Meeting Minutes of Working Group PC37.011 Guide for the Application of TRV for High-Voltage Circuit Breakers
April 25, 2018 Orlando, Florida.

Chair: Denis Dufournet Vice-Chair: Joanne Hu Secretary; Carl Schuetz

Introduction of members and guests

Attendees: 54

Members: 17

Guests: 37

Verbal call for patent identification: No essential patent identified

Approval of minutes from Fall meeting (Portland)

Motion to approve: Xi Zhu

Second: Anne Bosma

Introduction by the Chair

First working group meeting (PAR approval in June 2017), prior meetings were by a study group.

The chair presented a list of substantive revisions/additions to the document.

PAR will be active until Dec. 31, 2021

First official WG meeting in October 2017

Actions since last meeting

Dec. 2017 – January 2018 ballot for D6 closed with 91% participation, 97% approval rate, 2 negative comments

PC37.011 Guide for the Application of Transient Recovery Voltage for AC High-Voltage Circuit Breakers with Rated Maximum Voltage above 1000 V

BALLOT OPEN DATE: 22-Dec-2017

BALLOT CLOSE DATE: 22-Jan-2018

TYPE: Revision

DRAFT #: D6

COMMENTS: 83

MUST BE SATISFIED COMMENTS: 16

RESPONSE RATE
This ballot has met the 75% returned ballot requirement.

106 eligible people in this ballot group.

91 affirmative votes
2 total negative votes with comments
2 negative votes with new comments
0 negative votes without comments
4 abstention votes: (Lack of expertise: 2, Lack of time: 2)

97 votes received = 91% returned
4% abstention

APPROVAL RATE
The 75% affirmation requirement is being met.
91 affirmative votes
2 negative votes with comments

93 votes = 97% affirmative

Dispositions of comments were discussed by correspondence in February.

Draft 7 was done with implementation of accepted comments.

A draft of D.4 was written by Lucas Collette on short line fault modeling and the contribution of the line side to the TRV.

Discussion of draft on SLF modeling

Provide clarity on when the SLF capability curve can be used: it will be clarified that comparison of TRVs must be done for similar values of breaking current

Several attendees expressed the opinion that the rated line component is not adequately represented by the first peak without subsequent peaks. It will be clarified that the TRV up to the first peak is used to compare SLF severity. The Figures will be modified to show the TRVs up to the first peak.

L60 and L90 are used to show how the TRV changes due to the different current level.

A single-line diagram will be added to show the circuit in case of SLF, as done in other cases in Annex D.

The explanation on simulation of bundle conductors with or without bundle contraction will be moved to D.5.

Note: In the case of terminal fault, the value of the surge impedance of N lines on the supply side of the circuit breaker affects the RRRV that is equal to Z x dI/dt / N.

CIGRE TB 456 section was shown that describes the relation between fault current values and time until bundle contraction occurs.

3.4.3 Background of technical requirements

For the line surge impedance, IEC 62271-100 and IEEE C37.04 have a standard value of 450 Ω, considering bundle contraction due to magnetic attraction caused by a large fault current, although the equivalent line surge impedance calculated without bundle contraction is less than 360 Ω (see IEEE C37.011-2005 and values in Table 3.4.1 for system voltages 500 kV and 765 kV). Besides the fault current, the actual values of line surge impedance depend on multi-bundle conductor designs (materials, cross-section, span and spacer size) and the mechanical tension applied on the conductors of the lines.

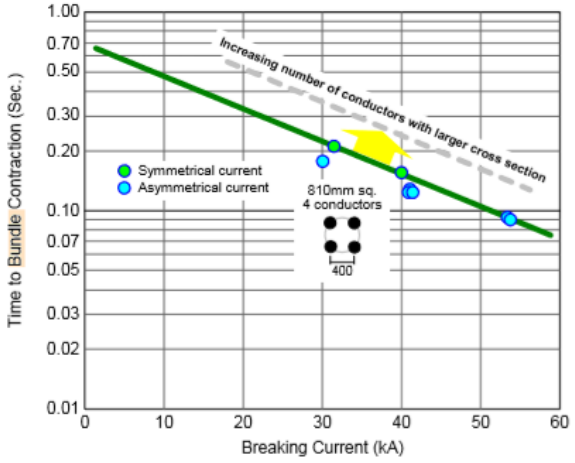

Figure 3.4.1 Collision time of multi-bundle conductors

Discussion of comments on balloted draft 6

The main comments and their resolution made by correspondence were reviewed.

