



Highly flexible platform for testing of MV power electronics systems

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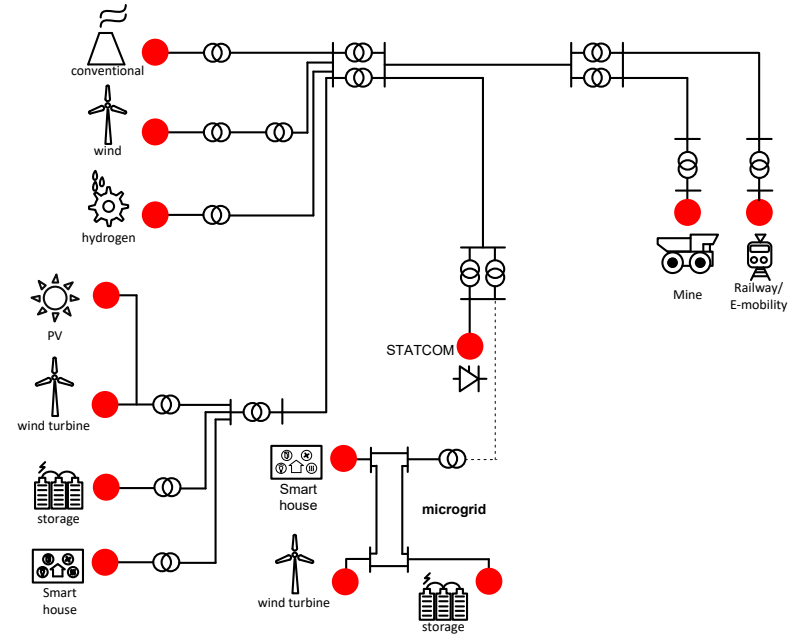
R&D in ABB Ltd.

Requirements for MV PE grid-tied converters

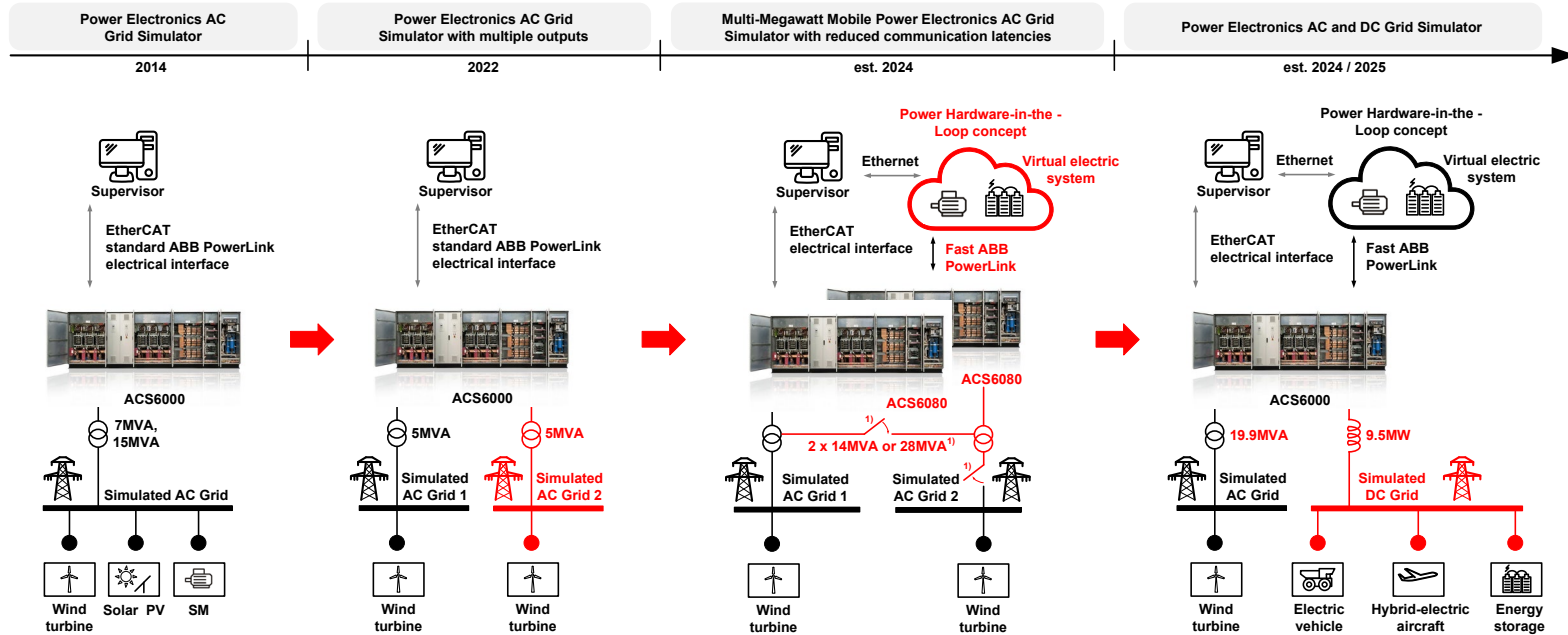
1. Safety and seamless transfer of electrical energy to the grid (Grid Code).
2. Standardized control interface introduced by e.g. ENTSO-E*.
3. High performance (reliability and efficiency).

