

Modern Power Transmission Systems



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Modern Power Transmission Systems

Key Words

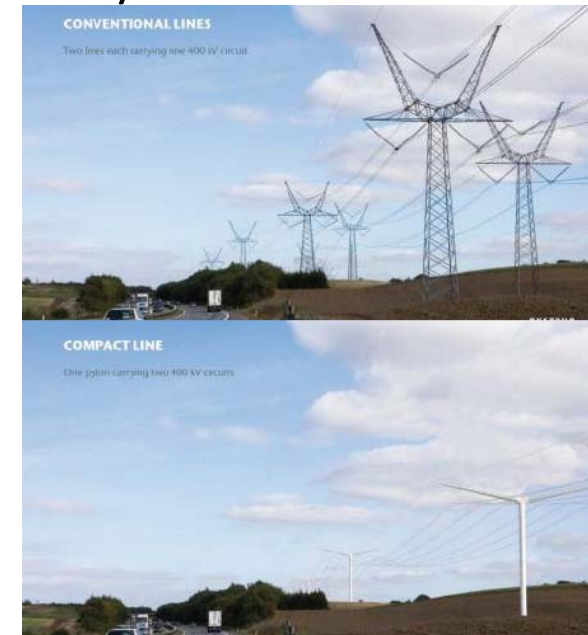
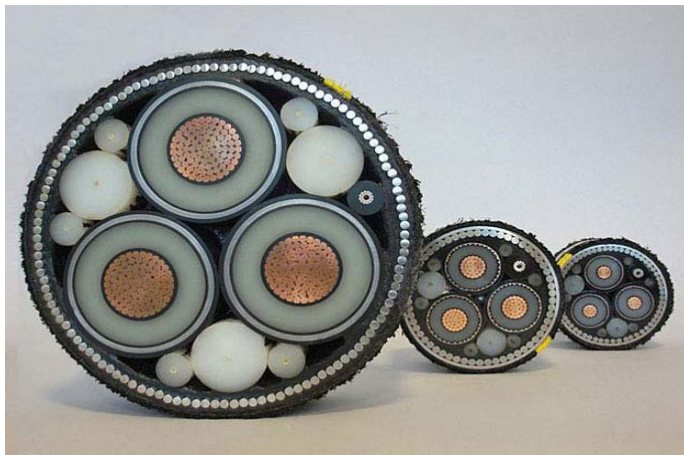
- Transmission power systems
- HVAC transmission cable technology
- Future Grid Structures
- VSC-HVDC transmission, future perspectives
- Offshore networks
- Bulk wind power integration
- Modern power system protection schemes
- Transient simulations – PSCAD/EMTDC
- Insulation coordination
- Harmonics in transmission power systems
- Transmission network components
- High Voltage and material technology
- Condition and lifetime assessment
- Overhead line corona audible noise



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Ongoing Research Projects

- SALS – Smart Adaptive Load Shedding (2016-2019)
- HARMONY - Harmonic identification, mitigation and control in power electronics based power systems (2013-2018)
- Active filter functionalities for power converters in wind power plants (2014-2016)
- DANPAC - HVAC transmission cable networks (2010-2016)
- Development of a Secure, Economic and Environmentally-friendly Modern Power System (2012-2016)
- Power Pylons of the Future (PoPyFu) (2014-2017)



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Ongoing PhD Projects

- High Power Medium Voltage DC/DC Converter (Catalin Dincan)
- Harmonic Stability in Power Electronics Based Power Systems (Esmaeil E)
- Planning and Control of Offshore VSC-HVDC Multiterminal Transmission Grids (Roni Irnawan)
- Harmonic Modelling, Propagation and Mitigation for Large Wind Power Plants Connected via Extra Long HVAC Cables (Mohammad Kazem Dowlatabadi)
- Control Tuning of Phase Measurement Units - based Protection Systems with VSC-HVDC controls to Mitigate Instability of System (Hesam Khazraj)
- Modelling of Long Submarine Transmission Power Cables (To be started soon)
- Voltage Control in the Future Power Transmission Systems (Nan Qin)
- Small Scale Harmonic Power System Stability (Changwoo Yoon)
- Technologies for the Power Supply of Electric Railways in Denmark (Stamatopoulos, Athanasios)
- Adaptive Protection for Medium Voltage Marine Applications (Catalin Ciontea)
- Electrical Design of a New, Innovative OHL Transmission Tower made in Composite Materials (Tohid Jahangiri and Qian Wang)



