RISK.twin
Digitale Zwillinge zum Schutz kritischer Infrastruktur

Energy Resilience of Wastewater Treatment Plants

Intelligent processes of (waste)water treatment / Energy

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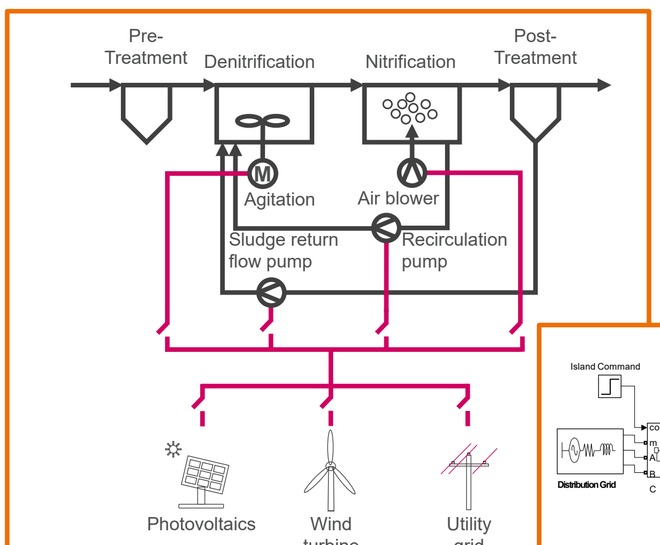
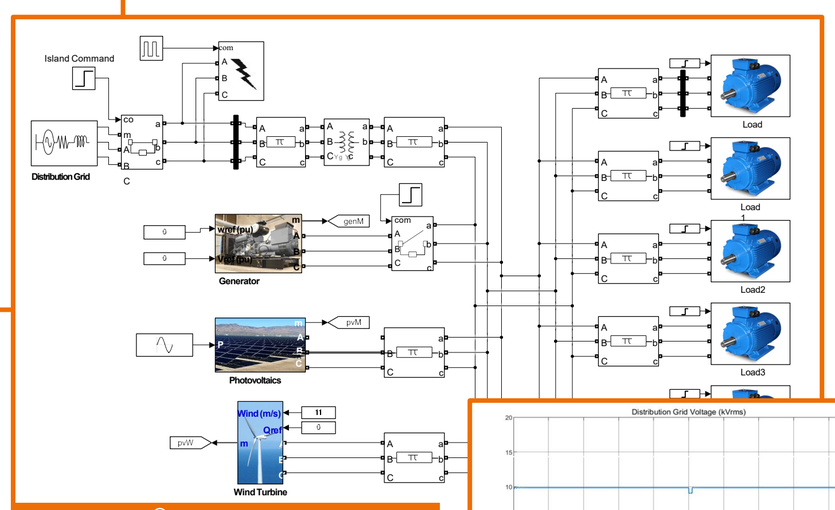


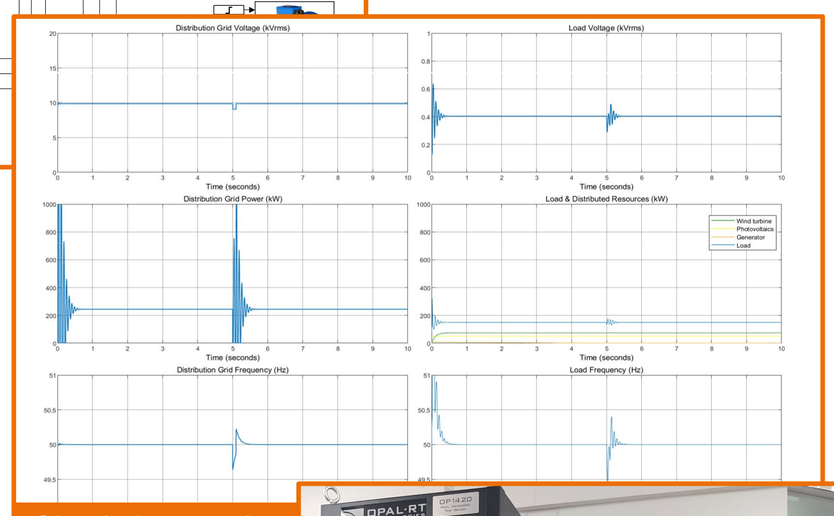
Schematic microgrid



MATLAB®/Simulink model

Motivation

- High reliability of plant operation and the ability to recover quickly from emergency events are two essential properties that critical infrastructures such as wastewater treatment plants must feature
- Investigations of possible power faults are usually not possible in real plants; simulative investigations and subsequent real-time testing of selected electrical components provide a solution
- Increasing usage of renewable energy sources for power supply of such plants requires additional investigations of power system stability and energy management



Simulation results

Methods and Results

- Typical electrical loads are three-phase asynchronous machines with high duty cycles for pumps and compressors, some of which are operated with adjustable speed drives
- Risk assessment of possible hazards identified the group of electrical faults, which are power dips and power outages
- Microgrid model with distributed energy resources in MATLAB®/Simulink allows simulative investigations of electrical faults and other system capabilities, such as prevention of unintentional islanding, black start capability and reconnection capability

Conclusion and Outlook

- Importance of investigating electrical hazards due to their high risk for severe damage
- Distributed energy resources in combination with supervisory energy management are able to significantly increase self-supply capability
- Further simulative investigations of electrical faults and emergency operation and validation with real-time testing of components using a Power-Hardware-in-the-Loop (PHIL) test bench

Microgrid PHIL test bench and power engineering test benches

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