What are *methods of modeling and testing power converters that can increase confidence of implementation into the electrical grid nowadays?*

*European Network of Transmission System Operators for Electricity

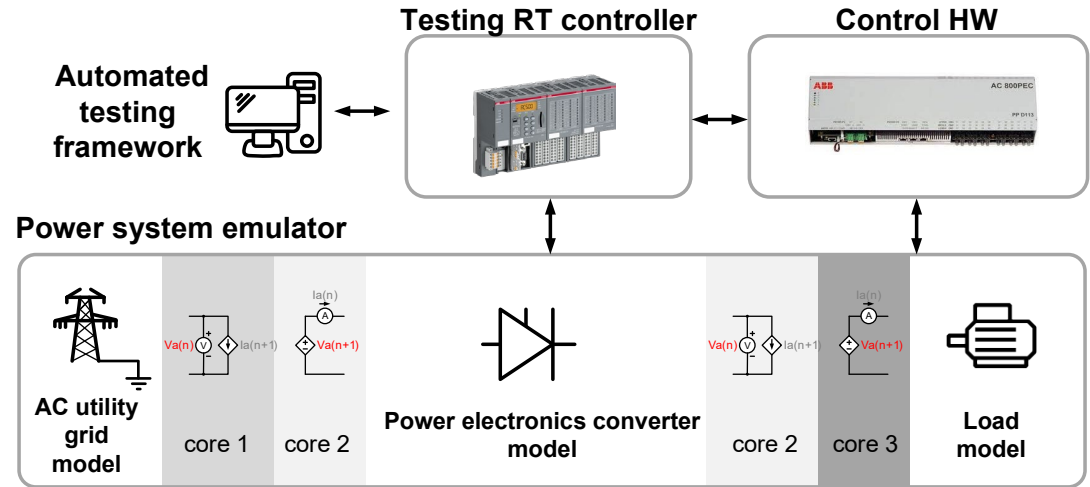


Multi-Megawatt Power Hardware-in-the-Loop system designed by ABB for testing of MV power electronics systems



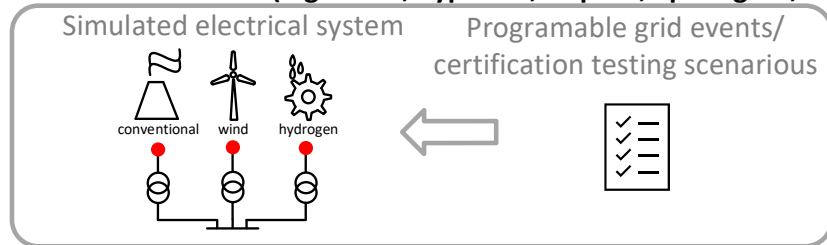
Control Hardware-in-the-Loop (CHiL)

1. Automated testing framework providing certification tests scenarios.
2. High accuracy of control bandwidth evaluation due to application of testing real-time controller.
3. Real-time testing (control HW latencies are considered).
4. Multi-core solution allowing an implementation of complex model with very low sampling time.