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Current research topics

Underground cables in the transmission system

High voltage OHL in composite material

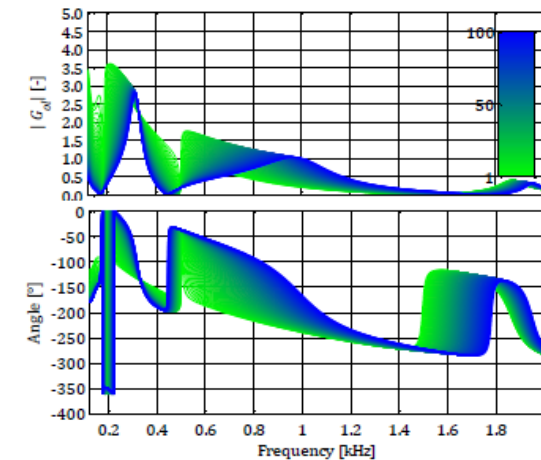
Railway electrification – voltage quality and unbalance

Harmonic interaction in multi-inverter networks (PV and WP, also offshore WPP)

Network stability including HVDC

Protection of grids

HVDC/MVDC technologies for the future offshore grid



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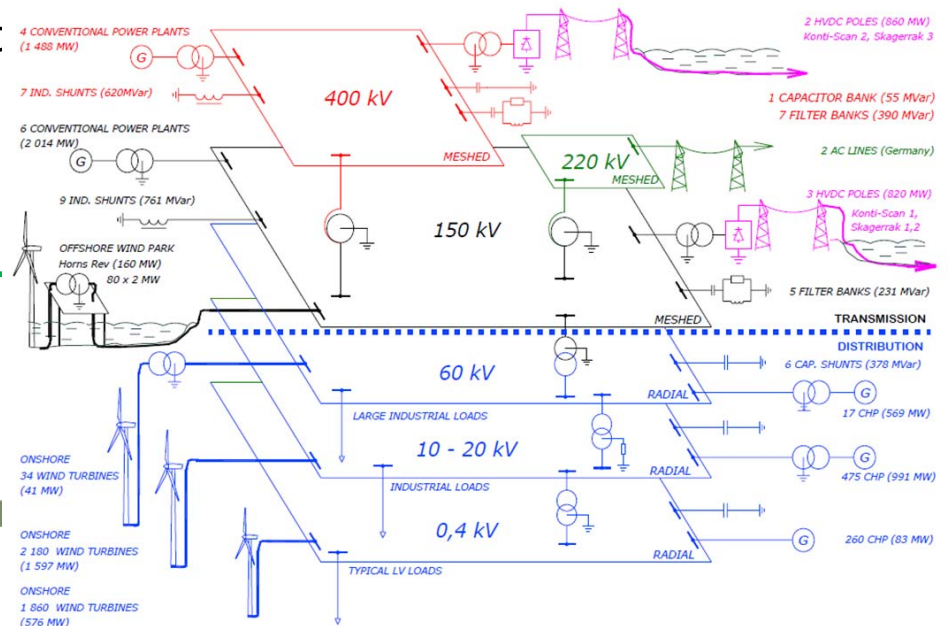
RESEARCH IN HARMONICS SINCE 2002

3 PhD's

- Harmonics in Transmission power systems by Wojciech Wiechowski 2006
- Harmonics in Large Offshore Wind Farms by Lukasz Kocewiak 2012
- Harmonics in Offshore Wind Power Plants Employing Power Electronic Devices in the Transmission System by Jakob Glasdam

