Stability management in Power Electronics dominated systems

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Statnett

Power electronics connected production

Norway

+30 GW

by 2040

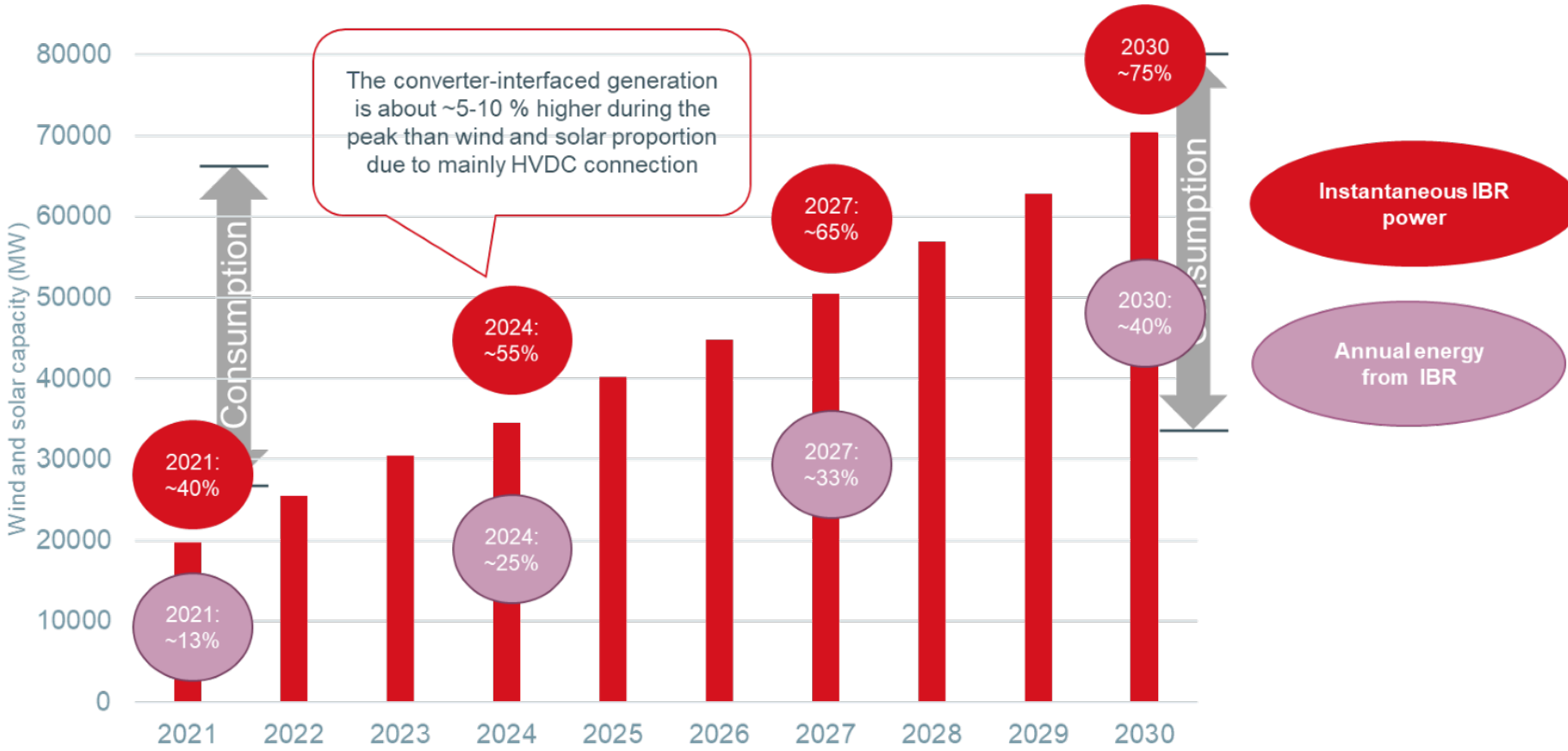
Europe

>100 GW

by 2030

Total installed power production in Norway 2022 ≈ 38 GW

Share of converter-interfaced generation



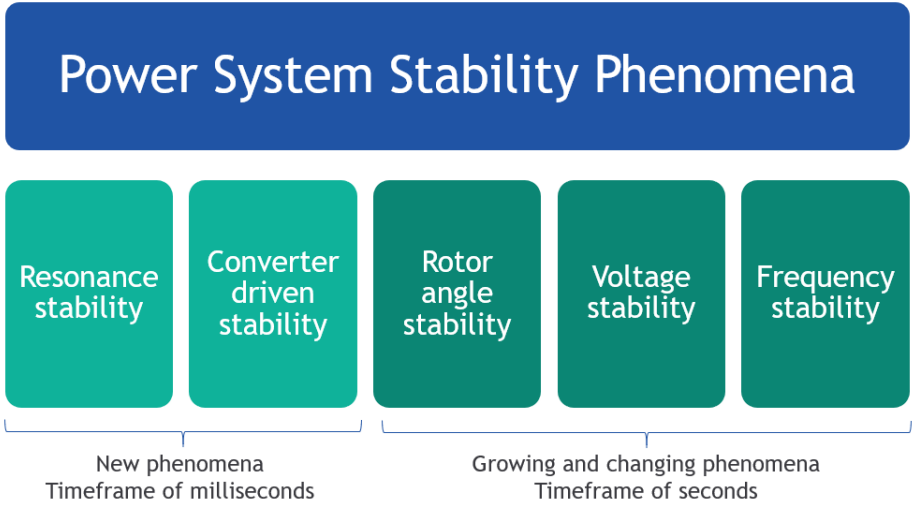
Power system stability phenomena and timeframes

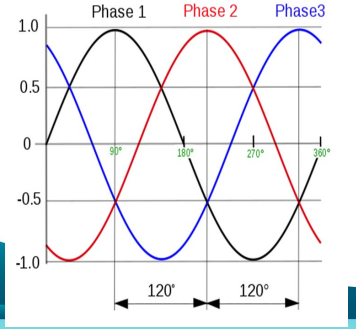
Old phenomena increase in rate and severity

