POWER SYSTEM RELAYING AND CONTROL COMMITTEE
OF THE IEEE POWER AND ENERGY SOCIETY
MINUTES OF THE MEETING
May 8-11, 2017

Albuquerque, NM

Call to order/ Introductions Pratap Mysore

Chairman Pratap Mysore called the meeting to order at 8:00 am on Thursday, May 11, 2017.

All attendees introduced themselves. A quorum check was conducted and it was verified that the quorum was met (68 members attended out of 130). Main Committee Attendance sheet was routed.

Approval of Minutes & Financial Report Murty Yalla

Motion to approve Minutes of the Jan 2017 meeting in New Orleans, LA was moved by Bob Dempsey, seconded by Roger Hedding and the motion was approved unanimously.

The financial status of PSRC is in good standing.

Chairman's Report Pratap Mysore

Dear Members and attendees

I take this opportunity to thank the past chair, Mike McDonald, who guided me through the past years when I was the secretary and vice-chair and also provided me with details of roles and responsibilities as the chair. I always reach out to him and the past chair Roger to get their thoughts whenever I need help. I am happy to know that Mike will be there providing input to the present officers when needed.

Our May 2017 meeting was a joint meeting with Power Systems Cyber Security Committee at Embassy Suites in Albuquerque. The meeting was well attended with over 200 attendees though the initial numbers registered were below our minimum room requirement. Thanks to those who responded and to those who registered earlier.

Publicity Working Group is now separated from Membership Working Group to focus on

publicizing the great work done by working groups of our Committee. Catherine Dalton has accepted the position as the chair and Mal Swanson would be the vice-chair. Cathy will also be assisting Mal as the vice-chair of the membership committee. Cathy brings in great enthusiasm and has already started working with several working groups who have finished their work to set up webinars through IEEE to promote our work around the globe. K15 WG which finished their report on centralized substation and protection is scheduled in June 2017. Shortly there will be an announcement from IEEE. Cathy is also working on one page documents for publicizing our work in IEEE sponsored events and also PAC World magazine. If you have completed the assignment and the report is published, please contact Cathy to this publicized to the IEEE community.

Power Systems relaying community lost two past members during the last quarter. Jules Esztergalyos (1940- 2017) was a very active contributor to many working groups. Though Jules is not with us, his contributions to the community will be remembered for a long time. According to one of his colleagues at BPA, he was known for his brilliance at solving problems and also for his sense of humor. We also lost Rick Taylor (1947-2017) who was the chair of PSRC from 2003-2004. He was also vice-president at the Technical activities at IEEE PES. His leadership and guidance and his contributions are well appreciated in the community and also at regional conferences where he was actively involved and promoted our work. He will be missed.

I take this opportunity to thank my colleagues on this ship, Russ Patterson, Vice-chair and Murty Yalla, Secretary and I am looking forward to the future meetings. Hope to see you all in September at Phoenix, AZ and I sincerely hope that you will all register and reserve your rooms early to allow us to concentrate on running a better meeting.

Thanks again and see you in September in phoenix.

Best regards

Pratap

Reports of Interest

Report from the Vice- Chair – Russ Patterson

Technical Paper Coordinator's Report.

2017 PES general meeting: There were 63 conference papers submitted and 31 papers accepted.

Future Meetings

September 2017 meeting will be held from September 11 -14, 2017 in Phoenix, Arizona at Sheraton Crescent Hotel.

January 2018 JTCM meeting will be in Jacksonville, FL and the January 2019 JTCM meeting will be in Garden Grove, CA.

Details are posted on the PSRC website

May 2018 meeting will be held from May 5-12. 2018 Pittsburg, PA at the Pittsburgh Marriott City Center

CIGRE B5 Activities Report – Rich Hunt

The next B5 Colloquium will be held in Auckland, New Zealand September 11th-1th, 2017. Conference details:

http://cigreauckland2017.org.nz/

The preferential topics for the Colloquium are:

PS1 - Challenges of design and maintenance of IEC 61850 based systems

Interoperability on PACS level for IED, Merging Units, time synchronization and communication networks

Requirements facilitating IED replacements and PACS extensions

PACS configuration management including SCL handling and IED- and switch configuration

PS2 - Protection issues in modern power systems with renewable generation and storage

Modeling of inverter-based sources for protection and automation

Recommendations for the short circuit response of inverter-based sources.

Protection challenges and solutions for applications near non-conventional sources.

PS3 - The Impact on Protection and Control from Working Existing Assets Harder

Refurbishment strategies of PAC Systems

Series compensation

Dynamic/flexible line rating & climatic conditionsWorking Groups

The U.S. has 2 papers being presented at the Colloquium.

CIGRE Grid of the Future Symposium

The CIGRE Grid of the Future is a Symposium is organized the by the CIGRE US National Committee, and involves the participation of all CIGRE Study Committees, including the B5 Protection & Control Study Committee. The best way to participate is to

present a paper at the Symposium. Full papers, not abstracts, are due July 28, 2017 for consideration for inclusion in the Symposium. Completed manuscripts will be due September 8th. To submit a paper, simply send the paper to GOTF@tamu.edu. For complete details on the Symposium, including preferential subjects for papers, please visit http://cigre-usnc.org/grid-of-the-future. Note that papers must be written and published in the CIGRE format, available on the Grid of the Future site. CIGRE operates on country representation. If you don't reside in the US, you're still welcome to submit papers to the Grid of the Future Symposium.

CIGRE 2018 General Session

The 47th CIGRE General Session will be held in Paris, France from August 26th through 31st, 2018. The Call for Papers is already released at. The call for synopses is already closed. The U.S. has submitted 4 synopses for consideration for the General Session, 3 authored by members of PSRC. All of these papers have been submitted to consider one of the 2 Preferential Subjects for the 2018 General Session:

PS 1 / Protection under system emergency conditions

Emergency loading, load shedding and islanding practices and experiences.

System oscillation detection and out of step / pole slipping techniques.

Thermal protection.

PS 2 / User experience and current practice with IEC61850 process bus

Interoperability between merging units, stand alone and associated to NCIT, and Protection functions.

Experience from FAT, SAT, commissioning and maintenance of process bus based equipment and functions.

Use of process bus for metering and monitoring of HV equipment

WG B5.42, Experience concerning availability and reliability of DSAS, has successfully completed its mission. The Technical Brochure has been approved for publication by SC B5, and will be published as TB 687, on www.e-cigre.org, with a summary on the next edition on Electra Magazine. This Bulletin
provides a review of Reliability, Availability, Maintainability and Performance (RAMP) of schemes included in digital substation automation systems (DSAS).

rich.hunt@ieee.org
richard.hunt@ge.com

IAS Power System Protection Committee – No report

IEC Report - Eric Udren

IEC REPORT
E.A. Udren
TC 95, Measuring Relays and Protection Systems

TC 95 drives IEC protection system standards – electrical and physical environment type testing, design, safety, and functional behavior. Technical work is carried out by Maintenance Teams (MTs) and by Working Groups led by Convenors. Dr. Murty Yalla of PSRCC is Chair of TC 95 (internationally).

The Technical Advisory Group (TAG) to the US National Committee of IEC for TC 95 meets as a part of PSRCC WG I4, developing US comments and votes on TC 95 standards drafts at each stage of international development. USNC requires an official TAG Administrator outside the TAG, a member organization of USNC; in order for our TAG to participate in international standards development. As a practical matter, our TC 95 handles its own administrative procedures and hasn't required any real outside administrator work or expense. Our official administrator has been IEEE Standards Association, but SA has withdrawn from this role for all of its TAGs; our TC 95 TAG must find a new administrator to maintain the US as a voting participant in relay standards development. We are currently in discussion with five potential new administrator organizations, and have a couple of prospects in play.

Since January, Committee Drafts (CDs) for two projects were reviewed by the TAG:

60255-1 Edition 2, CD, Common requirements (revision). This standard is the IEC parallel to IEEE C37.90, which is also now in revision, so a comparison and harmonization of any details we can accept makes sense – a review is in order with our revision WG. The TAG submitted minor comments on this CD.

60255-181, CD2, Functional requirements for frequency protection – after major comments and serious concerns on CD1, the TAG submitted minor comments on CD2.

TC 95 MTs 1-4 met in Tokyo in April 3-7 and worked on the following projects:

IEC 60255-181: *Functional requirements for frequency protection* – MT4 reviewed technical comments on CD2. The project leader will submit a review draft CDV to MT4 members by August 15.

IEC 60255-187-1: *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – MT4 member comments on the draft CDV were resolved; the project leader will be submitting the CDV to IEC the week of May 15 for subsequent international voting.

IEC 60255-187-2: *Functional requirements for busbar differential protection* – Project leader and co-leader will be appointed by the TC Chair. An international call for experts is forthcoming. PSRCC support WG should be planned in SC K.

IEC 60255-187-3: *Functional requirements for biased (percentage)*

differential relays for transmission lines – The project leader will be updating the draft with MT4 comment resolutions by August 15. PSRCC WG D34 had contributed earlier comments and remains in service for upcoming versions.

IEC 60255-1 Ed. 2: MT3 resolved all comments received from CD1 circulation. The next draft will be produced at the next meeting in October.

Update to IEC 60255-26 Ed. 3: Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements. As with Part 1, the revision addresses whether we test adequately for influences from Smart Grid devices. Francois Garrigou of FR is co-convenor; MT2 reviewed comments and will produce a new draft for circulation within the MT before the next meeting.

Update to IEC 60255-27 Ed. 2: Measuring relays and protection equipment – Part 27: Product safety requirements. Adapt the standard to meet requirements of the European Low Voltage Directive on protection of people and animals from all risks. MT3 will begin revision work at the next meeting.

A new TC 95 AHWG convened by Volker Leitoff of France will document how sampled values per TC 38 IEC 61869-9 impact functional standards of MT 4. System behavior under various failure and problem scenarios will likely require standardization. The group will first meet separately from MTs at the Paris office of RTE during the week of May 24.

Next TC 95 MT meetings are planned in London, UK during the week of October 23-27, 2017.

TC 57, Power systems management and associated information exchange

A TC 57 report is not available at time of writing. Check SC H minutes for a possible liaison report.

Standard Coordinators Report – Adi Mulawarman

PSR Standards Coordinator's Report Spring May, 2017

The status of standards activities that have taken place since the January 2017 meeting of the PSRC are as follows:

RevCom = Revision of existing standard
NesCom = New Standard

Revision to Existing Standards Completed

C37.94 (no longer PSRC, moved to PSCC)

C37.238 (no longer PSRC, moved to PSCC)

PAR for revising existing standard or creation of new standard Approved Standards due for 10 year review

None

Ballot Activity:

See attached spreadsheet.

Standards/Projects currently in Balloting (Sponsor Ballot, Comment Resolution, Recirculation)

PAR Nu	Project	PAR Expir	Invitation	Ballot Clo	Status
P60255-11	Revision	12/31/2017	10/28/2016	12/2/2016	Sponsor Ballot: Comment Resolution
PC37.237	New	12/31/2017	2/20/2016	5/16/2016	Sponsor Ballot: Comment Resolution
PC37.241	New	12/31/2017	10/27/2016	1/15/2017	Sponsor Ballot: Comment Resolution
PC37.246	New	12/31/2017	1/5/2017	2/10/2017	Sponsor Ballot: Comment Resolution
PC37.248	New	12/31/2017	2/8/2017	3/11/2017	Sponsor Ballot: Comment Resolution
PC57.13.1	Revision	12/31/2017	2/12/2017	4/13/2017	Sponsor Ballot: Comment Resolution
PC37.112	Revision	12/31/2021	5/11/2017		Sponsor Ballot: Invitation

PARS expiring at the end of 2017 (all in comment resolution and require no extension)

PAR Numb	oject Ty	ommitt	Ti	Approval Da	PAR Expirati	Invitation Close Da	Ballot Close Da	Stat
P60255-118-1	Revision	118.1_WG	urements	14-Jun-13	12/31/2017	10/28/2016	12/2/2016	esolution
PC37.237	New	37_WG-H3	ATAG(TM)	5-Dec-2012	12/31/2017	2/20/2016	5/16/2016	esolution
PC37.241	New	1_WG-I11	s Relaying	25-Mar-10	12/31/2017	10/27/2016	1/15/2017	esolution
PC37.246	New	C WG C18	nnections	10-May-13	12/31/2017	1/5/2017	2/10/2017	esolution
PC37.247	New	7.247_WG	r Systems	23-Aug-13	12/31/2017		WG Draft Development	
PC37.248	New	/GC37.248	COMDEV)	3-Sep-2015	12/31/2017	2/8/2017	3/11/2017	esolution
PC57.13.1	Revision	.13.1_WG	nsformers	11-Dec-13	12/31/2017	2/12/2017	4/13/2017	esolution

C37.247 will file for extension.

PARS expiring at the end of 2018-2019(all already have PARs and in various stages of work.

PC37.91	Revision	1_WG-K16	nsformers	27-Mar-14	12/31/2018	WG Draft Development
PC37.230	Revision	)_WG-D28	tion Lines	27-Mar-14	12/31/2018	WG Draft Development
PC37.245	New	7.245_WG	nsformers	8-Jun-2012	12/31/2018	WG Draft Development
PC37.249	New	C/WGH22	Data Files	24-Jun-14	12/31/2018	WG Draft Development
PC37.250	New	C/WG C21	Schemes	27-Mar-14	12/31/2018	WG Draft Development
PC37.108	Revision	7.108_WG	k Systems	5-Dec-2015	12/31/2019	WG Draft Development
PC37.110	Revision	.0_WG-I15	Purposes	11-Jun-15	12/31/2019	WG Draft Development
PC37.116	Revision	R/C37.116	itor Banks	11-Dec-13	12/31/2019	WG Draft Development
PC37.233	Revision	7.233_WG	on Testing	5-Dec-2015	12/31/2019	WG Draft Development
PC37.235	Revision	35_WG-I7	Purposes	11-Jun-15	12/31/2019	WG Draft Development
PC37.242	Revision	7.242_WG	d Control	26-Oct-15	12/31/2019	WG Draft Development
PC37.251	New	/WG-H27_	(COMSET)	5-Feb-2016	12/31/2020	WG Draft Development
P1646	Revision	/WGP1646	tomation	23-Mar-17	12/31/2021	WG Draft Development
PC37.102	Revision	2 WG - J17	rotection	23-Mar-17	12/31/2021	WG Draft Development
PC37.112	Revision	7.112_WG	nt Relays	23-Mar-17	12/31/2021	5/11/2017 Sponsor Ballot: Invitation
PC37.234	Revision	/PC37.234	em Buses	23-Mar-17	12/31/2021	WG Draft Development
PC37.118.2	Revision	118.2_WG	r Systems	Pending		NesCom Agenda 04-May-2017

PARS expiring beyond 2019

See attached spreadsheet

Additional notes:

PAR/Standard Submittal Deadlines & Standards Board Meeting Schedule:

Meeting schedule
Jan 30
May 4
Sep 7

Deadlines for submittal to RevCom or NesCom

10 February 2017
24 March 2017
05 May 2017
28 July 2017
16 October 2017

Power System Communications and Cybersecurity (PSCC) Committee Report

Chair: M. Dood
Vice Chair: K. Fodero
Secretary: C. Preuss

The PSCC thanks the PSRC for hosting the PSCC meeting. We had 14 working group meetings and generally had great attendance during the week. New PSCC working groups that may be of interest to the PSRC members are:

S6 is looking at standards for integrating home automation IoT to power utilities communication system.

P11 is working on at cloud computing uses and requirements by electric power utilities.

The PSCC will be requesting changes to meeting times for the September meetings and will be working with the PSRC to make those changes.

The PSCC Security Subcommittee meets at 1 pm, the Protocols and Architecture Subcommittee at 1:45 pm, the Power Line Carrier Subcommittee at 1 pm, and the PSCC meets at 2:30 pm.

NERC Report - Bob Cummings

Fault-Induced PV Inverter Disturbances

Several occurrences of PF inverters “tripping” during system faults

Inverter control action shutting down faster than normal-clearing of transmission elements by system protection, such as 1,178 MW lost during a 500 kV line-to-line fault normally-cleared in 2.49 cycles. That event included 26 utility grade,

transmission-connected PV resources built by 10 manufacturers, making this a systemic problem.

NERC & WECC have formed a task force to address this problem, including 7 out of the 10 inverter manufacturers.

A report will be presented to the NERC Planning and Operating Committees in early June.

That report concludes that the primary reason for loss of the inverters related to problems in measuring system frequency during the “phase jump” at the inception of the fault and again when the fault is cleared. The inverters measured frequency to be at 57 Hz, and were set to “trip” instantaneously for that level of frequency.

The second most prevalent cause of the inverter controls action was voltage falling below 0.9 pu during the fault.

NERC will be issuing an Alert to PV resource owners alerting them to the problem and steps to take to mitigate the problem for frequency and voltage ride-through.

This problem does not only occur on transmission-connected inverters, but could also impact inverters connected a sub-transmission or even distribution-level distributed energy resources.

NERC and IEEE have signed a Memorandum of Understanding to:

Encourage communication between the two organizations;

Promote shared knowledge of the standards development activities of each organization; and

Facilitate liaisons between each other’s technical groups and other cooperation where possible

Joint Operating Committee – prioritizing joint efforts.

New pre-qualifying process for organizations to provide or assist in development of Compliance Guidance for NERC Standards. PES or possibly Committees such as PSRC could become qualified Structure under discussion.

Single Point of Failure (FERC Order 754)

Moved into Standards development

Modifications to be made to Standard TPL-001-4

SAR finalized 6/30/2016

Revised TPL-001-4 and developed corresponding implementation plan

Scheduled a 30-day informal posting April 25 – May 24, 2017

System Protection Coordination (Phase 1)

PRC-027-1 – Coordination of Protection Systems for Performance During Faults

Replaces R3 and R4 from PRC-001-1.1(ii) concerning coordination of Protection Systems

Approved by NERC BOT November 2015

Filed with FERC on 9/2/2016

System Protection Coordination (Phase 2)

PER-006-1 – Specific Training for Personnel

Addressing Requirements R1, R2, R5, R6 of old PRC-001-1.1(ii)

Filed with FERC 9/2/2016

FERC-approval of PRC-027 and PER-006 retires PRC-001-1.1(ii)

Protection Systems Phase 3: Remedial Action Schemes (RAS)

PRC 012-2 – Remedial Action Schemes

Replacing existing RAS-related standards - PRC-012, PRC-013, PRC-014, PRC-015, PRC-016 and revises SPS definition

Approved the NERC Board of Trustees May 5, 2016

Filed with FERC on August 5, 2016

FERC issued NOPR on January 19, 2017 proposing to approve PRC-012-2

Comments on the NOPR were due by April 10, 2017

Project 2016-04 Modification of PRC-025-1 Generator Relay Loadability

Standards Committee, April 19, 2017 Accepted Standards Authorization Request (SAR)

Appointed SAR drafting team as standard drafting team (SDT)

First SDT meeting, May 15-18, 2017, NERC, Atlanta

SAR scope will:

Address settings limitation of some dispersed generation

Clarify IEEE device nomenclature (50/51)

Settings for weak generation remote to transmission system

Clarify the applications listed in Table 1

Update “Pickup Setting” term and other clean up items

Modification of PRC-025-1 Generator Relay Loadability

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First Standards Drafting Team meeting May 15-18, 2017

Standards Applicability for Dispersed Power Producing Resources

Collaborating with IEEE PSRC Standard 1547 Distributed Generation (resources) – Generally connected at distribution level voltages

DERTF now sub-group of the NERC Essential Reliability Services Working Group (ERSWG)

DERTF issued the Distributed Energy Resources Report in February 2017

DERTF Report Recommendations:

Develop guidelines to assist in modeling and assessments to account for impacts of DER

Distribution Provider (DP) be added as an applicable entity in MOD-032, replacing the Load Serving Entity – to enable data collection

Evaluate data requirements and sharing across the transmission-distribution (T-D) for assessment of future DER

DER should not be netted with load for modeling as penetration increases

Available dynamic models for different DER technologies should be used to model the evolving interconnection and performance requirements

A coordinated effort by distribution and transmission entities is needed to determine appropriate use of future DER capabilities

Determine whether DSM should be included in the DER definition – Should the DER definition be added to the NERC glossary and/or NERC functional model?

Industry Collaboration: the limited existing knowledge and experience of modeling DER in planning studies and operating with higher levels of DER will require future

collaborative research, knowledge exchange, and learning

ADVISORY COMMITTEE REPORTS

Chair: Pratap Mysore
Vice Chair: Russ Patterson

B1: Awards and Technical Paper Recognition

May 2017 Meeting Minutes:

The B1 Working Group met on Monday May 8, 2017 in Albuquerque, NM with 7 members. The January 2017 meeting minutes were approved.

The following items were discussed during this meeting:

SA Individual Awards – The WG discussed and selected potential nominees for the following awards.

SA Standards Medallion

SA Distinguished Service Award

SA Lifetime Achievement Award

Each potential nominee will be contacted to get their approval to be nominated and to request additional information required to complete the application. Members of the WG will help solicit the 3 to 5 supporting letters from people familiar with the nominee's contributions that are a requirement for the nomination.

IEEE PES Individual Awards – To expand our reach for PES level awards the WG discussed and identified 4 awards that we would like to search for potential nominees from our PSRC members.

