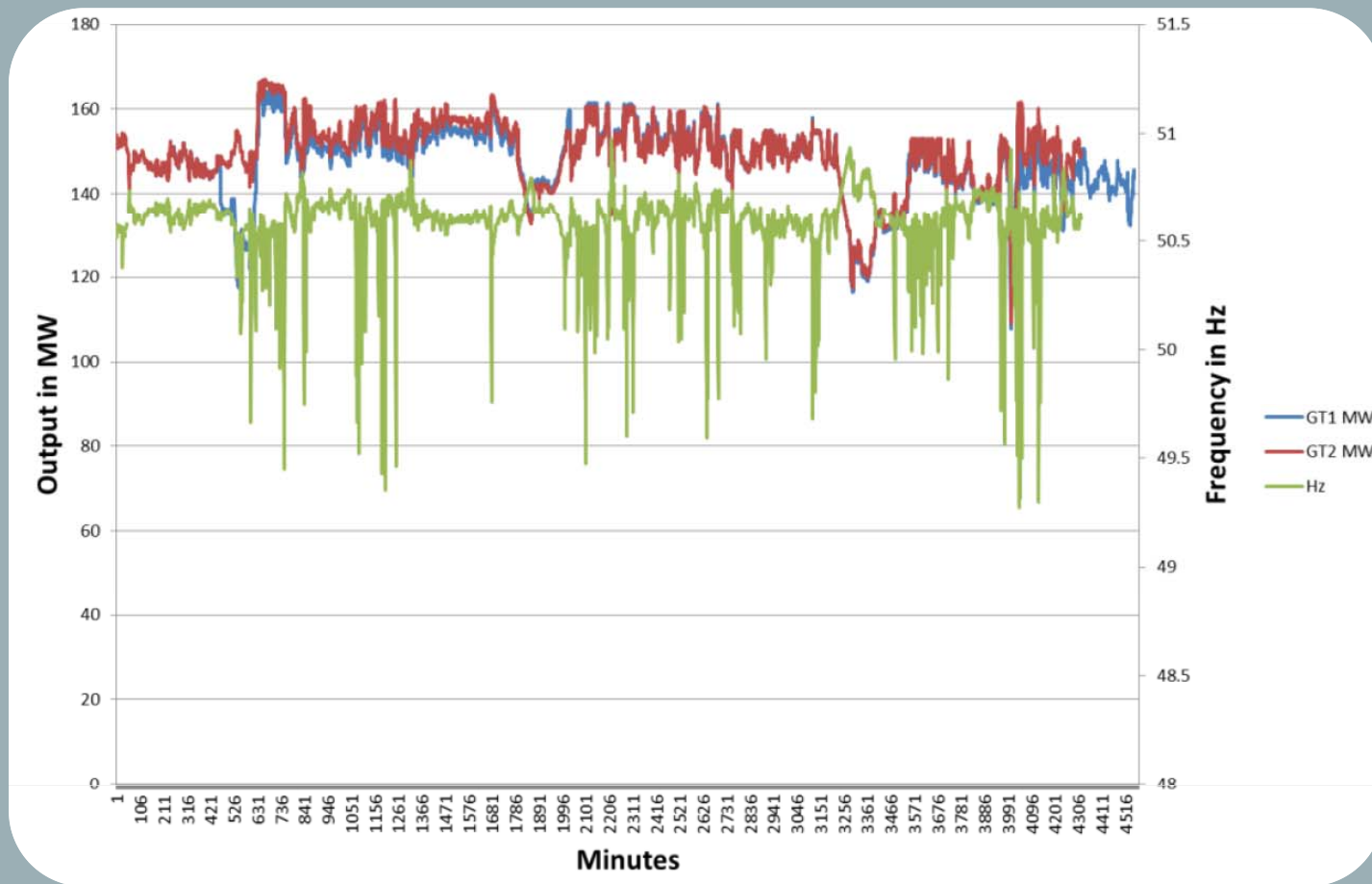
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Introduction

