Minutes for C37.30.7 - HVDC Switches
April 8, 2025
Spring 2025 Meeting – Orlando, FL

- The working group met for two sessions on April 8th.
- 32 participants were in attendance for the first meeting. 23 participants were in attendance for the second meeting. 9 of 11 members were in attendance for the first session, and 10 of 11 members were in attendance for the second session. See the attached attendance roster.
- Attendees introduced themselves and stated their affiliations.
- WG Chair Bill Hurst reviewed the Patent and SA Copyright slides with working group.
    - No participants stated any patent conflicts with the WG.
- WG Chair reviewed the minutes from the previous Fall meeting, no objections were made.
- Draft 7 is the newest version of the document.
- WG reviewed Draft 7
    - Table 2 - Removed Fault Initiating and Regulator Bypass columns
    - Annex G: Typical Bipolar DC System image and table - Table modified to include the switches that will be included in this standard (Disconnect or Earthing in nature) and not show what is covered by HVDC CB standard
        - Action Item: Remove color coding and color key block from image before final draft (Bill)
    - Ratings Discussion/Review
        - Dielectrics - Table 4b & Table 4c
            - Open gap withstand has 10% higher withstand (like in AC)
            - Remove the 10% on switching impulse, not lightning impulse - Previous WG decision in April 2024 session to remove the 10%, but TF has questioned that decision since then, so WG to revisit topic
                - IEC does not have the 10% higher switching impulse value across the gap
                - Breaker does not have the 10% higher withstand
                - There hasn't been a coordination of 10% for switching impulse in AC, only in lightning impulse (Danny)
                - In switching impulse for DC, you have 100% probability of having maximum voltage on both terminals , but in AC that probability could be lower to align both max voltages simultaneously (Riyad)
            - WG Member Vote - Motion made by Danny Hoss: Motion to vote to remove the 10% gap coordination from the switching impulse ratings. Seconded by John Kaminski.
                - Yes (remove) -5 - Danny Hoss, Jacob Blake, John Kaminski, Laura Reid, Brett Boles
                - No (keep)- 4 - Bill Hurst, Adam Voyles, Riyad Kechroud, Peter Mapp
                - WG Members voted to remove the 10% coordination
            - Question asked if we need to keep the extra voltage across the open terminals (Column 8) in switching in Table 4c (Wei). Is the voltage negligible?
                - The voltage, while small, is always there. In the wet condition for DC, this is more severe than in AC wet condition. (Riyad)

- Temperature Rise - Previous WG decision was to remove the switch part class designation and allowable continuous current class sections from the document (AC requirement). Then Table 3 would also have columns 3 and 5 removed, which supports those two sections.
    - Bill just restating this change being made
- Withstand Current- Tables 6 & 7
    - Added Column 3 to Table 6 to align with IEC, adds the Joule Integral
    - Duration of short circuit in Column 3 changed from .7 sec to 1 sec.
    - (Riyad) The maximum value of circuit breaker short circuit event is 1 second. We should align the switch with the CB requirement of 1 second
        - We can still use the I^2*t conversion to manage the time duration of the event
        - WG agreed to align with HVDC CB group to have the withstand time set to 1 second
- Mechanical (Table 7)
    - Concern that keeping the AC terminal loading requirements are too high for DC and will induce too high of bending moment on insulators with over-insulation (Riyad)
        - Ameren requires higher terminal pad capabilities than what is stated in Table 7 of AC and there's concern to decrease the values for DC (Adam)
        - Working load on the insulator is 40%. The values in Table 7 are too low for AC switches. (Danny)
        - Note below the table states that if higher forces are needed, to consult the manufacturer
        - Bus weight in DC will be smaller b/c can carry more current on same cross section (Danny)
        - Chair proposed to add note to Table 7: DC switch applications sometimes require significant increase in the insulator height in which case the manufacturer should be consulted regarding deflection due to terminal load.
    - Table 7 amperage groups 2000-6000 all together, should it better specify the higher amperages, i.e. 4000A? (Adam V)
        - Modify Column 2, Line 3 & 5 to replace "600-1600" to be "<2000" since 600A and 1600A are not common ratings anymore (Bill)
- Definitions - Should point-to-point and multiterminal be defined? (Adam V)
    - (Bill) Propose to show diagram of point-to-point and multiterminal in Annex and provide a description of each.

