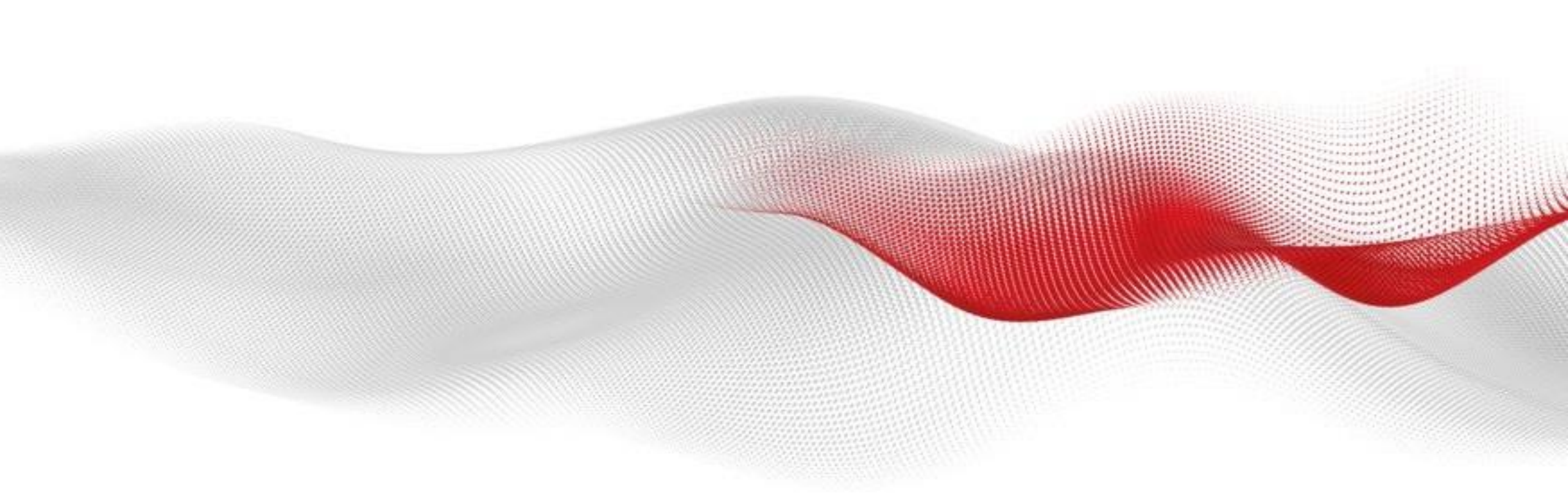

05.12.2019, IDUN MOSGREN

Simulating process power for a smarter and greener offshore grid

Agenda

- Offshore system design and operation
- Power Control challenges
- Simulation as a tool

