

EPE'25 – Call for Tutorials

HVDC Offshore and future DC grid applications

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Tutorial Objectives:

This tutorial aims to provide participants with a comprehensive understanding of VSC based HVDC systems, focusing on their architecture, operation, and emerging applications. The session will cover the fundamental components of HVDC systems, including MMC (Modular Multilevel Converter) station equipment and key design arrangements. Participants will gain insights into offshore HVDC applications, the integration of offshore wind farms, and challenges in future grid applications. Additionally, the tutorial explores innovations and R&D advancements, particularly in multi-terminal DC grids, through case studies of EU-funded projects such as Best Paths and InterOPERA.

Target Audience:

This tutorial is designed for engineers, researchers, and technical professionals working in the power systems and renewable energy sectors. It is particularly beneficial for those involved in HVDC projects, offshore energy projects, grid integration, and future energy network planning. Both beginners seeking foundational knowledge and experienced professionals aiming to stay updated on the latest advancements in HVDC systems will find this tutorial valuable.

Programme :

Introduction to HVDC and MMC station main equipment (Estimated time: 60 minutes)

- The basics of HVDC link
- HVDC MMC station main equipment description
- Single Line Arrangements
- Converter cell description
- Transformer arrangement and arm reactor
- AC/DC filters
- PQ diagram

HVDC Offshore application (Estimated time: 60 minutes)

- Offshore bus bar arrangement
- Coordination between offshore wind farm and HVDC
- Future offshore applications and challenges
- Example of dynamic performance and operation

Future DC grid application (Estimated time: 60 minutes)

- Overview on Multi-terminal DC grid
- DC grid concept
- R&D EU funded project : Best Paths feedback experience
- R&D EU funded project : InterOPERA

Provisional Schedule of the Tutorial:

Schedule:

- 2.00 pm – 3.00 pm : Introduction
- 3.00 pm – 3.30 pm : Offshore application part 1
- 3.30 pm – 3.45 pm : Coffee break
- 3.45 pm – 4.15 pm : Offshore application part 2
- 4.15 pm – 5.15 pm : DC grid
- 5.15 pm – 5.30 pm : Conclusions and open discussion

About the Lecturers:



Hani SAAD, Ph.D. HVDC Expert

Hani Saad (S'07) received his B.Sc. and Ph.D. degrees in electrical engineering from Polytechnique Montréal in 2007 and 2015, respectively. In 2015, he received the Best Ph.D. Thesis Award from Polytechnique Montréal for his thesis titled Modeling and Real-Time Simulation of VSC-MMC Based HVDC Transmission Systems.

He has over 14 years of experience in HVDC and renewable energy integration with RTE (the French TSO) and 5 years with RTE-International. He has been involved in the world's largest HVDC-VSC projects, EMT studies, and grid codes. Since 2022, he has been working as an independent consultant, supporting various stakeholders in the field of HVDC and grid integration of renewable energy systems.

Hani is an active member of several expert groups, including IEEE Task Forces, ENTSOE EG, and Cigré working groups. He is the convenor of Cigré B4-84, which focuses on the integration of energy storage in HVDC systems. Additionally, he serves as the French representative of the Cigré National Committee B4, a member of the B4 Advisory Group, and a member of the Advisory Group of the InterOpera R&D project.



Pierre RAULT, Ph.D. HVDC Expert

Pierre Rault has a decade of experience in HVDC field and has supported numerous related projects. His expertise has led him to participate in working groups in charge of setting standards in the HDVC field. He is a Power System Expert Engineer in RTE international since 2018, working mainly for the EQUINOR Johan Sverdrup project. In this position, he is involved in the coordination control philosophy of the two HVDCs links of the project. He follows replica installation and commissioning. In addition, he performs and analyses parallel tests with control replicas. At the same time, he is the secretary of CIGRE WG B4.70: “Guide for Electromagnetic Transient Studies involving VSC converters” and member of CIGRE B4-58: “Control Methodologies For Direct Voltage And Power Flow In A Meshed HVDC Grid”. Furthermore, he is the French representant in the committees TC8 / TC22 / TC115, where he follows and reviews new standards related to VSC-HVDC. Similarly, he is a member of TC115 – WG15 – Functional Specifications for HVDC Grid Systems. Pierre Rault has been studying and dealing with HVDC topics since his PhD on Multiterminal VSC-HVDC grid control strategies. Beforehand, he worked at GIE IDEA (EDF/Schneider Electric/G2Lab) on wind farm connections. He was in charge of the necessary requirements and thus reviewed grid codes compliance criteria. Moreover, he developed a methodology for wind farm reactive power management. Pierre Rault has good proficiency in English. He holds a PhD from Ecole Centrale de Lille, France and a Master’s degree from the Institut National Polytechnique de Grenoble, France.