

Why grid-forming control is needed to continue the integration of renewable energy in power systems?

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As power systems shift from conventional synchronous generation toward wind and solar power connected through power electronic converters, the dynamic of the grid is fundamentally changing. Indeed, the classical electromechanical behaviour that used to drive the main dynamics of a classical power system is progressively being replaced by the fundamentally different behaviour of power-electronics-based power sources, whose dynamics are fully driven by the control.

In a first step, the grid-following mode was chosen, meaning that the power sources behave mostly as synchronized current sources. With the increase of this kind of power source on the power system, this type of control reaches its limits. Nowadays, grid-forming control, behaving as a synchronized voltage source, is progressively being introduced into the power system, driven by transmission system operators.

The talk will start by recalling the fundamental dynamic characteristics of voltage sources and current sources, and will then explain the limitations of current sources. Then, the main principles of grid-forming control will be introduced, along with its main advantages — possible inertial effect, increased small-signal stability — but also its drawbacks.