

C37.06.1 Draft Meeting Minutes

Place: Pittsburgh, PA

Date: October 10th, 2016

Prepared by: Carl Schuetz

Attachment: Agenda, Roster

Spring Meeting minutes approved by Anne Bosma

Second by Denis Dufournet meeting minutes approved

Discussion: Sushil

Document will remain as a recommended practice. D3 comments will be reviewed, comments from July and August 2016.

Resolution of comments:

Roy Alexander_i-71 – Denis explained the 1.8*.0.7 factor (1.28) of the TRV peak is the same whether a TLF or reactor limited fault. The high-frequency part of the TRV in a TLF fault is addressed by this document the peak is addressed by the terminal fault test duty. The present revision of this document corrects the 1.28 (1.8 amplitude factor and 0.7 supply voltage). This explanation of TLF will be inserted into the TRV application guide C37.011. Proposal to add this TRV explanation into this document as C37.011 is not under PAR yet.

Ken Edwards_i-110 – same as above

Richard York_i-104 – Rich agreed that an explanation would satisfy his comment

Lucas Collette_i-70 – Many users prefer the peak values of the present C37.06.1. Anne and Denis explained that the peak value is related to the system grounding arrangement and should be limited to 1.3 EHV and 1.2 UHV.

Denis Dufournet_i-1 – Denis explained the idea behind fpcf 1.3 and table nos will be modified to accommodate that.

Ted Burse_i-105 – The historic values have been in use a long time and have not exhibited any problems. The present values are greater and cover more than the 80% of applications as listed in this version of the document. Ted requested a table of present ratings to be included in an Annex to help users compare and contrast the revisions between the two documents. Bill Long explained that the transition from ANSI to harmonized was made with an explanation that detailed how the harmonized values

Proposal is to include further explanation of how the new values were derived and compare to the present C37.06.1 values. Ted confirmed this proposal was acceptable to satisfy his comment.

Further documents review by Sushil:

Comment 29 - Revised the document to include high-freq TRV of comment 29

Comment 32 – One decimal place will be used for the time delays of Table 2.

Comment 43 pg11 by #22 – (comments regarding wording of Scope and Purpose clauses) **The Scope and Purpose clause wording will be taken from the PAR.**

Comment 42 – same resolution as comment 43

Comment 68 – Will reference the application guide in discussion of reactor limited faults.

Comment 91 pg 17, note – Table 3 has a note included since it applies only to that table. This note applies to system voltages less than 362 kV. The wording “effectively grounded” will be reviewed and considered for use.

Comments 104, 105, 110 – addressed previously

Comment 119 pg12, 90 – **remove wording “transformer limited fault” and make the wording able to stand on it’s own without reference to Clauses.**

Comment - Bill Long agreeable to

Comment 139 - **Will move description of TLF fault to after Table 1.**

Review of document by Sushil:

Scope and Purpose changed from PAR, allowed by IEEE SA as long as it agrees in principle w/PAR.

Table 1 gives rated TLF breaking currents, decouples TLF current from short circuit rating of the CB. This was based on a survey of data taken from the past. At rated voltages of 123 kV and above the mfg has the option of choosing TLF current rating according to historic data obtained. Lower TLF currents in Table 1 are covered by the higher current values out of the 3. Tables 2 and 3 list the TLF1 and TLF2 test duties corresponding to the closest R10 value found in Table 1. (discuss with Sushil).

Annex A explains basis of ratings

Annex B summarizes survey of transformer ratings that was used to determine fault current ratings of TLF

Annex C contains bibliography

Rich York-Wants to eliminate interpretational variation of TLF test currents. This is explained in Clause 5?

WG Revision of C37.06.1 IEEE Switchgear Meeting, Fall 2016 Pittsburgh, PA

Sushil Shinde / October 10, 2016

Agenda

- Welcome and Introductions
- Hilton Head, SC MOM
- Status of Working Group
- Ballot Result (Draft D3)
- Draft D4
- Next steps

Status of WG C37.06.1

- PAR expires Dec 2016
- PAR renewal will be requested for 1 yr before Oct 17, 2016
- The document will be “recommended practice” and not “standard”
- Draft 3 was circulated for 1st ballot process

Ballot Result

- Draft file name: PC37.06.1/D3, July 2016
- Close Date: 25-Aug-2016 23:59 ET
- Response Rate %: 90
- Approval Rate %: 77
- Abstain Rate %: 10
- No of Comments: 140

Ballot RESPONSE RATE

- This ballot has met the 75% returned ballot requirement.

