



Electric Energy Systems University Enterprise Training Partnership

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

EES-UETP course: HVDC technology and HVDC grids

Barcelona, Spain - December 13-16, 2016

Organizers

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

University of Leuven, Belgium

Cardiff University, UK

Coordinators

Dr Oriol Gomis-Bellmunt

Dr Dirk Van Hertem

Dr Jun Liang

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. The first electricity transmission line in the world was a DC line which was built in 1882. Since Westinghouse and Tesla won the “War of Currents” against Edison in 1890s, AC technology has dominated the electric power transmission. However, DC transmission has enjoyed a revival since the middle of the 20th century and, so far, more than two hundred high voltage DC (HVDC) projects have been built around the world and offer efficient transmission of large amounts of power over long distances. 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 course motivation is to present a complete picture of HVDC grid technologies by collecting and summarizing recent technological advances, academic research development and engineering applications.

The objectives of this course are to answer why HVDC is favourable over AC technologies for power transmission; what the key technologies and challenges are for developing an HVDC grid; how an HVDC grid will be designed and operated; and how future HVDC grids will evolve. The course also devotes significant attention to non-technical aspects such as the influence of energy policy and regulatory frameworks.

Course contents

Day 1		13 December		
8:00	9:00	Registration		
9:00	10:00	Introduction. Drivers for the development of HVDC grids. Energy Scenarios	Dirk Van Hertem	KUL
10:00	11:00	HVDC technology overview. Comparison of HVAC and HVDC Technologies	Hakan Ergun	KUL
		Break		
11:30	12:30	Topologies of offshore HVDC grids from the offshore wind prespective	Oriol Gomis	CITCEA-UPC
12:30	13:30	HVDC converter technology I	Arman Hassanpoor	ABB
13:30	15:00	Lunch		
15:00	16:00	HVDC converter technology II	Arman Hassanpoor	ABB
16:00	17:00	HVDC converter technology III (DC-DC converters and power flow control converters)	Eduardo Prieto, Jun Liang	CITCEA-UPC/Cardiff U
Day 2		14 Dec		
9:00	9:40	HVDC circuit breakers I	Robert Whitehouse	GE Grid Solutions
9:40	10:20	HVDC circuit breakers II	Cornelis Plet	DNV-GL
10:00	11:00	HVDC cables	Ernesto Zaccone	Prysmian
		Break		
11:30	12:30	Wind turbine technologies and Offshore wind power plants	Mikel de Prada, Eduardo Prieto	IREC/CITCEA-UPC
12:30	13:30	DC collection for offshore WPP + Alternative concepts	Jun Liang	Cardiff U
13:30	15:00	Lunch		
15:00	16:00	Models for HVDC grids. Power flow modeling of hybrid AC/DC systems. OPF	Jef Beerten	KUL
16:00	17:00	HVDC grid protection	Willem Leterme	KUL
Day 3		15 Dec		
9:00	11:00	Control principles of HVDC grids. Control design for HVDC grids	Oriol Gomis, Eduardo Prieto	CITCEA-UPC
		Break		
11:30	13:30	Interactions between ac and dc systems + frequency support	Marc Cheah	Cardiff
13:30	15:00	Lunch		
15:00	16:00	Operation and control of offshore wind power plants	Kevin Schönleber, Mònica Aragüés	GE, CITCEA-UPC
16:00	17:00	Anticipating the operation of upcoming HVDC grids from a TSO 'standpoint: from applied research to standardization	Samuel Nguefeu	RTE
Day 4		16 Dec		
9:00	10:20	HVDC Grid Planning. Power system operations with HVDC grids	Dirk Van Hertem	KUL
10:20	11:00	Governance models. Regulation. Ownership.	Diyun Huang	KUL
		Break		
11:30	12:30	New developments in HVDC and FACTS for power transmission grids	Ervin Spahic	Siemens
12:30	13:30	Inelfe project: VSC-HVDC interconnection between Spain and France	Luis Coronado	REE
13:30	14:00	Discussion and closure	Oriol Gomis	CITCEA-UPC
14:00	15:30	Lunch		

Instructors

Dr Ervin Spahic (Siemens)

Dr Jef Beerten (KUL)

Dr. Arman Hassanpoor (ABB)

Dr Diyun Huang (KUL)

Dr Robert Whitehouse (GE Grid Solutions)

Mr Willem Leterme (KUL)

Mr Luis Coronado (REE)

Dr Oriol Gomis-Bellmunt (CITCEA-UPC)

Dr Samuel Nguefeu (RTE)

Dr Eduardo Prieto-Araujo (CITCEA-UPC)

Dr Ernesto Zaccone (Prysmian)

Dr Mònica Aragüés (CITCEA-UPC)

Dr Cornelis Plet (DNV-GL)

Dr Mikel de Prada (IREC)

Mr Kevin Schönleber (GE Renewable Energy)

Dr Jun Liang (Cardiff U)

Dr Dirk Van Hertem (KUL)

Mr Marc Cheah (Cardiff U)

Dr Hakan Ergun (KUL)

Venue

ETSEIB-UPC, Av. Diagonal, 647, 08028 Barcelona, Spain <https://goo.gl/maps/bw73sL8CMx22>

Registration

The course fees include lectures attendance, documentation (cd and binder), coffee breaks and lunches.

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

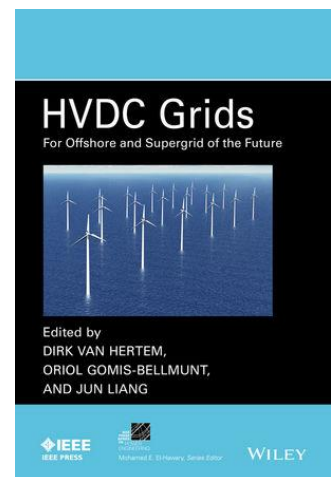
Students registered to the course will receive a hardcopy of the book "HVDC Grids: For Offshore and Supergrid of the Future", until the existences are extinguished. The books will be given strictly following the order of registration.

<http://www.wiley.com/WileyCDA/WileyTitle/productCd-1118859154.html>

This course is organized within the framework of the EES-UETP Consortium.

More information on this course shall be available very soon at:

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



Registrations are limited! You can register at <https://goo.gl/forms/N9ZLEYpAfRRx0E0I2>

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