EES-UETP 2014 HVDC Technology and Applications

Dates: 1-4 December 2014
Venue University of Strathclyde Glasgow, Scotland
Learn More: Web-link

Background

A previous version of this course "HVDC and HVDC Grids for Future Transmission" was organized by KU Leuven in December 2013 and was highly successful. We are now pleased to invite you to the new version of this course hosted by the University of Strathclyde, Glasgow from 1 to 4 December, 2014.

Who is this for? This course would suit anyone who attended in Leuven and wishes to refresh their knowledge but especially would suit graduate power systems engineers, postgraduate students, power systems researchers who starting to work in HVDC and engineers who work industry who are not already experts in HVDC and want to extend their knowledge.

The increasing power rating and capability of HVDC and its high controllability relative to AC network connections mean that HVDC is receiving increasing interest worldwide. As an active and fast growing research area, there is a healthy mix of research collaborations between industry and academia. This research and learning from initial applications feed into planning for regulators, system operators, and governments wondering about how to best integrate the technology.

This course considers HVDC technology from several perspectives. First, the economics and policy around the use of HVDC provide the rationale for investment into the technology and present current policy issues for its integration. Second, HVDC theory, design, control, and operation will link the latest developments of the technology to the core principles of its use. The third element, applications of HVDC, complements the basic principles already presented by demonstrating the effectiveness of real-life experiences, applications and practical issues. Two afternoon interactive tutorials on *Converter Design* and *Economics of HVDC* will complement the lectures in key concept areas.

EES-UETP is an Association of Universities and Enterprises for the training in the field of Electric Energy Systems. EES-UETP has 23 partners (4 enterprises and 19 universities) in 12 European countries.

Speakers

- Mike Barnes, University of Manchester
- Graeme Bathurst, RXPE
- Keith Bell, University of Strathclyde
- Alan Croes, TenneT
- Marie-Sophie Debry, RTE
- Justine Descloux, RTE
- Stephen Finney, University of Strathclyde
- Oriol Gomis, Universitat Politècnica de Catalunya
- Tim Green, Imperial College London
- Xavier Guillaud, Ecole Centrale de Lille
- Phil Mawby, University of Warwick
- Norman MacLeod, Parsons Brinckerhoff
- Carlos Moreira, INESC Porto
- Charlotte Ramsey, National Grid
- Dirk Van Hertem, KU Leuven
- Bob Whitehouse, Alstom
- Lie Xu, University of Strathclyde

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Registration Opens in October 2014

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Programme In-Brief

Dec 1 – Theme: Background of HVDC

HVDC Planning & Indications for Future Directions

- Energy Roadmap and the Need for More Transmission
- Topologies for Offshore Grids
- Economics of DC grids

Tuesday Dec 2 – Theme: Design and Operation HVDC Converter Technology & Control

HVDC Converter Technologies

- PE Components for VSC – HVDC Converters
- Converter Topologies
- Losses, Component Sizing, and Modulation

HVDC Converter Control

- VSC HVDC Control
- DC Grid Control
- Communication-free solutions for HVDC grids compatibility with grid code requirements

Converter Design Tutorial

Wednesday Dec 3 - Theme: HVDC Interaction with Power System

HVDC System-wide Interaction

- Operation of embedded HVDC
- Operation of LCC on an AC Power System
- AC System interactions

HVDC Protection Systems

- DC Fault Characterization
- System Protection challenges with HVDC
- HVDC Grounding

Economics of HVDC Tutorial

Thursday Dec 4 – Theme: HVDC Applications

Applications

- Moray Project
- Market and regulatory influence on interconnectors
- DC Circuit Breakers
- HVDC in China
- What happens after it's engineered and built: Experiences from BritNed Development Ltd

Registration and Costs

- Members of the EES-UETP: £280
- University non-members of the EES-UETP: £700
- Industry non-members of the EES-UETP: £1150

Registration includes lunches and a conference dinner.