99 eligible people in this ballot group.

63	affirmative votes
18	total negative votes with comments
18	negative votes with new comments
0	negative votes without comments
9	abstention votes: (Lack of expertise: 4, Lack of time: 4, Other: 1)
90	votes received = 90% returned 10% abstention

Resolution of Comments (major)

- i-71 (Alexander, Roy)

Comment:

Peak values are too low need to be multiplied by about factor of 1.28 This is not just TLF but used for inductor switching the peak values and rise times must not be less than the existing C37.06.1

Change:

Make certain all values are not less than the existing C37.06.1 for peak and the time to peak is not greater than the present times to peak for the equivalent 30% currents.

Resolution of Comments (major)

- i-110 (Edwards, Kenneth)

Comment:

This document has been revised to only cover one fast transient rise time cause. There are several other causes of fast transient rise times such as 3 phase faults, compensated lines, shunt and series reactors, and the list goes on. A TLF is not the worst case. The document now has three options for every fault current level, and some are higher than 50% of the rated fault current. The ratings must be tied to a fault rating. This has taken a proven guide and washed it down to no use. We will be specifying the older document as this one has no use anymore if left like this.

Change:

Go back to the original document and convert it to four parameter TRV and leave it as is.

Resolution of Comments (major)

- i-104 (York, Richard)

Comment:

Table 1 Lines 8 through 14 list three different "Rated TLF Breaking Current" values for Rated Maximum Voltages 123 - 800 kV. It is not clear how or why each voltage rating specifies three different TLF 'Ratings'.

Note 2 and Annex B does explain how/why the TLF rating is decoupled from the rated short circuit current for 362 kV and above. But, this table still specifies three separate rated TLF values. Is it the intention to increase the required testing to achieve a TLF rating per this recommended practice?

The test requirements are to perform interruption tests at both the 30% & 100% of the Rated TLF current in Table 1. This will require 3x the testing as what is currently required. For a 145 kV rated maximum voltage, tests will need to be performed at 3.75, 6, 7.5, 12.5, 20 & 25 kA! I cannot agree to this.

Change:

Assign a single TLF current rating for each voltage class;

or

re-couple the rated TLF to the breaker short circuit rating.

Resolution of Comments (major)

- i-70 (Collette, Lucas)

Comment:

Until a standard exists that covers other fast TRV phenomena such as series reactor-limited faults, we should not be lowering the test requirements by so much. Many in industry still use C37.06.1 for applications other than transformer-limited faults.

Change:

Maintain the same ratings as before (i.e., same overall peak and rate-of-rise) and just convert to 2-parameter curves.

Resolution of Comments (major)

- i-1 (Dufournet, Denis)

Comment:

As neutrals are effectively grounded in systems in the higher rated voltages range TRVs should be based on a first-pole-to-clear factor of 1.3 (instead of 1.5). The following recommendation in CIGRE Technical Brochure 570 should be followed: A first-pole-to-clear factor of 1.3 (100 kV up to and including 800 kV) or 1.2 (UHV) is regarded as being at the safe side of actual values, which are closer to 1.0. Though an exception are networks with non-effective earthed neutrals (possible up to and including 170 kV).

Change:

Revise at least lines 16 to 21 of Table 3 with TRV peak values based on $k_{pp} = 1.3$ (instead of 1.5) and revise equations in Annex A accordingly

Resolution of Comments (major)

- i-105 (Burse, Ted)

Comment:

This revision introduces completely new information on this subject which effectively obsoletes all circuit breakers tested to the 2000 version by simple omission of all the previous version's text and tables. Although perhaps this new information is technically acceptable, the omission and obsolescence of all prior art is not in good service to the industry.

Change:

Create an annex that captures the 2000 edition text and tables for continued viability of currently tested circuit breakers.

Next Steps

- Draft D4 will be recirculated for 2nd ballot process
- Resolve all comments before next meeting and recirculate if necessary

Questions?