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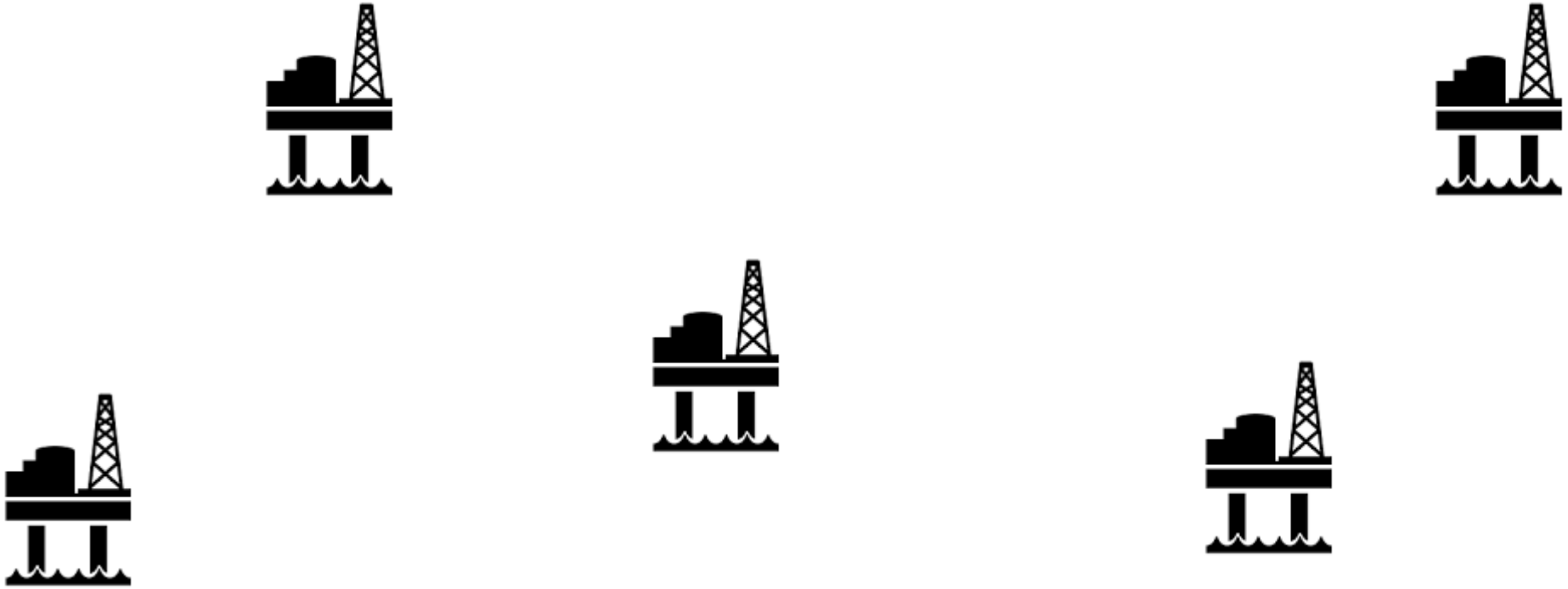
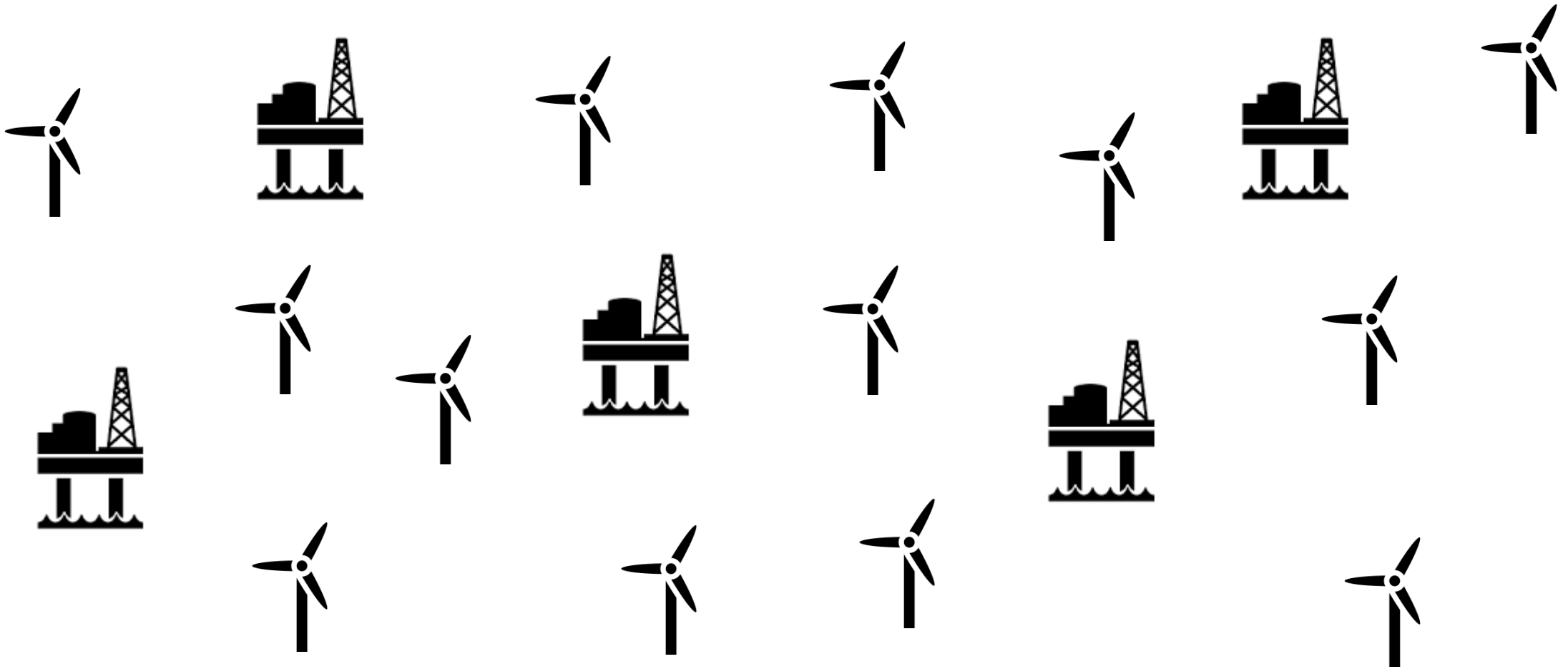
Offshore system design and operation