Other point of discussion

In standards it is considered that ITRV is covered by SLF testing performed with a line having a time delay less than 0.1 µs. This is based on studies done in 1970's and 1980's, in particular by Klaus Ragaller et el, the two cases: ITRV on supply side and line having a time delay, no ITRV and a line with time delay less than 0.1µs. The second case was found to be more severe. These studies were made using an arc model to represent the circuit breaker. Sushil who challenged this result is encouraged to provide evidence that this should be reviewed.

Next Steps for the document

Clarifications and improvements will be made to Annex D.

Recirculation 1 is planned in October 2018

Final recirculation ballot in 2019.

Expected submission to RevCom, after C37.04, in end of 2019 or in 2020.

Action Items

In Annex D

- Revise D.4 as discussed during the meeting (Action: Lucas)
- Move the text on bundle contraction modeling as a statement in station modeling D.5 (Denis)
- Circulate a revised draft D8 to WG members for comments (Denis)
- Recirculation 1 to do in October 2018 (Denis)

Working Group PC37.011
Attendance Meeting in Orlando, April 25th 2018

Name	Affiliation	Member/Guest
Denis Dufournet	Consultant (GE Grid Solutions)	Chair
Joanne Hu	RBJ Engineering	Vice-Chair
Carl Schuetz	ATC	Secretary
Mauricio Aristizabal	ABB	M
Arben Bufi	Hitachi HVB	M
Helmut Heiermeier	ABB	M
Victor Hermosillo	GE Grid Solutions	M
Amir Khosravi	BC Hydro	M
Jim van de Ligt	CANA High voltaje Ltd	M
Hua Y. Liu	Southern California Edison	M
Sushil Shinde	ABB	M
Mike Skidmore	AEP	M
Jan Weisker	Siemens	M
Xi Zhu	GE	M
Anthony Ricciuti	Eaton	G
Vincent Marshall	Southern Company Services	G
Will Zhang	Hitachi T&D Solutions	G
Tom Pellerito	DTE Energy	G
Jeff Brogdon	GTC	G
Jim Mc Bride	Jmx High Voltage	G
Li Yu	Eaton	G

Name	Affiliation	Member/Guest
Andrew Chovanec	GE	G
Michael Christian	ABB	G
Tom Mulcahy	Dominion Energy	G
Chris Jarnigan	Southern Company Services	G
Steven May	Southern Compnay Services	G
Brendan Kirkpatrick	Southern California Edison	G
Edwin Almeida	Southern California Edison	G
Andrew Peterson	ABB	G
Neil Hutchins	Southern Company Services	G
Sangtae Kim	HICO	G
Hang Jun Kim	HICO	G
Dave Riffe	Westinghouse	G
Elizabeth Gall	MEPPI	G
Zachary Pintado	Entergy	G
Dave Mitchell	Dominion Energy	G
Vernon Toups	Siemens	G
Bruce Fennell	NES	G
Don Steigerwalt	Duke Energy	G
Jerry Wen	BC Hydro	G
Mike Crawford	Mitsubishi Electric	G
Cory Johnson	BPA	G
Todd Irwin	GE Grid Solutions	G

Name	Affiliation	Member/Guest
Neil Mc Cord	KEC Precision	G
Patrick DiLillo	Consolidated Edison Company	G
John Eastman	Franklin Grid	G
Jeremy Hensberger	Mitsubishi Electric	G
Mary Owens	Eaton	G
Casey Weeks	Siemens	G
Curtiss Frazier	Ameren	G
John Phouminh	Pepco Holding Inc	G
John Webb	ABB	G