Numerous Master level and Masters thesis project

HARMONY ERC project by Prof. Blaabjerg



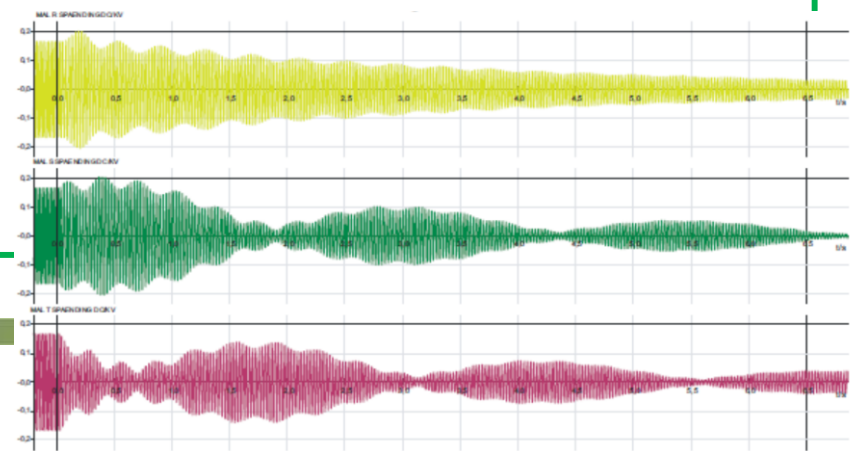
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RESEARCH IN UNDERGROUND/SUBMARINE TRANSMISSION CABLES SINCE 2004

5 (6) PhD's

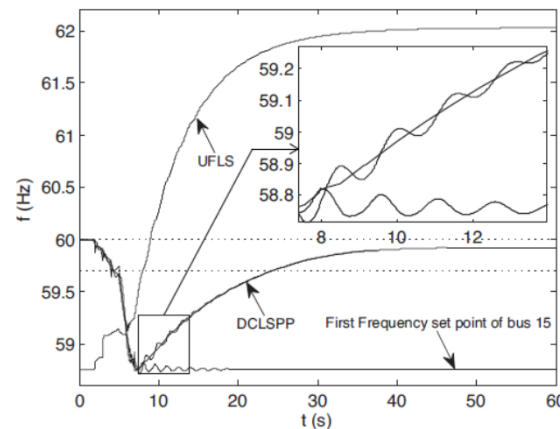
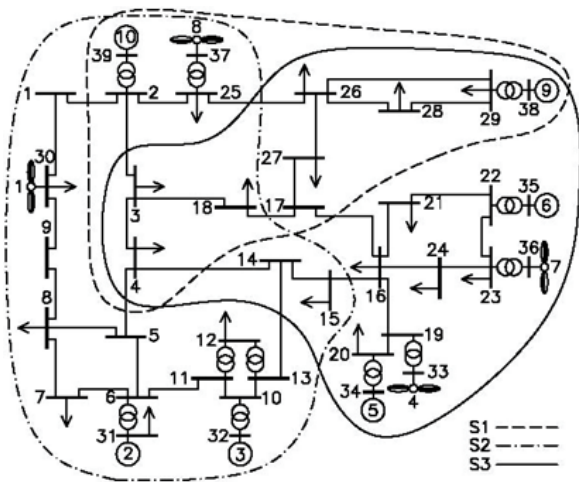
- Modelling of Long HVAC Cables in Transmission Systems by Stella Gudmundsdottir 2010
- Analysis and Simulation of Electromagnetic Transients in HVAC Cable Transmission Grids by Filipe Faria da Silva 2011
- Dynamic Study on the 400 kV 60 km Kyndbyværket – Asnæsværket Line by Teruo Ohno 2012
- Online location of Faults on AC Cables in Underground transmission Systems by Christian Jensen 2014
- EHV/HV Underground Cable Systems for Power Transmission by Claus Leth Bak 2015
- Losses in submarine cables (not completed)

