Meeting Minutes

PC37.01 Draft Standard for HVDC Circuit Breakers

Chair:	Steven Chen
Vice Chair:	Paul Yang
Secretary:	Carl Schuetz
Time:	Session 1: 8:00 am – 9:45 am
	Session 2: 10:15 am – 12:00 pm
Location:	Ft. Lauderdale, FL
Participants:	51 participants, including 11 members

1. Agenda and Topics

- Introduction of members and guests
- IEEE SA patent policy review
- IEEE SA copyright policy review
- Progress update
- Discussion
- Next Steps

2. Introduction

Welcome and introduction by Steven Chen, Chair of the WG. The roster is attached in the end of this meeting minutes as Attachment 1.

3. Review of IEEE SA Patent and Copyright Policies

IEEE SA Patent and copyright policies were presented and reviewed in the first session. The chair asked if anyone knew of any essential patents or copyright claims.
No patents or copyright claims were identified.

4. Approval of meeting minutes from F23

Quorum check (18 needed out of 34 members total): 11 members present – no quorum achieved.

Motion:
Second:

5. Approval of S24 agenda

Motion:
Second:

6. Progress Update

Ten additional individuals joined the WG, most of which have HVDC experience. Three online meetings were held since January with proposed voltage ratings being selected. More online meetings will be scheduled in order to collect data and experience to supply for the standard

draft. The chair shared the document development timeline with a proposed complete draft by the end of 2024. A call was made by the chair for more contributors to the standard from interested individuals.

An attendee mentioned initial draft work makes final document editing much easier if development is made within the IEEE-SA template document.

7. Discussion

Session #1

The DC system voltage rating starts at 3.2 kV and extends to an undefined value. This range has been selected to coordinate with C37.14 on the low end (that standard covers DC CB up to 3.2 kV) and the upper voltage level has been historically increasing. Specific industrial applications such as railway or shipboard-power systems are not covered (but are covered by other standards).

An attendee asked what the scope of the standard is. The chair and secretary replied that in a broad sense the scope is contained within the PAR. The PAR wording focuses on transmission and distribution of power in the DC form, specifically in a networked (or meshed) DC system. The attendee explained that there are present installations of battery and PV projects that utilize a DC voltage up to 3 kV. This limit is presently being held due to economics, space and arc flash concerns, there is claimed technology available to extend the dc voltage magnitude. If, or when this happens, the industry will need a standard that includes this type of circuit breaker application. The chair presented a slide that shows an example converter station and the associated equipment to the DC CB to illustrate why a DC CB standard is needed. The chair also explained that a standardized system voltage is required upon which a voltage range (including maximum value) for the DC CB can be set. Additionally, the DC CB standard is limited to DC systems that use a Voltage Source Converter (VSC).

An attendee pointed out that IEC has standards that address current interruption for Line Current Commutated (LCC) systems. The chairs response was that those IEC documents do not specifically distinguish between LCC and VSC systems and the fault current magnitudes and characteristics can be very different between them. For these reasons, the standard regarding DC circuit breaker would not apply to LCC systems because they do not use DC circuit breakers for protection.

An attendee mentioned that the PAR scope does not restrict the DC CB to one that is used in a networked DC system that is fed by VSC converters.

The chair reviewed the different types of DC CB construction (solid state, pure mechanical, mechanical-electronic hybrid) and what their component functionality is.

Session #2

The chair and secretary explained the need for a PAR extension and PAR change of scope. The scope change is necessary because of the industry trend toward all VSC HVDC systems and planned networked connections (mesh power system). The need for a faster interruption time

for a networked DC system and associated faster fault clearing time is the main reason that drives the need for this standard. The attendees in this session supported a PAR change in scope. Dustin Sullivan volunteered to supply the wording for the PAR scope change at the to-be scheduled online meeting.

The chair showed slides that provided the data used to select the rated DC voltage of range 1. Data used for range 2 was also provided, this came from existing world-wide projects (in China) and Cigre. In the range 2 class the CB max voltage may be higher than 5% due to the network voltage drop.