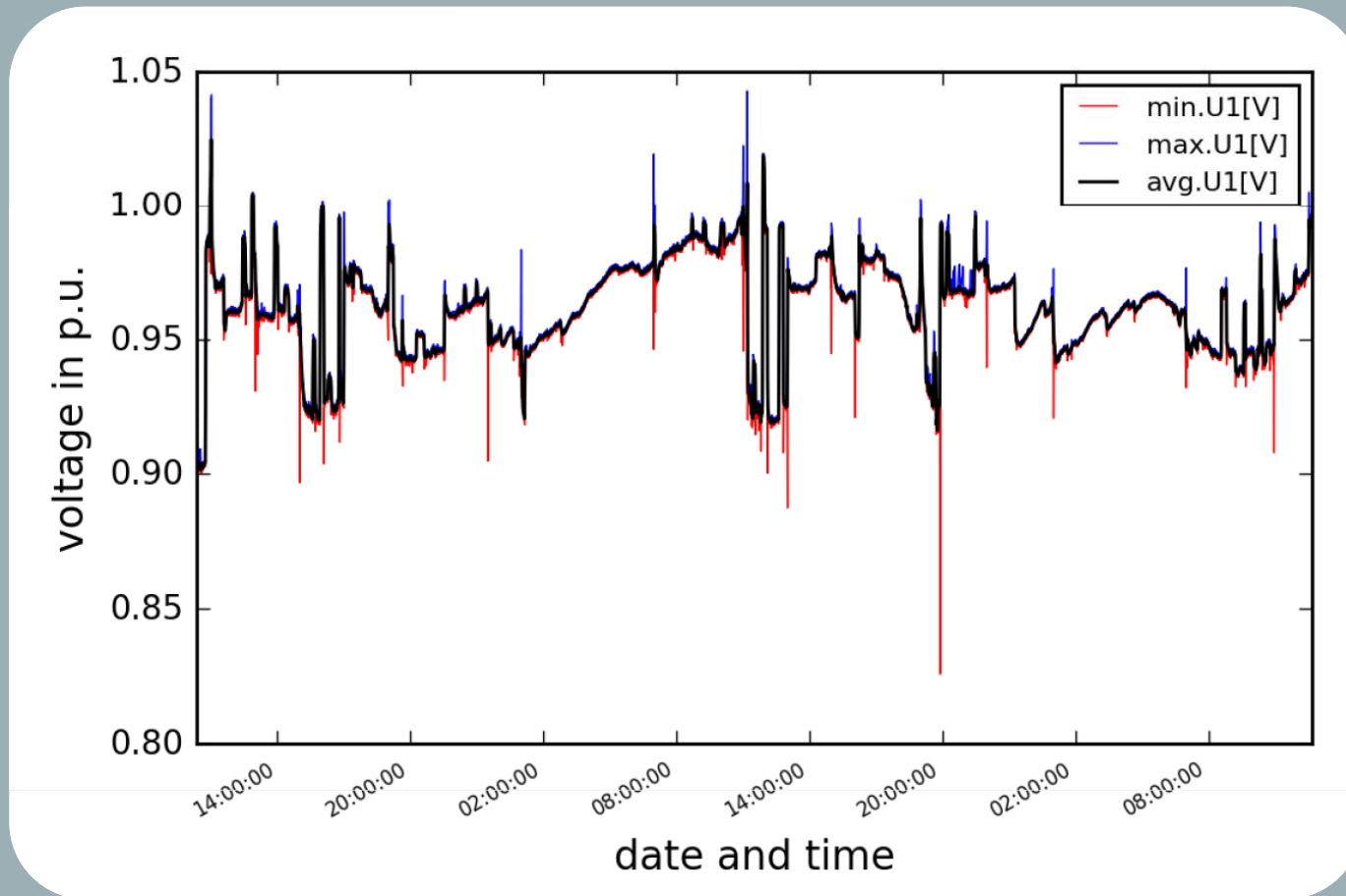
- The Study is initiated by EU-funded UNDP CEDRO and GEF-funded UNDP DREG projects and executed by the German firm Energynautics GmbH and local consultant Mr. Zakaria Rammal
- This code provides the requirements for wind generators connected to the Lebanese transmission grid and operated by Électricité du Liban (EDL).
- These guidelines are tailored to the Lebanese case and shared today on a semi-technical level