Challenges and solutions



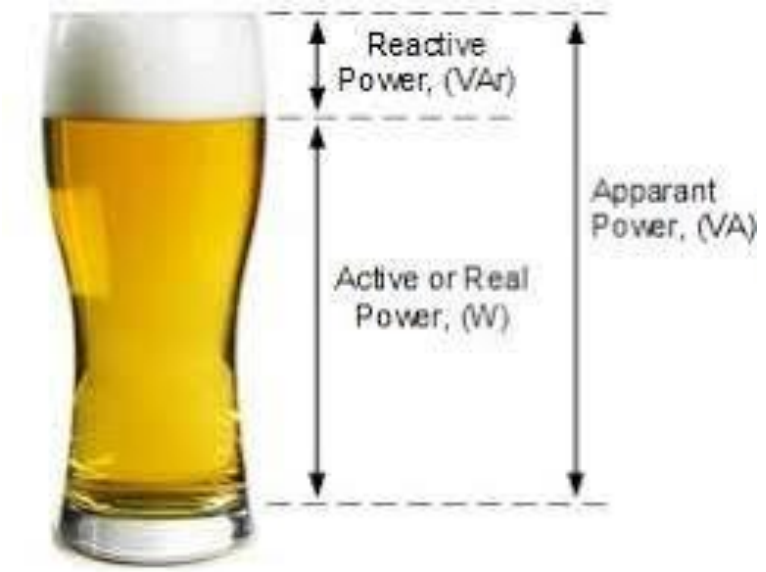
Offshore system design and operation

Challenges and solutions



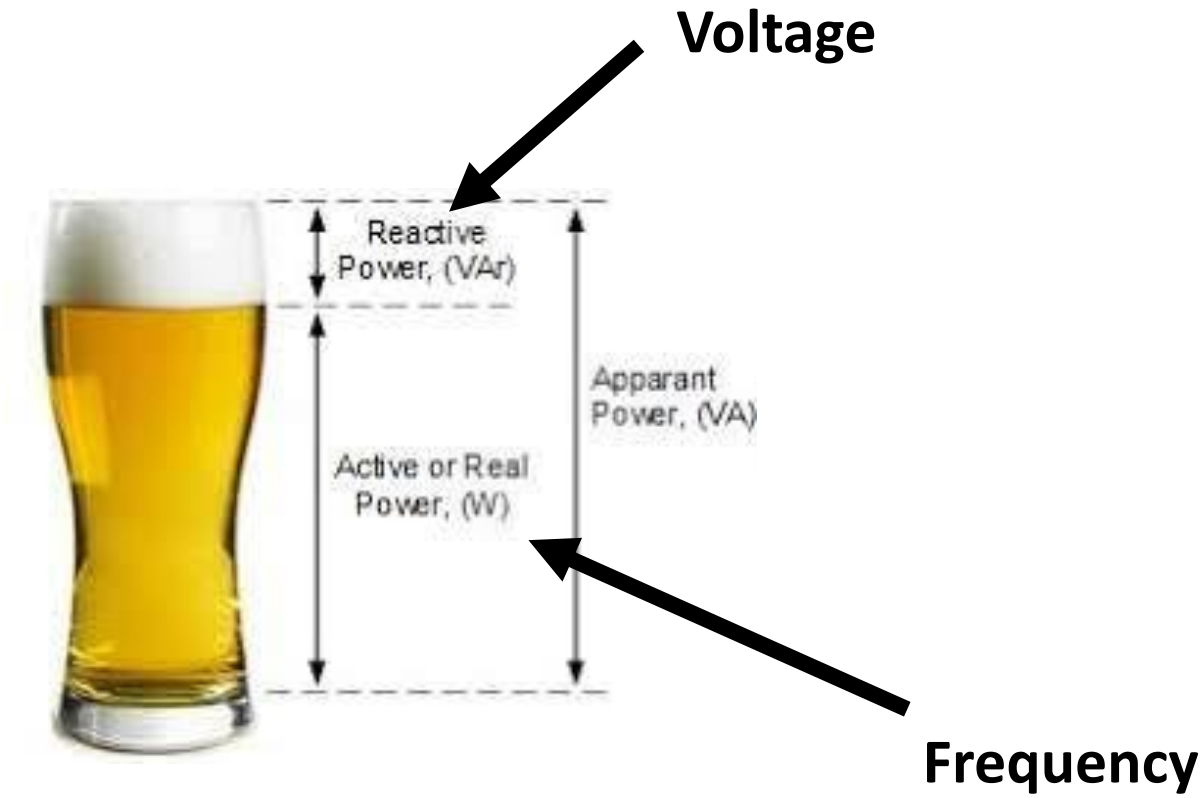
Power Control

Players and roles



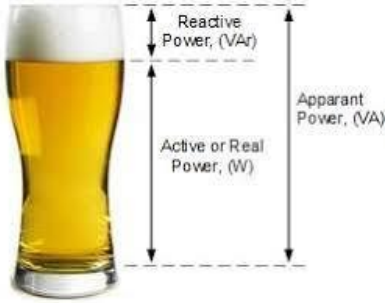
Power Control

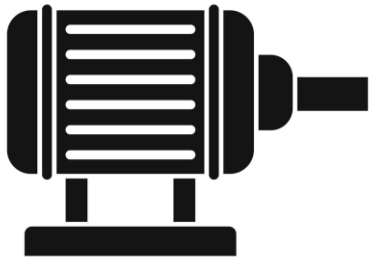
Players and roles



Power Control

Players and roles





- Governor(active)
- Automatic voltage control (reactive)

- Pitch control (active)
- Converter control (reactive)

- Reduce or increase load (active and reactive)

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Offshore platforms with windturbines connections

Increase power generation – decrease emissions

Operating assumptions:

- Maximum power output from the wind turbines
- Minimize operation of gas/diesel generators
- Strive to achieve seamless automation

Critical issues:

- Variable power availability
- Grid codes
  - Rate of change in power supply
  - Balance responsibility
- Limited energy storage possibility
  - Weight
  - Space