IEEE/PES Award for Excellence in Power Distribution Engineering
http://grouper.ieee.org/groups/td/dist/distaward.html
Nominations due by October 1

IEEE PES Douglas M. Staszesky Distribution Automation Award http://grouper.ieee.org/groups/td/dist/distaward.html Nominations due by October 1

IEEE PES Charles Concordia Power System Engineering Award http://www.ieee-pes.org/charles-concordia-power-system-engineering-award Nominations due by February 28

IEEE PES Leadership in Power Award
http://www.ieee-pes.org/leadership-in-power-award Nominations due by February 1st

The WG Members will start identifying potential nominees immediately. Discussion and selection of potential nominees will take place during the September meeting. An announcement will be made at the ADCOM and in the Main Committee Meeting to request help in identifying potential candidates.

The following awards were announced/issued during the May PSRC Main Committee Meeting on 5/11/17

2017 PSRC Career Service Award
Mal Swanson
Respectfully Submitted

Hugo Monterrubio, B1 Chair

B3: <u>Membership Activity Report</u>

Chair: M. Swanson
Vice-chair: Cathy Dalton
Assignment: Assist in searching for new attendees.

Requesting support from attendees' employers.

Attendance during the Albuquerque meeting was 226, which is a bit higher than normal attendance for us.

18 new attendees were in our Newcomers Orientation meeting on Tuesday. Cathy sent a pre-meeting welcoming email and a follow up to each newcomer for first impressions. Hugo Monterrubio promoted the Newcomers meeting during the Monday evening dinner.

Two management support let-ters were drafted. If any attendee or potential attendee needs stronger management support for PSRC participation, we encourage them to let us know.

No Service Awards were presented.

B4: <u>O & P Manual and WG Training</u>
Chair: Phil Winston: O&P Manual:
No information available.

Chair: R Hunt: WG Training:

No information available.

B5: <u>Publicity</u>

Chair: C. Dalton
Vice Chair: M. Swanson
Scope: Promote IEEE PES PSRCC activities globally.
Facilitate global outreach using tools such as webinars, tutorials, trade publications, and other similar methods.

Strengthen PSRCC awareness by preparing technical articles as may be required for the promotion of technical committee working group activities about the art of relaying, and the work of the PSRC.
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B8: <u>Long Range Planning</u>

Chair: Mike McDonald
No information available.

B9: PSRC Web Site

Chair: Russ Patterson
No report.

Items from the Main Committee meeting:

The following motion was made by SC chair to the Main Committee:

The following motion was moved by Gene Henneberg (C SC Chair): "Mr. Chair, the System Protection Subcommittee, C, requests approval for the transmittal of PC37.247 "IEEE Standard for Phasor Data Concentrators (PDC) for Power Systems" to the IEEE SA for balloting. The motion was seconded by Fred Friend and it was approved unanimously.

SUBCOMMITTEE REPORTS

C. SYSTEM PROTECTION SUBCOMMITTEE

Chair: Gene Henneberg ghenneberg@nvenergy.com
Vice Chair: Fred Friend fafriend@aep.com
System Protection Subcommittee Scope

Evaluate protection systems responses to abnormal power system states. Evaluate and report on special protection schemes, remedial actions schemes, monitoring and control systems and their performance during abnormal power system conditions. Recommend corrective strategies and develop appropriate standards, guides, or special publications. Evaluate and report on new technologies which may have a bearing on protection system performance during abnormal power system conditions.

Meeting Minutes
The System Protection Subcommittee of the PSRC met on May 10 in Albuquerque, NM. The participants introduced themselves, a quorum was achieved (22 of 39 members and 44 guests), and the January 2017 minutes were approved (Charlie Henville made motion, Rich Hunt seconded).

Advisory Committee Items of Interest

WG agendas are required to be posted at least two weeks prior to the meeting.

WG meeting minutes due to Fred and Gene by this Friday, May 12.

IEEE standard documents are only for distribution to WG members. The WG chair may provide paper copies at meetings, but a guest may not keep the paper copy of the draft. A public review period is available for IEEE standard documents.

WGs that complete their work are encouraged to present it to the IEEE

community through a WEBEX. Contact PSRC officers or Cathy Dalton (Publicity chair) for further information.

Working Group Reports
The minutes of the Working Groups are attached.

The nearly final report of the C2 WG (Role of Protective Relaying in the Smart Grid) was sent to the working group reflecting comments received from the C subcommittee members. The final report will be sent for publication in the next few days the list of working group members is added. A presentation is scheduled for the September meeting. A task force to determine if a transactions paper should be created (and include the work from H2) may also be suggested during the September meeting.

WG C2 is incorporating final proofreading corrections to their report on "The Role of Protective Relaying in the Smart Grid." A presentation is scheduled for the September meeting.

WG C-19 has WG approval to post for balloting the C37.247, IEEE Standard for Phasor Data Concentrators (PDC) for Power Systems.

CTF31 met for the second time to consider the possibility of developing a Guide for Redundancy Requirements for Transmission Protection Reliability. The TF developed the appropriate Scope and Purpose to produce the PAR. The C subcommittee approved the TF to become a WG (C-31) to accomplish this task. Solveig Ward is chair.

Old Business
There was no old business.

New Business
The Power Electronics Society (PELS) has initiated a PAR, joined by the Industrial Applications Society (IAS) and Industrial Electronics Society (IES) have invited PSRC to join in writing a recommended practice for Hardware-in-the-Loop Simulation Based Testing of Electric Power Apparatus and Controls. C subcommittee will form Task Force C-33 to explore this subject in conjunction with the other societies.

NERC has identified a Low Fault Current standards gap resulting from many inverter-connected generation sources. NERC wants to work with PES and PSRC to fill the identified gap for

Grid Code impacts on machine design and

Short circuit modeling

The C subcommittee already has several WGs doing work related to inverter connected generation, including C-24 which is working on short circuit fault models suitable to be included in commercial fault calculation programs.

In addition, NERC wants to determine how the present C37-246 Transmission to Generation Interconnection Protection Considerations (under ballot) ties into PRC-025.

The C subcommittee will further explore through Task Force C-34 with NERC how PSRC can help in these efforts.

General Discussion
There was no general discussion

C-2: Role of Protective Relays in the Smart Grid

Chair: Alex Apostolov
Vice Chair: Roy Moxley
Output: PSRC Report
Draft: Last
Expected Completion Date: September 2017

Assignment: Identify the functions and data available in Protective Relaying Devices that are used at different functional levels and different applications and can be used within a Smart Grid. Describe the use of interoperable data formats for protection, control, monitoring, recording, and analysis.

The working group did not meet.

Next meeting requirements: single session for 30 attendees with computer projector.

C-18: Transmission to Generation Interconnection Protection Considerations

Chair: Alla Deronja (aderonja@atcllc.com)
Vice Chair: Keith Houser (keith.houser@dom.com)
Output: IEEE Guide PC37.246
Draft: 10
Established: September 2011
Expected Completion Date: December 2017

Scope:
This Guide documents accepted protection practices for transmission to generation interconnections. It is intended to cover the protection system applications at the interconnections between transmission systems and generation facilities greater than 10 MVA. This Guide does not cover distributed energy resources.

Purpose:
This Guide provides guidance to those who are responsible for the protection of electrical interconnections between transmission systems and generation facilities greater than 10 MVA. It is not intended to supplant specific transmission or generator owner practices, procedures, requirements, or any contractual agreement between the transmission and generation owners.

Working group C18 met Wednesday, May 10, 2017, with 14 voting members and 7 guests present. The quorum was reached.

The WG chair read the IEEE patent slides as required for the working group with PAR

related activities.

The WG addressed the remaining technical comments of IEEE-SA sponsor ballot.

Ballot comment i-46.
Ballot comment i-52.
Ballot comment i-53.
Ballot comment i-106.
Ballot comment i-150.

The resolutions are presented in column U, Disposition Detail, of the Comment spreadsheet.

The WG discussed a possible placement in the Guide for a general statement to mention a need to consult regional regulatory requirements for relay loadability issues. The following statement was added to two sub-clauses, 4.2.2.1.2 Additional considerations for faults in generator zone and 4.2.2.1.3 Additional considerations for faults in transmission zone, to address this issue as it is related to the overcurrent and distance protective functions.

It may be necessary to consider regional regulatory requirements for relay loadability issues.

The plan is to finalize the Red Line of Guide Draft 10.0 and re-circulate it shortly. A consideration whether to extend the PAR will be revisited in September of 2017.

Requirements for the next tentatively scheduled meeting: Wednesday single session, meeting room for 20 - 30 people with a computer projector.

C-19: Standard for Phasor Data Concentrators for Power Systems

Chair: Vasudev Gharpure
Vice-chair: Mital Kanabar
Output: IEEE Guide C37.247
Draft: 2.33
Established: September 2011
Expected Completion Date: December 2017

Assignment:
Develop a standard for Phasor Data Concentrators for power systems.

15 Attendees: 6 members, 4 corresponding members & 5 guests attended.

Patent/IP related IEEE slides were shown

We had a quorum. However, previous meeting minutes had already been approved electronically.

WG C19 PAR, Assignment, Purpose, and Scope were presented

The WG's task status was presented.

Vasudev requested a motion to form a Ballot group. Motion seconded by

Deepak.

5 WG members agreed. 1 member abstained.

It was suggested to move the two normative Annexes into the main body of the standard

specification – normative annexes should be used for optional functions/features

The question was raised if Cyber security should be part of this document

The current sub-section on cyber security was reviewed. A reference to IEEE C37.240 for system level requirement was added.

A device hosting PDC functions or the PDC function itself should implement cyber security functions consistent with and as dictated by system level requirements for cyber security. These can be location and region specific. It would be the user's responsibility to know what these are and to specify them to the manufacturer.

WG to consider if PDC as a function can address cyber security to any possible extent, e.g. intrusion detection, password authentication etc.

One WG member (Dan Dwyer) opted to change status to corresponding member.

Next meeting requirements: single session for 25 attendees with computer projector.

C-20: Impact of VSC HVdc Transmission on AC Protective Relaying

Chair: Joe Mooney
Vice Chair: Ian Tualla
Output: PSRC Report
Draft: 3
Expected Completion Date: December 2017

Working Group Scope: Develop a report to the PSRC describing Voltage Source Converter (VSC) HVdc systems and the impact on local AC system protection.

The Working Group met Tuesday afternoon with 27 attendees; 5 members and 22 guests.

The WG received final writing contributions and reviewed the current report, Draft 3.0. The Vice-Chair asked WG to review the current Draft report and stressed the need to have comments by end of June at the latest. After comments received from WG, the goal is to have approval by mid-July 2017. A Suggestion was made by a WG member to move Section V (Field Experience) after Section VI (Communications between HVDC and AC Systems). Guest were solicited to review the paper and also provide comments by end of June at the latest. The Vice-Chair stressed that our goal remains to have the WG report completed by the September meeting.

Next meeting Requirements [September 2017]: single session, 40 attendees, with computer projector.

Meeting adjourned @ 17:15. local time

C-21: Guide for Engineering, Implementation and Management of System Integrity Protection Schemes (PC37.250)

Chair: Yi Hu
Vice Chair: Gene Henneberg
Output: IEEE Guide C37.250
Draft: 0.4
Established: September 2013
Completion: December 2018
Assignment: Develop an IEEE Guide for Engineering, Implementation, and Management of System Integrity Protection Schemes

Working group C21 met on Tuesday, May 9, 2017 in Albuquerque, New Mexico in single session chaired by Gene Henneberg with 12 members and 2 guests attending.

Each attendee introduced themselves and described their affiliation.

A quorum was not achieved. Gene Henneberg described that an Email ballot to approve the three most recent meetings of C21 working group is in process. (May 2016, Sept, 2016 and Jan, 2017).

Draft 0.40 was recently distributed to the working group members. This draft reflects most recent changes and additions made by the editing team volunteers. This included clean-up of grammar and spelling, shortening some sections and following the overall IEEE document format.

Gene mentioned that all members may be invited to future web-meetings. The general editing by the volunteer team is approaching completion.

Tony Seegers noticed that there was no specific definition within the Definition section for System Integrity Protection Schemes (SIPS), and that there were some general statements about SIPS that per IEEE format should be removed from the definitions section. He also mentioned that there were several definitions for other words listed that seemed to be not needed especially when these definitions might become self-evident as they are used within the context of the document. The workgroup was in agreement and proceeded to write a basic definition for SIPS.

It was mentioned that a basic definition for SIPS exists and is taken from page 91 of IEEE C37.233, “Guide for testing of SIPS” though this guide is currently under revision. Gene displayed the C37.233 definition wording on the overhead screen and suggested removing the “N-2” wording. Other terms being discussed as a possible part of the definition included “contingency”, “planned or unplanned”, “planned abnormal condition”, “unacceptable operating condition”, “control actions”, “undesirable conditions”, “lines verses equipment”, “preventing angular instability”, and “arresting frequency decline”. It was mentioned that there are many different possible control actions and that these are different than the resulting power system condition.

Dean Miller mentioned that the SIPS would react to how it has been designed whether or not the conditions causing its operation were planned or not and that a SIPS, unlike basic relaying, must continue to protect after it has taken control action until a new

stable power system operating condition is reached.

The final wording for the proposed definition is:

System Integrity Protection Schemes (SIPS), sometimes called Remedial Action Schemes (RAS) or Special Protection Schemes (SPS), serve to enhance security and prevent propagation of disturbances for severe system emergencies caused by unacceptable operating conditions. SIPS stabilize the power system by taking control action to mitigate those system conditions. SIPS designs are based on studies of predefined contingencies.

There was discussion about the scope, relationship and purpose of NERC, FERC and the IEEE standards development process. It was agreed that the technical standards should be developed by the technical experts within the IEEE development process and that the resulting IEEE standard or guide should not depend upon the legal rulings or resulting regulations of NERC and FERC. It is considered to be a better result if the IEEE standard is developed independently and the NERC and FERC regulations might refer to the IEEE standard best practices.

Requirements for next meeting: Room for 30, single session and projector.

C-23: Coordination of Synchrophasor Related Activities

Chair: Anthony Johnson (anthony.johnson@sce.com)
Vice Chair: Allen Goldstein
Output: Ongoing Liaison
Draft: N/A
Completion: Ongoing Liaison

Assignment:
The ongoing task force will provide three main functions:

Liason with NASPI (North American Synchrophasor Initiative) (specifically the PRSVTT (Performance Requirements, Standards and Verification Task Team)) to keep the PSRC in sync with the changes and needs in the industry with respect to the development and usage of PMU devices. Formalize transfer process of PRSVTT developed documents to PES PSRC including making recommendations which PRSVTT activities should be transferred to IEEE reports, guides and standards.

Make recommendations to PSRC for assignments that would require the creation of working groups in PSRC and also recommend what the output of those working groups might be (Guides, reports, etc.) based on the needs of the industry.

Coordinate related activities with other IEEE PES committees.

Meeting Agenda

Introductions
Jan 2017 meeting minutes Approval
NASPI Update

Gaithersburg, MD Mar 22, 2017 – Mar 23, 2017

NIST workshops prior to and following the NASPI meeting

NASPI is looking to potentially move to one meeting a year. (discussion)

Discussion of NASPI survey to change the nature and time of the meetings. Harold mentions that it has been stimulating to interact with the attendees. If the dynamic stayed the same, then it would be worthwhile to keep it at the current level.

Mapping...

Next Meeting NASPI Meeting in Springfield, MA, September 26-27-2017, NASPI Technical Workshop - Power System Oscillations

IEEE Workgroup Activity

	Title	Status
PSCC P8	Development of standard Mapping between C37.118 and IEC61850-90-5	In Progress
PSCC P9	C37.118.2 Revision	First Meeting or Work Group
PSCC P10	Advanced Synchrophasor Protocol	Evaluation of task
PSRC C19	Standard for Phasor Data Concentrators (PDC) for Power Systems	In Progress
PSRC C28	Guide for Synchronization, Calibration, Testing and Installation for PMUs	In Progress
PSRC H11	Revision of standard IEC60255-118-1	In Progress
PSRC H40	Recommended Practice for Databases used in SAS	In Progress
IEEE SCASC	Synchrophasor Measurement Conformity Assessment Steering Committee	Revising the TSS
Liason	Power System Dynamic Performance/PSIM	
Liason	Instrumentation and Measurement Society	

Mladens comment: Focus in C23 is mainly on the infrastructure and not on the application. There are other PES groups who are looking to synchrophasors (substations, communications, systems) but who have not been linink back to this (C23) work.

Ken and Tony did offer one or two anecdotal examples of some linkage. Mladen asks Where does it fit in this coordination? We should make more of an effort to look at the system requirements. Allen and Mahendra spoke in support of Maladen. Ken offered that he can report on his activities to C28. Mladen plans to go to comittees at PES GM and mention the same thing he is saying here.

Instrument and Measurement Society: Ken and Harold have a Liason with them concerning Synchrophasor measurements

Also PES Power System Dynamic Performance Committee also PSIM

Old Business

New Business

Phasors in a control applications

Jim O'Brian: Phasors in the control applications. Although there is a lot

of work in this area, there is no one to take the lead on this effort.

PARTF work at NASPI/NIST

PARTF: Framework is ready to begin beta. Weare looking for participants to learn the framework. Mladen mentions a consortium called the GNSS (global network of synchrophasor solutions) which has a similar effort. He will help connect PARTF with them. http://gnssconsortium.org/

Data retrieval from archives.

Mahendra Include a way of marking that the data was not available in real time.

Adjourn

Attendance: 8 Members, 6 guests

Requirements for next meeting: Single Session, Meeting room for 25 people with a computer projector.

C-24: Modification of Commercial Fault Calculation Programs for Wind Turbine Generators

Chair: Sukumar Brahma (New Mexico State University)
Vice Chair: Evangelos Farantatos (EPRI)
Output: PSRC Report
Draft: 0
Established: 2014
Completion: TBD

Scope:
1) To survey WTG manufacturers to determine what parameters they could provide that could be used by steady state short circuit program developers in various time frames.
2) Use the result of this survey to prepare a report that can be used by steady state program developers to refine their models.

Agenda

Introductions
Approval of minutes of the January 2017 meeting.
Discussion of WG activities and updates on responses
PSCAD Model - University of Manitoba/Manitoba HVDC Research Center
Inverter power factor – Charlie Henville
Discussion of the report outline and draft contributions
Adjourn

The meeting started with introductions, and then the January 2017 minutes were approved.

It was announced that NERC is initiating activities for standards development related to systems with high levels of renewables. Among the topics of interest are grids with low fault currents and short circuit modeling of renewables, so it is expected that NERC will

look for coordination with PSRC, including this WG C24, given its scope.

Then the WG chair described to the attendees the updates with respect to the data obtained by manufacturers.:

GE communicated through email that their report is not ready yet.

An updated report was provided to the WG by Athula Rajapakse, (University of Manitoba), Dharshana Muthumuni and Ali Goharrizi (Manitoba HVDC Research Centre). The report includes PSCAD simulation results and populated tables as suggested by the WG survey, using black box manufacturer models of Type III and Type IV wind turbines. The report was updated to include simulation results for faults in different locations in the test system, as was discussed in the previous meeting. The revised report includes also simulations using another wind turbine model based on generic controls used by IEC. The content of the report was shortly discussed during the meeting. Given the extent of the report material, it was decided to prepare summary tables that will be presented at the next meeting.

Then a presentation was given by Charlie Henville related to power factor control by wind turbines during a fault. The concern was expressed that for close-in zero impedance faults, the line impedance defines the power factor and the power factor cannot be controlled by the wind turbine. In that case the proposed short circuit model might have convergence issues. A discussion on this topic took place with varying opinions. It was agreed that members of the WG will investigate this further with EMTP simulations.

Then the report outline was discussed. Contributions from several members have been received (Dean Miller, Charlie Henville, Siemens, Sukumar Brahma, Electrocon, ASPEN, EPRI, ETAP). Dean Miller described his contribution related to the fault response of Type I and Type II wind turbines. It was decided to add in this section contributions from ASPEN and Electrocon on the models that are presently available in their platforms. Finally, the contribution from Siemens which was documented by Sukumar was presented.

A draft report with all the contributions will be prepared and sent to the members before the next WG meeting.

There were total 30 attendees in the meeting, 8 members and 22 guests.

For the next meeting in September 2017, we need a room with capacity of 30, and a computer projector. Please avoid conflict with WG C30, C32 and C25, in that order.

C-25: <u>Protection of Wind Electric Plants</u>

Chair: *Martin Best*
Vice Chair: Keith Houser
Output: PSRC Report
Draft: 3.2
Established: September 2013
Completion: December 2018

Assignment:
Write a report to provide guidance on relay protection and coordination at wind electric plants. This report will cover protection of generator step up transformers, collector system feeders, grounding transformers, collector buses, reactors, capacitors, main station transformers, tie lines and points of interconnection and associated arc flash issues. Although the report will address coordination with wind turbine generator protective devices and static var sources, the protection of the wind turbine generators and static var sources will not be included.

Working Group [WG] C25 met in Albuquerque, NM on Wednesday, May 10, 2017 at 09:30 with 13 members and 15 guests. Copies of the agenda, January 11, 2017 meeting minutes, and Draft 3.2 of the Report were reviewed by the Working Group members and guests.

After introductions, the January 2017 meeting minutes were cited for comment, additions or corrections. There being no corrections or comments, the minutes were approved.

It was recently pointed out that the word “Guide” has appeared on several drafts of the WG paper. Since the WG is writing a report and not a standard, the words “Guide” and “provides guidance” were removed from the front of the report.

The WG began by reviewing Section 3.4 on Main Substation Transformer Protection by Duane Buchanan. The section is an excellent start, and WG members provided additional suggestions to Duane as he further revises the section. There was some additional discussion the application of Volts/Hz settings for the main power transformer.

The WG next reviewed a newly revised Section 3.1 on Collector Feeder Overcurrent Relay Protection by Martin Best. The discussion included the criteria for setting the trip current pickup of non-directional phase TOC relays per NERC Standard PRC-025. There was also a discussion regarding setting considerations for directional phase TOC elements to ensure that they will operate correctly. Martin will also add some additional discussion on instantaneous overcurrent settings for collector feeders in the report.

