

Grid Forming Capabilities DSO Update

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Survey of WG members

At our last in-person meeting in September, each member was asked to report back on how much GFC related activity (if any) there was in their respective Countries/DSOs.

- The majority of members reported that there was no substantive activity or awareness of Grid Forming and potential impacts.
- However, the response from some members were particularly noteworthy and are described in the following slides.

Spain

- Regular TSO-DSO meetings.
- Three initiatives developed by i-DE (Iberdrola) to improve the operation of the grid under such conditions (similar initiatives have been developed by other DSOs):
 - Implementation of remote control for new connections of generators > 1 kV.
 - When a protection element is triggered, automatic software for restoring the grid (ARA) identifies the generators connected to the part of the grid that has been affected and disconnects them before proceeding to locate/isolate the fault.
 - SCADA alarms for potential islanding. The measurands of the disconnected elements are checked, and if they have voltage, the SCADA displays an alarm to warn that might be some islanding.

France

- Enedis raising the awareness of the topic.
- Explained to Central Development Partners.
- Some concern around low short circuit currents.
- Need for new tools to deal with instability identified by a PhD student, which predicts inter PPM oscillations if too much GFC on distribution systems.

Italy

- Very high level of awareness among DSOs
- Very large concerns about the inability to detect islands and/or network earth faults.
- Concern also about continuity impact due to ineffectiveness of automatic restoration schemes.
- The DSOs don't have evidence about preliminary analysis/studies (Network Development study) to define the best trade-off about GFCs introduction at LV and MV generators.

Ireland

- Initial conversation on topic with TSO. TSO commencing work on quantification of GFM needs.

Great Britain

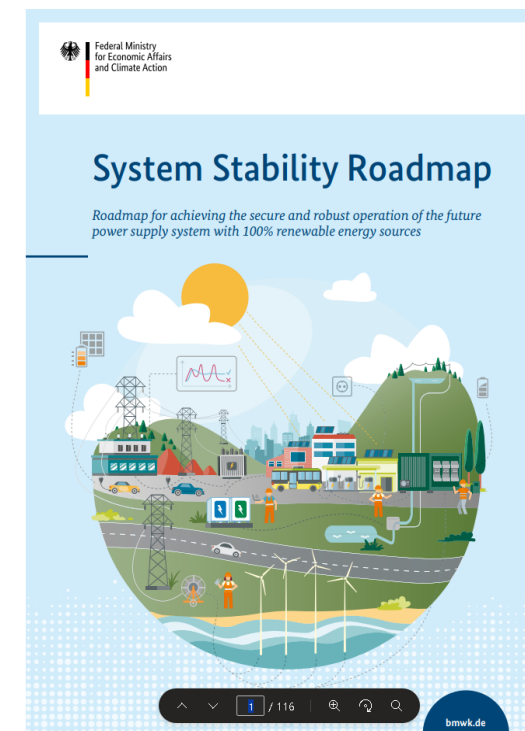
- TSO gone to market for Grid Forming.
- Some GFM projects now connected.
- Specs to be updated based on experience
- Likely to be made mandatory for Type D PPMs
- DSOs - unaware and RfG won't apply anyway.

Portugal

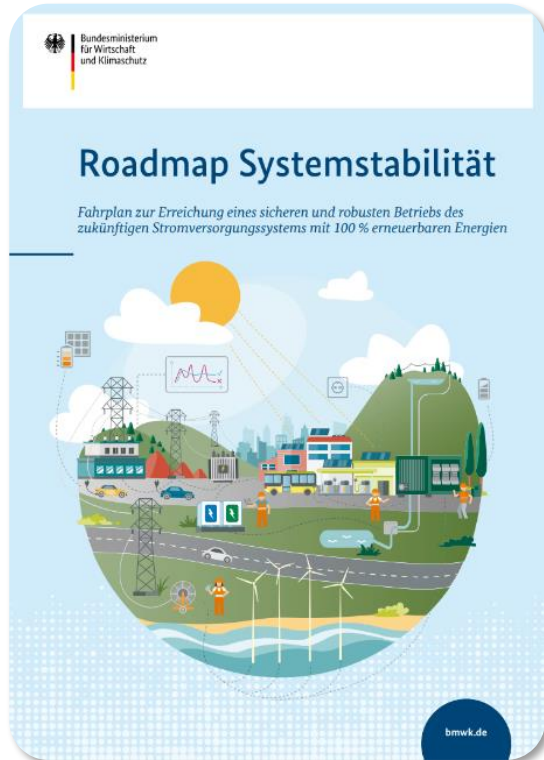
- Widespread Grid Forming distribution connected generation is a major concern for the DSO.
- The TSO has not initiated contacts on this subject.

Germany

- Intense activity here. Such is the level of concern of some German TSOs are pushing for GFM introduction now.
- Roadmap for System Stability published for a 100% renewables power system. GFM identified as key enabler.
- Conclusion that due to lack of experience, piloting should be carried out before introducing GFM to LV.
- Guidance being prepared for GFM controllers – to be subsumed into Grid and Distribution Codes in due course.
- In parallel, RA's preparing for creation of a market for spinning reserve.
- Study last year on performance of anti-islanding protection – conclusion: not one of the methods used could identify an island in a high [$>20\%$] GFM environment.



The Roadmap System Stability pushes the introduction of GFM



The roadmap was published in December 2023 by the German Federal Ministry for Economic Affairs and Climate Action

The roadmap shows a way forward for a secure and stable energy system with 100% renewables.

