Dynamic stability challenges of future electric power grids

International workshop in cooperation between SCCER-FURIES and CloudGrid project

11 September 2017

Lecture Hall TB 504

Zurich University of Applied Sciences, School of Engineering

Technikumstrasse 9, Winterthur, Switzerland

Source: Swissgrid

For **free** registration, please send email to: Dr. Rafael Segundo (segu@zhaw.ch)

Note: Workshop is limited to a maximum of 40 attendees

10:00	10:15	Registration
10:15	10:30	Welcome– Prof. Petr Korba
		Session 1
10:30	11:00	New methods and tools for power system transient control- Dr Alexander Fuchs (ETHZ-FEN, Switzerland)
11:00	11:30	Stability challenges in the Nordic power system- Dr Jukka Turunen (Fingrid, Finland)
11:30	12:00	Dynamic interactions and control in hybrid AC/DC power systems- Prof. Kjetil Uhlen (NTNU, Norway)
12:00	13:00	Lunch Break (lunch on own)
		Session 2
13:00	13:30	Power System Reserve Requirements: Impact of Dispatching Electric Distribution Networks by Means of Local Energy Storage Systems- Prof. Mario Paolone (EPFL, Switzerland)
13:30	14:00	Continental Europe TSOs challenges towards future generation mix- Dr Walter Sattinger (Swissgrid, Switzerland)
14:00	14:30	Grid Integration of Power Converters – The role of harmonics and stability- Dr Mats Larsson (ABB, Switzerland)
14:30	15:00	Coffee Break (provided)
		Session 3
15:00	15:30	Measurement-based modelling in power systems- Dr. Vedran Peric (GE Consulting, Germany)
15:30	16:00	Modelling strategies and their impact on simulation results- Dr Emil Hillberg (STRI, Sweden)
16:00	16:30	Clustering of large volume of data on power systems- Dr. Rafael Segundo (ZHAW, Switzerland)
	16:30	Adjourn

Motivation

The impact and penetration of fluctuating renewable energy sources (RES) are drastically increasing, driven by the falling costs and the proactive expansion in emerging economies and will be continuing in future as part of a sustainable society. Some reasons that motivate these changes are fighting climate changes, eliminate the risk of nuclear power, reduce energy imports, stimulate technology innovation, increment energy security and strength the local economies.

Implementing the transition to a cleaner energy production becomes extremely challenging particularly when green technologies production are highly stochastic, weather dependent, without rotating machines as the rest of the classical electric power plants, and indirectly require the use of energy storage technologies to reach its maximum potential. Some of the envisaged dynamic stability challenges of future power grids relate to the lack of rotating masses after nuclear decommissioning (lower inertia) making it increasingly difficult to maintain a constant frequency in the system and decreasing the damping of inter-area oscillations.

SCCER – FURIES
Shaping the FUtuRe SwIss Electrical InfraStructure

The SCCER-FURIES envisions the enabling of seamless and sustainable powering of Swiss citizens' houses, businesses and communities, by developing and demonstrating with the Distribution and Transmission network operators the essential knowledge and technologies for a sustainable and stable electrical infrastructure of the future which integrates cleaner and reliable power supplies and storage facilities

The working group Bulk Multi-Energy Grids (WP2) within SCCER-FURIES, aims to provide to the transmission network operator, with simulation tools for: the analysis and development of low-inertia energy grids with a high share of renewable energy sources for stability assessment and improvement. In parallel, quantitative evaluations of local and international market potential, assessment of planning options for alternative and more flexible power storage and generation; as well as identification of the risks involved with operating power grids are some of the research activities of the group.

Following the successful activities of SCCER-FURIES during the initial phase, dynamic stability assessment is one of the key research directions envisaged for the second phase of the program (2017-2020). Here, with close cooperation and support from the national transmission system operator (TSO) Swissgrid and different academic partners, definitions of performance metrics, simulation of different scenarios leading to stability challenges and design of control approaches as countermeasures are some of the topics that will be investigated.

swissgrid

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Swiss Federal Institute of Technology Zurich

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IEFE Institute of Energy Systems and Fluid Engineering

CloudGrid
STRI - ZHAW - NTNU - CHALMERS - IPE

Transnational Cloud for Interconnection of Demonstration Facilities for Smart Grid Lab Research & Development

The goal of the CloudGrid project is to provide recommendations and strategies to meet the challenges of the future power system, to facilitate larger amount of intermittent renewable generation together with less nuclear production while providing a secure and reliable electrical power supply. The project is divided into three research areas which are highly complementary, providing the project with a holistic view of the challenges of the future grid.

STRI
HIGH VOLTAGE TESTING AND CONSULTING

1. **System stability**

Stability is a prerequisite for operating the power system, and there is a need to develop new solutions and methods in order to maintain system security in a system which is utilised in an increased and altered manner. The research focus on: Identifying challenges and providing recommendations for the stability and operation of the power system with increased HVDC interconnections, increased Renewable Energy Sources, and decreased nuclear generation.

2. **Ancillary services & energy management**

With new components and systems integrated in the power system, there will be new opportunities to support the system through additional ancillary service solutions and novel strategies for energy management and market concepts. This research focus on: The value of ancillary services provided by distributed energy resources & Energy management optimization from a system perspective.

3. **Converter interoperability**

An increased amount of power electronics in the system is an enabler for increased flexibility. However, this implies increased requirements on compatibility and interoperability between the various converters. The research focus on: Identifying critical parameters and requirements to guarantee the interoperability of converters in hybrid AC/DC grids.

Zurich University of Applied Sciences
zhaw School of Engineering
IEFE Institute of Energy Systems and Fluid Engineering

NTNU
Norwegian University of Science and Technology

CHALMERS
UNIVERSITY OF TECHNOLOGY

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Budget: € 2,300,000, funded through ERA-Net Smart Grids Plus

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Partners: NTNU (Norway), Chalmers (Sweden), ZHAW (Switzerland), IPE (Latvia)

www.stri.se/cloudgrid