The chair reviewed the need for two different types of short circuit making rating. There are existing DC CB that do not close under load, they rely on a disconnect switch to close and pick up load. Other DC CB have the ability to close and open. In order to distinguish between the two types of short circuit making the chair proposed using the letter designation P; other possibilities are welcome. The P designation would be P1 or P2.

Discussion was undertaken regarding document development and the need for a completed working draft by the end of the year. An attendee suggested providing a proposed shell for each clause in which to provide the recommended rating values and verbiage. During the online sessions, and between them, the supporting data and verbiage can be added to continue with document draft. The chair explained that clause leaders have been identified, some newer clause leaders that have been selected as explained in session #1.

Suggested reading material from a WG member: IET – Green HV Switching Technologies for Modern Power Networks

8. Document Next Steps

- Plan for further, multiple online meetings to discuss progress and further work needed before the next meeting.

9. Motion to Adjourn

Motion: Victor Hermosillo

Report submitted by: Steven Chen and Carl Schuetz

Attachment 1 - Attendance

First Name	Last Name	Affiliation	Role
Joe	Andreyo	Southern States	Guest
Ganesh	Balasubramanian	Eaton Corporation	Guest
Paul	Barnhart	UL LLC	Guest
Francis	Beauchemin	Hydro-Quebec	Guest
Albane	Bornuat	GE Vernova	Guest
Arjan	Bronsveld	Hitachi Energy Sweden	Guest
Pedro	Castillo	ABB	Guest
Steven	Chen	Eaton Corporation	Chair
David	Dart	NOJA Power	Guest
Lissy	Diaz	FPL	Guest
Maxwell	Eastman	Black & Veatch	Guest
Sergio	Flores	Schneider Electric	Member
Juan	Gill	Southern States LLC	Guest
Christian	Heinrich	Siemens AG	Member
Victor	Hermosillo	GE Grid Solutions	Member
Tyler	Holp	Eaton Corporation	Guest
Danny	Hoss	Southern States	Guest
Bill	Hurst	GE Renewable Energy	Guest
Sudesh	Jaggernauth	Florida Power & Light	Guest
Riyad	Kechroud	GE Vernova	Member
Dwight	Krause	Black & Veatch	Guest
Linda	Liu	Sieyuan Electric Co., Ltd.	Guest
Steve	May	Southern Company Service	Member
Fernando	Ordein Torres	Dominion Energy	Guest
Miklos	Orosz	CB Technology & Support	Guest
Sumitabha	Pal	Schneider Electric	Member
Damian	Podgorski	Sargent & Lundy	Guest
Isaac	Pounders	Meiden America Switchgear	Guest
Nicholas	Redden	Georgia Transmission	Guest
Aaron	Rexrod	Meiden America Switchgear	Guest
Anthony	Ricciuti	Eaton Corporation	Guest
Brian	Robert	Southern States	Guest
Leonel	Santos	Schneider Electric	Member
Benjamin	Sax	Nashville Electric Service	Guest
Daniel	Schiffbauer	Toshiba International	Guest

Carl	Schneider	Schneider Electric	Guest
Carl	Schuetz	American Transmission Company	Secretory
Jeffrey	Scott	Ameren	Guest
John	Sestito	Hyundai Electric America	Guest
Devki	Sharma	Retired	Guest
Jeremy	Sneath	Electranix Corp	Guest
Dustin	Sullivan	Hubbell Power System	Member
Dragan	Tabakovic	Hubbell Power System	Guest
Timothy	Terry	Meiden America Switchgear	Guest
Francois	Trichon	Schneider Electric	Guest
Nenad	Uzelac	G&W Electric	Guest
Jacob	Walgenbach	Siemens	Guest
Jeffrey	Ward	Doble Engineering Company	Member
Jan	Weisker	Siemens Energy	Guest
Mina	Youssef	Eaton Corporation	Guest
Wei	Zhang	Southern Company	Guest