There was a lively discussion on the criteria for voltage and frequency ride-through settings per NERC Standard PRC-024 and the coordination of generator capacity, voltage regulating controls, and relay protection settings per NERC Standard PRC-019. A discussion of voltage and frequency ride-through setting criteria needs to be included in Section 3.6.3 of the report. Unfortunately, the WG ran out of time before completing their discussion.

The group requests a single session, meeting room for 25-30 at the September 2017 meeting, and a computer projector. It is requested that the meeting time for C-25 avoid conflicts with the meeting times for the C-18, C-24, C-30, and K-16 working groups, to the extent possible.

Meeting Adjourned @ 10:45 AM.

C-26: <u>C37.233, Power System Protection Testing Guide</u>

Chair: Don Ware
Vice Chair: Matt Black
Output: IEEE Guide, C37.233
Draft: 2.1
Established: January 2016
Completion: November 2019
Assignment: Revise C37.233 Power System Protection Testing Guide

The C26 working group, chaired by Don Ware, met on Tuesday, May 9, 2017 with 18 members and 13 guests.

When attendance was taken at the beginning of the meeting quorum was not satisfied; therefore, minutes from the January meeting were not voted on for approval.

Don Ware and Matt Black spoke on the subject of iMeetCentral desktop usage with the Working Group. We will use a combination of iMeet Central and normal email communications of transferring contributed work, whether section reviews or addition of any new material. Matt will control the current Draft within iMeet Central.

Volunteers to review guide sections and respond by July 14, 2017 are:
Don Burkart – 1.0 – 1.7
Mark Siira – 2, and new contribution on testing for inverters
Tony Seegers - 3
Mike Benitez – 4.1, 4.2
Wayne Stec – 4.3
Scott Short – 4.4, 4.5
Angelo Tempone – 4.6, 6.1
Rafael Garcia – 4.7
Brian Boysen – 6.4
Don Ware – 6.7
Andre Uribe – 6.2, 6.6, 6.7
Nestor Castilla – 6.8
Mike Stojak – 6.10
Jeff Brown – 7.1 Annex E
Jun Verzosa – 7.2
Rick Gamble – Annex B, C
Eugenio Carvalheira – new contribution on traveling wave

Tony Seegers gave a brief presentation regarding the WG C21 & WG C26 alignment for “SIPS” in the guide. The present revision of the guide incorrectly describes the definition. C21 has proposed a more correct definition to be implemented in both C21 and C26 documents.

Don brought attention to the need to accelerate efforts in getting contributions and reviewing completed in a more timely manner in order to achieve our targeted initial ballot deadline of June, 2018.

Wayne Stec and Mark Siira gave a short presentation on comprehensive protection system testing. There were four examples at construction sites presented that used load banks for primary injection to prove metering quantities and phase angle. Issues

were uncovered and setting errors discovered. Mark plans to submit information on this subject to be included in our guide since its presently in use by several entities within the industry.

Newer technology such as Travelling wave technology and solar interconnectivity has been suggested to be added for technological developments for this revision of C37.233. We will accept submissions and will review via web meetings described below.

We plan to have our first Web meeting in mid-June and throughout the summer in order to facilitate work coordination.

The current version of the Guide C37.233 is v2.1. Our next meeting will need to be a single session with pc/projector and room for 40.

We please request conflict avoidance with K16 and I2.

C-28: C37.242 Guide to the Synchronization, Calibration, Installation and Testing of PMUs for Power System Protection and Control

Chair: Allen Goldstein
Vice Chair: Harold Kirkham
Output: IEEE Guide, C37.242
Draft: 20170509
Established: September 2015
Completion: November 2019

Scope:
Revision of the IEEE guide which provides guidance for synchronization, calibration, testing, and installation of phasor measurement units (PMUs) applied in power system protection and control. The following are addressed in this guide:

Test and calibration procedures for PMUs for laboratory and field applications. These procedures have been superseded by another IEEE document and will be revised or deleted as appropriate.

Considerations for the installation of PMU devices based on application requirements and typical bus configurations. New lessons learned since the publication of this guide may be accounted for in a revision to the guide.

Techniques focusing on the overall accuracy and availability of the time synchronization system. New technologies and further information about synchronization may be accounted for in a revision to the guide

Communications testing for connecting PMUs to other devices including Phasor Data Concentrators (PDCs). Lessons learned from the field may be included in a revision of the guide.

28 attendees, 10 members, 12 guests. The IEEE patent statements were noted.

Chairman Allen Goldstein summarized the purpose of the meeting, and warned in advance that people would be asked particularly to work on the various Annexes of the document. Much work had already been done on the body of the Guide. As the group

advanced through the existing draft, the following points were noted:

Alison Silverstein proposed several subjects for new work to be added: Signal Registries and Lessons Learned. There was discussion from the floor.

Mladen Kezunovic brought up the topic of acceptance testing and commissioning, and agreed to help generate relevant material. There was discussion from the floor.

Harold Kirkham agreed to work with Alison Silverstein on updates to Section 6. The opinion that each installation in a company was no longer regarded as a de novo effort was voiced. Several others agreed to contribute, in particular Bonian Shi, Mladen Kezunovic, Mahendra Patel, Scott Cooper and Nuwan Perara

Considerable discussion took place on the topic of synchronization. Was PPS the only way to check timing? (Sec 5.2.3) Harold Kirkham suggested removal of a graph in this section, and indicated he would check with Tony Faris of BPA on its origin.

In discussion of the Annexes, Harold Kirkham suggested that contact should be made with Mike Meisinger, who was leading the I26 Working Group on Mathematical Models of Instrument Transformers. (This meeting took place immediately after the C28 meeting adjourned.)

Mladen Kezunovic Agreed to work on Annex E.

New Business

There was discussion of a matter of which reporting rates are required. No changes were in the end proposed.

Adjourn

The Chairman adjourned the meeting on time at 10:45.

Next meeting requirements: single session for 30 attendees with computer projector.

C-29: Power System Testing Methods for Power Swing Blocking and Out of Step Tripping

Chair: Heather Malson
Vice Chair: Mike Kockott
Output: PSRC Report
Draft: 0.5
Established: January 2016
Completion: TBD

WG Assignment: Create a report on test instructions/parameters to accompany the PSRC documents Application of Out-Of-Step Protection Schemes for Generators, and Tutorial on Setting Impedance Based Power Swing Blocking and Out of Step Tripping Functions on Transmission Lines, to aid the users in quality testing of their settings and systems when following the working group outputs which recommend testing of complex

relay settings and systems.

C29 met on Tuesday at 9:30 with 12 members and 23 guests for a total of 35 people. Update to numbers – 2 new members and 13 new guests.

The Chair was unable to attend. The Vice Chair conducted the meeting, with note taking assistance from Benton Vandiver.

The report Introduction writing assignment was reviewed with edits made by feedback provided. Alla Deronja suggested to move the Scope and Purpose to the beginning of the Introduction, Tom Beckwith and Jeff Long provided editorial changes.

Writing assignments that were previously due were not available due to pending review of the testing section removed from the J5 report.

Jackie Wilson and Mike Benitez volunteered to compare the J5 testing draft to the proposed C29 report outline and harmonize the content for the WG. With this the previous writing assignments were reconfirmed. Jose Ruiz will also contribute. The contributors for the Test Equipment & Environment section and the Type of Tests section were reaffirmed. The Vice Chair will send out assignment reminder. The due date for the assignments is August 1st.

The Vice Chair reviewed the purpose and scope to reinforce “why” this report is necessary to support the previous work of J5 and D29. The WG agreed as to the purpose, scope, and outline for the report in closing discussions. Report version Draft 0.5

Actions

A Writing assignments

Introduction – Mike Kockott, Gene Henneberg (draft complete)

Test Equipment and Environment – Jackie Wilson and Mike Benitez (J5 testing integration), Rob Fowler, Benton Vandiver, Eugenio Carvalheira

Types of Tests – Jackie Wilson and Mike Benitez (J5 testing integration), Rob Fowler, Jun Verzosa, Jim Vandeligt, Jose Ruiz

Due date: 08/01/17 (please send to Vice Chair)
J5 testing should be integrated first into the report structure. Other authors to then complete their assignments around the J5 integration. All contributors to please also take note of what has been written in the Introduction to ensure consistency. Changes to the Introduction may be required.

Authors to please work with partners to submit just a single deliverable. Here are the contact details for the authors:
jwilson9@ameren.com
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jverzosa@doble.com

jimvandeligt@shaw.ca
jruiz@doble.com

Other members/guests wishing to contribute are welcome to do so.

Compile received writing assignments into report outline
Vice-chair

Target date: 08/21/17. Email to all in preparation for September meeting.

C Related data sources
All members/guests

Due date: Sept meeting
Utilities' OOS testing data/practices; EPRI, NERC related data from PRC 026 (blocking testing)

D Transient testing section in report outline All members/guests

Due date: Sept meeting
What's envisaged here? Dynamic vs transient?

Next meeting requirements: single session for 40 attendees with computer projector.

Please avoid conflict with J5 & D29 working group meetings.

C-30: <u>Microgrid Protection Systems</u>

Chair: Michael Higginson
Vice Chair: Fred Friend
Output: PSRC Report
Draft: 0
Established: January 2016
Expected Completion Date: December 2018

Assignment
Prepare a report that will investigate and assess techniques, approaches, and potential solutions to the challenges of microgrid protection.

The working group meeting was conducted on Wednesday morning at 8:00 AM with 40 attendees, including 26 members (4 new members) and 14 guests.

The Chair opened the meeting with introductions. The meeting minutes for the January 2017 meeting were approved by the working group.

Since our previous meeting, several review comments were received. These comments (enumerated as follows) were discussed in the meeting.

Methods for Adaptive Settings Review

The working group discussed the need for a definition of adaptive protection. Amin Zamani volunteered to send the proposed definition and

references.

Short-Circuit Currents

The working group discussed the need for information on fault current decrement from induction machines. Sukumar Brahma volunteered to add this information.

Modes of Operation

Wayne Hartmann introduced the new additions to this section to the working group.

The working group discussed the value of showing an example one-line diagram in this section. Wayne volunteered to add this content.

There are also a few open review assignments. Working group members with open review assignments are encouraged to complete their review in the next month, if possible, and let the chair know if they are no longer able to complete this assignment.

An open action item from last meeting was to add descriptions of AC Microgrid, DC Microgrid, and Hybrid Microgrid, and clearly indicate that the scope of our report includes only AC Microgrids. Amin Zamani volunteered to complete this.

All contributions provided before July 4 will be integrated into the first report draft, which Michael Higginson will prepare. Michael will contact those with outstanding assignments. Draft 1 will be circulated prior to the next meeting. Working group members are encouraged to review the draft prior to the next meeting to facilitate discussion.

Next meeting: Computer projector and room for 50 attendees. Please avoid conflict with I29 and C32.

C-31: <u>Guide for Protection System Redundancy for Power System Reliability</u>

Chair: Solveig Ward
Vice Chair: Alla Deronja
Output: IEEE Guide
Draft: 0
Established: January 2017
Expected Completion Date: TBD

Scope: Create a guide which provides information about what factors to consider when determining the impact of protection system redundancy on power system reliability.

Purpose: A guide to provide information on protection system redundancy considerations by illustrating the purpose of redundancy and how it may be implemented in the protection system design.

Task Force CTF31 met on Wednesday, May 10, 2017 at 11:00am MST in a single session with 45 people attending.
After introductions, the TF Chair provided background information and the group discussed related reference material such as:

PSRC report WG I19, 2010 - now draft in IEEE format

NERC SPCTF 2009
NERC TPL-001-4 as applicable to protective relaying
Utility practices
C16 PSRC Report Relay Scheme Design Using Microprocessor Relays, 2014
NPCC Directory 1 (2016)
Ancillary functions K5
NPPC directory 4 - redundancy requirements
K15 Centralized protection

Discussions of the content of a guide resulted in suggesting to address "why" and "how," i.e. why is redundancy needed, and how can this be implemented in the protection system, considering different applications and present utility practices.

The consensus of the group was that a guide would be of interest to the industry and development of such a guide could be accomplished. 5 or the attendants in addition to the previous 24 indicated interest in becoming members of a working group.

The suggested PAR, scope and assignments for the WG was developed:

Title:
Guide for Protection System Redundancy for Power System Reliability

Scope:
This guide provides information about what factors to consider when determining the impact of protection system redundancy on power system reliability.

Purpose:
A guide to provide information on protection system redundancy considerations by illustrating the purpose of redundancy and how it may be implemented in the protection system design.

PSRC Assignment:
To produce an IEEE guide for protection system redundancy.

The Chair will submit a PAR according to the above.

No specific assignments were made but members were encouraged to review the old report before the next meeting.

For next meeting, when a PAR has been approved, the WG needs a room for 50 people, single session, and a PC projector.

C-32: <u>Protection Practices for Interconnecting Solar or Other Inverter Based Generation to Utility Transmission Systems</u>

Chair: James Deaton
Vice Chair: Mukesh Nagpal
Output: PSRC Report
Draft: 0

Established: January 2017
Expected Completion Date: TBD

Assignment
Write a report that addresses protection challenges and practices for the interconnection of inverter based generation to utility transmission systems.

The first meeting of working group C32 was held on Tuesday, May 9 at 11:00 AM with 21 members and 37 guests present. The following items were discussed:

Meeting agenda was reviewed.

Minutes from the January CTF32 meeting were reviewed.

Discussed relevant sections of publications created by C subcommittee working groups where the working group assignment is conducive for overlap in content with the C32 report. The goal of this discussion was to familiarize C32 participants with these publications and acknowledge similar content that may be referenced or further developed in the C32 report. Sections of the following documents were reviewed:

C18: "PC37.246 - Draft Guide for Protection Systems of Transmission to Generation Interconnections" (WG C18 is currently resolving ballot comments. Printed or electronic copies of PC37.246 cannot be shared with C32 participants.)

C17: "Fault Current Contributions from Wind Plants" (Report is complete and available on PSRC Publications webpage.)

C20: "Impact of Voltage Source Converter (VSC) HVDC Transmission on AC System Protection" (Active working group - Report is not complete)

C25: "Guide for Protection of Wind Power Plants" (Active working group - Report is not complete)

Reviewed C32 report draft outline. Comments and points of discussion were:

Minimum generator MVA rating will not be added to report scope.

Report's focus on impact to transmission system protection should prevent overlap with IEEE 1547.

The following topics were added to the outline (reference attached report outline for placement of new topics):

Effect of Pre-fault Conditions (on Fault Current)

Response of Tradition Protection Elements to Currents Produced by Inverters

Interaction of inverter controls at separate generation sites and impact on protection.

Interaction of inverters with control of SVC's, shunt capacitors, etc.

Frequency Ride Through

Smart Inverter Technology

Emerging Protection Technologies (to detect fault current from inverters)

Volunteers were identified to provide contributions for the following sections: (Assignments are due by August 15.)

Section 1 Introduction – Jimmy Deaton

Section 2-a Fault Current - Manish Patel, Amin Zamani, Prasad Dongale

Section 2-b Interaction of inverter controls and impact on protection - Yu Xia

Section 3-a Utility Owned Transmission Line Relaying (Tie Line/Adjacent Lines) - Hillmon Ladner, Addis Kifle

Section 3-a-iii Transfer Trip to isolate generator for short circuits on utility system - Mike Jensen, Andrew Nguyen

Section 3-a-v Contingency Considerations - Jeff Barsch

Section 4-a Short Circuit Model - Kevin Ridley

Thanks to Mike Jensen for taking meeting notes.

A meeting room with capacity of 50 with a projector is requested for the September meeting. Avoid conflicts with C18, C24, C25, and C30.

D: LINE PROTECTION SUBCOMMITTEE

Chair: K.V. Zimmerman
Vice Chair: B.D. Mackie

The Subcommittee meeting was called to order on Wednesday, May 10, 2017 with 28 members and 39 guests present.

Following introductions, a count of SC membership was made, and it was determined a quorum was present (28 out of 44 members present).

Minutes from the January 2017 meeting in New Orleans were approved.

The Chair reviewed items of interest from the Advisory Committee.
Working groups gave reports on their activity.

Reports from the WG Chairs:

D28: (PC37.230): Guide for Protective Relay Applications to Distribution Lines
Chairman: Brian Boysen
Vice Chair: Claire Patti
Established: 2013
Output: C37.230 – Guide for Protective Relay Applications to Distribution Lines
Draft :1.17
Expected Completion Date: 2018

Assignment: To review and revise C37.230-2007, “Guide for Protective Relay Applications to Distribution Lines” to correct errors and address additional distribution line protection related topics**.**

The working group met on Tuesday, May 9, 2017, 11:00 am MDT.
There were 17 members and 4 guests. The attendance list is attached.
The patent slides were presented.
Meeting minutes from January meeting minutes were presented and approved. Mike

Meisinger motioned to approve and Fred Friend seconded.
Meeting minutes from March WebEx meeting minutes were presented and approved. Mike Meisinger motioned to approve and Fred Friend seconded.
Working group discussed revisions to the following sections:

• 5.1.3 Bus Configurations o Working group decided to delete section 5.1.3.1 Bus Configurations at Generator Voltage Levels.

• Figure 8-7 o Working group has concerns about the location of the CTs causing comments.
o Consider adding note or dashed box indicating switchgear.
o Decided to a note explaining CT locations would be best.

• Section 5.3.4 Interrupters: o Working group discussed use of term. o Decided to combine sections 5.4.4 Other and 5.4.3 Interrupter and rename to "Other Fault Interrupters" and put before the section on Sectionalizers

• Section 8.3 o Move discussion of underfrequency restoration and overshoot from second to last paragraph to section 8.3.4 on restoration.

• Resonate Grounding: o Discussed in both Section 5 and Section 8.
o Working group decided to keep discussion of protection is Section 8 and move discussion of system to Section 5.

Assignments:
The following new assignments were made:
• Brian Boysen: Try to add note explaining CT locations in Figure 8-7.
• Pat Carroll: Combine section 5.4.4 Other and section 5.4.3 Interrupter and rename to "Other Fault Interrupters".
• Claire Patti: Move discussion of underfrequency restoration and overshoot from second to last paragraph of 8.3 to 8.3.4.
• Bruce Mackie: Move explanation of resonant grounded systems from 8.14.1 to 5.1.1.4 to prevent duplication of information. Also look at Figure 8-10 and determine if it is misnamed or needs to move to another section.

The following assignments are outstanding:
• Harmonize use of microprocessor, digital, and numerical within sections – Claire Patti

WebEx Scheduled for:
Monday, June 12, 2017 at noon EDT
Monday, July 10, 2017 at noon EDT
Assignments are due June 1st. iMeet Central updates are preferred.
https://ieee-sa.imeetcentral.com/login
Old Business:
We will address the use of pulseclosing and pulsefinding throughout the document per the guidance provided by Mike Meisinger.

We will need to confirm that all references are to valid/active standards and that the correct version is reference. This should be done before sponsor ballot.

D29: Tutorial on Setting Impedance-Based Power Swing Blocking and Out-Of-Step Tripping Functions on Transmission Lines
Chair: Kevin W. Jones
Vice chair: Normann Fischer

Assignment: Create a tutorial on setting impedance-based power swing blocking and out-of-step tripping functions related to transmission line applications. Specific relay settings examples will be provided. Other methods of detecting out-of-step conditions that exist will be summarized and referenced, but will not be discussed in detail.

D29 WG met in single session on May 9 in Albuquerque, NM 8 members and 22 guests.

Normann Fischer chaired the meeting in the absence of Kevin W. Jones. Gene Henneberg took meeting minutes.

Following introductions, review of the January minutes indicated that a quorum was not present. The January minutes will be circulated for approval via email.

Normann described that the short term WG objective is to get the basic writing of the report collected and compiled by the end of this year. Report drafts will be posted on the PSRC web site.

Kevin Jones prepared a presentation on the September 28, 2016 blackout in South Australia, which was presented by Normann Fischer. This event was initiated by a major storm that tripped 5 major lines (3 permanent outage) within 87 seconds. The pre-event system was served by about 330 MW of thermal generation, 613 MW through an AC tie (650 MW maximum limit) and 883 MW of wind generation. The initial series of line faults resulted in dropping 456 MW of wind due to multiple voltage dips, overloading the AC tie (which tripped on out-of-step). The system was then attempting to serve about 1800 MW of load with 330 MW of thermal generation and the system frequency collapsed so quickly (over 6 Hz/sec) that the under frequency load shedding program did not have time to operate before total system collapse. The basic cause of the collapse was attributed to operating with too large fraction of wind (about half) in the generation mix.

The item of specific interest to the work of D29 is that the out of step trip operation occurred at a slip rate of about 0.34 Hz. This is quite slow compared to many expectations of the slip rate difference between stable and unstable swings. Similar out of step swing conditions have occurred in Xcel's Texas system in 2008 and during the 2003 Northeast Blackout.

Normann and Demetrious Tziouvaras volunteered to further research the south Australia blackout and report to the WG at the September meeting. Tony Seegers (Ameren) and Deepak Maragal (NYPA) agreed to provide a utility perspective on how their UF schemes may have performed during the rapid frequency decline observed in the south Australia blackout.

Normann also presented a simplified system model proposed by Kevin to be used to illustrate out of step relay performance and settings calculations. Following a lively discussion, the consensus seemed to be leaning toward a model that would allow comparisons of out of step results both with and without at least AVR and perhaps other

controls. Norman, Demetrious, Arman, and Manish planned an off-line discussion of the system model, and Normann planned to discuss this issue with Kevin

For the next meeting, D29 will need a room for 40 and an overhead projector.