- ✓ Rotor angle stability
- ✓ Voltage stability
- ✓ Frequency stability

New power electronics related stability phenomena

- ✓ Resonance stability
- ✓ Converter driven stability





Power system stability phenomena

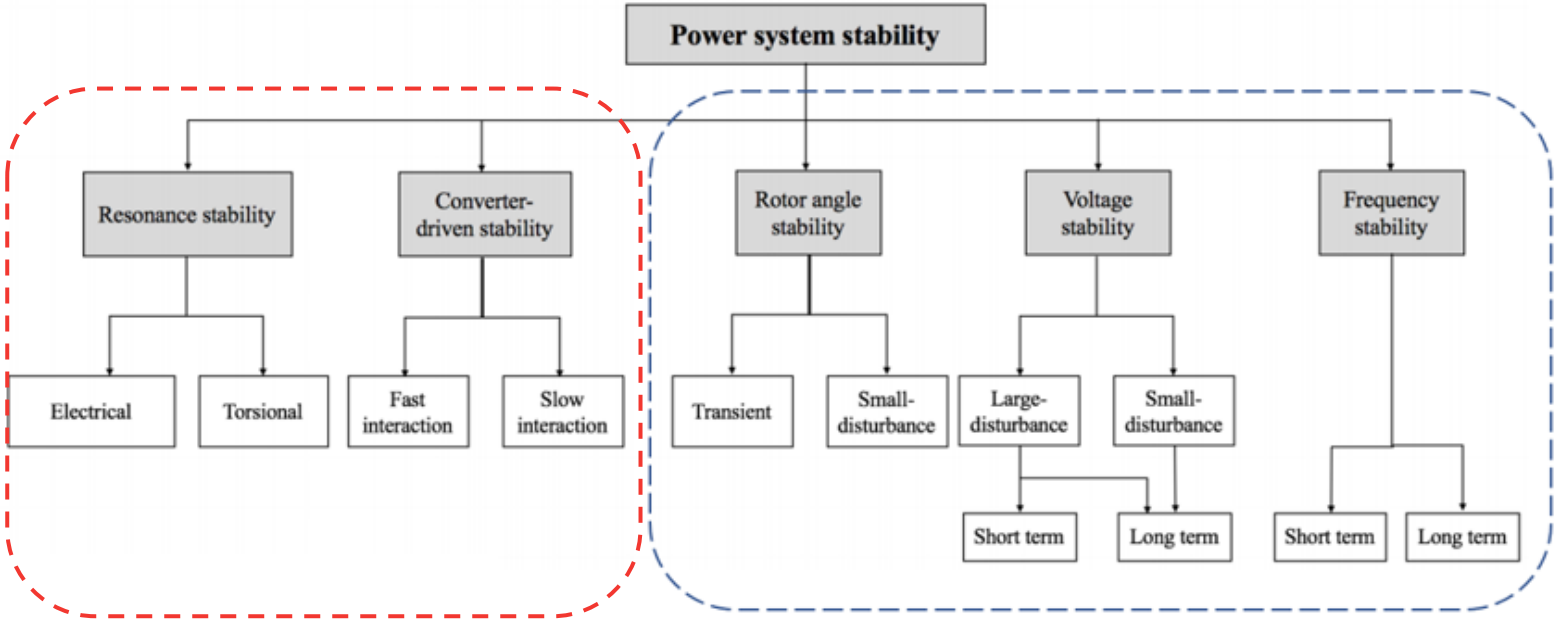
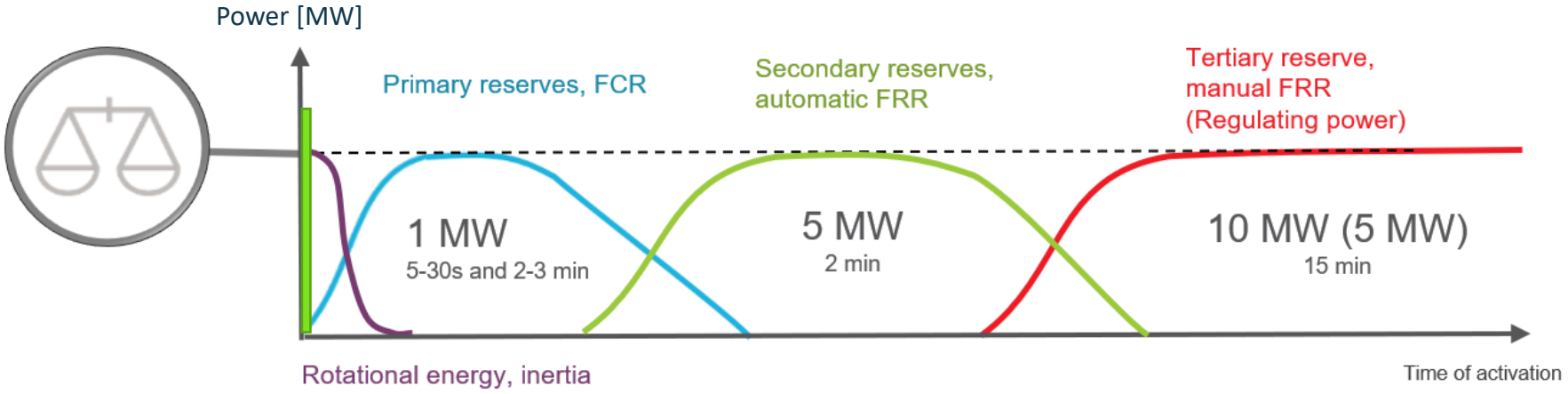
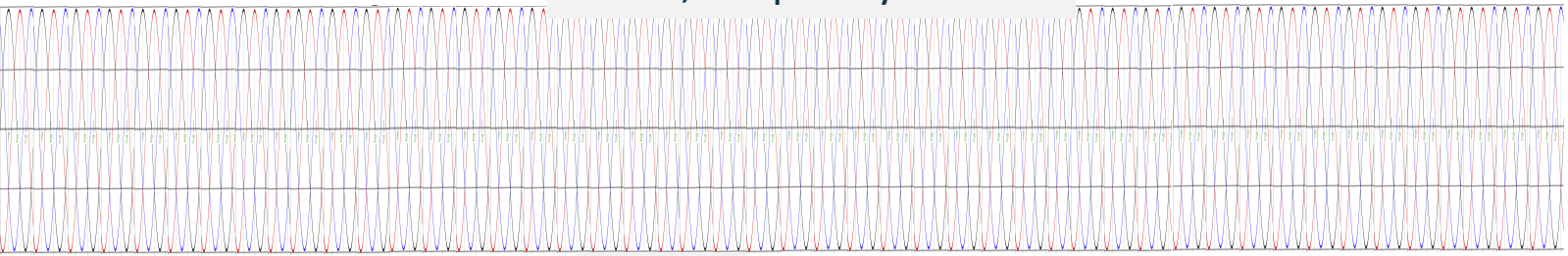


FIGURE 1: CLASSIFICATION OF POWER SYSTEMS STABILITY WITH HIGHLIGHTED PHENOMENA RELATED TO THIS WORKSTREAM [1].