- Session 1 ended on 4/8/2025 at 3:45pm.
- Session 2 began on 4/8/2025 at 4:15pm.
    - Testing
        - Test Labs: KEMA (100kV DC in USA), CHESI, Hitachi, Siemens
        - DC Voltage Withstand (Power Frequency equivalent in AC, Section 7.2.2.1)
            - Dry condition - IEC only allows DC voltage application, no AC equivalent
            - Wet condition - IEC only allows DC voltage application, no AC equivalent
            - Duration: 1 hour; Eros mentioned testing could be for 10-15 minutes and be sufficient. The stress from the capacitive charge will be achieved.
        - Power Frequency:

        - Dry conditions can likely test in AC with the same value as DC and be OK, IEC doesn't allow for this (Riyad)
        - Wet conditions, DC is more severe (Riyad)
    - Switching Impulse:
        - Impulse (in DC) to be applied on one side, but the other side IEC allows us to use AC, DC, or switching.
    - RIV
        - Can test in AC or DC
        - IEEE AC test starts at 123kV
        - IEC starts at 210kV DC
        - Proposed value: Start RIV testing at 200kV DC (Danny, Bill, Riyad)
        - RIV limit (500/750 in AC), is 2500 in DC in IEC
    - Continuous Current (Temp Rise)
        - Testing can be done in AC or DC
    - Short Time Withstand
        - Testing can be done in AC or DC
        - Test labs limited on DC capability
    - Peak
        - Danny proposes to use 10 cycles of symmetrical values since values are so low
    - Unfavorable distance testing for Earthing Switches
        - IEC has this dielectric test requirement. IEEE C37.30.1 has Table 24 for clearance dimension values.
- Insulators - Common Requirements in IEC 60071-11
    - Is there a definition for pollution? Is there a mm/kV value? We need to define a "normal condition" for insulators. (Danny)
    - Could also point to the IEC standard specific to insulator pollution in DC application.
- Task Force: Bill Hurst, Riyad Kechroud, Danny Hoss, Boubacar Diallo, Peter Mapp, and Laura Reid to continue looking at the dielectric testing requirements - DC testing, AC equivalent if it's an option
    - Action: TF to have a proposal for the dielectric requirements at the fall meeting and finish all of the testing criteria in the draft
- Motion to Adjourn: Peter Mapp, Second by Brett Boles at 5:48pm

- Next meeting in Reno, NV, week of October 5th
- Motion to Adjourn: Peter Mapp; Second: Brett Boles
- The second session adjourned on 4/8/2025 at 5:48pm.

<u>Action Items for Fall 2025 Meeting:</u>

- Task Force to continue working on the testing criteria and have a proposal for the dielectric requirements at the Fall meeting. Have the draft updated with all test criteria.
- Short circuit values will be reviewed by the Task Force and a recommendation made to the WG
- PAR revision to be submitted by WG Chair to update the scope from 1000 Vdc to 3200 Vdc.
- WG Chair will send out a copy of Draft 7 to the working group.

Thank you,
Laura Reid

WG Vice Chair

WG PC37.30.7 S24 Attendance

Last Name	First Name	Company	Role	4/8/2025 1of2	4/8/2025 2of2
Andreyo	Joe	Southern States LLC	Guest	X	
Beck	Jason	Dominion Energy	Guest	X	X
Blake	Jacob	Hubbell Power Systems	Member	X	X
Boles	Brett	Southern Company	Member	X	X
Cook	Tim	Pascor Atlantic	Guest	X	X
Cunningham	Jason	Power Grid Components	Guest	X	
Diallo	Boubacar	Southern States LLC	Guest	X	X
Dunn	Chris	Dominion Energy	Guest	X	
Ekpoudom	Assian (Chris)	Southern States LLC	Guest	X	
French	Chris	Beta Engineering	Guest	X	X
Gill	Juan	Southern States LLC	Guest	X	X
Gordish	Daniel	Cleaveland/Price Inc.	Guest	X	X
Grenier-Paulin	Renaud	Mindcore	Guest	X	X
Guan	Ron	PG&E	Guest	X	
Hamilton	Lon	Southern States LLC	Guest	X	
Holp	Tyler	Eaton	Guest	X	X
Hoss	Danny	Southern States LLC	Member	X	X
Hurst	Bill	GE Renewables	Chair	X	X
Jacques	Sara-Kim	EMSPEC	Guest	X	
Jur	Arthur	Electro-Mechanical	Guest	X	X
Kaminski	John	Siemens Industry	Member	X	X
Kechroud	Riyad	GE Grid Solutions	Member	X	X
Kowalik	Pete	Cleaveland/Price Inc.	Member		X
Mapp	Peter	EMSPEC	Member	X	X
Moore	Jeremy	Pascor Atlantic	Guest	X	X
Morehead	Mollie	Pascor Atlantic	Guest	X	X
Reid	Laura	Hubbell Power Systems	Vice Chair	X	X
Ross	Rob	Cleaveland/Price Inc.	Guest	X	X
Stevens	Harrison	Hubbell Power Systems	Guest	X	
Voyles	Adam	Ameren	Member	X	X
Wenzel	Jim	Eaton	Guest	X	
Zia	Danish	Underwriters Laboratory LLC	Guest	X	
Zhang	Wei	Southern Company	Guest	X	X