Collection and Analysis of Lebanese National Electricity Grid Data



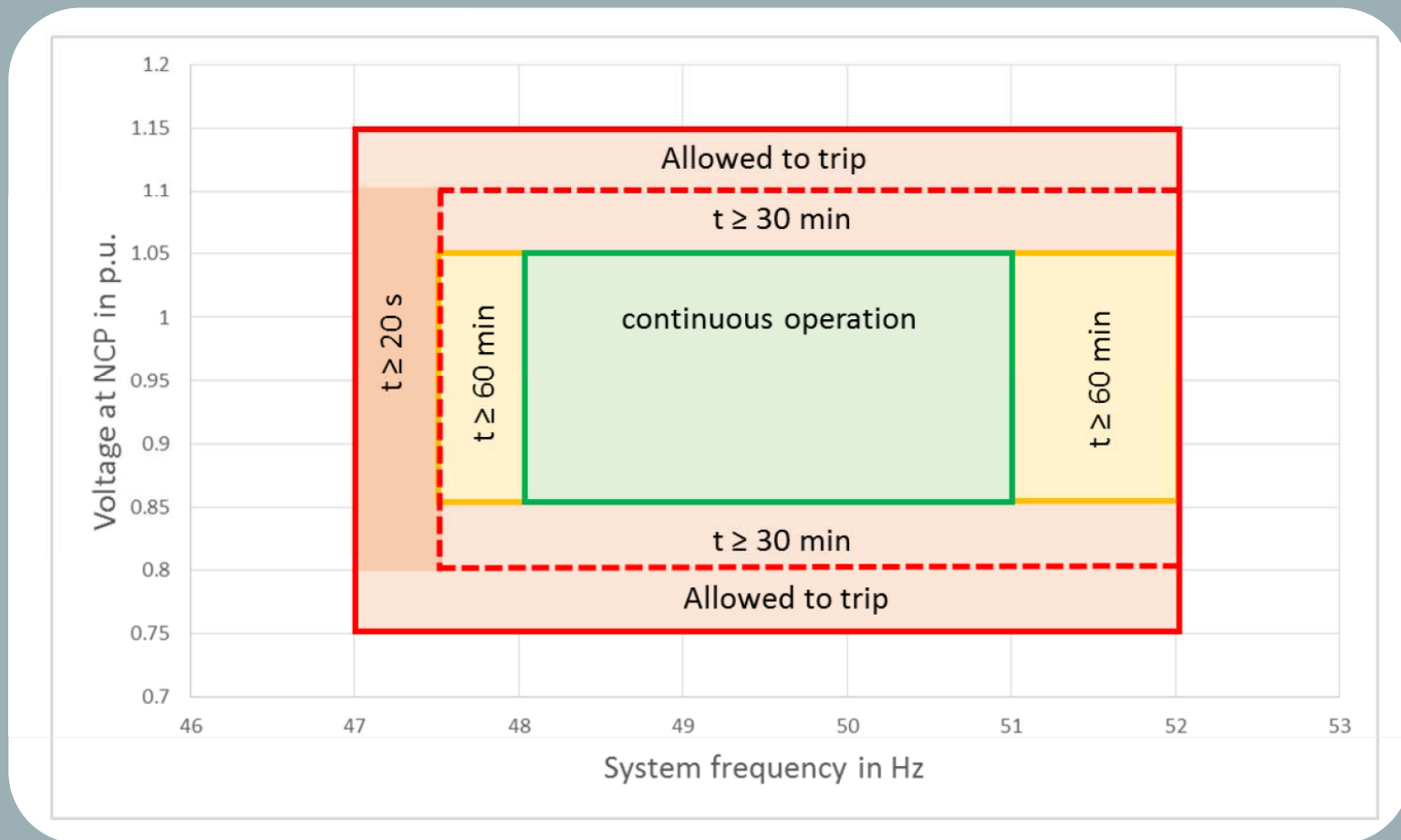
Gas turbines reacting to frequency deviations