Frequency containment timeframes

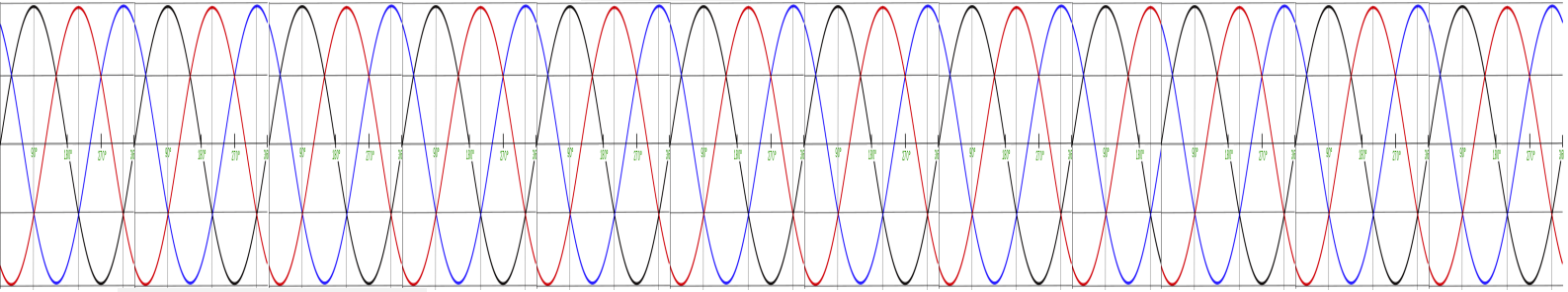


RoCoF, frequency nadir



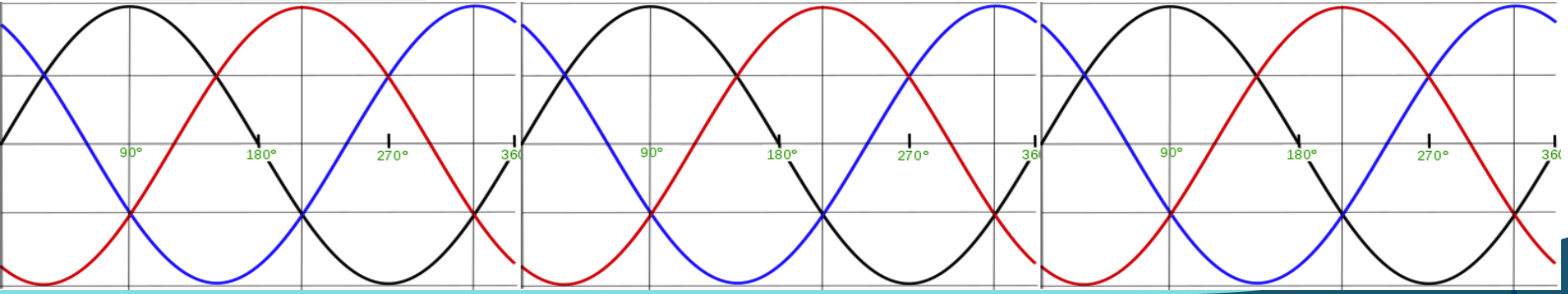
1000 ms

RoCoF



240 ms

Grid forming



60 ms

Impact on stability

Destabilizing Factors

Variable, Renewable Energy Resources

Conventional Power Electronics Interfaced Resources & Devices

Long Distance Transmission & Weak Connections

HVAC cables

Climate Change & Extreme conditions

Stabilizing Factors

Advanced Monitoring & Control of Stability

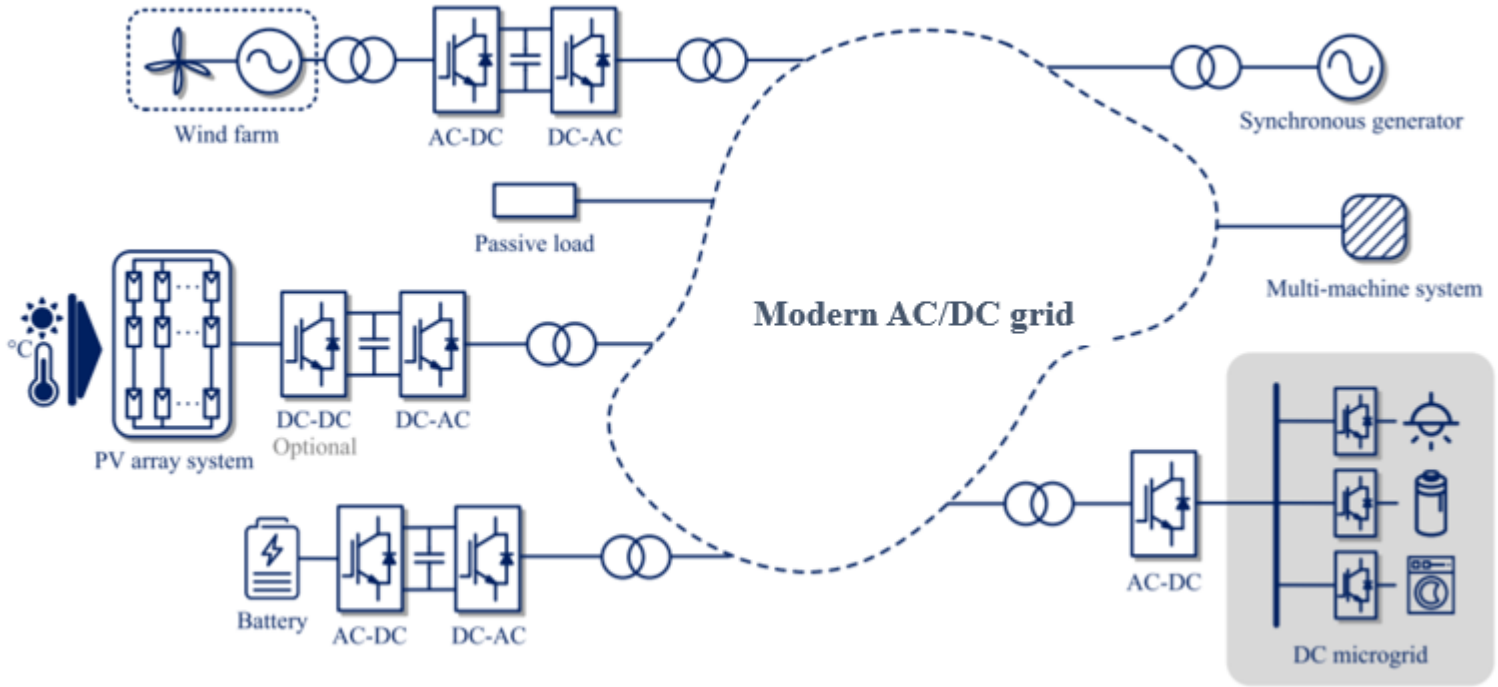
Simulation Techniques & Models

Controllable Resources & Flexibility

Grid Forming Capabilities & Interoperability

Synchronous Generation

Urgent need for TSOs to **develop, test and implement a new wide-area system stability management approach.**



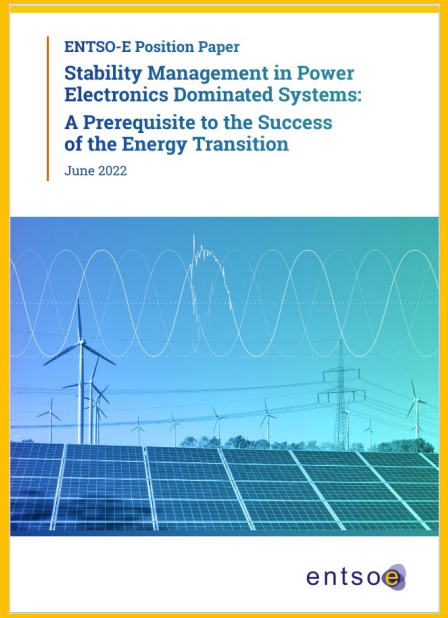
Need for Accelerated Innovation & Collaboration

- In spotlight: Stability management

Data driven services

FOCUS TOPICS for ACCELERATION

1. Faster electrification of transport
2. Optimal cross-sector planning (incl. storage & H_2)
3. Need for flexibility & its value at all timeframes
4. Improved modelling & management of extended datasets
5. Multi-vendor, multi-terminal offshore solutions
6. New system stability management approach
7. Fully automated decision support system


ENTSO-E Position Paper

Stability Management in Power Electronics Dominated Systems:

A Prerequisite to the Success of the Energy Transition

June 2022

entsoe

Contribute and get benefit

Stability management

interOPERA
Enabling multi-vendor HVDC grids

READY4DC
Q2/2022-Q4/2023

HVDC-wise
Q2/2022-Q5/2025

Horizon Europe
European Commission

Converter dominated Nordic Grid

Svenska Kraftnät
Fingrid
Energinet
Statnett

* Statnett er ikke partner i Ready4DC, men bidrar i prosjektet ved deltagelse i arbeidsgruppene.


A sustainable and resilient offshore and onshore gri
Collaboration & Innovation & Sustainability