D30: Tutorial on Application and Setting of Ground Distance Elements on Transmission Lines
Chair: Karl Zimmerman
Vice-Chair: Ted Warren
Established: Jan 2014
Draft 1.02
Working Group Assignment: Write a tutorial on factors affecting the application and setting of ground mho and quadrilateral distance elements on transmission lines.

The working group met in Albuquerque on May 10, 2017 with 9 members and 13 guests.
After introductions, the WG Chair reviewed the minutes, and restated the working group assignment.

For the January meeting, the document has been updated and put into an IEEE tutorial style, with the sections combined. It looks good, but still has a lot of work ahead. The WG chair provided an overview of several more sections of the tutorial that have been received, including: a section on the challenges of zero-sequence mutual coupling; an example system with weak infeed; and a portion of the section on the effect of distorted waveforms. We asked the WG to review existing sections, notably Section I, II, and II, as well as the Z0 mutual section.

The WG revisited the outline. Several sections are outstanding and the contributors are working on their assignments. One good comment we received from Aaron Martin was to add a section on providing settings guidance for ground distance as applied in pilot schemes. Don Burkart agreed to work with Aaron Martin to write this section. Ted Warren was assigned a section on ground element performance with breaker pole scatter. Also, Jorg Blumschein and Aaron Martin are going to add some system events of single pole operations related to ground distance.

The WG assignments are requested by July 15, to be incorporated into a new draft. Also, the present draft has been posted to the PSRC website.

We plan on meeting in September in a single session for 30 attendees with a projector.

D34: Coordinate with IEC 60255-187-3 Functional Specification for Line Current Differential
CHAIR: Normann Fischer
VICE CHAIR: Joe Mooney
D34 did not meet in Albuquerque and has no minutes to report. Based on a recent trip to Japan to discuss the current process of IEC 60255-187-3, Normann does expect to meet in September with 20 attendees.

D35: Evaluation of Transmission Line Pilot Protection Schemes

Chair: Rick Gamble
Vice Chair: Nathan Gulczynski
Established: January 2017
Output: Technical report to the Line Protection Subcommittee

Assignment: Prepare a technical report to the line protection subcommittee to evaluate advantages and disadvantages of common transmission line pilot protection schemes, including POTT, DCB, DCUB, and line current differential. The schemes will be evaluated in terms of speed, sensitivity, dependability and security based on the design and configuration of transmission lines and system topology. A limited number of example systems will be evaluated.

Expected Completion date:
Draft: 0
Working Group D35 met on Tuesday, May 9th, 2017 at 1:30pm in a single session with 15 members and 27 guests.

Reviewed assignment and completed introductions.

Reviewed the draft report. It was discussed that other schemes may be mentioned in the report, but the focus of the report will be the schemes identified in the assignment. Logic diagrams will be developed for each scheme.

Discussed and agreed on the system configurations to be considered. They are:
Double circuit overhead transmission line with mutual effects
Single circuit transmission line with WI (weak infeed)
Series compensated overhead transmission line
Hybrid line (overhead line and underground cable)
Overhead line and transformer in line
Tapped transmission line, grounded bank on line
High SIR, electrically short
Very long line
Three terminal lines
Line with outfeed
Weak infeed

Discussed including phone lines as a communication channel. Will discuss further once communication section is complete. Leaning toward leaving phone systems out since new installations will not typically utilize phone circuits.

Discussed desire to evaluate schemes based on subjective data. Decision was made to use detailed data to drive discussion, but to avoid detailed analysis in the report. Will only use data that creates a difference in the performance of pilot systems.

Invited utilities to provide misoperation/channel failure information.

Made writing assignments.

Meeting requirements for the September meeting – single session for 40 with projector.

Action Items:
Create logic diagrams for each scheme – inquire about getting from line guide. (Nathan Gulczynski)
Provide misoperation/channel failure information. (Utilities)
Writing assignments – develop evaluation of pilot protection for the following scenarios:
Double circuit overhead transmission line with mutual effects - Rick Gamble
Single circuit transmission line with WI (weak infeed) - Qiaoyin Yang
Series compensated overhead transmission line - Nuwan Perera
Hybrid line (overhead line and underground cable) - Alla Deronja
Tapped transmission line, grounded bank on line - Brandon Armstrong
High SIR, electrically short - Bruce Mackie
Very long line – Nathan Gulczynski

D36: Summary Paper for C37.113-2015 Line Protection Guide
Chair: Jeff Barsch
Vice Chair: Don Lukach
Scope: Develop a summary paper and presentation for C37.113-2015, IEEE Guide for Protective Relay Applications to Transmission Lines.
The D36 working group met in a single session on Tuesday, May 9, with 10 members, 2 corresponding members, and 17 guests.

Manish Patel made a motion to approve the January 2017 meeting minutes, and Greg Ryan seconded the motion. The WG approved the January minutes with no changes.

Between the January and May meetings, the D Subcommittee had approved the paper. The WG discussed Draft 4 of the paper, which included revisions made based on comments from D Subcommittee members. The WG discussed and resolved all of the comments and created Draft 5. The paper is now complete.

Don Lukach made a motion to accept Draft 5 of the summary paper with changes made from the resolution of comments. Manish Patel seconded the motion. All 10 WG members in attendance approved the motion.

The paper has been accepted for presentation at the 2017 Minnesota Power Systems Conference. The abstract has been submitted to the 2017 Western Protective Relay Conference committee.

Action items:
• Jeff Barsch will submit the completed Draft 5 to Karl Zimmerman so that he can submit to the PSRCC officers.
• Jeff will add a few slides to the presentation and send out to the WG for comments.
• Jeff and Don will work with planned presenters for the conferences to discuss the presentation slides.
• Jeff will apply for presentation at the 2018 Texas A&M and Georgia Tech relay conferences.

The D36 WG does not plan to meet in September 2017.

D37: Impact of Series Compensation on Transmission Lines
Chair: Mike Kockott

Vice Chair: Luis Polanco
Working Group Assignment: Create a report the impact of series compensation on transmission lines.

D37 met for the first time on Tuesday, 9 May with 32 attendees, 16 of whom signed up to be members, and 16 as guests.

The Vice Chair was unable to attend, so Roger Hedding assisted with the taking of notes.
"Series compensation" in the WG assignment to be limited to conventional fixed series capacitors.

Most of the discussion of this first meeting centered on the scope for the report. The starting point for this discussion was the scope identified by the task force as motivation for the formation of the working group, but good additional report content items were raised at the meeting.

The report should include short descriptions of the various aspects associated with series capacitors, e.g. sizing, SC location, VT location, etc., plus bypass mechanisms, etc., and how these impact line protection (21, 87L, …..).

Others issues to be included in the report
- Staged fault testing after the series capacitors are installed to fine tune settings (BPA)
- Single phase tripping on lines with series capacitors
- Influence on fault location
  - Communication requirements for POTT schemes, etc. Phenomena that arise due to the presence of series capacitors to be included in the report with just brief descriptions (the report is not about these phenomena), even if these phenomena have little or no impact on the line protection, e.g. SSR, etc.

Three presentations were set up for the Sep meeting (15 – 20 min each)
- BPA experience: Aaron Martin (attendance permitting)
- NYPA experience: Deepak Maragal
- New Zealand experience: Charlie Henville

Mike Thompson suggested getting someone to talk on design of series capacitor protection, MOVs, bypass breaker, etc. Will aim for the Jan meeting next year for this.
The outline for the report was worked on briefly.

Actions:
Mike Kockott to complete the report outline draft, and sent to all signed up members and guests. All members/guests to give feedback. Mike Kockott to incorporate the feedback received, and resent to all members/guests before the Sep meeting.

Any member or guest that has a good paper or other write up covering the impact of series capacitors to submit to Mike Kockott, who will then distribute to all members/guests.

Coordination Reports
T&D Committee / Distribution Subcommittee
The next T&D Committee / Distribution Subcommittee meeting will occur during the

IEEE PES General Meeting July 16 – 20, 2017 at the Sheraton Chicago Hotel & Towers, Chicago, IL.

The Distribution Subcommittee is comprised of working groups focused on Distribution Reliability, Switching and Overcurrent Protection, Smart Distribution, Distributed Resource Integration, and Voltages at Publicly and Privately Accessible Locations. Additional information can be found at the following link: http://grouper.ieee.org/groups/td/dist/

The following are items of interest to the Line Protection Subcommittee:

Working Group on Smart Distribution http://grouper.ieee.org/groups/td/dist/da/
Larry Clark, Chair Sal Martino, Vice-Chair Fred Friend, Secretary
P1854: Smart Distribution Application Guide is in ballot and closes May 12.
Scope: This guide categorizes important smart distribution applications, develops descriptions of the critical functions involved, defines important components of these systems, and provides examples of the systems that can be considered as part of distribution management systems or other smart distribution systems.
Volt-VAR Control Task Force
Larry Conrad, Chair Mike Simms, Vice-Chair John Sell, Secretary

Work continues on P1885 'Guide for Assessing, Measuring and Verifying Volt-Var Control Optimization (VVO) on Distribution Systems'. Balloting is expected later this year.
Working Group on Switching & Overcurrent Protection
http://grouper.ieee.org/groups/td/dist/sop/

Fred Friend, Chair Casey Thompson, Vice Chair Joe Viglietta, Secretary
Continued working on the "Guide for Reliability Based Placement of Overhead and Underground Switching and Overcurrent Protection Equipment", P1806 with the plan to go to ballot by the end 2017.

Scope: This guide provides analytical techniques to assist in the placement of switching and overcurrent protection devices on medium voltage distribution circuits for reliability purposes.
Purpose: This guide provides means and methodologies for proper placement of switches and protective devices to achieve the desired performance characteristics and reliability for medium voltage distribution circuits, including feeder and branch line equipment, with operating voltages up to and including 38 kV. Drivers for device placement, such as reliability and operational considerations are identified. Various types of switching and overcurrent equipment are covered such as: manual switches, automated switches, reclosers, sectionalizers, and fuses. Impacts on reliability and device placement are addressed for factors such as fault rate, interruption duration, exposure miles, customers affected and distribution automation.

Old Business
None

New Business
After a discussion initiated by the chair, Task Force DTF38 was created to investigate

the need for a working group on the “Impact of High SIR on Distance Relaying.” After the meeting, sixteen people have signed up to participate in the task force. For the task force, Christopher Walker will be the Chair and Greg Ryan will be the Vice-Chair.

The chair showed the matrix of guides the subcommittee are responsible for and the dates for the next revision. After a discussion, Task Force DTF39 was created to being the process of revising C37.104, IEEE Guide for Automatic Reclosing of Line Circuit Breakers for AC Distribution and Transmission Lines. The current guide is active until 2022. After the meeting, twelve people have signed up to participate in the task force. For the task force, Manish Patel will be the Chair and Bruce Mackie will be the Vice-Chair.

General Discussion

None

Line Protection operations of interest

None

The meeting adjourned

H: RELAYING COMMUNICATIONS SUBCOMMITTEE

Chair: Eric Allen
Vice Chair: Galina Antonova

The Subcommittee met on May 10, 2017 with 21 members of 42 total, comprising a quorum. 23 guests were also present. Minutes of the January 2017 meeting were approved without objection.

The Chair presented new several announcements

a. New items from May Adcom Meeting
i. WG agendas to be sent no fewer than 14 days prior to meeting
ii. No restrictions on sharing drafts for non-PAR activity (only WG members may share drafts for PAR groups)
iii. Credit toward NY P.E. continuing education requirements for attending PSRC WG meetings
a) obtain signatures from each WG chair to certify attendance
b) obtain signed letter from PSRC chair to certify that WGs are part of PSRC and address technical issues
iv. WGs that have completed their work are urged to make presentations to PSRC and/or industry webinars

b. New items from standards coordination meeting
i. Agendas for WG meetings are required a minimum of 14 days prior to each meeting
ii. RevCom is meticulously checking comment resolution

WG business:
None

Old business:
The Chair encouraged Subcommittee H Members and Guests to support KTF24 on centralized protection and control.

New business:

A new HTF43 was formed with assignment to determine if a working group should be formed to revise C37.232 (COMNAME) and Eric Allen as a Chair.

A presentation on Enhancing GOOSE I/O Monitoring was given by Aaron Martin. Further discussion revealed Subcommittee H support for forming a new HTF44 with assignment to determine if a working group should be formed to assess enhancing GOOSE I/O monitoring and Aaron Martin as a Chair.

Reports from the WG Chairs

H3: Time Tagging for Intelligent Electronic Devices (COMTAG)
Chair: W. Dickerson
Vice Chair: J. Hackett
Substations C4 Co-Chair: M. Lacroix
Output: Standard
Established: 2006
Expected completion date: December 2016

Assignment: Develop an IEEE Standard for time tagging for power system IEDs. This will include common requirements for time tags, and show how to apply them to various classes of time sequence data. Requirements and methods for stating the resulting time accuracy will be included.

The WG met on Tuesday with 4 members and 3 guests, Bill Dickerson is absent so co-chair Marc Lacroix convened the meeting. Marc will organize a web meeting to continue the comment resolution. It looks like there are at least 6 comments yet to be addressed, possibly more. Adjourn.

For the next meeting: a single session for 30 attendees. The existing slot (4:30 on Tuesday) continues to work well.

H6: IEC 61850 Application Testing
Chair: C. Sufana
Vice Chair: B. Vandiver
Output: Report
Established: 1999
Expected completion date: December 2014

Assignment: Write a report to the H Subcommittee on application testing of IEC-61850 based protection and control systems. Emphasis will be on the GOOSE functions.

Introductions were done after a welcome by Chair Charlie Sufana. There were 8 members and 12 guests present for the May 9, 2017 meeting. The minutes from the Jan 2017 meeting were reviewed and approved with no comments.

The Chair began with a review of the report's status, it has been voted by the SC and several comments were returned. Technically the report was approved but there were negative ballots to be addressed. Many of these were editorial in nature and have been

addressed in Draft 5.0. There were some graphics that need to be reworked to make them clearer and there are some comments that require the WG review and recommendations on what action to take.

The chair lead the WG through the draft to address the relevant comments. Changes were made and a new Draft 6.0 produced. Once the revised graphics have been received and incorporated the new draft will be recirculated to the WG for approval and then resubmitted to the SC.

Once the Report is approved, the SC will be requested to approve disbanding the H6 WG.

In case the Working Group needs to meet for the September meeting, a single session for 30 plus PC projector is requested.

H11: IEC/IEEE 60255-118-1, Synchrophasor for Power Systems – Measurements
Chair: K. Martin
Vice Chair: A. Goldstein
Output: Standard
Established: 2006
Expected completion date: December 2017

Assignment: Develop a joint IEC/IEEE standard for synchrophasor measurements based on the IEEE Stds. C37.118.1-2011 and C37.118.1a-2014 according to the PAR issued June 2013.

WG H11 met on 2 days during this meeting schedule:

Monday, May 8, 2017, 8:00 AM - 12:00 PM (noon)

Wednesday, May 10, 2017, 9:30 – 10:45 AM

Total attendance was 10 members, 1 corresponding member, and 12 guests. Both meetings all followed the same process: attendees introduced themselves, the patent announcements were made, and a roster was circulated. This was followed by a review of the current status:

The IEC CD circulation and the IEEE ballot were completed near the end of 2016 with 111 comments to resolve. The IEEE balloting received 6 negative, 56 affirmative, and 4 abstention votes. IEC circulation is for information and feedback at this stage, no voting. The WG has reviewed and resolved all the comments and made changes to the draft as needed.

The target at these meetings is to review the comment resolutions and make further changes to the responses and the draft as needed. The WG will also review and plan the next steps.

On Monday the WG reviewed all comment responses. Several responses were modified and a few more changes were made to the standard draft. Two controversial changes were deferred to the Wednesday meeting.

On Wednesday, written modifications for the deferred changes were considered. The first considered the objection to the use of the word Nyquist frequency when referring to the phasor reporting rate. Proposed wording of the relevant paragraph in Table 2 with

the description modified so it did not use the word Nyquist was discussed. Discussion did not resolve the issue, but a straw poll of attending members was 5 to 4 in favor of the change. Since the dissenters did not have a strong objection to the change, it was agreed to make the change.

The second issue was in improving the working of the latency test. The group could not come to a final decision in the time allowed, so this will be resolved by Email.

The next steps were also discussed. On the IEEE side, we can move ahead any time to a recirculation. On the IEC side, we need to do another CD if the changes are significant enough that we might expect negative ballots. Otherwise, we should move to a CDV. The consensus is that we are ready for the CDV. IEC is encouraging that step as the progress is a little behind their time line. The chair will work with the WG members to complete the latency test modification and then hold a WG vote to move the new draft to IEEE recirculation and CDV stage at the IEC. This is expected to complete by the end of May and then the move to CDV and IEEE recirculation will follow.

IEC CDV circulation takes 5 months and FDIS takes 2 months, so the IEC process is unlikely to complete by 31 Dec 17 when the IEEE PAR expires, so we will file for an extension.

The WG requests a meeting space for 25 people, single session, and computer projector for the next meeting in September.

H17: <u>Establishing Links between COMTRADE, IEC 61850 and CIM</u>
Chair: C. Brunner
Vice Chair: A. Apostolov
Output: Report
Established: 2010

Expected completion date: December 2013
Assignment: Develop a standards approach to link IEC 61850, CIM and COMTRADE so that the COMTRADE channels can be associated to a node in the power network.

No meeting and no report. Room for 25 people and computer projector.

H22: <u>PC37.249 Guide for Categorizing Security Needs for Protection Related Data Files (Joint Working Group Substations Committee C19 & PSRC H22)</u>
Chair: Amir Makki **Chair C19: Denis Holstein**
Vice Chair: Cesar Calix
Secretary: R. Cornelison
Output: Guide
Established: January 2014
Expected completion date: January 2018

Assignment: Identify and categorize protection related data files based on content, use, and risk of disclosure or compromise. Protection related data files include but are not limited to files used for configuration, management, and analysis of protective relaying systems.

The Working Group met on time with eight (8) members and seven (7) guests in

attendance. Quorum was established and the minutes of the previous meeting were approved.

The Guide is now at draft 6.0. Nine (9) out of twenty one (21) assignments have been submitted, reviewed, and accepted. The Group has a few more assignments to go but we anticipate having them done in time for the next meeting. The PAR expires at the end of 2018.

One important development is that the members agreed to add a new assessment category which is No Security Risk. We now have 4 categories: No, Low, Moderate, and High. The members added "No" because "Low" actually means that there is a risk. Low is defined as noticeable damage to assets and/or individual harm.

The group plans to meet again at the next meeting. The meeting requirements are: Single session, meeting room for 20 people, and a computer projector.

H23: Guide for Naming Intelligent Electronic Devices (COMDEV)
Chair: R. Cornelison
Vice Chair: Eric Allen
Secretary: Amir Makki
Output: Guide
Established: January, 2013
Estimated Completion Date: January, 2017

Assignment: Develop an IEEE Guide for naming Intelligent Electronic Devices (IEDs) based on the report of Working Group 10.

The Working Group met on Wednesday May 10, 2017 with 7 members and 3 guests. Draft 7.1 was sent to members prior to the meeting. Results of the Draft 7 balloting were: 94 balloters, 81% response rate, 95% approval rate, and 3% abstain rate. 122 comments were made.

Prior to the meeting the chair handled 65 questions. Of the remaining 57 comments, 19 handled during the meeting. The remaining 38 comments will be discussed via web sessions in the coming weeks.

Kevin Easley pointed out that the only allowed responses to the comments are Accepted, Revised, and Rejected. The Accepted response can only be used when the when commenters suggestion is followed verbatim.

Amir Makki volunteered to write the introduction which was lacking in draft 7. The introduction will include a statement clarifying that the guide applies to more than files (comment 22131700023). The introduction will also include a statement clarifying why the guide title doesn't mention channels, but the information contained in the guide can be extended to the channel in certain device types (comment 22297500023).

Charles Sufana volunteered to add a statement that this guide is also beneficial to manufacturers of devices and software tools.

A copy of the comments and final draft will be sent to members for review prior to

sending to IEEE SA. James Formea joined the group as a corresponding member.

A room for 20 people is requested for the September meeting.

H27: Standard File Format for IED Configuration Data (COMSET)
Chair: C. Chelmecki
Vice Chair: Bharadwaj Vasudevan
Output: Standard
Established: September 2013
Estimated Completion Date: September 2017

Assignment: Develop a standard XML based file format for exchange of protection and control configuration data between engineering tools and asset management tools. The modeling and naming conventions should be based on the definitions and extension rules defined in IEC 61850.

The working group met with 6 members and 2 guests in attendance. Chris showed patent/copyright slides.

Presentations: Eric Allen gave a brief overview of the COMNAME standard. The group agreed it was not applicable to the COMSET standard.

Rick Cornelison gave a brief overview of the in development standard COMDEV. The group agreed that COMDEV could be referenced for naming devices in COMSET.

Chris and Benton reminded the group that we have example file formats from IPS and Omicron that should be reviewed for concepts that are useful in COMSET.

Charlie Sufana reviewed the settings hierarchy used in a GE relay in detail. Chris Chelmecki provided a brief view of the Basler model and it was noted that there were many similarities and both the GE and Basler hierarchies could be harmonized to create a single COMSET hierarchy. Other manufactures will be polled for feedback.

The group discussed header file information and found we didn't have a concise description of what is already available within SCL.

Action Items: Combine presented hierarchy into a single suggested hierarchy for COMSET

Status: Draft 0.3.Requirements for the next meeting: 1 session, meeting room for 20 attendees.