Numerous Masters projects and publications



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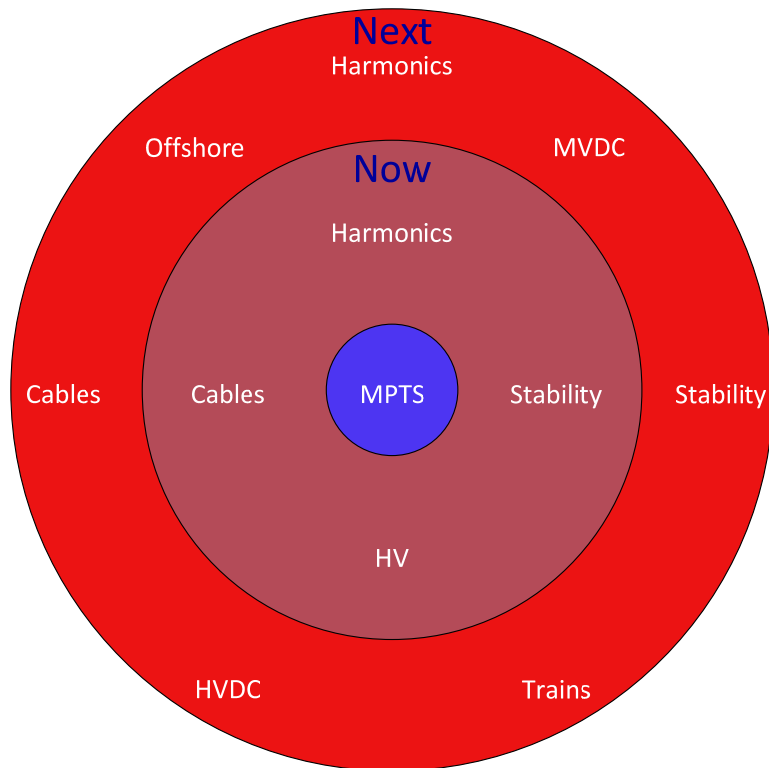
SALS – Smart Adaptive Load Shedding



ForskEl 2016
Very positive technical review
2 years
3 WP's for 1 postdoc
Total budget 2,5 Mkr
Approved!
One Assistant Professor and
partly two professors

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Core competences and focus areas

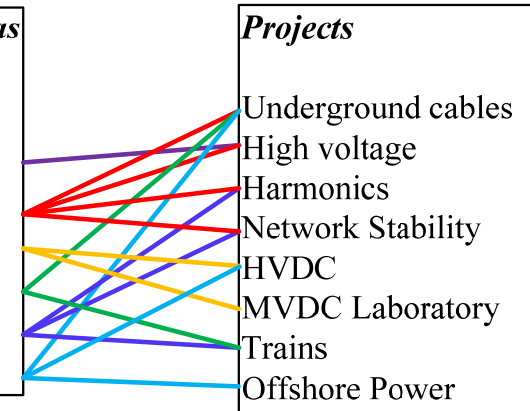


Core competences and focus areas

- High Voltage
- AC Power Transmission
- DC Power Transmission
- Electromagnetic Transients
- Security of supply
- Offshore-to-onshore connection

Projects

- Underground cables
- High voltage
- Harmonics
- Network Stability
- HVDC
- MVDC Laboratory
- Trains
- Offshore Power



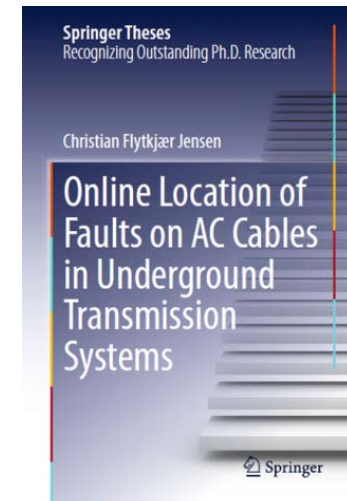
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Publication partners



Dept. of Energy Technology
and Danish Cigré NC
organizes Cigré international
Symposium 2019

**GOING OFFSHORE
CHALLENGES OF THE FUTURE
POWER SUPERGRID**



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State-of-the-art laboratory facilities in both HV and MV



ENERGINET/DK

DONG Energy, Siemens, ABB, Vattenfall
DEIF, Tennet, TU Delft....