Collection and Analysis of Lebanese National Electricity Grid Data



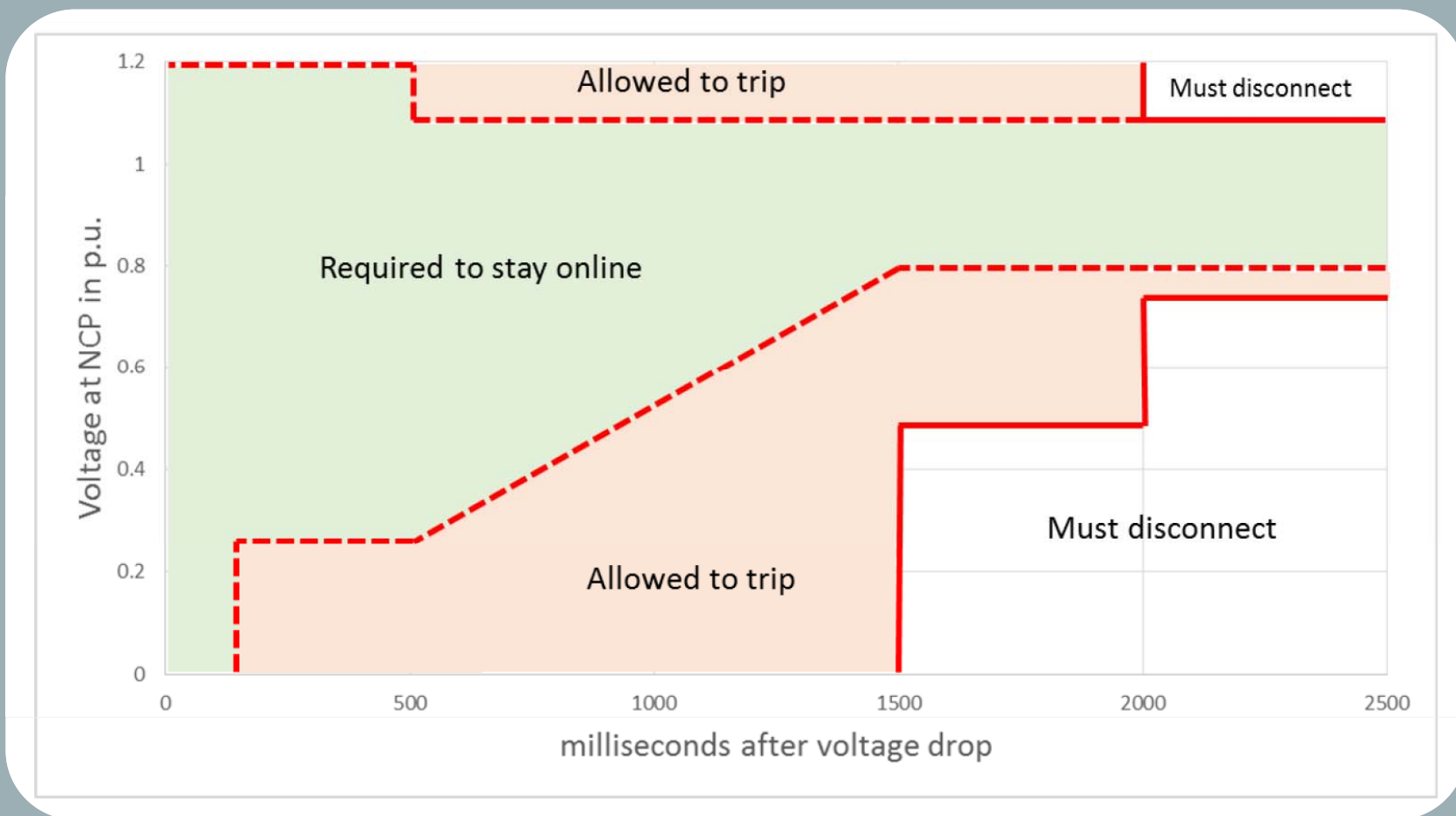
Voltage measured at a 66 kV bus in Kobayyat