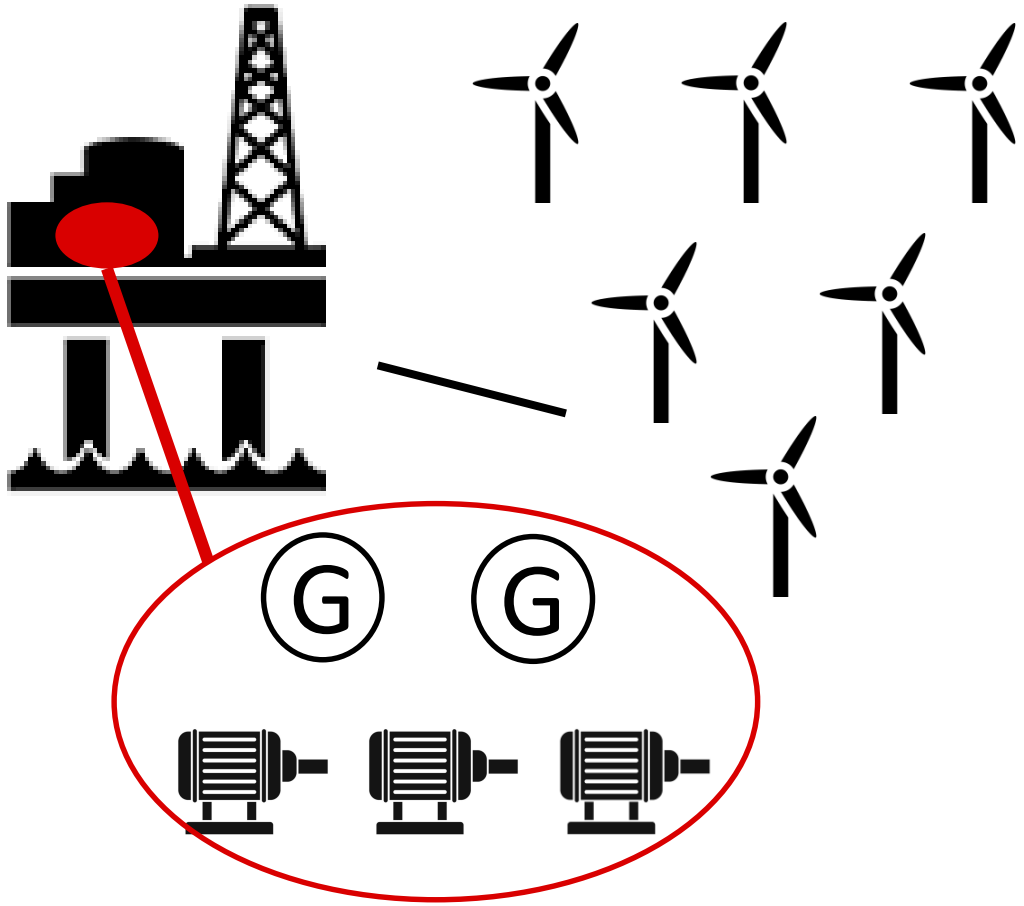

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ABB Process Power Simulator

Optimize power system design - Reduce risk in control application - Enable training environment