H30: IEC 61850 User Feedback
Chair: D. Maragal
Vice Chair:
Output: Recommendation on formation of a Working Group
Established: September, 2014
Estimated Completion Date: September, 2015

Assignment: Collect user feedback from utilities and consultants for designing and

implementing IEC-61850 based substation automation system. Prepare a report outlining the experienced issues and suggest enhancements to IEC-61850 standard and manufacturer implementations.

The Working Group met on May 08 with 8 members and 10 Guests.
Chair requested members and attendees to review the draft R04 and provide comments. Following items from the draft R04 report were discussed and reviewed:

- Edition compatibility and life cycle management:

The subject issues were discussed and writing/review assignments were assigned to specific attendees.
Additionally, the attendees brought out the difficulties working with both system configuration and IED configuration tools. The issues were related to inconsistency in implementation of IEC 61850. In response to the diverse discussions, Chair stated the role of this working group/forum is to not to discuss the specific manufacturer tools and IEC 61850 conformance issues but focused on how we could make IEC 61850 simpler, easier and better. This would involve providing the feedback on configuration, monitoring and test tools, engineering process, and sharing methodologies and best practices for configuration, monitoring and testing.

- IEC 61850 Naming conventions

The need for adding custom names to the existing standard IEC 61850 naming convention was specified. Attendees expressed mixed opinions whether or not to allow custom names. ABB and Siemens representatives mentioned that this issue has come-up earlier in Europe and the utilities have settled on the best practices; they will share the experience and reports from what has been done in Germany and Europe.

- Time synchronization:

The criticality of time synchronization in IEC 61850 process bus implementation was expressed.

- Engineering process:

A detailed used case on existing engineering process is being prepared in discussion and feedback from utilities participating in IEC 61850 working group at North American Transmission Forum (NATF). Chair will bring this used case in next PSRC meeting for discussion and comparison with IEC 61850 engineering process.
Chair mentioned: IEC Working Group 10's User Feedback Task Force extended support to PSRC's H30 User Feedback Forum. The PSRC's feedback items will be discussed in October's 2017 IEC 61850 Working Group-10 meeting.
H30 will conduct monthly web-meetings in addition to existing schedule due to following reasons:

- Not every interested member/guest could attend the PSRC meeting in-person and the feedback process will not be effective unless the subject matter experts and end-users participate and share their concerns & experiences.
- 75 minutes time slot available during PSRC meeting is not enough to discuss each and every items to a considerable detail.
- The collected feedback has to be provided to IEC working Group-10, manufacturers and experts so that actionable items can be taken as soon as possible to ease the IEC 61850 implementation.

Room for 30 people and projector are needed for the September 2017 meeting.

H31: <u>Common Protection & Control Parameters for COMSET</u>
Chair: D. Maragal

Vice Chair: A. Apostolov
Output: Report
Established: September, 2015
Estimated Completion Date: September, 2020
Assignment: Develop generic models and parameters of protection functions.

The working group met on May-09th with 6 members and 4 Guests.
The group discussed the role of this working group and the coordination with other IEC working groups in TC57 and TC95.
Generic relay model with Inputs, Outputs, Settings, Controls, blocking signals was presented. IEC 61850 object models of protection and protection related functions were highlighted which constituted total of 243 parameters for defining all parameters (attributes).
Group reviewed the PIOC (Overcurrent), PTUF (Under frequency) parameters obtained from 4 manufacturers (ABB, Basler, Gentec, Siemens). Based on the review, the group identified and noted the following 3 aspects:

1. Inconsistency in interpretation of parameters by manufacturers. For ex: some manufacturers utilized HdDITmms (Hold Time) instead of RsDITmms (Reset time delay) setting.
2. The IEC 61850 parameter names was also not clear and not commonly used in North America. For ex: Operate time defined in IEC 61850 is setting in the relay to designate trip time, while operate time is a total time taken by an IED to access the abnormal condition and initiate the trip.
3. Some of the parameters and functions seem to redundant and would require consolidation.

In this regard, group decided to focus on clearly defining all the parameters related to protection and protection related functions through timing diagrams, graphs etc. to avoid the ambiguity in interpretation. Further, the commonly used (North American) parameter names will have to be mentioned in addition to existing IEC 61850 parameter names.

In next meeting, the group will focus on reviewing and defining all the parameters for Under/Over Frequency functions.
In the interest of time and effort, the group will meet monthly on web-conferences to make progress.

Room for 25 people and projector are needed for the May 2017 meeting.

H32: <u>Performance Requirements for Ethernet Circuits Applied to Teleprotection</u>
Chair: K. Fodero
Vice Chair: W. McCannon
Output: Report
Established: September, 2014
Estimated Completion Date: 2017

Assignment: Develop a report on the use of Ethernet transport for teleprotection services and line current differential protection. This report will define the channel performance requirements for Ethernet transport systems / circuits that carry pilot protection communications.

No meeting, no report. Same room requirements for next meeting.

H35: XML Translation for COMTRADE
Chair: M. Adamiak
Vice Chair:
Output: Report
Established: May, 2015
Estimated Completion Date:

Assignment: Create a report with recommendations and implementation guidelines for the update of COMTRADE - specifically with the inclusion of XML definitions of the Configuration, Header, and Data areas.

The WG met on Tuesday, with 6 members in attendance. Parallel functionality between the existing COMTRADE and the XML version will be maintained as much as possible.

Draft 3 of the document was reviewed and the following features were defined and reviewed:

- New names for XML section of COMTRADE:CFG and XCFG; DAT and XDAT; CFF and XFF
- Addition of an Analog and Digital Quality field to better align with 61850. Alignment with the existing standard possible.
- Addition of an HTML-based Header section (HHDR) to enable viewing of comments in a web browser. Backward compatibility is not possible as a CFF file cannot be opened in a web browser
- Definition of Periodic Data mapping defined (e.g. – one set of harmonic data for every X samples of data)
- Definition of Virtual Channels – created via programmable logic (61131) as contained in a new section: XCAL
- Identified the need for “repeated data” reduction

For the next meeting: a single session, for 20 attendees with a projector.

H38: Design and Implementation of Time Synchronization Distribution Systems for Substation Automation (P2030.101)
Chair: J. Bougie
Vice Chair:
Output: Guide
Established: 2017
Expected completion date:

Assignment: This guide practice covers the design, installation and monitoring of time synchronization systems in power utility substations. This includes time sources such as Global Positioning Satellite (GPS) and time distribution systems such as Inter-Range Instrumentation Group -B (IRIG-B), Network Time Protocol /Simple Network Time Protocol SNTP (NTP/SNTP), and Standard Profile for Use of IEEE Std. 1588 Precision Time Protocol in Power System Applications - IEEE STD

The WG met on Monday, with 5 members and 13 guests in attendance.

CHAIR'S REMARKS Purpose of meeting is to discuss the open issues from the ballot resolution. Our PAR has been extended to Dec 31, 2017

APPROVAL OF PREVIOUS MINUTES There was not a quorum present to approve the previous meeting minutes. An email vote will take to approve these minutes
AGENDA APPROVAL Agenda approved.

Review/discuss draft document The chair will approach C37.238 committee to verify that the information concerning C37.238-1027 is accurate. If this cannot be done in a timely matter (within the next 30 days) we will revert back to 2011.

The Chair will contact Eric Thibodeau is regards to his comments. Eric did provide a document to include, but it was decided that we could include it at this time.

The chair will set up a meeting with the ballot resolution team to review the resolutions. The goal is to re-ballot by July 2017

ACTION ITEMS Jim B will work with C23.238 WG for their support on updating the guide to include their work
Jim B will contact Eric T concerning his comments
Jim B will set up a meeting with the ballot resolution team

For the next meeting: a single session, for 25 attendees.

H39: Implementing IEC 61850 Substation Automation Systems (P2030.100)
Chair: R. Liposchak
Vice Chair:
Output: Guide
Established:
Expected completion date: 2017

Assignment: This recommended practice outlines the necessary steps and procedures a utility should undertake to implement an IEC 61850 substation in a multi-vendor equipment environment. The document addresses equipment configuration, equipment procurement specification, documentation procedures and general design philosophy that will condense the IEC61850 standard into a practical working implementation guide. The recommended practice also defines baseline information sets and functionality for IEC 61850 devices to allow users to implement similar design philosophies between vendors of IEC 61850 equipment.

The WG met on Monday, with 7 members, 1 corresponding member and 11 guests in attendance.

The working group has completed ballot resolution and has submitted D12 for RevCom review.

During our session the working group was updated on the second round ballot results. We reviewed the RevCom Comments which required "no action".

As for next steps the following action items were created:

1. Chair will develop a 10-15 minute presentation of P2030.100 to circulate to the working group for comment and approval.
2. Chair will get the P2030.100 presentation on the PSRCC Main Committee meeting in September.
3. Alex Apostolov will create a transition paper for P2030.100.
4. Alex Apostolov will get the Chair on the PAC World August agenda to present the P2030.100 work. Chair has agreed to present.

For the next meeting: a single session, for 30 attendees.

H40: Databases used in SAS
Chair: J. Bougie
Vice Chair:
Output: Guide
Established:
Expected completion date:

Assignment: This recommended practice presents general requirements, design, and lifecycle costs versus performance for databases associated with substation automation systems. Also included are specifications for database elements that should be standardized to ensure interoperability. Example designs are included for reference purposes, which are not intended to prescribe a definitive database design. Applications utilizing databases can be very different and may have vastly different requirements.

The WG met on Wednesday, with 4 members and 3 guests in attendance.

CHAIR'S REMARKS Reviewed where we are at APPROVAL OF PREVIOUS MINUTES Minutes were not approved

AGENDA APPROVAL Agenda approved.

Review/discuss draft document We started to work on the definition of a database and the different kinds of databases. Lengthy discussion held on how to handle a flat file. Chair will send out the latest draft of the guide.

For the next meeting: a single session, for 25 attendees.

H41: Revision of IEEE 1646 Communication Delivery Time Performance Requirements
TF Chair: C. Preuss
Vice Chair: N/A
Output: Recommendation for Assignment for Formation of New Working Group
Established Date: 2017 January
Completion Date: 2017 May

Assignment: Revise IEEE standard 1646-2004 – IEEE Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation"

No report.

H42: C37.93 Review
Chair: Marc Benou
Vice Chair: Craig Palmer
Output: Revision

Assignment: Revise IEEE standard C37.93-2004 - IEEE Guide for Power System Protective Relay Applications of Audio Tones Over Voice Grade Channels"

H42 met for the first time as a WG on Tuesday at 8:00 with 8 people, 7 members and 2 guests

Unlike the first meeting, where only vendors were present, in this meeting users outnumbered vendors.

The WG was assigned to review C37.93 which is due to expire in 2020 and determine if there is interest in either revising, withdrawing, or allowing the standard to expire.

Introductions were made and an explanation of the purpose of the WG was made by the chair. After much discussion and a lot of valuable input from the users present, it was determined that C37.93 needed much more than a minor revision. It is out of date and would require a complete overhaul. It was also agreed that the use of voice grade channels is fading away. The group estimated that there was approximately 4 years' worth of work to revise the existing standard, at which point, the need for the standard would already be too small to be worth the effort.

The consensus of the group was to allow the standard to expire.

The group does feel that there are helpful recommendations that could be made for using voice channels in an age where the infrastructure is not ideal.

The idea of the group's efforts be used to write a report that would be faster to complete and more focused was considered.

Marc and Craig will review the standard and come up with ideas for a report. These ideas will be presented in September at which point the WG will decide whether to proceed or disband.

Requirements for the next meeting: 1 session, meeting room for 20 people.

Liaison Reports

IEC TC 57 WG 10, 17, 18, and 19 and related WGs
C. Brunner
No report.

Power System Communications and Cybersecurity Committee
C. Preuss
Craig Preuss informed the SC that Power System Communications and Cybersecurity Committee will meet 1-4pm on Thursday May 11, 2017, and invited attendees to participate.

I: RELAYING PRACTICES SUBCOMMITTEE

Chair: B. Mugalian
Vice-Chair: A. Uribe

The I Subcommittee met on Wednesday, May 10th, 2017 with 22 members in attendance – a quorum was achieved.

Welcome and Introductions were held.

Minutes of the I Subcommittee held in Albuquerque, NM on January 11th, 2017 were approved. Motion to accept the minutes by Michael Meisinger and seconded by Jeff Pond.

Coordination & Advisory Committee Meetings Items of Interest

Future Meetings:

September 2017 – Phoenix AZ

January 2018 – Jacksonville FL

May 2018 – Pittsburgh, PA

September 2018 – TBA

January 2019 – Orange County (Garden Grove) CA

Join.me is available for conference calls/screen sharing – Contact Erin Spiewak and an account can be set up for the WG/TF Chair

Looking for Webinars to publicize our PSRCC work products

Looking for presentations for the Main Committee meetings – please contact Andre Uribe or Brian Mugalian

For May 2017, I Subcommittee will have a total of 18 WGs and TFs!

Administrative Items

WG/TF Agendas and Minutes: ***"The 14-calendar-day rule"- the Standards Appociation requirement in O&P.*** **Andre will be sending out a meeting minder as reminder to submit your agendas two weeks prior to the meetings.**

Review Draft 1 of the meeting agenda as soon as the meeting notice arrives in your inbox – to avoid meeting conflicts and multiple agenda revisions. Contact Brian Mugalian and Andre Uribe for your requested changes – we will consolidate them and forward to Murty Yalla.

Make sure that on the Meeting Room Request (MRR) form for September 2017 that you include "do not conflict with I50, D87…"

As Chair or Vice-Chair of WG or TF, please contact Brian and Andre if you cannot attend your session. Do this when the Subcommittee agenda is sent, or during the update phone calls we have. Thanks.

Non PAR related document drafts can be shared with anyone who is

interested. Please add a note that this is a draft version subject to change. Once this document is complete and approved it will be posted on PSRC website which is open to all.

All PAR related document (IEEE related) drafts cannot be forwarded by the WG member to anyone else – there is a public review time period for all IEEE documents where anyone can submit their comments.

When submitting "comments resolution" CSV file back to IEEE-SA in myProject, make sure that your draft is updated to reflect all of the changes made – must match up to the CSV file! – Bruce Pickett advised that if you accept a comment, you must include it word for word. If you make a change to the comment, then you are revising the comment.

Email WG or TF Minutes *including membership list* to Brian Mugalian and Andre Uribe at: bmugalian@sandc.com and auribe@powergridmail.com

PSRC Website – Email items to post on the I web pages to Brian Mugalian and Andre Uribe which will be reviewed and forwarded to: webmaintenance@pes-psrc.org

Working Group/Task Force Chairs and Vice-Chairs: please use the "*documents"* button on your web page to upload files, agendas, and minutes for use by others – this way we can include links in our correspondence

Working Group/Task Forces: please bring five paper copies of your work product. If a PAR controlled document, ask them to be returned at the end of your meeting – this is to help newcomers see what work is being done and see the stage in your assignment

iMeet Central (formerly Central Desktop) is to be used for IEEE Guide/ Recommended Practice/Standard documents with a PAR

Subcommittee Chair/Vice-Chair will hold progress report conference calls with each WG and TF Chair/Vice-Chair in ***late July 2017. Andre Uribe will set up the conference bridge for these calls.***

Task Force Proposal Submission Form – two received and will be reviewed at the September 2017 meeting contingent on release of members of other working groups that have completed their work.

Reports from the Working Group Chairs

I2: Terminology Review Working Group

Chair: M. Swanson
Vice Chair: F. Friend
Output: Definitions for IEEE Definition Database (formerly IEEE Std. 100)
Expected Completion Date: No expiration date

Assignment: Review drafts of PSRC publications for proper terminology, abbreviations and symbols; and to recommend additions and changes to the IEEE database as appropriate.

May Meeting
Albuquerque, NM

The I2 working group, chaired by Mal Swanson, met on Wednesday, May 10, 2017 with 7 members and 3 guests.

Quorum was achieved and minutes from the January meeting in New Orleans, LA were reviewed and approved.

Liaisons have been assigned for all working groups with a PAR to facilitate the development of new terms during the working group process.

Updates were given on the status of each of the standards.

The working group resolved the definitions for Digital Relay, Microprocessor Relay and Numerical-Based Relay for standardized PSRC use.

All working groups are reminded the database is available to them for use during their document development. All IEEE members have access to The *IEEE Standards Dictionary Online* using their IEEE account credentials at http://ieeexplore.ieee.org/xpls/dictionary.jsp.

Any standards work with a PAR must be submitted for review and approval of terms from I2. The output from a working group in the form of a report does not need the mandatory review; however, these will be accepted for review and comment upon request to the chair.

Words from approved Standards and Guides with a Section 3 (Definitions) have been incorporated into the IEEE database. An alphabetical listing of the words not in the database, but useful to the PSRC is posted on the web site under "TERMS" link under the "Knowledge Base" tab.

I4: IEC Advisory Working Group

Chair: E.A. Udren
Vice Chair: Jay Gosalia
Output: IEC TC 95 USNC standards votes and PSRC status reports
Established: 1990
Expected completion date: Meetings are continuing

Assignment: Develop comments and votes for USNC of IEC on TC 95 (Measuring Relays and Protection Systems) standards projects and drafts. Report to PSRC on IEC Standards development.

The WG met on May 9, 2017 with 5 members and 3 guest to review TC 95 standards activities. The January minutes of meeting were approved. Main discussion points:

TC 95 Maintenance Teams (MT)-1, MT-2, and MT-3 held their meetings in Tokyo, Japan during April 1-3, 2017. The TC 95 plenary meeting was also

held in Tokyo during April 5-7, 2017.

The official Technical Advisory Group (TAG) Administrator for our US TC 95 activity has been IEEE Standards Association (SA), but SA has withdrawn from this role for all of its TAGs; our TC 95 TAG must find a new administrator to maintain the US as a voting participant in TC 95 relay standards development. We are currently in discussion with five potential new administrator organizations, and have a couple of prospects in play.

Since January, Committee Drafts (CDs) for two projects were reviewed by the WG:

60255-1 Edition 2, CD, Common requirements (revision). This standard is the IEC parallel to IEEE C37.90, which is also now in revision, so a comparison and harmonization of any details we can accept makes sense – a review is in order with our revision WG. The TAG submitted minor comments on this CD.

60255-181, CD2, Functional requirements for frequency protection – after major comments and serious concerns on CD1, the TAG submitted minor comments on CD2.

At the Tokyo meeting, TC 95 MTs 1-4 worked on the following projects:

IEC 60255-181: *Functional requirements for frequency protection* – MT4 reviewed technical comments on CD2. The project leader will submit a review draft CDV to MT4 members by August 15.

IEC 60255-187-1: *Functional requirements for restrained and unrestrained differential protection of motors, generators and transformers* – MT4 member comments on the draft CDV were resolved; the project leader will be submitting the CDV to IEC the week of May 15 for subsequent international voting.

IEC 60255-187-2: *Functional requirements for busbar differential protection* – Project leader and co-leader will be appointed by the TC Chair. An international call for experts is forthcoming. PSRCC support WG should be planned in SC K.

IEC 60255-187-3: *Functional requirements for biased (percentage) differential relays for transmission lines* – The project leader will be updating the draft with MT4 comment resolutions by August 15. PSRCC WG D34 had contributed earlier comments and remains in service for upcoming versions.

IEC 60255-1 Ed. 2: MT3 resolved all comments received from CD1 circulation. The next draft will be produced at the next meeting in October.

Update to IEC 60255-26 Ed. 3: Measuring relays and protection equipment – Part 26: Electromagnetic compatibility requirements. As with Part 1, the revision addresses whether we test adequately for influences from Smart Grid devices. Francois Garrigou of FR is co-convenor; MT2 reviewed comments and will produce a new draft for circulation within the MT before

the next meeting.

Update to IEC 60255-27 Ed. 2: Measuring relays and protection equipment – Part 27: Product safety requirements. Adapt the standard to meet requirements of the European Low Voltage Directive on protection of people and animals from all risks. MT3 will begin revision work at the next meeting.

A new TC 95 AHWG convened by Volker Leitoff of France will document how sampled values per TC 38 IEC 61869-9 impact functional standards of MT 4. System behavior under various failure and problem scenarios will likely require standardization. The group will first meet separately from MTs at the Paris office of RTE during the week of May 24.

Other items discussed during the meeting:

TC 95 MT 4 is waiting for a response from IEC on adopting a dual logo for IEC 60255-151 and C37.112.

Chris Huntley update on the status of new project TC 57 IEC 61850-90-13, deterministic Ethernet networks. Work on writing the scope has commenced.

Eric informed that the CDV IEC 61850-8-2 is now ready. It is using XMPP format which is like XML. MMS structure is not used in this standard.

I11: PC37.241 – Guide for Application of Optical Current Transformers for Protective Relaying

Chair: Farnoosh Rahmatian
Vice-Chair: Bruce Pickett
Output: Guide PAR-PC37.241
Established:, March 25, 2010,
Expected Completion: Dec 31, 2017

Assignment: Develop Guide for "Application of Optical Instrument Transformers for Protective Relaying"

The Working Group met on May 10, 2017 in a single session. The session was chaired by Bruce Pickett. There were participation from **6 members and 0 guests**. We did not have quorum.

All participants introduced themselves.

The IEEE-SA Patent and Copyright slides were presented – there were no comments from the participants.

TW Cease led the discussion on reviewing and resolving the remaining ballot comments.
At the WG meeting we made a few insignificant changes. They are in the revised documents sent to the Chair. The one significant change was to change some items from "Accepted" to "Revised". TW was told that if the suggested change was Accepted

the wording in the disposition detail had to be exactly as suggested. However, we are allowed to accept a suggested change with some revisions as long as disposition status was marked as Revised. At this time the next step is to send the documents out for recirculation. Both documents have to be sent as on recirculation the only comments can be on the revisions. Also there are some notes in the comment form that need to be deleted before it is sent out.