Technical Requirements – Frequency Voltage Envelope



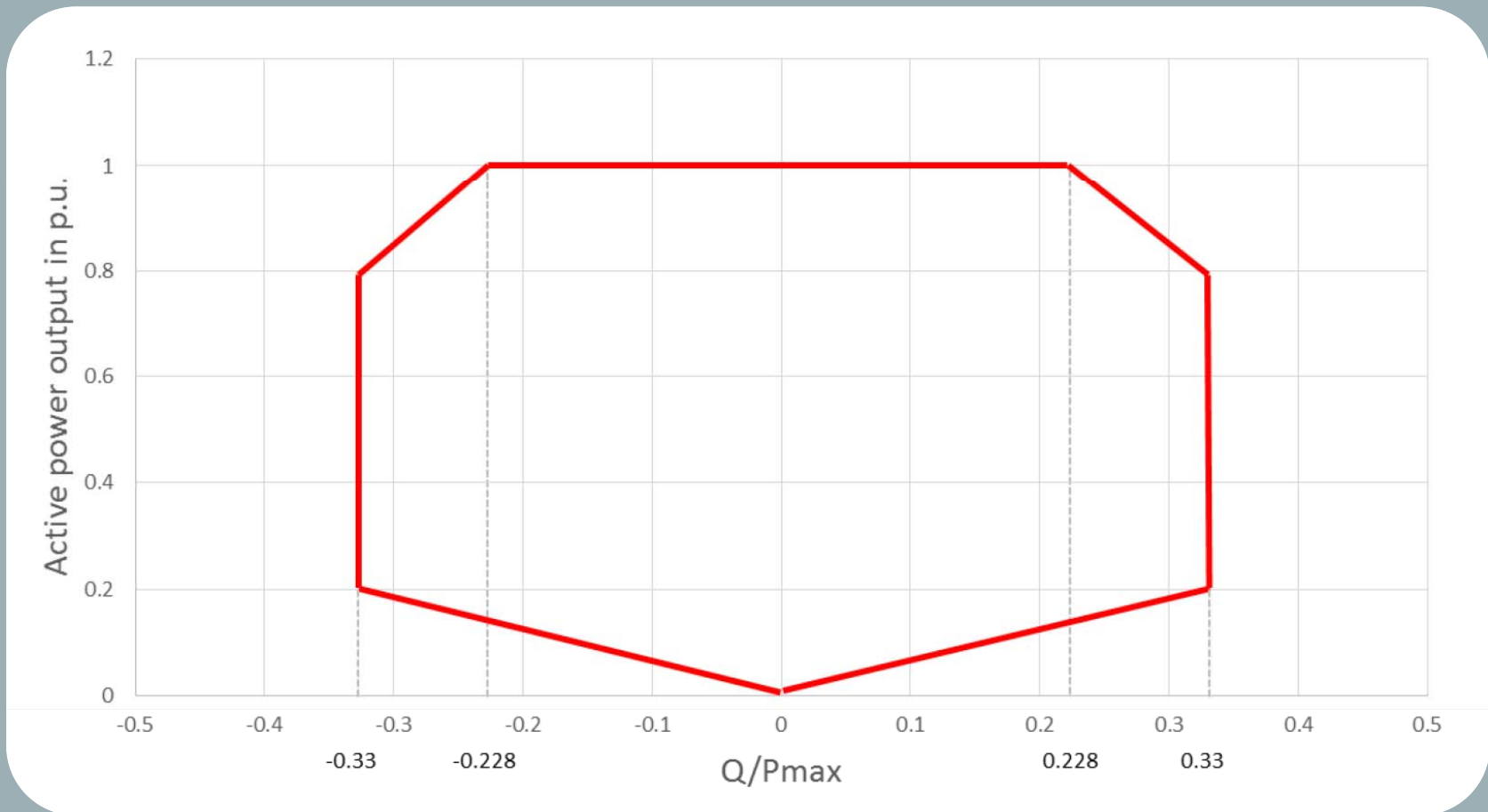
Frequency-Voltage Envelope with Required Operating Times

Technical Requirements – Voltage Ride Through



Low and High Voltage Ride Through Envelope

Technical Requirements – Reactive Power



Minimum Reactive Power Range Required

Technical Requirements – Operator and Plant

- In the cases listed below but not limited to them, the grid operator is entitled to require a temporary limitation of the power feed-in or disconnection of the plant:
 - Risk of islanding
 - Risk to the steady state or dynamic grid stability
 - Within the scope of generation management/feed-in management/grid security management
 - *More cases are detailed inside the report*
- The wind power plant must be capable of automatically reducing their active power in any operating condition and from any operating point to a target value given via SCADA signal by the grid operator within one minute.

Future Considerations

- Électricité du Liban (EDL) to adopt the requirements of the grid code for the development and operation of wind farms in Lebanon
- EDL to follow the Connection Application Process developed alongside the grid code
- MoEW, after mutual discussions with EDL, to adopt the grid code's requirements within the expected agreement for wind farms in Lebanon
- Update of these guidelines should be carried out whenever required

Thank You

Questions

