Electric Energy Systems University Enterprise Training Partnership
http://www.ees-uetp.com/

EES-UETP course

HVDC technology and HVDC grids

Stockholm, November 17-19, 2025

Location: KTH, Gradängsalen
Teknikringen 1
SE-100 44 Stockholm Sweden

Map Link

Nearby rooms available for work and meetings

Important information

- Students have to bring their own laptop for the practical sessions
- For different sessions, Matlab & Simulink v2020 or newer is required
- It will be possible to work in groups for those students without license or without computer
- For practical session 1, Julia is going to be used, see documents attached, questions to Hakan Ergün hakan.ergun@kuleuven.be
- For practical session 2, Matlab & Simulink v2020 or newer is required, see documents attached, questions to adria.junyent-ferre@imperial.ac.uk
- For practical session 3, tbd

Dinner (TBD)

Monday, 17th November

Organizers

- KTH Royal Institute of Technology, Sweden
- CITCEA-UPC, Technical University of Catalonia, Spain.
- Technical University of Denmark, Denmark
- University of Leuven, Belgium

Coordinators

Dr. Staffan Norrga (KTH Royal Institute of Technology)
Dr. Ilka Jahn (KTH Royal Institute of Technology)

Prof. Oriol Gomis-Bellmunt (Technical University of Catalonia)
Prof. Nicolaos A. Cutululis (DTU)
Prof. Dirk Van Hertem (KU Leuven)

Description of the course

HVDC transmission is being considered as key driver to enhance the energy transition worldwide. The rapid development of offshore wind power, especially in North Sea, is favoring –and is also favored by – development of DC transmission. Based on the development of modern conversion technology (voltage source converter) the plans for the interconnection of multiple renewable power sources, loads and AC grids through DC technologies are leading to an exciting transmission concept: HVDC grids.

HVDC grids and Supergrids have sparked so much interest that researchers and engineers across the globe are talking about them, studying them, supporting or questioning them. The main motivation of this course is to present a complete picture of HVDC grid technologies and offshore wind power by collecting and summarizing recent technological advances, academic research development and engineering applications.

The course is conducted in three days covering various aspects of HVDC technology, HVDC grids applications including offshore wind, HVDC systems operations and control, and protections. The course consists of lectures, hands-on exercises and live Q&A sessions with the lecturers. All lecturers are internationally recognized experts in the area and they come from both academic and industry.

The course covers the overall spectrum regarding HVDC technologies, including:
(1) the advantages of HVDC compared to AC technologies for power transmission;
(2) the key technologies and challenges for developing an HVDC grid;
(3) design, operation, control and protection of HVDC grids;
(4) offshore wind power technology, offshore energy islands and synergy with DC technology.

The course is partly based on the books
"HVDC Grids: For Offshore and Supergrid of the Future", edited by the course coordinators.

Course program

DAY 1 - November 17th 2025						
Registration	8:30	-	9:00			
Intro to the course and HVDC systems (fundamentals, applications)	9:00	-	9:40	Oriol Gomis (conf)		UPC
Intro HVDC (basics, monopole, bipole, ac compared to dc, ...)	9:40	-	10:20			KUL
Grid-forming and grid codes	10:20	-	11:00	Xiongfei Wang (conf)		KTH/Tsinghua
Break	11:00	-	11:15			
HVDC power engineering - Manufacturer perspective	11:15	-	12:00	Jürgen Häfner (conf)		Hitachi
Operator perspective	12:00	-	12:30	Perry Hofbauer (conf)		SSEN
Offshore transmission developer perspective	12:30	-	13:00	Ervin Spahic (conf)		Elia Windgrid
Lunch	13:00	-	14:30			
Offshore wind technology	14:30	-	15:00	Nikos Cutululis (conf)		DTU
Practise module 1 -	15:00	-	18:00	Oscar Saborio (conf)		DTU & KUL

Design of offshore wind transmission systems (DTU) and HVDC Grid Planning (KUL)								
DAY 2 - November 18th 2025								
VSC & MMC 1 - *(from simple PE converter to MMC)*		9:00	-	10:00		Adria Junyent (conf)		Imperial
MMC 2 – Looking detailed at the MMC inside *(from semiconductor to cell to arm, PWM, arm balancing, low-level control & protection)*		10:00	-	11:00		Staffan Norrga (conf)		KTH
Break		11:00	-	11:30				
MMC 3 - principles of operation *(higher level MMC control)*		11:30	-	12:15				UPC
HVDC Circuit breakers		12:15	-	13:00		Staffan Norrga (conf)		KTH/ Scibreak
Lunch		13:00	-	14:00				
Insulation coordination and high voltage equipment for HVDC		14:00	-	14:45		Willem Leterme (conf)		RWTH
HVDC Cables		14:45	-	15:30				
Break		15:30	-	16:00				
Practise module 2 -VSC and MMC modeling		16:00	-	18:00		Adria Junyent (conf)		Imperial
DAY 3 - - November 19th 2025								
Operation and control principles for HVDC grids		9:00	-	9:45				UPC
Impedance Analysis and Stability Assessment of MMCs		9:45	-	10:30		Mehrdad Nahalparvari (conf)		Hitachi Energy
Break		10:30	-	11:00				
Ancillary services from offshore wind power and HVDC grids		11:00	-	11:45		Oscar Saborio (conf)		DTU
HVDC fault analysis & RMS/EMT modeling of systems with HVDC		11:45	-	12:30		Vinicius Lacerda (conf)		UPC
Lunch		12:30	-	13:30				
Protection for HVDC systems		13:30	-	14:15		Ilka Jahn (conf)		KTH
RT HIL simulation for HVDC systems		14:15	-	15:00				KUL
Break		15:00	-	15:30				
Practise module 3 – Protection of HVDC systems		15:30	-	18:00		Ilka Jahn (conf)		KTH

Intended Audience

The course would suit anyone who works in HVDC and/or offshore wind power integration related topics, especially would suit graduate power systems engineers, postgraduate students, power systems researchers who are starting to work in HVDC and/or offshore wind and junior engineers who want to

extend their knowledge. This course is also a great opportunity to meet and communicate with the experts and colleagues who work in the HVDC field.

Wifi

tbd