I23: Revision of C57.13.1 – Guide for Field Testing of Relaying Current Transformers

Chair: Bruce A. Magruder
Vice-Chair: Will Knapek
Output: Revision of Guide for Field Testing of Relaying Current Transformers
Established: 2013
Expected Completion Date: 2018

Assignment: Correct errors, update with new test methods and equipment

Working Group I23, Revision of C57.13.1 - Guide for Field Testing of Relaying Current Transformers, was held in the Sandia VI room at Embassy Suites, Albuquerque, NM on May 8, 2017 at 8:00 am. 6 members and 5 guests were present and a quorum was not met.

Patent Conflict slides were shown.

Went over comments from Balloting body. All comments were resolved. Revision 6.6 of the Guide will be sent out for second ballot.

Meeting was adjourned.

I24: Use of Hall Effect Sensors for Protection and Monitoring Applications

Chair: Jim Niemira
Vice Chair: Jeff Long
Output: Develop a Report on the Use of Hall Effect Sensors for Protection and Monitoring Applications. The report will discuss the technology and compare with other sensing technologies.
Established: Jan, 2013
Expected Completion Date: 2017

The Working Group I-24 met on Tuesday, May 9, 2017 in Albuquerque, NM in a single session chaired by Jim Niemira with a total of **6 attendees**, (5 members and 1 guest). Quorum was met.
The working group reviewed the balloting comments provided by members of the working group. Regarding these contributions, the following action items were developed:

Due May 31, 2017:

Dr. Tapan Manna to provide additional relay protection application material to the section on Geomagnetic Induced Current (GIC).

Jeff Burnworth to provide a new section discussing potential relay protection applications for HE sensors. This new section is to serve as a 'conclusions' section as well.

Dr. Amir Makki to provide updated graphs to show +/- degrees of deviation instead of % deviation in phase angle.

Due June 2, 2017:

Working Group members to review all comments provided thus far and return new suggestions/comments to Jim Niemira.

Due June 16, 2017:

Jim Niemira will incorporate all comments including the new section from Jeff Burnworth, and then resubmit to the working group for review.

Due June 30, 2017:

Working Group to meet via WebEx (or at IEEE General Meeting) to discuss the revisions and additions.

Dr. Amir Makki moved to adjourn, John Buffington seconded the motion. The working group voted to adjourn.

I25: Disbanded at Subcommittee meeting

I26: <u>Review and Expand Transaction Paper on Mathematical Models of Current, Voltage, and Coupling Capacitive Voltage Transformers</u>

Chair: Mike Meisinger
Vice Chair: Steve Turner
Output: Revise Transactions Paper
Established: 2013
Expected Completion Date: December 2018

Assignment: Recommendation to update and expand mathematical models of instrument transformers and transducers, including interface electronics such as merging units, for use in both off-line and real time transient simulation. There are now new transducer types such as optical, Hall Effect and Rogowski coils in addition to improved models for conventional CTs, VTs and CVTs.

Amir Makki has converted to the Comtrade protocol using the CoolUtils.com utility. Amir demonstrated these waveforms using Wavewin. Note that these current waveforms are

50 Hz. A section will be added to the report regarding harmonic content (refer to note below). Steve Turner will work with Russ Patterson to create a website where we can store data.

The output files are for one internal fault and one external. They will include all of the following:

Primary current waveform

DC offset*

Secondary current waveform

Harmonic content*

Remnance flux*

*The main purpose of these channels is for direct comparison with mathematical models

I27: Investigation of Protective Relay Self-Monitoring Capabilities

Chair: Roy Moxley
Vice Chair: Cathy Dalton
Output: Report
Established: 2014
Expected Completion Date: 2017

Assignment: Investigation of Relay self- monitoring capabilities

The I-27 working group met with 6 members and 8 guests. We discussed final changes to the report. Additional details will be added by Robert Frye and a summary by Roy Moxley. Following this the report will be sent to the working group for ballot by the end of May and then to the subcommittee before the September meeting. If needed to accommodate changes made by the subcommittee we request a room for 25 at the September meeting.

I29: Revision of C37.110 Guide for Application of Current Transformers for Protective Relaying Purposes

Chair: Joseph Valenzuela
Vice Chair: Michael Higginson
Output: Revision of the Guide
Established: September 2014
Expected Completion Date: October 2018

Assignment: Guide for the Application of Current Transformers – Revision to Guide

The Working Group I-29 met on Tuesday, May 9, 2017 at Cincinnati, OH in a single session chaired by Joseph Valenzuela with a total of **16 attendees**, (10 members, 1 corresponding members, and 5 guests). Quorum was met. The working group reviewed the January meeting minutes. Will Knapek motioned to approve, and Mal Swanson seconded the motion. The working group voted to approve the meeting minutes.

The working group then reviewed action items from previous meetings. Discussing this past work also brought up new action items to be addressed by the group. Action items are as follows:

Joseph Valenzuela will obtain the IEEE C37.234 Bus Protection guide for Jim Niemira, which he can use to continue editing section 7.4.2.

Jim Niemira will re-sketch figure 26-30 to address accuracy concerns from the group, including circuit breaker tagging and inconsistent presentation symbols for current transformers.

It was noted that figures 31 and 32 were identical but have a different description. Michael Higginson will check Figure 25 of previous standard revisions and compare to figures 31 and 32 of working revision, to assess which figure is correct in our revised standard

The working group discussed the time to saturate equation, and concerns about accuracy and consistency of the equation. Jackie Wilson volunteered to review time to saturation calculations from the existing guide, Ilia Voloh's contributions, the PSRC saturation calculator, and reference document GET-8402.

Michael Higginson will get Ilia's contribution to working group + posted to iMeetCentral

Ilia's contributions are also included here:

Equations and references need to be re-visited after formatting change. Joseph Valenzuela will talk to Erin about obtaining clerical assistance. Michael Higginson will work on updating equations if assistance is not available.

Content needs to be added to section 8.2.2.1. Joseph Valenzuela volunteered to add this text.

Content needs to be added to section 7.2 referring to previous section. Joseph Valenzuela and Michael Higginson will edit this in the draft.

Michael Higginson will look in to table of contents and ensure it updates correctly.

Working group expressed interest in changing WebEx time. Joseph Valenzuela will send out time options to team.

The full draft report will be reviewed by Jeff Long, Jackie Wilson, John Lane and Will Knapek. They will also ensure the corrigendum edits are incorporated.

Jim Niemira motioned to adjourn the meeting, which was seconded by Jackie Wilson.
All assignments are due June 9, 2017.

The latest document draft is at the following location:
https://ieee-sa.imeetcentral.com/p/aQAAAAADApoP

I30: Revision of C37.235 Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes

Chair: Ljubomir Kojovic
Vice Chair: Robert Frye

Output: Revision of Guide
Established: 2014
Expected Completion Date: 2020

Assignment: Revise and update the IEEE Guide C37.235 - Guide for the Application of Rogowski Coils Used for Protective Relaying Purposes

May 10, 2017 PSRC meeting, 11:00-12:15 PM, Sandia II, Albuquerque, NM
I-30 met with 4 members and 7 guests

Meeting Notes:

Did not have a quorum.

Chair discussed status of revision of document

We had lots of discussions on accuracy of Rogowski Coils and testing of Rogowski Coils. Two new members volunteered to write a section on Rogowski Coil Testing.

We also had lots of discussions and help from Mark Schroeder regarding definitions and acronyms. It appears as though the IEEE dictionary only has our definitions, and we do not need to revise any definitions. The same is true for our acronyms. We do have two new acronyms that will be added.

We expect to be ready for balloting in May 2018.

We expect to adjust the status of two members who have not attended meetings in quite some time.

Writing Assignments: Edgar Flores and Scott Short will prepare a section on Rogowski Coil testing. Chair will make minor modifications to document.

I31: IEEE 1613 – Draft Standard for Environmental and Testing Requirements for Intelligent Electronic Devices (IEDs) Installed in Electric Power Transmission or Distribution Facilities

Chair: B. Mugalian and J.T. Tengdin
Vice Chair: Jerry Ramie
Secretary: Craig Preuss
Established Date: 05-Feb-2016 (PAR approval date)
Completion Date: 31-Dec-2020
Output: Revision
Draft: 0.25

Met with 20 attendees.

After introductions and review of PAR slides and copyright policy, the Secretary announced quorum was achieved. A motion was made to approve the minutes from the September 2016 meetings and passed. Next, the Secretary reviewed the action item

status from the previous meeting:

Zone B text to be clarified

Conference call with technical editors resulted in updated text to attempt clarification in draft 0.27

Conference call was held to discuss draft 0.27 with commenters, but the issue was unresolved

Zone B seen as outside the scope of the PSRC.

T&D committee already co-sponsored and no comments received to date

Switchgear committee identified as another committee whose work may overlap

Draft 0.26 sent to T&D Committee for comment on March 16, 2017

Response from T&D Committee on April 3 indicating no comments.

Draft 0.29 (current draft)

Addressed IEC 61000-4-18 referenced in 61850-3-2013

IEEE PC37.100.1 is ongoing Switchgear Committee work that includes similar coverage as P1613.

Next the working group discussed that some working group members were aware of other representatives attending Switchgear meeting first week of May.

The remaining discussion was around Zone B, application of 1613 to communication ports and relays, and establishing a link with the Switchgear Committee. Action item is for the officers to work with contacting the Switchgear Committee.

Action item is for the technical editors to specifically look for relevant switchgear standards (such as reclosers) for changes to the baseline requirements.

I32: <u>A Survey of Protective System Test Practices</u>

Chair: Andre Uribe
Vice Chair: Nef Torres
Output: Review
Established: May 2015
Expected Completion Date: September 2017

Assignment: To review report prepared by working group I11 in 2001 called “Survey of Relaying Test Practices” and update the survey accordingly to today’s industry environment.

The Working Group met Tuesday, May 9th, 2017, Albuquerque, NM in a single session chaired by Andre Uribe with a total of **22 attendees**, 10 of which were members.

Introductions were held.

May meeting minutes were reviewed.

Working Group reviewed the last section of the survey in Human Performance

A final review will be conducted to eliminate any discrepancies and maintain consistency throughout the survey, due on May 31st.

Committee members agreed that there will not be a meeting held until we receive the results of the survey

Adjourned at 9:00 am

I33: Review of Relaying Testing Terms

Chair: Jay Gosalia
Vice Chair: Amir Makki
Output: Report
Established: 2015
Estimated Completion Date: September 2017
Draft: 1.4

Assignment: Review the various definitions of relay testing terms and develop a Report with formal definitions in order to help eliminate any confusion. The Report will also be used by I2 for inclusion in the IEEE dictionary.

May 2017 Meeting Minutes:

The Working Group met on time with 6 members in attendance (quorum was established). So far, 23 terms have been identified (spanning 2 standard documents and 4 subcommittee reports). Draft definitions have been compiled for all of the identified terms which were mostly extracted from the said standards and reports.

The members agreed that focus moving forward is to refine the draft definitions by removing obsolete terms, repetitive terms, and extensive verbiage. The members will begin working on this electronically and will have a web session in preparation for the next meeting.

I34: PC37.1.1 – Draft Standard for Input and Output Requirements and Testing Methodology for Intelligent Electronic Devices (IEDs)

Chair: Craig Preuss

Vice Chair: N/A

Output: Recommendation for Assignment for Formation of New Working Group

Draft: 3.0 (sent out after meeting)

Established Date: September 3, 2015 (Revised PAR approval date)

Completion Date: December 2017

I34 met with 10 attendees with one member to discuss the status of PC37.1.1.

After introductions and showing of the patent slides, copyright policy, the chair

discussed draft version 3.0 (which was sent to the working group via email on Tue 1/10/2017 9:02 PM) and the chair reported that no comments were received.

Next, the chair discussed the PAR date (as shown above).

Then the chair discussed the relationship with the ongoing task force work to evaluate the revision of C37.90. At the January 2017 PSRC meeting, the I subcommittee found a chair to evaluate revision of C37.90 and the first meeting is today at 4:30 pm as ITF37 in the Sandia II room (check for any schedule updates)

The chair then noted that C37.90 discusses contact inputs in 5.4.3 and contact outputs in 5.7 and 5.8 and displayed those pages. Draft 3.0 was provided to the ITF37 chair. Potential options are:

Incorporating draft 3.0 into a PC37.90

Update PC37.1.1 draft 3.0 to clarify the relationship between PC37.90 (perhaps electro-mechanical relays only) and C37.1.1 (only IEDs)

Something else

Action item is for the chair to create a spreadsheet that discusses the pros and cons regarding different options. A decision on approach needs to be made by the September PSRC meeting.

I35: PC37.2 – Standard for Electrical Power System Device Function Numbers, Acronyms, and Contact Designations

Chair: Mike Dood
Vice Chair: Marc Lacroix
Output: Comments resolution for an updated version of the standard
Draft: N/A
Established Date: October 2014
Completion Date: December 2018

I35 met with 5 members and 4 guests to discuss the comments in order to prepare an upgraded version of C37.2 standard.

Discussion about the 68 and 78 devices

Many discussions regarding the description of devices 68 and 78. Originally 68 described a blocking function while 78 described a relay command. The new description introduced many years ago leads to confusion. The group has agreed:

68: the name should be simply blocking relay

78: change the definition in changing the order of words power measuring relay or power swing relay

Oscar has sent the updated 61850 equivalence table. Reference to device 16 were removed since there is no equivalent in 61850.

To be clarified: mapping of devices related to temperature measurements.

I36: Revision of IEEE Std. C37.90.2 – IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

Chair: Jeffrey Pond
Vice Chair: Jeff Burnworth
Output: Recommendation to revise or withdraw the standard
Established: September 2016
Expected completion date: May 2017

Assignment: To review IEEE Std. C37.90.2 – IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers to determine if it is to be revised.

I36 met on Tuesday May 9, 2017 with eight participants.

The task force reviewed the comments from the previous ballot, the table comparing of C37.90.2 to IEC 60255-26 and IEC61000-4-2, and an email inquiry from 2013.

After discussion the task force agreed that the standard needs to be revised. The standard should be updated to include frequencies above the 1 GHz range. The task force does not recommend harmonizing C37.90.2 with the IEC standard. The TF also recommends that an inquiry of utilities to learn if there are any known RFI issues affected relay systems be considered.

The Task Force recommends a Working Group be formed to revise C37.90.2 IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers. The working group will finalize the scope and purpose for the PAR at their first meeting.

Reports from the Task Force Chairs

ITF37: Review of C37.90 – Standard for Relays and Relay Systems Associated with Electric Power Apparatus

Chair: Oscar Bolado
Vice Chair: N/A
Output: Formation of a New WG
Established: May 2017
Expected completion date: September 2017

Assignment: Explore the creation of a working group for the review of C37.90 Standard due for withdrawn in 2021. Consider coordination or merging with ongoing work for C37.3.1.

The ITF37 Task Force met for first time on May 9th, 2017 in Albuquerque, NM with 1 member and 3 guest.

C37.90 is due for withdrawn in 2021. Due to the long history and legacy of this standard

the task force recommends forming a working group for the review of the standard.

C37.90 was revised in 2006 and reaffirmed in 2011. The task force recommendation is to perform a revision to the standard, not another reaffirmation. This revision will address the harmonization with IEEE 1613 and IEC 61850 requirements.

Additionally, there is ongoing work for C37.1.1 related to performance and testing requirements for IED I/O. It has been suggested to consider merging this work with C37.90. The options of the table are:

Continue the development of both standards in parallel trying to coordinate them

Expand the scope of C37.90 to cover IEDs, not just relays

Extract the I/O performance requirements from C37.90 into a new standard (C37.90.4?) with an expanded scope for protection, control, and communications.

The task force requests suggestions and comments from the subcommittee. We will hold a second meeting in September to gather additional ideas.

With no additional business to discuss the meeting was adjourned.

ITF38: <u>Review of C37.92 – Standard for Analog Inputs to Protective Relays from Electronic Voltage and Current Transducers</u>

Chair: Eric Udren
Vice Chair: Robert Frye
Output: Formation of new Working Group
Established Date: May 10th, 2017
Expected Completion Date: No PAR at this time

May 10, 2017 PSRC meeting, 9:30-10:45 PM, Sandia II, Albuquerque, NM
ITF-38 met with 14 attendees where 8 expressed interest in membership.

Meeting Notes:

Chair provided an excellent presentation on the C37.92 document, its contents, and its relevance.

We feel the document is relevant and still has a role today. There is nothing technically wrong with the document.

No modifications have been proposed to the document.

There are some unused features in the document, but they are harmless.

We may want to align the document with the IEC Accuracy Classes.

We had a fair amount of discussion on the need for C37.92 since many vendors support mostly IEC or other non-IEEE output ranges. This may be mostly a publicity issue.

We will be making no decision at this time whether to revise the document. Instead, we are letting the attendees digest the Chair's presentation and the document itself, and we expect to make the "revision" decision at the September meeting.

Liaison Reports

Instrument Transformer Subcommittee – Fred Friend

The next Transformers Committee meeting will occur October 29 – November 2, 2017 at Louisville Marriott Downtown, Louisville, KY.

C57.13 "Standard Requirements for Instrument Transformers" published January 2016.
C57.13.2 "Conformance Test Procedure for Instrument Transformers" will be revised but the start date and leadership has not been established.
C57.13.5 "Standard of Performance and Test Requirements for Instrument Transformers of a Nominal System Voltage of 115 kV and Above" revision in process.
C57.13.6 "Standard for High Accuracy Instrument Transformers" no activity
C57.13.7 "Standard for Instrument Transformer with max output of 250ma" balloting complete, PAR extension until December 2017.
C57.13.8 "Station Service Voltage Transformers" is working on Draft 3
TF work has begun to revise the CCVT standard, proposed as IEEE C57.13.9 (previously C93.1)

New PAR
PC57.13.9 Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers

Old Business

Creation of new Task Forces for IEEE standards expiring in 2021 and 2022

General update was reviewed by the Subcommittee, no new Task Forces to be formed at this time

Request volunteers that participated in the existing revision

Note that Task Force Chair does not need to become the Working Group Chair

Update: Traffic of IEEE Std. C37.105 – IEEE Standard for Qualifying Class 1E Protective Relays and Auxiliaries, unassigned

From Erin Spiewak: no sales both in IEEE Xplore or in the Standard Store for C37.105 in 2016

Propose Mario Ranieri's suggestion to discuss with Nuclear group. The Chair will follow up on this item.

New Business

Scope revision of our Subcommittee – Task Force? The Chair asked the Subcommittee members who would be interested in preparing a new scope for the Subcommittee that would harmonize with the new scope of PSRCC. Nine SC members volunteered for the creation of this AdHoc group. We will plan a meeting at the September 2017 PSRCC to begin work.

A discussion occurred between Tom Beckwith and Craig Preuss on the content of IEEE 1613. Further work is needed to review how this impacts the C37.90 and C37.90.x series of documents. A meeting will be held in September with the appropriate parties.

Motion to Adjourn – meeting adjourned.

J: ROTATING MACHINERY PROTECTION SUBCOMMITTEE

Chair: M. Reichard
Vice Chair: D. Finney

Scope: Evaluate and report on protective relaying concepts and practices applicable to generators, motors, synchronous condensers, associated auxiliary systems, and performance of plant protective systems. Develop and maintain related relaying standards.

J SC met with 22/38 members and 16 guests.

J5: Application of Out-of-Step Protection Schemes for Generators

Chair: **Sudhir Thakur**
Vice Chair: **Manish Das**
Output: **Report to the Subcommittee**
Established: **2011**
Status: **13th Meeting**

Working Group Scope: Produce a summary and full report to the "J" Subcommittee explaining the various schemes and setting guidelines in use for Out-of-Step protection for AC generators. The report should be in the format that could be used as feeder material into the next revision of C37.102-IEEE Guide for AC Generator Protection

The Working Group met for a single session with 12 members and 11 guests present.

The Working Group met for a single session with 9 members and 11 guests present.

The latest report draft (Draft 14) was presented, which captured updates to Section V: Stability Studies, Section VII: Additional Considerations and other editorial changes.

Bob Pettigrew will revisit the Additional Considerations section to further harmonize the symbols. Phil Tatro has volunteered to help verify the References. These and other editorial comments received from the Chair will be incorporated into Draft 15, which will be uploaded to the J webpage in the next 4-5 weeks. A notification will be sent to the WG with a specific timeline for final reviews and WG balloting period prior to the September meeting. The ballot will be conducted via email.

A single session with space for 35 people and a computer projector is requested for the September meeting.

J7 <u>Avoiding Unwanted Reclosing on Rotating Apparatus</u>
Chair: Mike Reichard
Vice Chair: Steve Conrad
Output: Report to the Rotating Machinery Protection Subcommittee of the PSRC
Established: 2011

Assignment: To review and provide comment on the protection and control vulnerability known as “Aurora”

The WG is disbanded.

J12: <u>Improved Generator Ground Fault Protection Schemes</u>
Chair: Dale Finney
Vice Chair: Manish Das
Established: Jan 2013
Output: Report to subcommittee
Status: 12th Meeting

Assignment: To review new methods related to generator ground fault protection
The group met on Wednesday 5/10/2017 with 10 members and 10 guests in attendance.

The Chair presented the agenda and minutes from the last meeting and then presented several example figures of intermitted faults that have been added into the report.

The limitations of conventional timer logic to detect intermittent faults was discussed. For relays without a built-in timer logic, several methods that utilize the internal logic of the relay that have been added into the report were discussed. Nate Klingerman agreed to expand on the first scheme that uses a dropout timer followed by a pickup timer.

Wayne presented a new timer logic with interval and delay timers used together to detect intermittent pickups of arcing ground faults. It will be added to the paper.

