Annex E HVDC Converter Transformers and Smoothing Reactors Subcommittee

April 26, 2021, 3.45 pm Central Time USA
Virtual Webex meeting

Chair: **Ulf Radbrandt (ulf.radbrandt@hitachi-powergrids.com)**
Vice Chair: **Les Recksiedler (absent)**
Secretary: **Klaus Pointner (klaus.pointner@ieee.org)**

E.1 Introduction / Attendance

Introductions were made and the attendance was checked by a poll.

There was a total of 24 persons in the meeting, 8 members and 16 guests present. 4 new requests for membership were received. Qualification for membership in the SC will be verified by the SC Chair.

Membership:

Short Name	Member ID	First Name	Last Name	Company Name	Role
HVDC		9 Leslie	R	M	Vice-Chair
HVDC		2 Michael	S	Ti	Member
HVDC		9 Christoph	P	H	Member
HVDC		2 Peter	H	W	Member
HVDC		1 Klaus	P	Ti	Secretary
HVDC		1 Pierre	R	P	Member
HVDC		5 Waldemar	Z	P	Member
HVDC		3 Eric	D	B	Member
HVDC		5 Rogerio	V	V	Member
HVDC		0 Ulf	R	H	Chair
HVDC		4 David	C	Ti	Member
HVDC		9 John	Jo	V	Member
HVDC		3 Solomon	C	Tl	Member
HVDC		2 Alexander	G	C	Member

	Answers	Results	%
A	Member	8/24	33
B	Guest	10/24	42
C	Guest requesting membership	4/24	17
	No Answer	2/24	8

The total membership of the SC is 14. We needed at least a total of 8 members to be present in order to have a quorum. This was achieved.

The agenda for this meeting, that was distributed via email April 14, was presented. The agenda was unanimously approved.

The list of all attendees of the meeting is shown here:

First Name	Last Name	Company	Role
Ulf	Radbrandt	Hitachi ABB Power Grids	Chair
Klaus	Pointner	Trench Austria GmbH	Secretary
David	Caverly	Trench Limited	Member
Eric	Davis	Burns & McDonnell	Member

Alexander	Gaun	Coil Innovation GMBH	Member
Christoph	Ploetner	Hitachi ABB Power Grids	Member
Pierre	Riffon	Pierre Riffon Consultant Inc.	Member
Michael	Sharp	Trench Limited	Member
Waldemar	Ziomek	PTI Transformers	Member
Robert	Berland	Kiewit Power Engineers	Guest
Thomas	Blackburn	Gene Blackburn Engineering	Guest
William	Boettger	Boettger Transformer Consulting LLC	Guest
Steven	Brzoznowski	Bonneville Power Administration	Guest
Domenico	Corsi	Doble Engineering Co.	Guest
Daniela	Ember Baciu	Hydro-Quebec - Laboratoire Haute Tension	Guest
Thomas	Falkenburger	Coil Innovation USA, Inc.	Guest
Feras	Fattal	Manitoba Hydro	Guest
Kurt	Kaineder	Siemens Energy	Guest
Dennis	Marlow	DenMar TDS Transformers	Guest
Sylvain	Plante	Hydro-Quebec	Guest
Alvaro	Portillo	Ing. Alvaro Portillo	Guest
Adnan	Rashid	Measurement Canada / ISED	Guest
Afshin	Rezaei-Zare	York University	Guest
Hemchandra	Shertukde	University of Hartford	Guest

E.2 Approval of the minutes of the October 19, 2020 virtual meeting

The minutes from the virtual Fall 20 meeting, that was distributed via email April 14, 2021 were presented and then unanimously approved.

E.3 Brief report on the meeting of the Administrative SC by Ulf Radbrandt

Proposal of the new name of the SC has been presented to the Administrative SC. However, the name must be approved by the Transformers Committee (TC) members by a vote – this will probably happen at the Thursday closing session.

Proposal of the new scope was also presented, but needs be confirmed by the TC members as well. The Administrative SC recommended to coordinate with the Dry Type SC regarding converter reactors as well as with the Performance Characteristics SC regarding Shunt Reactors (C57.21). The HVDC SC Chair

does currently not see any overlap and action required. The reason is that we already have coordinated with the Dry Type SC so that we include converter reactors, in IEEE 1277, that are located at the converter arms (with DC current) and Dry Type SC, in C57.16, include converter reactors that are located in series with the AC bus (without DC current). We don't need to coordinate with the Performance Characteristics SC since converter reactors never are shunt connected .

E.4 Name of this Subcommittee

As discussed at the Fall 2020 meeting the name of the SC shall be amended to:

TRANSFORMERS AND REACTORS FOR HVDC APPLICATIONS SUBCOMMITTEE

to also include converter reactors, which are included in IEEE 1277, Dry-Type and Oil-Immersed Smoothing Reactors and Dry-Type Converter Reactors

This item was also discussed at the Administrative SC meeting on April 20 and needs to be agreed by the Transformer Committee by a poll on Thursday – The Chair will make a motion at the closing session to initiate a voting.

