

DISCUSSION MEETING

Study Committee B4

DC Systems and Power Electronics

31 August 2022

SUMMARY

Chair: Jingxuan (Joanne) Hu

Secretary: Rebecca Ostash

Special Reporters: Kamran Sharifabadi (Norway), Ricardo Tenorio (Brazil), Christian Winter (USA)

1. INTRODUCTION

The 2022 discussion meeting of Study Committee B4 was held on 31 August in the Grand Amphitheatre at the Palais des Congrès in a morning and afternoon session.

B4 GDM session was attended by approximately 150-200 in-person delegates and by approximately 7-10 remote delegates. The 67 papers covered by Study Committee B4 during the 2022 CIGRE and the 21 questions prepared by Kamran Sharifabadi, Ricardo Tenorio and Christian Winter in the special report were used as the basis for the discussion. The discussion included 60 prepared contributions, one invited presentation from CIGRE young (NGN) members. Spontaneous contributions were encouraged by the Special Reporters, and as a result 32 spontaneous contributions were made, one of these included a spontaneous contribution by a remote delegate. The large number of submitted contributions reflect the large interest in the preferential subjects and the area of HVDC and Power Electronics in general.

2. RUNNING OF THE MEETING

The Discussion Group Meeting was chaired by the Study Committee Chairman, *Joanne Hu*, with *Kamran Sharifabadi*, *Ricardo Tenori* and *Christian Winter* as Special Reporters and *Rebecca Ostash* as SC B4 Secretary.

Three preferential subjects were covered in the Technical Session:

PS 1 HVDC Systems and their Applications

- Planning and implementation of new HVDC projects including need, justification, design, integration of renewables, environmental assessment, and economic assessment.
- Application of new technologies including cyber security and advanced controls to address emerging network issues, DC grid, multi-terminal HVDC, hybrid HVDC systems.

- Refurbishment and upgrade of existing HVDC systems, service and operating experience of converter stations including offshore converters, and implications for converter equipment resulting from the conversion of AC circuits to DC circuits.

PS 2 DC for Distribution Systems

- New concepts, technologies and designs of DC converters for distribution systems.

PS 3 FACTS and Power Electronics (PE)

- Planning and implementation of new FACTS and other PE devices including need, justification, for integration of renewables, environmental and economic assessment.
- Application of new technologies in FACTS and other PE devices including interfacing generation and storage to the network.
- Refurbishment and upgrade of existing FACTS and other PE devices, service and operating experience.

These papers represent the latest information on many aspects of HVDC and MVDC systems as well as FACTS schemes at various stages from planning, design, construction, testing to operation, including:

- HVDC Planning, Control, Protection, Operation, Design & Performance
- Fault Ride-Through & Clearing in VSC HVDC Applications
- HVDC Refurbishment
- Harmonics and Filtering in HVDC Applications
- Offshore HVDC
- DC Grids
- Multi-Terminal & Hybrid (LCC+VSC) HVDC Systems
- HVDC Multi-Vendor Issues
- Lab & Field Testing of HVDC & MVDC Applications
- HVDC Statistics, Reliability Availability & Maintainability (RAM)
- DC/DC Converters
- SVC & STATCOM Applications
- Other FACTS Applications
- Grid Forming Applications

The GDM meetings started at 9:00 am (CEST) with opening remarks from Joanne Hu and continued till 5:30 pm (CEST), with two 30-minute breaks and 2h-hour break for lunch.

3. CONTRIBUTIONS TO PREFERENTIAL SUBJECT 1

Forty-nine (49) papers were accepted in 2022 under the **PS1 subject**. There were fourteen (14) questions raised in the special report for PS1 and total of forty-one (41) contributions were received in response to these questions.

4. CONTRIBUTIONS TO PREFERENTIAL SUBJECT 1/2

Four (4) papers were accepted in 2022 under the **PS1 and PS2 subject**. This Session PS1 and PS2 were grouped into one subject for relevant matters. There was one (1) question raised in the special report for PS1/PS2 and total of three (3) contributions were received in response to these questions.

5. CONTRIBUTIONS TO PREFERENTIAL SUBJECT 3

Eight (8) papers were accepted in 2022 under the **PS3 subject**. There were two (2) questions raised in the special report for PS3 and total of eight (8) contributions were received in response to these questions.

6. CONTRIBUTIONS TO PREFERENTIAL SUBJECT – Special Topic

Six (6) papers were accepted in 2022 under the **special subject**. This special topic was created later when it was observed that some subjects deserve special attention, such as Grid Forming Converters. In this special topic there were two (2) questions and eight (8) contributions.

6. CONCLUSION

The CIGRE 2022 session was a successful event for study committee B4. The GDM included 60 accepted contributions, one invited NGN presentation and 32 spontaneous contributions.

DC systems and power electronics continues to be a topic of great interest and participation around the globe. CIGRE has an important role in further development of this technology by making a wealth of technical information available to the engineers around the world and by providing a forum for detailed technical discussions and exchange of experience. In this session a hot topic was Grid Forming Converters and its utilization in present and future power systems.