The WG agreed that this paper should provide some additional guidance on the dropout and pickup timers.

The Chair will add to that discussion.

The Chair mentioned that there are still a few lingering pending assignments. The assignees will be provided a last chance to respond and send their completed assignments, after which the Chair and Vice Chair will complete those assignments themselves so the WG can proceed to ballot in the next meeting.

The working group will have its 13th meeting in Sep 2017, with the need for a single session, computer projector and seating for 35 people.

J12 – Mike T had one question for J12 on whether we will get a response from the instrument transformer committee. Dale will follow up.

J13 : <u>Modeling of Generator Controls for Coordinating Generator Relays</u>
Chair: Juan Gers
Vice Chair: Phil Tatro

Assignment: Work jointly with the Excitation Systems and Controls Subcommittee (ESCS) of the Energy Development and Power Generation Committee (EDPG) and the Power Systems Dynamic Performance Committee (PSDP) to improve cross discipline understanding. Create guidelines that can be used by planning and protection engineers to perform coordination checks of the timing and sensitivity of protective elements with generator control characteristics and settings while maintaining adequate protection of the generating system equipment. Improve the modeling of the dynamic response of generators and the characteristics of generator excitation control systems to disturbances and stressed system conditions. Improve the modeling of protective relays in power dynamic stability modeling software. Define cases and parameters that may be used for the purpose of ensuring coordination of controls with generator protective relays especially under dynamic conditions. Write a report to the J-Subcommittee summarizing guidelines.

The working group met with 13 members and 21 guests present. A quorum was achieved (13 members present out of 24 total members).

The working group approved the minutes of the January 10, 2017 meeting.

Gene Henneberg presented an overview of Chapter 6 on operating characteristics, settings, and coordination of overexcitation and underexcitation limiters, which was added since the January meeting. Discussion focused on what constitutes an acceptable level of coordination. The example in the report shows “perfect” coordination; members requested an example where the machine or system parameters make coordination more difficult. Juan Gers will provide another example for an actual machine. A discussion of prioritization will be added to address situations where all criteria cannot be met. The Working Group will review previously published PSRC material on this subject to assure consistency and will note in the report that the example does not exclude other acceptable coordination methods. Some members raised a concern with an apparent contradiction with NERC Reliability Standard

PRC-019. It was observed that PRC-019 requires limiters to operate before protection, but does not dictate where protection operates with respect to machine capability other than to limit damage.

Mike Reichard led a discussion to develop responses to questions received from the Electrical Machinery Committee Grid Code Task Force regarding the need for generators to be able to provide short circuit at specified high values for specified times. Mike will incorporate input received at the meeting and coordinate a formal response with members of the subgroup assigned at the previous meeting.

Juan Gers reviewed recent additions and changes to the draft report and requested members to review the report and submit comments by the end of June. Support is needed for the chapter regarding governor control systems and relationship with generator protective systems. Phil Tatro will set up a WebEx meeting for the last week of May with members of PSDPC and ECSC.

The requirements for the next meeting are a single session, a meeting room for 40 people, and a computer projector.

J14: Plant Protection Issues Associated with Black Starting of Generators
Chair: Chris Ruckman
V Chair: Zeeky Bukhala
Established: May 2014
Output: Report to Subcommittee
Expected Completion: January 2017
Status: 9th Meeting

The working group held its eighth meeting on Tuesday, January 10th, 2017 with 5 members and 5 guests in attendance.

Assignment: Investigate and report to the J Subcommittee on plant protection issues associated with black start.

Chair and Vice-chair did not attend. Meeting was conducted by J SC Chair. WG discussed D3 assignments and progress.

J-15: Investigation of the Criteria for the Transfer of Motor Buses
Chair: Wayne Hartmann
Vice Chair: Joseph Valenzuela
Established: 2015 (1/15)
Output: Report
Status: 7th Meeting
Assignment:

Review, compare and contrast NEMA MG-1 with ANSI C50.41 regarding transfer criteria.

Examine published reports and papers on motor bus transfer criteria to compare the conclusions with NEMA MG-1 with ANSI C50.41 regarding fast transfer

criteria.

Investigate existing open-transition motor bus transfer (MBT) actual data from multiple events at the medium voltage level. Examine for current and torque ratio versus Volts/Hz at transfer periods to see if there is a correlation.

Examine published reports, papers, C50.41 and NEMA MG-1 on motor fast bus transfer criteria to reconcile the conclusions with the field-measured results.

IF available, study existing motor protection oscillography voltage and current to identify which motors are generating and which are motoring. Examine v/Hz of composite bus and individual motors, and individual motor reacceleration current versus total bus reacceleration current (if available).

Produce a Report to Subcommittee with findings of the above

The WG met May 9th, 2017 with 10 members and 10 guests.

Chair reviewed a brief history and purpose of WG, including the focus of reviews, presentations and questions to effect the assignment. Also reviewed were the WG expectations for meeting order and etiquette.

Dale Finney again reviewed his Motor Bus Transfer Simulation results from the January Meeting, but noted there were no updates to the results per his January 2017 assignment.

Assignments:

Dale Finney and Derek Haas to update the single motor MBT modeling results with the following scenarios:

Residual Transfers using IEEE 2012 MBT Report inertial brackets and closing bus/new source phase angles of 0, 30, 60…..330 degrees to see airgap torque ratio trends (assume motor loaded to nameplate). Intent is to see how observations of live transfer airgap torque ratio and modeling correlate.

Fast and In-Phase Transfers using IEEE 2012 MBT Report inertial brackets and closing bus/new source phase angles of of 0, 30, 60…..330 degrees and loadings of 1.0, 0.75, 0.5, 0.25 and 0 pu to see airgap torque ratio trends. Intent is to see how observations of live transfer airgap torque ratio and modeling correlate.

Normann Fischer to compare his MathCAD motor model simulation to the MATLAB results from Dale Finney above, using the cases as outlined above, and review torque impacts to the single motor model at the next meeting.

Chair to start integration of accomplished literature review assignments and field result observations into a first draft of Report.

Chair to contact Dennis Tierney about monitoring one of his power plants for the WG's analysis of synchronous and residual transfers.

J15 – Tom B said that all we need is a plant with relay oscillography. Dale said that we should also get some data on the machine. Mike T said that cross triggering is needed. Murty said that cross triggering is a challenge.

J16: <u>Revision of C37.101, Guide for AC Generator Ground Protection</u>
Chair: Nate Klingerman
Vice Chair: Sudhir Thakur
Established: Jan 2017
Status: 2nd Meeting
JTF16 had its 2nd meeting on Wednesday, 5/10/2017 with 21 members and 6 guests.

The Chair started with editing the draft PAR, and Scope was agreed upon. The Purpose was edited but will be finalized via email. The PAR is expected to be submitted for review during the next IEEE-SA NesCom meeting, with approval expected prior to the September meeting.

The Chair then proceeded to revisit several discussion items from the previous meeting minutes.

A discussion took place regarding the possible need to reorganize the structure of the clauses pertaining to the major protection schemes and the actions resulting from detection.

It was mentioned that a sub-group from J17 will be looking how best to handle the overlap between C37.101 and 102 on stator ground fault protection.

There was a consensus to further expand the discussion on resonant grounding.

Oscar Bolado will review the section for Terms and Definitions.

With an approved PAR the group will meet in September. A single session and room for 40 people with a projector is requested.

J16 – Murty said that any changes originating with NERC should be communicated with NERC. Murty said that we can't forget that Clyde Maughan's comments are addressed.

J17: <u>Revision of C37.102, Guide for AC Generator Protection</u>
Chair: Manish Das
Vice Chair: Gary Kobet
Established: Jan 2017
Status: 2nd Meeting

Working Group J17 held its meeting in a single session on Tuesday, May 9, 2017. This was the first meeting for this working group.

There were 17 out of 29 members present and a quorum was reached. Nineteen guests attended the meeting. Membership stands at 39 including those guests who accepted assignments during this meeting (see below).

The IEEE patent requirement slides were presented, and attendees were given the opportunity to identify any known patent claims.

The Chair stated that each WG member had been given access to the iMeetCentral workspace provided by IEEE-SA. All WG documents will be stored on this site, and any member having difficulty accessing the site should contact the Chair, Vice-Chair, or IEEE-SA. No documents will be sent by email.

The Chair has received from IEEE-SA the C37.102 document in Word format and posted it to the iMeetCentral workspace under “C37.102/Drafts/Drafts in Progress” as “PC37.102_9 May2017.doc”.

The Chair discussed the following items:
C37.102 clause 4.3.3. (Stator) Ground fault protection & C37.101 - aim for consistency or minimal overlap? It was noted that WG J16 is in the process of reviewing C37.101, so the WG work in this area will need to be coordinated with that WG. Discussion seemed to lean toward retiring C37.101 and incorporating its material into C37.102 (to be decided by this WG).

Review clauses 3.2 Generator grounding and 4.3.3 (Stator) Ground fault protection, for consistency

Editorial/Technical comments (from 2012 Reaffirmation)

New "J" materials (J-SC reports, NERC Standards, etc.) - a list is provided at the end of these minutes

Comments provided by Alla Deronja in the standard comment template (4 pages)

Comment by Russ Patterson that the year in the present document is ‘1006’ instead of ‘2006’; also that there may be a new template

Other typographical errors: (1) Subclause 4.3.3.1.1, the 5:5 CT should be something with a higher primary ratio; e.g., 400:5; (2) Subclause 4.4.1.5, kW should be kilo-ohm.

Claire Patti is the I2 liaison for Terminology Usage for this document.

Volunteers were requested and accepted the following assignments. Note that WG members who were absent were arbitrarily assigned at least one subclause to review.

Subclause 4.3.3 (Stator) Ground fault protection - review against subclause 3.2 Generator grounding for consistency, review and coordinate with J16 WG on C37.101 - Juan Gers, Joe Uchiyama, Tom Beckwith, Wayne Hartmann, Nate Klingerman, Dale

Finney

Consistency in the figures throughout the document was discussed, with Wayne Hartmann agreeing to provide Al Darlington's Visio template, plus his own. A team of Mircea Rusicior, Don Burkhart, Jason Espinosa. Gary Kobet agreed to contact Murty Yalla, Chair of the WG that produced the 2006 version of the document, to see if any figures are available in Visio (or other) editable format. IEEE-SA will check if the figure sources can be maintained in a standard repository for future revisions.

Clause 3 Description of generators, excitation systems, and generating station arrangements - Onur Usmen, Rich Bauer, Trevor Sawatzky

Subclauses 4.2 Generator stator thermal protection, 4.4 Generator rotor field protection, 4.8 Excitation system protection - Onur Usmen, Doug Weisz, Trevor Sawatzky
Subclauses 4.1 Generator stator thermal protection, 4.3 Generator stator fault protection (excluding subclause 4.3.3) - Dale Finney, Nate Klingerman, Russ Patterson
Subclause 4.5.1 Loss of field - Gary Kobet, Doug Weisz, Lubomir Sevov
Subclause 4.5.2 Unbalanced currents - Russ Patterson, Bob Pettigrew, Sudhir Thakur
Subclause 4.5.3 Loss of synchronism - Jason Espinosa, Doug Weisz, Dennis Tierney
Subclause 4.5.4 Overexcitation - Will English, Jason Espinosa, Murty Yalla
Subclause 4.5.5 Motoring - Kelvin Barner, Mike Bloder, Jason Espinosa, Doug Weisz
Subclauses 4.5.6 Overvoltage, 4.5.7 Undervoltage - Ryan Carlson, Prem Kumar, Manish Das
Subclause 4.5.8 Abnormal frequencies, with concurrent review of C37.106 as appropriate - Jason Espinosa, Mircea Rusicior, Lifeng Yang
Subclauses 4.6 Backup protection, 4.7 Generator breaker failure protection (with concurrent review of subclause 6.15 of C37.119-2016) - Phil Tatro, Mike Thompson
Subclause 4.9 Power transformer protection through mechanical fault detection - Don Burkhart, Zeeky Bukhala
Subclauses 5.1 Current transformers, 5.2 Voltage transformers - Hasnain Ashrafi, Zeeky Bukhala
Subclause 5.3 Protection during start-up or shutdown - Sungsoo Kim, Ratan Das
Subclause 5.4 Inadvertent energizing - Russ Patterson, Derrick Haas
Subclause 5.5 Subsynchronous resonance (SSR) - Dale Finney, Suparat Pavavicharn
Subclause 5.6 Transmission line reclosing near generating stations, with review of J7 output - Gary Kobet, Chris Ruckman
Subclause 5.7 Synchronizing - Randy Hamilton, Mike Thompson
Clause 6.0 Multifunction generator protection systems - Gustavo Brunello, Kelvin Barner
Clause 7.0 Protection specification - Manish Das, Sungsoo Kim

Annex A (informative) Sample calculations for settings of generator - Onur Usmen

In addition, Mike Thompson volunteered to review the work of the J8 WG which produced the most recent Tutorial on AC Generator Protection and provide comments on what could be better explained in this document.

Volunteers are requested to work together on these assignments, taking in to account previous comments as mentioned above, as well as comments posted to iMeetCentral under "C37.102/Comments from previous revisions". Each group should place their comments in a single copy of the C37.102 Word document using "Tracked Changes",

and upload it to iMeetCentral under “C37.102/Assignments/2017-07-31”. Assignments are due July 31, 2017.

Having accepting assignments, guests becoming new WG members include: Mircea Rusicior, Kelvin Barner, Dale Finney, Doug Weisz, Jason Espinosa, Michael Bloder, Don Burkhart, Juan Gers, Joe Uchiyama, Onur Usmen.

Next meeting requirements: single session for 50, with computer projector

List of Potential Reference Documents for J17 WG:
J1 Adjustable Speed Drive Motor Protection Applications and Issues (2008)
J2 Protection Considerations for Combustion Gas Turbine Static Starting (2011)
J3 Power Plant and Transmission System Protection Coordination (2012)
J5 Coordination of Generator Protection with Generator Excitation Control and Generator Capability (2007)
J5 Application of Out-of-Step Protection Schemes for Generators (ongoing)
J6 Protection Issues Related to Pumped Storage Generation (ongoing)
J7 Avoiding Unwanted Reclosing on Rotating Apparatus (ongoing)
J8 Tutorial on the Protection of Synchronous Generators (2011)
J12 Improved Generator Ground Fault Protection Schemes (ongoing)
J13 Modeling of Generator Controls for Coordinating Generator Relays (ongoing)
J14 Plant Protection Issues Associated with Black Starting of Generators (ongoing)
NERC SPCS Technical Reference Document - Power Plant and Transmission System Protection Coordination - Revision 1 - July 2010
NERC Std PRC-001-1.1(ii) System Protection Coordination
NERC Std PRC-004-5(i) Protection System Misoperation Identification and Correction
NERC Std PRC-005-1-1b Transmission and Generation Protection System Maintenance and Testing
NERC Std PRC-019-2 Coordination of Generating Unit or Plant Capabilities, Voltage Regulating Controls, and Protection
NERC Std PRC-024-2 Generator Frequency and Voltage Protective Relay Settings
NERC Std PRC-025-1 Generator Relay Loadability

JTF1: <u>Impact of Renewables on Synchronous Generators</u>
Chair: Normann Fischer
Vice Chair: (Acting) Dale Finney
Scope of the Task Force:
Penetration of renewable energy *resource* and the impact on synchronous generator protection *(Scope is still pending)*
Pratap – 1547 is out for ballot now

The chair has spoken with 2 utilities about their concerns about increasing renewable penetration

Sungsoo – Is this a bit of a myth?
Wayne S. – Will the scope include synchronous motors
Mike R. – Issues with isolated DGs and loss of grounding?
Mike R. – Most important is item 1 – ROCOF and change in inertia.

Normann – will talk to Mr. J. Schetter (Renewable Impacts) about the possibility of a presentation
Mike R. – will talk to Nick Miller (GE Wind) about a presentation
The chair showed some wind turbine modelling results
Phil – coordination throughout PSRC is key

REQUIREMENTS FOR NEXT MEETING:
Room for approximately 40 people and a projector

Liason Reports – Murty will report in the September meeting on PES. J needs a liason for IAS I&CPS motor protection issues.

New Business: J SC will respond to questions received from the Electrical Machinery Committee Grid Code Task Force regarding generator short circuit and requirements defined in IEEE Std. C50.13.

J to correspond with Deepak Maragal regarding Sub-synchronous resonance JTF
Mike Thompson volunteered to present the generator tutorial and TAMU next year.

Randy Hamilton is a new member of J SC.

K SUBSTATION PROTECTION SUBCOMMITTEE

Chair: D. G Lukach
Vice Chair: B.A. Pickett

The K-Subcommittee met on May 10, 2017 in Albuquerque, NM with 22 members and 43 guests in attendance. A quorum was achieved. Don Lukach requested a motion to approve the January 2017 subcommittee meeting minutes. Steve Conrad made the motion, Gene Henneberg seconded. Vote was unanimous to approve.

Reports from the WG Chairs

K1 PC 37.245 Guide for the Application of Protective Relaying for Phase Shifting Transformers.

Chair: Lubomir Sevov
Vice Chair: Brandon Davies
Established: Jan. 2012
Output: PC37.245 Guide for the Application of Protective Relaying for Phase Shifting Transformers
Draft 7.1b
Expected Completion Date: Dec.2018

Assignment: To write a guide for the application of Protective Relaying for Phase Shifting Transformers (PSTs). The protection methods for different types of PST and operating conditions of PSTs will be reviewed. Representation of PST models to determine short circuit currents for relaying considerations will be considered. Protection CT sizing and location issues will be considered. Relay application and setting examples will be provided.

The K1 working group met in a Double session. 10 members and 9 guests were present. After the introduction, a call for quorum was made, quorum was achieved. A motion was made by M. Thompson and seconded by R. Crellin to approve the minutes of the last meeting in New Orleans, and the motion was approved. A motion was made by S Conrad and seconded by C Henville to approve the minutes of the March WebEx meeting, and the motion was approved.

Current draft of the document is 7.1b The draft for the next meeting will be 7.2a.

The IEEE Patent disclosure slides were presented. One letter of assurance has previously been received from a patent holder. This letter has been transmitted to IEEE.

The following was discussed:
• Section 9.1 of the guide describing different CT types (bushing or non bushing) has been modified. Information on other CTs is going to be moved to different sections where protection details are provided

• New section 11.2.2.4 regarding the LTC and Advance-Retard-Switch (ARS) was discussed with minor revisions made. This section now includes a reference to IEEE Std. C57.135.2012 the title of the relevant section (4.6 Special on load tap changer (OLTC) features) will be added.

• Modifications to Section 11.1.3 (thermal overload) were discussed.

• Modifications to Sections 11.1.1 and 11.2.1 were considered. Mike Thompson agreed to draft modifications to remove redundant information from one of these two sections.
• Section 11.2.2.1 CTs at SOLO in Figures A and B will be modified to be not bushing CT style.

• Section 11.2.2.2 was modified with respect to impact of saturation of the series winding, on 87S and B. Davies will add a reference. Figures C and E will be modified to add a note regarding the fact that the CT on the N0 terminal may or may not be a bushing CT.

• Section 11.2.2.2.1 was modified to discuss alternative connections (leading or lagging) of the delta in the series transformer.

• Section 11.2.2.2.2 was compared with new Section 11.2.2.2.3 which both discuss magnitude compensation factors. B. Davies agreed to merge the magnitude compensation factor discussion so that it just described normalized currents. The normalized excitation current is equal to the sum of the normalized source and normalized load currents.

• Possible modifications to Section 11.7 to describe in words rather than numbers, the variability of reach of the phase distance relay through a PST were discussed. C Henville volunteered to draft revisions to this section, and send it to D Tziouvaras for review and subsequent replacement into the next draft.

New Assignments (Assignments Due 6/30/17):

• Mike Thompson – Review Clauses 11.1.1 and 11.2.1 to remove or update duplicate information.
• Brandon Davies – Add reference to paper by D. Tziouvaras to section 11.2.2.2 discussing desensitization of 87S for series unit saturation concern.
• Brandon Davies – Revise section 11.2.2.2.2 and 11.2.2.2.3 to make discussion of magnitude compensation more generic.
• Charlie Henville and Mike Thompson - Review section 11.7 on distance protection.

Request for next meeting is a room for 30 attendees single session and a projector

K10: SCC21 Distributed Resources Standard Coordination
Chair: R. Ben Kazimier
Vice Chair: Mark Siira
Established, 1999
Output: Standard through the SCC 21

Assignment: To interface with SCC21/P1547 in order to reduce unnecessary delays by getting PSRC input into the process without having to wait for after-the-fact coordination.

First introductions were made and attendance was taken. Mark Siira then presented an overview of SCC21and Activities for 2017. IEEE 1547 Revision Working Group major tasks and milestones were discussed. The IEEE ballot process was discussed and it was noted that interested parties need to register interest on IEEE MyProject by May 12, 2017 11:59PM ET.

The IEEE 1547 WG posed Questions for PSRC K10 generally related to:

Can relay vendor offer specific, 1547-compliant relays, e.g. by offering specific firmware versions? i.e., Specified ranges of adjustability for frequency and voltage trip settings.

If so, could the range of adjustability for voltage or frequency thresholds and clearing time be limited to the values specified by the revised IEEE Std 1547?

The group responded that it is not likely to modify firmware on relays as it is difficult to change.

Can undervoltage relays set their voltage threshold down to zero voltage (0 pu)?

A small sample revealed that some relays can go down to 0.

It was generally discussed that going forward, some relevant comments that are appropriate may be forwarded to K10 for discussion via web.