E.5 Scope of this Subcommittee

The proposed update of the scope as discussed at the April 20, 2021 Administrative SC meeting is:

- Studying and reviewing engineering aspects of the requirements, design, testing, and installation of HVDC converter transformers, smoothing reactors and converter reactors. Only converter reactors for dc transmission located at the converter arms are dealt with;
- Developing and maintaining related standards, recommended practices, and guides for such product;
- Coordinating with other technical committees, groups, societies, and

Chris Ploetner questioned if it is required to limit ourselves by mentioning the converter reactors – if a new equipment comes up, then another revision might be required. The SC Chair stated that the change is in line with the information in the currently published standards of the SC.

Dave Caverly questioned, if cross reference to the C57.16 and vice versa shall be made. Klaus Pointner explained that the references are made in the relevant standards, thus no further clarification required.

Pierre Riffon made a motion, seconded by Hemchandra Shertuke to vote on:

- *Studying and reviewing engineering aspects of the requirements, design, testing, and installation of HVDC converter transformers, smoothing reactors and converter reactors. Only converter reactors for dc transmission located at the converter arms are included.*

After a short discussion a second proposal was brought on the floor.

- *Studying and reviewing engineering aspects of the requirements, design, testing, and installation of HVDC converter transformers, smoothing reactors and converter reactors. Only converter reactors for dc transmission located at the converter arms are dealt with herein.*

Pierre Riffon withdrew his initial motion and made motion to vote on the two alternatives: A - ending with "included"; B – ending with "dealt with herein".

Result of the online poll:

	Answers	Results	%
A	variant - "Included"	7/27	26
B	variant - "dealth with herein"	2/27	7
C	Abstain	1/27	4
	No Answer	17/27	63

The SC Chair will forward this proposal again to Bruce Forsyth for vote at the closing session. The Chair also mentioned that this change might impact the scope of the Transformers Committee, as the HVDC Converter Transformers and Smoothing Reactors (without the Converter Reactors) are mentioned in the TC scope as well.

E.6 HVDC Tutorial

Two tutorials are approved:

Part 1 (the second tutorial in the agenda for Thursday) will be at this Spring 21 meeting.

Scope:

HVDC Tutorial 1, HVDC System Aspects (LCC and VSC)	Duration, minutes	Responsible for material and doing presentation
Why HVDC? E.g. asynchronous connections, long DC cables, controllability, off-shore wind parks, Bulk Power	10	Ulf Radbrandt
Different types of converter configurations (e.g. bipolar, symmetrical monopolar, asymmetrical monopolar, back-to-back, multi-terminal). Perhaps we could include current rationale for application of different HVDC scheme types/topologies and any trends (IGBT ratings) or possible new technologies (Series Resonant Converters, MVDC)	10	Carsten Bartzsch
Different types of topologies 1/2 Bridge, Full Bridge, Hybrids, DC breakers	15	Carsten Bartzsch
Difference between Line Commutated Converters and Voltage Source Converters, including Single Line Diagram, operation principles, performance and guarantees	20	Pierre Riffon
Aspects of system design (e.g. calculations and simulations)	10	Ulf Radbrandt
Time for questions	10	

Unfortunately, Les Recksiedler is on sick leave for this meeting. Therefore, his part is split between Carsten and Ulf. Four alignment meeting have been held prior the tutorial. Tutorial material is in a good shape and a good presentation is expected by the SC Chair

Part 2 will be held at the Fall 21 meeting (Milwaukee)

HVDC Tutorial 2, HVDC Equipment Aspects (LCC and VSC)	Duration, minutes	Responsible
Special stresses and testing of converter transformers (LCC and asymmetric VSC)	15	Pierre Riffon
Special stresses and testing of smoothing reactors	15	Klaus Pointner
Special stresses and testing of converter reactors (only VSC)	15	Klaus Pointner
Special stresses and testing of DC bushings	10	Waldemar Ziomek
Special stresses and testing of AC and DC filter equipment, for LCC, with focus on the filter reactors	10	Alexander Gaun
Time for questions	10	

E.7 Working Group Reports

Currently no active working group.

E.8 Secretary of this Subcommittee

After the Fall 2020 meeting, Klaus Pointner has volunteered to act as the Secretary for the Subcommittee.

E.9 Future Work of this Subcommittee

As there is currently no active WG, question about possible tasks has been raised by the SC Chair. Waldemar Ziomek proposed to wait until the first tutorial if some topics are coming up by the attendees. All members and guests are welcome to raise topics in this context. Input may be dropped any time after the meeting to the SC Chair or the SC Secretary.

E.10 Old Business

There was no old business

E.11 New Business

There is no new business

E.12 Adjournment

The meeting was adjourned at 4:27 pm.