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Detailed Agenda

Location: **204 George St, University of Strathclyde, Glasgow, G1 1XW** — **Royal College Building, Montrose Room R2.15**

December 1, 13:00 – 16:45 Theme: Background of HVDC

Timing	Topic	Speaker	Organisation
13:00 – 13:30	Opening Remarks	Stephen Finney	Strathclyde
13:30 – 14:30	Energy Roadmap and the Need for More Transmission	Dirk Van Hertem	KU-Leuven
14:30 – 14:45	Coffee / Tea Break		
14:45 – 15:45	Topologies for Offshore Grids	Oriol Gomis	UPC
15:45 – 16:45	Economics of DC grids	Keith Bell	Strathclyde
18:00 – 20:00	Conference Dinner		

December 2, 8:45 – 18:00 Theme: Design and Operation HVDC Converter Technology & Control

Timing	Topic	Speaker	Organisation
8:45 – 9:45	PE Components for VSC – HVDC Converters	Phil Mawby	Dynex
9:45 – 10:00	Coffee / Tea Break		
10:00 – 11:00	Converter Topologies	Tim Green	Imperial
11:00 – 12:00	Losses, Component Sizing, and Modulation	Mike Barnes	Manchester
12:00 – 13:00	Lunch		
13:00 – 14:00	VSC HVDC Control	Lie Xu	Strathclyde
14:00 – 15:00	DC Grid Control	Xavier Guillaud	Lille
15:00 – 15:30	Coffee / Tea Break		
15:30 – 16:30	Communication-free solutions for HVDC grids compatibility with grid code requirements	Carlos Moreira	INESCPorto
16:30 – 18:00	**Converter Design Tutorial** - design of the electrical components for a given 1 GW HVDC transmission system considering the typical required operating ranges. This includes the selection of the transformer voltages, the relevant AC and DC reactors, the power electronics converters voltage and current ratings etc.		Stephen Finney, Lie Xu - Strathclyde

December 3, 8:45 – 18:00 Theme: Design and Operation HVDC Converter Technology & Control

Timing	Topic	Speaker	Organisation
8:45 – 9:45	Operation of embedded HVDC	Marie-Sophie Debry	RTE
9:45 – 10:00	Coffee / Tea Break		
10:00 – 11:00	Operation of LCC on an AC power system	Norman MacLeod	Parsons Brinckerhoff
11:00 – 12:00	AC System interactions	Xavier Guillaud	Lille
12:00 – 13:00	Lunch		
13:00 – 14:00	DC Fault Characterization	Stephen Finney	Strathclyde
14:00 – 15:00	System Protection challenges with HVDC	Justine Descloux	RTE
15:00 – 15:30	Coffee / Tea Break		
15:30 – 16:30	HVDC Grounding	Dirk Van Hertem	KU-Leuven
16:30 – 18:00	**Economics of HVDC Tutorial** - An exercise to evaluate and make a recommendation on competing investment propositions, including a new interconnector. Guidance will be given on key elements of an investment appraisal and a discussion on uncertainties and risks.		Keith Bell - Strathclyde

Continued…

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December 4, 8:45 – 18:00 Theme: Design and Operation HVDC Converter Technology & Control

Timing	Topic	Speaker	Organisation
8:45 – 9:45	Moray Project	TBD	TBD
9:45 – 10:00	Coffee / Tea Break		
10:00 – 11:00	DC Circuit Breakers	Robert Whitehouse	Alstom
11:00 – 12:00	International Experience - China	Graeme Bathurst	RXPE
12:00 – 13:00	Lunch		
13:00 – 14:00	What happens after it's engineered and built: Experiences from BritNed Development Ltd	Alan Croes	TenneT
14:00 – 15:00	Market and regulatory influence on interconnectors	Charlotte Ramsey	National Grid
15:00 – 15:15	Coffee / Tea Break		
15:15 – 15:45	Closing Remarks	Stephen Finney	Strathclyde
15:45	Close		

Contact and More Information

- **If you have any questions, please contact:** eee-cpd@strath.ac.uk
- **More Information is available online at:** http://www.strath.ac.uk/eee/cpd/courses/ees-uetphvdctechnologyandapplications/

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