



**Electric Energy Systems University Enterprise Training Partnership**

<http://www.ees-uetsp.com/>

## **EES-UETP course: HVDC technology and HVDC grids**

Leuven, Belgium – 29 May – 1 June, 2018

### **Organizers**

University of Leuven, Belgium

CITCEA-UPC, Technical University of Catalonia, Barcelona, Spain

Cardiff University, UK

Technical University of Denmark, Denmark

### **Coordinators**

Dr Dirk Van Hertem (KU Leuven)

Dr Oriol Gomis-Bellmunt (Universitat Politècnica de Catalunya)

Dr Jun Liang (Cardiff University)

### **Description of the course**

The course is based on the book “HVDC Grids: For Offshore and Supergrid of the Future”, edited by the course coordinators.

In the past years, development of DC transmission has gained significant momentum as a result of two key drivers. Firstly, the development of modern conversion technology (voltage source converter) and secondly, the need for transmission of offshore wind power. 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 by collecting and summarizing recent technological advances, academic research development and engineering applications.

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) Non-technical aspects such as the influence of energy policy and regulatory frameworks.

### **Credits**

Course: 3,5 days (1 ECTS)

Course + exam (optional): 2 ECTS

## Intended Audience

The course would suit anyone who works in HVDC related topics, especially would suit graduate power systems engineers, postgraduate students, power systems researchers who starting to work in HVDC 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.

## Preliminary Program

<b>Day 1</b>	<b>29-May</b>			
9:00	10:30	General introduction of HVDC technology. Drivers for the development of HVDC grids. Energy Scenarios	Dirk Van Hertem	KUL
10:30	11:00	coffee break		
11:00	12:00	HVDC converter technology I (introduction on HVDC)	Carl Barker	GE
12:00	13:30	Lunch break		
13:30	14:00	HVDC converter technology II - Power electronics	To be confirmed	
14:00	14:30	Detailed and averaged converter (MMC) modelling	Mike Barnes	Manchester University
14:30	15:00	Converter control: low level control and capacitor balancing		
15:00	15:30	coffee break		
15:30	16:15	Cable technologies	Markus Saltzer	NKT
16:15	17:00	Cable modelling	To be confirmed	
19:00	~	Reception at Leuven city hall		
<b>Day 2</b>	<b>30-May</b>			
9:00	10:00	Models for HVDC grids. Power flow modeling of hybrid AC/DC systems. OPF	Jef Beerten	KUL
10:00	10:30	Converter control and design principles I: upper level control	Gilbert Bergna Diaz	NTNU



16:00	16:30	HVDC circuit breaker technology II: testing	Cornelis Plet	DNV-GL
16:30	17:15	Anticipating the operation of upcoming HVDC grids from a TSO 'standpoint: from applied research to standardization	Olivier DESPOUYS	RTE
17:45	18:30	Lab tour		
19:00	~	Dinner at Genk		
<b>Day 4</b>	<b>1-June</b>			
9:00	9:30	On regulatory and policy	To be confirmed	
9:30	10:00	Governance models. Regulation. Ownership.	Diyun Huang	KUL
10:00	10:30	Key regulatory and finance issues applied to COBRACable	Speaker to be confirmed	TENNET
10:30	11:00	coffee break		
11:00	11:30	HVDC Grid Planning. Power system operations with HVDC grids	Dirk and Hakan	KUL
11:30	12:00	NEMO/Alegro HVDC project	Tim Schyvens	Elia
12:00	12:30	Experience of Multiterminal projects	To be confirmed	
12:30	13:00	Future aspects of HVDC grids	To be confirmed	
13:00	13:15	Discussion and closure	Dirk Van Hertem	KUL
13:15	14:00	Lunch break (Brussels)		
17:00	~	beer testing @ Leuven		

## Venue

Main Location: Erasmushuis- Blijde-Inkomststraat 21, 3000, Leuven Belgium

Session on 31 May: Room Sun, EnergyVille Thor park 8310, 3600 Genk, Belgium

Session on 1 June: Friends of the Supergrid, Avenue de Cortenberg, 71, 1000 Brussels, Belgium

## **Registration fees**

The course fees include lectures attendance, documentation (cd and binder), coffee breaks and lunches, a reception, a conference dinner and transportation between the venues

Members of the EES-UETP: 450 EUR

University non-members of the EES-UETP: 1100 EUR

Industry non-members of the EES-UETP: 1835 EUR

## **Registration information**

Registration will open start from 15<sup>th</sup> March.

Additional information regarding accommodation and venue is available on

<https://www.esat.kuleuven.be/electa/ku-leuven-ees-uetp-course>