Representation and simulation

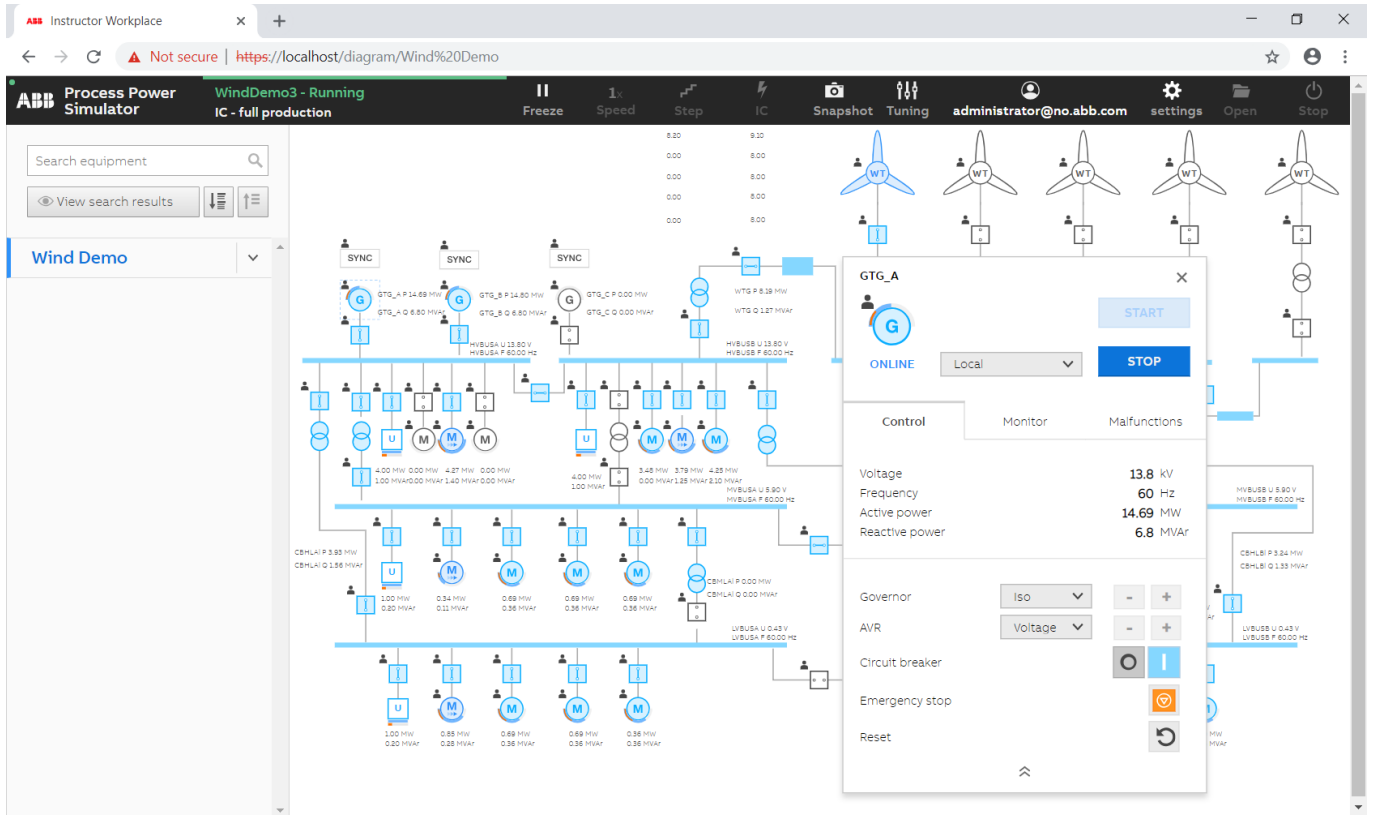
- Real-time simulator for power systems
- Dynamic models for typical components
- Interfaces for control and measurement
- Large scale system capability