Roadmap System Stability, p.6

Topics

- Frequency stability
- Voltage control
- Short-circuit currents, angle stability
- Grid operation and system restoration

1

Generation and consumption units in the distribution grid have a significant influence on system stability

2

Converter-based units replace the stabilizing properties of disappearing conventional power plants

Grid Forming is identified as a key technology to ensure system stability.

Due to lack of experience, piloting, definition of technical requirements, and clarification of open questions should be carried out initially.

Germany

- A funded R&D project with focus on LV-grids with two universities is under preparation. Efforts being made to get manufacturers on board.
- A funded R&D project with focus on MV-grids with Enercon (Local Wind Turbine Manufacturer) and other partners is under preparation.



System simulation and stability analyses



1kV-Grid-Laboratory and virtual synchronous machines



20kV and 110kV-Grid-Laboratory

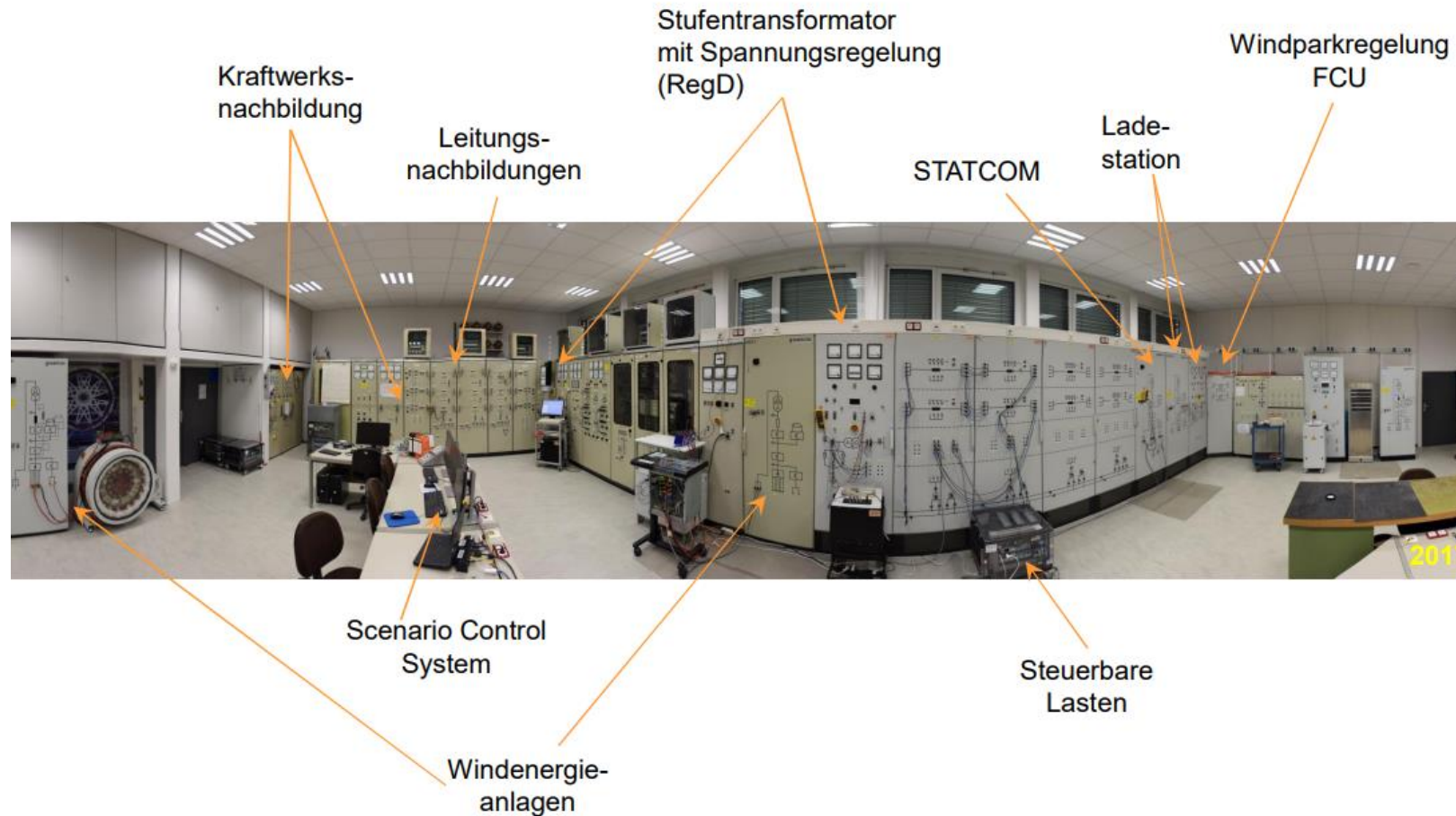


Field tests in context of controller stability

Expected start of project: 2026, 3 years duration

Laboratory for Electrical Energy Supply

3 Phasige Netzmodell – (physikalisches Realmodell)



Further Activities:



Institute of
Networked Energy Systems



Control centre of the emulation laboratory DLR_NESTEC at the Institute of Networked Energy Systems

All test series in the emulation lab for networked energy systems can be controlled from the control centre

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DLR_NESTEC

The DLR_NESTEC laboratory uses emulation to create a protected space in which the behaviour of real distribution grids can be tested in a realistic environment. Devices such as charging stations, battery storage systems, heat pumps or photovoltaic inverters can be set up on site and coupled with an environment that emulates a wide range of framework conditions for the components to be analysed in real time.

Questions?