First Name	Last Name	Company	Role	10/10/2016
Mehmet	Adanur	Southern Company Services	Guest	
Roy	Alexander	RWA Engineering	Member	
Michael	Anderson	American Transmission Company	Guest	
Mauricio	Aristizabal	ABB	Member	XX
Ayers	Roy		Guest	
William	Bane	Nashville Electric Service	Guest	
W.J. (Bill)	Bergman	PowerNex Associates Inc.	Member	
Stan	Billings	Mitsubishi Electric PP	Member	XX
Anne	Bosma	ABB AB	Member	XX
Cody	Brehm	American Transmission Company	Guest	
Steven	Brown	Allen & Hoshall	Guest	XX
John	Brunke	Dr. John H. Brunke, P.E.	Guest	
Arben	Bufi	HITACHI HVB, INC.	Member	XX
Richard	Burge	Southern States LLC	Guest	
Ed	Burt	BC Hydro	Guest	
Eldridge	Byron	Schneider Electric	Guest	
Michael	Cannady	Southern Company Services	Guest	
Donald	Cantrelle	Georgia Power	Guest	
Gilbert	Carmona	Southern California Edison	Guest	
Stephen	Cary	Eaton Corporation	Guest	
Steven	Chen	Chenhouse North America	Guest	
Chih	Chow	PEPCO	Member	XX
Dave	Collette	Mitsubishi Electric	Guest	
Lucas	Collette	Mitsubishi Electric Power Products	Member	XX
Michael	Crawford	Mitsubishi Electric	Guest	
Jason	Cunningham	HITACHI HVB, INC.	Guest	
Patrick	Di Lillo	Consolidated Edison Co. of NY, Inc.	Member	
Denis	Dufournet	Alstom Grid	Member	XX
John	Eastman	INCON	Guest	X
Alexander	Ebbert	HICO America	Guest	
Doug	Edwards	Siemens Energy, Inc.	Guest	
Ken	Edwards	Bonneville Power Administration	Guest	
Robert	Foster	Megger	Guest	

Sahadev	Gohil	AZZ/Central Electric Mfg. Co.	Guest
John	Hall	Tennessee Valley Authority	Guest
Daryl	Hallmark	Southern Company Services	Guest
Helmut	Heiermeier	ABB	Member XX
Charles	Hendrickson	Arizona Public Service Company	Guest
Victor	Hermosillo	Alstom Grid	Member XX
Luther	Holloman	Dominion	Guest
John	Horton	EPRI	Guest
Jingxuan (Joanne)	Hu	RBJ Engineering Corporation	Member
Todd	Irwin	Alstom Grid Inc	Guest XX
Anton	Janssen	Liander	Guest
Cory	Johnson	BPA	Guest
Joseph	Jasinski	ITC Holdings	Guest X
Dave	Johnson	Consultant	Guest
Byung-Kyue	Jun	Hyosung Corporation (HICO)	Guest
Aaron	Kalyuzhny	Israel Electric	Guest
Amir	Khosarvi	BC Hydro	Guest
William	LaMantia	Mitsubishi Electric Power Products, Inc.	Guest
Stephen	Lambert	Shawnee Power Consulting, LLC	Guest
Matthew	Lawrence	Doble Engineering	Guest
David	Lemmerman	PECO/Exelon	Member XX
Paul	Leufkens	KEMA-Powertest	Guest
Hua Ying	Liu	Southern California Edison	Member XX
Albert	Livshitz	Schneider Electric Services	Guest
Bjorn	Lofgren	Siemens Energy	Guest
Russell	Long	Retired	Member XX
Antonio	Mannarino	PSE&G	Guest
Vincent	Marshall	Southern Company Services	Guest XX
Ricardo	Martinez	CFE-LAPEM	Guest
Peter	Marzec		Guest
John	Marzula	Mitsubishi	Guest
Deepak	Mazumdar	Central Electric Manufacturing Co.	Guest
Neil	McCord	Southern States	Guest
Peter	Meyer	S&C Electric Company	Guest