Use Cases

- Electrical studies
- Control Concept Evaluation
- Virtual FAT
- Operator training

Integration

- 800xA simulator (Control application)
- Process models



Example:What is the best grid code for power limitation of turbines?

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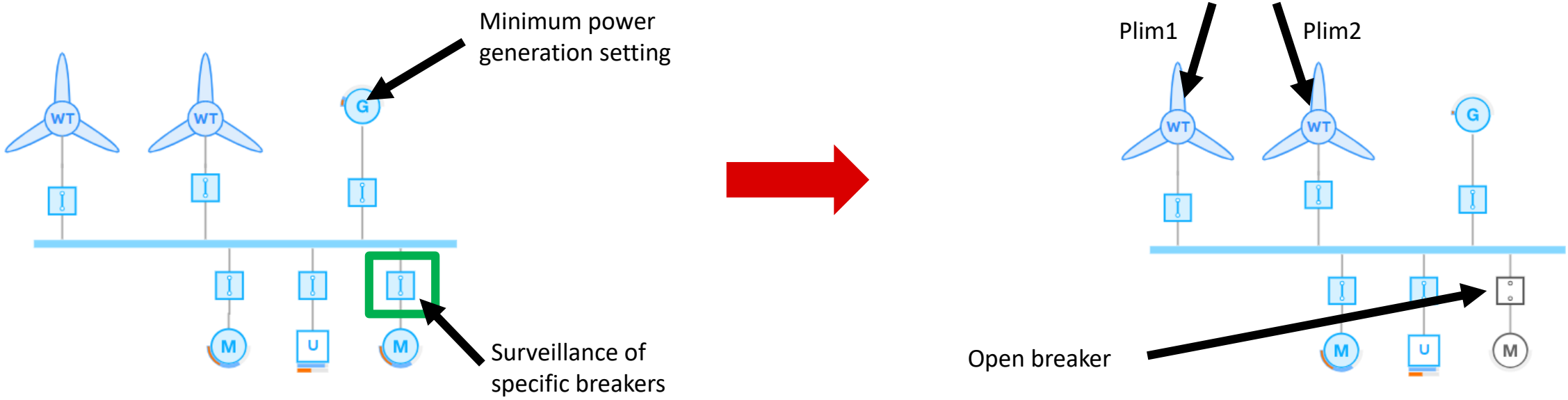
Wind Turbine active power limitation - PPM simulation function

Reduce active power generation to ensure a minimum active power supply from other sources