Power Hardware-in-the-Loop (PHIL)

Real-time simulator (e.g. OPAL, Typhoon, DSpace, Speedgoat, ...)



Tests
references/
results



Automated
testing
framework

References \leftrightarrow Measurements



Power Electronics Grid
Simulator (ACS6080)

3
power flow



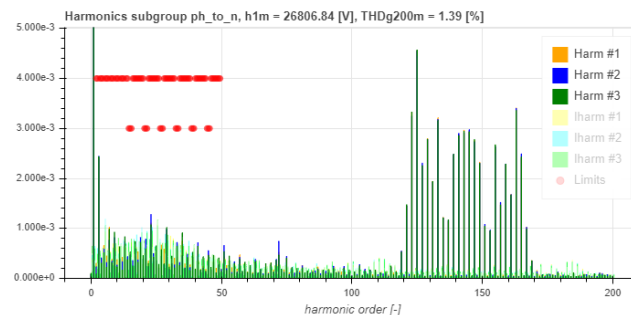
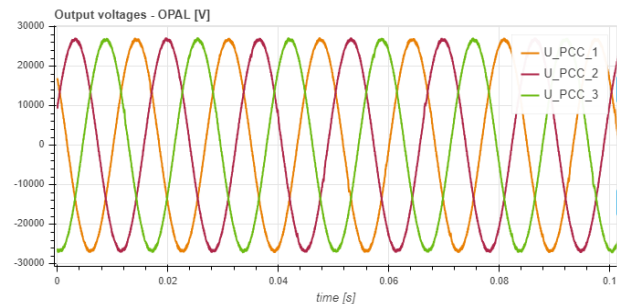
Tested power electronics motor drive
system + control HW

3
power flow



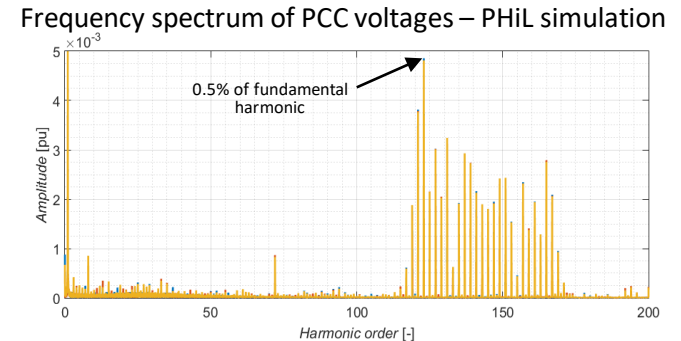
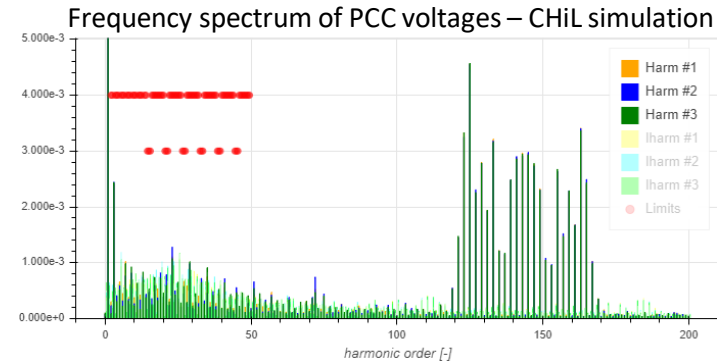
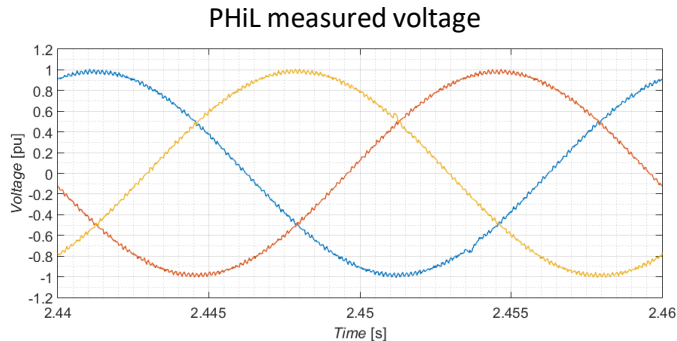
Power Electronics Grid Simulator with high control bandwidth

1. Multi-megawatt, medium voltage, high power quality controllable voltage source with high control bandwidth.
2. Special features:
 - harmonic injection (emulation of impedance in wide frequency range, anti-islanding test, system identification),
 - LVRT, HVRT, FRT (certification tests),
 - microgrid or load emulation (grid-forming or grid following control),
 - voltage or current control according to rapid prototyped model in real-time controller.
3. Compatibility with industrial communication protocols.
4. High overload capability.
5. Mobility.