Dave	Mitchell	Dominion	Guest	XX
Georges	Montillet	GFM Consulting LLC	Guest	
Raj	Nayar	Siemens Energy Inc.	Guest	
Jeffrey	Nelson	Tennessee Valley Authority	Guest	
T	Olsen	Siemens Industry, Inc.	Guest	
Miklos	Orosz	Schneider Electric NAOD/Square D Co	Guest	
Mirko	Palazzo	ABB	Guest	
Amit	Patel	GE	Guest	
Shawn	Patterson	US Bureau of Reclamation	Guest	
Thomas	Pellerito	Detroit Edison	Guest	X
Lise	Phan	Parcific Gas and Electric Company	Guest	
Cornelius	Plath	Omicron electronics	Guest	
Reynaldo	Ramos	Southern Company	Guest	
Francis	Ricard	FirstPower Group LLC	Guest	
Anthony	Ricciuti	Eaton Corporation	Member	XX
Jon	Rogers	Siemens Energy, Inc	Guest	
Roderick	Sauls	Southern Company Services	Member	
Rahman	Syed	The United Illuminating Co	Guest	
Carl	Schuetz	American Transmission Company (ATC)	Member	XX
Jon	Schumann	ATC	Guest	
Devki	Sharma	Consultant	Member	XX
Harish	Sharma	Southern Company Services	Member	
Sushil	Shinde	ABB Inc.	Chair	X
John	Shullaw	GE Energy - Industrial Solutions	Guest	
Dean	Sigmon	Eaton Corporation	Guest	X
Michael	Skidmore	AEP	Member	XX
Robert	Smith	Eaton Corporation	Guest	
Zachary	Smith	Mitsubishi Electric Power Products, Inc.	Guest	
Don	Steigerwalt	Duke Energy	Guest	X
Henk	te Paske	KEMA Netherlands	Guest	X
John	Toney	GE	Guest	
Vernon	Toups	Siemens	Guest	
Stephen	Tyler	Dominion	Guest	
James	van de Ligt	CANA High Voltage Ltd.	Guest	

Steve	Vatterott	ABB Inc.	Guest
Jan	Veisker	Siemens AG	Member
Wes	Wadsworth	Hitachi HVB, Inc.	Guest
Keith	Wallace	Southern Company	Guest
John	Webb	ABB	Guest
Jerry	Wen	BC Hydro	Guest X
Richard	York	MEPPI	Member XX
Jiong	Zhang	MEPPI	Guest
Xi	Zhu	HICO America	Member XX
Sandeep	Zope	Powell Electrical Systems Inc.	Guest
John	Eastman	INCON	Guest
Jeff	Brogdon	Georgia Transmission Corp.	Guest
Mike	Lafond	Genereal Electric	Guest
Casey	Weeks	Siemens Energy	Guest X
Ahmed	Shahab	Siemens Energy	Guest
Jeremy	Hensberger	MEPPI	Guest
Aasim	Atiq	Siemens Energy	Guest X
Timothy Shane	McGee	Siemens Energy	Guest
Berne	Dwier	PECO/Exelon	Guest
Jean-Marc	Torres	Eaton Corporation	Guest
Wei	Zhang	HITACHI HVB, INC.	Guest
Art	Jur	Eaton Corporation	Guest
Kavin	Rogerson	Eversource	Guest
Thomas	Kohhler	Ameren	Guest
Frank	Mayle	TechniBus Inc	Guest
David	Cauerly	Trench Limited	Guest
Jean-Marc	Torres	Horseheads NY	Guest
Jeremy	Hensberger	MEPPI	Guest
Roy Neil	Hutchins	Southern Company Services	Guest
Fennell	Howard	Nashville Electric Service	Guest
Anil	Dhowan	Comed	Guest
Andrew	Peterson	ABB Inc.	Guest
Joe	Browning	FirstPower Group LLC	Guest
Jeff	Brogdon	Georgia Transmission Corp.	Guest

Dan	Schiffbauer	Toshiba	Member	XX
Scott	Lanning	S&C Electric Company	Guest	X
Anton	Poeltl	ABB Inc.	Guest	X
Joe	Kausek	FirstPower Group LLC	Guest	X
Oscar	Montana	Salt River Project	Guest	X
Frank	Mayle		Guest	X
Kim	Jinho		Guest	X
Jim	McBride		Guest	X
Jeffrey	Britton		Guest	X
Neil	Hutchins		Guest	X
Ted	Burse	Powell Ind	Guest	X
Santosh	Reddy	Powell Ind	Guest	X
Alexander	Hoover	Siemens	Guest	X
Robert	Warren	KEMA Laboratories	Guest	X
Alan	Peterson	Utility Services Corp	Guest	X
Jason	Cunningham	Hitachi T&D Solutions	Guest	X