- Minimum power generation setting
- Critical breakers and power flow
- Equal division of wind turbine active power limitation when multiple turbines



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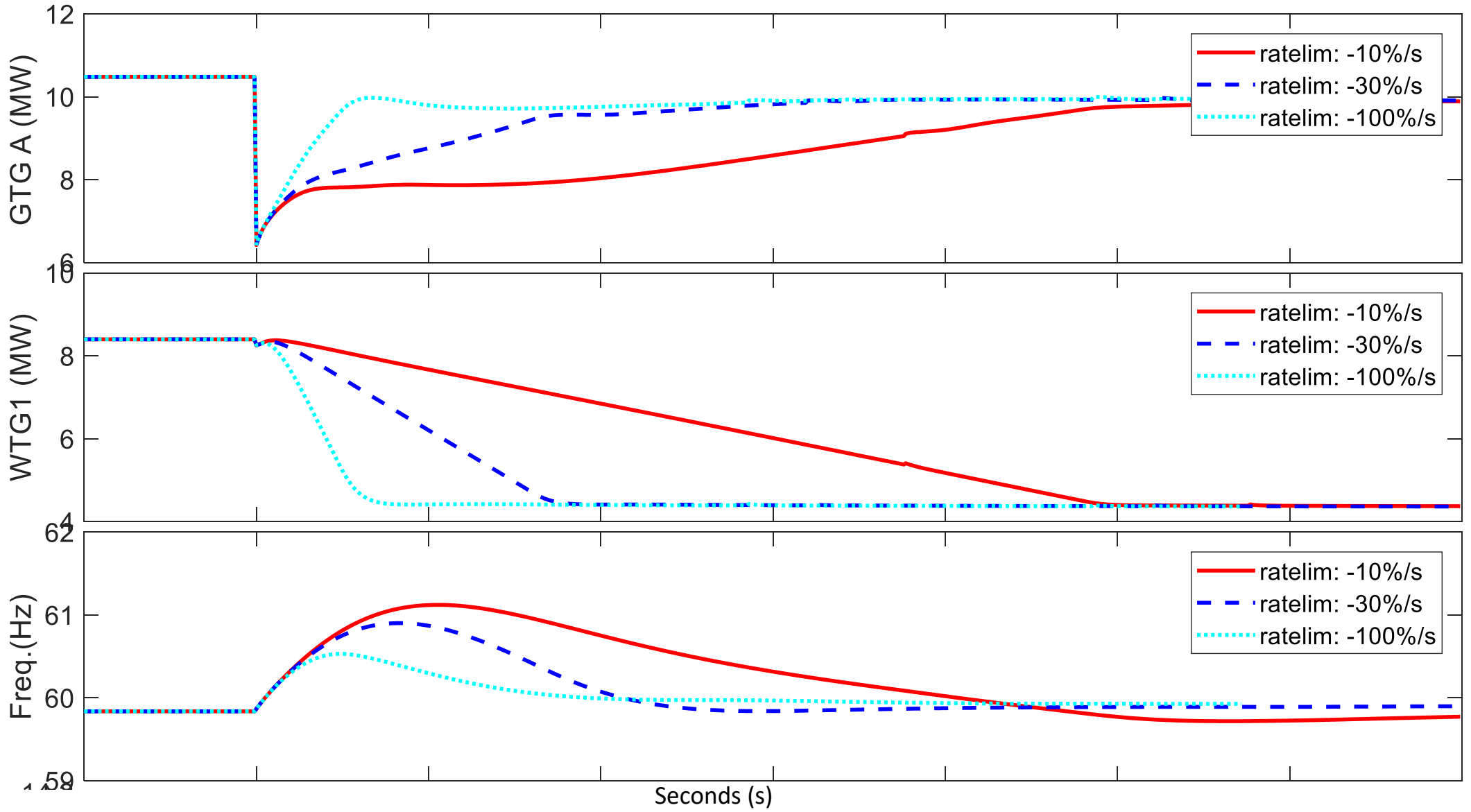
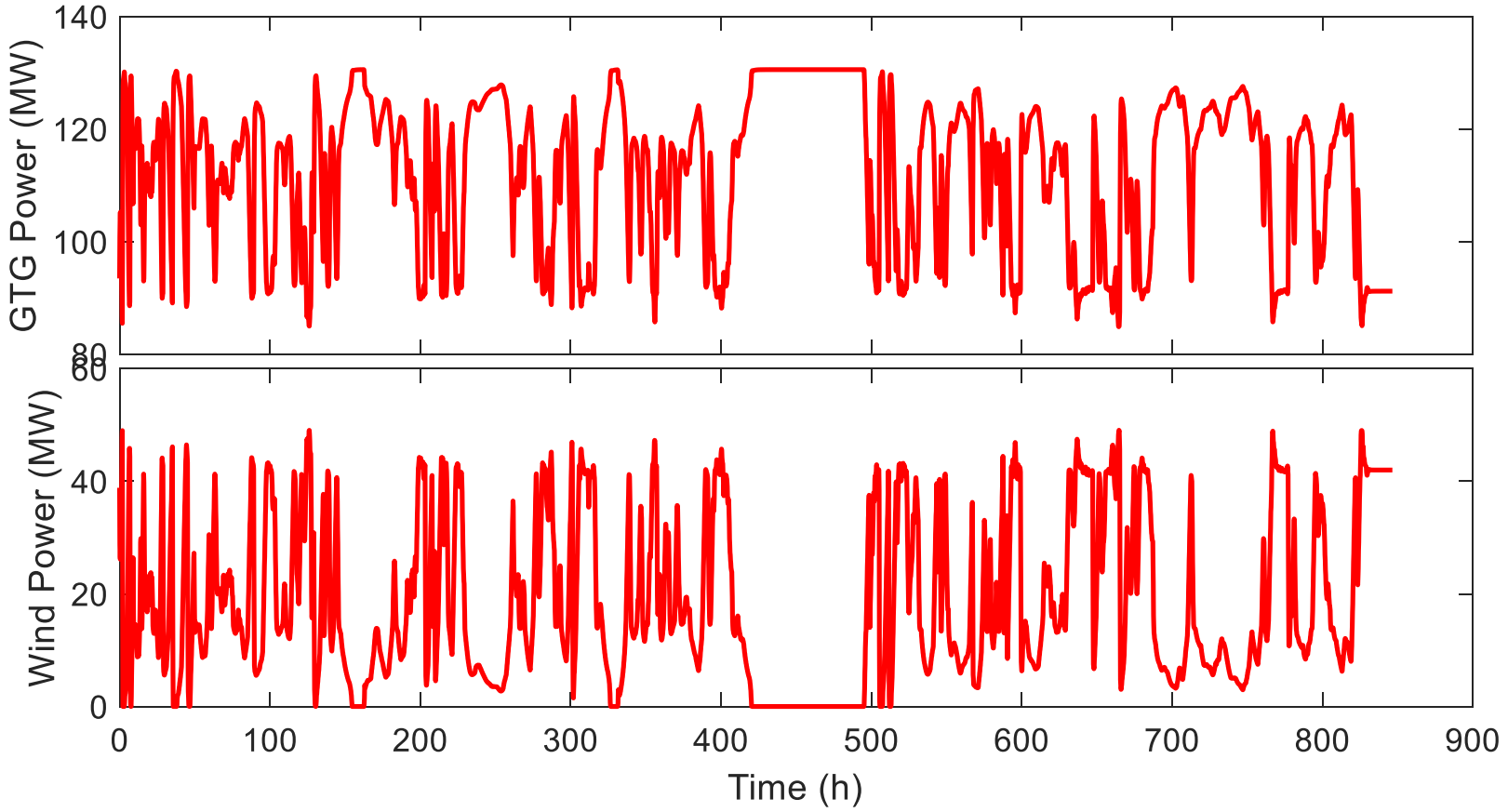

GTG A (MW)
WTG1 (MW)
Freq.(Hz)
Seconds (s)
ratelim: -10%/s
ratelim: -30%/s
ratelim: -100%/s

Long term analysis

Example – wind variations over 3 months, constant load



Summary

Challenges:

- Variable power availability
- Grid codes
- Limited energy storage possibility

Proposed method:

- Simulate and analyze the control system and power system combined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