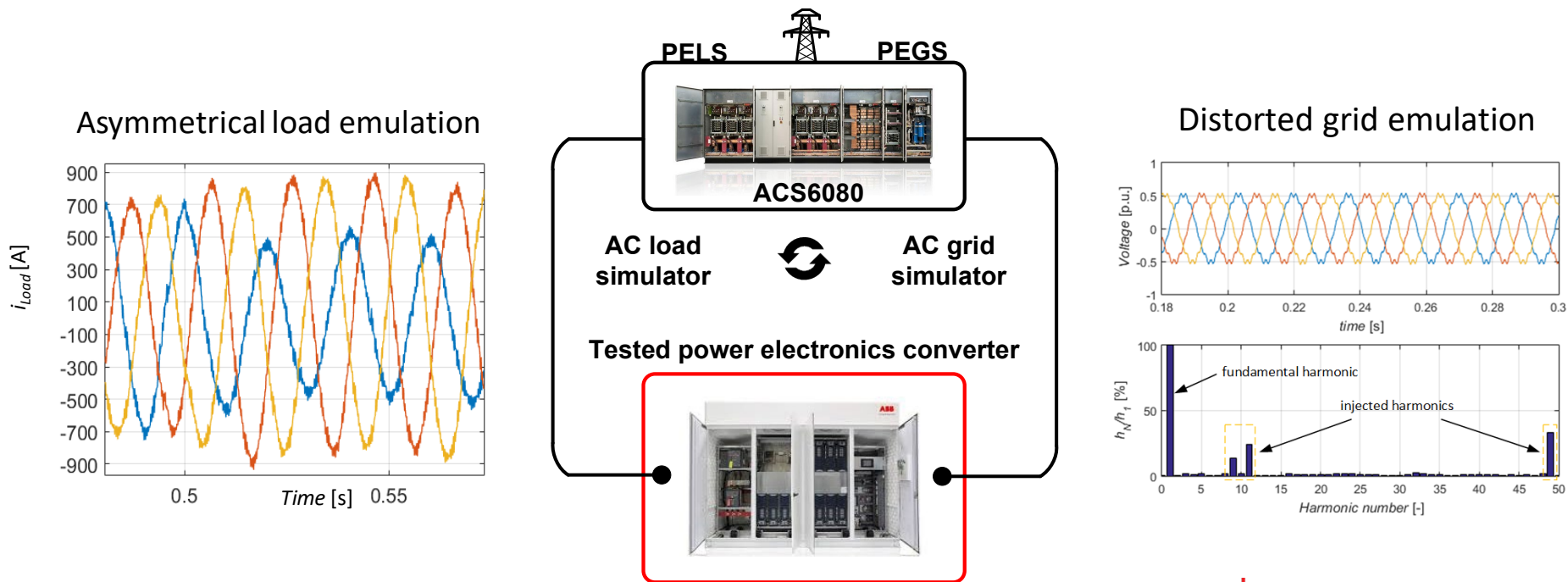


Power Electronics Grid Emulation performance

1. Performance of Power Electronics Grid Simulator matches CHiL results.
2. Applied voltage modulation technique provides perfect voltage quality (very low content of higher harmonics).
3. High bandwidth of voltage modulator allows to emulate grid in wide frequency range.



Multi-megawatt drive configuration used for testing of power electronics converter



Highly flexible platform for testing of MV power electronics systems

1. Power Electronics Grid Simulator (PEGS) provides high-fidelity testing capability of variety of MV electrical systems.
2. Voltage or current control according to reference model.
3. Mobility.