The next 1547 meeting will be hosted by Salt River Project on June 22 in Tempe, AZ. Registration for the meeting is located at the following address: http://www.cvent.com/d/75qs3t .
For the next K10 meeting we request a room for approximately 20 people for a single session. We request that conflicts be avoided between K10 and the D28, I27, and I25 working groups.

K11: Open Phase Detection for Nuclear Generating Stations

Chair: Charlie Sufana
Vice Chair: M. Urbina
Output: Report
Draft 6.7

Assignment*:* Write a report to the K Subcommittee entitled Methods for Analyzing and Detecting an Open Phase Condition of a Power Circuit to a Nuclear Plant Station Service or Startup Transformer.

Introductions were done after a welcome by Chairman Charlie Sufana. There were 5 members and 2 guests in attendance for the May 9, 2017 meeting.

The minutes from the January 10, 2017 K11 meeting were read and approved.

Charlie then went over the report draft 6.6 and indicated that he has requested the PCS2000 folks to edit their contribution again. Their latest contribution was sent to 4 reviewers for their comments. The initial comments indicated that it should not be included since it seemed sort of like an ad.

There was also a suggestion to add a table in the conclusions that show the viable schemes. Charlie said he would put something together.

It is hoped that the final version of the report can be completed in about a month so that the Working Group can vote. Once the working group has voted and any issues cleaned up, then the report will be sent to the K Subcommittee for their consideration to allow the report to be posted to the PSRC webpage. The K Subcommittee Chair has requested that the Working Group provide a draft for balloting by July.

For the next meeting a single session for 30 plus PC projector is requested.

K12 P1032 Guide for Protecting Transmission Static Var Compensators.
Chair: Satish Samineni
Vice Chair: Martin Best
Established: May 2013
Output: Guide for Protecting Transmission Static Var Compensators
Expected Completion Date: December 2016
Draft 13.4

Assignment: To work jointly with Substations WG I9 to write a guide for protecting transmission static var compensators. PSRC WG K12 will provide guidance and review on topics that are already covered in other IEEE guides to prevent overlap and identify areas where interpretation of existing guides is necessary to meet the specific application challenges unique to transmissions static var compensators.

PSRC K12 met on Tuesday, May 9 with 3 members and 2 guests. The January 2017 meeting minutes with the Substation I9 Working Group were reviewed. The K12 working group did not have a quorum, so the January 2017 meeting minutes will be approved after the meeting via email.

The current draft number is 13.4. The working group reviewed Section 7.4 on Medium

Voltage Bus Protection by Dean Miller. The members present accepted Dean's section as written. Martin will notify the I9 working group of K12's approval.

The working group also revisited and resolved several comments in Section 7.3 on Transformer Protection by Michael Thompson. Martin will capture the additional revisions and comment resolutions for Section 7.3 and notify the I9 working group of K12's approval.

Martin also pointed out several comments in Section 6.1 on CT Considerations that are still in the document but have in fact been resolved. Michael suggested that rather than simply deleting the comments, Martin should add a note that the comment is resolved so that I9 will know that the comment is resolved and therefore can be removed.

The next K12 meeting will be in September 2017. The requirements are a single session, a meeting room for 20 people, and a computer projector..

K13 PC37.116 IEEE Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks

Chair: Ilia Voloh
Vice Chair: Luis Polanco
Established: September 2013
Draft 1.9

Assignment: Revise IEEE C37.116 "Guide for Protective Relay Application to Transmission-Line Series Capacitor Banks**"**

K13 did not meet at the May meeting. The group will be developing a balloting body and balloting the Guide between May and September..

K16 PC37.91 Revision of IEEE Guide for Protecting Power Transformers

Chair: Will English

Vice Chair: Steve Conrad

Output: Revised IEEE C37.91 Standard -Guide for Protecting Power Transformers

Established: May 2014

PAR Expires: December 2018
Draft: 8

Assignment: To revise and update C37.91, IEEE Guide for Protecting Power Transformers to correct errors and address additional protection related topics.

The working group met with 14 members and 10 Guests on May 10, 2017, at Embassy Suites Hotel – Albuquerque, NM.

The chair displayed and reviewed the required patent information slides related to PAR activity of the WG, and provided opportunity for participants to identify patent claims. The assignment of the WG was also reviewed / discussed. As a requirement of standards development work all participants are required to indicate both their Company and Affiliation on the attendance sheet. The attendance sheet was circulated to collect the required information of each participant.

Quorum was not achieved at the start nor throughout the meeting.

Terminology review- Mark Schroeder and Clair Patti updated the WG on the terminology review. The terms to be used in the guide are “protective relay”, “digital relay”, and “microprocessor-based relay”. The definitions will be forwarded to the chair.

Clause 8.2.9 M Thompson to review the application of high impedance relaying associated with fig 15.

Clause 8.4.3 Case Ground was reviewed and accepted by the group. A comment was made to ensure C37.108 title is updated.

Clause 8.2.3.3 Chris Walker to review

Clause 9.3.1 The chair and Don Ware to review the clause and include the use of transducer techniques.

Clause 9.3.2 Rewrite the introductory sentence to remove reference to figures 28 & 29.

Clause 9.3.4 Static Pressure Relay- clause to be removed

Clause 13. Gas Analysis is to be paired down as the C57.104 guide is under revision and will be referenced.

The chair asked for volunteers to perform and editorial review of the document after the recent changes have been implemented. The figures still need to be updated and will also be included for review. Mike Thompson, Abu Bapary, Clair Patti and Johan Van den Berg agreed to review the document with Mike to chair this editorial group.

All assignments are due to the chair prior to June 1, 2017. The chair will then send the updated draft to the shared site.

Meeting adjourned.

Next meeting requirements: Single meeting, room for 50 and computer projector.

Avoid WG conflicts with K16 and K22

K17 <u>Geomagnetic Disturbances (GMD)</u>
Chair: Qun Qiu
Vice-Chair: Luis Polanco
Draft: 4

Assignment: To submit a WG report to the PSRC K Substation Subcommittee evaluating the performance of protection systems during Geomagnetic Disturbances

K17 met on Wednesday May 10th 2017 with 12 participants (8 guests and 4 signed members).

Meeting minutes of the K17 January 2017 meeting was previously approved via email.

Chair provided updates on the WG report, went over the writing assignments and discussed unassigned sections that we need volunteers to sign on to provide contributions.

Chair reviewed the proposed changes to TPL-007-1 and discussed the new requirements and implementation plans.

K17 group reviewed the sections submitted since last meeting. Members discussed the application of blocking device for underground cables, reviewed historical GMD events, hall-effect CT, and the Geomagnetic Field Monitoring system.

It was proposed to remove sections 2.4 Protective Relaying Susceptible to GMD since most of related contents are covered in other sections, e.g., sections 2.2.

Chair/vice-chair will follow up with pending assignments to make sure all previous and new assignments to be completed as scheduled.

For next meeting chair requests a single-session and a meeting room for 30 persons, with AV capabilities.

K18 PC37.108, Guide for Protection of Secondary Network Systems

Chair: Adi Mulawarman

Vice Chair: Surarat Pavavicharn

Established: May 2015
PAR Expires : December 2019
Draft: 2.4

Assignment: To revise and update C37.108-2002 –Guide for the Protection of Secondary Network Systems

Time 5/8/2017 : Monday 4:30-5:45 pm Albuquerque, NM

Workgroup Assignment:

1. Introductions/ Sign up sheet/Patent slides/ 50% Quorum? Quorum met, 7 needed
   _12_ attendees
   _7_ out of _15_ members attended
   _0_ new members added
2. Approve last meeting minutes
   1st Member name __Charlie Sufana _____ - motioned
   2nd Member name __ Don Lukach - seconded
3. Status on PAR process/submittal/schedule
   PAR Submitted for Approval : October 7th 2015

PAR Approved by RevCom : December 5th 2015
Expected Date of submission of draft to IEEE-SA for Initial sponsor Ballot : January 2018.
Projected Completion Date for submittal to RevCom : 08/2018
PAR will expire December 31st 2019
PDF of PC37.108 describing the accepted PAR form has been uploaded to our working folder.

4. Title, Scope and Purpose restatement from accepted PAR

Title : Guide for the Protection of Secondary Network Systems
Scope : Devices and protection schemes that are being used in secondary network system protections are discussed in this guide. These devices should act to sense the fault and initiate fault interruption locally or remotely, thereby minimizing damage and restoration time.
Purpose : This guide covers devices that are being used in secondary network systems protections schemes. These devices should act to sense the fault and initiate fault interruption locally or remotely, thereby minimizing damage and restoration time.

Update on assignments

Any update on review of section 6 from Kevin. D.

Any update on review of section 9 from Lubo. (this is no longer needed, section will be removed. See below for detail discussion during meeting)

Any update on review of section 10 from Charlie. S. (submitted. Review done. Charlie also updated the normative reference section.)

Looking for new vice-chair. If interested please email Adi.

Other update : (NEW ASSIGNMENTS)

PLEASE DOWNLOAD LATEST DRAFT FROM THIS LINK BELOW
https://ieee-sa.imeetcentral.com/psrcktf18/folder/5770883/#folder:4361073
Brief discussion points:

Introduction, patent slides

Approval of meeting minutes

Vacancy of vice chair announced

Charlie's presentation. Will be uploaded into the project folder.

Roger Whitaker will be the new vice-chair of the working group.

We discussed removal of section 9 because a lot of use thinks this is out of scope. However, 1547.6 refer to our standard for more information on protection of distributed resource on secondary network system. I think the consensus is to remove section 9.

Adi will talk to Ben Kazimier from K10-SCC21 Distributed Resources Standard Coordination about the discussion on our section 9 being used as a normative reference. We would like the 1547.6 working group realize that their reference to our 2002 version of the standard will no longer be there when we revised our standard so they should consider revising their section when their standard is up for revision. We may be able to provide input to their document. (Update: Adi talked to Ben and he will discussed with the SCC21 group).

Adi will also need to talk to WG Chair of C57.12.42 about giving inputs on the protection section of their document. Adi will email the member the link to password protected site for C57.12.42 draft so we can comment on the protection section of their guide.

Don Lukach asks if a Web-conference can be setup for members to discuss comments on C57.12.42 before we give an official response.

For the next meeting :

Rm for 20 people, projector and no conflict with K16

K19 <u>Advisory to IEC 60255 -187-1 Functional Requirement for Restrained and Unrestrained Differential Protection of Motors, Generators and Transformers</u>

Chair: Gustavo Brunello

Vice Chair: Abu Bapary

Established: May 2015

Assignment: To provide an advisory function to the IEC working group

Meeting: September 20th, Cincinnati, OH
The working group did not meet at the MAy PSRC meeting as no new IEC activity has taken place.

K21 <u>C37.112 Standard Inverse-Time Characteristic Equations for Overcurrent Relays</u>
Chair: Randy Crellin
Vice Chair: Michael Thompson
Established: May. 2016
Output: Revise C37.112
Draft: Assign Status
Expected Completion Date: TBD based on PAR

Assignment: To pursue the renewal of C37.112
The working group did not meet at the May meeting and is in the process of forming a balloting body.

K22 <u>C37.234 IEEE Guide for Protective Relay Applications to Power System Buses</u>
Chair: Abu Bapary
Vice Chair: Michael Thompson
Established: September. 2016
Output: Revise C37.324
Draft: 1
Expected Completion Date: September, 2019

Assignment: Revise and ballot IEEE Standard C37.234 prior to its expiration in 2019.

The K WG22 met on Wednesday, May 10th with 30 members and 4 guests. Five attendees agreed to join the working group.

Introductions were made.

Don Lukach motioned to approve the minutes of the previous meeting. Steve Conrad seconded the motion. The minutes to the previous meeting were approved by a quorum of the working group.

The chair informed the working group of the status of the PAR. It was approved in March 2017 and expires in 2021. However, the actual guide expires in 2019. The chair discussed that we would make trying to complete the project before the expiration of the guide as a stretch goal. Given that the guide was very well done and was awarded by the PES when it was first published, it is hoped that the review effort will reveal little that needs to be revised.

The chair also informed the members that the imeetcentral web site had been set up and that the doc file and the figure files were available there. All persons who have signed up as members have been given access. The chair will add the new members to the roster as soon as possible after the meeting. The chair has requested that IEEE SA put the doc file into the current SA template for us as a start file. Until then, members are asked to enter their comments in the current doc file. The vice-chair will merge the files so that all comments and edits are in a single file.

Working group processes were discussed further in the meeting. Clair Patti suggested that we use the lock feature with imeetcentral where each member downloads and locks the draft file in turn, makes their edits, and uploads the file back and unlocks it. The issue with the current plan is that the merge function in WORD can be quite unreliable. The chair indicated that we would attempt to use the following process for integrating assignments with the document. Each team or individual will email their assignment to the chair and vice chair. The vice chair will integrate the comments and edits with the draft and post updated drafts to imeetcentral as required but generally prior to a scheduled meeting.

The status of the assignments was reviewed. The outstanding assignments are highlighted in **bold font** in the body of these minutes.

Section 4, S. Conrad, L. Sevov, A. Deronja (Comments received from Alla. Waiting on Lubo. Not sure when the review will be complete.)
Section 5, J. Barsch, N. Gulczynski, H. Lander (Received 3/31/2017)
Section 6, J. O'Brien, I. Tualla, C. Walker (Received 5/10/2017)
Section 7, B. Davies, A. Nguyen, M. Leyba (Received 4/24/2017)
Section 8.1-6, G. Ryan, D. Lukach, I. Voloh (Received 4/27/2017)
Section 8.7-12, R. Crellin, A. Mulawarman, B. Boysen, R. Hedding (Should be done in two weeks.)
Section 8.13-18, G. Moskos, C. Suffana (Should be done by mid June.)

Annex A, M. Nagpal (No report.)

Annex B, TBD
Annex C, J. Barsch (Received 3/31/2017. No changes required.)
New assignments were made. Some of these overlap previous assignments. Please send your assignments directly to the chair and vice chair for integration with the next draft.

Section 4, L. Tulaladhar.
Section 5, D. Burkart, A. Deronja.
Section 7, D. Maragal, A Martin.
Section 8.1 – 8.6, B. Macke
Section 8 all, P. Dongale, N. Gulczynski.

Figures, Compare tiff to vsd files to determine if SA editors had modified from the vsd files that were obtained from B. Kasztenny. M. Thompson, S. Conrad.
The need to review Table 1 with IEEE SA regarding language (recommended, etc.) was discussed. The chair will discuss this with E. Spiewak to determine if the existing table will trigger any issues during editorial review.

Don Lukach brought it to the working group's attention that WG D28 revising C37.230, IEEE Guide for Protective Relay Applications to Distribution Lines is planning to remove material on distribution bus configurations and we will need to coordinate with that group to ensure that all critical information is included in C37.234. **G. Ryan, B. Boysen, and D. Lukach will review the two guides and make recommendations to the working group.**

All assignments are requested by August 1st so that a new consolidated draft can be prepared and uploaded to imeetcentral prior to the September meeting.

We request a single meeting with room for 40 and a computer projector for September 2017 no conflict with K/WG16 & K/WG21.

K23 <u>Summary Paper for</u> <u>C37.119 IEEE Guide for Breaker Failure Protection of Power Circuit Breakers</u>
Chairman: Roger Whittaker
Vice Chair: Adi Mulawarman
Established: 2016
Output: Summary Paper for C37.119-2016

Workgroup Assignment: To make and present at regional conferences, a summary paper of C37.119-2016 – IEEE Guide for Breaker Failure Protection of Power Circuit Breakers.

Introductions/ Sign up sheet/ Quorum?
12 members attended out of 14, Quorum met. 6 guests attended. Total attendees 18.
New Orleans minutes
Motion to approve meeting minutes by Adi Mulawarman, Seconded by Jeff Barsch

Present edited draft, summary paper
Roger presented the fully edited version of the latest draft with comments from Yuchen, Roger, and Jeff Long and the workgroup discussed and resolved each comment. The group did some minor editorial and rewrite of the background section. Roger will further edit this and make it available for the workgroup's approval. Per the group discussion, Roger will add a sentence on why the guide was revised in the background section.
Roger is performing a final edit that will capture the workgroup resolutions to the issues and this document will be presented to the workgroup for a ballot via Email with opportunity for further comments from members. Draft 3 of the document will be sent out to the members.

Discuss vote and comment approval process
The workgroup needs to achieve a 50% (75%?) approval rate of the workgroup membership for the final paper. Approval will be done via email before the September meeting.
Review conference paper procedures/schedules
Volunteers presenters are: Roger Whittaker at WPRC, Mike Thompson at Texas A&M, Bruce Mackie at Georgia Tech, and Adi Mulawarman at Mipsycon.

Power point presentation
Should this presentation be flavored with extra tutorial info? Discussion for this topic was moved to next meeting.

Breaker failure events? ……..Adjorn

There were no interesting BF events presented.

Minutes by Adi Mulawarman, edited by Roger Whittaker, presented 05/17/2017

KTF24: <u>Explore the Possibility of a Working Group to Prepare a "Guide on Centralized Protection and Control within a Substation"</u>
Chair: R. Das

ASSIGNMENT: Explore the Possibility of a Working Group to Prepare a "Guide on Centralized Protection and Control within a Substation"

Meeting # 1 (May 9, 2017)

The task force met on May 9, 2017 with 32 participants. Chair provided the background for the formation of the task force and the work done by the WG K15 which is the basis for this task force. Chair then requested all the participants to express their views about the assignment and attendees expressed their opinion and suggested to have a scope defined before a decision can be made about the formation of a working group to develop the guide. 11 new people decided to join the task force brining the task force membership to 28.

Task force then deliberated the scope of the WG and comments were taken. Each of

the participants are provided with a hard copy of the proposed scope and requested to provide their input by end of May 9 so that a consolidated view can be expressed to the subcommittee.

As there is a consensus on the formation of the working group, chair requested any opposition to the request to form the working group – two task force members suggested to delay the request as more discussions about the scope and research on Guide development technology is necessary.

[See the balance of the KTF24 request under New Business] - DGLukach

Liaison Reports:

No liaison reports were given. Information can be found at the following web addresses for T&D and the Transformers Committee. A summary of the Transformer Committee is included at the end of the minutes.

T&D Committee, Capacitor Subcommittee
Pratap Mysore
http://grouper.ieee.org/groups/td/cap/

TX Committee
Fred Friend
http://www.transformerscommittee.org/

Old Business:

No Old Business was discussed.

New Business:

The KTF24 request for a working group was discussed with the subcommittee. Don Lukach presented to the subcommittee discussions that he had with several PSRC officers, other subcommittee chairs, and PSCCC officers regarding the best location for this group due to the amount of communication scope. The subcommittee has no authority to stop the PAR nor approve the PAR per IEEE rules. After lengthy discussions, the K Sub chair asked for an opinion vote that could be transmitted to the PSRC officers, namely to table the subject in this subcommittee until further discussion could be had with the PSRC officers to determine the best location for the work. There were no dissenting votes to table this work.

[Subsequent discussions after the subcommittee meeting led the chairman to propose that the work of KTF24 be transferred to the H Subcommittee with a liaison relationship to the PSCCC. The K substation subcommittee would provide protection requirements on the subject if requested via normal working group membership.] – DGLukach

Transformers Committee Summary

The next Transformers Committee meeting will occur October 29 – November 2, 2017

at Louisville Marriott Downtown, Louisville, KY. The following is the status of their work:

REVISIONS approved

C57.12.24 Standard for Submersible, Three-Phase Transformers, 3750 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 Volts and Below; Low Voltage, 600 Volts and Below

C57.120 Guide for Loss Evaluation of Distribution and Power Transformers and Reactors

C57.138 Recommended Practice for Routine Impulse Test for Distribution Transformers

Corrigenda approved

C57.12.38-2014 Corrigendum 1
Standard for Pad-Mounted-Type, Self-Cooled, Single-Phase Distribution Transformers 250 kVA and Smaller: High Voltage, 34 500 GrdY/19 920 V and Below; Low Voltage, 480/240 V and Below

C57.163-2014 Corrigendum 1
Guide for Establishing Power Transformer Capability while under Geomagnetic Disturbances

C57.12.90-2015 Corrigendum 1
Standard Test Code for Liquid-Immersed Distribution, Power, and Regulating Transformers

PARs for New Standards

P60214-1-57-131 Standard Requirements for Tap Changers

PC57.13.9 Standard for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers

PC57.32a Standard for Requirements, Terminology, and Test Procedures for Neutral Grounding Devices Amendment: Neutral Grounding Resistor Section

PC57.165 Guide for Temperature Measurements for Liquid Immersed Transformers and Reactors

PARs for Revisions

P1277 Standard General Requirements and Test Code for Dry-Type and Oil-Immersed Smoothing Reactors for DC Power Transmission

PC57.12.00 Standard for General Requirements for Liquid-Immersed Distribution, Power, and Regulating Transformers

PC57.12.80 Standard Terminology for Power and Distribution Transformers

PC57.142 Guide to Describe the Occurrence and Mitigation of Switching Transients Induced by Transformers, Switching Device, and System Interaction

PC57.143 Guide for Application of Monitoring Equipment to Liquid-Immersed Transformers and Components

PC57.150 Guide for the Transportation of Transformers and Reactors Rated 10,000 kVA or Higher

PAR Extensions approved

P1276 Guide for the Application of High-Temperature Insulation Materials in Liquid-Immersed Power Transformers

PC57.12.20 Standard for Power Transformers - Part 16: Transformers for Wind Turbine Application

PC57.12.39 Standard Requirements for Distribution Transformer Tank Pressure Coordination

PC57.13.7 Standard for Current Transformers with a Maximum mA Secondary Current of 250 mA

PC57.120 IEEE Loss Evaluation Guide for Power Transformers and Reactors

PC57.158 Guide for the Application of Tertiary and Stabilizing Windings in Power

Transformers